

Manual

f o r O p e r a t i n g



coupling NX series

3-phase coupling decoupling network

Testing of electronic modules with EFT/burst and 1.2/50 μ s
Surge pulses up to 5 kV, 2.5 kA

The coupling NX series coupling decoupling network is used to couple the surge and burst pulses from the compact NX5 generator to a three phase test object (coupling as per. IEC standard).

The coupling NX coupling decoupling network is controlled from EM Test transient generator of the compact NX- series.

Burst, Surge Pulse as per.
– IEC 61000-4-4
– IEC 61000-4-5



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Specifications subject to change

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1. General

The following manual is based on the following product family:

- coupling NX5 family

1.1. Purpose

The coupling NX5 family is a 3-phase coupler for coupling Burst and Surge transient impulses to 3- phase supply lines. It couples conducted electromagnetic interference effects for immunity testing to a test equipment according 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 |
| - IEC 61000-4-9 | Pulse Magnetic Field applied to a loop antenna |

1.2. Warranty Terms

EM TEST (Switzerland) GmbH, provides this written warranty covering the product stated above, and if the buyer discovers and notifies EM TEST (Switzerland) GmbH in writing of any defect in material or workmanship within the applicable warranty period stated above, then EM TEST 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 EM TEST in accordance with the return procedure specified below. EM TEST will, at its expense, deliver the repaired or replaced product or parts to the buyer. Any warranty of EM TEST 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 EM TEST;
- is damaged by modifications, alterations or attachments thereto which are not authorized by EM TEST;
- is installed or operated contrary to the instructions of EM TEST;
- is opened, modified or disassembled in any way without EM TEST's consent; or
- is used in combination with items, articles or materials not authorized by EM TEST.

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 EM TEST provided for in the purchase order agreement.

1.3. Product return procedure

1. Request a Return Material Authorization (RMA) number from the local EM TEST 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 EM TEST, 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 EM TEST compact NX5 series generator complies with the directive 2011/65/EU (RoHS - Restriction of certain Hazardous Substances).

From December 2005, all EM TEST products either hand soldered or by machine are produced using lead-free solder.

1.4.2. WEEE directive 2012/19/EU

The EM TEST coupling NX series couplers are 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. EM TEST 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 coupling NX series.

1.4.4. Parts which can be recycled

The NX coupling 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.

10.5 Parts which cannot be recycled

All parts in the coupling NX 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 NX” test system with his coupling NX series 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 NX” generates these tests in accordance with IEC/EN 61000-4-4, -4-5, -4-11, -4-18 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 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, or EM TEST (Switzerland) 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 coupling NX series 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 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 coupling NX series 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 coupling NX series 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 coupling NX series 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 coupling NX series 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 coupling NX series

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 coupling NX 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 EM TEST service center for repair or calibration.

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

1. coupling NX-series CDN
2. Safety manual (only one per delivery)
3. 1 Power mains cable for the coupler supply, country coded
4. 1 HVS – Banana – Banana, 0.3 m (3HU) or 0.5 m (6HU) HV cable, 1 x red, 1 x black
5. 1 BCC 350 – Coax – Coax, 0.4 Meter HV cable SHV - SHV
6. 1 SLC 500 Sys Link Cable, 0.5 Meter, NX5 to compact NX5
7. 1 3-phase EUT supply input cable, 2.0 Meter, 3* black, 1* blue, 1* yegn
8. 1 ESA2, EUT supply adapter 1 phase country coded and 3 phase 16 A or 32 A
9. Earth connection, 0.3 m brass bar including mounting parts (screws M4 x 10)
10. Earth connection, 0.3 m brass bar, mounting parts → has to be prepared and mounted by the user
11. User manual (pdf on the delivered memory stick)
12. Optional items, as ordered

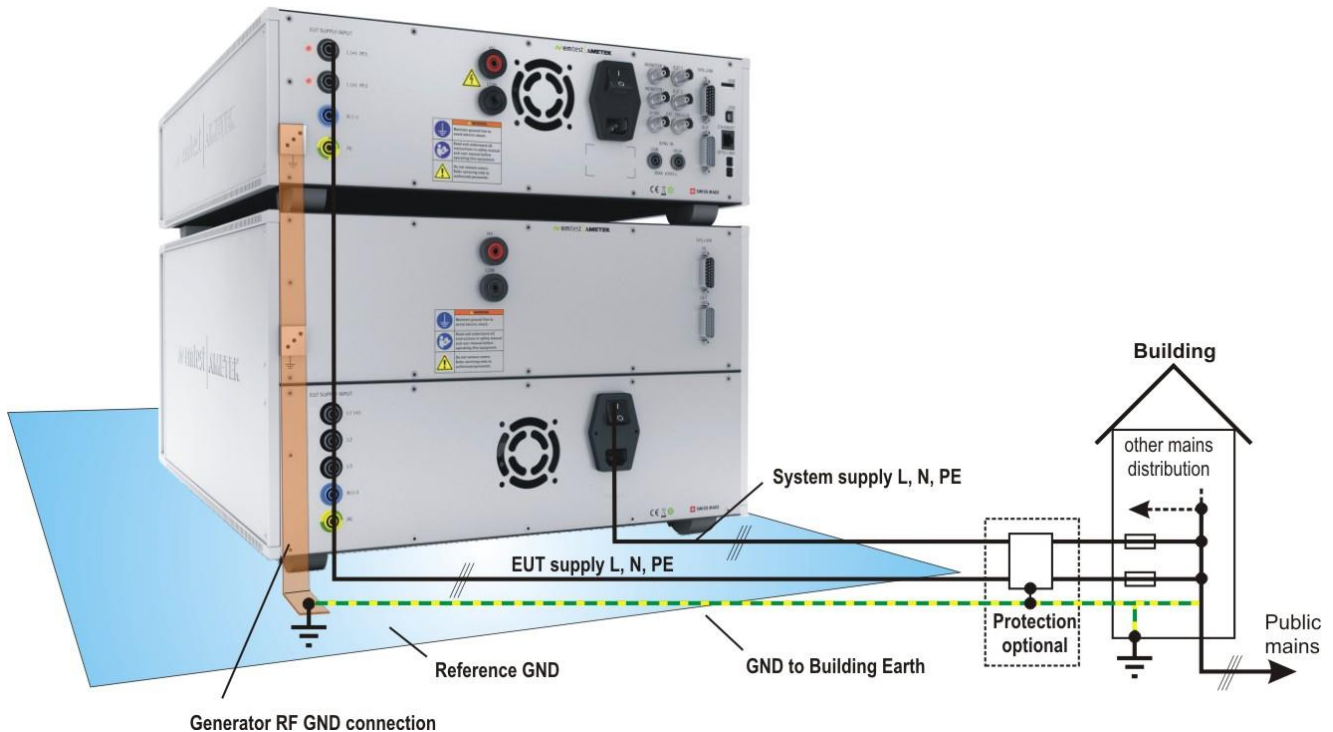
If additional equipment is ordered

- SLC xxx ;Sys Link Cable with various cable length

Check the equipment for signs of transport damage. Any damage should be reported to the Transportation Company and local representative immediately.

3.2.2. 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 coupling, 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.

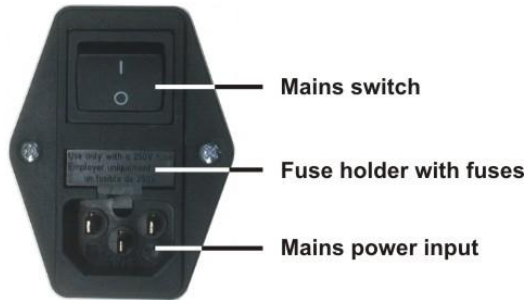
Protection (optional)

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.

3.2.3. 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 2 fuses, (2 x 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

3.2.4. Connecting the compact NX5 system to the ground reference

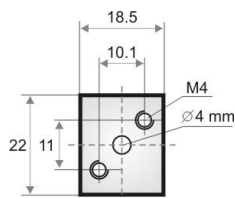


Connection to reference ground

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 18.5 x 22 mm

Earth bolt dimension

Earth bolt dimensions:

Screws: Metric M4 x 10 mm

Distance: 10.1 mm x 11 mm

Plug: Banana plug, Ø 4 mm

3.2.5. Connecting System coupling NX with compact NX5 generator

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



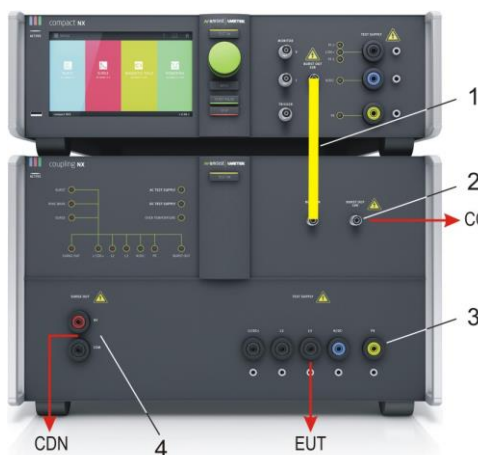
All units, the surge generator, the EFT and the coupling matrix can be installed one above the other. **The coupling matrix should be used as central output for the EUT and should be mounted directly onto the ground reference plane.**

The compact NX5 has to be mounted directly above the coupling NX5 due to the short HV cable. It is recommended to connect the simulator to the ground reference plane of the test set-up.

Figure 6.1: Example of a test rack with compact NX5 and coupling NX5 bs-3-480-16

Connect the following cables between the generator and coupling network

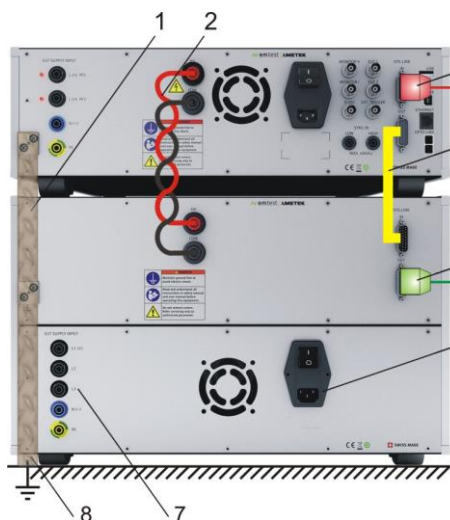
	Name	Length [m]	Connection	Remark
1	SLC 500, Sys Link cable	0.5 m, (1.0 m)	compact NX5 – coupling NX	26 pole D-Sub High Density
2	BCC 350, HVS Burst cable	0.4 m	compact NX5 – coupling NX	Coaxial cable
3	HVS Surge cable	0.5 m	compact NX5 – coupling NX	2 cable for HV and COM
4	Earth connection	0.3 m	compact NX5 – coupling NX	300 mm x 23 mm; 25 mm ²
5	Earth connection	0.3 m	coupling NX – Ref GND	300 mm x 23 mm; 25 mm ²
6	Power mains cable	2 m	Mains – Supply coupling	85V to 154 V 50 / 60 Hz
7	EUT mains	To define	Mains 3-ph – EUT input	Ext fuse required



Connection front side:

1. **BCC 350, Burst connection cable.** Coaxial cable for connect the EFT Burst pulse from the generator to the coupling.
2. Burst output to a capacitive coupling clamp CCI with the **coaxial connection cable BCC 1000.**
3. **Output to the EUT.** Burst and Surge pulses are coupled to the supply lines.
4. Surge output to external CDN for data lines via a **HVS cable.**

Figure 6.2: Front side compact NX5 with coupling NX5



Connection rear side:

1. **Copper braid** for earth the generator and coupling
2. **HVS Surge cable**
3. **SCC AD**, Safety circuit Adapter (Sys.link)
4. **SLC 500** Sys.Link cable (Daisy chain)
5. **SWL AD**, Safety warning Lamp Adapter (Sys.link)
6. Mains supply (control)
7. EUT supply input
8. Earth connection to reference ground plane with low inductance connection.

Figure 6.3: Rear side compact NX5 with coupling NX5

4. List of coupling networks

The separator at the end of the device name has the following meaning:

No separator: one current range

...xxx.1 The device includes taps for cover more than one current range

4.1. Coupling networks for IEC pulses

3- phase Coupling Network for **Burst** up to 5.5 kV and **Surge** up to 5 kV impulses.

Device for 3 x 690 V	EUT ac voltage [V]	EUT dc voltage [V]	EUT Current [A]	Housing
coupling NX5 bs-3-480-16	3 x 480	na	16	19", 6 HU
coupling NX5 bs-3-480-32	3 x 480	na	32	19", 6 HU
coupling NX5 bs-3-480-63	3 x 480	na	63	rack 25 HU
coupling NX5 bs-3-480-125	3 x 480	na	125	rack 25 HU
coupling NX5 bs-3-480-63.1	3 x 480	na	0-32, 63	rack 34 HU
coupling NX5 bs-3-480-125.1	3 x 480	na	0-32, 63, 125	rack 34 HU
coupling NX5 bs-3-480-200.1	3 x 480	na	0-32, 63, 125, 200	rack 34 HU

Device for 3 x 690 V	EUT ac voltage [V]	EUT dc voltage [V]	EUT Voltage [V]	EUT Current [A]
coupling NX5 bs-3-690-16	3 x 690	na	16	19", 6 HU
coupling NX5 bs-3-690-32	3 x 690	na	32	19", 6 HU
coupling NX5 bs-3-690-63.1	3 x 690	na	0-32, 63	rack 34 HU
coupling NX5 bs-3-690-125.1	3 x 690	na	0-32, 63, 125	rack 34 HU
coupling NX5 bs-3-690-200.1	3 x 690	na	0-32, 63, 125, 200	rack 34 HU

Device for 3 x 690 V, 1000 Vdc	EUT ac voltage [V]	EUT dc voltage [V]	EUT Voltage [V]	EUT Current [A]
coupling NX5 bs-3-690-16	3 x 690	1000 V	16	rack 34 HU
coupling NX5 bs-3-690-32	3 x 690	1000 V	32	rack 34 HU
coupling NX5 bs-3-690-63.1	3 x 690	1000 V	0-32, 63	rack 34 HU
coupling NX5 bs-3-690-125.1	3 x 690	1000 V	0-32, 63, 125	rack 34 HU
coupling NX5 bs-3-690-200.1	3 x 690	1000 V	0-32, 63, 125, 200	rack 34 HU

4.2. Special Coupling networks for IEC pulses

Coupling Network for Burst impulses

Device	Impulse voltage	Phases	EUT Voltage [V]	EUT Current [A]
coupling NX5 b-3-480-100	5 kV	3	3 x 480	100



It is forbidden to disconnect the plug in DC operation under voltage.

Risk of a stationary spark!

5. Operating Functions

5.1. coupling NX5 bs-3-480-16 / 32

5.1.1. Front view coupling NX5 bs-3-480-16 / 32

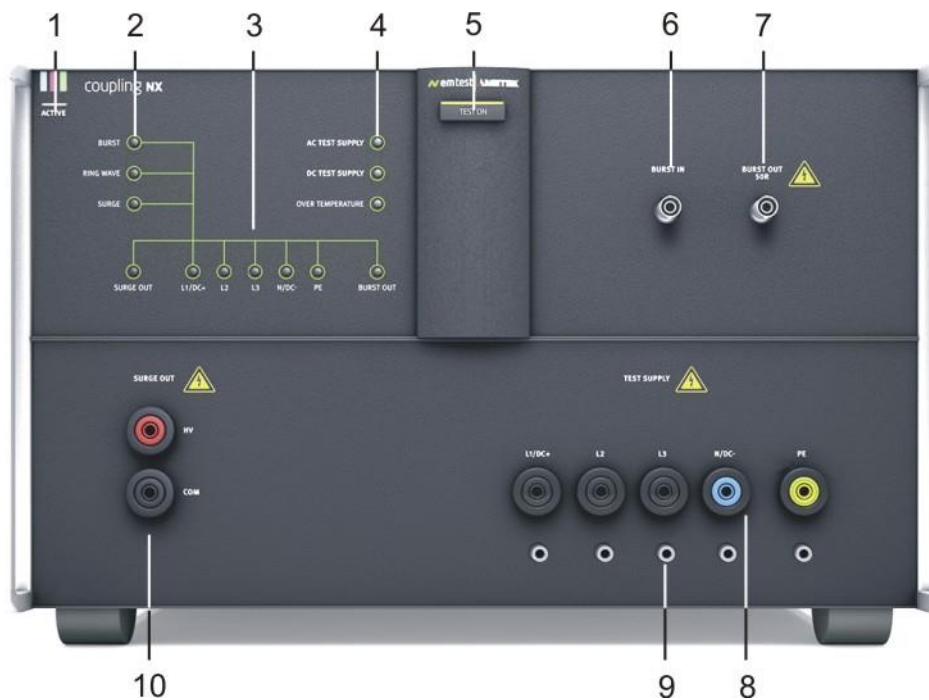


Figure 5.1: coupling NX front side (model for 5kV/16 A / 32 A)

- | | | | |
|---|---|----|---|
| 1 | Active LED | 6 | EFT input from compact NX generator |
| 2 | Phenomenon (Burst, Ring Wave, Surge) | 7 | EFT output to capacitive coupling clamp |
| 3 | Coupling indication LED | 8 | EUT Output L1/DC+, L2, L3, N/DC-, PE |
| 4 | Test Supply AC, DC and Over temperature | 9 | GND reference for EFT verification |
| 5 | "TEST ON" button | 10 | Output HV & COM to external Surge CDN |

1 Active LED

Indicates that the impulse are actual served to this device. Enabled display indicates, that this device is actually not used from the system.

2 Phenomenon

The LED indicates the impulse phenomenon that is actually used for coupling. The coupling NX can handle the following Phenomenon: Burst, Ring wave and Surge

3 Coupling Indication

Selected coupling and selected coupling output

4 EUT Application

- Selected EUT coupling path AC or DC if available
- Over-temperature indication, blinking recommend to switch off the TEST ON, constant waiting for cool down

5 Test ON

Switches on the internal mains contactor and allows to coupling of transient impulses to the lines

6 Burst input plug

Input plug (SHV type) for the EFT/Burst transient impulses from the Burst generator

7 Burst output plug

Output plug (SHV type) of the EFT/Burst transient impulses to a capacitive coupling clamp

8 EUT Output

Output plug to a3-phase EUT. For dc application L1 for positive and N for negative line are used.

9 GND reference for EFT verification

This plug is used for ground the PVF AD1 adapter during a Burst verification

10 Test ON

Surge output HV and COM for external CDN for data lines

5.1.2. Rear side coupling NX5 bs-3-480-16 / 32



Figure 5.2 : Rear side coupling NX

- | | |
|---|--|
| 1 Reference earth connection (Screw M4) | 5 Power switch |
| 2 EUT power L1 & dc+, L2, L3, N & dc-, PE | 6 Mains connector and fuse (5 x 20 mm) |
| 3 Input HV & COM from NX generator | 7 Sys Link |
| 4 Ventilator | |

1 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

2 EUT supply Input L1, L2, L3, N, PE

Input plug for the EUT power supply (4mm safety banana plug up to 32A). The input is not fused.

- L1, L2, L3: Mains voltage to EUT phase L1 to L3
- N: Neutral to EUT supply
- PE: Protected earth to EUT supply

3 HV and COM output

The direct HV and COM input for surge impulses.

4 Ventilation

A power controlled ventilator is cooling the coupling NX5. During the most application the ventilator runs with variable speed depends the cooling requirement.

After long term duration tests the coupling NX 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)

6 Mains Input and Fuse

Mains input for the generator power supply.

Input voltage: 85 V – 254 V ac

Fuses: 115 V: 2 A slow blow, 5 x 20 mm.

230 V: 2 A slow blow, 5 x 20 mm

7 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.

5.2. Rack with built in coupling NX5-bs-480-125

5.2.1. Front and rear view coupling NX5-bs-480-125



Figure 5.3: Test system with compact NX5, coupling NX5 (model for EUT 3 x 480V /125 A)

- | | | | |
|---|--|---|--------------------------------------|
| 1 | Generator compact NX5 | 5 | Power ON switch |
| 2 | Front coupling NX5-bs-3-480-125 | 6 | Ref GND plate for floor standing EUT |
| 3 | EUT output L1, L2, L3, N, PE; 6mm Ø | 7 | Lock for open the rack |
| 4 | Reference ground plate for table top EUT | 8 | Ref GND plate for floor standing EUT |

1 Generator compact NX5

Generator compact NX5 for generate burst and surge impulses.

2 Front coupling NX5-bs-3-480-125

Indication LED and output plugs of the coupling NX5 bs-3-480-125. See the previous chapter 5.1.1. *Front view coupling NX5 bs-3-480-16 / 32* for explain all functions.

3 EUT output L1, L2, L3, N, PE; 6mm Ø

Input plug for the EUT power supply (6 mm safety banana plug up to 125A). The input is not fused.

- L1, L2, L3: Mains voltage to EUT phase L1 to L3
- N: Neutral to EUT supply
- PE: Protected earth to EUT supply

For more information concerning the connectors refer to the Annex in this manual

4 Reference ground plate for table top EUT

Reference ground plate for table top test equipment. Use a low inductance copper foil or braid to connect the reference ground of the table to the test rack.

5 Power ON switch

Main switch to power on the test system (equipment and the EUT supply).

For power ON the EUT press the Test ON button for release the supply to the EUT

6 Ref GND plate for floor standing EUT

Front side reference ground plate for floor standing test equipment. Use a low inductance copper foil or braid to connect the reference ground of the reference GND to the test rack.

7 Lock for open the rack

Rotate the two screws for open the rear of the rack.

8 Ref GND plate for floor standing EUT

Rear side reference ground plate for floor standing test equipment. Use a low inductance copper foil or braid to connect the reference ground of the reference GND to the test rack.

5.2.2. Connecting plate coupling NX5 bs-3-480-125 Rack

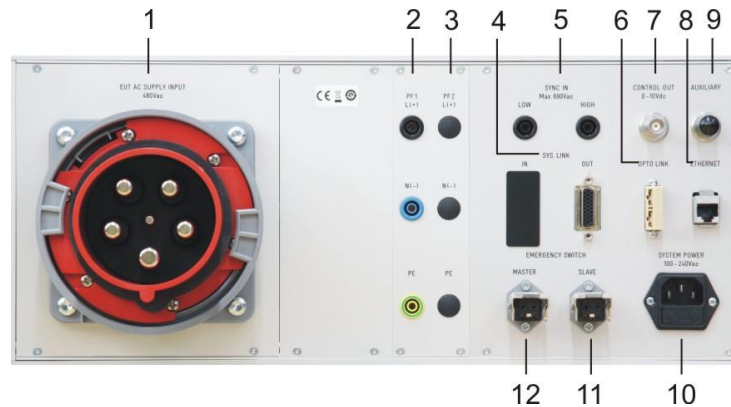


Figure 5.4: coupling NX front view (model for 5kV/100 A / 16 A)

- | | | | |
|---|--|----|-----------------------------|
| 1 | EUT AC supply input 3 x 400 V / 100A | 7 | Control Out 0-10Vdc |
| 2 | EUT supply input PF1 / N, PE; (300 V / 16 A) | 8 | Ethernet interface |
| 3 | EUT supply input PF2 / N, PE; not used | 9 | Auxiliary output not used |
| 4 | Sys Link out | 10 | System power input 100-240V |
| 5 | Sync IN | 11 | Emergency switch Slave |
| 6 | Opto Link interface | 12 | Emergency switch Master |

1 EUT AC supply input 3 x 400 V / 63 A / 100 A / 125 A

EUT mains supply via a CEE 100 A connector. This input EUT is internal not fused. Connectors are rated with 63 A, 100 A or 125 A (color coded)

2 EUT supply input PF1, N, PE

EUT supply input of the compact NX5 generator to PF1, N and PE.
Plug: 4mm banana MC safety plug
EUT: 300 V / 16 A see manual compact NX5

3 EUT supply input PF2, N, PE

This input is not used.

4 Sys Link

Sys Link output to an external device

5 Sync IN

Input for external synchronization signal. (LOW / HIGH) max. 690 Vac. For more information refer to the compact NX5 manual

6 Opto Link interface

Connector for external optical interface to the computer

7 Control Out 0-10Vdc

Output for control an external variable transformer

8 Ethernet interface

Ethernet interface to the remote computer

9 Auxiliary output

This BNC output is not used

10 System power Input and Fuse

Mains input connector to the Rack control devices, NX5 generator and coupling NX5 device.
Input voltage: 100 V – 240 V ac
Fuses: 10 A slow blow, 5 x 20 mm.

11 Emergency switch Slave

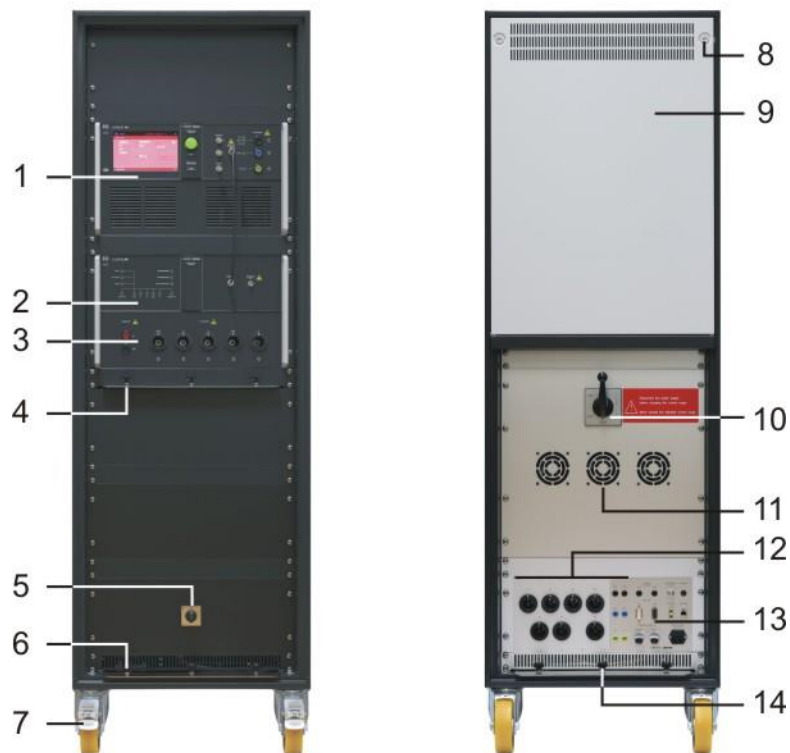
Emergency switch, slave output for control an external device

12 Emergency switch Master

Input for the safety circuit master switch

5.3. Rack with built in Coupling NX5-bs-3-690-200.3

5.3.1. Front and rear view coupling NX5-bs-3-690-200.3



- | | | | |
|---|--|----|---------------------------------------|
| 1 | Generator compact NX5 | 8 | Screw for open rear cover |
| 2 | CDN coupling NX5 bs-3-690-200.x front | 9 | Rear cover |
| 3 | EUT Output 200 A | 10 | Current range selector switch |
| 4 | GND reference for table top EUT | 11 | Ventilation |
| 5 | Main switch | 12 | EUT mains input AC / DC |
| 6 | GND reference front floor standing EUT | 13 | Control plugs |
| 7 | Wheel | 14 | GND reference rear floor standing EUT |

1 Generator compact NX5

Generator with control panel for the complete system

2 CDN couplingNX5 bs-3-690-200.x front

Front panel for of the CDN with output to the EUT. The LED indicates the impulse phenomenon that is actually used for coupling. The coupling NX can handle the following Phenomenon: Burst and Surge

3 EUT output

Output plugs 200 A to L1/DC+, L2, L3, N/DC-, PE. HV-COM is for external surge data line CDN

4 GND reference plate for table top EUT

The reference GND of table top must connected with a low inductive connection to this ground plate.

5 Main Switch

Main switches for the system supply (230V 50/50 Hz)

6/14 GND reference plate for floor standing equipment

On each front- and rear side is a GND reference plate for grounding the test system with the EUT ref GND plane and the building GND. A low ohmic and inductive connection is required for this connection.

7 Wheel

Wheel with foot operated parking brake on front side wheels.

8/9 Screw for open the Rear Cover

For open the cover use a screw driver. Behind this are the cables and connections to the compact NX5 generator.

10 Current range selector switch

EUT current range selector (32A, 63 A, 125 A, 200 A). The current must be changed only in no load and no voltage condition.

12 EUT mains input for AC/DC

Input for 3 x 690 V and 1000 VDC wit Multi Contact plugs.

13 Control plugs

Panel for control and system mains connectors.

5.3.2. Front and rear view coupling NX5 bs-3-690-200.x



Figure 5.3: Test system with compact NX5b, coupling NX5 (model for EUT 3 x 400V /100 A

- | | | | |
|---|---|----|---|
| 1 | Active LED | 6 | EFT input from compact NX generator |
| 2 | Phenomenon (Burst, Ring Wave, Surge) | 7 | EFT output to capacitive coupling clamp |
| 3 | Coupling indication LED | 8 | EUT Output L1/DC+, L2, L3, N/DC-, PE |
| 4 | Test Supply AC, DC and Over temperature | 9 | GND reference for EFT verification |
| 5 | "TEST ON" button | 10 | Output HV & COM to external Surge CDN |

1 Active LED

Indicates that the impulses are actually served to this device. Enabled display indicates, that this device is actually not used from the system.

2 Phenomenon

The LED indicates the impulse phenomenon that is actually used for coupling. The coupling NX can handle the following Phenomenon: Burst, Ring wave and Surge

3 Coupling Indication

Selected coupling and selected coupling output

4 EUT Application

- Selected EUT coupling path AC or DC if available
- Over-temperature indication, blinking recommend to switch off the TEST ON, constant waiting for cool down

5 Test ON

Switches on the internal mains contactor and allows to coupling of transient impulses to the lines

6 Burst input plug

Input plug (SHV type) for the EFT/Burst transient impulses from the Burst generator

7 Burst output plug

Output plug (SHV type) of the EFT/Burst transient impulses to a capacitive coupling clamp

8 EUT Output

Output plug to a3-phase EUT. For dc application L1 for positive and N for negative line are used.

9 GND reference for EFT verification

This plug is used for ground the PVF AD1 adapter during a Burst verification

10 Test ON

Surge output HV and COM for external CDN for data lines

5.3.3. Connecting plate coupling NX5 bs-3-690-200.3 Rack



Figure 5.4: coupling NX rear view

- | | |
|--|--------------------------------|
| 1 EUT AC supply input 3 x 690 V / 200A | 8 Control Out 0-10VDC |
| 2 EUT DC supply input 1000 V / 200A | 9 Auxiliary not used |
| 3 EUT supply input PF1 / N, PE; (300 V / 16 A) | 10 Ethernet interface |
| 4 EUT supply input PF2 / N, PE; not used | 11 System power input 100-240V |
| 5 Sys Link IN / out | 12 Emergency switch Slave |
| 6 Sync IN (Low/High) max. 690 VAC | 13 Emergency switch Master |
| 7 Opto-Link interface | |

1 EUT AC supply input 3 x 690 V / 200A

EUT mains supply via coded MC S16BV-N5 plugs. This input EUT is internal not fused.

5 coding possibilities are available (C1 – C5). These are achieved by varying the positioning of the guide pins and grooves. The coding number is engraved on the connector beside the white marking.

Designation AC	Symbol AC	Symbol DC	Code (MC)
Phase 1	L1	DC +	C1
Phase 2	L2		C2
Phase 3	L3		C3
Neutral	N	DC-	C4
Ground	PE	PE	C5

Important:

Only plugs and sockets with the same code number can be connected together.

2 EUT DC supply input 1000 V / 200A

EUT DC supply via coded MC S16BV-N5 plugs. This input EUT is internal not fused.

3 EUT supply input PF1, N, PE

EUT supply input of the compact NX5 generator to PF1, N and PE.

Plug: 4mm banana MC safety plug

EUT: 300 V / 16 A see manual compact NX5

4 EUT supply input PF2, N, PE

Same parameter as for PF1 (3).

5 Sys Link

System Link output and Input to external devices

6 Sync IN

Input for external synchronization signal. (LOW / HIGH) max. 690 Vac. For more information, refer to the compact NX5 manual

7 Opto Link interface

Connector for external optical interface to the computer

8 Control Out 0-10Vdc

Output for control an external variable transformer

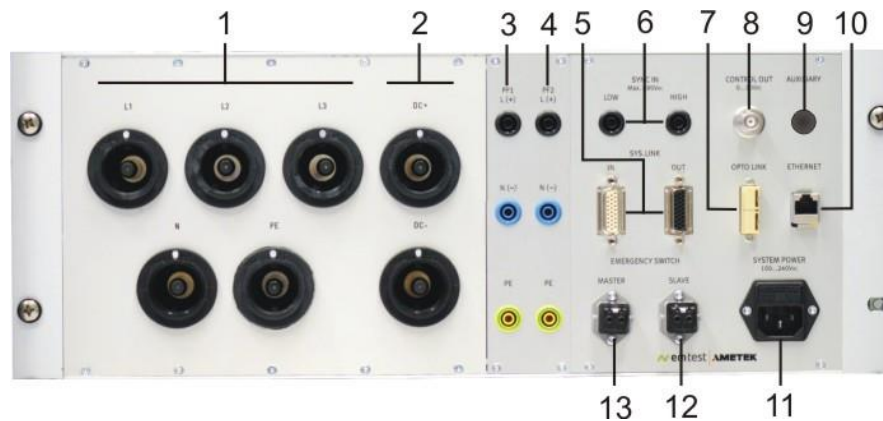


Figure 5.4: coupling NX rear view

- | | | | |
|---|--|----|-----------------------------|
| 1 | EUT AC supply input 3 x 690 V / 200A | 8 | Control Out 0-10VDC |
| 2 | EUT DC supply input 1000 V / 200A | 9 | Auxiliary not used |
| 3 | EUT supply input PF1 / N, PE; (300 V / 16 A) | 10 | Ethernet interface |
| 4 | EUT supply input PF2 / N, PE; not used | 11 | System power input 100-240V |
| 5 | Sys Link IN / out | 12 | Emergency switch Slave |
| 6 | Sync IN (Low/High) max. 690 VAC | 13 | Emergency switch Master |
| 7 | Opto-Link interface | | |

9 Auxiliary output

This BNC output is not used

10 Ethernet interface

Ethernet interface to the remote computer

11 System power Input and Fuse

Mains input connector to the Rack control devices, NX5 generator and coupling NX5 device.

Input voltage: 100 V – 240 V ac

Fuses: 10 A slow blow, 5 x 20 mm.

12 Emergency switch Slave

Emergency switch, slave output for control an external device

13 Emergency switch Master

Input for the safety circuit master switch

5.3.4. Current Range selector NX5 bs-3-690-200

At the rear side is the current range selector switch. It is a mechanical drum switch for adapt the inductance of the decoupling inductor to the current range.



Fig: 5.5



WARNING

Disconnect the power supply before changing the current range!



WARNING

Never exceed the selected current range!

Overload of the current range may overheat and destroy the internal decoupling inductance.

The table below shows the valid current depends on the current range setting

Current range	Valid AC current 50/60 Hz	Valid DC current
32 A	0 - 32 A	0 - 32 A
63 A	0 - 63 A	0 - 63 A
125 A	0 - 125 A	0 - 125 A
200 A	0 - 200 A	0 - 200 A

6. General

The coupling network has to couple the transients well defined to the lines of a power supply system. The coupling is realized by discrete coupling capacitors, having a sufficient voltage capability and bandwidth. The specification is given in IEC 61000-4-4, IEC 61000-4-5.

The coupling/decoupling network is divided in two parts:

- The decoupling and filtering unit
- The coupling unit

The decoupling unit has to

- To decouple the low impedance power mains supply from the test setup.
 - protect other equipment which is connected to the power mains supply
- But which is not part of the test set-up.

The coupling network superimposes the transients to the lines of a power supply system, AC as well as DC supply.

6.1. Coupling modes

The test can be conducted with different coupling modes.

61000-4-5 Surge immunity requirements

- Line or lines to protective earth (unsymmetrical) e.g. L1-PE; L1+L2+L3+N-PE
- Line to Line (symmetrical) e.g. L1-L2 or L3-N

61000-4-4 Electrical fast transients

Coupling mode line, or lines to reference ground. All combinations are possible. The protective earth (PE) is regarded as equal to all other lines and therefore is tested as all other lines

6.2. Coupling to Signal Lines

The coupling to I/O lines is realized with other coupling networks than used for power supply lines. The loading of the I/O lines with large coupling capacitors is mostly not possible. The data transmission may be disturbed. For coupling to I/O lines special couplers acc. to IEC 61000-4-5 are available, such as the DCD series and previous CNV 504 and the CNV 508 family for eight wire systems.

For coupling the Burst transient to signal lines, a capacitive coupling clamp is used. The clamp is connected and controlled via the coupling NX. Normally it is connected directly to the coaxial output of the generator itself.

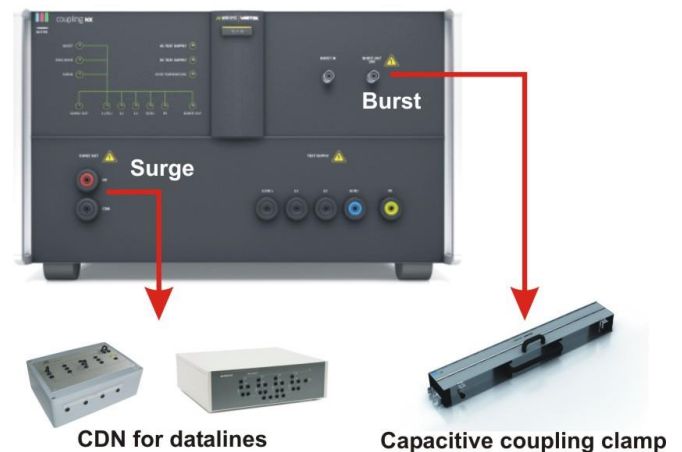


Figure 6.1: External device plug for Burst and Surge

6.3. Surge coupling decoupling networks rated up to 200 A

The voltage drop across the CDN shall not exceed 10 % of the CDN input voltage at the specified current rating, but should not exceed 1.5 mH.

To prevent unwanted voltage drops in the CDN, the value of the decoupling inductors are reduced for CDNs rated at > 16 A. As a consequence, the peak voltage and the duration of the open-circuit voltage waveform which is measured with no load can vary within the tolerances given in Tables 4, 5 and 6 in IEC 61000-4-5: Ed 3. High current EUTs represent lower impedances and cause surges close to short-circuit conditions. Therefore, for high current CDNs it is the current waveform which is predominant. Large tolerances on the voltage definition are acceptable.

Surge voltage parameters under open-circuit conditions	Coupling impedance	
	18 μ F (line-to-line)	9 μ F + 10 Ω (line-to-ground)
Peak voltage Current rating \leq 16 A 16 A < current rating \leq 32 A 32 A < current rating \leq 63 A 63 A < current rating \leq 125 A 125 A < current rating \leq 200 A	Set voltage ± 10 % Set voltage ± 10 % Set voltage ± 10 % Set voltage ± 10 % Set voltage ± 10 %	Set voltage ± 10 % Set voltage ± 10 % Set voltage +10 % / - 15 % Set voltage +10 % / - 20 % Set voltage +10 % / - 25 %
Front time	1,2 μ s \pm 30 %	1,2 μ s \pm 30 %
Duration Current rating \leq 16 A 16 A < current rating \leq 32 A 32 A < current rating \leq 63 A 63 A < current rating \leq 125 A 125 A < current rating \leq 200 A	50 μ s +10 μ s / -10 μ s 50 μ s +10 μ s / - 15 μ s 50 μ s +10 μ s / - 20 μ s 50 μ s +10 μ s / - 25 μ s 50 μ s +10 μ s / - 30 μ s	50 μ s +10 μ s / -25 μ s 50 μ s +10 μ s / - 30 μ s 50 μ s +10 μ s / - 35 μ s 50 μ s +10 μ s / - 40 μ s 50 μ s +10 μ s / - 45 μ s

Data correspond to Table 4 IEC 61000-4-5 Ed3

The selection of the CDN specification from Table 4 IEC 61000-4-5 Ed3 shall be made to match the current rating of the EUT (for example: an EUT rated at 7 A shall be tested using a CDN complying with the specifications of a 16 A rated CDN). Any higher current rated CDN can be used if it meets the specification requirements in Table 4 for the relevant lower current rating of the EUT (for example: a CDN rated 63 A can be used for testing an EUT rated at 5 A, if it meets the specification requirements of a 16 A rated CDN).

Coupling	Range	16 A	32 A	63 A	125 A	200 A
Coupling NX5 bs-3-690-200.3	32 A	ok	ok			
	63 A	ok	ok	ok		
	125 A	ok	ok	ok	ok	
	200 A	ok	ok	ok	ok	ok

7. Technical Data coupling NX

7.1. Technical data coupling decoupling models

7.1.1. Technical data coupling NX5 bs-3-480-xx

Device	EUT nominal Current	Inrush Max. @230V		Weight [kg]	Dimension
		50 Hz	60 Hz		
coupling NX5 bs-3-480-16	16 A	244 A	203 A	app. 30 kg	19" 6HU
coupling NX5 bs-3-480-32	32 A	305 A	254 A	app. 45 kg	19" 6HU
coupling NX5 bs-3-480-63	63 A	610 A	508 A	app. 100 kg	19" rack, 25 HU
coupling NX5 bs-3-480-125	125 A	610 A	508 A	app. 200 kg	19" rack, 25 HU
coupling NX5 bs-3-480-63.1	16, 32, 63 A	610 A	508 A	app. 100 kg	19" rack, 34 HU
coupling NX5 bs-3-480-125.1	16, 32, 63, 125 A	610 A	508 A	app. 180 kg	19" rack, 34 HU
coupling NX5 bs-3-480-200.1	16, 32, 63, 125, 200 A	1220 A	1017 A	app. 200 kg	19" rack, 34 HU

General data for family coupling NX5 bs-3-480-xx.y

Parameter	Value	
Impulse voltage Burst	5.5 kV ± 10%	
Impulse voltage Surge	5.0 kV 2.5 kA ± 10%	
EUT		
Phases	3 phase: L1, L2, L3, N, PE	
EUT supply voltage	3 x 480 VAC ± 10%	
Frequency	50Hz, 60 Hz	
EUT DC current capacity	DC current capacity see table in Chapter 7.3. <i>DC current capability of coupling NX devices</i>	
Output plug		
AC / DC lines	16 A / 32 A	4 mm safety banana plug
	63 A	6 mm safety banana plug (Multi Contact)
	125 A	6 mm safety banana plug (Multi Contact)
	200 A	10 mm safety banana plug (Multi Contact)
Data lines Burst	SHV coaxial	
Data lines Surge	4 mm safety banana plug, double insulated	

7.1.2. Technical data coupling NX5 bs-3-690-xx.y

Device	EUT nominal Current	Inrush Max. @230V		Weight [kg]	Dimension
		50 Hz	60 Hz		
coupling NX5 bs-3-690-16	16 A	244 A	203 A	app. 30 kg	19" 6HU
coupling NX5 bs-3-690-32	32 A	305 A	254 A	app. 45 kg	19" 6HU
coupling NX5 bs-3-690-63.1	16, 32, 63 A	610 A	508 A	app. 100 kg	19" rack, 34 HU
coupling NX5 bs-3-690-125.1	16, 32, 63, 125 A	610 A	508 A	app. 180 kg	19" rack, 34 HU
coupling NX5 bs-3-690-200.1	16, 32, 63, 125, 200 A	1220 A	1017 A	app. 200 kg	19" rack, 34 HU

General data for family coupling NX5 bs-3-690-xx.y

Parameter	Value
Impulse voltage Burst	5.5 kV $\pm 10\%$
Impulse voltage Surge	5.0 kV 2.5 kA $\pm 10\%$

EUT

Phases	3 phase: L1, L2, L3, N, PE
EUT supply voltage	3 x 690 VAC $\pm 10\%$
Frequency	50Hz, 60 Hz
EUT DC current capacity	DC current capacity see table in Chapter 7.3. <i>DC current capability of coupling NX devices</i>

Output plug

AC / DC lines	16 A / 32 A	4 mm safety banana plug
	63 A	6 mm safety banana plug (Multi Contact)
	125 A	6 mm safety banana plug (Multi Contact)
	200 A	10 mm safety banana plug (Multi Contact)

Data lines Burst	SHV coaxial
Data lines Surge	4 mm safety banana plug, double insulated

Dimension and weight

Housing 19" 6HU (models up to 32 A all models if not otherwise specified)

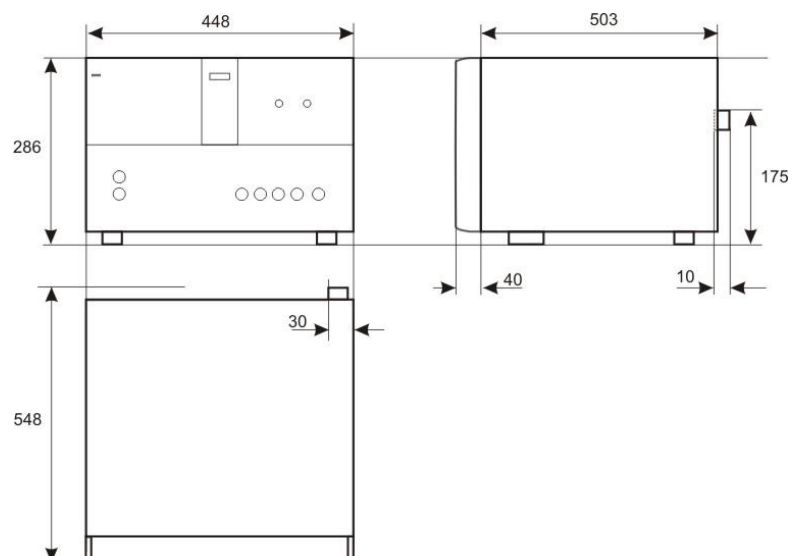


Figure 7.1

7.1.3. Technical data coupling NX5 bs-3-690-xx.2 and coupling NX5 bs-3-690-xxx.3

Device	EUT nominal current [ac/dc]	Inrush Max. @230V		Weight [kg]	Dimension
		50 Hz	60 Hz		
coupling NX5 bs-3-690-16.2	16 A	244 A	203 A	app. 120 kg	19" rack, 34 HU
coupling NX5 bs-3-690-32 .2	32 A	305 A	254 A	app. 140 kg	19" rack, 34 HU
coupling NX5 bs-3-690-63.3	16, 32, 63 A	610 A	508 A	app. 180 kg	19" rack, 34 HU
coupling NX5 bs-3-690-125.3	16, 32, 63, 125 A	610 A	508 A	app. 250 kg	19" rack, 34 HU
coupling NX5 bs-3-690-200.3	16, 32, 63, 125, 200 A	1220 A	1017 A	app. 290 kg	19" rack, 34 HU

General data for family coupling NX5 bs-3-690-xxx.y

Parameter	Value
Impulse voltage Burst	5.5 kV $\pm 10\%$
Impulse voltage Surge	5.0 kV 2.5 kA $\pm 10\%$

EUT

Phases	3 phase: L1, L2, L3, N, PE DC: L1/DC+, N/DC-
EUT supply voltage	3 x 690 VAC $\pm 10\%$
Frequency	50Hz, 60 Hz
EUT DC current capacity	DC current capacity is same as for AC with separate DC input plugs

Output plug

AC / DC lines	16 A / 32 A	4 mm safety banana plug
	63 A	6 mm safety banana plug (Multi Contact)
	125 A	6 mm safety banana plug (Multi Contact)
	200 A	10 mm safety banana plug (Multi Contact)

Data lines Burst	SHV coaxial
Data lines Surge	4 mm safety banana plug, double insulated

7.2. Coupling capacitors and decoupling inductances

7.2.1. Burst coupling to capacitive coupling clamp for signal- and data lines

Burst coupling as per IEC 61000-4-4

Coupling	Coupling all combinations	Coupling capacitor
Supply lines Datalines	Common mode all combinations L1, L2, L3, N, PE SHV 50 Ω output to capacitive coupling clamp	33 nF

7.2.2. Surge coupling

Surge coupling to AC / DC supply lines capacitors and resistors

Standard family	Coupling all combinations	Coupling capacitor	Coupling resistor
IEC 61000-4-5	Line to line	18 μ F	2 Ω
IEC 61000-4-5	Line to ground	9 μ F	12 Ω

Decoupling inductances (lines / neutral)

To prevent unwanted voltage drops in the coupling/decoupling networks, the value of the decoupling element generally must be reduced for coupling/decoupling networks rated at >25 A. The Table below shows the reduced inductor values per line in function of the rated current.

Current	Line / Neutral	PE
16 A	1.5 mH	200 μ H
32 A	0.95 mH	200 μ H
63 A	0.68 mH	150 μ H
125 A	0.56 mH	150 μ H
200 A	0.36 mH	150 μ H

For this case, the "time to half value" of the open-circuit voltage waveform may be reduced in accordance with Tables 4 and 5 in standard IEC 61000-4-5.

Surge coupling to data lines

Output sockets 4mm banana plugs for testing signal and data lines with DCD -, CNV 50x family

7.3. DC current capability of coupling NX devices

Coupler models with a built in ac mains contactor have a reduced dc switching capability. This current rate depends on the following parameters:

- contactor model, applied dc voltage and time constant L/R of the dc circuit

coupling NX with rated power 3x480V 16 A / 32 A

dc time constant	dc current capability	
DC-1 L/R ≤ 1ms	24 V DC	40 A
	48 V DC	23 A
	60 V DC	18 A
	110 V DC	8 A
	220 V DC	1 A
DC-3 L/R ≤ 2ms	24 V DC	19 A
	48 V DC	10 A
	60 V DC	5 A
	110 V DC	1.8 A
	220 V DC	0.3 A

coupling NX with rated power 3x480V 63A / 125A

dc time constant	dc current capability	
DC-1 L/R ≤ 1ms	24 V DC	50 A
	48 V DC	50 A
	75 V DC	50 A
	110 V DC	8 A
	220 V DC	6 A
DC-3 - DC-5 L/R < 2ms	24 V DC	35 A
	48 V DC	25 A
	75 V DC	25 A
	110 V DC	3 A
	220 V DC	1 A

Coupling NX with rated power 3x690V 63A / 125A

dc time constant	dc current capability	
DC-1 L/R ≤ 1ms	< 75 V DC	220 A
	110 V DC	110 A
DC-3 - DC-5 (L/R ≤ 15ms)	< 75 V DC	160 A
	110 V DC	80 A

Coupling NX with rated power 3x690V 200A

dc time constant	dc current capability	
DC-1 L/R ≤ 1ms	< 75 V DC	350 A
	110 V DC	160 A
DC-3 - DC-5 (L/R ≤ 15ms)	< 75V DC	280A
	110V DC	150A

Categories for DC application

The IEC 60947-4-1 rating system is broken down into different utilization categories that define the value of the current that the contactor must make, maintain, and break.

DC-1	Non inductive or slightly inductive loads, resistance furnaces, heaters
DC-3	Shunt motors, starting and breaking of a shunt motor during inching or plugging. The time constant shall be less than or equal to 2 msec. On de-energization, the contactor will break around 2.5 times the starting current at a voltage that may be higher than the line voltage.
DC-5	Series-motors, starting and breaking of a series motor during inching or plugging. The time constant being less than or equal to 7.5 msec. On energization, the contactor sees about 2.5 times the nominal full load current. On de-energization, the contactor breaks the same amount of current at a voltage which can be equal to the line voltage.

This list is not complete. For more information refer to specific manuals of the contactor manufacturers.

7.4. General

7.5. Control supply and Safety

Control supply

Mains (control)	85 V - 264 V, 50/60 Hz
Power	Approx. 50 W
Fuses device supply	115 V: 2 x 2 A slow blow, 230 V: 2 x 2 A slow blow
Fuses Rack system supply	115 V: 2 x 6.3 A slow blow, 230 V: 2 x 6.3 A slow blow

Safety

Security circuit	Control input (24 VDC),	Sys.link (see compact NX manual)
Warning lamp	Floating contact (max. 60 V/2 A)	Sys.Link (see compact NX manual)

7.6. Environment 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)

8. Operation

8.1. Power supply input (EUT)

The power supply input for the EUT is located at the rear side of the coupler. Adapters for customized three phase connectors have to be realized by the user himself or can be manufactured on customer's specification.

The output of the power mains supply (surged lines) for the EUT is located at the front panel of the equipment.

8.2. Synchronization

The synchronization signal for trigger the Surge and optional Burst impulse is generated in the three phase coupler. The NX generator receive the sync signal from the coupling NX via the sys.link cable.

The synchronization signal is taken from the coupler internal lines **L1 - N**. Alternative the phase synchronization can be connected to the SYNC IN plugs at the rear side of the compact NX generator.

Phase synchronization angle in star-delta 3-phase system

The synchronization in a 3-phase coupler system is taken between **L1 – N** lines.

In case of a delta supply without connected neutral line, an artificial high impedance network defines the neutral point. This artificial neutral is taken for the phase synchronization.

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

The tables below shows 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.

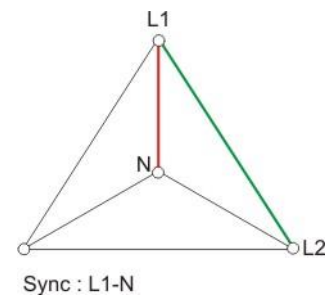


Figure 8.1

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 NX5.

8.3. Operation with coupling NX or generator internal CDN

The coupling network of the coupling NX is operated and controlled via the compact NX generator. After power on, the compact NX generator scans the system for searching all devices.

Power ON procedure

	same time	second	first
	same time	first	second
Result power on	OK	OK	FAIL, generator cannot find the coupling NX, switch OFF / ON compact NX generator

The test generator realizes that a three phase coupler is connected and shows the possible coupling modes in the display of the generator. The complete system is controlled by the generator from front panel or software.

If the external coupling network is connected or switched on later than the generator, the generator must be reset by switching power ON/OFF.

On the front panel of the coupler the user can switch ON/OFF the power supply of the EUT.

Using iec.control software the coupling matrix is completely controlled by software.

Coupling device detection



After power ON the compact NX, the controller searches all external devices.

coupling NX detected: Working with **external coupling device**

coupling NX detected not detected: Working with **internal generator CDN**

8.4. Connection of DC Equipment

For the connection of DC power supplies following connections are provided.

Polarity	3- Phase coupler	1- Phase coupler
+ Pole	L1	L
- Pole	N	N

As DC input the terminals L1 and N must be used. These two plugs are marked at the rear side of with an additional plus or minus sign.

TEST ON Switch

There are **special models for DC current** where the coupling network should have the same parameters for AC and DC. A special DC mains switch is installed, for meet the DC specifications. This costly expansion requires a larger enclosure than the normal version.

Models with **no special DC input** have a reduced DC current capacity. The switching capacity of conventional AC contactors for DC application is limited. Therefore, the specification for DC current and voltage are reduced compared to the AC specifications as shown in the technical data.

9. Test set up

9.1. Test setup for Burst impulses

Coupling to power lines via coupling NX

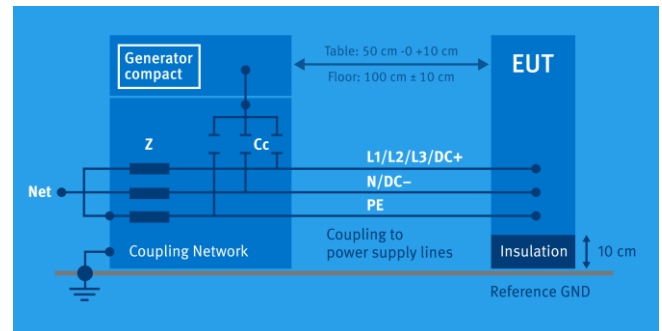


Figure 9.1

Coupling to signal and data lines via an external capacitive coupling clamp.

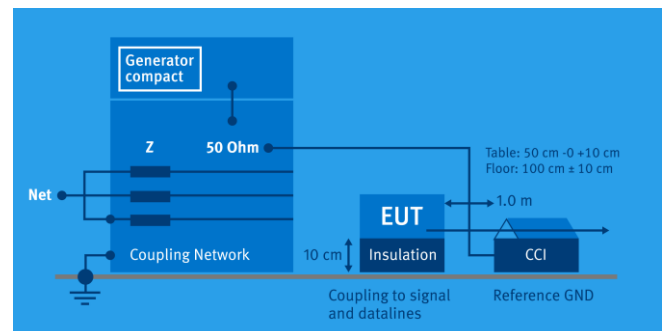


Figure 9.2

9.2. Test level with Burst as per IEC 61000-4-4 Ed.2.

Burst generators, which comply with the specifications of IEC 61000-4-4 Ed3: 2012, have a limitation of the maximum output voltage. Therefore, the maximum test level is limited by the number of coupling on several lines.

Please see the following limits:

Coupling	compact NX5
50 Ω	5500V
1 coupling any	5500V
2 couplings any	5000V
3 couplings any	5000V

Generator with 3- phase coupler	compact NX5
50 Ω	5500V
1 coupling any	5500V
2 couplings any	5000V
3 couplings any	5000V
4 couplings any	4500V
5 couplings any	4500V

9.3. Test setup for Surge impulses

9.3.1. Surge coupling to power lines

Coupling of surge impulses to power lines via coupling NX as per IEC 61000-4-5

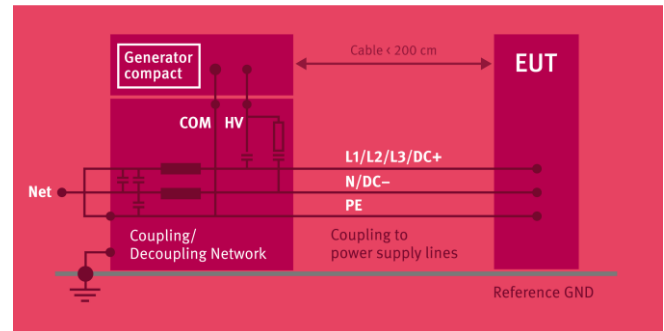


Figure 9.3

9.3.2. Surge coupling to signal- and data lines

Coupling to unsymmetrical signal- and data lines

Coupling to signal and data lines via an external CDN for unsymmetrical signal- and data lines.

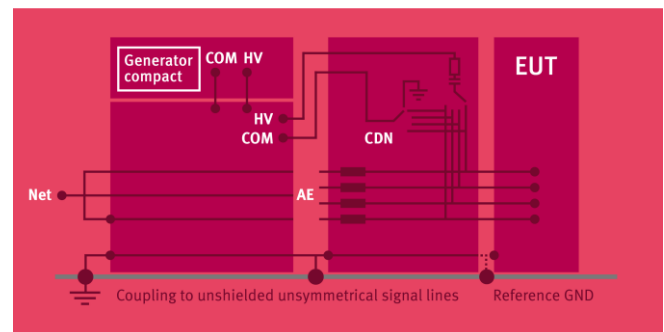


Figure 9.4

Coupling to symmetrical signal- and data lines

Coupling to signal and data lines via an external CDN for symmetrical signal- and data lines.

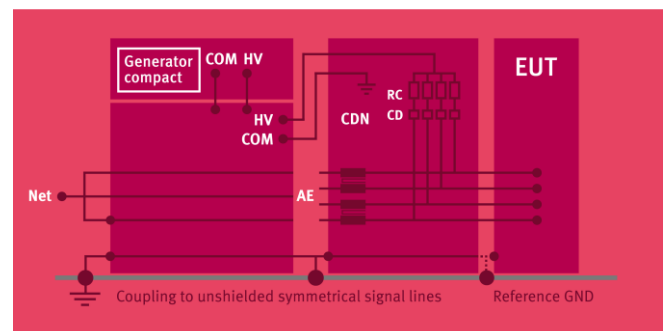


Figure 9.5

10. Maintenance and calibration

10.1. General

The coupling network is absolutely maintenance-free by using.

10.2. Calibration and Verification

10.2.1. Factory calibration

Every EM TEST 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 EM Test equipment are 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.



Example: Calibration mark

10.2.2. Guideline to determine the calibration period of EM Test instrumentation

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

EM TEST 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:

EM TEST 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 has to be defined based on two criteria:

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation has to be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment has to be taken into consideration.
- Based on the experience and observation collected over the years **EM TEST 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.

10.2.3. 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.

10.2.4. 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, EM Test suggests referring to the wave shape and values of the original calibration certificate.

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



Before starting the calibration or verification
remove the EUT Mains Supply
from the generator and from the coupling network

11. Delivery Groups

11.1. Basic equipment

- coupling NX network, type coupling NX series
- 1 Power mains cable for the coupler supply, country coded
- 1 HVS – Banana – Banana, 0.5 Meter HV cable, 1 x red, 1 x black
- 1 BCC 350 – Coax – Coax, 0.4 Meter HV coaxial cable, SHV – SHV connectors
- 1 SLC 500 Sys Link Cable, 0.5 Meter, coupling NX5 to compact NX5
- 1 3-phase EUT Supply Input, 2.0 Meter, safety lab cable, 3* black, 1* blue, 1* yegn
- Earth connection, 0.3 m brass bar including mounting parts, screw M4 x 10 mm
- Earth connection, 0.3 m brass bar, mounting parts → has to be prepared and mounted by the user
- 1 ESA2, EUT supply adapter 1 phase country coded and 3 phase 16 A or 32 A
- User Manual English, delivered on USB memory stick
- Calibration certificate

Identical accessory parts are delivered only once if several devices are orders. The delivered packing list is in each case valid for the delivery.

11.2. Accessories and options

K-VCS-500R Impedance for voltage withstand testing

Technical data K-VCS-500R

Impedance: $500 \Omega \pm 5\%$
 Voltage: 10'000 V
 Current: 20 A
 Connector: Banana plugs on both sides



Figure 11.1

Application

- Connect the K-VCS-500R to the HV output on the front side of the coupling NX series.
- Connect the other side of the K-VCS-500R to the EUT test fixture
- Connect the other cable to the COM at the front side of the coupling NX series

Connect the other side of the cable to the other side of the EUT test fixture

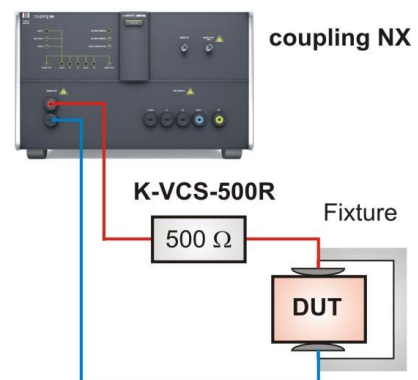


Figure 11.2:

Adapter box with mains adapter

The adapter box can be delivered according to different countries specifications.

This box is available for 16 A and 32 A nominal current.



Figure 11.3:

12. Appendix

12.1. Declaration of CE-Conformity

12.1.1. Declaration of CE-Conformity Coupling Network coupling NX5 bs-3-480-16 / 32

Manufacturer: **EM TEST (Switzerland) GmbH**
Address: Sternenhofstr. 15
CH 4153 Reinach
Switzerland

Declares, that under its 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 / decoupling network
Model Number(s) coupling NX5 bs-3-480-16
coupling NX5 bs-3-480-32

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. Gerstner
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Date 12. December 2016

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A. Burger
Design and Research
Reinach BL, Switzerland
25. February 2016

12.1.2. Declaration of CE-Conformity Coupling Network coupling NX5 bs-3-480-xx.1

Manufacturer: **EM TEST (Switzerland) GmbH**
 Address: Sternenhofstr. 15
 CH 4153 Reinach
 Switzerland

Declares, that under its 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: Test Rack including coupling / decoupling network
 Model Number(s) coupling NX5 bs-3-480-63.1
 coupling NX5 bs-3-480-125.1
 coupling NX5 bs-3-480-200.1

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12.1.3. Declaration of CE-Conformity Coupling Network coupling NX5 bs-3-690-16 / 32

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Model Number(s) coupling NX5 bs-3-690-16
coupling NX5 bs-3-690-32

Low Voltage Directive 2014/35/EU

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EN 61010-1:2011 Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

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12.1.4. Declaration of CE-Conformity Coupling Network coupling NX5 bs-3-690-xx.1

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coupling NX5 bs-3-690-125.1
coupling NX5 bs-3-690-200.1

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12.1.5. Declaration of CE-Conformity Coupling Network coupling NX5 bs-3-690-xx.2

Manufacturer: **EM TEST (Switzerland) GmbH**

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CH 4153 Reinach
Switzerland

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Product's name: Test Rack including coupling / decoupling network
Model Number(s) coupling NX5 bs-3-690-16.2
coupling NX5 bs-3-690-32.2

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12.1.6. Declaration of CE-Conformity Coupling Network coupling NX5 bs-3-690-xx.3

Manufacturer: **EM TEST (Switzerland) GmbH**
Address: Sternenhofstr. 15
CH 4153 Reinach
Switzerland

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Product's name: Test Rack including coupling / decoupling network
Model Number(s) coupling NX5 bs-3-690-63.3
coupling NX5 bs-3-690-125.3
coupling NX5 bs-3-690-200.3

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:

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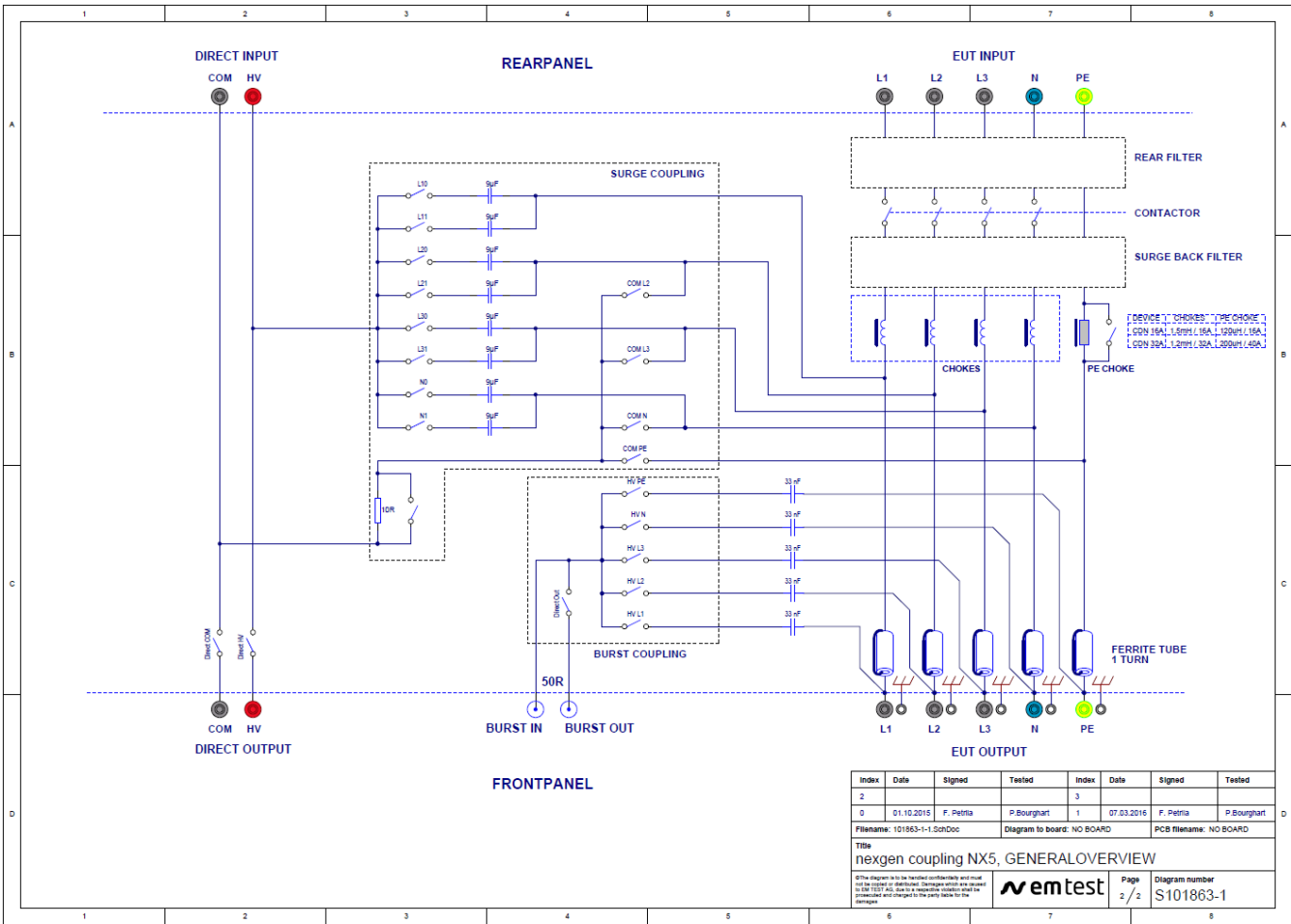
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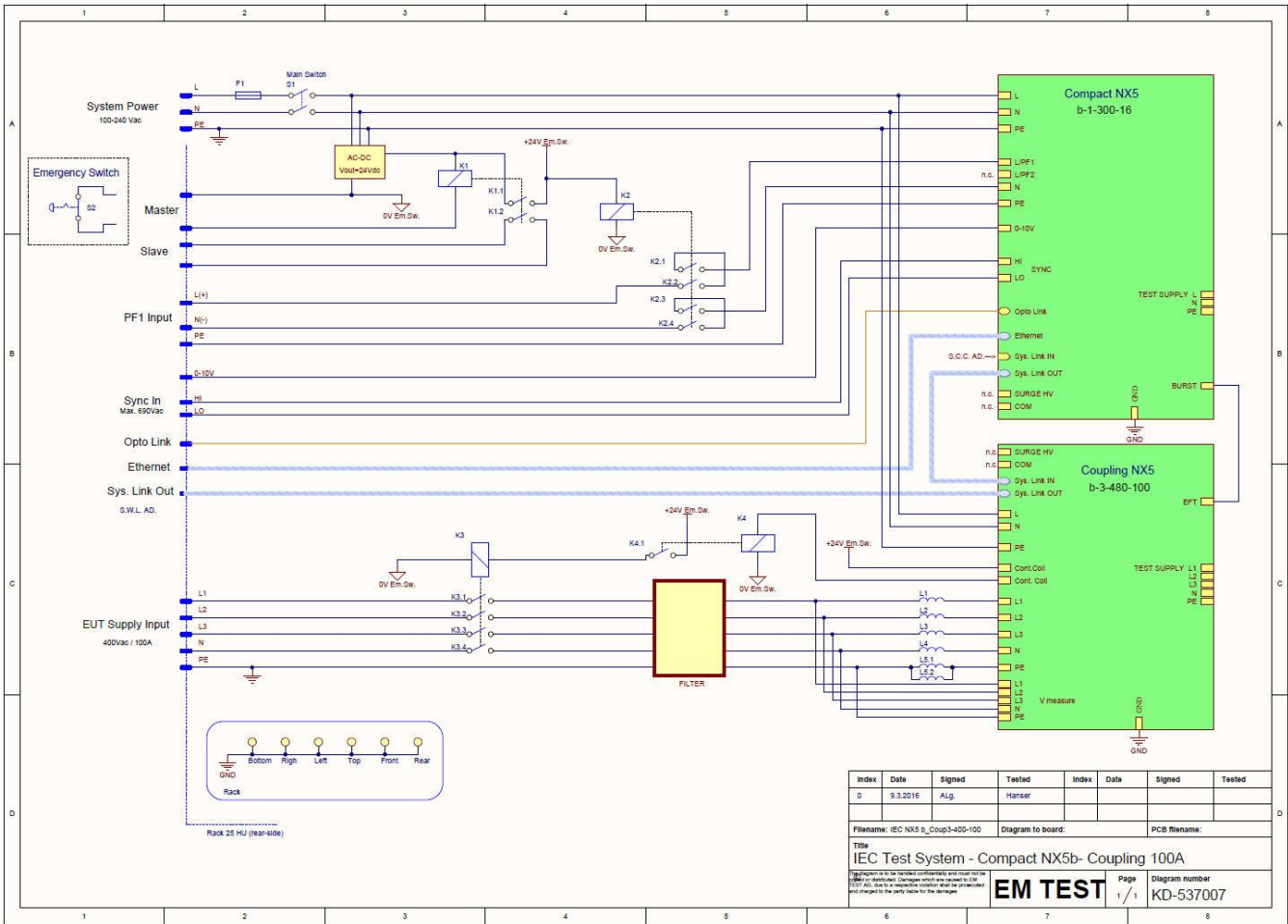
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25. February 2016

12.2. General diagram

12.2.1. General diagram coupling NX5 models for 16 A and 32 A



12.2.2. General diagram Test System Coupling NX5-b - 100A



System Power
100-240VAC / 10A

Emergency Switch

EUT Supply Input
480VAC / 125A

Grounding

PF1 Input
PF2 Input
Control OUT

Sync In
Max. 650VAC

Opto Link
Ethernet
Sys. Link IN
Sys. Link OUT

Compact NX5
bsp-1300-16

Coupling NX5
bs-3480-125

Decoupling inductors

Stack Error
101155

Diagram to board:

Index

Index	Date	Signed	Index	Date	Signed	Tested	Tested
0	10.12.2016	P. Meyer	A. Lignini				

File Name: IEC NX5 125.0

PCB Name:

Title
IEC Test System - 3 x 480 VAC / 125 A

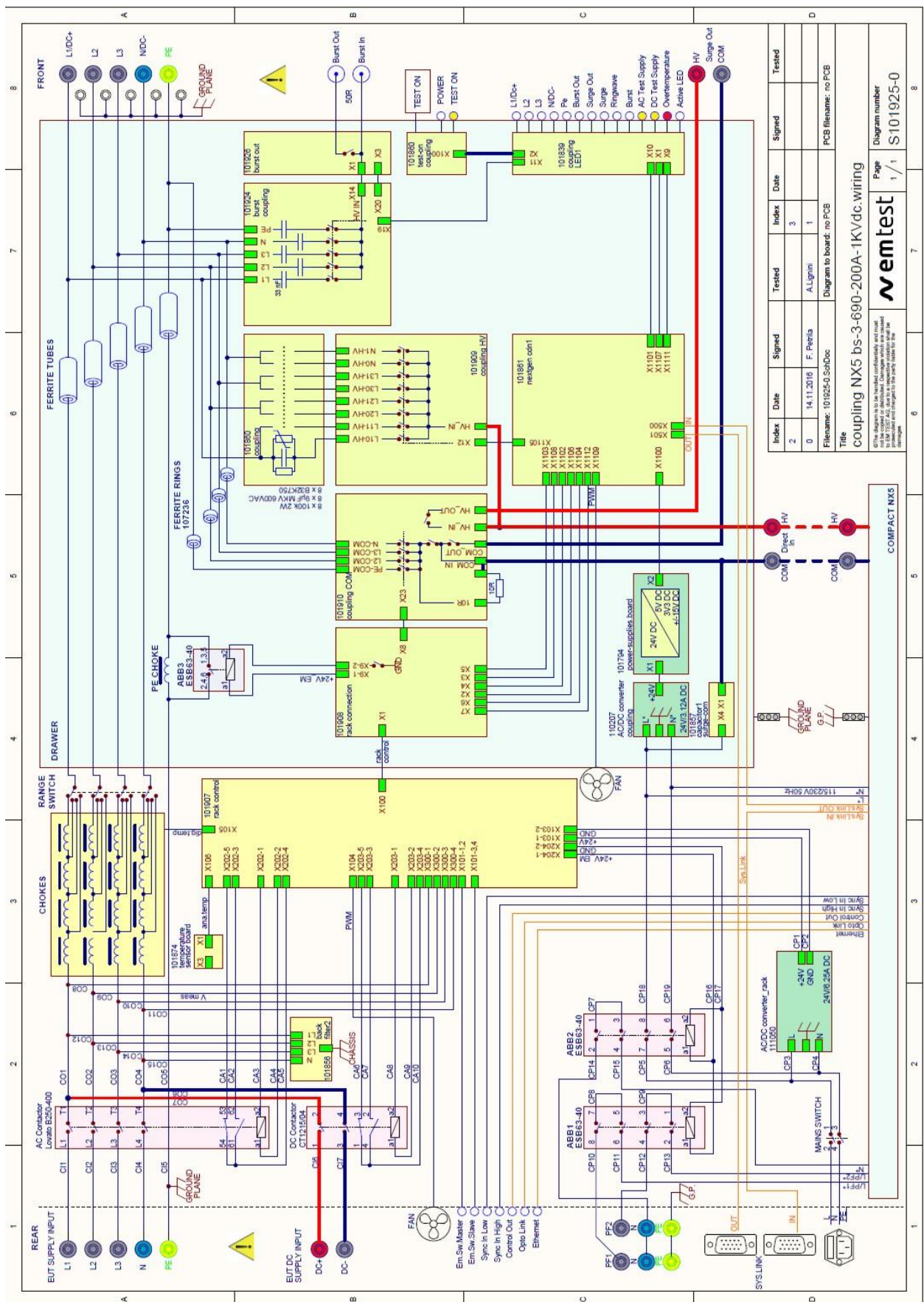
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1 / 1

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KD-

EM TEST

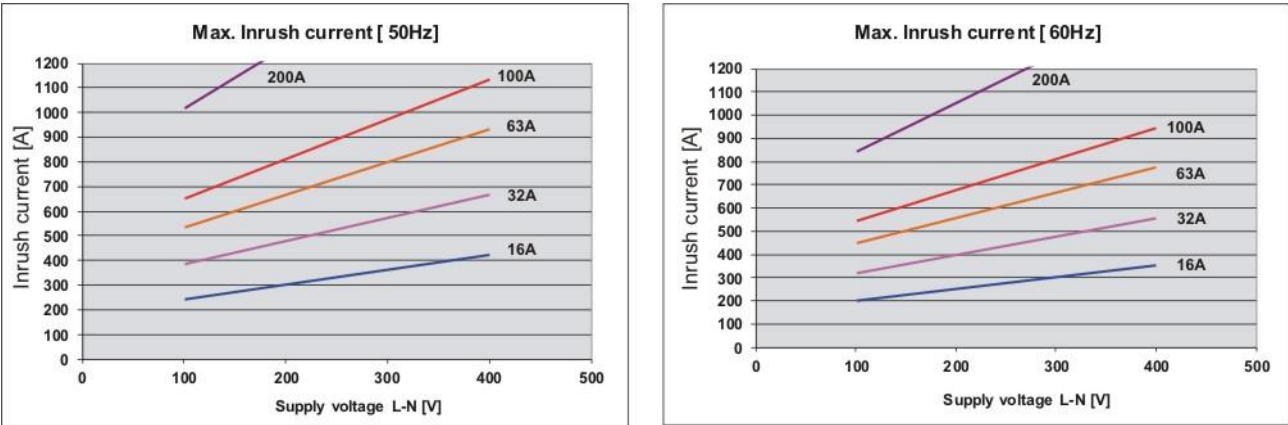
Back Front Side

12.2.4. General diagram Test System compact NX5-bs coupling NX5 bs-3-690-200.3



12.3. Inrush current

The inrush current depends from the mains impedance, the inductance of the surge inductors and the EUT impedance. The inrush current in the tables below are theoretical maximum, calculated with the decoupling inductance only. These values cannot be reached in a real system.



Theoretical maximum Inrush current for coupling NX for 50Hz and 60Hz system related to the supply voltage

12.4. 100 A Plugs and connectors from Multi Contact

Safety sockets KBT6AR-N/...-S with snap-in lock and crimp connection

Model KBT6AR-N/...-S safety sockets are sockets with locking devices and for crimping onto highly flexible Cu conductor with cross-sections of 10mm², 16mm² or 25mm².

This safety socket is suitable for mating with either safety flush-mounting plugs or plugs model KST6AR-N. Used together with a flush-mounting plug it acts as an appliance connector and with plugs as a coupler.

KBT6AR-N/...-S 



Sockets BP...AR-N with snap-in lock and crimp termination

Crimp termination for flexible and highly flexible Cu-cables class 6 (according to IEC 6028). MC recommends a hexagonal crimp. Indent crimping and soldering is also possible. Cables with compacted conductors need a special crimping sleeve.




IH6 + T6N



Safety branch adapter AZB6AR-N-S/6-4

Safety branch adapter with snap-in lock and ergonomic PA/TPE insulation that grips well. Mating plugs with suitable locking devices can be snap-locked into the socket. With one pick-off socket Ø 6mm and two safety sockets Ø 4mm for voltage tests up to 600V, CATIII.

AZB6AR-N-S/6-4 



Safety flush-mounting plugs ID/S6AR-N-B4S with snap-in lock and threaded stud
Model ID/S6AR-N-B4S safety flush-mounting plugs are insulated plugs designed for flush mounting in housings and panels. The plugs are designed to mate with sockets KBT6AR-N. The resulting plug connections are securable by means of snap-in lock. The plug ID/S6AR-N-B4S also mates with Ø 4mm MC Safety plugs, because the Ø 6mm plug has a Ø 4mm socket hole. The internal connection is made with an M6 threaded stud with nuts and washers. These safety flush-mounting plugs are also used to be connected with test leads according to the test accessories IEC/EN61010, (UL3111) and are UL recognized.

ID/S6AR-N-B4S 



12.5. 200 A Plugs and connectors from Multi Contact

Introduction ...10BV...

Single-pole round connectors, insulated, Ø 10mm with bayonet locking

The MC Connectors may be used as “connectors for class II equipment”. The connector itself meets the requirements of double and/or reinforced insulation.

Important note:

The new round connector Ø 10mm fulfils and surpasses the safety requirements for encapsulated plug connectors – protection against electric shock according to IEC 61984.

Panel receptacle

Plug ID/S10BV-C... with bayonet locking and threaded stud

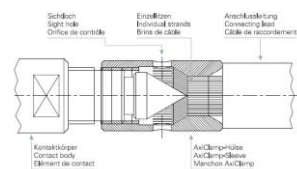
Couplers

Sockets with bayonet locking and AxiClamp termination for flexible cables class 5 and 6 KBT10BV-AX/M...-C...

What is AxiClamp?

The patented lead termination system for electrical and mechanical termination of Cu leads 6mm² – 300mm² class 5 and class 6 according to DIN VDE 0295, IEC 60228.

The individual strands of the connecting lead are screw-clamped against a metal cone by means of a tapered threaded sleeve. The metal cone is part of the contact body. This gives a firm clamp termination with an equally good transition resistances compared to a crimp termination and additional advantages besides.



Bayonet locking system (BV-System)

Plugging procedure:

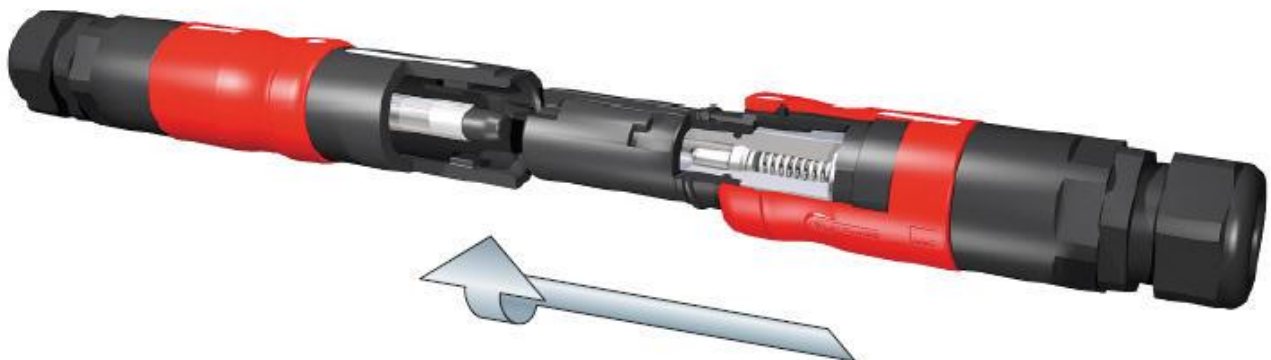
The markings on the plug and socket have to be lined up. Insert plug in with socket to the stop then insert further with axial pressure and turn simultaneously to the right (seen from the plug in the direction of insertion) until the bayonet lock engages.

Unplugging procedure:

Push plug in further and turn simultaneously **1** to left (seen from the plug in the direction of insertion) until the markings are lined up. Pull plug out of socket.

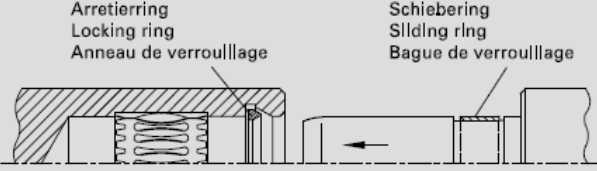
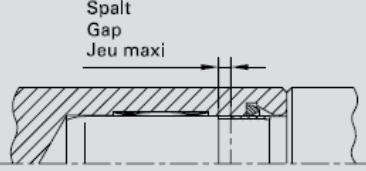
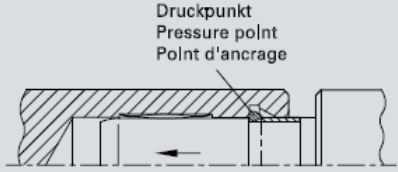
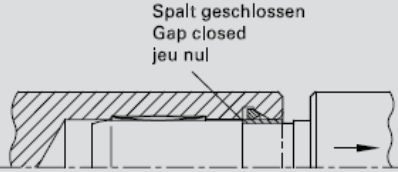
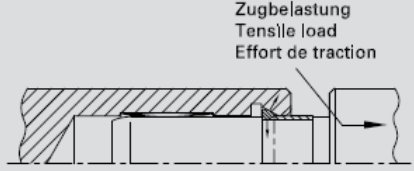
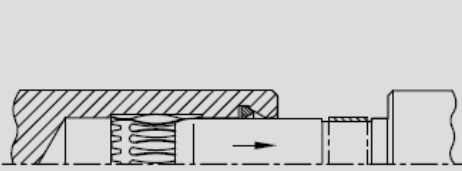
Caution:

During connecting or disconnecting, the 10BV... and 16BV... connectors must be at no load, the 30BV... connectors must be isolated from the power supply. Protection against electric shock has to be provided in the end-use product.







12.5.1. Multi Contact MC Locking system (AR-system)

The MC Locking system (AR) operates on the “push-pull” principle. It is self – locking when connected. Disconnection is effected by an axially displaceable coupling ring: first push, then pull to disconnect. Dirty parts should be cleaned with industrial alcohol before connecting.

Locking	Releasing
	
Insert plug into socket...	To release, push plug further in ...
	
... and lock!	... and pull!
	
To control: Apply tensile load!	The connection is released! 6

12.5.2. Multi Contact MC Crimping materials


Von MC empfohlene
Crimpzangen und
Crimp-EinsätzeMC recommended Crimping
pliers and crimping insertsPincettes à sertir et matrices
recommandées par MC

				
	1	2	3	4
Type Type Type	DMC PV-CZL	BEKU Apparatebau M-PZ13	Elpress M-PZ-T2600	Elpress V1311C
Bestell-Nr. Order No. No. de Cde	32.6001	18.3700	18.3710	¹⁾
Für Leiterquerschnitt For conductor cross section Pour section du conducteur	2,5mm ² – 6mm ²	6mm ² – 25mm ²	10mm ² – 95mm ²	10mm ² – 300mm ²
Crimpform Crimp form Forme de matrice	Achtdornpressung Eight indent crimp Sertissage à huit pans	6-kant Hexagonal 6 pans	6-kant Hexagonal 6 pans	6-kant Hexagonal 6 pans
Antrieb Tractive system Mise en oeuvre	Hand Hand A la main	X	X	X
	Hand-Hydraulisch Hand-Hydraulic A la main-Hydraulique			X
Bedienungsanleitung ²⁾ Operating instructions ²⁾ Mode d'emploi ²⁾		MA224	MA226	MA069

Einsätze

Inserts

Matrices

					Crimphülsenmasse für Leiterklasse 6 ³⁾ Sizes of crimp sleeves for conductor class 6 ³⁾ Dimensions des fûts à sertir pour classe conducteur 6 ³⁾		
Leiterquerschnitt Conductor cross section Section du conducteur		Crimpzange Crimping pliers Pince à sertir	Einsatz Insert Matrice	Bestell-Nr. Order No. No. de Cde		X = Prüfmass X = Control dimension X = Cote de contrôle	
mm²	AWG				Ø A mm	Ø B mm	X mm
6	8	2	MES-PZ-TB5/6	18.3701	4	6	–
10	6	2	MES-PZ-TB8/10	18.3702	5	8	6,3
16	4	2	MES-PZ-TB9/16	18.3703	6	9	7,3
25	2	2	MES-PZ-TB11/25	18.3704	8	11	8,8
35	1	3	TB9-13 (KRF)	18.3712	9	13	10,2
50	1/0	3	TB11-14,5 (KRF)	18.3713	11	14,5	11,4
70	3/0	3	TB8-17 (KRF)	18.3711	13	17	13,4
95	4/0	3	TB20 (KRF)	18.3714	15	20	16,4
120		4	B22 (KRF)	1)	17	22	16,3
150		4	B25 (KRF)	1)	19	25	20,3
185		4	13CB27 (KRF)	1)	21	27	20,5
240		4	13CB30 (KRF)	1)	24	30	23,3

¹⁾ Nicht von MC geliefert. Bestell-Unterlagen unter:
www.multi-contact.com > Produkte >
Industrie-Steckverbinder > Technische Info >
Crimpzangen

²⁾ siehe www.multi-contact.com

³⁾ Gemäss IEC 60228, DIN VDE 0295,
Crimphülsenmasse für Leiterklasse 5, auf
Anfrage.

¹⁾ Not delivered by MC. Download of ordering
informations: www.multi-contact.com > Products
> Industrial Connectors > Technical Info >
Crimping pliers

²⁾ see www.multi-contact.com

³⁾ According to IEC 60228, DIN VDE 0295, sizes of
crimp sleeves for conductor class 5, on Request.

¹⁾ N'est pas livré par MC. Informations de
commande sous: www.multi-contact.com >
Produits > Connecteurs Industriels > Fiches
Techn. > Pince à sertir

²⁾ voir www.multi-contact.com

³⁾ Selon CEI 60228, DIN VDE 0295, dimensions des fûts
à sertir pour classe de conducteur 5, sur demande.