Manual

For Operation

OCS 500N6 series
OCS 500N6F series

The Damped Oscillatory and
Ring Wave generator in one box

OCS 500N6x series - designed as a modular system - is the most intelligent solution offering exactly what you need for full-compliant immunity tests against damped oscillatory and ring wave phenomena. The distinct operation features, convenient DUT connection facilities, a clearly arranged menu structure and display philosophy as well as the pre-programmed standard test routines make testing easy, reliable and safe. Extendable by a variety of test accessories the OCS 500N6 is universal equipment for abroad range of recommendations even for three-phase applications up to 100A.

ANSI /IEEE C62.41
ANSI /IEEE C37.90
EN/IEC 61000-4-10
EN/IEC 61000-4-12
EN/IEC 61000-4-18
IEC 60255-1

AMETEK CTS GmbH
Sternenhofstrasse 15
4153 Reinach BL1
Switzerland

Phone: +41 61 204 41 11
Fax: +41 61 204 41 00

URL : http://www.ametek-cts.com

Contents

1. General

1.1. Purpose

The compact OCS 500Nx generator is a multifunction compact generator that simulates conducted electromagnetic interference effects for immunity testing to international, national, and manufacturers' standards.

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

Only *qualified personnel* who deal with attendant hazards in impulse generators, are allowed to perform installation and servicing. Before put in service the attached safety and user manual must be readed and applied. The Safety and user manual are 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.

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.

1.2. 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 the instrument shows, that that it can source 1000 volt or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

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

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

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

Attention

Before using this equipment, read the operating manual and the separate delivered **safety manual** carefully

1.3. Standards covered by OCS 500N6 / N6F generators

Fully equipped OCS 500N6 / N6F generators cover the following standards

- IEC 61000-4-10	**Oscillatory Magnetic Field test**
- IEC 61000-4-12	**Ring wave immunity test**
- ANSI-IEEE C62.41.2	
- ANSI-IEEE C62.45	
- IEC 61000-4-18	**Oscillatory waves immunity test** Slow damped oscillatory wave (100 kHz or 1 MHz) Fast damped oscillatory wave (3, 10, 30 MHz) OCS500N6F only
- IEC 60255-26	**Measuring relays and protection equipment** - 1 MHz burst immunity tests

1.4. Models and options

This manual is for the written for the following device model and options:

Device:

Unit for damped waves as per IEC 61000-4-12 / -18 and ANSI C62-41:
- incl. damped oscillatory waves 100 kHz and 1 MHz
- incl. Ring Wave 100 kHz

Model	name till 2008	coupling network	AC voltage	DC voltage
OCS 500 N6	OCS 500 M6	1-phase	250 V / 16 A	250 V / 10 A
OCS 500 N6.2	OCS 500 M6S2	1-phase	250 V / 32 A	250 V / 20 A
OCS 500 N6.3	OCS 500 M6S3	3-phases	3x400 V / 16 A	250 V / 10 A
OCS 500 N6.4	OCS 500 M6S4	3-phases	3x400 V / 32 A	250 V / 20 A
	OCS 500 M6S5	3-phases	3x400 V /100 A	250 V / 20 A
	OCS 500 M6-690V	1-phase	690 V / 32 A	250 V / 20 A
	OCS 500 M6S8	3-phases	3x440 V /100 A	250 V / 20 A
OCS500 N6.11		3-phases	3x690 V /32 A	250 V / 32 A
OCS500N6F		1-phases	250 V / 16 A	250 V / 16 A
OCS500N6F.1		1-phases	250 V / 32 A	250 V / 32 A
OCS500N6F.2		3-phases	3x440 V / 16 A	250 V / 16 A
OCS500N6F.3		3-phases	3x440 V / 32 A	250 V / 32 A
OCS500N6F.4	See special model	3-phases	3x440 V / 32 A	250 V / 32 A

Model for 3kV on direct HV output	coupling network	AC voltage	DC voltage
OCS500N6.5	CDN1-16 A	250 V / 16 A	250 V / 16 A
OCS500N6.6	CDN1-32 A	250 V / 32 A	250 V / 32 A
OCS500N6.7	CDN3-16 A	3x440 V / 16 A	250 V / 16 A
OCS500N6.8	CDN3-32 A	3x440 V / 32 A	250 V / 32 A

OCS500M6S8

1.5. Special Models

Modell	Remarks	AC voltage	DC voltage
OCS500N6.1	Damped Oscillatory generator as per IEC 61000-4-18 incl Damped Oscillatory waveform 100kHz and 1MHz No Ringwave module	250V/16A	250V / 10A
OCS500N6.9	With built-in Ringwave module only, 1 phase CDN	250V/16A	250V / 10A
OCS500N6.10	With built-in Ringwave module only, 1 phase CDN	250V/32A	250V / 20A
OCS500N6.11	Damped Oscillatory generator as per IEC 61000-4-12, IEC 61000-4-18 and ANSI C62-41 incl. Ringwave 0.5us/100kHz & Damped Oscillatory waves 100kHz and 1MHz	3x690V / 32A	250V / 32A
OCS500N6.12	Damped Oscillatory generator as per IEC 61000-4-18, with waveforms 100kHz and 1MHz, w/o Ringwave	3x690V / 32A	250V / 32A
OCS500N6.13	Damped Oscillatory Wave waveforms 100kHz/1MHz up to 3kV and Ringwave 100kHz; In minirack 25HU, weight approx. 50kg	3x440V / 100A	250V / 32A
OCS500N6.14	Damped Oscillatory generator as per IEC 61000-4-18, 100kHz and 1MHz damped oscillatory waves, no Ringwave	3x440V/32A	250V / 32A
OCS500N6.15	Damped Oscillatory generator as per IEC 61000-4-18, 100kHz and 1MHz damped oscillatory waves, no Ringwave, In 25HU minirack	3x440V100A	250V / 32A
OCS500N6.16	With built-in Ringwave module 0.5us/100kHz	3x440V/16A	250V / 10A
OCS500N6.17	With built-in Ringwave module 0.5us/100kHz, calibrated as per IEC 61008-1 and 61009-1 for RCCB option	3x440V/32A	250V / 32A
OCS500N6.18	With built-in Ringwave module 0.5us/100kHz In minirack 16HU, weight approx. 50kg	3x440V/100A	250V / 32A
OCS500N6.19	Damped Oscillatory generator as per IEC 61000-4-18, 100kHz and 1MHz damped oscillatory waves, no Ringwave	3x440V/16A	250V / 16A
OCS500N6.22	Damped Oscillatory generator as per IEC 61000-4-12, -4-18 and ANSI C62.41, incl Damped Oscillatory waveform 100kHz and 1MHz up to 3kV, incl Ring Wave waveform	3x690V/100A	250V / 32A
OCS 500N6F.4	Fast Damped Oscillatory Generator as per IEC 61000-4-12, IEC 61000-4-18 and calibrated as per IEC 61008-1 and 61009-1 for RCCB option, incl. Ringwave and IMN2, with USB-optical remote control interface; incl. OptoLink 3 meters, optional slow damped module S-DOW/N6F	3x440 V / 32 A	250V / 32A

2. Operating Functions

2.1. OCS 500N6.x models

2.1.1. Front view OCS 500N6.x

1	"Test On"	**5**	Cursor keys "←" and "→"	**9**	LED coupling 1 ph. version
2	Function keys "F1..F7	**6**	Knob (Inc. / Dec.)	**10**	EUT test supply L, N, PE 1ph version
3	Display	**7**	Escape	**11**	LED coupling 3 ph. version
4	Exit	**8**	CRO trigger output ↑ 5V	**12**	EUT test supply 3-phase version
				13	Direct output HV – COM

1 Test On
By pressing the key "Test On" the power supply of the high voltage part will be ready for start. The red LED indicates the trigger of a burst event.

2 Function keys "F1 .. F7
Parameters and functions, displayed in the lowest line, can be selected with the related function key.

3 Display
All functions and parameters are displayed (8 lines with max. 40 characters).

4 Exit
Pressing of the Exit function will cause a reset of the firmware. This is only possible if no test routine is running.

5 Cursor keys
Parameters and functions can be changed on-line. The selection of these parameters is realized with the cursor moving to the left or to the right.

6 Knob (Inc. / Dec)
The knob increments or decrements test parameters with a numeric value or selects from a list of parameters.

7 ESC
When pressing the ESC button the user moves back one page in the menu. The displayed parameters before are stored.

8 Trigger output
At the BNC output the generator trigger can be used as oscilloscope trigger output. It is synchronous to the impulse events.

9 LED coupling
The LED Indicates the actual coupling mode for the 1-phase version.

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

1	"Test On"	**5**	Cursor keys "←" and "→"	**9**	LED coupling 1 ph. version
2	Function keys "F1...F7	**6**	Knob (Inc. / Dec)	**10**	EUT test supply L, N, PE 1ph version
3	Display	**7**	Escape	**11**	LED coupling 3 ph. version
4	Exit	**8**	CRO trigger output ↑ 5V	**12**	EUT test supply 3-phase version
				13	Direct output HV – COM

11 LED coupling
The LED Indicates the actual coupling mode for the 3-phase version.

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

13 Direct HV and COM output
The HV and COM output are the designed for an external using of the impulse. This output is floating and is used for external coupling/decoupling networks or magnetic field antenna.

Attention

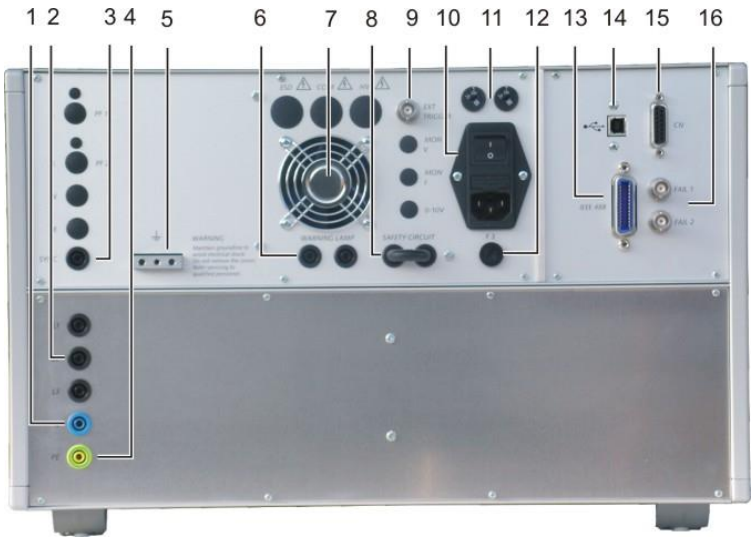
The direct HV and COM output of the generator is located at the front panel of the instrument. It is not allowed to connect these outputs to any other coupling/decoupling network than manufactured by AMETEK CTS, e.g. the types CNV or CNI.

Before to connect any external networks to this output the operator must contact the manufacturer. Any damages due to this matter are not covered by warranty.

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

2.1.2. Rear view OCS 500N6.x

1 EUT supply input neutral
2 EUT power mains supply line
3 Sync input
4 Test supply input PE
5 Reference earth connection
6 Warning lamp
7 Ventilation
8 Safety Circuit



1 EUT power mains supply input - Neutral
The neutral N is conducted to the EUT via the coupling/decoupling network to the front panel output N.

2 EUT power mains supply input - Phase
The phase of the power mains supply for the EUT is connected to the lack banana connector L. The 3-phase device has all power mains supply ports on the lower part at the rear side.

3 SYNC input
Input port for an ac synchronization voltage, to which the events shall be synchronized. If no voltage is available the tests will start automatically in asynchronous mode. Normally the Sync input shall be connected directly from the L power mains input (2) of the EUT. The input voltage range is 10 to 250Vac

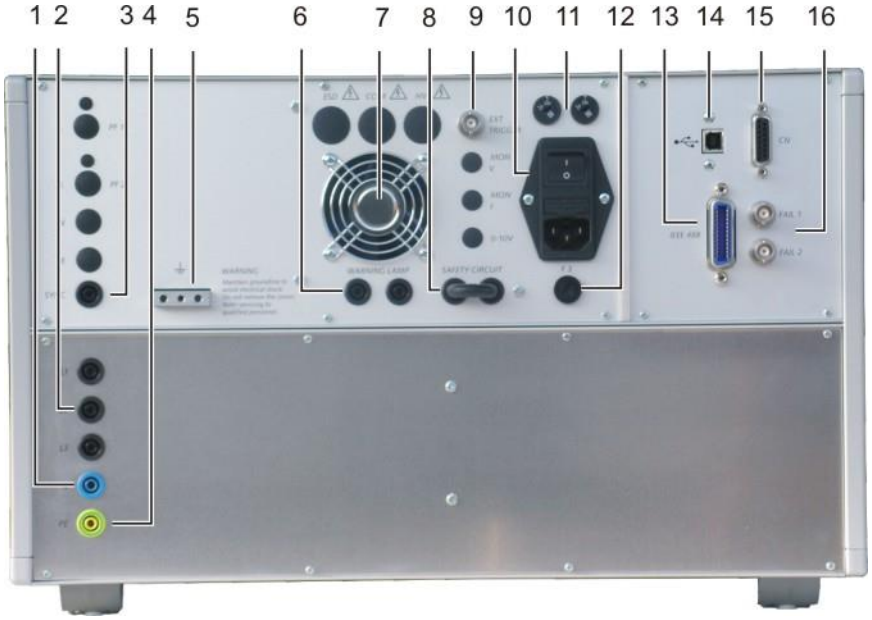
4 EUT power mains supply input – Protective Earth (PE)
The protective earth PE is conducted directly to the front panel output PE.

5 Reference earth connection PE
The generator must be connected to the reference earth plane of the test set up.

6 Warning lamp
A voltage free contact is available for external warning indications (warning lamp). The relays contact (250V / 5A) will switch after pressing TEST ON button.

7 Ventilation
After long term duration tests the generator should keep on running for some minutes to cool down the system.

8 Safety circuit
A test can only be started if the safety circuit is closed. By opening the safety circuit during a running test, the test will be stopped immediately and the high voltage will be switched Off and grounded. For s
The safety circuit will not switch off the EUT Mains supply. For switch off the EUT mains a similar safety circuit must be used as described in a rack solution in the safety manual.



9 External trigger
10 Power on switch and fuse
11 Mains selector 115V / 230V
12 Fuse of the high voltage power supply
13 Parallel interface IEEE
14 USB Serial interface
15 Remote control connector
16 FAIL 1 / FAIL 2 connector

9 External trigger (BNC plug)
Trigger input for a pulse release (5-15V positive trigger).

10 Power on switch
The switch is part of the mains filter. Mains fuses are part of the filter. (230V / 1A and 115V / 2A)

11 Mains selector
Selection of 115V / 230V

12 Fuse of the high voltage power supply
The high voltage power supply is protected by this fuse „F3“. In case that no high voltage is generated but the control unit works properly this fuse shall be checked.

13 Parallel interface GPIB / IEEE 488
IEEE 488 interface with IEEE connector

14 USB Serial interface
USB interface “USB B” connector. For data transfer a USB interface is available. The internal RS 232 interface is converted to USB standard. Therefore the user must set the same Baud rate in the device and control software.
Using the USB interface the user can have emc problems during EMC tests Our experiences says, that usually the computer USB port is disturbed by interference’s. Therefore a high quality USB cable (USB 2.0 standard) must be used.

15 Remote control connector CN
External coupling devices are controlled via this remote control connector.

16 Fail detection FAIL 1 EUT control (TEST STOP)
Grounding this input will cause a complete stop of the running test procedure. (+15V to ground) The test must be completely restarted.

Fail detection FAIL 2 EUT control (TEST PAUSE)
Grounding this input will cause a break for the running test procedure (+15V to ground).The test will be continued when the input is disconnected from ground.

2.2. OCS 500N6F models

2.2.1. Front view OCS 500N6F.x

1	"Test On"	**5**	Cursor keys "←" and "→"	**9**	LED mains coupling 1/3 ph.
2	Function keys "F1..F7	**6**	Knob (Inc. / Dec)	**10**	EUT test supply 1ph/3ph
3	Display	**7**	Escape	**11**	Fast damped output for I/O lines
4	Exit	**8**	Trigger output ↑ 5V	**12**	Direct output HV – COM

1 Test On
By pressing the key "Test On" the power supply of the high voltage part will be ready for start. The red LED indicates the trigger of a burst event.

2 Function keys "F1 ... F7
Parameters and functions, displayed in the lowest line, can be selected with the related function key.

3 Display
All functions and parameters are displayed (8 lines with max. 40 characters).

4 Exit
Pressing of the Exit function will cause a reset of the firmware. This is only possible if no test routine is running.

5 Cursor keys
Parameters and functions can be changed on-line. The selection of these parameters is realized with the cursor moving to the left or to the right.

6 Knob (Inc. / Dec)
The knob increments or decrements test parameters with a numeric value or selects from a list of parameters.

7 ESC
When pressing the ESC button the user moves back one page in the menu. The displayed parameters before are stored.

8 Trigger
At the BNC output (5V pos slope) the generator trigger can be used as oscilloscope trigger output. It is synchronous to the impulse events.

1	"Test On"	**5**	Cursor keys "←" and "→"	**9**	LED mains coupling 1/3 ph.
2	Function keys "F1..F7	**6**	Knob (Inc. / Dec)	**10**	EUT test supply 1ph/3ph
3	Display	**7**	Escape	**11**	Fast damped output for I/O lines
4	Exit	**8**	CRO trigger output ↑ 5V	**12**	Direct output HV – COM

9 LED mains coupling
The LED Indicate the actual coupling mode for the 1-phase or 3-phase.

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

11 Fast damped output for I/O lines
Coaxial output plug for the fast damped oscillatory wave to a capacitive coupling clamp for testing I/O lines.

12 Direct HV and COM output
The HV and COM output are the designed for an external using of the impulse. This output is floating and is used for external coupling/decoupling networks or magnetic field antenna.

Attention

The direct HV and COM output of the generator is located at the front panel of the instrument. It is not allowed to connect these outputs to any other coupling/decoupling network than manufactured by AMETEK CTS, e.g. the types CNV or CNI.

Before to connect any external networks to this output the operator must contact the manufacturer. Any damages due to this matter are not covered by warranty.

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

2.2.2. Rear view OCS 500N6F.x

1 EUT supply input neutral
2 EUT power mains supply line
3 Sync input
4 Test supply input PE
5 Reference earth connection
6 Warning lamp
7 Ventilation
8 Safety Circuit

1 EUT power mains supply input - Neutral
The neutral N is conducted to the EUT via the coupling/decoupling network to the front panel output N.

2 EUT power mains supply input - Phase
The phase of the power mains supply for the EUT is connected to the lack banana connector L. The 3-phase device has all power mains supply ports on the lower part at the rear side.

3 SYNC input
Input port for ac voltage pulse synchronization to the mains. If no voltage is available the tests will start automatically in asynchronous mode. Normally the Sync input shall be connected directly from the L power mains input (2) of the EUT. The input voltage range is 10..250 Vac

4 EUT power mains supply input – Protective Earth (PE)
The protective earth PE is conducted directly to the front panel output PE.

5 Reference earth connection
The generator must be connected to the reference earth plane of the test set up.

6 Warning lamp
A voltage free contact is available for external warning indications (warning lamp). The relays contact (250V / 5A) will switch after pressing TEST ON button.

7 Ventilation
After long term duration tests the generator should keep on running for some minutes to cool down the system.

8 Safety circuit
A test can only be started if the safety circuit is closed. By opening the safety circuit during a running test, the test will be stopped immediately and the high voltage will be switched off and grounded. For s
The safety circuit will not switch off the EUT Mains supply. For switch off the EUT mains a similar safety circuit must be used as described in a rack solution in the safety manual.

9 External trigger
10 Power on switch and fuse
11 Mains selector 115V / 230V
12 Fuse of the high voltage power supply
13 Parallel interface IEEE
14 Optical interface (USB)
15 Remote control connector
16 FAIL 1 / FAIL 2 connector

9 External trigger (BNC plug)
Trigger input for a pulse release. Trigger level 5-15V positive going.

10 Power on switch
The switch is part of the mains filter. Mains fuses are part of the filter. (230V / 1A and 115V / 2A)

11 Mains selector
Selection of 115V / 230V

12 Fuse of the high voltage power supply
The high voltage power supply is protected by this fuse „F3“. In case that no high voltage is generated but the control unit works properly this fuse shall be checked.

13 Parallel interface GPIB / IEEE 488
IEEE 488 interface with IEEE connector

14 Optical interface (USB)
For data transfer an optical USB interface is available. The user must set the same Baud rate in the device and control software. (Default setting 9600 baud).
When the interface is not used, the input and output must be closed by the delivered sticks. Otherwise unwanted light can start an interrupt on the optical input circuit.

15 Remote control connector CN
External coupling devices are controlled via this remote control connector.

16 Fail detection FAIL 1 EUT control (TEST STOP)
Grounding this input will cause a complete stop of the running test procedure. (+15V to ground) The test must be completely restarted.

Fail detection FAIL 2 EUT control (TEST PAUSE)
Grounding this input will cause a break for the running test procedure (+15V to ground).The test will be continued when the input is no more connected to ground.

3. Operation

3.1. Description of the menus

The simulator is operated by an easy menu control system. Seven function keys are available to select parameters and functions. All functions are indicated on the display; max. 8 lines and 40 characters.

The selected parameter is blinking and can be changed by turning the knob (Inc. /Dec.). The takeover of the input value occurs after about 500ms encoder downtime. This allows the operator a brief check of the correct input value.

←→ : The digit to be changed can be selected with the cursor (←→).
- Settled values are direct indicated on the screen.
- Status on the bottom lines shows the desired status after pressing the function key.

ESC: ESC will take you back to the previous level in the menu and set the displayed values. The latest settings are stored automatically and will be recalled when the menu is selected again.

EXIT: The firmware will reset to the main screen.

EM TEST

OCS 500N6

Damped Oscillatory
V 2.00

Oscillatory
Ringwave

SWN: 001234

Start-up display example OCS 500N6

The serial number and the version number SWN are used for traceability reasons. These numbers are listed in the test reports and calibration certificates. These numbers also are listed within the test reports generated by the AMETEK CTS software ISM IEC.

3.2. Menu structure

Page 0...4

Page 0	Page 1	Page 2	Page 3	Page 4..x
MAIN MENU **F1** Damped Osc. 100kHz IEC 61000-4-18 **F2** Damped Osc. 1MHz IEC 61000-4-18 **F3** Ringwave 100kHz IEC 61000-4-12 **F4** Damped Osc. 100kHz MF IEC 61000-4-10 **F5** Damped Osc. 1MHz MF IEC 61000-4-10 **F6** Damped Osc. 1MHz ext. IEC 60255-26 **F7** Service	**Damp. Osc.100kHz** IEC 61000-4-18 **F1** Quick Start **F2** Standard test routines **F3** User test routines	**Quick Start** **F1** Start **F2** Change **F3** Continue	**Start** Start the test routine **Change** Select all parameters **Continue** Continue the test routine	
	Damped Osc. 1MHz IEC 61000-4-18 **F1** Quick Start **F2** Standard test routines **F3** User test routines	**Standard test routines** Preprogrammed test routines as per standard requirements	**Standard routines** **F1** Common Mode **F2** Differential Mode	**Standard routines** **F1** Level 1 **F2** Level 2 **F3** Level 3 **F7** Manual
	Ringwave IEC 61000-4-12 **F1** Quick Start **F2** Standard test routines **F3** User test routines	**User test routines** Preprogrammed test routines for evaluation and design support	**User test routines** **F1** Synchronous to the mains **F2** Random burst release **F3** Change V after T by ΔU **F4** Change polarity after T	**User test routines** **F1** Start **F2** Change **F3** Continue
	Damped Osc. 100Hz MF IEC 61000-4-10 **F1** Quick Start **F2** Standard routines **F3** User test routines **F7** Magnetic field correction factor	**Setup Magnetic field** **F1** Coil factor Cf [1/m]	**Magnetic field factors** Correction factors for magnetic field antenna	
	Damped Osc. 1MHz IEC 60255-26 **F1** Quick Start **F2** Standard test routines **F3** User test routines	**Damped Osc. 1MHz** IEC 60255-26 **Standard test routines** **F1** Common Mode 1 **F2** Common Mode 2 **F3** Differential Mode	**Damped Osc. 1MHz** IEC 60255-26 **User test routines** **F1** Synchronous to the mains **F2** Random burst release **F3** Change V after T by ΔU **F4** Change polarity after T	**Damped Osc. 1MHz** IEC 60... **F1** Level 1 **F2** Level 2
	Damped Osc. 1MHz Ext IEC 60255-26 **F1** Quick Start **F2** Standard test routines **F3** User test routines	**Setup** **F1** Change language **F2** LCD backlighting **F3** Interfaces **F4** Beeper **F5** Power –on counter	**Change language** German or English **LCD backlighting** On, Off or Auto **Interfaces** Select all parameters **Beeper** (on, off) **Power.on counter** Display of Power on time and Testing time	
	Service **F1** Addresses **F2** Setup **F3** Change standard levels **F7** Status	**Change standard level** **F1** set all parameters acc.to standard **F2** Damped Osc. 100kHz **F3** Damped Osc. 1MHz **F4** Ringwave 100kHz **F5** Damped Osc. 1MHz MF	**Change standard level** **F1** Level 1 **F2** Level 2 **F3** Level 3 **F4** Level 4 **F6** Coupling Diff / Common mode	

3.3. Main Menu OCS 500N6.x

Page 1

MAIN MENU		
F1 : Damped Osc.	100 kHz	IEC 61000-4-18
F2 : Damped Osc.	1MHz	IEC 61000-4-18
F3 : Ringwave	100 kHz	IEC 61000-4-12
F4 : Damped Osc.	100kHz MF	IEC 61000-4-10
F5 : Damped Osc.	1MHz MF	IEC 61000-4-10
F6 : Damped Osc.	1MHz ext.	IEC 60255-26
F7 : Service		

F1 F2 F3 F4 F5 F6 F7

F1 Damped Oscillatory 100 kHz
With function key F1 the user can select **Damped Oscillatory 100 kHz** as per **IEC 61000-4-18**. The test pulses are oscillatory waves with a frequency of 100 kHz and a rise time of 75ns.

F2 Damped Oscillatory 1MHz
With function key F2 the user can select **Damped Oscillatory 1MHz** as per **IEC 61000-4-18**. The test pulses are oscillatory waves with a frequency of 1MHz and a rise time of 75ns...

F3 Ringwave 100 kHz
With function key F3 the user can select the **Ring Wave 100 kHz** as per **IEC 61000-4-12**. The test pulses are oscillatory waves with a frequency of 100 kHz and a rise time of 0.5µs.

F4 Damped Oscillatory 100 kHz Magnetic Field
With function key F4 the user can select the Damped Oscillatory Magnetic Field Test as per **IEC 61000-4-10.** The test pulses are the same as used under F1 Damped Oscillatory 100 kHz.

F5 Damped Oscillatory 1MHz Magnetic Field
With function key F5 the user can select the Damped Oscillatory Magnetic Field Test as per **IEC 61000-4-10.** The test pulses are the same as used under F2 Damped Oscillatory 1MHz.

F6 Damped Oscillatory 1MHz Ext.
With function key F6 the user can select **Damped Oscillatory 1MHz** as per **IEC 60255-26** with coupling to the external coupling device CNV 508N4. The test pulses are oscillatory waves with a frequency of 1MHz and a rise time of 75ns...

F7 Service
Setup and servicing routines are available.

3.4. Main Menu OCS 500N6F.x

Page 1

MAIN MENU		
F1 Fast Damped Osc.		IEC 61000-4-18
F2 Slow Damped Osc.		IEC 61000-4-18
F3 Ringwave Gen. 100 kHz		IEC 61000-4-12
F4 Damped Osc.	1MHz ext.	IEC 60255-26
F7 : Service		

F1 F2 F3 F4 F5 F6 F7

Page 2 Fast Damped Osc

SETUP Fast Damped Osc.		
F1 Damped Osc.	3MHz	IEC 61000-4-18
F2 Damped Osc.	10MHz	IEC 61000-4-18
F3 Damped Osc.	30MHz	IEC 61000-4-18

F1 F2 F3 F4 F5 F6 F7

Page 2 Slow Damped Osc

SETUP Slow Damped Osc.		
F1 Damped Osc.	100 kHz	IEC 61000-4-18
F2 Damped Osc.	1 MHz	IEC 61000-4-18
F3 Damped Osc.	100 kHz MF	IEC 61000-4-18
F4 Damped Osc.	1 MHz MF	IEC 61000-4-18

F1 F2 F3 F4 F5 F6 F7

Page 2 Ringwave (See menu structure Chap 3.2)

Ringwave.	IEC 61000-4-12
F1 Quickstart	
F2 Standard test routines	
F3 User test routines	

F1 F2 F3 F4 F5 F6 F7

Page 2 Standard test routines Ringwave (See menu structure Chap 3.2)

Damped Osc	1MHz ext.	IEC 60255-26
F1 Quickstart		
F2 Standard test routines		
F3 User test routines		

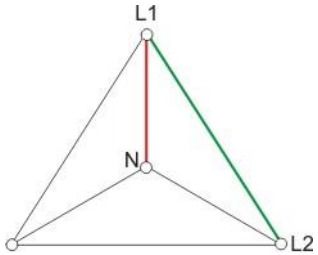
F1 F2 F3 F4 F5 F6 F7

3.5. Phase synchronization in 3-phase system

The built in hardware phase synchronization is between the sync input and PE. The user must connect the synchronize line L1 with the sync plug.

The synchronization is based on a 3-phase system where neutral is connected to PE in the supply system.

As Standard **line L1 is connected to the sync** plug. For coupling other lines, the OCS500 hardware will not shift the phase angle in relation to the used coupling.



Sync : L1-PE

The tables below shows the correction angels considering the phase in a 3-phase system with connected L1 to the sync input. The user must set the correction angle value manually.

Synchronization: L1 to Sync input

	Sync. Source	Settled phase angel value for coupling:					
Coupling	**L1-PE**	**L1-N L1-PE**	**L2-N L2-PE**	**L3-N L3-PE**	**L1-L2**	**L1-L3**	**L2-L3**
Sync.-Angel	**0°**	0°	0°	0°	0°	0°	0°
	90°	90°	90°	90°	90°	90°	90°
	180°	180°	180°	180°	180°	180°	180°
	270°	270°	270°	270°	270°	270°	270°

Example: For setting the coupling L1-L2 with a 180° phase angle **set the generator phase to 180°**

3.6. Service

SERVICE
F1 : Addresses
F2 : Setup
F3 : Change standard levels

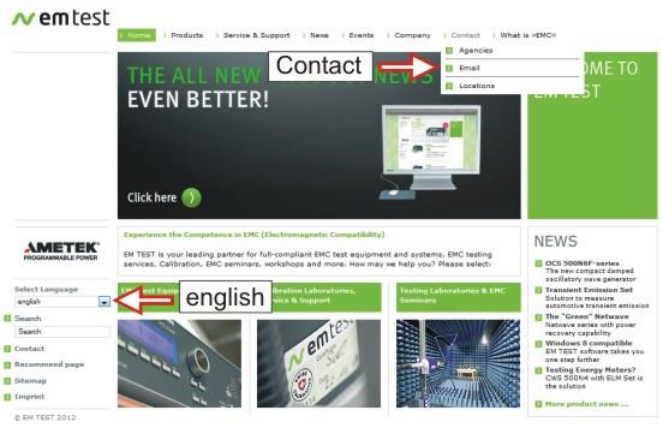
F7 : Status

F1 F2 F3 F4 F5 F6 F7

F1 Addresses

The addresses of the AMETEK CTS GmbH in Switzerland and Germany are shown. The addresses of all AMETEK CTS sales agencies are listed on the web site of EM TEST under :

www.emtest.com



F2 Set-up

The software will clearly explain the set-up procedure.

F3 Change standard levels OCS 500 N6.x

The stored standard test levels can be changed within this menu.

F1: Reset all standard levels
F2: Change standard level for IEC 61000-4-18 Damped Oscillatory 100 kHz
F3: Change standard level for IEC 61000-4-18 Damped Oscillatory 1MHz
F4: Change standard level for IEC 61000-4-12 Ringwave 100 kHz
F5: Change standard level for IEC 61000-4-10 100 kHz Damped Oscillatory Magnetic Field
F6: Change standard level for IEC 61000-4-10 1 MHz Damped Oscillatory Magnetic Field
F7: Change standard level for IEC 60255-26 Damped Oscillatory 1MHz ext.

F3 Change standard levels OCS 500 N6F.x

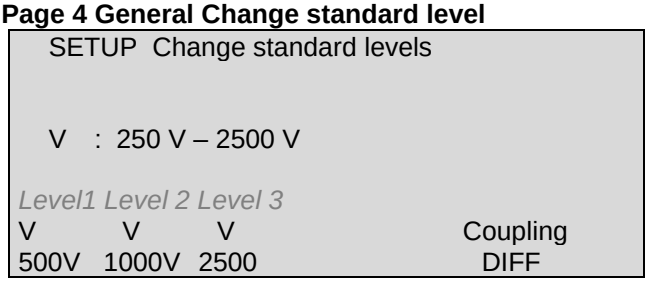
The stored standard test levels can be changed within this menu.

F1 Fast Damped Osc. IEC 61000-4-18
F1: Set all standard acc. to standard
F2: Damped Osc. 3MHz IEC 61000-4-18 Damped Oscillatory 3MHz
F3: Damped Osc. 10MHz IEC 61000-4-18 Damped Oscillatory 10MHz
F4: Damped Osc. 30MHz IEC 61000-4-18 Damped Oscillatory 30MHz

F2 Slow Damped Osc. IEC 61000-4-18
F1: Set all standard acc. to standard
F2: Damped Osc 100 kHz IEC 61000-4-18 Damped Oscillatory 100 kHz
F3: Damped Osc 1MHz IEC 61000-4-18 Damped Oscillatory 1MHz
F4: Damped Osc 100kHz MF IEC 61000-4-18 Damped Oscillatory 100 kHz H-Field
F5: Damped Osc 1MHz MF IEC 61000-4-18 Damped Oscillatory 1MHz H-Field

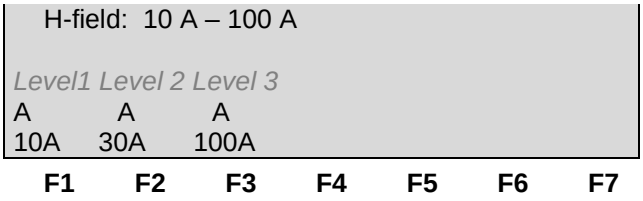
F3 Ringwave Gen. 100kHz IEC 61000-4-12
F1: Set all standard acc. to standard
F2: Ringwave Gen. 100kHz IEC 61000-4-12 Ringwave 100kHz

Page 4 General Change standard level



F1, F2, F3 For each coupling (Differential mode and Common mode) a separate level can be settled. The display shows the actual working mode.

F6 Selection **Differential mode** and **Common mode**



F7 Status

This menu shows all device settings.

3.7. Setup

Page 3

SETUP
F1 : Change language
F2 : LCD - Backlighting
F3 : Interfaces
F4 : Beeper
F5 : Power – on counter

F1 F2 F3 F4 F5 F6 F7

F1 Change language
The user can chose between two languages, German and English. The user can chose between two languages, German and English.

F2 LCD - Backlighting
With the use of F2 the backlighting can be switched on or off.
Additionally the **Auto Off** function can be programmed to switch Off the backlighting after a defined time that the equipment has not been in operation (1 - 30minBecause of the limited lifetime of LCD displays, approx. 10,000h this function should always be activated.

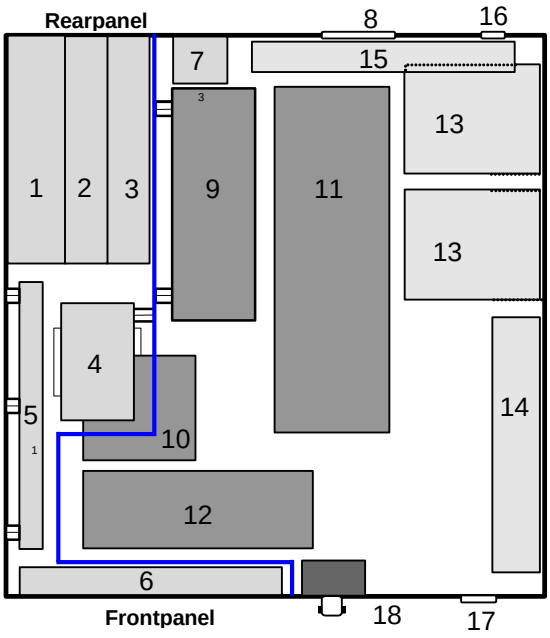
F3 Interfaces
This menu will help the user to define the status of the integrated serial and parallel interfaces, e.g. the baud rate of the RS 232 or the address of the IEEE interface.

F4 Beeper
In the beep menu F1 is the selector for switch ON / OFF the keyboard-beep. The test-finish-beep is not selectable and sounds always 3 times when a test routine is finished.

F5 Operating time
Pressing of F5 will show the total operating time of the test equipment. There are two timers,
- Total operating time (powered on)
- Testing time (total testing time)

4. Test Equipment OCS 500 Nx

4.1. Assembling OCS 500N6



Control unit

1 Power supply board
2 Interface board
3 Controller board
4 Power supply transformer
5 Filter board / connecting board
6 Keyboard / LCD- display

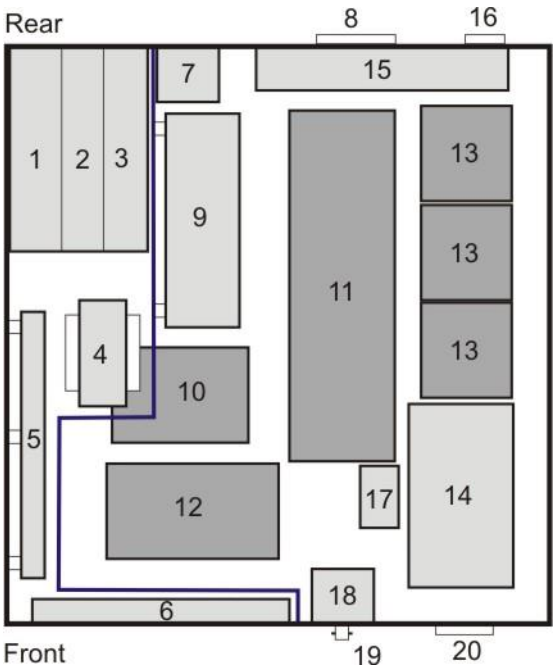
High voltage unit

7 General power supply input, filter
8 Ventilation
9 High voltage power supply
10 Storage capacitor
11 Damped oscillatory module
12 Ringwave module

Coupling/decoupling unit

13 Decoupling chokes
14 Coupling network
15 Filter board for the EUT supply
16 Input EUT supply
17 Output for the EUT supply
18 Trigger output BNC

4.2. Assembling OCS 500N6Fx



Control unit

1 Power supply board
2 Interface board
3 Controller board
6 Power supply transformer
7 Filter board / connecting board
6 Keyboard / LCD- display

High voltage unit

7 General power supply input, filter
8 Ventilation
9 High voltage power supply
10 Storage capacitor
11 Damped oscillatory module
12 Ringwave module

Coupling/decoupling unit

13 Decoupling chokes
14 Coupling network
15 Filter board for the EUT supply
16 Input EUT supply
17 Current probe
18 Current measuring Ringwave
19 Trigger output BNC
20 Output to EUT supply

5. Technical data

5.1. Slow damped oscillatory as per IEC 61000-4-18

Test Level

Output voltage	250 V – 2`500 V ± 10 % 250 V – 3`000 V ± 10 % HV out on model N6.5; N6.6; N6.7; N6.8
Wave form (open circuit):	
Rise time	75 ns ± 20 %
Oscillation frequency	100 kHz and 1 MHz ± 10 %
Decaying	Peak 5 must be > 50 % of peak 1 value Peak 10 must be < 50 % of peak 1 value No requirements for other peaks
Source impedance	200 Ω ± 20 %
Coupling capacitors	0,5 µF ± 10 %
Polarity	Positive, Negative
Repetition rate	At least 40/ s for 100 kHz and At least 400/ s for 1 MHz

Trigger

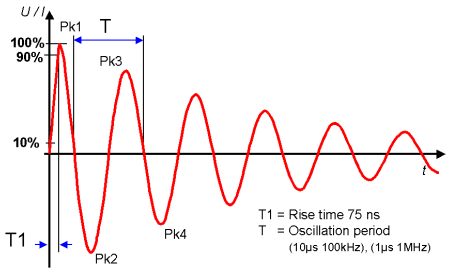
Trigger of bursts	AUTO, MANUAL, EXTERN (min. repetition time 0.1 s)
Repetition rate, Rep	20/ s – 50/ s for 100 kHz 20/ s – 400/ s for 1 MHz
Burst duration td	0.1 s – 99.9 s
Burst repetition time tr	0.1 s – 99.9 s
Test duration T	0:01 min – 99:59 min ± 1 s, endless

Output

Direct at the front panel	2 banana plugs for: - For connect ext. coupling devices with firmware **V 3.30axx and higher** Ri = 100 Ω for coupling set to “Ext CN” Ri = 200 Ω for coupling set to “\” - For previous firmware versions **up to V3.24a xy** Ri =200 Ω for coupling set to “\” coupling “ExtCN” not awailable - Magnetic Field antenna 100 Am^{-1} (Firmware Version 1.13 and higher) - Magnetic Field antenna 60 Am^{-1} (Firmware Version 1.10 up to 1.12)
Coupling network 1 phase	To L, N, PE all combinations
Coupling network 3 phase	L1...L3-N, L1...L3-PE, N-PE, L1+L2+L3-PE , L1+L2+L3+N-PE
EUT Supply	AC 250 V / 16 A / 50/60 Hz DC 250 V/10 A

Test routines

Quick Start	Immediate start, all parameters adjustable during a running test
Standard test as per	IEC 61000-4-18 level 1 up to level 3 IEC 61000-4-18 Manual operated standard test routine
User test routines	Synchronized Random release Voltage change after T by steps of dV Change polarity after T



Option required for Magnetic Field Test per IEC 61000-4-10

- Magnetic field antenna MS 100 (square 1m x 1m coil)
- Adapter cable for connecting the square coil to the OCS output (twisted pair of cable max. 3 m, part of the antenna delivery).

5.2. Fast damped oscillatory as per IEC 61000-4-18

Test Level

Output voltage	450V – 4`400 V ± 10 %
Wave form (open circuit):	
Rise time	5 ns ± 30 %
Oscillation frequency	3 MHz, 10 MHz, and 30 MHz ± 10 %
Decaying (voltage)	Peak 5 must be > 50 % of peak 1 value Peak 10 must be < 50 % of peak 1 value No requirements for other peaks
Source impedance	50 Ω ± 20 %
Coupling capacitor	33 nF ± 10 %
Polarity	Positive, Negative
Repetition rate	5000 /s
Burst duration, td	50 ms ± 20 % at 3 MHz 15 ms ± 20 % at 10 MHz 5 ms ± 20 % at 30 MHz
Burst period	300 ms ± 20 %
Short circuit current	9 A to 88 A ± 20 %
Rise time current	< 330 ns at 3 MHz < 100 ns at 10 MHz < 33 ns at 30 MHz at
Decaying (current)	Peak 5 must be > 25 % of peak 1 value Peak 10 must be < 25 % of peak 1 value No requirements for other peaks

Trigger

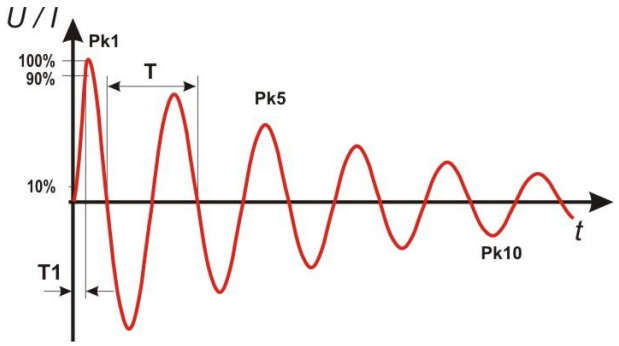
Trigger of bursts	AUTO, MANUAL, EXTERN
Repetition rate, Rep	1 /s – 5000 /s for 3, 10, 30 MHz
Burst duration td	3 MHz: 1.0 – 50 ms 10 MHz: 1.0 – 15 ms 30 MHz: 1.0 – 5.0 ms
	0.1 s – 99.9 s
Test duration, T	0:01 min – 99:59 min ± 1 s, endless
Repetition time tr	0.3 s – 99.9 s / Man

Output

Direct at the front panel	Coaxial 50 Ω to capacitive coupling clamp (HFK)
Coupling network 1 phase	To L, N all combinations to PE
Coupling network 3 phase	Lx-PE, N-PE, L1+L2+L3-PE, L1+L2+L3+N-PE

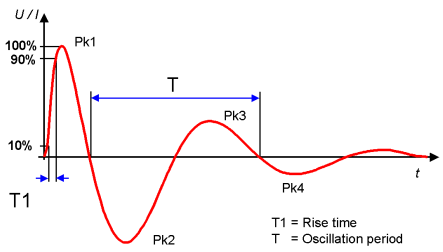
Test routines

Quick Start	Immediate start, all parameters adjustable during a running test
Standard test as per	IEC 61000-4-18 level 1 up to level 4 IEC 61000-4-18 Manual operated standard test routine
User test routines	Synchronized Random release Voltage change after T by steps of dV Change polarity after T



5.3. RINGWAVE Immunity requirements as per ANSI C 62.41 (IEC 61000-4-12)

Test level	
Open circuit voltage	250 V – 6‘000 V ± 10 %
Wave shape open circuit	
Rise time first peak T1	0.5 µs ± 30 %
Oscillation frequency 1/T	100 kHz ± 10 %
Decaying of Pk1 to Pk2	40 % - 110 %
Decaying of Pk2 to Pk3	40 % - 80 %
Decaying of Pk3 to Pk4	40 % - 80 %
Decaying other peaks	no requirements for other peaks
Output impedance	12 Ω, 30 Ω ± 20 % (internal depend setting) 12 Ω internal ± 20 % (with setting R external)
Wave shape short circuit	
Rise time first peak tr T1	0.2 to 1.0 µs (short circuit)
Oscillation frequency 1/T	100 kHz ± 10 %
Decaying	no requirements
Short circuit current 12Ω	500 A ± 10 %
Short circuit current 30Ω	200 A ± 10 % (+10 % - 0 %, models as per IEC 61008-1 for RCCB)
Polarity	positive / negative / alternating
Repetition rate	250 V – 4000 V 1 s – 999 s > 4000V 10 s – 999 s
Events preselection	1 - 30'000 or endless
Counter	1 – 100’0000
Trigger	
Trigger of pulses	AUTO, MAN, EXTERN
Synchronization	0 - 360° (16 – 500 Hz) Asynchron = 0° If a reference signal is connected to the Sync input.
Resolution	1°
Output	
Direct	HV-COM connector Zi = 12 Ω or 30 Ω depend setting
Coupling network 1 phase	To L, N, PE all combinations
Coupling network 3 phase	L1...L3-N, L1...L3-PE, N-PE, L1+L2+L3-PE , L1+L2+L3+N-PE
Measurements	
CRO	5V Trigger
Peak voltmeter	6000 V ± 10 % 50 V resolution
Peak current meter	500 A ± 10% 5 A resolution
Test routines	
Quick Start	Immediate start, all parameters adjustable during a running test
Standard test routines as per	IEC 61000-4-12 level 1 IEC 61000-4-12 level 2 IEC 61000-4-12 level 3 IEC 61000-4-12 level 4 IEC 61000-4-12 Manual operated standard routine (single phase equipment)
User test routines	Change polarity after n pulses Change voltage level V after n pulses by ΔV Change phase angle A after n pulses by ΔA Change coupling mode after n pulses



5.4. General Specifications OCS 500N6.x

DUT Supply

OCS 500 N6.5	N6	built in 1- phase coupling network	250 V	16 A ac	250 V/16 A dc
OCS 500 N6.6	N6.2	built in 1- phase coupling network	250 V	32 A ac	250 V/32 A dc
OCS 500 N6.7	N6.3	built in 3- phase coupling network	3x440 V	16 A ac	250 V/16 A dc
OCS 500 N6.8	N6.4	built in 3- phase coupling network	3x440 V	32 A ac	250 V/32 A dc
OCS 500 N6.17	(for RCCB)	built in 3- phase coupling network	3x440 V	32 A ac	250 V/32 A dc
OCS 500 N6.11		built in 3- phase coupling network	3x690 V	32 A ac	250 V/32 A dc
OCS 500 M6S8		built in 3- phase coupling network	3x440 V	100 A ac	
OCS 500 N6.22		built in 3- phase coupling network	3x690 V	100 A ac	250 V/32 A dc

Mains

Power mains supply	230 V/115 V, 50/60 Hz, less than 100 W
Fuse	230 V: 2 AT slow blow, 115 V: 4 AT slow blow

Safety

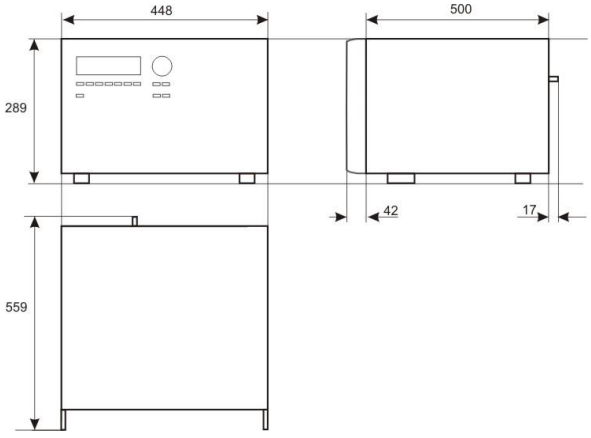
Safety circuit	External interlock capability
Warning lamp	Voltage free contact max. 250 V 5 A
Design	per IEC 1010, EN 61010

Interfaces

Serial RS 232	1200 - 19200 Baud
Parallel IEEE	Address 1-31

Dimensions

OCS 500 Nx 19" / 6 HU



OCS 500 M6S8 19" / 25 HU minirack 1240 x 553 x 780 mm

Weight

OCS 500 N6.5	N6.1	app. 28 kg	1ph / 16 A
OCS 500 N6.6	N6.2	app. 32 kg	1ph / 32 A
OCS 500 N6.7	N6.3	40.90 kg	3ph / 16 A
OCS 500 N6.8	N6.4	40.65 kg	3ph / 32 A
OCS 500 N6.11		40.5 kg	3ph / 32 A
OCS 500 N6.17	(for RCCB)	40.5 kg	3ph / 32 A
OCS 500 N6.20		179.5 kg	3ph / 100 A
OCS 500 N6.22		ca. 210 kg	3ph / 100 A 25 HU 1320 mm x 550 mm x 800 mm

5.5. General Specifications OCS 500N6F.x

DUT Supply

OCS 500 N6F		built in 1- phase coupling network	250 V	16 A ac	250 V/16 A dc
OCS 500 N6F.1		built in 1- phase coupling network	250 V	32 A ac	250 V/32 A dc
OCS 500 N6F.2		built in 3- phase coupling network	3x440 V	16 A ac	250 V/16 A dc
OCS 500 N6F.3		built in 3- phase coupling network	3x440 V	32 A ac	250 V/32 A dc
OCS 500 N6F.4	(for RCCB)	built in 3- phase coupling network	3x440 V	32 A ac	250 V/32 A dc

Mains

Power mains supply	230 V/115 V, 50/60 Hz, less than 100 W
Fuse	230 V: 2 AT slow blow 115 V: 4 AT slow blow

Safety

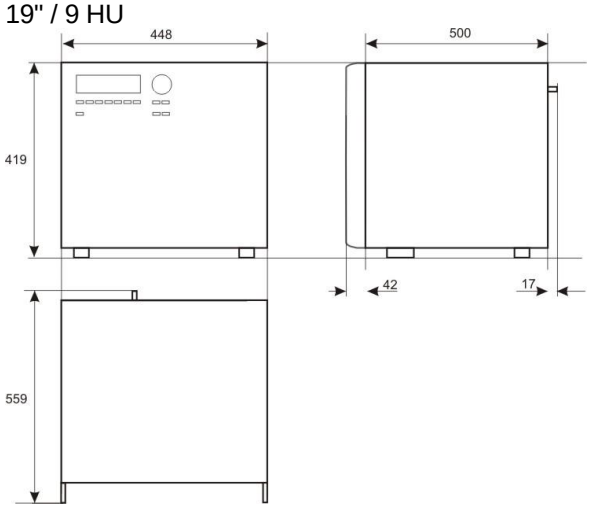
Safety circuit	External interlock capability
Warning lamp	Voltage free contact max. 250 V 5 A
Design	per IEC 1010, EN 61010

Interfaces

Optical USB	1200 - 19200 Baud
Parallel IEEE	Address 1-31

Dimensions

OCS 500 N6F.x 19" / 9 HU



Weight

OCS 500 N6F	app. 28 kg	1ph / 16 A
OCS 500 N6F.1	app. 32 kg	1ph / 32 A
OCS 500 N6F.2	50.50 kg	3ph / 16 A
OCS 500 N6F.3	app. 60 kg	3ph / 32 A
OCS 500 N6F.4	app. 60 kg	3ph / 32 A

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

6. Damped Oscillatory 100 kHz or 1 MHz as per IEC 61000-4-18

This phenomenon is representative of switching of isolators in HV / MV open-air stations, and is particularly related to the switching of HV bus-bars, as well as of background disturbances in industrial plants.

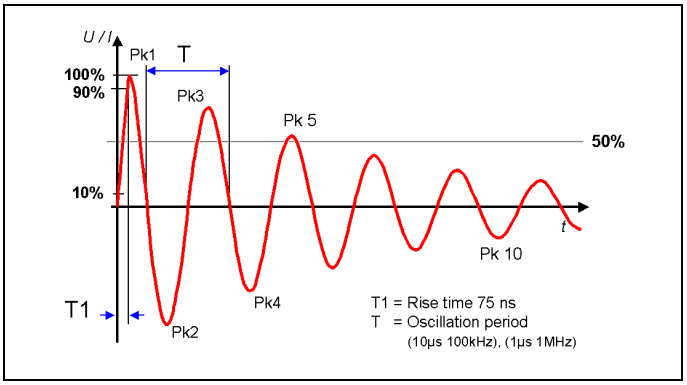
Verification as per IEC 61000-4-18:

Open circuit

V peak	250 V – 2500 V	±10 %
Rise time first peak	75 ns	±20 %
Oscillating frequency	100, 1000 kHz	±10 %
Decaying of peak 5-1	> 50% of peak 1	
Decaying of peak 10-1	< 50% of peak 1	
Repetition rate	at least 40/s for 100 kHz at least 400/s for 1 MHz	

Short circuit

I peak (200Ω)	1.25, 2.5, 5, 10A	± 20 %
Source impedance	200 Ω	± 20 %



6.1. Operation

This menu offers different test routines for Damped Oscillatory testing. The menu structure is identical for both, the 100 kHz and the 1MHz damped oscillatory.

Page 2

Damped Osc. 1MHz	IEC 61000-4-18
F1 : Quick start	
F2 : Standard test routines	
F3 : User test routines	

F1 **F2** **F3** **F4** **F5** **F6** **F7**

F1 Quick start
Easy and fast online-operation of the equipment.

F2 Standard test routines
The operator can select between various preprogrammed test routines as required in different standards

F3 User test routines
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

6.1.1. Quick start

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

Page 3

Damped Osc. 1MHz						Quick start
V	=	500	V	Rep	=	400/s
td	=	2	s	tr	=	10s
cpl	=	L-PE		+/-	=	+
T	=	01:00 min				
START	CHANGE					

F1 F2 F3 F4 F5 F6 F7

Press ***CHANGE*** and the test parameters parameter can be changed.

Select the desired parameter with the related function key and change the value by turning the front panel knob. The cursor allows the user to define the digit to be changed (fast or slow change).

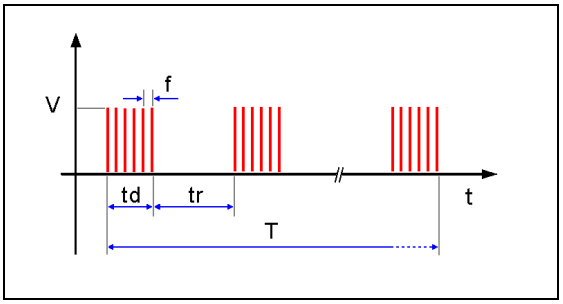
Press ***START*** and the test starts immediately with the displayed test parameters.

The operator now can navigate with the ***Cursor*** from parameter to parameter. The blinking parameter can be changed by turning the front panel knob.

Press ***ESC*** will bring the user back to the previous menu level. All function keys except F2 (manual trigger) can ***Stop*** the test routine.

Burst specification as pre IEC 61000-4-18

Td = 2 s
tr = not specified
f = 400/ s for 1 MHz and 40/ s for 100 kHz



6.1.2. Standard test routines

The user can select preprogrammed standard test routines.

Page 3

Damped Osc. 1MHz	IEC 61000-4-18
F1 : Common Mode	*L-PE, N-PE L+N - PE*
F2 : Differential Mode	*L-N*

F1 F2 F3 F4 F5 F6 F7

Page 4

Damped Osc. 1MHz		IEC 61000-4-18
F1 :	Level 1	500 V
F2 :	Level 2	1000 V
F3 :	Level 3	2000 V
F7 : Manual		

F1 F2 F3 F4 F5 F6 F7

The standard levels for common and differential mode can be changed in the setup menu.

6.1.2.1. Level test

A selected level will step through all couplings in the selected Mode. The following parameters are used:

Defined per standard	Voltage	selected level voltage	
	Repetition f	40/s (100 kHz)	400/s (1 MHz)
	Polarity	each coupling	positive and negative
	Coupling	Differential Mode Common Mode	L-N L-PE, N-PE, L+N-PE

Variable parameters	Burst Time td	0.1s – 99.9s
	Repetition tr	0.0s – 99.9s
	Test duration	1 min.

Page 5 (standard test in stop mode)

Damped Oscillatory			IEC 61000-4-18		Level 3
V	=	2000V	Rep	=	400/s
			Td	=	2s
			Tr	=	2s
			T	=	1:00 min
L					
START	CHANGE				

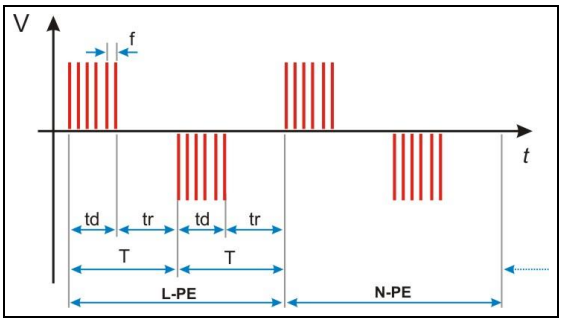
F1 F2 F3 F4 F5 F6 F7

(Running standard test)

Damped Oscillatory			IEC 61000-4-18		Level 3
V	=	2000V	Rep	=	400/s
			Td	=	2s
+ 2000 V			Tr	=	2s
L					Testtime
			current coupling ⇒		0:00:21
STOP	Step		*complete test time* ⇒		0:02:21

F1 F2 F3 F4 F5 F6 F7

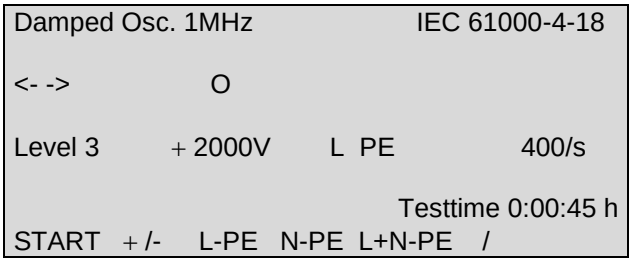
- The Test time shows the elapsed time per actual test level as well as the complete time of all triggered test levels within the running test sequence.
- Pushing the function key F2 STEP will bring you into the next iteration sequence.



6.1.2.2. Manual testing

The manual test menu is only in the single phase equipment available.

Manual standard test routine



Common mode menu

F1 F2 F3 F4 F5 F6 F7

Differential mode menu

F1 F2 F3 F4 F5 F6 F7

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

Example:

- By pushing the cursor ←→ the test level will be increased/decreased to the next standard level.
- By turning the INC knob (**o**) the test level can be continuously adjusted.
- Pressing the function keys the related function will be immediately activated.
- The displayed time will be resettled to zero after every new setting.

All functions can be operated during the running test.

6.1.3. User Test Routines

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

Damped Oscillatory	User test routines
F1 : Synchronized	
F2 : Random release	
F3 : Voltage change after T by dV	
F4 : Change polarity +/- after T	

F1 F2 F3 F4 F5 F6 F7

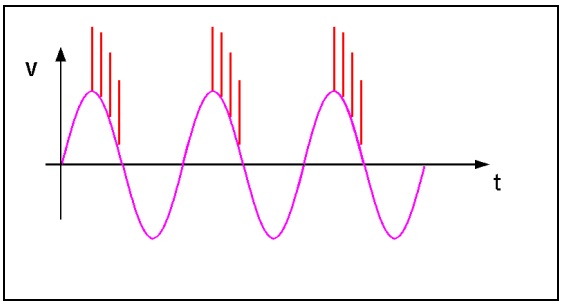
After selection the last used test parameters will be indicated on the display.

Customized test routines

The software controls user test routines according to the specification of the user. All limitations are the same as defined under Quick Start.

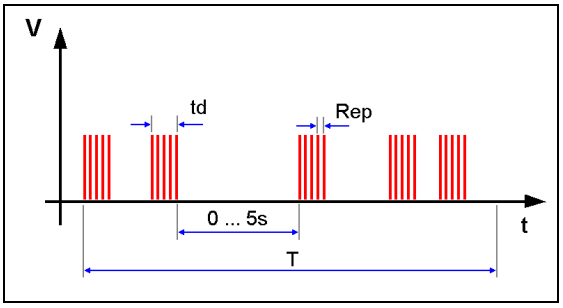
F1 Synchronized with a fixed phase angle

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



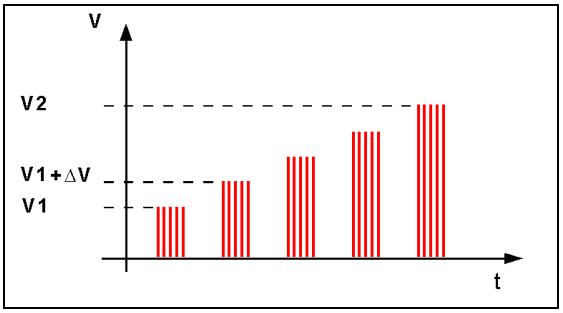
F2 Random release

No repetition rate is selected. The single burst with 2s duration will be triggered by statistics in the limits **of 0.0 to 5s** as time between two bursts. All limitations are the same as defined under Quick Start.



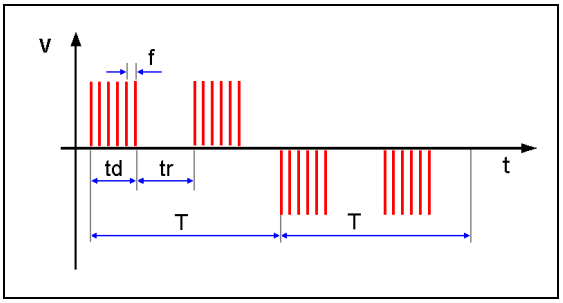
F3 Voltage change after T by ΔV

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



F4 Polarity change after T

The polarity will be changed from + to - after the defined test time T.



6.2. Coupling decoupling network

The decoupling part of the coupling network has to:

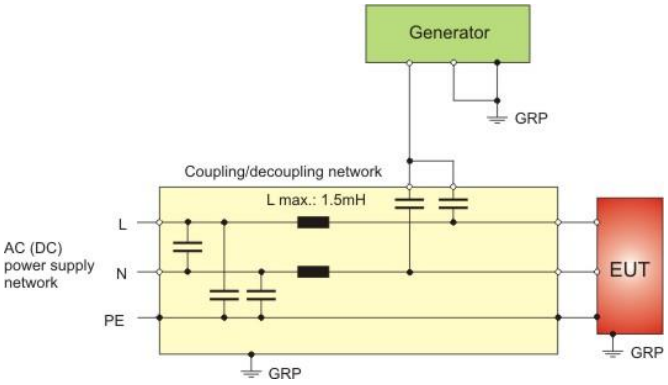
- filter the interference pulses in the direction to the power supply;
- protect other systems that are connected to the same power supply and
- realize a high impedance of the power supply, e.g. battery supply.

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

The coupling network has to couple the interference pulses to the lines of a power supply system (AC or DC). As coupling devices capacitors of sufficient strength and bandwidth shall be used according to IEC 61000-4-18.

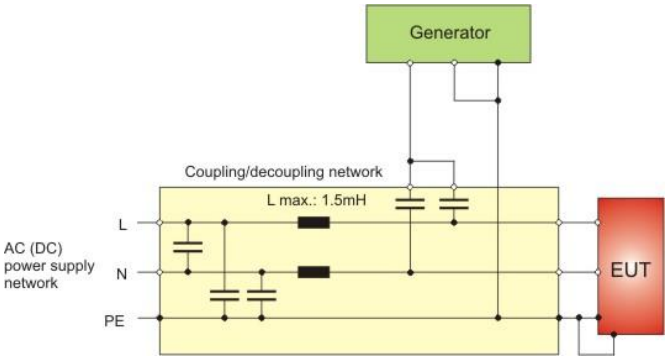
Single-phase coupling

Test setup for Line to ground test



IEC 61000-4-18 Ed1 figure 5a

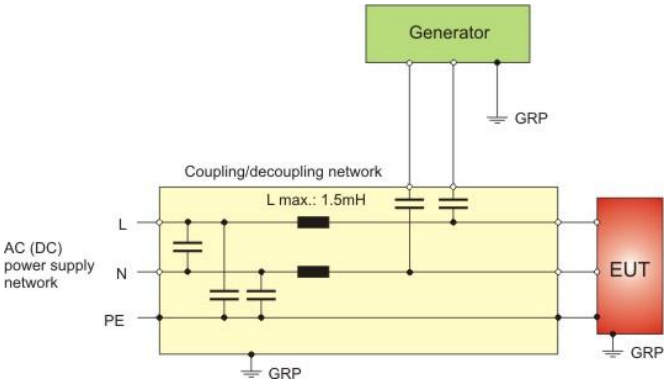
Setup implemented with the ground reference plane



IEC 61000-4-18 Ed1 figure 5b

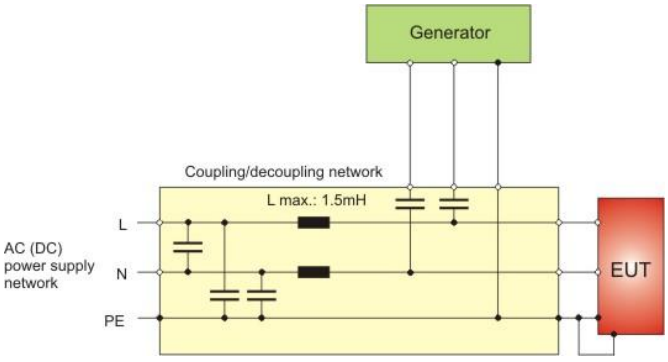
Setup implemented with dedicated earth connection

Test setup for Line to Line test



IEC 61000-4-18 Ed1 figure 9a

Setup implemented with the ground reference plane



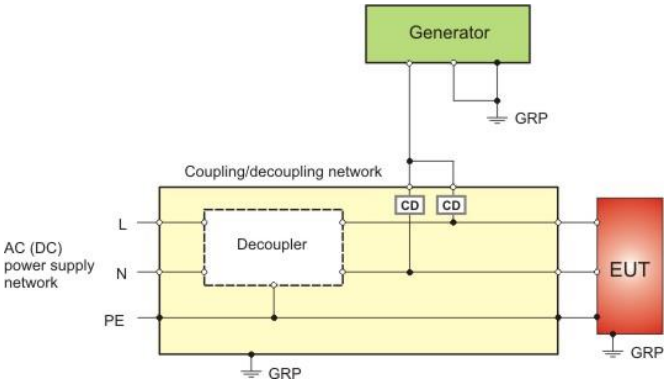
IEC 61000-4-18 Ed1 figure 9b

Setup implemented with dedicated earth connection

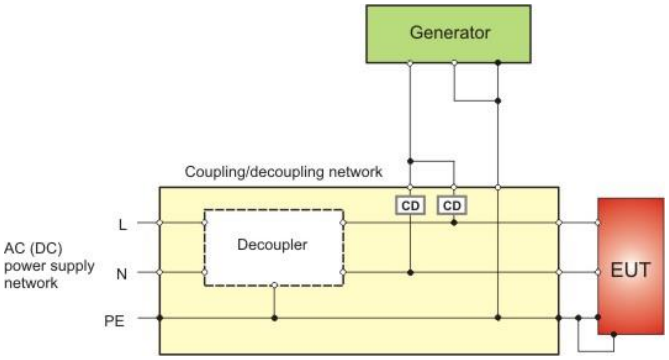
6.2.2. Coupling to Signal- and Datalines

For coupling of Ringwave or damped waves to signal- and data lines special coupling network as per IEC 61000-4-12 / -18 are available. The CND uses special coupling capacitors (CNV 504N1 for four lines).
For many applications special coupling networks are necessary for such kind of test.

Test setup for Line to ground test

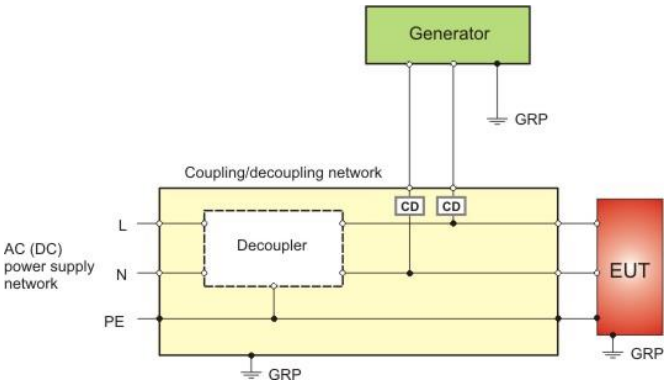


IEC 61000-4-18 Ed1 figure 7a
Setup implemented with the ground reference plane

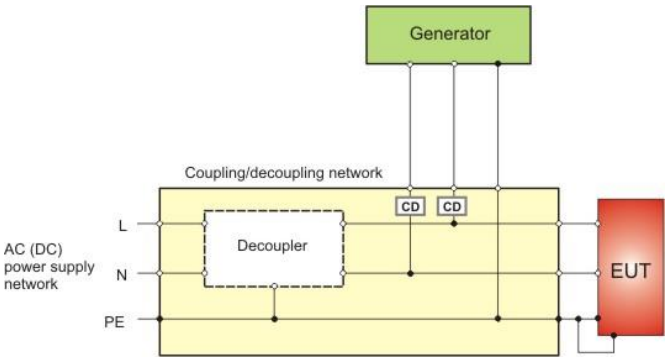


IEC 61000-4-18 Ed1 figure 7b
Setup implemented with dedicated earth connection

Test setup for Line to Line test



IEC 61000-4-18 Ed1 figure 11a
Setup implemented with the ground reference plane

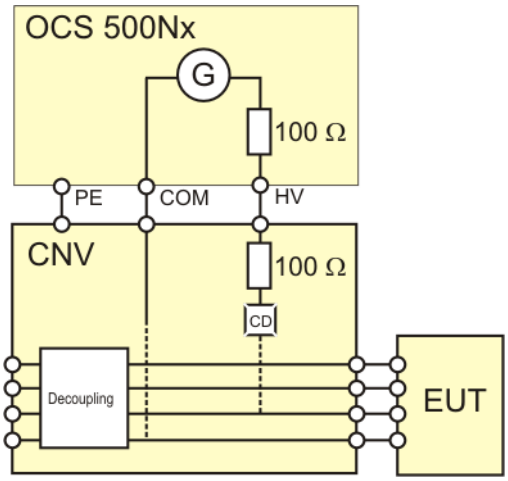


IEC 61000-4-18 Ed1 figure 11b
Setup implemented with dedicated earth connection

6.2.3. Ri setting for slow damped oscillatory wave 100 Ω or 200 Ω

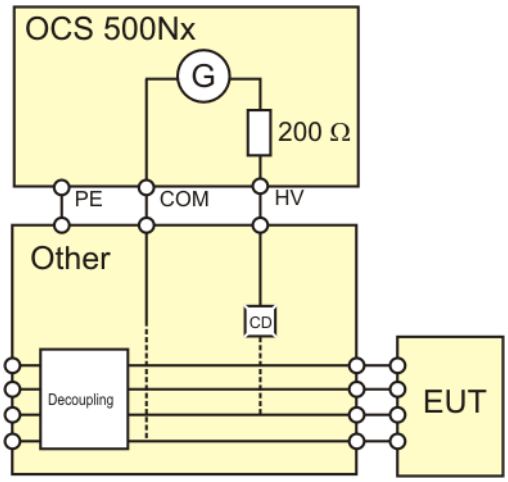
This chapter is valid for OCS 500Nx with firmware versions **V 3.30axx and higher.**

AMETEK CTS coupling decoupling networks



Ri = **100 Ω** Coupling setting to: "**ExtCN"**

All other CDN not from AMETEK CTS



Ri = **200 Ω** Coupling setting to: **"\"**

All earlier firmware versions V3.24axx and earlier, have only one external coupling (\) with 100 Ohm setting.

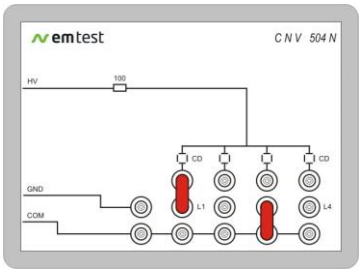
CNV 504N5.x Series

- IEC 61000-4-5
- IEC 61000-4-12
- IEC 61000-4-18
- ANSI IEEE C62.41.2

For coupling of **damped waves** to signal- and data lines a special coupling network as per IEC 61000-4-12 / -18 is available. It works with smaller coupling capacitors (CNV 504N5.1 for four lines).

For many applications special coupling networks are necessary for such kind of test.

The internal impedance in the OCS 500 N6/N6F will change by setting to external coupling network (ExtCN) to 100Ω. The coupling network CNV 504N5.x includes an additional impedance of 100 Ω, for be compliance to the recommended 200Ω for Rd.

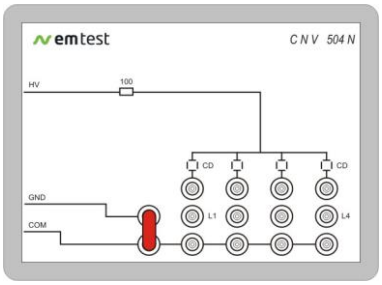


The coupling to the data lines happens with short circuit lines. The middle plug line is connected direct to the EUT output. With individual setting the short circuit connector each combination can be realized.

Example

testing L1 _ L3: HV Coupling to L1
COM to L3

Coupling COM - GND



If the COM line must be connected to GND (protected earth) the short circuit connector must be mounted in the position between CON and GND. Between COM and GND plug an internal inductance of 120 µH is connected.

6.3. Menu Damped Osc. 1MHz EXT.

This menu appears only if an external coupling network **CNV 508N4 is connected** via the CN interface and recognized from the OCS 500N6 during the power on routine. The menu structure is analogue the tests with damped oscillatory for 100kHz and 1MHz.

CNV 5084N4

CNV 5084N4.1

Page 2

Damped Osc. 1MHz EXT.	IEC 60255-26
F1 : Quick start	
F2 : Standard test routines	
F3 : User test routines	

F1 F2 F3 F4 F5 F6 F7

F1 Quick start
Easy and fast online-operation of the device.

F2 Standard test routines
The operator can select between various preprogrammed test routines as required in different standards

F3 User test routines
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

6.3.1. Coupling as per IEC 60255 with CNV 508 N4

The coupling network CNV 508 N4 offers the following coupling modes. The settings can be made on the generator OCS 500N6 or with the software IEC.control.

Common Mode 1

L1+L2 – GND
L3+L4 – GND
L5+L6 – GND
L7+L8 – GND

All not tested pairs are not coupled; floating

Common Mode 2

L1+L2 – GND	(L3+L4+L5+L6+L7+L8) via Koppel C an GND
L3+L4 – GND	(L1+L2+L5+L6+L7+L8) via Koppel C an GND
L5+L6 – GND	(L1+L2+L3+L4+L7+L8) via Koppel C an GND
L7+L8 – GND	(L1+L2+L3+L4+L5+L6) via Koppel C an GND

All not tested pairs are connected via a coupling capacitor to generator GND

Differential Mode

L1 - L2
L3 - L4
L5 - L6
L7 - L8

Coupling between the lines of the selected pair X

6.3.2. Quick start

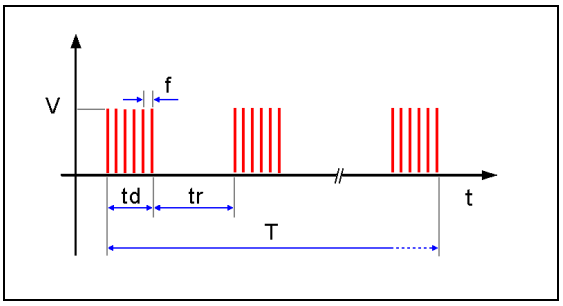
Easy and very fast operation of all standard functions of the device. The latest simulator settings are stored automatically and will be recalled when Quick Start is next selected.

Page 3

Damped Osc. 1MHz EXT.						Quick start
V	=	500	V	Rep	=	400/s
td	=	2	s	tr	=	2s
cpl	=	M1 L1-L2		+/-	=	+
T	=	01:00 min				
START CHANGE						

F1 F2 F3 F4 F5 F6 F7

Press ***ESC*** will bring the user back to the previous menu level. All function keys except F2 (manual trigger) can ***Stop*** the test routine.



Burst specification as pre IEC 60255-26

Td = 2s
tr = not specified (2s factory setting)
f = 400/s for 1MHz

6.3.3. Standard test routines

The user can select preprogrammed standard test routines.

Page 3

Damped Osc. 1MHz EXT.	IEC 60255-26
F1 : Common Mode 1	*L1+L2, L3+L4, L5+L6, L7+L8*
F2 : Common Mode 2	*L1+L2, L3+L4, L5+L6, L7+L8*
F3 : Differential Mode	*L1-L2, L3-L4, L5-L6, L7-L8*

F1 F2 F3 F4 F5 F6 F7

Page 4

Damped Osc. 1MHz EXT.		IEC 60255-26
F1 :	Level 1	1000 V
F2 :	Level 2	2500 V

F1 F2 F3 F4 F5 F6 F7

The standard levels for common and differential mode can be changed in the setup menu.

6.3.3.1. Level test

A selected level will step through all couplings in the selected Mode. The following parameters are used:

Defined per standard	Voltage	selected level voltage	
	Repetition f	40/s (100 kHz)	400/s (1 MHz)
	Polarity	each coupling	positive and negative
	Coupling	Differential Mode	L-N
		Common Mode	L-PE, N-PE, L+N-PE

Variable parameters	Burst Time td	0.1s – 99.9s
	Repetition tr	0.0s – 99.9s

Page 5 (standard test in stop mode)

```
Damped Oscillatory      IEC 61000-4-18   Level 3
V     =    2000V          Rep    =  400/s
                          Td     =  2s
                          Tr     =  2s

L

START  CHANGE
```

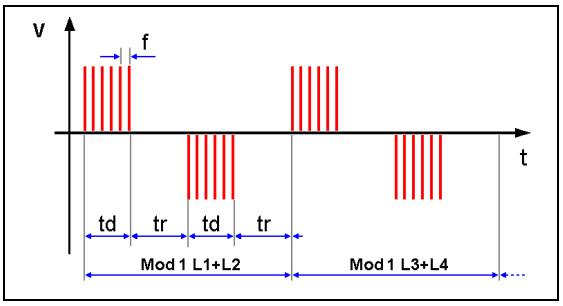
F1 F2 F3 F4 F5 F6 F7

(Running standard test)

```
Damped Oscillatory      IEC 61000-4-18   Level 3
V     =    2000V          Rep    =  400/s
                          Td     =  2s
+ 2000 V                  Tr     =  2s
L                                      Testtime
                          current coupling ⇒  0:00:21
STOP   Step               complete test time ⇒  0:02:21
```

F1 F2 F3 F4 F5 F6 F7

- The Test time shows the elapsed time per actual test level as well as the complete time of all triggered test levels within the running test sequence.
- Pushing the function key F2 STEP will bring you into the next iteration sequence.



6.3.4. User Test Routines

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

Damped Oscillatory	User test routines
F1 : Synchronized	
F2 : Random release	
F3 : Voltage change after T by dV	
F4 : Change polarity +/- after T	

F1 F2 F3 F4 F5 F6 F7

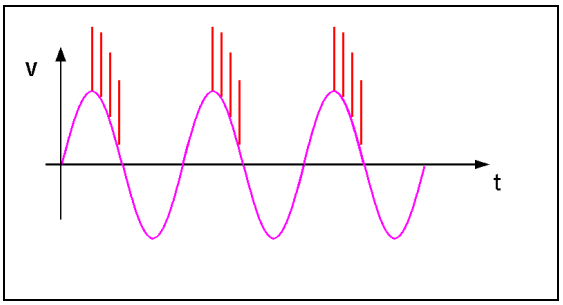
After selection the last used test parameters will be indicated on the display.

Customized test routines

The software controls user test routines according to the specification of the user. All limitations are the same as defined under Quick Start.

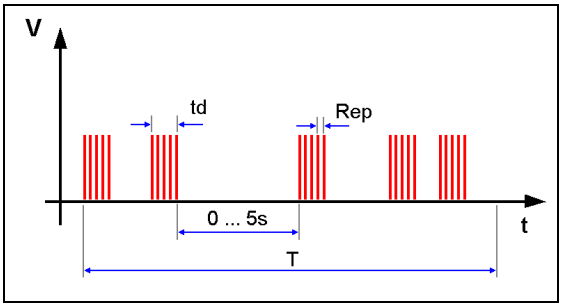
F1 Synchronized with a fixed phase angle

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



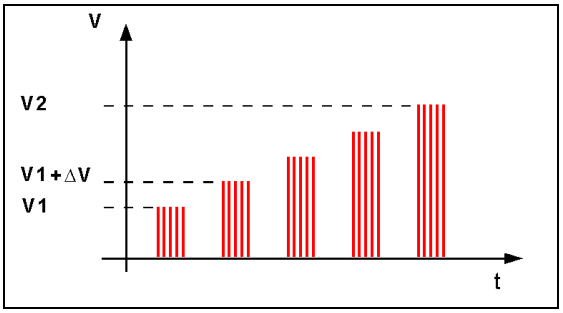
F2 Random release

No repetition rate is selected. The single burst with 2s duration will be triggered by statistics in the limits **of 0.0 to 5s** as time between two bursts. All limitations are the same as defined under Quick Start.



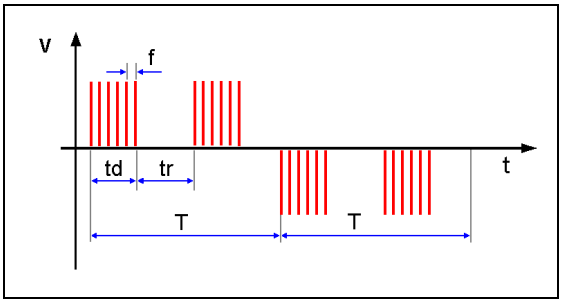
F3 Voltage change after T by ΔV

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



F4 Polarity change after T

The polarity will be changed from + to - after the defined test time T.

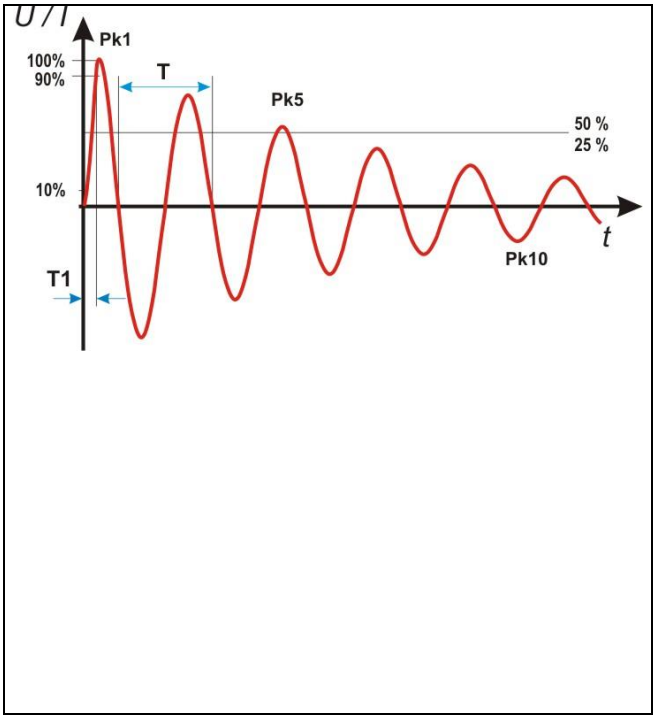


7. Fast Damped Oscillatory 3 MHz, 10 MHz or 30 MHz as per IEC 61000-4-18

This phenomenon is representative of switching of isolators in HV / MV open-air stations, and is particularly related to the switching of HV bus-bars, as well as of background disturbances in industrial plants.

Verification as per IEC 61000-4-18:

Open circuit		
V peak	250V – 4000V	±10 %
Rise time first peak T1	5ns	±20 %
Oscillating frequency	3 MHz, 10 MHz, 30 MHz	±10 %
Decaying of peak 5	> 50% of peak 1	
Decaying of peak 10	< 50% of peak 1	
Repetition rate	5000/s	±10 %
Burst duration	3 MHz 50 ms	±20 %
	10 MHz 15 ms	±20 %
	30 MHz 5 ms	±20 %
Burst period	300 ms	±20 %
Output Impedance	50Ω	±30 %
Short circuit		
Rise time first peak T1	3 MHz < 330 ns	
	10 MHz < 100 ns	
	30 MHz < 33 ns	
Osc. current frequency	3 MHz, 10 MHz, 30 MHz	±30 %
Decaying of peak 5	> 25 % of peak 1	
Decaying of peak 10	< 25 % of peak 1	
I peak	5 A to 80 A	± 20 %



7.1. Operation

This menu offers different test routines for Damped Oscillatory testing. The menu structure is identical for all, the 3 MHz, 10 MHz and the 30 MHz damped oscillatory.

Page 2

Damped Osc. 3MHz IEC 61000-4-18
F1 : Quick start
F2 : Standard test routines
F3 : User test routines

F1 F2 F3 F4 F5 F6 F7

F1 Quick start
Easy and fast online-operation of the equipment.

F2 Standard test routines
The operator can select between various preprogrammed test routines as required in different standards

F3 User test routines
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

7.1.1. Quick start

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

Page 3

Damped Osc. 3MHz						Quick start
V	=	500	V	Rep	=	5000/s
td	=	30	ms	tr	=	10s
cpl	=	L-PE		+/-	=	+
T	=	01:00 min				
START	CHANGE					
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

Press ***CHANGE*** and the test parameters parameter can be changed.

Select the desired parameter with the related function key and change the value by turning the front panel knob. The cursor allows the user to define the digit to be changed (fast or slow change).

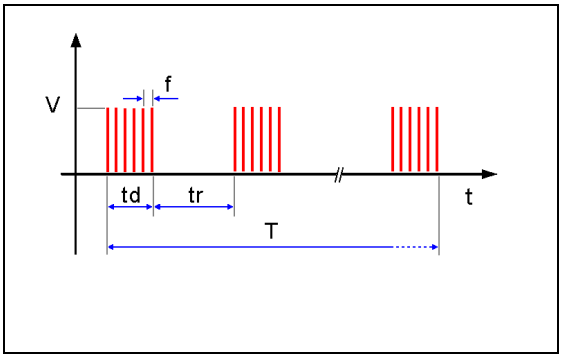
Press ***START*** and the test starts immediately with the displayed test parameters.

The operator now can navigate with the ***Cursor*** from parameter to parameter. The blinking parameter can be changed by turning the front panel knob.

Press ***ESC*** will bring the user back to the previous menu level. All function keys except F2 (manual trigger) can ***Stop*** the test routine.

Burst specification as per IEC 61000-4-18

Burst duration Td	3 MHz	50 ms	±20 %
	10 MHz	15 ms	±20 %
	30 MHz	5 ms	±20 %
tr	300 ms		
f	5000/s for 3, 10, and 30 MHz		
T	1 min		



7.1.2. Standard test routines

The user can select preprogrammed standard test routines.

Page 3

Damped Osc. 3MHz	IEC 61000-4-18
F1 : Common Mode	

F1 F2 F3 F4 F5 F6 F7

Page 4

Damped Osc. 3MHz		IEC 61000-4-18
F1 :	Level 1	500 V
F2 :	Level 2	1000 V
F3 :	Level 3	2000 V
F4 :	Level 4	4000 V
F7 : Manual		

F1 F2 F3 F4 F5 F6 F7

The standard levels for common and differential mode can be changed in the setup menu.

7.1.2.1. Level test

A selected level will step through all couplings in the selected Mode. The following parameters are used:

Defined per standard	Voltage	selected level voltage	
	Repetition f	5000/s (3MHz)	5000/s (10 MHz) 5000/s (30 MHz)
	Polarity	each coupling	positive and negative
	Coupling	Common Mode	Lx-PE, N-PE, Lx+N-PE

Variable parameters	Burst Time td	1 ms – 50 ms	Depends on fast module setting 3, 10, 30 MHz
	Repetition tr	0.0 s – 99.9 s	
	Test duration	1 min	

Damped

Page 5 (standard test in stop mode)

Damped Osc. 3 MHz		IEC 61000-4-18 L3		
V	= 2000 V	Rep	=	5000/s
		Td	=	50ms
		Tr	=	0.3s
		T	=	1:00min
START CHANGE				

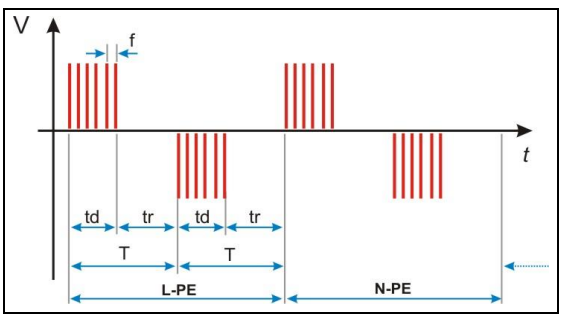
F1 F2 F3 F4 F5 F6 F7

(Running standard test)

Damped Osc. 3 MHz		IEC 61000-4-18 L 3		
V	= 2000 V	Rep	=	5000/s
		Td	=	50ms
+ 2000 V		Tr	=	0.3s
L				Testtime
		current coupling ⇒		0:00:21
STOP Step		*complete test time* ⇒		0:02:21

F1 F2 F3 F4 F5 F6 F7

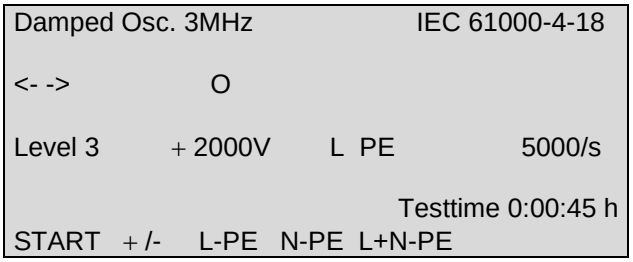
- The Test time shows the elapsed time per actual test level as well as the complete time of all triggered test levels within the running test sequence.
- Pushing the function key F2 STEP will bring you into the next iteration sequence.



7.1.2.2. Manual testing

The manual test menu is only in the single phase equipment available.

Manual standard test routine



Common mode menu

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

Example:

- By pushing the cursor ←→ the test level will be increased/decreased to the next standard level.
- By turning the INC knob (**o**) the test level can be continuously adjusted.
- Pressing the function keys the related function will be immediately activated.
- The displayed time will be resettled to zero after every new setting.

All functions can be operated during the running test.

7.1.3. User Test Routines

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

Damped Osc. 3MHz	IEC 61000-4-18
F1 : Synchronized	
F2 : Random release	
F3 : Voltage change after T by ΔV	
F4 : Change polarity after T	

F1 F2 F3 F4 F5 F6 F7

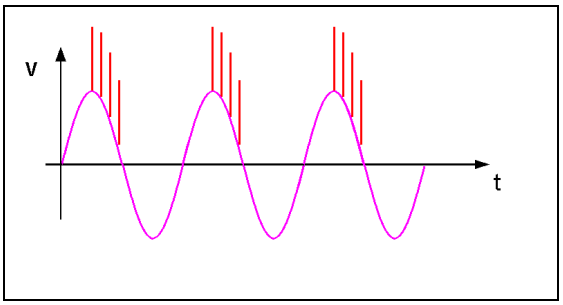
After selection the last used test parameters will be indicated on the display.

Customized test routines

The software controls user test routines according to the specification of the user. All limitations are the same as defined under Quick Start.

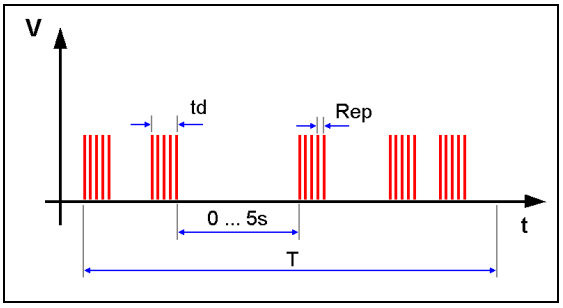
F1 Synchronized with a fixed phase angle

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



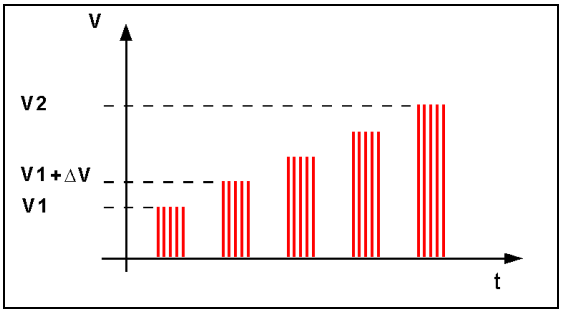
F2 Random release

No repetition rate is selected. The single burst with 2s duration will be triggered by statistics in the limits **of 0.0 to 5s** as time between two bursts. All limitations are the same as defined under Quick Start.



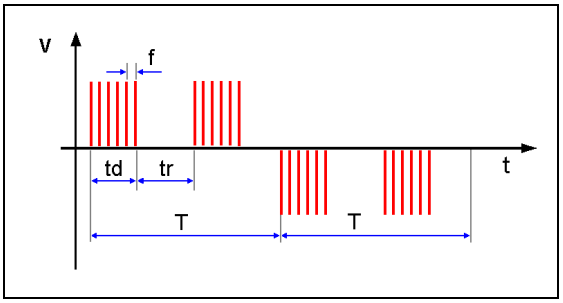
F3 Voltage change after T by ΔV

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



F4 Polarity change after T

The polarity will be changed from + to - after the defined test time T.



7.2. Coupling decoupling network

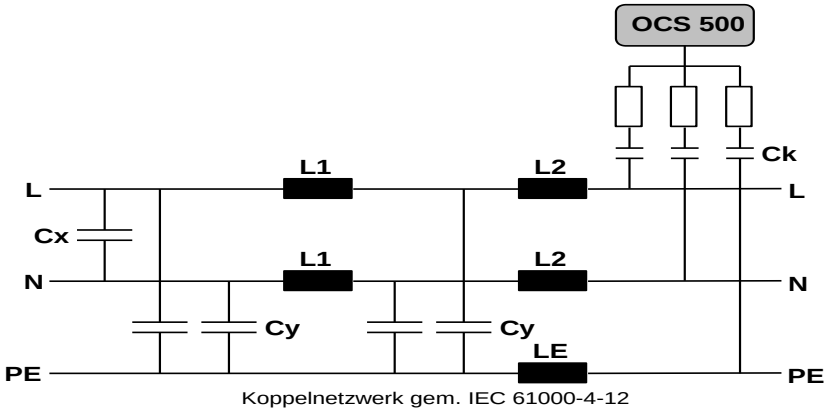
The decoupling part of the coupling network has to:

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

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

The coupling network has to couple the interference pulses to the lines of a power supply system (AC or DC). As coupling devices capacitors of sufficient strength and bandwidth shall be used according to IEC 61000-4-12 / -18.

-	**Normal Mode**	Line	=>	GND
		Neutral	=>	GND
-	**Common Mode**	Line + Neutral	=>	GND
-	**Protected earth PE**	The PE line to the EUT is decoupled via an inductance from the power supply. The test pulse is coupled direct to the PE line on the EUT direction		



Koppelnetzwerk gem. IEC 61000-4-12

7.2.2. Coupling to Signal and Datalines

For coupling the fast damped oscillatory wave to signal and data lines the user must use the capacitive coupling clamp HFK. It is the same clamp as used for EFT/burst test as per IEC 61000-4-4 for coupling to signal and data lines.

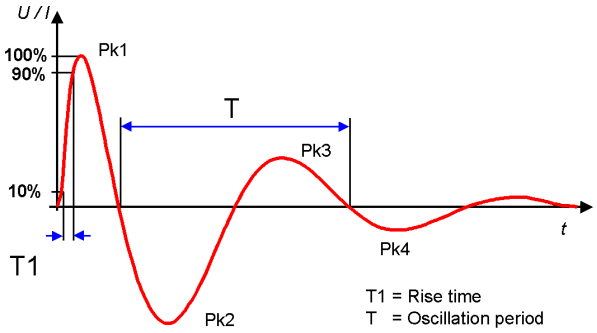
The generator signal output is located at the front side of the OCS 500N6F


CCI

8. Ring Wave

The ring wave is a typical oscillatory transient, induced in low-voltage cables due to the switching of electrical networks and reactive loads, faults and insulation breakdown of power supply circuits or lightning.
The phenomena are simulated by a damped oscillatory transient with defined 0,5 µs rise time and 100 kHz oscillation frequency.

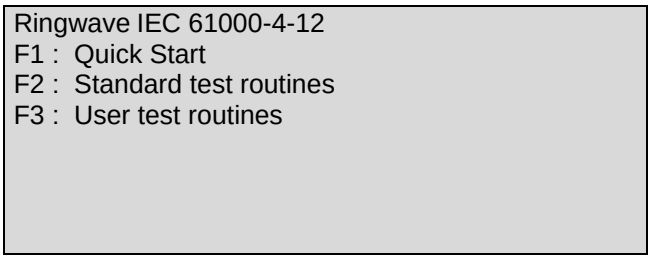
Voltage rise time T1:	0,5 µs ± 30 % (open-circuit condition)
Current rise time T1:	0.2 to 1.0 µs (short-circuit condition)
Voltage osc. frequency:	100 kHz ±10% Defined as the reciprocal of the period between the first and third zero crossings after the initial peak.
Decaying:	0,4 < Ratio of Pk 2 to Pk 1 < 1,1 0,4 < Ratio of Pk 3 to Pk 2 < 0,8 0,4 < Pk 4 to Pk 3 < 0,8 No requirements for other peaks.
Output impedance	12 Ω and 30 Ω ±20% (switchable) calculated as open circuit voltage divided by short circuit current



Waveform of the ring wave

8.1. Operation

The menu offers different test routines for Ring Wave testing.



F1 Quick Start
Easy and fast online-operation of the equipment.

F2 Standard test routines

The operator can select between various preprogrammed test routines. By pressing the related function key the test will be started automatically with the specified test parameters.
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

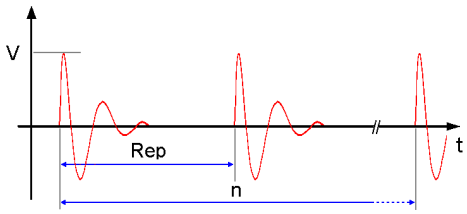
F3 User Test Routines
The operator can select between various preprogrammed test routines which helps to accelerate testing and which are very helpful especially during design.

8.1.1. Quick Start

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

Page 2

Ringwave						Quick start
V	=	2000 V		Imp	=	12 Ohm
A	=	0 dgr		+/-	=	+
cpl	=	L–PE		tr	=	1 s
tri	=	Auto		n	=	1001 pulses
START CHANGE						
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**



Press **START** and the test routines begin to work.
Press **CHANGE** and the actual parameters can be changed.

All function keys except F2 (manual trigger) can ***Stop*** the test routine.

Page 3 (Start)

Ringwave						Quick start
V	=	2000V		Imp	=	12 Ohm
A	=	0 dgr		+/-	=	+
cpl	=	L–PE		tr	=	1 s
tri	=	Auto		n	=	1001 pulses
VSet =	2000V		U = +	2000V		COUNTER
STOP	5s		I = +	165A		43
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

The user can select the parameter with the related function key and can change the value with the knob. The cursor allows the user to define the value of the digit which should be changed (fast or slow change).

Pressing the ESC button will bring the user back to the previous level from where the test can be restarted with new levels. After restart the actual test time is displayed. All functions keys except F2 (MAN TRIGGER) can stop the test routine. The latest setting will be displayed.

Any pressing of a function key will indicate the functions START, CHANGE or CONTINUE. F3 will continue the same test routine. Also the test time will continue running. If the user selects at first START or CHANGE the test will be stopped completely.

Page 3 (Change)

Ringwave						Quick start
Voltage	V	:	250V-	6000V		
Impedance	Imp	:	12Ω	30Ω		
Angle	A	:	0grd	-360grd / asyn.		
Coupling	cpl	:	L / N / PE			
U	Imp	A	+/-	cpl	tr	
250	12 Ohm	0	+	L-PE	2	1 / 2
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

Ringwave						Quick start
Repetition	tr	:	1s	-	999s	
Trigger	tri	:	Auto / Man			
Events	n	:	1	-30000 / Endless		
tri	n					2 / 2
Auto	100					
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

8.1.2. Standard test Routine

Page 3

Ringwave	IEC 61000-4-12
F1 : Common Mode	
F2 : Differential Mode	

F1 F2 F3 F4 F5 F6 F7

Page 4

Ringwave		IEC 61000-4-12
F1 :	Level 1	500 V
F2 :	Level 2	1000 V
F3 :	Level 3	2000 V
F4 :	Level 3	4000 V
F7 : Manual		

F1 F2 F3 F4 F5 F6 F7

With the selection of F1 ....F4 the test is conducted automatically with the parameters and the test sequence as required per IEC 61000-4-12. The only parameters the operator is able to change are the
- **impedance**
- **repetition rate**
- **number of pulses per test level**
- **trigger Auto / Manual**

8.1.2.1. Level test

A selected level will step through all couplings in the selected Mode. The following parameters are used:

Defined per standard	Voltage	selected level voltage	
	Polarity	each coupling	positive and negative
	Coupling	Differential Mode	L-N
		Common Mode	L-PE, N-PE, L+N-PE

Variable parameters	Impedance:	imp	12 Ω or 30 Ω
	Repetition:	tr	0.0 s – 999 s
	trigger:	tri	Auto, Manual
	Events:	N	1 - 30000

Ringwave	IEC 61000-4-12	Level 3
2000V	2s	AUTO
	5 pulses	12 Ohm
L		
START CHANGE		

F1 F2 F3 F4 F5 F6 F7

Ringwave	IEC 61000-4-12	Level 3
2000V	2s	AUTO
	5 pulses	12 Ohm
- 1000 V		
L-N 90 deg		Counter
	V = -980 V	*act coupling* ⇒ 4
STOP Step	I = - 85.A	*complete* ⇒ 29

F1 F2 F3 F4 F5 F6 F7

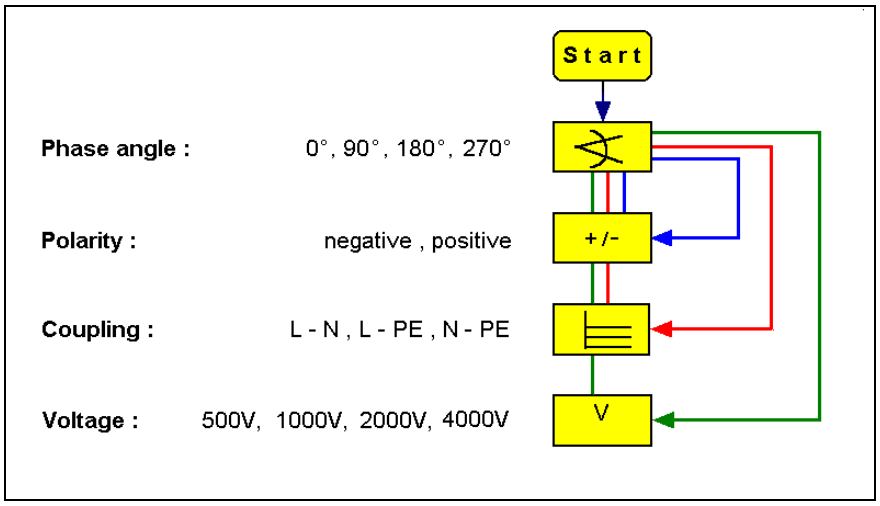
- The counter shows the number of triggered pulses per actual coupling as well as the number of all triggered test pulses within the running test sequence.
- Pushing the function key F2 STEP will bring you into the next iteration sequence.

Iteration of the standard test procedure as per IEC 61000-4-12

The ring wave has to be applied synchronized to the voltage phase at the respective angle and the peak value of the ac. voltage wave (positive and negative).

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

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



List of settings EN 61000-4-12 (each setting with 5 pulses)

Setting	Voltage	Coupling	Polarity	Phase angle
1 2 3 4	500	L-N	neg.	0 90 180 270
5 6 7 8			post	0 90 180 270
9 10 11 12		L-PE	neg	0 90 180 270
13 14 15 16			post	0 90 180 270
17 18 19 20		N-PE	neg	0 90 180 270
21 22 23 24			post	0 90 180 270
25 26 27 28	1000	L-N	neg	0 90 180 270
29 30 31 32			post	0 90 180 270
33 34 35 36		L-PE	neg	0 90 180 270

Setting	Voltage	Coupling	Polarity	Phase angle
37 38 39 40	1000	L-PE	post	0 90 180 270
41 42 43 44		N-PE	neg	0 90 180 270
45 46 47 48			post	0 90 180 270
49 50 51 52	2000	L-N	neg	0 90 180 270
53 53 55 56			post	0 90 180 270
57 58 59 60		L-PE	neg	0 90 180 270
61 62 63 64			post	0 90 180 270
65 66 67 68		N-PE	neg	0 90 180 270
69 70 71 72			post	0 90 180 270

Example for Level 3

8.1.2.2. Manual test routine

The manual test menu is only in the single phase equipment available.

Within this test routine all standard parameters can be easy set. A test cycle makes **10 impulses** within this setting.

Manual standard test routine

Damped Osc. 1MHz				IEC 61000-4-12		
<- ->		O		O		
Level 3	+ 2000V	12 Ohm	0 dgr	L-N		
				Testtime 0:00:45 h		
Start	+ /-	oV/A	Imp	L--PE	N-PE	L+N-PE
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

Common mode menu

Start	+ /-	oU/A	Imp	L--N	/	
F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**

Differential mode menu

Example:

- By pushing the cursor ←→the test level will be increased/decreased to the next standard level.
- By turning the Inc. knob the test voltage V resp. the phase angle A will be adjusted continuously. The blinking circle (**o**) shows which parameter can be changed. Pressing the function „O V/A“ will change between both parameters.
- Pressing the function keys the related function will be immediately activated.
- The displayed time will be resettled to zero after every new setting.

It is allowed to change all parameters during a running test

8.1.3. User Test Routines

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

```
Ringwave            IEC 61000-4-12
F1 :  Change polarity after n pulses
F2 :  Voltage change after n pulses by ΔV
F3 :  Change Angle after n pulses by Δa
F4 :  Change coupling after n pulses
```

F1 F2 F3 F4 F5 F6 F7

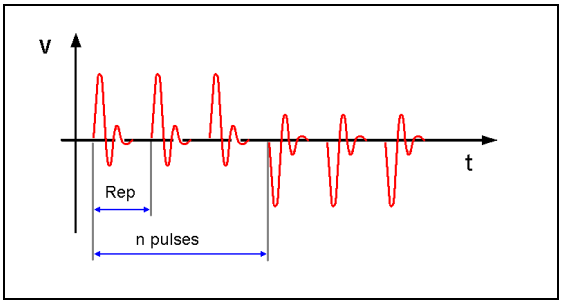
After selection the last used test parameters will be indicated on the display.

Customized test routines

The software controls user test routines according to the specification of the user. All limitations are the same as defined under Quick Start.

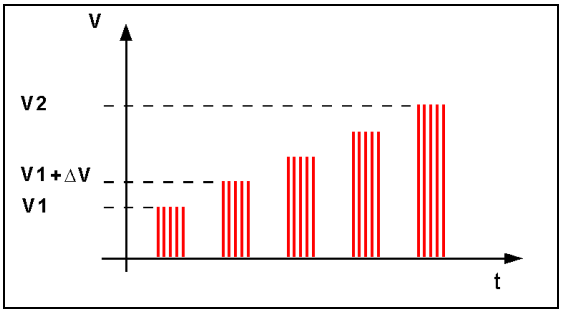
F1 Change polarity after n pulses

After the release of the preselected number of pulses the polarity is changed. The procedure always starts with positive polarity and changes than to negative. The same parameters as under Quick Start can be selected.



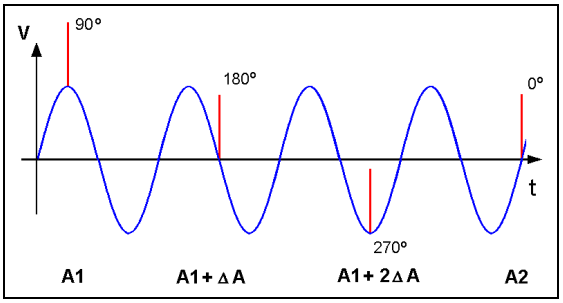
F2 Voltage change after n pulses by ΔV

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



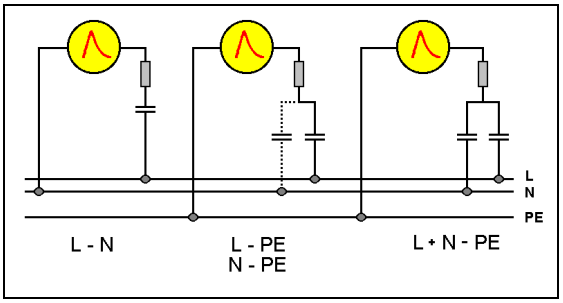
F3 Change the phase angle after n pulses by ΔA

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

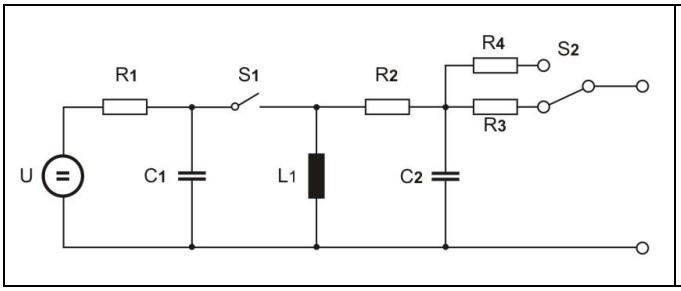


F4 Change coupling after n pulses

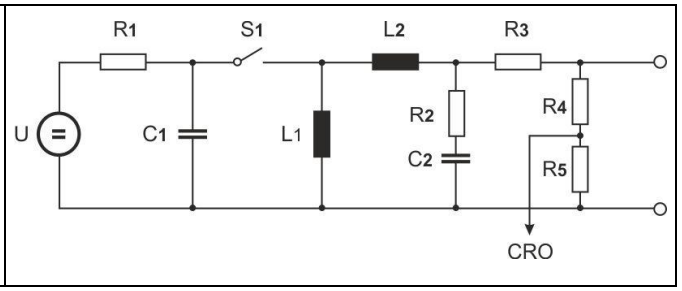
The coupling mode will automatically be changed after the preselected number of pulses has been released. All possible coupling modes will be selected. The same parameters as under Quick Start can be selected.



8.2. Ringwave and damped oscillatory pulse generation



Block diagram Ringwave Generator



Block diagram Damped oscillatory Wave Generator

U	High voltage source (Surge)	R_2	Filter resistor	S_2	Output impedance selector
R_1	Charging resistor	C_2	Filter capacitor	C_3	Coupling capacitor
C_1	Energy storage capacitor	R_3	12Ω resistor	L_2	Filter inductance
S_1	High voltage switch	R_4	30Ω resistor	R_5	Source resistor
L_1	oscillating circuit coil				

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

8.3. Coupling decoupling network

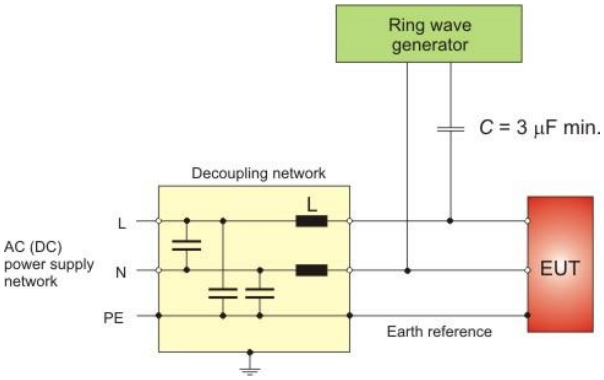
The coupling network has to couple the interference pulses to the lines of a power supply system (AC or DC) or to signal and control ports of the EUT. Capacitive coupling is the specified coupling mode for surge testing.

8.3.1. Coupling to ac / dc power supply lines

The surge generator OCS 500N6 has an integrated coupling network in accordance with IEC 61000-4-12. It must be possible to test with different coupling modes:

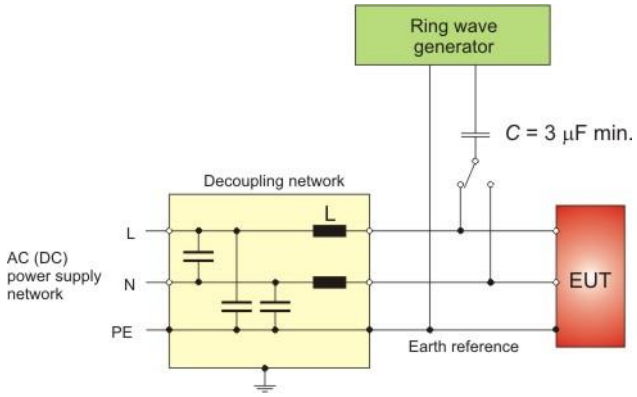
Line	→	GND	(source impedance is 12Ω / 30Ω)
Neutral	→	GND	(source impedance is 12Ω / 30Ω)
L + N	→	GND	(source impedance is 12Ω / 30Ω)
Line	→	Neutral	(source impedance is 12Ω / 30Ω)

Single-phase coupling



IEC 61000-4-12 Ed2 figure 5

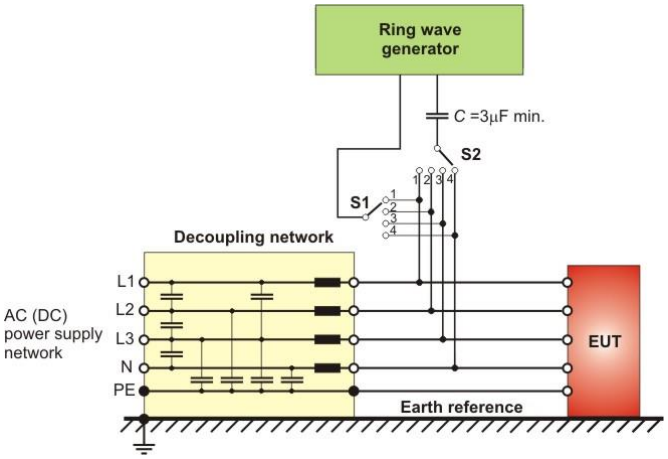
Coupling Line to Line



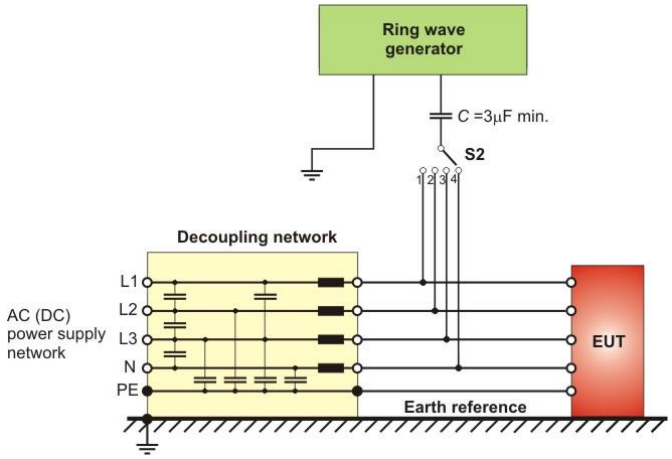
IEC 61000-4-12 Ed2 figure 6

Coupling Line to Earth

3-phae coupling



IEC 61000-4-12 Ed2 figure 7



IEC 61000-4-12 Ed2 figure 8

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

8.3.2. Coupling to Signal- and Datalines

For coupling of Ringwave or damped waves to signal- and data lines special coupling network as per IEC 61000-4-12 / -18 are available. The CND uses special coupling capacitors (CNV 504N1 for four lines).
For many applications special coupling networks are necessary for such kind of test.

CDN 504N1.x CDN 508N1.x and CDN504N2.x CDN 508N2.x

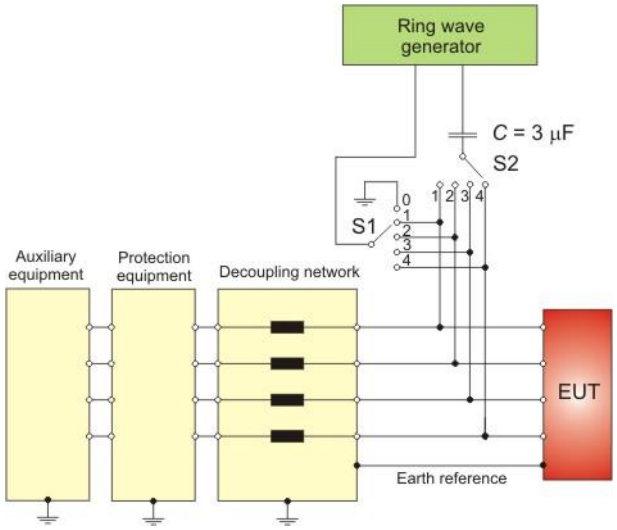
- IEC 61000-4-5
- IEC 61000-4-12,
- ANSI IEEE C62.41.2

For coupling of signal and- und data lines as per figure 9 of IEC 61000-4-12, AMETEK CTS offers the coupling networks of the series CNV.

CDN up to 4 lines:	CNV 504N1.x	4 kV
	CNV 504N2.x	7 kV
CDN up to 8 lines:	CNV 508N1.x	4 kV
	CNV 508N2.x	7 kV

The CDN are designed for different test voltages with various nominal voltages and currents. The protected levels on the EA port can be customized in different steps.

Because the large number of CDN's only the basic types are listed below.



IEC 61000-4-12 Ed2 figure 9

CNV 504N1

CNV 508N1

CNV 504N2

8.4. Test set-up

According to the specifications of IEC 61000-4-12, the surge generator has a source impedance of 12Ω or 30Ω when the simulator is coupled between the lines and protective earth.

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

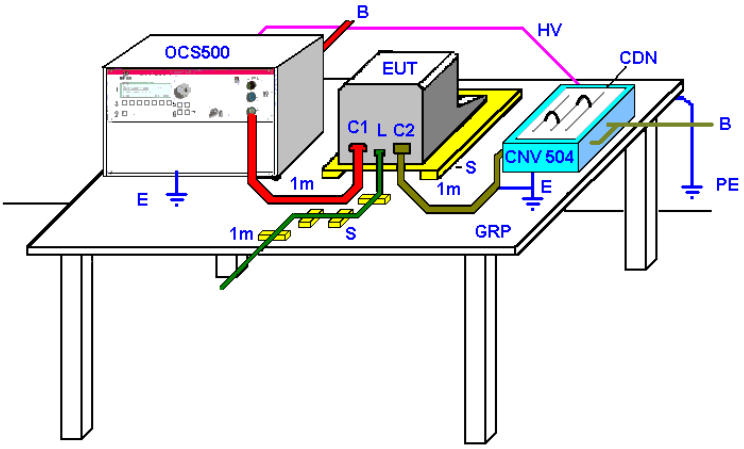
Therefore it is important
- Not to disconnect the surge simulator form protective earth (power cable)
- To have an installation where the simulator is connected via its ground reference connector to earth

Devices:

OCS500 :	Ringwave test generator
CNV 504:	Coupling network I/O lines
EUT:	Equipment under test
CDN:	Coupling/decoupling network
S:	Insulating support

Ports

C1:	Power supply port
C2:	Input/output port
L:	Communication port
GRP:	Ground reference plane
PE:	Protective earth
E:	Earth connection
B:	Power supply and I/O to source



NOTE - Earth connections should be as short as practically possible.

Application with CNV 504N

Coupling to coupling network CNV504 for data lines. The earth cable must be connected to the earth plug on the rear.

Application with CNV 508N4.1

Front side:

HV cable connection HV, COM
OCS 500N6x.y to CNV 508N5.1

Rear side:

- Earth connection (and to GND)
- CN control cable

9. Damped Oscillatory Magnetic Field as per IEC 61000-4-10

For magnetic test a separate manual is damped oscillating magnetic field.

For the magnetic field test, an additional and more detailed operating manual is available. This manual can be requested if required, or is included in case of an upgrade.

9.1. General

Damped oscillatory magnetic fields are generated by switching of H.V. circuit breakers or disconnectors. The test is mainly applicable to electronic equipment to be installed in H.V. sub-stations. Power plants, switchgear installations, smart grid systems may also be applicable to this standard and may be considered by Product Committees.

Testlevel	**Peak current *I* ± 20 % [A]**	
	System using 1 m x 1 m standard induction coil	**System using 1 m x 2,6 m standard induction coil**
1	not applicable	not applicable
2	not applicable	not applicable
3	11.1	15.2
4	33.3	45.5
5	111	see note 2
X	Special/0,9	Special/0,66
NOTE 1 – The values 0,9 and 0,66 are the calculated coil factors of standard induction coils.		
NOTE 2 – The calculated value is 152; however, there is currently no commercial generator available.		

Table 2 – Peak current specifications of the test system as per. Draft IEC 61000-4-10 Ed. 2.0

Calibration items	**Oscillation frequency**	
	100 kHz	**1 MHz**
Oscillation period	*T* = 10 µs ± 10 %	*T* = 1 µs ± 10 %
Repetition rate of the pulses	***Trep*** = 25 ms ± 10 %	***Trep*** = 2,5 ms ± 10 %
Decay rate of one pulse	$D_{r1} = \lvert I(PK_5) \div I(PK_1) \rvert > 50\ \%$ $D_{r2} = \lvert I(PK_{10}) \div I(PK_1) \rvert < 50\ \%$	$D_{r1} = \lvert I(PK_5) \div I(PK_1) \rvert > 50\ \%$ $D_{r2} = \lvert I(PK_{10}) \div I(PK_1) \rvert < 50\ \%$

Table 3 – Waveform specifications of the test system as per. Draft IEC 61000-4-10 Ed. 2.0

9.2. Menu Damped Osc. Wave 1 MHz magnetic field (MF)

There are the same menu functions for the 100 kHz and 1 MHz damped oscillating magnetic field.

Page 2 (Select function)

Damped Osc. 1MHz MF	IEC 61000-4-10
F1 : Quick Start	
F2 : Standard test routines	
F3 : User test routines	
F7 : Magnetic field correction factor	

F1 F2 F3 F4 F5 F6 F7

F7 Magnetic field correction factors

The operator may enter: F1: Antenna factor Af [1/m] = 0.90 (MS100N)

For a magnetic field of **30Am^{-1}** the current in the Antenna is 30 Am^{-1} / 0.90 m^{-1} = **33.3A** ± 20%

These values are given together with the delivered antenna. The antenna factor depends on the type of antenna which is used for the test. The operation of the pulsed oscillating magnetic field test is similar as to the standard oscillating routines. For magnetic field testing the antenna correction factor shall be entered for fine tuning the current. The operator can enter this factor within the setup menu under the service routine.

Page 2 (show parameter)

Damped Osc. 1MHz MF					Quickstart
H	=	30A/mA	Rep	=	400/s
td	=	2s	tr	=	10s
cop	=	/	+/-	=	+
T	=	00:10 min			
START CHANGE					

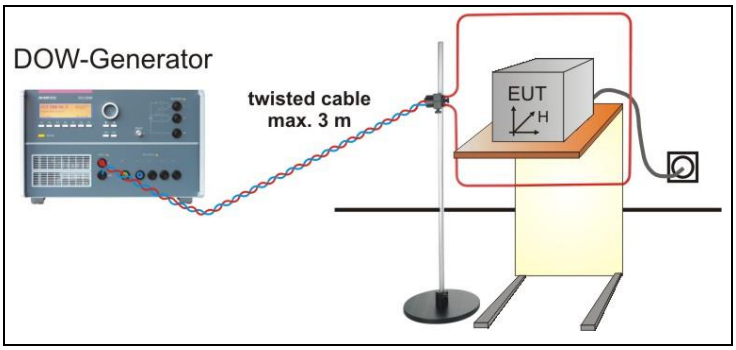
F1 F2 F3 F4 F5 F6 F7

H max for magnetic field test = 100A/m

Recommended antenna factor for 100Am^{-1}:
Frequency = 100kHz : 0.90
Frequency = 1 MHz : 0.90

Press **START** and the test routines begin to work.
Press **CHANGE** and the actual parameters can be changed.

Setup of pulsed magnetic Test field



At 1 MHz test, the cables (max. 3 m) must be twisted

Connect the antenna with two banana cables to the HV and COM plug on the OCS 500 N6x model

The release of the damped oscillated impulse is mostly related to a certain phase angle. The impulses are synchronized to the input signal at the rear Sync-connector.

Warning

High Voltage

Danger of life by touching the antenna!

10. Maintenance

10.1. General

The generator is absolutely maintenance-free by using a solid state semiconductor switch to generate transients

10.1.1. Test set- up

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

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

The generators of the series 500, UCS, VCS, CSS, TSS, OCS and CNI, can be linked together to a fully automotive test set-up.

The set-up communicates via the IEEE / GPIB bus and is controlled by ISMIEC software. For setting up the system see the following figures:

Each generator can be operated individual as single equipment.

10.2. Calibration and Verification

10.2.1. 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 re-calibration.

Examples: Calibration mark

10.2.2. 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.

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, AMETEK CTS suggests for refer to the waveshape and values of the original calibration certificate.

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


Danger

Before starting the calibration or verification

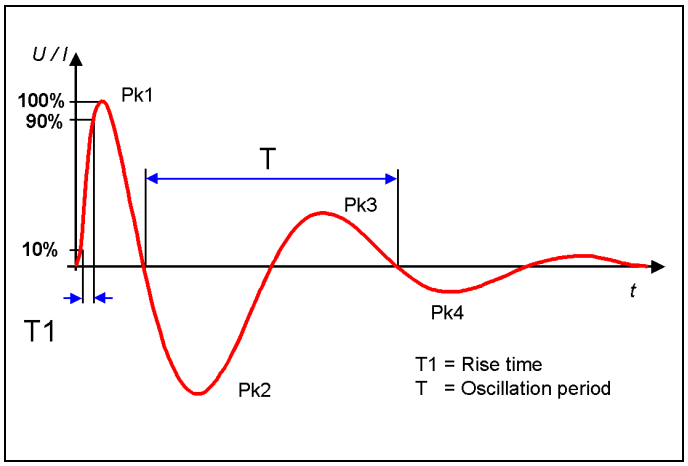
remove the EUT Mains Supply

from the generator and from the coupling network

10.3. Verification Ringwave

10.3.1. Verification Parameter

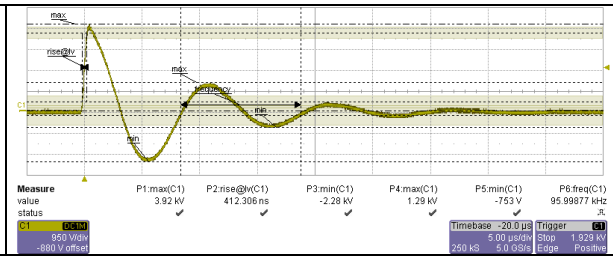
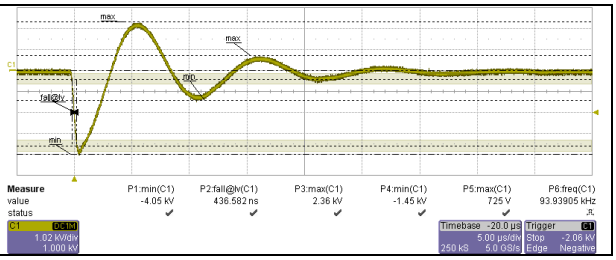
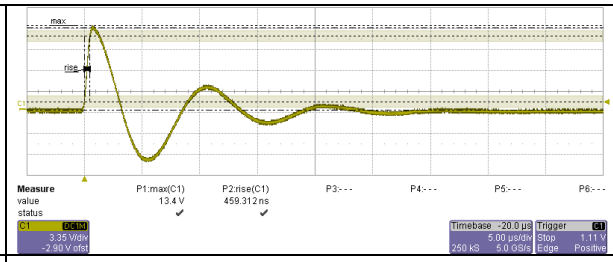
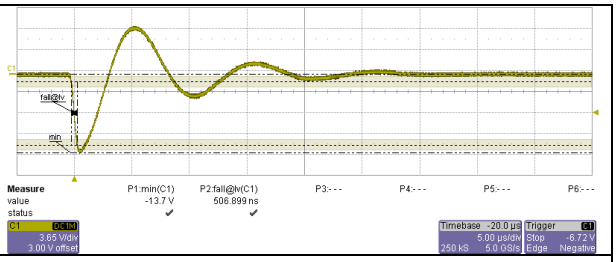
IEC 61000-4-12, ANSI C62.41 (open circuit)		
V peak open circuit voltage		±10%
Rise time first peak	0.5 µs	±20%
Oscillating frequency	100 kHz	±10%
Decaying of peak 2-1	40% to 110%	
Decaying of peak 3-2	40% to 80%	
Decaying of peak 4-3	40% to 80%	
(Short circuit)		
I peak (12Ω)	333.33A	±10%
I peak (30Ω)	133.33A	±10%
Rise time first peak	0.2 to 1.0 µs	
Oscillating frequency	100 kHz	±10%
Impedance	12Ω / 30Ω	±20%



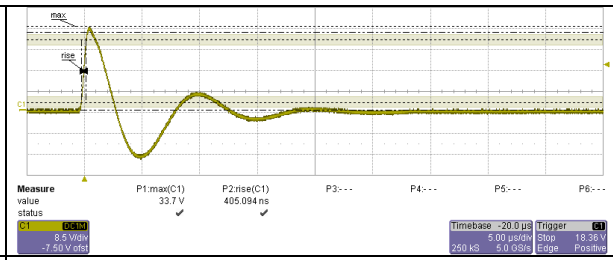
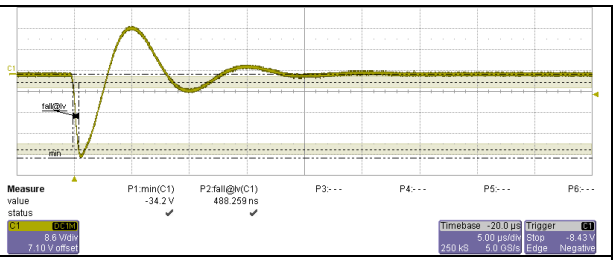
Remark: The output impedance is calculated result of the ratio of the first peak open circuit voltage and the first peak short current, measured with a 4000V pulse.

Typical pulses, measured with a calibrated equipment

Ringwave coupling L1 – N impedance = 30Ω

Open circuit		
Short circuit		
	U set : +4000V	U set : -4000V

Ringwave coupling L1 – N impedance = 12Ω

Short circuit		
	U set : +4000V	U set : -4000V

10.4. Verification Damped Oscillatory Wave

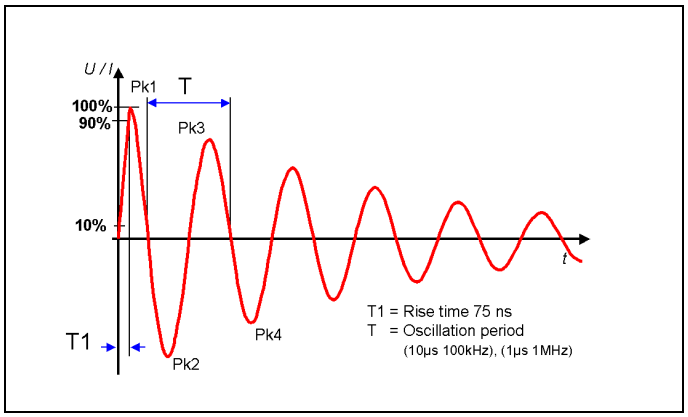
10.4.1. Verification Parameter slow damped oscillatory wave

IEC 61000-4-18 (open circuit)

V peak		±10%
Rise time first peak	75ns	±20%
Oscillating frequency	100, 1000 kHz	±10%
Decaying of peak 5-1	> 50% of peak 1	
Decaying of peak 10-1	< 50% of peak 1	

(short circuit)

I peak (200Ω)	1.25, 2.5, 5, 10A	±20%
Impedance	200Ω	±20%



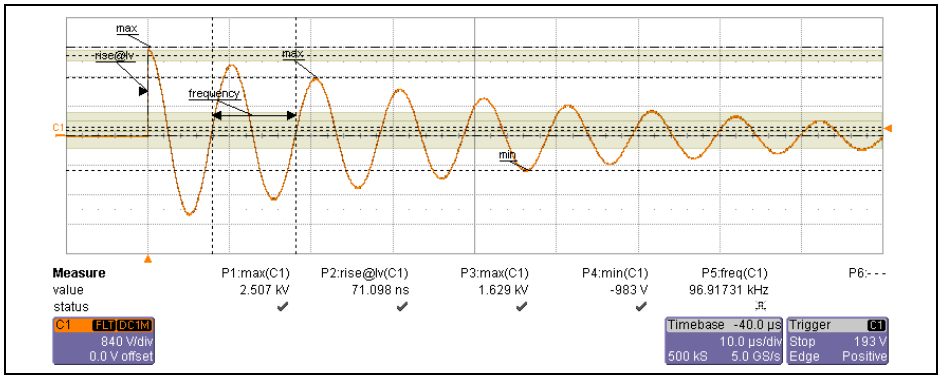
Remark: The output impedance is calculated result of the ratio of the first peak open circuit voltage and the first peak short current, measured with a 2500V pulse.

Typical pulses, measured with a calibrated equipment

U set : +2500V 100kHz

U peak = 2507V
Peak 5 = 1629V (65%)
Peak 10 = - 963V (38%)

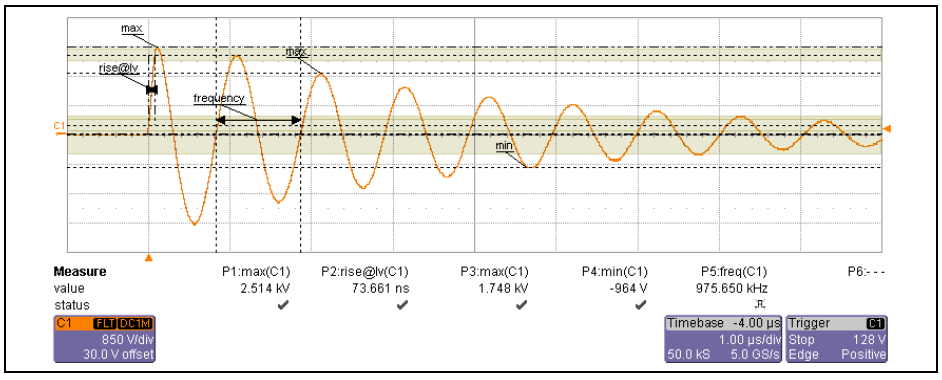
tr = 71.098ns
frequency = 96.917kHz



U set : +2500V 1000kHz

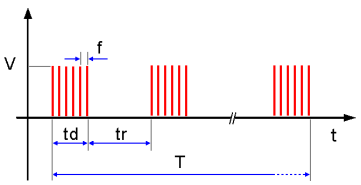
U peak = 2514V
Peak 5 = 1748V (69%)
Peak 10 = - 964V (38%)

tr = 76.4ns
frequency = 975.65kHz



Burst definition :

Burst duration : (td + tr)>2s
td : not specified
Frequency f : 40/s for 100kHz
400/s for 1MHz
Test duraton T :

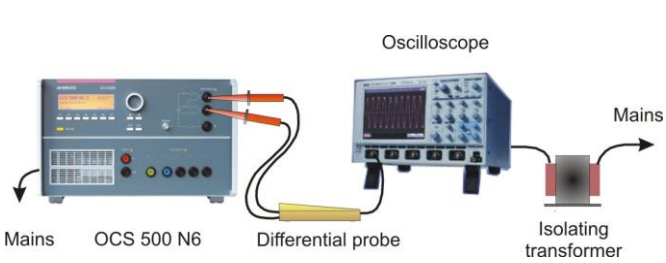


Phase relationship mains frequency: no requirement;

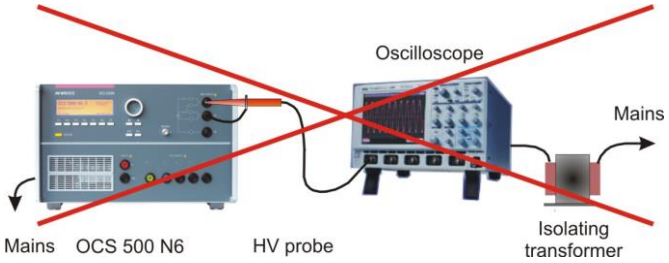
10.4.2. Verification Setup

The verification setup is very important for a correct measurement. A differential high voltage measuring probe is strongly recommended for the Waveform and amplitude measurement.
There is a significant wrong amplitude measuring result if the user makes the verification with a single high voltage probe. The measured peak voltage is approx. 6 to 12% too low in comparison to the correct measuring setup with differential probes.

10.4.2.1. Compare of verification results with correct and poor measuring setup



Correct setup with differential HV probes



Poor setup with a single HV probe

Setting +-2500V 100kHz Coupling L1-N

Setting Standard	Parameter	Reference accredited Lab	Differential HV probe measured	Differential HV probe Deviation [%] to acc. Lab	HV – probe measured	HV – probe Deviation [%] to acc. Lab
+2500V	V Peak [V]	**2485**	2507	0.89	**2334**	**-6.1**
75ns	Rise time tr [ns]	**75.62**	71	-6.11	77	1.8
> 50%	Decaying 1.-5. Peak	65.9	65.0	-1.37	65.1	-1.2
< 50%	Decaying 1.-10. Peak	38.4	39.2	2.08	38.3	-0.3
100kHz	Osc frequency [kHz]	96.90	96.9	0.00	97.3	0.4
-2500V	V Peak [V]	**-2484**	-2488	0.16	**-2314**	**-6.8**
75ns	Rise time tr [ns]	**73.86**	73	-1.16	**80**	**8.3**
> 50%	Decaying 1.-5. Peak	66.1	65.3	-1.21	64.7	-2.1
< 50%	Decaying 1.-10. Peak	39.3	38.3	-2.54	38.6	-1.8
100kHz	Osc frequency [kHz]	97.37	98.0	0.65	97.7	0.3

Setting +-1000 V / 1000 kHz Coupling L1-N

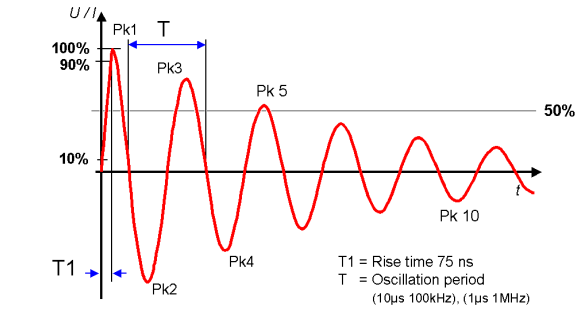
Setting Standard	Parameter	Reference accredited Lab	Differential HV probe measured	Differential HV probe Deviation [%] to acc. Lab	HV – probe measured	HV – probe Deviation [%] to acc. Lab
+1000V	V Peak [V]	**1008**	1021	1.29	**925**	**-8.23**
75ns	Rise time tr [ns]	**76.87**	74	-3.73	72	-6.34
> 50%	Decaying 1.-5. Peak	65.7	69.5	5.78	70.6	7.46
< 50%	Decaying 1.-10. Peak	32.9	38.3	16.41	37.9	15.20
1000kHz	Osc frequency [kHz]	952.38	975.7	2.45	969.0	1.75
-1000V	V Peak [V]	**-1020**	-1003	-1.67	**-896**	**-12.16**
75ns	Rise time tr [ns]	**79.49**	76	-4.39	72	-9.42
> 50%	Decaying 1.-5. Peak	64.3	68.8	7.00	71.2	10.73
< 50%	Decaying 1.-10. Peak	32.3	38.1	17.96	38.4	18.89
1000kHz	Osc frequency [kHz]	952.38	969.9	1.84	957.7	0.56

10.4.3. Verification Parameter fast damped oscillatory wave

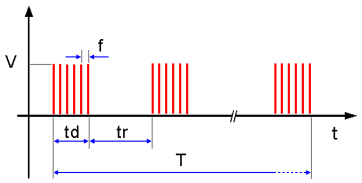
This phenomenon is representative of switching of isolators in HV / MV open-air stations, and is particularly related to the switching of HV bus-bars, as well as of background disturbances in industrial plants.

Verification as per IEC 61000-4-18:

Open circuit		
V peak	250V – 4000V	±10 %
Rise time first peak T1	5ns	±20 %
Oscillating frequency	3 MHz, 10 MHz, 30 MHz	±10 %
Decaying of peak 5	> 50% of peak 1	
Decaying of peak 10	< 50% of peak 1	
Repetition rate	5000/s	±10 %
Burst duration	3 MHz 50 ms	±20 %
	10 MHz 15 ms	±20 %
	30 MHz 5 ms	±20 %
Output Impedance	50Ω	±30 %
Short circuit		
Rise time first peak T1	3 MHz < 330 ns	
	10 MHz < 100 ns	
	30 MHz < 33 ns	
Osc. current frequency	3 MHz, 10 MHz, 30 MHz	±30 %
Decaying of peak 5	> 25 % of peak 1	
Decaying of peak 10	< 25 % of peak 1	
I peak	5 A to 80 A	± 20 %



Burst definition

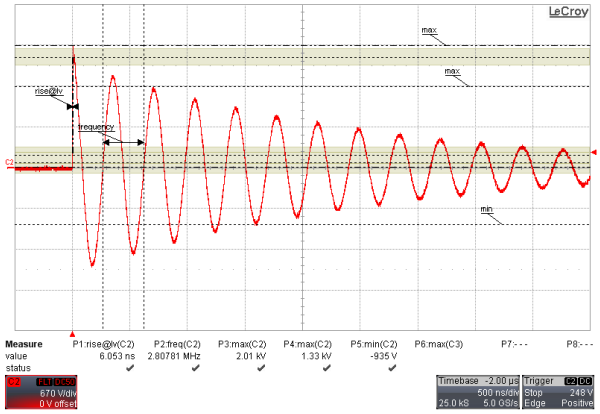


Typical pulses, measured with a calibrated equipment

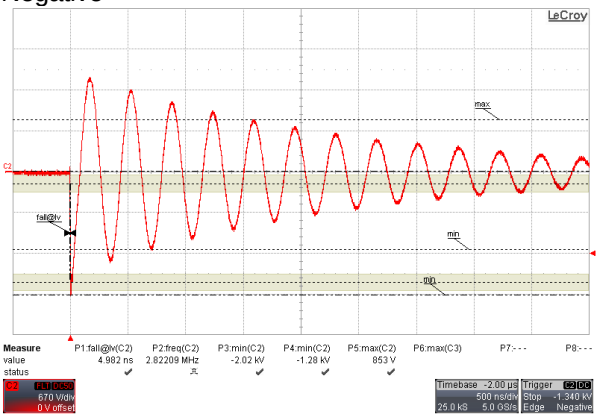
Fast Damped Oscillatory Wave, 3 MHz, Coaxial output

2000 V on 1000 Ω

Positive



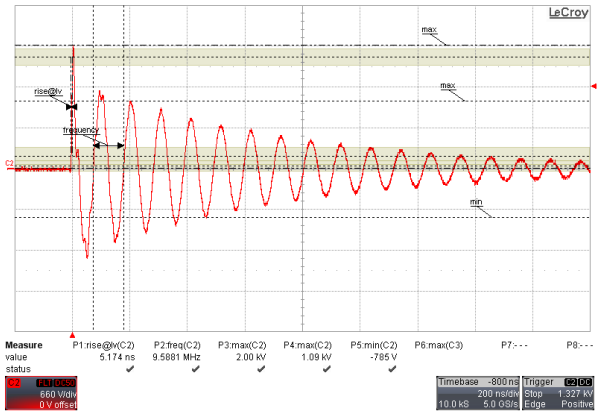
Negative



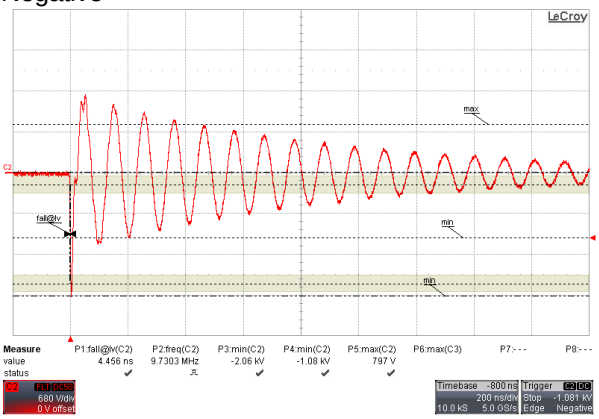
Fast Damped Oscillatory Wave, 10MHz, Coaxial output

2000 V on 1000 Ω

Positive



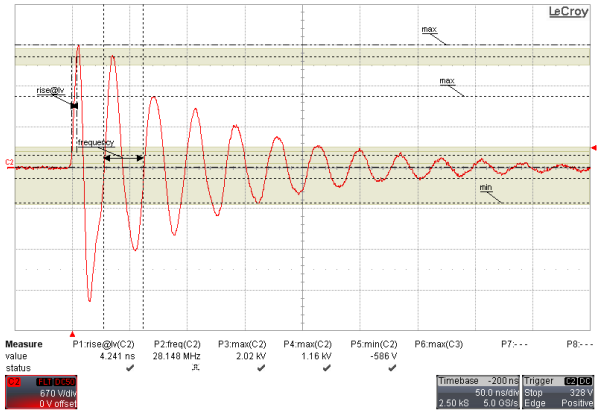
Negative



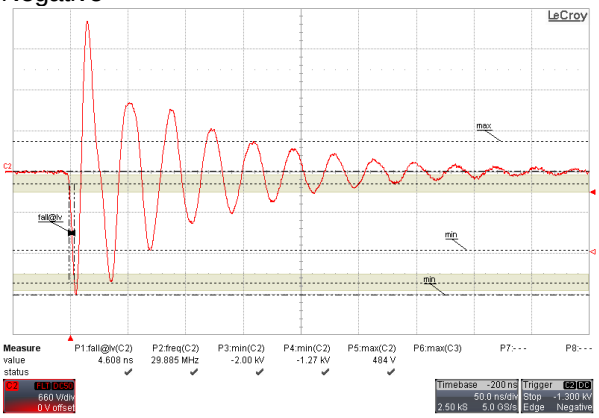
Fast Damped Oscillatory Wave, 30 MHz, Coaxial output

2000 V on 1000 Ω

Positive



Negative

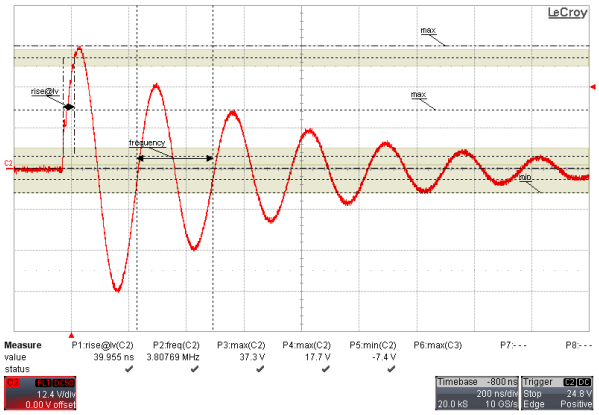


Nominal setting		**V Peak**	**Rise time tr**	**Decaying [% of Peak 1]**		**Osc. Freq**
[V]	[MHz]	[V]	[ns]	Peak 5	Peak 10	[MHz]
+2000	**3**	1963	5.77	66.2	46.5	2.80
-2000	**3**	-1918	4.88	63.4	42.2	2.82
+2000	**10**	1976	5.09	54.5	39.3	9.59
-2000	**10**	-2007	4.91	52.4	38.7	9.73
+2000	**30**	2022	3.93	57.4	29.0	28.14
-2000	**30**	-2071	4.30	63.5	24.2	29.89

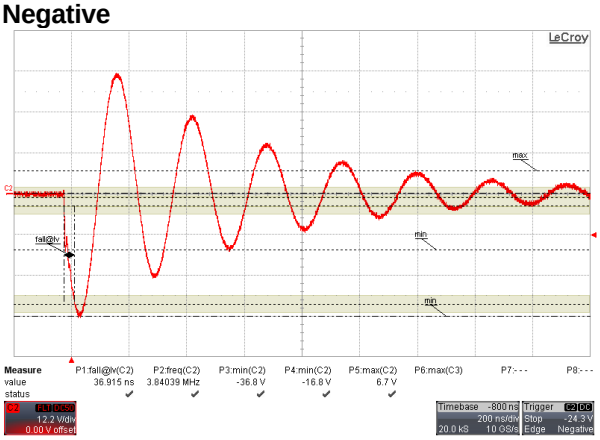
Fast Damped Oscillatory Wave, 3 MHz, Coaxial output

2000 V on 0.1 Ω

Positive



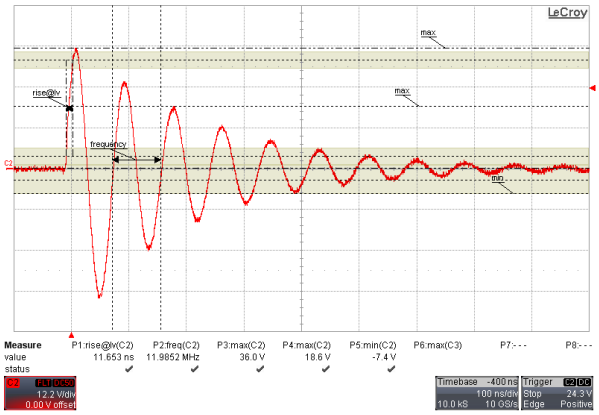
Negative



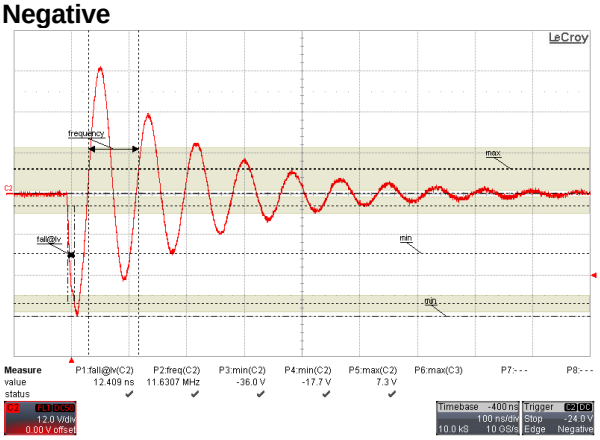
Fast Damped Oscillatory Wave, 10MHz, Coaxial output

2000 V on 0.1 Ω

Positive



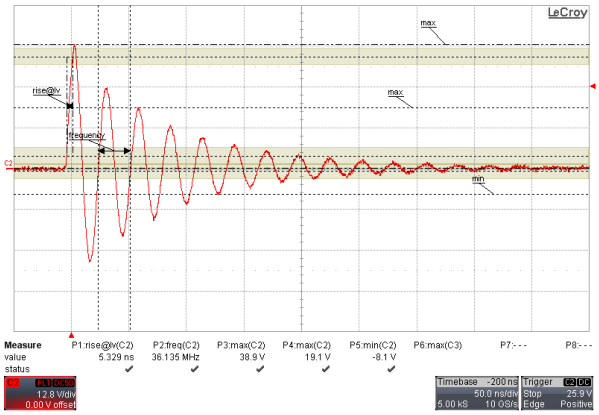
Negative



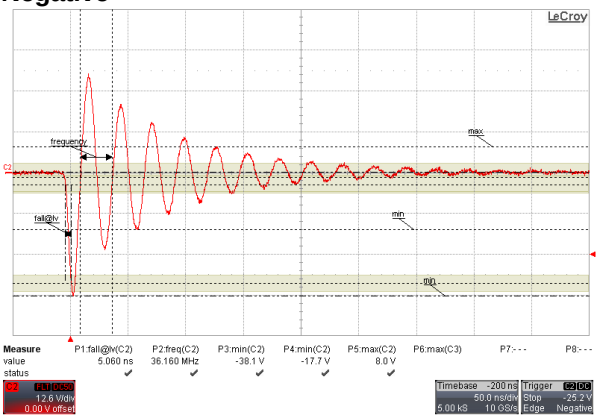
Fast Damped Oscillatory Wave, 30 MHz, Coaxial output

2000 V on 0.1 Ω

Positive



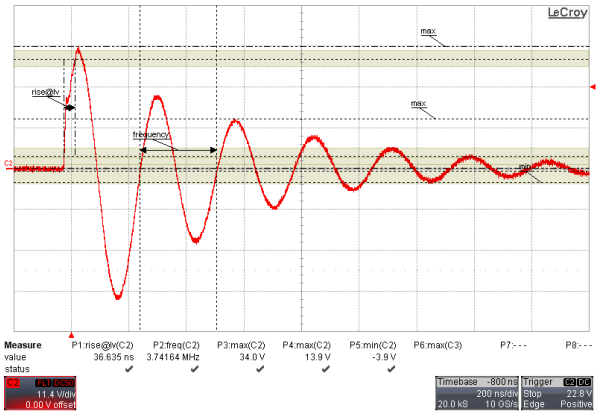
Negative



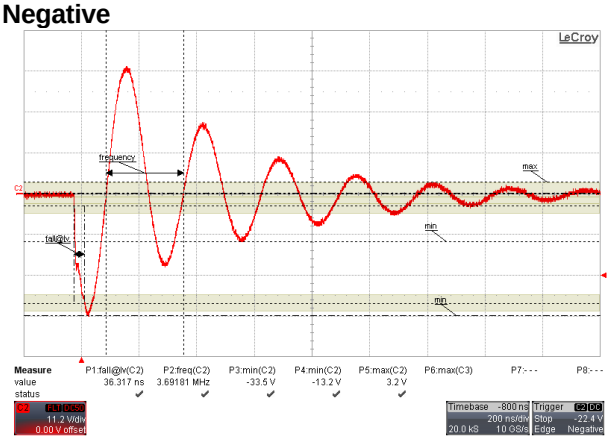
Nominal setting		**I Peak**	**Rise time tr**	**Decaying [% of Peak 1]**		**Osc. Freq**
[V]	[MHz]	[A]	[ns]	Peak 5	Peak 10	[MHz]
+2000	**3**	39.3	39.7	47.5	19.8	3.80
-2000	**3**	-39.0	35.6	45.7	18.2	3.84
+2000	**10**	41.8	12.0	51.7	20.6	11.92
-2000	**10**	-41.7	12.8	49.2	20.3	11.60
+2000	**30**	39.0	4.94	49.1	20.8	36.13
-2000	**30**	-41.4	5.18	46.5	21.0	36.16

Fast Damped Oscillatory Wave, 3 MHz, output L+N-PE 2000V at L1

Positive

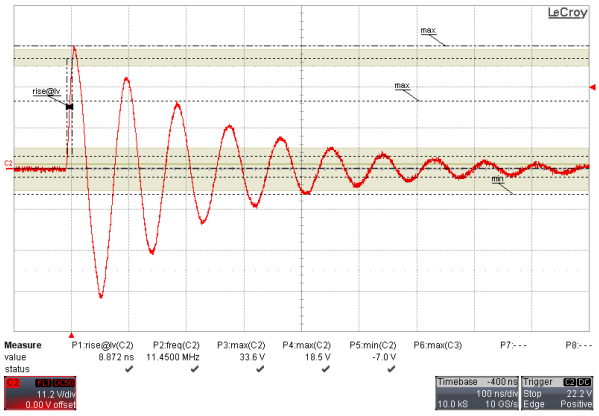


Negative

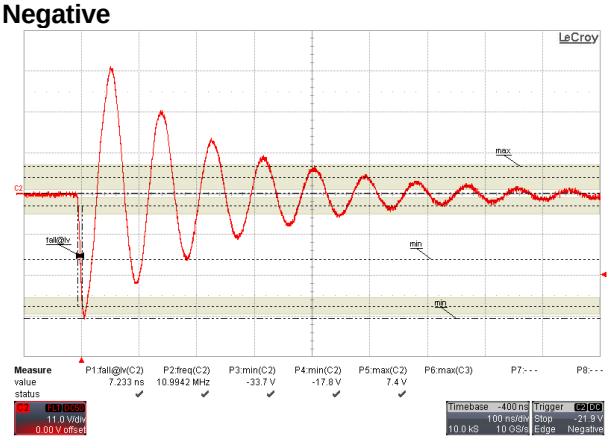


Fast Damped Oscillatory Wave, 10 MHz, output L+N-PE 2000V at L1

Positive

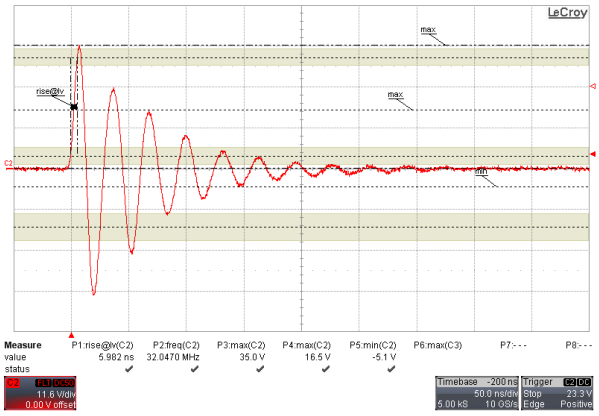


Negative

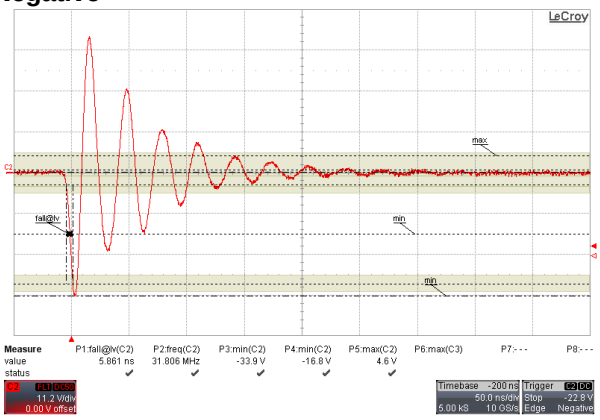


Fast Damped Oscillatory Wave, 30 MHz, output L+N-PE 2000V at L1

Positive



Negative



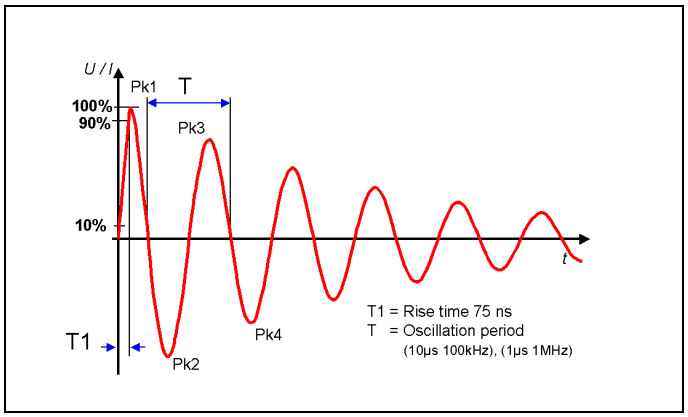
Nominal setting		I Peak	Rise time tr	Decaying [% of Peak 1]		Osc. Freq
[V]	[MHz]	[A]	[ns]	Peak 5	Peak 10	[MHz]
+2000	**3**	36.7	35.9	39.1	10.7	3.52
-2000	**3**	-36.7	36.5	42.1	7.2	3.54
+2000	**10**	40.5	10.67	53.5	24.1	10.64
-2000	**10**	-42.0	9.95	49.7	20.0	10.80
+2000	**30**	34.5	6.10	45.5	23.4	31.1
-2000	**30**	-35.5	6.26	46.4	20.4	31.2

10.5. Verification Damped Oscillatory Wave 100 / 1000 kHz magnetic field

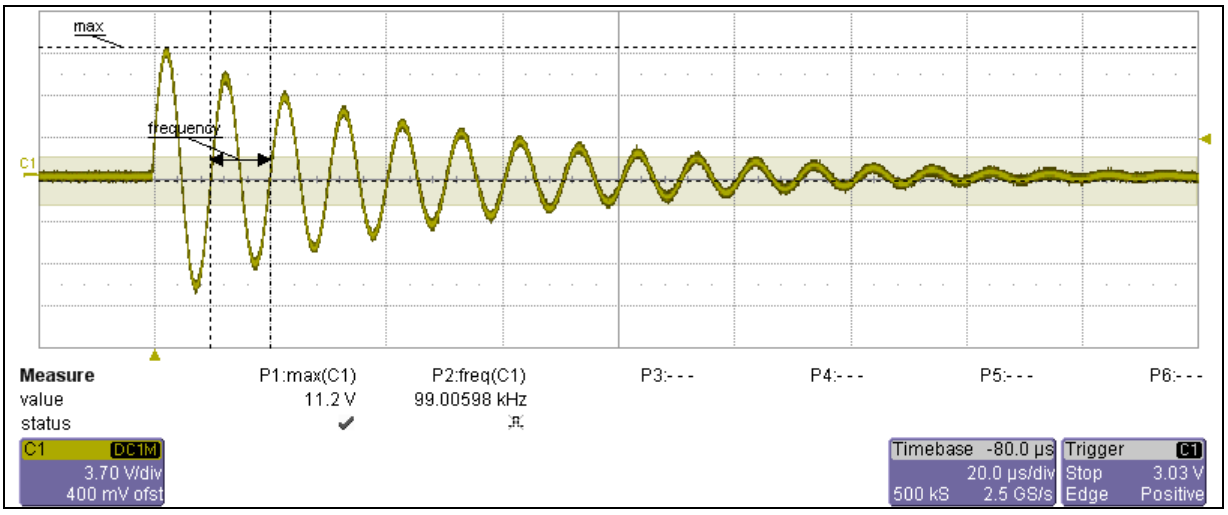
10.5.1. Verification Parameter

IEC 61000-4-10 (to MS 100 antenna)

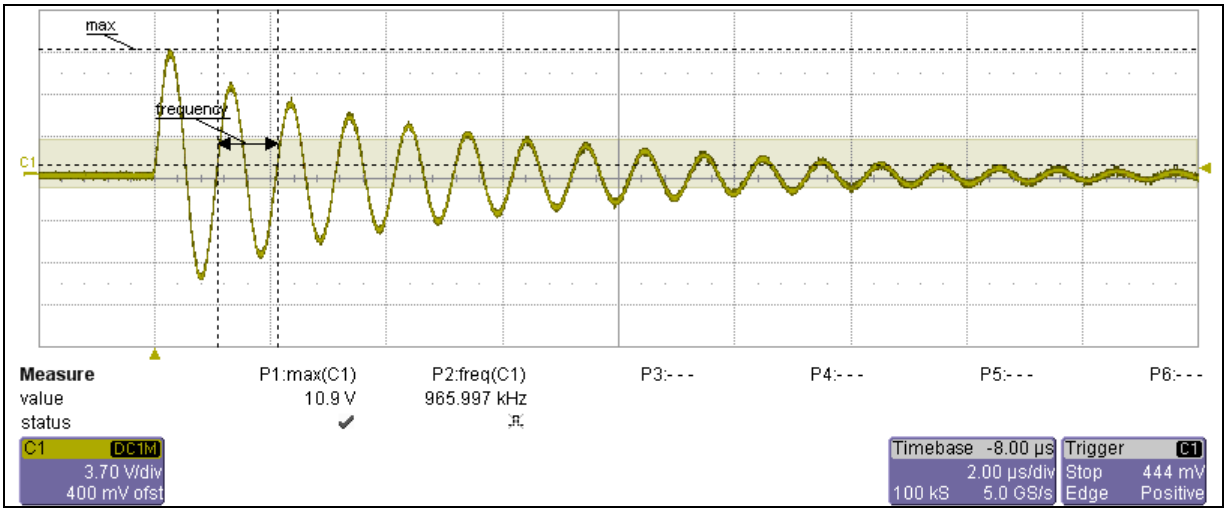
Current measurement		
Current	10.0A	±10%
Current	30.0A	±10%
Current	100.0A	±10%
H-Field measurement		
Settings: 100A/m Antenna factor= 0.9		
Current	111.1A	±10%
Oscillating frequency	100, 1000 kHz	±10%



Typical pulses, measured with a calibrated equipment



U set : +100A 100kHz Antenna factor = 0.9



U set : +100A 1000kHz Antenna factor = 0.9

11. 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.

11.1. Basic equipment

- Generator OCS 500N6.x series with including slow damped oscillatory 100kHz and 1MHz and Ringwave
  or
  Generator OCS 500 N6F.x series including fast damped oscillatory 3, 10, 30 MHz
  - Option including slow damped oscillatory 100kHz and 1MHz
  - Option including Ringwave
-
- Mains cable
- Mains cable for the EUT supply
- Adapter for power cable
- Manual on USB memory Stick
- Calibration certificate

11.2. Accessories and options

Coupling network for signal and data lines

- **CNV 504N / 508N Series**
  Coupling/decoupling network as per IEC 61000-4-5 and -12
  - 4/8 signal/data lines for Surge and Ringwave
  - coupling capacitor value 0.5 uF / 40Ω for Surge, 0.5 uF for Ringwave
  - decoupling inductor value 20 mH per line
  - Rated line voltage 50 V/ 300 V, current 1 A / 5 A
  - Generator series: OCS 500M6/N6/N6F

CNV 504N1	**CNV 508N1**	50V AC/DC / 1 A per line, 4 kV
CNV 504N1.1	**CNV 508N1.1**	50V AC/DC / 5 A per line, 4 kV
CNV 508N1.2	**CNV 508N1.2**	300V AC/DC / 1 A per line, 4 kV
CNV 504N1.3	**CNV 508N1.3**	300V AC/DC / 5 A per line, 4 kV

  Other models for 7 kV and 10 kV are available

- **CNV 504N5.x**
  Coupling/decoupling network as per IEC 61000-4-18
  - 4 signal/data lines for 100kHz and 1MHz damped oscillatory wave
  - coupling capacitor value 0.5uF, R = 100 Ohm
  - decoupling inductor value >1.5mH
  - Rated line voltage/current 50V/ 300V4A
  - Generator series: OCS 500M6/N6/N6F

CNV 504N5.1	50V AC/DC per line
CNV 504N5.3	250V AC/DC per line

- **CNV 508N4.x** Coupling/decoupling network as per IEC 60255-26
  for signal lines (4 signal pairs) 2.5kV

CNV 504N4	250V	4A
CNV 504N4.1	250V	16A

Coupling network for power lines

- **3 phase CNI 503N up to 100A**

EUT mains supply	400 V rms max. // 480V for USA		
Nominal current	In = 16 A / 32A / 63A / 100 A rms		
Frequency	50/60 Hz		
Coupling to	L1-L2,	L1-L3,	L2-L3
	L1-N,	L2-N,	L3-N
	L1-PE,	L2-PE,	L3-PE
	L1+L2+L3 – PE		
	L1+L2+L3 +N – PE		

Verification

- **CA OCS F kit**
  Calibration kit for fast OCS verification (incl. CA MC F + KW0R1 + KW1000)

- **CA MC F**
  Adapter for the EUT output

Other accessories

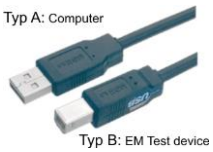
- **MS 100** Magnetic field antenna

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

11.3. USB Interface

USB interface “USB B” connector. For data transfer a USB interface is available. The internal RS 232 interface is converted to USB standard. Therefore the user must set the same Baud rate in the device and control software.
Using the USB interface the user can have emc problems during burst tests Our experiences says, that usually the computer USB port is disturbed by interference’s. Therefore a high quality USB cable (USB 2.0 standard) must be used.

- **K-USB USB interface cable**
  High quality USB 2.0 interface cable for data transfer to the computer.
  Length: 3m connector type USB A – USB B

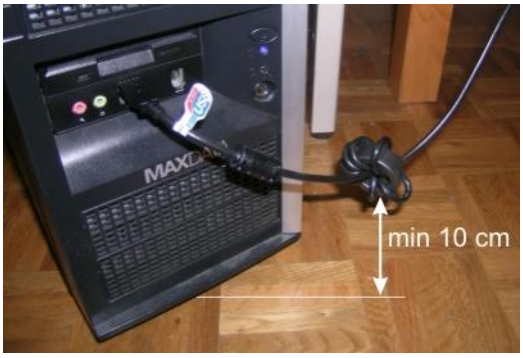


USB cable setup

The USB cable must be above ground with a distance of at least 10 cm. Otherwise the cable can be an antenna for the common mode burst pulses and will “collect” the interferences.

For filtering the following type of ferrites can be used: Kitagawa TR-40-27-15 with 8 windings

AMETEK CTS deliver the ferrite under the name FER-USB as an option



11.4. Optical Interface

For eliminate EMC interferences as earth loops, an optical link delivers a galvanic separation between generator and computer for remote control.

OptoLink

- Fiber optic link and interface with USB A connector
- Optical cable , length 3m

12. Appendix

12.1. Declaration of CE-Conformity

Manufacturer :	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15CH 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:	Oscillating Compact Simulator
Model Number(s)	OCS 500N6, all models OCS 500N6.x OCS 500N6F, all models OCS 500N6F.x

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

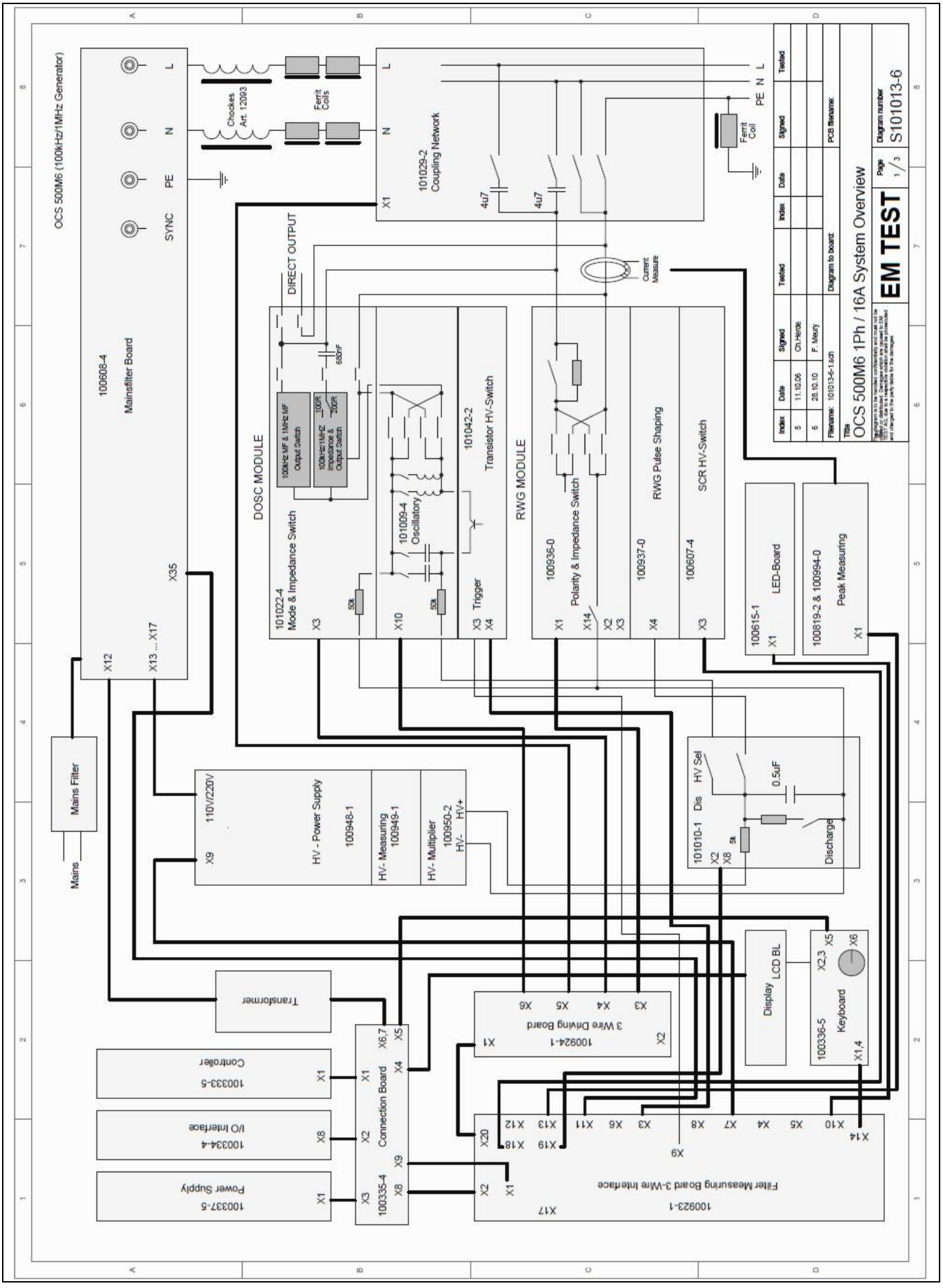
Standard(s) to which conformity is declared:

EN 61326-1 : 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 : 2007	Limits for harmonic current emissions
EN 61000-3-3 : 2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

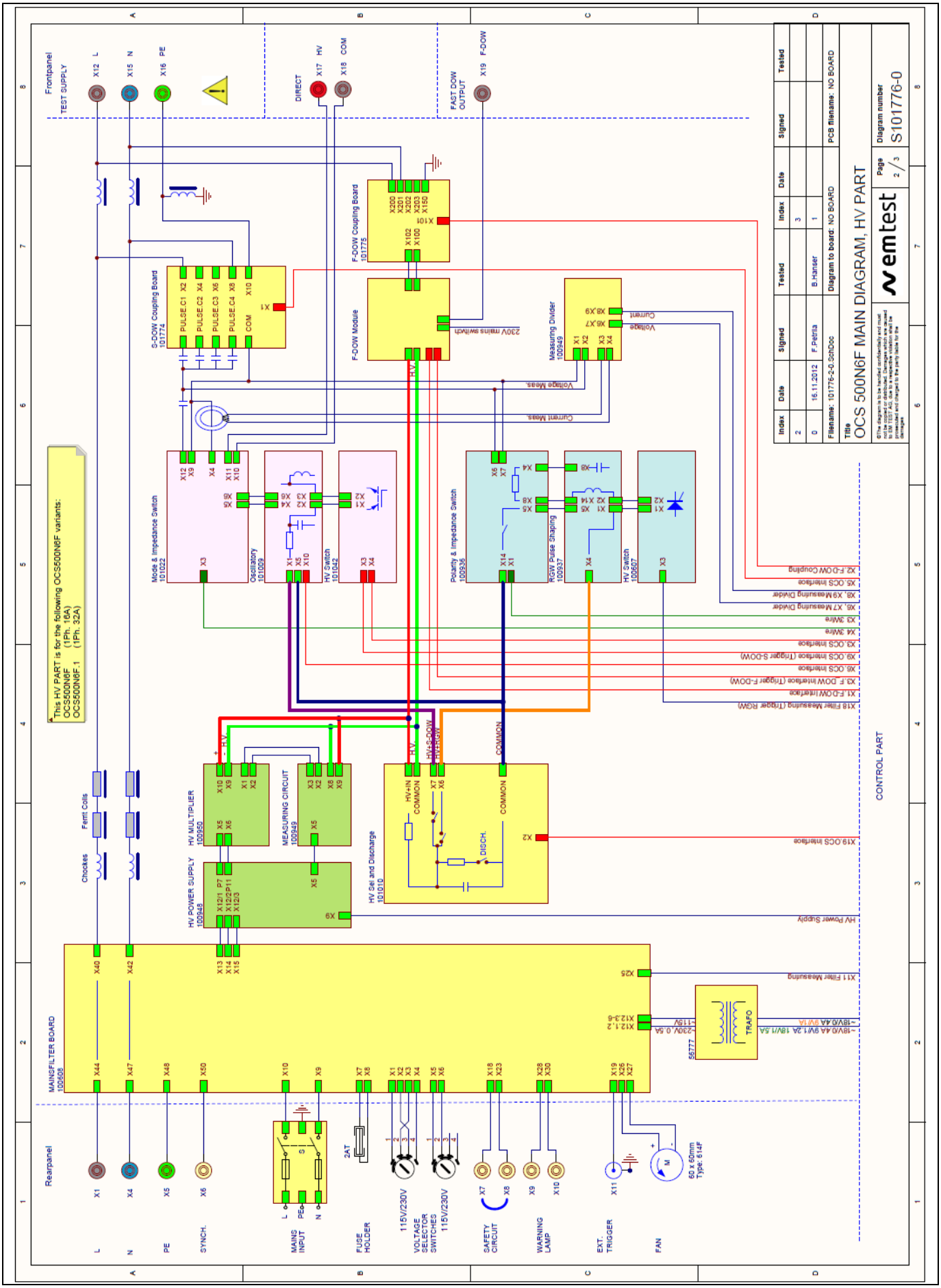
Manufacturer
AMETEK CTS GmbH
Sternenhofstr. 15
CH 4153 Reinach
Phone: +41 61 204 41 11
Fax: +41 61 204 41 00

By	A. Burger Design and Research
Place	Reinach BL , Switzerland
Date	1. July 2017

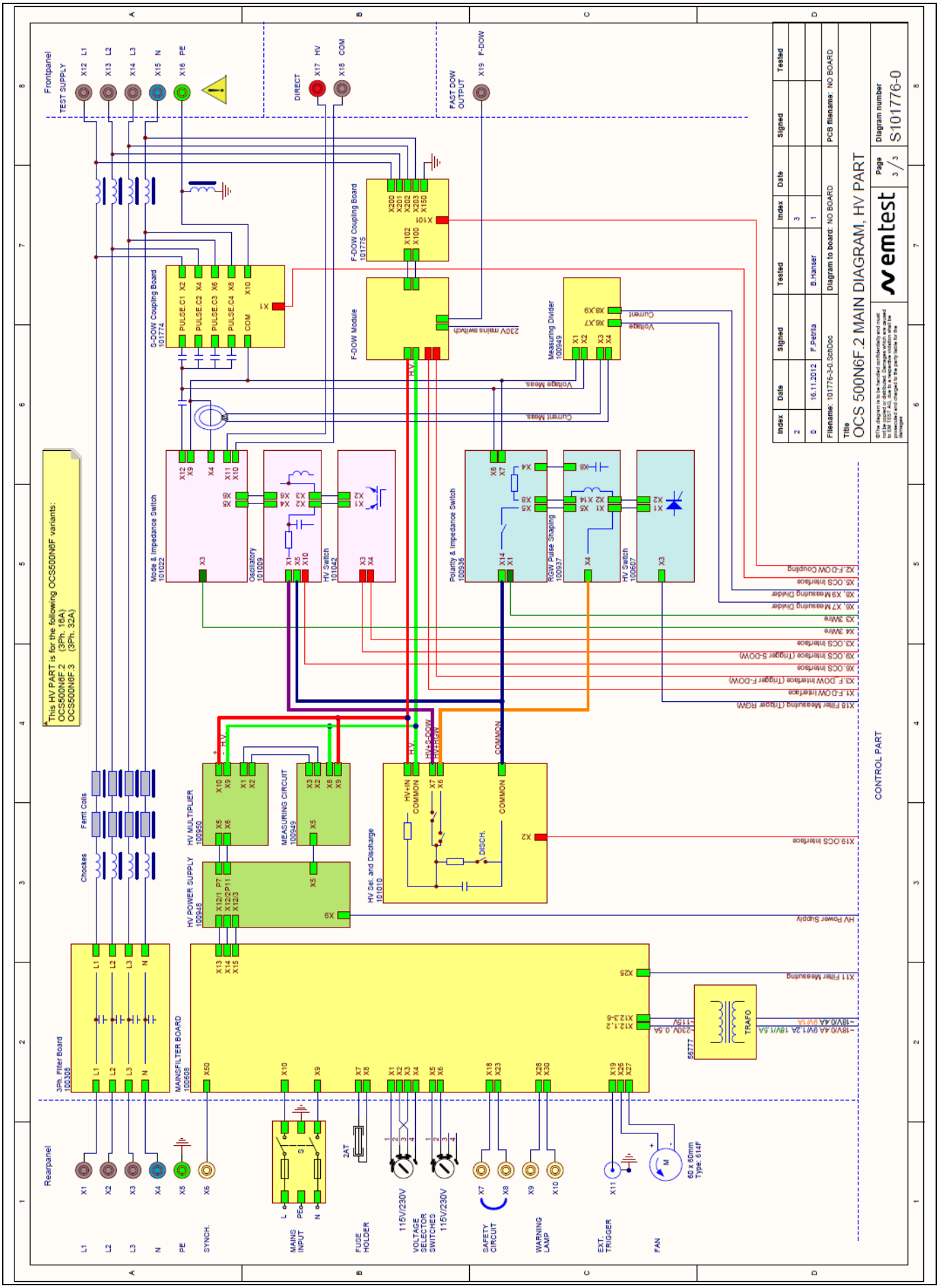
12.2. OCS 500 N6- General Diagram



12.3. OCS 500 N6F- General Diagram 1-phase devices



12.4. OCS 500 N6F- General Diagram 3-phase devices



12.5. OCS 500N6 1-phase operating with 3-phase devices

A 3-phase OCS 500 N6 uses in single phase mode the following phases:

L1 = phase line L
N = neutral line N
PE = protected earth PE

L+N-PE coupling

For coupling L+N-PE

select L1+L2+L3+N-PE

The lines L2 and L3 are not connected in the OCS 500 N6 and therefore the pulse is coupled only to the connected lines L and N to PE

Using software iec.control

Some standards and the DC coupling selection do not offer the coupling L+N-PE. For test this coupling precedes the following steps:

Figure 11.1: Coupling L+N-PE with software IEC.control

Example for select coupling L+N-PE

1. DoubleClick into the area **Standard Area** for change to **Device Area** mode
2. Select **Ringwave**
3. Select radio button **4 Line + PE** coupling. This offers the desired coupling mode
4. Select the button **coupling** for open the coupling selection
5. Select coupling **L1+L2+L3+N-PE** and deselect all other couplings
6. Press **OK** button

Save the setting as test file for use it later or in a link file.