



CDN 3063 SERIES AUTOMATED 3-PHASE COUPLING/DECOUPLING NETWORKS

USER MANUAL 601-315E

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1 EXPLANATION OF THE SYMBOLS USED IN THIS MANUAL



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 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.

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



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

The NSG 3040/3060 with its CDN may only be installed and used by authorised and trained EMC specialists (electrical engineers).

The NSG 3040/3060 with its CDN must only be used for EMC tests as set down in these operating instructions.



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

Lethal danger from high voltages and the risk of high levels of electromagnetic radiation being generated.

The system must only be used for EMC test purposes as set down in these operating instructions.

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

2 INTRODUCTION



2.1 General description

The NSG 3040/3060 test systems are designed primarily for cable-borne transient interference tests as specified in the European generic standard IEC/EN 61000-6-1 covering equipment for household, office and light industrial use, and IEC/EN 61000-6-2 for applications in industrial environments, in accordance with the requirements of the basic standards. IEC/EN 61000-4-4, -5, -12 as well as -8 and -9 .

The EU directive no. 2004/108/EEC (for the assignment of the CE symbol) refers back to this standard for this type of equipment.

The CDN 3063 is modular and automated coupling/decoupling network, depending on the version it can inject surge and/or burst pulses.

The modularity has the advantage that upgrades can be performed at any time in a cost effective way, ensuring a safe investment in future laboratory needs.

The CDN 3063 in connection with the NSG 3060 can handle the special ANSI C62.41 recommendation. This standard requires that the EUT power voltage level has to be taken into account.

In combination with NSG 3040 the CDN 3063 is not able to take EUT frequency and EUT voltage into account like the NSG 3060.

2.1.1 CDN 3063 automated 3-phase coupling/decoupling networks

CDN 3063 series is a family of 3-phase coupling networks, rated to test equipment of 16 A, 32 A, 63 A or 100 A per phase. They are able to couple combination wave - ring wave pulses up to 6.6 kv and EFT pulses up to 4.8 kV.

No PQT test can be selected since the three phase PQT test recommends other test units like the Tesseq Proflin 2100 system. 1-phase PQT test is only available in the CDN 3061 and NSG 3040.

3 SAFETY INSTRUCTIONS



The coupling networks CDN 3063 are intended for use with surge and/or burst generators. These generators produce high voltage test pulses with high energy.



Improper or careless handling can be fatal! The instrument must only be accessible to trained persons.

These operating instructions, together with the generator manual, form an essential part of the equipment and must be available to the operator at all times. All the safety instructions and advice notes are to be observed.

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

3.1 General

Use of the coupling device in combination with the generator is restricted to authorized and trained specialists.

The user is directly responsible for ensuring that the test rig 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 energy.

To avoid problems with unwanted radiation the standards organisations recommend that the test rig is operated inside a Faraday cage.



Because of its type of construction the instrument is not suitable for use in an explosive atmosphere.



Persons fitted with a heart pacemaker must not operate the instrument nor approach the test rig while a test is being executed.

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



Upon switching on the generator, it will perform a self test. This includes the function of the EUT coupling relays and the detection of the EUT input power for synchronisation. Therefore the EUT output is to be considered as carrying EUT power all the times!

The test rig must provide adequate insulation protection for up to 8 kV surge and burst. Particular care should be given to the connections between the CDN and the equipment under test (EUT).

The EUT may only be tested when placed inside a suitable protective enclosure which should provide protection against flying fragments, fire and electric shock.

The pulse voltage must not be able to find its way to unearthed metal objects in the event of the EUT failing.

Only use the instrument in a dry room.

Never leave the instrument unattended when the EUT is switched on.

Do not open the instrument. Repairs and adjustments must only be carried out by qualified maintenance personnel.

Do not continue to use the CDN in case of mechanical damage. The CDN housing and the cables have both insulating and a screening function, which can only be assured while the housing is intact. Return the damaged CDN to a Teseq service center immediately for repair.

4 INSTALLATION



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



Operation without a protective earth connection is forbidden!



Switch off EUT power before accessing EUT power IN or OUT terminals.

The terminals of the three phases CDN 3063 are accessible with the included insulated Allen key.

Two independent protective earth connections are necessary (for the test system and the EUT). These must be connected back to the local permanent installation or to a fixed, permanent protective earth conductor.

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 reference ground plane and the earth connections to the instruments, as described in the relevant test standard, serve this purpose well.

Since the instrument works, on principle, with two independent power supplies (one for the coupling network and one for the EUT), the CDN 3063 must be disconnected from both sources before any modifications to the test rig are undertaken. Besides the mains connections themselves, certain components also operate at high voltages, which are not provided with any form of extra protection against being accidentally touched.

4.1. Installation of a power emergency off switch

The CDN itself has an internal power switch to control EUT power ON/OFF, accessible via the user interface or the software, but nevertheless, it is recommended to connect the EUT power through a properly rated circuit breaker and an emergency off button as per IEC/EN 61010-1:2001. In order to ensure an easy and quick access, the button should be located close to the test setup and should be clearly and visibly labelled as a device for "Emergency power ON/OFF" switching.



The test setup should only be accessible to trained persons.

Dimensioning of mains supply and rating of fuse protection of AC or DC power supply must conform with National prescriptions and EUT requirements.

Inappropriate arrangement, mounting, cabling or handling of the device under test or the protective elements can make the protective features that are incorporated in the design of the instrument worthless.

5 APPLICABLE SAFETY STANDARDS



The construction of the instrument conforms to the safety requirements and offers everything 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).

All mains power driven types of units are designed for high voltage working safety.

The interference immunity has been tested in accordance with EN 60326-1. It is the user's responsibility to ensure that the test rig does not emit excessive electromagnetic interference (EMI) which might affect other items of 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 starting to radiate EMI. To avoid radiating of unwanted interference the test rig might be operated in a Faraday cage.

Since the purpose of the test system is to produce interference signals for interference immunity testing, the requirements in IEC/EN 61000-6-x series concerning limiting the radiated EMI can only be complied with by operating the test system inside a Faraday cage.

6 PULSE COUPLING



Various types of CDN 3063 models are available.

Type	Description
CDN 3063-B32	Automated 3-phase coupler for burst only with an EUT current rate of 32 A
CDN 3063-S32	Automated 3-phase coupler for surge only (combination and ring wave) with an EUT current rate of 32 A
CDN 3063-C32	Automated 3-phase coupler for burst and surge with an EUT current rate of 32 A
CDN 3063-B63	Automated 3-phase coupler for burst only with an EUT current rate of 63 A
CDN 3063-S63	Automated 3-phase coupler for surge only (combination and ring wave) with an EUT current rate of 63 A
CDN 3063-C63	Automated 3-phase coupler for burst and surge with an EUT current rate of 63 A
CDN 3063-B100	Automated 3-phase coupler for burst only with an EUT current rate of 100 A
CDN 3063-S100	Automated 3-phase coupler for surge only (combination and ring wave) with an EUT current rate of 100 A
CDN 3063-C100	Automated 3-phase coupler for burst and surge with an EUT current rate of 100 A

6.1. Combination wave and ring wave test

The surge test (in compliance with IEC/EN 61000-4-5, ANSI 62.41+45 and IEC/EN 61000-4-12) simulates high voltage/high energy interference as experienced with a lightning strike. Generally speaking the interference finds its way into equipment by way of the mains 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.

Surge pulse interference can also occur on signal and data lines through coupling effects and electrical discharges. For this, the CDN 117/118 is recommended.

The test 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 test system for the direct mains injection test. Externally coupled tests require the interference to be superimposed on the EUT power feed cable via an external coupling unit that is connected to the Surge output on the front panel of the system.

6.1.1 Combination wave (CW) - Surge generator

The combination wave test involves the generation of high voltage surge pulses as specified in the international standard IEC/EN 61000-4-5 and ANSI C62.41+45.

The test pulses are injected directly into the EUT power supply lines. The EUT obtains its power from the EUT power outlet on the CDN of the test system where the voltage has the interference signal superimposed on it.

- Surge voltage of up to 6.6 kV which follows the 1.2/50 μ s curve (open-circuit)
- Surge current of up to 3.3 kA which follows the 8/20 μ s curve (short circuit)

6.1.2 Ring wave (RW)

The ring wave is specified in the ANSI IEEE Std C62.41 and IEC/EN 61000-4-5.

The open-circuit voltage waveform is defined by the following parameters:

- Rise time: 0.5 μ s
- Ringing frequency: 100 kHz

No short-circuit current waveform is specified for the 100 kHz ring wave. Because the purpose of the ring wave is not to provide high-energy stress to the EUT, the precise specification of the current waveform is unnecessary.

The test pulse is injected directly into the EUT power supply lines as they pass through the CDN of the test system. The EUT obtains its power from the EUT power outlet on the CDN of the test system where the voltage has the interference signal superimposed on it.

6.2 Electrical fast transient EFT (burst)

Burst tests (in compliance with IEC/EN 61000-4-4) simulate the high voltage/high frequency interference pulses typically produced when an inductively loaded switch is operated. Such interference always occurs when a current through an electromagnetic device, e.g. motor, circuit breaker, relay, fluorescent lamp, etc. is switched on or off.

This kind of interference can affect other equipment in either of two ways.

First, the interference can be coupled directly into the target equipment via the mains power cable. Secondly the interference can be transmitted from the source along the mains power cable connected to the target. Interference from the mains can reach any other piece of equipment connected to the same power source in a similar way.

Alternatively, the interference can be coupled capacitive into any target device in the vicinity. Teseq offers such capacitive coupling clamp device like CDN 3425.

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The test system enables a test to be carried out using both coupling methods. The EUT is connected to the mains power socket on the front panel of the test system for the direct mains injection test. Capacitive coupled tests require the interference to be superimposed on the EUT power feed cable via an external coupling unit that is connected to the Burst output on the front panel of the system.

The coupling network CDN 3063 serves to inject standardized pulses into the mains supply to the device under test called for in the international standard IEC/EN 61000-4-4:

Fast transient (Burst) up to 4.8 kV which follows the 5/50 ns curve (50 Ω condition).

7 FIRST STEP



This chapter contains a short check-list with steps that should be taken before the instrument is connected to the generator, 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. Due the weight of the CDN 3063, a two man lift is needed to prevent injury. Lift the CDN 3063 coupling network out of its packaging by taking hold of the front mounted grips.

Check, using the following list, that all the items ordered as well as their accessories have been delivered:

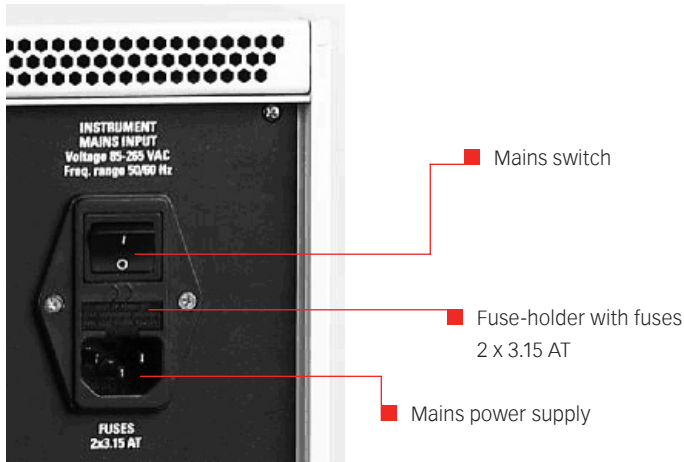
1. CDN 3063 coupling network unit
2. Operating instruction (*.pdf or WIN 3000 CD)
3. 1 Mains power cable for the CDN
4. 1 grounding ship (to ref. ground)
5. 2 HV cable with Fischer/Fischer connector (in C or S versions)
6. 1 HV cable with SHV/SHV connector (in B or C versions)
7. 1 System cable
8. 1 Allen key for output connector
9. Ordered options

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

8 INSTALLATION OF THE CDN 3063



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



To insert a fuse, pull the fuse-holder out of the connector, insert 2 fuse cartridges 2 x 3.15 AT (slow blow) into the holder and put the holder back.

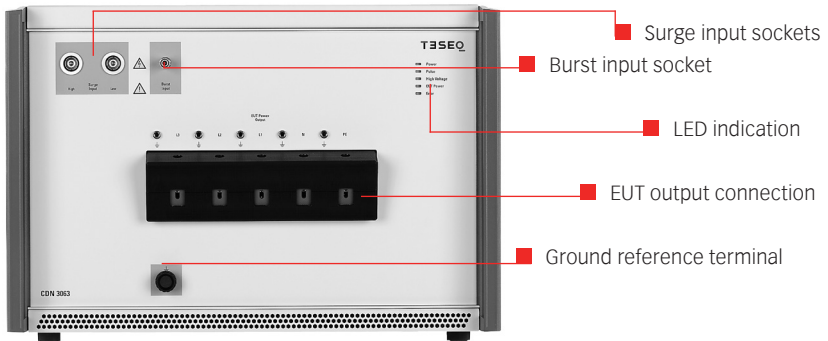
Plug the mains cable into a power outlet with a solid earth connection. Place the test system such that there is sufficient free space around the cooling air inlets on both sides and behind the fan outlet on the rear panel switch on and operate as stated in the accompanying instructions.

9 MAIN FRAME DESCRIPTION

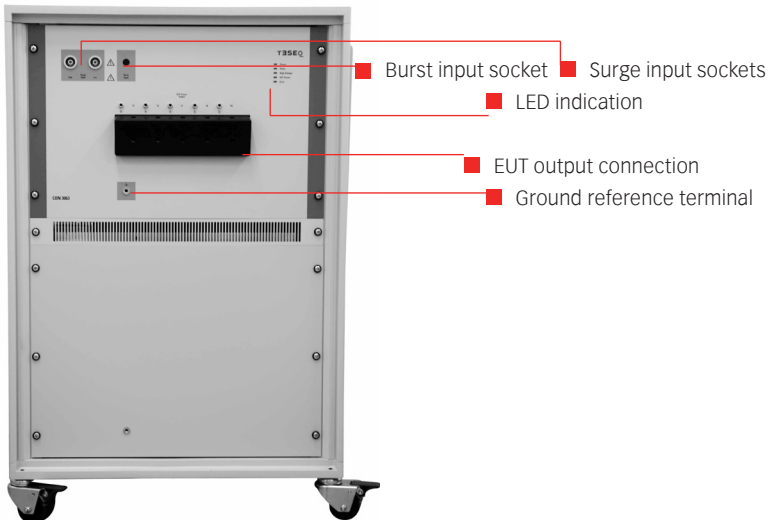


9.1 Front panel CDN 3063

9.1.1 32 A versions



9.1.2 63 A and 100 A versions



9.1.3 EUT output connection



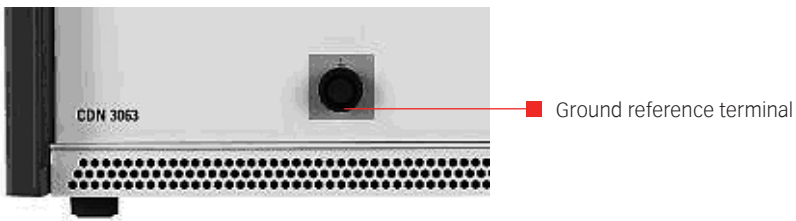
Never attempt to connect or disconnect an EUT while a test is being carried out.

The power output connection for three phase 5 cord EUTs. A suitable “Allen key” to screw /unscrew the power leads is included in the delivery package.

	CDN 3063-32	CDN 3063-63	CDN 3063-100
EUT current range	32 A	63 A	100 A
Max.wire gauge	10 mm ²	16 mm ²	25 mm ²
Torque	5 Nm	5 Nm	5 Nm

9.1.4 Ground reference terminal

As mentioned in the EFT standard IEC 61000-4-4, the generator together with the coupling network has to be placed on a ground reference plane which is connected to earth. A good earth connection between the CDN and the earth reference plate is absolutely essential for performing burst tests correctly.



This terminal of the CDN provides a solid earth connection point to the test system. There is no need to connect the earth connector from the generator itself, since the burst and surge connectors provide the reference ground from the generator to the CDN.

9.1.5 Surge input sockets (Fischer connector)

These sockets (High, Low) serve to connect the surge signal (CW and RW) from the generator to the CDN. The surge output from the generator is potential free (floating). The inner conductor of each connector is the surge high and surge low connection respectively while the outer conductor (screen) is connected to the instruments earth.

9.1.6 Burst input socket (SHV connector)

This socket serves to connect the CDN to the burst output connector of the generator.

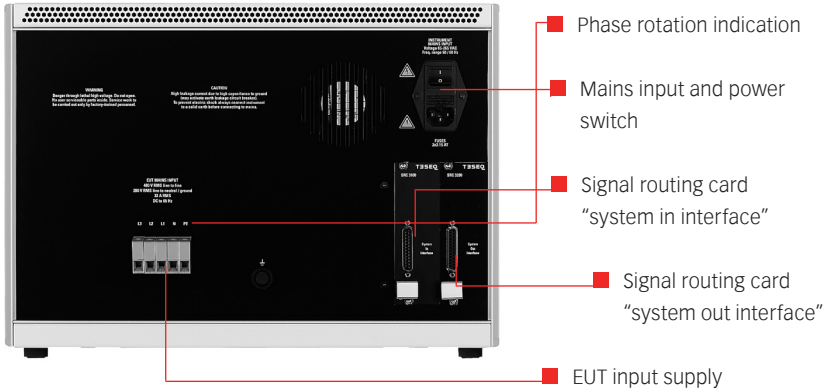
9.1.7 LED indicator

LED indicator function

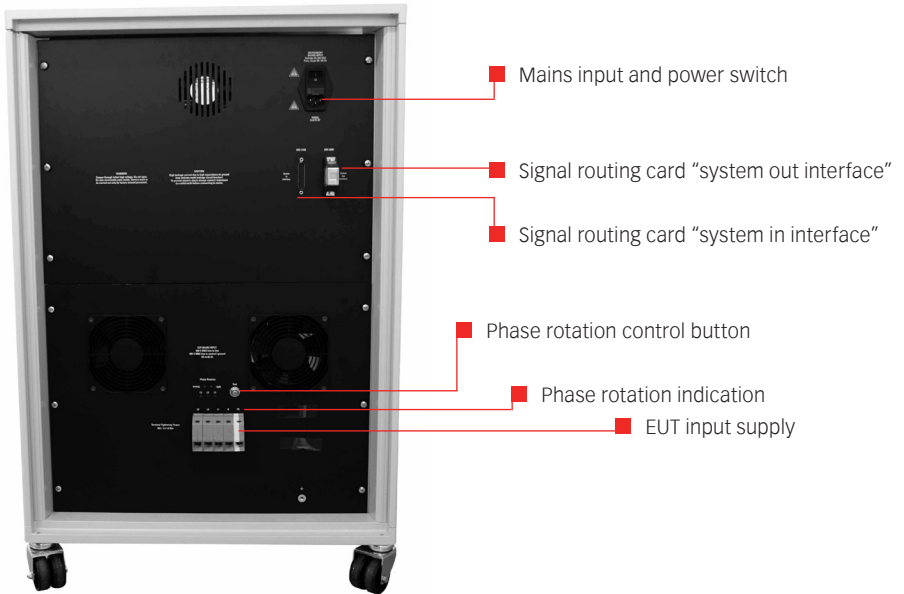
Power on	Instrument/system in operation
Pulse	Shows the occurrence of a pulses or a test event
High voltage active	Shows that high voltage is present in the instrument (in line with "Pulse" LED)
EUT-Power on	Indicates when the power supply to the EUT is present at the EUT connector on the front panel
Error	Indicates that a system error has occurred

9.2 Rear panel

9.2.1 32 A versions



9.2.2 63 A and 100 A versions



9.2.3 Mains power input and power switch

The main input is the power to the internal electronics of the CDN.



This connection must not be confused with the EUT power input.

The input contains the mains power input connector, the mains switch and the mains fuses.



Before putting the instrument into operation, please make sure that the voltage range shown on the mains input module corresponds with the voltage of the local supply to which the instrument will be connected, and whether the fuses are correctly rated (2 x 3.15 AT).

9.2.4 EUT input supply



The power source connected to this connector provides the power for the EUT.

Burst and surge interference signals are coupled into this supply line internally.



Special care must be taken to use the right phase line from the EUT input at the EUT output connector.

Depending on countries, different colour codes are used. Please refer to the EUT input section in this manual to verify the coding.



Because of the capacitors in the internal coupler, earth leakage currents of up to 4 A can occur in the EUT power supply network.

The test system must therefore be correctly earthed and be powered from a supply that is not protected by a residual current detector (RCD).

If the CDN test system is connected to a DC power source for the EUT, care must be taken to ensure that the polarity at this connector corresponds with that at EUT power connector.

9.2.5 3-phase AC EUT mains input

The EUT main input is equipped with screw terminals type Phoenix HDFK 10-HV, resp. HDFK 25 with following parameters:

CDN type/ Phoenix type	max. current	Wire gauge	max. voltage	Torque
CDN 3063-32 HDFK 10-HV	57 A	Solid min. 0.5 mm ² max. 16 mm ² Stranded min. 05 mm ² max. 10 mm ² AWG/kcmil min. 20 max. 6	1000 V	min. 1.5 Nm max. 1.8 Nm
CDN 3063-63/100 HDFK 25	125 A	Solid min. 6 mm ² max. 35 mm ² Stranded min.10 mm ² max. 25 mm ² AWG/kcmil min. 10 max. 2	600 V	min. 4 Nm max. 4.5 Nm

9.2.6 Colour codes of a 3-phase system

Conductors of a three phase system are usually identified by a color code, to allow for balanced loading and to assure the correct phase rotation. Colors used may adhere to International Standard IEC 60446, older standards, or to no standard at all, and may vary even within a single installation. For example, in the U.S. and Canada, different color codes are used for grounded (earthed) and ungrounded systems.

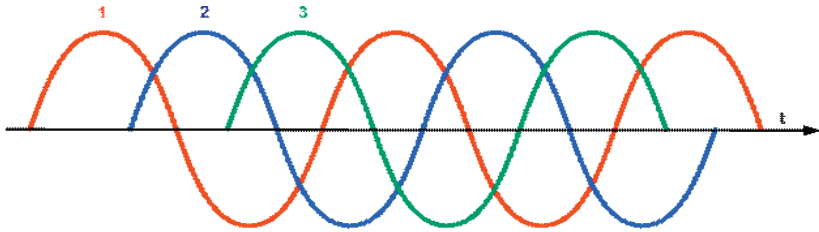
Countries / 5 wire power cord	L1	L2	L3	Neutral	Ground / protective earth
United States (common practice)	Black	Red	Blue	With or gray	Green, green/yel- low striped or a bare copper wire
United States (alternative practice)	Brown	Orange (Delta) or Violet (Wye)	Yellow	Gray or white	Green
Canada (mandatory)	Red	Black	Yellow	White	Green (or bare copper)
Canada (isolated 3-phase installations)	Orange	Brown	Yellow	White	Green
Europe and many other countries, including UK from April 2004 (IEC 60446), Hong Kong from Juli 2007	Brown	Black	Grey	Blue	Green/yellow striped
Older European (IEC 60446, varies by country)	Black or brown	Black or brown	Black or brown	Blue	Green/yellow striped
UK until April 2006, Hong Kong until April 2009, South Africa, Malaysia	Red	Yellow	Blue	Black	Green/Yellow striped (green on installa- tions approx. before 1970)
Pakistan	Red	Yellow	Blue	Black	Green
India	Red	Yello	Blue	Black	Green
Austalie and New Zealand (per AS/NZS 3000:2000 section 3.8.1)	Red	With (prev. yel- low)	Blue	Black	Green/yellow sti- ped (green on very old installations)
People's Republic of China (per GB 50303-2002 Section 15.2.2)	Yellow	Green	Red	Light blue	Green/yellow striped

Peak impulse voltages of up to 630 V can occur on these power lines. Such voltages can, under certain circumstances, destroy AC/DC power supplies. It is the user's responsibility to ensure adequate protection being provided at the inputs of the source.

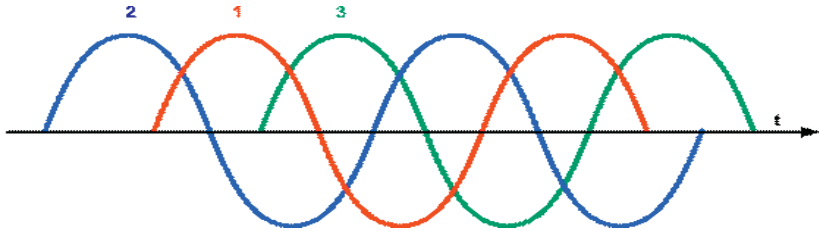
9.3 Phase rotation indication

This important and easy to read feature guarantees a correct coupling especially in synchronous mode.

The phase rotation identification at the back of the CDN units shows clearly, if all phases are connected and if the rotation of L1, L2 and L3 are correctly set, this is important especially in synchronous mode. The phase angle shift of 120° is a function of the actual rotational angle, following a definite order. For clockwise rotation the phase sequence order is 1-2-3.

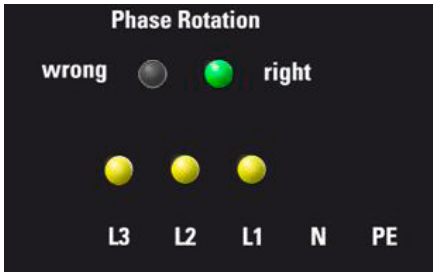


However, if we reverse the rotation winding 2's waveform will be leading 120° ahead of 1 instead of lagging, so the coupling point of a synchronous coupling will be wrong, since the zero crossing of L1 is measured and calculated for the other lines. The counter clockwise rotation phase sequence is 2-1-3, which is wrong.

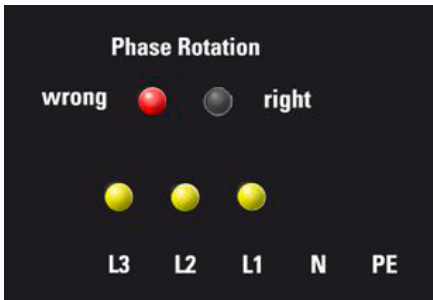


To test the proper phase rotation of the EUT Power Input, push the button beside the LED's - phase rotation will be shown by the LED's as long as the button is pushed.

This is a correct EUT power setting, all phases are connected (all lines indication are on) and the rotation is right too.



The EUT power lines provide all power, but the phase rotation is wrong. In this case the exchange of line L1, L2, or L3 will solve the rotation problem.



Not all EUT power lines provide power and the phase rotation is wrong too. All phase of the EUT in power need to be checked and re-plugged.



9.3.1 2- or 1-phase AC EUT mains input

The CDN is able to handle also two and single phase power mains. In this case the colour code is different.



It is the user's responsibility to ensure that in two or 1-phase system, the phases are correctly set at the input as well as at the EUT output connector, in this case the phase rotation detector does not work properly.

Following lines have to be used to guaranty the correct coupling mode selection:

- 2-phase system: L1, L2, N, PE
- 1-phase system: L1, N, PE

9.3.2 Phase rotation indication using single- or two lines EUT power mains

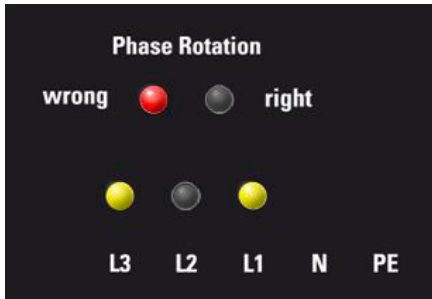


The phase rotation indication is made for 3-phase EUT power mains. In single or two phase application the indication will show different behavior.

As soon as the three phase input is used for single or two phase EUT application, the rotation indication will not work, resp. will not indicate properly and always showing error. However, the EUT power mains will anyway go through the CDN with any damage or harm.

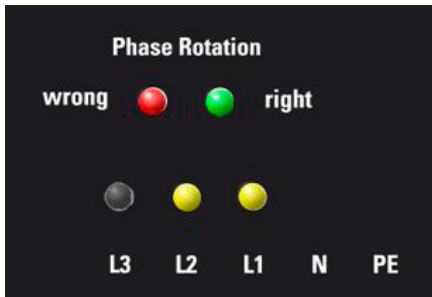
Indication in single-phase mode

If L1 is connected then L2 will be dark while L3 will light up softly as well and the red rotation led will be on.



Indication in two-phase mode

If L1 and L2 are connected then L3 will light up softly as well and the red and green rotation led will be on dimly.



9.3.3 DC EUT input

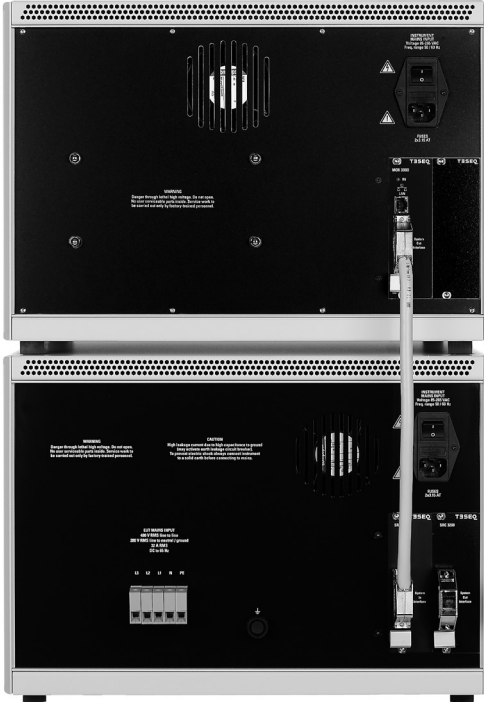
Pin allocation for DC voltages: L1 = Positive (+), N = Negative (-)

In the case of DC applications, the positive and negative lines have to be connected to L1 and N respectively.

The polarity at this EUT power input connector must be the same as at the EUT output connector.

9.3.4 Signal routing card “system in interface”

This is for the system interface between generator and the coupling network. This “System in” connector need a link to the “Master controller” of the generator. The system cable is part of the delivery.



9.3.5 Signal routing card “system out interface”

This connection is used if additional automated accessories need to be connected. Otherwise the termination plug has to be connected and the screws need to be tightened. The termination plug is part of the generator.

9.3.6 Fan and cooling concept

All Teseq CDN 3043 series instruments have been designed with a dynamic cooling concept. Internal elements suspected to warm up in any condition, especially the Surge pulse decoupling chokes, are equipped with thermal sensors. So at standby or for lower EUT currents, when there are nearly no dissipation losses in the CDN, and so no heat generation, there is no need of cooling and the fans will turn at a very low speed, generating no noise.

As soon as the EUT current raises, heat will be generated in the housing, the internal control electronics will detect this and increase fan speed to improve cooling.

In case of international or unintentional overloading, there will be a point where even full speed cooling will no more be sufficient, at this moment the CDN 3043 will switch OFF EUT power through the built in EUT power contractor, and so avoid destruction of the instrument (risk of fire). The CDN 3040 control electrics will also send a message back to the NSG 3040 which will immediately stop the firing of pulses.

That way CDN 3043 series give large overload capabilities, allowing up to 1,5 nominal current loading for 10 to 20 minutes, as well as high inrush currents or peak loads.

10 TEST SETUP SETTING



10.1 Applicable safety standards

Development and manufacture is in compliance with ISO 9001.

The instrument complies with the safety requirements of IEC/EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use).

The interference immunity has been tested in accordance with EN 61326-1.

It is the user's responsibility to ensure that the test rig does not emit excessive electromagnetic interference (EMI) that might affect other items of 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 starting to radiate EMI. To avoid radiating unwanted interference the standards organisations recommend that the test rig be operated in a Faraday cage.

Since the purpose of the test system is to produce interference signals for interference immunity testing, the requirements in IEC/EN 61000-6-1,-2,-3,-4 concerning limiting the radiated EMI can only be complied with by operating the test system inside a Faraday cage



During a test, the EUT together with its accessories and cables are to be considered as being live at all times. The test system must be stopped and the EUT supply disconnected before any work is carried out on the EUT.

The EUT is to be tested only in a protective cage or under a hood which provides protection against electric shock and all manner of other dangers pertaining to the particular EUT (see: Dangers concerning the EUT).

The safety instruction concerning all the instruments and associated equipment involved in the test rig have to be observed.

The configuration of the test rig is to be strictly in compliance with the methods described in the relevant standard to ensure that the test is executed in a standard-conforming manner.

10.3 Dangers concerning the generator



- Local burning, arcing, ignition of explosive gases.
- Danger from the resultant EUT supply current caused by a flashover or breakdown resulting from the superimposed high voltage effects.
- Dangers from a disrupted EUT.
- Disturbance of other, unrelated electronics, telecom munications, navigational aids 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 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 be at an elevated voltage level that would make touching dangerous. In many power connectors even the screws are linked to the protective earth.

10.4 Dangers concerning the EUT



- EUTs are often simply functional samples that have not previously been subjected to any safety tests. It can therefore happen in some cases that the EUT is quickly damaged by internal overloads caused by the control electronics being disrupted or it may even start to burn.
- As soon as the EUT begins to show 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 and in plugged connections that is 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 plastics materials.**
- **Faulty behaviour by the EUT, e.g. a robot arm strikes out or a temperature controller fails, etc.**

10.5 Test setup

Regular setup is the CDN on the test table (or floor) and the generator on top of the CDN. A standardized test setup can be referred at the IEC/EN 61000-4-5 standard.

1. Connect the ground strap of the CDN from the reference ground connector to the ground reference plate of the test setup. A proper earth strip to the CDN it is imperative. For EFT test a proper grounding to the ground reference plane is essential to fulfil standard test requirements.



Operation without a protective earth connection is forbidden!

2. The earth connection between the CDN and the generator is realized via the HV connector and/or the EFT connection. No additional earth link from the generator CDN is needed.

3. Connect the HV cable and/or the EFT cable between CDN and generator using the delivered cables.
4. Connect the 25 pin system cable at the rear of the generator (MCR 3000 System out interface) with the CDN (SCR 3100 system in interface) unit and tighten the screws of this connectors. (The pin setting are described in the NSG 3040/3060 manual).
5. Connect the termination plug to the CDN (SCR 3200 system out interface) to terminate the system.

If accessories such as INA, VAR or MFO are used for the test, these may need to be connected at the CDN (SCR 3200 System out interface) and the X1 connector from the accessories and be terminated via termination plug at X2.

6. Connect the mains to the CDN and to the generator.
7. Connect the EUT supply input, use the phase rotation detection to verify proper connection.
8. Use the delivered and insulated allen key to connect the EUT cable on the EUT output of the CDN. Respect the phase L1 for single phase resp. L1, L2, L3 for the three phase connection. Do not forget to check the proper connection to the EUT earth. Make sure that the EUT is properly connected to the CDN EUT output.



To ensure a proper recognition of the automated accessories and CDN, the generator is the final unit to be switched on.

9. Switch on the mains on CDN first then the generator.
10. Start test procedure.

10.6 Mounting in a 19" rack for the CDN 3063-32A version

For system use, i.e. when the NSG 3040/3060 test system is to be combined with other equipment, it can be useful to mount the instrument in a 19" rack. The width of the unit fits the 19" rack system and the height is 5HU for the NSG 3040 and 7U for the NSG 3060 and CDN 3063-x32. For ordering information please refer to the section "Accessories".

11 CDNS SETUP AND COUPLING MODE CONNECTION



11.1 General

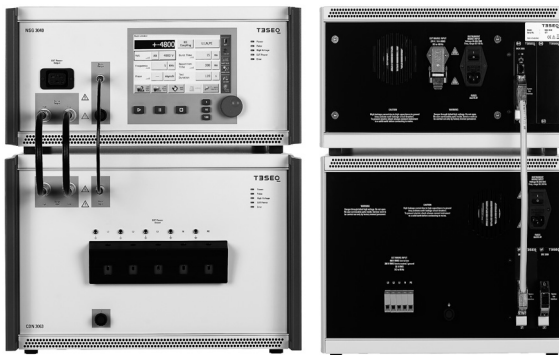
As long as a CDN 3063 3-phase coupler is connected to the generator, this CDN will always be taken as default unit and the 3-phase coupling modes is shown at the user interface.

Since the CDN 3063 can be used as an EFT coupler or a surge coupling only, the user interface will only show the 3-phase menu for the existing coupling modules.

11.2 Combination of 1-phase CDN and 3-phase CDN

In case a 1-phase CDN is connected to the system and the coupling path has to go through this coupler, the three phases CDN has to be switched off and the user interface needs to be reset by touching the "Reset Interlock" button in the main menu.

11.2.1 NSG 3040 with CDN 3063



CDN 3063 series - Automated 3-phase coupling/decoupling networks

If a NSG 3040 goes with a CDN 3063 then the 3-phase coupler is default and active in the meaning that surge and EFT pulse will be coupled into the CDN 3063, while the PQT test is available at the NSG 3040 EUT output. Performing PQT test can realized without disconnecting or switching of the CDN 3063 (internal CDN of NSG 3040 is called CDN 3041).

No ANSI coupling is possible, since the NSG 3040 has no EUT voltage and frequency measurement capability. ANSI standard requires that the EUT power voltage level has to be taken into account when the surge voltage is applied.

11.2.2 NSG 3060 with CDN 3063



The combination of NSG 3060 with CDN 3063 allows to couple conform to ANSI as well as to IEC, this of course always in connection with the included module setting of the CDN.

11.2.3 NSG 3060 with CDN 3063 and CDN 3061 (for PQT test 1-phase testing)



In this combination the CDN 3061 can be used for PQT tests or single phase tests if the CDN 3061 has the proper modules. The combination of NSG 3060 with CDN 3063 and CDN 3061, allows to couple conform to ANSI as well as to IEC standard, this of course always in connection with the included module setting of the CDNs.

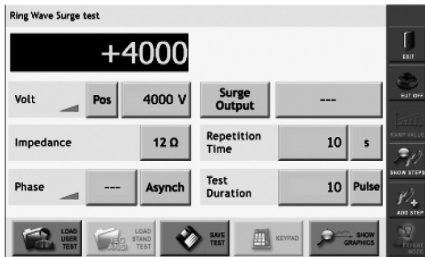
The CDN 3063 is in this case always set as default and the user interface shows the three phase coupling setting. The PQT test is available at the CDN 3061 EUT output without disconnecting or switching of the CDN 3063.

In case if single phase needs to be coupled, this can be achieved with the CDN 3063 and the proper "EUT power in" connection and the use of the correct interface setting (refer to section "Two or single phase AC EUT mains input").

Alternatively the CDN 3061 can be used. In this case the CDN 3063 needs to be switched off and the user interface has to be reset by touching the "Reset Interlock" button in the main menu.

CDN 3063 series - Automated 3-phase coupling/decoupling networks

12 COUPLING MODE SELECTION AT THE GENERATOR USER INTERFACE



The possible selections are:

- Surge output or burst output
- Manual CDN
- IEC coupling
- ANSI coupling

12.1 Surge output/burst output

Depending on the actual selected pulse, the surge output or burst output selection will activate the HV pulse output. No coupling to the EUT lines of the connected CDN will be realised.



12.2 Manual CDN

This selection has to be used if an external manual coupler is connected; like CDN 3083 for surge pulse or for burst CDN 163 or CDN 8014/8015 respectively. With this selection, the loss of an external CDN will be compensated.

12.3 ANSI and IEC coupling mode

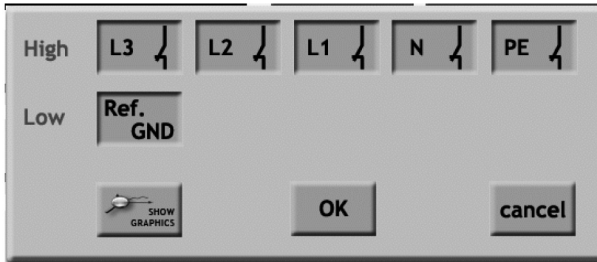
ANSI standard coupling requires that the EUT power voltage level has to be taken into account when the surge voltage is applied. To fulfil complete the ANSI coupling requirement, a NSG 3060 generator has to be used.

In NSG 3040 user interface setting has therefore no ANSI selection mode.

12.3.1 IEC coupling

Touching the coupling line selection field, it will activate a new window with the selection possibilities.

Three phase setting windows for burst



Three phase setting windows for surge

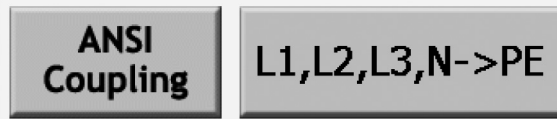


The coupling path will be shown by open or closed relay signs.

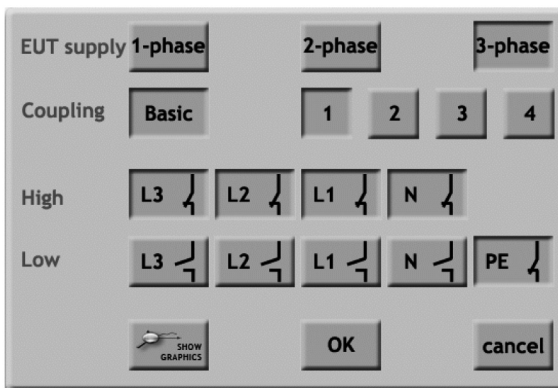
By touching the "OK" button the selected coupling will be activated. With "cancel" it will close the window without saving the coupling selection. By touching the button "Show Graphics" it will show a graphical setting.

12.3.2 ANSI coupling

For Burst coupling it does not matter if IEC or ANSI coupling mode is selected since the ANSI standard refers to IEC/EN 61000-4-4 standard.



By touching the coupling line selection field it will display a new window.



EUT supply

Set the EUT supply in mode: 1-phase, 2-phase or 3-phase. Make sure, that the EUT connector on the CDN does match accordingly the EUT supply selection.



EUT supply selection has to be in line with the connected EUT supply input at the rear of the CDN 3063, otherwise the coupling path setting will be switched incorrect.

Coupling

Then the coupling mode has to be set which can be changed via multiple button touch between Basic, Supplemental and Diagnostic. Those wording are equal to the ANSI standard. Depending on selected EUT supply mode different coupling mode level can be selected.

For the ANSI coupling path, please refer to 13.2.

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 show a graphical setting.

13 TECHNICAL DATA COUPLING NETWORK CDN 3063



13.1 Dimensions/weight

Versions	Value CDN 3063-X32	Value CDN 3063-S63	Value CDN 3063-S100
Current rating:	32 A EUT current	63 A EUT current	100 A EUT current
Weight approx:	42 kg (96.6 lb)	100 kg (220.5 lb)	100 kg (220.5 lb)
Dimensions W:	449 mm (17.7")	570 mm (22.4")	570 mm (22.4")
H:	310.5 mm (12.25"), 7 HU	840 mm (33"), 16 HU	840 mm (33"), 16 HU
D:	565 mm (22.2")	630 mm (24.8")	630 mm (24.8")

Electrical parameter

EUT current:	3 x 32 A continuous (over temp. protection): 3 x 50 A for ca. 10 min.	3 x 63 A continuous 3 x 100 A for ca. 30 min.	3 x 100 A continuous 3 x 150 A for ca. 30 min.
Instrument supply:	85 to 265 VAC, 50/60 Hz		
Standard-conform pulse:	Electric fast transient EFT (Burst) Combination wave Ring wave		
Connections:	HV-surge pulse input from generator (Fischer connector) EFT input connector from generator (SHV connector) Connector for EUT supply input (Screw terminals Phoenix) Connector for EUT supply output (Screw terminals) Power inlet for CDN input System cable (25 pin connector) Earth connection		
EUT supply:	Three phase (5 wire) Two phase (4 wire) Single phase (3 wire)		
EUT VAC line to line:	Up to 480 VAC rms, 50/60 Hz (below 30 V synchronisation not guaranteed, asynchronous mode only)		
EUT VAC line to neutral/ground:	Up to 280 VAC rms, 50/60 Hz (below 30 V synchronisation not guaranteed, asynchronous mode only)		
EUT VDC max:	225 VDC		
DC current range:	Up to 125 VDC – full current range/Up to 225 VDC – max. 7 A		

13.2 Coupling possibilities

Combination wave pulse IEC/EN 61000-4-5:	EUT input connections		
	1-phase L1, N, PE	2-phase L1, L2, N, PE	3-phase L1, L2, L3, N, PE
Line to ground (12 Ω)	L1 ⇔ PE	L1 ⇔ PE	L1 ⇔ PE
	N ⇔ PE	L2 ⇔ PE	L2 ⇔ PE
		N ⇔ PE	L3 ⇔ PE
			N ⇔ PE
Lines to ground (12 Ω)	L1, N ⇔ PE	L1, L2 ⇔ PE	L1, L2 ⇔ PE
		L1, N ⇔ PE	L1, L3 ⇔ PE
		L2, N ⇔ PE	L1, N ⇔ PE
		L1, L2, N ⇔ PE	L2, L3 ⇔ PE
			L2, N ⇔ PE
			L3, N ⇔ PE
			L1, L2, L3 ⇔ PE
			L1, L2, N ⇔ PE
			L1, L3, N ⇔ PE
			L2, L3, N ⇔ PE
Line to line (2 Ω)	L1 ⇔ N	L1 ⇔ L2	L1 ⇔ L2
		L1 ⇔ N	L1 ⇔ L3
		L2 ⇔ N	L1 ⇔ N
		L1, L2 ⇔ N	L2 ⇔ L1
			L2 ⇔ L3
			L2 ⇔ N
			L3 ⇔ L1
			L3 ⇔ L2
			L3 ⇔ N
			L1, L2 ⇔ N
			L1, L3 ⇔ N
			L2, L3 ⇔ N
		L1, L2, L3 ⇔ N	

Ring wave IEC/EN 61000-4-12:	EUT input connections		
	1-phase L1, N, PE	2-phase L1, L2, N, PE	3-phase L1, L2, L3, N, PE
Line to ground (12 Ω, 30 Ω)	L1 ⇨ PE	L1 ⇨ PE	L1 ⇨ PE
	N ⇨ PE	L2 ⇨ PE	L2 ⇨ PE
		N ⇨ PE	L3 ⇨ PE
			N ⇨ PE
Lines to ground (12 Ω 30 Ω)	L1, N ⇨ PE	L1, L2 ⇨ PE	L1, L2 ⇨ PE
		L1, N ⇨ PE	L1, L3 ⇨ PE
		L2, N ⇨ PE	L1, N ⇨ PE
		L1, L2, N ⇨ PE	L2, L3 ⇨ PE
			L2, N ⇨ PE
			L3, N ⇨ PE
			L1, L2, L3 ⇨ PE
			L1, L2, N ⇨ PE
			L1, L3, N ⇨ PE
			L2, L3, N ⇨ PE
			L1, L2, L3 ⇨ PE
	Line to line (12 Ω, 30 Ω)	L1 ⇨ N	L1 ⇨ L2
		L1 ⇨ N	L1 ⇨ L3
		L2 ⇨ N	L1 ⇨ N
		L1, L2 ⇨ N	L2 ⇨ L1
			L2 ⇨ L3
			L2 ⇨ N
			L3 ⇨ L1
			L3 ⇨ L2
			L3 ⇨ N
			L1, L2 ⇨ N
			L1, L3 ⇨ N
			L2, L3 ⇨ N
			L1, L2, L3 ⇨ N

Combination wave & ring wave ANSI (IEEE) C62.41:		1-phase	2-phase	3-phase
	Basic 1	L1, N \Rightarrow PE	L1, L2, L3 \Rightarrow PE	L1, L2, L3, N \Rightarrow PE
	Basic 2	L1 \Rightarrow N	L1 \Rightarrow N	L2 \Rightarrow L1
	Basic 3		L2 \Rightarrow N	L3 \Rightarrow L2
	Basic 4			L1 \Rightarrow L3
	Supplemental 1	N \Rightarrow PE	N \Rightarrow PE	N \Rightarrow PE
	Supplemental 2	L1 \Rightarrow PE	L1 \Rightarrow PE	L1 \Rightarrow PE
	Supplemental 3		L2 \Rightarrow PE	L2 \Rightarrow PE
	Supplemental 4			L3 \Rightarrow PE
	Diagnostic 1	N, PE \Rightarrow L1	L1, L2 \Rightarrow N	L1, L2, L3 \Rightarrow N
	Diagnostic 2	L1, PE \Rightarrow N	L1, L2 \Rightarrow PE	L1, L2, L3 \Rightarrow PE

	EFT (Burst Standard coupling all lines to ref ground (GND) IEC/EN 61000-4-4 ans ANSI (IEEE) C62.41:			
EFT (Burst) Common mode	L1, L2, L3, N, PE \Rightarrow ref GND			
Any Lines and combi- nation to ref GND:	L1 \Rightarrow ref GND L2 \Rightarrow ref GND L3 \Rightarrow ref GND N \Rightarrow ref GND PE \Rightarrow ref GND	L1,L2 \Rightarrow ref GND L1,L3 \Rightarrow ref GND L1,N \Rightarrow ref GND L1,PE \Rightarrow ref GND L2,L3 \Rightarrow ref GND L2,N \Rightarrow ref GND L2,PE \Rightarrow ref GND L3,N \Rightarrow ref GND L3,PE \Rightarrow ref GND N, PE \Rightarrow ref GND	L1,L2,L3 \Rightarrow ref GND L1,L2,N \Rightarrow ref GND L1,L2,PE \Rightarrow ref GND L1,L3,N \Rightarrow ref GND L1,L3,PE \Rightarrow ref GND L1,N,PE \Rightarrow ref GND L2,L3,N \Rightarrow ref GND L2,L3,PE \Rightarrow ref GND L2,N,PE \Rightarrow ref GND L3,N,PE \Rightarrow ref GND	L1,L2,L3,N \Rightarrow ref GND L1,L2,L3,PE \Rightarrow ref GND L1,L2,N,PE \Rightarrow ref GND L1,L3,N,PE \Rightarrow ref GND L2,L3,N,PE \Rightarrow ref GND

14 MAINTENANCE AND FUNCTION CHECK



14.1 General

There are no adjustable elements accessible to the user for either calibration or maintenance purposes.

The housing of the test system must not be opened. Should any maintenance or adjustment become necessary, the whole test system, together with an order or fault report, should be sent in to a Teseq service center.

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



The only exception concerns the exchange of modules or the upgrading of the system with new modules. In such cases the instructions accompanying the modules are to be strictly observed.

14.2 Cleaning

In general a moist cloth is sufficient for cleaning the outer housing. In stubborn cases use a small amount of a mild, non-foaming household cleanser as well.

No chemicals 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.

14.3 Function check



The safety measures described previously must be strictly observed while carrying out a 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 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.



Teseq recommends the use of a differential probe type MD 200 or MD 200A and the INA 6560 banana adapter.

14.4 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, Asia and USA that is in the position to undertake calibrations in this specialized field.

15 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 discretion 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 are to be returned in their original packaging or other equivalent packaging suitable for the purpose of the foreseen means of transportation.

Teseq can accept no responsibility for damage in transit.

16 CE CONFORMITY



The equipment is CE-certificated. The following standards apply:

TESEQ
Advanced Test Solutions for EMC

Teseq AG Nordstrasse 11F, 4542 Luterbach, Switzerland
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Declaration of conformity



Manufacturer: Teseq AG
 Address: Nordstrasse 11F, 4542 Luterbach, Switzerland
 declares that the following product
 Product: CDN 3063-32 Automated 3-phase Coupling Network
 Options: all
 conforms to the following Directives and Regulations
 EMC Directive 2004/108/EEC
 LVD Directive 2006/95/EEC
 Generic standards: EN61326-1, 2005
 EN61326-2-1, 2005
 EN61010-1, 2001
 The relevant technical file is available for inspection:
 Technical file: N° EMC_CDN3063_2008 / LVD_CDN3063_2008
 Teseq AG
 CH - 4542 Luterbach

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.

European representative: Teseq GmbH, Landsberger Str. 255, 12623 Berlin, Germany

Place and Date: Luterbach, June 18th, 2008

Johannes Schmid
President

17 ACCESSORIES



CAS 3025

Calibration set for burts/EFT. Consists of INA 265A: 50 Ohm/1000 to 1 terminator/attenuator, of INA 266: 1000 Ohm/2000 to 1 terminator/attenuator, of coax cable of 1 meter, RG 58, of traceable calibration certificate, user manual and carrying case. Full compliant to IEC 64000-4-4.



INA 3239

Burst/EFT calibration adapter to connect CDN 3043 and CDN 3063 series to calibration termination/attenuator CAS 3025.



INA 3236 (former INA 6560)

HV-plug adapter set for NSG 3000 series - Surge out to safety Banana, 1 plug to RED banana, 1 plug to black banana. Required for surge pulse calibration (safe and reliable connection to measuring probes - max. applicable surge voltages is 10 kV). Can also be used to build injection probe to couple surge pulses to shielded datalines and EUTs housings, etc.



INA 3235

Surge calibration adapter (set of 5 pces) to connect CDN 3043 and CDN 3063 series to HV probe MD 200 or current probe MD 300. Can also be used for EUT connection to CDN 3043 and 3063 series via banana plugs, limited to 32 A.



MD 200

1000:1 High voltage differential probe 3.5 kV common / 7 kV differential. Delivered in a hard shell suitcase, includes set of batteries, two HV safety probes, user manual, traceable calibration certificate.



MD 200A

1000:1 High voltage differential probe 7 kV common/differential. Delivered in a foamed hard shell suitcase. Includes set of batteries, two HV safety croco clamps, user manual, traceable calibration certificate.



MD 300

Current sensor for surge current measurement. Ratio of 0.002 V/A @1M Ohm and 0.001 V/A @50 Ohm. For surge peak currents up to 5 ka. Delivered in a hard shell foamed suitcase, includes 1 meter coax cable with BNC termination, 30 cm cable with safety bananas, user manual and traceable calibration certificate.



INA 166

Rack mounting brackets (5HU) for NSG 3040 series.



INA 167

Rack mounting brackets (7HU) for NSG 3060 series, CDN 30x3 - x16 and x32 series, VAR 3005.



INA 3000

Trolley for NSG 3000 series. Convenient accessory to get standalone instruments stacked and mobile through large castors. Static load < 150 kg.

18 SYSTEM LIMITS



Description:	Test system for EMC tests with mains-borne interference in accordance with the IEC/EN 61000-6-1 and 2 standards for burst, surge and mains quality 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 or 19" rack housing made of metal. 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°–40°C, 20–80% relative humidity (non-condensing), 68–106 kPa atmospheric air pressure.
Self-test:	Routines for functional self-test.
Relevant safety standards:	IEC/EN 61010-1 safety requirements for electrical equipment used for measurement and control purposes as well as laboratory use.
Relevant EMC standards:	IEC/EN 61000-6-1 and 2; generic standards for electromagnetic interference immunity.

Manufacturer

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