Manual
for Operation

EFT 500N5 / N8 series

EFT 500N5
EFT 500N5.1 / .2 / .3 / .4 / .5 / .6/ .7/ .8
EFT 500N8
EFT 500N8.1 / .2

EFT/burst generator pulse 5/50ns

EFT 500Nx series – an EFT/Burst generator – is an intelligent solution offering exactly what you need for full-compliance immunity tests against Electrical/Fast transients phenomena. The distinct operation features, convenient EUT 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 EFT 500Nx is a universal equipment for abroad range of recommendations even for three-phase applications up to 100A

- IEC 61000-4-4
- IEC 61000-4-4 Ed 3
- EN 61000-4-4
- EN 61000-4-4 Ed 3

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Content

1. Model Overview

1.1. EFT Models

Standard and special models

Special models have the index EFT 500Nx **S**x . The difference to the standard models is the voltage or current ranges. The operation is the same as by the standard EFT equipment's.

Generator model	Model name up to 2008	**Description**		
EFT 500N5	EFT 500 M4	4.8kV Burst Generator with built-in CDN	250V	16A
EFT 500N5.1	EFT 500 M4 S1	4.8kV Burst Generator with built-in CDN	3x440V	32A
EFT 500N5.2	EFT 500 M4 S2	4.8kV Burst Generator with built-in CDN	3x440V	50A
EFT 500N5.3	EFT 500 M4 S3	4.8kV Burst Generator without CDN		
EFT 500N5.4	EFT 500 M4 S4	4.8kV Burst Generator with built-in CDN	690V	32A
EFT 500N5.5	EFT 500 M4 S5	4.8kV Burst Generator with built-in CDN	250V	32A
EFT 500N5.6	EFT 500 M4 S6	4.8kV Burst Generator with built-in CDN additional ext. CNE 503S16	250V	32A
EFT 500N5.7		4.8kV Burst Generator with built-in CDN	3x440V	16A
EFT 500N5.8		4.8kV Burst Generator with built-in CDN	3x690V	32A
EFT 500N8	EFT 500 M8	Burst Generator up to 7kV with built-in CDN	250V	16A
EFT 500N8.1	EFT 500 M8 S1	Burst Generator up to 7kV with built-in CDN	3x440V	32A
EFT 500N8.2	EFT 500M8 S2	Burst Generator up to 7kV with built-in CDN	250V	32A

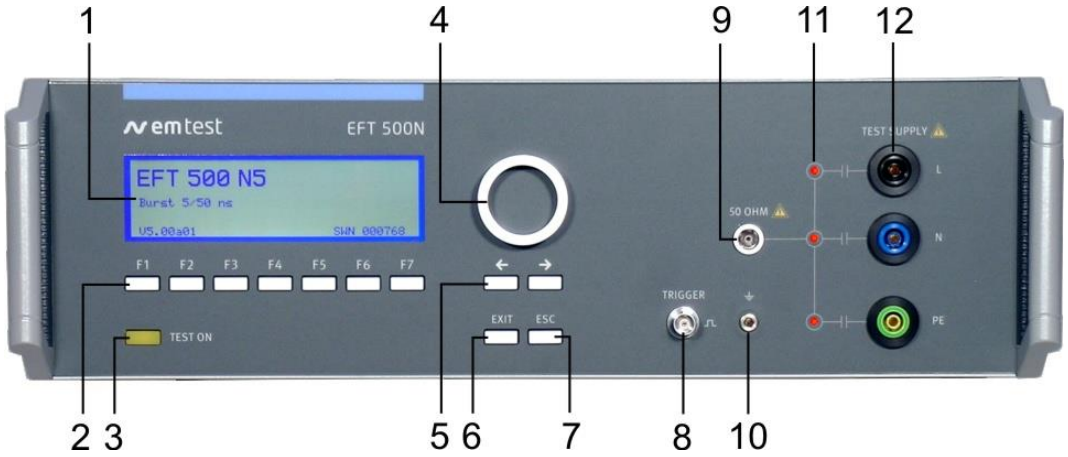
No longer available models

The following models are no longer available on the sales list but still supported by maintenance and upgrade to the actual standard.

Modell	**Pulse voltage**	**CDN**			**replaced by**
EFT 500	4,4kV	3x440V	16A	3 - phase	EFT 500N5
EFT 503	4,4kV	3x440V	16A	3 - phase	EFT 503 M4 S6
EFT 503 S1	4,4kV	3x690V	16A	3 - phase	--
EFT 503 S2	4,4kV	3x440V	32A	3 - phase	EFT 500N5.1
EFT 503 S3	4,4kV	3x440V	50A	3 - phase	EFT 503 M4 S2

2. Operating Functions

2.1. Front view



1	Display	**5**	Cursor keys "←" and "→"	**9**	HV pulse output 50 ohm
2	"Test On"	**6**	Exit	**10**	Ground reference
3	Function keys "F1..F7"	**7**	Escape	**11**	Coupling “On”
4	Knob (Inc / Dec)	**8**	CRO	**12**	EUT test supply

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

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

3 Test On
By pressing the key "Test On" the test procedure is initiated with the preselected parameters. The red LED indicates the trigger of a burst event.

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

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

7 ESC
When pressing the ESC button the user moves back one page in the menu.

8 BNC - CRO Trigger
At the BNC output the generator trigger can be checked, e.g. the burst duration, the burst repetition rate and the spike frequency (+15 V rectangular). This output signal can also be used to trigger external measuring devices (e.g. an oscilloscope)

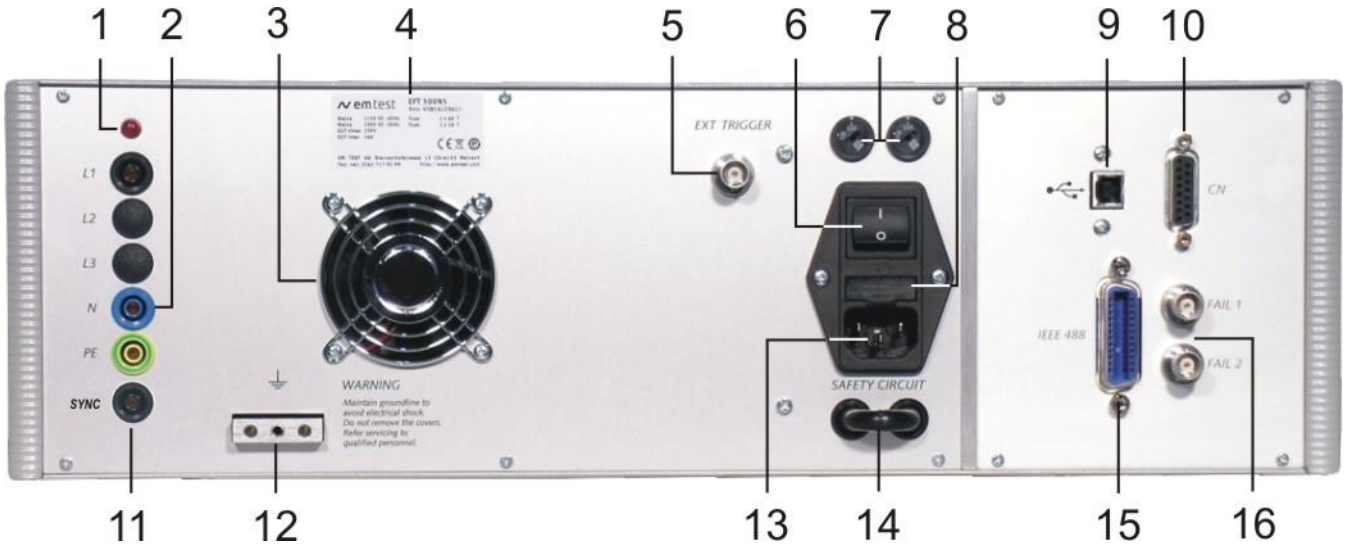
9 HV pulse output 50 ohm
External coupling devices such as the capacitive coupling clamp and the coupling network CNE 503 are connected to the coaxial 50 ohm output. Also the pulse parameters, on 50Ω and 1000Ω load condition must be verified at this coaxial output.

10 Ground reference
During test or calibration procedure the burst generator must be grounded to the reference ground plane.

11 Coupling
The LED indicates that the pulses are coupled to the L –N –PE line.

12 EUT test supply
The coupling / decoupling network is part of the generator. The EUT is powered via the safety laboratory plugs at the front panel of the simulator. The nominal power mains supply is 250V/16A. For higher currents, up to 100A, the external coupling network CNE 503 shall be used.

2.2. Rear view



1 Voltage indicator
2 EUT test supply input
3 Ventilator
4 Label for serial number
5 External Trigger
6 Power On switch
7 Mains selector 115V / 230V
8 Fuse holder
9 USB Interface optical forN8 models
10 Remote control connector CN
11 Sync input
12 Reference ground connector
13 Mains plug
14 Safety circuit
15 Interface GPIB / IEEE 488
16 Fail input Fail 1and Fail 2

1 Voltage indicator
Glow lamp for phase detection. The glow lamp is connected to PE and indicates a correct phase connection. Is the lamp not on, the voltage is off or the phase and neutral is inverse.

2 EUT test supply input
The power supply for the EUT is connected to the safety laboratory connectors + and -. The front panel output is decoupled by the internal coupling/ decoupling network.

3 Ventilator
Behind the ventilator hole a free space of at least 10cm for device cooling is necessary.

4 Label for serial number
The serial number tag indicates additionally the operating voltage and used fuse sizes.

5 External trigger
One single burst event can be released. Trigger level 5-15V positive going.

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

7 Mains selector
Selection of 115V / 230V

8 Fuse holder
Mains fuse 2-pole (phase and neutral). Fuse 5 x 20mm (230V / 1A and 115V / 2A) slow blow

9 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. EFT 500N8 models are equipped with an optical USB interface

10 Remote control connector CN
To remote control an external coupling matrix CNE 503. All functions are controlled by the EFT 500. It is recommended to connect and power the CNE 503 before turning the power mains ON at the EFT 500.

1 Voltage indicator
2 EUT test supply input
3 Ventilator
4 Label for serial number
5 External Trigger
6 Power On switch
9 Mains selector 115V / 230V
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12 Reference ground connector
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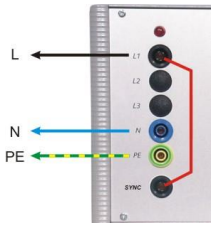
16 Fail input Fail 1and Fail 2

12 SYNC input
An ac voltage to which the events shall be synchronized is connected to this input. If no voltage is available the tests are started automatically in asynchronous mode with no phase angle adjust for pulse release.
Normally this input shall be connected directly to L1 plug.
The maximum input voltage is 300Vac.



12 Reference ground connection
The generator has to be connected to the reference ground plane of the test set up. Very important is the connection at the front panel of the simulator.

13 Mains plug
C14 type plug, for ac mains power 115V/240V 50/60Hz.

14 Safety circuit
For connect an external security circuit.

15 Parallel interface GPIB / IEEE 488
IEEE 488 interface with IEEE connector.

16 Fail detection FAIL 1 (TEST STOP)
The BNC input FAIL 1 can be used for DUT monitoring. In case of a low going signal (to chassis ground) the EFT 500 will stop pulse generation and the actual running test routine is paused. The test routine than can be stopped completely or can be continued from break point.
A message of FAIL 1 is indicated in the LCD display as well as in the ISM ISO software.

Fail detection FAIL 2 (TEST PAUSE)
The BNC input FAIL 2 can be used for DUT monitoring In case of a low going signal (to chassis ground) the EFT 500 will stop pulse generation and the actual running test routine is paused as long as the low level signal is available at the FAIL 2 input.
The test routine continues automatically as soon as the low level signal goes to high level.
A message of FAIL 2 is indicated in the LCD display as well as in the ISM ISO software.

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 (incr. /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

EFT 500N5

Burst 5/50ns

V 5.00a01 SWN: 001234

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 ISM IEC software

Start-up display example EFT 500N5

3.2. Main Menu

MAIN MENU

F1 : Quickstart
F2 : User test routines
F3 : Standard test routines acc

F7 : Service

F1 F2 F3 F4 F5 F6 F7

Quick Start

Easy and fast operation mode for equipment using without special functions. All parameters can be adjusted during the running test.

User Test Routines

The user can program, save and recall customized specific test routines. He can select standard routines or special functions such as automatic change of voltage or frequency during a test routine.

Test Routines as per IEC 61000-4-4

The user can call up the standard routines as per IEC 61000-4-4 and start them immediately.

Service

Set-up menu for the generator.

3.3. Quick Start

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

```
QUICK START
V    =   2000V          f    =   5.0kHz
td   =   15.0ms         tr   =   300ms
kop  =   L N PE         +/-  =   +
T    =   5:00min


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.

Page 3 (Change)

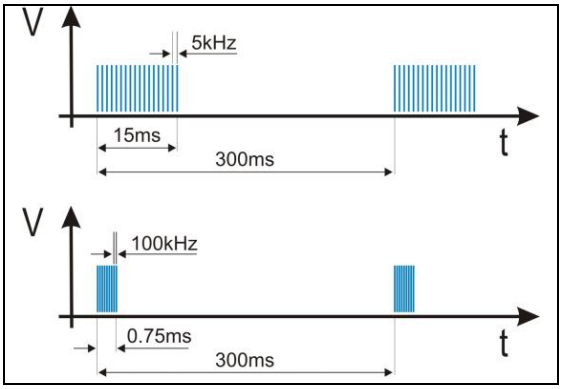
```
QUICKSTART
Voltage      V  :  200V    -  4400V
Frequency    f  :  0.1kHz  -  1000.0kHz
Duration     td :  0.1ms   -  999.9ms
Repetition   tr :  10ms    -  9999ms
Test time    T  :  0:01min -  99:59min
U      f     td     tr     cpl      +/-   T
200    5.0   15.0   300    L N PE   +     5:00
```

F1 F2 F3 F4 F5 F6 F7

After starting the test the elapsed test time is displayed. All function keys except F2 (manual trigger) can ***Stop*** the test routine. After test stop (Stop, Test OFF), the display keeps for about 2s.

After starting the test the elapsed test time is displayed. All function keys except F2 (manual trigger) can ***Stop*** the test routine. After test stop (Stop, Test OFF), the display keeps for about 2s.

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 61000-4-4 (2004-07) Ed 2

f	= **5kHz**	**100kHz**
td	= 15ms	0.75ms
tr	= 300ms	300ms

Warning

If the user reduces the test voltage in **Quickstart**, the **storage capacitor will be discharged only by the burst pulses**. The result is a higher test voltage on the EUT than indicated on the display till the storage capacitor is discharged to the settled value.

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

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

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.

USER TEST ROUTINES	Page 1 / 2
F1 : Customized test routines	
F2 : Voltage change after T by ΔV	
F3 : Frequency change after T by Δf	
F4 : Frequency sweep in one single burst	
	Page 2

F1 F2 F3 F4 F5 F6 F7

USER TEST ROUTINES	Page 2 / 2
F1 : Change duration after T by Δdt	
F2 : Change polarity after T	
F3 : Statistical burst release	
F4 : Synchronized at fixed angle	
	Page 1

F1 F2 F3 F4 F5 F6 F7

Each of these special functions can include 7 stored test routines.

CUSTOMISED TEST ROUTINES	
F1 : Store F1	F5 : Store F5
F2 : Store F2	F6 : Store F6
F3 : Store F3	F7 : Store F7
F4 : Store F4	

F1 F2 F3 F4 F5 F6 F7

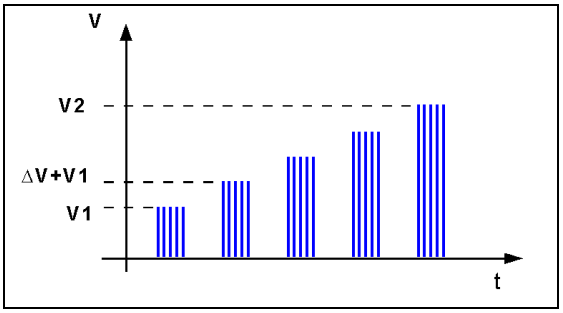
After selection of a stored test file the test parameters will be indicated on the display.

Customized test routines

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

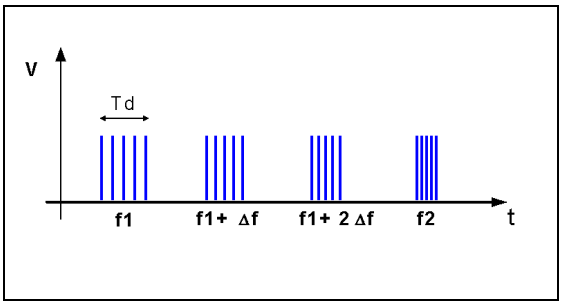
Voltage change after T by ΔV

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



Frequency change after T by Δf

The spike frequency is increased from f1 to f2, and then from f2 to f3 by steps of Δf after the defined test time T. All limitations are the same as defined under Quick Start. The limitation of the max. generated number of spikes is related to the higher frequency of f1, f2 or f3.



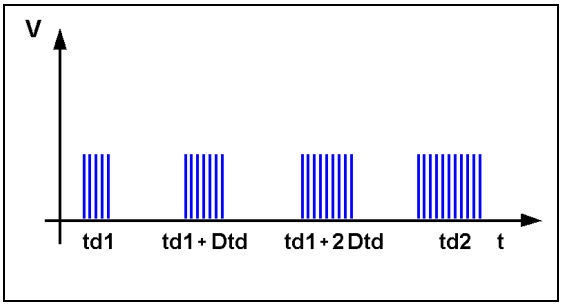
Frequency sweep in one single burst

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

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

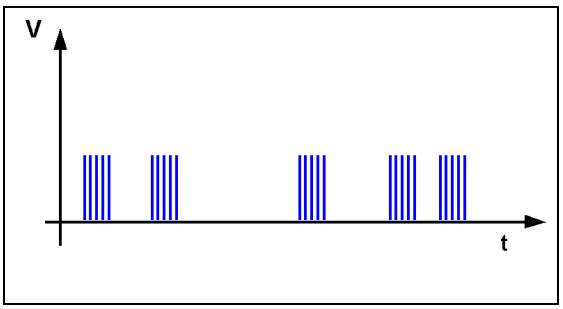
Duration change after T by Δt4

The burst duration is increased from t4s to t4e by steps of Δ t4 after the defined test time T. All limitations are the same as defined under Quick Start. The limitation of the max. generated number of spikes is related to the higher duration of t4s or t4e.



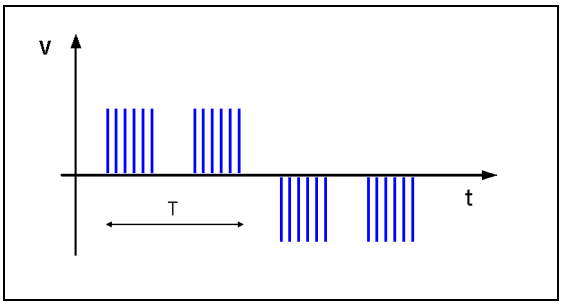
Random burst release

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



Polarity change after T

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



3.5. Test Routine as per IEC 61000-4-4

The display shows a list of test levels as per the standards IEC 61000-4-4. In the menu Service F4 Change standard level you select between the burst frequency 5 kHz and 100 kHz.

N5 models Setting IEC 61000-4-4

STANDARD TEST ROUTINES				
F1	:	Level 1	250 V /	5.0 kHz
F2	:	Level 2	500 V /	5.0 kHz
F3	:	Level 3	1000 V /	5.0 kHz
F4	:	Level 4	2000 V /	5.0 kHz
F5	:	Level 5	4000 V /	5.0 kHz
F6	:	Level X - Level Y		

F1 F2 F3 F4 F5 F6 F7

Setting IEC 61000-4-4 Ed 2

STANDARD TEST ROUTINES				
F1	:	Level 1	250 V /	100.0 kHz
F2	:	Level 2	500 V /	100.0 kHz
F3	:	Level 3	1000 V /	100.0 kHz
F4	:	Level 4	2000 V /	100.0 kHz
F5	:	Level 5	4000 V /	100.0 kHz
F6	:	Level X - Level Y		

F1 F2 F3 F4 F5 F6 F7

N8 models Setting IEC 61000-4-4

STANDARD TEST ROUTINES				
F1	:	Level 1	1000 V /	5.0 kHz
F2	:	Level 2	2000 V /	5.0 kHz
F3	:	Level 3	4000 V /	5.0 kHz
F4	:	Level 4	6500 V /	5.0 kHz
F6	:	Level X - Level Y		

F1 F2 F3 F4 F5 F6 F7

Setting IEC 61000-4-4 Ed 2

STANDARD TEST ROUTINES				
F1	:	Level 1	1000V /	100.0 kHz
F2	:	Level 2	2000V /	100.0 kHz
F3	:	Level 3	4000 V /	100.0 kHz
F4	:	Level 4	6500 V /	100.0 kHz
F6	:	Level X - Level Y		

F1 F2 F3 F4 F5 F6 F7

The function key F5 selects a procedure which starts at test level X and stops at test level Y. The test level is changed automatically after the preselected test time T.
(X <= Y)

Page 3 (Show values)

Standard IEC 1000-4-4					Level 3
V	=	2000V	f	:	100 kHz
td	=	0.8ms	tr	:	300ms
kop	=	L N PE	+/-	:	+
T	=	1:00min			

F1 F2 F3 F4 F5 F6 F7

The Standard defines the burst duration at 100kHz with 0.75ms. The EFT 500 generators with firmware < V 5.10 support not a resolution of 0.05ms.

The burst duration at 100kHz is set to 0.8ms which is inside the specified tolerance of the standard of 0.75ms ± 20%

The functions START, CHANGE and PRINT are the same as defined under Quick Start.
The function key CHANGE can only handle the coupling, polarity and the test time.
All other parameters are defined by the standard.

EFT generators with firmware V5.10 or higher have a td resolution of 0.01 ms an support the setting of 0.75 ms.

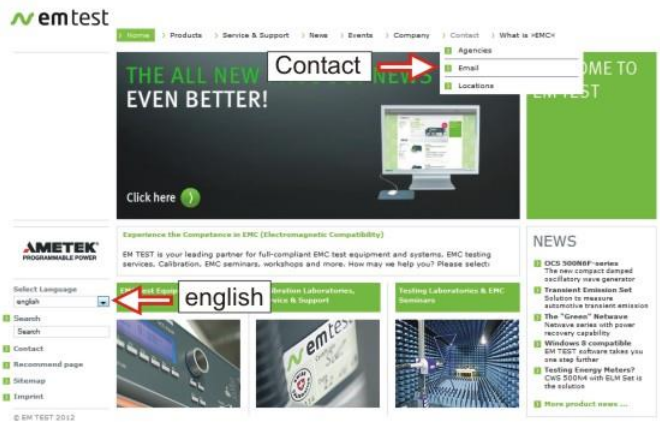
3.6. Service

SERVICE
F1 : Addresses F2 : Selftest F3 : Set-up F4 : Change standard levels

F1 F2 F3 F4 F5 F6 F7

F1 Addresses
The addresses of the EM TEST (Switzerland) GmbH and the EM TEST GmbH are shown. The addresses of all EM TEST sales agencies are listed on the web site of EM Test under :

www.emtest.com



F2 Selftest
Selftest for check the key functions.

F3 Set-up
The software will clearly explain the set-up procedure.

F4 Change standard levels
This procedure allows the user to change the standard values to his actual requirements.

The Burst Repetition frequency has the following rulers:
- IEC 61000-4-4 5 kHz 15ms
- IEC 61000-4-4 Ed.2 100 kHz 0.75ms

SERVICE
F1 : Change parameters Level 1 F2 : Change parameters Level 2 F3 : Change parameters Level 3 F4 : Change parameters Level 4 F5 : Change parameters Level 5 F6 : Change parameters IEC 61000-4-4 F7 : Change parameters IEC 61000-4-4 Ed.2

F1 F2 F3 F4 F5 F6 F7

3.7. Setup

SETUP
F1 : Change language
F2 : LCD backlighting
F3 : Interfaces
F4 : Keyboard-Beeper
F5 : Timer
F6 : Safety circuit

F1 F2 F3 F4 F5 F6 F7

Change language

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

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 specified time the generator has not been in operation (1 - 30min).

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.

Keyboard-Beeper

F1 is the selector for the beeper ON/OFF mode.
The beeper is always on when a test routine is finished. To indicate that a running test is finished the beeper sounds 3 times.

Timer

Pressing of F5 will show the total operating time of the test equipment.

Safety circuit

The menu F6 is the setting if security circuit is built in or not. Old EFT generators models have no built in safety circuit. This must be settled in the device setup. The display on the bottom line shows the state after pressing the function key F1.

Software ISMIEC cannot work proper if the safety circuit setting is not correct.

For **generators with a built in safety circuit connector**

the **setting must** be as shown in the **figure below**!

SETUP

F1 : Safety circuit on/off

on / off
off

F1 F2 F3 F4 F5 F6 F7

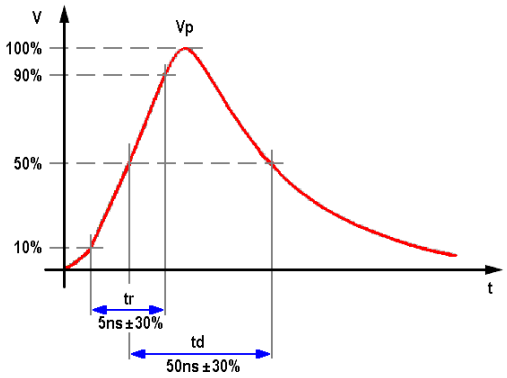
Display for Burst generators **with Safety circuit**

must have the display shown on the left figure

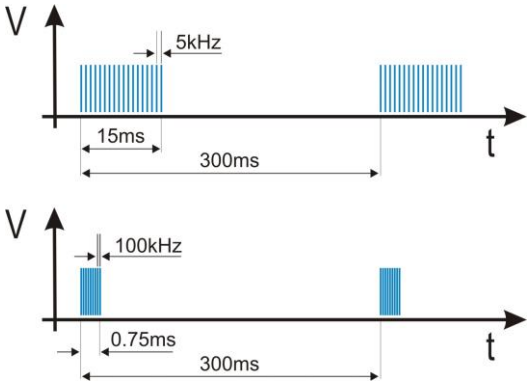
4. Test Equipment EFT 500N

4.1. Specification of the test parameters

As per IEC 61000-4-4 the EFT pulses are specified as follows:



Definition of a single pulses



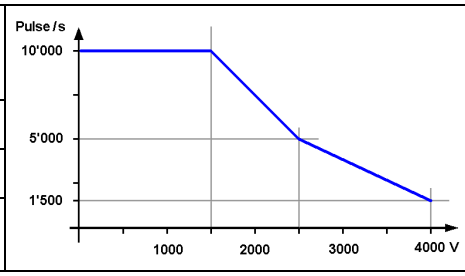
Definition of a complete burst

Parameter	on a 50 Ω load	on a 1000 Ω load
VS	125V – 2000V	250V - 4000V
Ri	50Ω	50Ω
td	50ns ±30%	35ns – 150ns
tr	5ns ±30%	5ns ±30%
f1	5kHz/2.5kHz	5kHz/2.5kHz
t4	15ms	15ms
t5	300ms	300ms

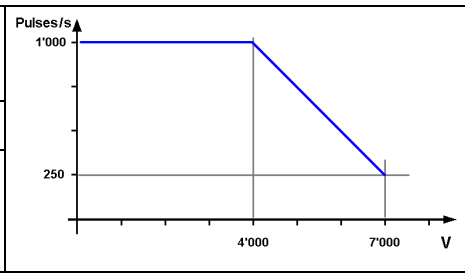
4.2. Burst generation

Discharge switch:
The discharge switch is a highly reproducible semiconductor switch. Spike frequencies up to 1000 kHz are by a factor of 200 higher than recommended in the actual EFT standards. This means of course that also the pulse energy would be 200 times higher. This is not generally possible for the high voltage switch. Therefore the following limitation protects the pulse forming circuit against overload:

M5 Version

Voltage U	Max. pulse / burst td * f	Max. pulse / s td * f / tr	
< 1'500V	1,000	10,000	
>= 1'500V < 2'500V	1,000	linear decrease to 5,000	
>= 2'500V	linear decrease to 500	linear decrease to 1,500	

N8 version:

Voltage U	Max. pulse / burst td * f	Max. pulse / s td * f / tr	
< 4'000V	150	1,000	
>= 4'000V <= 7'000V	150 – 75 linear decrease to 75	1,000 – 250 linear decrease to 250	

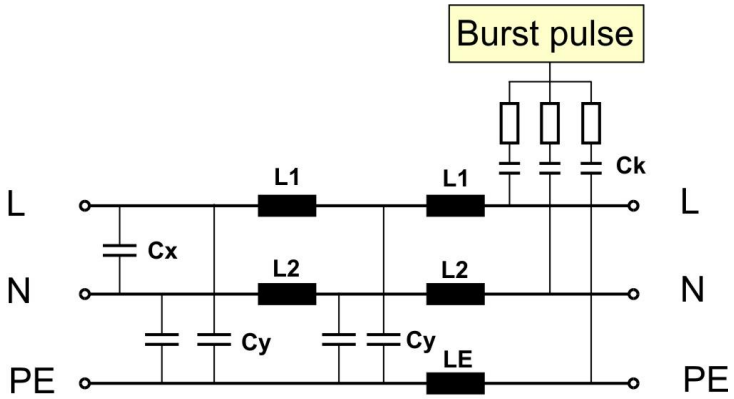
4.3. Coupling decoupling network

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.

4.3.1. 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 61000-4-4.



Coupling network as per IEC 61000-4-4

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

Coupling method:

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

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

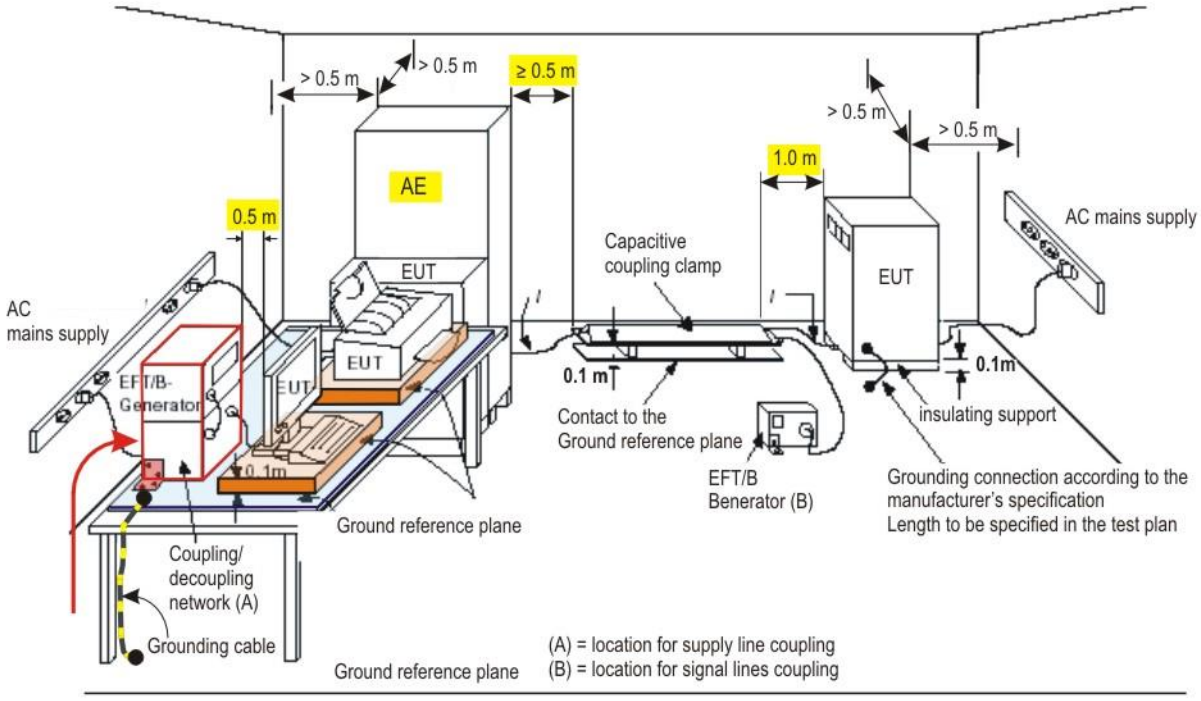
IEC 61000-4-4 (1995, 2001) requires all line combination to be tested individually.
A 1-phase EUT needs to test all combination L, N, PE, L+N, L+PE, N+PE, L+N+PE each with two tests with 60s (positive and negative 60s each). Total test time 14 x 60 seconds

4.3.2. Capacitive coupling clamp

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

4.4. Burst Test Setup

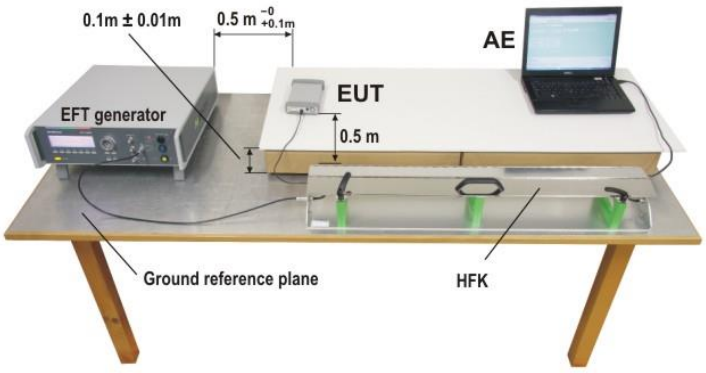
- The test generator and the coupling network should be connected to the reference ground plane (acc. to high frequency requirements).
- The equipment under test must be isolated from the reference ground plane. The distance should be 10cm. being part of the EUT, these requirements are also recommended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



4.4.1. Test setup with capacitive coupling clamp

When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces (including the generator), except the ground reference plane beneath the coupling clamp and beneath the EUT, shall be at least 0,5 m.

The distance between any coupling devices and the EUT shall be (0,5 − 0/+0,1) m for tabletop equipment testing, and (1,0 ± 0,1) m for floor standing equipment, unless otherwise specified in product standards. When it is not physically possible to apply the distances mentioned above, other distances can be used and shall be recorded in the test report.



4.5. Computer setup for EFT/Burst testing.

During immunity tests high frequency interference is generated. Due to the length of the connected lines, a certain part of this energy will be transformed into radiated interference.

Therefore the operator shall be aware that systems and installations in the neighborhood, even those not being part of the test set-up can be disturbed.

Especially for fully automated test systems, where simple computers may be used, EMC problems within the test system may occur. To avoid such disturbances in the following paragraphs some information is given to which the operator has to take care:

- EM TEST generators are tested with the maximum test level. If no damage has been occurred the equipment must be seen as immune.
- The interference always will enter into a system at the weakest part. Within a computer controlled system the weakest unit is almost the computer with its interconnection lines and the peripheral equipment.
- The most critical test concerning the above mentioned problems is the burst test according to IEC 61000-4-4 and IEC 61000-4-6 (conducted RF up to 80MHz). This is a high frequency test, which may radiate extreme interference fields to the environment.

Concerning the test set-up the following points are explained:

1. The burst generator must be connected very well to the ground reference plane on the table.
2. The ground reference plane shall be connected to the protective earth system. For tests within a shielded room the connection shall be made to the walls of the room.
3. The test set-up shall have one single ground reference point (not several)

GROUND LOOPS SHALL BE STRICTLY AVOIDED

4. The central ground reference point shall be located where the EFT generator is connected to the ground reference plane. At the same point the reference ground plane shall be connected to the protective earth system or to the shielded room.

For conducting the test the following points shall be taken under consideration:

1. It is not allowed to touch the EUT or the cables under test during a running test. The test results will be influenced and are no more reproducible.

2. If the operator in contrary touches directly the EUT or the connected lines increased radiation from the test set-up is generated. The operator itself will radiate and/or will cause ground currents into the whole environment.

3. As larger the dimensions of an EUT are, as higher the radiation of high frequency energy will be.

4. Especially the capacitive coupling clamp with its length of 1m radiates.

5. Auxiliary equipment as well as computer can be influenced directly due to the radiation.

Remarks:
Even the use of fiber-optic links for the communication between a computer and EFT does not help in case of direct radiation. The computer and its lines will be directly influenced and the data transmission will be disturbed.

6. The influence of direct radiation can be reduced by increasing the distance between a computer and the test set-up. In any case a minimum distance of 3m shall be available.

It is not only the length of the cable but also the physical distance between computer and test set-up which is important to take care to.

7. It is shall be strictly avoided to put the computer directly onto the ground reference plane of the test set-up. The computer then is part of the test set-up and will also be tested. Mostly all computers are not immune to this test and will be disturbed.

What to say about the computer:

1. Do not use oldest equipment available in your company. Actual computer show better behavior to what EMC concerns.

2. **Do not use notebooks for this application. Laptops are fully manufactured within a plastic housing and therefore are very sensitive to all kind of interference.**

4. It would be better to use tower- or mini-tower equipment. They are at least partially screened. The interface connectors are mounted on metallic surfaces so that the screen of the communication lines can be connected to the chassis.

5. The screens of the USB and IEEE cables must be connected to the chassis of the instruments at both sides, at the computer and at the EFT generator.

6. **The communication cables, USB and IEEE, shall be screened. Do not use standard cables, consumer products with plastic connectors.**
   These cable types are using mostly very bad designed cable screens. The contact to the housing of the connector is mostly realized with a small cable, which is very bad under the aspect of RF screening.
   Please take care that the screen is connected very good to the metallic housing of the connector and that the connector is screwed to the housing of the generator.
   This mostly is the problem when using the USB interface. Especially those cables are badly designed. For IEEE cables very good products are available.

7. The weakest parts within the computer system are the peripherals, as keyboard and mouse. Both products are not designed to operate under these severe conditions.

It is very easy to make the design better. The operator would be able to do it for himself.

What is the problem?

The screen of the cables between a computer and the keyboard (mouse) are soldered directly to the printed circuit board.
The screen shall not be soldered to the print, but to another „ground reference plane“.

E.g. put into the keyboard, directly under the keyboard print a broad copper foil area. Connect the screen of the cable to this copper foil, without any connection to the print. You will see a dramatic change to better results.

5. Technical data

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

Test Level	**N5 / N5.x**	**N8 / N8.x**
Open circuit	200V - 4800V ± 10% Step 20V	1000V - 7000V ± 10% Step 50V
Wave shape into a 50Ω load	100V - 2400V	500V – 3500V
Rise time tr	5ns ± 30%	
Pulse duration td	50ns ±30%	
Wave shape into a 1000Ω load	200V - 4800V	1000V – 7000V
Rise time tr	5ns ± 30%	
Pulse duration td	35ns - 150ns	
Source impedance	Zq = 50Ω ± 20%	
Polarity	positive / negative	
Trigger		
Trigger of bursts	AUTO, MANUAL, EXTERN	
Synchronization	0 - 360° (16 - 500Hz) Asynchron = 0° If a reference signal is connected to the Sync input.	
Synchronization	0° - 360°	
Burst duration td	0.1ms - 999.9ms, step 0.01 ms	
Burst repetition rate tr	10ms - 9999ms	
Spike frequency f	0.1kHz - 1000kHz	
Test duration T	0:01 min - 99:59 min	
Output	**EFT 500 N5 /N5.4 /N5.5 / N5.6 N8 /N8.2**	**EFT 500 N5.2 /N5.7 /N5.8 N8.1**
Direct via 50Ω coaxial connector	To connect ext. coupling devices	
Coupling network	To L, N, PE all combinations	
EUT power mains AC 50/60Hz	250 V / 16 A N5/ N8 250 V / 32 A N5.5/ N5.6/ N8.2 690 V / 32 A N5.4	3 x 440V/16A EFT N5.7 3 x 440V/32A EFT N5.1/N8.1 3 x 440V/50A EFT N5.2 3 x 690V/32A EFT N5.8
EUT DC power	270V / same as AC	270V / same as AC per line
EUT power supply fuse	Max Output voltage to 3-phase coupling may be reduced The EUT power supply fuse must be installed external. The fuse dimension must match the rated current of the devices EUT current	
Test routines		
Quick Start	Immediate start, all parameters adjustable during a running test	
Standard test as per	IEC 61000-4-4 : N5 level 1 ... level 5 Level X - Level Y	N8: level 1 ... level 4
User test routines	Customized test routines Voltage change after T by ΔV Frequency change after T by Δf Frequency sweep in one single burst Change duration after T by Δtd Change polarity after T Statistical burst release Synchronized at fixed angle	
Safety		
Safety circuit	Control input (short circuit)	
Design	as per IEC 1010, EN 61010	
Interfaces		
USB	USB (compatible to USB 1.1 and 2.0); optical for N8 models	
IEEE	parallel, addresses 1-30	
CN port	Control of CNE 503 for 3-ph testing	
Opto Link	Optical interface	

General data

Dimensions and Weight	Device	Weight	Dimension
	EFT 500N5	12.6 kg	19" / 3 HU
	EFT 500N5.1	22.4 kg	19" / 6 HU
	EFT 500N5.2	ca. 40 kg	19" / 6 HU
	EFT 500N5.3	12.0 kg	19" / 3 HU
	EFT 500N5.4	20.0kg	19" / 6 HU
	EFT 500N5.5	ca. 20.0kg	19" / 6 HU
	EFT 500N5.6	13.5kg	19" / 3 HU
	EFT 500N5.7	17.0kg	19" / 6 HE
	EFT 500N5.8	22.6kg	19" / 6 HE
	EFT 500N8	14.4kg	19" / 6 HU
	EFT 500N8.1	ca 40 kg	19" / 6 HU
	EFT 500N8.2	20.0kg	19" / 6 HU

Power supply	115V/230V +10/-15% 50/60Hz
Power	265W max.
Fuses	230V : 2 x T 2A slow blow 115V : 2 x T 4A slow blow

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

6. Maintenance

6.1. General

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

6.2. 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 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.

6.3. Fuse for the EUT power supply

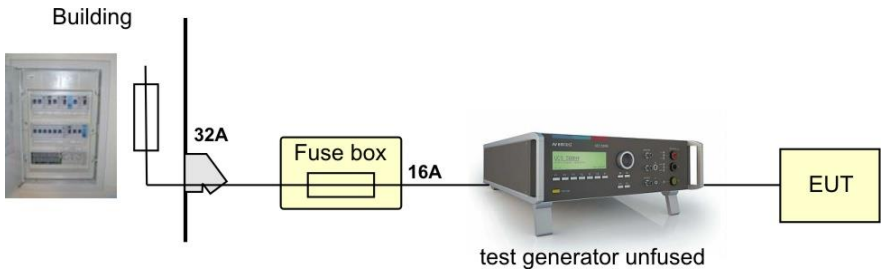
The test generator has no built in fuse for the EUT power supply. It is in the scope of responsibility of the user to protect the EUT external for the rated current.

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

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

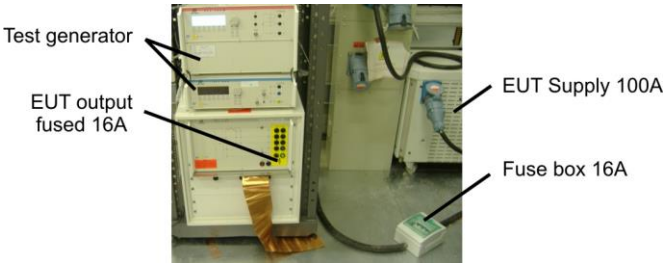
Example of external fuse

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



Example
16A protection with a 100A installation with a 3-phase fuse box.

The user has protected his Equipment Under Test with this additional fuse box for a rated current of 16A.



6.4. Calibration and verification

6.4.1. Factory calibration

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

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

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

Example: Calibration mark

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

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

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

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

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation has to be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment has to be taken into consideration.

- Based on the experience and observation collected over the years **EM TEST recommends a calibration interval of 1 year** for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators in order to assure proper performance and compliance to the standard specifications.

6.4.3. Calibration of Accessories made by passive components only:

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

6.4.4. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, EM Test suggests referring to the wave shape and values of the original calibration certificate.

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


Danger

Before starting the calibration or verification

remove the EUT Mains Supply

from the generator and from the coupling network

6.4.5. General information for verification

Basic standard	**IEC 61000-4-4 Ed.2 : 2004**
Verification chapters	6.1.2 Verification of the characteristics of the fast transient/burst generator 6.2.2 Verification of the characteristics of the coupling/decoupling network
Verification adapter	Verification with 50Ω and 1000Ω coaxial termination
Oscilloscope bandwidth	at least 400MHz

6.4.6. Verification tests according standard

Burst verification, 50Ω output according IEC 6100-4-4

loaded with 1000Ω	**Unit**	**Nominal Value**	**Tolerance**
Pulse level	[V]	±250, ±500, ±1000, ±2000, ±4000, ±6500*	
Measuring level	[V]	±240, ±480, ± 950, ±1900, ±3800, ±6175*	± 20%
rise time	[ns]	5	± 30%
pulse duration	[ns]	50	-15/+100ns

loaded with 50Ω	**Unit**	**Nominal Value**	**Tolerance**
Pulse level	[V]	±250, ±500, ±1000, ±2000, ±4000, ±6500*	
Measuring level	[V]	±125, ±250, ± 500, ±1000, ±2000, ±3250*	± 10%
rise time	[ns]	5	± 30%
pulse duration	[ns]	50	± 30%

Burst verification, EUT output according IEC 6100-4-4

loaded with 50Ω	**Unit**	**Nominal Value**	**Tolerance**
Pulse level	[V]	±500, ±1000, ±2000, ±4000, ±6500*	± 10%
Measuring level	[V]	±250, ± 500, ±1000, ±2000, ±3250*	± 20%
rise time	[ns]	5	± 30%
pulse duration	[ns]	50	± 30%
Couplings	- - -	L + N + PE	- - -
Measuring point	- - -	measured on L or N or PE	- - -

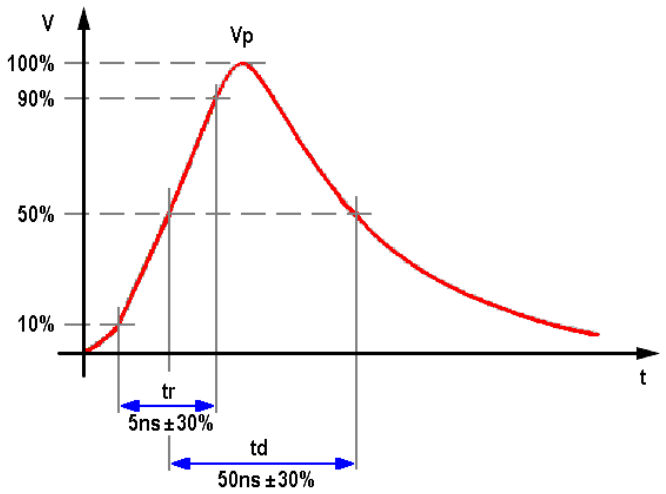
The generator must be verified to ensure compliance to the parameters listed below for both no load and loaded conditions.

- Under no load condition (with a 1000Ω coaxial attenuator)
- Under matched load conditions (with a 50Ω coaxial attenuator)

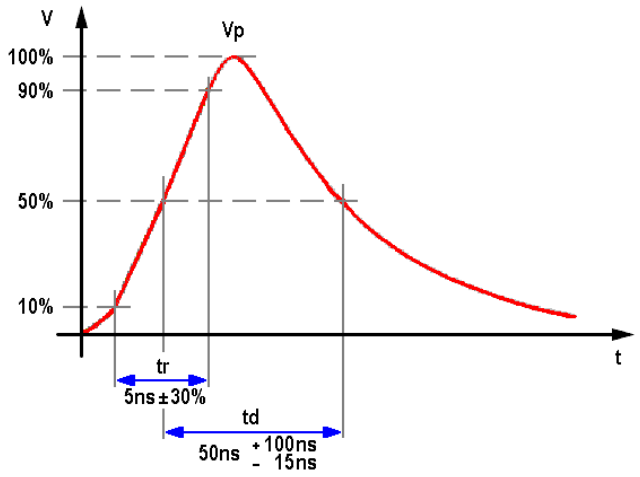
The line power for this verification procedure is not connected

* Only EFT 500N8

6.4.7. Specification of the pulse parameters



Waveform definition into 50Ω



Waveform definition into 1000Ω

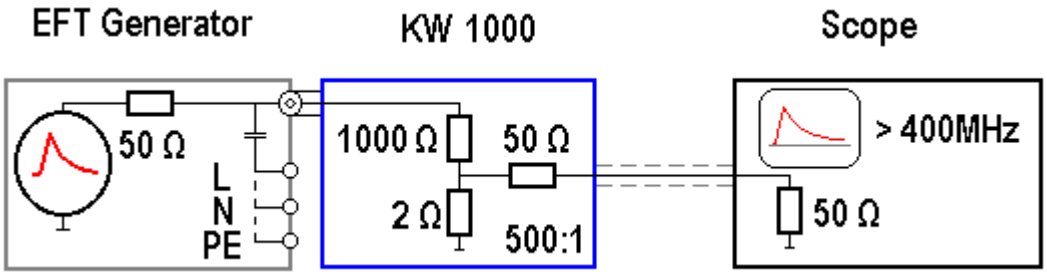
	Vp Peak voltage			t_r	10% - 90%		t_d	50% - 50%	
50Ω	Vp	±10%	see Table 2	5ns	±30%	(± 1.5ns)	50ns	±30%	(± 15ns)
1000Ω	Vp	±20%	see Table 2	5ns	±30%	(± 1.5ns)	50ns	- 15 + 100ns	

IEC 61000-4-4 Table 2 : Output voltage peak values and repetition rates

	Set voltage Vs [kV]	**Vp (open circuit)** [kV]	**Vp (1000 Ω)** [kV]	**Vp (50 Ω)** [kV]	**Repetition frequency** [kHz]
N5	0,25	0,25	0,24	0,125	5 or 100
N5	0,5	0,5	0,48	0,25	5 or 100
N5 / N8	1	1	0,95	0,5	5 or 100
N5 / N8	2	2	1,9	1	5 or 100
N5 / N8	4	4	3,8	2	5 or 100
N8	6.5	6.5	6.175	3.25	5 or 100

6.4.8. Verification on coaxial output

Verification Setup with 1000Ω load



Procedure of verification

- Switch on the EFT 500Nx
- Disconnect the line power from the EUT supply input at the rear of the EFT 500Nx
- Set the input impedance of the oscilloscope to **50 Ω**
- Select **Quick Start** mode and set the following parameters under **Change** for further operation.

Parameter values for setting		description
V	= 250 / 500 / 1000 / 2000 / 4000 / 6500V*	(test voltage settings)
f	= 5kHz	(frequency)
td	= 15ms	(burst duration)
tr	= 300ms	(repetition rate, time between 2 bursts)
cpl	= /	(to measure at the coaxial output port)
+/-	= pos and neg	(polarity selection)
T	= Endl.	(test duration)

- Perform the verification by the following steps

1. 1000Ω loaded condition (KW1000)

For verification connect the oscilloscope via the 1000:1 high impedance attenuator **KW1000** to the coaxial output of the EFT 500Nx and measure as specified. Set the oscilloscope to the **50 Ω input impedance** mode.

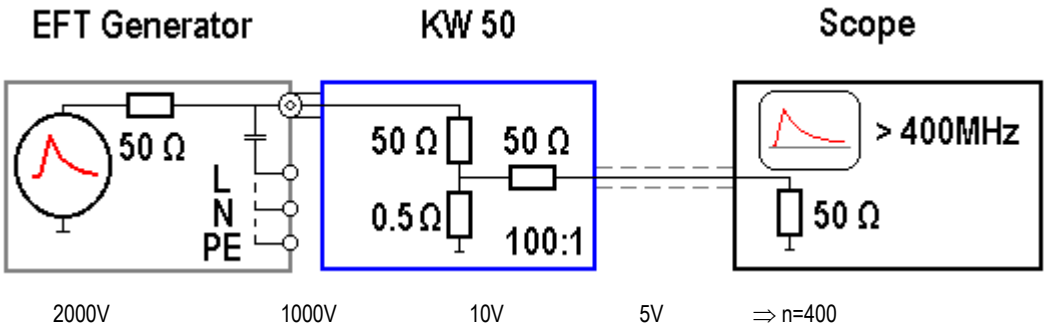
2. Measure the rise time tr, pulse width td and the peak voltage.

setting	required Vs on KW1000	tolerances
250V	± 0.24 kV ±20%	± 192V to 288V
500V	± 0.48 kV ±20%	± 384V to 576V
1000V	± 0.96 kV ±20%	± 768V to 1152V
2000V	± 1.9 kV ±20%	± 1520V to 2280V
4000V	± 3.8 kV ±20%	± 3040V to 4560V
*6500V	± 6.175 kV ±20%	± 4940V to 7410V

t_r	10% - 90%	5ns	±30%	3.5ns to 6.5 ns
t_d	50% - 50%	50ns	-15 + 100ns	35ns to 150 ns

* Only EFT 500N8

Verification Setup with 50Ω load



Procedure of verification

- Switch on the EFT 500Nx
- Disconnect the line power from the EUT supply input at the rear of the EFT 500Nx
- Set the input impedance of the oscilloscope to **50 Ω**
- Select **Quick Start** mode and set the following parameters under **Change** for further operation.

Parameter values for setting		**description**
V	= 250 / 500 / 1000 / 2000 / 4000 / 6500V*	(test voltage settings)
f	= 5kHz	(frequency)
td	= 15ms	(burst duration)
tr	= 300ms	(repetition rate, time between 2 bursts)
cpl	= /	(to measure at the coaxial output port)
+/-	= pos and neg	(polarity selection)
T	= Endl.	(test duration)

- Perform the verification by the following steps

1. Loaded condition.

Connect the 50Ω coaxial load attenuator KW50 to the coaxial output of the EFT 500Nx and measure as specified.

2. Measure the rise time tr, pulse width td and the peak voltage.

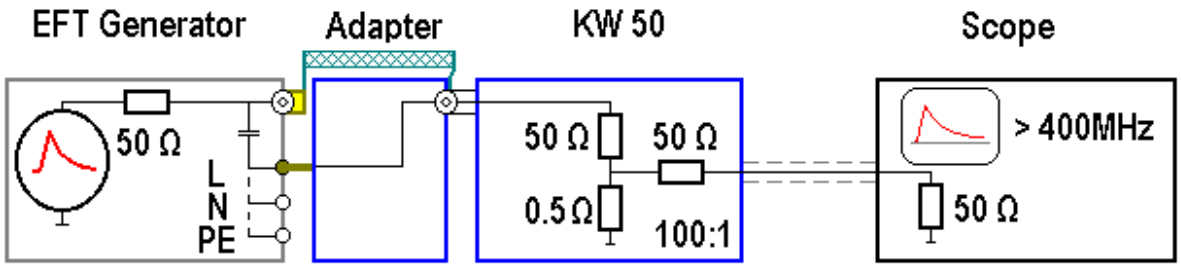
setting	**required Vs on KW 50**	**tolerances**
250V	± 0.125 kV ±10%	± 112.5V to 137.5V
500V	± 0.25 kV ±10%	± 225V to 275V
1000V	± 0.5 kV ±10%	± 450V to 550V
2000V	± 1.0 kV ±10%	± 900V to 1100V
4000V	± 2.0 kV ±10%	± 1800V to 2200V
*6500V	± 3.25 kV ±10%	± 2600V to 3900V

t_r	10% - 90%	5ns ±30%	3.5ns to 6.5 ns
t_d	50% - 50%	50ns ±30%	35ns to 65 ns

* Only EFT 500N8

6.4.9. Verification on EUT output

Verification Setup



Procedure of verification

- Switch on the EFT 500Nx
- Disconnect the line power from the EUT supply input at the rear of the EFT 500Nx
- Set the input impedance of the oscilloscope to **50 Ω**
- Select **Quick Start** mode and set the following parameters under **Change** for further operation.

Parameter values for setting		**description**
V	= 4000V	(test voltage settings)
f	= 5kHz	(frequency)
td	= 15ms	(burst duration)
tr	= 300ms	(repetition rate, time between 2 bursts)
cpl	= L+N+PE (all)	(to measure at the coaxial output port)
+/-	= pos and neg	(polarity selection)
T	= Endl.	(test duration)

- Perform the verification by the following steps

1. Loaded condition.

Connect the 50Ω coaxial load attenuator KW50 to the output L of the EFT 500Nx and measure as specified. Repeat the measurements with connection to the output N and PE.

2. Measure the rise time tr, pulse width td and the peak voltage.

setting	**required Vs on KW50**	**tolerances**
4000V	± 2.0 kV ±10%	± 1800V to 2200V

tr	10% - 90%	5ns	±30%	3.5ns to 6.5 ns
t_d	50% - 50%	50ns	±30%	35ns to 65 ns

7. Delivery Groups

7.1. Basic equipment EFT 500Nx

- EFT/burst generator type EFT 500Nx
- Mains cable
- Mains cable for the EUT supply
- Adapter for power cable
- Manual on USB memory stick
- Calibration certificate
- User manual

EFT500 N5

EFT 500N5.1 / N5.7 / N8.1

- **ESA 1 Adapter for adapt different power mains connectors**

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

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

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

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

No ESA 1 adapter included for EFT 500N5.1 and EFT 500N8.1

7.2. Accessories and options

- **CA EFT kit** Calibration adapter for burst verification on the EUT output + KW50 + KW1000
- **KW 50** matching resistor 50 Ω (1:100)
- **KW 1000** matching resistor 1000Ω (1:1000)

- **HFK** Capacitive coupling clamp as per IEC 61000-4-4 for coupling to signal- and datalines

- **CA HFK** Calibration kit for capacitive coupling clamp as per IEC 61000-4-4 Ed.3
  - Flexible plate insulated
  - Support for KW 50 and adapter to KW 50

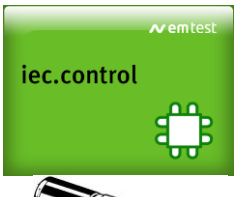
- **CNE 503** External coupling / decoupling network 3 - phase
  - EUT mains supply 400 V rms max. // 480V for USA
  - Nominal current In = 16 A / 32A / 63A / 100 A rms
  - Frequency 50/60 Hz
  - Coupling to all lines. Lx, N, PE
  - 50Ω Burst output
  - The coupling will be controlled by the EFT 500Nx

- **ITP** immunity test probe set

- **PUW 500** EUT Monitoring sensors
- **ADA-800** Adapter EFT 500N8 - SHV / Fischer

- **A6dB** Attenuator 6 dB / 50 Ω for additional test signal attenuation.

- **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



- **S-F 103-KOAX** Connector for HFK Junction cable
  Fischer Type S 103 A023

USB Interface

- **Optical Interface** (EFT 500N8, N8.1)
  for eliminate EMC interferences as earth loops, an optical link delivers a galvanic separation between generator and computer for remote control.
  - Fiber optic link and interface with USB A connector
  - Optical cable , length 3m

- **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

- **FER-USB**
  Ferrite for suppress burst pulses on the USB cable.
  Application: 8 turn for the best result. max. 10cm above ground.

8. Appendix

8.1. Declaration of CE-Conformity

Manufacturer :	**EM TEST (Switzerland) GmbH**
Address:	Sternenhofstr. 15 CH 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:	Burst generator series EFT 500Nx series
Model Number(s)	EFT 500N5 EFT 500N5.1 EFT 500N5.2 EFT 500N5.3 EFT 500N5.4 EFT 500N5.5 EFT 500N5.6 EFT 500N5.7 EFT 500N5.8 EFT 500N8 EFT 500N8.1 EFT 500N8.2

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.

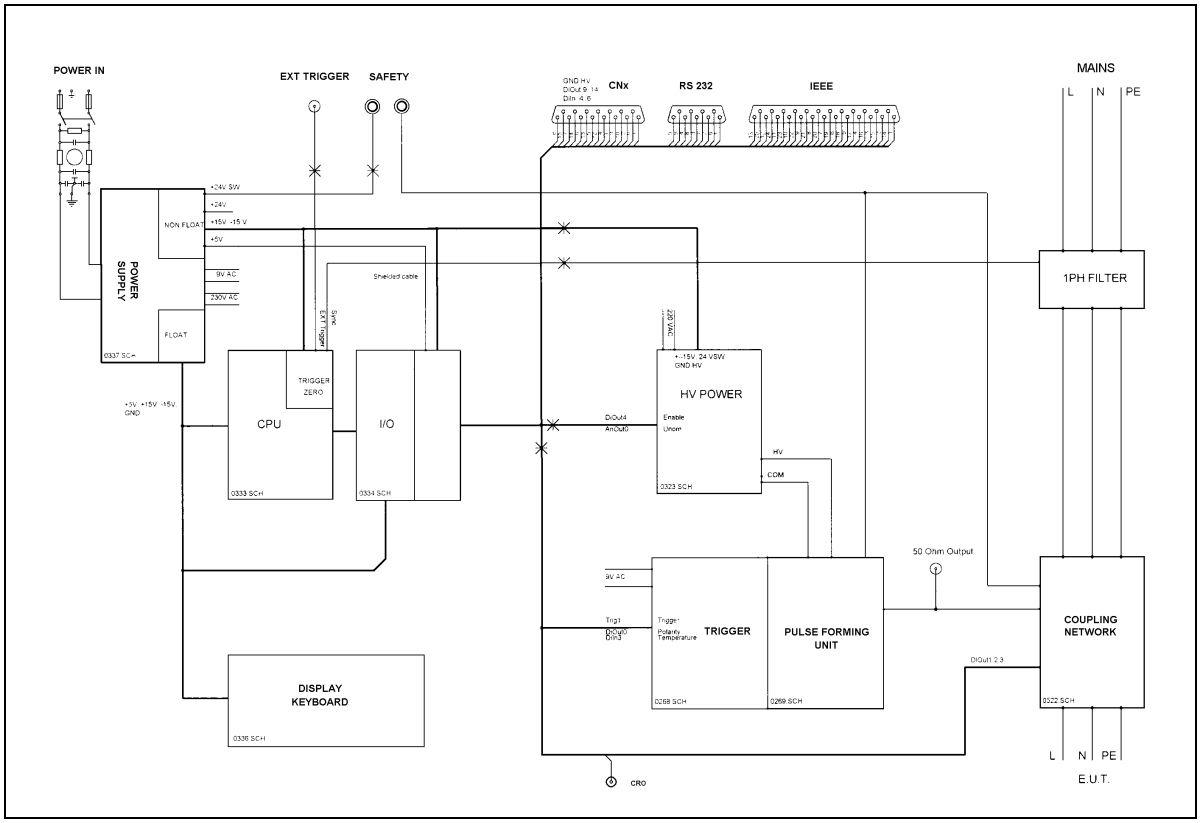
EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

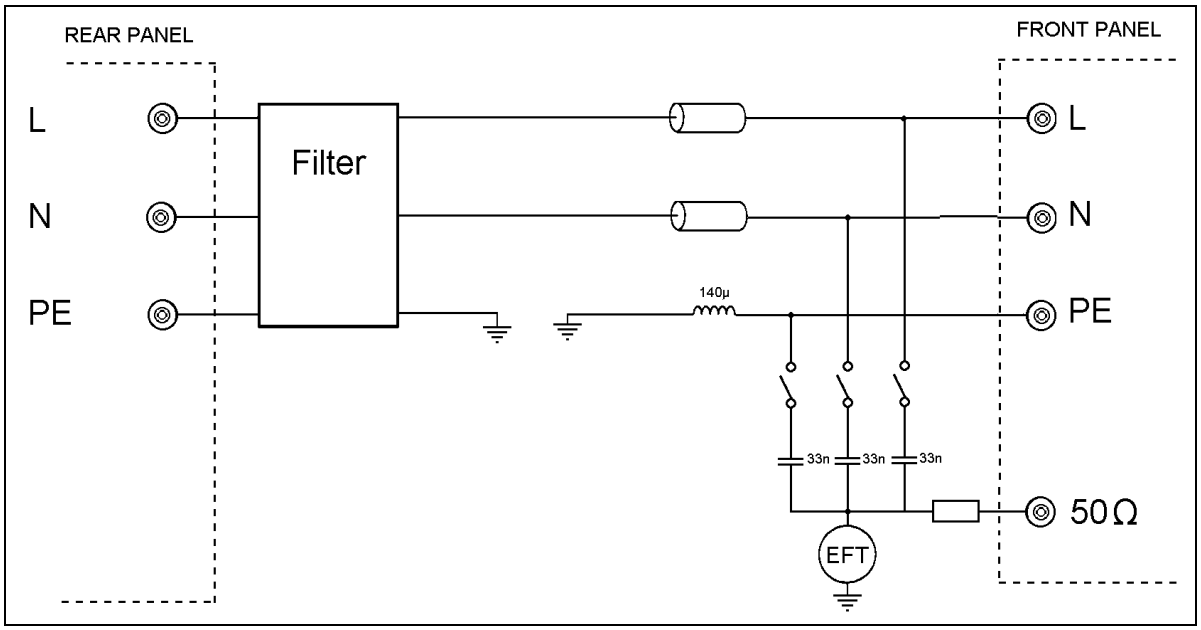
EN 61326-1 : 2012	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 : 2014	Limits for harmonic current emissions
EN 61000-3-3 : 2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

	European representative	Manufacturer
	AMETEK CTS Germany GmbH Lünenerstr. 211 D 59174 Kamen Tel: +49 (0) 2307 / 26070-0 Fax: +49 (0)2307 / 17050	EM TEST (Switzerland) GmbH Sternenhofstr. 15 CH 4153 Reinach Tel: +41 61-7179191 Fax: +41 61-7179199
By	N. Holub General manager	A. Burger Design and Research
Place	Kamen, Germany	Reinach BL , Switzerland
Date	25. February 2016	25. February 2016

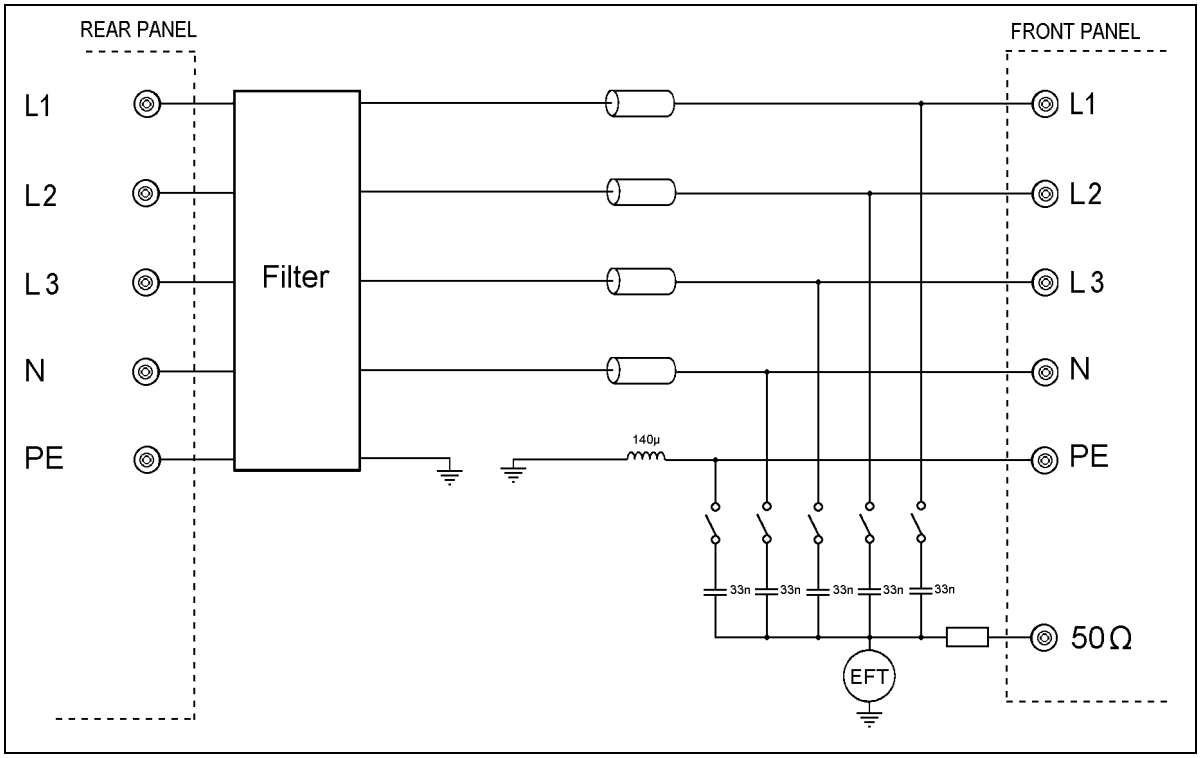
8.2. EFT 500Nx series - General Diagram



8.3. EFT 500Nx - Overview



8.4. EFT 500Nx - Overview 3-phase coupling



8.5. USB Interface

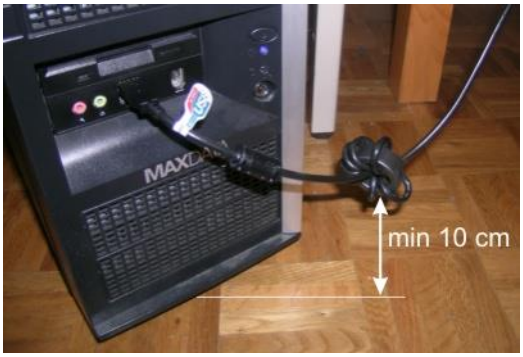
USB interface “USB B” connector. For data transfer a USB interface is available. The internal RS 232 interface is converted to USB standard. Therefore the user must set the same Baud rate in the device and control software.
Using the USB interface the user can have emc problems during burst tests Our 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.

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

EM Test deliver the ferrite under the name FER-USB as an option



8.6. EFT 500Nx Menu overview

Page 0

EM TEST

EFT 500N5

Burst 5 / 50ns
V4.00 SWN: 000115

Page 1

Main menu
F1 Quick Start
F2 User test routines
F3 Standard test routines
F7 Service

Page 2

Quick Start
F1 Start
F2 Change
F3 Continue
F7 Print

User test routines
F1 : Customized test routines
F2 : Voltage change after T by ΔV
F3 : Frequency change after T by Δf
F4 : Frequency sweep in one single burst
F1 : Change duration after T by Δtd
F2 : Change polarity after T
F3 : Statistical burst release
F4 : Synchronized at fixed angle

Standard test routines
F1 : Level 1 250 V / 5 / 100 kHz
F2 : Level 2 500 V / 5 / 100 kHz
F3 : Level 3 1000 V / 5 / 100 kHz
F4 : Level 4 2000 V / 5 / 100 kHz
F5 : Level 5 4000 V / 5 / 100 kHz
F6 : Level X - Level Y

Service
F1 Addresses
F2 Selftest
F3 Set-up
F4 Change standard test levels
F5 Print all settings

Page 3

Start
Starting the test procedure
Change
Selection the parameters
Continue
Print (Set-up)

Select store
Each user test routine includes 7 stores in which specific test routines can be saved and selected.

Test level 1..5 / x..y
F1 Start
F2 Change
F3 Continue
F7 Print

Addresses
All addresses of
EM TEST AG and GmbH and
URL address

Self-test

Set-up
F1 Change language
F2 LCD backlighting
F3 Interfaces
F4 Keyboard beeper
F5 Timer
F6 Safety circuit

Change standard levels
F1..F5 Change the levels
F6..F7 Change to standards

Print all
F7 Print

Page 4

User test routines F1-F7
F1 Start
F2 Change
F3 Continue
F5 Save
F7 Print

Test level 1 .. 4
Start
Start of the test routine
Change
Select new parameters
Continue
Print /Set-up

Change language
German/English
LCD backlighting
On/Off or Auto
Interfaces
Select parameters
Keyboard beeper (On/Off)
Running time display
Safety circuit (On/Off)

Change
U, f, t4, t5, pol can be changed
Set to standard (Yes/No))

Print
Print all stores

Page 5

Start (test procedure)
Change
Select the parameters
Continue
Save
Store the parameters
Print (Set-up)