Manual
for operation

Continuous Wave Simulator
Type CWS 500

CWS 500N1.3 10 kHz to 400 MHz
CWS 500N1.4 100 kHz to 300 MHz

IEC 61000-4-6 / EN 61000-4-6

- IEC 61000-4-6
- EN 61000-4-6

The CWS 500N1.3 and CWS 500N1.4 are compact single box test equipment for testing conducted RF immunity per IEC 61000-4-6 Ed.3 and Ed.4 and related standards. with a frequency range between 10 kHz to 400 MHz. Apart from the 1 kHz 80 % AM signal, the generator also generates a 2 Hz 80 % AM signal to test medical appliances and a 1 Hz PM signal with 50 % duty cycle required to test safety equipment like fire alarms.

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1. Model Overview

This Manual describes the continuous frequency generator models:

- CWS 500N1.3 Generator with frequency range from10 kHz to 400 MHZ and
- CWS 500N1.4 Generator with frequency range from100 kHz to 300 MHZ

2. Safety

2.1. Safety Aspects

Tests performed with RF-disturbances, induced by radio-frequency fields, are immunity tests on electronic equipment. Therefore, it is the responsibility of the user to avoid critical failures and risks to the environment and the operators.

Long power supply lines to the EUT may radiate energy. It is the responsibility of the user to determine whether it is allows conducting immunity tests in a given location. The CWS 500N1.x are RF generators and therefore connected cables can radiate and have interferences into the environment. It is in the responsibility of the user that sensible areas will not disturbing by the RF tests.

The RF voltages on the center pin of the RF output connector can be hazardous. The RF output connector has to connect to a load before applying AC power to the CWS 500N1.x. Do not touch the center pin of the RF output connector or accessories, connected to it. Switch the equipment to the “Test OFF” position before disconnecting or connecting the load to the RF output connector.

During this RF test, the interference power can be 80W or more. Therefore, the test should perform in a shielded room to prevent interference with other equipment in the vicinity. Also, see the information included in the declaration of conformity for the CE mark.

For the test setup, national and international safety regulations must observed.

Individuals with pacemakers must not allow participating in the testing procedure.

WARNING

Before using the CWS 500 N1.3 / N1.4 read the following manuals carefully :

- Safety requirements manual
- Manual for operation CWS 500N1.x generator

2.2. Safety when testing conductive immunity as per IEC 61000-4-6

For a test setup as per IEC 61000-4-6, the following safety aspects have to consider strictly:

WARNING

For this test setup, no ground fault relays can be installing at the working area.

Reason:

The **C**oupling **D**ecoupling **N**etworks have built in filter capacitors to PE. The ground current to PE therefore is much higher and the fault current relays will be continuously switching off the power supply source.

The same problem is in a setup for measuring conductivity. In this case the specified LISN is causing the above described ground fault current.

Special Information for operating the CWS 500N1.x:

1. The intake and outlet for the cooling system must not cover. Free air circulation is required for proper function of the CWS 500N1.x. Blockage of the cooling air system may result in damage to the RF amplifier or intermittent shut down of the equipment.

2. All panels have to install. They are important components of the cooling system. Never perform tests with a partially or completely open generator.

3. Before a test or a calibration may performed, the generator must be operating for warm up
   - CWS 500N1.3 for at least 15 minutes and
   - CWS 500N1.4 for at least 30 minutes.
   After this time the CWS 500N1.x output is stable

4. High voltage components are only be exposing when remove the three cover panels (unscrewed). To service the inside the generator, the power supply must turned off and the power cord must remove before opening the equipment.

5. Some CDN's are design for higher and hazardous voltages. It is necessary to remove the power cord from the input connection of the CDN's before opening the housing.

6. Only trained and qualified service technicians are allow to perform service and repair the instruments. Please contact an EM TEST service center or your local sales partner for repairing or servicing the units.

3. Unpacking and first installation

3.1. Unpacking

EM TEST tests the instrument before shipment and pack carefully on a transport palette. Each box is marked with a detailed list of the contents.

Before activating the equipment, check if a damage occurs during shipment. Check each container as well as the generator itself. In case of physical damage, contact an EM TEST representative before operating the unit.

In case of a transportation damage do not throw away any package material and contact immediately the responsible forwarder and as well your local EM TEST representative.

Fig 3.1 : example for shipping box

Checks after unpacking

1 Connection bridge
2 Bridge SG OUT – AMP IN
3 Safety Circuit
4 Voltage selector
5 Main Switch
6 Interface

Fig 3.2 : CWS 500N1.3 and CWS 500N1.4 rear side

Fig 3.3

1 Connection bridge

Connect the delivered N-connector bridge to the plug **COUPLER IN – AMP OUT**

2 Bridge SG OUT – AMP IN

Check the RF bridge (SMA connectors) if the connection is not damaged

3 Safety Circuit

Check the short circuit bridge for the safety circuit.
If required implement your own safety circuit.
(shielded cable required)

Fig 3.4

4 Voltage selector

Set the voltage selector to the correct voltage range.
Switch off the device before change the selector.

5 Main Switch

Switch on the device. After few seconds the display will indicate the CWS 500N1.x model

6 Interface

Connect the USB or GPIB interface cable to the CWS 500N1.x for remote control. For software refer to the sicd.control manual

3.2. Part Identifications and Functions

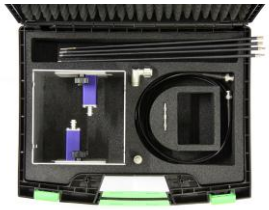
	**Continuous Wave Simulator** CWS 500N1.3 or CWS 500N1.4 Fig 3.5
	**Attenuator ATT6/80** 6 dB / 80W N/BNC connector Fig 3.6
	**Attenuator 20 dB** / 1W Fig 3.7
	**Coupling / Decoupling Network** Types: (not complete list) CDN-M 1; M 2; M 3; M4; M 5; CDN-S1-50/75Ω; S 2; S 4; S 9; S 15; S 25; S68 CDN-T 2; T 4; T 2-RJ11; T8-RJ45; CDN-AF 2; AF 3; AF 4; AF 8 Fig 3.8
	**EM Clamp** Type EM 101 Fig 3.9
	**Bulk Current Injection Clamp BCI type** F-120-9A FCC-BCICF-4 Calibration Fixture for BCI clamp (jig) Fig 3.10
	**Current Monitor Probe** Type F-33-2 1kHz – 250MHz Fig 3.11

Calibration

CWS-Cal Basic Calibration Kit
Transport Case
1x R100N 150Ω to 50Ω Adapter
1x BNC cable 0.5m

Cal adapter according to CDN ,

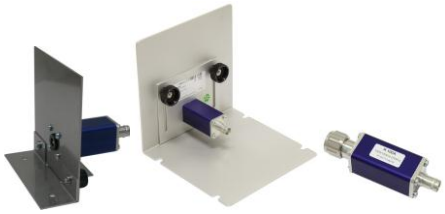
Fig 3.12



Calibration

CA EM Ed.4 Basic Calibration Kit
1 x Transport Case
2 x R100N1 150Ω to 50Ω Adapter
1 x BNC cable 0.5m, 1 x T-50, 1 x N L-adaptor plug/jack
4 x metal rod
1 x connector male-male metal rod
4 x plastic spacers (only for impedance measurement)

Fig 3.13



150Ω to 50ΩAdapter for calibration

R100N 150Ω to 50Ω Adapter 100 mm x 100 mm
R100N1 150Ω to 50Ω Adapter 150 mm x 150 mm
R100A 150Ω to 50Ω Adapter for Current Clamp CAL Fixture

Fig 3.14

T-50 Termination resistor

50 Ω termination resistor

Fig 3.15

Bridge AMP OUT – COUPLER IN

N - connector bridge (part of the CWS 500N1.x delivery)

Fig 3.16

Bridge AMP IN – SG OUT

SMA - connector bridge (part of the CWS 500N1.x delivery)
Max. torque 100 Ncm

Fig 3.17

Bridge Safety Circuit

Short circuit bridge for safety circuit

Fig 3.18

4. Operating Functions

4.1. Front View

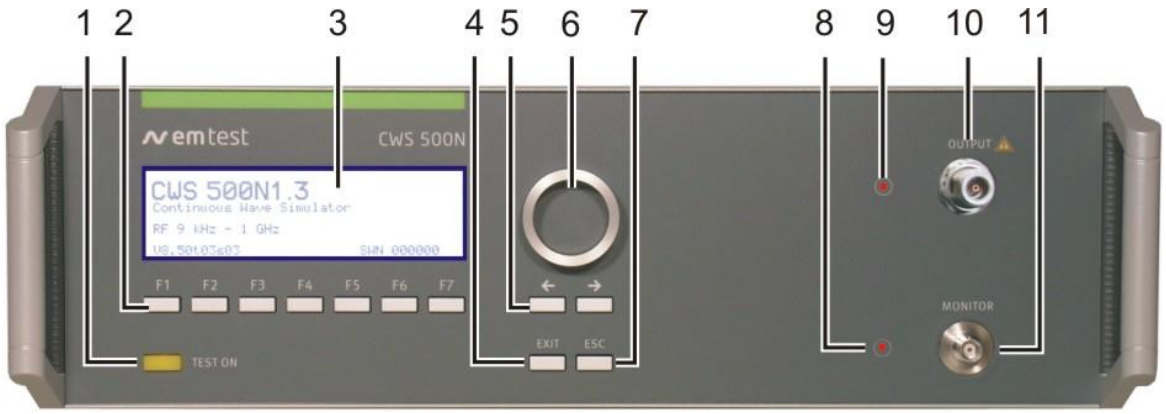


Fig 4.1

1	"Test On"	**5**	Cursor keys "←" and "→"	**9**	LED RF Output
2	Function keys "F1..F7"	**6**	Knob (Inc / Dec)	**10**	RF Output
3	Display	**7**	Escape	**11**	Current Probe Input (Monitor)
4	Exit	**8**	LED Monitor input	**12**	LED Current Probe Input

1 Test On
By pressing the key "TEST ON", the test procedure can be started with the pre-selected parameters and amplifier is turned ON.

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

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

4 EXIT
The EXIT button resets the firmware to the main menu. This is only possible, if no test routine is running.

5 Cursor Key
Parameters and functions can be changed during the test. The selection of these parameters is done with the cursor, moving it to the left or to the right. The increment value of the selected parameters in the lowest line can also be selected with the cursor key.

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

7 ESC
The ESC button returns back to the previous level in the menu.

8 LED Current Probe Input
When current monitoring is active this LED on the front panel is illuminated.

9 LED RF Output
When the RF output is active this LED on the front panel is illuminated to indicate that a test signal is applied to the test object.

10 RF-Output
At this output the RF power is available. The 6dB-attenuator is connected via coaxial cable. For conducting tests together with CDN’s, EM clamps or current injection clamps, the generator must always be loaded with a 6dB-attenuator as per IEC 61000-4-6 (see chapter Test Setup).

11 Current Probe Input
For tests with a coupling clamp where the EUT current has to be monitored, the current probe can be connected to this input.

ATTENTION: Do not connect the RF output directly to this input otherwise the CWS500 might damage.

4.2. Rear View

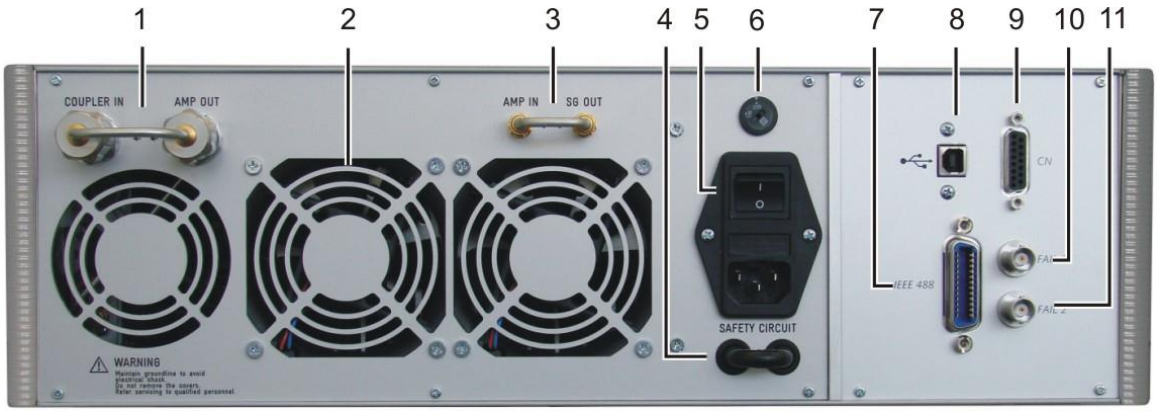


Figure 4.2: Rear side CWS 500N1.3

1 Bridge AMP OUT – Coupler IN
2 Air output
3 Bridge SG OUT – AMP IN
4 Safety Circuit
5 Power On Switch and fuse
6 Power selector 115V – 230V
7 IEEE Interface
8 USB Serial Interface
9 Remote Control Connector
10 Fail 1 Detection "Stop"
11 Fail 2 Detection "Pause"

1 Amp OUT / Coupler IN

Bridge for connect the amplifier output to the dual directional coupler.

2 Air output

Air output of the heated air of the CWS 500N1.x generator. For sufficient cooling time, take care that at least a 20 cm free space is behind the Air output.

3 Amp In / SG Out

The internal signal generator can control an external amplifier. Disconnect the short circuit link for this operation. Plug the external amplifier to the connector "**SG OUT"**.

6 115/230V Power selector

Input power selector for input voltage 115V – 230V. Switch the unit off when change the voltage in another position.

5 Power On Switch

The switch and the main fuses are part of this box. (230V / 3.15AT or 115V / 6.3AT)

4 Safety Circuit

Only when the Safety Circuit is closed, the test can started. Opening the Safety Circuit during a test will interrupt the RF amplifier power and stop the test.

8 USB Interface

USB interface "USB B" connector for remote control the CWS 500N1.x generator. The internal RS 232 interface is converting 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 tests our experiences says, that usually the computer USB port is disturbed by interference's. Therefore, use a high quality USB cable (USB 2.0 standard).

7 IEEE 488 Parallel Interface

IEEE 488 interface with IEEE connector.

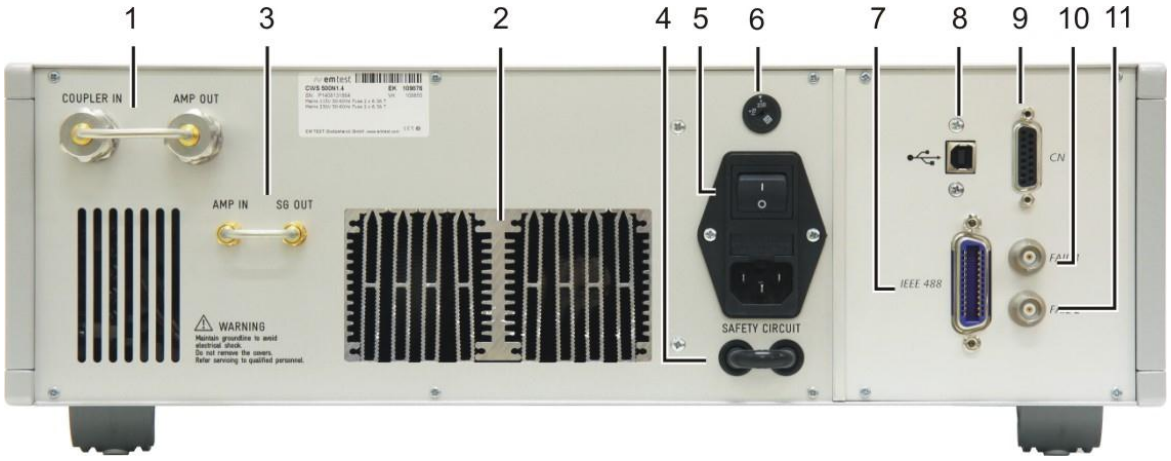


Figure 4.3: Rear side CWS 500N1.4

1 Bridge AMP OUT – Coupler IN
2 Air output
3 Bridge SG OUT – AMP IN
4 Safety Circuit
5 Power On Switch and fuse
6 Power selector 115V – 230V
7 IEEE Interface
8 USB Serial Interface
9 Remote Control Connector
10 Fail 1 Detection "Stop"
11 Fail 2 Detection "Pause"

9 CN Remote Control Connector

Not used.

10 FAIL 1 Fail Detection (TEST STOP)

The BNC input FAIL 1 is for failure detection on the EUT. If the input is set to ground (chassis), the CWS 500N1.x generator stops the actual test routine and terminates the test. It is not possible to continue the test routine.
A complete restart of the routine will be necessary. The message "FAIL 1" indicated on the LCD-Display as well as in the icd.control software.

11 FAIL 2 Fail Detection

The BNC input FAIL 2 is for failure detection on the EUT. If the input is set to ground (chassis), a failure event detects, and the test continues normally. After 10 FAIL 2 events the program will stop and the message **„FAIL 2 : 10**" indicates on the LCD-Display as well as in the icd.control software.

Minimum event time for FAIL 1 and FAIL 2

The minimum time duration for a fail event must be >100 ms. After a fail event a pause of minimum 100 ms is required before the next Fail appears.

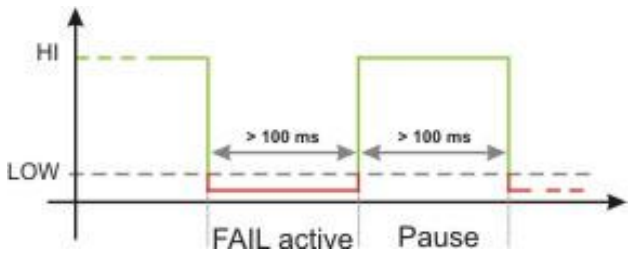


Fig 4.4

5. Manual Operation

5.1. Basic Operations

The simulator operates by an easy menu control system. Seven function keys are available to select parameters and functions. All functions are indicated on the display.

Fig 5.1

Fig 5.2

The selected parameter is blinking and can be changed by turning the knob (incr./ decrease.).

←→ : Select the digit to change with the cursor (←→).

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.

Start-up display

CWS 500N1.3 ← Generator Model
Continuous Wave Simulator
RF 9 kHz – 1 GHz ← Frequency Ranges
V 8.50 SWN: 001234

The version number and the software number SWN used for tracing purposes. The report and calibration certificates list these numbers. Even the software report generator lists these numbers.

Page 1 (Main Menu)

MAIN MENU

F1 : Test Routines
F2 : Calibration and Saturation Test
F3 : Freestyle mode 9kHz – 1 GHz

F7 : Service

F1 F2 F3 F4 F5 F6 F7

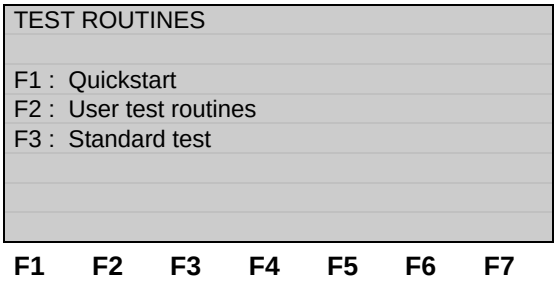
F1 Test Routines
The firmware includes the test routines for IEC 61000-4-6 standard.

F2 Calibration and Saturation Test
This menu includes calibration routines for the test. The amplifier saturation-check routine with 5.1dB higher level, than calibrated, completes the Ed. 4 requirement. The functions are the same as selecting Cal within a test routine.

F3 Freestyle Mode 9 kHz – 1 GHz
This menu operates the internal signal generator manually. For frequencies from 400 MHz up to 1 GHz (N1.3), or 9 kHz-100 kHz and 300 MHz – 1 GHz (N4.x), external amplifier is used.

F7 Service
Select and displays the setup.

Page 2 (Test Routines)



F1 Quickstart
Menu offers easy and fast operation, with individual parameter settings.

F2 User Test Routines
The user saves and recalls individual specific test routines. He can select standard routines or special functions such as automatic change of voltage or frequency during a test routine.

F3 Standard test
The user can call up the standard routines as per IEC 61000-4-6 level 1 - 3 and start them immediately.
The CWS 500N1.x delivers preprogrammed values of the actual standard IEC 61000-4-6 / EN 61000-4-6.

5.1.1. Parameter definition for the following menus

V	Voltage level Uo [V] The open- circuit test level (e.m.f.) of the unmodulated disturbing signal.
Mod	Modulation of the disturbing signal (OFF, 2Hz, 400Hz, 1000Hz, pulsed)
f	Output frequency of the disturbing signal [MHz]
td	Dwell time for the applied disturbing signal. 0.0s, 0.3s...9999.9s (pulsed 3s...9999.9s)
tr	Rest time where no disturbing signal is applied.
CAL	Calibration files of the applied CDN (F1...F5). The CWS 500N1.x is capable to store the calibration data in five internal memory files.
CP	Calibration file of the current probe. Download the file with the ICD software.

5.1.2. Modulation

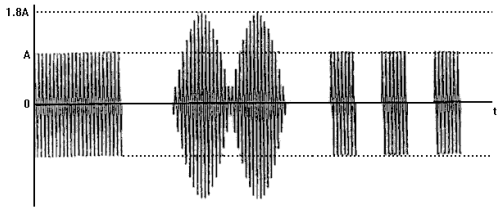


Fig 5.3 : Unmodulated 80% AM Pulse modulation

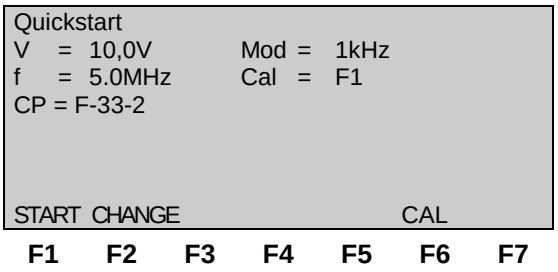
Figure 6.3 shows an example of different modulation settings of CWS 500N1.x.

The 80% modulation is selectable with a frequency of 2Hz, 400Hz, 1000Hz.

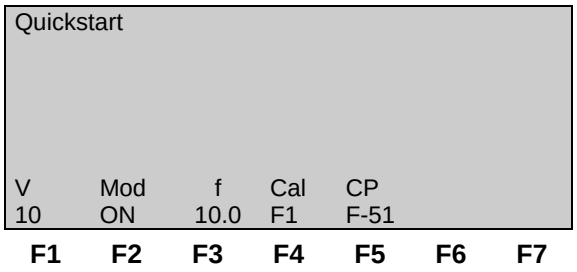
5.2. Quickstart

Easy and very fast operation of all standard functions of the equipment.

Page 3 (Show Parameters)

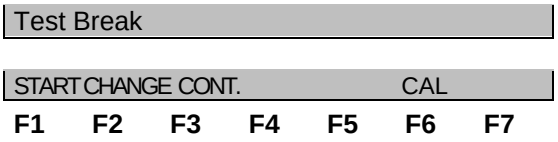


Page 4 (Change)



Press **START** to begin testing.
Press **CHANGE** and the change the actual parameters. Selecting a parameter to change will display the range.
Press **CAL** for calibrate the system.

The test begins by pressing **START**. The blinking parameter can be changed with the knob inc./dec.
Use the cursor keys (🡐🡒) to select other parameters. By pressing **STOP** the test will be stopped and on the last line of the display it will be indicated that the test has been stopped.



Pressing any of the function keys will display the functions **START**, **CHANGE**, **CONTINUE, SAVE *** or **CAL**. Selecting another function than CONTINUE will definitely stop the test routine. Pressing **START** restarts the test from the beginning.

While the test procedure is in progress the settings of CAL and CP cannot be changed.

***** CONT and SAVE are not available in the Menu Quick Start.

5.3. User Test Routines

The user can change, save and recall own specific test routines based on IEC 61000-4-6. All special functions and routines are stored in this part of the user menu.

Page 3 (Selection of the function)

```
USER TEST ROUTINES

F1 :  Voltage-Sweep
F2 :  Frequency-Sweep
F3 :  Dwell-Time-Sweep

F1   F2   F3   F4   F5   F6   F7
```

Page 4 (Select store)

```
VOLTAGE - SWEEP

F1 :  Store  F1
F2 :  Store  F2

F1   F2   F3   F4   F5   F6   F7
```

Each of these special functions can offer two test routines, which can be stored.
After selecting, one of the stored test files the test parameters shows in the display.
The user has to define the memory. The software will ask whether to overwrite the existing procedure or not.

5.3.1. Voltage Sweep

Change the test level from V1 to V2. After the dwell time td and the pause time tr changes the test level by ΔV until reaching the set value for V2.It is not necessary that V1 is smaller than V2.

After selecting one of the stored test files, the test parameters show on the display.

Page 5 (Show Parameters)

```
VOLTAGE - SWEEP                    Store F1
V1   =   1.0  V          V2   =  10.0V
ΔV   =   1.0  V          Mod  =  1kHz
f    =  10.0  MHz        td   =   2.0s
tr   =   1.0  s          Cal  =  F2
CP   =   F-51

START CHANGE                SAVE   CAL
F1   F2   F3   F4   F5   F6   F7
```

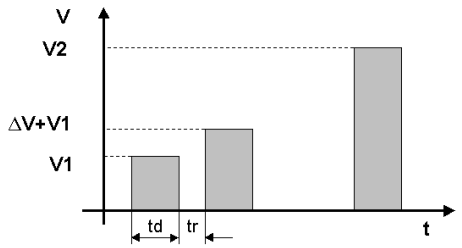


Fig 5.4

All functions and limitations are the same as those of Quick Start. The function SAVE will store the new parameters of a test file.

5.3.2. Frequency Sweep

Changes the test frequency from frequency f1 to f2. After the dwell time td and the pause time tr, changes the test frequency by Δf until reaching the set value for f2. The step size Δf is being either a fixed frequency value or a percentage of the preceding frequency value.

After selecting, one of the stored test files the display shows the test parameters.

Page 5 (Show Parameters)

```
FREQUENCY –SWEEP                   Store F1
V    =  10.0  V          Mod  =  1    kHz
f1   =   0.15 MHz        f2   =  80.0 MHz
Δf   =  10.0  %          td   =   2.0 s
tr   =   1.0  s          Cal  =   F2
CP   =   F-51

START CHANGE                SAVE   CAL
F1   F2   F3   F4   F5   F6   F7
```

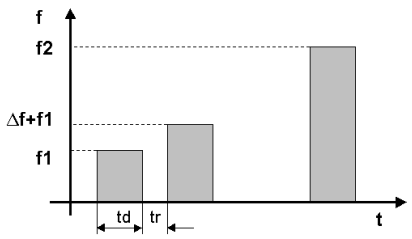


Fig 5.5

All functions and limitations are the same as those of Quick Start. The function SAVE will store the new parameter of a test file.

5.3.3. Dwell Time Sweep

The dwell time changes from td1 to td2. After the dwell time td and the pause time tr, the dwell time is changed by Δtd until the set value for td2 is reached.

Page 5 (Show Parameters)

DWELL TIME SWEEP						Store F1	
V	=	10.0	V	Mod	=	1	kHz
f1	=	0.15	MHz	td1	=	1.0	s
td2	=	5.0	s	Δtd	=	1.0	s
tr	=	1.0	s	Cal	=	F2	
CP = F-51							
START	CHANGE				SAVE	CAL	

F1 F2 F3 F4 F5 F6 F7

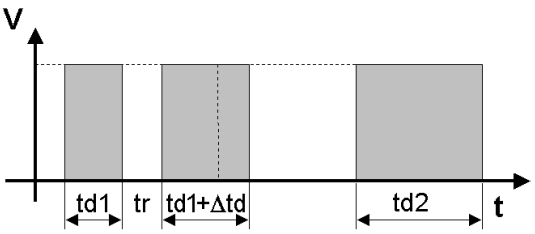


Fig 5.6

After selecting, one of the stored test files the display shows the test parameters.

All functions and limitations are the same as those of Quick Start. The function SAVE will store the new parameter of a test file.

5.4. Standard Test Routines according to IEC 61000-4-6

The display shows a list of different test levels. The CWS 500N1.x offers preprogrammed values of the actual standards IEC 61000-4-6 / EN 61000-4-6.

Page3 (Standard Test Levels)

STANDARD TEST
F1 : Level 1 1.0V
F2 : Level 2 3.0V
F3 : Level 3 10.0V
F4 : Level X - Level Y

F1 F2 F3 F4 F5 F6 F7

Page 4 (Show Parameters)

Standard test routine						Level 3		
V	=	10.0	V	Mod	=	1	kHz	
f1	=	0.150	MHz	f2	=	80.0	MHz	
Δf	=	1.0	%	td	=	1.0	s	
Cal = F2								
START	CHANGE					SAVE	CAL	

F1 F2 F3 F4 F5 F6 F7

With the function keys, selects the desired Level.

The functions START, CHANGE and CAL are the same as those of Quick Start. The function key CHANGE can only handle the dwell time, frequency step, calibration file and the current probe file (the frequency step size can be either a fixed frequency value or a percentage of the preceding frequency value). All other parameters are according to the standard.
If the standard changes in the future, the fixed parameters are adjustable under Service / Change Standard Parameters.

The function key F4 selects a procedure that starts at test Level X and stops at test Level Y (X ≤ Y).

With the help of the Level X – Level Y test routine, special requirements, e.g. those according to the Generic Standard IEC 61000-6-2, tests easily.
Simply change the frequency and the voltage under Service/Change Standard within the Main Menu for each Level. By starting the program Level X – Level Y with X=1 and Y=3 the Generic Standard IEC 61000-6-2 can be tested automatically.

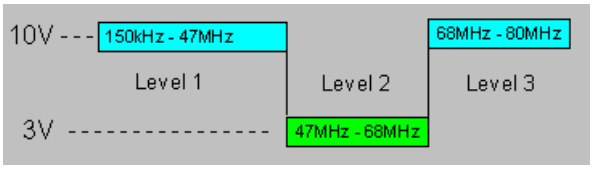
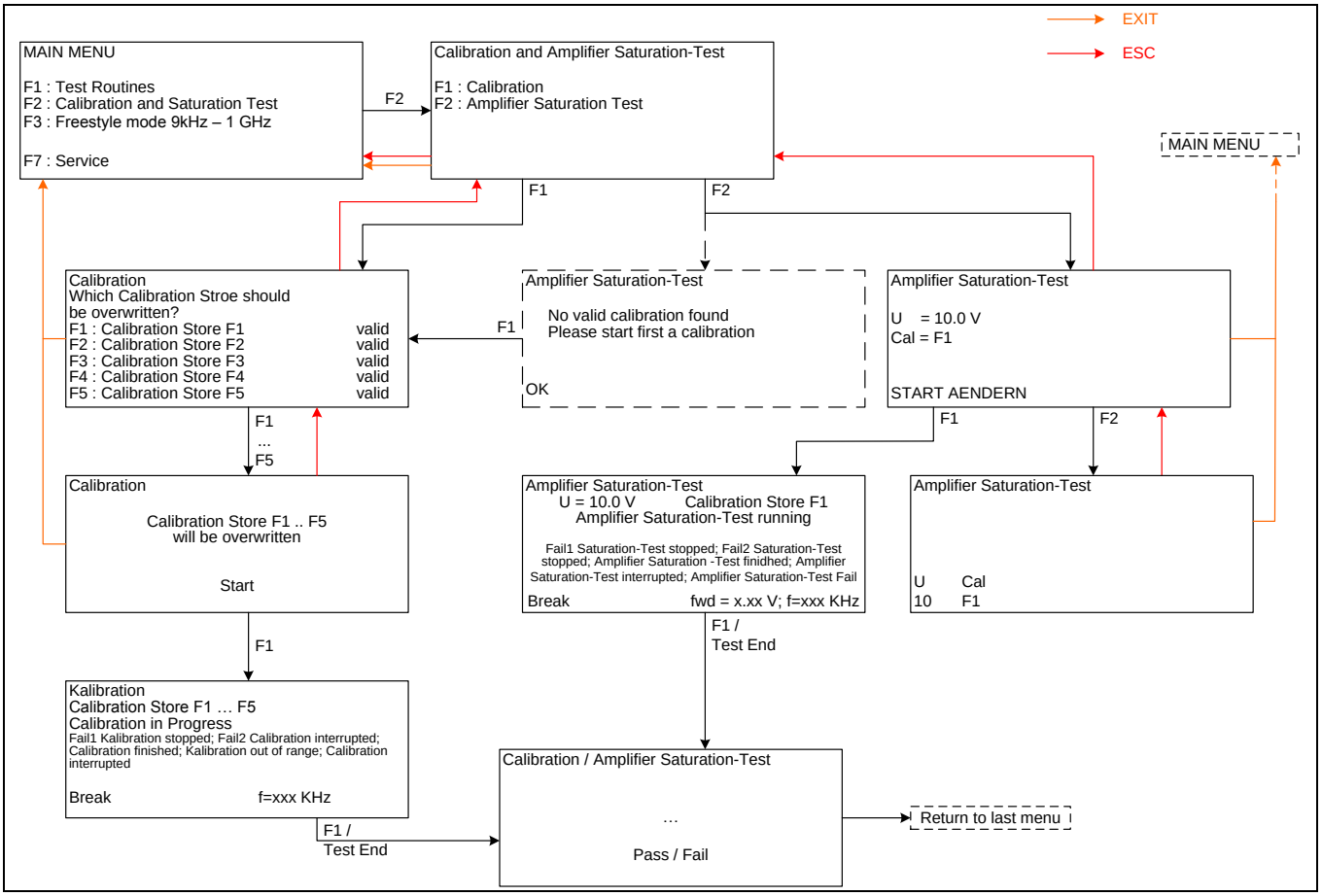


Fig 5.7: Test procedure according to IEC 61000-6-2

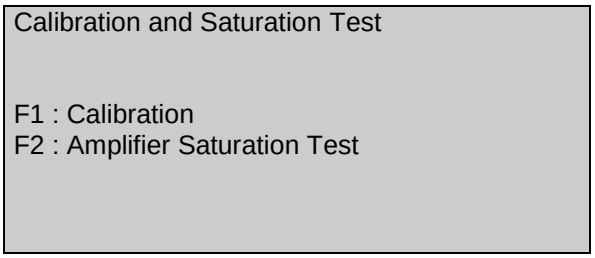
5.5. Calibration and Saturation test Menu

After selecting CAL in any of the internal programs of the CWS 500N1.x or selecting the “Calibration and Saturation Test” in the main menu, the display will show the calibration stores.

Structure of the calibration Menu

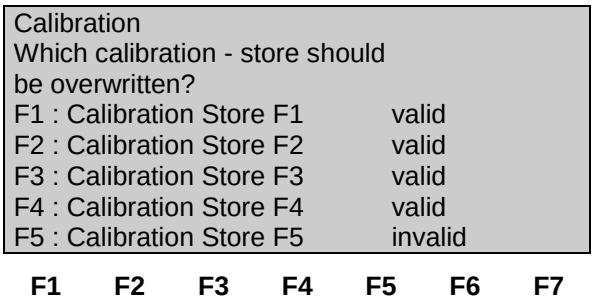


Main Menu Calibration and Saturation

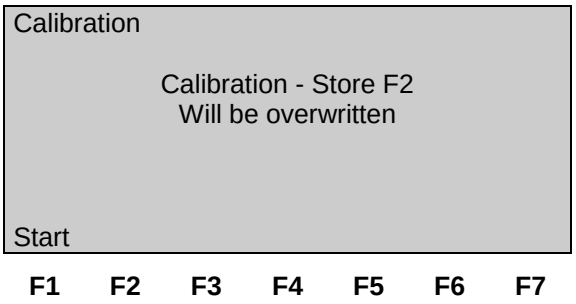


5.5.1. Calibration

Menu Calibration

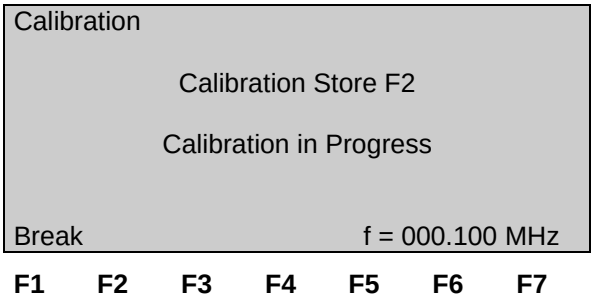


Calibration Procedure



After selecting one of the calibration stores the user may start the calibration. The firmware will ask whether to overwrite the existing calibration store or not.

A new CAL routine will overwrite the selected store F1 / F5. The operator has to confirm that he wants to overwrite the existing data.



During the calibration the display shows the actual calibration frequency

By pressing BREAK, the calibration will be stopped and the firmware will restore the calibration data from the previous calibration.

If the CWS 500N1.x is unable to complete the calibration procedure (out of range, calibration setup incorrect or incomplete, etc.) the firmware will restore the calibration data from the previous calibration.

Typical calibration data files are stored in the software icd.control

It is very important to check the calibration setup for correctness
- Cabling
- Ground reference is conductive
- CDN or clamp is correct connected

The CAL data of cal store can only be lost due to a discharged internal battery or by overwriting existing data. In case of battery discharge, the calibration stores are cleared and marked invalid.

Calibration Which calibration store should be overwritten?	
F1 : Calibration Store F1	invalid
F2 : Calibration Store F2	invalid
F3 : Calibration Store F3	invalid
F4 : Calibration Store F4	invalid
F5 : Calibration Store F5	invalid

F1 F2 F3 F4 F5 F6 F7

A nearly unlimited number of CAL data can be generated, managed and included in the actual operation of the CWS 500N1.x. If the operator is working with more than two CDN's or clamps, the internal stores F1 / F1 are not sufficient and ICD will have to be used which assures the security of data storage.

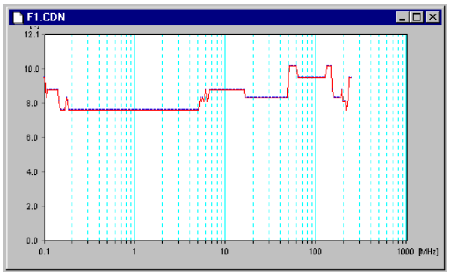


Fig 5.8: Calibration data CDN

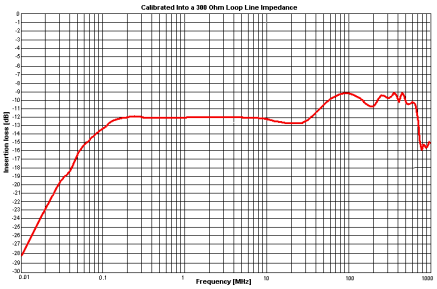
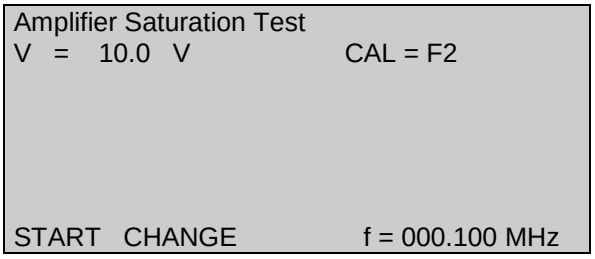


Fig 5.9: Transfer Characteristic EM Clamp

5.5.2. Saturation check

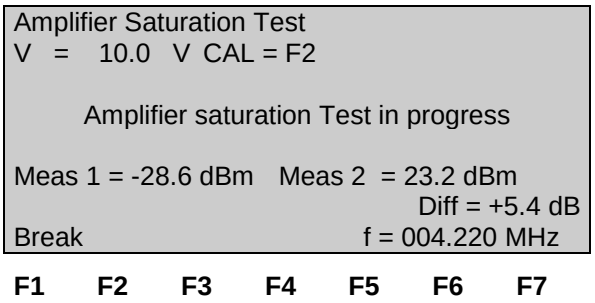
For the saturation check the generator increase to the calibrated signal with +5.1dB for check



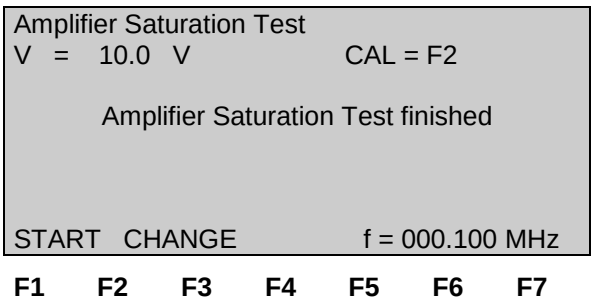
CHANGE:
- F1: Voltage level of the calibrated signal
- F4: Calibration storage file F1 to F5

START: Starts the saturation test with the selected level and calibration file.

Display during the saturation test



Display at the end of the saturation test



5.6. Service

All service functions are indicated in the display.

Page 2 (Overview service)

```
SERVICE
F1 :  Addresses

F3 :  Setup
F4 :  Change Standard Parameters
F5 :  Function check PM 1000

F7 : Amplifier state
```

F1 F2 F3 F4 F5 F6 F7

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

www.emtest.com

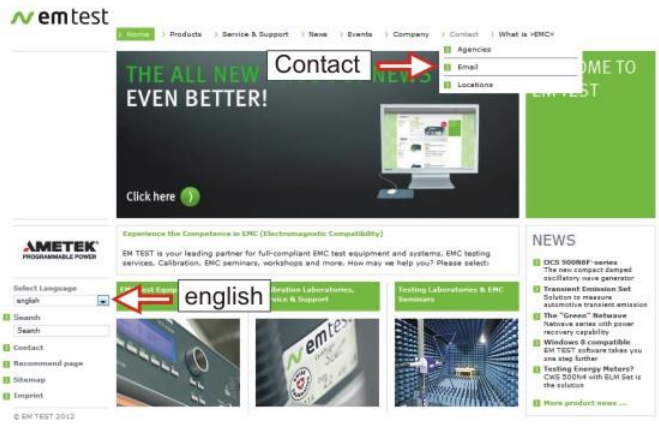


Figure 5.10

F3 Setup
The software will clearly explain the setup procedure.

F4 Change Standard Parameters
Future products or dedicated product standards may use different test levels or test parameters. This procedure allows the user to change the standard values according to his preferences.

F5 Function check PM 1000
PM 1000 function-check routine. With this function the user checks the correct function of the MONITOR input and the FWD- and REV power inputs if connected. If the bi-directional coupler is not connect these results are marked with fail.

F7 Amplifier state
This function indicates the amplifier temperature status measured at the internal amplifier module.

State:
State of TEST ON button, safety circuit, amplifier power and temperature (CWS 500N1.3)

Temperature: (CWS 500N1.3)
Operating temperature: typical 45°C to 56°C under labor conditions
Max temperature: 60°C (The CWS will switch off the amplifier)

CWS 500N1.3

```
AMPLIFIER STATE

TEST ON:       ON / OFF
Safety Circuit: OPEN / CLOSED
Amplifier:     ON / OFF
Temperature:   xx.x degC
```

F1 F2 F3 F4 F5 F6 F7

CWS 500N1.4

```
AMPLIFIER STATE

TEST ON:       ON / OFF
Safety Circuit: OPEN / CLOSED
Amplifier:     ON / OFF
```

F1 F2 F3 F4 F5 F6 F7

Error messages

Overtemperature CWS 500N1.3 only	The firmware observes the amplifier temperature. 60 ºC: Firmware switches off the amplifier. After approx. 5 minutes the amplifier will switch on. The CWS 500N1.3 indicates the actual temperature in the display. 63 ºC: The hardware will switch off the amplifier automatically. Over temperature should not appear normally. Please check if the cooling airflow is not free or a ventilator is not working. (contact EM TEST service center)
AMP Failure	An internal error occurs Switch OFF and ON the CWS 500N1.x
AMP OFF	Switch ON the TEST ON button

Temperature

Figure 5.11 illustrates the temperature behavior in case of power on. After approx. 15 minutes the amplifier arrives the operating temperature.

----- Temperature at power ON

-- -- Cooling after over temperature (60 ºC) will stop when the temperature is below 50 ºC

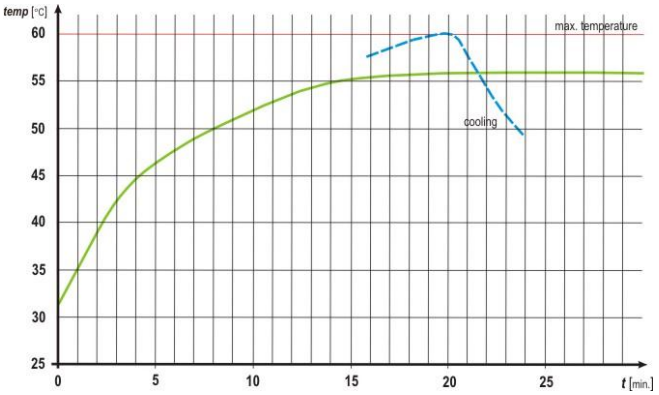


Figure 5.11: Temperature behavior after power on and cooling in case of over temperature

5.6.1. Setup

This menu helps the user to define the configuration of the CWS 500N1.x

Page 3 (Setup Overview)

```
Setup
F1 : Change language  / Sprache ändern
F2 : LCD Back Lighting
F3 : Interfaces
F4 : Keyboard Beeper
F5 : Power – on counter
```

F1 F2 F3 F4 F5 F6 F7

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

F2 LCD Back Lighting
With the use of F2 the back lighting can be switched ON or OFF. The Auto-Off Function to switch the back lighting off after a predetermined time following the last manual operation (1 - 30 minutes).
Due to the limited lifetime of the LCD back lighting (approx. 10,000 hours), this function should always be activated.

F3 Interfaces
With this menu the user can define the status of the integrated serial and parallel interfaces, e.g. the baud rate of the RS232- or the address of the IEEE-interface.

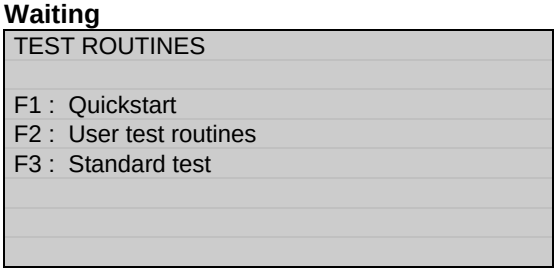
F4 Keyboard Beeper
F4 selects the beeper ON/OFF mode.

F5 Power-on counter
Pressing of F5 will show the total power-on time and testing time of the test equipment.

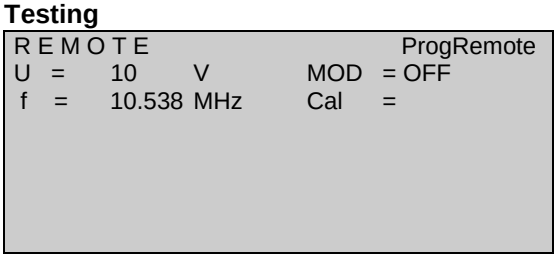
5.7. Remote display

During Remote operation the display shows different screens depend the actual software procedure

Waiting



Testing



6. Starting Operation

6.1. Generator Function Check

As with all testing equipment, the continuous wave simulator type CWS 500N1.x should be checked for performance and accuracy from time to time. The check should be conducted as listed below.

- Connect the RF-output of the CWS 500N1.x to the 6dB-attenuator with a coaxial cable.
- Switch on the power supply.
- Select the following test parameters within the QUICK START menu:

  voltage : 1V
  frequency : 23MHz
  modulation : OFF, 2Hz, 400Hz or 1kHz
- Connect the output of the 6dB-attenuator with the 50Ω input channel of the oscilloscope. Pay attention to the maximum input power capability and the bandwidth of the test input.
- Push "TEST ON" and start the test.

ATTENTION DO NOT connect the output of the ATT6 nor the output of the CWS 500N1.x to the monitor input, otherwise the monitor input will be destroyed.

Using an oscilloscope allows checking the operation of the generator very easy. Fig 6.1.

Take notice that this procedure is only a functional check of the generator. Differences in the test level may be caused by a limited bandwidth or mismatching within the testing system.

Exact and accurate measurements is guaranteed only with the specified test setup according to IEC 61000-4-6.

Fig 6.1 Setup for a function test

6.2. Function Check PM 1000

This function is for checking the PM 1000 measuring input MONITOR. With a measuring procedure, the CWS 500N1.x compares the two inputs with two different measurements. After the test the CWS verify the correct function of the two measuring. The accuracy of the measuring is checked in a larger range. During the test, the output voltage of the amplifier is low enough, that no damage can occur at the inputs.

The MONITOR, FWD and REV inputs are tested with the following signals:
- Measuring with a 50Ω terminal connection at the input.
- Measuring with the maximum attenuation (-63dB) to the RF output via a 6dB attenuator.
- Measuring with a reduced attenuation (-48dB) to the RF output via a 6dB attenuator.

Material for the function test:

- ATT 6/80 Attenuator 6dB Option to CWS 500 N1.x
- T50 terminating resistor 50Ω Option to CWS 500 N1.x
- BNC and N cables

The function check has the following procedure:

Step 1

Page 3 (Service)

Function check Powermeter	step 1/2
- Close Safety Circuit	
- Press TEST ON	
- Connect a 50 Ohm matching resistor To the monitor input	
Continue	break

F1 F2 F3 F4 F5 F6 F7

Steps for first measurement. The monitor input is terminated with the 50Ω terminating resistor.

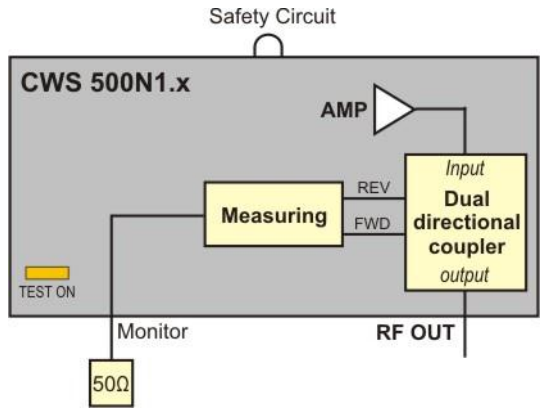


Fig 6.2 :Setup for Step 1

Step 2

Page 3 (Service)

Function check Powermeter	step 2/2
- Connect the MONITOR input to the RF OUT via a ATT 6 dB attenuator	
Continue	break

F1 F2 F3 F4 F5 F6 F7

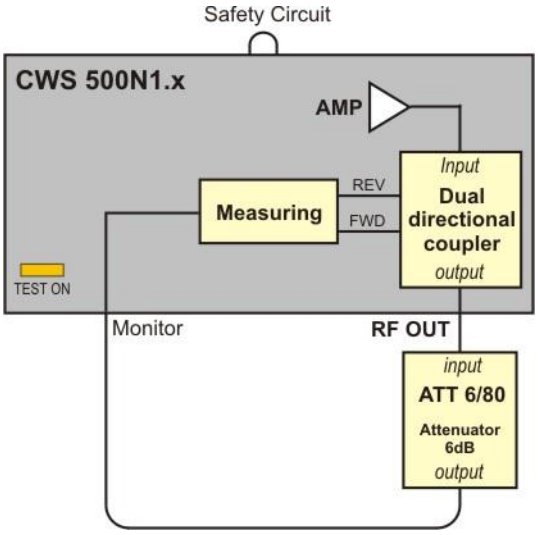


Fig 6.3 :Setup step 2 with connected 6 dB attenuator

Result after the test
Finally the result of the check appears in the display.

Page 3 (Service)

Function check Powermeter	result
MONITOR input test	
Pass	
FWD and REV inputs test	
Pass	
END	

F1 F2 F3 F4 F5 F6 F7

In case of a fail result
Check the T50 terminating resistor and 6dB attenuator and repeat the test.
contact your local EM TEST representative.

6.3. Calibration and Test setup Overview

A calibration starts at 100 kHz the first calibration and increases the next frequency 1% of the previous value. The calibration ends at approx. 240 MHz.

6.3.1. CDN

Calibration setup acc. IEC 61000-4-6 Ed. 3

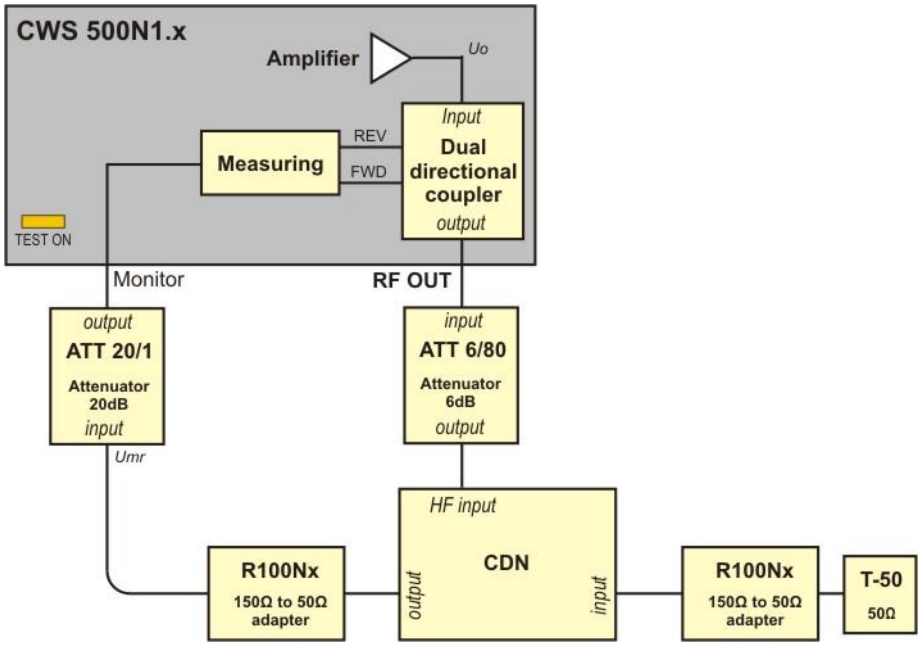


Fig 6.4 :

Tolerances for calibration: Umr = (Uo/6) +/- 25 % or Uo – 15,6 dB +/- 2 dB
Measuring for calibration: Umr (Monitor input voltage)
Recorded signal: Generator RF level

Test setup acc. IEC 61000-4-6 Ed 3

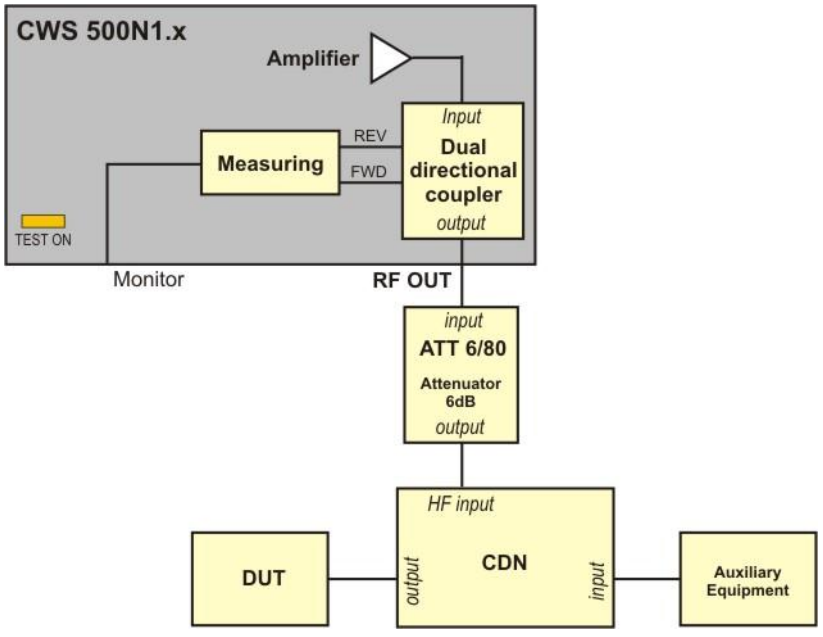


Fig 6.5 :

Calibration setup acc. IEC 61000-4-6 with amplifier level control as per Ed. 4

The standard IEC 61000-4-6 Ed.4 propose as alternative to use a dual directional coupler for control the forward power. The firmware controls the forward voltage during a test. With the icd.control software the user can select the method (Ed. 3 or Ed. 4) for the test.

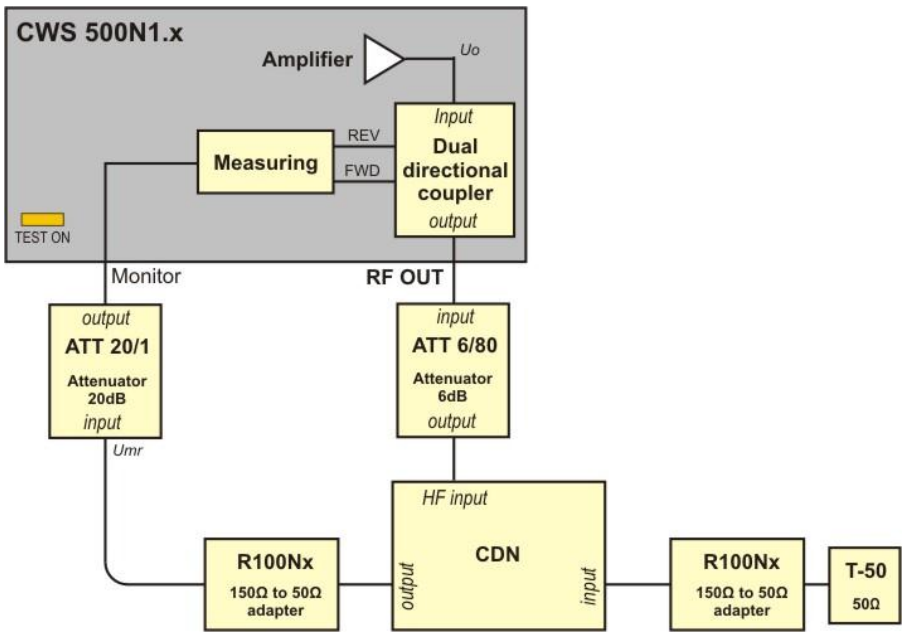


Fig 6.6 :

1. Calibration

Tolerances for calibration: Umr = (Uo/6) + 19% -16% or Uo – 15,6 dB ± 1.5 dB
Measuring for calibration: Umr (Monitor input voltage), Forward power
Recorded signal: Forward power

2. Saturation check

- Apply calibration value (forward power) and increase the signal with +5.1 dB
- Measure the signal level: Forward power
- Signal check: Signal difference +5.1 dB ± 2 dB
- Result: Pass or Fail

Test setup acc. IEC 61000-4-6 as per Ed. 4

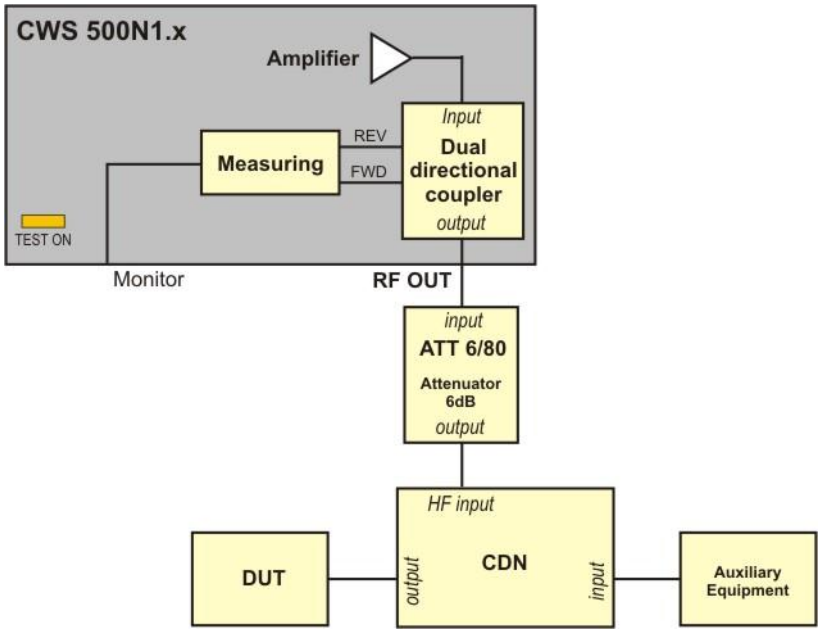


Fig 6.7 :

6.3.2. EM-Clamp / BCI Clamp

Calibration setup acc. IEC 61000-4-6

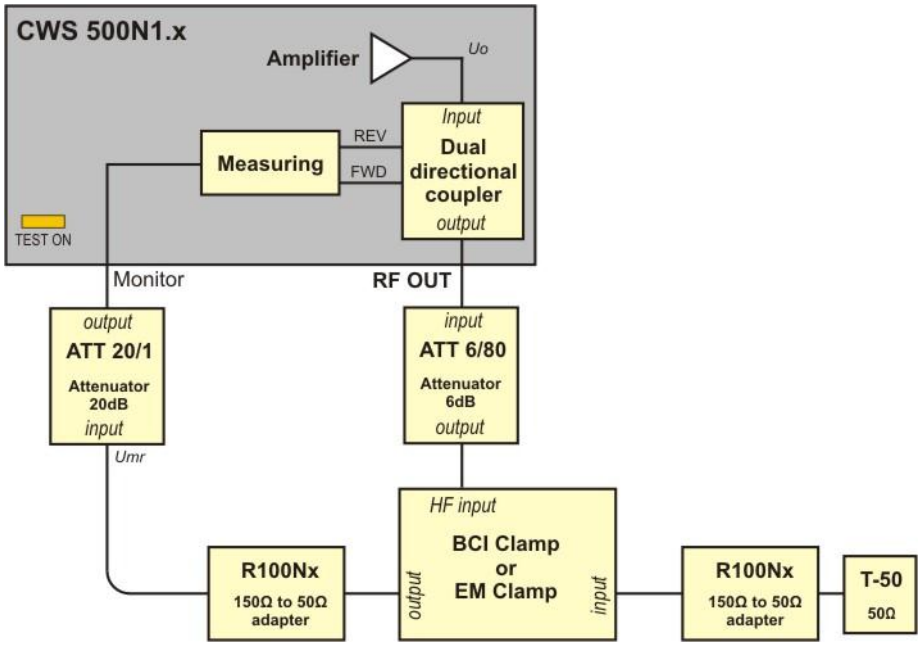


Fig 6.8 :

Test setup acc. IEC 61000-4-6

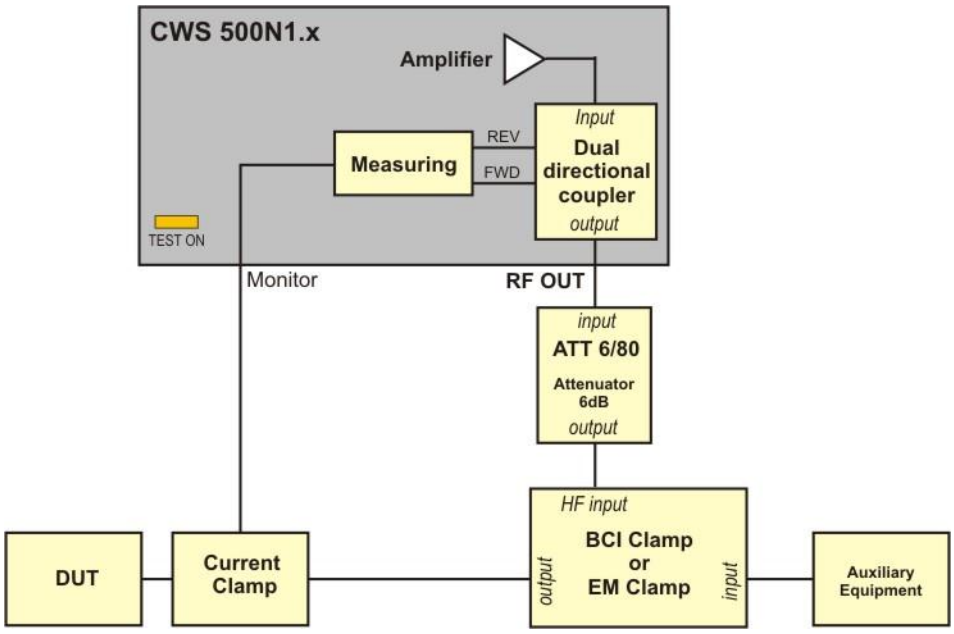


Fig 6.9 :

Calibration setup for EM Clamp / BCI acc. IEC 61000-4-6 with generator level control as per Ed. 4

The standard IEC 61000-4-6 Ed.4 propose as alternative to use a dual directional coupler for control the forward power.

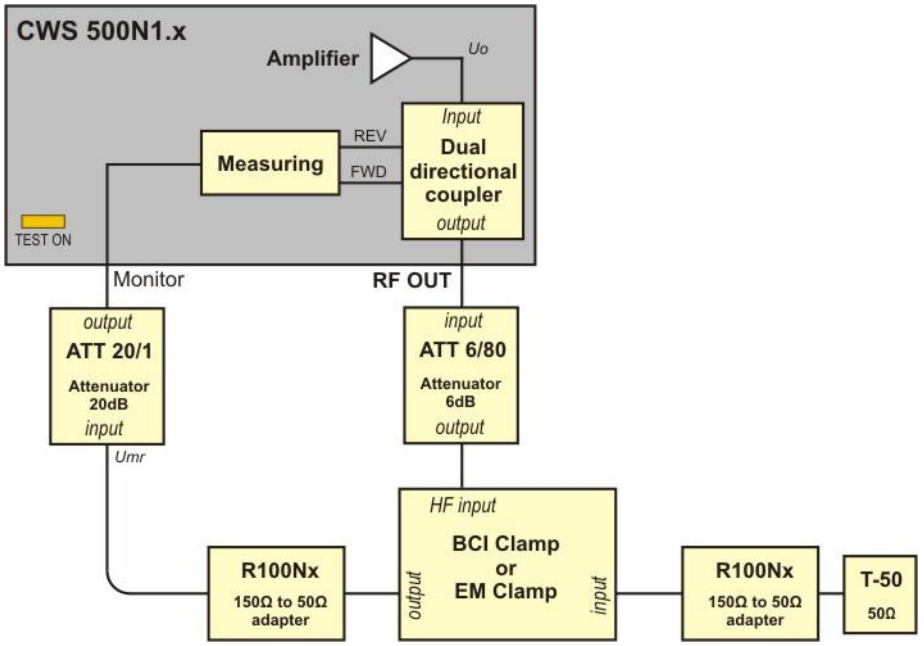


Fig 6.10

Test setup for EM Clamp / BCI acc. IEC 61000-4-6 as per Ed. 4

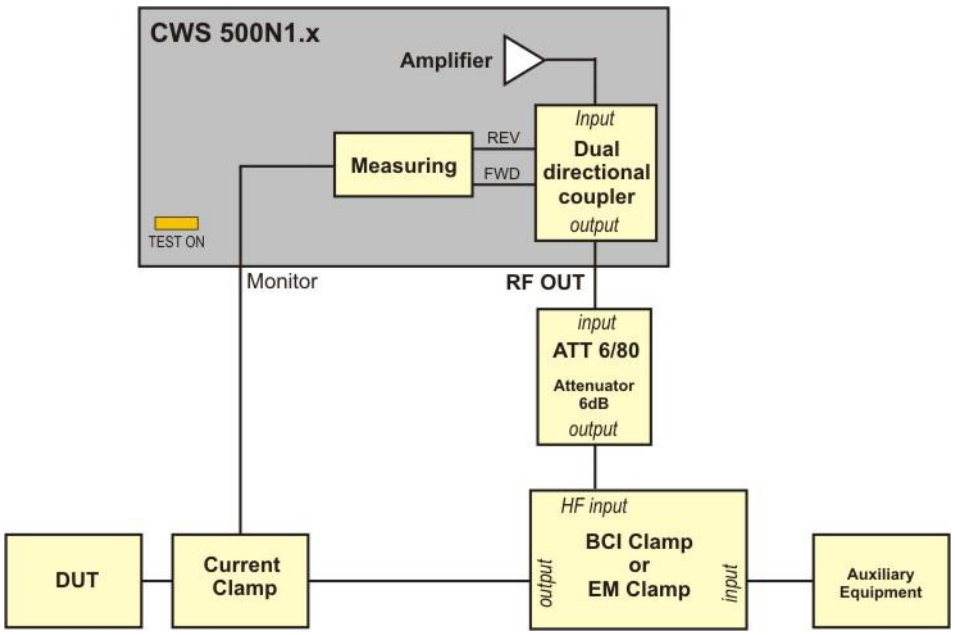


Fig 6.11

7. Calibration

Information

Calibration files, generated with CWS500N1.x (*.cdx) are only applicable with standard test who are based on the standard IEC 61000-4-6.

Tests based on other standards uses own calibration files (*.cal icd.control software)

7.1. General Information

A high frequency powermeter is included within the CWS500N1.x. This measuring device is used for calibration purposes. The complete test setup, including insertion loss of coupling devices and cables, can be calibrated with this powermeter.
The internal controller will compensate the frequency behavior of the test setup according to the requirements of IEC 61000-4-6.

For each single CDN, a calibration file is generated and stored in the CWS500N1.x. During the test in process, this file controls the output level of the RF-amplifier. Five Cal files may be stored and handled in the CWS500N1.x . The EM clamp as well as the current injection clamp (BCI-Clamp) can be calibrated by using the same method.

The advantage of this system can be explained as follows:

1. Different CDN's can be calibrated and used together with the CWS500N1.x . The internal software of the CWS500N1.x will compensate automatically for non-linear results during each calibration.
2. The operator can calibrate the complete test setup as necessary. The operation is easy and fast.
3. Changes in the test setup and in the cable layout will also be compensated with a new calibration.
4. The calibration function can be started by each internal program of the CWS 500N1.x. These Cal files are valid for all test routines as long as the test setup is not changed. Cal files can be activated during each test routine by pressing "Change".
5. If the operator needs more than five Cal files, he can use the icd.control software (delivered with the CWS 500N1.x). icd.control can upload the calibration data to a computer to be saved on the hard drive. The necessary files to conduct a test can also be downloaded to the CWS 500N1.x and stored in one of the five memories (e.g. when a larger number of different CDN's are used in the same test setup).

icd.control supports an almost unlimited number of CAL files. The CAL files can be displayed graphically.

It is recommended to calibrate the setup each time it was changed.

For calibration EM TEST propose to use the icd.control software. Do not use any other program. For a calibration procedure use the CWS 500N1.x as measuring instrument. Please work only with the implemented CAL routine (software or firmware). Icd.control software only handles these two functions.
For more information please consult your local EM TEST representatives.

7.1.1. 150Ω to 50Ω adaptor

Reference plane of the 150Ω to 50Ω adaptor
New in IEC 61000-4-6 Ed. 4 is the size of the reference plane. The reference plane area depends on the parameter h. (height of the CDN connector)

Height	Dimension of the reference plane
h = 30mm	100 mm x 100 mm
h > 30mm	150 mm x 150 mm

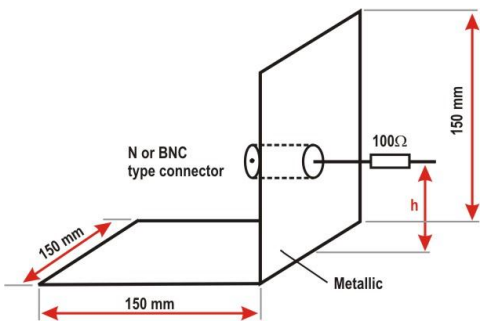
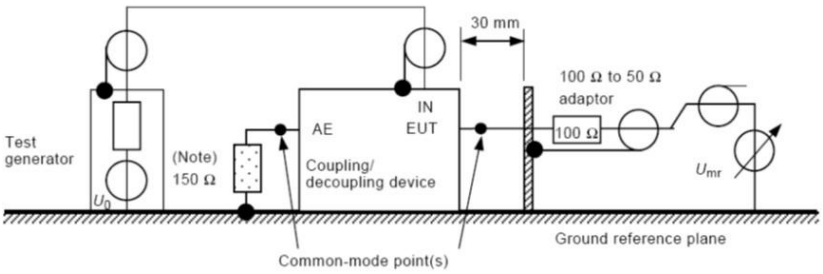


Fig 7.5 : example of reference plane dimension

7.2. Calibration Setup with CDN

Maximum Voltage on the Monitor input U_{max} = 1.0 Vrms (13dBm)



The CDN and the 150Ω to 50Ω adapter must well connect to the ground reference plane (i.e. by using copper tape).

Fig 7.6 : General Calibration set-up

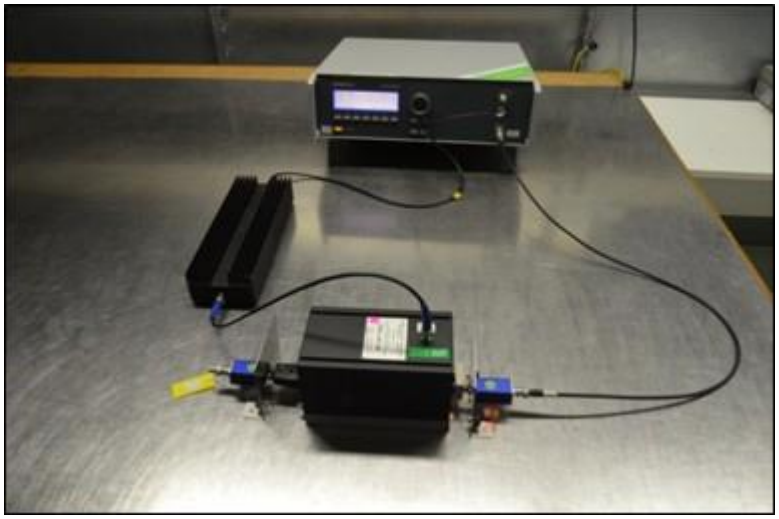


Fig 7.7 :Example Calibration Setup with CDN

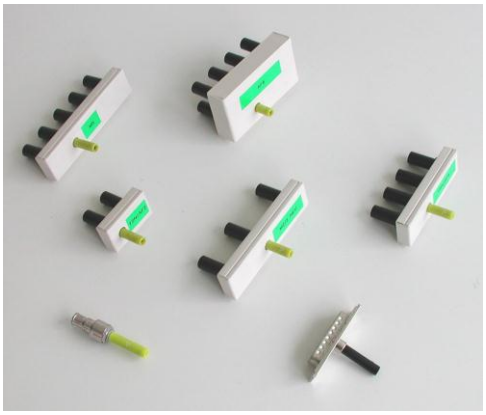


Fig 7.8 :Example of cal adapters

Note: The frequency range of the implemented calibration routine is always 100 kHz - 240 MHz. The calibration voltage is always 10V, independent of the actual program setting.

For calibration procedures with external receivers, power meters or analyzers, variable frequency ranges as well as variable test levels, icd.control software must be used. As an option, test instruments with IEEE488 (GPIB) interfaces may be incorporated.

7.3. Calibration Setup with EM Clamp

The calibration with an EM Clamp is similar to the CDN calibration.

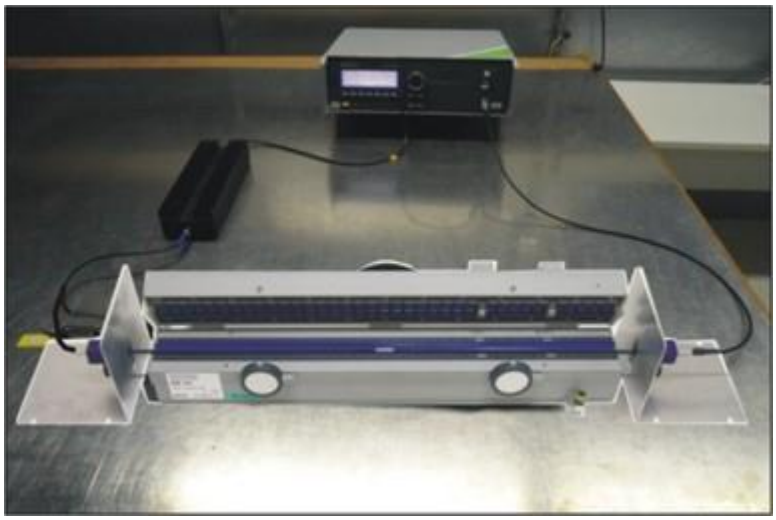


Fig 7.4 : Calibration setup with EM Clamp

7.4. Calibration Setup for Bulk Current Injection Clamp (BCI)

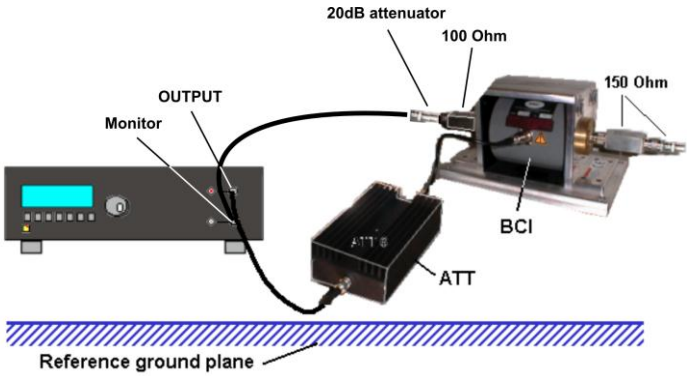


Fig 7.6 : Calibration setup with BCI

Attention

During calibration of the test setup on a ground reference plane at very low levels (very low currents), the test results may be influenced by the cable layout on the ground plane. High grade coaxial cables are essential. The best solution is to use double shielded cables. RG 58 cables are not sufficient in this case.

8. Setup

8.1. Test Setup with CDN's

The following information is important for a correct test setup:

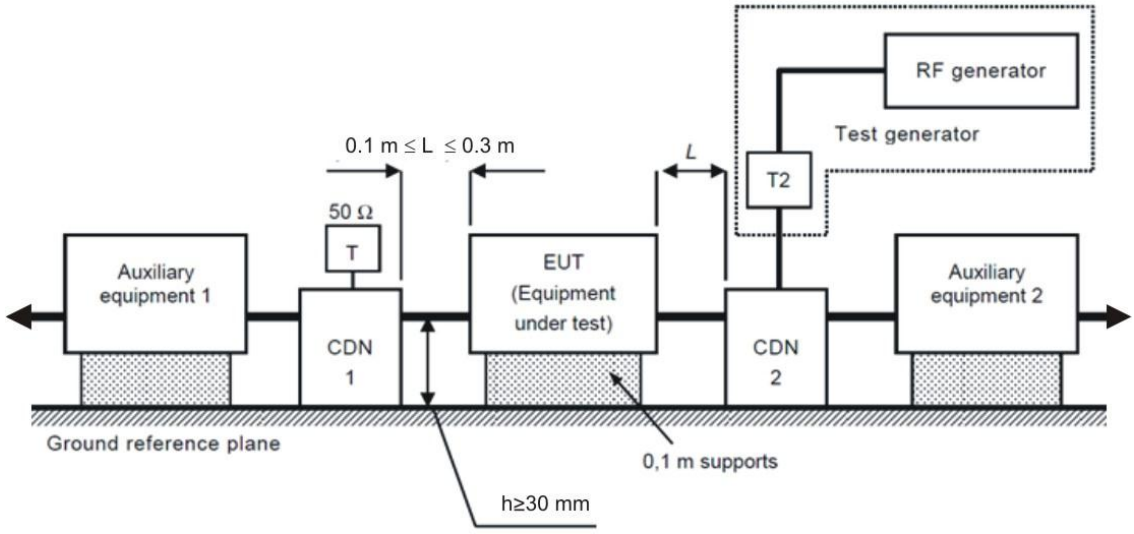


Fig 8.1 :Test setup with CDN

- Each, the EUT and the AE are **10 cm isolated** above the reference ground surface.
- All outgoing lines have to be **decoupled via CDN**.
- The CDNs have to be inserted in a distance of **0.1 m up to 0.3 m** from the EUT.
- The CDNs have to be connected well **with** the **reference ground plane** in a RF-accordant manner.
- Only **one** CDN is terminated with **a 50Ω load resistor.**
- Refer to IEC 61000-4-6 Standard for more information to terminate coupling/decoupling devices

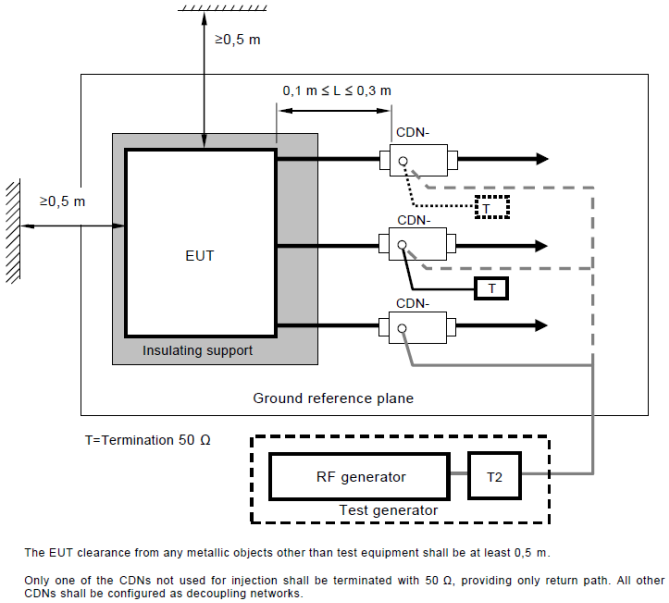


Fig 8.2 :Test Setup using CDN's

8.2. Test Setup with injection clamps (EM and BCI)

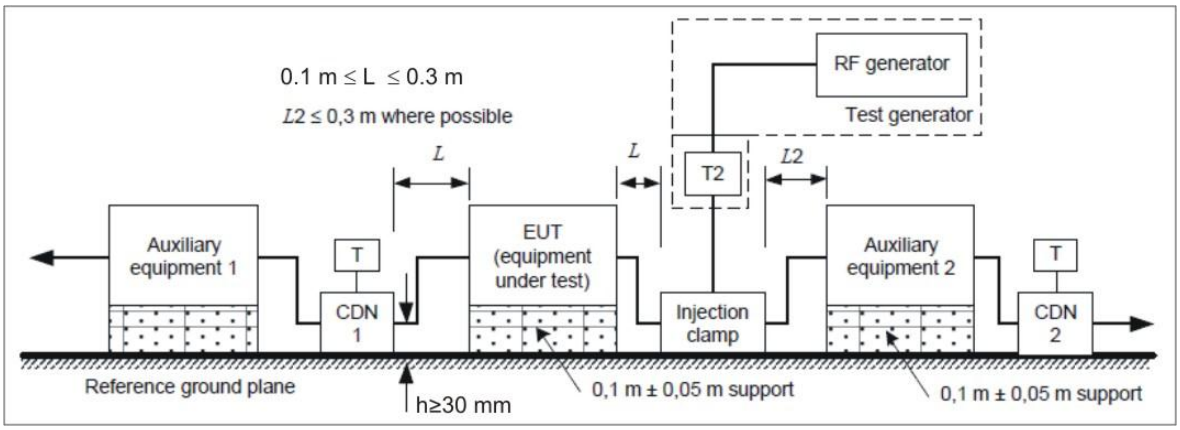


Fig 8.3 :Test Setup using Injection clamps

The **CDN**-side has no special requirements for the connected AE unit. The AE is placed 10cm above the reference ground plane.

The other side of the **EM-clamp** needs asymmetric impedance with 150Ω. The AE 2 is once to terminate with a 50Ω loaded CDN (see CDN 2). Other lines of the AE must be decoupled.

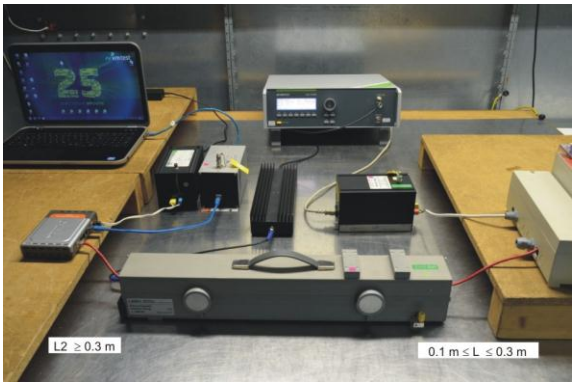


Fig 8.4 :Example Setup using EM clamp

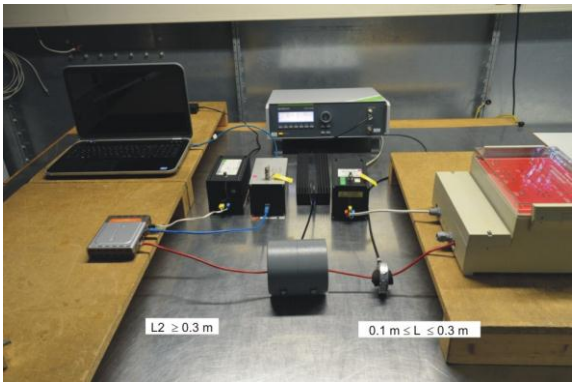


Fig 8.5 :Example Setup using BCI clamp

9. Test Equipment CWS 500N1.x

9.1. Design of CWS 500N1.3 series

The CWS 500N1.3 continuous wave simulator is divided into three main parts. The control unit is completely separated and uncoupled from the RF power section.

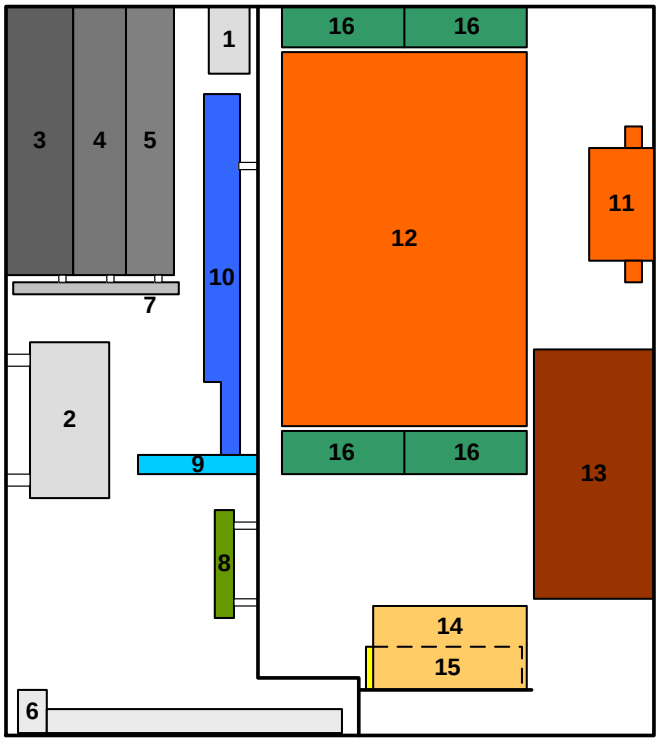


Fig 7.1 : CWS 500 N1.3

I Control unit

1 Power Supply Filter
2 Transformer
3 Power Supply
4 Interface Board
5 Processor Board
6 Keyboard / LC Display
7 Connection Board
8 Amplifier Monitor Board

II Generator Unit

9 Signal Generator Connection Board
10 Signal Generator

III RF Power Unit

11 Filter + pre-Amplifier
12 Amplifier
13 Power supply (Amplifier)
14 Bi-Directional Coupler
15 Power Meter
16 Fans

9.2. Design of CWS 500N1.4 series

The CWS 500N1.3 continuous wave simulator is divided into three main parts. The control unit is completely separated and uncoupled from the RF power section.

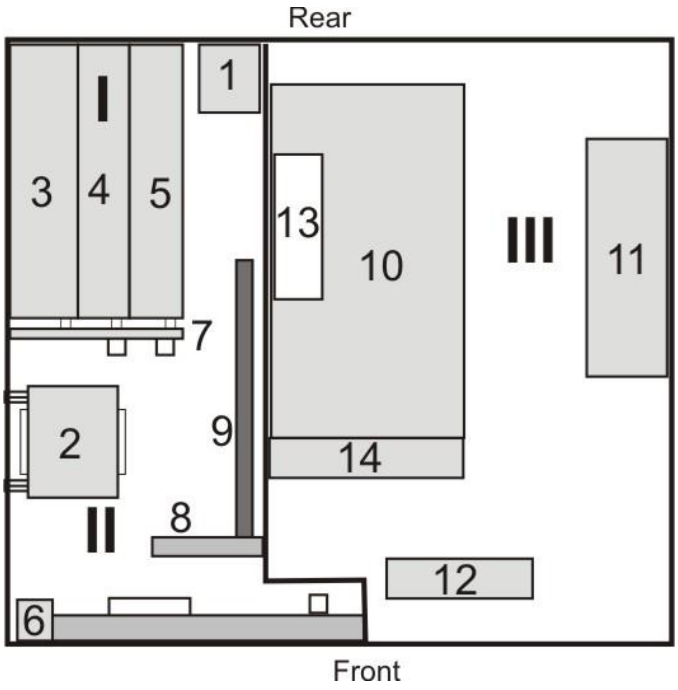


Fig 7.1 : CWS 500 N1.3

I Control unit

1 Power Supply Filter
2 Transformer
3 Power Supply
4 Interface Board
5 Processor Board
6 Keyboard / LC Display
7 Connection Board

II Generator Unit

8 Signal Generator Connection Board
9 Signal Generator

III RF Power Unit

10 Amplifier
11 Power supply (Amplifier)
12 Bi-Directional Coupler
13 PM 1000 Power Meter
14 Fans

9.3. Control Unit

The control section includes the processing unit and the driver electronics for the high frequency section. All signals coming from and going to the processing unit are uncoupled.

9.4. Generator Unit

The signal generator provides all RF signals required for the operation of the amplifier. The signal generator is controlled by serial communication from the control unit.

9.5. RF Power Unit

This part is a class A amplifier with a nominal power of 80 watts and forced air cooling.

9.6. Fail 1 & 2 Input

The Fail 1 and Fail 2 input are located at the rear side of the CWS 500N1.x

Fail 1: A short circuit at the Fail 1 input will stop the test procedure. It is not possible to continue this test.

Fail 2: A short circuit at the Fail 2 input will store the actual test data. The test procedure will continue normally.

The display indicates the number of Fail 2 events.

After the first Fail 2, the following events on the same test level are ignored (for the actual selected dwell time).

When the counter detects 10 Fail 2 events, the test will stop automatically. After a new start the counter will be reset to zero.

Mode of operation for Fail 2 (figure 8.3)
The Fail 2 will increase the counter each event during the dwell time td with the following mode:

A: **Single Events during td**
Each Fail 2 event will increase the counter.
No function until the counter has reached 10 counts and the test stops.

B: **Fail signal is present during longer time**
If the Fail 2 signal is present during longer time; the Fail 2 counter will increase exact one-step as during the dwell time td. Beginning with the next step, the Fail 2 counter will increase for the new dwell time. The test will stop after the counter reached 10 events.

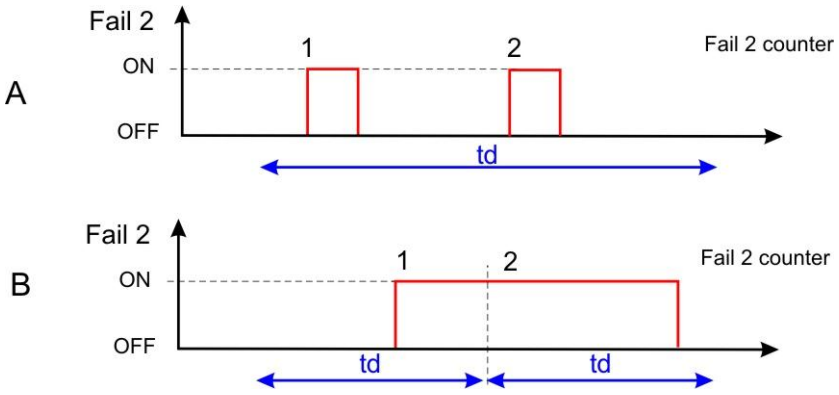


Figure 8.3

Fail function: Input signal: Negative slope.
NOTE: The signal is release to high before you start the next test.

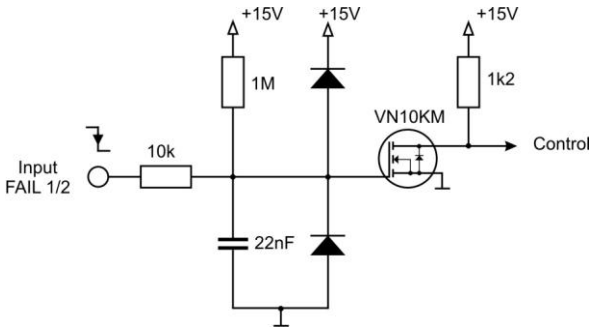


Figure 8.4 Fail 1/2 input circuit diagram

9.7. 6dB Attenuator

The 6dB attenuator is connected directly to the RF-output of the CWS 500N1.x The attenuator matches the output to a 50Ω system. The attenuator must be connected as close as possible to the coupling/decoupling network (CDN, EM clamp or current injection clamp), using a 50cm (20 inch) coaxial cable.

Fig 8.5 : ATT 6/80

The attenuator has an N-connector at the CWS 500N1.x side and a BNC connector at the CDN output.

The attenuator is required in the actual standard. However, the included amplifier will work correctly with any load.

9.8. CDN Coupling/ Decoupling Network

The CDN's are connecting externally to the output of the 6dB-attenuator. The coupling network is use to couple the interference to the lines of the equipment under test. The coupling accomplished with capacitors or resistors having a sufficient bandwidth according to IEC 61000-4-6.

The components, the common mode impedance and the coupling factor specified within the standard.

Fig 8.6 : CDN M5

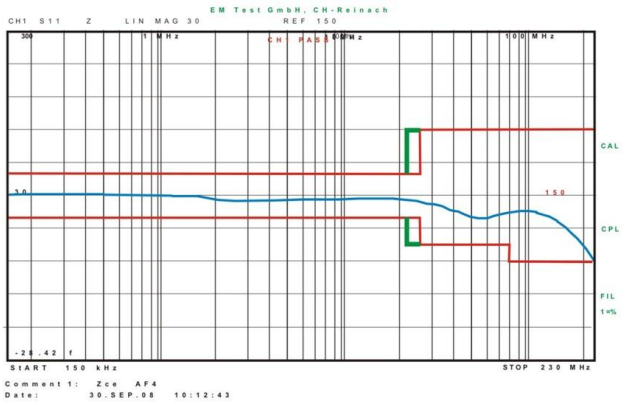


Fig 8.7 : Typical Impedance Zce of a CDN

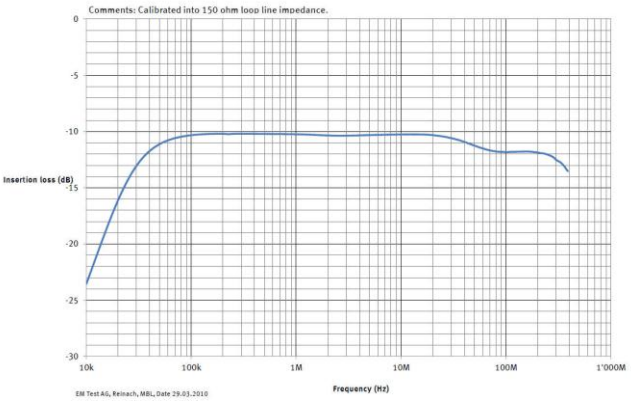


Fig 8.8. : Typical insertion loss of a CDN

Impedande values as per IED 61000-4-6 Ed. 4

0.15 MHz	– 24 MHz	150 Ohm +/- 20 Ohm
24 MHz	– 80 MHz	150 Ohm +60/- 45 Ohm
80 MHz	– 230MHz	150 Ohm +/- 60 Ohm (informative according Annex B for tests >80MHz)

Examples of a single shielded line (S1) and a 3-line power supply (M3) are shown below.

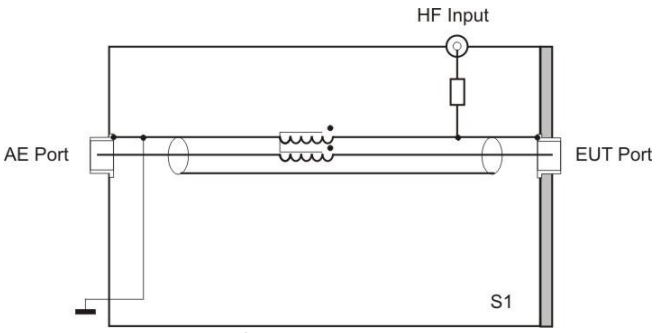


Fig 8.9 : CDN S1

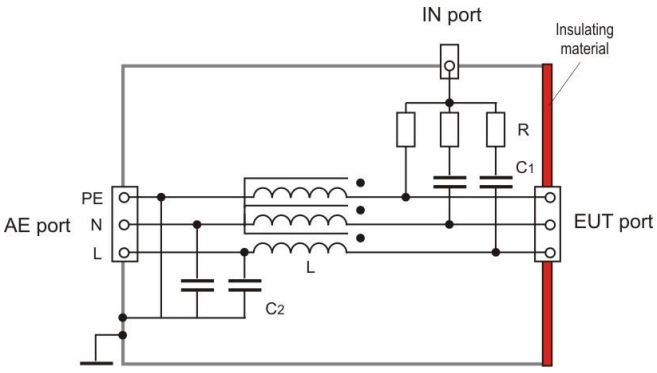


Fig 8.10 : CDN M3

10. Technical Data

Test Level CWS 500N1.3 :

Output Level	1 - 30Ve.m.f. after 6dB-attenuator
Output power	80W (nominal)
Output impedance	50 Ohm
max. VSWR	1:1.2 at all phase angles and at max. power (without destruction)
Harmonic distortion (at max. power)	< 15dBc

Test frequencies	**CWS 500N1.3**	**CWS 500N1.4**	
Sinusoidal (CW)	10 kHz – 400 MHz	100 kHz – 300 MHz	step: 1kHz
	In the menu QUICK START the step size can be selected by the user		

Modulation

Modulation method	Amplitude modulation 80% <±5% and 1kHz <±10% acc. to IEC 61000-4-6 80% <±5% and 2Hz, 1kHz acc. to IEC 60601-1-2
Pulse modulation	1Hz, 50% duty cycle acc. to EN 50130-4
General	80% at Frequencies 2Hz, 400Hz,1kHz
Other modulation	via ICD software Settings in Vector mode

Signal Generator

Output level	-63.5 dBm to 0 dBm
Step level	0.5 dB
Frequency range	9 kHz to 1 GHz
Output impedance	50 ohm

Calibration measurements

Cal data	5 internal stores for calibration data.
ICD	Software for the upload and download of Cal-files.
LCD	On-line display of the test level and the preselected frequencies.
Monitor input PM1000	RF monitor input for calibration procedures and current probes measurement Input voltage for current monitoring V_{max} = 1.0 V_{rms} (13dBm)
Cal data for current probe (CP)	2 internal stores ; (download with ICD software) A download will reduce data to 10/ decade and frequency range 100kHz ... 300MHz

Timing:

Dwell time	general td = 0,3s - 9999.9s pulse modulation td = 3s - 9999.9s
Rest time	tr = 0 / 0,3s - 9999.9s

Output

Direct	N

EUT control

BNC input FAIL 1	Fail 1; test will be stopped immediately
BNC input FAIL 2	Fail 2; failure is detected, test continues (max. 10 failures)

Test routines (integrated)

Quick Start	immediate start, all parameters adjustable during testing.
User test routines	1. Voltage sweep 2. Frequency sweep 3. Dwell time sweep
Standard test routines.	1. Level 1-3 acc. to IEC 61000-4-6 2. Automatic Level X - Level Y
Cal procedure	Calibration of the complete test set-up. Internal storage of the Cal-files.
Service	Service, Setup

Interfaces

Serial Interface	USB
Parallel IEEE 488 GPIB interface	Addresses 1 - 30 selectable
	All interfaces are included as standard features.

Power meter PM 1000

Frequency range	9kHz – 1000 MHz	
Input range	Monitor	-45 dBm ... +13 dBm
	FWD power	-50 dBm ... +13 dBm
	REV power	-50 dBm ... +13 dBm
Max. Input MONITOR	13dBm	approx. 1.0 Vrms
Accuracy	< ± 0.5 dB	(0.09MHz...400MHz)
	< ± 1.0 dB	(0.01MHz...1000MHz)

Dual Directional Coupler

Frequency range	10kHz – 1000 MHz
Power	150 W max.
Insertion loss	0.6 dB max.
Mainline VSWR	1.1:1 max.

RF Amplifier (build in)	**CWS 500N1.3**	**CWS 500N1.4**
Class of Operation	Class A	Class A
Frequency range	10 kHz .. 400 MHz	100 kHz .. 300 MHz
Output power nominal	80 W	80 W
Gain	48 dB nominal	48 dB nominal
Input power for rated output	0 dBm	0 dBm
Input power max.	10 dBm	10 dBm
Input / Output Impedance	50 Ω	50 Ω
Input VSWR	1.5 : 1 max.	1.5 : 1 max.

General data

Dimensions	19"/3HE	19"/3HE
Weight	17.25 kg	14.95 kg
Power supply	110-230V/ max 50/60Hz	
Input power	max. 380W	
Power factor	cosϕ=0,98 at max output power	acc. to IEC 555
Fuse	230V: 2x3,15AT	
	115V: 2x6.3AT	
Cooling	active cooling, air ventilation	
Environment conditions	10°C - 35°C	10°C - 40°C
Humidity	Max. 85 %, non condensing	

=>> Non compulsory specification, may be subject to change <<=

11. Maintenance

11.1. General

The generator is absolutely maintenance-free by using solid state semiconductors. The generator uses forced air cooling. Take care not to cover the cooling slots.

11.2. Calibration and Verification

11.2.1. Factory calibration

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

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

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

Example: Calibration mark

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

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

EM TEST doesn't know each customer's Quality Assurance Policy nor do we know how often the equipment is used and what kind of tests are performed during the life cycle of a 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 recommend 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.

11.2.3. 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.

11.2.4. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, EM TEST suggests to 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.

12. Delivery Groups

12.1. Basic equipment

- Continuous wave simulator type CWS 500N1.3 or CWS 500N1.4
- Mains cable
- Calibration certificate
- icd.control software on delivered USB memory stick
- 1 x BNC cable 0.5m,
- 1 x N cable 0.5 m + 1 x N cable 1.5 m
- 20 dB / 1W attenuator
- N-connector bridge (AMP OUT – COUPLER IN)

Safety manual

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

12.2. Options

Coupling networks (CDN)	as per IEC 61000-4-6 Wide range of different CDN's	
Coupling clamps	EM clamp as per IEC 61000-4-6 for coupling of the RF signal to multiple cables. Current injection clamp acc. To IEC 61000-4-6	
Current Probe	acc. IEC 61000-4-6	
6 dB attenuator	ATT 6/80	6dB/80W
50Ω- matching resistor	T-50	50Ω as matching resistor for CDN's
150Ω to 50Ω adapter	R-100N	100Ω as per IEC 61000-4-6, Ref plane: 100 mm x 100 mm
	R-100N1	100Ω as per IEC 61000-4-6, Ref plane: 150 mm x 150 mm
	R-100A	100Ω with N-type-connector for current clamp calibration
Calibration adapters	For all types of CDN's and clamps (manufactured and delivered by EM TEST)	

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

13. Appendix

13.1. Declaration CE- Conformity

DECLARATION OF 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: Continuous Wave Simulator
Model Number(s) CWS 500N1.3
CWS 500N1.4

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	EM TEST (Switzerland) GmbH
	Lünenerstr. 211	Sternenhofstr. 15
	D 59174 Kamen	CH 4153 Reinach
	Tel: +49 (0) 2307 / 26070-0	Tel: +41 61-7179191
	Fax: +49 (0)2307 / 17050	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

13.2. Block Diagram

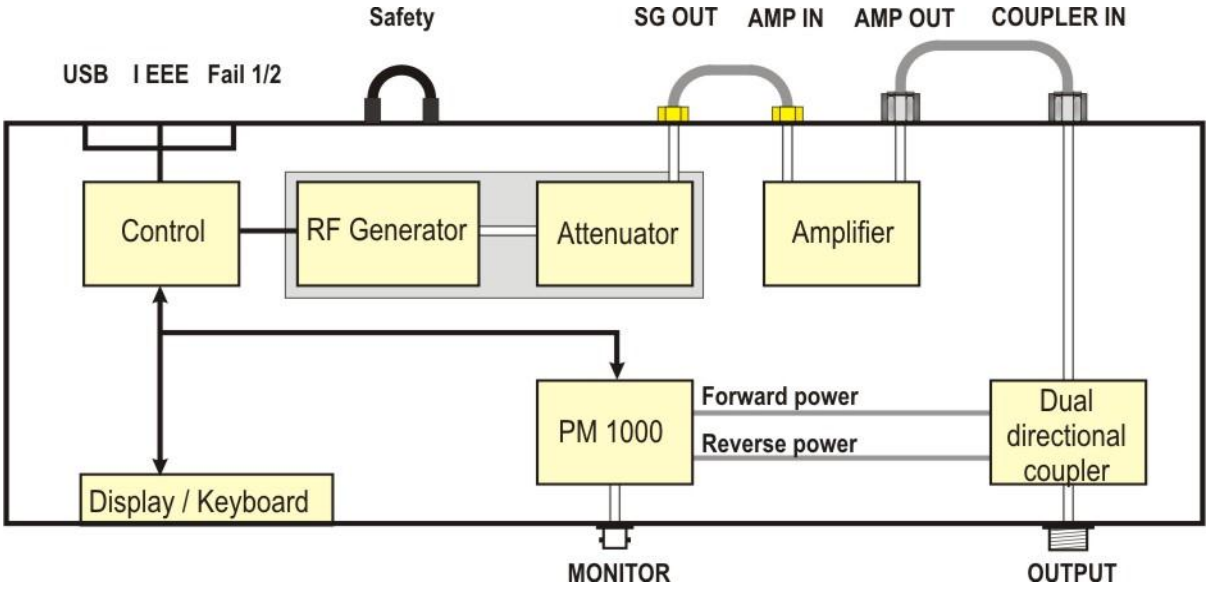


Fig 13.1