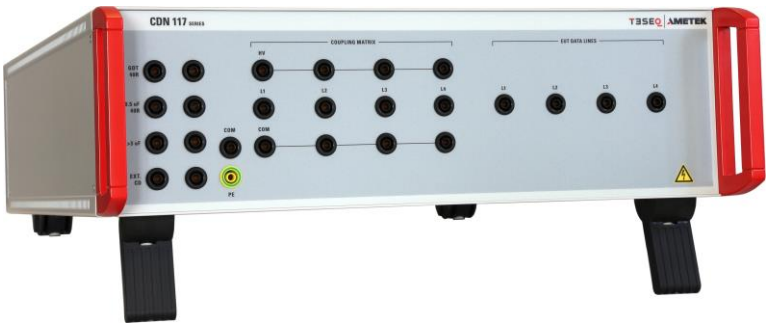
.

Operating-manual



CDN 117A - series

CDN 117A-C4-4-1
CDN 117A-C6-4-1

Coupling network for Surge and Ring wave to signal and datalines

IEC 61000-4-5
IEC 61000-4-12
EN 61000-4-5
EN 61000-4-12

The coupling network of the CDN 117A series are designed for coupling ringwave, surge- or telecom pulses to signal or data-lines.

The coupling network expands the range of application of the impulse generator of the NSG 3040A and NSG 3060A series, for testing signal and datalines.

Main characteristics are the advantages for handling and the easy using with banana plugs.

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Content

1. General

1.1. Intended use

Coupling decoupling networks of the CDN 117A seriesare used for simulating conducted electromagnetic interference effects for immunity testing to international, national, and manufacturers' standards.

The CDN's are 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.

Only *qualified personnel* who deal with attendant hazards in impulse generators, can perform installation and servicing. Before putting in service the attached safety and user manual must be read and applied. The Safety and user manual are an essential part of the equipment and must be available to the operator always. The user must obey all safety instructions and warnings.

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 is located in a Faraday cage.

1.2. Safety label on the device

Please take note of the following explanations of the symbols used 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 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. Safety

2.1. Safety aspects

Read the following operation manual carefully. Pay special attention to both safety and operation details!!!
Observe all of these precautions to ensure your personal safety and to prevent damage to the test equipment.
The generators correspond to Installation Category II (overvoltage category).

Symbols marked on equipment

	**WARNING**	Risk of electric shock. Dangerous voltages are present. Use extreme care. Refer to the manual.
	**GROUND**	Indicates protective earth terminal

Power Mains
The equipment is not intended to operate with a power mains supply. The equipment is designed (depending the model) to operate with maximum dc voltage up to 250 Vdc between the lines, or between line and ground. A proper protective ground connection, through the grounding conductor in the power cord of the impulse generator, is essential for safe system operation.

Safety Ground and grounding the generators
The generators are grounded through the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle where earth ground has been verified by a qualified service person. Do this before making connections to the input or output terminals of the test equipment.
Without the protective ground connection, all parts of generators are potential shock hazards. This includes knobs and controls that may appear to be insulators. The equipment **MUST NOT BE USED** if this protection is impaired.

Use the proper power cord
Use only the power cord and connector specified for your product. Only use a power cord that is in good condition.

Use the proper fuse
To avoid fire hazard, use only the fuse specified in the parts list for your product, with matching type, voltage rating, and current rating.

Do not remove covers or panels
To avoid personal injury, do not operate the generators without the panels in place or covers.

Do not operate in explosive atmospheres
The generators provide no explosion protection from electrostatic discharges or arcing components. Do not operate them in an atmosphere of explosive gases around explosive chemicals.

Electric Overload
Never apply a generator's voltage to a connector which is not specified for that voltage range.

☞	**Read the Operation Manual of each instrument carefully!**

2.2. Testing and danger

All tests offered by the High Voltage or EMC generators are immunity tests on electronic equipment or devices. These tests are potentially dangerous for the operator. Therefore, it is the responsibility of the user to avoid critical failures and risks to the environment and operator.

Long and distributed lines of the DUT are able to radiate certain energy to their vicinity. Therefore, it is also the responsibility of the user to decide whether it is allowed to conduct immunity tests in a given installation.

National and international recommendations regarding human safety must be followed.

People with certain health conditions, e.g. with a heart pace-maker or similar device, must be excluded from testing.

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

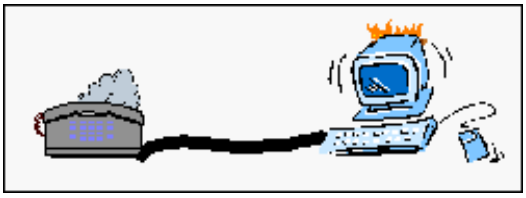
Generator and coupling/decoupling network must be grounded and connected to reference plane.

2.2.1. Coupling networks

- The coupling network has mostly no On- Off switch and no internal fuse for the EUT power supply. This is caused the different regulation in each country. The device under test must be protected by the user in an adequate safe solution. As an option special adapters and switches can be built in, but the user must to specify this special solution.
- Generators and coupling devices must be grounded and connected to the reference ground.
- For coupling pulses to the lines, the coupling path must be setted.
- If a line has not to be coupled, it is necessary to disconnect or switch off this coupling path.
- Special safety adapter cables are part of the delivery.

2.2.2. Danger from EUT

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



Therefore, the operator shall take the following precautions:

- As soon as the EUT ceases to operate as intended, the test shall be stopped immediately.
- In case of internal damage, the operator may be exposed to high frequency signals of high power (up to 75 Watts and more) anywhere on the EUT.
- Cables and connectors can be overloaded by high voltages or energies.
- Due to internal damage of components fire and/or explosion may occur.
- Unintended use of the EUT may cause hazardous situations near the test area.

Never touch the EUT or anything connected to the EUT during a test.

It is suggested to read the operating manual carefully and completely. It is necessary to observe and comply with all safety recommendations.

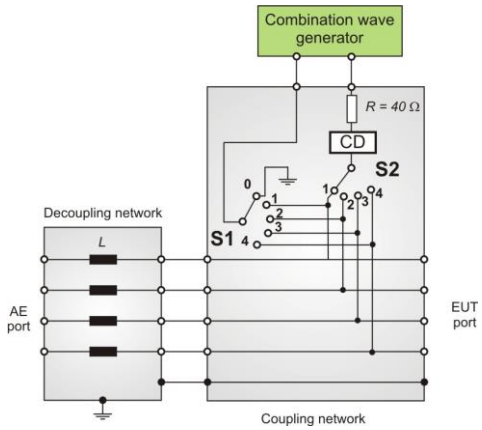
3. Standards for testing with coupling networks of CDN 117A series

The coupling network CDN 117A seriesare suitable for testing the following standards:

IEC 61000-4-5 Surge 1.2/50µs with capacitor and gas arrestor

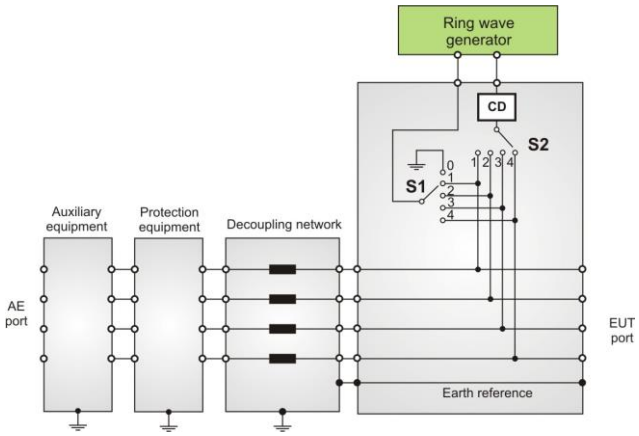
IEC 61000-4-12 Ring wave

The figures below show the setup as per the applied standards.



IEC 61000-4-5 Ed.3 Figure 9

Coupling and decoupling network for unshielded unsymmetrical interconnection lines for coupling line to line and line to ground via capacitor and gas arrestor



IEC 61000-4-12 Ed.3 Figure 8

Coupling and decoupling network for unshielded unsymmetrical interconnection lines for coupling line to line and line to ground via capacitors

3.1. Description

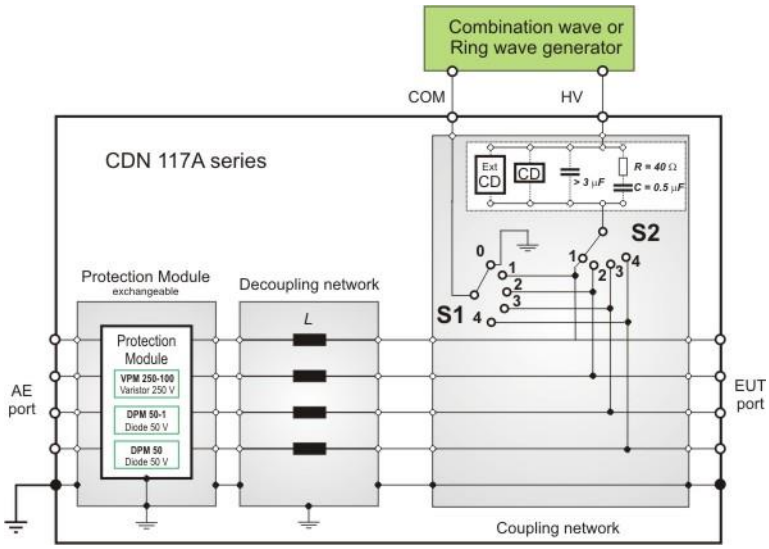
The CDN 117A is a coupling/decoupling network for coupling Surge and Ringwave impulses to unsymmetrical signal- and data-lines. The surge impulses as per IEC 61000-4-5 can be coupled as per standard via a coupling impedance of 5.0 µF and 40 Ω. Alternatively, a coupling via a gas discharge tube (GDT 90 V) is possible. The advantage is, that the GDT is built in the bridge. So, it is possible to adapt the breakdown voltage of the GDT to the EUT line voltage.
For Ringwave application to signal and datalines, the CDN 117A offers a bridge for coupling the impulse via a capacitor > 3 µF.

3.2. Coupling- decoupling network models

Following coupling decoupling network for signal and data lines exis:

Model	Signal lines	EUT current max.* I	Test level max.	Coupling gas arrestor	0.5µF	> 3 µF
CDN 117A C4-4-1	4 wires	1 A	4.8 kV 1.2/50us	x	x	x
CDN 117A C6-4-1	4 wires	1 A	6.6 kV 1.2/50us	x	x	x

na= no application
* max intermittent current for 1 models = 2A for 20 minutes, pause 20 minutes



3.3. Impulse generators

The CDN 117A coupling/decoupling series can be used for the following surge and ring wave generators:

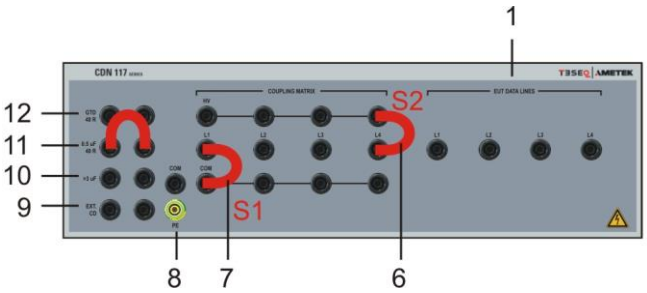
Device	previous name	Pulse form	Remark generator
NSG 3040A	All models	1.2/50µs - 8/20µs	up to 4800V as per IEC 61000-4-5
NSG 3060A	All models	1.2/50µs - 8/20µs / Ring wave	up to 6600V as per IEC 61000-4-5/12
NSG 3040	All models	1.2/50µs - 8/20µs	up to 4800V as per IEC 61000-4-5
NSG 3060	All models	1.2/50µs - 8/20µs / Ring wave	up to 6600V as per IEC 61000-4-5/12

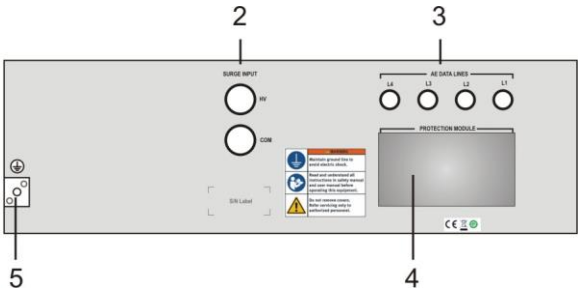
4. Device functions and operating

The difference between the various models is:

- Number of data lines (CDN 117A Cx-4-1 series with 4 lines
- nominal voltage and current level of the signal- and data lines
- various test voltage level of 4.8 kV and 6.6 kV

4.1. Coupling network CDN 117A C4-4-1 and CDN 117A C6-4-1



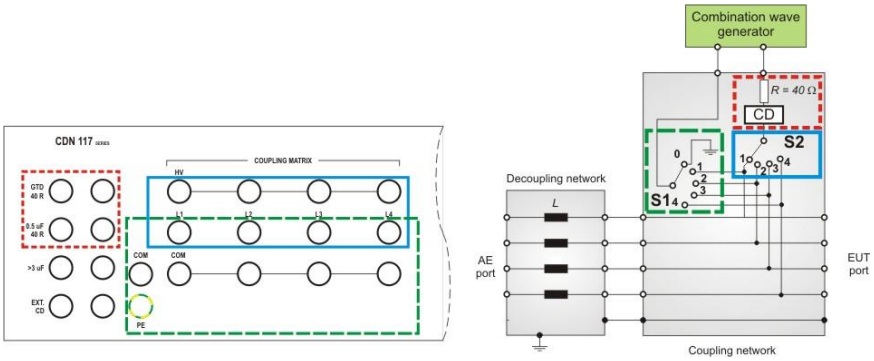


1 Signal output to EUT
2 HV COM input (Generator)
3 Signal input (AE port)
4 Protection device
5 PE earth plug to ground
6 Coupling HV to L1 - L4 (S2)
7 Coupling L1 L4 to COM (S1)
8 Connection COM-GND (S1)
9 External coupling
10 Coupling 3 µF Ringwave
11 Coupling 0.5 µF / 40 Ω Surge
12 Coupling GDT (inside the bridge) / 40 Ω Surge

4.1.1. Coupling Surge and Ringwave

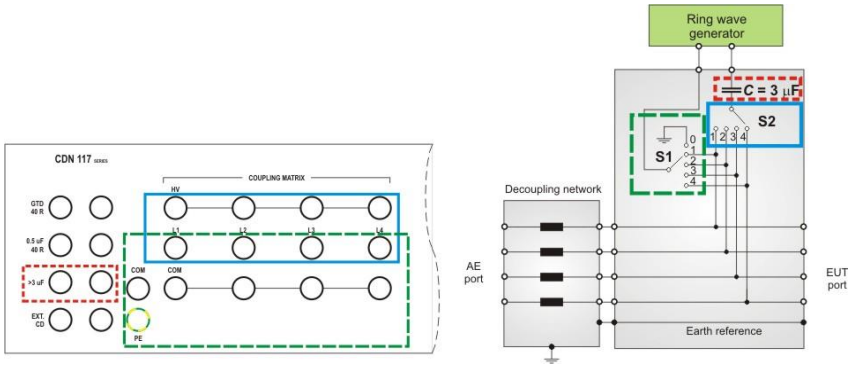
The coupling networks of the CDN 117A seriesare suitable for tests according the following standards:

IEC 61000-4-5 Surge impulse with combination generator 1.2/50 µs / 8/20 µs



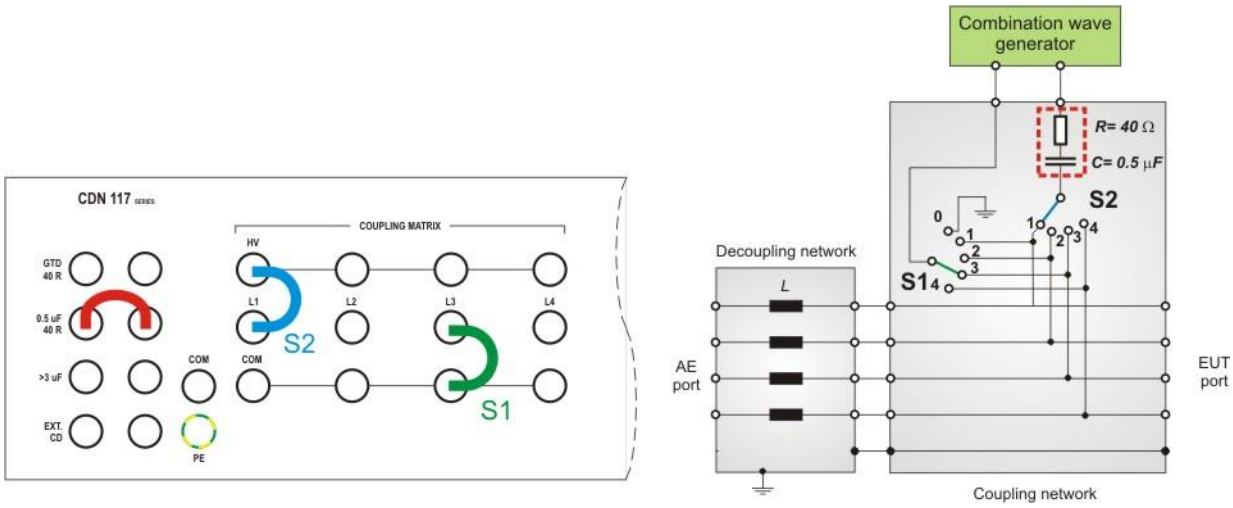
The **GTD** is line voltage related (90 V type) and inside the bridge located. Other line voltages may require an GTD with adapted line voltage. For more information see *4.2.2.Coupling with 40 Ohm and Gas Discharge Tube (GDT)*

IEC 61000-4-12 Ringwave



4.2. Coupling Line to Line

4.2.1. Coupling with 40 Ω resistor and 0.5 µF capacitor

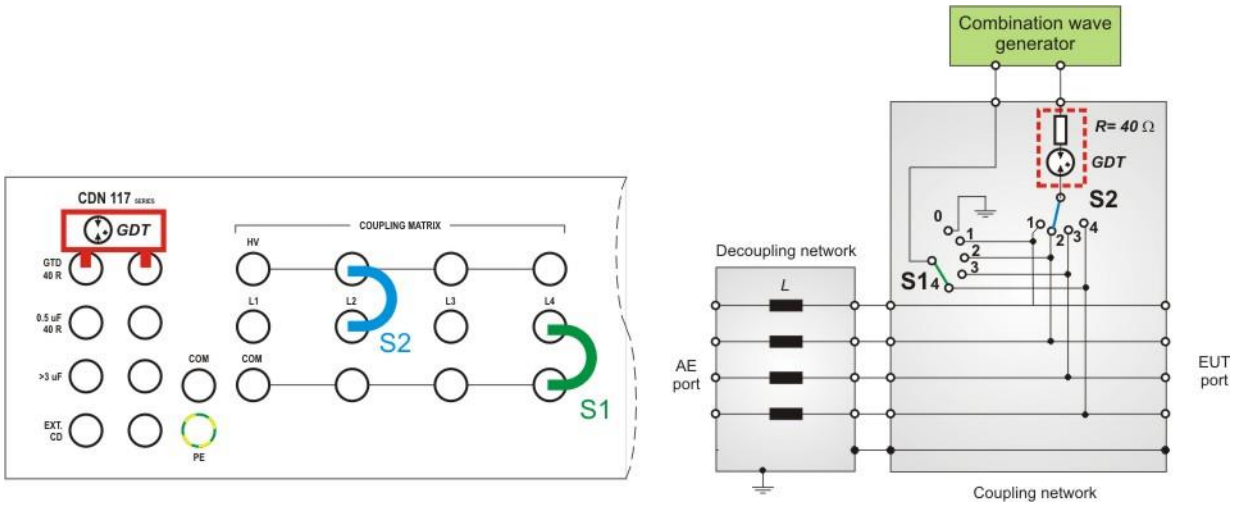


Example for coupling as per IEC 61000-4-5

Coupling: Capacitive with 0.5 µF and 40 Ω resistor
Coupling Path: Line L1 (S2) to Line L3 (S1)

4.2.2. Coupling with 40 Ohm and Gas Discharge Tube (GDT)

Use only bridges with built in GDT (gas discharge tube). Otherwise the generator circuit is loaded with the line voltage in series with 40 Ω. This can destroy the generator



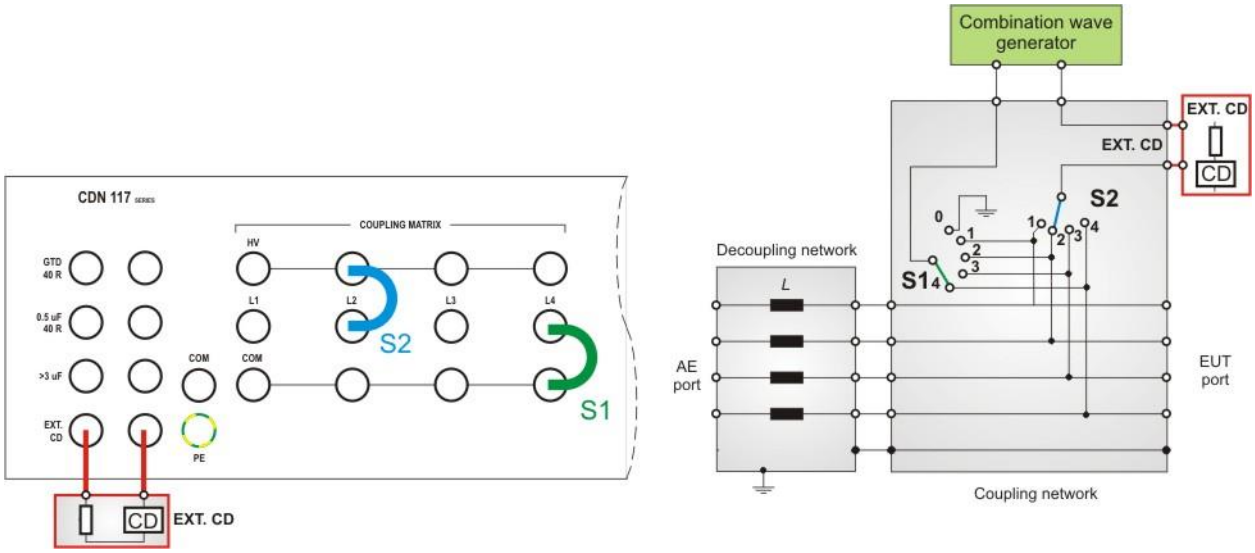
Example for coupling as per IEC 61000-4-5

Coupling: Gas discharge tube (GDT) and 40 Ω resistor
Coupling Path: Line L2 (S2) to Line L4 (S1)

NOTE: The GDT is inside the bridge!

Max. applied EUT voltage with GDT coupling is given by the GDT breakdown voltage of 90 V. Other line voltages may require an GTD with adapted line voltage.

4.2.3. Coupling with external coupling device



Example for coupling as per IEC 61000-4-5

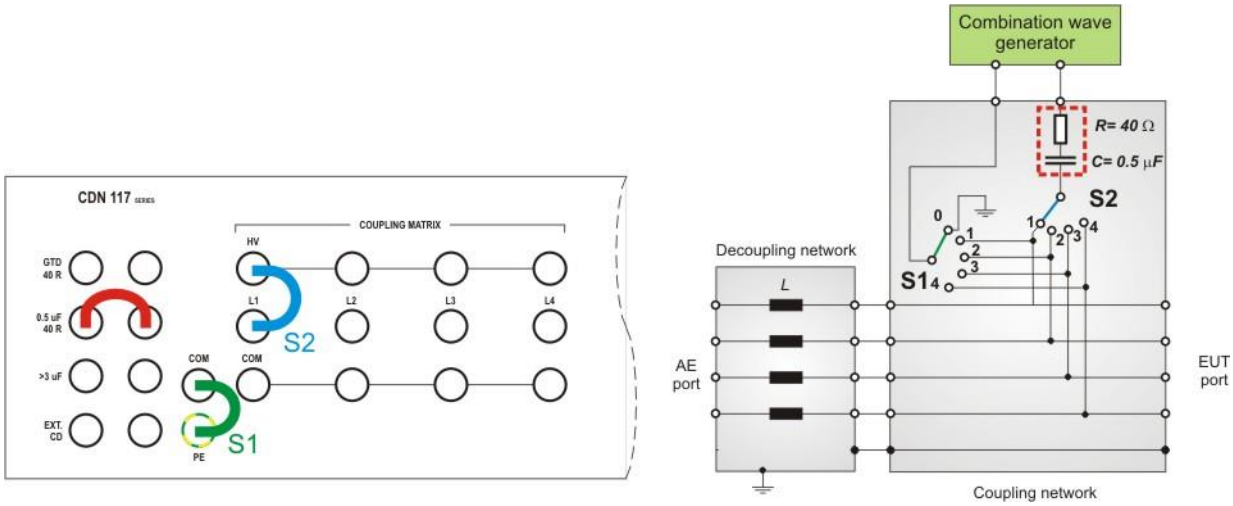
Coupling: Ecternal coupling device, designed by the user
Coupling Path: Line L2 (S2) to Line L4 (S1)

The external coupling device requires the following components

- **Coupling:** **Capacitor or GDT** (gas discharge tube) od clamping **diode** / **varistor**
- **Resistor:** **For limit the max. surge impulse current**

4.3. Coupling to GND

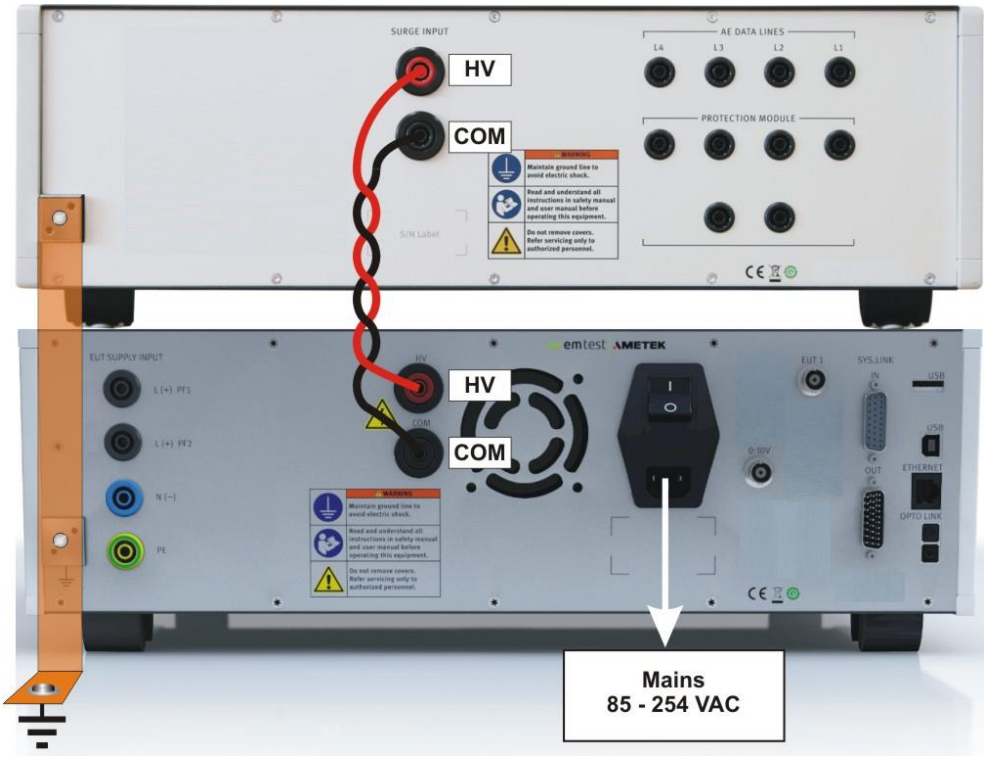
4.3.1. Test setup Coupling to PE



Example for coupling as per IEC 61000-4-5

Coupling: Capacitive with 0.5 µF and 40 Ω resistor
Coupling Path: Line L1 (S2) protected earth PE (S1)

4.4. Test Setup for CDN 117A series application



CDN 117A
coupling / decoupling network

Impulse generator

Earth connections

Earthcable: Low inductance and low ohmic connection ex. Use a copper tresse or a flat copperband.
Connection: Connect the earth bolt of the **CDN 117A**, **NSG 3040A / 3060A generator** and **ground reference** together

Depending on the application, the sequence of the earth connection CDN 117A - generator - reference earth can be changed as required.

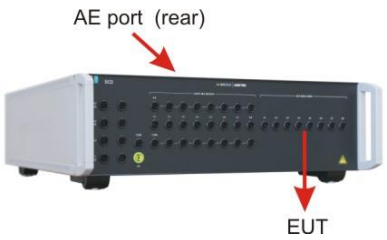
The device earth bolt must be connected to the ground reference plane, if there is one. In other case user is responsible that the generator earth bolt is proper connected with the building earth.

Connection HV – COM (impulse cable generator – CDN 117A series)

Twisted cable (HV and COM)
HV-cable red: HV generator - HV CDN 117A coupling / decoupling network
HV-cable black: COM generator - COM CDN 117A coupling / decoupling network

Dataline connection
- Input from AE port on rear side
- Output to EUT on frontside

The coupling musd be made as reported in chapter 4



5. Technical data CDN 117A series

5.1. Technical data

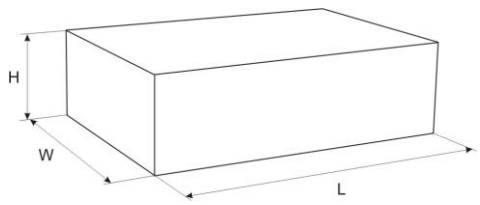
na= no application
* max intermittent current for 4 A models = 5 A, for 20 minutes, pause 20 minutes

Line coupling	For coupling line to line and line to GND	
4 lines CDN	L1, L2, L3, L4, GND	
Coupling		
Coupling as per IEC 61000-4-5	C coupling 0,5µF	damping resistor 40 Ω + 2 Ω Generator
Coupling as per IEC 61000-4-5	Gas arrestor 90V	damping resistor 40 Ω + 2 Ω Generator
Coupling as per IEC 61000-4-12	C coupling > 3µF	
Decoupling		
Decoupling inductance	L = 20mH	
General		
Temperature	5 - 40 °C operating	
Humidity	10%...90% no condensing	
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1,060 mbar)	

5.2. Weight and dimension

Model	**Signal lines**	**Weight** [kg]	**Dimension** L x W x H [mm]	**Housing**
CDN 117A C4-4-1	4 wires		448 x 500 x 142	A
CDN 117A C6-4-1	4 wires		448 x 500 x 142	A

Housing: A

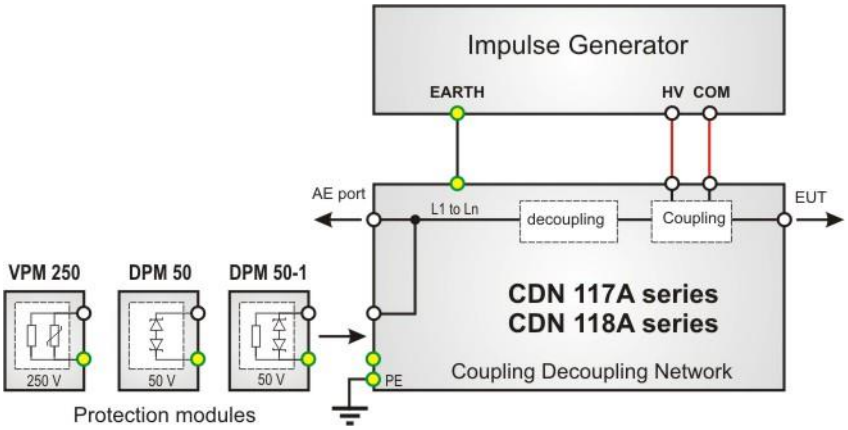


5.3. AE Protection for auxiliary equipment

Application

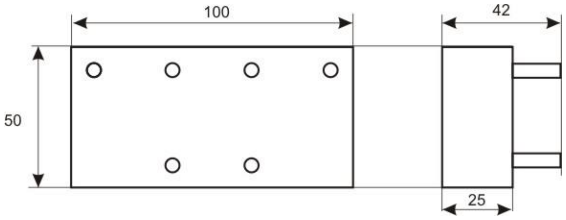
Depends on the application different protection units are available to protect the auxiliary equipment.

The protection unit is changeable to get the best protection for the auxiliary equipment



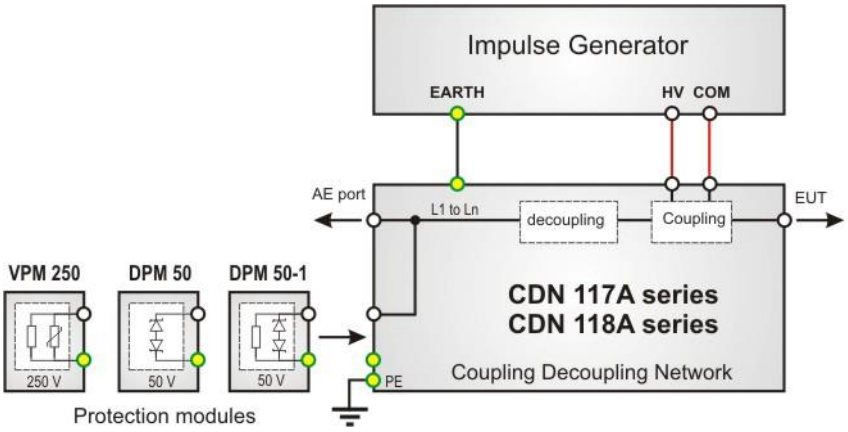
Dimension and weight off all protection modules

Dimension : 100mm x 50 mm x 42 mm
Weight: 170 g



5.3.1. Protection unit VPM 250-100

This protection unit is suitable for mains driven datalines up to 250VAC. The used varistor has a non-linear characteristics as shown in the diagram below.



250 V Varistor: **Epcos S20K300**

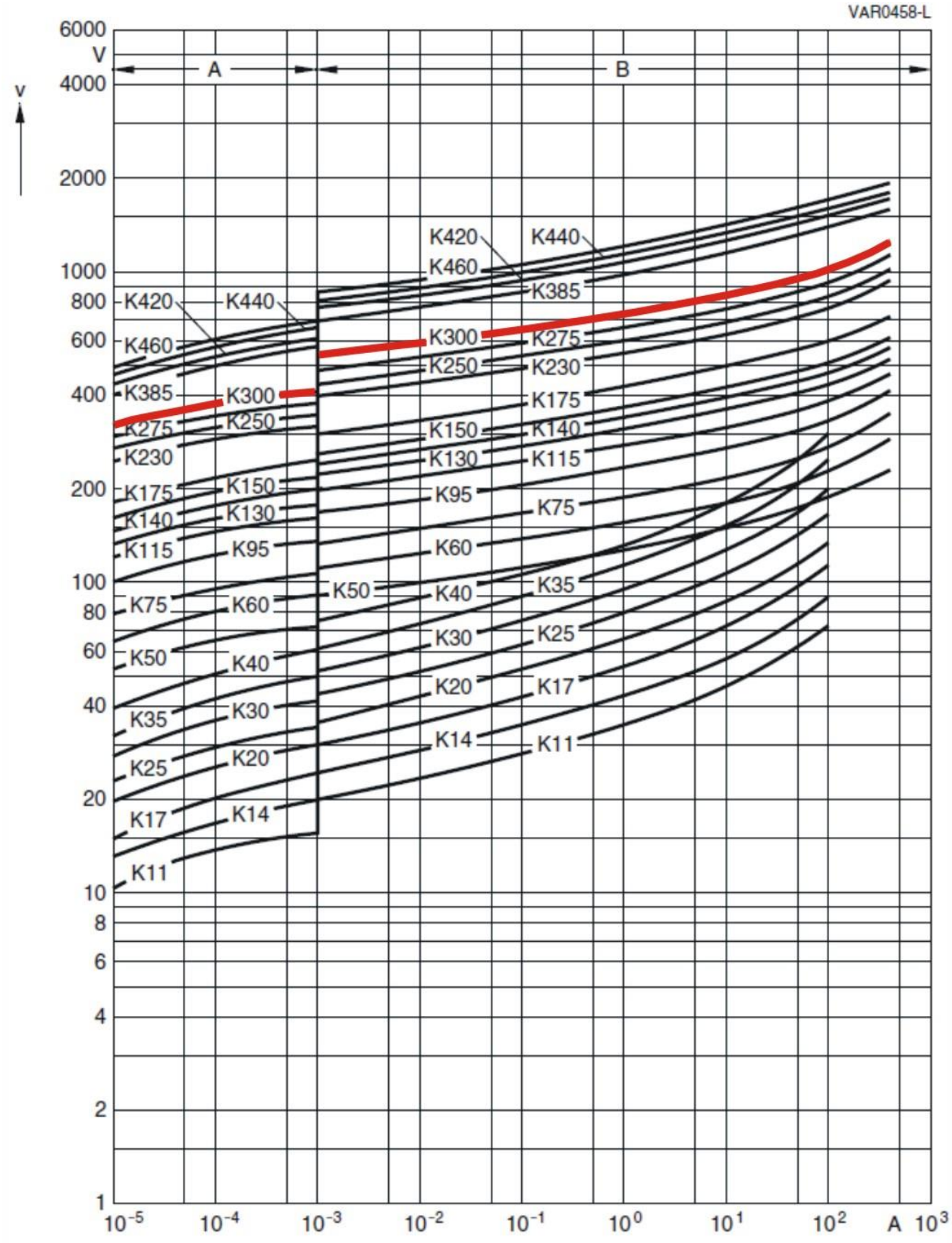
Technical data of the built in varistor

Type	V_{RMS} [V]	V_{DC} [V]	i_{max} (8/20 μ s) [A]	W_{max} (2 ms) [J]	P_{max} [W]
S20K300 (Epcos)	300	385	8000	173	1

Maximum ratings (TA = 85 °C)

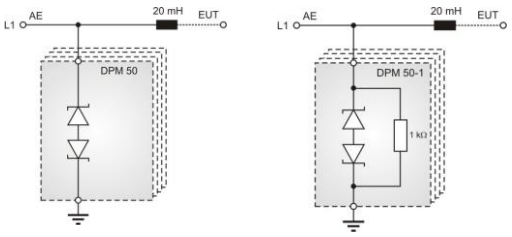
V/I characteristics

v = f (i) - for explanation of the characteristics refer to "General technical information", 1.6.3
A = Leakage current,
B = Protection level for worst-case varistor tolerances



5.3.2. DPM 50 and DPM 50-1

The Protection module **DPM 50** and **DPM 50-1** includes two transil diodes, provide high overvoltage protection by clamping action. With a peake pulse power of 5000 W (10/1000 µs)



Parallel resistor:

DPM 50 none, open circuit
DPM 50-1 1 kΩ, 4W

Transil diode	I_{RM} @ V_{RM}		max. V_{BR} @ $I_{R(1)}$ min.		V_{CL} @ I_{PP} 10/1000 µs max.		V_{CL} @ I_{PP} 8/20 µs max.		$\alpha T_{(2)}$	$C_{(3)}$typ.
	µA	V	V	mA	V	A	V	A	10^{-4}/°C	pF
BZW50-68	5	68	75.6	1	121	41	157	382	10.5	3000

1. Pulse test: tp < 50 ms.
2. To calculate VBR versus Tj: VBR at TJ = VBR at 25 °C x (1 + αT x (Tj - 25))
3. VR = 0 V, F = 1 MHz. For bidirectional types, capacitance value is divided by 2.

=> Non relevant data for the standards can be changed by the manufacturer <=

6. Maintenance

6.1. General

The coupling network is built with passive components only. The coupling network of the DCD series is absolutely maintenance free.

6.2. Calibration and Verification

6.2.1. 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 recalibration.

Examples: Calibration mark

6.2.2. 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.

6.2.3. 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.

6.2.4. 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, AMETEK CTS suggests refers 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.

Before starting the calibration or verification

remove the EUT Mains Supply

from the coupling network

Danger

6.3. Maintenance, Adjustments, Replacement of Parts

ATTENTION

Electrical maintenance must only be performed by qualified service technicians...

The generators do not contain any parts or components requiring special maintenance.

Electrical maintenance must only be performed by experienced and specially trained technicians. Generally, standard maintenance requires only the periodic cleaning of the instrument, verification and calibration of certain parameters.

- When removing the cover or other parts of the equipment, high voltage parts may become exposed. High voltages are potentially lethal.
- For service, repair, adjustment or replacement of parts, the generator must be disconnected from all power supply sources before covers are to be removed.
- The user is not permitted to change or modify any AMETEK CTS generator. Only original AMETEK CTS parts and components shall be used for repair and service. AMETEK CTS is not responsible for accidents or injuries caused through the use of parts or components not sold by AMETEK CTS
- Maintenance and service must only be performed by qualified service technicians who are trained and familiar with the dangers of servicing the AMETEK CTS device.

6.4. Calibration procedure as per IEC 61000-4-5 Ed3

6.4.1. General

It is recommended and sufficient to calibrate the CDNs for interconnection lines in the same configuration that will be used for testing. The residual surge voltage measured between the surged lines and ground on the AE side of the CDN, with the EUT and AE equipment disconnected, shall be measured and recorded so that users of the CDN may determine if the protection is sufficient for use with a particular AE.

6.4.2. Calibration procedure for CDNs for unsymmetrical interconnection lines

Measurements shall be performed with the impulse applied to one coupling path at a time.

The peak amplitude, the front time and impulse duration shall be measured for the CDN rated impulse voltage and current at the EUT output port according to (Table 7 of IEC 61000-4-5 Ed3.0).

The inputs of the decoupling network at the AE side shall be short-circuited to PE for the impulse voltage and impulse current measurement at the EUT output port.

The residual voltage value depends on the protection requirements of the AE. Therefore, no limits are given in this standard.

	Coupling	Measuring	AE side	EUT side
Surge voltage at EUT side	Single line to PE	Single line Peak voltage, front time, duration	All lines shorted to PE	Open–circuit
Surge current at EUT side	Single line to PE	Single line Peak current, front time, duration	All lines shorted to PE	Short-circuit
Surge voltage at EUT side	Single line to line	Single line Peak voltage, front time, duration	All lines shorted to PE	Open–circuit
Surge current at EUT side	Single line to line	Single line Peak current, front time, duration	All lines shorted to PE	Short-circuit
Residual voltage on AE side (with protection elements)	Single line to PE	Line to PE at a time peak voltage	Open–circuit	Open–circuit

Table 7 IEC 61000-4-5 Ed3.0 Summary of calibration process for CDNs for unsymmetrical interconnection lines

The intention of this calibration process is to check the proper function of the components, the saturation of de-coupling chokes, the decoupling effect of the decoupling part, the current capability and the coupling effect of the coupling network part. The coupling method has an influence on the voltage and current wave forms. The parameters for the calibration are defined in Table 8 of IEC 61000-4-5 Ed3.0

Coupling method	**CWG Output voltage** a,b,c	**Voc at CDN EUT output ± 10 %**	**Voltage front time Tf** Tf = 1,67 × Tr **± 30 %**	**Voltage duration Td** Td = Tw **± 30 %**	**Isc at CDN EUT output ± 20 %**	**Current front time Tf** Tf = 1,25 × Tr **± 30 %**	**Current duration Td** Td=1,18 ×Tw **± 30 %**
Leitung- PE R = 40 Ω CD = 0,5 µF	4 kV	4 kV	1,2 µs	38 µs	87 A	1,3 µs	13 µs
Leitung- PE R = 40 Ω CD = GDT	4 kV	4 kV	1,2 µs	42 µs	95 A	1.5 µs	48 µs
Leitung - Leitung R = 40 Ω CD = 0,5 µF	4 kV	4 kV	1,2 µs	42 µs	87 A	1,3 µs	13 µs
Leitung - Leitung R = 40 Ω CD = GDT	4 kV	4 kV	1,2 µs	47 µs	95 A	1.5 µs	48 µs

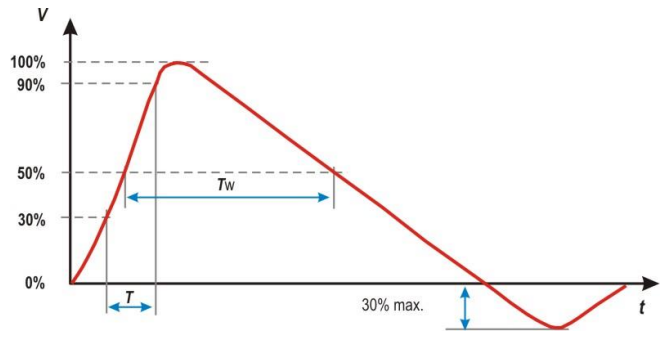
a It is recommended to calibrate the CDN at the highest rated impulse voltage, as this will minimize the effects of the switching noise generated by CLDs and GDTs. The value shown in the table is for a generator setting of 4 kV. In case the CDN is rated for another maximum impulse voltage, the calibration shall be done at this maximum rated impulse voltage. The short-circuit peak current specification shall be adapted accordingly. For example, if the maximum voltage is 1 kV the short-circuit current value shown in this table shall be multiplied by 1/4.

b Coupling via gas arrestors, clamping or avalanche devices will show some switching noise on the impulse waveform. Working with the highest possible impulse voltage will minimize their impact on measurements; it Is recommended to neglect the switching noise for the front times and duration values measurements.

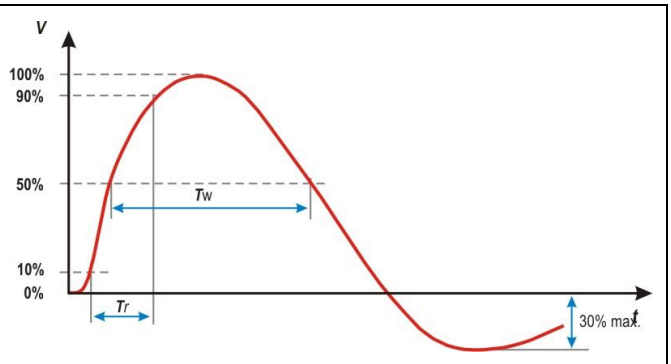
c The values shown in this table are for a CWG with ideal values. In case the CWG generates parameter values close to the tolerances, the additional tolerances of the CDN may generate values out of tolerances for the CWG CDN combination.

Table 8 – Surge waveform specifications at the EUT port of the CDN for unsymmetrical interconnection lines

6.4.3. Surge waveform definition



Waveform of open circuit voltage (1,2/50 µs)



Waveform of short circuit current (8/20µs)

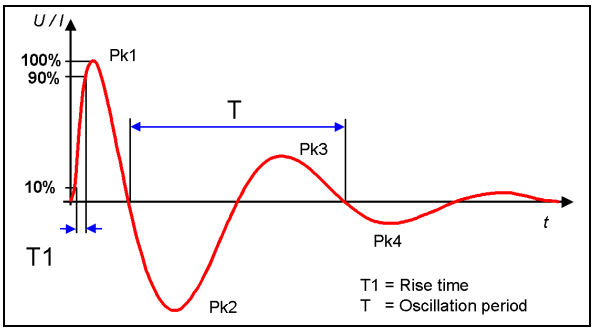
	Front time Tf [µs]	**Duration Td** [µs]
Open-circuit voltage	Tf = 1,67 × T = 1,2 ± 30 %	Td = Tw = 50 ± 30 %
Short-circuit current	Tf = 1,25 × Tr = 8 ± 30 %	Td = 1,18 × Tw = 20 ± 30 %

6.5. Kalibrationsprozedur gem. IEC 61000-4-12 Ed.3

6.5.1. Ringwave Impulsformdefinition gem. IEC 6100-4-12 Ed.3

Parameter

voltage rise time T_1 : 0,5 µs ± 30 % (open-circuit)
current rise time T_1: ≤1 µs (short-circuit)
voltage osc frequency: 100 kHz ± 10 %;
decaying Voltage only 0,4 < Ratio of Pk_2 to Pk_1 < 1,1
0,4 < Ratio of Pk_3 to Pk_2 < 0,8
0,4 < Ratio of Pk_4 to Pk_3 < 0,8
output impedance: 12 Ω and 30 Ω ± 20 % (switchable)
open circuit voltage Pk_1: 250 V to 4 kV (± 10 %)
short-circuit current Pk_1: 333 A ± 10 % for 12 Ω gen. setting
133 A ± 10 % for 30 Ω gen. setting



Ring Wave pulse, Open circuit

Parameter	CD	Kopplung	Einheit	Nominalwert				Toleranz
Gerätemodell	- - -	- - -	- - -	**N1, N1.1**		**N2, N2.1**		- - -
Pulslevel max.	CAP	Lx-PE, Lx-Lx	[V]	±4000		±6000		± 10%
Standard Levels	CAP	Lx-PE, Lx-Lx	[V]	±250	±500	±1000	±2000	± 10%
Rise time 1. Peak	CAP	Lx-PE, Lx-Lx	[µs]	0.5				± 30%
Oszillation Frequenz	CAP	Lx-PE, Lx-Lx	[kHz]	100				± 10%
Abklingen vom Peak 2	CAP	Lx-PE, Lx-Lx	[%]	40% - 110% of Peak 1				- - -
Abklingen vom Peak 3	CAP	Lx-PE, Lx-Lx	[%]	40% - 80% of Peak 2				- - -
Abklingen vom Peak 4	CAP	Lx-PE, Lx-Lx	[%]	40% - 80% of Peak 3				- - -
Restspannung	CAP	Lx-PE	[V]	15% of Vpeak max or twice the rated peak voltage of the coupling / decoupling network, whichever is higher				- - -

Ring Wave pulse Short circuit

Parameter	CD	Kopplung	Einheit	Nominalwert				Toleranz
Gerätemodell	- - -	- - -	- - -	**N1, N1.1**		**N2, N2.1**		- - -
Pulslevel max.	CAP	Lx-PE, Lx-Lx	[V]	±4000		±6000		- - -
Strom I bei 12Ω	CAP	Lx-PE, Lx-Lx	[A]	±333.3		±500.0		± 10%
Strom I bei 30Ω	CAP	Lx-PE, Lx-Lx	[A]	±133.3		±200.0		± 10%
Standard Level	CAP	Lx-PE, Lx-Lx	[V]	±250	±500	±1000	±2000	± 10%
Strom I bei 12Ω	CAP	Lx-PE, Lx-Lx	[A]	±20.8	±41.7	±83.3	±166.7	± 10%
Strom I bei 30Ω	CAP	Lx-PE, Lx-Lx	[A]	±8.3	±16.7	±33.3	±66.7	± 10%
Rise time 1. Peak	CAP	Lx-PE, Lx-Lx	[µs]	≤1				- - -
Oszillation Frequenz	CAP	Lx-PE, Lx-Lx	[kHz]	100				± 10%

Ring Wave Impedanz

Coupling	CD	Impedanz	Einheit	Nominalwert	Toleranz
Leitung - PE, Leitung - Leitung	CAP	12	[Ω]	12	± 20%
Leitung - PE, Leitung - Leitung	CAP	30	[Ω]	30	± 20%

7. Delivery Groups

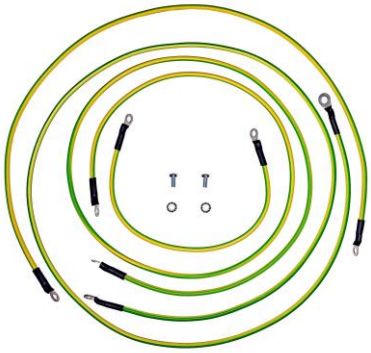
Identical accessory parts are delivered only once if several devices are ordered. The delivered packing list is in each case valid for the delivery.

7.1. Delivery groups CDN 117A series coupling network

- **Base equipment DCD sr all models**
- **DPM 50-1** 1 x for 4 lines CDN 117A, AE Protection module for 4 lines, 50V, 1 kΩ
  GDT 90 1 x Gas discharge tube 90 V
- **HVS - Banana - Banana** 1 x HV cable red (HV), 1.0 m
  1 x HV cable black (COM), 1.0 m
- **SCC** 3 x Short circuit connector, 4mm, RM 25 mm, Art 109849
- **SCC** 1 x Short circuit connector, 4mm, black, Art 102783
- **Safety lab cables** 8 x 0.25 m Safety lab cables, Art:105886
- **Manual** English manual on USB memory stick
- **Earth set** article includes earth cables Art: 109046

Length	cable lug 1	cable lug 2
250 mm	M4	M4
500 mm	M4	M4
1000 mm	M4	M4
1000 mm	M4	M5

Cable lug 1 M4: Earth bolt DCD
Cable lug 2 M4: Earth bolt Generator
Cable lug 2 M5: Earth plate Rack



7.2. Accessories

ABD Plug 140 V Avalanche Breaking Diode (± 140 V)
Coupuling diode for
- Surge impulse 1.2 / 50 µs and
- Telecom surge impulse 10 /700 µs
- Max. impulse voltage 7 kV

GDT Plug 90 V Gas Discharge Tube for coupling
- Surge impulse 1.2 / 50 µs and
- Telecom surge impulse 10 /700 µs
- Max. impulse voltage 7 kV

8. Appendix

8.1. Declaration of conformity

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 4153 Reinach 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:	CDN 117A series coupling decoupling network for surge & Ringw wave pulses
Model Number(s)	NSG 117A C4-4-1, NSG 117A C6-4-1

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:

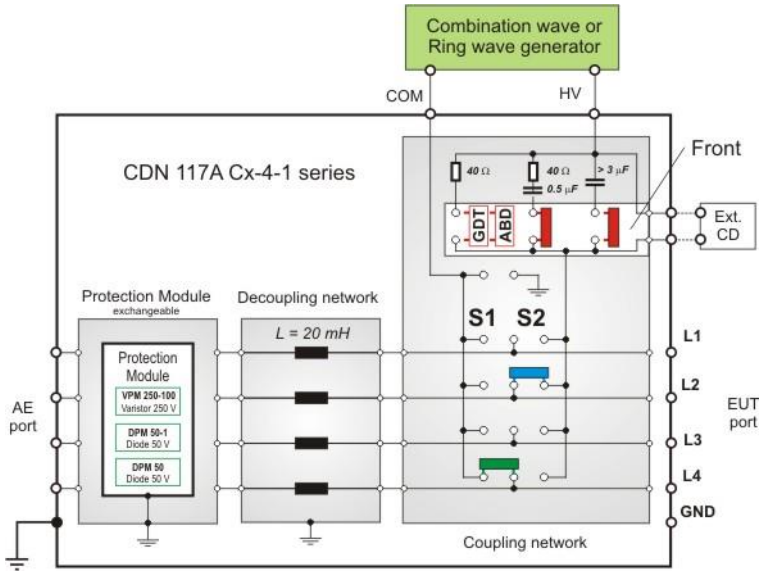
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area).
EN 61000-3-2:2014	Limits for harmonic current emissions, (not applicable).
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, (not applicable).

The purpose of this instrument is to couple defined interferences signals (surge impulses) for EMI immunity testing. The device includes only passive components like resistors, capatitances and inductors. 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.

Manufacturer
AMETEK CTS GmbH
Sternenhofstr. 15
CH 4153 Reinach
Tel: +41 61-7179191
Fax: +41 61-7179199

By	A. Burger Director Engineering AMETEK CTS
Place	Reinach BL, Switzerland
Date	2. April 2019

8.2. Diagram CDN 117A series



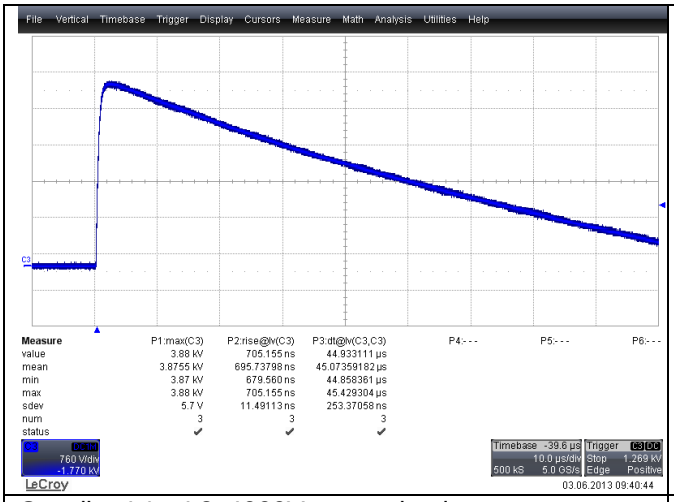
CDN 117A Cx-4-1

8.3. Typical waves

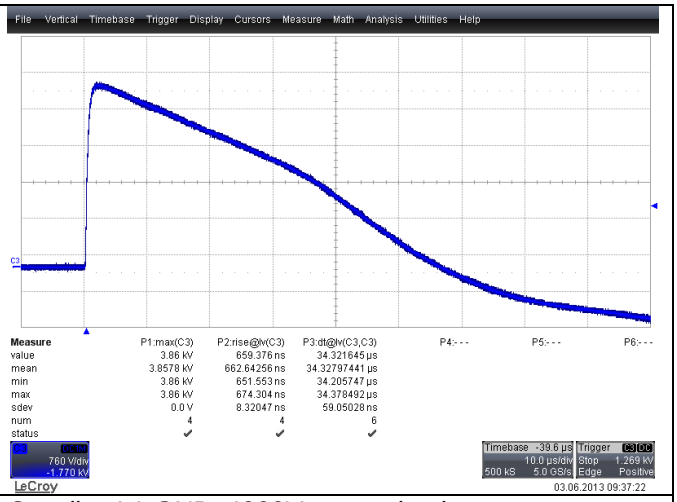
The measurements below shows a typical waveform recorded with a DCD model

8.3.1. Surge coupling

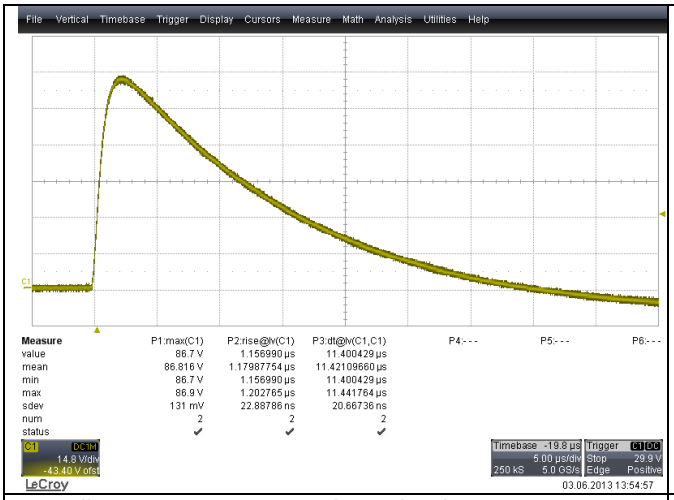
Typical surge pulses with 4000V charging voltage of the hybrid generator with an impedance of 2Ω



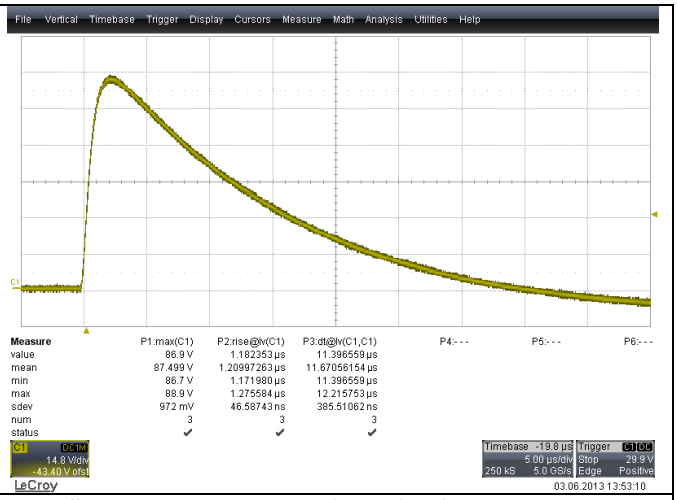
Coupling L1 – L2; 4000V, open circuit



Coupling L1-GND; 4000V, open circuit



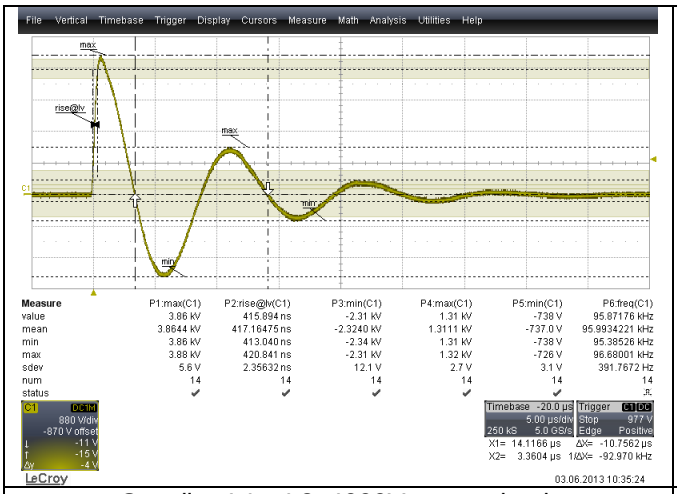
Coupling L1 – L2; 4000V, short circuit



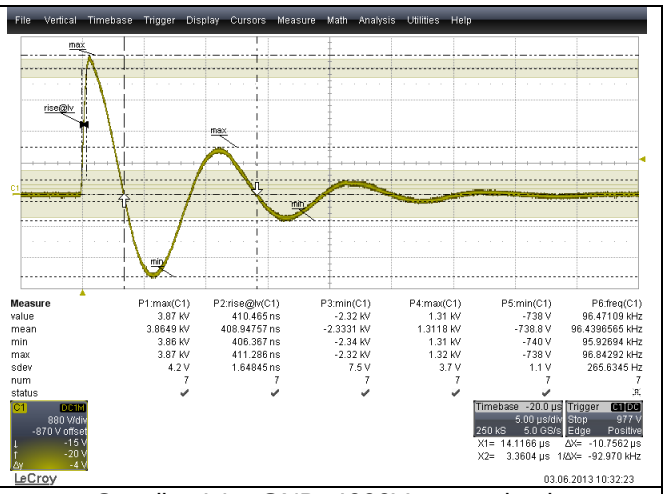
Coupling L1-GND; 4000V, short circuit

8.3.2. Ringwave coupling 12 Ω generator impedance

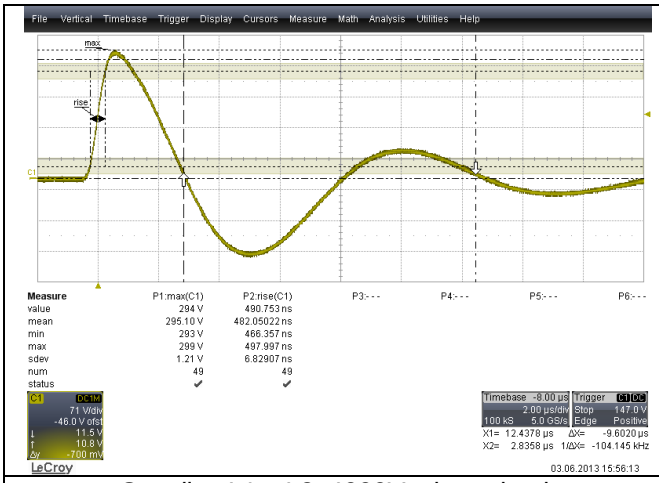
Typical Ringwave pulses with 4000V charging voltage with an impedance of 12Ω,



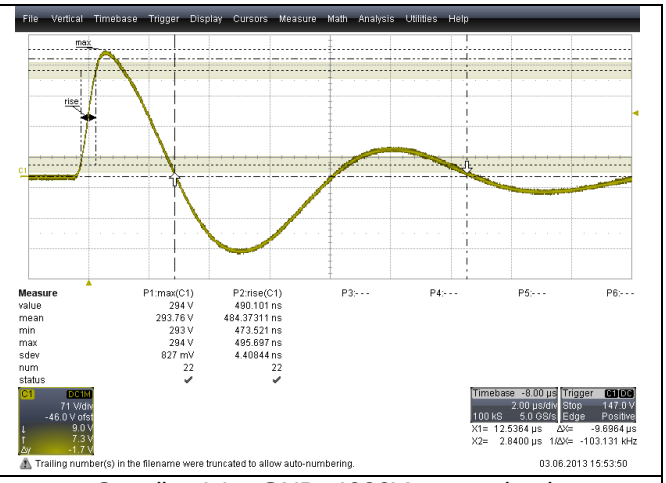
Coupling L1 – L2; 4000V, open circuit



Coupling L1 – GND; 4000V, open circuit



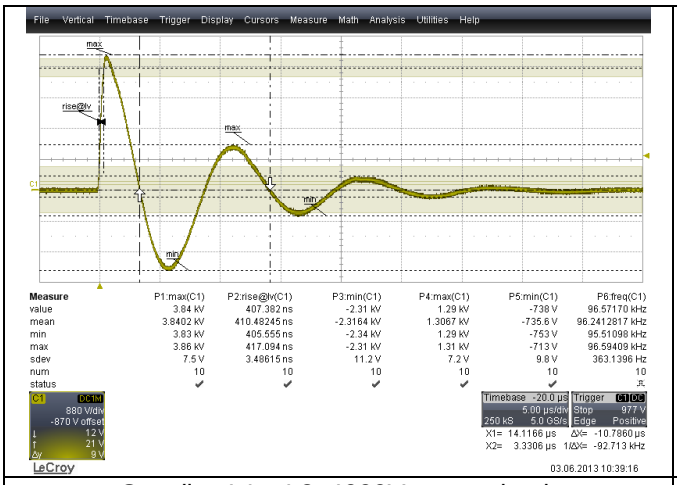
Coupling L1 – L2; 4000V, short circuit



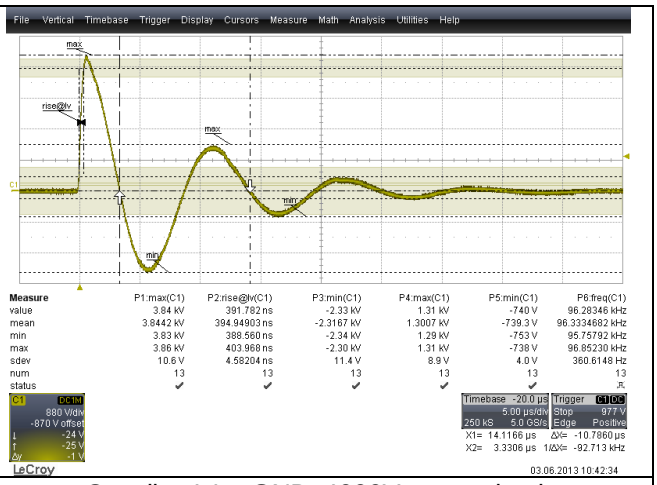
Coupling L1 – GND; 4000V, open circuit

8.3.3. Ringwave coupling 30 Ω generator impedance

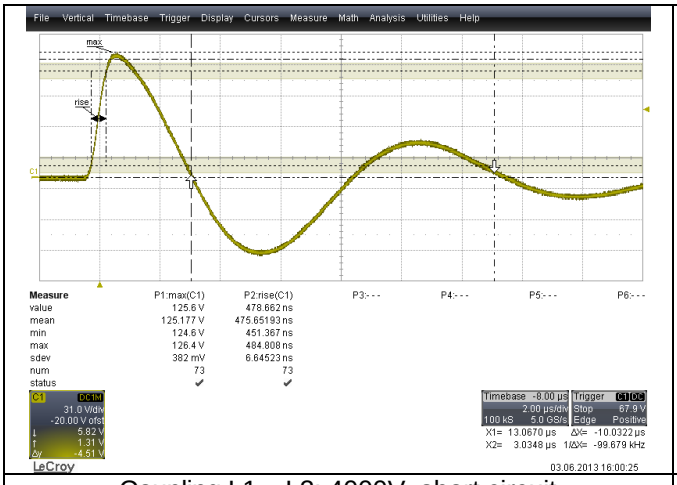
Typical Ringwave pulses with 4000V charging voltage with an impedance of 30 Ω,



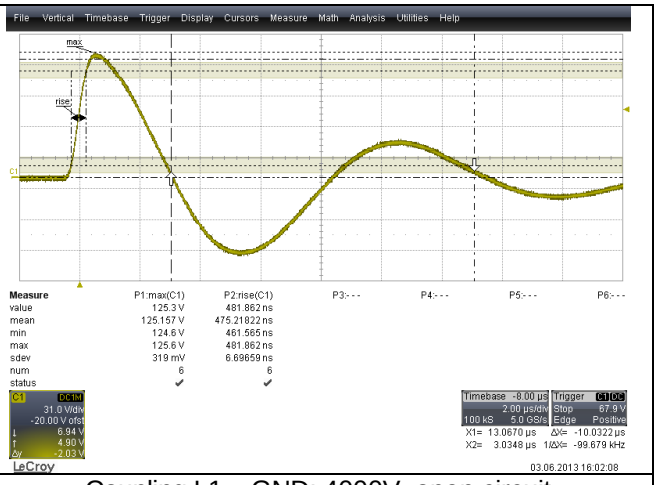
Coupling L1 – L2; 4000V, open circuit



Coupling L1 – GND; 4000V, open circuit



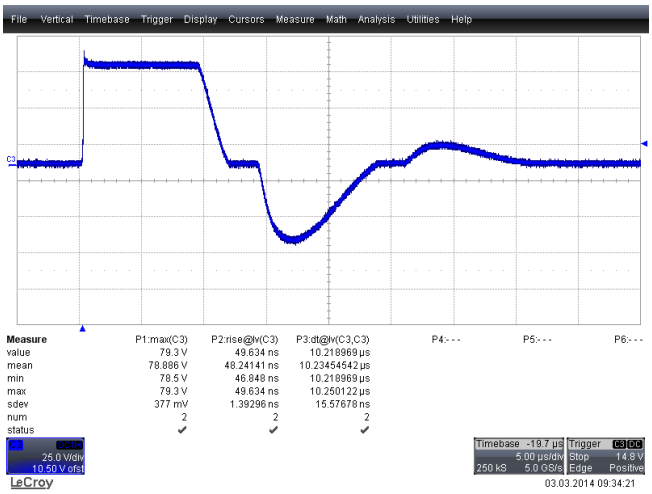
Coupling L1 – L2; 4000V, short circuit



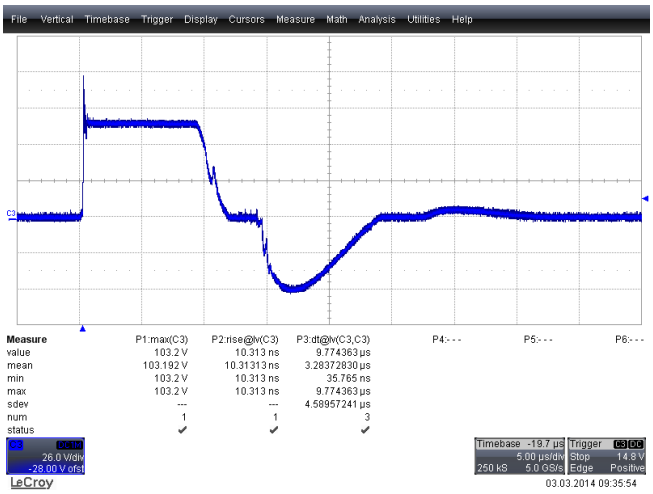
Coupling L1 – GND; 4000V, open circuit

8.3.4. Residual voltage measurements at the AE port

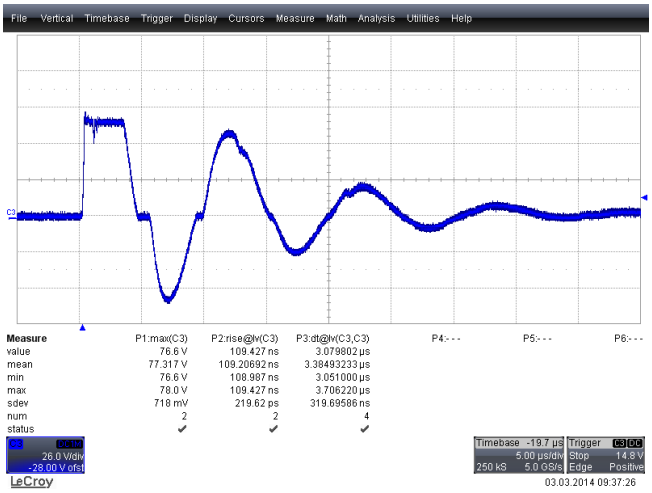
The diagrams shown are typical for the standard coupling/decoupling network CDN 117A model. The diagram shows voltage impulses with different couplings and 4000V impulse open circuit waveshape at the AE Port



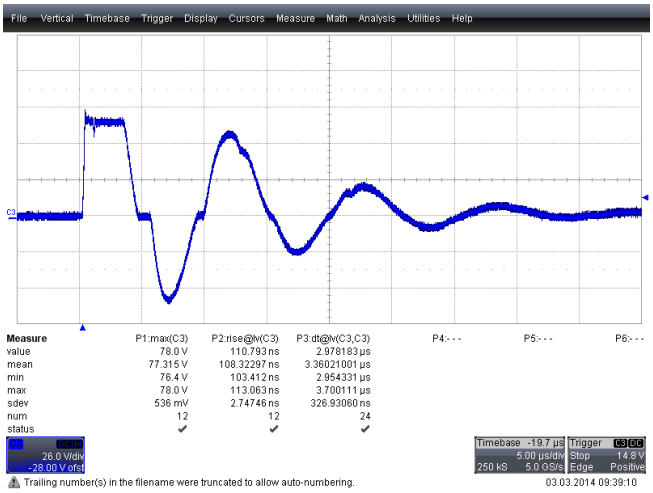
Residual voltage with capacitive coupling, Pulse 1,2/50 µs



Residual voltage with GDT (gas arrestor) coupling , Pulse 1,2/50 µs



Residual voltage with capacitive coupling, Ringwave 12 Ω

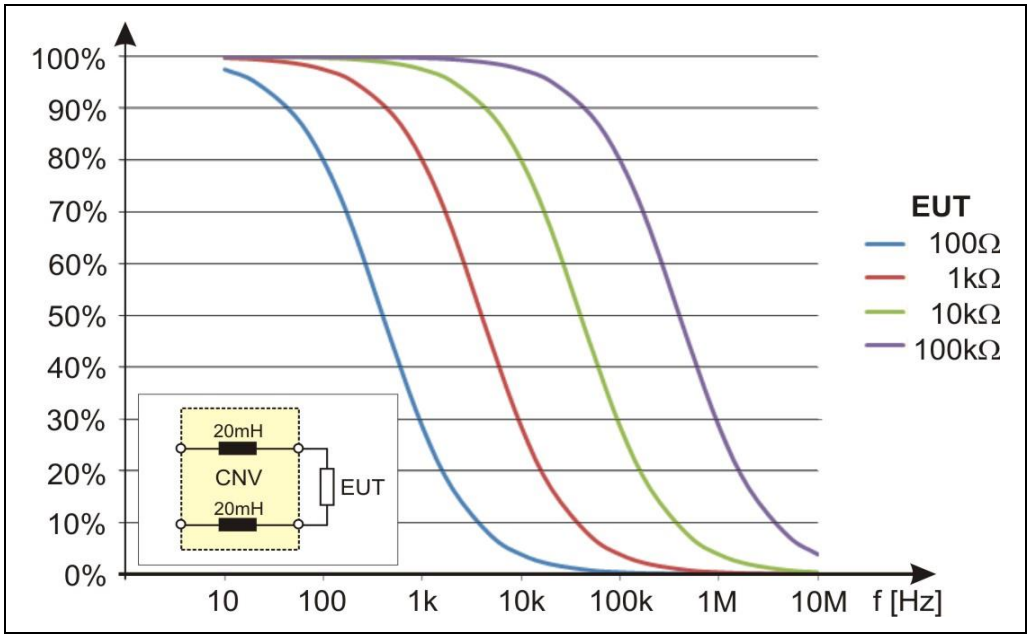


Residual voltage with capacitive coupling, Ringwave 30 Ω

Spec devices: The residual voltage is according the ordered specification in the technical data.

8.4. Transfer function in function with the EUT Impedance

The figure below illustrates the transfer function respective the voltage drops over the inductances of the coupling network (2x20 mH). The graph shows the influence of different UET impedances. Is only one inductance used, the voltage drop is reduceing and the ratio is to recalculate.



Transfer function f(EUT impedance and frequency)