Manual

For Operation

compact NX5 / NX7

The ultra-compact simulator and its system modules

compact NX5
compact NX7
Sys App 5.0.0 or higher

The compact NX series, whereby well understood NX says Next Generation, is the most versatile tester to cover transient and power fail requirements, according to international standards (basic and generic standards) and product family standards. With the intuitive touch panel, the NX series is the most economical solution for tests during development as well as for full-compliant immunity tests and CE Marking for single phase DUT with the ability to be extended for testing three-phase DUTs by means of an automatically controlled external coupling network up to 200 A.
AMETEK CTS supplies a large range of accessories for the various applications such as magnetic field tests and more.

EN/IEC 61000-4-4
EN/IEC 61000-4-5
EN/IEC 61000-4-8
EN/IEC 61000-4-9
EN/IEC 61000-4-11
EN/IEC 61000-4-12
EN/IEC 61000-4-29
EN 61000-6-1
EN 61000-6-2

Exclusion for Documentation

Unless specifically agreed to in writing, AMETEK Compliance Test Solutions (AMETEK CTS):

(a) Makes no warranty as to the accuracy, sufficiency or suitability of any technical or other information provided in its manuals or other documentation.

(b) Assumes no responsibility or liability for losses, damages, cost or expenses, whether special, direct, indirect, consequential or incidental, which might arise out of the use of such information. The use of any such information will be entirely at the user's risk, and

(c) Reminds you that if this manual is in any language other than English, although steps have been taken to maintain the accuracy of the translation, the accuracy cannot be guaranteed. Approved AMETEK content is contained with English language version.

The present manual shows suggestions of test setups according the standards IEC 61000-4-x using equipment manufactured by AMETEK CTS.
The suggestions do certainly not replace the standards! Variations due to different interpretations of the standard are possible. The circuits shown in the figures supposed to illustrate the functional principles only and do not show every single detail of the components.

Manual information

Version / date:	2.03 / 07.03.2019
Replaces:	2.02 / 10.10.2018
Filename:	UserManual-compact-NX series-E-V2.02.doc
Printdate:	07.03.19

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Contents

1. General

The following manual is written for the following equipment of Generators NX series:

Available Generators compact NX 7 models	Burst	Surge	Power Fail	Telecom Surge
16 A models 300 V				
compact NX5 bsp-1-300-16	X	X	X	
compact NX5 bst-1-300-16	X	X		X
compact NX5 bspt-1-300-16	X	X	X	X
compact NX5 bs-1-300-16	X	X		
compact NX5 bp-1-300-16	X		X	
compact NX5 sp-1-300-16		X	X	
compact NX5 st-1-300-16		X		X
compact NX5 b-1-300-16	X			
compact NX5 s-1-300-16		X		
compact NX5 p-1-300-16			X	
16 A models 400 V				
compact NX5 bsp-1-400-16	X	X	X	
compact NX5 s-1-400-16		X		
32 A models 300 V				
compact NX5 bspt-1-300-32	X	X	X	X
compact NX5 bsp-1-300-32	X	X	X	
compact NX5 bst-1-300-32	X	X		X
compact NX5 bs-1-300-32	X	X		
compact NX5 bp-1-300-32	X		X	
compact NX5 sp-1-300-32		X	X	
compact NX5 st-1-300-32		X		X
compact NX5 b-1-300-32	X			
compact NX5 s-1-300-32		X		
compact NX5 p-1-300-32			X	
32 A models 400 V				
compact NX5 bsp-1-400-32	X	X	X	
compact NX5 bspt-1-400-32	X	X	X	X

Grey indicated models are not available in Q2 2019

Available Generators compact NX 7 family models	Burst	Surge	Power Fail	Ring wave	Telecom Surge	Size [HU]
16 A models 300 V						
compact NX7 bsp-1-300-16	X	X	X			6
compact NX7 bspr-1-300-16	X	X	X	X		6
compact NX7 bspt-1-300-16	X	X	X		X	9
compact NX7 bsprt-1-300-16	X	X	X	X	X	9
compact NX7 bs-1-300-16	X	X				6
compact NX7 bst-1-300-16	X	X			X	9
compact NX7 sp-1-300-16		X	X			6
compact NX7 st-1-300-16		X			X	9
32 A models 300 V						
compact NX7 bsp-1-300-32	X	X	X			6
compact NX7 bspr-1-300-32	X	X	X	X		6
compact NX7 bspt-1-300-32	X	X	X		X	9
compact NX7 bsprt-1-300-32	X	X	X	X	X	9
compact NX7 bs-1-300-32	X	X				6
compact NX7 bst-1-300-32	X	X			X	9
compact NX7 sp-1-300-32		X	X			6
compact NX7 st-1-300-32		X			X	9
32 A models 400 V						
compact NX7 bsp-1-400-32	X	X	X			6
compact NX7 bspr-1-400-32	X	X	X	X		6
compact NX7 bspt-1-400-32	X	X	X		X	9
compact NX7 bsprt-1-400-32	X	X	X	X	X	9

Other equipment

This document is also the Manual for the following auxiliary equipment, that are necessary to operate together with NX series generators:

Device	Description	Picture
V 4780	Tapped autotransformer with 40/70/80/100 % output voltage, 16 A, manual control	
V 4780S2	Tapped autotransformer with 40/70/80/100 % output voltage, 16 A, automatic control	
V 4780S3	Tapped autotransformer with 40/70/80/100 % output voltage, 32 A, manual control	

1.1. Purpose

The compact NX5/ NX7 test system is a multifunction compact generator that simulates conducted electromagnetic interference effects for immunity testing according to international, national, and manufacturers' standards.

The system is designed for full compliance conducted electromagnetic compatibility (EMC) test requirements. The application range is for testing of industrial, light industrial, household or commercial equipment, including many product family and product standards as per following basic standards

- IEC 61000-4-4 EFT / Burst
- IEC 61000-4-5 Surge and Telecom Surge
- IEC 61000-4-8 50/60Hz Magnetic Field
- IEC 61000-4-9 Pulse Magnetic Field
- IEC 61000-4-11 Voltage Dips, Voltage Interruptions for ac power mains supply
- IEC 61000-4-12 Ring Wave
- IEC 61000-4-29 Voltage Interruptions
  Voltage Dips for dc power supply systems

1.2. Warranty Terms

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

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

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

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

1.3. Product return procedure

1. Request a Return Material Authorization (RMA) number from the local AMETEK CTS representative
2. When requesting an RMA, have the following information ready:
   - Model number
   - Serial number
   - Description of the problem

NOTE: Unauthorized returns will not be accepted and will be returned at the shipper's expense.

NOTE: A returned product found upon inspection by AMETEK CTS, to be in specification is subject to an evaluation fee and applicable freight charges.

1.4. Recycling and Disposal

1.4.1. RoHS directive 2011/65/EU (RoHS 2)

RoHS directive *2011/65/EU* (RoHS 2)
The AMETEK CTS compact NX5 / NX7 series generator complies with the directive 2011/65/EU (RoHS - Restriction of certain Hazardous Substances).
From December 2005, all AMETEK CTS products either hand soldered or by machine are produced using lead-free solder.

1.4.2. WEEE directive 2012/19/EU

The AMETEK CTS compact NX5 / NX7 series generator, is dedicated under category 9 in the directive 2012/19/EU (WEEE).

The product should be recycled through a professional organization with appropriate experience for the disposal and recycling of electronic products. AMETEK CTS is also available to help with questions relating to the recycling of this equipment.

1.4.3. Dismantling information

Always remove power cord first. There is no special danger involved in dismantling the compact NX5

1.4.4. Parts which can be recycled

The compact NX5 / NX7 generators contains parts made from steel, aluminum, PVC, two-component sealing compound. The impulse capacitors are filled with non-poisonous mineral oil. The various parts can be separated and recycled.

1.4.5. Parts which cannot be recycled

All parts in the compact NX5 / NX7 series can be recycled.

2. Safety information

Attention

Before using this equipment, read the operating manual and the

separate delivered **safety manual** carefully

2.1. Intended use

The “compact NX5 / NX7” test system is designed primarily for conducted transient interference tests as specified in the European generic standards IEC/EN 61000-6-1 to cover equipment for household, office and light industrial use, and IEC/EN 61000-6-2 for applications in industrial environments. The “compact NX5” generates these tests in accordance with IEC/EN 61000-4-4, -4-5, -4-11, -4-12, and -4-29, depending of the model configuration. Accessories are available for generating optional tests to IEC/EN 61000-4-8 and -9.

The EMC Directive 2014/30/EU (for the assignment of the CE mark) refers to these standards and to this type of equipment.

2.2. Responsibility of the operator

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

WARNING

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

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

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.

2.3. General hazard

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

WARNING

The compact -NX-series, system and its accessories operate at high voltages.

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

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

Only *qualified personnel* who deal with attendant hazards in impulse generators, are allowed to perform installation and servicing.

Ensure that the AC power line ground is connected properly to the Power Rack input connector or chassis. Similarly, other power ground lines including those to application and maintenance equipment *must* be grounded properly for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting any cable.

The user must ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is eliminated.

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

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

WARNING **Personnel fitted with a heart pacemaker must neither operate 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.

2.4. Qualification of personnel

The compact NX5 / NX7 must be operated only by authorized and trained specialists.

2.5. Safety label on the device

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.

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

This symbol indicates where a caution is required. Refer to the operating instructions located in the manual in order to protect against personal injury or damage the equipment.

CAUTION The CAUTION symbol indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, , could possibly cause damage to equipment. Such damage may invalidate the warranty. If a CAUTION is indicated, do not proceed until its conditions are fully understood and met.

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

2.6. Prohibition of unauthorized conversions and modifications

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

3. Installation put in service

This chapter includes a checklist with steps that should be taken before the compact NX5 / NX7 generator is switched on and put into operation.

3.1. Safety instructions for installation and initial installation

National regulations in installation and operation of electrical equipment must be respected.

WARNING The compact NX5 / NX7 test system is not suitable for use in an explosive atmosphere.

WARNING Connect the EUT only after the initial system setup has finished.

3.1.1. Qualifications of the staff

Basic knowledge of electrical engineering and electromagnetic compatibility is required to service the unit. The national regulations for installation of electrical equipment as well as the safety at work of electrical equipment must be known to the user.

3.1.2. Installation

The compact NX5 / NX7 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!

Two independent ground connections are necessary - one for the test system and one for the EUT. These must be connected back to the local permanent installation or to a fixed, permanent ground 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 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. The equipment works, on principle, with two independent power supplies, one for the generator and one for the EUT. The compact NX5 / NX7 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.

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 organizations 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.

3.2. Installation of the compact NX5 system

3.2.1. Unpacking

Check the packaging for signs of damage in transit. Any damage should be reported immediately to the transportation company and the local representative.
Lift the compact NX5 test system out of its packaging. 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 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 AMETEK CTS service center for repair or calibration.

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

Item	Name	Remark	Picture
1	**Compact NX5**	compact NX5 generator including - Single phase coupling network xxx V / yy A Including ordered Modules *- Burst Module* *- Surge Module* *- Power Fail Module* *- Telecom Surge Module*	
2	**Compact NX7**	compact NX7 generator including - Single phase coupling network xxx V / yy A Including ordered Modules *- Burst Module* *- Surge Module* *- Ring wave Module* *- Power Fail Module* *- Telecom Surge Module*	
2	**Power Mains cable**	Power Mains cable - Connectors country coded	
3	**ESC**	EUT Supply Cable - Connectors country coded	
4	**ESA 1**	EUT Supply Adapter - Connectors country coded	
5	**SCT** #112801	Safety Circuit Terminator (Sys. Link) Short circuit for Interlock (no ext. loop), Alternative with ext. loop: **SCC AD** (option)	
6	**SWL AD** #111241	Warning Lamp Adapter	
7	**Ethernet cable** #107460	Ethernet crossover network cable RJ45, Cat 6, SF/UTP, red	
8	**Cleaning tissue**		
9	**Safety Manual**	Safety Manual 200 / 500 / NX Series	
10	**Quick Start Guide**	Quick Start Guide compact NX – English or German	
11	**USB Memory card**	Files on USB Memory card	

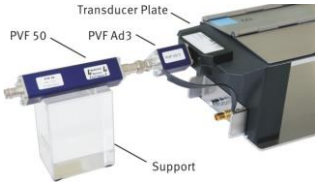
12	**User Manual**	User manual (pdf on the memory card)	
13	**Iec.control Software**	Software iec.control, (on the memory card)	
14	**Software license**	**If ordered** on a license sheet - UOC Optolink Converter USB to LWL - Optical fiber cable 5m	

3.2.2. Accessories

If additional equipment is ordered refer to the user manual of these devices

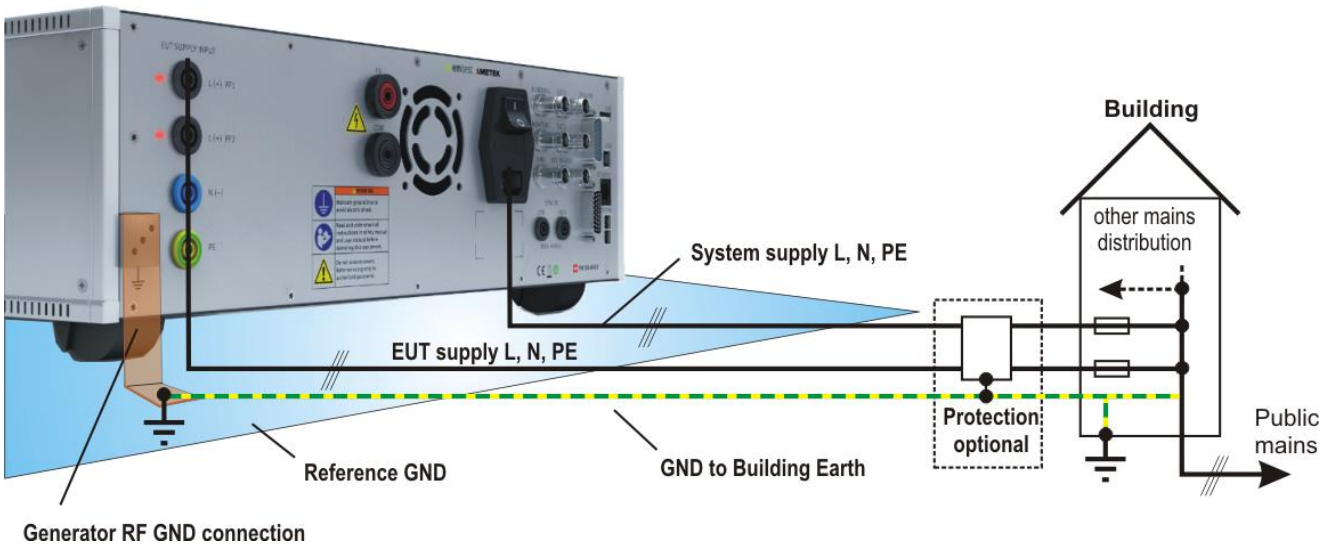
Name	Remark	Picture
SLC xxx	Sys Link Cable with various cable length	
UOC #111311	**USB Optolink Converter** (USB to LWL) Optical Fiber cable, 5m Remark: The USB Optolink is included in the software license	
Copper braid	Earth band connection NX-generator to coupling NX, Dimension: 300 x 23 mm, 25mm^2, 4 x Screws M4 x 10mm	

3.2.3. Options

Name	Remark	Picture
PVF BKIT 1	**Pulse Verification Fast Burst Kit 1** **PVF 50**, Pulse Verification Fast 50 Ohm **PVF 1000**, Pulse Verification Fast 1000 Ohm **PVF AD 1** Pulse Verification Fast Adapter 1 – Multi Contact (MC) to SHV fix	 PVF AD1 PVF 50 or PVF 1000
CCI PVKIT 1	**Industrial Capacitive Coupling Clamp** **Pulse Verification Kit 1** **Transducer plate** **Support** **PVF AD3** Pulse Verification Fast Adapter 3 – MC to SHF	
ESS 1 #111607	**ESS 1 Interlock for compact NX5 system** Switches OFF High voltage and EUT power supply	
SCC AD #111240	**Safety Circuit Adapter** (Sys. Link) Short circuit for Interlock for external safety loop Alternative to: **SCT** Safety Circuit Terminator	
Coupling NX…	**External 3-phase coupling network** AC voltage: 3 x 400 V / 690 V DC voltage: up to 1000 VDC Current: 16 A up to 200 A CA and or DC	
CCI	**Capacitive Coupling Clamp Industrial** For coupling of Burst impulses to signal and data-lines. **BCC 1000** Burst connection cable SHV 1000 mm	
SWL #111594	**Safety Warning Lamp** Safety warning lamp for NX series	

3.2.4. Grounding and power connection

Two independent ground connections are necessary- one for the test system and one for the EUT. These must be connected back to the local permanent installation or to a fixed, permanent ground conductor. To avoid electric shock the power cord protective grounding conductor must be connected to ground.



System GND

The system is connected to GND via the earth wire of the connected mains power cable for the generator and the EUT supply. A separate GND wire from the reference GND plane to the building earth point may be useful to avoid interferences to other areas.

EUT GND

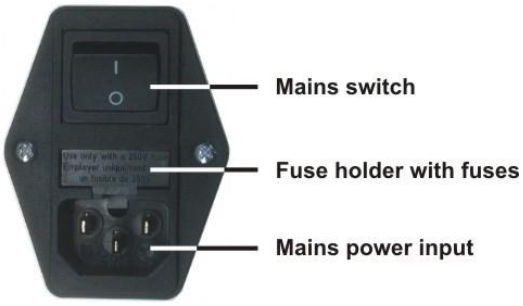
Ensure that a reliable return path for the interference current is provided between the EUT and the generator. The GND wire from the generator to the reference GND and must be designed as a low inductance connection suitable for high frequencies. The reference ground plane and the ground connections to the instruments, as described in the relevant test standards, serve this purpose well.

Protection (optional)

A proposal is to separate protection of the EMC system with filters, insulation transformer or fault current protection and other measures may be useful for the EMC installation. The advantage is the separation of the EMC system from all other installation.
A shielded room with adequate filters may be the best solution for avoid unwanted conducted and radiated interference to other areas.

3.2.5. Mains Switch and fuse

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

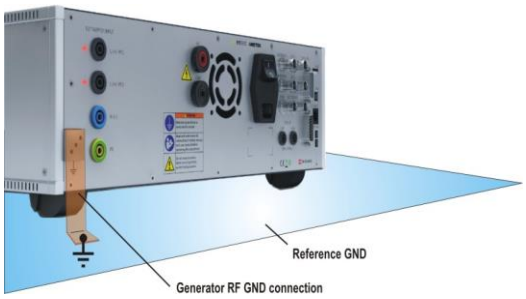


Mains Switch, fuse holder and power input

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 fuses (4 A / 115V and 2 A / 230 V slow blow)
5) Replace the fuse holder
6) Plug the mains cable into a power outlet with a solid ground connection
7) Switch the system on and operate as instructed in this manual

3.2.6. Connecting the compact NX5 system to the ground reference

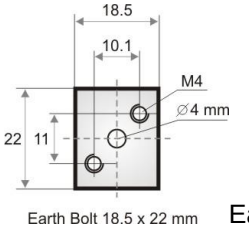


Connection to reference ground

Connection to reference ground

For burst tests, the generator must be placed on a ground reference plane which is connected to ground.

A low inductive high frequency ground connection between the test system and the ground reference plane (GRP) is absolutely essential for performing burst tests correctly.



Earth bolt dimension

Earth bolt dimensions:

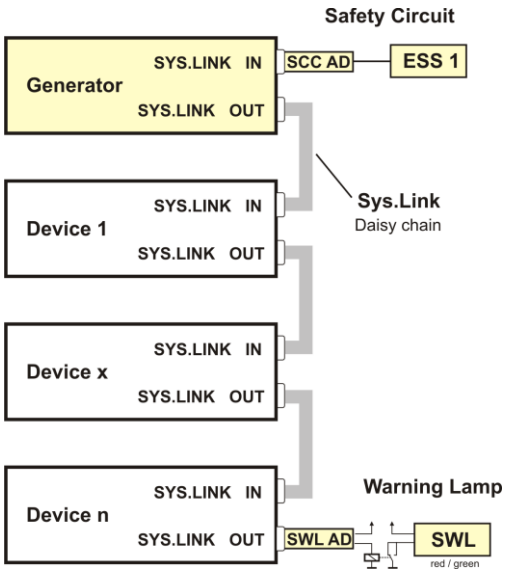
Screws: Metric M4 ,
Distance: 10.1 mm x 11 mm
Plug: Banana plug, ∅ 4 mm

3.3. Safety circuit, Warning lamps

Safety circuit and warning lamps are located at each end of the Sys Link. Each End of the Sys.Link is terminated with an adapter.

Safety circuit
Plug position: **SYS.LINK IN** compact NX generator
Connector: 2 screw contacts IN, OUT
Pin Sys Link: 7, 16
Operating: short circuit closed = operation
short circuit open = no operation
Voltage level: 24 Vdc (internal powered)

Warning Lamp
Plug position: **SYS.LINK OUT** Last device from daisy chain
Connector: 2 screw contacts IN, OUT
Pin Sys Link: 8, 17
Operating: Potential free contact
open = System is out of operation (green)
closed = System is operating (red)
Voltage level: 60 V, max. 2 A (external powered)



IMPORTANT

Important for operation

Connect the delivered Safety Circuit Terminal SCT  or the optional **Safety Circuit Adapter SCC AD**  **to the SYSLINK plug.**

The compact NX generator does not start any test if the safety circuit is not connected and closed.

NOTE: *The short circuit is already short-circuited at the delivered Safety circuit terminal SCT and Safety Circuit Adapter SCC AD*

.

SCT Safety Circuit terminal

The safety circuit terminal **SCT** is part of the delivery and includes the short circuit for the safety circuit. If an external safety circuit is required, please order the optional Safety Circuit Adapter **SCC AD**.

SCC AD option for external safety circuit loop.

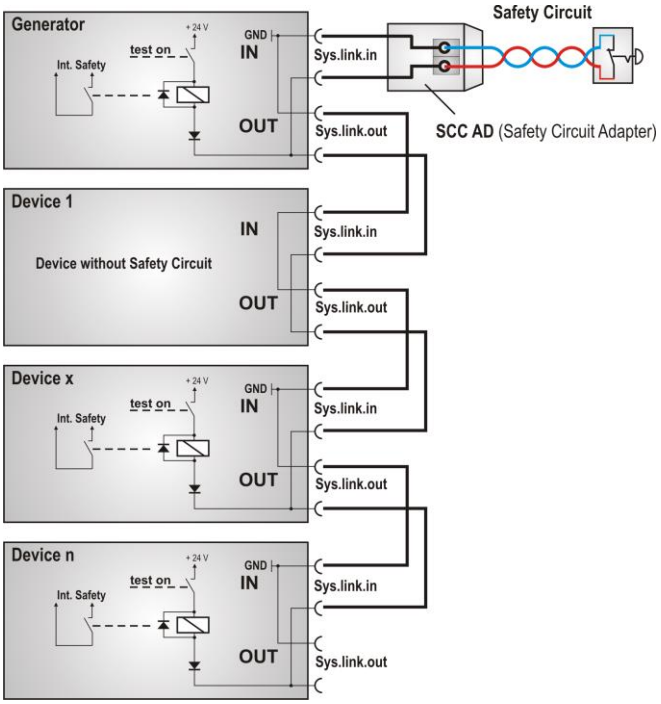
3.3.1. **Safety circuit** with Safety Circuit Adapter **SCC AD**

The safety circuit locks the system and enables the generation of the high voltage impulses in the generators. In general, the **SCT** Safety circuit terminator is delivered, because the most user do not use this function. The **SCC AD** must be ordered as an option.

Design
Each device that has internal relevant high voltage unit, includes a safety circuit. The safety circuit works like an “open collector circuit”, where the external safety loop must be closed for switch on the high voltage.

Safety circuit closed
The device will generate high voltage pulses after start

Safety circuit open
The device will switch off the high voltage and discharges the high voltage circuit



3.3.2. Warning Lamp

The warning lamp offers a voltage free contact that indicates the status of the generator system.

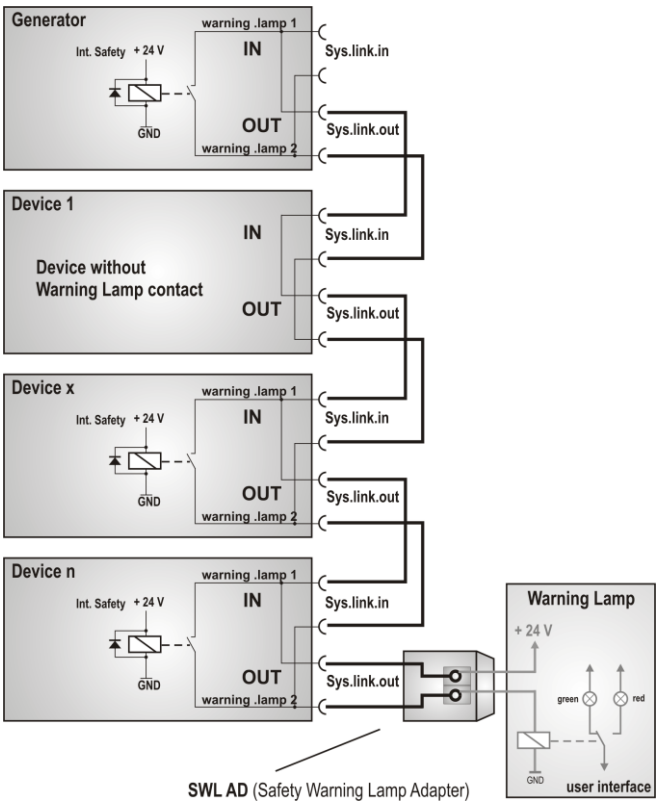
Design
Each device with warning lamp function can short thewarning lamp contact. An external powered relays max. 60 V / 2 A controls the lamp. The user is responsible for the warning lamp power supply

Warning Lamp switch closed (red):
- Safety circuit is closed and
- TEST ON is on

Status**:** RED Lamp, Power on EUT output,
High voltage can be “switched ON”

Warning Lamp switch opened (green):
- Safety circuit is open and / or
- TEST ON is off
- Generator is switched off

Status**:** GREEN Lamp, no danger, High voltage is off



3.4. EUT Power supply and 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 61010-1:2001.

Dimensioning of the mains supply and rating of fuse protection of the AC or DC power supply must conform with local electrical codes and EUT requirements. Inappropriate arrangement, mounting, cabling or handling of the EUT or ground can reduce or negate the effectiveness of the compact NX5’s safety features.

3.4.1. Notes on protective devices which need to install the operator

There are two different protective devices in a mains distribution system for safe operation.

A **Fault current protection**: A **residual-current device** (RCD), or residual-current circuit breaker (RCCB) is an electrical wiring device that disconnects a circuit whenever it detects that the electric current is not balanced between line and the return neutral. In normal circumstances, these two wires are balanced, and any difference current usually indicates a short circuit or other electrical anomaly like a surge impulse is present.

B **Circuit breaker protection:** A **circuit breaker** is an electrical switch designed to protect an electrical circuit by overload or short circuit. Its basic function is to detect a fault condition and interrupt current flow.

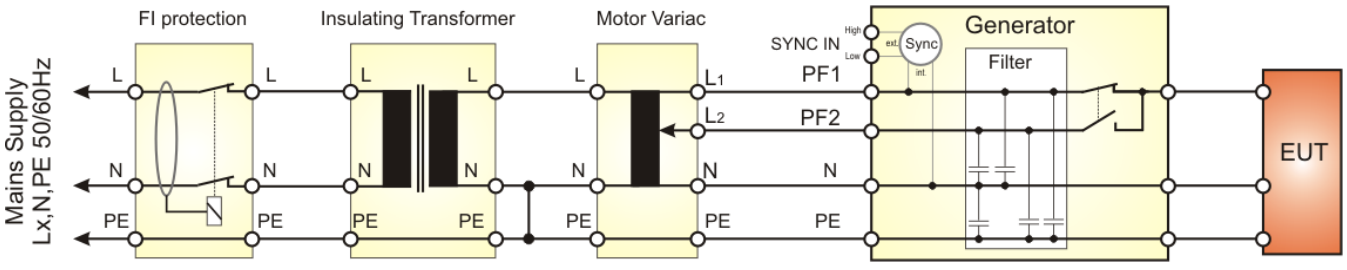
3.4.1.1. Fault current protection

The standards recommend decoupling and filter capacitors to PE for decoupling surge pulses. This is the reason for tripping fault current protection relays that interrupt the mains to the EUT supply. For eliminate the circumstance use one of the following options:

Remove the fault current protection
This solution does not limit the current to PE. The surge test as other EMC tests with higher currents to PE are possible. The user must take care to the circuit with no fault current protection. Only trained professional people are allowed to perform such tests. Some countries do not allow to operate without fault current protection.

Using of insulating transformers
An insulating transformer separates the circuit from the test circuit. The Fault current detector (FI protection) cannot detect the earth current in the EUT circuit.

The fault current safety detection function in the generator circuit is disabled. The user must respect this circumstance. For a safe operation, he must follow the electrical rulers.



Behind the insulating transformer, the neutral must be connected to PE. In case of a 3-phase system the user must connect similar.

In the generator, **the neutral layer (N) is not interrupted by an internal switch**. If neutral and earth are not connected together in the system supply, it is normal to measure a voltage between neutral and earth! (may be 115 V or more at 230 V mains)

3.4.1.2. Fuses for EUT with smaller nominal currents

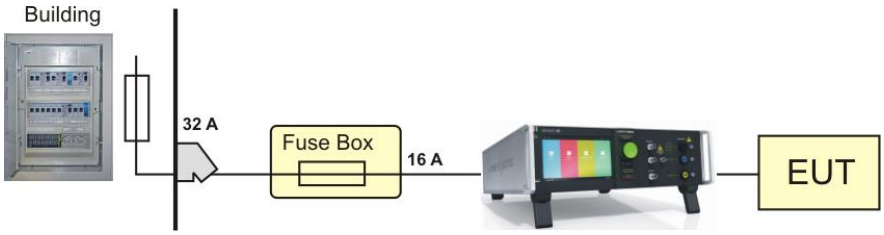
The AMETEK CTS pulse generators have no built-in fuse for the EUT power supply. It is in the scope of responsibility of the user to protect the EUT external for the rated current.

The design of the external fuse must be match the following rules:

- fuse dimension must be **equal or smaller** than the **rated EUT current** of the connected **test generator**
- fuse must be designed for **protect the connected EUT** device under test in malfunction

Example of external circuit breaker

Circuit breakers in the building are designed for 32 A. A circuit breaker box with 16 A protection is installed between the building supply and the test generator.
Test generator and EUT are now fused for 16 A rated current



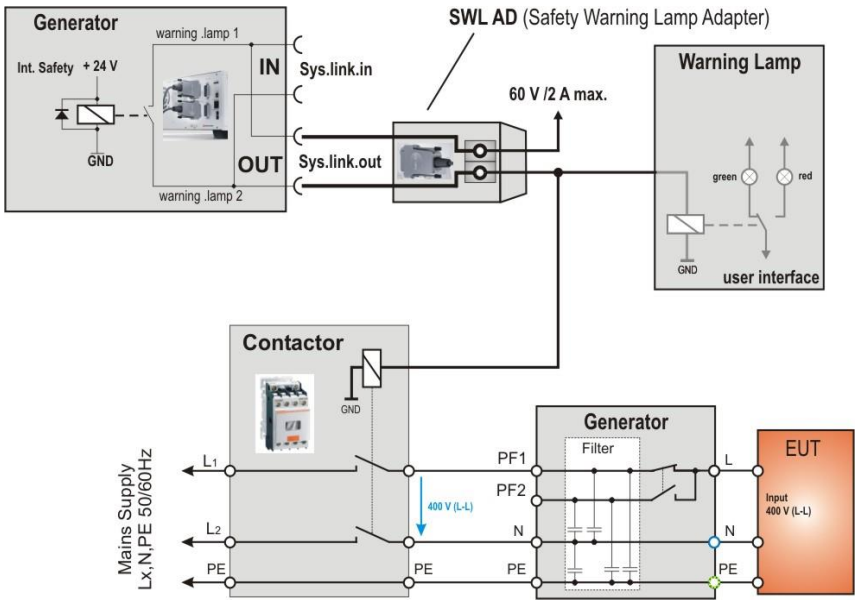
test generator unfused

3.4.2. EUT power ON/OFF with supply Line to Line (400V)

The generator must be designed for 400 V line to line

The internal electrical switch interrupts the power on line L. Using a two-phase supply (L-L), the second line is connected to the Neutral EUT path and can't be interrupted by the NX generator. The following setup with an external contactor will interrupt both lines L1 and L2 (connected to N-path). It is controlled via the potential-free contact of the warning lamp.

The design and installation of the contactor is in the responsibility of the user.



EUT power setup for a test device powered with 400 V line to line

3.4.2.1. Phase indicator

The phase indication shows the correct connection of the supply to **Phase** and **Neutral** input of the compact NX5. For the generator hardware, both, L and N paths are potential free and a reverse connection is not relevant for the generator operation. It is in the responsibility of the user to decide to run the test in correct phase-neutral connection. Anyway, with wrong phase connection it is possible and normal to measure a voltage between neutral and earth.

For EUT where it is important that phase and neutral are correct, the LED indication shows the correct phase connection.

Phase indication

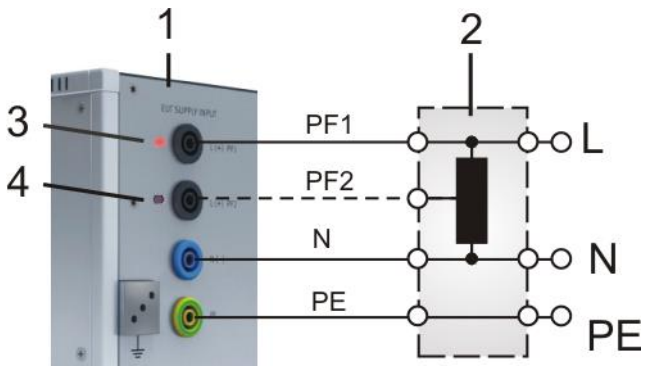
1 compact NX5 generator

2 EUT supply may be a
- **direct supply from building** or via a
- **tapped or variac transformer**

3 Phase indication LED illuminated

4 Phase indication LED inactive

Remark: The phase synchronization signal taken from the L path.



The table below shows all combinations with correct (OK) and incorrect (Fail) supply connections

Type A

Supply to PF1, L, PE

Type B

Supply to PF1, PF2, L, PE

Type C

Supply to PF2, L, PE

3.5. System configuration

This chapter describes how to configure the compact NX5 generator to work with the EUT and the connected accessories. The software library includes all accessories with their parameters. Some parameters must be matched to the current device. For device, that is not existing in the library, the user must create one by modify an existing equipment.

Procedure
The following system configuration is a short instruction guide. For detail setting refer to the related chapters in this manual.

1. Power ON the compact NX generator
2. EUT configuration setup
3. System settings
4. Transformers settings
5. External coupler settings

NOTE: If you have ordered the complete compact NX5 System from AMETEK CTS, the System configuration was completed in the AMETEK CTS factory in Switzerland

3.5.1. Power ON the compact NX5 generator

Approx. 3-4 seconds after power on the generator will drive the ventilator at full speed during few seconds. Then the ventilator returns to a variable speed control concerning the temperature.

Booting

After the welcome screen the software scans the equipment for search all existing internal phenomenon's and external devices.

A list shows and list all detected modules.

Home screen after booting

The home screen shows all detected symbols of phenomenon with their color.

Next steps:

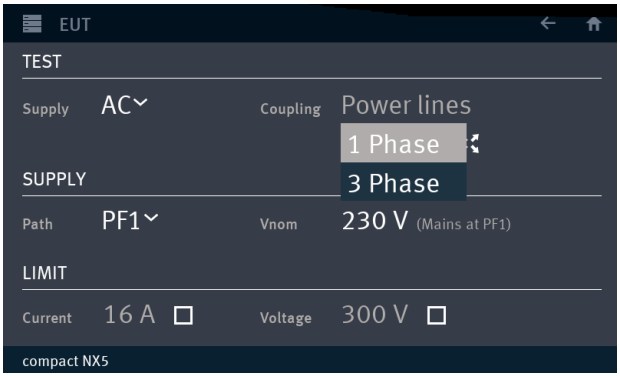
1. **EUT configuration setup**

2. **Menu / Setup** for
   - System settings
   - Transformer settings
   - External coupler settings

3.5.1.1. EUT configuration Setup

If an external coupling network is detected, the user can select 1/3 phase at AC coupling by *long press* to **1 Phase** / **3 Phase** as:

1 Phase set to L, N, PE
3 Phase to L1, L2, L3, N, PE



The output path for 1-ph EUT can be selected in the Test menu by the user.

Supply: **AC**

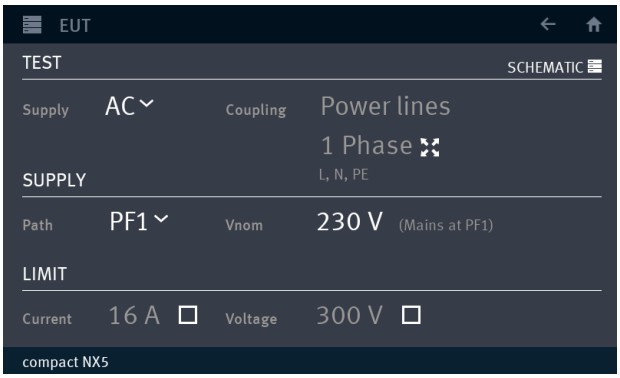
Coupling: 1 ph set to **L, N, PE**
3 phases to L1, L2, L3, N, PE

Path: **PF1**

Vnom: **230 V** (115 V)

Limit: all disabled

NOTE: For detailed information see chapter 4.3.5. EUT Setup



Example for 3-phase EUT

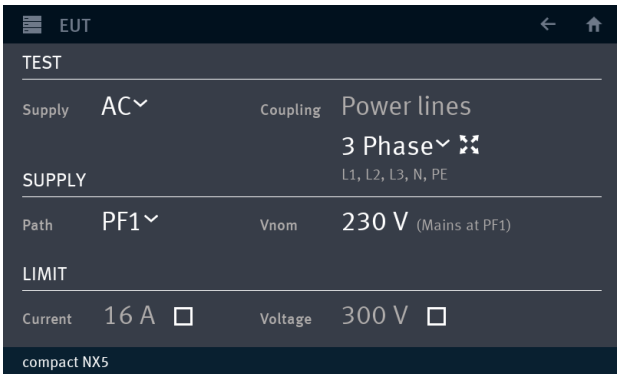
Supply: **AC**

Coupling: 1 ph set to L, N, PE
3 phases to **L1, L2, L3, N, PE**

Path: **PF1** *(not relevant for 3-ph application)*

Vnom: **230 V** (115 V)

Limit: all disabled



3.5.1.2. Select the output path for impulse coupling

To define at which device the generated pulse to applies, the user must configure it in the system. This happens in the **menu Devices and Modules**

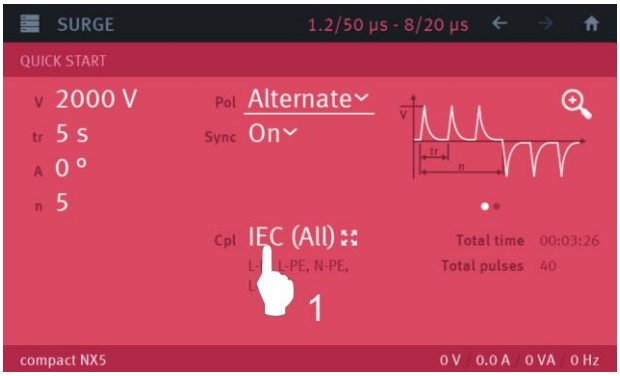
Internal Pulse output at the **compact NX5 CDN**
- 1 phase

External Pulse output at the **coupling NX5 CDN**
- 1 phase
- 3 phase

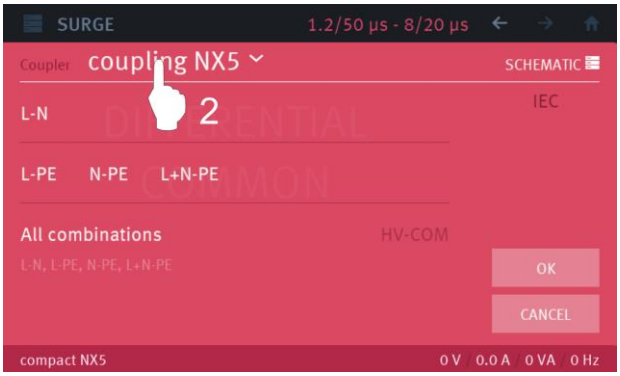
Select output path for the impulse

1. Select **Cpl**

For select the coupling path for other phenomenon like EFT Burst, pulsed magnetic field or other, the procedure is very similar



2. **Click** to the field Coupling for display all coupling devices.



3. Select the coupling device for testing:

- **INTERNAL**
  using CDN from compact NX5 generator

- **COUPLING NX5**
  using CDN from coupling NX5

NOTE: *The display will indicate all recognized coupling devices*

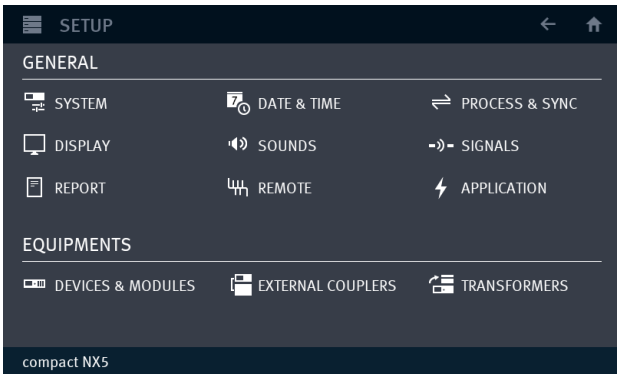
3.5.1.3. System Settings

Setup General

- System: **Language** if other than English
- Date / Time: modify
- etc.

Setup Equipment

- Transformers
- External couplers
- Devices & Modules

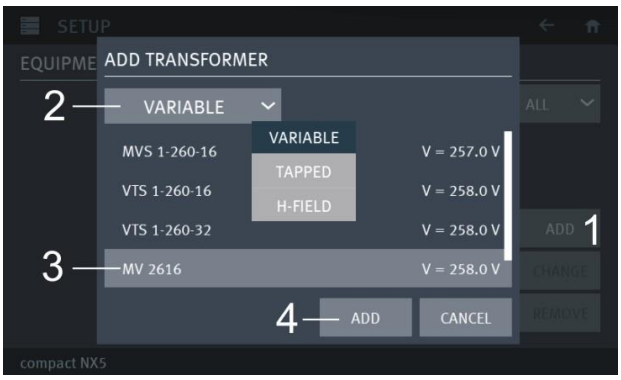


Transformers
If you have no variac or tapped transformer, you can skip this paragraph.

Add a Transformer into the setup

1. Select **ADD** for open the add transformer window
2. Select **VARIABLE** or TAPPED
3. Select the transformer (variac NX 1-260-16)
4. Press **ADD** for close and exit

NOTE: See separate chapter for adjust the variable transformer parameters.

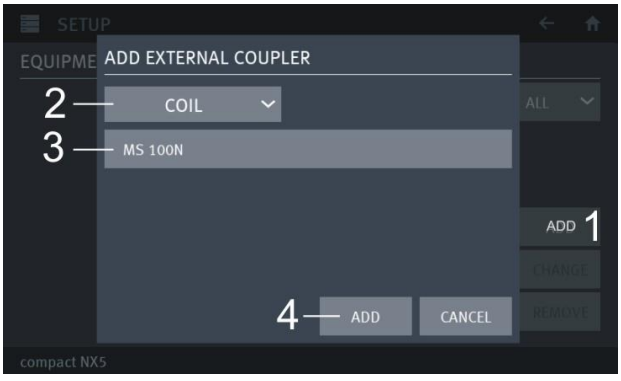


External couplers
External 3-phase coupling NX series devices are detected after power up the system automatically. If you have no magnetic field coil or external
3-phase coupling network, you can skip this paragraph.

Add an external coupler into the setup

1. Select **ADD** for open the add ext. couplers window
2. Select **DCD**, **PCD** or **COIL**
3. Select the transformer (variac NX 1-260-16)
4. Press **ADD** for close and exit
5. Select for return to the Home screen

NOTE: See separate chapter for adjust the external coupler parameters.



For operate a test see chapter ***4.3.3. Test phenomena*** and ***4.3.3.1. Parameter setting***

3.5.2. Help

A short start guide instruction delivers a short instruction for compact NX operation. The example guides the user for proceed a Burst test.

Start screen for Help after touch the

Help symbol on the Home screen

General Safety Instructions

Front Connections

Rear Connections

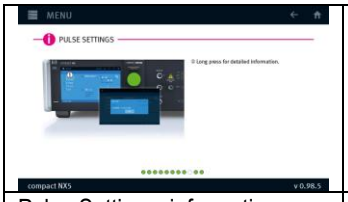
Control Elements

Home Screen

Quick Start

Pulse Settings, wheel

Pulse Settings, numeric pad



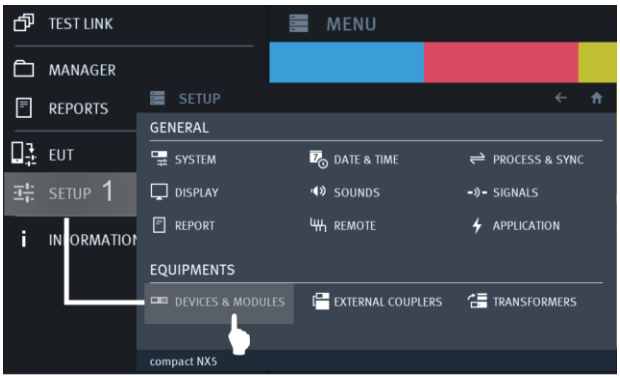
Pulse Settings, information

Test Run

3.5.3. Software Number for iec.control software license

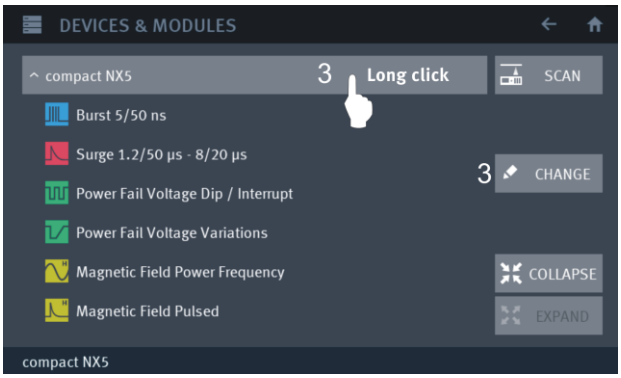
Software Update procedure

1. Select **MENU / Setup**



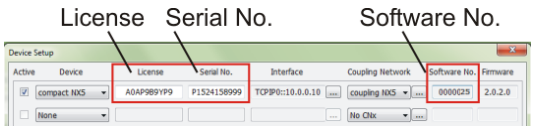
2. Select **DEVICES & MODULES**

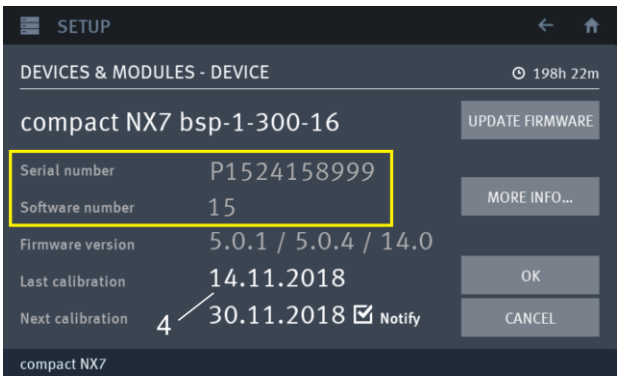
3. Make a **click** or **long click** to compact NX5 or press **change**



The yellow field indicates the information for:

- **Serial number**
- **Software number**
  This number is matched with the **license** code in the **IEC.control** software

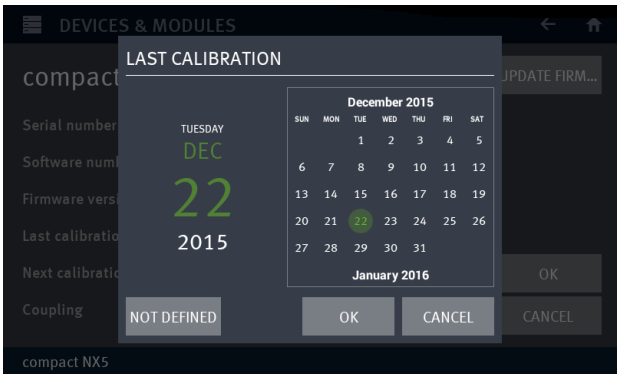




4. Click **Not defined** for enter a date for:

- **Last calibration** date
- **Next calibration** date

When expired, the following message appears after device power on.



3.6. Software Update

For update the compact NX5 generator with a new software it is necessary to copy the new software to an empty USB memory stick.
The following software updates, backup and restore procedures are described in this chapter.

A **3.6.1 Software update** new version

B **3.6.2 SysOS update**
This update overwrites the settings to the factory setting. A previous **Backup** with **Export Settings** is strongly recommended

C **3.6.3 Export actual settings**

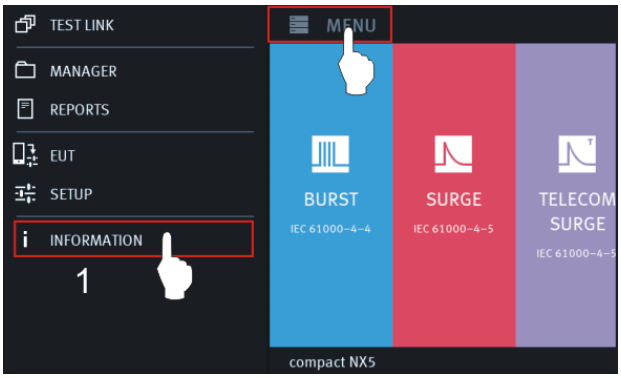
D **3.6.4 Import settings**

F **3.6.5 Firmware update**

3.6.1. Software Update new Version

Software Update procedure

1. Select **MENU / INFORMATION**



Software Update procedure

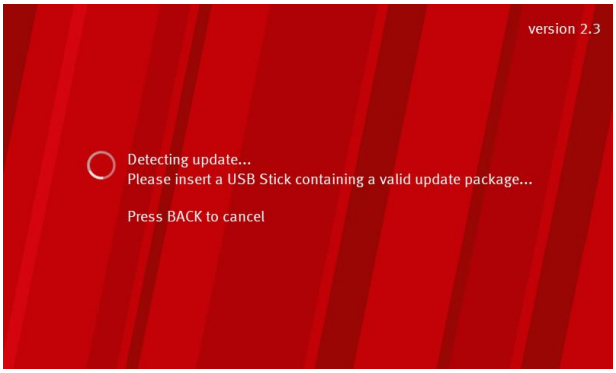
2. Press **Update Software**

*Note: The button Update **SysOS** is only displayed when a new SysOS is recognized.*

A message appears to **insert an USB memory stick** with a valid update package to the front or back side USB Port.

The update file will be automatically detected

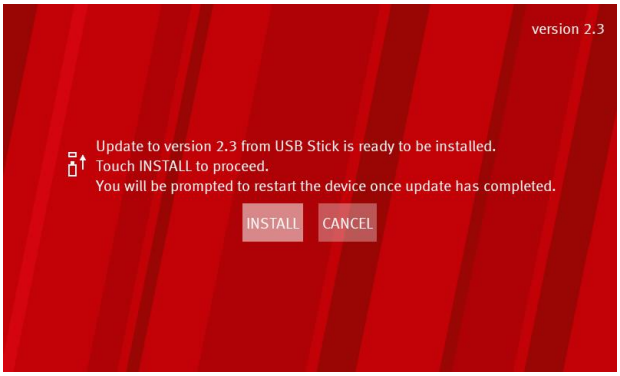
SW filename: **com.cts.appsw.apk**



3. Press **INSTALL** for start the update procedure. The update process is shown on the screen.

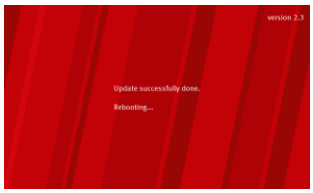
updating

Press **CANCEL** for exit

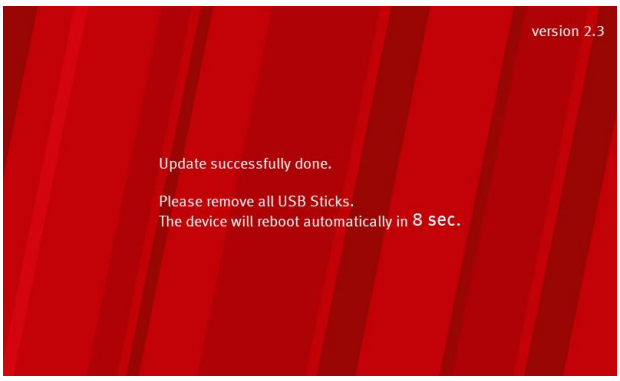


4. After display Update successfully done, **remove** the USB Sticks when indicated

A counter will indicate that the device will reboot after 10 seconds



System reboot

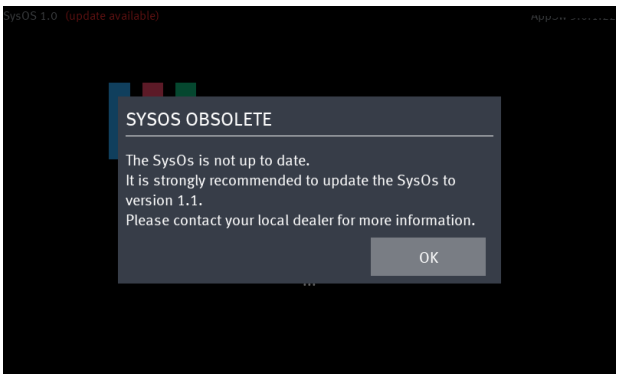


6. If you get the following message after rebooting,

a. Click **OK**,

b. Continue with **step 7 to 12** for the Phenomenon Firmware update to complete.

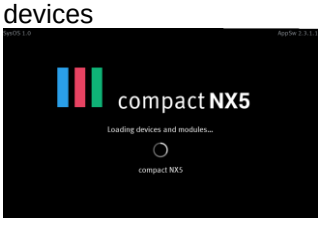
c. Then continue with the following steps:
- Save the settings on an USB Stick
- Proceed the SysOP upgrade
- Import the saved settings from the USB stick



7. After switch on,

DO not switch OFF while updating

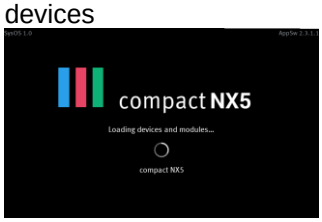
After the update the system is loading the devices



8. After switch on,

DO not switch OFF while updating

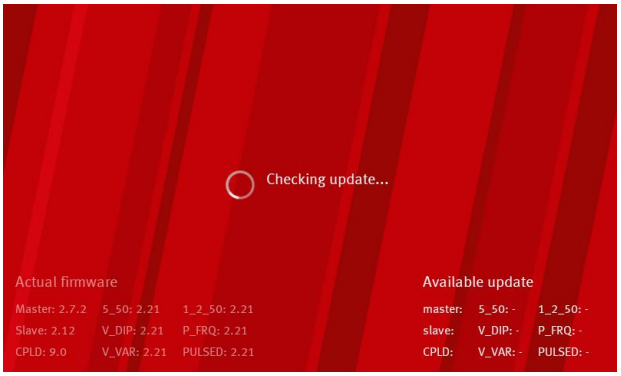
After the update the system is loading the devices



9. When starting a new app-sw version, the system checks the actual firmware versions and indicates the

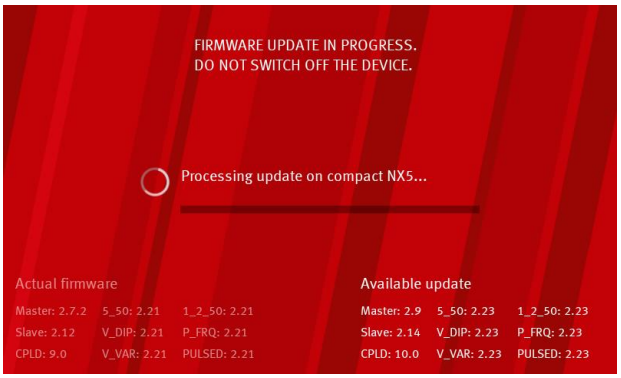
Actual firmware versions and

Available updates for install



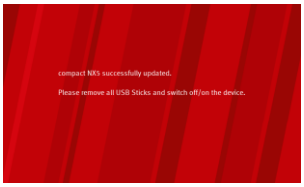
10. The available firmware updates are installed automatically on the compact NX generator.

The update processing is indicated and may need several minutes to complete.



11. After successfully update remove all USB memory sticks and

Switch OFF / ON the device



12. After switch on the final firmware update is installed and configured.

DO not switch OFF while updating

After the update the system is loading the devices

3.6.2. Software Update Install SysOS

Important

Before **install a new SysOS**,

Save the system settings on an external USB memory stick with the function **Export Settings**.

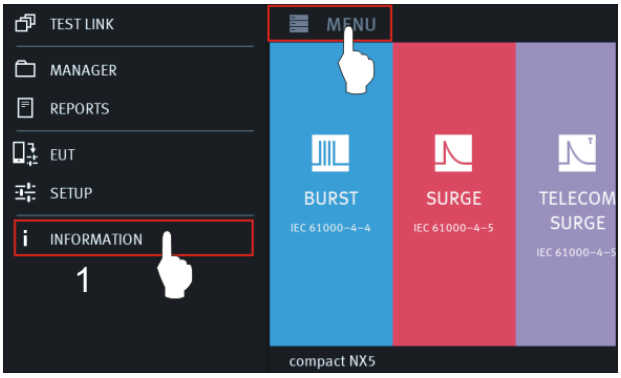
The update SysOS will **set all** settings **to factory setting**

- EUT settings
- All settings in SETUP GENERAL
- All settings in SETUP EQUIPMENTS
- All Link tests, User tests, Customized Standards

Make sure that you have done the Chapter 3.6.3. Export actual settings

Software Update procedure

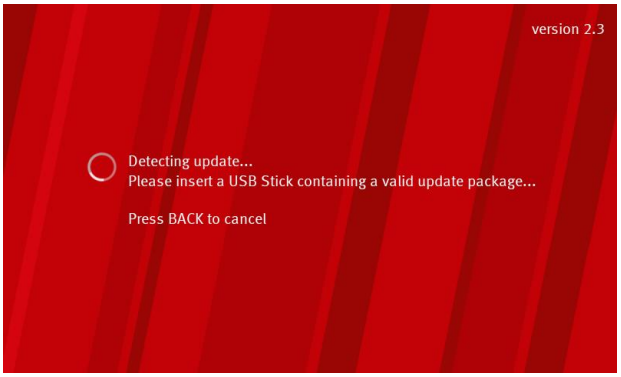
1. Select **MENU / SETUP**



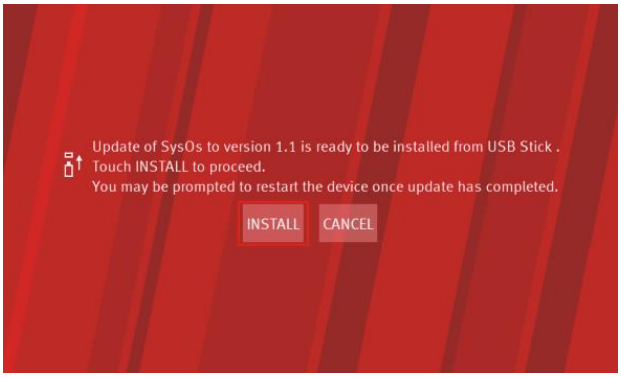
Software Update procedure

2. **Remove all USB Sticks** from the System and Click on **UPDATE SYSOS**

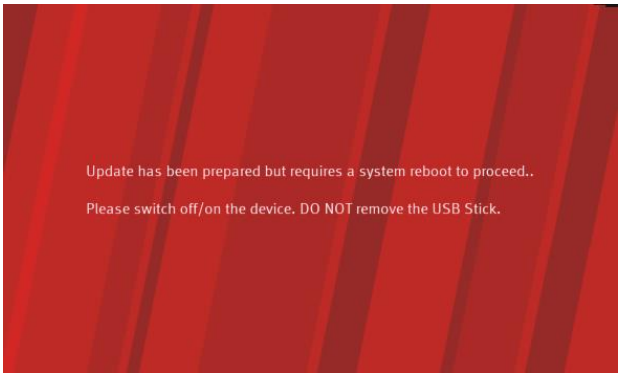
3. **Insert the USB Stick** containing the update files in the compact NX5 (front or back). Update file will be automatically detected and analyzed. This may take a minute.



4. Once the update package has been checked, click **INSTALL** to proceed.



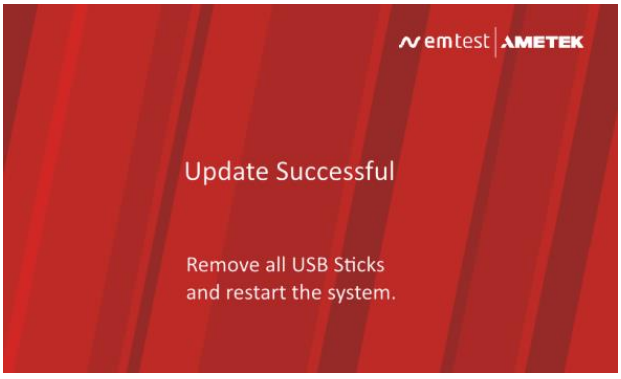
5. The update is then prepared but will need a System reboot to proceed.



6. **DO NOT REMOVE** the USB Stick from the device and
- **Switch OFF** the compact NX,
- **wait 5 seconds** and
- **switch it ON** again.

7. A few seconds after restarting the device, you should see the following screen. Please wait until update process completed. This may take a few minutes.

8. Once update has completed and the following screen appears
- **remove all USB Sticks**,
- **Switch OFF** the compact NX,
- **wait 5 seconds** and
- **switch it ON** again.

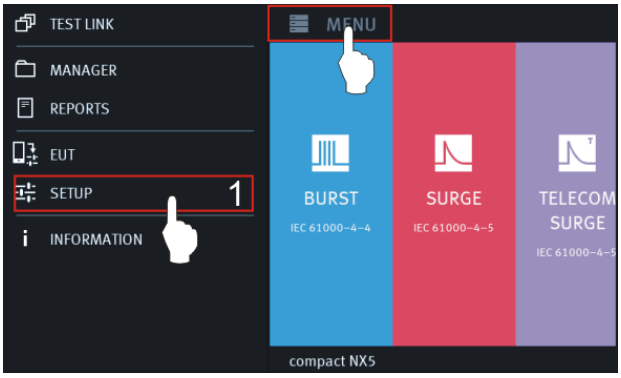


3.6.3. Export actual settings

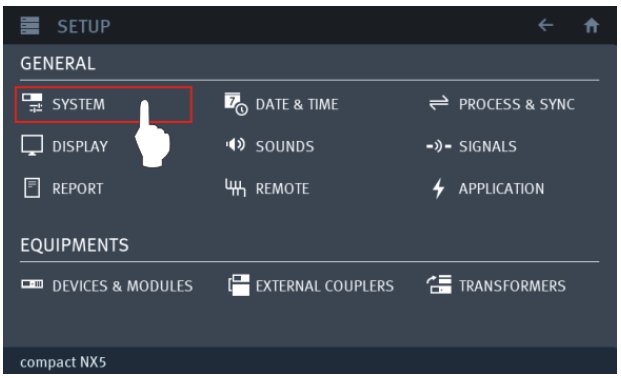
The Export settings saves all device settings on an external USB Stick. It is strongly recommended to export the settings before doing a SysOS update.

Export settings procedure

1. Select **MENU / SETUP**

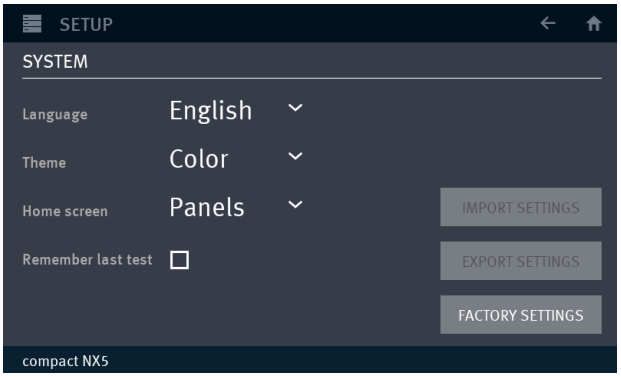


2. Press **System**

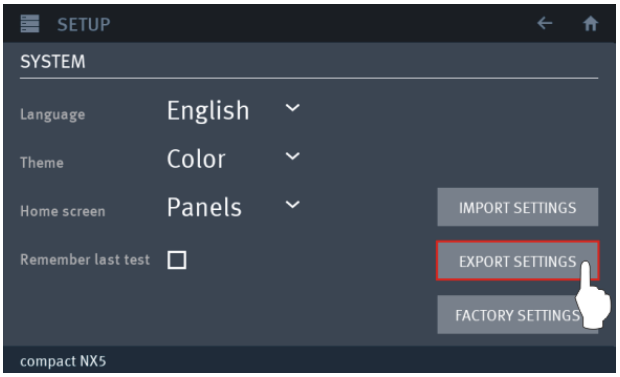


3. **Insert USB Stick** to the front USB slot

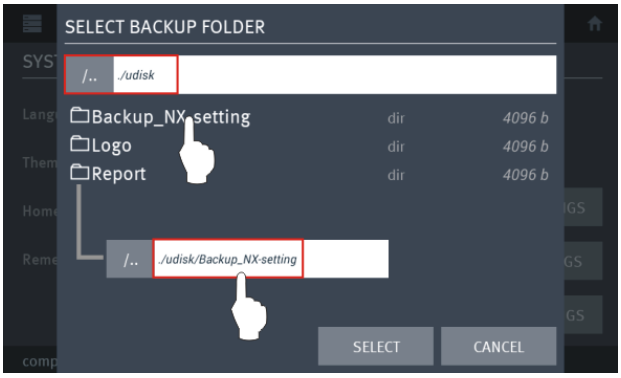
   After few seconds the Backup settings button will automatically be enabled.



4. Click on **Backup Settings**



5. Select the folder where you want save the backup setting files

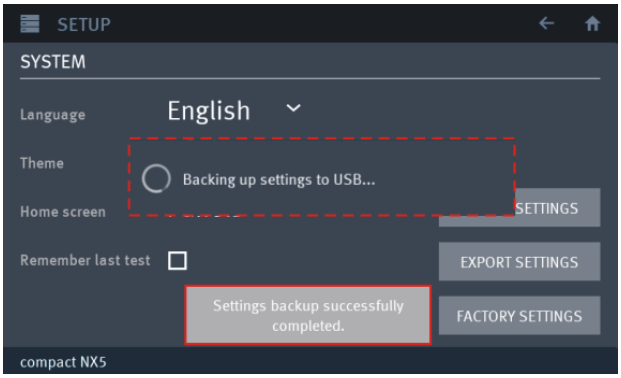


6. A message indicates the backup writing to the USB stick.

A message on the bottom of the screen confirms that the backup has completed.

Filename is **syssettings.bkp**

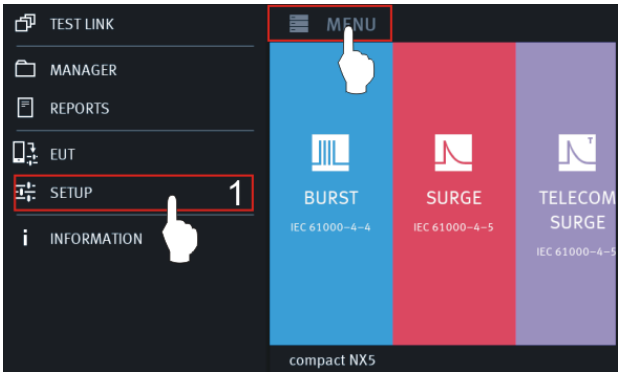
Remove the USB Stick from the generator compact NX



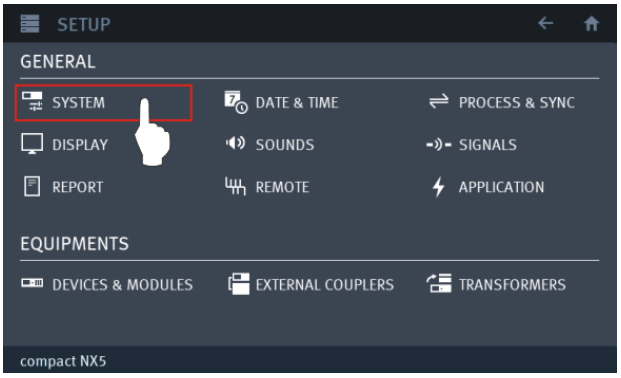
3.6.4. Import the settings

The Import settings restores all device settings from an external USB Stick. It will reinstall all device settings after a SysOS update.

1. Select **MENU / SETUP**

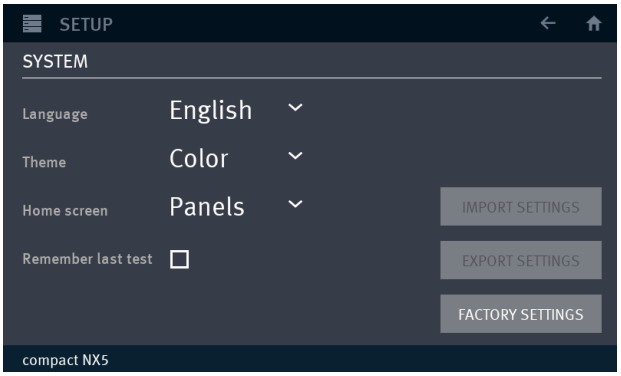


2. Press **Update Software**

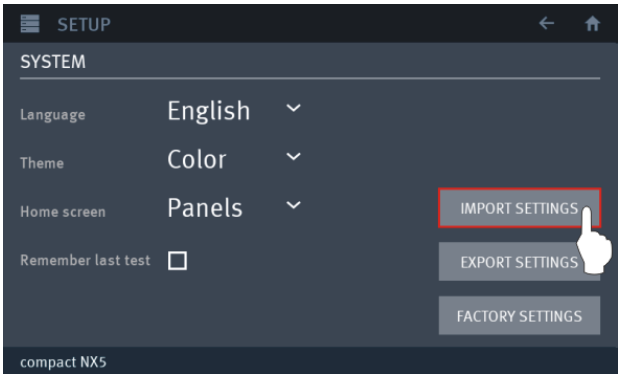


3. **Insert USB Stick** to the front USB slot

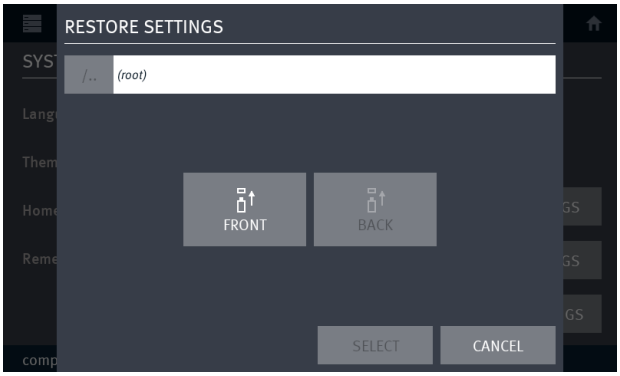
   After few seconds the Backup settings button will automatically be enabled.



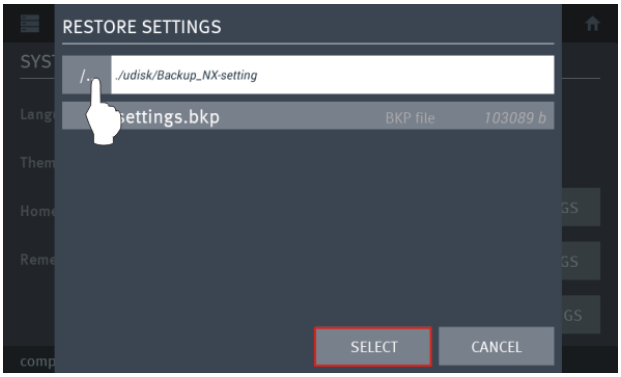
4. Click on **Import Settings**



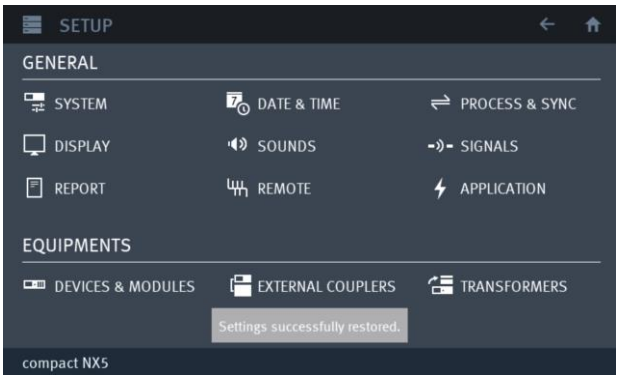
5. Press Front



6. **Select the backup file** (syssettings.bkp) and click **SELECT**.



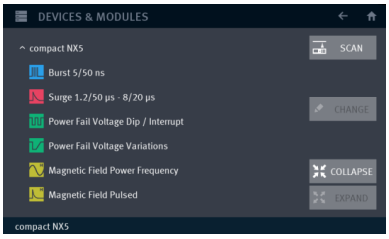
7. **Remove all USB Sticks** and **Restart** the compact NX, the initialization process will start normally and take you to the Home Screen.

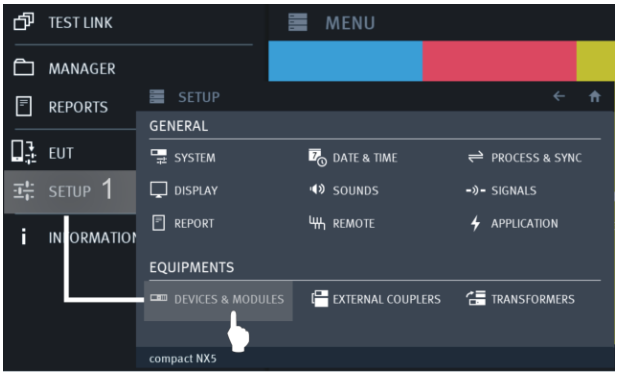


3.6.5. Manual Firmware Update

Firmware Update procedure

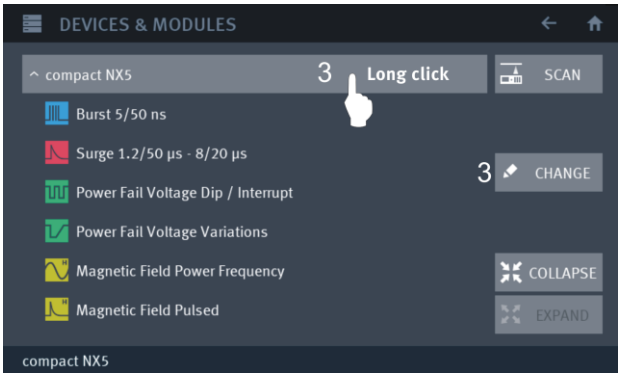
1. **Select MENU SETUP / DEVICE & MODULES**





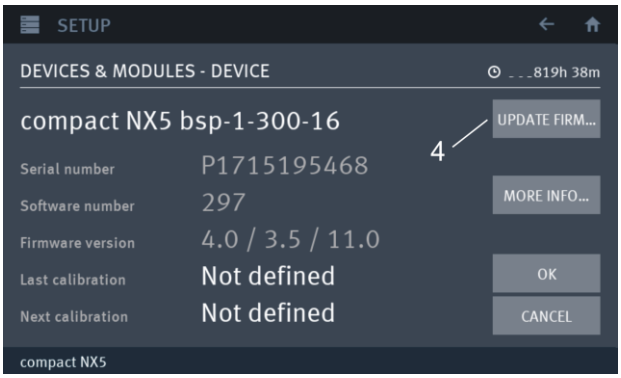
2. Insert the memory Stick with the update software in the root
   A message for search the memory stick appears until the memory stick is recognized.

   Firmware filename: *.upt



3. Make **click,** a **long click to compact NX** or press **change**

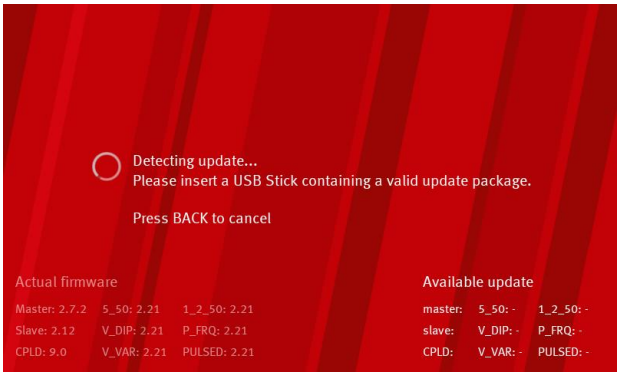
4. Press **Update Firmware**
   The program search the firmware update on the memory stick



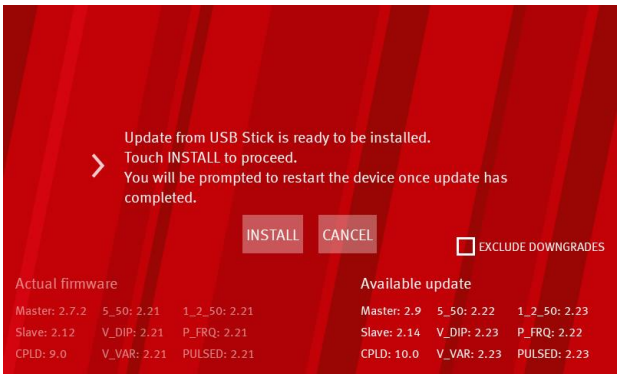
The device shows the actual and recognized new firmware version

If no USB stick is detected

Insert a USB stick containing valid update package



The device shows the actual and recognized new firmware version

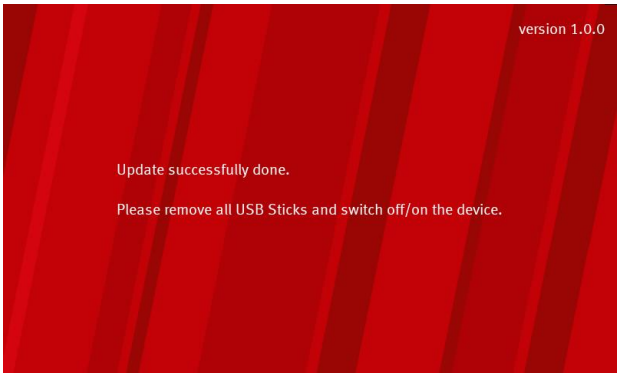


5. Press **INSTALL** for start the update procedure. The update process is shown on the screen and needs several minutes.

   Press **CANCEL** to exit

   Exclude Downgrades will not install older versions, when detected on the USB stick

6. After display "*Update successfully done*",
   - **remove** all USB Sticks
   - **switch off / on** the device



After the rebooting the device starts with the new firmware.

4. Design and Functions

4.1. Front view

1	Active indication	**6**	CRO V (surge)	**11**	CRO Trigger output ↑ 5V
2	Touch screen	**7**	HV pulse Burst output 50 Ω	**12**	Start / Pause
3	Knob (Inc. / Dec /Enter)	**8**	Coupling (Power, Burst, Surge)	**13**	Stop
4	" Test On"	**9**	EUT test supply	**14**	Back
5	CRO I (surge)	**10**	Ground reference (calibration)	**15**	USB input (Memory stick)

1 ACTIVE
Indicates that this unit is active

2 Touch screen and user interface
With the 7” capacitive touch screen display the user controls the equipment. The display indicates the status of the generator and test equipment.

3 Wheel (Inc. / Dec / Enter)
Rotate for increments or decrements a selected parameter. Push change the digit and hold with a numeric value or selects from a list of parameters. Press to change adjustment range. Selected range will be shown briefly next to selected parameter. Push and hold to “zero” to nearest range.

4 Test On
By pressing the key "Test On" follows the functions:
- Activate the high voltage power unit; HV is ready to start.
- Switches ON the supply to the EUT test supply (only with built in Power Fail module).

5 CRO I (surge)
At the BNC output the current pulse (surge) of the generator can be measured galvanic separated.
- Impedance measuring instrument: >1MΩ.
- Max. output voltage: 10V ±10% at 2.5 kA output current.

6 CRO V (surge)
At the BNC output the voltage pulse (surge) of the generator can be measured galvanic separated.
- Impedance measuring instrument: >1MΩ.
- Max. output voltage: 10V ±10% at 5 kV impulse voltage.

7 HV pulse burst output 50 Ω
External coupling devices such as the capacitive coupling clamp and the 3-phase coupling networks are connected to the coaxial 50 ohm output. Also the calibration of the generator is handled at this output.
Note: The burst signal is present on this output at every coupling mode.

8 Coupling mode
The LED indicates
- actual coupling mode of the Burst or Surge impulse to lines L, N, PE, or + for dc
- active power supply source PF1, PF2

1	Active indication	**6**	CRO V (surge)	**11**	CRO Trigger output ↑ 5V
2	Touch screen	**7**	HV pulse Burst output 50 Ω	**12**	START / PAUSE
3	Knob (Inc. / Dec /Enter)	**8**	Coupling (Power, Burst, Surge)	**13**	STOP
4	" Test On"	**9**	EUT test supply	**14**	BACK
5	CRO I (surge)	**10**	Ground reference (calibration)	**15**	USB input (Memory stick)

9 EUT test supply
For single-phase EUT the coupling/decoupling network is part of the generator. The EUT is powered via the safety banana plugs at the front panel of the simulator.

10 Ground reference
The ground reference (4mm) is used for EFT/Burst calibration adapters.

11 BNC - CRO Trigger
At the BNC output the generator trigger can be checked, e.g. the burst duration, the burst repetition rate and the spike frequency (+5 V rectangular). This output can be generally used as oscilloscope trigger output and is synchronous to the following events.
- Burst and surge release
- Voltage dip or interruption, start of the event.

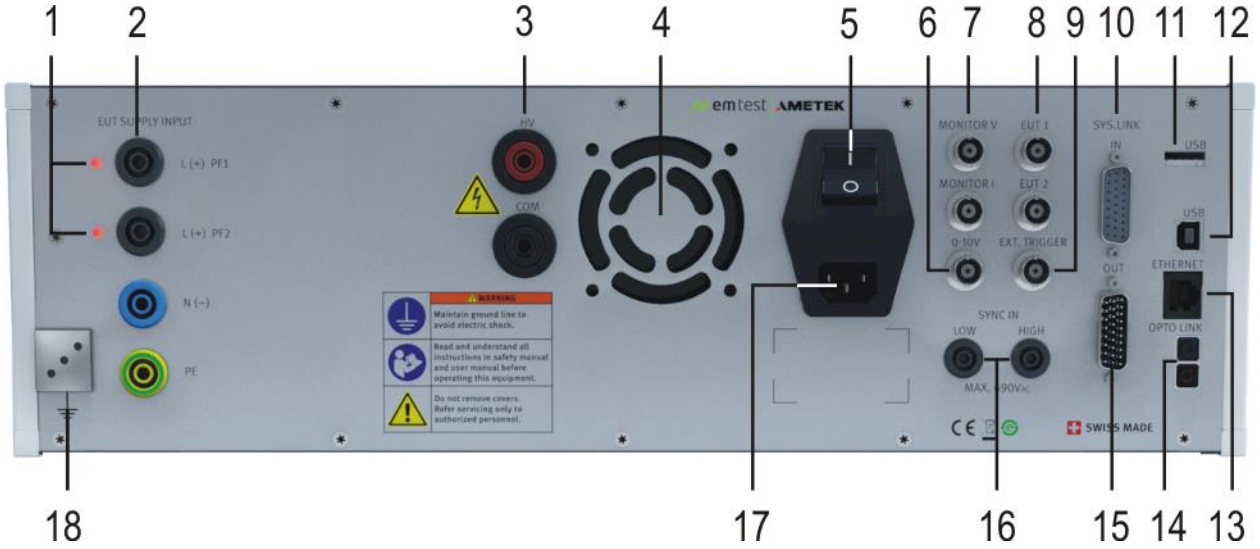
12 START / PAUSE button
- Green indication: Start or continues a test
- Orange indication: Pause of a running test

13 STOP / Pause button
- Red indication: Stop a running or paused test.

14 BACK button
- Returns from a stopped test to the input screen.
- Same effect with two fingers swipe on the screen, slide them from right to left

15 USB input (Memory Stick)
Input plug for a memory stick for export / import test reports or test and link-files. The user can load from this port setup pictures, updates and other files to the compact NX generator.

4.2. Rear view



1 Phase indication PF1 / PF2
2 EUT supply input
3 Surge output HV - COM
4 Ventilator
5 Mains Switch
6 DC output 0-10V
7 Monitor V, Monitor I
8 Fail, EUT 1, EUT2
9 External Trigger IN
10 Sys Link IN
11 USB A interface
12 USB B interface
13 Ethernet interface
14 Opto Link Interface
15 Sys Link OUT
16 Sync input
17 Mains input device
18 Reference earth connection

1 Phase indication
Phase indicator for PF1 and PF2 input, with reference to PE. To guarantee correct phase angle synchronization, the red lamp must illuminate. Otherwise the phase angle setting is 180 degree inverted.

2 EUT supply Input PF1, PF2, N, PE
Input plug for the EUT power supply (4mm safety banana plug). The input is not fused. The internal power fail switches (PF1, PF2) protect the system against overcurrent and are configurable.
- PF1: Mains voltage to EUT phase L
- PF2: Reduced dip voltage to EUT phase L (used for dip voltages as per IEC 61000-4-11)
- N: Neutral to EUT supply
- PE: Protected earth to EUT supply

3 HV and COM output
The direct HV and COM outputs are floating output plugs for surge impulses.

Attention

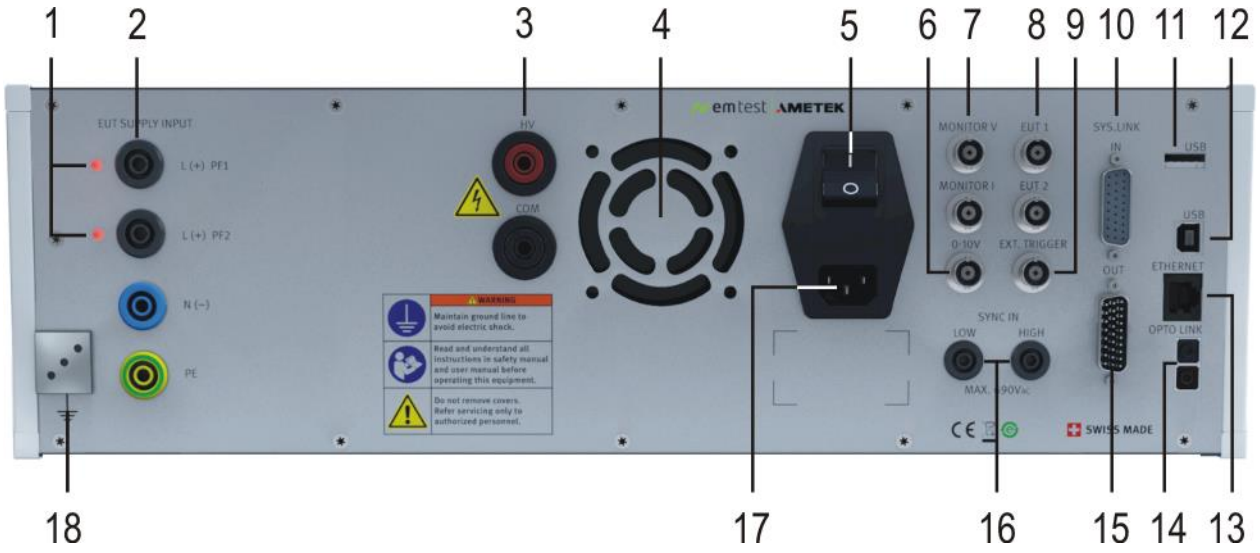
The direct HV and COM output of the surge generator is located at the rear panel of the generator. It is not allowed to connect these outputs to any other coupling/decoupling network than manufactured by AMETEK CTS. Before to connect any external networks to this output the operator must contact the manufacturer. Any damages due to this matter are not covered by warranty.

The direct pulse output shall also not be used to connect the generator directly to any power conducting lines

The wave shape measured at the direct pulse output must not be within the tolerances specified in IEC 61000-4-5. The pulse shape shall be verified at the CDN output directly, no matter whether it is an internal or external CDN.

4 Ventilation
A power controlled ventilator is cooling the compact NX generator. During the most application the ventilator runs with variable speed depends the cooling requirement.
After long term duration tests the generator should keep on running for some minutes to cool down the system.

5 Power on switch
The switch is part of the mains filter. Mains fuses are part of the filter. (230V / 2A and 115V / 4A)



1	Phase indication PF1 / PF2	**7**	Monitor V, Monitor I	**13**	Ethernet interface
2	EUT supply input	**8**	Fail, EUT 1, EUT2	**14**	Opto Link Interface
3	Surge output HV - COM	**9**	External Trigger IN	**15**	Sys Link OUT
4	Ventilator	**10**	Sys Link IN	**16**	Sync input
5	Mains Switch	**11**	USB A interface	**17**	Mains input device
6	DC output 0-10 V	**12**	USB B interface	**18**	Reference earth connection

6 DC output 0-10 V

Dc output for control an external AC source.
0.0 V = zero position
10.0 V = max. position for maximum voltage

7 Monitor V and Monitor I (BNC connector)

BNC output for measuring the EUT supply voltage and supply current
Impedance measuring instrument: ≥ 1MΩ.
Accuracy: 5%

Monitor V:	**16 A model**	**32 A model**
Voltage output: 10 V =	300 V rms, 450 V peak	400 V rms, 565 V peak
Internal divider:	42.5: 1	56.5:1

Monitor I:	**16 A model**	**32 A model**
Current output:	10 V = 70 A peak,	10 V = 140 A peak
Internal divider:	7 A/V	14 A/V
Max.	16 A rms, 16 A dc	32 A rms, 32 A dc

8 Fail input EUT 1, EUT 2

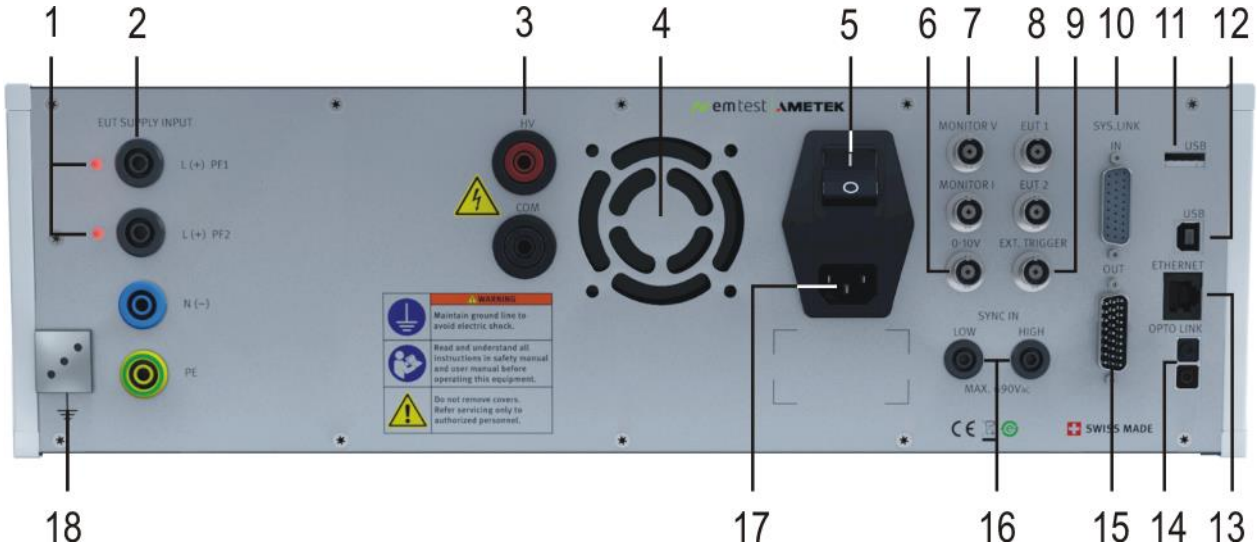
Programmable input monitors for fail events. Possible input settings: Notify, Stop, Break or Disabeled
Input signal: 5 V neg. slope
Max- Input voltage: +20 V
Input protection 15 V, transzorb diode

9 External trigger

One single event, burst, surge, voltage dip can be released. Trigger level 5V positive going.
BNC connector 50 Ω
Digital Input (0 – 5 V)
Positive slope
Trigger Level: 2.5 V +/-1 V
Max- Input voltage: +10 V
Input protection 5 V, Transzorb diode

10 Sys Link input

Sys link is the internal control bus to the connected compact NX devices. The sys link is a daisy chain wired bus for connect the devices in series. The bus includes a 26 pole high density connectors. This port is terminated with the **SSC AD** Safety circuit adapter with a short circuit.



1	Phase indication PF1 / PF2	**7**	Monitor V, Monitor I	**13**	Ethernet interface
2	EUT supply input	**8**	Fail, EUT 1, EUT2	**14**	Opto Link Interface
3	Surge output HV - COM	**9**	External Trigger IN	**15**	Sys Link OUT
4	Ventilator	**10**	Sys Link IN	**16**	Sync input
5	Mains Switch	**11**	USB A interface	**17**	Mains input device
6	DC output 0-10V	**12**	USB B interface	**18**	Reference earth connection

11 USB interface (for service purpose ONLY)
USB interface “USB A” connector. Input plug for a memory stick for export / import test reports or test and link-files. The user can load from this port setup pictures, updates and other files to the compact NX generator.

12 USB interface (for service purpose ONLY)
USB interface “USB B” connector for service purpose with an external computer. Using the USB interface may cause EMC problems during burst tests at the computer or notebook side of the communication line. Therefore, only a high quality USB cable shall be used.

13 Ethernet interface for REMOTE operation
Ethernet interface for remote control from an external computer.

14 Opto Link interface for REMOTE operation
USB to Opto Link interface for remote control from an external computer.

15 Sys Link output
Sys link is the internal control bus to the connected compact NX devices. The sys link is a daisy chain wired bus for connect the devices in series. The bus includes a 26 pole high density connectors. This port is terminated with the **SWL AD** (Safety Warning Lamp Adapter).

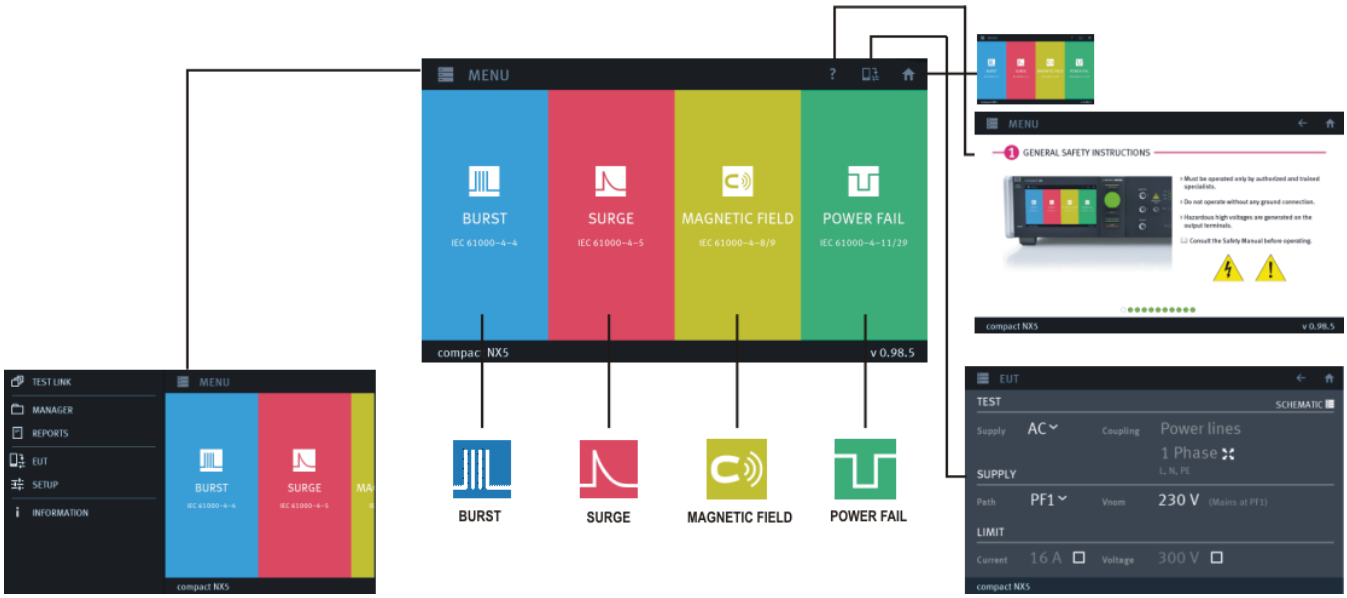
16 SYNC input (External)
External synchronization input for synchronize the generator impulse to this signal.
Input signal range: 10 V – 690 V.15Hz to 500 Hz
For each test with synchronization the generator measures the frequency. If no signal is detected, a window will propose to continue in asynchronous mode.
Internal synchronization detects the signal from input L of the channel PF1.

17 Mains Input and Fuse
Mains input for the generator power supply.
Input voltage: 85 V – 254 V ac
Fuses: 115 V: 4 A slow blow, 5 x 20 mm.
230 V: 2 A slow blow, 5 x 20 mm

18 Reference earth connection
The generator has to be connected to the reference earth plane of the test set up. The connection at the rear part of the generator is an alternative to the grounding point at the front panel

4.3. Menu description

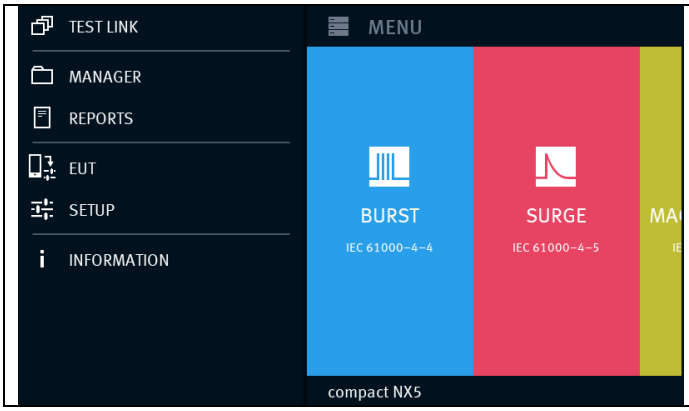
4.3.1. Main Menu



	**Home** Returns to the Home screen
	**Help** Shows the Quick Start Guide for a brief information for NX5 generator operation
	**EUT and Supply configuration** - EUT configuration (power line arrangement / data lines) - Test supply and coupling - Supply Path and voltage - Limiter for EUT current and voltage
	**Menu Setting**: Opens the menu for general settings Test Link Configuration of test link procedures Manager Test files management for test library configuration EUT Configuration of EUT and EUT supply Setup General setup compact NX and configuration of auxiliary test equipment Modules List of all available pulse modules Information Device name, Software and firmware version, address of representatives
	**Test phenomena** Touch into the colored field for select and load a test. The icon shows the kind of test phenomena. **Burst** impulse test 5/50 ns as per IEC 61000-4-4 **Surge** impulse test 1,2 /50 µs as per IEC 61000-4-5 **Telecom Surge** test 10/700 µs as per IEC 61000-4-5 **Magnetic field** test Power magnetic field as per IEC 61000-4-8 Pulsed magnetic field as per IEC 61000-4-9 **Power Fail** tests Dips and interruptions IEC 61000-4-11 / 29 Voltage variation as per IEC 61000-4-11

4.3.2. Menu Setting

Each test phenomena is operating similar. The next section shows the basic operation for perform a test.



Screen after Touch on

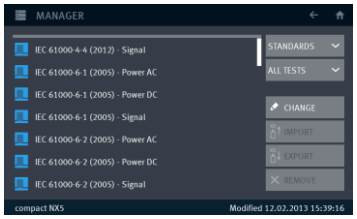
Test Link

In this menu, the user creates and complete his own test Link

A Link Test is generated from

- Test files, loaded from the library (Burst, Surge, …)
- Pause or messages with information to the test
- Save or load any test

Manager

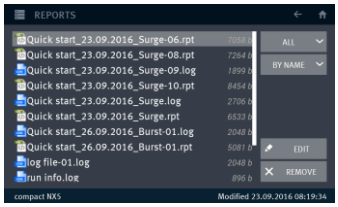


The user configures in this menu the library Manager of all existed test files.

- Rename of tests
- Mark as visible or hide
- Remove test from the library
- Import and Export of test

Reports

16.3. Report Export

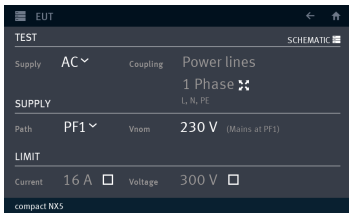


Report Menu for export Report and Log files:

- Report as *.rpt
- Report as *.pdf
- Report as *.rtf
- Report Run Information as *.log

EUT

4.3.5. EUT Setup



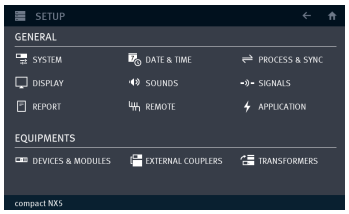
EUT and Supply configuration

EUT Configuration and Setup for the test.

The generator uses the settings and offers exact the needed information for the EUT. All needless information will not be displayed

Setup

4.3.6. Setup



Setup

General setup for compact NX settings

- System, Date/Time, Process & Sync Display, Sounds & Signals, Application, Report; Remote,

Equipment setup for

- External couplers, Transformers

Information

System Information

- Device Version, Firmware, Software
- Representative address AMETEK CTS offices, when touch the national flags
- CH, Germany, USA, Poland, France, Italy, Austria, China, Japan
- - Software update (3.6. Software Update)

4.3.3. Test phenomena

Every phenomenon is supported by a color code. Touch into the colored field for select and load a test. The icon shows the kind of test phenomena.

Burst impulse test 5/50 ns as per IEC 61000-4-4

Surge impulse test 1,2 /50 µs as per IEC 61000-4-5

Telecom Surge test 10/700 µs as per IEC 61000-4-5

Magnetic field test

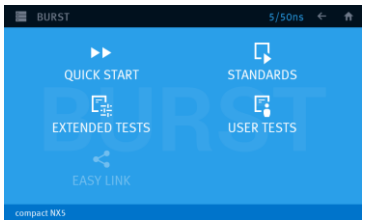
- power magnetic field as per IEC 61000-4-8
- Pulsed magnetic field as per IEC 61000-4-9

Power Fail tests

- Dips and interruptions IEC 61000-4-11 / 29
- Voltage variation as per IEC 61000-4-11

Ring wave test 0.5 µs / 100 kHz

The phenomenon offers up to five different test modes.
USER TEST and EASY LINK with lighted symbols are libraries that includes at least one test. An Empty library is marked with gray color and includes actually no test (e.g. EASY LINK).



Quick Start: Manual operating with online changing of parameters

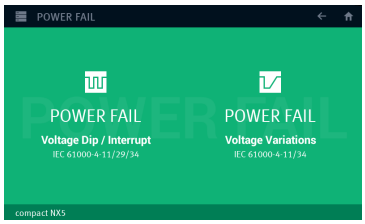
Standards: Library with Basic- and Generic Standards. The Standards are separated in Power AC, Power DC, and Signal lines. Each Basic Standard includes all existing levels.

Extended Tests: Test procedures with useful sequences like voltage iteration

User Tests: User configured test library. These tests can be used in any link files.

Easy Link: Temporary storage of test files of the phenomenon. Easy Link files are deleted after switch off the device.

Power Fail



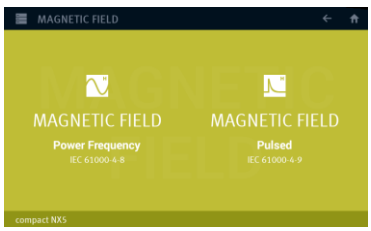
Power Fail offers two different phenomenon test proceduresThe screen shows both tests.

Select a test you like to perform for open.


Voltage Dip / Interrupt


Voltage variation

Magnetic Field



Magnetic field offers two different phenomenons.

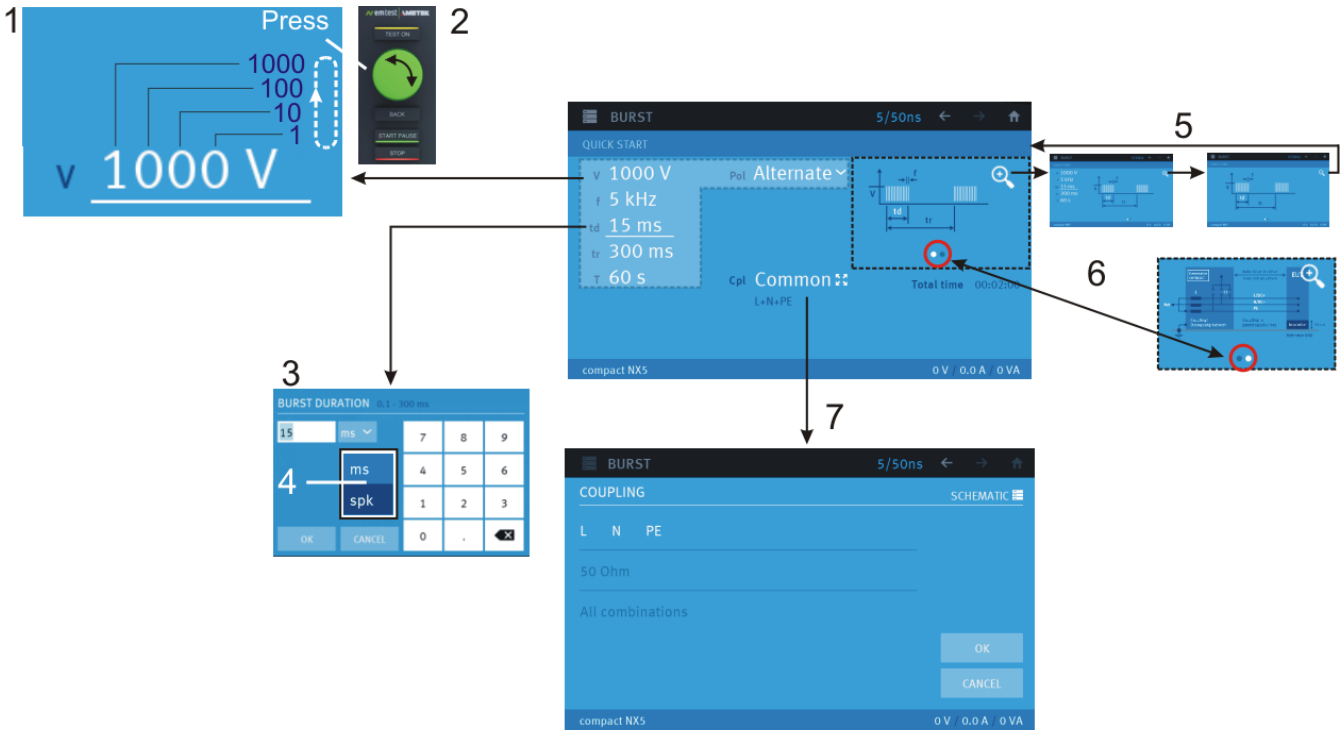
Select a test you like to perform for open.


Power Frequency
as per IEC 61000-4-8


Pulsed
as per IEC 61000-4-9

4.3.3.1. Parameter setting

All phenomena offer similar parameter setting procedures. The figure below explains the different actions for parameter setting.



1 Parameter change

All white colored parameters are changeable. Blue colored parameters are normally defined by the used standard and fixed. For change a parameter proceed the following:
Touch into the parameter you like to modify
The selected parameter is marked with underline 1000 V[1]. The [1] indicates the digit that changes using the wheel.

2 Parameter modification with the wheel

- **Rotate** the wheel: **Increase** or **decrease** the selected digit. Depend on the parameter the digit is defined.
- **Press** the wheel: Will change the digit, press again for the next digit. This will rotate the digits cyclic (1, 10, 100, 1000, 1, 10 …). A small value indicates the selected digit that will be controlled by the wheel.
- **Long press** wheel: All digits right will be replaced by a zero. Example

3 Parameter modification with the touch

A numeric display, with the parameter description and his limits appears at the screen.

- **Parameter**: **Enter** the new value of this parameter.
- **OK / CANCEL** Terminate the parameter input
  - **OK** replaces the parameter with the new input value
  - **CANCEL** keeps the old value

4 Parameter unit modification

Some parameters allow changing the unit as (ms / spikes) or (µs / ms / s) or (% / V) for the test procedure. Select the desired parameter unit for perform the test

5 Picture Loupe function

Touch the loupe symbol or **double tap** the figure for magnifying the picture. There are three magnifying steps rotating the size.
It is possible to add new pictures in this picture gallery.

6 Picture change

The dots below the picture indicate the number and position of available  pictures. Slide left or right through the picture for change to the next / previous picture.

7 Coupling screen

Touch the coupling symbol 

for open the coupling screen. The screen offers all options for change the coupling. See to the phenomenon description for more information.

4.3.3.2. Set and test window

The screen for each phenomenon separated in two different screens. The figure below illustrates the state machine during the testing.

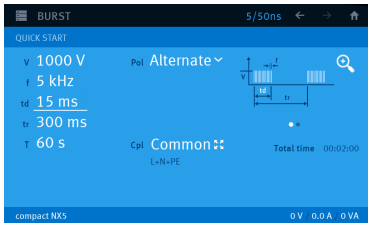
SET screen: Screen for setting all test parameters (yellow circle).

TEST screen: Screen during a test is running. After the **START** the user can **PAUSE** and **START** (Resume) or **STOP** the test (grey circle)

Testing: Test is running
Break: Test is paused and can be continued with start
Resume: Test is running and continued after a break
Stop: Test is stopped during running or at a break. The test is not completed with all test sequences. A stopped test cannot be continued.
Finished: The test is completed and terminated with all test sequences

4.3.4. Test and Run Window

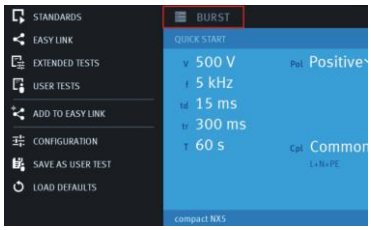
Test Window
In the test window the user can enter the parameters of the test. Further it is possible to change in another test menu and to safe the test as Easy Link or User test.



Test window

The window shows all parameter for the test. The underlined parameter **15 ms** is the parameter that can changed with the wheel. A graphic shows the focused parameter.

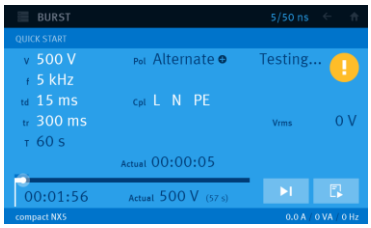
- Touch to a white colored parameter for select and change
- Rotate the wheel for parameter value change



Test Window Menu

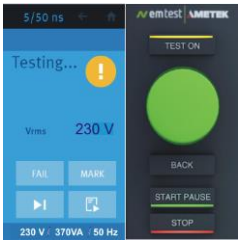
Menu functions:
- Change to Standards, Easy Link, Extended Tests, User tests
- Add the actual test to Easy Link
- Configuration menu
- Safe the test as User Test
- Load default test settings

Run Window
The run window is active from the Start of the test until the user press the **Back** or ←button after a stop or when the test is finished. It is possible to return into the Run window with the button ➔ al long as no parameter has changed in the Test Window.
In the Run window the user can view the run information and save the report or run Information.



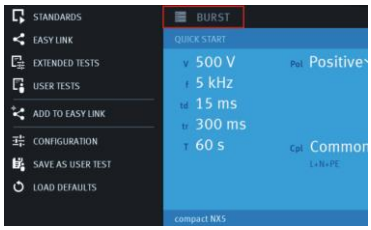
Run window

The run window shows the following information
- **Set parameters**: Parameter color; white changeable, blue fix parameters
- **Run Status**: Testing, Break, Stopped, Finished
- **Graphic bar**: Indicates running time of actual setting and total test time
- **Time**: Time of actual setting and total test
- **Measuring**: EUT parameters (voltage, current, power, frequency)



Test control buttons

START / PAUSE	Starts, pause and continues the test after a pause
STOP	Stopps a test. The test is finished
BACK	Return to the test window for change parameters
▶I	Step to the next test sequence (e.g. coupling, polarity)
	Report functions enable
FAIL MARK	FAIL and MARK function for Report event

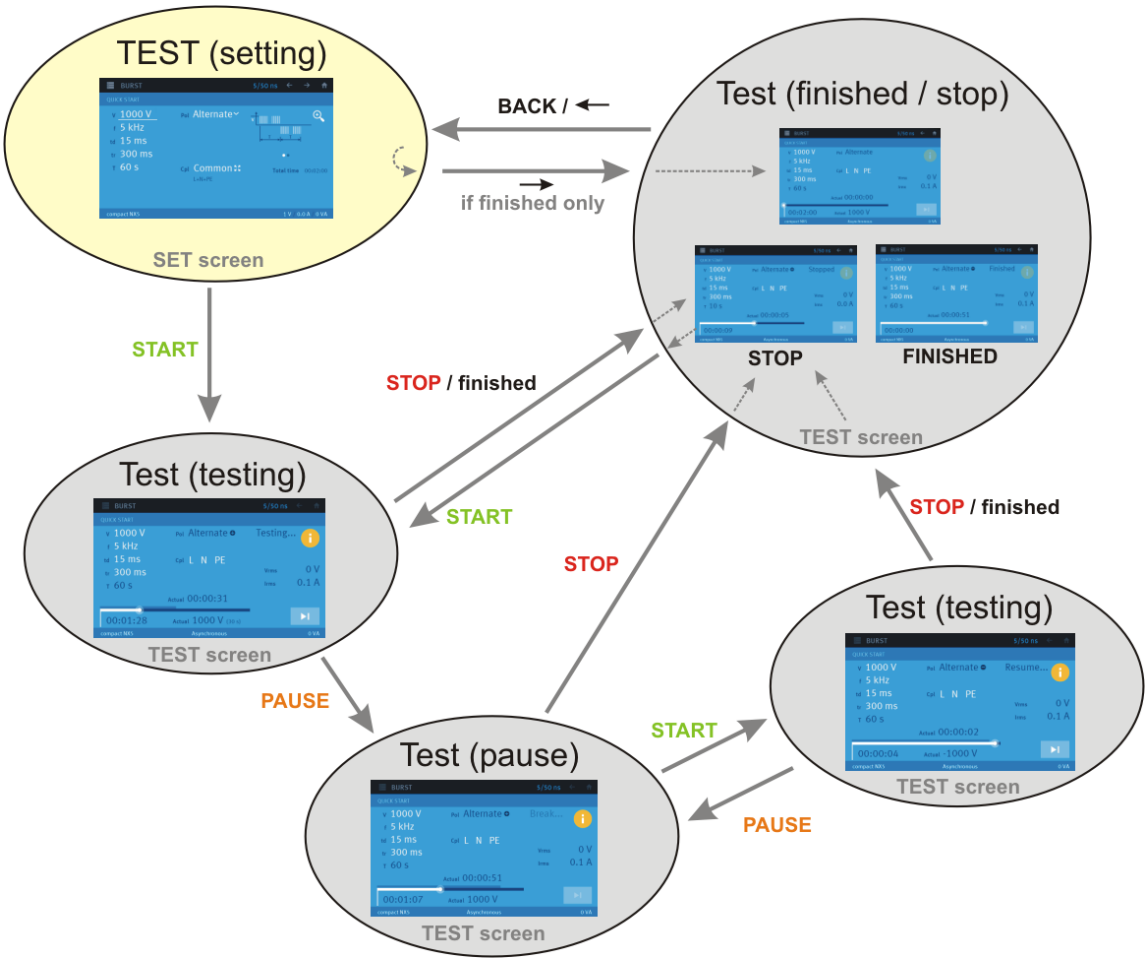


Run Window Menu

Menu functions:
- View Run Information
- Save Report
- Save Run Information
- Configuration menu

Block diagram for a test

Test window: Yellow background
Run Window: Grey background



State machine for the generator screen during a test sequence

Test window Menu

4.3.4.1. Run Window Menu

The run Window Menu offers the following functions. The most functions are available in all phenomenon.

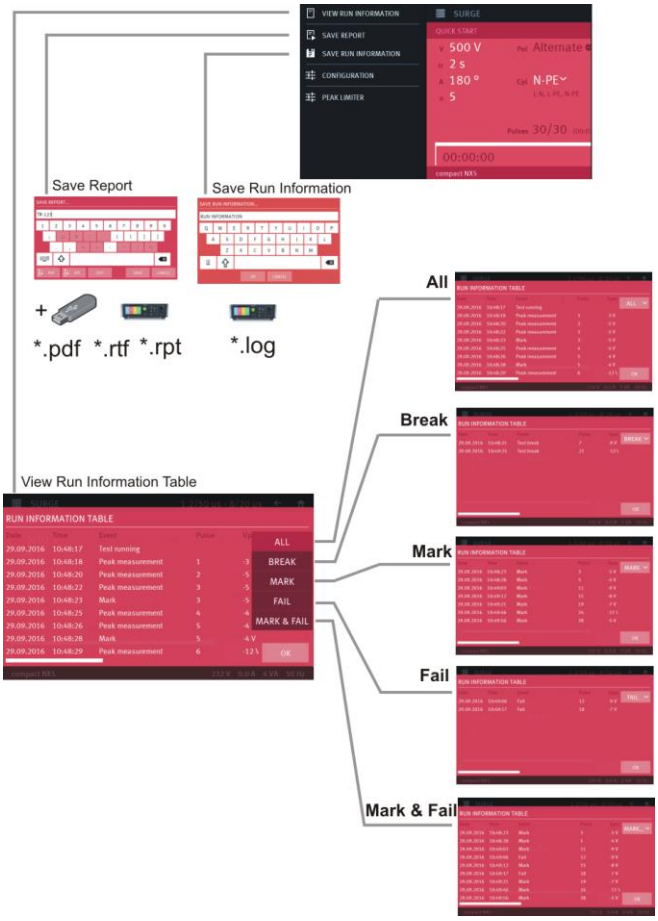
View Run Information
Run log table where all parameter changes and events during the test are logged.

Save Report
Save the report to
- Ext. USB Stick as a *.pdf file
- Ext. USB Stick as a *.rtf file
- Internal in the device as *.rpt file

Save Run Information
Saves the run information internal to the device as log file. The file can be export in the main menu

Configuration
Trigger- and Monitor configuration

Peak Limitter
Setting of Peak current Limitter



4.3.4.2. Run Window at test end

After running a test, the VIEW RUN INFORMATION shows all run information during the test. The list shows:

- The actual date and time of the event
- All parameter settings and their changes
- Measurements like peak voltage or peak current
- Events like Mark, Fail and breaks

A Filter separates the log table by: **All**, **Break**, **Mark**, **Fail** and **Mark & Fail**

4.3.5. EUT Setup

In the EUT Setting the user specified his EUT. With this information the compact generator software will configure all settings to the EUT requirements.

The user defines:

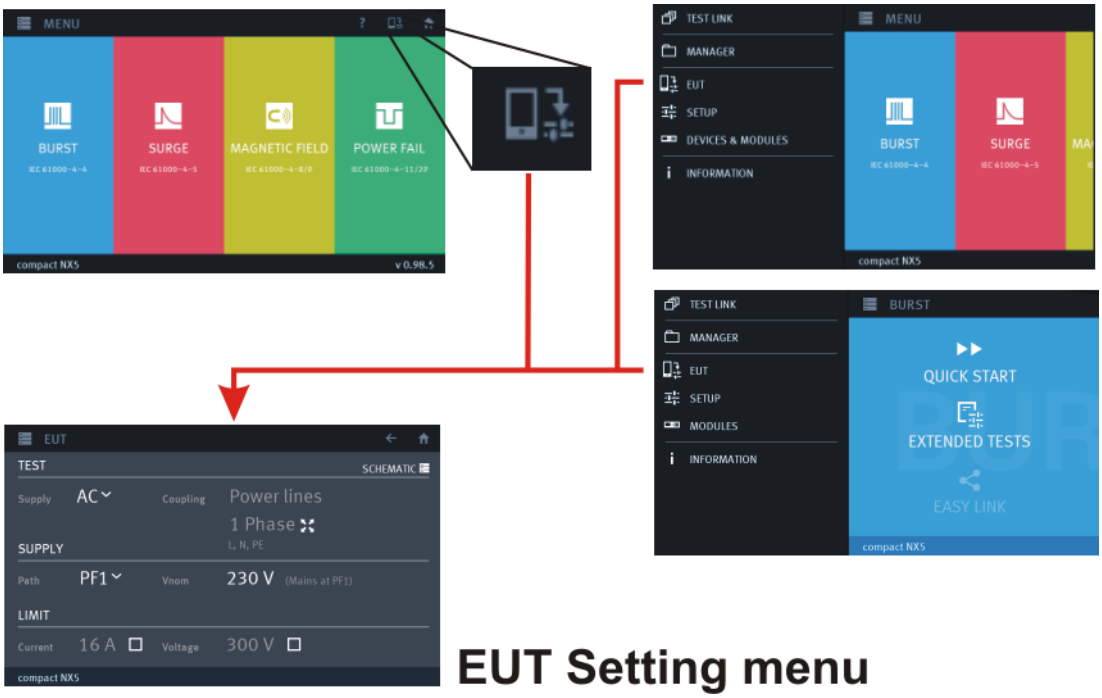
- Mode of supply voltage (AC/DC)
- Configuration of the EUT supply wiring
- Default channel for the power supply
- The mains supply voltage
- Current and Voltage limit and their settings

Advantages are:

- Select only set the possible couplings and hides all unnecessary settings for the user
- Filters the standard tests adapted to the EUT like AC 50Hz, AC 60 Hz, DC.
- Set the motor variac to the settled nominal voltage

Select EUT setting menu

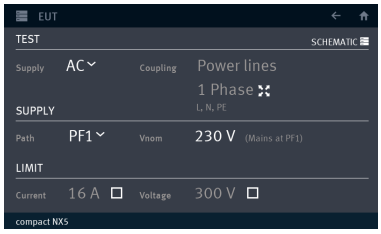
Figure below shows how enter into the EUT setting menu



EUT Setting menu

EUT Setup

The generator uses the settings and offers exact the needed information for the EUT. All needless information will not be displayed



← EUT Configuration and Setup for the test.

← EUT and Supply path and mains voltage configuration

← EUT current and voltage limit

4.3.5.1. EUT Setup / TEST

TEST Power configuration for the actual connected EUT

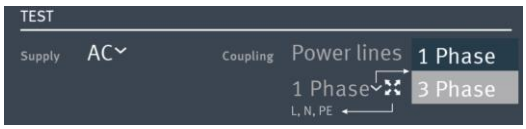
Supply: AC
DC
For CDN with AC/DC coupling the source will automatically **change to AC or DC when selected**

Coupling: Power lines
Data lines

Phase Filter: Select the used lines
- 1-phase (L, N, PE)
- 3-phases (L1, L2, L3, N, PE)

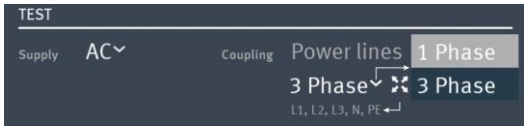
1 Phase
3 Phase

Coupling Select the used coupling Mode to the selected coupling device
- 1 phase for NX5 device
- 1 or 3 Phase for coupling NX

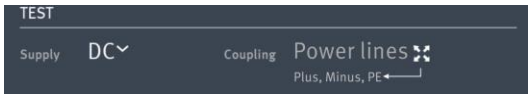


Supply **AC** Coupling **Power Lines**

1 Phase	L, N, PE	with PE
	L, N	no PE



3 Phases	L1, L2, L3, N, PE	Star with PE
	L1, L2, L3, N	Star no PE (PEN)
	L1, L2, L3, PE	Delta with PE
	L1, L2, L3	Delta np PE
	L1, L2, PE	Interphase
	Lx, Lx, …	other combination



Supply **DC** Coupling **Power Lines**

Plus, Minus, PE	with PE
Plus, Minus	no PE

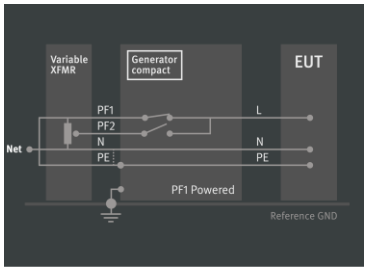
4.3.5.2. EUT Setup / SUPPLY

SUPPLY Defines the default supply path to the EUT and the nominal voltage. For DC application the user needs two DC sources for PF1 and PF2 voltage each.

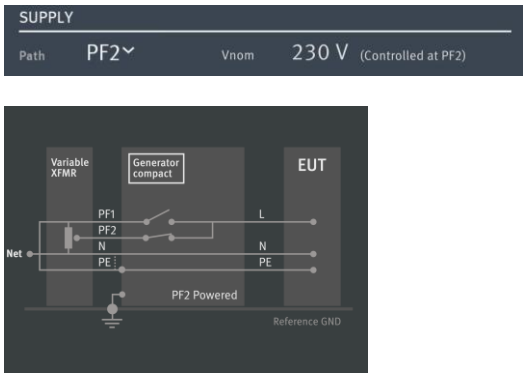
Path: PF1 Mains voltage from the power grid
PF2 Voltage from the variac or tapped transformer

Vnom: Mains voltage or defined voltage

Path	**Vnom** (mains from the grid)
PF1	100 V, 115 V, 230 V, or any mains voltage



NOTE: PF1 is the default setting for general application for Burst, Surge and Power Fail testing.
The compact NX generator uses this V*nom* voltage as **100% value for Dips** test as per IEC 61000-4-11.



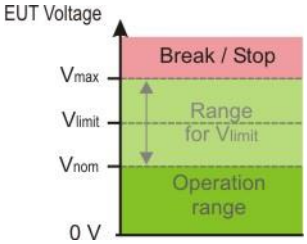
Path	**Vnom** (controlled at PF2)
PF2	Any voltage (example 230 V- 10%) The variac voltage is set to the following voltages:
	Power Fail: settled DIP voltage Power magnetic Field: 0 V All other phenomenon's: Vnom (PF2)

NOTE: PF2 is used for operate a EUT with different voltage than the actual mains voltage.
For Power Fail tests only PF2 mode with voltage interrupt tests are possible.

4.3.5.3. EUT Setup / LIMIT

LIMIT Defines the limit for the voltage and current rms measurement for stop the test.

- **Enable the box** for activate and set the limit
- Current limit will trip if the current is above the settled limit and will **break / stop the test**
- Voltage limit will trip if the rms voltage is above the settled limit and will **break / stop the test**



	Enabled (white)	**Disabled** (grey)
Current:	Range 0 to 50 A	no function
Voltage:	Range 0 to 300 V	no function

Internal hardware current limiter

The built in internal hardware limiter operates as follow. In case of an overcurrent the **TEST ON** is switched off, and the user has to confirm a message.

16 A models

I < 23 A	No action
23 A ≤ I < 40 A	Fail after 45 s
40 A ≤ I < 50 A	Fail after 30 s
50 A ≤ I	Fail after 5 s

32 A models

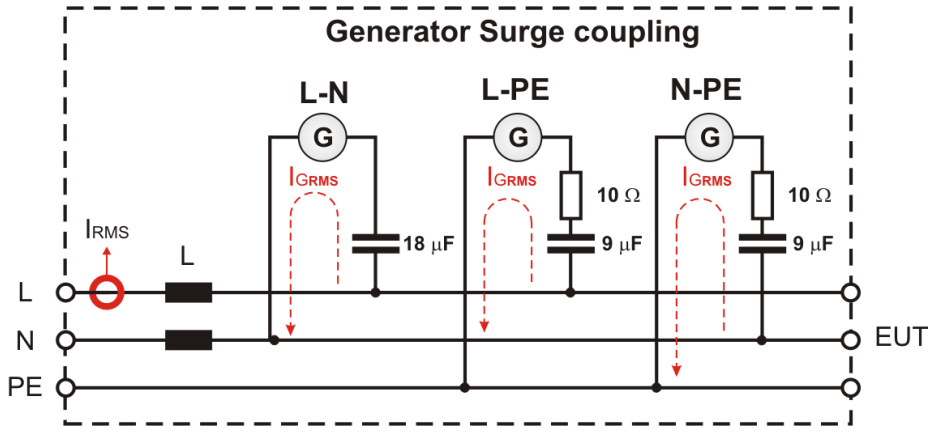
I < 46 A	No action
46 A ≤ I < 80 A	Fail after 45 s
80 A ≤ I < 100 A	Fail after 30 s
100 A ≤ I	Fail after 5 s

4.3.5.4. RMS Measurement

The built-in RMS measurement measures the EUT voltage and current.

During the surge coupling an ac current is flowing over the coupling capacitor through the surge wave shape circuit. This current is also measured by the rms meter and is to respect for the EUT reading.

Additional ac current during surge coupling:



Current in the coupling path measured by the EUT current meter

Current I_{GRMS} through the coupling pat at 50 Hz

Unom / 50 Hz	Coupling L-N	Coupling L-PE
100 V	0.57 A	0.28 A
115 V	0.65 A	0.32 A
230 V	1.30 A	0.65 A

Current I_{GRMS} through the coupling pat at 60 Hz

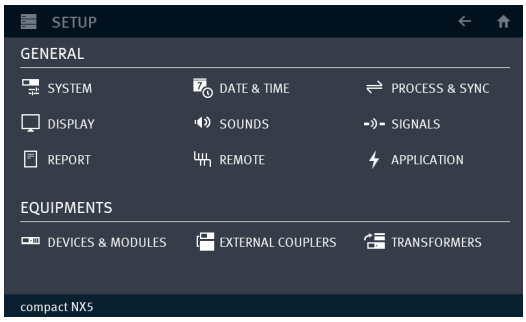
Unom / 60 Hz	Coupling L-N	Coupling L-PE
100 V	0.68 A	0.34 A
115 V	0.78 A	0.39 A
230 V	1.56 A	0.78 A

4.3.6. Setup

The Setup menu is the place where the user configures his test equipment and device behavior.

General: Setup menu for the compact NX system

Equipment: Setup menu for equipment's connected to the compact NX test generator



Overview Setup

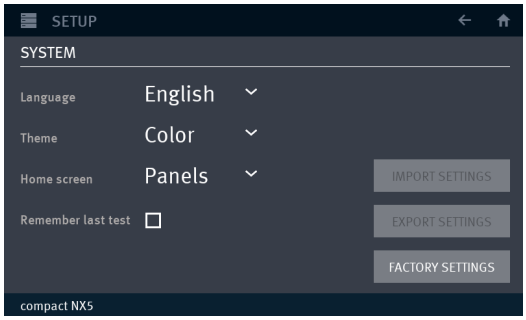
General

System:	Language, Display design, Home screen, Last test memory
Date & Time:	Setting date and time with format,
Process & Sync:	Ac mains synchronization, timeout for sync and trigger, Power frequency detection, HV-COM 18 µF capacitor
Display:	Brightness
Sounds:	Loudspeaker volume; Sounds Test running; Test finish, enable/disable
Signals	Surge countdown; Waiting for trigger; warning signal, enable/disable
Application:	Surge coupling to HV-COM output with 18 µF enable/disable
Report:	Report settings implemented from V 3.0.0 and higher
Remote:	IP address, subnet mask, gateway, MAC address

Equipment's

Devices and Modules	List of all available Devices and Modules like Burst, Surge, Telecom Surge, Power Fail, Magnetic Field, Ringwave…
External Couplers:	3-phase coupling networks, Magnetic field antennas
Transformers:	Variac transformers, tapped transformers, H-field ac transformers

4.3.6.1. Setup / General / System menu



Language: Selection English (default), German, Espanol, Francais, Italian, Polish, Rushia…

Color: Color design of the display selection


Color,


Grey

Home screen: Design of the home screen


Panels


Carousel

Remember last test:

Enable: When enter in any test menu; the software will automatically load the same test that was used last time in this menu.

Disabled: Load the selected test in the menu.

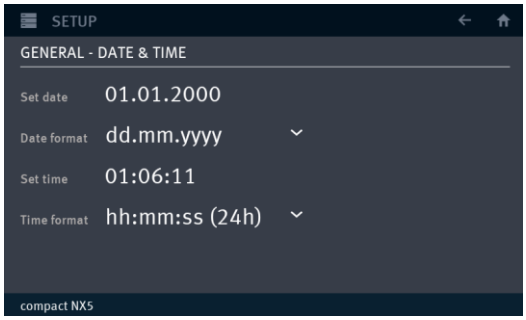
Import / Export Settings

Export/ import the system settings to file *syssettings.bkp*

FACTORY SETTING

Sets all parameters to the factory settings, even the messages.

4.3.6.2. Setup / General / Date and Time menu



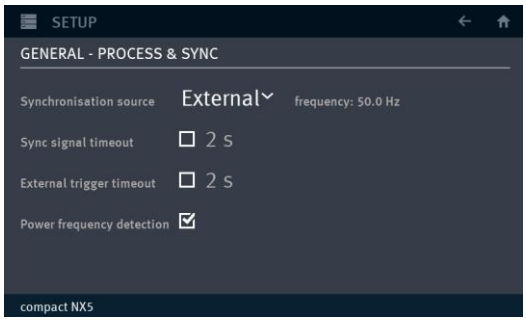
Set Date: Year; Month and Day from calendar
For set tap to the Year, Month (date)

Date format: dd.mm.yyy; dd-mm-yyyy, dd/mm/yyyy, yyyy-mm-dd

Set time: Hour; minute

Time format: hh:mm:ss (24 h), hh:mm:ss (12 h)

4.3.6.3. Setup / General / Process & Sync menu



Synchronization: Phase angle sync form EUT line or from an external sync signal.

Internal: 1-phase: Phase L to N
3-phases: Phase L1 to N

External: Sync input rear: Low – High max. 690 V

Sync signal timeout: Waiting time to sync timeout

Disable: Default setting, no timeout

Enable: activate and set time [s]

External trigger timeout: Waiting time to external trigger timeout

Disable: Default setting, no timeout

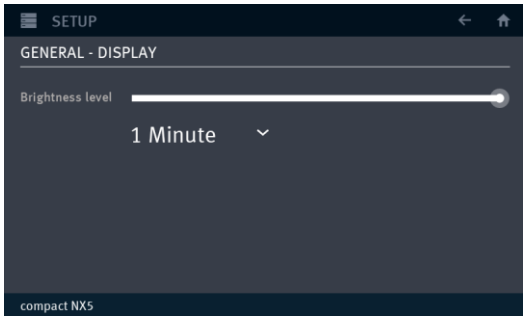
Enable: activate and set time [s]

Power Frequency detection:

Disable: No filter for Power Fail standard

Enable: Standard library is filtered to 50 Hz / 60 Hz

4.3.6.4. Setup / General / Display

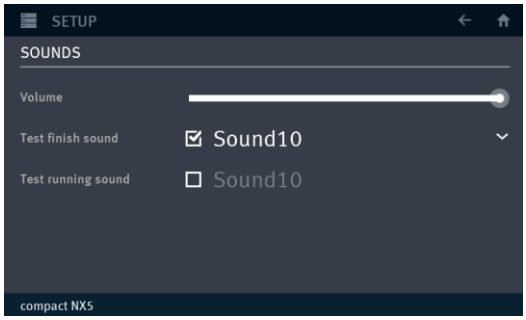


Brightness level:
Move the cursor to change

Timer Dims the backlighting after the preset time if no touch is carried.

Setting:
1, 2, 10, 20 minutes
1 hour
never

4.3.6.5. Setup / General / Sounds



General sounds and signals level:

Volume: Move the cursor to change

Test running signal:

Disable: no sound

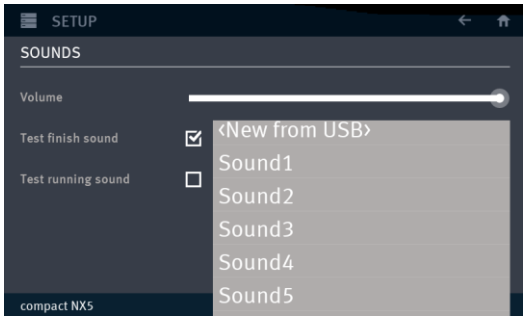
Enable: selected sound is playing during the test

Sound selection

For the running and test finished signal are 10 different sound signals available.
The user can individual selects one of these signals or load his own MP3 sound into the library. Max. file size= **10** MB

Delete a sound

Delete the file with long-click and follow the procedure



Sound selection procedure:

1. Enable the sound button. The predefined sound-number is highlighted

2. Select the sound. The sound will start when selected

New from USB:

1. Insert USB stick on front

2. Select <New from USB>

4.3.6.6. Setup / Signals menu

Surge countdown signal

Beep 2 seconds before surge trigger

Disable: Default setting, no beet

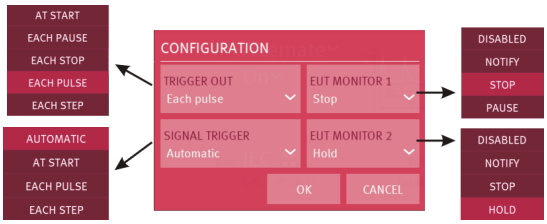
Enable: Beep occurs 2 seconds before trigger release

Waiting for trigger signal:

Waiting time to external trigger timeout

Disable: Default setting, no waiting (AUTOMATIC)

Enable: activate, request a setting of the SIGNAL TRIGGER (at start, each pulse, each step).



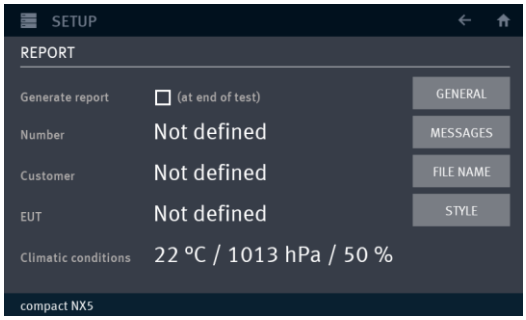
Warning signal:

Disable: No warning signal

Enable: Tripple beep for warning

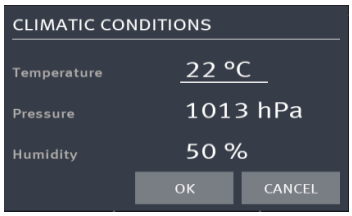
4.3.6.7. Setup / General / Report

Report menu is implemented on version 3.0.0.0. and higher



Individual setting for:

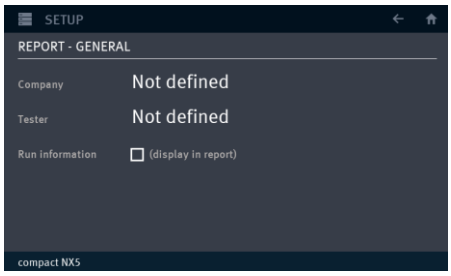
- Generator report
- Test report number
- Customer name
- EUT name General Report generation,



- Climatic condition of the EUT during test

	Parameter	Input Range
-	Temperature [°C, °F, °K]	- 30 °C - + 80 °C
-	Pressure [h Pascal]	800 hPa – 1100 hPa
-	Relative humidity [%]	0 % - 100 %

All settings work with Keypad only



Report General

Company	Company Name
Tester	Name of the tester
Run Information	Shows the run information in the report. Additional actions like settings, Peak measurements etc..

Report Message

The user can predefine messages that are displayed and selectable during a pause.

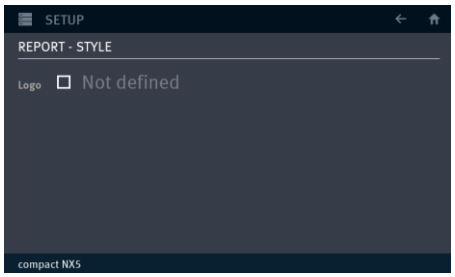
Report Break Messages

Example for the message box during a pause with four preselected messages. The selected message will be added to the report.

Report Filename

The user defines the report file name which is displayed as proposal after the test. The filename is built with the selected patterns

+	Add the selected pattern into the list
-	Removes the selected pattern from the list
↑ ↓	Shift the selected symbol in the list

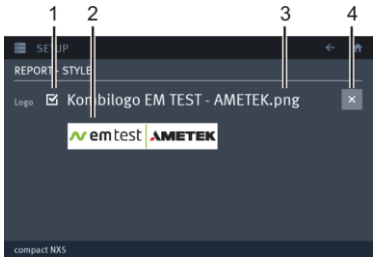


Report Style

The user can load a logo that will be implemented in the report.

Supported Formats: png, jpg

Max. file size: 200 kBytes



Report Style (loaded logo)

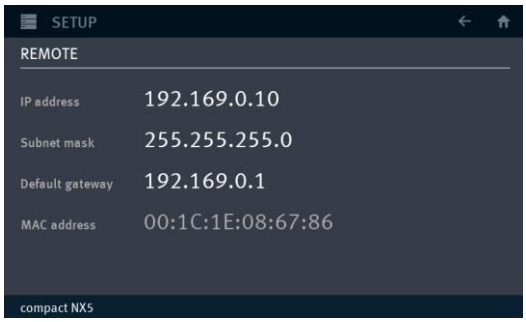
1 Indication for implement the picture in the report

2 Picture in reduced resolution

3 Filename

4 Deletes the actual loaded picture

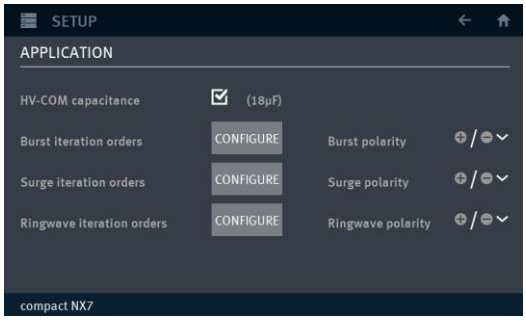
4.3.6.8. Setup / General / Remote



Individual setting for:
- IP Address
- Subnet Mask
- Standard Gateway

MAC Address: Device MAC address

4.3.6.9. Setup / General /Application



HV – COM capacitance: HV – COM output at rear side
Direct or coupled with 18 µF

Burst Iteration orders: Definition of parameter orders

Surge Iteration orders: Definition of parameter iteration

Burst Iteration orders: Definition of parameter orders

Polarity sequence: **Pos-Neg** or **Neg - Pos**

HV – COM capacitance: HV – COM output at rear side

Default setting is **"Enable".** When using an AMETEK CTS coupling device with syslink connection, the capacitor is automatically disabled. The recognized connected AMETEK CTS 3-phase CDN has already a built in 18 µF capacitor.

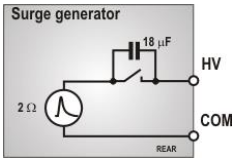
When using a CDN for signal and data lines, the user has to consider, that the default settled capacitor of 18 µF is in series with the standard coupling capacitor of 0.5 µF. This reduces the total coupling capacity to 0.486 µF what is still inside the ±10% tolerance.

It is in the responsibility of the user to disable the default settled 18 µF capacitor.

Enable: - Generator impedance 2 Ω + **18 µF coupling**

Application: - External CDN without 18 µF capacitors

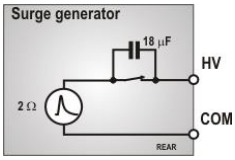
- Other application where 18 µF is required (pulsed H- field, surge verification at this output)



Disable: - Generator impedance is 2 Ω

Application: - External CDN with built in 18 µF capacitors

- Verification of the HV-COM output



Polarity sequence

For each phenomenon it is possible to define the sequence of polarity.

Examples of polarity sequence

Burst: positive / negative (default setting for all impulses)

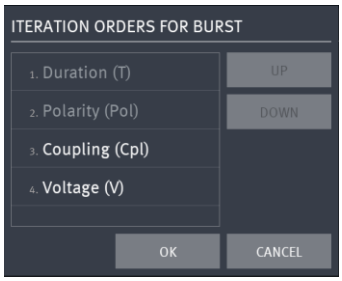
Surge: negative / positive

Ring wave: Example for sequence selection

Penomenon iteration orders

In this menu the user defines the order of iteration if one is selected.

Burst Iteration orders:



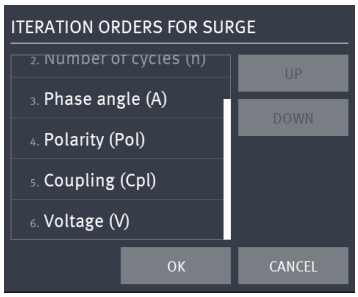
Parameter Iteration orders for burst test

Default: Coupling, Voltage

1. **Select** any **parameter** for change
2. Change order with **UP / DOWN**
3. Press **OK** or **Cancel**

Note: The parameter "Duration" and "Polarity" are fix parameters for the burst test and can't be iterated.

Surge Iteration orders:



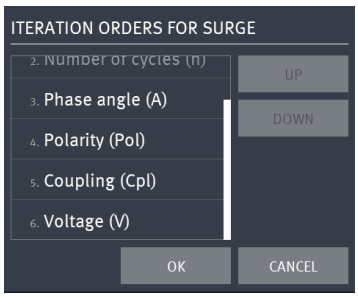
Parameter Iteration orders for surge test

Default: Phase Angle, Polarity, Coupling, Voltage

1. **Select** any **parameter** for change
2. Change order with **UP / DOWN**
3. Press **OK** or **Cancel**

Note: The parameter "Repetition time" and "Number of cycles (n pulses)" are fix parameters for the surge test and can't be iterated.

Surge Iteration orders:



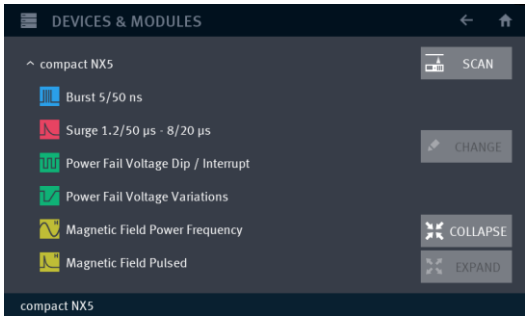
Parameter Iteration orders for surge test

Default: Phase Angle, Polarity, Coupling, Voltage

1. **Select** any **parameter** for change
2. Change order with **UP / DOWN**
3. Press **OK** or **Cancel**

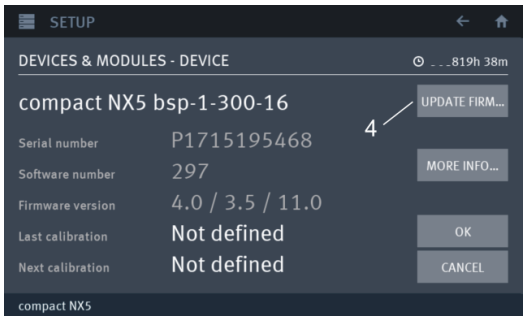
Note: The parameter "Repetition time" and "Number of cycles (n pulses)" are fix parameters for the surge test and can't be iterated.

4.3.6.10. Setup / Equipment / Devices & Modules



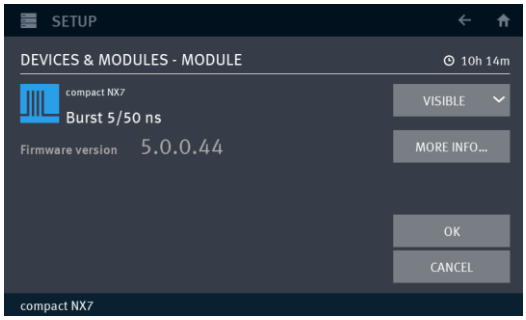
The Device & Modules screen shows all recognized modules in the present system.

System equipment's are displayed with his internal modules.
A "longpress" to compact NX will show the **serial number** and **software number** of the compact NX generator.



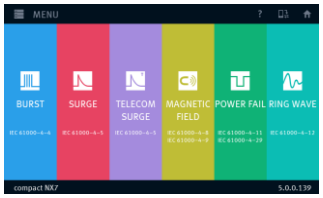
Longpress to compact NX

- Device name
- Serial number
- Software number
- Firmware version
- Calibration date / last - next
- Firmware Update compact NX
-

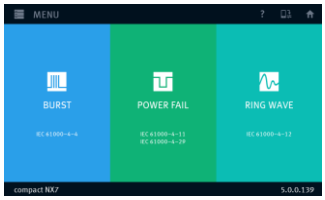


Longpress to the module will show:

Module operating time:	hour, minutes
Phenomenon icon,	Pulse indication and name
Firmware version	Installed FW version
More Info	Module parameter
Visible:	Phenomenon **visible** or **hide** in the main menu.

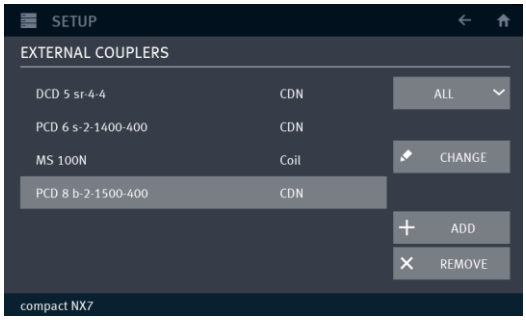


all phenomenas visible



Hide of Surge, T-Surge H-Field

4.3.6.11. Setup / Equipment / External Couplers



Define and load an external coupler

Coil Magnetic field coil

CDN external CDN or automatic detection, when connected

Default external coupler library that can selected by + ADD

CDN coupling / decoupling network:

- DCD sr-4-1, DCD sr-4-4, DCD sr-8-1, DCD sr-8-4
- DCD st-4-1, DCD st-4-4, DCD st-8-1, DCD st-8-4
- PCD 8 b-2-1500-400
- PCD 6 s-2-1400-400

Coil for magnetic field:

- MS 100N

4.3.6.12. Setup / Equipment / Transformers

Define and load an external transformer

Variable Motorized variac transformer

Tapped Tapped transformer

H-Field Magnetic field current transformer

Default transformer Library that can selected by + ADD

Variable Transformer:

- variac NX 1-260-16
- variac NX 1-260-32
- MV 2616
- MV 2632

Tapped Transformer:

- V 4780
- V 4780 S2
- V 4780 S3

H-Field Transformer

- MC 26100
- MC 2630 (30 A range)
- MC 2630 (3 A range)

4.3.7. TEST Link

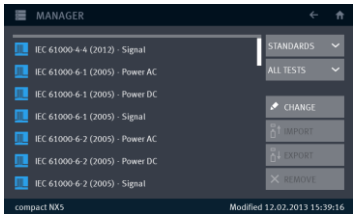
TEST LINK

In this menu the user creates and complete his own “Test Link”
A “Test Link” is generated from

- Test files, loaded from the library (Burst, Surge…)
- Pause or messages with information to the test
- Save or load any test

4.3.8. Manager

Manager

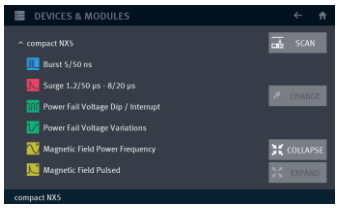


The user configures in this menu the library Manager of all existed test files.

- Rename of tests (Standards & User)
- Mark as visible or hide (Standards & User)
- Remove test from the library (User)
- Import and Export of test (All change to User test)

4.3.9. Devices & Modules

Devices & Modules



Module screen shows all recognized modules in the present system.
System equipment’s are displayed with his internal modules.
The user can

4.3.10. Information

Information

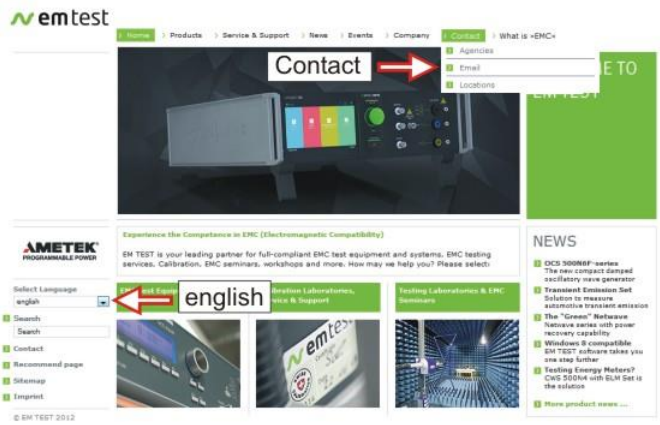
System Information

- Device Version, Firmware, Software
- Representative address AMETEK CTS offices, when touch the national flags
- CH, Germany, USA, Poland, France, Italy, Austria, China, Japan
- Software update menu (see chapter software update) **3.6. Software Update** Press **“Update Software”** button for return when detecting update

4.4. Service

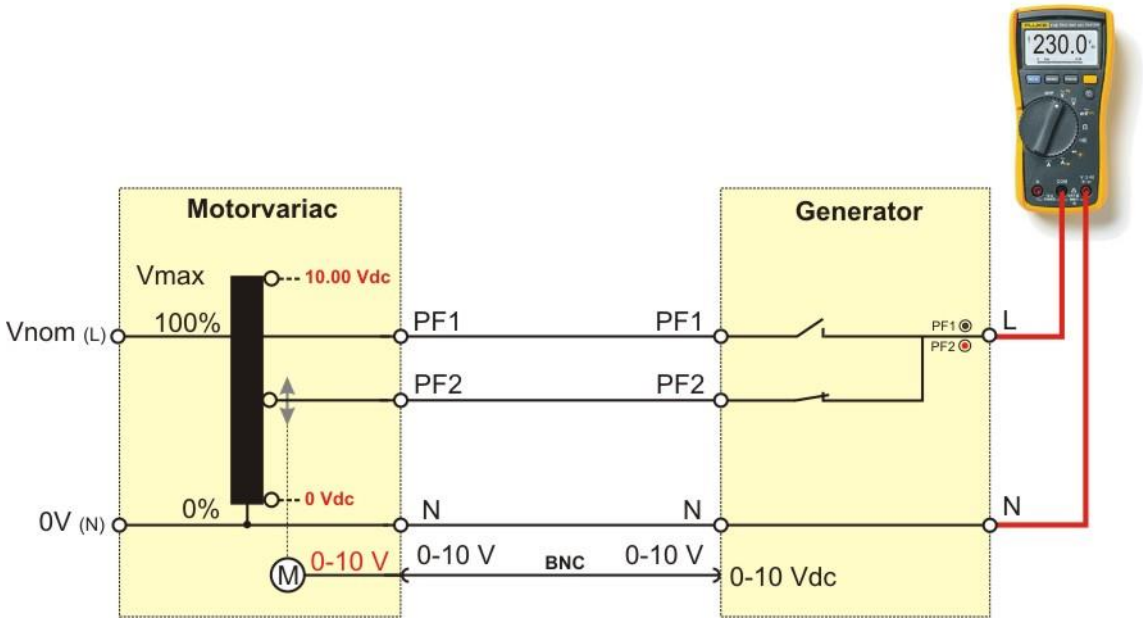
The addresses of the AMETEK CTS GmbH and their representatives are shown on the web page.
The addresses of all EM TEST sales agencies are listed on the web site of EM Test under:

www.emtest.com



4.5. Variable voltage transformers adjustment procedure

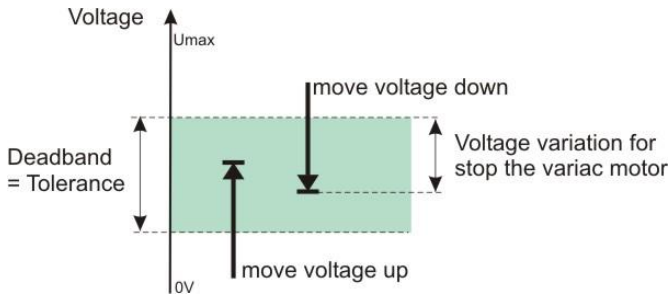
The compact NX is able to control an external voltage source with a 0-10 V analogue dc signal.
The 10 V level corresponds to the max. output voltage of the connected voltage source. For the correct setting it is necessary to know the max. output voltage of the source. For setting for ac or dc source the same procedure is necessary.



Setup for adjust the external voltage variac to the compact NX

The voltage setting is a regulating procedure where one winding of the motor-variac is approx. 1.9 V.
Additionally the control needs some mechanical tolerance for stop the step motor. Therefore, the selected voltage is normally in a tolerance of ±4 V

The motor-variac control has an internal dead-zone where the voltage will not be adjusted.



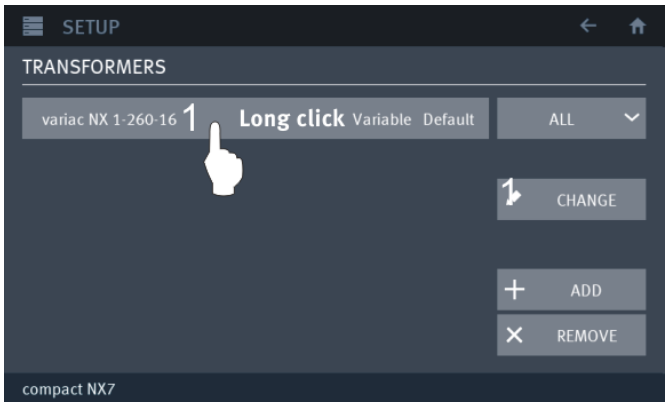
The following procedure will guide the user through the Set Voltage procedure.
The setting procedure for Vmax and Vnom is listed in the figures below.

If the output voltage is out of the tolerance, change the Vmax voltage and repeat the procedure.

4.5.1. Adjustment procedure for variable transformers

For adjust a variac transformer, select first the device to adjust in: **Menu / Setup / Transformers / Variable**

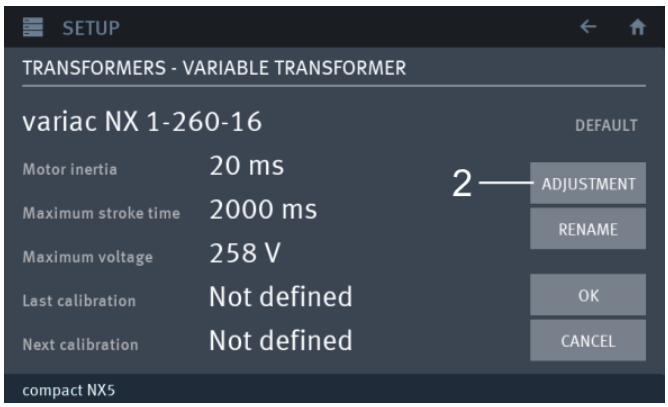
1. Select **CHANGE** or make a **Long click** into the device for change into the software setup.
   This will rotate the screen and opens the configuration parameter of the device.



Adjustment procedure

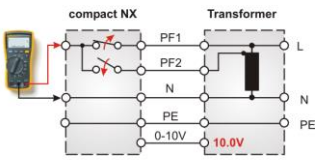
The adjustment procedure has the following structure:

2. Press **ADJUSTMENT** for start the adjustment procedure.



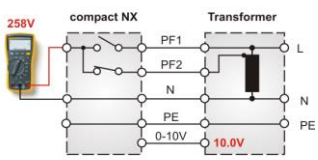
Initialize the adjustment wizard

For prepare
- Press **TEST ON** (if not activated)
- Connect variable transformer at the rear side to the generator to plug PF1, PF2, N, PE
- Connect a multimeter to the front side connectors “Test supply” output L and N



3. Press **Next** to continue or **Cancel** for exit.

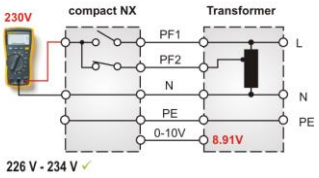
Detect the max. variac output voltage
- Settled nominal voltage: to max. voltage
- Output (0-10 V) voltage: 10.00 V



4. **Read the value** at the voltmeter and
5. Enter the value to **Maximum voltage** field
6. Press **NEXT** to continue

Check at Vnom (230 V) level. variac output voltage

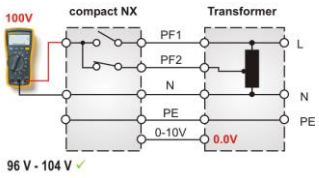
- Settled nominal voltage: =V_{nom} (230 V)
- Output (0-10 V) voltage: 230V/Max. voltage *10.00 V



7. **Read the value** at the voltmeter and check if the value is inside the tolerance of ± 4 V
8. If needed correct the **Maximum voltage**
   - **decrease** the value for higher voltage
   - **increase** the value for lower output
9. Press **NEXT** to continue

Check at Vnom (100 V) level. variac output voltage

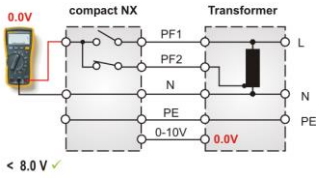
- Settled nominal voltage: = V_{nom} (100 V)
- Output (0-10 V) voltage: 100V/Max. voltage *10.00 V



10. **Read the value** at the voltmeter and check if the value is inside the tolerance of ± 4 V
11. If needed correct the **Maximum voltage**
    - **decrease** the value for higher voltage
    - **increase** the value for lower output
12. Press **NEXT** to continue

Check at Vnom (0 V) level at zero position

- Settled nominal voltage: = V_{nom} (0 V)
- Output (0-10 V) voltage: 0 V to 0.3 V

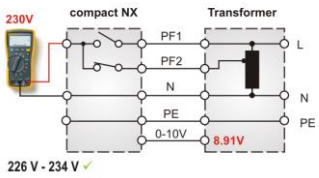


13. **Read the value** at the voltmeter and check if the value is below 8 V
14. If needed correct the **Maximum voltage**
    - **decrease** the value for higher voltage
    - **increase** the value for lower output

    NOTE: The correction at this level will change the voltage only marginal. Note that one transformator winding is approx. 1.9 V
15. Press **NEXT** to continue

Check at Vnom (230 V) level. variac output voltage

- Settled nominal voltage: =V_{nom} (230 V)
- Output (0-10 V) voltage: 230V/Max. voltage *10.00 V



16. **Read the value** at the voltmeter and check if the value is inside the tolerance of ± 4 V
17. If needed correct the **Maximum voltage**
    - **decrease** the value for higher voltage
    - **increase** the value for lower output
18. Press **NEXT** to continue

Final screen of max. voltage adjustment

- Settled nominal voltage: =V_{nom} (230 V)
- Output (0-10 V) voltage: 230V/Max. voltage *10.00 V

19. **OK**: Write the max. Voltage value into the parameter list and exit wizard.

    Previous: Jumpers to the previous page

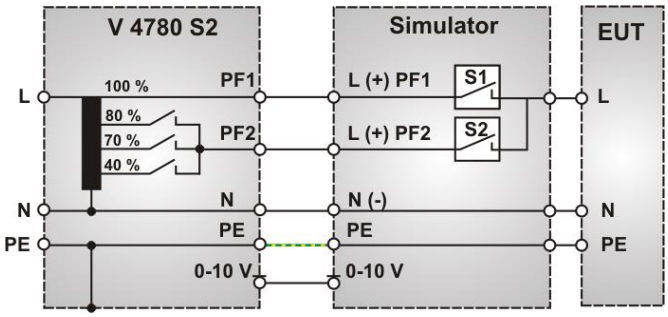
    Cancel: Exit the wizard without change

4.5.2. Adjustment procedure for tapped transformers with analogue DC control voltage

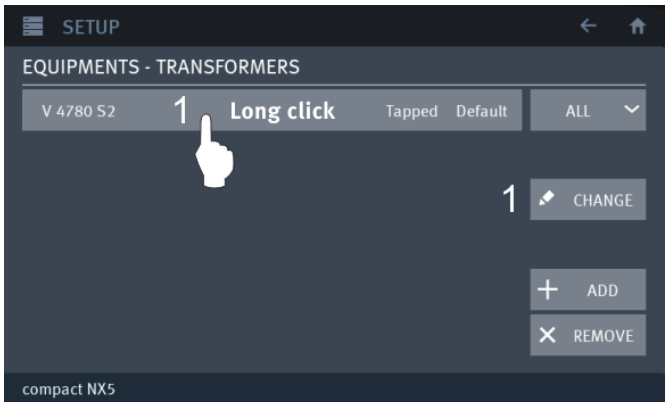
For adjust a tapped transformer, select first the device to adjust in: **Menu / Setup / Transformers / Variable**

The tapped transformer is programmed that the **nominal voltage** corresponds to **10.0V dc** as **100%** for set. The settings are defined as following:

Position	ref dc voltage
80%	8.00 V ± 0.35V
70%	7.00 V ± 0.35V
40%	4.00 V ± 0.35V



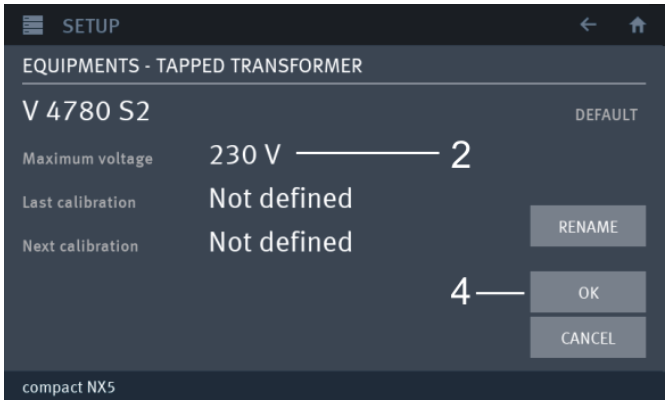
Example for automatic tapped transformer V 4780 S2



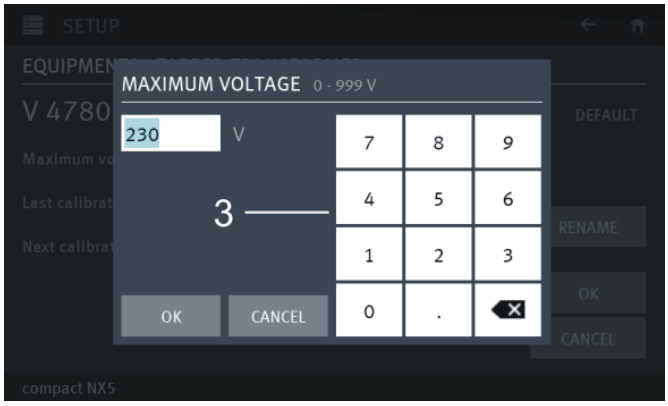
1. Make a **click**, **Long click** into the device or press **CHANGE** button for change into the software setup.
   This will rotate the screen and opens the configuration parameter of the device.

Adjustment procedure

The 100% value of the tapped transformer must correspond to the actual nominal voltage of the EUT.



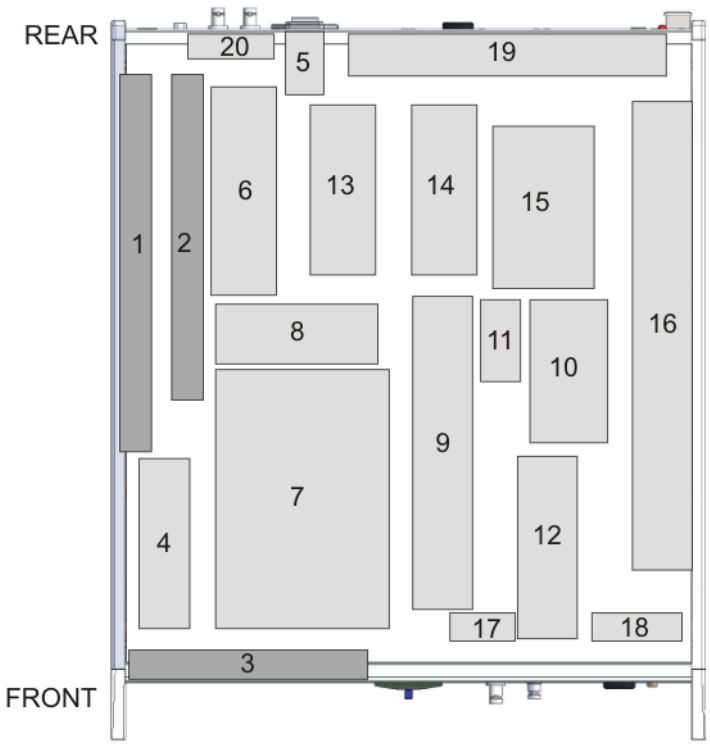
3. Press **230 V** for adjust the 100% voltage
4. Enter the nominal EUT voltage used for the test (**100 V, 115 V, 220 V or 230 V**) and confirm with **OK**.
5. Confirm and exit with **OK**



5. Test Equipment compact NX5 and NX7series

The simulator compact NX5 N is separated in different main parts. The control unit is screened to all other parts.

5.1. compact NX5

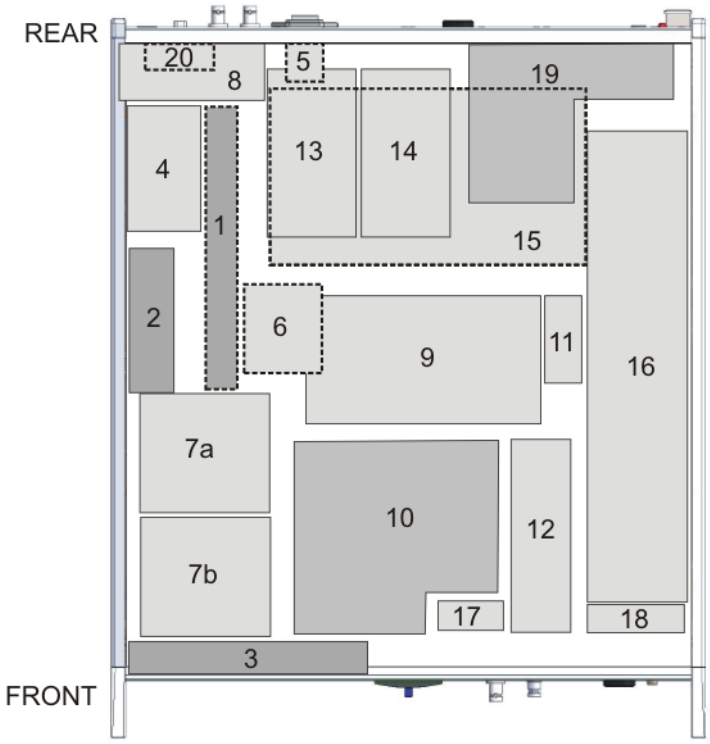


Control unit
1 App board controller
2 Device board controllers
3 HMI board, touch panel

Power supply
4 Power supply
5 Mains filter

High voltage unit
6 High voltage power supply
7 Energy storage capacitors, Pulse forming
8 Measuring Unit
9 Surge pulse forming unit
10 Surge coupling capacitor
11 Surge pulse measuring transformer
12 Burst pulse forming unit
13 Power Fail switch PF2
14 Power Fail switch PF1
15 decoupling inductors 1.5 mH
15 Measuring unit
16 Coupling relays surge
17 Peak current measurement
18 Burst Coupling board
19 Back filter board
20 Rear panel interface board

5.2. compact NX7



Control unit
1 App board controller
2 Device board controllers
3 HMI board, touch panel

Power supply
4 Power supply
5 Mains filter

High voltage unit
6 High voltage power supply
7a Energy storage capacitor, Surge
7b Energy storage capacitor, Ring wave
8 Measuring Unit AC
9 Surge pulse forming unit
10 Ring wave pulse forming unit
11 Surge pulse measuring transformer
12 Burst pulse forming unit
13 Power Fail switch PF2
14 Power Fail switch PF1
15 decoupling inductors 1.5 mH
15 Measuring unit
16 Coupling relays surge
17 Peak current measurement
18 Burst Coupling board
19 Back filter board
20 Rear panel interface board

6. Technical data

6.1. EFT Electrical Fast Transients Burst as per IEC 61000-4-4

Test Level	**Model NX5**	**Model NX7**
Open circuit *	200 V – 5500 V ± 10% Step 1 V	Technical data for Burst are identical with the NX5 devices
Wave shape into a 50Ω load	100 V – 2750 V	
Rise time tr	5 ns ± 30%	
Pulse duration td	50 ns ±30%	
Wave shape into a 1000Ω load	200 V – 5500 V	
Rise time tr	5 ns ± 30%	
Pulse duration td	35 ns – 150 ns	
Source impedance	Zq = 50 Ω ± 20%	
Polarity	Positive / negative	

Trigger

Trigger of bursts	AUTO, MANUAL, EXTERN
Synchronization	0 - 360° (16 – 500 Hz) Asynchronous = 0° a reference signal is connected to the Sync input.
Burst duration td	0.10 ms – 999 ms
Burst repetition rate tr	10 ms – 9999 ms
Spike frequency f	1Hz – 1000 kHz
Test duration T	1 s – 9999 s 1 min - 167 min

Range	Step
< 10 kHz	1 Hz
10 – 1000 kHz	1.0 kHz

Output

Direct via 50 Ω coaxial connector	To connect ext. coupling devices
Coupling network	To L, N, PE all combinations

Test routines

Quick Start	Immediate start, all parameters adjustable during a running test
Standard test as per separated to (AC / DC)	IEC 61000-4-4 level 1-4 to power lines IEC 61000-4-4 level 1-4 to signal lines EN 61000-6-1 Generic to power lines EN 61000-6-1 Generic to signal lines EN 61000-6-2 Generic to power lines EN 61000-6-2 Generic to signal lines IEC 61000- 4-4 Manual operated standard test routine
Extended Tests	Voltage iteration stepwise: Voltage level V after n pulses by ΔV Frequency sweep in one single burst Frequency sweep with constant pulse numbers Frequency sweep, constant burst duration Synchronized with phase angle Random burst release

* With Burst pulses as per. IEC 61000-4-4 Ed 3: 2012 the max. output voltage with external CDN can be limited.

6.2. SURGE Immunity requirements as per IEC 61000-4-5

6.2.1. Technical data Surge module for compact NX5 models

The technical data of the 16 A and 32 A models are identical if not otherwise stated.

Test Level	**compact NX5** (16A Models)		**compact NX5** (32 A Models)	
Open circuit voltage	160 V – 5000 V ± 10% Step 1 V			
Short circuit current	80 A – 2500 A ± 10%			
Wave shape open circuit				
coupling	18 µF line to line	9 µF line to ground	18 µF line to line	9 µF line to ground
Front time tr	1,2 µs ± 30%	1,2 µs ± 30%	1,2 µs ± 30%	1,2 µs ± 30%
Pulse duration	50 µs +10 µs/-10 µs	50 µs +10 µs/-25 µs	50 µs +10 µs/-15 µs	50 µs +10 µs/-30 µs
Wave shape short circuit				
coupling	18 µF line to line	9 µF line to ground		
Front time tr	8 µs ± 20%	2.5 µs ± 30%		
Pulse duration	20 µs ± 20%	25 µs ± 30%		
Polarity	Pos., Neg., Alt			
Repetition rate	max. 1 Hz (1 s* - 9999 s)			
Events preselection	1 - 99'999			
Counter	1 – 1'000'000			
Trigger				
Trigger of pulses	AUTO, MAN, EXTERN			
Synchronization	0 - 360° (16 – 500 Hz)			
	Asynchronous = 0°	a reference signal is connected to the Sync input.		
Resolution	1°		1°	

Measurements	
CRO	5 V Trigger
CRO Û	10 Vp at 5 kV
CRO Î	10 Vp at 2.5 kA
Accuracy CRO V , CRO I	± 10%
CRO Û/I Z measuring instrument	> 1 MΩ
Peak voltmeter	5000 V
Peak current meter	2500 A: Display ± 1 Digit ± 20 A
Current limiter setting	10 A...3000 A step 10 A

Output		**no capacitor**	**9 µF**	**18 µF**
Direct HV-COM	HV-Banana connector, Zi = 2Ω	x		x
Coupling network	L – N with Z = 2Ω			x
	L-PE, N-PE, L+N-PE with Z = 12Ω		x	
DUT supply	AC 300 V / 16 A / 50/60 Hz			
	DC 300 V / 16 A			
	AC 400 V / 16 A/ 32 A / 50/60 Hz			
	DC 400 V / 16 A/ 32 A			

Test Routines	
Quick Start	Immediate start, all parameters adjustable during a running test
Standard test routines *separated to (AC / DC)*	IEC 61000-4-5 one level: Selectable level 1 to 4 IEC 61000-4-5 all levels: Starts from lowest level to selected level IEC 61000-4-5 level 3 IEC 61000-4-5 level 4 EN 61000-6-1 Generic (AC / DC) EN 61000-6-2 Generic
Extended Tests	Voltage iteration stepwise: Voltage level V after n pulses by ΔV Angle iteration stepwise: Change phase angle A after n pulses by ΔA Angle random iteration: Random phase angle A after n pulses

* depends on charging voltage

6.2.2. Technical data Surge module for compact NX7 models

The technical data of the 16 A and 32 A models are identical if not otherwise stated.

Test Level	**compact NX7** (16A Models)		**compact NX7** (32 A Models)	
Open circuit voltage	200 V – 7000 V ± 10% Step 1 V			
Short circuit current	80 A – 3 500 A ± 10%			
Wave shape open circuit				
coupling	18 µF line to line	9 µF line to ground	18 µF line to line	9 µF line to ground
Front time tr	1,2 µs ± 30%	1,2 µs ± 30%	1,2 µs ± 30%	1,2 µs ± 30%
Pulse duration	50 µs +10 µs/-10 µs	50 µs +10 µs/-25 µs	50 µs +10 µs/-15 µs	50 µs +10 µs/-30 µs
Wave shape short circuit				
coupling	18 µF line to line	9 µF line to ground		
Front time tr	8 µs ± 20%	2.5 µs ± 30%		
Pulse duration	20 µs ± 20%	25 µs ± 30%		
Polarity	Pos., Neg., Alt			
Repetition rate	max. 1 Hz (1 s* - 9999 s)			
Events preselection	1 - 99'999			
Counter	1 – 1’000’000			
Trigger				
Trigger of pulses	AUTO, MAN, EXTERN			
Synchronization	0 - 360° (16 – 500 Hz)			
	Asynchronous = 0°	a reference signal is connected to the Sync input.		
Resolution	1°		1°	
Measurements				
CRO	5 V Trigger			
CRO Û	10 Vp at 5 kV			
CRO Î	10 Vp at 2.5 kA			
Accuracy CRO V , CRO I	± 10%			
CRO Û/I Z measuring instrument	> 1 MΩ			
Peak voltmeter	5000 V			
Peak current meter	2500 A: Display ± 1 Digit ± 20 A			
Current limiter setting	10 A...3000 A step 10 A			

Output		**no capacitor**	**9 µF**	**18 µF**
Direct HV-COM	HV-Banana connector, Zi = 2Ω	x		x
Coupling network	L – N with Z = 2Ω			x
	L-PE, N-PE, L+N-PE with Z = 12Ω		x	
DUT supply	AC 300 V / 16 A/ 32 A / 50/60 Hz DC 300 V / 16 A/ 32 A AC 400 V / 16 A/ 32 A / 50/60 Hz DC 400 V / 16 A/ 32 A			

Test Routines	
Quick Start	Immediate start, all parameters adjustable during a running test
Standard test routines *separated to (AC / DC)*	IEC 61000-4-5 one level: Selectable level 1 to 4 IEC 61000-4-5 all levels: Starts from lowest level to selected level IEC 61000-4-5 level 3 IEC 61000-4-5 level 4 EN 61000-6-1 Generic (AC / DC) EN 61000-6-2 Generic
Extended Tests	Voltage iteration stepwise: Voltage level V after n pulses by ΔV Angle iteration stepwise: Change phase angle A after n pulses by ΔA Angle random iteration: Random phase angle A after n pulses

* depends on charging voltage

6.3. Pulsed magnetic Field as per IEC 61000-4-9

Test Level	**Model NX5**	**Model NX7**
Generator charging voltage	160 V – 5000 V ± 10% Step 1 V	200 V – 7000 V ± 10% Step 1 V
Short circuit current	80 A – 2500 A ± 10%	Approx. 80 A/m to 3500 A/m
Wave shape		
Rise time tr	8 µs ± 20%	
Pulse duration	20 µs ± 20%	
Polarity	Pos., Neg., Alt	
Repetition rate	max. 1 Hz (1 s* - 999 s)	
Events preselection	1 - 99'999	
Counter	1 – 1'000'000	
Trigger		
Trigger of pulses	AUTO, MAN, EXTERN	
Synchronization	0 - 360° (16 – 500 Hz)	
	Asynchronous = 0° a reference signal is connected to the Sync input.	
Resolution	1°	1°
Measurements		
CRO	5 V Trigger	
CRO V	10 Vp at 5 kV	10 Vp at 7 kV
CRO I	10 Vp at 2.5 kA	10 Vp at 3.5 kA
Accuracy CRO V CRO I	± 10%	
CRO V/I Z measuring instrument	> 1 MΩ	
Peak voltmeter	5000 V	
Peak current meter	2500 A: Display ± 1 Digit ± 20 A	
Current limiter setting	10 A...3000 A step 10 A	

Output		**no**	**9 µF**	**18 µF**
Direct HV-COM	HV-Banana connector, Zi = 2Ω	x		x
Coupling network	L – N with Z = 2Ω (not preffered)			x

Test Routines

Quick Start	Immediate start, all parameters adjustable during a running test
Standard test routines *separated to (AC / DC)*	IEC 61000-4-5 one level: Selectable level 1 to 4 IEC 61000-4-5 all levels: Starts from lowest level to selected level IEC 61000-4-5 level 3 IEC 61000-4-5 level 4 EN 61000-6-1 Generic (AC / DC) EN 61000-6-2 Generic
Extended Tests	Voltage iteration stepwise: Voltage level V after n pulses by ΔV Angle iteration stepwise: Change phase angle A after n pulses by ΔA Angle random iteration: Random phase angle A after n pulses
Magnetic field test	test routine as per IEC 61000-4-9 test level 100, 300 and 1000 A/m cont. adjustable within Quick Start

* depends on charging voltage

6.4. Power Fail Generator as per IEC 61000-4-11

EUT supply	**Model NX5 / NX7**	**Other models NX series**
Channel PF1 and PF2		
AC voltage/current	max. 300V/ 16 A or 32 A	Up to max. 400 V/ 16 A or 32 A
Mains frequency	50/60 Hz	
DC voltage/current	max. 300 V/ 16 A or 32 A	Up to max. 300 V/ 16 A or 32 A
Inrush current	more than 500 A	
Protection	Electronic fuse for continuous overcurrent / inrush currents Electronic control of overheating PF1 and PF2 are safe against short circuit	
max. current channel PF1	nominal current continuous	
max. current channel PF2	nominal current continuous	
Trigger		
Events trigger	AUTO, MAN, EXTERN	
Repetition rate	0.01 s – 9'999 s	Accuracy 0.05 % + phase sync
Duration of events	0.01 ms – 9'999 s	Accuracy 0.05 %
Events preselection	1 - 99'999	
Counter	1 – 1'000'000	
Synchronization	0 - 360° (16 – 500 Hz) Asynchronous = 0° if a reference signal is connected to the Sync input.	
Max Sync input voltage	Max. 300 V or same as EUT voltage specs.	
Resolution	1°	
Measurements		
EUT supply	AC/DC voltage in the LCD display, divider ratio 1:100 +/- 10%	
BNC output MON U	Measurement of the EUT supply divider ratio 1:100 ± 5%	
BNC output MON I	Measurement of the EUT current and the EUT inrush current 16 A model: 7A/V, max 10 V 32 A medel: 14 A/V, max. 10 V	
CRO TRIGGER	positive going flank	
0-10V Control Output	0-10 Vdc for external voltage source	
Test routines		
Quick Start	Immediate start, all parameters adjustable during a running test	
Standard test routines	as per IEC 61000-4-11 ac power ports as per IEC 61000-4-29 dc power ports as per IEC 61000-6-1 Generic as per IEC 61000-6-2 Generic Manual operated standard test routine	
User test routines	Voltage variation, external variac control Change phase angle A after n events by ΔA Change events duration td after n events by Δtd Inverse mode	
Magnetic field test	test routine according to IEC 61000-4-8 test level 1, 3, 10 and 30 A/m with MC 2630 and a variac test level 100, 300 and 1000 A/m with MC26100	

Magnetic field tests per IEC 61000-4-8 and -9

The test routines for handling the magnetic field tests are included in the internal compact NX firmware. All functions to control external options as voltage/current sources or magnetic field antennas are included. In addition, the following hardware is required:

Option required for Magnetic Field Test per IEC 61000-4-9

- Magnetic field antenna (square 1mx1m coil MS 100N)
- Adapter for connecting the square coil to the surge output.

Option required for Magnetic Field Test 50/60Hz per IEC 61000-4-8

- External transformer (variac NX 1-260-16) and magnetic field antenna (square 1mx1m coil MS 100)
- External current transformer (MC2630) to test 1, 3, 10 and 30 A/m levels
- External current transformer (MC26100) to test level 100, 300 and 1000 A/m levels (short term).

6.5. Ring wave Generator as per IEC 61000-4-12

The ring wave module is only for compact NX7 series available.

Test Level	**compact NX7**
Open circuit voltage	200 V – 7000 V ± 10% Step 1 V
Voltage	Wave shape (open circuit)
Rise time	0.5 µs ± 30% (first peak)
Oscillation frequency	100 kHz ± 10%
Decaying	Peak 2 to peak 1 = 40 - 110% Peak 3 to peak 2 = 40 - 80% Peak 4 to peak 3 = 40 - 80%
Current	Wave shape (short circuit)
Rise time	0.2 µs < tr <= 1.0 µs
Oscillation frequency	100 kHz ± 10%
Source impedance	12 Ω, 30 Ω, 50 Ω
Peak current	As per selected source impedance
Polarity	Positive, negative, alternate
Trigger	
Trigger of pulses	AUTO, MAN, EXTERN
Synchronization	0° - 360°, resolution 1°
Repetition rate	max. 1 Hz (1 s* - 9999 s)
Event counter	1 - 99,999, selectable
Measurements	
CRO Û	10 Vp at 7 kV,
CRO Î	10 Vp at 3.5 kA
Accuracy CRO V, CRO I	± 10%
CRO Û/I Z measuring instrument	> 1 MΩ
Peak voltmeter	7000 V, measurement below 500 V are indicated with - - -
Peak current meter	Not available
Outputs	
Direct	Via HC-COM, safety lab connectors
Coupling mode	IEC: L-N, L-PE, N-PE, L+N-PE ANSI: L-N, L-G, N-G, L+N-G
CRO trigger	5 V trigger signal for oscilloscope
Test Routines	
Quick Start	Immediate start, all parameters adjustable during a running test
Standard test routines *separated to (AC / DC)*	IEC 61000-4-12 one level: Selectable level 1 to 4 IEC 61000-4-12 all levels: Starts from lowest level to selected level IEEE STD C 62.41.2 Cat A, B Power lines IEEE STD C 62.41.2 Cat A, B Signal lines
Extended Tests	Voltage iteration stepwise: Voltage level V after n pulses by ΔV Angle iteration stepwise: Change phase angle A after n pulses by ΔA

* depends on charging voltage

6.6. Telecom Surge Generator as per IEC 61000-4-5 (TSurge module)

The Telecom surge module is available for compact NX5 and compact NX7 series available.

As per ITU and ETS recommendations

	compact NX5	**compact NX7**
Output voltage open circuit	160V – 5'000V ±10%	200V – 7'000V ±10%
Pulse 10/700µs		
Front time T_F (rise time tr)	10µs ± 30% (1.0µs ± 30%)	
Pulse duration td	700µs ± 20%	
As per FCC part 68 Pulse B		
Output voltage open circuit	160V – 5'000V ±10%	200V – 7'000V ±10%
Front time T_F	9µs ± 30%	
Pulse duration td	720µs ± 20%	
Output current short circuit	4 – 100A	6 – 189A
Rise time tr	5µs ± 30%	
Pulse duration td	320µs ± 20%	
As per IEC 61000-4-5		
Pulse 10/700µs		
Open circuit output voltage	160V – 5'000V ±10%	200V – 7'000V ±10%
Rise time tr	10µs ± 30%	
Pulse duration td	700µs ± 20%	
Short circuit output current	4 – 100A	6 – 189A
Rise time tr	5µs ± 20%	
Pulse duration td	320µs ± 20%	

Coupling

As per ITU	For 2 wire T1 and T2 with 25Ω each
As per FCC part 68	For 2 wire T1 and T2 with 25Ω each
As per IEC 61000-4-5	For 4 wire T1, T2, T3, T4 with 25 Ω each External networks are required for other applications (options)

General

Polarity	Pos., Neg., Alt
Repetition rate	max. 1 Hz (1 s* - 9999 s)
Events preselection	1 - 99'999
Counter	1 – 1'000'000
Energy storage capacitor	20µF

Dimensions

Housing	Additional 19", 3HU, 450x500x155mm at the device bottom

6.7. EUT Supply Specifications

Standard models

Model	CDN	Remarks
compact NX5 bsp-1-300-16	300 VAC* / DC 16 A 1- phase	
compact NX5 bspt-1-300-16	300 VAC* / DC 16 A 1- phase	
compact NX5 bsp-1-400-16	400 VAC*/ DC 16 A 1- phase	Ext CDN: 3 x 690 V, 1000V DC

* AC 50/60 Hz

EUT Fuse
The compact NX models have **no internal fuse for the EUT** supply.
The user is responsible to adapt a suitable fuse for the EUT outside the compact NX

6.8. General Specifications

Mains supply	85 to 264 Vac, 50/60Hz	
Power consumption	75 W	
Fuse	115 V: 2 x 4 AT slow blow	
	230 V: 2 x 2 AT slow blow	
Safety		
Safety circuit	External interlock capability	
Warning lamp	voltage free contact max. 60 V, 2 A	
Design	As per IEC 1010, EN 61010	
Interfaces		
Serial interface	1 x USB A front side	for memory stick
	1 x USB A rear side	for memory stick
	1 x USB B	for service purpose only
	1x opto-link	user remote interface (convert to USB port on computer)
LAN	Ethernet	user remote interface
SYS link IN, OUT	26 pin high density Sub D to control external devices	
Analog output	0-10V DC, to control an external power supply	

EUT1, EUT 2 input

Digital input	+ 15 V to 0 V, negative slope to zero
Trigger level	2 V ±1 V
Input impedance	> 10 kΩ
Max. Input voltage	+ 20 V

Device	Frame	Dimension (W x H x D)	Weight
compact NX5 bsp-1-300-16	19" / 3 HU	448 x 154 x 500 mm	app 25 kg
compact NX5 bp-1-300-16	19" / 3 HU	448 x 154 x 500 mm	16.6 kg
compact NX5 bspt-1-300-16	19" / 6 HU	448 x 286 x 500 mm	30.7 kg
compact NX5 bsp-1-400-16	19" / 6 HU	448 x 286 x 500 mm	29.2 kg
compact NX7 bsp-1-300-16	19" / 6 HU	448 x 286 x 500 mm	app 30 kg
compact NX7 bspt-1-300-16	19" / 9 HU	448 x 440 x 500 mm	app 45 kg
compact NX7 bsp-1-400-16	19" / 6 HU	448 x 286 x 500 mm	App 32 kg

6.9. Environmental conditions

Temperature	10 °C to 35 °C
Humidity	30 % to 70 %; non condensing
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1 060 mbar)

=> Not relevant data for the standards can be changed by the manufacturer <=

7. Maintenance setup and service

7.1. 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. Should any maintenance or adjustment become necessary, the whole test system, together with an order or fault report, should be sent to an AMETEK CTS service center.

7.2. Maintenance and cleaning

The generator is absolutely maintenance-free by using a solid state semiconductor switch to generate transients. Maintenance by the user is restricted to cleaning the outer housing, performing a function check and verification of the pulse parameters.

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.

7.3. Test set- up

When setting up the test national and international regulations regarding human safety must be guaranteed.

It is recommended to connect the simulator to the ground reference plane of the test set-up.

The generators of the compact NX series and their coupling networks, can be linked together to a fully automotive test set-up.

The set-up communicates via the Ethernet / optical link is controlled by software. For setting up the system see the following figures:

7.4. Insulating- or external transformer for EUT power supply

The recommended power of an external transformer must be **> 500VA**. The reason is the capacitive current of the internal filter capacitors inside the compact NX.

7.5. Calibration and verification

7.5.1. Factory calibration

Every AMETEK CTS generator is entirely checked and calibrated as per international standard regulations before delivery. A calibration certificate is issued and delivered along with a list of the equipment used for the calibration proving the traceability of the measuring equipment. All auxiliary equipment and accessories are checked to our internal manufacturer guidelines.

The calibration certificate and the certificate of compliance (if available) show the date of calibration.

The AMETEK CTS equipment is calibrated in the factory and marked with a calibration mark. The used measuring instruments are traceable to the Swiss Federal Office of Metrology.
The calibration date is marked. The validity of the calibration is to the responsibility of the user's quality system. Neither the certificate of calibration nor the corresponding label mark any due date for re-calibration.

Examples: Calibration mark

7.5.2. Guideline to determine the calibration period of AMETEK CTS instrumentation

Our International Service Departments and our QA Manager are frequently asked about the calibration interval of AMETEK CTS equipment.

AMETEK CTS doesn't know each customer's Quality Assurance Policy, nor do we know how often the equipment is used and what kind of tests is performed during the life cycle of test equipment. Only the customer knows all the details and therefore the customer needs to specify the calibration interval for his test equipment.

In reply to all these questions we like to approach this issue as follows:
AMETEK CTS make use of a solid-state semiconductor switch technique to generate high voltage transients. A precious advantage of this technique is the absolute lack of periodical maintenance effort. In consequence, thereof a useful calibration period must be defined based on two criteria:

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation must be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment must be taken into consideration.
- Based on the experience and observation collected over the years **AMETEK CTS recommends a calibration interval of 1 year** for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators in order to assure proper performance and compliance to the standard specifications.

7.5.3. Calibration of Accessories made by passive components only

Passive components do not change their technical specification during storage. Consequently, the measured values and the plots stay valid throughout the storage time. The date of shipment shall be considered as the date of calibration.

7.5.4. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, AMETEK CTS suggests for refer to the waveshape and values of the original calibration certificate.

All calibrations and verifications are always done without mains supply voltage connected to the coupling network input.


Danger

Before starting the calibration or verification

remove the EUT Mains Supply

from the generator and from the coupling network

8. Delivery Groups

8.1. Basic equipment

- Generator model: compact NX with recommended modules (Burst, Surge, Power Fail, Magnetic Field, Telecom Surge)
- Mains cable
- Mains cable for the EUT supply
- Adapter for power cable
- Manual
- Calibration certificate

8.2. Accessories and options

- **ESA Adapter for adapt different power mains connectors**

As accessories adapters to different power mains connectors are part of the delivery of AMETEK CTS surge generators. E.g. these are adaptors for Schuko - US - AUS - UK power mains connectors.

Most of these commercially available power mains sockets cannot withstand surge voltages higher than 4000V. Therefore, each of these adaptors are labeled to be **used up to 4000V** maximum.

In case that the surge generator can generate higher surge voltages than 4000V a sparkover at the power mains socket may occur.

Customers shall be aware of this matter and shall **not use higher voltages than labeled** on the adapter.

For **testing higher voltage**, it is necessary to use high voltage cables with sufficient isolation and safety banana connectors connected direct to the generator output plugs (L-N-PE).

Burst

- **PVF BKIT 1** Calibration kit for Burst verification on EUT output including PVF 50 + PVF 1000 and PVF AD1 adapter

- **PVF AD1** adapter for calibration
- **PVF 50** Matching resistor 50 Ω with integrated attenuator (1:100)

- **PVF 1000** Matching resistor 1000 Ω with integrated attenuator (1:500)

- **CCI** Industrial capacitive coupling clamp as per IEC 61000-4-4 to couple the fast transients to signal and data lines.

- **CCI PVKIT 1** Calibration kit for capacitive coupling clamp as per IEC 61000-4-4 Ed.3
  - Flexible plate insulated
  - Support for PVF 50 and adapter to PVF 50

- ITP EF Radiating set for immunity and emission

- **A6dB** as additional 6 dB / 50 Ω attenuator of the test signal

- **PUW 500** EUT monitoring

Surge

Power Fail

- **V 4780 transformer with taps**
  - Transformer with taps at 40%&, 70%, 80%
  - 230V / 16A

- **Variac NX 1-260-16**
  - Motorvariac 0-260 V / 16 A or 32 A
  - Control signal 0-10 Vdc.

Magnetic field

MS 100N Magnetic field antenna	 MFC 1000.1  MFC 1000
• **MFT 30 or MC 2630** Current transformer up to 30 A/m	 MFT 30
• **MFT 100**, previous **MC 26100** Current transformer up to 1000 A/m	 MFT 100

General CDN for Burst and Surge

- **Coupling NX5 bs-3-xxx-yyy.z external coupling/decoupling network**
  - EUT AC mains 3 x 480 V or 3 x 690 V rms max
  - EUT DC supply up to 1000 VDC
  - Nominal current In = 16 A / 32A / 63A / 125 A / 200 A rms / DC
  - Frequency 50/60 Hz
  - Coupling to all lines, N, PE
  - 50 Ω Burst output The coupling will be controlled by the compact NX
  - Output for Surge coupling to other coupling networks as CNV models.

- **User software " iec.control "**
  - Test, analysis and documentation with Windows
  - License version for testing according the most automotive standards
  - Report generator with export function to word-processing software

UOC optical Interface

- **USB-Optolink Converter**
  - USB Optolink converter
  - Optical Fibre cable, 5m

9. EFT Burst as per IEC 61000-4-4

Burst Module 5/50 ns

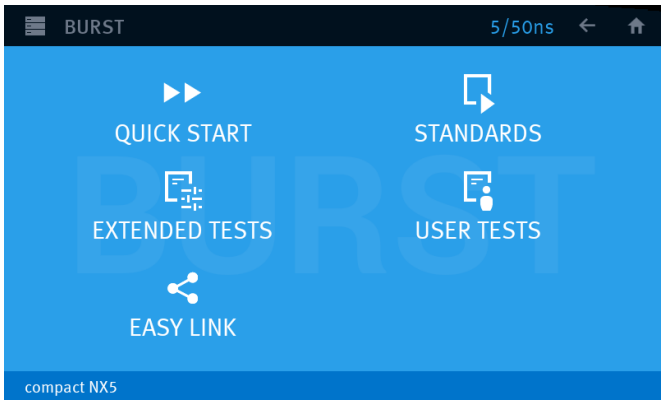
Warning

If the user reduces the test voltage in **Quick Start** or in the **Manual Standard Test Routine**, the **storage capacitor will be discharged only by the burst pulses**. The result is a higher test voltage on the EUT than indicated on the display until the storage capacitor is discharged to the preselected value.

If the voltage reduction is several 100V the discharge time to the correct test voltage can be some seconds. The discharge time depends on the repetition rate tr and the duration td of the burst pulse.

Pressing STOP / START will discharge the storage capacitor over the discharge resistor immediately. After the START the test will continue with the correct voltage level.

9.1. Operation



Main Menu Burst

The Burst menu offers different test routines for burst testing.

Quick Start
Easy and fast online-operation with the phenomenon Burst. In this menu the user can operate all burst test manually with online change the most parameters during a test.

Standard
The operator can select between various preprogrammed test routines as required in different standards
The standard library is filtered according the EUT setting (AC, DC etc.)

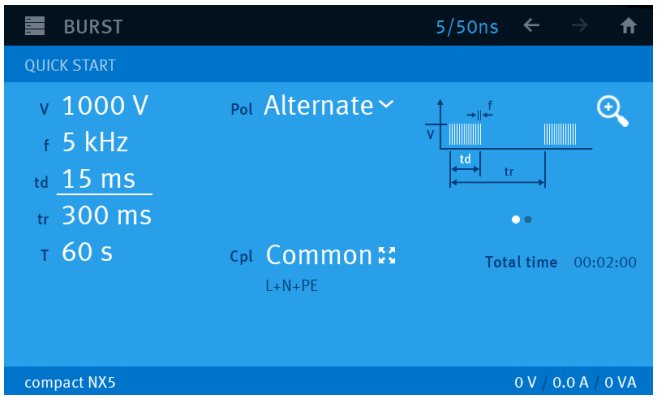
Extended Tests
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

User test routines
The user defined library where all created Burst tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

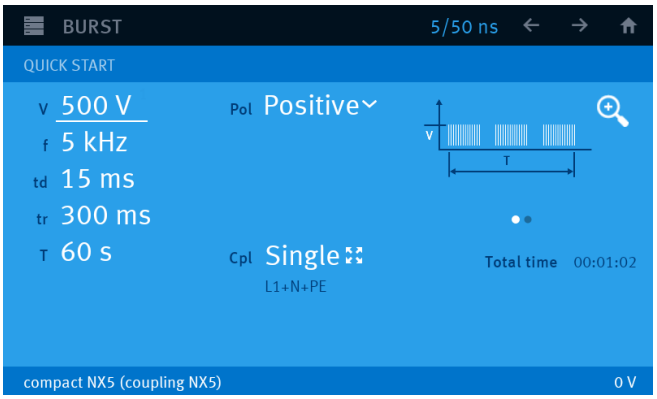
9.1.1. Quick Start

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.



Quick Start Menu

Devices: ***compact NX***



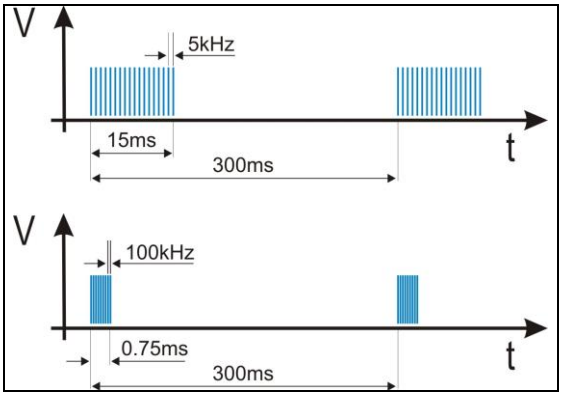
Quick Start Menu

Devices: ***compact NX*** and ***coupling NX5***

Burst specification as per IEC 61000-4-4 Ed3 (2012)

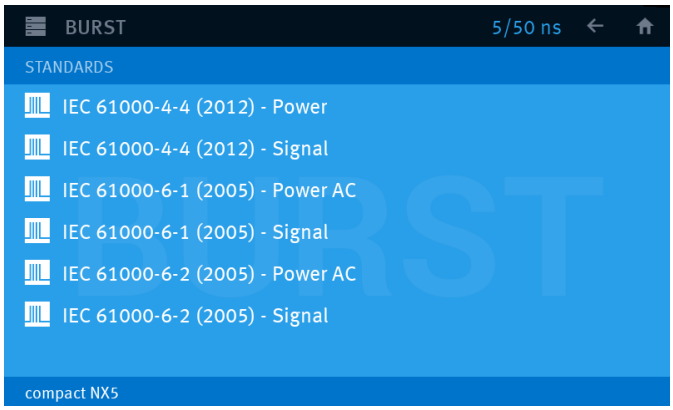
f = 5kHz
td = 15ms
tr = 300ms

f = 100kHz
td = 0.75ms
tr = 300ms



9.1.2. Standard test routines

The user can select preprogrammed standard test routines.



Standard Menu

Within this test routine all standard parameters can be changed online during testing at the **1-phase and coaxial 50 Ω output of the compact NX** generator. This procedure therefore is very easy and fast to use.

The user can easy select the following parameters

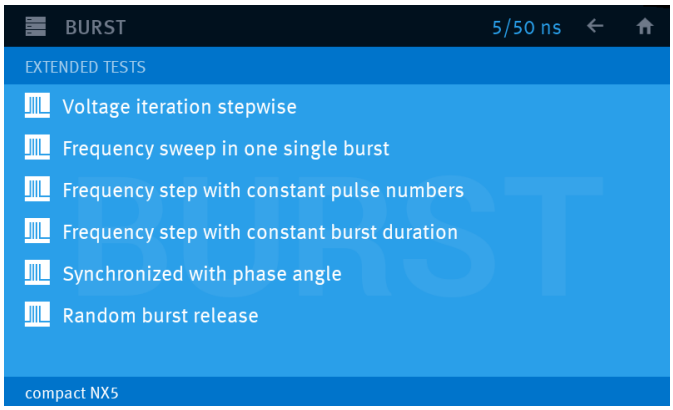
Level (voltage): Select Level 1(500 V), Level 2(100 V), Level 3(2000 V), Level 4(4000 V)

Coupling (Cpl): Common (L+N+PE), All (All combinations (L, N, PE), 50 Ohm (coaxial output)

Rep (frequency): 5 kHz (td= 15 ms), 100 kHz (td= 0.75 ms)

9.1.3. Extended Test

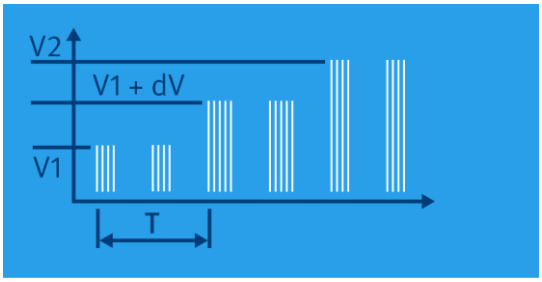
The extended menu offers various useful tests for testing and development.



Extended Menu

Voltage iteration stepwise

Voltage change after T by ΔV The test voltage is increased from V1 to V2 by steps of ΔV after the defined test time T. All limitations are the same as defined under Quick Start. The limitation of the max. generated number of spikes is related to the higher voltage of V1 or V2.



Frequency sweep in one single burst

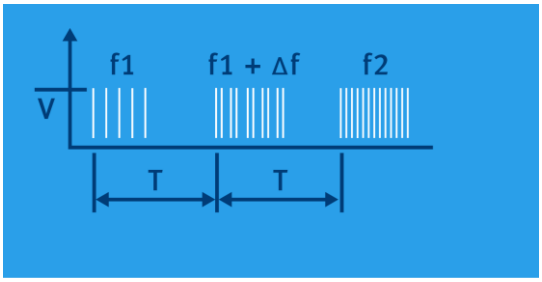
During one single burst the frequency sweeps from f1 to f2. For this function the following limitations have to be respected:

Tr	>=	100 ms
f1	<=	f2
Td	>=	5.0 ms
Td	>=	5 / f1
tr -td	>=	50 ms

Note: The maximum value for frequency, burst duration td and voltage are in dependence of each other and therefore limited by the generator performance. The practical limits of the UCS500N7 are 20kHz for f2 and 50ms for the burst duration td. The limits of the generator model compact NX N5 are approx. 10 times higher.

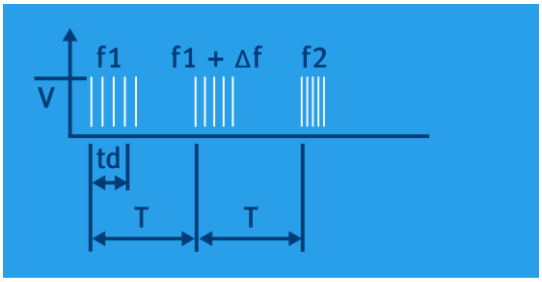
Frequency sweep with a constant duration after T by Δf

The spike frequency is increased from f1 to f2 by steps of Δf after the defined test time T. All limitations are the same as defined under Quick Start. The limitation of the max. generated number of spikes is related to the higher frequency of f1 or f2.



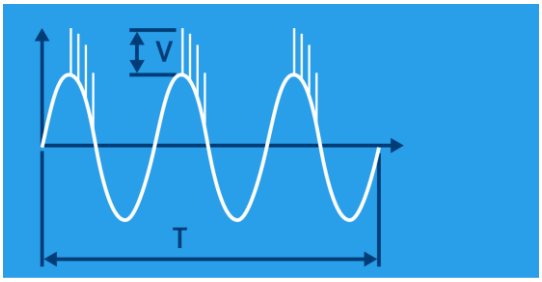
Frequency sweep with a constant pulse numbers

The burst duration is increased from td1 to td2 by steps of Δ td after the defined test time T. All limitations are the same as defined under Quick Start. The limitation of the max. generated number of spikes is related to the higher duration of td1 or td2.



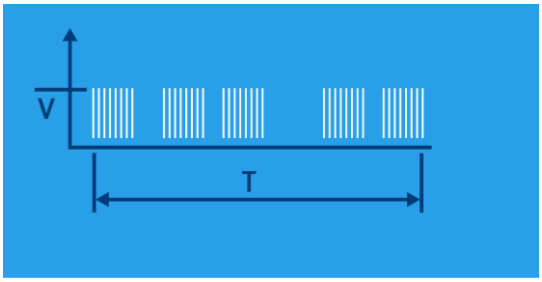
Synchronized with a fixed phase angle

The burst is triggered with respect to the phase angle of the power supply connected to the Sync input at the rear panel of the equipment. The power supply must be an AC voltage with a nominal frequency of 16 to 500Hz. The phase must be connected to L. This can be checked by the lamp connected to the L input.



Random burst release

No repetition rate is selected. The single burst will be triggered by statistics in the limits of 20 to 2000ms as time between two bursts. All limitations are the same as defined under Quick Start.



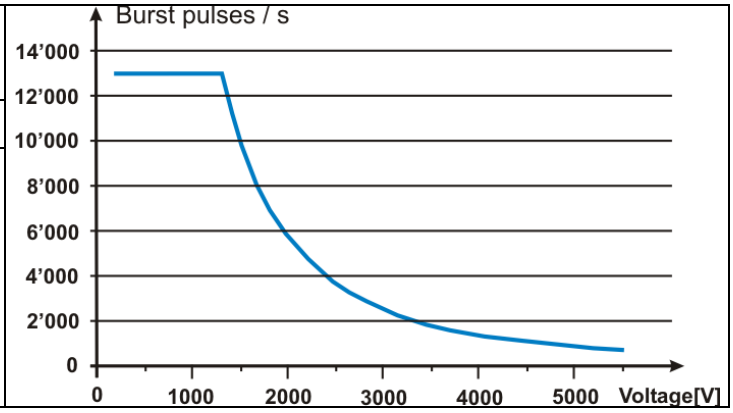
9.1.4. Max Burst impulses / s

Burst spike limit:

The pulse switch is a highly reproducible semiconductor switch. Spike frequencies up to 1000 kHz are by a factor of 10 higher than recommended in the actual EFT standards. This means of course that also the pulse energy would be 10 times higher. This is not generally possible for the high voltage switch. Therefore the following limitation protects the pulse forming circuit against overload:

Burst impulses / s

Voltage V	Max. pulses / s continuous burst
<= 1'300V	13,000
2'000 V 3'000 V 4'000 V 5'000 V 5'500 V	5680 2525 1420 900 750

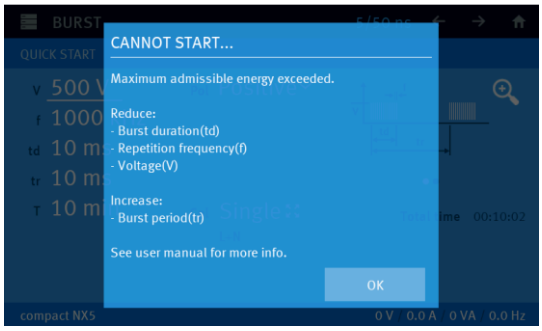


Error message: Cannot Start

The maximum energy of the burst impulses is limited to 30 J per second. This value is calculated by the formula:

$$\frac{U^2 * Td * f}{Trep} < 30\ J$$

U [kV]
f [kHz]
Td, Trep [ms]

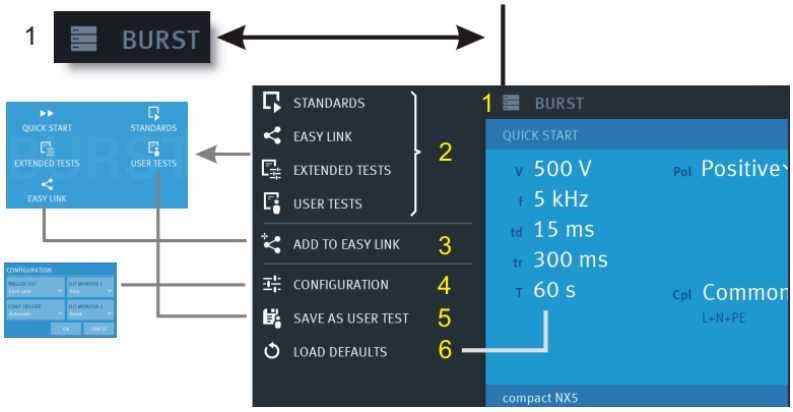


In case of this message the user must reduce the energy by changing at least one parameter

Reduce:
- Burst duration (Td)
- Repetition frequency (f)
- Voltage (V)

Increase:
- Burst period (td)

9.2. Burst Menu



Burst Menu

1 Button for open and close the Burst Menu

2 Change to other Burst test routines. The last used test in this routine will be loaded.
- Quick Start
- Standards
- Extended Tests
- User Tests
- Easy Test

3 Add the actual test to Easy Link library

4 Trigger and Monitor setting for Burst test (Each phenomenon has an individual configuration).

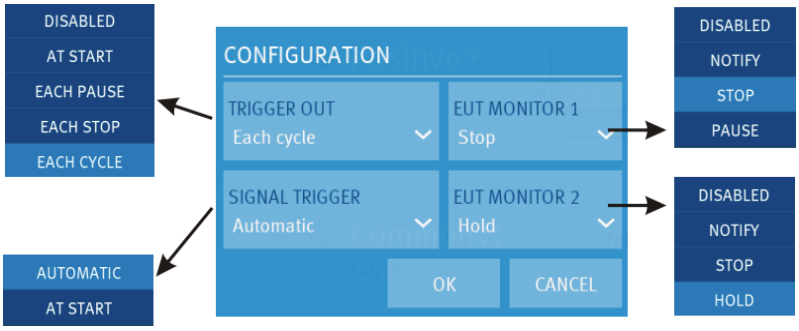
5 Add the actual test to User Test library

6 Load the default parameters for the Quick Start test (factory setting)

9.2.1. Configuration

In the configuration menu the user set the following parameters:

- **Trigger out signal** at the BNC plug on generator front side
- **Start trigger** for the impulse or event on the BNC Ext. Trigger plug on rear side or blinking Start button
- Behavior of the **EUT Monitor 1** and **EUT Monitor 2** on BNC plug on rear side

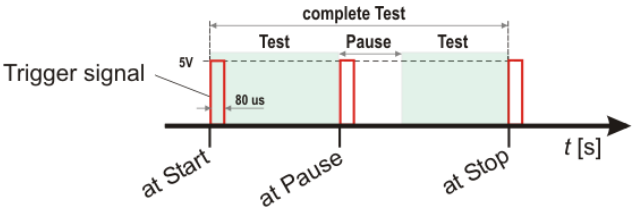


9.2.1.1. Trigger OUT

The trigger out signal is a programmable 5V edge signal located at the front side BNC Trigger plug. This signal is for trigger other devices like oscilloscopes or other devices.

The generator offers the following trigger out options:

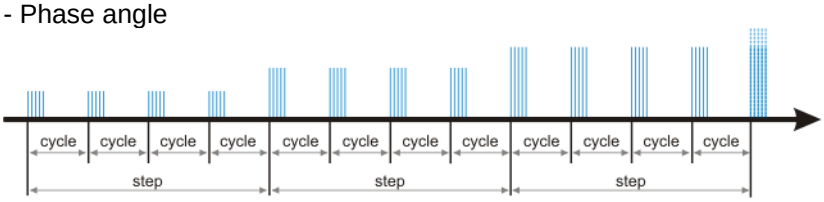
- At **Start**
- Each **Pause (Break)**
- Each **Stop**
- Each **Cycle** every burst packet release



Iterations

For Iteration tests the parameters changes after each step as shown in the figure below. Depends of the order and setting the following parameters can change:

- Polarity
- Voltage
- Frequency
- Phase angle



Example with voltage iteration that illustrate trigger out for cycle and step

9.2.1.2. Signal Trigger

The Signal Trigger occurs by pressing the blinking **START / PAUSE** button or with an external trigger positive slope signal at the rear side BNC **Ext. Trigger** plug.

The start trigger offers the following status:
- **Automatic**
- At **Start** (starts after the trigger)

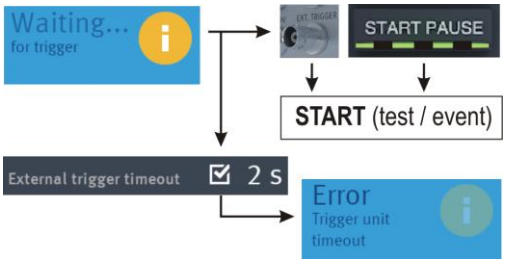
If the start trigger is not set to Automatic, the trigger indicates with "**Waiting for trigger"** the recommended trigger signal.

The waiting time for a trigger signal is endless if no trigger timeout is enabled.

External trigger timeout

This function stops the test after the defined timeout time and indicates the message, "**Error trigger unit timeout**".

For enable the function External trigger timeout select from the Home screen:
Menu / Setup / General / Process & sync



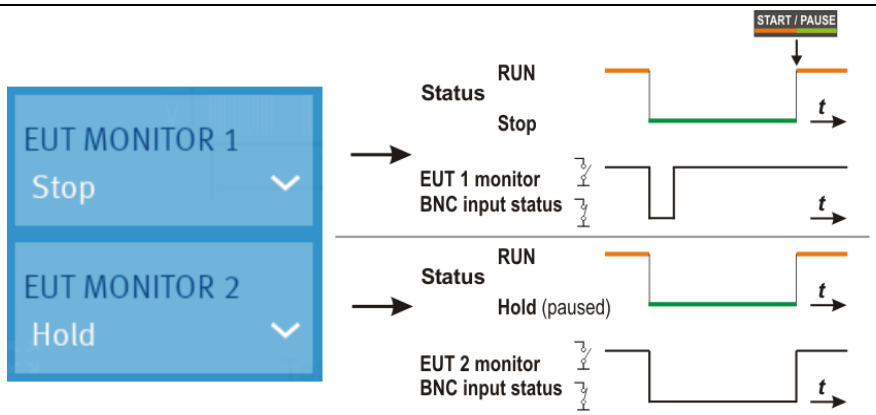
Start Trigger flowchart

9.2.1.3. EUT Monitor

The EUT monitor 1 and EUT Monitor 2 input is used for control the compaxt NX device according the EUT behavior. Each input is programmable to have different events as:

Disabled	No function
Notify	Makes a mark in the NX software. The report will make a time stamp and notes the actual generator settings.
Stop	Stops the test immediately. It is not possible to continue the test.
Pause (EUT monitor 1)	Break the test and go to pause status. For continue the user must press the START/PAUSE button or continue in iec.control software. NOTE: The EUT monitor input 1 must go to **open status before press continue**
Hold (EUT monitor 2)	Keep in pause status as long the EUT monitor 2 input is grounding. After release the break, the test will continue automatically.

EUT Monitor input signal

EUT Monitor Input	BNC plug on rear side of the compact NX generator 
Status of BNC input of EUT monitor 1 / 2	
Input signal	Open collector signal 15 V to 0 V negative slope
Triger level	2 V ±1 V
Input impedance	>10 kΩ
Max. Input	+ 15 V

9.3. Burst generation

Burst switch:
The discharge switch is a highly reproducible semiconductor switch. Spike frequencies up to 1000 kHz are by a factor of 10 higher than recommended in the actual EFT standards. This means of course that also the pulse energy would be 10 times higher. This is not generally possible for the high voltage switch. Therefore, the following limitation protects the pulse forming circuit against overload:

Pulses / s

Voltage V	Max. pulses / s continuous burst
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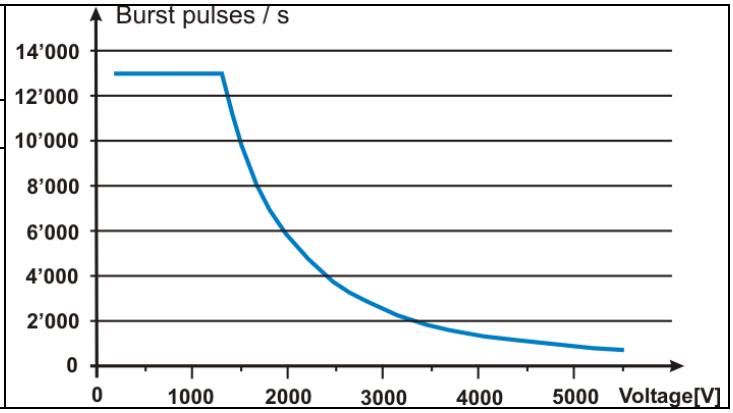


9.4. Test level with Burst as per IEC 61000-4-4

Burst generators, which the specifications in accordance with IEC 61000-4-4 are limited at the maximum output voltage. The efficiency of the burst pulses decreases with the numbers of couplings.

Therefore, the maximum test level is limited by the number of coupling on several lines.

Coupling	compact NX
50 Ω	5500V
1 coupling any	5500V
2 couplings any	5500V
3 couplings any	5500V

Generator with 3-phase CDN	
50 Ω output	5500V
1 coupling any	5500V
2 couplings any	5000V
3 couplings any	5000V
4 couplings any	4500V
5 couplings any	4500V

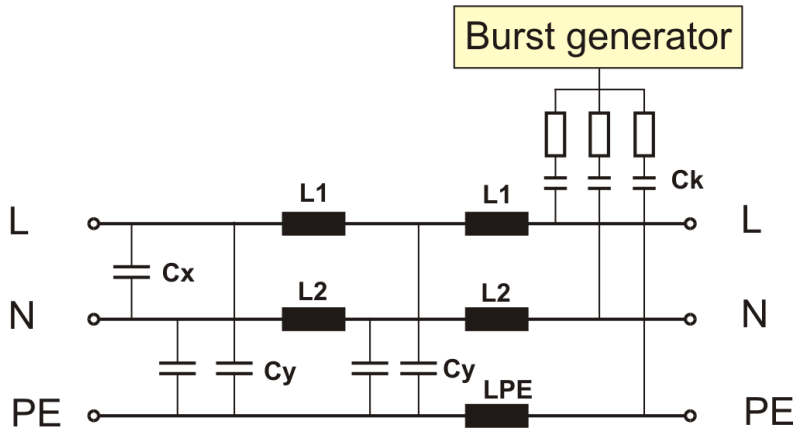
9.5. Coupling/decoupling network

The decoupling part of the coupling network must be:

- filter the interference pulses in the direction to the power supply;
- protect other systems that are connected to the same power supply and
- realize a high impedance of the power supply, e.g. battery supply.

9.5.1. Coupling/decoupling network for ac/dc power lines

The coupling network couples the EFT pulses via 33 nF capacitors onto the AC or DC power lines. As coupling devices capacitors of sufficient strength and bandwidth shall be used according to IEC 61000-4-4.



Coupling network as per IEC 61000-4-4

The coupling on signal lines can usually not be effected capacitive without interfering with the signal flow. It is often impossible to contact the required circuit (direct), e. g. coaxial or shielded cables. In this case the coupling is realized with the capacitive coupling clamp. The interference simulator can be connected on both sides of the coupling clamp.

Coupling method:

Test duration: At least 2 minutes in positive and negative polarity. The test duration must be at least as long for examine all functions of the EUT

Coupling IEC 61000-4-4 edition 2 (2004) and later versions requires to couple all lines simultaneously in Common Mode coupling.
This means that a burst test needs **two tests with 60s** (positive and negative 60s each).

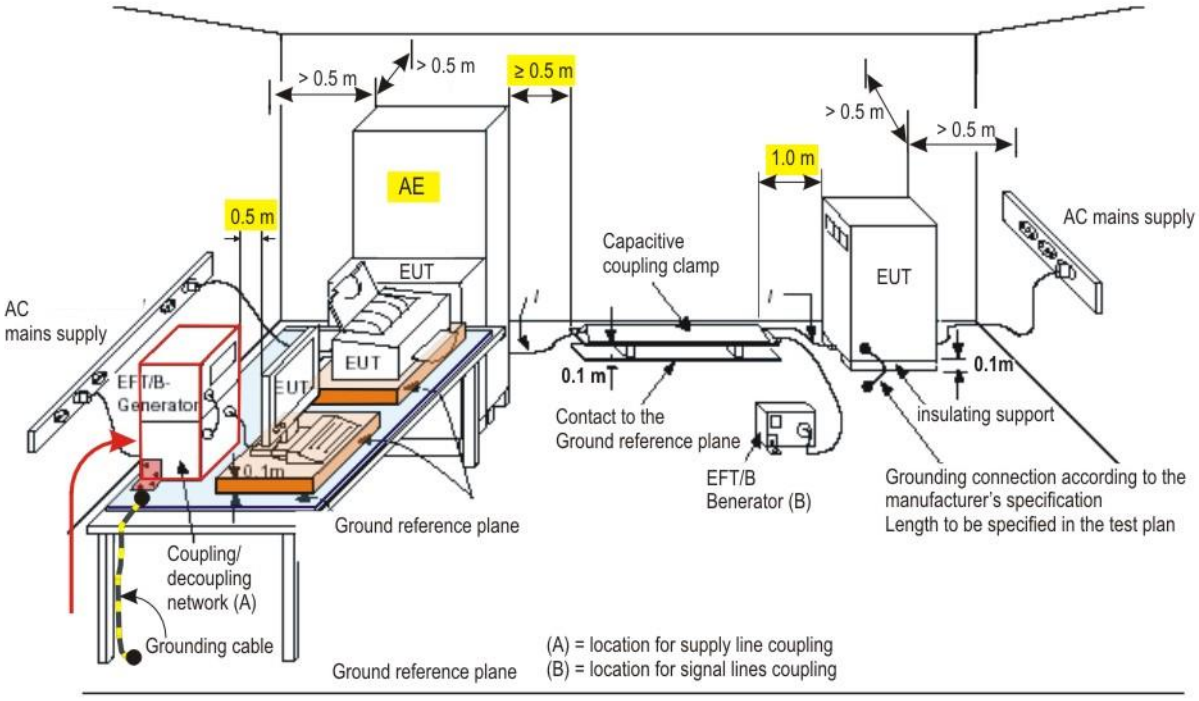
IEC 61000-4-4 (1995, 2001) requires **all line combination** to be tested individually.
A 1-phase EUT needs to test all combination L, N, PE, L+N, L+PE, N+PE, L+N+PE each with two tests with 60s (positive and negative 60s each). Total test time 14 x 60 seconds

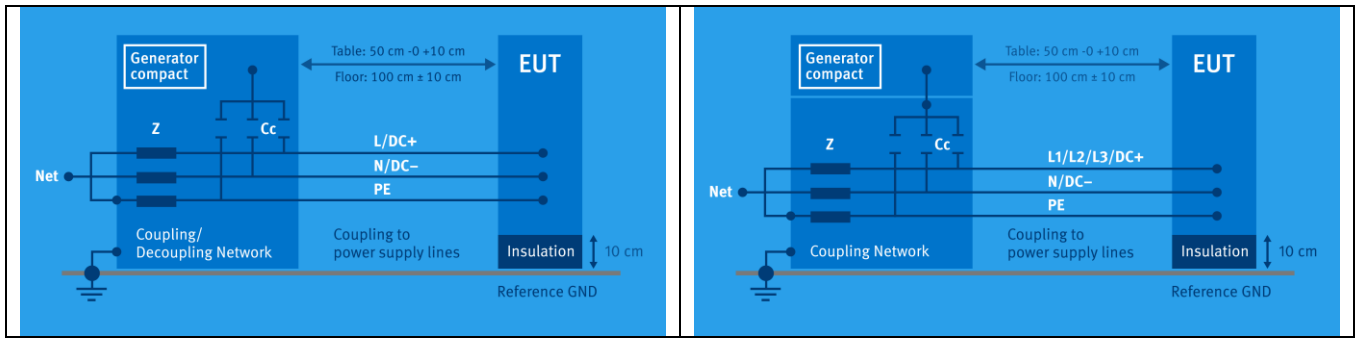
9.5.2. Capacitive coupling clamp

- The coupling clamp is not matched by 50 Ω. If the clamp is matched there exists an additional magnetic coupling, which may cause completely different test results.
- The clamp should be placed in a distance of 0.5m to the equipment under test. When the distance is shorter distances, the EUT may be influenced by radiation.
- If the EUT is includes two separate equipment, the test should be conducted on each single equipment with the required distance.

9.6. Burst Test Setup

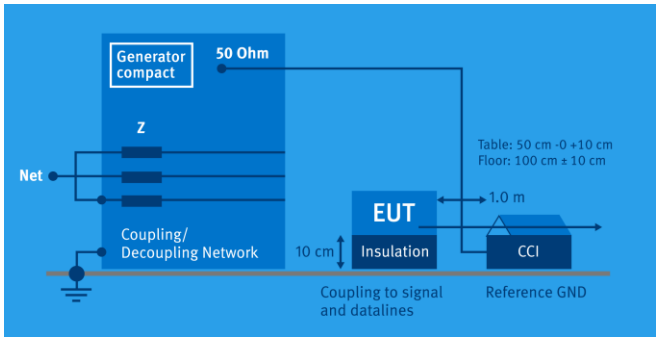
- The test generator and the coupling network should be connected to the reference ground plane (acc. to high frequency requirements).
- The equipment under test must be isolated from the reference ground plane. The distance should be 10 cm. Being part of the EUT, these requirements are also recommended for all connected cables. The EUT should only be grounded if this is recommended by the installation guideline. For safety reasons, the test without any ground connection should be conducted as well (at 100MHz 1 m ground cable length has an impedance of about 600 Ω)
- Whenever possible the test set-up and the cabling should always be the same; e.g. for testing power lines it would be possible to fix the cables on the test table for all tests in the same way.
- Lines under test and all other lines should be decoupled strictly.

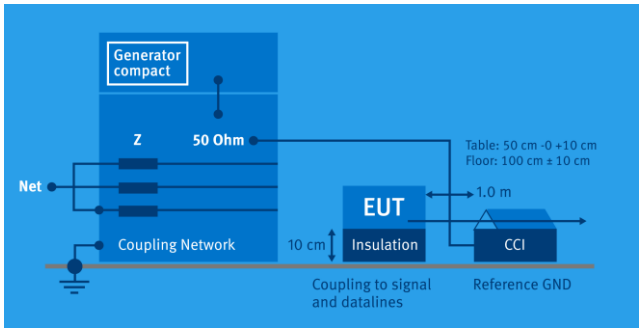




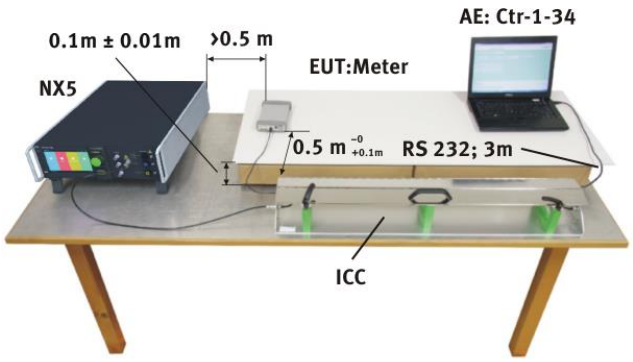
9.6.1. Test setup with capacitive coupling clamp

When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces (including the generator), except the ground reference plane beneath the coupling clamp and beneath the EUT, shall be at least 0.5 m.





The distance between any coupling devices and the EUT shall be (0.5 − 0/+0,1) m for tabletop equipment testing, and (1,0 ± 0,1) m for floor standing equipment, unless otherwise specified in product standards. When it is not physically possible to apply the distances mentioned above, other distances can be used and shall be recorded in the test report.



10. Surge Immunity as per IEC 61000-4-5

Surge Module 1.2/50µs – 8/20µs

WARNING

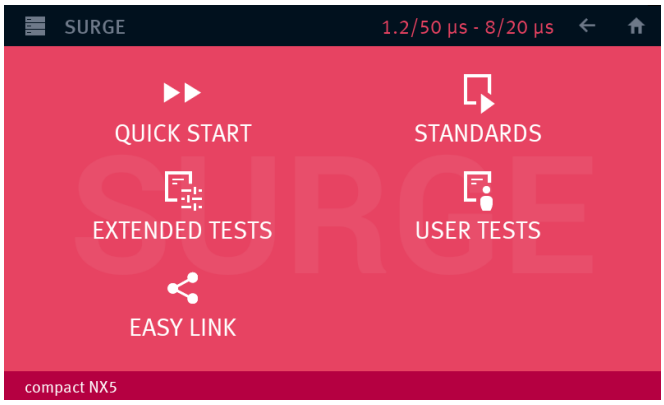
The internal coupling network is designed for **mains frequency 50 Hz / 60 Hz**.

When L – N coupling is selected an **additional current of approx. 1.5 A** flows, caused by the 18 µF coupling capacitor and the pulse forming network. A similar current appears during the couplings to PE.

Tests with 400 Hz mains frequency **destroy the coupling network**. An external coupling network is recommended with inductors and capacitors matched to the 400 Hz mains frequency.

10.1. Operation

The Surge menu offers different test routines for burst testing.



Main Menu Surge

The Surge menu offers different test routines for surge testing.

Quick Start
Easy and fast online-operation with the phenomenon Surge. In this menu the user can operate all surge test manually with online change the most parameters during a test.

Standard
The operator can select between various preprogrammed test routines as required in different standards
The standard library is filtered according the EUT setting (AC, DC etc.)

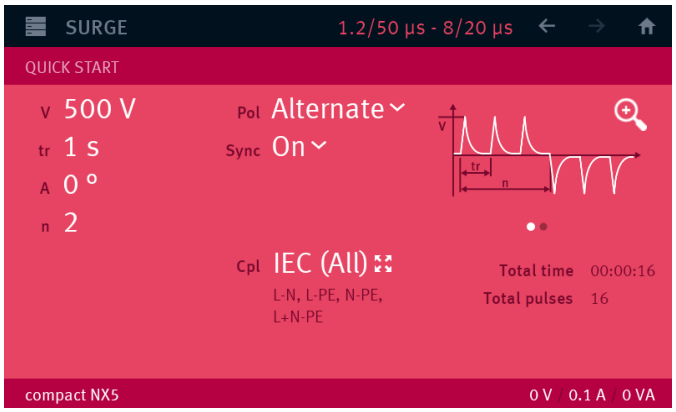
Extended Tests
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

User test routines
The user defined library where all created Surge tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

10.1.1. Quick Start

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.



Quick Start Menu

While a test runs, the user can select parameters. The selected parameter then can be changed online with the inc/dec knob.

10.1.2. Standard test Routine

The user can select preprogrammed standard test routines.

The Surge Standard menu offers a list of standards. The name of the standard defines the characteristic of the rulers that is given in the application of the standard.

The standard name has the character: **[Standard Family], [Standard number], [year]), [Application],** where

Standard Family
IEC: *International Electrotechnical Commission*
EN: European Committee for Standardization (CEN)

Standard Number
Indicates the official standard number defined in the standard.

Year
Year of standard publication. The year indicates the different standard publication. The year is used for follow the definitions specified in this publication.

Application
Specifies different applications or EUT characteristics

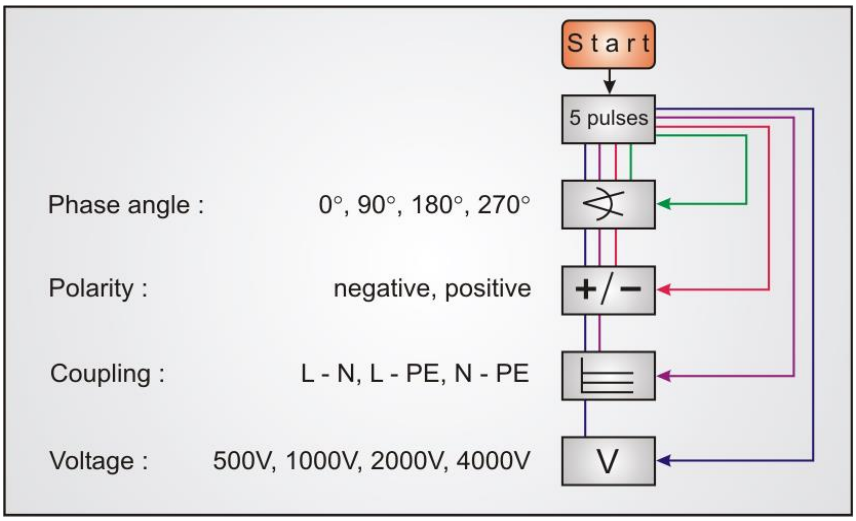
- One level: only one test level will be in this test. The user can select the test level (level 1 to 4)
- All levels: The test procedures start at the lowest level and increase to the level specified.

Iteration of the standard test procedure as per IEC 61000-4-5

The surges must be applied synchronized to the voltage phase at the respective angle and the peak value of the a.c. voltage wave (positive and negative).

The surges have to be applied line to line and line(s) and earth. When testing line to earth the test voltage has to be applied successively between each of the lines and earth.

The test voltage has to be increased by steps from the lowest test level up to the test level specified in the product standard or test plan.



List of settings EN 61000-6-1 (each setting with 5 pulses)

Setting	Voltage	Coupling	Polarity	Phase angle
1	500	L-N	pos	0
2				90
3				180
4				270
5			neg	0
6				90
7				180
8				270
9		L-PE	pos	0
10				90
11				180
12				270
13			neg	0
14				90
15				180
16				270
17		N-PE	pos	0
18				90
19				180
20				270
21			neg	0
22				90
23				180
24				270
25	1000	L-N	pos	0
26				90
27				180
28				270
29			neg	0
30				90
31				180
32				270

Setting	Voltage	Coupling	Polarity	Phase angle
33	1000	L-PE	pos	0
34				90
35				180
36				270
37			neg	0
38				90
39				180
40				270
41		N-PE	pos	0
42				90
43				180
44				270
45			neg	0
46				90
47				180
48				270
49	2000	L-PE	pos	0
50				90
51				180
52				270
53			neg	0
53				90
55				180
56				270
57		N-PE	pos	0
58				90
59				180
60				270
57			neg	0
58				90
59				180
60				270

Within this test routine all standard parameters can be changed online during testing. This procedure therefore is very easy and fast to use.

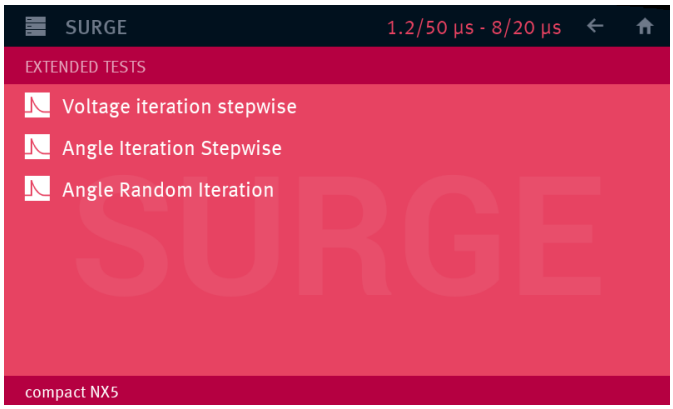
10.1.2.1. Standard Surge tests

There are two different Surge standard tests application for **Power lines** and **Signal lines**

10.1.3. User Test Routines

The user can program, save and recall his own specific test routines. The next pages show the selection of the functions.

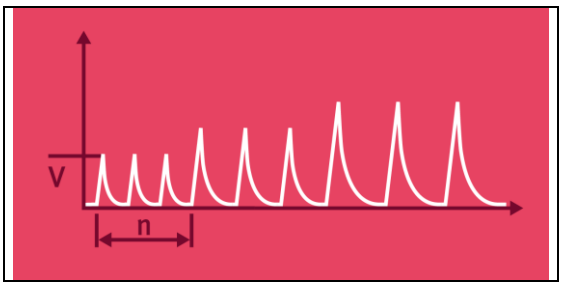
The extended menu offers various useful tests for testing and development.



Extended Menu

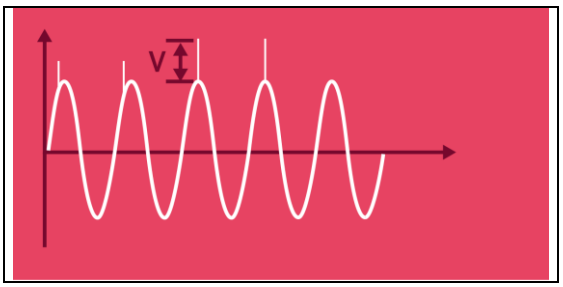
Change test level V after n pulses by ΔV

The test voltage V is changed from V1 to V2. After the preselected number pulses the test level is changed by ΔV until V2 is reached. The same parameters as under Quick Start are selectable. For the limitation of the max. admissible repetition rate the higher value of V1 and V2 is valid.



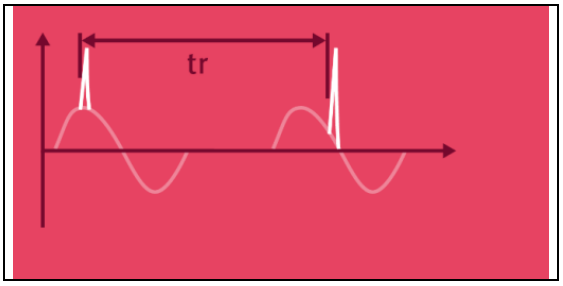
Angle Iteration Stepwise after n pulses by ΔA

The phase angle related to which the surge pulse is released is changed from A1 to A2. After the preselected number of n pulses the actual phase angle is changed by ΔA until A2 is reached. The same parameters as under Quick Start can be selected.



Angle Random Iteration

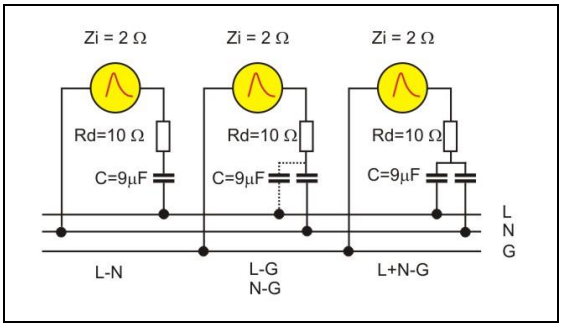
The phase iterated angle will be played in random mode. After the test all steps are tested once.



This Function is only implemented in the coupling models with ANSI coupling options

ANSI A coupling after n pulses

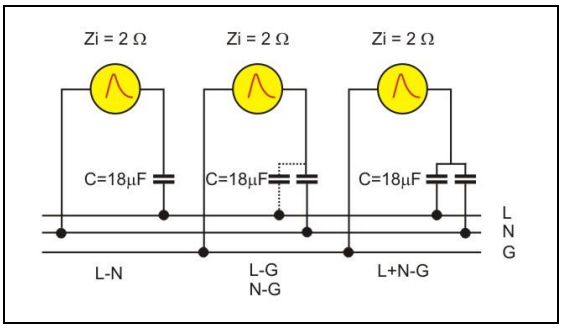
The coupling mode with 12Ω und 9µF will automatically be changed after the preselected number of pulses has been released. All possible coupling modes will be selected. The same parameters as under Quick Start can be selected.



ANSI B coupling after n pulses

The coupling mode with 2Ω und 18µF will automatically be changed after the preselected number of pulses has been released. All possible coupling modes will be selected. The same parameters as under Quick Start can be selected.

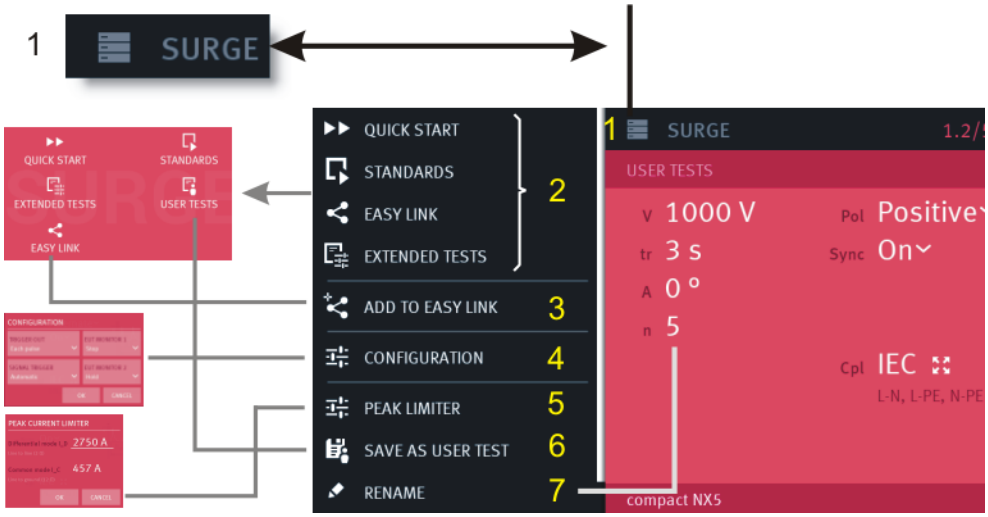
For coupling ANSI B **coupling L-N** is actually **not supported** with NX system.



Surge Generator and coupling impedances

	Line to Line	**Line to PE** (IEC) **Line to GND** (ANSI**)**
IEC	2Ω; 18µF	12Ω; 9µF
ANSI A	12Ω; 9µF	12Ω; 9µF
ANSI B	2Ω; 18µF	2Ω; 18µF

10.2. Surge Menu



Surge Menu

1 Button for open and close the Surge Menu

2 Change to other Surge test routines. The last used test in this routine will be loaded.
- Quick Start
- Standards
- Extended Tests
- User Tests
- Easy Test

3 Add the actual test to Easy Link library

4 - Trigger and Monitor setting for Surge test. (Each phenomenon has an individual configuration)
- Additional configuration in Standard Mode for change all parameters

5 Current limiter setting

6 Add the actual test to User Test library

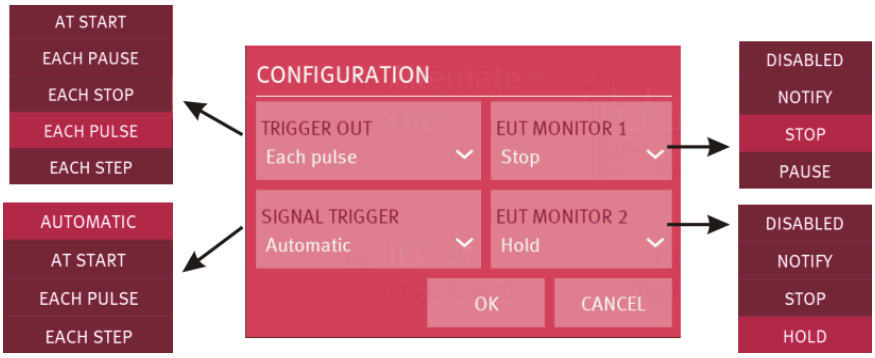
7 Load the default parameters for the Quick Start test (factory setting)

10.3. Surge pulse settings

10.3.1. Configuration

In the configuration menu the user set the following parameters:

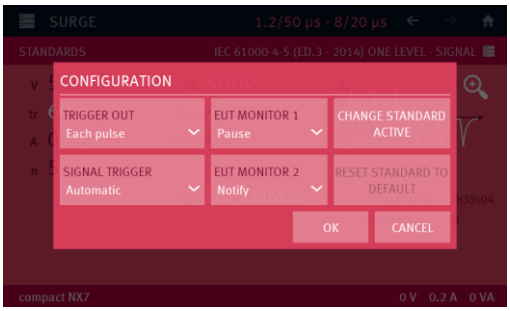
- **Trigger out signal** at the BNC plug on generator front side
- **Signal trigger** for the impulse or event on the BNC Ext. Trigger plug on rear side or blinking Start button
- Behavior of the **EUT Monitor 1** and **EUT Monitor 2** on BNC plug on rear side



Additional Configuration in Standard Mode

Change Standard ACTIVE
All parameters are free to change, even these which are fix defined in the standard as polarity, phase angel, number of impulses…

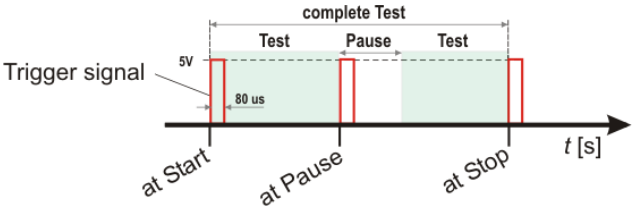
Reset standards to default
Reset the changed parameters to default value.



10.3.1.1. Trigger OUT

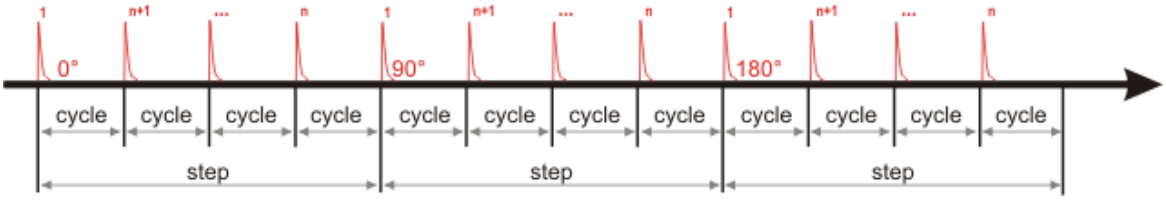
The trigger out signal is a programmable 5V edge signal located at the front side BNC Trigger plug. This signal is for trigger other devices like oscilloscopes or other devices.

The generator offers the following trigger out options:
- At **Start**
- Each **Pause**
- Each **Stop**
- Each **Pulse** every surge impulse release
- Each **Step** for tests with iteration



Iterations

For Iteration tests the parameters changes after each step as shown in the figure below. Depends of the order and setting the following parameters can change:
- Polarity
- Voltage
- Phase angle



Example with voltage iteration that illustrate trigger out for cycle and step

10.3.1.2. Start Trigger

The Start Trigger occurs by pressing the blinking **START / PAUSE** button or with an external trigger positive slope signal at the rear side BNC **Ext. Trigger** plug.

The start trigger offers the following status:
- **Automatic**
- At **Start** (starts after the trigger)
- Each **pulse** (same as trigger out)
- Each **step** (same as trigger out)

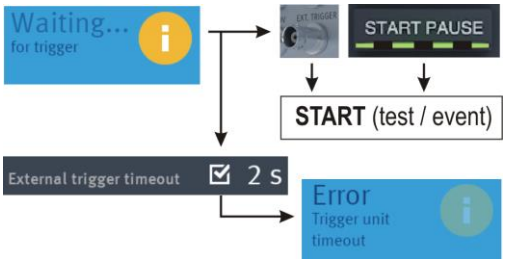
If the start trigger is not set to Automatic, the trigger indicates with "**Waiting for trigger"** the recommended trigger signal.

The waiting time for a trigger signal is endless if no trigger timeout is enabled.

External trigger timeout

This function stops the test after the defined timeout time and indicates the message, "**Error trigger unit timeout**".

For enable the function External trigger timeout select from the Home screen:
Menu / Setup / General / Process & sync



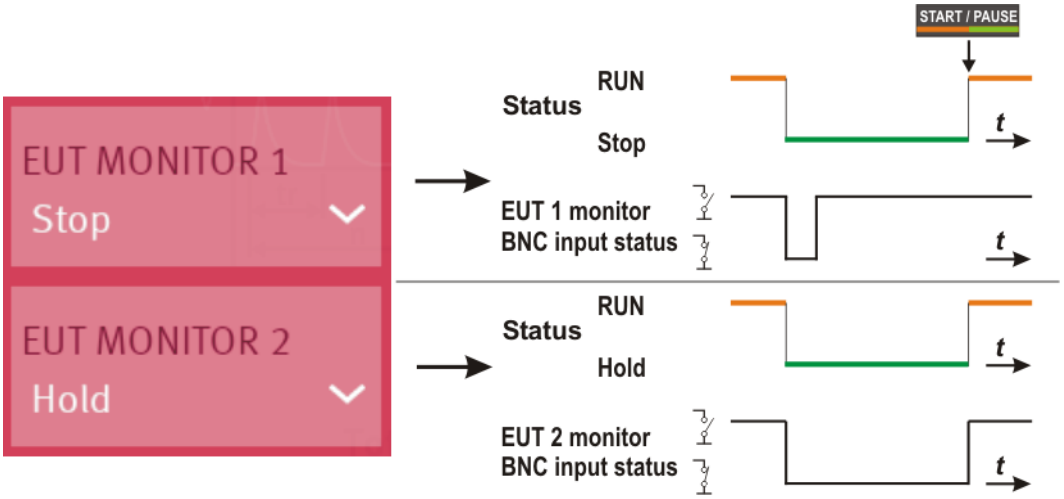
Start Trigger flowchart example from burst

10.3.1.3. EUT Monitor

The EUT monitor 1 and EUT Monitor 2 input is used for controling the compaxt NX device according the EUT behavior. Each input is programmable to have different events as:

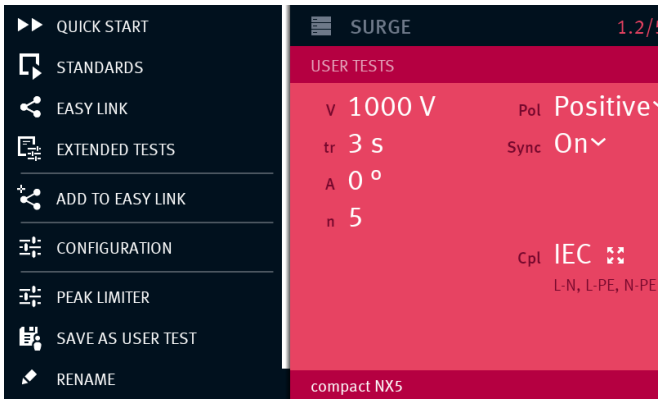
Disabled	No function
Notify	Makes a mark in the NX software. The report will make a time stamp and notes the actual generator settings.
Stop	Stops the test immediately. It is not possible to continue the test.
Break (EUT monitor 1)	Break the test and go to pause status. For continue the user must press the START/PAUSE button or continue in iec.control software. NOTE: The EUT monitor input 1 must go to **open status before press continue**
Break (hold) (EUT monitor 2)	Keep in pause status as long the EUT monitor 2 input is grounding. After release the break, the test will continue automatically.

EUT Monitor input signal

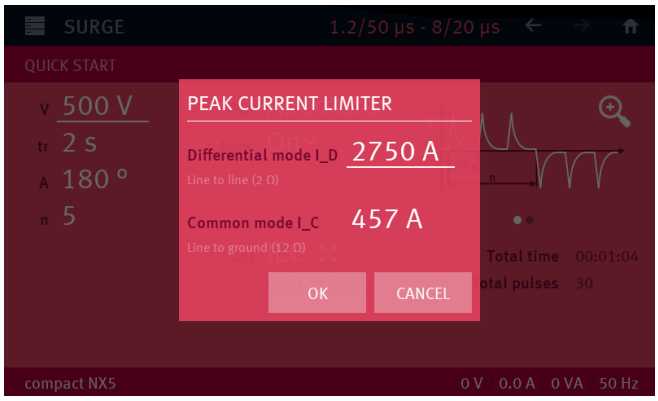
EUT Monitor Input	BNC plug on rear side of the compact NX generator 
Status of BNC input of EUT monitor 1 / 2	
Input signal	Open collector signal 15 V to 0 V negative slope
Triger level	2 V ±1 V
Input impedance	>10 kΩ
Max. Input	+ 15 V

10.3.2. Setup current peak limiter for surge current

The peak current limiter stops the test run when during a test the measured peak current of a surge pulse is higher than the preselected current value. This safety function protects the EUT for further surge pulses that can become any dangerous situation.
Depends of the different impedance of the surge generator, one current limiter for both impedances (2 Ω, 12 Ω) is available.



Select SURGE Menu / Current Limiter



Set peak current limiters

I_D = Current limiter Differential mode (line to line): The generator impedance is 2 Ω

I_C = Current limiter Common mode (line to ground): The generator impedance is 12 Ω

REMARK

The current limits in Software and Manual operation are two individual settings.

Software uses the **software settings** for I_D and I_C
Manual operating uses the **device settings** for I_D and I_C

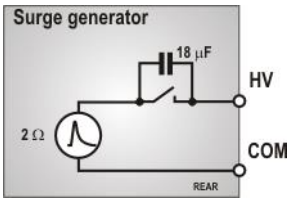
Note: Surge pulses with the coupling position for data lines use the settings of common mode. This is general used for the coupling network CNV 504 / 508 series with have an impedance of 42 Ω (2 Ω+ 40 Ω).
Using a coupling network coupling NX-series uses the limits of differential and common mode.

10.3.3. **HV-COM output** (18 µF capacitor)

The HV – COM output includes a configurable output capacity with 18 µF. Using AMETEK CTS coupling-decoupling networks, the coupling capacitor is part of the CDN. For other applications e.g. pulsed surge magnetic field or a surge verification requires an 18 µF capacitor in the circuit. The NX generator includes a configurable 18 µF capacitor at the HV – COM output.

Application with 18 µF capacitor

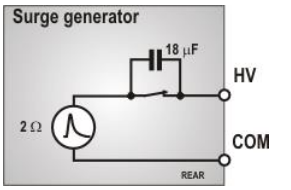
- Pulsed magnetic field application to a single turn antenna as per IEC 61000-4-9
- Generator pulse verification at the NX5 HV-COM output
- Pulse verification at the coupler HV-COM output
- Application to any external CDN not from AMETEK CTS manufactured



Application without 18 µF capacitor

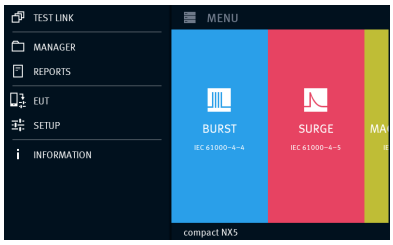
- Using a coupling decoupling network from AMETEK CTS.

REMARK: All CDN from EM TEST includes a built in coupling capacitor. The values are 18 µF, 9 µF, 0.5 µF or any other special value according the application.

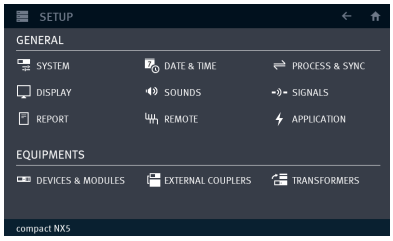


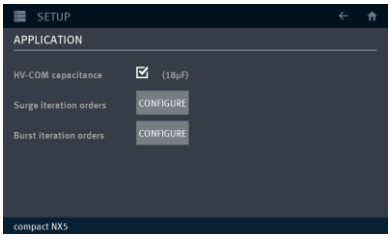
Capacitor setting

For set the 18 µF capacitor use menu



MENU / SETUP /





APPLICATION

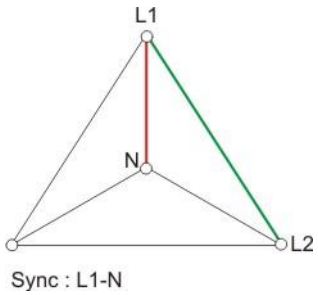
10.4. Surge pulse application

10.4.1. Phase synchronization in 3-phase system

The synchronization in a 3-phase coupler system is taken from the phase L1 and neutral. In case of a delta supply without neutral connected, an artificial neutral point is defined by a high impedance network. This artificial neutral is taken for the phase synchronization.

For all couplings, the generator calculates the correct phase angle for phase triggering.

In case of too high phase shifting the user can connect a proper sync signal to the SYNC IN plugs at the rear side of the compact NX generator



The tables below illustrates the correction angels considering the phase in a 3-phase system with synchronization signal from L1-N lines. The generator firmware will automatically add the correction angle to the settled value.

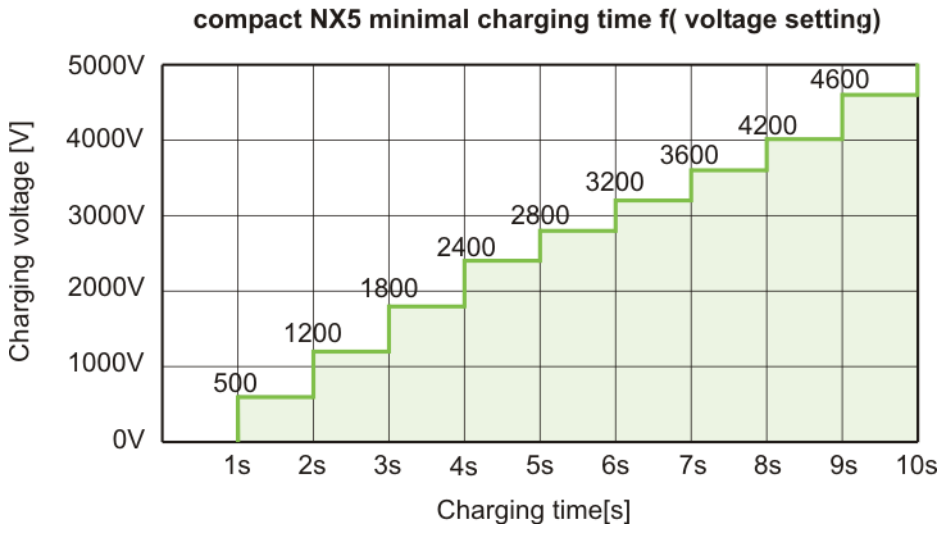
Phase Synchronization correction for L1-N as sync signal

	Sync. Source	Correction angel added by the compact NX firmware					
Coupling	**L1-N**	**L1-N**	**L2-N**	**L3-N**	**L1-L2**	**L1-L3**	**L2-L3**
Sync.-Angel	**0°**	0°	120°	240°	330°	30°	90°
	90°	0°	210°	300°	60°	120°	180°
	180°	0°	300°	30°	150°	210°	270°
	270°	0°	30°	150°	240°	300°	0°

The correct phase angle will be set automatically from the compact NX.

10.4.2. Charging time for surge

The energy for charging the surge generator depends on the charging voltage of the internal capacitor of 11 uF Therefore, the following minimum charging time is requested:



10.5. Surge pulse application

Discharge switch:
The discharge switch is a highly reproducible semiconductor switch.

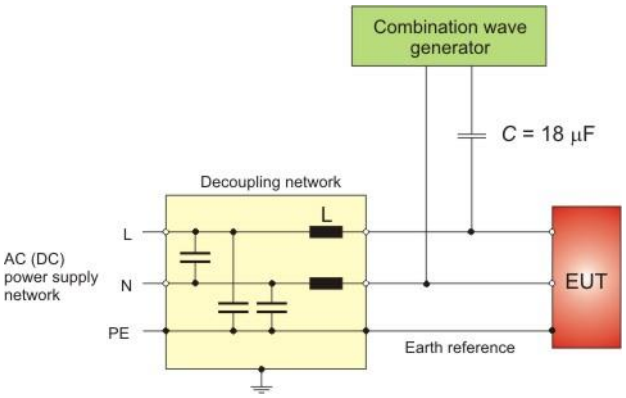
10.6. Coupling/decoupling network

The coupling network couples the surge impulses to the lines of a power supply system (AC or DC). Capacitive coupling is the specified coupling mode for surge testing.

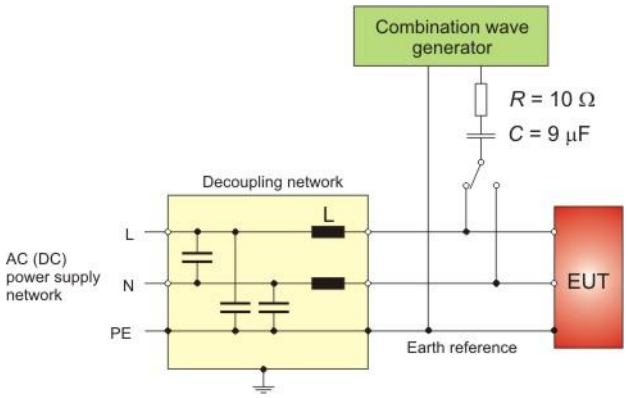
10.6.1. Coupling to AC/DC power supply lines

The surge generator compact NX has an integrated coupling network in accordance with IEC 61000-4-5. It must be possible to test with different coupling modes:

Line	→	GND or	(source impedance is 12 Ω)
Neutral	→	GND or	(source impedance is 12 Ω)
L + N	→	GND or	(source impedance is 12 Ω)
Line	→	Neutral	(source impedance is 2 Ω)



Coupling Line to Line



Coupling Line to Earth

The release of the surge pulses is mostly related to a certain phase angle.
The surge pulses are synchronized to the input signal at the rear Sync-connector.

Attention: The decoupling part of the coupling/decoupling network includes some capacitors for filtering of 20µF related tp protective Earth (chassis of the generator). This is to be conform to the requirement of IEC 61000-4-5 concerning attenuation of the surge transients in direction to the power mains supply input of the CDN.
As consequence there will exist an increased current to PE (protective earth) which might be hazardous to the operator in case of a failure or wrong installation. Therefore, it is very important to take the following points into account before setting the generator into full operation.

1. **Due to this increased current into the PE system no earth fault current protectors can be used within a surge testing area.**

2. **As consequence the surge generator shall be connected always to Protective Earth, even if no test is conducted.**
   - **via plugged in power mains supply cable including the PE wire !!!!**
   - **via plugged in EUT power mains supply at the rear side of the generator, including the PE wire !!!!**
   - **via Ground Reference Connector, screwed to the chassis of the generator.**

These measures result in double safety in case of a fault

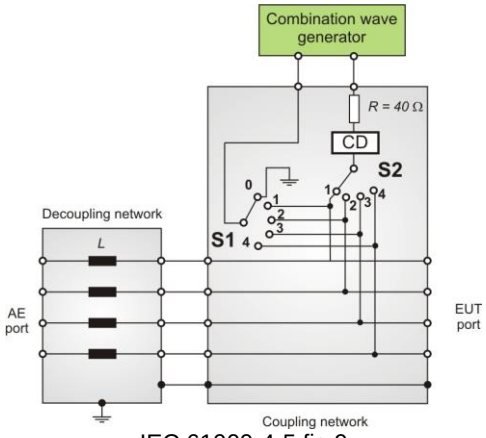
10.6.2. Coupling to I / O lines

The coupling to I/O lines is generally realized with other coupling networks than for power supply lines.

For surge coupling to I/O lines special couplers according the Standard IEC 61000-4-5 are available.

CDN for unsymmetrical data lines IEC 61000-4-5 fig 9

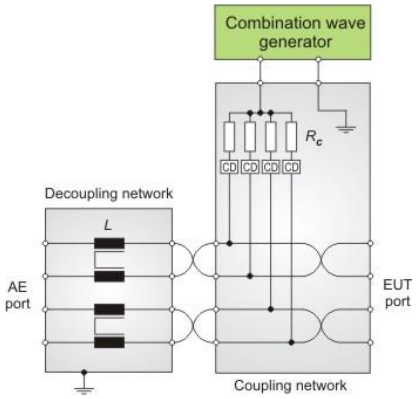
- DCD 5/7 sr series
- CNV 504, CNV 508 series



IEC 61000-4-5 fig 9

CDN for symmetrical data lines IEC 61000-4-5 fig 10

- DCD 5/7 st series
- CNV 504T, CNV 508T series

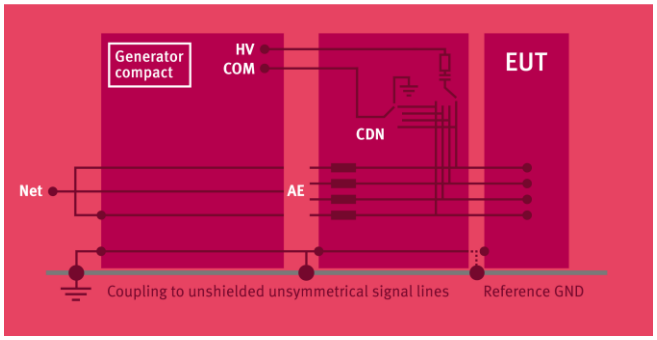


IEC 61000-4-5 fig 10

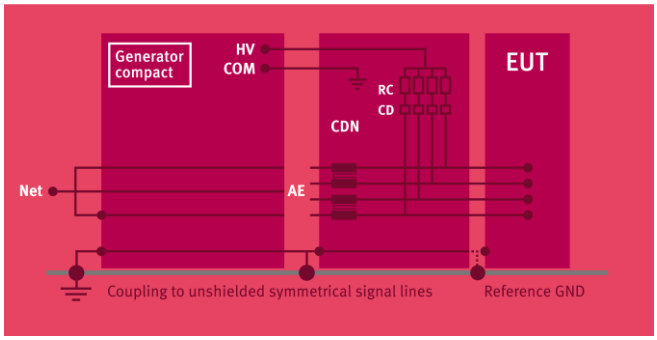
Danger

Using coupling networks CNV series

Switch OFF the high voltage during manual change of the coupling



Setup for unsymmetrical data lines

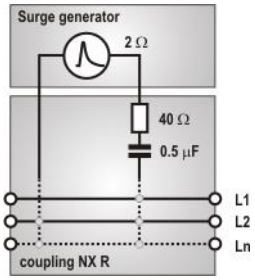


Setup for symmetrical data lines

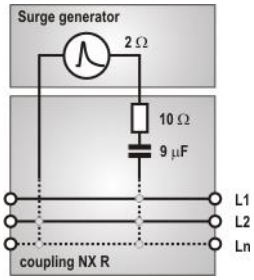
10.7. Railway testing as per EN 50121 standards

A separate series of coupler can be used for railway application. These couplers include an additional unit for couple with the impedance of 0.5 µ in series with 40 Ω to all coupling path.
For 3-phase application, the coupling NX5 / 7 -R series offers a large range of couplers up to 3 x 690 V, 200 A

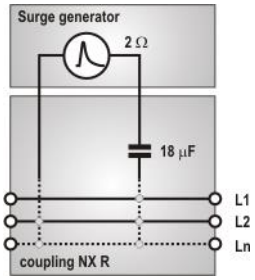
The railway standard defines the following coupling impedances



42 Ω, 0.5 µF



12 Ω, 9 µF

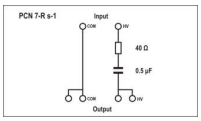


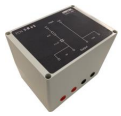
2 Ω, 18 µF

For coupling with the impedance 42 Ω, 0.5 µF, the coupling network PCN 7-R s-1 is required for coupling.

10.7.1. Railways application for 1-phase coupling with PCN 7-R s-1 as per EN 50121 standard

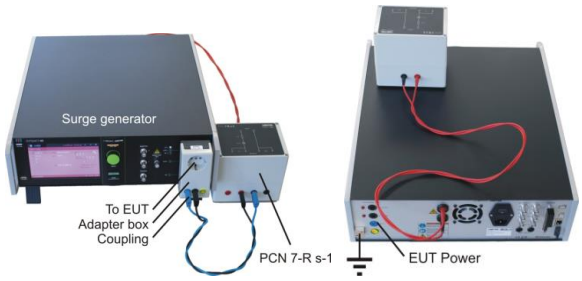
The PCN 7-R s-1 is a 1 - phase coupling network for manual coupling with an impedance of 42 Ω, 0.5 µF according EN 50121 standards
The decoupling network of the generator is used for decoupling the impulse.





Application

Connections rearside:
- HV cable red: HV generator - PCN 7-R s-1 Input HV
- HV cable black: COM generator - PCN 7-R s-1 Input COM
- Earth: Earth bolt generator - **to the system GND**



Connections frontside
Couplings: All couplings for surge pulses are realized with the connection from PCN 7-R s-1 Output to the adapter box connection coupling to the AC lines (L-N, L-PE, N-PE).

Generator Setting

Coupling: Select Internal HV – COM
Voltage setting: Set Surge voltage and repetition time and other required parameters

10.8. Surge Test set-up

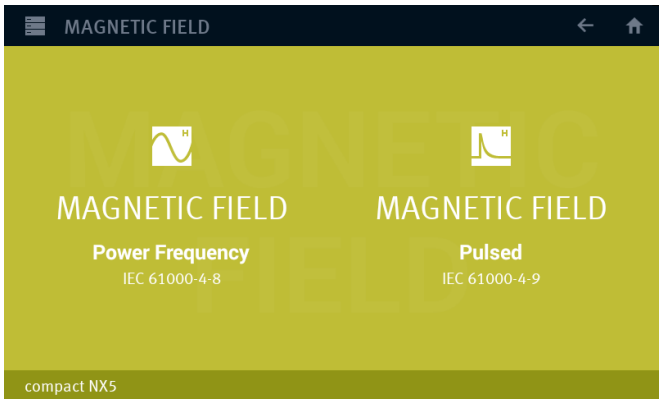
According to the specifications of IEC 61000-4-5, the surge generator has a source impedance of 12 Ω when the simulator is coupled between the lines and protective earth.

This will activate fault current detectors or protectors which may be installed in the laboratory.

Therefore, it is important
- not to disconnect the surge simulator form protective earth (power cable)
- to have an installation where the simulator is connected via its ground reference connector to earth

11. Magnetic field test as per IEC 61000-4-9

Pulsed Magnetic field as per IEC 61000-4Surge Module 1.2/50µs – 8/20µs



Main Menu Magnetic Field

WARNING

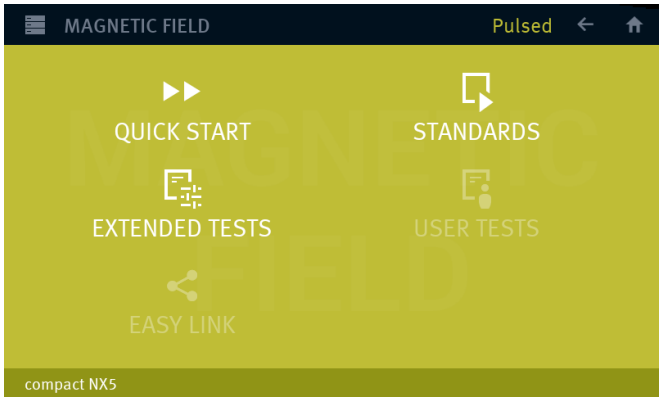
The internal coupling network is designed for **mains frequency 50 Hz / 60 Hz**.

When L – N coupling is selected an **additional current of approx. 1.5 A** flows, caused by the 18µ F coupling capacitor and the pulse forming network. A similar current appears during the couplings to PE.

Tests with 400 Hz mains frequency **destroy the coupling network**. An external coupling network is recommended with inductors and capacitors matched to the 400 Hz mains frequency.

11.1. Pulsed Magnetic field as per IEC 61000-4-9

The menu offers different test routines for pulsed magnetic field testing.



Main Menu Pulsed Magnetic Field

The Magnetic Field menu offers different test routines for pulsed magnetic testing.

Quick Start
Easy and fast online-operation with the magnetic Surge phenomenon. In this menu the user can operate all test manually with online change the most parameters during a test.

Standard
The operator can select between various preprogrammed test routines as required in different standards
The standard library is filtered according the EUT setting (AC, DC etc.)

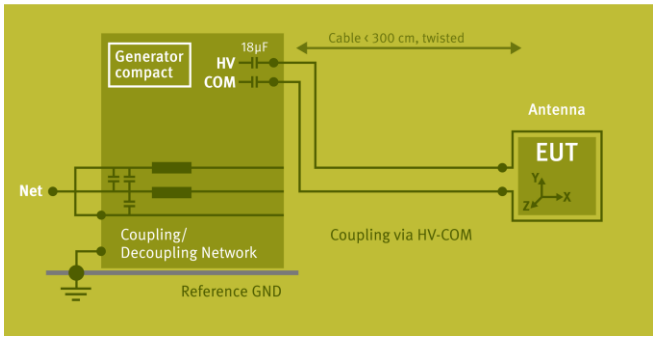
Extended Tests
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

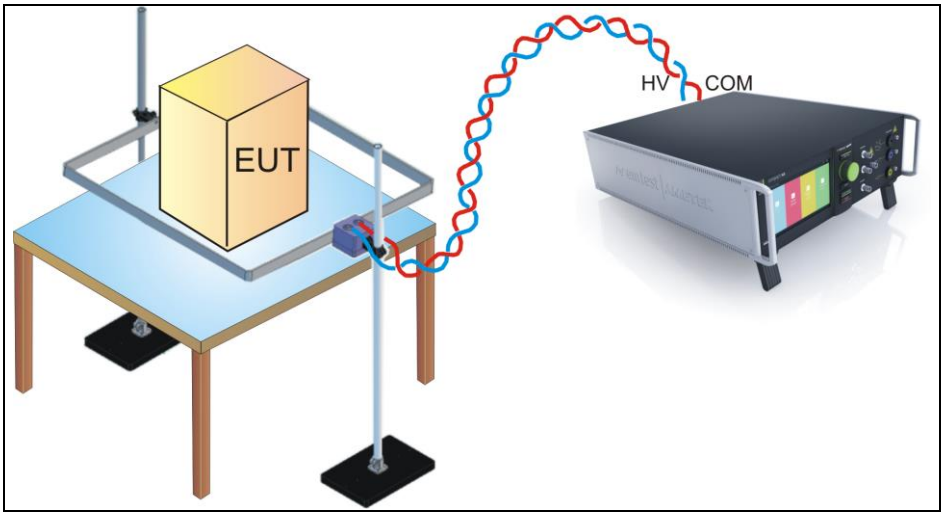
User test routines
The user defined library where all created magnetic field tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

For magnetic field testing the antenna correction factor shall be included. The operator can enter this factor within the setup menu under the service routine.

Setup pulsed magnetic Test field





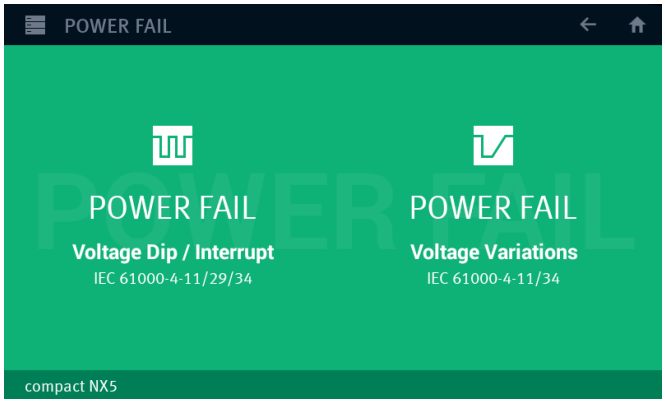
Warning

Disconnect all power cables on the rear side at the Test supply plugs.

PF1, PF2 and N

Don’t touch the antenna during the test!

12. Voltage Dips and Interruptions as per IEC 61000-4-11

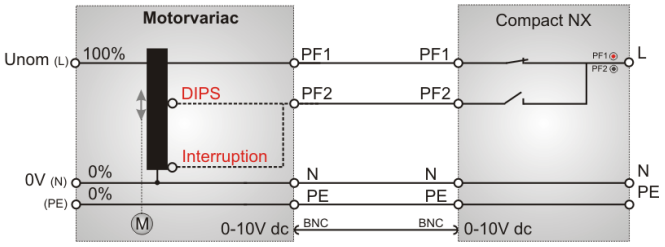


Main Menu Power Fail for voltage dips and interrupt tests and voltage variation

12.1. Test setup for DIPS and Interruption tests

Voltage DIPS

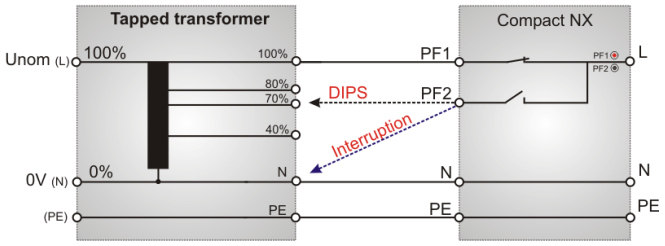
For voltage DIPS a connection must be made from the compact NX PF2 input to the motorvariac PF2 or V4780, where the reduced voltage is present.



Interruption tests

For Interrupts connect the compact NX PF2 input to the neutral as follows:

- **Motorvariac**: PF2 output (default setting) set motorvariac to zero volt.
- **V 4780**: Connect the cable to the N output at the V 4780

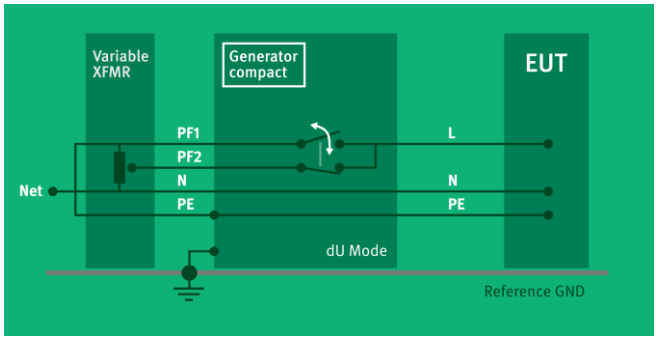


Setup for dU mode

The generator is connected as follow:

PF1: Mains voltage from the grid
PF2: Reduced voltage preset for the dip test. Mostly set to 40%, 70% or 80% of the mains voltage

The internal generator switch will change the EUT supply voltage between PF1 and reduced PF2 voltage.

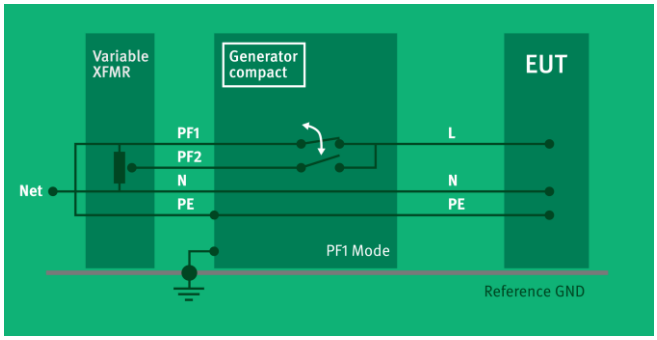


Setup for PF1 mode

The generator is connected as follow:

PF1: Mains voltage from the grid
PF2: Switch is open during the test

The generator switch will PF1 for interrupt the supply voltage to the EUT

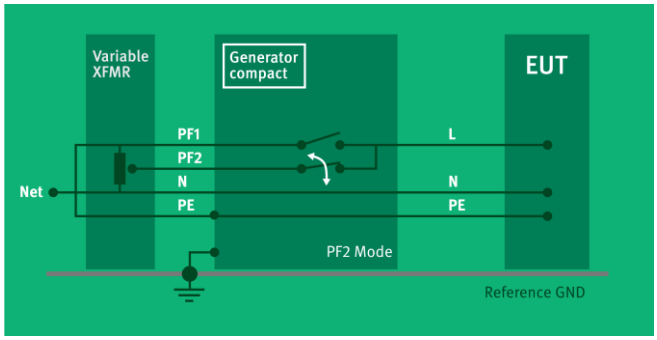


Setup for PF2 mode

The generator is connected as follow:

PF1: Switch is open during the test
PF2: EUT supply voltage from the variable XFMR during the test.

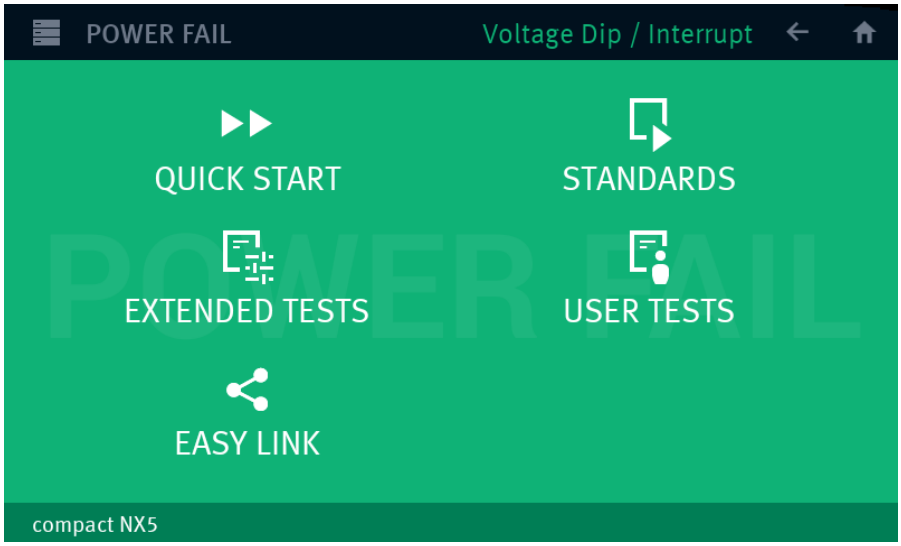
The variable XFMR starts at the default voltage and reduce to the settled voltage. Start the voltage interruptions with PF2. After the last interruption the variable XFMR returns to the default voltage.



12.2. Operation

Dips Module for voltage Dips and short interruptions.

The menu offers different test routines for pulsed magnetic field testing.



Main Menu Power Fail for voltage dips and interrupt tests

The Power Fail menu offers different test routines for voltage dips and interrupt testing.

Quick Start
Easy and fast online-operation of the equipment for voltage DIPS and power interruption tests.

Standard
The operator can select between various preprogrammed test routines as required in different standards.
The operator can select the standard routine for 50/60Hz, depend of the measured frequency, testing as per IEC 61000-4-11.

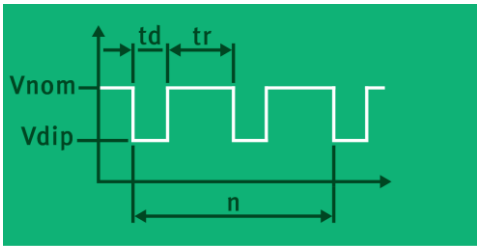
Extended test
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

User test routines
The user defined library where all created power fail tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

12.2.1. Quick Start

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.



Explanations	
A	Phase angle
td	Duration of a single event
Rep	Repetition rate (time between two events)
CH	Channel select (PF1, PF2 or ΔV)
V2	Variable test voltage (controlled by 0-10 V analog voltage)
n	Number of events
tri	Trigger mode

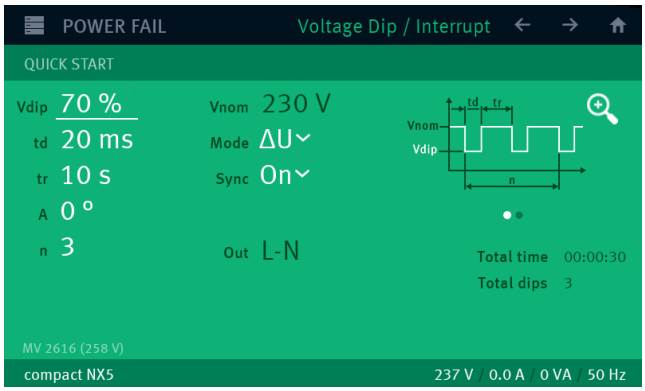
The parameter to change can be selected by pressing a function key. The corresponding range will then be displayed.

12.2.1.1. Voltage DIPS

For testing voltage DIPS select:

Mode **ΔU**: During the test the internal switch toggle the supply voltage between PF1 and PF2

Vdip: Dip voltage [%Vnom] or [V]
td: Duration of the dip
tr: Repetition time between two dips [ms, s]
Sync: Synchronization with **phase angle A** [°]
n: Number of events

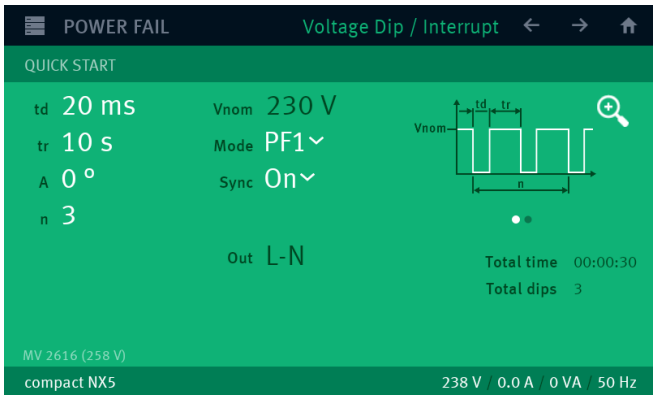


12.2.1.2. Voltage Interruption

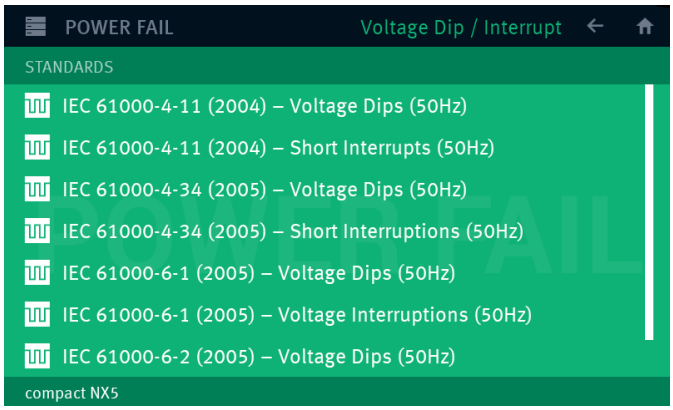
For testing voltage DIPS select:

Mode **ΔPF1**: During the test the internal switch PF1 will switch ON and OFF during the test

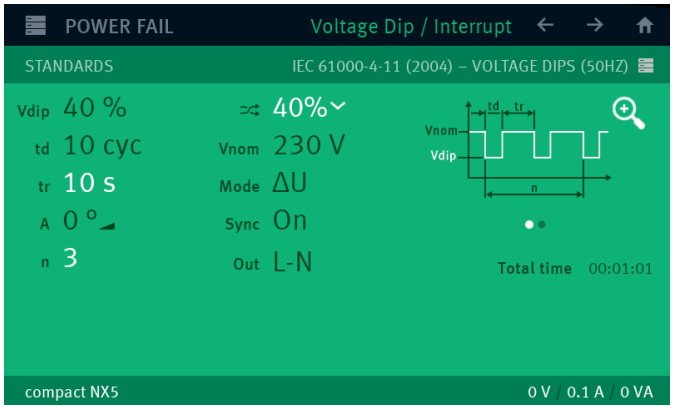
td: Duration of the interruption
tr: Repetition time between two interruption
Sync: Synchronization with **phase angle A** [°]
n: Number of events

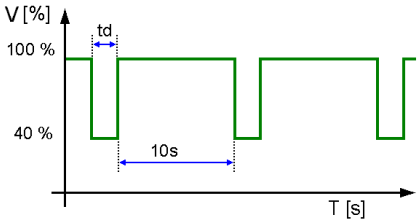


12.2.2. Standard Test Routines



12.2.2.1. IEC 61000-4-11 (AC power supply mains)

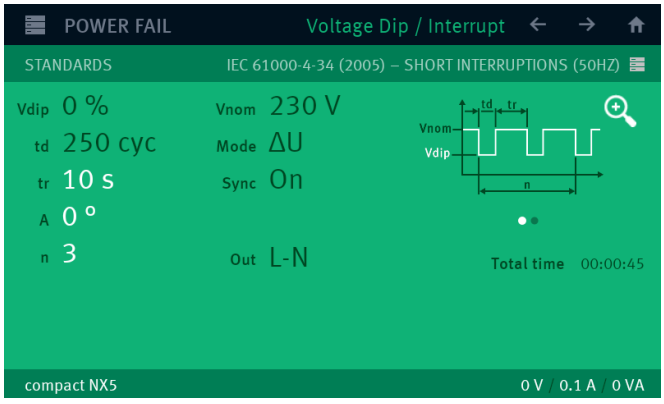


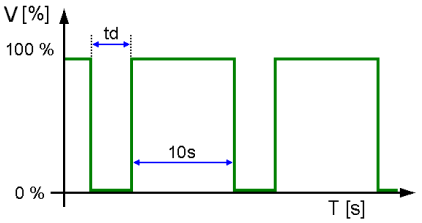


As long as the external transformer variac NX 1-260-16 is used, controlled by an analogue 0-10V control voltage, the test is conducted automatically. If this option is not available the manual test routine shall be used.

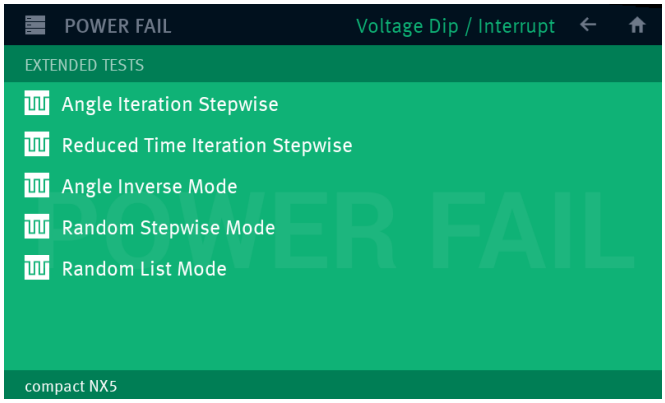
Using a tapped transformer V 4780, the user must connect the PF2 UCS input with the correct plug at the V4780. At 0% selection the PF2 input must be connected to the neutral (0V) plug.

Short interruptions



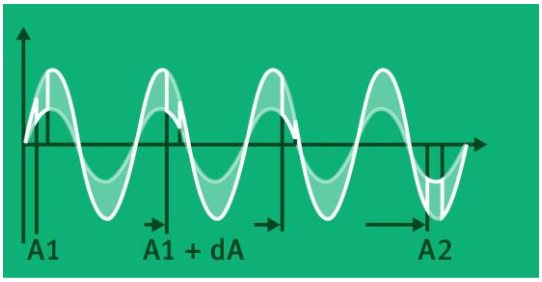


12.2.3. Extended Tests



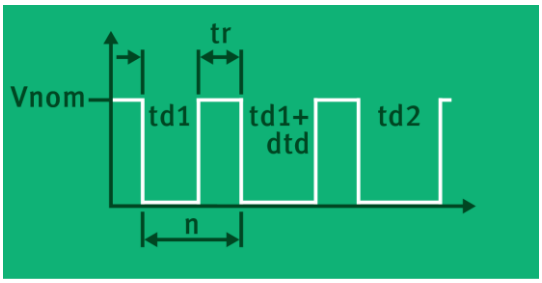
Angle iteration stepwise

After n events the phase angle related to which the events are released will change from A1 to A2 by steps of ΔA until A2 is reached. The same parameters as under Quick Start can be selected.



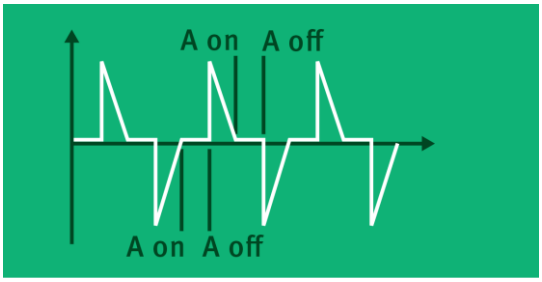
Reduced Time Iteration Stepwise

After n events the duration of a single event will change from td1 to td2 by steps of Δtd until td2 is reached.
The same parameters as under Quick Start can be selected.

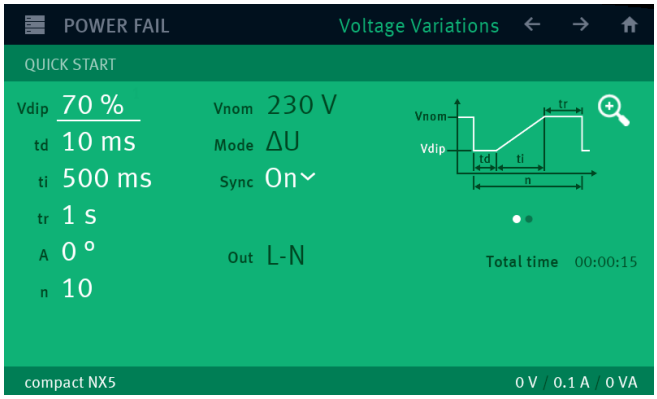


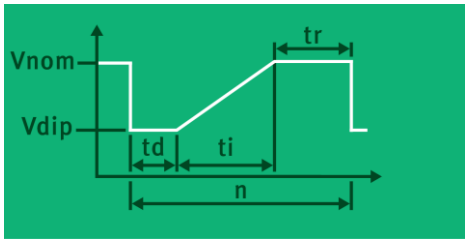
Angle Inverse mode

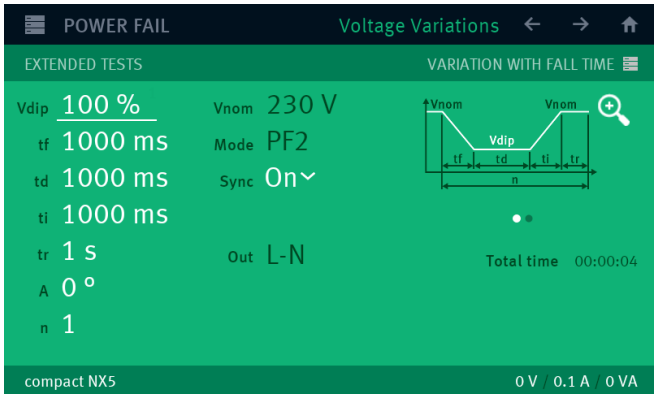
The inverse mode can simulate a phase control circuit, switching power (voltage) on/off at a certain phase angle. The phase angle is selectable in the range of 0-180°. The voltage will be switched on/off in each half-wave. Inverse is only working in **ΔU** mode.



12.3. Voltage Variation

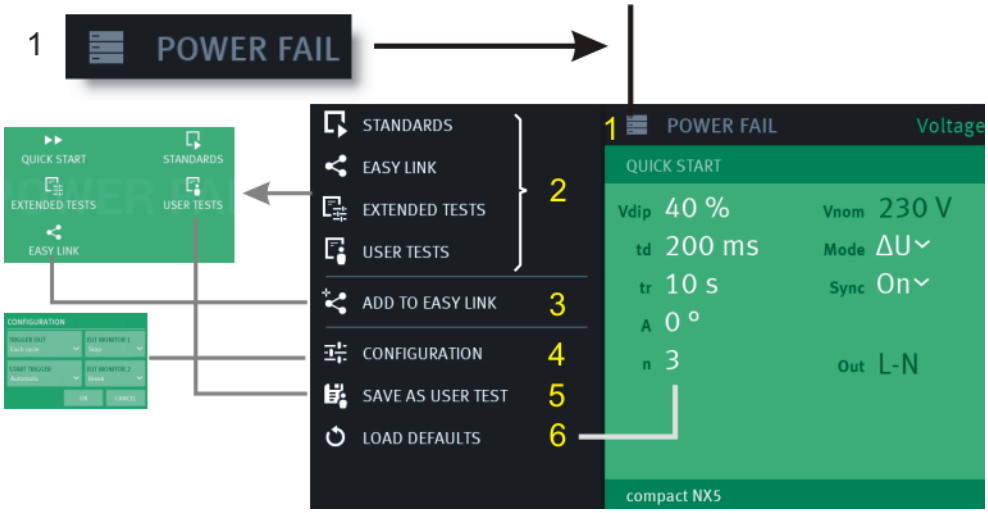






Voltage variation as per IEC 61000-4-11 (2004)
An external power source or motor driven variac is controlled by a 0-10V control signal. The operator can select the time per voltage level, the ramp up and ramp down of the voltage change and the voltage levels itself.

12.4. Power Fail Menu



Burst Menu

1 Button for open and close the Power Fail Menu

2 Change to other power Fail test routines. The last used test in this routine will be loaded.
- Quick Start
- Standards
- Extended Tests
- User Tests
- Easy Test

3 Add the actual test to Easy Link library

4 Trigger and Monitor setting for Power Fail tests. (Each phenomenon has an individual configuration)

5 Add the actual test to User Test library

6 Load the default parameters for the Quick Start test (factory setting)

12.5. The Power Fail Test

12.5.1. Test routines termination

The test routine for power fail starts with an event with the duration (td), followed by a repetition time (tr). For operating, the compact NX generator has the following handling for the test routine

Single Test routine	
Test routine in a testlink implemented	

Δ

12.5.2. Operating

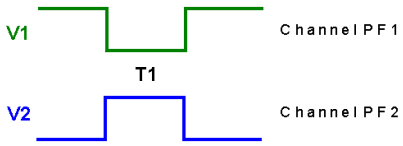
The power fail simulator operates in the following mode:

PF1: The voltage supply at channel PF1 will be interrupted for the preselected time T1.

PF2: The voltage supply at channel PF2 will be interrupted for the preselected time T1.

ΔU: Channels PF1 and PF2 are supplied with different voltages; e.g. channel PF1 with nominal voltage, channel PF2 with 15% under-voltage.

- channel PF1 is switched off for the preselected time T1.
- channel PF2 is switched on for T1.



LED

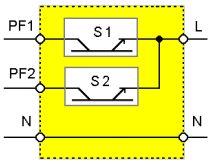
Two LED's mounted on the front panel show if a channel is active or not. The LED of an active channel is lighted. During mode ΔU the LED display switches from one channel to the other.

Voltage interference

In order to accelerate the test procedure, the voltage interference may be generated repetitively. In the operating mode „AUTO", the events are released at a preselected interval time.

Power switches

The power unit of the simulator consists of two electronic power switches S1 and S2. The two separated input channels PF1 and PF2 are connected to each other at the front panel of the simulator via S1 and S2.



Input channels

The input channels PF1 and PF2 are located at the rear part of the equipment. Attention has to be given to the following:

1. **The phase shall be connected correctly. When putting into operation check the lines with a phase tester or with the incorporated LED phase.**
2. **Phase must be set on L, neutral must be set on N.**
3. **This applies to both channels. If during installation phase and neutral is changed, the operator will cause a short-circuit at the input plug of the channel.**
4. **The neutral of both channels is connected internally and directly leads to the output.**
5. **The power switches can bear no more than a voltage of 350Veff.**
6. **If isolating transformers are used special care shall be taken to have both channels in phase. Otherwise too high voltages, in difference mode, may occur and destroy the internal protection devices (varistors).**

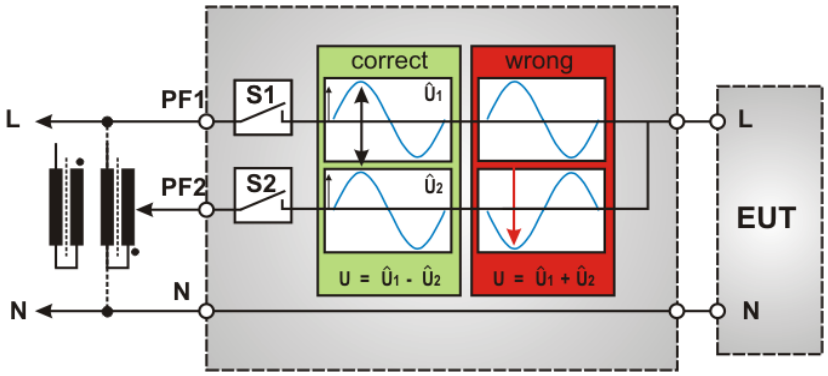
12.6. Overcurrent

Power switches

The power switches are electronically protected against overload and short-circuits. The nominal current of the switches is 25 A (16 A model).

Special protection requirements of the EUT must be separately assured by the user.

Inrush currents of < = 500 A are permitted. To avoid higher inrush currents of the EUT an electronic control limiting the inrush current is incorporated in the device.



Correct phase relation between PF1 and PF2

Over-voltage generated by connecting or disconnecting additional loads will be limited internally by varistors in parallel to the electronic switch.

Occurs an overcurrent during a test, The PF switches will switch off immediately and the display shows:

	**Overcurrent REMOVE SHORT CIRCUIT! at the generator**

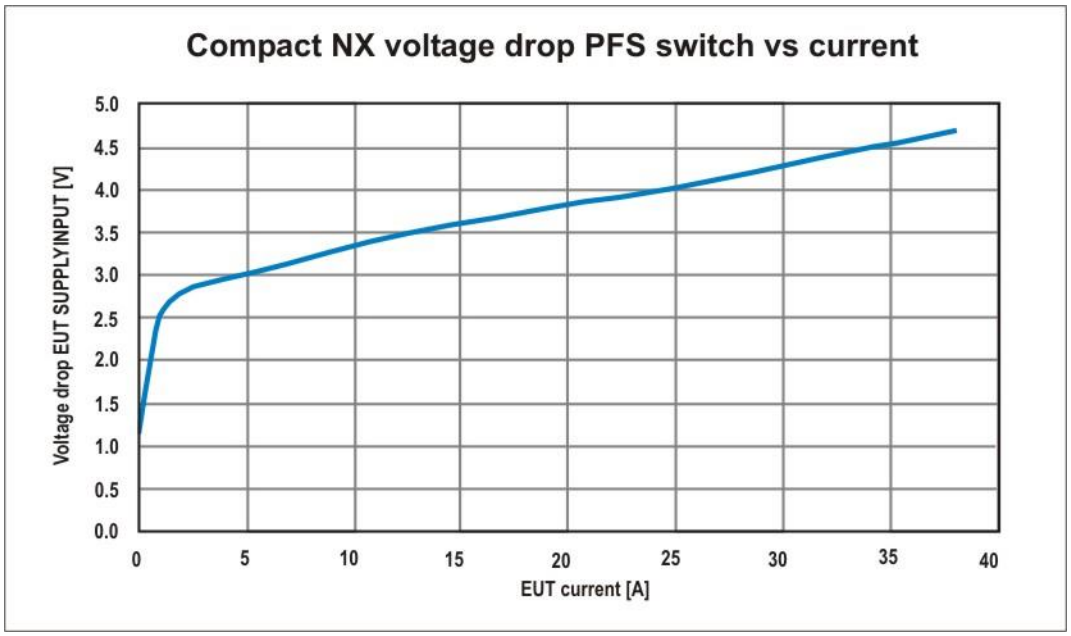
This error message appears after a short circuit at the EUT output plugs. This current can be up to 700A during few µs and will be detect from the overcurrent detection.

For overcurrent handling proceed as follow:

1. **Disconnect the short circuit** and make sure to remove the failure.
2. Press **OK**. This will switch on the PF switch again and returns the power to the EUT output.
3. Continue in the start menu with START.

12.7. Voltage drop over the PFS switch

The voltage drop, over the internal PFS switch is shown in the diagram below.



current [A]	voltage drop [V]
0.01	1.18
0.1	1.62
0.5	2.43
1	2.60
2	2.75
3	2.82
4	2.90
5	2.97
6	3.05
7	3.12
8	3.18
9	3.25
10	3.30
11	3.37
12	3.43
13	3.49
14	3.54
15	3.60
16	3.66
18	3.77
20	3.88
22	3.99
24	4.10
26	4.22
28	4.34
30	4.46
32	4.58

12.8. The Power Fail Test

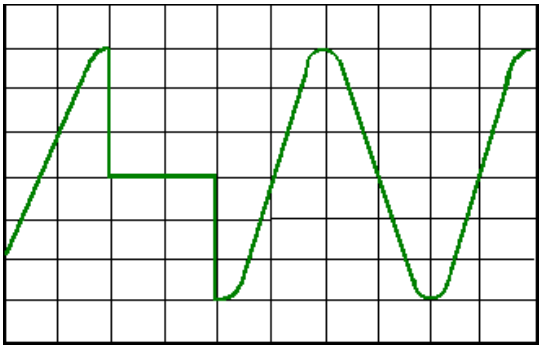
The generator type compact NX simulates the following interference:

- Voltage dips
- Voltage interruptions
- Voltage variations
- Inverse

12.8.1. Voltage Interruptions

Depending on the preselected test parameters at the front panel of the simulator the power supply for the EUT is interrupted for a certain time and at a certain phase angle (AC power supplies).

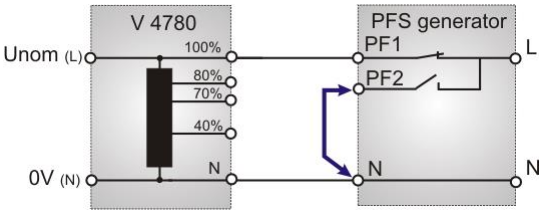
The power supply for the EUT is connected at the rear part of the simulator to channel PF1.
The power supply may be taken directly from the mains power supply or from a separate voltage source. Mostly used for these tests are motor driven variacs



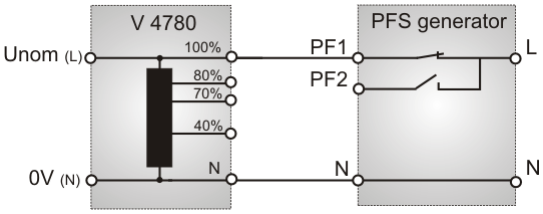
Power fail tests are normally carried out at a nominal voltage and at maximum tolerance under-voltage.
The nominal voltage may be connected to PF1 and the reduced dip voltage to PF2.

The power fail test may be carried out in various operating modes:

High impedance interruptions
With ΔU mode the EUT supply is interrupted by the electronic switch. The PF2 input is not connected. The EUT must discharge itself internally.



Low impedance interruptions
The EUT supply is connected to PF1. The channel PF2 is short-circuited (L-N). The EUT supply is disconnected by the electronic switch of PF1 and the EUT will be discharged into a low impedance via the electronic switch of PF2

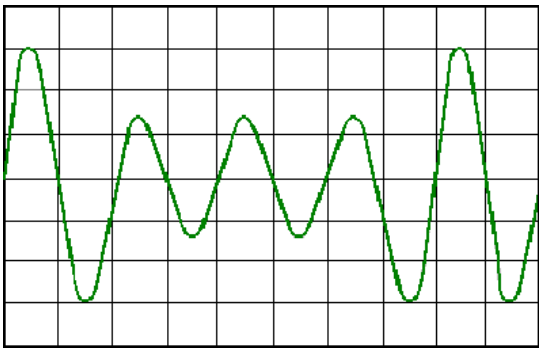


12.8.2. Voltage dips, voltage variations

Depending on the preselected test parameters, the test voltage is changed to a higher or to a lower value for a certain duration and at a certain phase angle.

Voltage variations are normally related to the nominal value of the supply voltage. Therefore, two different variacs shall be connected at the rear side of the simulator.

- PF1 → Nominal voltage
- PF2 → Under- / overvoltage



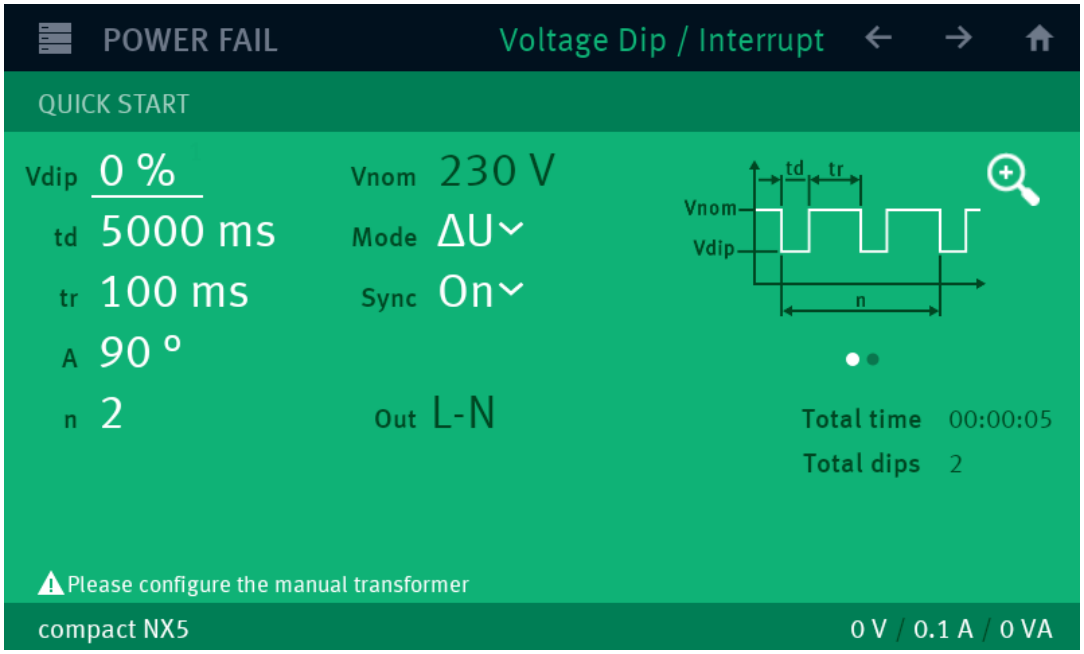
The operation mode ΔU shall be preselected. The voltage variation is realized by switching the power supply from channel PF1 to channel PF2.

If a motor driven variac is available, it is also possible to drive the source by an analogue voltage 0 - 10V. This control voltage is available at the coaxial output at the rear part of the simulator

The control voltage is to be set via the operator menu or the interfaces of the Power Fail. A complete user software to drive ramps and functions is also available

12.9. The Power Fail Verification

Program setting:



During the test the power change to PF2 for 5 seconds. During this 5 seconds the user has to connect the CA PFS to the output of the co

A. Preparation before the test starts:
- Make the setting as shown in the picture above
- Discharge the CA PFS box
- Do not power the PF2 input of the compact NX at the rear side
- Connect only the N-wire to the compact NX N-EUT output plug on front side
- Prepare the L wire to connect it after test start to the L-EUT output plug in a short time

B. Test procedure:
- Press start button. The white LED changes from PF1 to PF2
- The user has 5 seconds time to connect the L-wire of the CA PFS to the L-EUT output of the compact NX
- After 5000 ms at the 90 deg phase angle, the generator will change the power from PF2 to PF1
- Measure and record the inrush current via PF1

Remark: If the 5 seconds are too short for connect the CA PFS to the compact NX Generator, the user can increase the td time. Take care that the td time is a multiple of the frequency period

12.10. DC Power networks

Basically, there is no difference in the operation of the equipment between AC and DC power supplies. The only point the user should take care of are the grounding conditions.
The voltmeter, the "MONITOR" output and the LED are related to protective earth or to the simulator's chassis, respectively. Therefore, these instruments can be used to check line or neutral and to measure at the output CRO V while the test procedure is running.
It results for the DC power supply operation:

- If it is possible to ground the "MINUS" pole of the DC supply, from the EUT point of view, the blue output plug (minus) should be connected to the green/yellow plug.

- By this way the power supply source connected at the rear side of the simulator might be grounded.

→ All measuring facilities are available if
- it is not possible to ground the "MINUS" pole and therefore the voltmeter cannot indicate the DC voltage.
- the phase indication led at the EUT supply input are not glowing
- there is no signal at the "CRO V" output.

12.11. Test setup and accessories

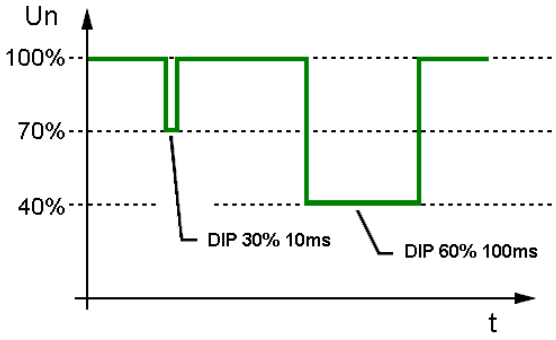
12.11.1. Transformer type V4780

The transformer shall be used to generate under-voltages in ac power supply systems. According to the IEC 61000-4-11 and the EN 50081-2 voltage dips shall be generated as shown in fig. below. Different test levels are recommended

12.11.1.1. Voltage interruptions (DIPS)

Voltage interruptions will cause a reduction of the power supply voltage for a certain period of time. Three different test levels are required:

- Voltage dip by 100% to 0% of the nominal voltage for 10ms or. ½ period
- Voltage dip by 100% to 0% of the nominal voltage for 20ms respectively 1 period
- Voltage dip by 60% to 40% of the nominal voltage for 200ms respectively 10 periods
- Voltage dip by 30% to 70% of the nominal voltage for 500ms respectively 25 periods
- Voltage dip by 20% to 80% of the nominal voltage for 5000ms respectively 250 periods



Standard voltage dips

V 4780 S2 with automatic tap control

The transformer is an accessory to the following devices
- compact NX Nx,

12.11.1.2. Device models V 4780

V4780	250 V 16 A, manual control
V4780 S2	250 V 16 A, automatic control
V4780 S3	250 V 32 A, manual control

12.11.1.3. Control V4780 S2

The V4780 S2 is controlled through the analogue input (0...10Vdc). The control circuit switches to the related tap, 40%, 70% or 80%, proportional to the applied dc reference voltage (0...10V dc) to the output PF2.
Is the reference dc voltage out of the tolerance (± 0.25V), the control will not switch to any tap to the PF2 output.

Operating with ramps the control circuit will not select a tap, if the ramp (0-100%) is shorter than approx. 4s. Programming longer ramps, each tap will switch on and off when the reference is in the valid range.

Voltage taps	**DC reference voltage**
80% of Vnom	8.00V ± 0.25V
70%	7.00V ± 0.25V
40%	4.00V ± 0.25V

Settings on compact NX for V4780 S2
The compact NX must be matched to the 0-10V input of the V4780. Therefore, a **V4780 must be configured as a motor variac.** For V and Vn must set to the same value which is the value of the voltage of your power supply.

Setup: **EUT / SUPPLY** **Equipment tapped transformer**

Settings	**V**	**Vnom**	**Path**	**Maximum voltage**
Example for 230V mains	230 V	230 V	PF1	230 V

12.11.1.4. Technical Data V 4780 models

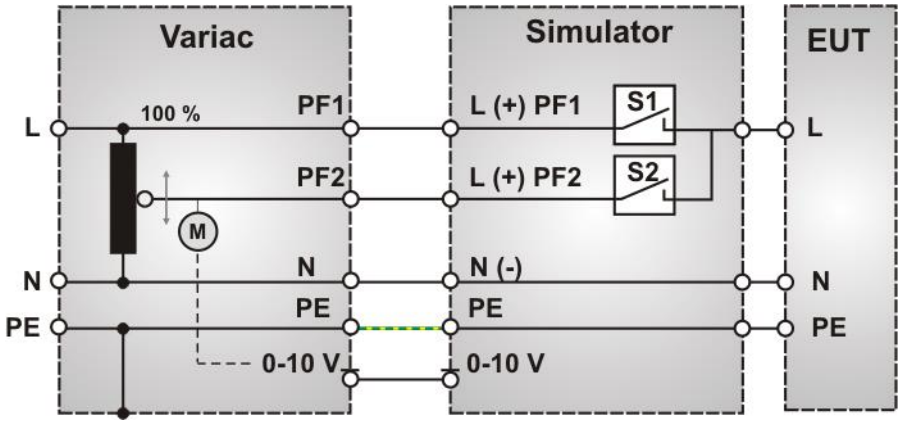
Design	Tapped auto-transformer with 40%, 70%, 80%, 100 % output voltage
Input:	
Voltage	Uin: max. 250 V
Frequency	50/60Hz
Tap selection	manually (V4780) banana plugs for 40%, 70%, 80%
Remote control	0.10V dc (V4780 S2) for 40%, 70%, 80%
Output:	
Voltage tap [% Unom]	100 % 80 % 70 % 40 %

	V 4780 S2	**V 4780 S3**
Current Imax.	16 A	32 A
Power	4.1 kVA	8.2 kVA
Fuse	2x 16 A	2x 35 A
Weights and measures		
Dimensions	95 x 170 x 190 mm (H x B x T)	200 x 170 x 190 mm (H x B x T)
Weights	ca. 7 kg	ca. 14 kg
Temp Ambiance	10°C - 35°C	10°C - 35°C

12.11.1.5. Setup V4780

The output voltages are available at safety banana plugs. For safety reasons the related safety cables shall be used.

The power supply input is realized with a power connector for L, N and PE. The voltage shall be 100% of the nominal voltage Vn.



Connection V 4780 / V 4780 S2

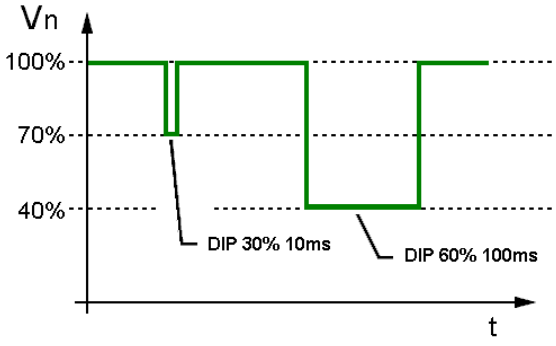
12.11.2. Variable Transformer variac NX 1-260-16

The motor variac can be used to simulate power supply failures as under-voltages, voltage interruptions and voltage variations. The basic standard IEC 61000-4-11 and the generic standard EN 61000-6-2 are specifying these phenomena.

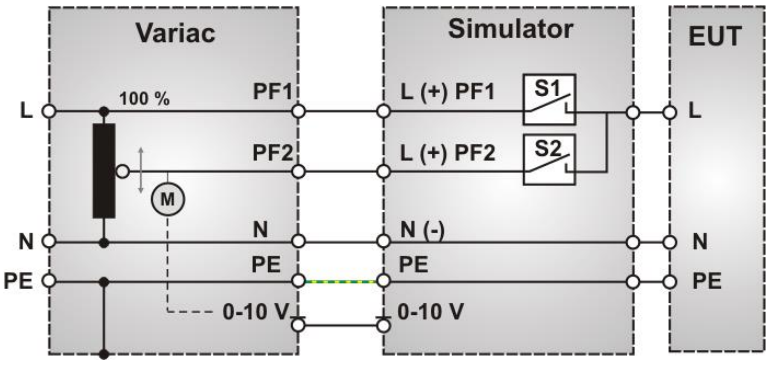
12.11.2.1. Voltage dips / interruptions

Voltage interruptions will cause a reduction of the power supply voltage for a certain period of time. Three different test levels are required:

- Voltage dip by 100% to 0% of the nominal voltage for 10 ms or. 0.5 cycle
- Voltage dip by 100% to 0% of the nominal voltage for 20 ms respectively 1 period
- Voltage dip by 60% to 40% of the nominal voltage for 200 ms respectively 10 periods
- Voltage dip by 30% to 70% of the nominal voltage for 500 ms respectively 25 periods
- Voltage dip by 20% to 80% of the nominal voltage for 5000 ms respectively 250 periods



Standard voltage dips

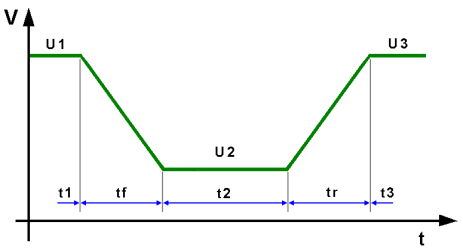


Connection diagram variac NX 1-260-16

The unit has to be connected at the rear part of the equipment. For connection safety labor cables shall be used.

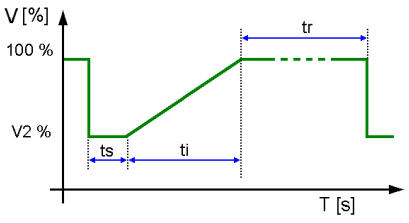
12.11.2.2. Voltage variation

Additionally, it is possible to drive certain functions of variation, which also are required in IEC 61000-4-11. These functions can easily be programmed within the simulators itself or within the related windows software ISMIEC



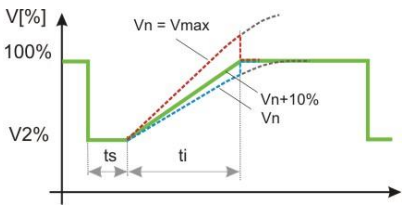
V2	Test level [%U1]:	40%, 0%
tf	Time for decreasing voltage [sec]	2 ± 20%
t1	Time at retained voltage [sec]	1 ± 20%
tr	Time for increasing [sec]	2 ± 20%

For new FDIS IEC 61000-4-11 (2004) use a new procedure for voltage variation, who simulate a voltage dip during a motor start.



The motor variac will be set previously to the voltage V2. The switch to PF2 happens in the compact NX. Then the motor variac increase the voltage controlled by the UCS. After ti the voltage change back to PF1

The speed of the voltage variation depends on the max. speed of the motorvariac and the control setting of the integral action controller.
The behavior can be influenced by the parameter Vnominal. Setting in the setup menu Setup / F5 Voltage setting.



The user can optimize his setting for the test.

Vn = Vmax of motorvariac	Red curve the voltage rising is too fast.
Vn = 110% of Vnominal	Green curve optimum setting
Vn = Vnominal	Blue curve the voltage regulation is too slow.

12.11.2.3. Technical data Motorvariac variac NX-1-260-16

Input:

Voltage	Vin: max. 250 V
Frequency	50/60 Hz

Output

Voltage variable	Vout: 0 – 260 V for channel PF2
Voltage fix	Vout: Vin for channel PF1
Current	max: 16 A
Power	0 - 4.1 kVA

Control

Main switch	On /Off for the output voltages
Control voltage	analogue 0 - 10V DC for 0-260V output voltage
Time 0 to 100%	< 2s

Dimensions and weight

Dimensions	19" 6HE	266x485x400mm (H x W x D)
Weight	app 27 kg	
Power supply	115/230 V	
Fuse	20 A (PF1), 16 A (PF2)	
Environment Tmax	40°C	

12.11.2.4. Technical data Motorvariac variac NX-1-280-16

Input:

Voltage	Vin: max. 250 V
Frequency	50/60 Hz

Output

Voltage variable	Vout: 0 – 280 V for channel PF2
Voltage fix	Vout: Vin for channel PF1
Current	max: 16 A
Power	0 - 4.1 kVA

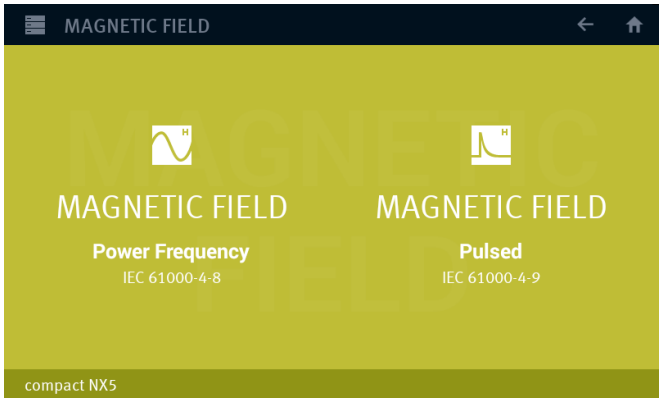
Control

Main switch	On/Off for the output voltages
Control voltage	analogue 0 - 10V DC for 0-280V output voltage
Time 0..100%	< 2s

Dimensions and weight

Dimensions	19" 6HE	266x485x400mm (H x W x D)
Weight	app 27 kg	
Power supply	115/230 V	
Fuse	20 A (PF1), 16 A (PF2)	
Environment Tmax	40°C	

13. Power frequency Magnetic Field as per IEC 61000-4-8



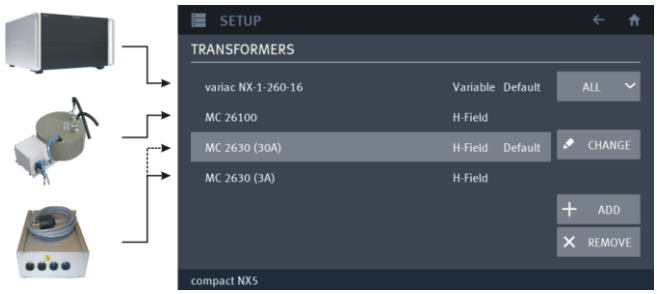
Main Menu Magnetic Field separated to
"Power frequency" and "Pulsed"

Required Device settings to perform a power frequency magnetic field test

For perform a 50/60 Hz magnetic field test, the NX5 generator must be configured with the used hardware in the menu:

Menu / SETUP / Equipment

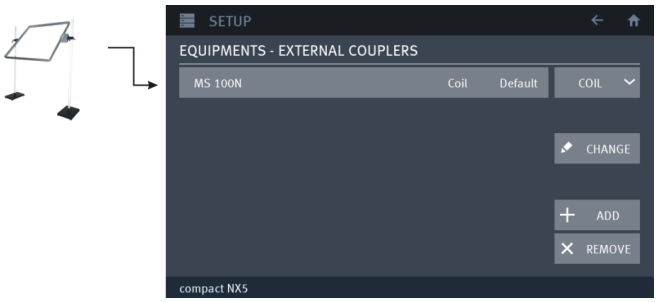
1. **Variable transformer**:
   - variac NX 1-260-16
   - variac NX 1-260-32
2. **Magnetic current transformer**
   - MC 26100 H-field 75 to 1100 A/m
   - MC 2630 (1 A range) H-field 1 to 9 A/m
   - MC 2630 (30 A range) H-Field 9 to 75 A/m



Note: The MC 2630 has two ranges and therefore the NX generator list this current-transformer in the configuration for (1 A) and (30 A) range. Set the range switch of the MC 2630 to the correct position before starting the test.

Menu / SETUP / EXTERNAL COUPLERS

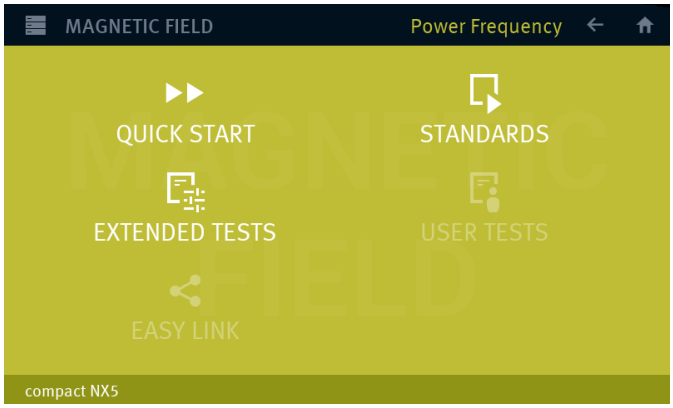
3. **Magnetic field antenna**:
   - MS 100N



Set the used equipment to default status

13.1. Magnetic field as per IEC 61000-4-8

The menu offers different test routines for power frequency magnetic field testing.



Main menu ac powered magnetic field

The Magnetic Field menu offers different test routines for pulsed magnetic testing.

Quick Start
Easy and fast online-operation with the phenomenon magnetic-field. In this menu the user can operate all test manually with online change the most parameters during a test.

Standard
The operator can select between various preprogrammed test routines as required in different standards

Extended Tests
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

User test routines
The user defined library where all created magnetic field tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

Test setup

Warning

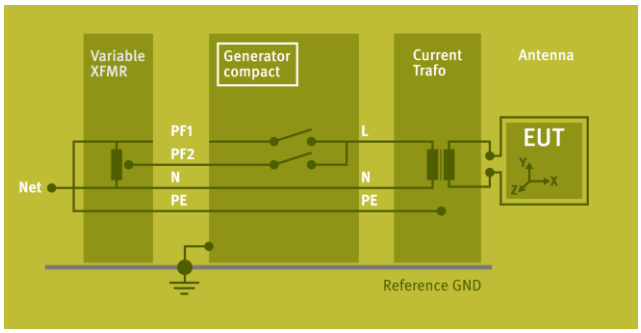
For magnetic field testing the power mains input at PF1 shall be disconnected.; 230 V/16 A.

The voltage V is adjusted with a variac as long as the required antenna current is available and the related H field is generated in the center of the magnetic field antenna.

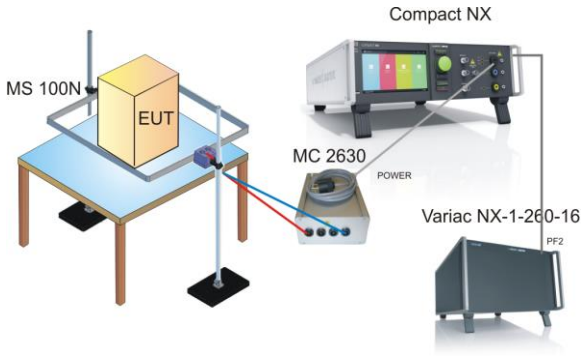
The variac NX 1-260-16 may be controlled automatically via the test generator. Any equivalent variac available in the lab can be used to control the current manually. Please take care that the variac has a sufficient current capability.

For more detailed information the operator can require an additional manual especially for magnetic field testing. This manual is part of the delivery of magnetic field testing accessories.

Test setup with MC 2630 for H-Fields up to 30A/m



Schematics



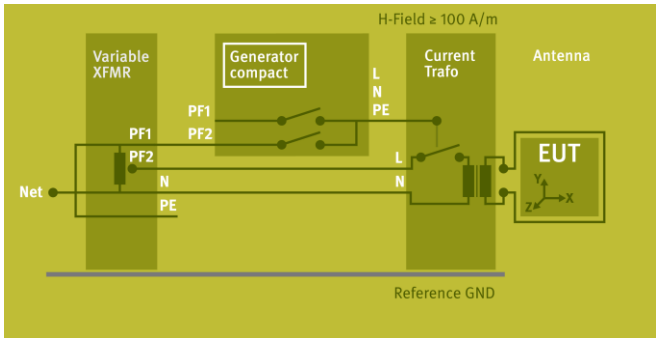
Test setup

Schematics and Test setup with compact NX, variac NX 1-260-16, MC 2630 and MS 100N

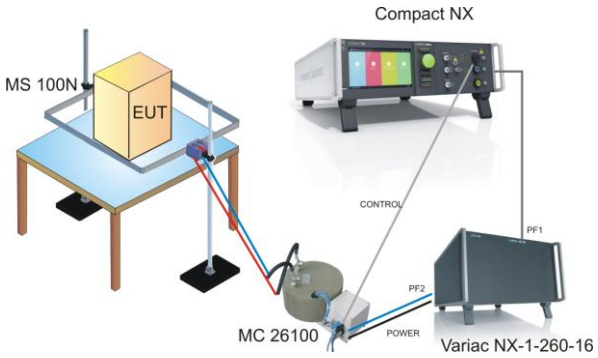
Option for required magnetic field tests as per IEC 61000-4-8

- External variable motor transformer **variac NX 1-260-16**
- External Magnetic field antenna **MS 100N**
- External current transformer **MC 2630** to test 1, 3, 10 and 30A/m levels

Test setup with MC 26100 for H-Fields up to 1000A/m



Schematics



Test setup

Schematics and Test setup with compact NX, variac NX 1-260-16, MC 26100 and MS 100N

Option for required magnetic field tests as per IEC 61000-4-8

- External variable motor transformer **variac NX 1-260-16**
- External Magnetic field antenna **MS 100N**
- External current transformer **MC 26100** to test 100 to 1000A/m levels

14. Telecom Surge Immunity as per IEC 61000-4-5

Surge Module 10/700µs – 8/20µs

WARNING

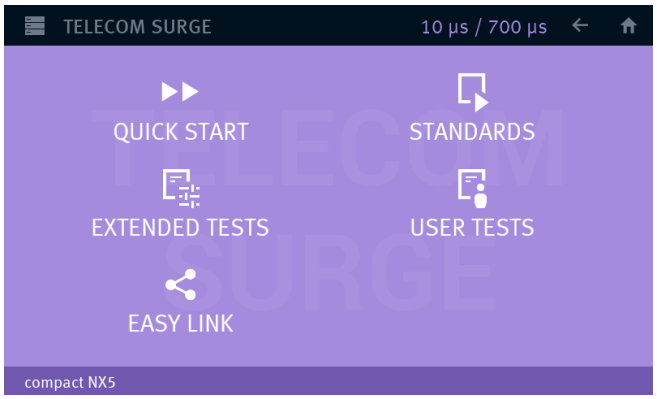
The internal coupling network is designed for **mains frequency 50 Hz / 60 Hz**.

When L – N coupling is selected an **additional current of approx. 1.5 A** flows, caused by the 18 µF coupling capacitor and the pulse forming network. A similar current appears during the couplings to PE.

Tests with 400 Hz mains frequency **destroy the coupling network**. An external coupling network is recommended with inductors and capacitors matched to the 400 Hz mains frequency.

14.1. Operation

The Surge menu offers different test routines for burst testing.



Main Menu Telecom Surge

The Surge menu offers different test routines for surge testing.

Quick Start
Easy and fast online-operation with the phenomenon Telecom Surge. In this menu the user can operate all surge test manually with online change the most parameters during a test.

Standard
The operator can select between various preprogrammed test routines as required in different standards
The standard library includes IEC, ITU and ETSI standards

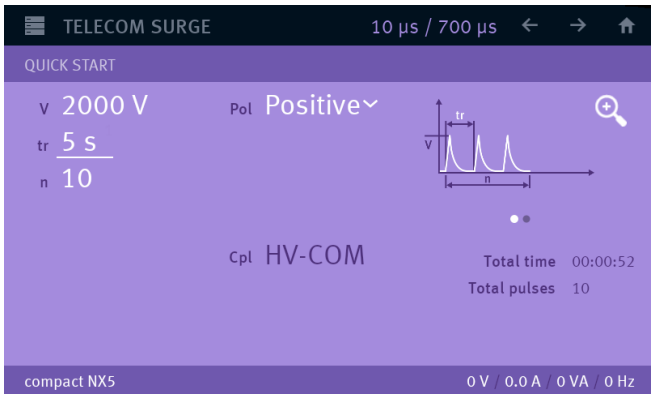
Extended Tests
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

User test routines
The user defined library where all created Surge tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

14.1.1. Quick Start

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.



Quick Start Menu

While a test is running the user can select parameters. The selected parameter then can be changed online with the inc/dec knob.

14.1.2. Standard test Routine

The user can select preprogrammed standard test routines.

The Telecom Surge Standard menu offers a list of standards. The name of the standard defines the characteristic of the rulers that is given in the application of the standard.

The standard name has the character: **[Standard Family], [Standard number], [year]), [Application],** where

Standard Family
IEC: *International Electrotechnical Commission*
ITU: International Telecommunication Union
ETS: European Telecommunication Standard

Standard Number
Indicates the official standard number defined in the standard.

Year
Year of standard publication. The year indicates the different standard publication. The year is used for follow the definitions specified in this publication.

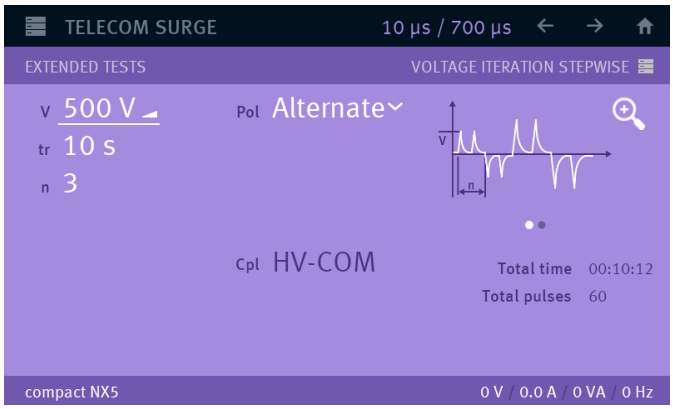
Application
Specifies different applications or EUT characteristics

- One level: only one test level will be in this test. The user can select the test level (level 1 to 4)
- All levels: The test procedures start at the lowest level and increase to the level specified.

14.1.3. Extended Test Routines

The user can program, save and recall his own specific test routines. The next pages shows the selection of the functions.

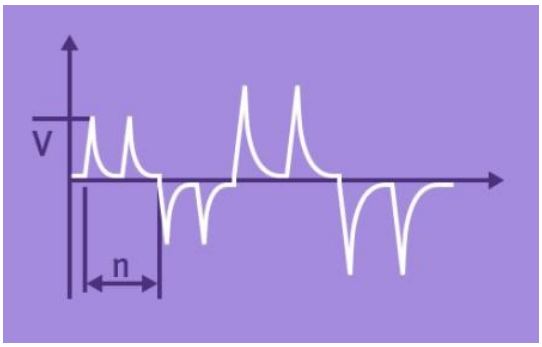
The extended menu offers various useful tests for testing and development.



Extended Test

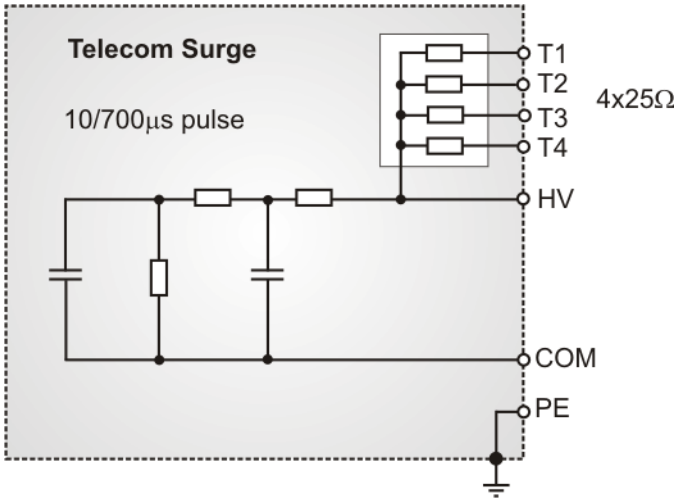
Change test level V after n pulses by ΔV

The test voltage V is changed from V1 to V2 in steps of ΔV. After the preselected number pulses the test changes the polarity. Then the next level is changed by ΔV until V2 is reached.
The repetition time tr will be increased automatically if the setting time is too short.



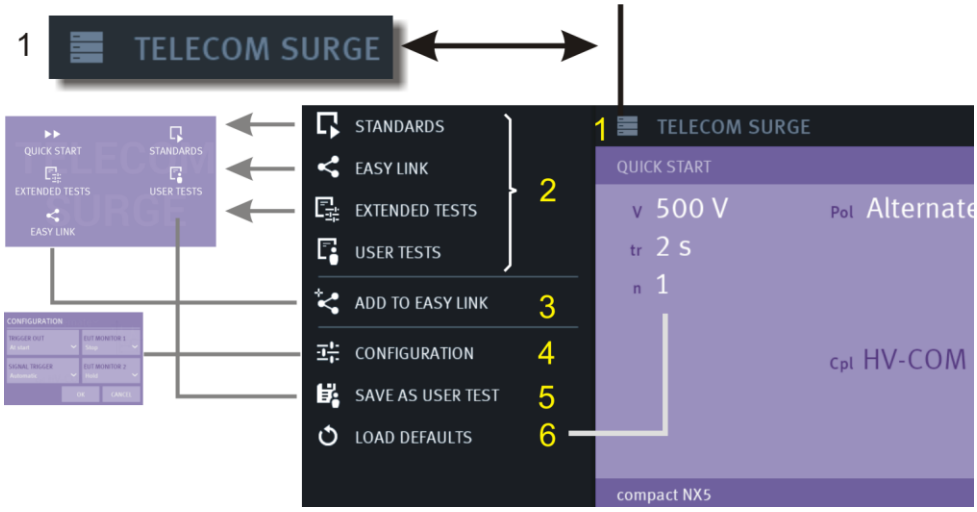
14.1.4. Generator Network for Telecom Surge

The figure below shows the elements and schematic of the Telecom Surge pulse circuit



T1 to T4	Ports for direct application
HV, COM	Port to external coupling network

14.2. Telecom Surge Menu



Telecom Surge Menu

1 Button for open and close the Telecom Surge Menu

2 Change to other Surge test routines. The last used test in this routine will be loaded.
- Quick Start
- Standards
- Extended Tests
- User Tests
- Easy Test

3 Add the actual test to Easy Link library

4 Trigger and Monitor setting for Surge test. (Each phenomenon has an individual configuration)

5 Add the actual test to User Test library

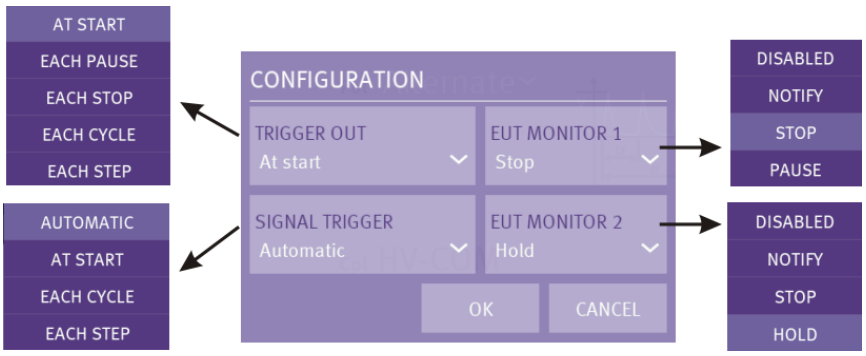
6 Load the default parameters for the Quick Start test (factory setting)

14.3. Telecom Surge pulse settings

14.3.1. Configuration

In the configuration menu the user set the following parameters:

- **Trigger out signal** at the BNC plug on generator front side
- **Start trigger** for the impulse or event on the BNC Ext. Trigger plug on rear side or blinking Start button
- Behavior of the **EUT Monitor 1** and **EUT Monitor 2** on BNC plug on rear side

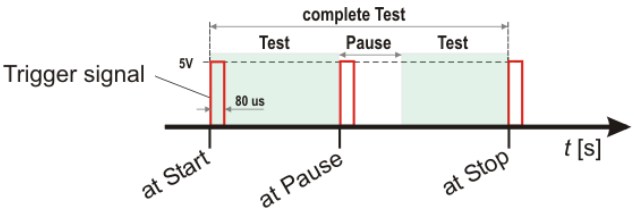


14.3.1.1. Trigger OUT

The trigger out signal is a programmable 5V edge signal located at the front side BNC Trigger plug. This signal is for trigger other devices like oscilloscopes or other devices.

The generator offers the following trigger out options:

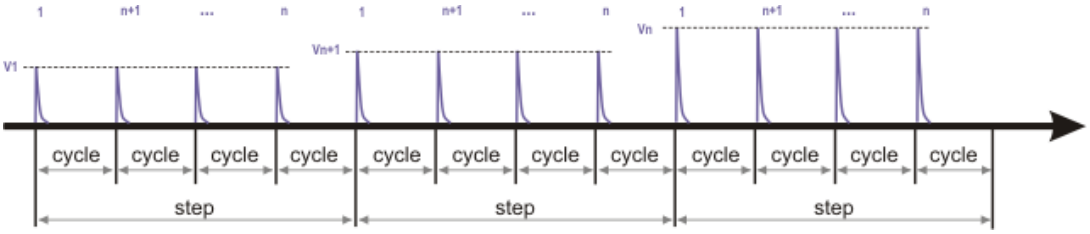
- At **Start**
- Each **Pause**
- Each **Stop**
- Each **Pulse** every surge impulse release
- Each **Step** for tests with iteration



Iterations

For Iteration tests the parameters changes after each step as shown in the figure below. Depends of the order and setting the following parameters can change:

- Polarity
- Voltage



Example with voltage iteration that illustrate trigger out for cycle and step

14.3.1.2. Start Trigger

The Start Trigger occurs by pressing the blinking **START / PAUSE** button or with an external trigger positive slope signal at the rear side BNC **Ext. Trigger** plug.

The start trigger offers the following status:
- **Automatic**
- At **Start** (starts after the trigger)
- Each **pulse** (same as trigger out)
- Each **step** (same as trigger out)

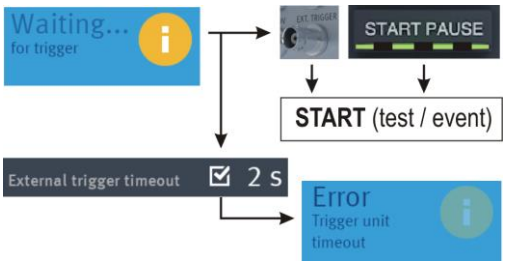
If the start trigger is not set to Automatic, the trigger indicates with "**Waiting for trigger"** the recommended trigger signal.

The waiting time for a trigger signal is endless if no trigger timeout is enabled.

External trigger timeout

This function stops the test after the defined timeout time and indicates the message, "**Error trigger unit timeout**".

For enable the function External trigger timeout select from the Home screen:
Menu / Setup / General / Process & sync



Start Trigger flowchart example from burst

15. Ring wave Immunity as per IEC 61000-4-12

Ring wave Module 0.5 µs – 100 kHz

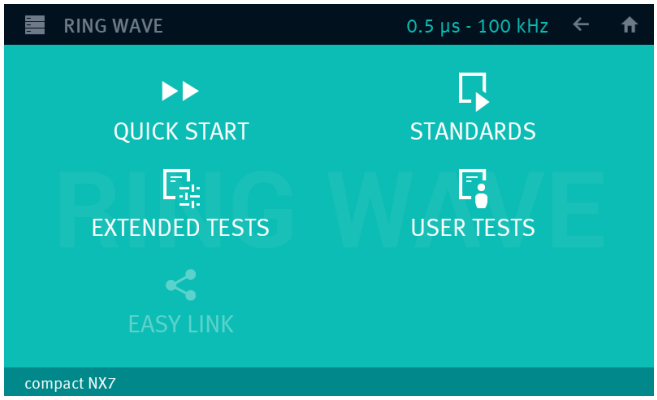
WARNING

The internal coupling network is designed for **mains frequency 50 Hz / 60 Hz**.

Tests with 400 Hz mains frequency **destroy the coupling network**. An external coupling network is recommended with inductors and capacitors matched to the 400 Hz mains frequency.

15.1. Operation

The Ring wave menu offers different test routines for burst testing.



Main Menu Ring wave

The Ring wave menu offers different test routines for Ring wave testing.

Quick Start
Easy and fast online-operation with the phenomenon Ring wave. In this menu the user can operate all surge test manually with online change the most parameters during a test.

Standard
The operator can select between various preprogrammed test routines as required in different standards
The standard library is filtered according the EUT setting (AC, DC etc.)

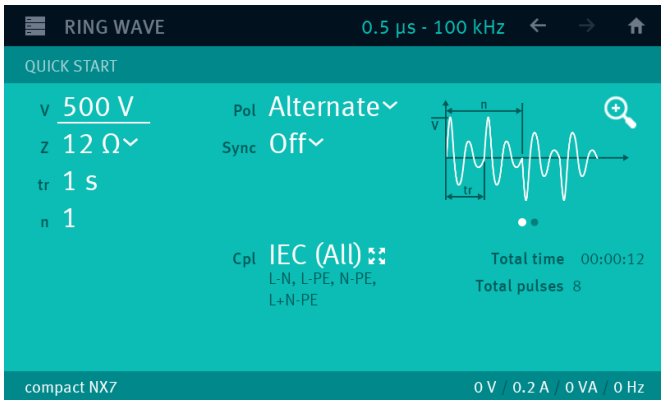
Extended Tests
The operator can select between various preprogrammed test routines which helps to accelerate testing, and which are very helpful especially during design.

User test routines
The user defined library where all created Ring wave tests are stored.

Easy Link
Link files library created during the actual session. The user can easy save a test into the Easy Link library. After switch off the Equipment all Easy Link tests are deleted. Use “SAVE AS USER TEST” for definitive save the test.

15.1.1. Quick Start

Easy and very fast operation of all standard functions of the equipment. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.

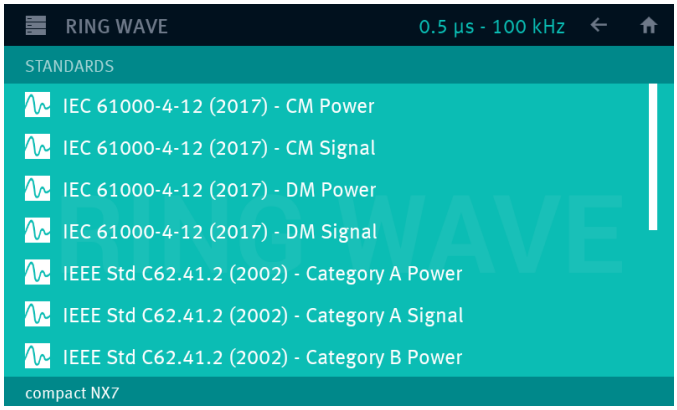


Quick Start Menu

While a test runs, the user can select parameters. The selected parameter then can be changed online with the inc/dec knob.

15.1.2. Standard test Routine

The user can select preprogrammed standard test routines.



The Ring wave Standard menu offers a list of standards. The name of the standard defines the characteristic of the rulers that is given in the application of the standard.

CW: Common mode (line to GND)
DM: Differential mode (line to line)

The standard name has the character: **[Standard Family], [Standard number], [year]), [Application],** where

Standard Family
IEC: *International Electrotechnical Commission*
IEEE: Institute of Electrical and Electronics Engineers Standards Association
EN: European Committee for Standardization (CEN)

Standard Number
Indicates the official standard number defined in the standard.

Year
Year of standard publication. The year indicates the different standard publication. The year is used to follow the definitions specified in this publication.

Application
Specifies different applications or EUT characteristics

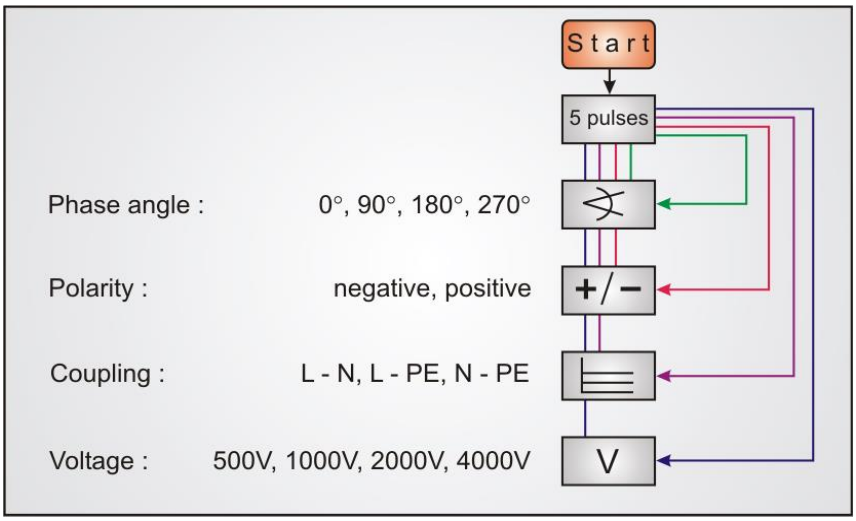
- One level: only one test level will be in this test. The user can select the test level (level 1 to 4)
- All levels: The test procedures start at the lowest level and increase to the level specified.

Iteration of the standard test procedure as per IEC 61000-4-12

The ring wave must be applied synchronized to the voltage phase at the respective angle and the peak value of the a.c. voltage wave (positive and negative).

The ring wave have to be applied line to line and line(s) and earth. When testing line to earth the test voltage has to be applied successively between each of the lines and earth.

The test voltage has to be increased by steps from the lowest test level up to the test level specified in the product standard or test plan.



List of settings EN 61000-4-12 (each setting with 5 pulses)

Setting	Voltage	Coupling	Polarity	Phase angle
1 2 3 4	500	L-N	pos	0 90 180 270
5 6 7 8			neg	0 90 180 270
9 10 11 12		L-PE	pos	0 90 180 270
13 14 15 16			neg	0 90 180 270
17 18 19 20		N-PE	pos	0 90 180 270
21 22 23 24			neg	0 90 180 270
25 26 27 28	1000	L-N	pos	0 90 180 270
29 30 31 32			neg	0 90 180 270

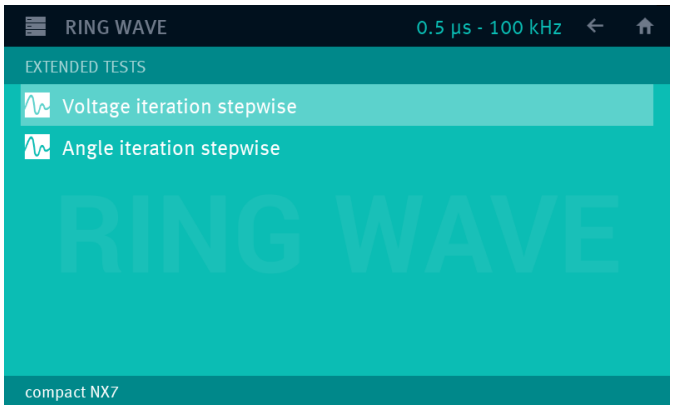
Setting	Voltage	Coupling	Polarity	Phase angle
33 34 35 36	1000	L-PE	pos	0 90 180 270
37 38 39 40			neg	0 90 180 270
41 42 43 44		N-PE	pos	0 90 180 270
45 46 47 48			neg	0 90 180 270
49 50 51 52	2000	L-PE	pos	0 90 180 270
53 53 55 56			neg	0 90 180 270
57 58 59 60		N-PE	pos	0 90 180 270
57 58 59 60			neg	0 90 180 270

Within this test routine all standard parameters can be changed online during testing. This procedure therefore is very easy and fast to use.

15.1.3. Extended Test Routines

The user can program, save and recall his own specific test routines. The next pages show the selection of the functions.

The extended menu offers various useful tests for testing and development.



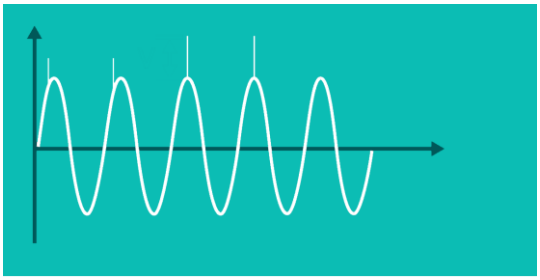
Extended Menu

Change test level V after n pulses by ΔV

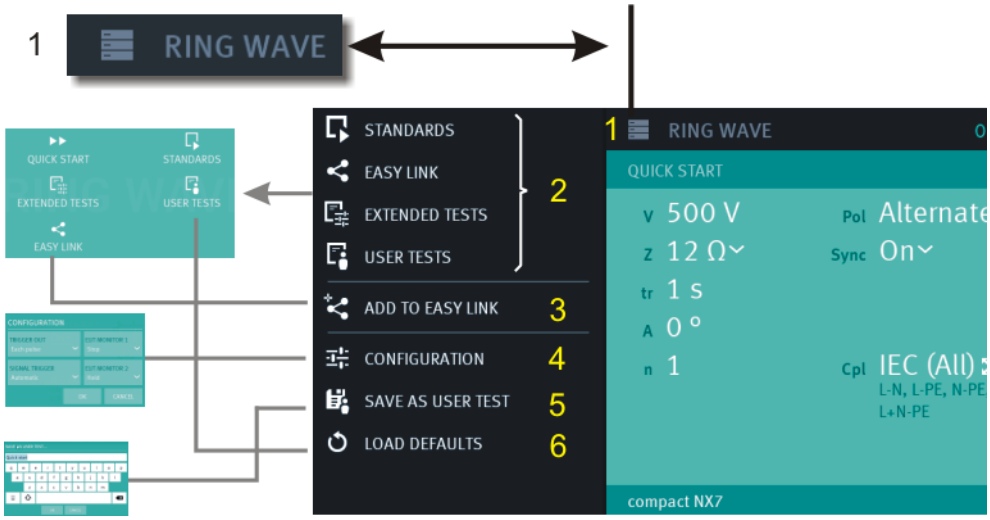
The test voltage V is changed from V1 to V2. After the preselected number pulses the test level is changed by ΔV until V2 is reached. The same parameters as under Quick Start are selectable. For the limitation of the max. admissible repetition rate the higher value of V1 and V2 is valid.

Angle Iteration Stepwise after n pulses by ΔA

The phase angle related to which the surge pulse is released is changed from A1 to A2. After the preselected number of n pulses the actual phase angle is changed by ΔA until A2 is reached. The same parameters as under Quick Start can be selected.



15.2. Ring wave Menu



Ring wave Menu

1 Button for open and close the Ring wave Menu

2 Change to other Ring wave test routines. The last used test in this routine will be loaded.
- Quick Start
- Standards
- Extended Tests
- User Tests
- Easy Test

3 Add the actual test to Easy Link library

4 Trigger and Monitor setting for Surge test. (Each phenomenon has an individual configuration)

5 Current limiter setting

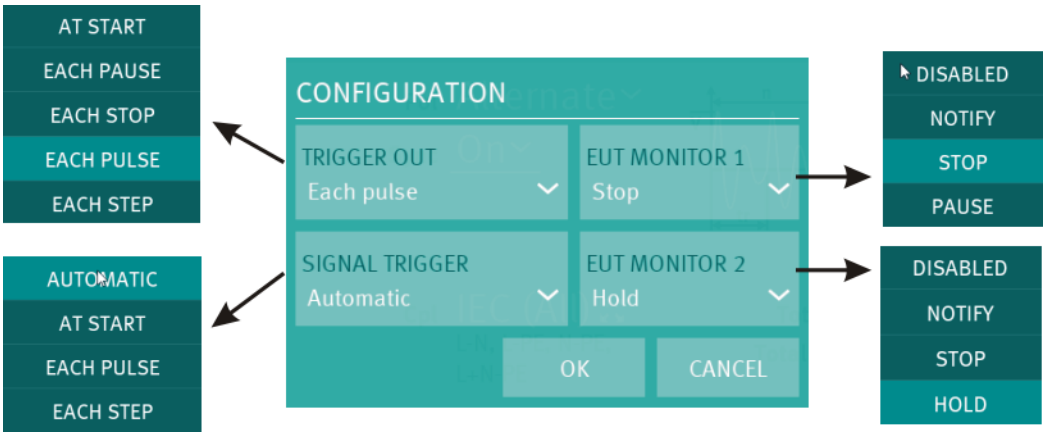
6 Add the actual test to User Test library

15.3. Ring wave pulse settings

15.3.1. Configuration

In the configuration menu the user set the following parameters:

- **Trigger out signal** at the BNC plug on generator front side
- **Signal trigger** for the impulse or event on the BNC Ext. Trigger plug on rear side or blinking Start button
- Behavior of the **EUT Monitor 1** and **EUT Monitor 2** on BNC plug on rear side

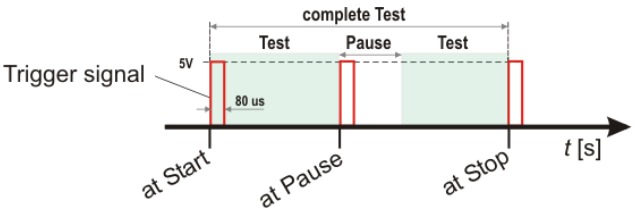


15.3.1.1. Trigger OUT

The trigger out signal is a programmable 5V edge signal located at the front side BNC Trigger plug. This signal is for trigger other devices like oscilloscopes or other devices.

The generator offers the following trigger out options:

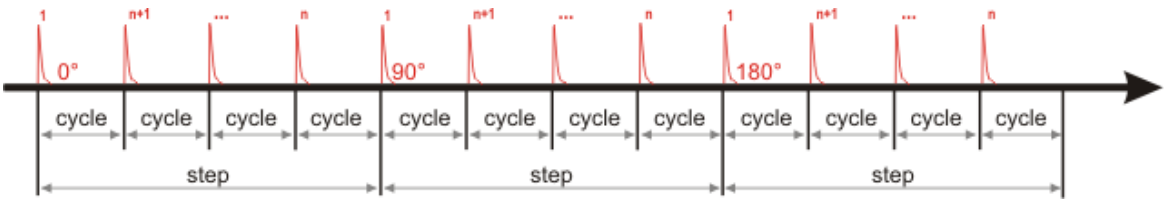
- At **Start**
- Each **Pause**
- Each **Stop**
- Each **Pulse** every surge impulse release
- Each **Step** for tests with iteration



Iterations

For Iteration tests the parameters changes after each step as shown in the figure below. Depends of the order and setting the following parameters can change:

- Polarity
- Voltage
- Phase angle



Example with voltage iteration that illustrate trigger out for cycle and step

15.3.1.2. Start Trigger

The Start Trigger occurs by pressing the blinking **START / PAUSE** button or with an external trigger positive slope signal at the rear side BNC **Ext. Trigger** plug.

The start trigger offers the following status:
- **Automatic**
- At **Start** (starts after the trigger)
- Each **pulse** (same as trigger out)
- Each **step** (same as trigger out)

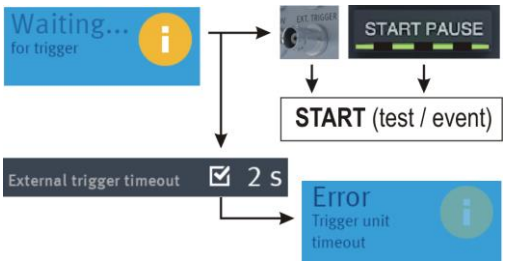
If the start trigger is not set to Automatic, the trigger indicates with "**Waiting for trigger"** the recommended trigger signal.

The waiting time for a trigger signal is endless if no trigger timeout is enabled.

External trigger timeout

This function stops the test after the defined timeout time and indicates the message, "**Error trigger unit timeout**".

For enable the function External trigger timeout select from the Home screen:
Menu / Setup / General / Process & sync



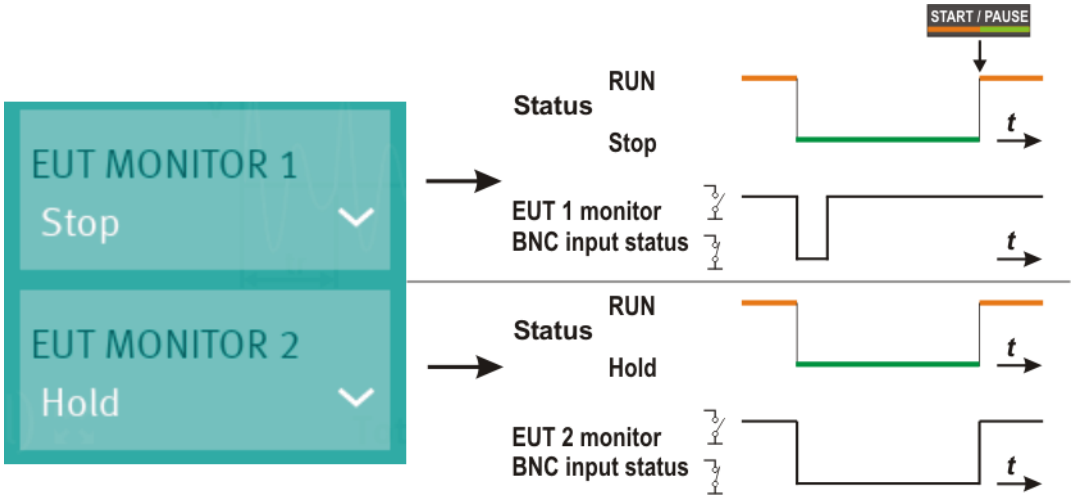
Start Trigger flowchart example from burst

15.3.1.3. EUT Monitor

The EUT monitor 1 and EUT Monitor 2 input is used for controling the compaxt NX device according the EUT behavior. Each input is programmable to have different events as:

Disabled	No function
Notify	Makes a mark in the NX software. The report will make a time stamp and notes the actual generator settings.
Stop	Stops the test immediately. It is not possible to continue the test.
Break (EUT monitor 1)	Break the test and go to pause status. For continue the user must press the START/PAUSE button or continue in iec.control software. NOTE: The EUT monitor input 1 must go to **open status before press continue**
Break (hold) (EUT monitor 2)	Keep in pause status as long the EUT monitor 2 input is grounding. After release the break, the test will continue automatically.

EUT Monitor input signal

EUT Monitor Input	BNC plug on rear side of the compact NX generator 
Status of BNC input of EUT monitor 1 / 2	
Input signal	Open collector signal 15 V to 0 V negative slope
Triger level	2 V ±1 V
Input impedance	>10 kΩ
Max. Input	+ 15 V

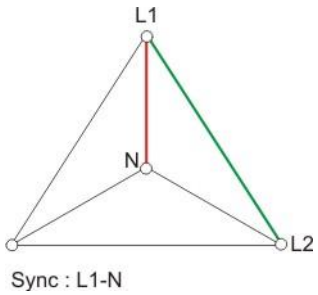
15.4. Ring wave pulse application

15.4.1. Phase synchronization in 3-phase system

The synchronization in a 3-phase coupler system is taken from the phase L1 and neutral. In case of a delta supply without neutral connected, an artificial neutral point is defined by a high impedance network. This artificial neutral is taken for the phase synchronization.

For all couplings, the generator calculates the correct phase angle for phase triggering.

In case of too high phase shifting the user can connect a proper sync signal to the SYNC IN plugs at the rear side of the compact NX generator



The tables below illustrate the correction angels considering the phase in a 3-phase system with synchronization signal from L1-N lines. The generator firmware will automatically add the correction angle to the settled value.

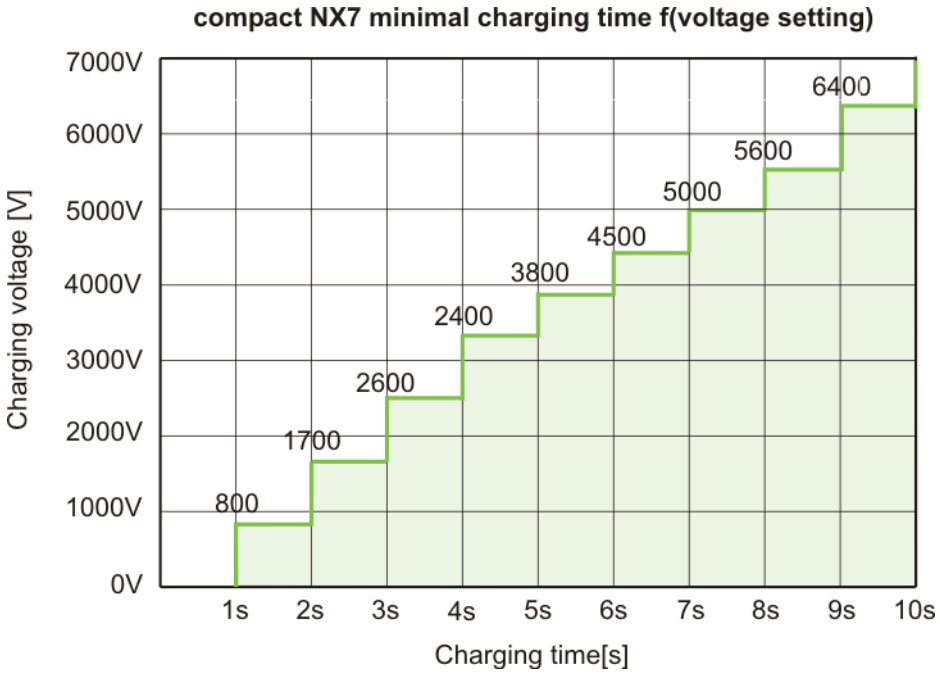
Phase Synchronization correction for L1-N as sync signal

	Sync. Source	Correction angel added by the compact NX firmware					
Coupling	**L1-N**	**L1-N**	**L2-N**	**L3-N**	**L1-L2**	**L1-L3**	**L2-L3**
Sync.-Angel	**0°**	0°	120°	240°	330°	30°	90°
	90°	0°	210°	300°	60°	120°	180°
	180°	0°	300°	30°	150°	210°	270°
	270°	0°	30°	150°	240°	300°	0°

The correct phase angle will be set automatically from the compact NX.

15.4.2. Charging time for Ring wave

The energy for charging the surge generator depends on the charging voltage of the internal capacitor of 11 uF Therefore, the following minimum charging time is requested:



15.5. Ring wave pulse application

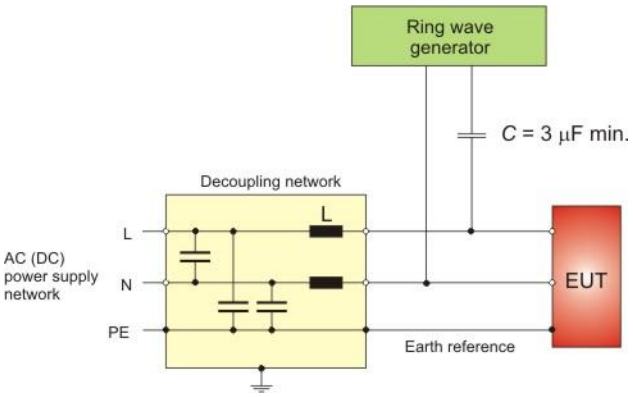
Discharge switch:
The discharge switch is a highly reproducible semiconductor switch.

15.6. Coupling/decoupling network

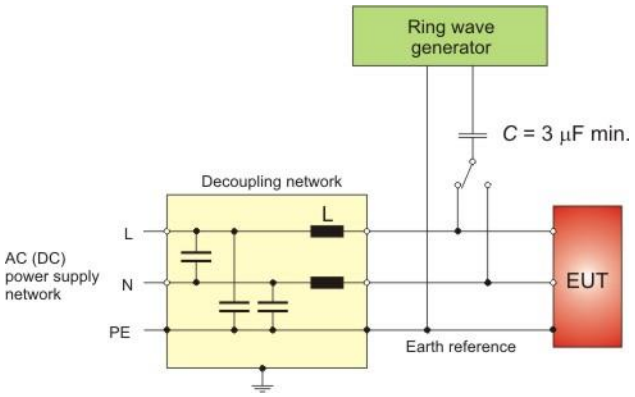
The coupling network must couple the interference pulses to the lines of a power supply system (AC or DC). Capacitive coupling is the specified coupling mode for surge testing.

15.6.1. Coupling to AC/DC power supply lines

The surge generator compact NX7 has an integrated coupling network in accordance with IEC 61000-4-12. It must be possible to test with different coupling modes:



Coupling Line to Line



Coupling Line to Earth

The release of the surge pulses is mostly related to a certain phase angle.
The surge pulses are synchronized to the input signal at the rear Sync-connector.

Attention: The decoupling part of the coupling/decoupling network includes some capacitors for filtering related tp protective Earth (chassis of the generator). This is to be conform to the requirement of IEC 61000-4-12 concerning attenuation of the surge transients in direction to the power mains supply input of the CDN.
As consequence there will exist an increased current to PE (protective earth) which might be hazardous to the operator in case of a failure or wrong installation. Therefore, it is very important to take the following points into account before setting the generator into full operation.

1. Due to this increased current into the PE system no earth fault current protectors can be used within a surge testing area.

3. As consequence the surge generator shall be connected always to Protective Earth, even if no test is conducted.
via plugged in power mains supply cable including the PE wire !!!!
via plugged in EUT power mains supply at the rear side of the generator, including the PE wire !!!!
via Ground Reference Connector, screwed to the chassis of the generator.

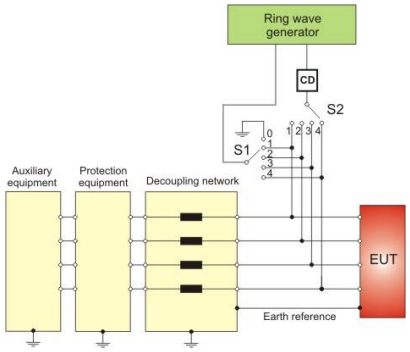
These measures result in double safety in case of a fault

15.6.2. Coupling to I / O lines

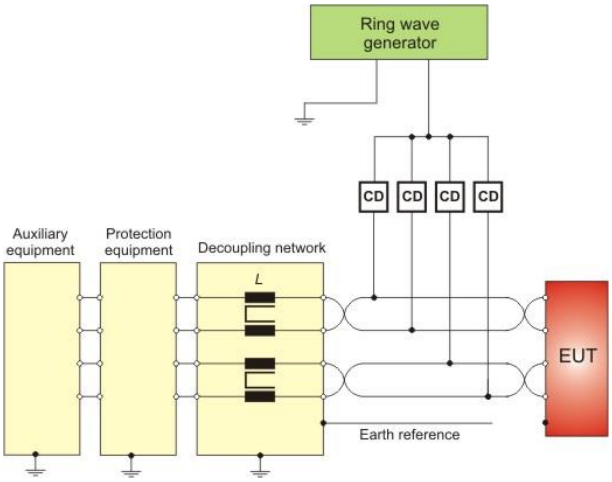
The coupling to I/O lines is generally realized with other coupling networks than for power supply lines. The loading of the I/O lines with high coupling capacitors is mostly not possible. The data transmission may be disturbed.

For coupling to I/O lines special couplers according the Standard IEC 61000-4-12 are available, such as the CDN DCD sr and DCD st series

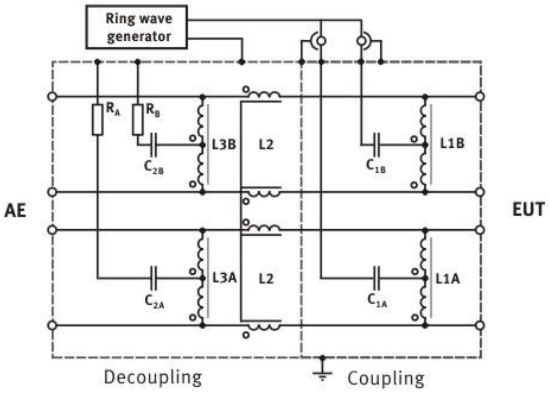
Example: Coupling to -unbalanced unshielded cables-shielded cables with shield at one end



Example: Coupling to shielded cables with shield at both ends



Example: Coupling to symmetrical unshielded high-speed data lines



Danger

Using coupling networks CNV or DCD series

Switch OFF the high voltage during manual change of the coupling

15.7. Test set-up

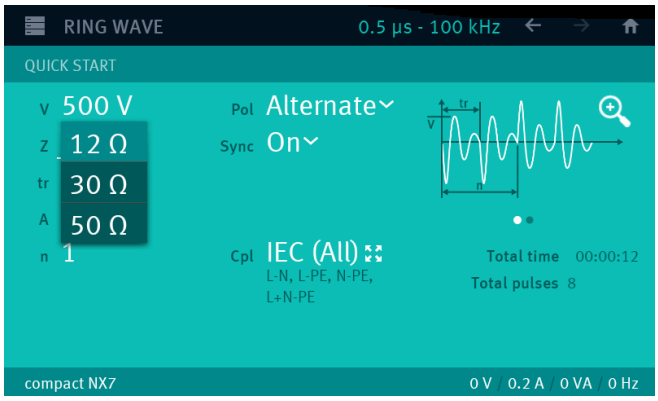
According to the specifications of IEC 61000-4-12, the Ring wave generator has a **source impedance** of

Generator impedance

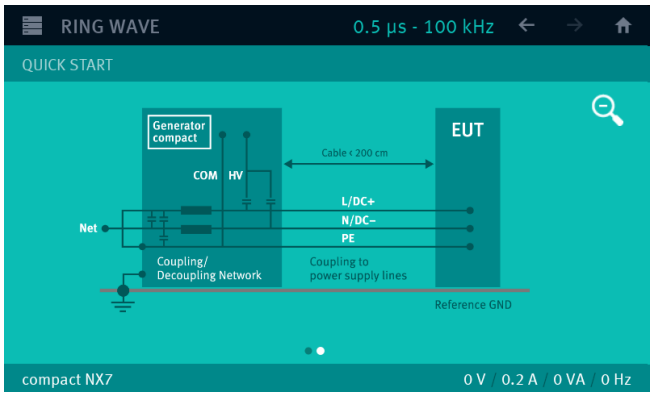
12 Ω for **a.c./d.c. power ports** and shielded interconnection lines

30 Ω for **interconnection lines**.

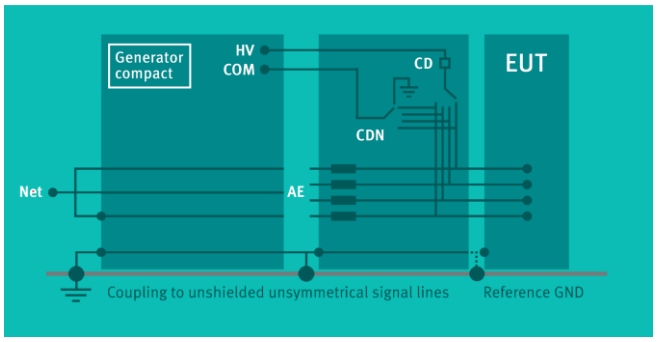
50 Ω as per UL 943.



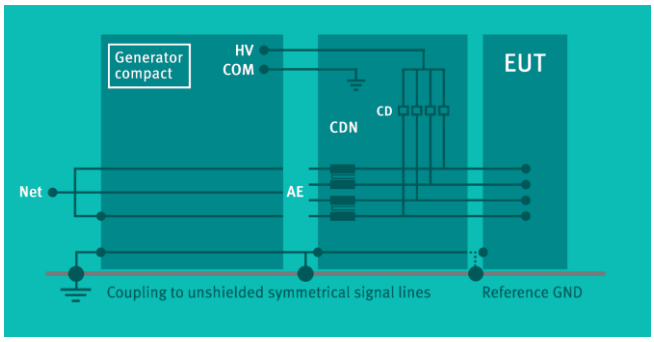
Impedance selection



Test setup coupling to a.c. / d.c. power lines



Setup for unsymmetrical data lines



Setup for symmetrical data lines

16. Report

General

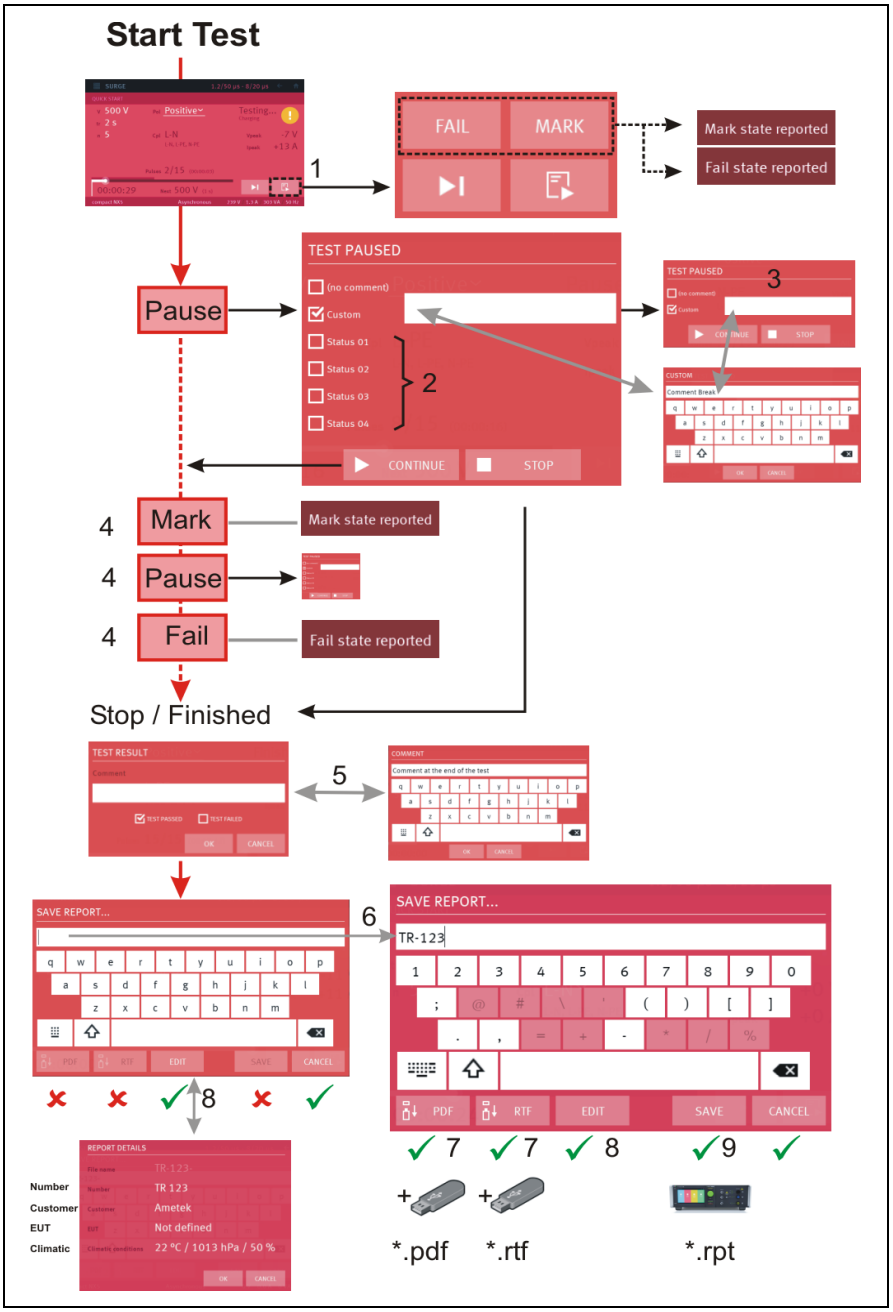
The NX application software generates during each test an internal log-file with all parameter settings and all actions during the test. This log file will be used for generating a report after the test. After the test following procedures are possible:

- The program starts to generate the report when “generate Report” is enabled.
- The user can manual generate the report when “generate Report” is disabled
- The user can save the log-file

Format of USB Memory Stick

USB Sticks up to 4GB	Format as FAT32
USB Sticks > 4GB	Format as extFAT or NFTS Format

16.1. Block diagram for report generation



1 Press Report sign for enable report function MARK and FAIL

2 Status text (predefined) appears when messages are defined in menu Setup Report

3 Enter comment if required

4 Press **MARK**, **PAUSE** or **FAIL** for set a marker or comment

5 Enter a comment or/and Pass/Fail marker

6 The predefined Filename appears (if selected). Add individual letters for complete the filename.
Note: The Save buttons are disabled as long no filename is entered.

7 Save as *.pdf or *.rft file to the USB memory stick.
Note: The USB memory stick must be connected to the NX-device.

8 Edit window for Test teport number, customer, EUT name and climatic conditions

9 Save to internal SD card as *.rpt file
Note: If no SD card is present the file is saved on a USB memory stick. A message will indicate the missing SD card.

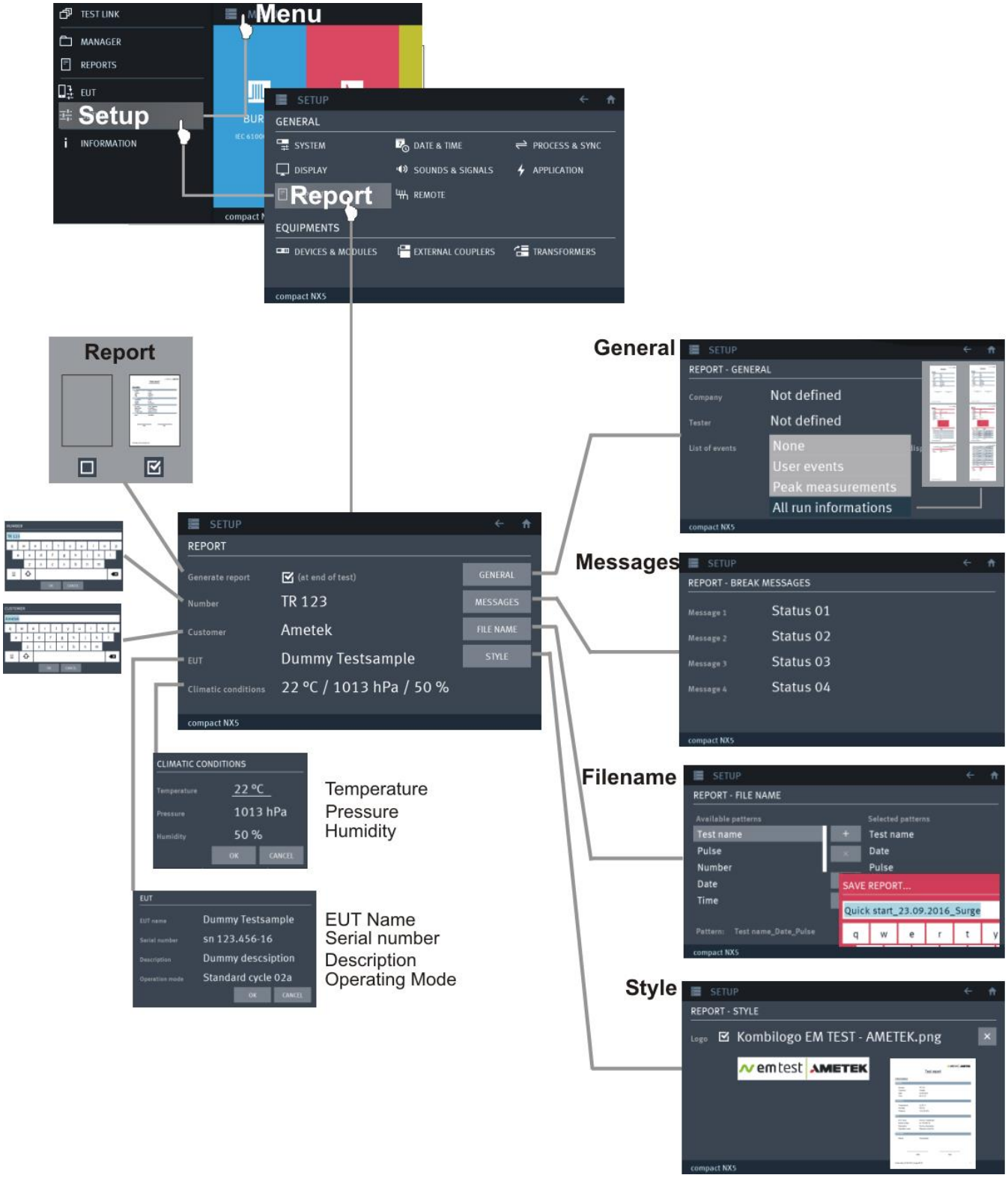
16.1.1. Safe a report after the test

There is a possibility to save a report after the test, even when the user did not activate “generate report at test end”.

	A report can be saved until the user press **BACK**. After this action the report information is lost

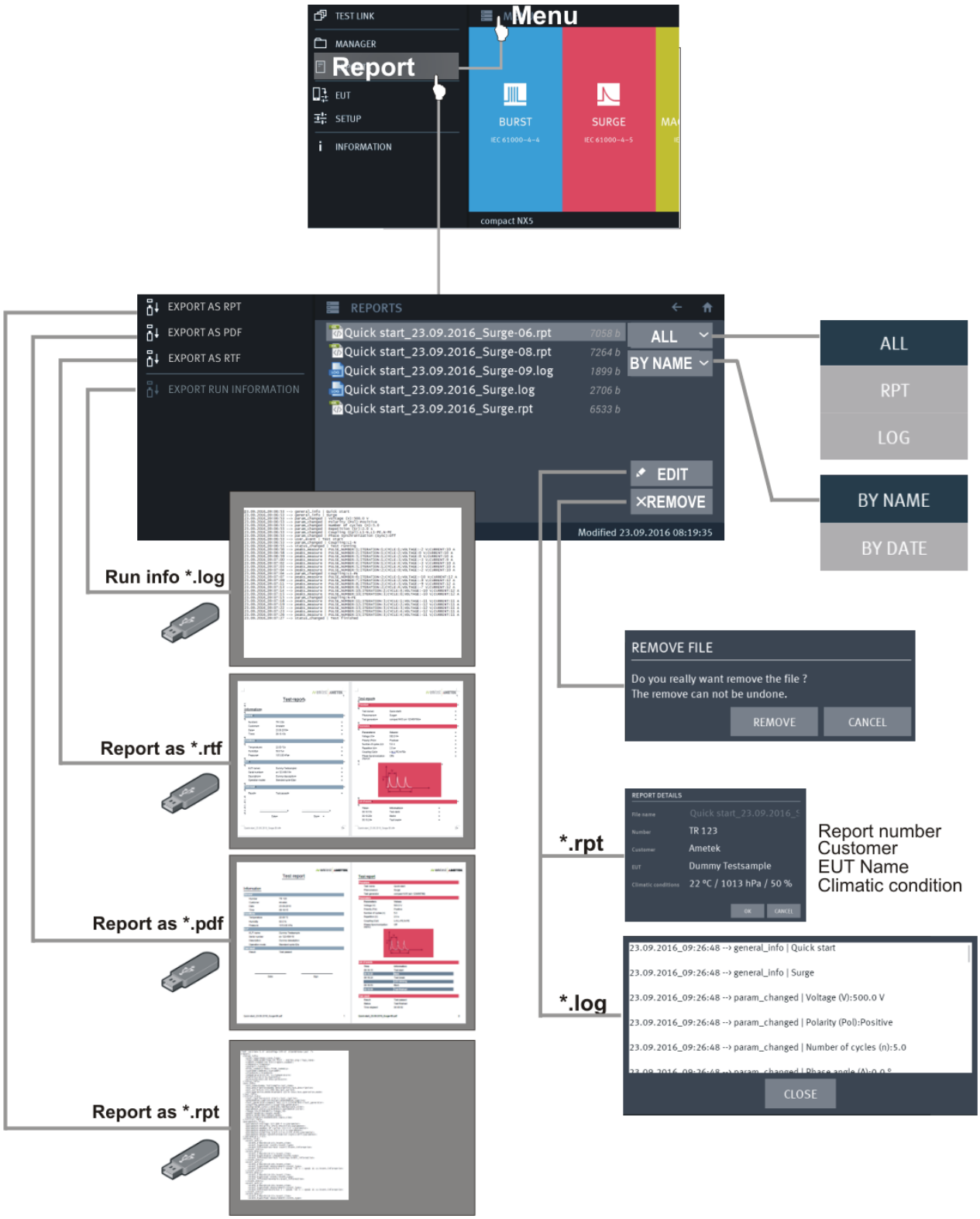
16.2. Report setting

The detailed report setting description is in chapter 4.3.6.7. Setup / General / Report. Below you see the overview about the report configuration


TEST LINK
MANAGER
REPORTS
EUT
Setup
INFORMATION
Menu
SETUP
GENERAL
SYSTEM
DATE & TIME
PROCESS & SYNC
DISPLAY
SOUNDS & SIGNALS
APPLICATION
Report
REMOTE
EQUIPMENTS
DEVICES & MODULES
EXTERNAL COUPLERS
TRANSFORMERS
compact NX5
Report
General
SETUP
REPORT - GENERAL
Company
Not defined
Tester
Not defined
List of events
None
User events
Peak measurements
All run informations
compact NX5
SETUP
REPORT
Generate report
(at end of test)
GENERAL
Number
TR 123
MESSAGES
Customer
Ametek
FILE NAME
EUT
Dummy Testsample
STYLE
Climatic conditions
22 °C / 1013 hPa / 50 %
compact NX5
Messages
SETUP
REPORT - BREAK MESSAGES
Message 1
Status 01
Message 2
Status 02
Message 3
Status 03
Message 4
Status 04
compact NX5
CLIMATIC CONDITIONS
Temperature
22 °C
Pressure
1013 hPa
Humidity
50 %
OK
CANCEL
Temperature
Pressure
Humidity
EUT
EUT name
Dummy Testsample
Serial number
sn 123.456-16
Description
Dummy descsiption
Operation mode
Standard cycle 02a
OK
CANCEL
EUT Name
Serial number
Description
Operating Mode
Filename
SETUP
REPORT - FILE NAME
Available patterns
Test name
Pulse
Number
Date
Time
Selected patterns
Test name
Date
Pulse
SAVE REPORT...
Quick start_23.09.2016_Surge
Pattern:
Test name_Date_Pulse
compact NX5
Style
SETUP
REPORT - STYLE
Logo
Kombilogo EM TEST - AMETEK.png
emtest
AMETEK
compact NX5

16.3. Report Export

The detailed report setting description is in chapter 4.3.6.7. Setup / General / Report. Below you see the overview about the report configuration



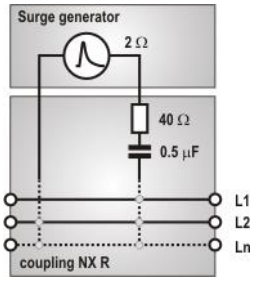
Used file extensions

17. Applications

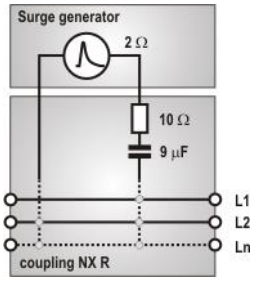
17.1. Railway testing as per EN 50121 standards

A separate series of coupler can be used for railway application. These couplers include an additional unit for couple with the impedance of 0.5 µ in series with 40 Ω to all coupling path.

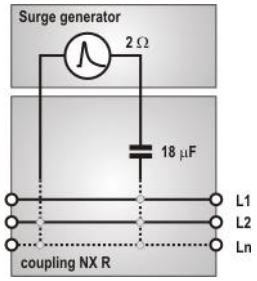
The railway standard defines the following coupling impedances



42 Ω, 0.5 µF



12 Ω, 9 µF



2 Ω, 18 µF

17.1.1. Coupling network

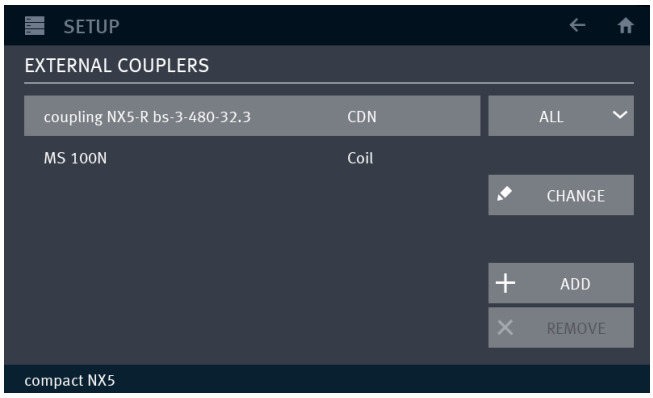
The **coupling NX R** family are design to support all couplings to 1- and 3-phase CDNs. The compact NX generator will automatically detect the built railway module and will enable all related settings for AC and DC tests.

Detection of coupler with built in railway module

Menu /
SETUP /
EQUIPMENTS /
EXTERNAL COUPLERS

The coupler is automatically detected.

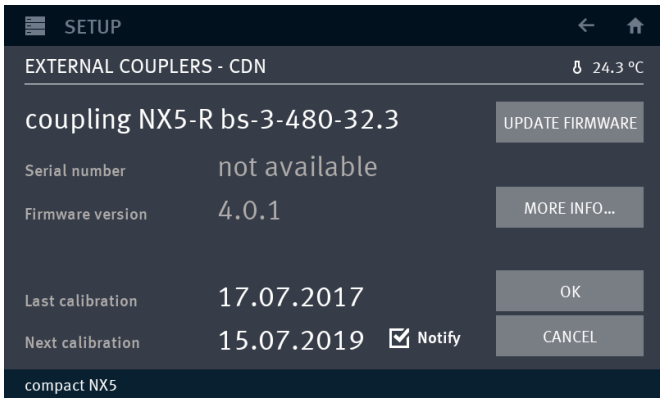
Coupling NX5-**R** bs-3-480-32.3



Long click to ***coupling NX 5-R bs….*** will enable the settings to CDN parameters. **Serial number** and **Firmware version** are indicated (factory setting)

More info shows the technical data

User settings:
- Last calibration
- Next calibration
- Notify mark



Hardware

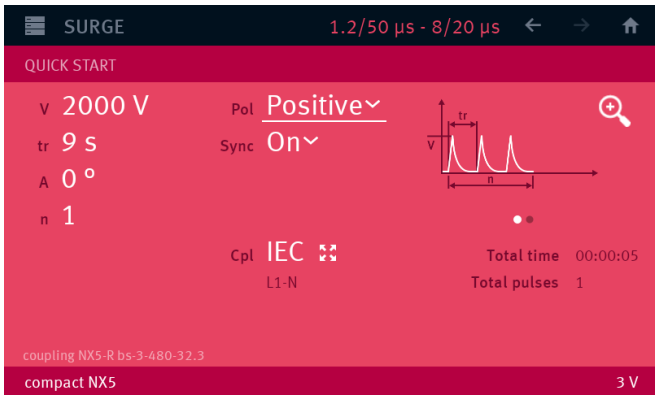
The railway module includes a RC combination with a resistance of 40 Ω and a serial capacitance of 0.5 µF. It is switched in series to the other coupling capacitor. This RC combination is bypassed by a high voltage relays in case of other couplings than railway application. The 0.5 µF capacitor is realized with the series combination of the 18 µF and the capacitor of the RC combination.

17.1.2. Operating

Enable the railway couplings

1. **Enter** in a surge menu like ***Quick Start***

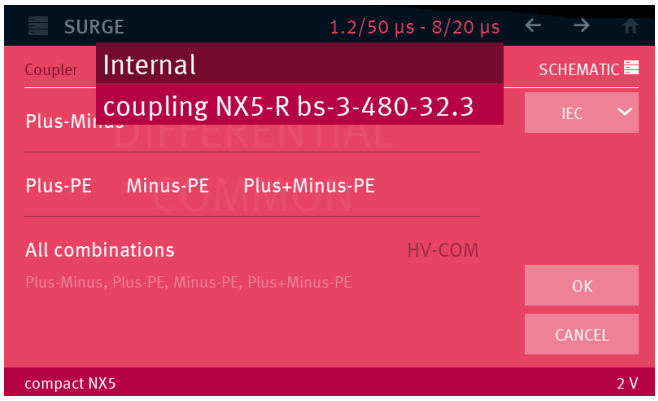
2. **Click** to the actual coupling ***IEC***



Example for **DC and 1-ph AC application**.

3. **Select the output device**

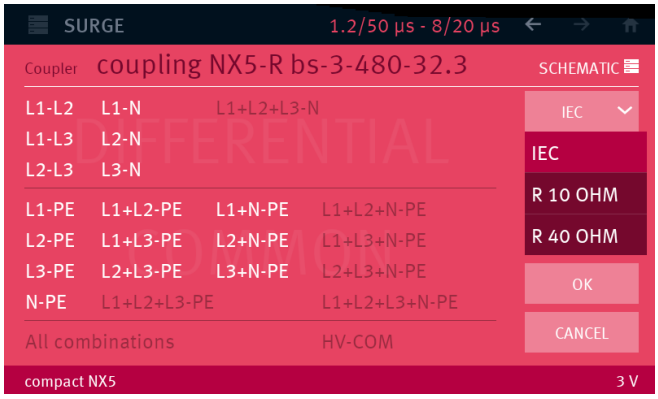
   Internal: compact NX generator
   coupling NX… 3-phase coupler



4. **Select the coupling impedance**

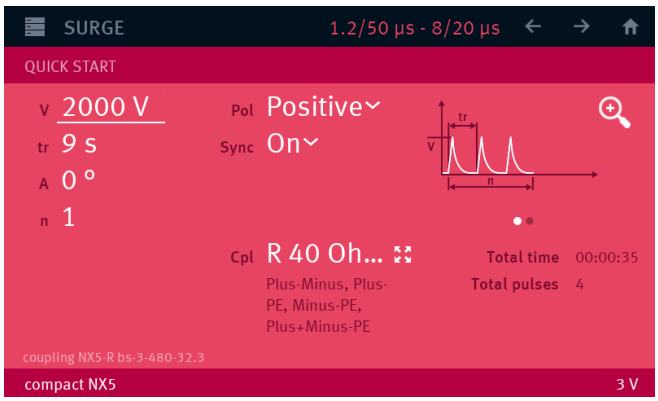
   IEC: IEC coupling
   R 10 OHM: coupling 12 Ω, 9 µ
   R 40 OHM: coupling 40 Ω, 0.5 µ

5. **Select the couplings** and press **OK**



Example with setting of railway coupling 42 Ω, 0.5 µF for DC application.

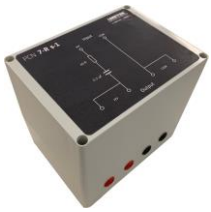
It may be that other menu like extended test are more comfortable for iteration.

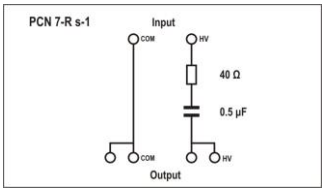


17.1.3. PCN 7-R s-1 Railway coupling network for single phase application

The PCN 7-R s-1 is an optional box for single-phase railway application with a standard surge generator. The box includes the 0.5 µF capacitor with the 40 Ω series resistor

PCN 7-R s-1





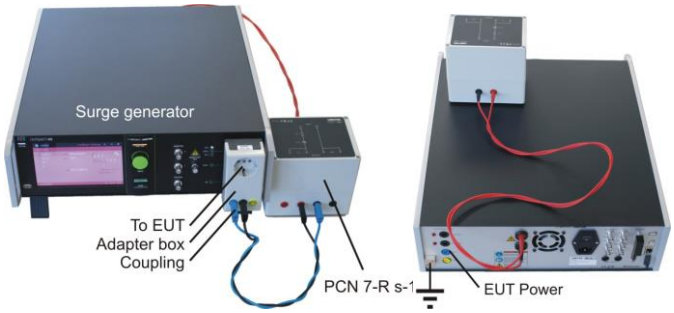
Technical data:

Capacitor:	0.5 µF ±10%
Resistance:	40 Ω ±10%
Max impulse voltage:	7 kV surge impulse
Max EUT AC voltage:	690 V

Application

Test setup

1. Connect the HV-COM of the generator with the input of the PCN 7-R s-1
2. Connect the output of the PCN 7-R s-1 to the desired coupling lines at the adapter box. Take care for the correct coupling.
3. The generator internal CDN is the decoupling network for the surge impulse to the AE port.

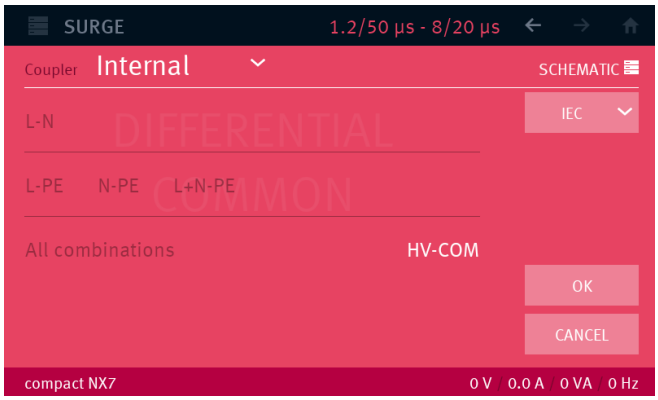


Application with the NX generator

Generator setting

1. Select Menu: **Surge / Quickstart / Coupling**
2. Select **HV – COM** for apply the surge impulse via the PCN 7-R s-1 box to the adapter box.
3. Press **OK**

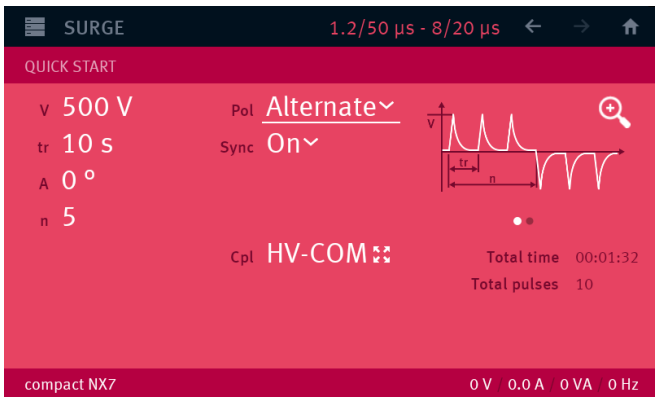
NOTE: *Firmware, that does not support the PCN 7-R device as external coupler, must use the output via HV – COM. Newer version may support the PCN as external coupler in future.*



Pulse setting

Set in Quickstart mode the **impulse parameter** as recommended in the railway standard. If required enable the phase synchronization.

The coupling path must be set manually with the connection cable at the adapter box.



17.1.4. Actual Railway standards as per EN 50121 family

There is a list of some Railway standards. The standard list is not complete

The railway standard as per IEC 50121-4 (2015)

Table 2 — Immunity – Input / Output

Test specification		Remarks
Surge 1,2 / 50 µ ± 2 kV 42 Ω, 0.5 µF ± 1 kV 42 Ω, 0.5 µF	 Open circuit line to ground Open circuit line to line	All severity levels below the given severity level have to be tested with 5 pulses for each severity level and a test sequence not alternating but starting with one polarity followed by the other polarity.

Table 3 — Immunity – DC ports

Test specification		Remarks
Surge 1,2 / 50 µ ± 2 kV 42 Ω, 0.5 µF ± 1 kV 42 Ω, 0.5 µF	 Open circuit line to ground Open circuit line to line	All severity levels below the given severity level have to be tested with 5 pulses for each severity level and a test sequence not alternating but starting with one polarity followed by the other polarity.

When the power supply is isolated from ground (earth), an output impedance of 42 Ω (40 Ω and 2 Ω generator) and a coupling capacitance of 0.5 µF is recommended.

Table 4 — Immunity – AC ports

Test specification		Remarks
Surge 1,2 / 50 µ ± 2 kV 12 Ω, 9 µF ± 1 kV 2 Ω, 18 µF	 Open circuit line to ground Open circuit line to line	All severity levels below the given severity level have to be tested with 5 pulses for each severity level and a test sequence not alternating but starting with one polarity followed by the other polarity.

The railway standard as per IEC 50121-5 (2017)

Surge Tests as per IEC 61000-4-5 one polarity followed by the other polarity

Table 3 — Immunity – Ports for process, measurement and control lines, and long bus

Test specification		Remarks
Surge 1,2 / 50 µ ± 2 kV 42 Ω, 0.5 µF ± 1 kV 42 Ω, 0.5 µF	 Open circuit line to ground Open circuit line to line	All severity levels below the given severity level have to be tested with 5 pulses for each severity level and a test sequence not alternating but starting with one polarity followed by the other polarity.

Table 4 — Immunity – DC input and DC output power ports

Test specification		Remarks
Surge 1,2 / 50 µ ± 2 kV 12 Ω, 9 µF ± 1 kV 2 Ω, 18 µF	 Open circuit line to ground Open circuit line to line	All severity levels below the given severity level must be tested with 5 pulses for each severity level and a test sequence not alternating but starting with one polarity followed by the other polarity.

[g] Not applicable to input ports intended for connection to a battery or a rechargeable battery which shall be removed or disconnected from the apparatus for recharging.

Table 5 — Immunity – AC input and AC output power ports

Test specification		Remarks
Surge 1,2 / 50 µ ± 4 kV 12 Ω, 9 µF ± 2 kV 2 Ω, 18 µF	 Open circuit line to ground Open circuit line to line	All severity levels below the given severity level must be tested with 5 pulses for each severity level and a test sequence not alternating but starting with one polarity followed by the other polarity.

18. Appendix

18.1. Declaration of CE-Conformity

18.1.1. CE-Conformity compact NX5

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Ultra compact generator
Model Number(s)	compact NX5

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems. The 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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Fax: +41 61 204 41 00

By	A. Burger Design and Research
Place	Reinach BL, Switzerland
Date	01. July 2017

18.1.2. CE-Conformity compact NX7

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Ultra compact generator
Model Number(s)	compact NX7

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems. The 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. Burger Design and Research
Place	Reinach BL, Switzerland
Date	01. July 2018

18.1.3. CE-Conformity V4780

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Tapped transformer
Model Number(s)	V 4780

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

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Place	Reinach BL, Switzerland
Date	01. July 2017

18.1.4. CE-Conformity V4780S2, V 4780S3

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Tapped transformer
Model Number(s)	V 4780S2, V 4780S3

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer
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By	A. Burger Design and Research
Place	Reinach BL, Switzerland
Date	01. July 2017

18.1.5. CE-Conformity CCI (capacitive coupling clamp)

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Capacitive coupling clamp Industry
Model Number(s)	CCI

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)

The purpose of this device is to couple EFT burst impulses as per IEC 61000-4-4 to signal and data lines for EMI immunity testing. Depending on the design of the CCI, given in the standard IEC 61000-4-4, 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. Burger Design and Research
Place	Reinach BL, Switzerland
Date	01. July 2017

18.1.6. CE-Conformity PCN 7-R s-1

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name:	Coupling Network for railway application as per IEC 50121 series standards
Model Number(s)	PCN 7-R 1-s

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1:2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer
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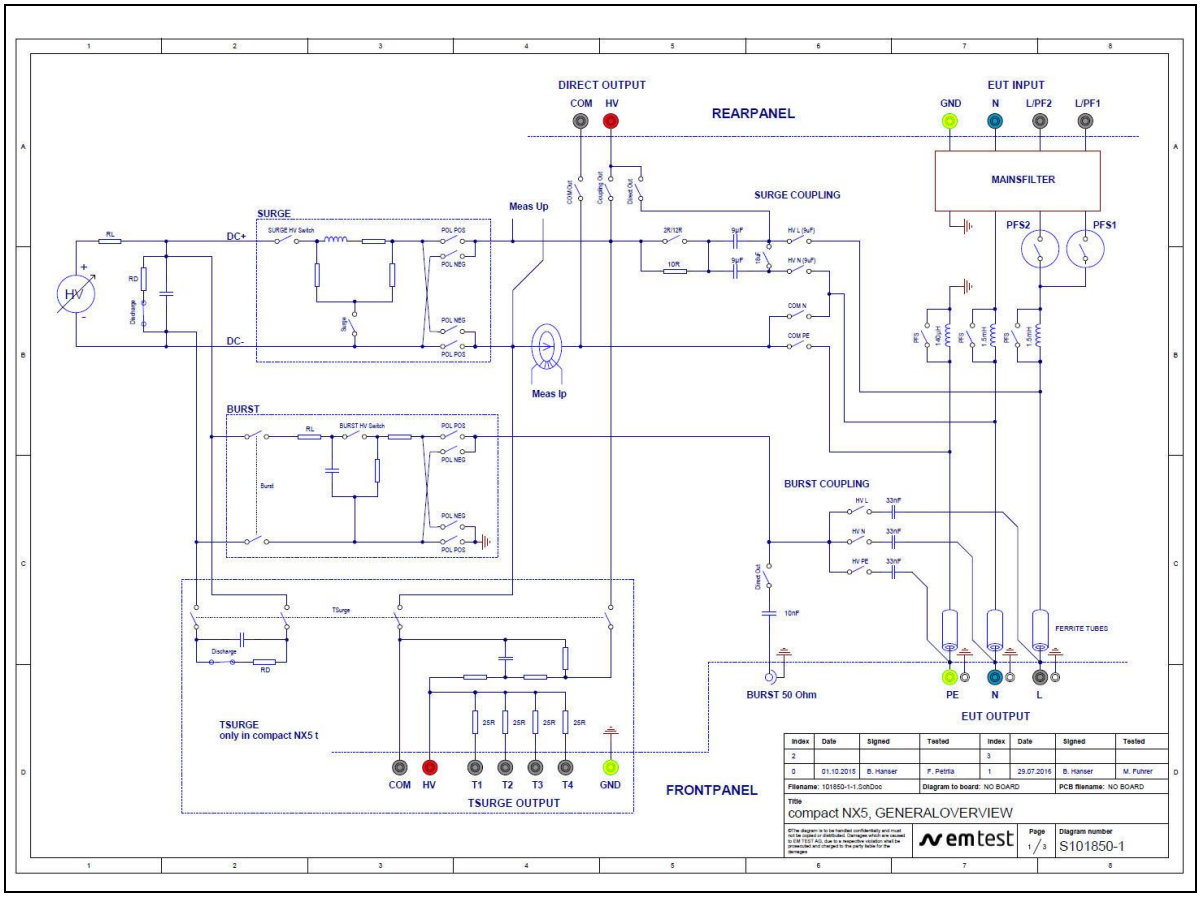
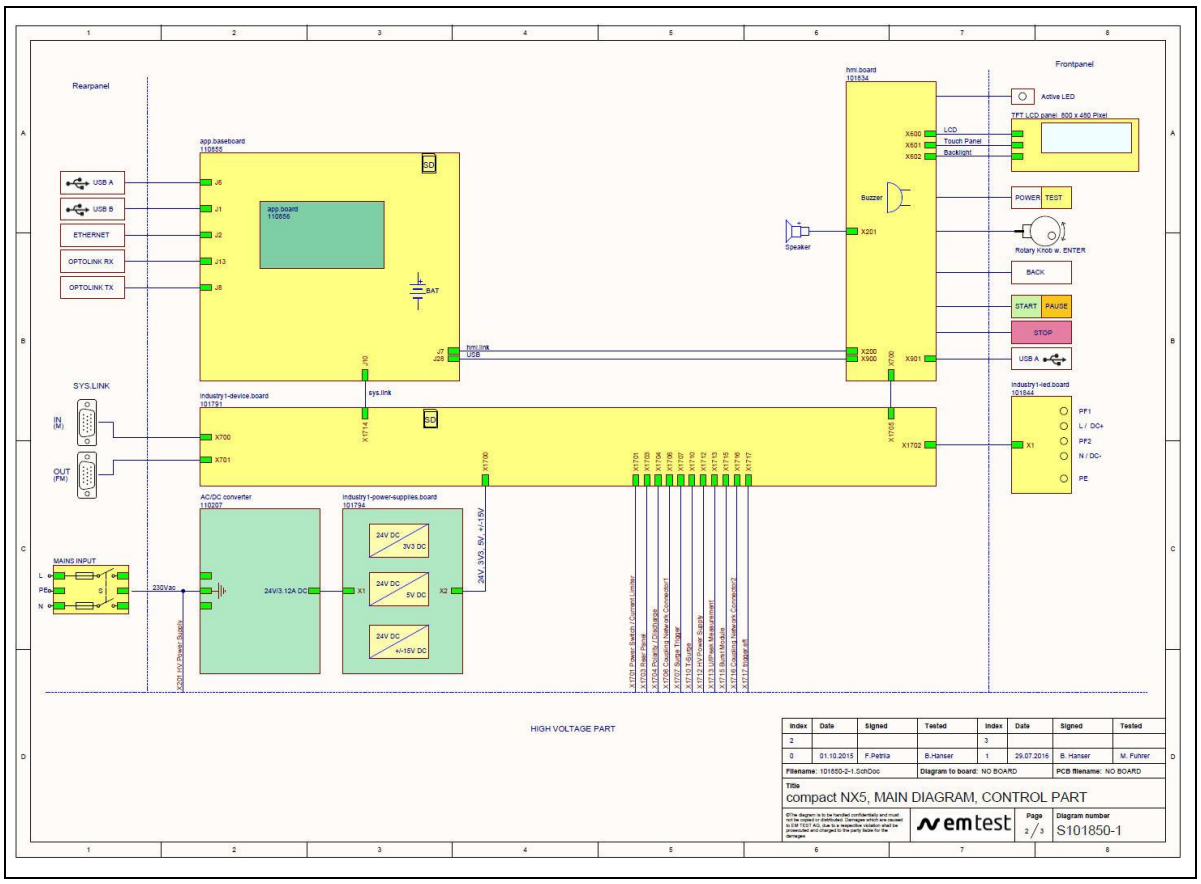
Phone: +41 61 204 41 11
Fax: +41 61 204 41 00

By	A. Burger Design and Research
Place	Reinach BL, Switzerland
Date	05. Mars 2019

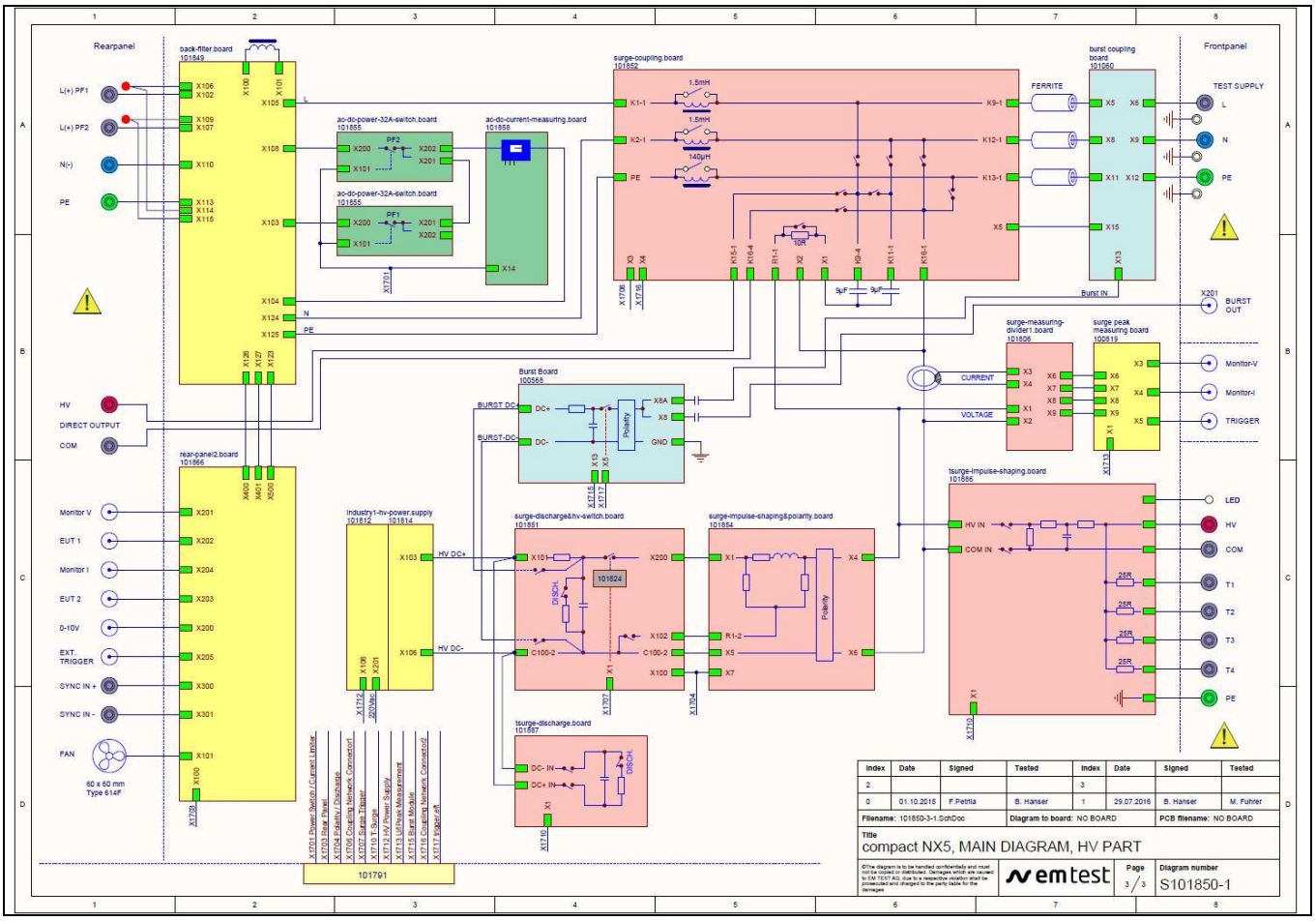
18.2. compact NX5 General Diagram



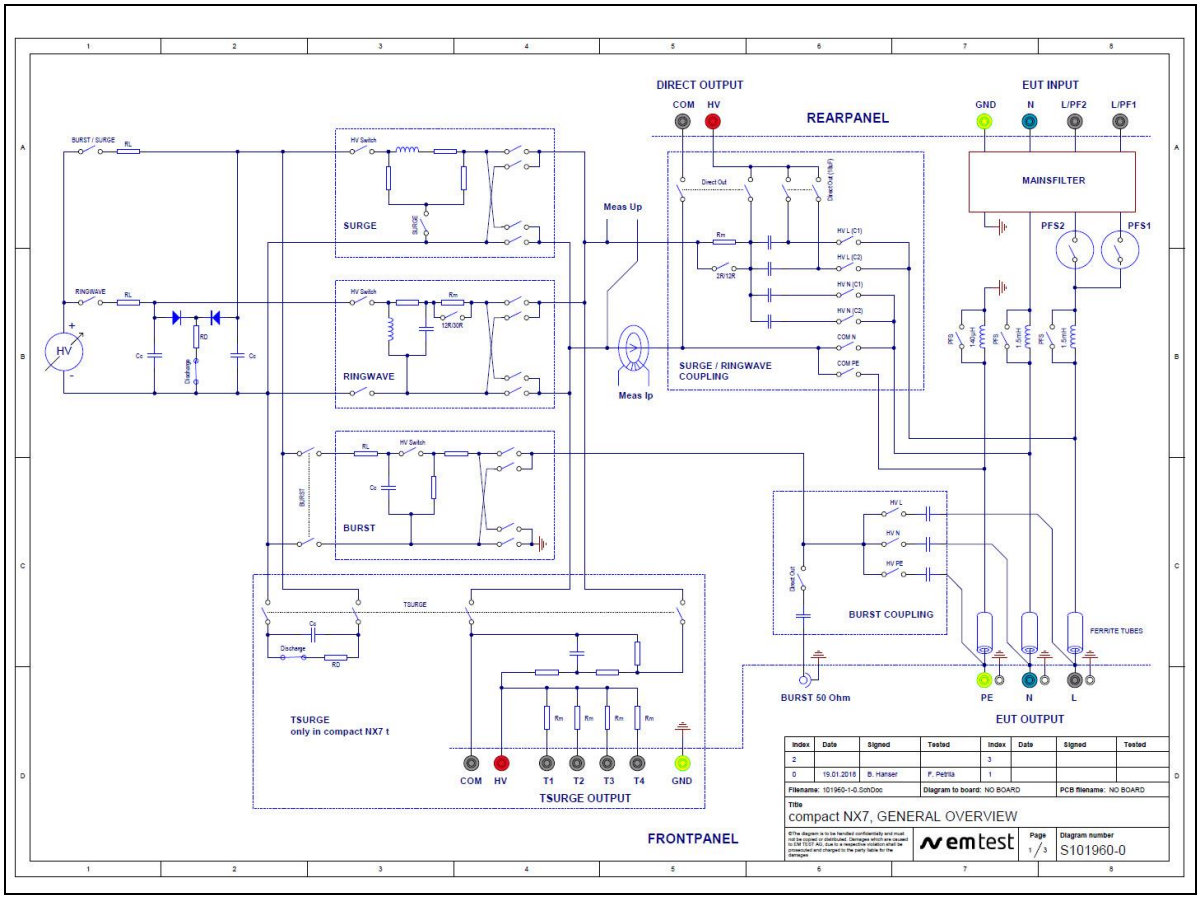
18.2.1. Main diagram compact NX5 control connection



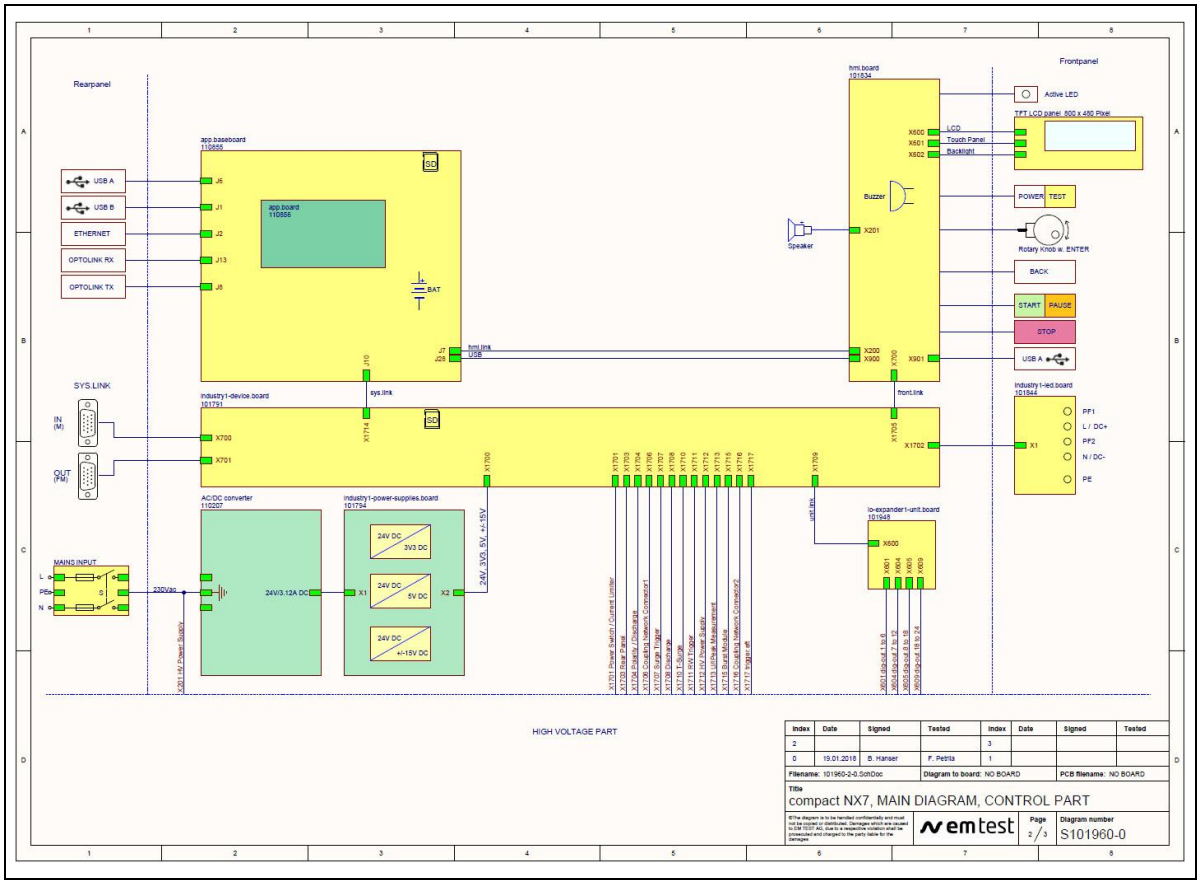
18.2.2. Main diagram compact NX5 high voltage connection



18.3. compact NX7 General Diagram



18.3.1. Main diagram compact NX7 control connection



18.3.2. Main diagram compact NX7 high voltage connection