NSG 3150
EMC TEST SYSTEM

USER MANUAL 601-340B

AMETEK®
COMPLIANCE TEST SOLUTIONS

TESEQ
Advanced Test Solutions for EMC

WARNING - Lethal danger from high voltages and the risk of radiating illegal electromagnetic interference.

This system must be used only for EMC test purposes as specified in these operating instructions.

The NSG 3150 must be installed and used only by authorized and trained EMC specialists.

Personnel fitted with a heart pacemaker may not operate the instrument and must not be in the vicinity of the test setup while it is in operation.

When the system is used in conjunction with options, accessories or other equipment the safety instructions concerning those devices must also be observed.

Content

1 EXPLANATION OF 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.

The following symbol draws your attention to a circumstance where non observation of the warning could lead to inconvenience or impairment in the performance.

Example:

This connection must not be confused with the Equipment under Test (EUT) power input.

The following symbol draws your attention to a circumstance where non observation of the warning could lead to component damage or danger to the operating personnel.

Example:

Never connect or disconnect the EUT while the test system is performing a test.

1.1 General description

The NSG 3150 test system enables cable-borne EMC (electromagnetic compatibility) immunity tests to be carried out on electrical equipment intended for household, office, light industrial or commercial use. The test system is a concept from Teseq AG for electromagnetic immunity testing purposes and fulfills the requirements to accomplish CE marking.

It is an open system, built on a modular principle that communicates through a serial and standardized bus system and has open interfaces available. Operation is performed by means of standardized operator interfaces.

A master controller in the NSG 3150 system architecture takes care of all the “real-time” control functions and communicates with all the function modules both within the instrument’s casing and external devices via an interbus link.

The system has a simple construction. All function units contain a slave controller. All these units are connected together through their slave controllers and networked with the central master controller via a field bus (Interbus). Information concerning the special features and their adjustable parameters are stored directly in the function modules. In addition to this bus system, the NSG 3150 system also has a further interface standard, Ethernet, with which the system can be controlled via single PC, a computer network or even via the Internet.

This modularity enables the function units to be re-combined in ever newer instruments and subsystems. The function units can be readily expanded to cope with new standards and new function units for new parameters can be incorporated in existing systems.

To ensure optimal user and equipment safety, only industry-standard and correctly specified plugs and sockets are used throughout. High voltage outputs are switch-protected.

2 STANDARDS AND APPLICATIONS

The NSG 3150 test system is designed to test lighting, communication and energy distribution equipment, railways and protection systems and relays (e.g. IEC 60255-26). The 15kV surge pulse voltage 1.2/50 µs, 8/20 µs allows manufactures to reach new quality levels, which helps them to outperform competitors.

2.1 Combination wave

The surge test, in compliance with IEC / EN 61000-4-5. Duplicates high voltage / high energy interference as experienced with a lightning strike. Generally speaking, the interference finds its way into equipment via the mains power supply.

This kind of interference can affect equipment in either of two ways. Firstly, the interference can be coupled directly into the equipment via the mains supply. The interference is conveyed directly from the source (e.g. lightning strike to external power cables). Every item of equipment connected to this power source will be affected by the interference pulses.

Alternatively, the pulses from the source of the interference or its associated mains cables can be coupled into other equipment positioned nearby.

Surge pulse interference can also occur on signal and data lines through coupling effects and electrical discharges.

The system enables tests to be carried out using both coupling methods. The EUT is connected to the mains power socket on the front panel of the CDN for direct mains injection tests. Externally coupled tests require the interference to be superimposed onto signal / data line cables via an external coupling unit that is connected to the surge output on the front panel of the CDN.

2.2 Pulsed magnetic fields (option)

Tests with pulsed magnetic fields, or PULSEM tests, simulate the type of interference produced by surge pulses as a result of lightning strikes to buildings and other metallic structures such as freestanding masts, ground conductors, grounding networks, etc. as specified in IEC / EN 61000-4-9. Magnetic fields of this type can upset the operation of installations that find themselves within such fields. The NSG 3150 performs this test by causing a heavy current to flow in a magnetic field coil such that the amplitude of the pulse current produces a proportional field within the coil parameters.

The magnetic field coils, available as accessories, are connected to the surge pulse output socket via an INA 753 pulse shaping network.

With the NSG 3150 it is possible to create magnetic fields much higher than required in the IEC / EN 61000-4-9 standard. It is in the scope of the user to test only inside the Standard requirements

3 SAFETY INSTRUCTIONS

The NSG 3150 system and its accessories operate at high voltages.

WARNING - Improper or careless operation can be fatal!

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.

Neither Teseq AG, Reinach, Switzerland, nor any of its subsidiary sales organizations can accept any liability for personal, material or consequential injury, loss or damage that may result from improper use of equipment and accessories.

3.1 General

The NSG 3150 must be operated only by authorized and trained specialists.

The generator is to be used only for the purpose specified by the manufacturer. The user is directly responsible for ensuring that the test setup does not cause excessive radiated interference which could affect other instrumentation. The test system itself does not produce any excessive EM radiation. However, the injection of interference pulses into a EUT can result in it and / or its associated cables radiating electromagnetic radiation. To avoid unwanted radiation, the standards organizations recommend that the test setup be operated inside a Faraday cage.

WARNING - Because of its construction, the NSG 3150 is not suitable for use in an explosive atmosphere.

WARNING - Personnel fitted with a heart pacemaker must neither operate the 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.

WARNING - Connect the EUT only after the initial system selftest has finished.

- The safety is not guarantee when using the device in other application than specified.
- Under normal operating conditions no toxic gases are released.
- Take care to have access to all connectors for disconnect them in no time in case of emergency.

3.2 Installation

The NSG 3150 test system conforms to protection class 1. Local installation regulations must be respected to ensure the safe flow of leakage currents.

WARNING - Operation without a ground connection is forbidden!

Operate the equipment only in dry surroundings. Any condensation that occurs must be allowed to evaporate before putting the equipment into operation. Do not exceed the permissible ambient temperature or humidity levels. Use only officially approved connectors and accessory items.

Ensure that a reliable return path for the interference current is provided between the EUT and the generator. The ground reference plane and the ground connections to the instruments, as described in the relevant test standards, serve this purpose well.

The test system may only be opened by a qualified specialist upon specific instruction given by the manufacturer. Since the instrument works, on principle, the NSG 3150 must be disconnected from both sources before any modifications to the test setup are undertaken. Besides the mains connections themselves, certain components also operate at high voltages, and are not provided with any form of extra protection against accidental contact.

Take care to have access to all connectors for disconnect them in no time in case of emergency.

3.3 Installation of an EUT power switch

The EUT input should be connected through a properly rated power switch device, which should be located close to the test setup. In order to ensure easy and quick access to the EUT power, the switch should be clearly and visibly labeled as “EUT power ON / OFF”.

The in-house power distribution must be equipped with a proper circuit breaker and an emergency off button as per IEC 61010-1.

WARNING - Operation without a ground connection is forbidden!

Dimensioning of the mains supply and rating of fuse protection of the AC power supply must conform with local electrical codes and EUT requirements. Inappropriate arrangement, mounting, cabling or handling of the EUT or ground can hamper or negate the effectiveness of the NSG 3150’s safety features.

3.4 Applicable safety standards

The NSG 3150 conforms to the safety requirements and offers all the features necessary for safe and efficient operation. Development and manufacture is in compliance with ISO 9001. The system complies with the safety requirements of IEC / EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use).

It is the user's responsibility to ensure that the test rig does not emit excessive electromagnetic interference (EMI) that might affect other equipment. The test system itself does not produce any excessive radiation; however, the injection of interference pulses into the EUT can result in the device and / or its associated cables radiating EMI. To avoid radiating unwanted interference the standards organzations recommend that the test setup be located in a Faraday cage. Since the purpose of the test system is to produce interference signals for interference immunity testing, the requirements in the IEC / EN 61000 series concerning limiting the radiated EMI can only be complied with by operating the test system inside a Faraday cage.

3.5 Test execution

WARNING - The test area must be organized so that unauthorized persons do not have access during the execution of a test. If a safety contact (Interlock) is used as a means of access control to the test zone (e.g. a Faraday cage), then an additional contact connected in series is necessary to provide protection for parts of the EUT that are likely to be touched accidentally.

The user must observe safety instruction for all the instruments and associated equipment involved in the test setup.

Test setup configuration 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.

3.6 User Warnings Generator

WARNING - Users must be aware of the following dangers that can occur during testing:

- **Local burning, arcing, ignition of explosive gases.**
- **EUT supply current surge caused by a flashover or breakdown resulting from the superimposed high voltage.**
- **Disturbance of other, unrelated electronics, telecommunications, navigational systems and heart pacemakers through unnoticed radiation of high frequency energy.**
- **In the test system the interference voltage, corresponding to the level called for in the relevant test specification, is superimposed also on the EUT's protective earth conductor. Earth contacts or pins (e.g. as in German and French mains plugs) as well as the EUT earth itself can therefore be at an elevated voltage level that would make touching dangerous. In many power connectors even the screws are linked to the protective earth.**

Warning symbols on the test system:

CAUTION! Warning of a danger spot (refer to the documentation).

CAUTION! Warning of electrical hazards!

CAUTION! Warning "Lift two men"!

3.7 Dangers concerning the EUT

WARNING - Users must be aware of the following dangers that can occur during testing:

- **EUTs are often functional samples that have not yet been subjected to safety tests. It is therefore possible that the EUT could be damaged by internal overloads or may even start to burn.**
- **As soon as the EUT shows signs of being disrupted the test should be stopped and the power to the EUT switched off.**
- **Internal disruption of the electronics can result in the interference voltage or the EUT supply voltage being present on the EUT's outer casing.**
- **Electrical breakdown or arcing from connections that are overstressed voltage wise during the test.**
- **Explosion of components with fire or fragmentation as a result of energy dissipated, e.g. from the resultant supply current or ignition of vaporized plastic materials.**
- **Faulty behavior by the EUT, e.g. a robot arm strikes out or a temperature controller fails, etc.**

The user is responsible to control the rating and the integrity of all cables connected to the NSG 3150 generator, especially cables connected to the Surge output.

4 FIRST STEPS

This chapter contains a short checklist with steps that should be taken before the instrument is switched on and put into operation.

Check the packaging for signs of damage in transit. Any damage should be reported immediately to the transportation company.

Lift the NSG 3150 test system out of its packaging by grasping of the mounted grips.

NOTE: Do not dispose of packaging materials. All packaging should be retained in the event that the instrument or any of its accessories should need to be returned to a Teseq service center for repair or calibration.

Using the following list, check that all the items ordered have been delivered:

1. NSG 3150 generator
2. User manuals
3. 1 mains power cables for the test system
4. 1 termination plug (interlock blind connector)
5. 1 ground cable (to reference ground plane)
6. WIN 3000 Remote control software (trial version)
7. Ethernet cable, type: SFTP, CAT 5e, 2 m
8. Ordered options

Check the instrument for signs of transport damage. Any damage should be reported to the transportation company immediately.

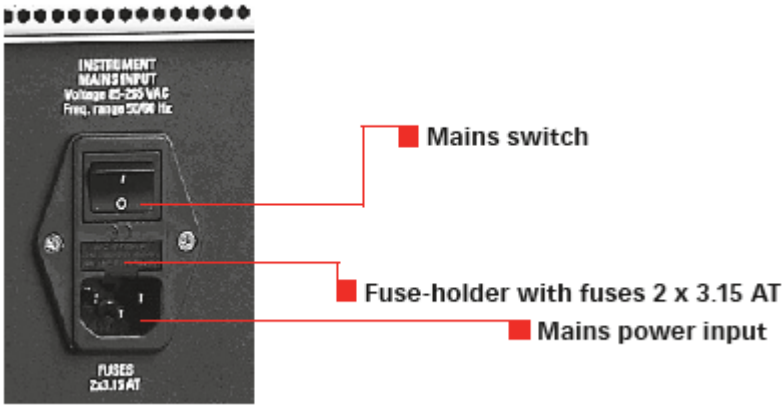
Items delivered with optional CDN

1. CDN 3153-S63 coupling network (optional)
2. 1 mains power cables for the test system
3. 2 HV surge cables GES S125 pro (only with CDN)
4. 1 system cable (connects the CDN to the NSG)
5. 1 EUT power output connector High voltage screw driver

The NSG 3150 is a heavy equipment, need two men to lift!

4.1 Installation of the NSG 3150 system

The mains power voltage indicated on the instrument must correspond with the local supply voltage (mains voltage: 85 to 265 VAC, universal power unit, mains frequency: 50 to 60 Hz).



Mains switch, fuse holder and power input

To replace a fuse:
1) Disconnect the mains cable
2) Pull the fuse holder out of the connector
3) Remove the damaged fuse(s)
4) Insert 1 or 2 x 3.15 AT fuses
5) Replace the fuse holder
6) Plug the mains cable into a power outlet with a solid ground connection
7) Note the polarity of all input and output connections
8) Switch the system on and operate as instructed in this manual

NOTE: Place the test system so that there is sufficient free space around the cooling air inlets on both sides and behind the fan outlet on the rear panel.

NOTE: In case the test system is being used without an Emergency Stop device, make sure to place the system such as the operator has quick access to its power supply switch.

NOTE: Your NSG 3150 generator has been delivered with a correctly rated power supply cable. If the cable needs to be replaced, the user needs to make sure the new cable is suited for the rated supply voltage and current.

4.2 Installation of the NSG 3150 system

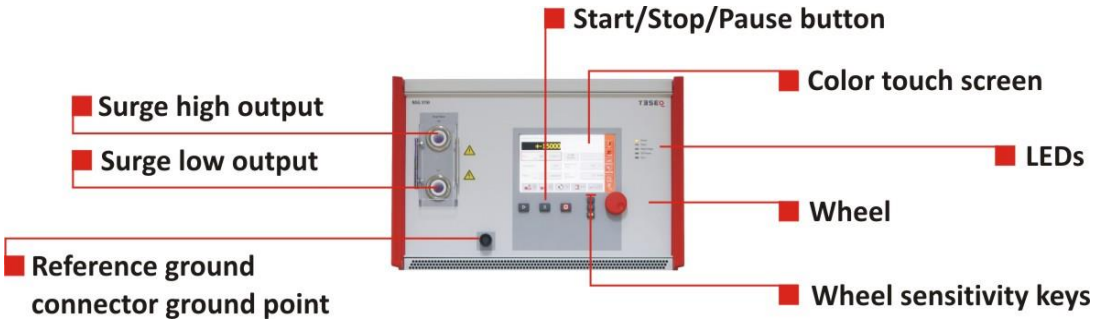
As mentioned in the standard, the generator must be placed on the CDN rack and connect to the ground reference plane which is connected to ground.

Connect the ground terminal on the front panel of the NSG 3150 to the ground reference plane using the link and bolts supplied. If a CDN is connected please refer to section “Reference ground connector”.

5 MAINFRAME DESCRIPTION

The 3150 housing NSG is specially designed for EMC applications and is EMC approved.

5.1 Front panel



5.1.1 Reference ground connector

The earth connection between the CDN and the generator is realized via the shield of the HV connectors. There is no need to connect the ground connector from the generator itself.

Without using a Teseq CDN, the NSG 3150 can be efficiently connected to the ground reference plane using a ground strap connected to the reference ground connector point.

5.1.2 Surge output

These output (high, low) connects the surge output impulse to a 1-phase or 3-phase coupling unit or to another external coupling unit.

These coaxial high voltage output are protected by a plexiglas window. The surge output is potential free (floating). The inner conductor of each connector is the surge high and surge low connection respectively, while the outer conductor (shielded) is connected to the NSG 3150's ground point.

Cable insulation for EUT surge output must be rated for 20 kV

5.1.3 Indicator LEDs

The five indicator LEDs serve to show the most important test system conditions:

LED indicator function	Description
Power on	Instrument/system in operation
Pulse	Shows the occurrence of a pulses or a test event
Pulse blinking	The generator is set to a safe position and need some seconds to move the switch into the final position.
High voltage active	Shows that high voltage is present in the instrument (in line with "Pulse" LED)
EUT-Power on	Indicates when the power supply to the EUT is present at the EUT connector on the front panel
Error	Indicates that a system error has occurred

The LEDs switch on and off during the boot period and when errors occur.

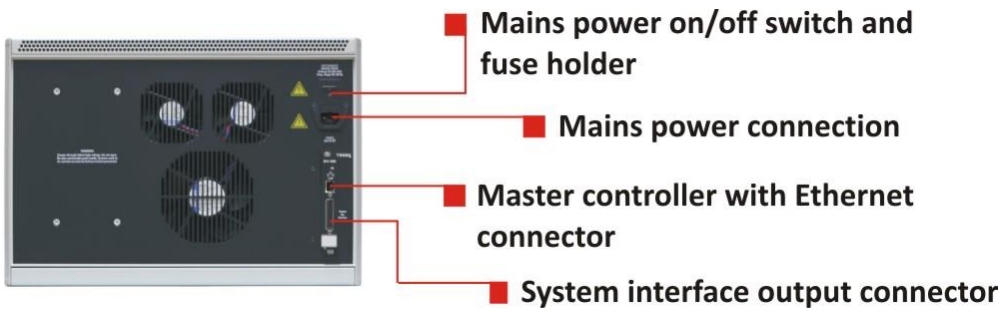
5.1.4 Touch screen and user interface

The color 7” touch screen display controls include a wheel and 3 sensitivity keys used to 1, 10 or 100 steps per wheel click. The Start, Stop, and Pause keys are used to control the procedure.

All user interface function menus and sub-menus are described in chapter 7, standard user interface.

5.2 Rear panel

Rear panel NSG 3150



5.2.1 Instruments mains input

The mains input is the connection point for power to the NSG 3150.

NOTE - Do not confuse the Mains power input with the EUT power input.

This input contains the mains power input connector and the mains fuses.

WARNING - Before operating the NSG 3150, make sure that the voltage shown on the mains input module corresponds with the voltage of the local supply to which the instrument will be connected, and that the fuses are correctly rated (2 x 3.15 AT).

5.2.2 System interface connector 25 pin D sub

Pin #	Sync.line	Signal	Remark	Working direction
7	Sync0	Mains synchronization	Mains voltage passes through the zero crossing point with rising signal level	From a coupling network
5	Sync1	Interlock	Puts the NSG 3150 into an idle state. The «Error» LED lights in this state	From each controller / to interlock circuit
6	Sync2	EUT fail	EUT reports a fault to the NSG 3150 software. The test is stopped	From EUT to master controller
18	Sync3	Trigger to oscilloscope	External device receives the Trigger-to-Scope signal from the generator	To / from the active function module, the slave controller and master controller
17	Sync4	Pulse enable	External device stops the test run	
4	Sync5	EUT power OFF	Connecting this PIN to GND24S will force the EUT power to OFF. Note: First EUT power needs to be switched ON via the instrument front panel or WIN 3000 Software, This allows dual drive, as then the EUT power can be switched OFF and ON either from software control or from this external signal drive.	From external device to the slave and master controllers
16	Sync6	High voltage ON	Output is High when HV is active	Output to drive INA 3001 warning lamps
3	Sync7	Pulse LED	Used to synchronize the pulse LEDs of different units	From a pulse module
2, 8, 15, 20, 22		GND	Sync bus ground return	
1, 9, 14, 21		+ 24 V	Interbus +24 V supply	
19		Interlock return	Interlock return line	
All others		Interbus lines		

See chapter “System interface connector functions”, for more detail.

5.2.3 Synchro-Bus system

This connection includes external device control and interlock capability. If the NSG is used only as a stand alone unit, the termination connector needs to be plugged otherwise the unit will not start.

All connected accessories will be detected automatically. Written tests are linked with this accessories so if other accessory is connected, it may get an error if the test contains not the suitable accessories.

Any automated CDN and complementary automated equipment need to be linked together. Thereby the termination connector needs to be moved to the system output plug of the last unit of the system.

The interfaces for the interbus, interlock and synchro-bus are bundled together in a sub-miniature D-connector. These three interfaces are looped through from one instrument to another.

NOTE - Good EMC engineering practices should be applied when connecting signals to this port. As the whole system generates disturbances, in order to avoid auto disturbing, all wires connected to this port should be properly shielded, the shield of the cable should not serve as signal return path and the shield should be connected via a large surface to the conductive shell of the Sub-D plug.

6 THE STANDARD USER INTERFACE (SUI)

The NSG 3150 Standard User Interface (SUI) consists of

– A 7” color touch panel
– A wheel for setting parameters
– A wheel sensitivity keys labeled 1, 10, and 100 to denote the units
– A Start key to start tests
– A Stop key to stop tests
– A Pause key to pause tests.

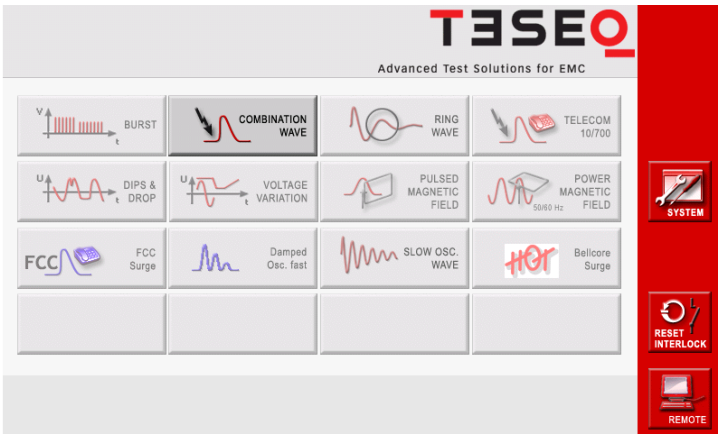
NSG 3150 touch screen, keys and wheel

CAUTION – Never use a metal, sharp or pointed tool for touching the panel. Use a soft towel for cleaning. Never use aggressive cleaning liquids.

As soon as the unit is powered and switched on, the boot procedure starts (approx. 30 s) and the Start menu is displayed.

SUI boot-up screen

6.1 Front panel



Main menu NSG 3150

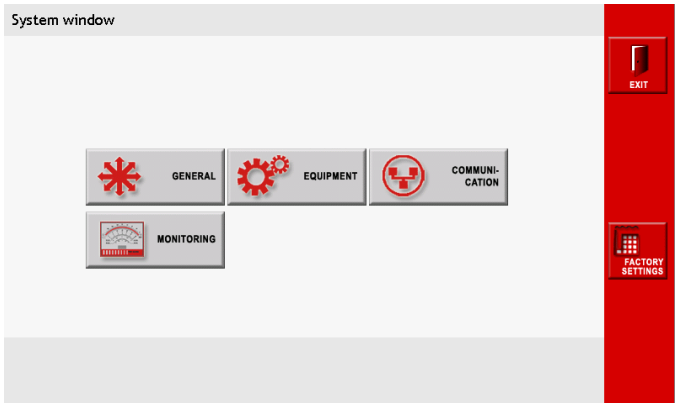
The main menu is displayed following boot-up. The main menu shows the possible pulses or tests which are available (combination wave, surge) in the NSG 3150. Faded generator icons (e.g. Telecom 10 / 700 us pulse and voltage variation) mean, that the generator is configured to generate those pulses but the proper unit is not connected. The empty buttons are reserved for future applications.

In the red vertical bar there are two buttons, “System” and “Reset Interlock”. Touching the Reset interlock button will close the interlock. The interlock must be closed before starting a test.

REMOTE
Touch “Remote” button to enter remote controlled screen. No inputs via touch panel are possible. The NSG can now be controlled via WIN 3000 remote control software. Touch “Exit” on screen and in WIN 3000 to use NSG manually.

6.2 System window

Touch the “System” button to display the “System” window:



System window

The “System” window displays 4 buttons: GENERAL, EQUIPMENT, COMMUNICATION and MONITORING. In the red bar there are two buttons: FACTORY SETTINGS and EXIT.

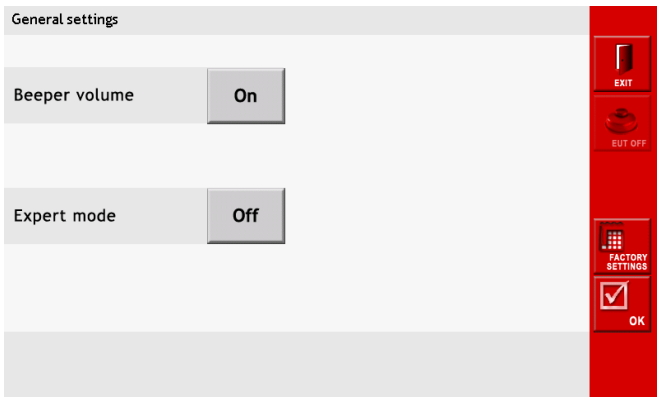
FACTORY SETTINGS

Touch the FACTORY SETTINGS button to reset the properties associated with each of the buttons in the System window to the original factory settings.

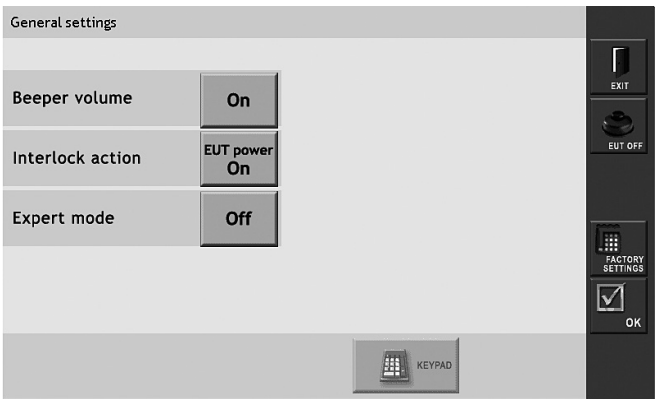
EXIT

Touch the EXIT button to return to the main menu.

6.2.1 GENERAL settings



General settings window when no optional hardware (CDN, variac, etc.) connected.



General settings window when an EUT power switch has been detected.

Beeper volume

During the surge test there is a beep sound to alert the user. Touch the “Beeper volume” button to switch the sound on and off. Default setting is “On”, for safety purpose.

The red vertical bar on the right side of the General settings window displays 4 buttons: “Exit”, “EUT OFF / ON”, “Factory Settings”, and “OK”.

Interlock action

Touch the “Interlock action button” (“EUT power On” in the example) to keep EUT power on when the interlock is activated, or to have it automatically shut off (“EUT power Off”) when the interlock is activated.

EXIT

Touch the “Exit” button to return to the system window without saving settings.

EUT ON / OFF

The “EUT ON / OFF” button is used only when an option with a built-in EUT switch, such as a CDN 3153-S63 is connected to the NSG 3150.

The NSG 3150 itself does not have an EUT switch. Touching the button will turn the EUT switch on or off.

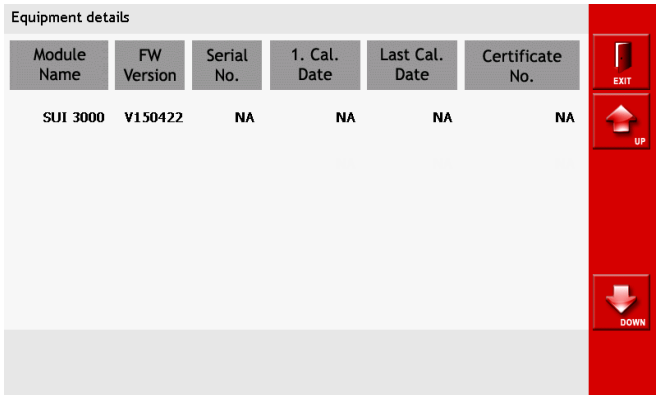
FACTORY SETTINGS

Touch the “FACTORY SETTINGS” button to reset the properties associated with each of the buttons in the general settings window to the original factory settings.

OK

Touch the “OK” button to save all settings and return to the system window.

6.2.2 GENERAL settings



Equipment window

Touch the “Equipment” button to access a list of all internal and external generator modules, including firmware versions, serial numbers, calibration dates and certificate numbers.

The red vertical bar on the right of the equipment window displays three buttons: “Exit”, “Up” and “Down”.

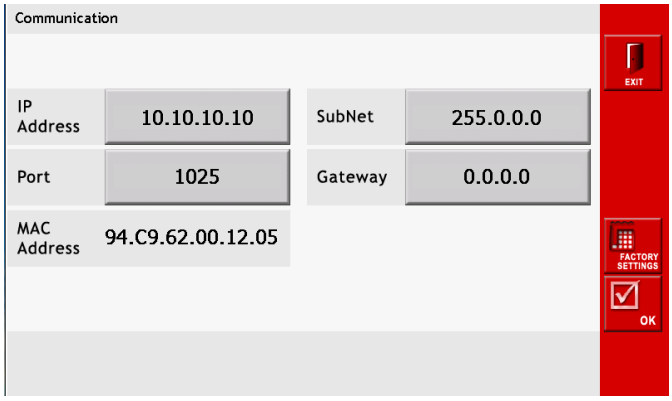
EXIT
Touch the “Exit” button to return to the system window.

UP / DOWN
If the system includes more than 5 modules, touch the “Up” and “Down” arrows to scroll through the list.

Viewing the current SUI version

See entry starting with “SUI 3000” under column “FW Version” (in the example above: 150122).

6.2.3 COMMUNICATION screen



Communication window

Touch the “Communication” button to view and enter the network address information required to integrate the NSG 3150 into a local area network or connect it to a PC.

By touch the IP address-, SubNet-, Port- or Gateway-field the key board will appear and the new numbers can be added. To enter a new address only the number key and the dot may be used. After touching “Enter” the keypad will close and the new setting are saved. The “Del” key will delete all text entered. The backspace button (<--) will delete the last letter entered. Touch the “cancel” button to return to the test parameter window without saving the parameters.

IP address
An IP address (Internet protocol address) is a unique address that certain electronic devices uses to identify and communicate with each other on a computer network utilizing the Internet Protocol standard (IP). Any participating network device must have its own unique address. Touch the “IP Address” button to enter the IP address. Enter the IP address using the virtual keypad and confirm with “Enter”.

Subnet
A subnet is a logical grouping of connected network devices which is used to partition networks into segments. Devices on a subnet share a contiguous range of IP address numbers.

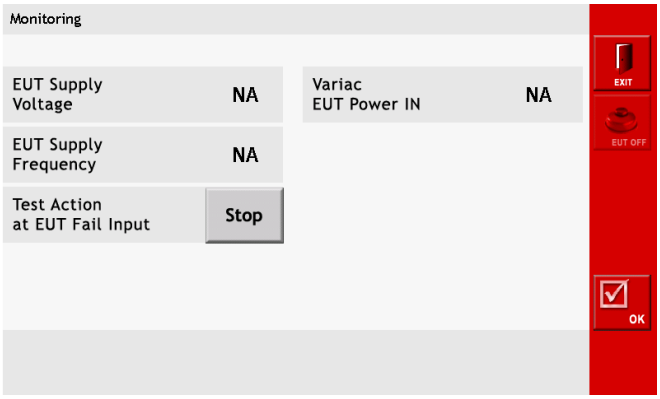
A subnet mask defines the boundaries of an IP subnet and hides the network address portion of an IP address. For example, if a network has a base IP address of 192.168.0.0 and has a subnet mask of 255.255.255.0, then any data going to an IP address outside of 192.168.0.X will be sent to that network’s
gateway.
Touch the “SubNet” button to enter the subnet mask. Enter the subnet mask using the virtual keypad and confirm with “Enter”.

Gateway
A gateway is a node on a network that serves as an entrance to another network. In enterprises, the gateway is the computer that routes the traffic from a workstation to the outside network that is serving the Web pages. In homes, the gateway is the ISP that connects the user to the internet.
In enterprises, the gateway node often acts as a proxy server and a firewall. The gateway is also associated with both a router, which use headers and forwarding tables to determine where packets are sent, and a switch, which provides the actual path for the packet in and out of the gateway.
The gateway address is usually set at 0.0.0.0. Touch the “Gateway” button to enter the gateway address. Enter the gateway address using the virtual keypad and confirm with “Enter”.

Port
Network ports can be either physical or virtual connection points. The NSG 3150 has a physical Ethernet port that allows it to be connected to a PC or router.
The port address for the NSG 3150 should be set to 1025. Touch the “Port” button to enter the port number. Enter the port number using the virtual keypad and confirm with “Enter”.

MAC address
Media Access Control (MAC) technology provides a unique identification and access control for devices on an IP network. This address cannot be changed. Media Access Control assigns a unique number, the MAC address, to each network adapter.

6.2.4 MONITORING screen



Monitoring window

Touch the “Monitoring” button to view EUT power input parameters, and to control test activity and EUT power input in the event of EUT failure.

EUT Supply Voltage, EUT Supply Frequency
In case a CDN 3153-S63 is connected to the NSG 3150, the “EUT Supply Voltage” field displays the actual EUT voltage when the AC EUT input supply is connected and EUT power is switched “On”. When the input supply is not connected and / or the EUT is switched off, these fields will display NA.

The EUT Supply frequency field shows the measured frequency of the EUT supply voltage.

Test Action at EUT Fail Input
Touch the “Test Action at EUT Fail Input” button (“Stop” in the example) to specify the test action taken if the “EUT fail input” (on system Interface port) is activated.

When the button is set to “Stop” and the “EUT fail input” is activated, the test stops. The test can be restarted by pressing the Start key on the front panel.

When the button is set to “Pause” and the “EUT fail input” is activated, the test goes into pause mode. The test can be continued by pressing the “Start” key on the front panel. When the button is set to “CONT.”, the test will continue even if the EUT fail.

EUT Power Supply at EUT Fail Input
Touch the “EUT Power Supply at EUT Fail Input” button (not shown on example) to specify the action taken if an “EUT fail signal” is generated.

When the button is set to “On”, EUT power stays ON after the “EUT fail Input” is activated.

When the button is set to “Off”, EUT power shuts down when the “EUT fail Input” is activated.

EXIT
Touch the “Exit” button to return to the system window without saving changes.

EUT ON / OFF

This button displays the EUT input power status.

OK
Touch the **”Ok”** button to save changes and return to the system window.

6.3 Updating SUI software via the SC-card

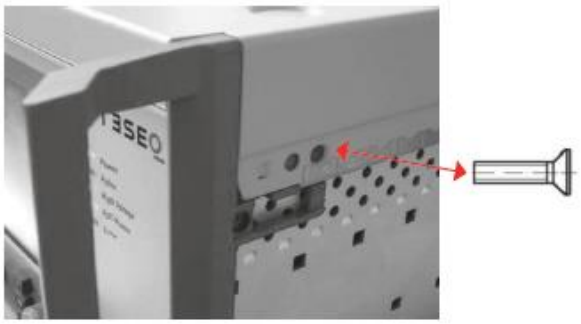
To change the SUI software, first switch off the generator and remove all power cords and cables. Open the top housing cover of the generator as described below.

WARNING - Before opening the generator make sure that it is turned OFF and disconnected from all power and signal cables!

For complete discharge of the NSG 3150's internal capacitor we recommend to wait 24 hours, before opening the device.

To open the NSG 3150, the user must first remove the sides panels. Each side panel has 4 snap fixtures which will separate when outward pressure is applied.

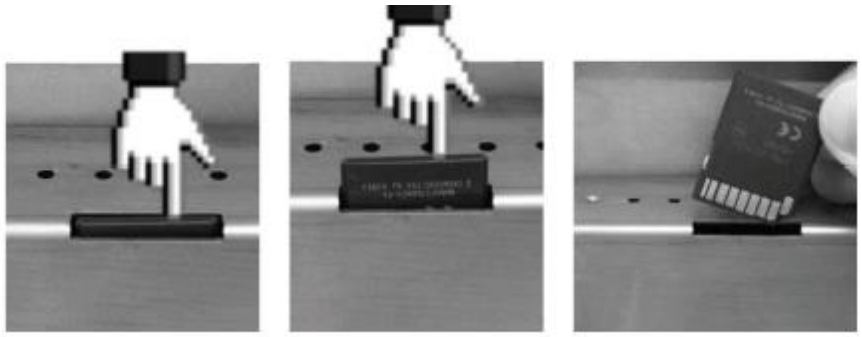
1. Pull outward on the indentation in the front of the side panel. A blunt tool which will not scratch the paint on the panel may be used.
2. Pull outward to separate the panel from the snap fixtures.
3. Remove the upper screws on both sides of the generator cover.
4. Remove the NSG 3150 cover. The SD-card slot is located at the right front of the generator, in back of the front panel.
5. Press the SD-card to release it. Remove the card from the slot. To install a new SD-card, proceed to step 7.
6. To download new software from a PC to the SD card, insert the card in the SD port of the PC and copy the software to the SD card. The file name must remain SUI3000AP.EXE. Remove the SD card from the PC.
7. Insert the SD-card in the NSG 3150. Follow steps 1 - 4 in reverse to replace the generator cover and side panels.
8. Restart the NSG 3150. The new software version will boot automatically and may be verified in the equipment detail window (see section 7.2.1).



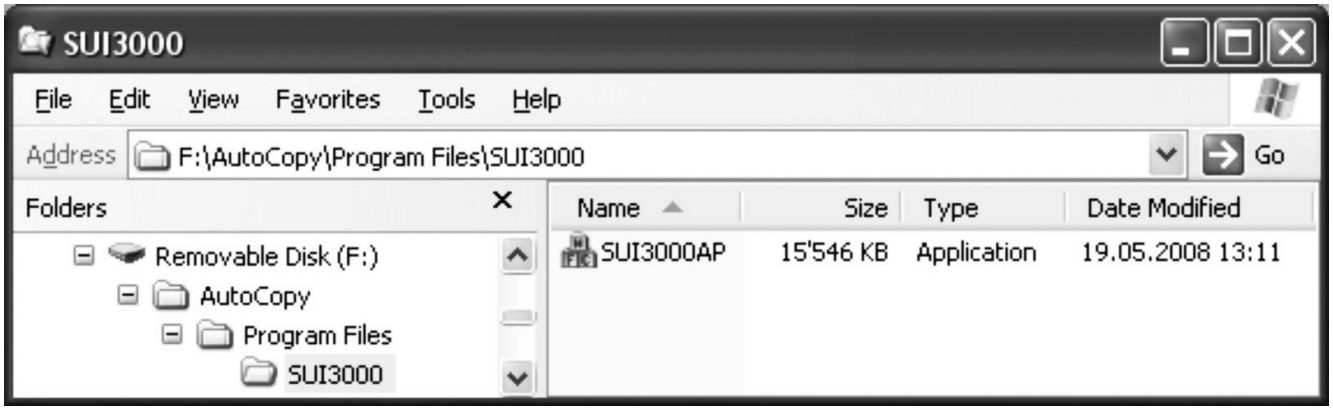
Removing the NSG 3150 side panels and cover

The SD-card is placed on the upper right position

NSG 3150 SD-card slot



Removing the SD-card



Windows explorer displaying the SUI program filename (SUI3000AP.EXE) on the SD-card (removable disk (F:)

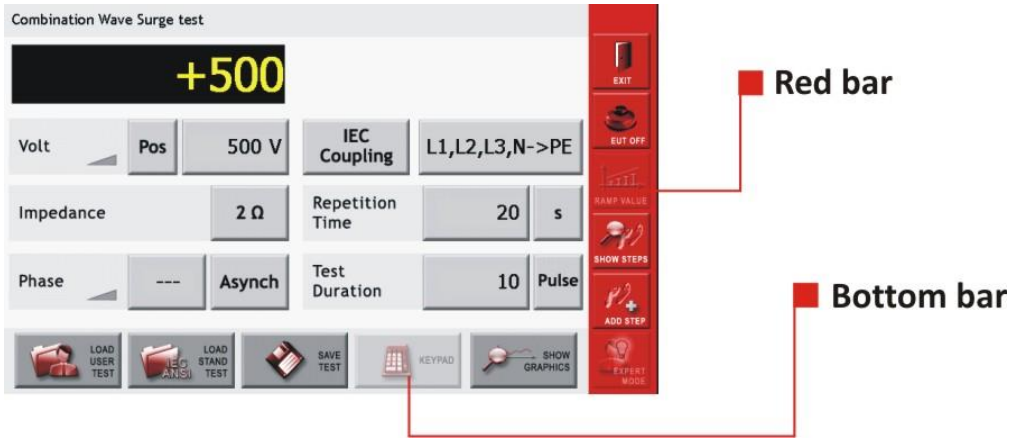
NOTE: Do not change the SUI program filename.

7 PARAMETER SETTING WINDOW

The main menu displays a button for every type of test that can be performed by the NSG 3150. Buttons for tests that are not available on the system as configured are greyed out.

The user can set parameters for available tests and create new tests in the test parameter window.

The next figure shows the test parameter window for burst tests. While the input fields differ for each type of test, the red side bar and bottom bar remain the same.



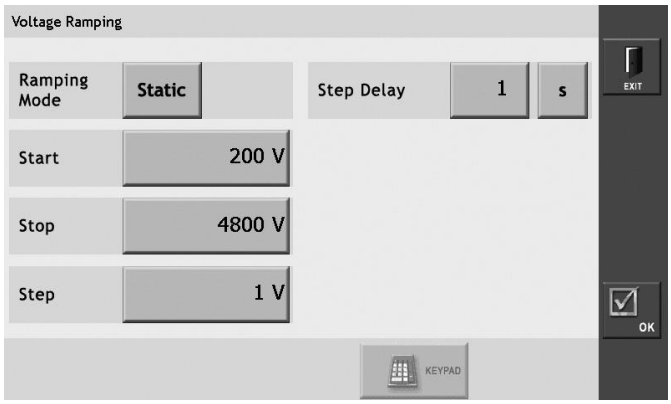
Example of the surge test window, showing the red bar and bottom bar.

7.1 The red menu bar

EXIT
Touch the “Exit” button to return to the system window without saving settings.

EUT OFF / EUT ON
Touch the “EUT Off / EUT On” button to switch EUT power off or on. Note: The EUT power function can work only in combination with an automated accessory, such as a variac, step transformer or automated CDN.

RAMP VALUE
The “Ramp value” button is active only if a rampable parameter in the test window is selected. All rampable parameters are identified by a small gray ramp icon. This icon will turn red when a parameter is ramped.



Ramping window for voltage parameter

- Ramping mode — Touch the “Ramping mode” button (“Static” in the example) to change the ramping mode from static to linear. In linear mode the user can set Start, Stop and Step values.
- Start — Touch the “Start” button (“200 V” in the example). A red frame is displayed around the field. Enter the Start value using either the wheel or the keypad.
- Stop — Touch the “Stop” button (“4800 V” in the example). A red frame is displayed around the field. Enter the Stop value using either the wheel or the keypad.
- Step — Touch the “Step” button (“1 V” in the example). A red frame is displayed around the field. Enter the Step value using either the wheel or the keypad.
- Step delay — Touch the “Step delay” button (“1” in the example). A red frame is displayed around the field. Enter the Step Delay value using either the wheel or the keypad. Touch the “Unit” button (“s” in the example) to set the step delay unit. The step delay depends on pulses and the minimum repetition rates.

OK
Touch the “OK” button to save all settings and return to the test parameter window.

EXIT
Touch the “Exit” button to return to the test parameter window without saving settings.

SHOW STEPS
Touch the “Show Steps” button to view, change the order of, or delete individual test steps. The show step window displays individual test steps in the order that they will be executed.

- **UP / DOWN**
  Use the “UP” and “DOWN” arrows on the right side of the Show Step window to change the test step order. Touch a line number to select a step. A red frame is displayed around the selected step. Touch the “UP” button to move the step up in the list. Touch the “DOWN” button to move the step down in the list.

- **DEL**
  Touch a line number to select a step. A red frame is displayed around the selected step. Touch the “DEL” button to delete the step.

- **OK**
  Touch the “OK” button to save all settings and return to the test parameter window.

- **EXIT**
  Touch the “Exit” button to return to the Test parameter window without saving settings.

ADD STEP
Multi-step tests can be programmed manually in the test parameters window using the “Add Step” button.

Touch the “Add Step” button create a new step with the values currently displayed in the Test parameters window. The user can program a maximum of 10 test steps.

When the first test step is programmed, “Test Step 1 / X” is displayed in the upper right corner, and the step can no longer be changed from the Test parameters window.

To change a step, the user must first delete it using the “Show Step” button, then use “Add Step” to re-enter the step.

Refer to sections 8.3 - 8.9 for detailed information on setting parameters for specific types of tests.

7.2 The bottom bar

7.2.1 LOAD USER TEST

Touch the “Load User Test” button to display a list of all test files that have been created and saved by the user. Only files for the selected test type are displayed. The Figure below shows the load user test window with several burst tests displayed.

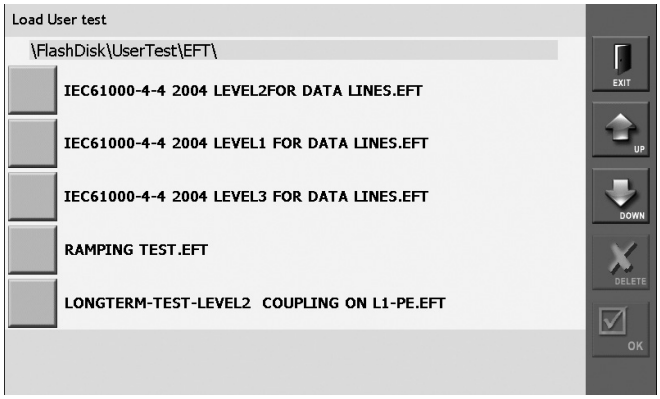
The user can scroll through the tests by touching the “UP” and “DOWN” arrows on the right side of the screen to scroll through the tests.

Touch the button to the left of the test name to select it. A red border is displayed around the selected test.

Touch the “OK” button to load the test and return to the test parameter window.

Touch the “Delete” button to delete a saved test. A window asking the user to confirm or cancel this action will be displayed. Touch “OK” to delete the file, or “Cancel” to cancel this action.

NOTE: Once a test has been deleted it cannot be restored.



Load user test window

7.2.2 LOAD STANDARD TEST

The NSG 3150 includes all necessary test libraries corresponding to the latest editions of the IEC basic standards from the IEC / EN 61000-4-x series. They conform to many standard derivate and product standards.

Depending on the selected pulse the appropriate IEC standard tests can be selected.

Following standard tests are included in the SUI:

Combination wave (Surge), IEC 61000-4-5 [1.2/50 µs & 8/20 µs]
1-Phase power lines L-N coupling level 1 up to level 4
1-Phase power lines L-PE coupling level 1 up to level 4
1-Phase power lines N-PE coupling level 1 up to level 4
3-Phase power lines Lx-Lx coupling level 1 up to level 4
3-Phase power lines Lx-PE coupling level 1 up to level 4

DC-Line L-N coupling level 1 up to level 4
Unshielded unsymmetrical I/O lines level 1 up to level 4
Unshielded symmetrical communication lines level 1 up to level 4

Pulsed magnetic field, IEC 61000-4-9
CF 0.98, level 3 up to level 5
CF 3.4, level 3 up to level 5

7.2.3 SAVE TEST

The “Save Test” button is used to save the current test to a file for later use.

Touch the “Save Test” button. A keyboard is displayed. Touch the individual keys to enter a file name in the black bar above the keyboard.

The “Delete” key will delete all text entered. The backspace button (<--) will delete the last letter entered. Touch the “Enter” button to save the file under the name entered.

All letters and numbers, as well as hyphens, spaces and dots, can be used in file names. The maximum file name is 40 characters, including spaces.

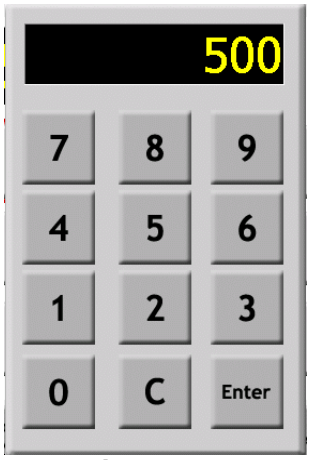
The system automatically generates a file extension to identify the type of test. For example, all surge tests will are given the extension CW.

Touch the “Cancel” button to return to the test parameter window without saving the file.

7.2.4 KEYPAD

Touch the “Keypad” button to display a numeric keypad. The Keypad button is active only when the user has selected a parameter that requires a numeric entry.

Touch individual numbers to enter them, touch “C” to clear an entry, and touch “Enter” to enter the value in the field. After touching “Enter” the keypad will close.



Keypad

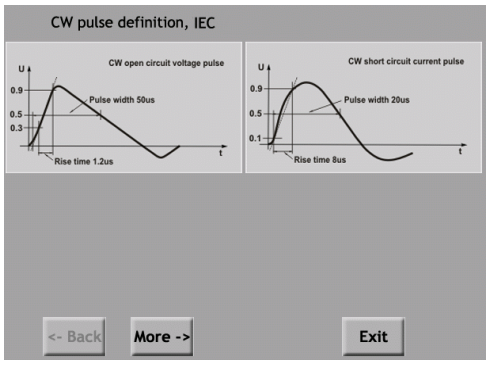
7.2.5 SHOW GRAPHICS

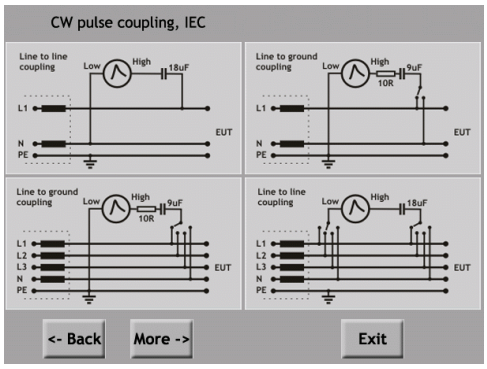
Touch the “Show Graphics” button to display waveforms, coupling diagrams and other graphical information for the selected test.

Touch the “More” button to view additional information.

Touch the “Back” button to view previous graphics.

Touch the “Exit” button to return to the Test parameters window.





Example surge pulse graphs

7.3 Combination wave (Surge) parameter setting

The surge test generates high voltage pulses as specified in the international standards EN / IEC 61000-4-5.

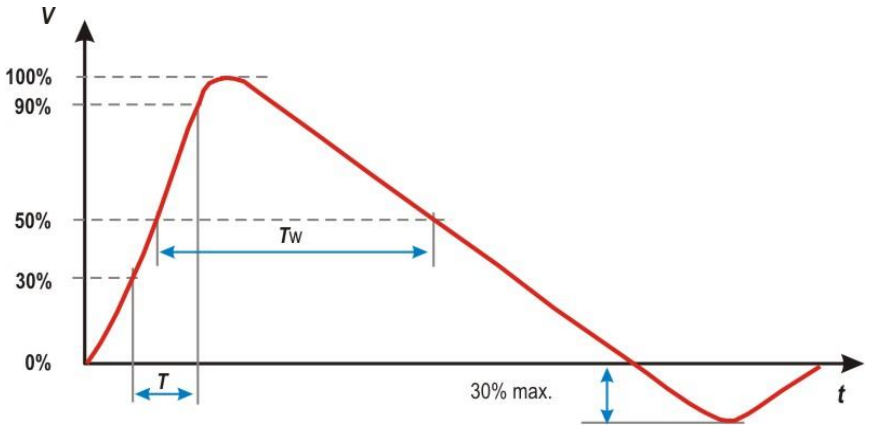
7.3.1 Test configuration for power line coupling

Test pulses are injected directly into the EUT power supply lines as they pass through the mains CDN 3153-S63. The EUT obtains its power from the EUT power outlet on the front panel of the CDN where the mains voltage has the interference signal superimposed on it.

7.3.2 Test configuration for external coupling

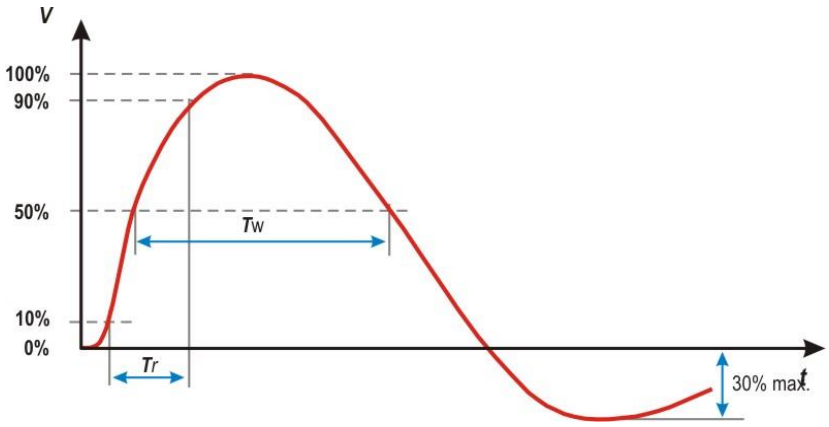
In this mode, the interference pulses are switched to the surge Hi and Lo output sockets on the front panel, to which an external data line signal coupler can be connected. By using such an external signal couppler it is possible to superimpose the interference signal, as specified in the standards, on communication cables and other kinds of data lines.

The same HV output sockets may also be used for connection to all other CDNs.



Front time Tf = 1.67 x T = 1.2 µs ± 30%
Duration Td = Tw= 50 µs ± 20%

Wave shape of open circuit voltage (1.2 / 50 µs), wave shape definition according to IEC / EN 61000-4-5.

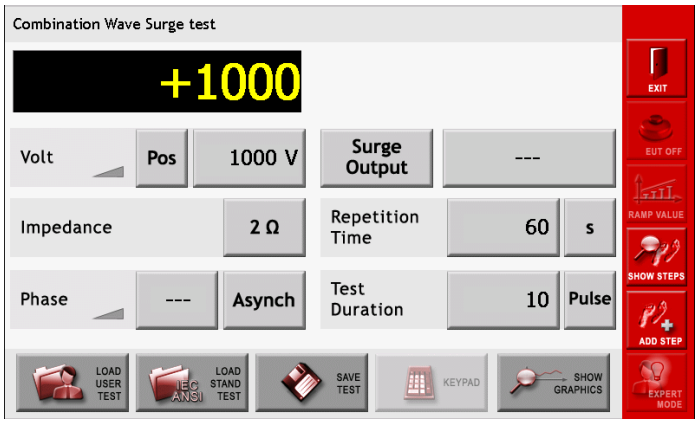


Front time T1 = 1.25 x Tr = 8 µs ± 20%
Duration: Td =1.18 x Tw = 20 µs ± 20%

Wave shape of short circuit current (8 / 20 µs), wave shape definition according to IEC / EN 61000-4-5.

WARNING - Using improper equipment when measuring surge pulses can result in personal injury or equipment damage.

NOTE - Teseq recommends using a CIC-Research DP20-20K High voltage differential probe in combination with a Pearson Model 4997 20 kA for surge pulse verification.



CW Parameter window

7.3.3 Voltage

Touch the “polarity” button (ALT in the example) to select test polarity. Polarity values are: **positive (POS), negative (NEG), or alternating (ALT).**

On odd pulse number there will be one pulse less in negative then in positive. Positive pulse will be first executed.

Touch the “voltage” button (1000 V in the example) to enter the test voltage. A red frame is displayed around the field. The voltage value may be entered using the wheel or the keypad.

7.3.4 Impedance

Touch the “impedance” button (2 ohms in the example), it will repetitively change between 2 Ω and 12 Ω.

7.3.5 Phase

Touch the “Sync / Async” button (Async in the example) to activate the synchronization of test pulses to the EUT mains frequency.

When this button is set to Asynch, the “phase value” button (--- in the example) will display ‘---’. When this button is set to Synch, the user must also set the phase value.

To set the phase value, touch the “phase value” button. A red frame is displayed around the field. The phase value may be entered using the wheel or the keypad.

The value is in degree units and may range from 0 to 359. Synch mode is only available if the EUT power is switched on.

7.3.6 Coupling

Touch the “coupling mode” button (in the example) to select **SURGE OUTPUT, MANUAL CDN or IEC COUPLING**.

Surge output
Select SURGE OUTPUT when a pulse is to be applied directly to the EUT; for example, in component testing of non-powered EUTs.

Manual CDN
This setting will compensate the loss of an external manual CDN such as the CDN 3083 or CDN 117.

NOTE - The EUT supply selection must match the EUT supply input on the rear panel of the CDN and the connections to the EUT from the front panel of the CDN. Otherwise, the coupling path setting will be switched incorrectly.

High / low
The coupling path will be shown by open or closed relay signs. The relay buttons are not selectable, they are for information only.

By touching the “OK” button the selected coupling will be activated. With “cancel” it will close the window without saving the coupling selection. By touching the button “Show Graphics” it will illustrate a graphical setting.

IEC coupling
When IEC coupling is selected the window in figure below displayed.

Touch the individual “High” and “Low output coupling” buttons (L, N, and PE in the example), to select an open or closed relay.

Touch “OK” to enable the coupling selection and close the window.

Touch “Cancel” to close the window without saving the coupling selection.

Touch “Show Graphics” to display a graphical example of the coupling selection.

IEC coupling selection window

7.3.7 Repetition time

Touch the “Repetition time” button (60 in the example) to set the test repetition time. A red frame is displayed around the field. The repetition time may be entered using the wheel or the keypad.

Touch the “units” button (s in the example) to set the time unit. Time units are s and min.

7.3.8 Test duration

Touch the “Test Duration” button (10 in the example) to set the test duration time. A red frame is displayed around the field. The duration time may be entered using the wheel or the keypad.

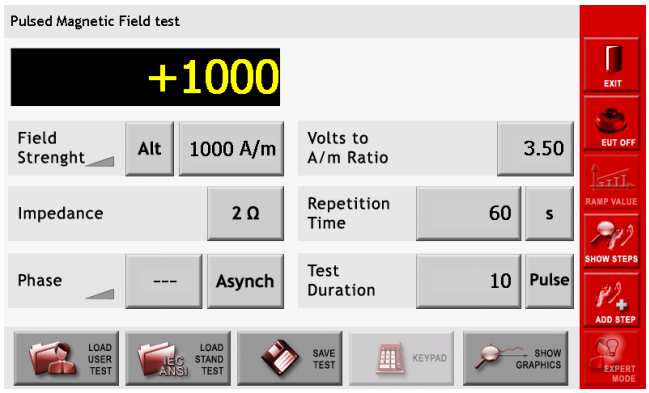
Touch the “units” button (pulse in the example) to set the unit. Unit values are pulse and cont (continuous).

7.4 Pulsed magnetic field testing (-4-9) parameter setting

Tests with pulsed magnetic fields simulate the type of field produced by surge pulses such as those occurring during lightning strokes on buildings and other metallic structures such as free-standing masts, lightning conductors, earth networks, etc.

The NSG 3150 in conjunction with the **pulse wave shape adaptor** and a **loop antenna** it generates these fields in accordance with the IEC 61000-4-9 standard by inducing a surge current into magnetic field loop.

It is recommended for the user to stay away (at least a few meters) from the loop antenna while magnetic fields are generated. Also keep away magnetic field sensitive devices and items such as credit cards – magnetic key cards etc. which might be influenced by the field.



Pulsed Magnetic Field test window

Parameter	Value
Field:	1 to 9999 A / m (in 1 A / m steps)
Polarity:	positive / negative / alternate
V to A / m ratio (Coil factor):	0.35 to 99.99
Impedance:	2 Ω
Repetition time:	s: 10 ... 600, min: 1 ... 10
Test duration:	1 to 9’999 pulses, Continuous
Phase synchronization:	asynchronous, synchronous 0° to 359º, (in 1º steps)

More information about variable voltage sources is available in section 14 “Accessories”.

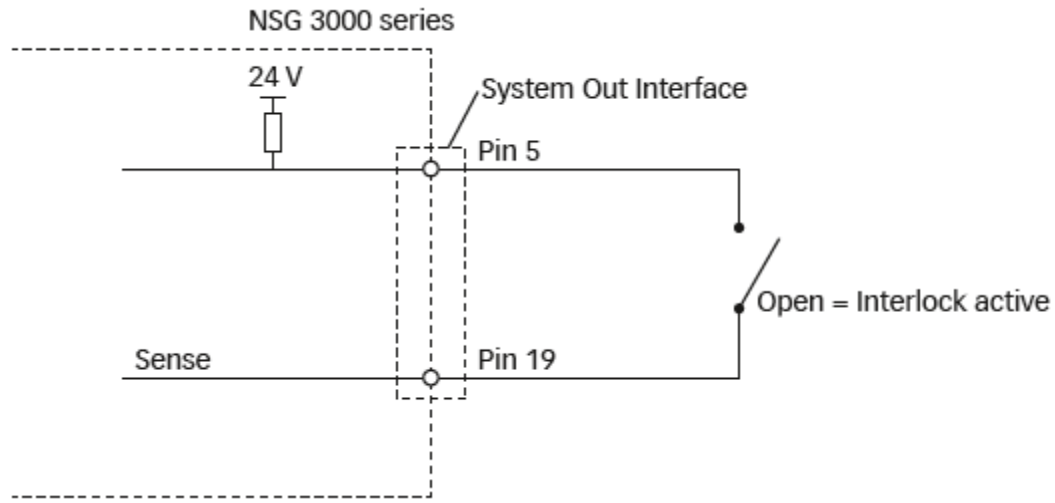
8 DESCRIPTION OF THE 25 PIN D-SUB SIGNALS

Good EMC engineering practices should be applied when connecting signals to this port. As the whole system generates disturbances, in order to avoid auto disturbing, all wires connected to this port should be properly shielded, the shield of the cable not serving as signal return path, the shield to be connected via a large surface to the conductive shell of the Sub-D plug.

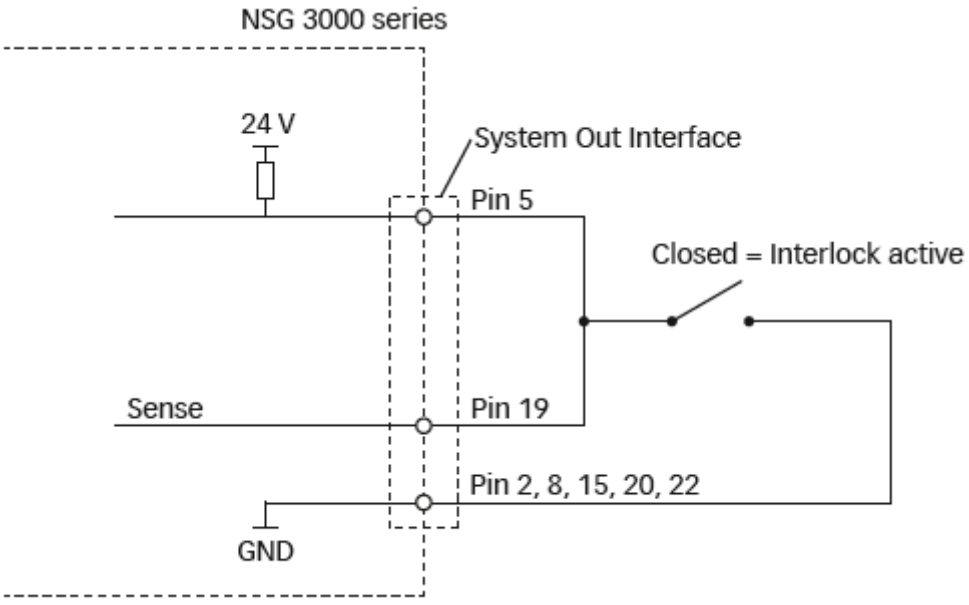
8.1 Interlock

The interlock has to be connected following one of the two options below.

Interlock connection option 1



Interlock connection option 2



This connection is an integral part of the interlock safety circuit. If a number of units are incorporated in a system, then these connections can be “daisy-chained” together to form a single safety circuit. If no external interlock circuit is required, then the shorting connection must be made by using the terminator connector supplied. Otherwise pulse generation in the system will be inhibited.

A built in circuit breaker enables the EUT power supply also to be switched off, while the interlock function only blocks the generation of pulses or any other ongoing test resp.

The interlock is a safety function to ensures the following:

- The interlock forms a bus to which all instruments in a system are connected.
- The interlock feature can be connected to external safety devices (door contacts, test enclosure hoods, etc.).
- If any part of the interlock circuit is interrupted, all the generator modules are inhibited from producing or switching high voltages. Additionally, the power supply to the EUT can be switched off too.
- Activation of this safety feature is reported to the master controller.
- The master controller is also notified when the interlock facility is reset.
- Once the interruption is over and the re-instatement of the interlock has been acknowledged, then power to the EUT is restored.

Activation of the interlock function is achieved without the help of microprocessors and software. This ensures that the safety feature is not affected or hindered in the event of a program crash.

8.2 Trigger to scope output signal

Between Pin 18 (hi) and Pin 2, 8, 15, 20 (low)
Inactive state: at 24 V, in the active state: < 2.4 V

Note: The trigger signal has generally a duration of approx. 50 µs e.g. for surge testing.

8.3 Synchronization (Sync) signal: Output signal

Between pin 7 (hi) and pin 2, 8, 15, 20 (low)
Inactive state: at 24 V; in the active state: < 2.4 V

The sync signal consists of a level that goes low for each cycle of the mains frequency. The reference is the signal at the power supply input (“EUT supply IN”). The position (timewise) of the sync signal corresponds to the specified phase angle (converted into time, irrespective of the supply frequency).

The sync signal is only active while an AC test is in progress and Phase is set to sync.

8.4 Pulse enable / next step input

Between pin 17 (hi) and pin 2, 8, 15, 20 (low)
Input open = inactive; input shorted = active

If this input is activated during a test run the test is halted (exactly the same as the pause function in the control software). The test will continue to run as soon as the input is made inactive again.

If the input is already active before a test is implemented, then the test cannot start.

8.5 EUT fail input

Between pin 6 (hi) and pin 2, 8, 15, 20 (low)
Input open = inactive; input shorted = active

This connection serves as a control input that can be activated externally.

The EUT can activate this input if it is capable of reporting a disturbance effect caused during an EMC test. Such events are time / date stamped by the system and are stored together with the current test parameters for subsequent use in a test report if required.

8.6 EUT power off

Between pin 4 (hi) and pin 2, 8, 15, 20 (low)

Input open = Inactive, EUT power is controlled via front panel or WIN 3000 software

Input shorted = Active, in case EUT power is switched on, shorting this input will set EUT power to off

Notes:

1. Using this function only makes sense if an EUT power contactor is available somewhere in the system. EUT power contactors are available in CDN 3153-S63.
2. First the EUT power has to be switched ON via front panel or WIN 3000 software. This way allows dual drive, as the EUT power can then be switched OFF either from software control or from this external drive.
3. This signal is also used to drive the orange lamp of INA 3001 warning lamps.

8.7 High voltage active

Between pin 16 (Hi) and pin 2, 8, 15, 20 (low).

This function is activated for firmware revisions 2.30 and higher.

This output is to drive external warning lamps INA 3001. The HV on signal is working together with the high voltage LED located on the front panel.

Output high (24 V): High voltage is ON
Output low (0 V): High voltage is OFF

9 TECHNICAL DATA

Parameter	Value
Pulse voltage (open circuit):	± 500 V to 15.0 kV (in 1 V steps)
Pulse current (short circuit):	± 250 A to 7.5 kA
Impedance:	2 / 12 Ω
Polarity:	Positive / negative / alternate
Phase synchronization:	Asynchronous, synchronous 0° to 359º (in 1º steps)
Coupling:	IEC / external / manual
Pulse repetition:	10* .... 600 s (in 1 sec steps) 1 .... 10 min. 500 V – 4400 V 10 s @ positive, negative 20 s alternate 4401 V – 8000 V 20 s 8001 V – 12000 V 35 s 12001 V – 15000 V 50 s
Test duration:	1 to 9999 pulses, Continuous
Instrument supply	85 to 265 VAC, 50 / 60 Hz (max. 3.15 A)
Fuse	3.15 A slow blow

Mechanical

Dimension (W x H x D)	554 mm x 257 mm x 500 mm
Weight	44 kg

Environment

Temperature	10 °C to 40 °C
Humidity	30 % to 78 %, non condensing
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1,060 mbar)

Operating in high altitude

At lower atmospheric pressure, the user has to respect the reduced withstand voltage of the air. The user must reduce the maximun charging voltage.

10 COUPLING / DECOUPLING NETWORKS

These CDN 3153-S63 is fully automatic controlled, featuring plug and play technology - just connect them to the NSG 3150 and they will auto detect and auto configure at system power up, available coupling possibilities will show up in respective test windows.

All CDN 3153-S63 feature:

■	Manual and programmable control of EUT power ON / OFF
■	Input phase rotation detection (CDN 3153-S63 only)
■	Thermal monitoring of internal backfilter chokes; in case the EUT current goes up, the integrated fans, which are still in standby mode and at low EUT currents, will speed up to improve cooling.
■	In case of intentional or unintentional overloading, the CDN 3153-S63 will automatically switch off EUT power, in order to protect itself (risk of fi re).

10.1 CDN 3153-S63

NSG 3150 on top of CDN 3153-S63

Technical specifications:

Voltage ratings:	400 VAC - phase to neutral or phase to ground
	690 VAC - phase(s) to phase(s)
	up to 1000 VDC - full current range (only with optional INA 3151-63)

11 VARIOUS NSG 3150 VERSIONS

11.1 NSG 3060-TS-EXT telecom surge (10 / 700us) extension unit

NSG 3060-TS-EXT

The NSG 3060-TS-EXT is an extension chassis for the NSG 3040/60 and NSG 3150 series which contains the functionality to generate the so called telecom surge pulse (10 / 700 us). With its pulse voltage up to 7.7 kV it fully complies not only with IEC 61000-4-5 but also with the highest requirements of the ITU-TK series standards.

This extension unit becomes necessary either because the NSG 3150 has no space for auxiliary modules. If you wish to extend your testing capability to the Telecom Surge 10/700 us, you need this extension.

Note: The NSG 2260-TS-EXT can only be operated in combination either with a NSG 3040/60 or NSG 3150 generator.

12 MAINTENANCE AND FUNCTION CHECK

12.1 General

Inside the test system there are no adjustable elements accessible to the user neither for calibration nor for maintenance purpose.

The housing of the test system must not be opened (except for SW update via SD-card). Should any maintenance or adjustment become necessary, the whole test system, together with an order or fault report, should be sent to a Teseq service center.

Maintenance by the user is restricted to cleaning the outer housing, performing a function check and verify cation of the pulse parameters.

12.2 Cleaning

In general, a moist cloth is sufficient for cleaning the outer housing, including the touch panel. If necessary add a small amount of a mild, non-foaming household cleanser.

No chemicals (acid, etc.) should be used for cleaning purposes.

Before beginning to clean the test system ensure that it is switched off and the mains power cable is unplugged from the supply.

12.3 Function check

As soon as the test system is switched on the Power-LED should light up. If this is not the case then please check the mains power connection to the test system as well as the fuses, voltage selector and any other cabling.

The instrument automatically carries out a diagnostic routine once it has been successfully switched on.

The generator cannot perform any test while the interlock circuit is open.

Pulse generation can be observed at the output connectors by means of an oscilloscope. This is a practical way to check that the system is functioning correctly but should never be used for reference or calibration purposes.

Do not connect the oscilloscope directly in order not to exceed its max. input voltage.

Teseq recommends the use of a HV differential probe type with adequate input range.

12.4 Calibration

The combination of high voltages and high frequencies in a single pulse makes the calibration of EMC pulse generators particularly demanding and difficult. Teseq has one of the few accredited test laboratories in Europe that is in the position to undertake calibrations in this specialized field.

12.5 Warranty

Teseq grants a warranty of 2 years on this test system, effective from the date of purchase.

During this period, any defective components part will be repaired or replaced free of charge or, if necessary, the test system will be replaced by another of equivalent value. The decision regarding the method of reinstating the functional capability is at the sole discression of Teseq.

Excluded from the warranty is damage or consequential damage caused through negligent operation or use as well as the replacement of parts subject to degradation.

The warranty is rendered invalid by any intervention on the part of the customer or a third party.

The faulty items have to be returned in their original packaging.

Teseq accept no responsibility for damage in transit.

13 DECLARATION OF CONFORMITY (CE)

AMETEK
COMPLIANCE TEST SOLUTIONS

TESEQ
Advanced Test Solutions for EMC

Teseq AG Sternenhofstrasse 15 4153 Reinach Switzerland
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Declaration of conformity

CE

Manufacturer:	Teseq AG
Address:	Sternenhofstrasse 15, 4153 Reinach, Switzerland
	declares that the following product
Product:	**NSG 3150**
	conforms to the following Directives and Regulations
	EMC Directive 2014/30/EU LVD Directive 2014/35/EU
Generic standards:	EN 61326-1:2013 EN 61326-2-1:2013 EN 61010-1:2011

The purpose of this instrument is the generation of defined interference 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 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.

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By	A. Gerstner General manager	A. Burger Business Manager Conducted EMC
Place	Kamen, Germany	Reinach BL, Switzerland
Date	09. December 2016	09. December 2016

14 ACCESSORIES

The NSG 3150 is suitable for perform surge impulses up to 15 kV There are many surge applications where the NSG 3150 is suitable with using auxiliary equipment that is rated for lower surge voltages.

When using accessories rated for lower surge impulse voltages, the user is responsible not to test with higher voltages than the used equipment is rated.

14.1 PC software

WIN 3000

WIN 3000 remote software is a comprehensive program designed to create test libraries for the surge / burst, PQT, magnetic field and SOW tests that can be performed with Teseq's NSG 3000 generator series and its accessories.

WIN 3000 comes on a CD-ROM included in each NSG package or can be downloaded from the Teseq web site. Insert the CD-ROM and double click on setup. exe and follow the instructions on the screen.

The required communication cable (Crossover S-FTP cable) is part of the delivery.

All required documentation is available on the CD-ROM in PDF fi le format.

Consult first the document "Software Version History Vx.yz", to verify which FW and SUI version you may need to install for a proper function of the generator. WIN 3000 requires always the corresponding FW and SUI software.

The proper FW and SUI software are on the WIN 3000 installation disk or can be downloaded from the Teseq website.

WIN 3000 features a free 30 days license of the professional version WIN 3000- SRD.

WIN 3000-SDR

The extension "SDR" stands for "Sequences" – "Dialogs" – "Reports"

WIN 3000-SDR is the professional version of PC Software for NSG 3xxx series. It features the basic settings possibilities of WIN 3000, inclusive parameter ramping, stepping, etc.… and includes additionally:

- Test library covering most of basic and generic standards.
- Test sequencer
- Real time report facility in MS-Word
- Dialogs facility with the user

WIN 3000 and NSG 3000 series can run via a LAN connection.

A Win 3000 software license is always valid for a specific NSG 3xxx instrument.

Nevertheless, the Software can be installed on an unlimited number of computers since the dongle is the NSG 3xxx instrument itself.

14.2 Magnetic field options

The NSG 3150 is suitable for perform pulsed magnetic field tests as per IEC 61000-4-9. The user is responsible that the applied surge impulse voltage is in a Range up to 1000 A/m that corresponds to a surge impulse voltage of approx..2300V.

The user is responsible that the applied surge impulse voltage is in a Range up to 1000 A/m that corresponds to a surge impulse voltage of approx.2300V.

Pulsed magnetic fields

Tests with pulsed magnetic fields simulate the type of field produced surge pulses such as those occurring during lightning strokes on buildings and other metallic structures such as free-standing masts, lightning conductors, earth networks, etc.

NSG 3150 generates these test signals in accordance with the IEC 61000-4-9 standard by inducing a current (generated by the surge module CWM 3151) into magnetic field loop in which the magnetic field produced in proportional to the current within the loop parameters.

It is recommended for the user to stay away (at least a few meters) from the loop antenna while magnetic fields are generated. Also keep away magnetic field sensitive devices and items such as credit cards – magnetic key cards etc. which might be influenced by the field.

Magnetic field loops INA 701, 702 and INA 703

Tests with mains frequency and pulsed magnetic fields are performed using the magnetic field loops designed for NSG 3150. These are rectangular loops measuring 1 x 1m and are suitable for test objects with dimensions up to 0.6 x

0.6 x 0.5 m (l x w x h).

Three types of loop can be supplied:

INA 701

The INA 701 is a 1 x 1 m loop – single turn - with a coil factor of 0.89. It enables the generation of field strengths of up to 3.6 A / m for mains frequency fields 50 or 60 Hz when used with the MFO 6501 or MFO 6502 current sources and 1200 A / m for pulsed magnetic fields, where the current is generated by a 4400 V surge generator.

INA 702

The INA 702 is a 1 x 1 m loop - 11 turns – coil factor 9.8 - when fitted with the power plug. It enables the generation of field strengths of up to 40 A / m for mains frequency fields 50 or 60 Hz when used with the MFO 6501 or MFO 6502 current sources.

INA 702 becomes a single turn loop when fitted with the pulse plug, which allows the generation of pulsed field strengths up to 1200 A / m, where the current is generated by a 4400 V surge generator.

In order to meet the pulse waveform required by IEC 61000-4-9, the waveshape adapter INA 752 needs to be used with NSG 3150 and the INA 701 and INA 702 loop antennas.

The tests are carried out using the so-called immersion method, i.e. the item under test is placed in the center of the loop. The test is performed in accordance with the IEC 61000-4-8 (mains frequency) or IEC 61000-4-9 (pulsed) standards for magnetic fields.

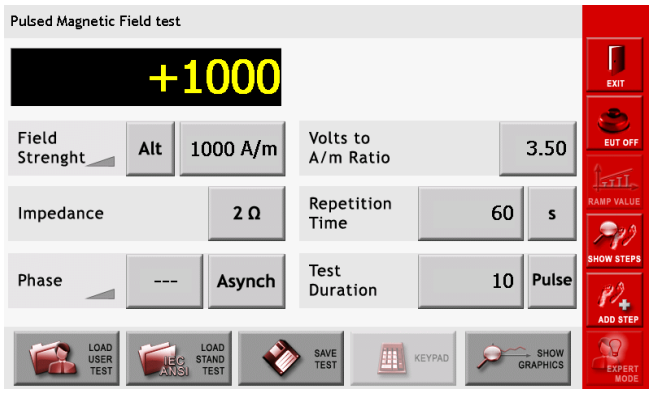
14.3 Pulse wave shape adapter INA 752

The pulse waveshape adapter INA 752 is a standard accessory for the Teseq NSG 3000 series. It provides a convenient means for interconnecting the NSG 3150 surge generator with the loop antennas INA 701 or 702 and insures that the generated pulsed magnetic field has the waveshape as specified in the application standard.

The combination NSG 3150 with CWM 3151– INA 752 – INA 701 (or 702) is required for magnetic field testing for pulsed fields up to 1200 A / m. It complies to the requirements of IEC 61000-4-9.

The control is fully automatic, driven from NSG 3150. Click on following icon:

Following test screen will appear:



Once the right Volts to A / m ratio – which is available on the INA 752 as well then in its calibration certificate is entered in its respective field, the user will be able to enter the required test level directly in A / m – no need for him to proceed with calculations, the instrument software does the job.

In case an INA 702 loop antenna is used, the termination plug labelled "Pulse" need to be used.

Technical specifications NSG 3150 (CWM 3151) - INA 752 - INA 701 /INA 702

Parameter	Value
Volts to A / m ratio*:	3.55
Magnetic field adjustment:	Software driven, NSG 3150 settings 200 to 4400 V => allows 60 to 1200 A / m
INA 752 weight:	0.6 kg
INA 752 dimensions:	140 x 75 x 55 mm

* Typical, exact value is given on INA 752 front panel

14.4 Coupling decoupling networks for data lines

14.4.1 Surge CDN for unsymmetrical data lines CDN 117

Teseq's CDN 117 coupling-decoupling network enables convenient testing with surge pulses of 1.2 / 50 µs on data, signal or peripheral lines, as specified in many product standards. The test method, severity levels, permissible reaction of the EUT and specification of the coupling networks are included in IEC / EN 61000-4-5.

All coupling methods described in IEC / EN 61000-4-5 for unshielded unsymmetrical line pairs can be performed both in differential- and common mode coupling (line-to line and line-to-ground).

The user can manually select coupling modes by connecting the surge generator's output to the appropriate input of the CDN 117.

Several CDN 117s can be arranged in parallel for applications in which more than two conductors must be decoupled.

The CDN 117 can be easily interfaced with the EUT and is designed as a bench top unit. It can be used with Teseq's NSG series or any industry standard surge generator with the appropriate connector adapter.

Technical specifications

Signal line		
Max. operating voltage:	AC 250 VDC 250 V	
Max. operating current:	1.5 A	
Ohmic resistamce per path:	2.5 Ω	
Decoupling chokes 1 KHz:	20 mH nominal	
Pulse:	1.2 / 50 µs pulse	
Max. pulse voltage:	6.6 kV	
Accessories:		
Series resistor:	2 x 40 Ω, 6 W	
Coupling adapters:	INA 170	Sparkling gap device, 90 V trip voltage
	INA 171	Capacity 0.1 µF / / spark gap, device, 90 V trip voltage
	INA 174	Capacitor 0.5 µF

14.4.2 Surge pulse CDN for symmetric datalines CDN 118

Teseq's CDN 118 coupling-decoupling network is designed for convenient surge testing of telecommunications equipment to IEC / EN 61000-4-5, which specifies a 1.2 / 50 or a 10 / 700 µs pulse.

The CDN 118 includes the special decoupling network and coupling elements that are required for these tests.

The CDN 118 can be easily interfaced with the EUT and is designed as a bench top unit. It can be used with Teseq's NSG series or any industry standard surge generator with the appropriate connector adapter.

Technical specifications

Parameter	**Value**
Max. operating voltage:	AC 250 V, DC 250 V
Max. operating current:	0.5 A
Ohmic resistamce per path:	3 Ω
Decoupling chokes 1 KHz:	20 mH nominal
Pulse:	1.2 / 50 and 10 / 700 µs pulse
Max. pulse voltage:	6.6 kV line to ground, 3 kV line to line
Accessories:	
Resistor networks:	INA 172 4 x 100 Ω, 6 W, INA 175 4 x 160 Ω, 6 W
Coupling adapters:	INA 170 Sparkling gap device, 90 V trip voltage INA 171 Capacity 0.1 µF / / spark gap, device, 90 V trip voltage INA 173 Short circuit connector

14.5 Measuring accessories

14.5.1 CIC-Research DP20-20K differential high voltage probes

The CIC-Research DP20-20K high voltage differential probes are ideally suited to allow EMC engineers to verify their conducted EMC test generators periodically. Their performance permits to be used for many other purposes where higher voltages have to be measured in a potential free manner.

Annual calibration and periodic verification
The annual calibration of test equipment recommended by most of the quality systems (ISO 9000, ISO 17025, etc.) has to be considered as a validation of all measurements done since the last calibration.

Many EMC standards call for a verification of the test equipment before and after every test session. If the verification shows differing results, no valid test results can be assumed and the test equipment has to be re-calibrated. It is therefore highly recommended that the EMC test engineer periodically verifies his test equipment in order to ensure good functionality and accuracy.

Periodic verification can be done before a test session or once a day or week or month; it is up to the user to decide. Only a few points need to be checked, which will take only a few minutes if the right test equipment is available.

Potential free (differential) measurements
Since it may be useful to measure pulses superimposed on the mains for periodic verification purposes, it is essential to work with differential measurements. Using classic non-differential probes and connecting with reversed polarity will result in the oscilloscope chassis being connected to the mains. In the best case a circuit breaker will trip, in the worst case, for example if the oscilloscope is battery powered or supplied via an isolation transformer, the oscilloscope chassis will be at a voltage equal to mains voltage plus the peak pulse voltage, which could be lethal for the user. CIC-Research DP20-20K high voltage differential probe DP20-20 is ideally suited to measure all kinds of EMI pulses in the microsecond range, industrial, telecom and automotive surges as well as power line dips, interrupts and distortions.

CIC-Research DP20-20K

Technical specifications DP20-20K

Attenuation ratio:	1:20,000
Bandwith:	DC to 120 MHz
Accuracy:	+ / 1.0 %
Max. input voltage different mode:	30 kV peak
Max. input voltage common mode:	15 kV peak
Input impedance:	20 MΩ / 2 pF each input ground
Common Mode Rejection	-145 dB at 100 Hz; -115 dB at 100 kHz,
CMRR (typical):	-100 dB at 10 MHz
Operating temperature:	-40 ºC to + 85 ºC (-40 ºF to 185 ºF)
Dimensions (L x W x D):	168 mm x 183 mm x 92 mm (6.625 x 7.22 x 3.625”)
Connector to scope:	50 Ω RG223 BNC-BNC and auxiliary earth lead
Input connectors:	4 mm safety plugs
Power	±5.20 V @ 100 mA
Weight:	2.5 kg approx. (5.5 lbs)

14.5.2 Pearson Model 4997 surge pulse current probe for 20 kA

The Model 4997 probe has been specially designed to verify surge current pulses as specified in IEC / EN 61000-4-5.

The main advantage of the Model 4997 current probe is, that the measuring system is physically isolated from the circuit under test. The probe can be used for current pulse verification on surge generators.

The Model 4997 current probe is ready to use as coming along with pre-mounted coaxial cable. The BNC-end plug needs to be connected to the high-impedance input or 50 Ω input of an ordinary memory oscilloscope. Then the conductor carrying the surge current to be measured is passed through the hole in the current probe. The resulting voltage wave shape on the oscilloscope will then be an authentically reproduction of the actual current wave shape within the given accuracy.

Technical specifications

Max. peak. Current:	20,000 Amp
Max. RMS current:	150 Amp
Sensitivity:	0.01 V / Amp (MΩ system), 0.005 V / Amp (50Ω system)
Hole diameter:	53.3 mm, 2.1 “
Probe connector:	BNC (UG-290A/U)
Scope coax cable:	BNC
Operating temperature:	0 to 65°C
Output impedance:	50 Ω
Accuracy:	<±1 %

14.5.3 Calibration adapters (Accessories)

	INA 3154	**15 kV pulse verification box** **18 µF capacitor for NSG 3150** Dimension: 250mm x 160 mm x 155 mm Connection cable to generator: 0.5 m Weight: 3.9 kg
	INA 3155	**Pulse verification voltage probe adapter** Surge calibration adapter set of 2 pieces to connect CDN 3153-S63 to the HV probe ex. DP20-20K or current probe Pearson Model 4997. Can also be used for EUT connection to CDN 3153-S63 via banana plugs, limited to 32 A.

14.5.4 Options

	**INA 3157**	**15 kV Surge output to banana jack** HV-plug set (surge out) for NSG 3000 series for cable diameter 10.3 mm. Can be used for connection to external CDN, or to make an injection probe to couple surge pulses to shielded data lines and EUT's housings.
	INA 3050	**3 phase isolation transformer,** 90KVA, Input 690V (p-p), Output 190/380/690V (p-p) Max 75A

15 SYSTEM DESCRIPTION

Parameter	Value	
Dimensions NSG 3150:		
W:	449 mm	(17.7”)
H:	310 mm	(12.9”; 7 HU)
D:	565 mm	(22.2”)
Weight NSG 3150:	41.2 kg	(90.8 lb) approx.
Dimensions CDN 3153-S63:		
W	554 mm	(21.8”)
H:	1105 mm	(43.5”; X HU)
D:	600 mm	(23.6”)
Weight CDN 3153-S63:	234 kg	(516 lb) approx.

Description:	Test system for EMC tests with mains-borne interference in accordance with the EN 61000-6-1 and 2 standards for surge tests. Operation via touch-screen or software-wise via a PC link Ethernet TCP / IP interface. Pulse output to external coupling networks. Housing for bench-top or rack use.
Housing:	Bench-top housing made of metal with moulded plastic front panel. Supplementary rack-mounting kit.
Mains on / off:	On / off switch on rear panel of the instrument
Indicator LED’s on front panel:	Power on: LED, yellow, Pulse: LED, green, High voltage active: LED, red, EUT Power on: LED, green, Error: LED, red
Safety functions:	Main fuses, interlock, EUT fail input
Ambient conditions:	+5° to 40°C, 20 to 80% relative humidity (non-condensing), 68–106 kPa atmospheric pressure
Self-test:	Routines for functional self-test
Relevant safety standards:	IEC 61010-1 safety requirements for electrical equipment used for measurement and control purposes as well as laboratory use
Relevant EMC electro-standards:	IEC / EN 61000-6-1 and 2; generic standards for magnetic interference immunity

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