Manual
for Operation

Software

icd.control

For icd Version ≥ 8.0

- ISO 11452 part 4
- ISO 11452 part 5
- ISO 11452 part 8
- ISO 11452 part 10
- SAE J1113-4
- RTCA/DO-160
- MIL-STD-461
- IEC/EN 61000-4-6
- IEC/EN 61000-4-16
- various automotive manufacturer's specifications

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AMETEK® COMPLIANCE TEST SOLUTIONS

AMETEK CTS GmbH
Sternenhofstrasse 15
4153 Reinach BL1
Switzerland

Phone: +41 61 717 91 91
Fax: +41 61 717 91 99

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

Foreword

Thank you for purchasing the icd.control software.

This user's manual describes the software tool and contains useful information about the functions and operating procedure of the device.

This user's manual lists precautions that must be taken during use and contains useful information about the functions and operating procedure of the device.

To ensure correct use, please read this manual thoroughly before beginning operation. After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.

This manual contains a selection of typical system setup with the correct wiring diagram.
Further information about the technical data, using and handling with the device generators, see the manual for these products.
Generators offering customized features are not explained in this manual. The parameter windows for special tests are basically the same as for the standard pulses.

Notes

The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that actually appear on your display and screen.

Every effort has been made in the preparation of this manual to ensure the accuracy of this contents. Should you have any questions or find any errors, please contact your representative or send an email.

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Version

This manual is written for icd.control Software version 8.0.0 and higher.

Contents

1. Introduction

1.1 Preliminary Remarks

The icd.control software is operated under Microsoft Windows.
The manual describes as detailed as possible all the applications of the program that are available for the user. Due to the extensive variety, however, not all possibilities and options can be described in this manual. The program is subject to change.

Simulation mode as well as the example files included in the delivery allow user to get familiar with the software.

It is easy to make your first tests quickly with the ***Standard Test.*** The ***Vector Test*** is structured so it stands to your highest requirements on the most variable test-procedures.
Let the icd.control test and monitor the immunity of your equipment through the ***EVENT*** function and automatic reduction of voltage testing according to predefined settings.

The software supports most serial-port and IEEE-bus measuring equipment.

1.2 General

This software is used for control of continuous wave generators.
The software works in Windows 7, Windows 8 and Windows 10.
The name **icd.control** originates from the English

"**I**mmunity to **C**onducted **D**isturbances"

The software can produce a test, save it and generate reports.
The recognition and registration of occurrences / events during tests on the sample (further EUT) can be done through the **Fail1**- and **Fail2**- connectors located in the back of the CWS equipment (NSG 4070 excluded), or with the help of external measuring equipment (**EVENT)**.
Activating of the buttons **Stop**, **Pause** and **EVENT** also produces occurrences/events during testing. All occurrences are listed in the report with the topical parameters and can be provided with additional commentaries.

1.3 User Requirements

The user is expected to have an understanding and knowledge about EMC. Within the frame of this instruction manual no information is provided with regard to standard testing. Please refer to the relevant standard documents for detailed information.

1.4 Technical Requirements

The *icd.control* program has to be installed on an IBM compatible AT computer.

Processor	Dual Core or better
Memory	2 GByte at least
Hard disk	at least 500 MByte memory available
Windows™	Windows 7, Windows 8, Windows 10 (32/64 Bit)
Interface	USB or IEEE 488 Interface card (National-Instruments).

Operating System	***icd.control***
Windows 7 (32 Bit)	X
Windows 7 (64 Bit)	X
Windows 8 (32 Bit)	X
Windows 8 (64 Bit)	X
Windows 10 (32 Bit)	X
Windows 10 (64 Bit)	X

1.5 Supported IEEE boards by the icd TEST software by AMETEK CTS

Single devices are usually operated via the serial interface whereas in configurations of several devices the parallel IEEE interface is used. Therefore, the computer has to be equipped with the corresponding interface board.

The following IEEE boards are supported by icd.control for Windows to control the EM TEST equipment:

Manufacturer	**Device**	***icd.control***
National Instruments	PCI-GPIB	X
	PCMCIA-GPIB	X
	GPIB-USB-B	X
	GPIB-USB-HS	X
	ExpressCard-GPIB	X
	PCIe-GPIB	X

This list doesn't claim to be complete.

As a standard we highly recommend to use the following hardware:
IEEE Interface **Type PCIe-GPIB** of **NATIONAL INSTRUMENTS**

National Instrument Driver

Install NI-488.2 rev. 15.0 or higher. The use of older revisions may cause in software errors.

1.6 Hardware setup connection Computer <-> Generator

A:) Application of USB interface.

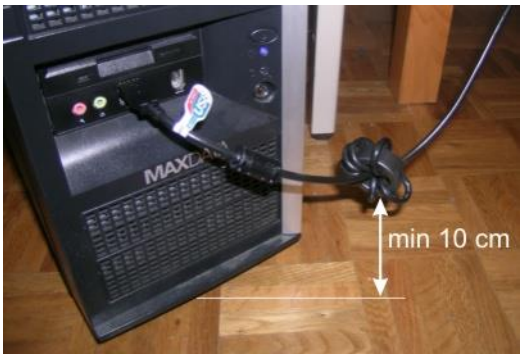
USB interface "USB B" connector. For data transfer a USB interface is available. The internal RS 232 interface is converted to USB standard.

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. According to our experience, 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 longer distances such as 10 m, it can be too long and USB cable is not the best option. An alternative cable should be used.

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



B:) Application of IEEE 488 interface.

Use a general IEEE488 resp. GPIB - cable.
Connect the instruments.

C:) Application of Ethernet interface.

Use an Ethernet cable.
Connect the instruments.

1.7 Computer settings restrictions

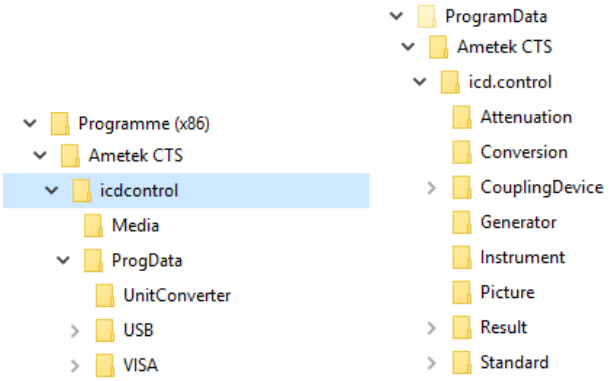
The following computer settings are mandatory for proper software operation.

Settings	Remark
Energy safe or **Suspend Mode** must be disabled.	Windows sets the IEEE interface in the standby mode. The software can switch to simulation mode. Problems occur with long durations tests, where the PC is idle for a long time.
Screen safer disable	Screen safer can influence the running program.
Hard disk sleepmode disable	The access of programs to a hard drive in sleeping mode may be a reason for program conflicts.
Notebook operation use mains power	When the storage battery is low, the notebook will close the program and shut down the computer. The test generator stays in remote status with the last voltage and frequency settings, until the setup is changed manually on device.

1.8 Directory Structure of the *icd.control* Software

The software shows the following directory structure after a default installation (Windows 10 style):

Program **C:\Programs (x86)\Ametek CTS\icdcontrol**
Program Data **C:\ProgramData\Ametek CTS\icd.control**



The following list of directories shows the default purpose of application:

Directories *icd.control for program data*

Attenuation	Files for specifying the attenuation
Conversion	Files for specifying the conversion
CouplingDevice	Files for specifying the coupling devices in use
Generator	Generator configuration files
Instrument	Configuration files for internal and external measuring instruments
Picture	Library for setup pictures
Result	Reports generated by *icd.control*
Standard	Library for icd.control standard tests

Directories *icd.control for programs*

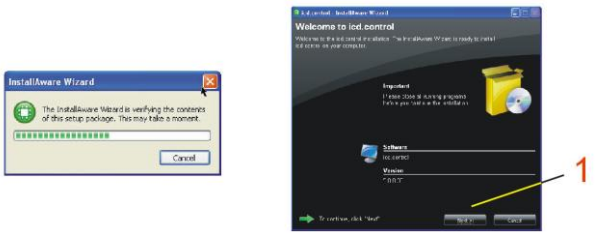
Media	Some media files for internal use
ProgData	Software components

1.1. icd.control Software Install and Uninstall

1.1.1. Installation

To start the installation, select the routine **icdcontrolSetup.exe** from the software CD or USB.

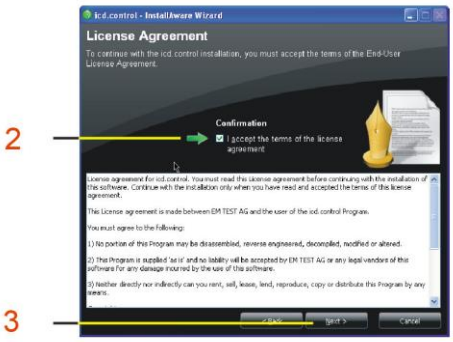
1. Press **Next** to continue



The installation routine guides you with an easy dialogue through the installation procedure. During the installation the relevant data will be expanded, copied and the user program will be installed either in a new or in an existing program group.

2. Press the field: I accept the terms of **Licence Agreement**.

3. Press **Next** to continue



4. Accept the default Product install path

5. Check the available disk space

6. Press **Next** to continue

7. Press **Install** continue.

8. Press **Finish** for terminate the installation.

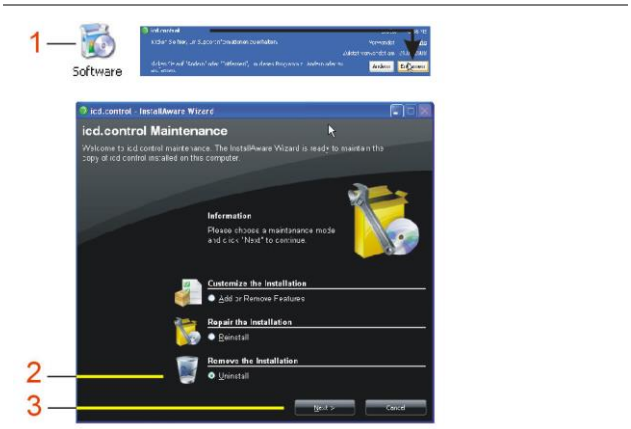
1.1.2. Uninstall

1. Start the uninstall procedure in the **System control** and

   select icd.control for **uninstall**

2. Select **Uninstall** for remove installation

3. Press **Next** for start the uninstall procedure



4. Click **Uninstall** to remove icd.control

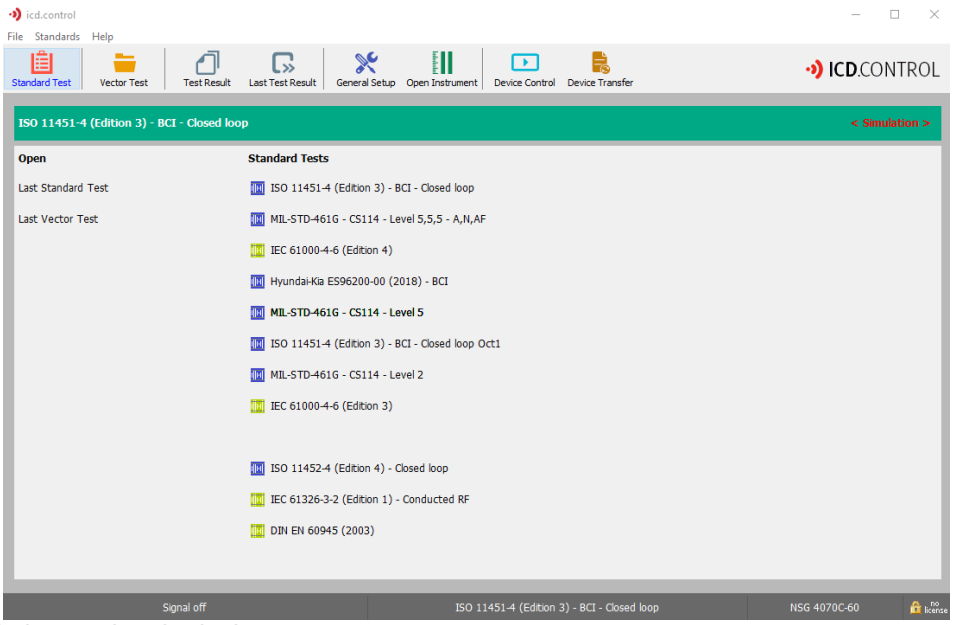
5. Click **Finish** after a successful uninstall procedure

2. Guide to icd.control

2.1. Software Overview

1.) Start Windows operating system.

2.) Start icd.control, double-click on the icd.control -Icon.

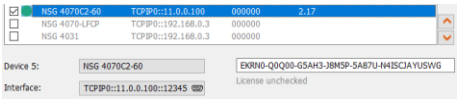


icd.control main desktop

2.2. Software License

With the software license you get the access to the full program facilities.
Each license is associated with one device (by serial number for NSG 4070 and SWN i.e., software number for CWS)

Click on **General Setup** on the top menu bar.
This is where you enter your license code. If you have finished entering your license you will see the SWN code of your generator.



icd.control without license:
Without license icd.control runs with it complete functional range but only in simulation mode. That means the software may be used for demonstration purposes, file transfer of results, file configurations and report generating but not together with a connected generator.

icd.control Licence:
All functions are accessible. icd.control runs without limitations.

2.2.1. Operating mode

icd.control works in two different operating modes.

Test System

- icd.control has connection to one generator.
- You can work with icd.control together with your generator.

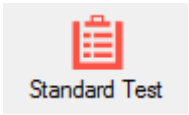
Simulation

- icd.control works in simulation mode.
- icd.control has no contact to a generator.
- The interface is not or wrong configured (software or generator).

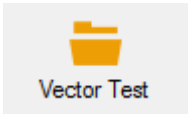
2.2.2. Status bar

Info related to the cursor position | Actual standard | Model | Status

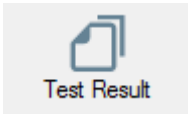
2.2.3. Main Toolbar



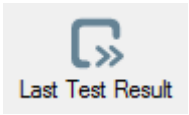
Open the standard test manager.



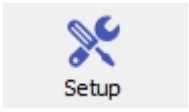
Open a vector test file.



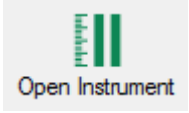
Open a test result in the view mode.



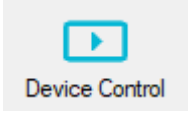
Open the last test result.



Open the general setup.



Open the instrument list for configuration.



Open the device control panel window for manual control of the generator.

Exchange of calibration files for IEC 61000-4-6 edition 3 in combination with CWS. The connection with NSG reads the directional coupler data and result files. See Chapter 3.2.1 for details.

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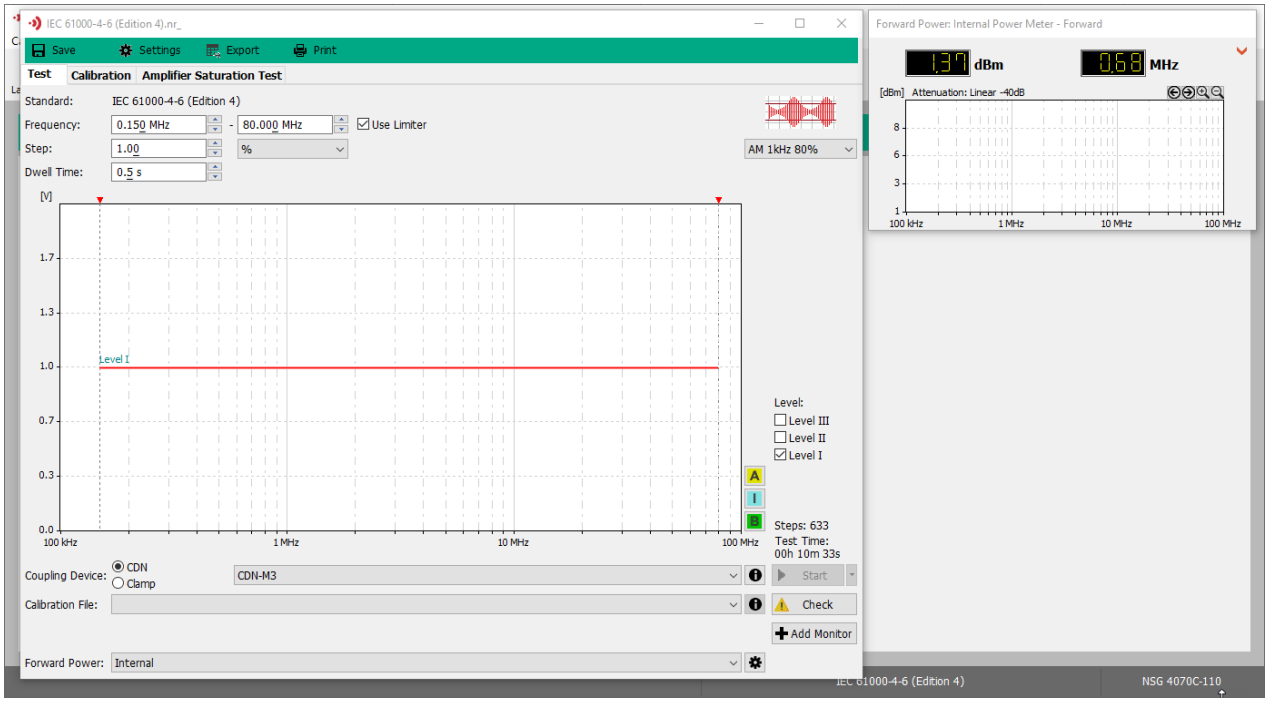
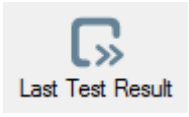
2.3. The icd.control window in the test mode

This is how you recognize the test mode.

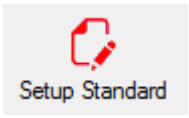


2.3.1. Test Mode Toolbar

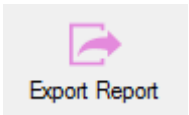


Switching into the view mode and opens the last test result.

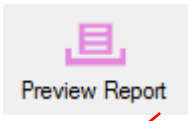
Open the general setup. All settings are changeable except of selecting another generator.



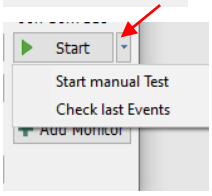
Open the settings window of the standard.



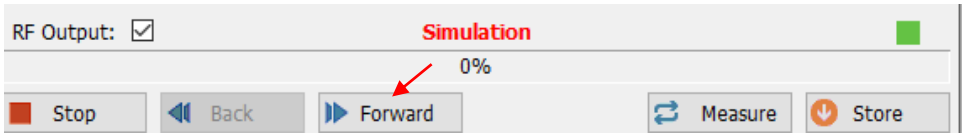
Export the standard or instrument settings into a pdf or rtf file.



Open the preview window for the standard or instrument settings.



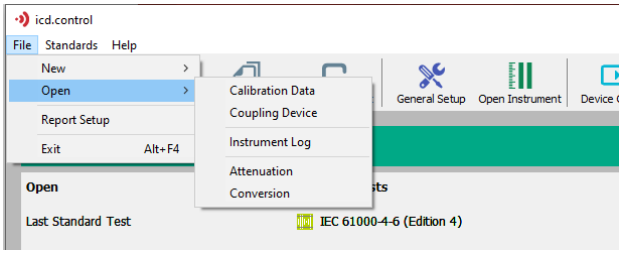
This features allows you to manually run the test for each step. The user has to click Forward each time to go to the next step.

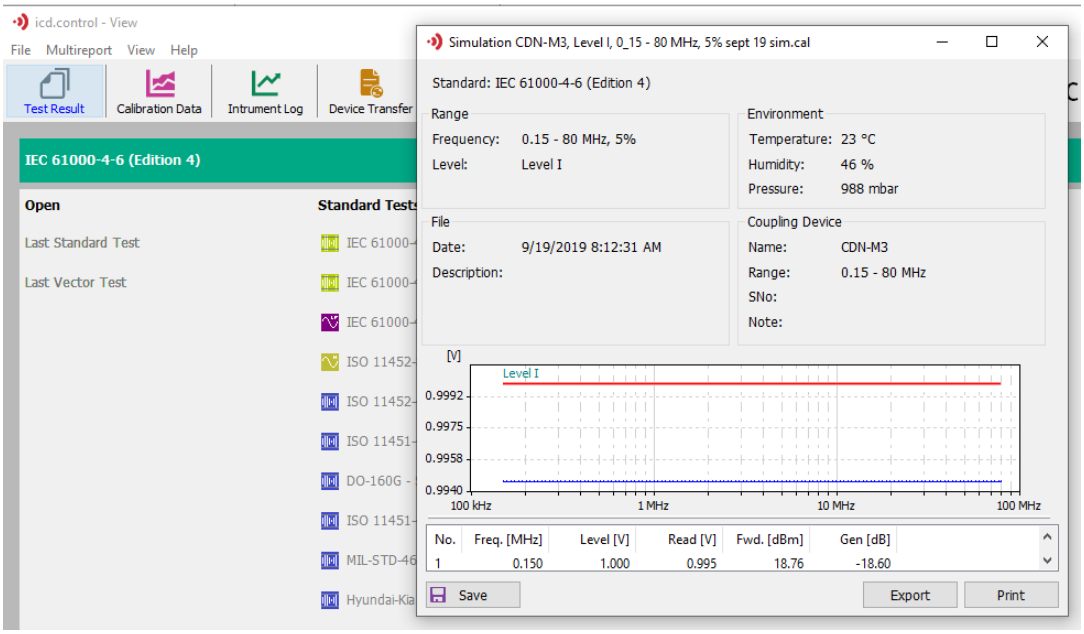


2.4. The icd.control window in data view mode

You can view the data files about instruments, test reports and calibration files.

Test result files are viewed by clicking on “**Test Result**” or “**Last Test Result**” icons at the top. For the calibration data, please see the below

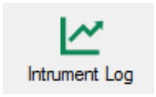




2.4.1. View Mode Toolbar

Open a report file in the view mode.

Opens a Calibration file.



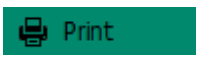
Opens an Instrument log file.

2.4.2. View Mode options

Save the **active** window.

Open the settings window of the **active** window/panel object

Export the settings of the **active** window/panel object into a pdf or rtf file.



Open the preview window for the **active** window/panel object settings

3. First use

This chapter will guide you through the configuration menu with a suitable setting proposal for 95% of all users.

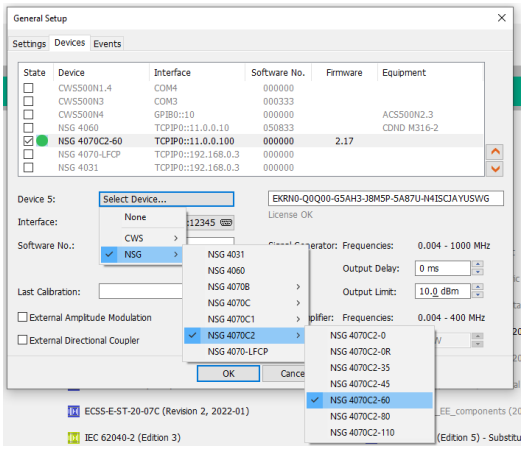
Steps for first use
- Software configuration
- Performing of a calibration
- Proceed a test
- Viewing the results

3.1. Software Configuration

Overview
- Operation mode (Simulation / Connection computer <-> Generator)
- Device interface configuration and license
- Break, Fail, Trigger
- Password setup
- Miscellaneous settings

3.1.1. Device Setup

1. Click on **General Setup**. The **Device** setup window of the system configuration appears.

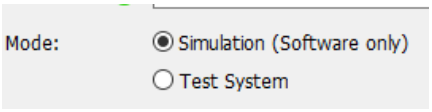


Select **Test System** to work with a connected generator
or
Simulation to work without a connected generator

To view other settings, click into the listed menu titles.

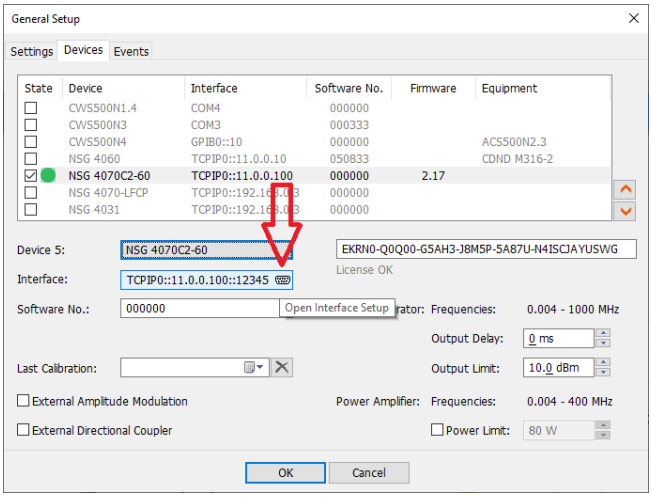
Select the correct generator under **Device**.

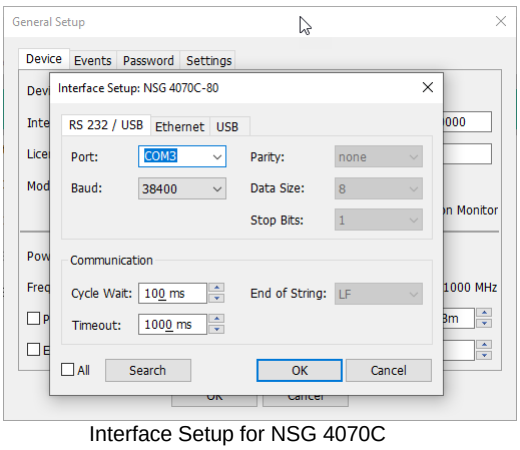
2. Check the IEEE address of the device.
   If necessary, enter it in the field "Address:".
   Default address: 10. Software No should be matching the device. For NSG systems, the license is linked to the Serial No.
3. Enter the device **Serial number**. This number will be used for the test report and will be linked to the License of the software Each icd license is associated with one device.
4. Press the **OK** button



3.1.2. Search connected Devices

1. Click on the **General Setup** button
2. In the **Interface Setup** choose the corresponding interface and click on **Search** button
3. The software will automatically search connected devices on computers interfaces which corresponds to the selected unit.





Interface Setup for NSG 4070C

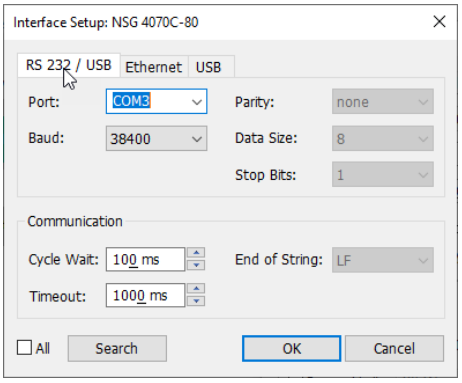
3.1.3. icd.control Interface

In the row Address the Interface address, normally IEEE488 device address or Ethernet IP Address, needs to be entered. The same address as shown in the display of the related test generator must be entered here. This is the address iec.control will search for to communicate with connected test generator. The addresses given below show the factory settings. When changing any of this address check the related test generator for equal setting of the interface address. Click into field on the right side of the device address for open the interface setup and configure the interface.
See also section 4.1.1 for details on test setup.

A) Using the USB interface

Now set the Baud rate in generator

1. Select **USB / RS232**
2. Choose the **COM Port** and the **Baud rate**.
   Factory setting: COM 3, 38400 Baud
3. An **Additional Timeout** can be used if no answer is received from Gen.

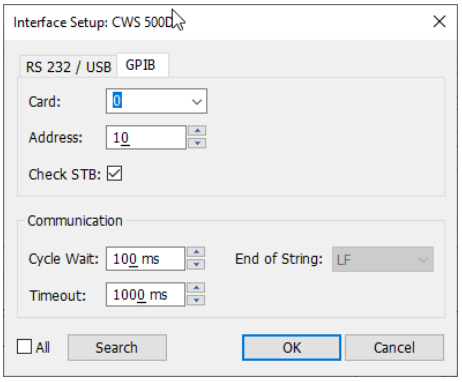


B) Using the IEEE 488 Interface

Now enter the IEEE address in generator

1. Select **IEEE/ GPIB**
2. Set the IEEE address of the generator
   Factory setting: IEEE address = 10

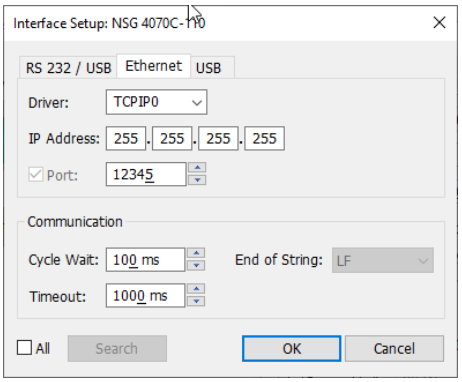
   The option Check STB (Status Bit) allows an efficient communication (not supported by all devices)



C) Using the Ethernet Interface (NSG 4060/4070 only)

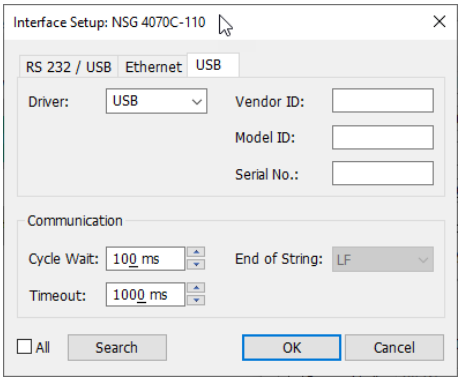
Now enter the Ethernet address in generator

1. Select **Ethernet**
2. Set the IP address of the generator



D) Using the USB Interface Option (NSG 4060/4070 only)

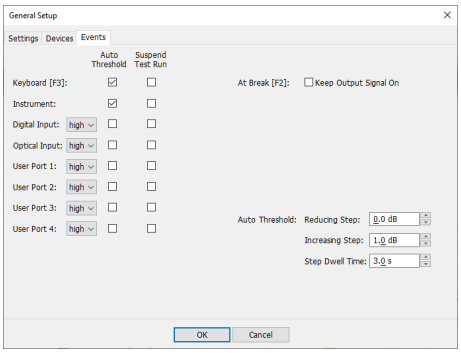
1. Select USB
2. Set Vendor ID, Model ID and Serial No. of the Generator



3.1.4. Events (Break, Fail, Trigger)

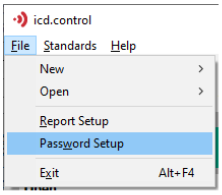
Set your options according to the graphic at the right.
This is the easiest way to follow the actions of the software.
Here you can select Suspend and Threshold features during the test and adjust parameters in Auto Threshold

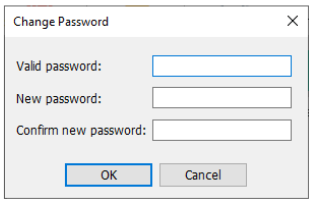
After the occurrence of an event, the software will use the auto select values until reaching the defined test



3.1.5. Password Device

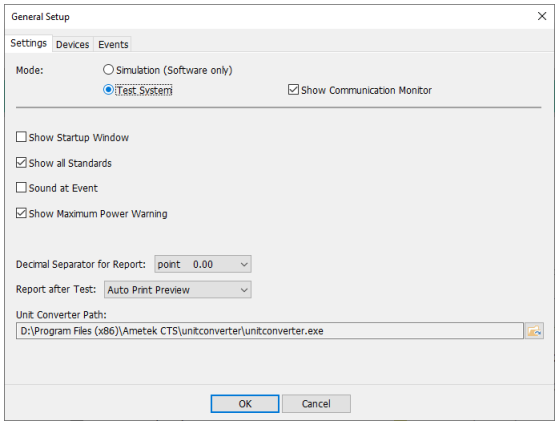
If a password is set, then the software doesn't allow to change test parameters without entering the password. The software can be used without entering the password, but no changes to standard parameters are allowed. See also section 4.1.3

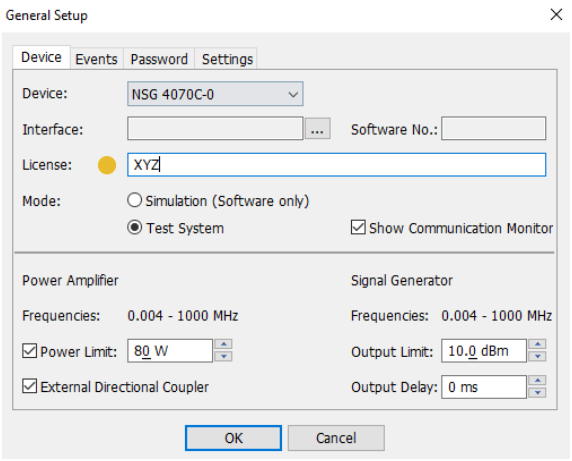




3.1.6. Settings

Set your devices according to the graphic at the right.





3.2. Perform a test

This manual will show you two examples with of tests according to IEC 61000-4-6 and ISO 11452-4. Other test examples refer to the special application notes web page of Signal Generator (e.g., NSG 4070C)
- Proceed a standard test
- Execute the test
- Create a report

Other test routines with icd.control:
- **Vector Test** program
- **Device Control** program

3.2.1. Standard Test as per IEC 61000-4-6

The following pages describes how to proceed an IEC 61000-4-6 standard test with CDN application. For detailed screen information of software please refer to the separate chapters at the end of this manual.

Basic Settings

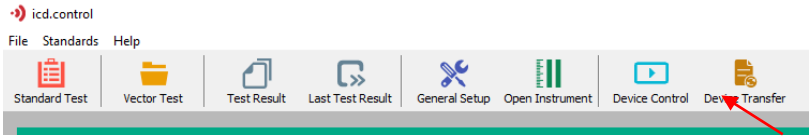
Clicking on "**General Setup**" opens the generator settings

menu > Under **Device** select the appropriate generator model e.g., NSG 4070

If necessary, set limits for the connected hardware. "**Power Limit**" limits the forward power. This feature avoids a damage in case of error. Based on forward power measurement, the output power is limited from the amplifier to prevent any damage. „**Output Limit**" limits the output level of the signal generator and is e.g. to 0 dBm if the maximum input power of the connected amplifier is limited to 0 dBm.

For NSG 4070, if the "**External Directional Coupler**" is selected, it expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the checkbox must not be set. After finishing settings, click **OK**

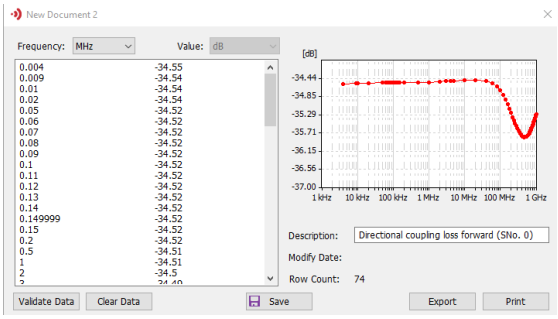
Click on "**Device Transfer**" to read the directional coupler data of the NSG 4070 and open the following window.



In this window, device specific values can be inserted according to calibrated results.

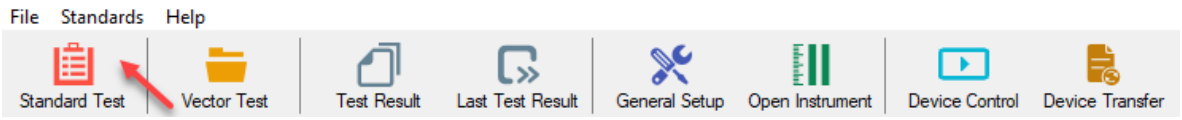
A comment can be inserted or changed in "**Description**"

Clicking on "Save" allows the program to assign a file name.

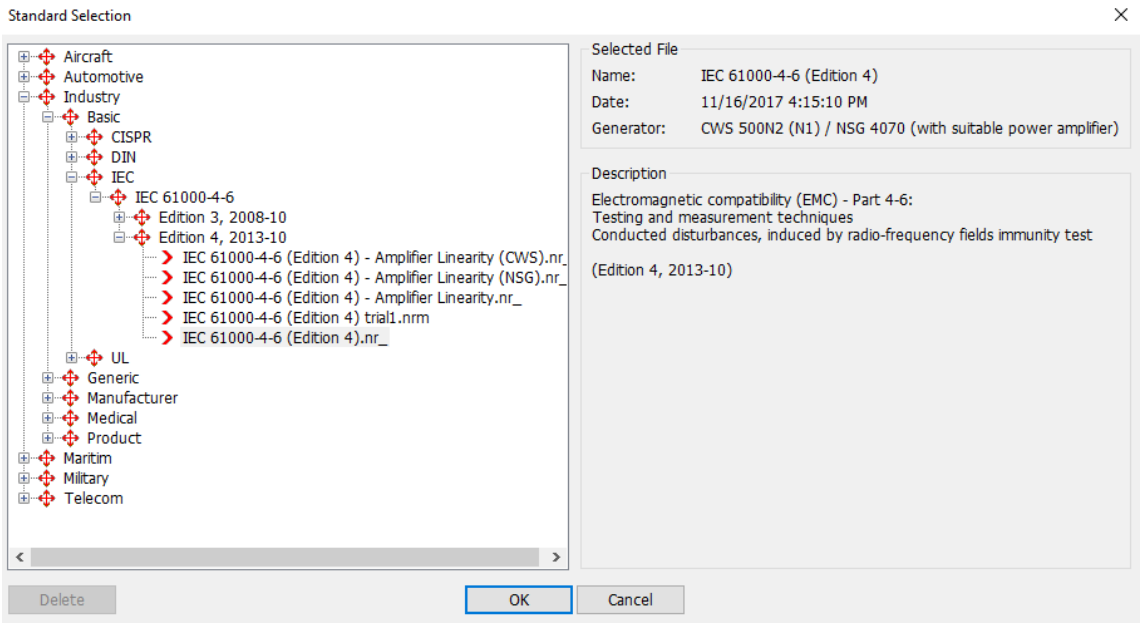


Setup

1. Click on the **Standard Test** button in the toolbar to open the standard manager window.



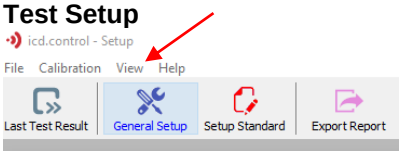
2. Select the desired standard group on the left frame.
   IEC EN / Basic /
   Then the stored standard files of the selected standard appear in the right frame.



3. Select the desired standard **EN 61000-4-6 (Edition 4) .nr** in the right frame.

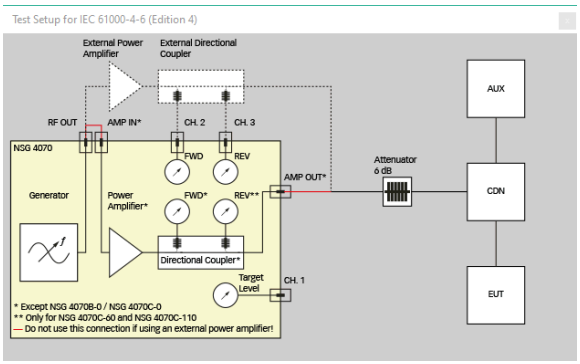
   Click the **OK** button to switch to the test windows.

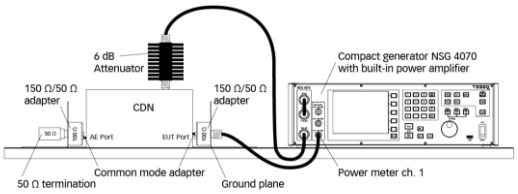
In order to view the test setup, click on **View> Show Test Setup**



- CWS 500N1x / N2 or NSG 4070
- 6dB and 20dB attenuator (as needed)
- CDN coupling decoupling device
- 150/50 Ohm and common mode adapter as required for the coupling device. (R100N)

This setup can also be used for the first calibration. Please look for application notes on the web page for more info on setup.

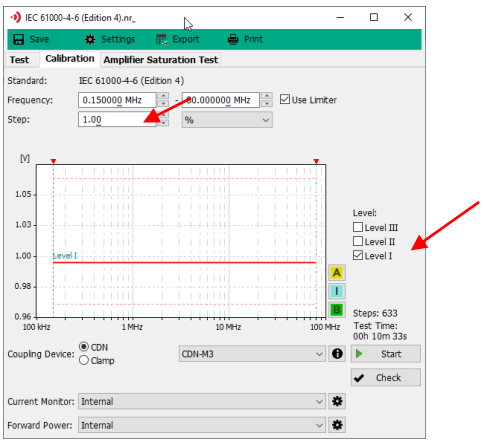




Example of Calibration setup with CDN and NSG 4070 with internal amplifier.

A) Start a level specific attenuation calibration

1. Select **Level I** (1V) in the **Level** array.



2. Select the **Calibration** tab on top of the window.

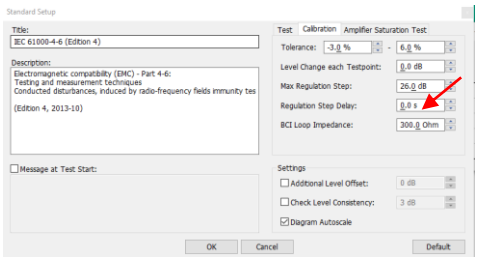
3. Select in the field **Coupling Device** the radio button **CDN** and then the used CDN **M3**.

4. In the **Step** field, you can change the step size for each frequency change.

5. Select the current monitor.
   Select "internal" if using the built-in power meter of CWS 500 or NSG 4070.

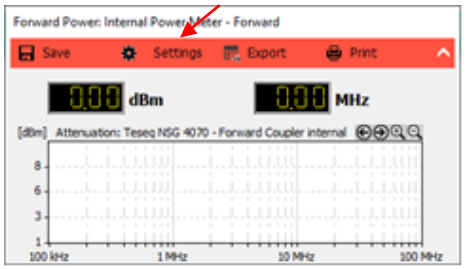
6. Click 

to set the test level setting for the connected hardware.

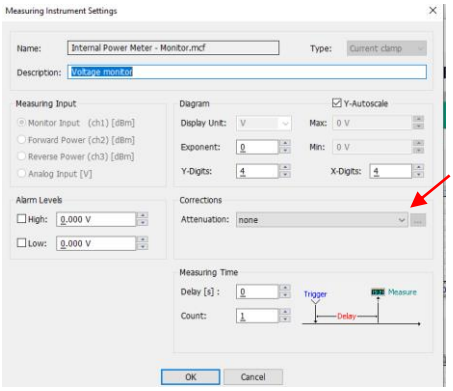


7. In the field, **"Level Change each Testpoint",** a value of, for example, -6 dB, means the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do not usually exist and a value of 0 dB shortens the calibration time. When finished, click **OK**

8. Select the attenuator: In Current Clamp window, a double-click into the diagram or a simple click on the settings symbol  opens the following menus.

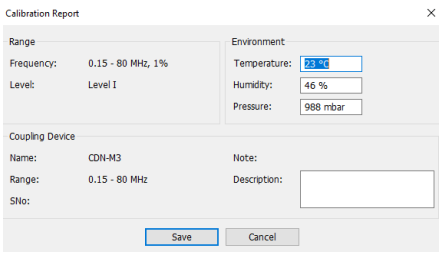


9. Select the file containing the correction data of the attenuator connected on the power meter channel 1 of the NSG 4070, e.g. -20 dB for a 20 dB attenuator. This file can be supplemented with the attenuation values of the connected cable, recommended for long lines. For attenuation values, the software expects a minus sign before the numerical value. Clicking on the icon  opens the file. No attenuator was set for this example. Click **OK**.
   Similarly, double clicking on the "Internal Power Meter-Forward" will allow to set up the settings for the Forward Power Meter Coupler used (see also Sec 3.2.1). When finished, click **OK.**



10. In case of external amplifier, see section 6.1.2.3
11. Press the button **Start** to begin calibration.

12. After successful calibration, the operator is prompted to save the file.

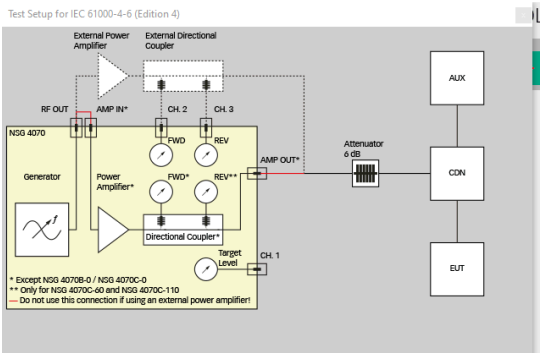


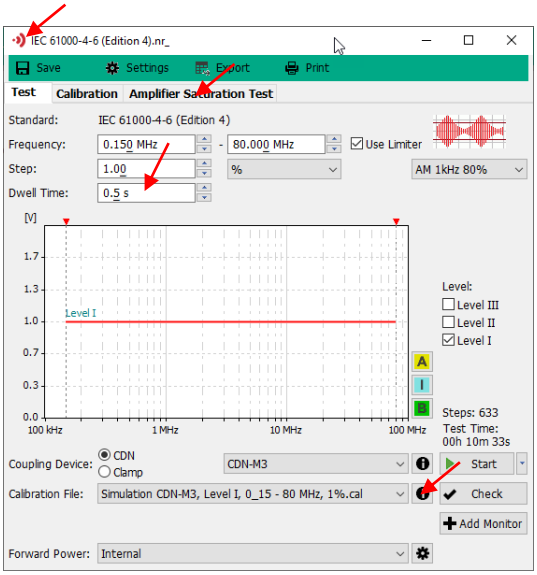
B) Start the test

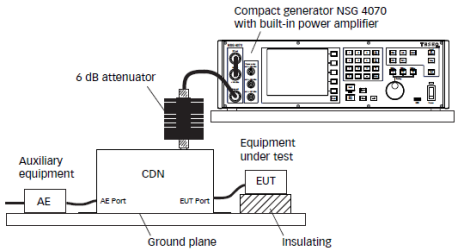
1. **Amplifier Saturation Test** allows you to test the performance of Amplifier and can observe if the Amplifier meets the allowed 5 dB tolerance level. The standard describes the following: If the difference is between 3,1 dB and 7,1 dB then the amplifier is in tolerance and the test system is sufficient for testing at the selected test level. If the difference is less than 3,1 dB or more than 7,1 dB then the amplifier is non linear and is not suitable for testing.

2. Immediately after calibration and saving the results, the program enters the test mode. Make sure the tab **Test** on top of the window is active.

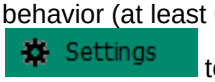
3. As it was done during Calibration, the test setup can be viewed by clicking on "**View**" -> "**Show Test Setup"**







Example of Test Setup with CDN for NSG 4070 and internal amplifier.

4. Select **Dwell Time** for the duration for one cycle of DUT behavior (at least 0.3s).
5. Click 

to set the test level settings for the connected hardware.
6. In the field, **"Level Change each Testpoint",** the test level can be changed e.g., -6dB.

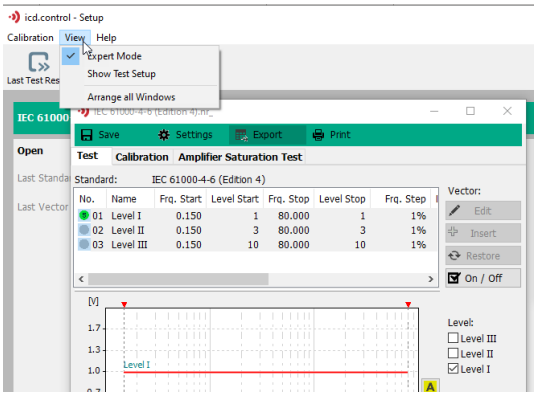
7. Press OK and select the **Test** tab below the diagram.

8. Choose a **Calibration File**. immediately after calibration and saving the results, this file is used for the test. If necessary, select another calibration file. Click on the "**i"** icon to display the content.

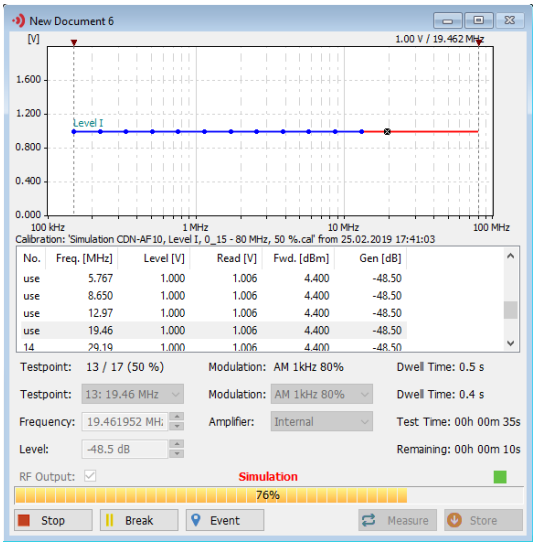
9. **"Expert Mode"** allows the user to change the test criteria as may be needed for the test.

10. In case of external amplifier, see section 6.1.2.3

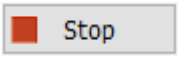
11. Press **Start** to begin the test procedure.



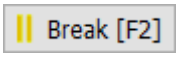
A test with 1s dwell time and 1% frequency step needs approx. 12-15 minutes.



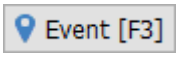
Use following buttons:



to stop the test.



for break.

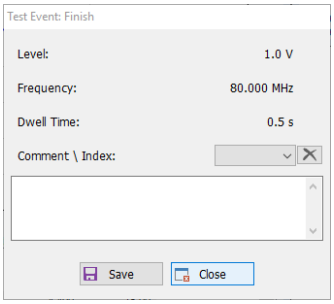


for an event.

Monitor window allows you to see parameters at each step

More information about the function see next chapters.

At the end of the test the finish window appears.

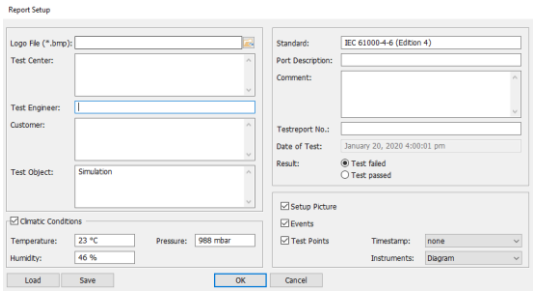


12. Enter a comment for the test complete documentation.

13. Press **Save** to save the test.

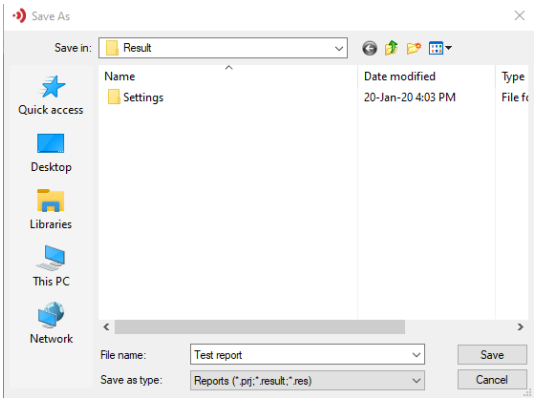
14. The selected report settings can be changed, saved or overwritten by loading another .rep file.

    Report setting files contains following data:
    - Company logo (max. 256 color .bmp file)
    - Test center and test engineer
    - Customer name and address
    - Tested object
    - Used standard
    - Result with comment
    - Climatic conditions
    - Visible elements for the report

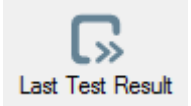


Confirm with **OK**.

15. Save the test under a given name.
    The file will be saved with the extension .prj.



16. The test result file will be quickly available by pressing **Last Result**.



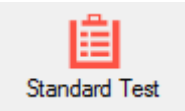
Report functions refer chapter **Viewing the results**
.

3.2.2. Standard BCI Test as per ISO 11452-4

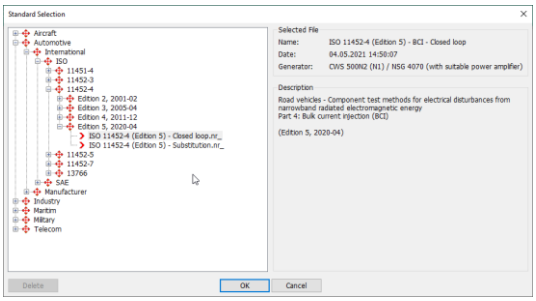
The following pages describes how to proceed a ISO 11452-4 BCI standard test with a closed loop application. For detailed screen information, please refer to the separate chapters.

Setup

1. Click on the **Standard Test** button in the toolbar to open the standard manager window.



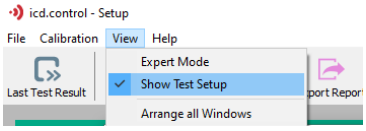
2. Select the desired standard group on the left frame. **Automotive / International / ISO / 11452-4 / Edition 5 / Closed Loop**
   Then the stored standard files of the selected standard appear in the right frame.

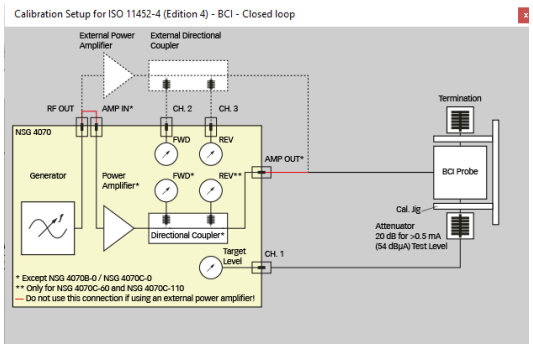


3. Select the desired standard **ISO 11452-4 (Edition 5) BCI - Closed loop.nr_** in the right frame.

4. Click the **open** button to switch to the test window.

For this first test we propose to use the following test setup as shown in the figure (as example) :
In order to view the test setup, click on **View> Show Test Setup** and you will see the diagram on right**.**





This setup can also be used for the first calibration.

See also available application notes on the web related to signal generator e.g., NSG 4070C

Proceed the setup and calibration procedure

1. Select **Level I** in the **Level** array.

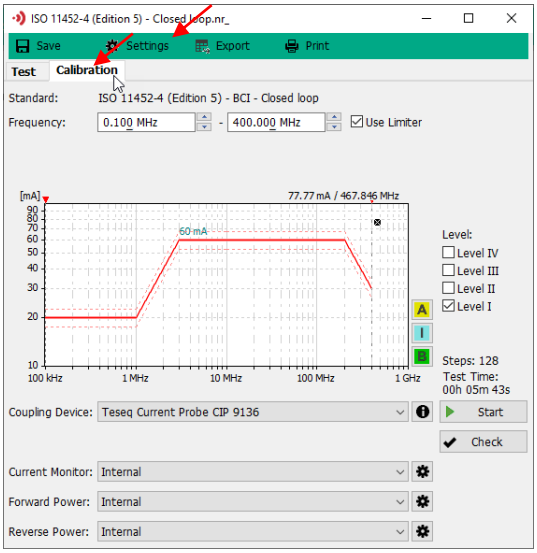
2. Select the **Calibration** tab below the diagram.

3. Select in the field **Coupling Device** the injection clamp model.

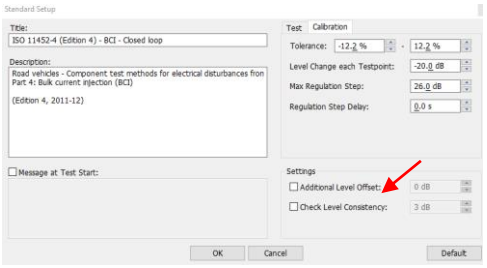
4. In order to change test parameters, click on 

and in calibration tab, you can adjust as needed. With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do not usually exist and a value of 0 dB shortens the calibration time.

5. Press OK to save settings
6. In order to change the setting of power meters, click on settings icon in the following window or simply double click on the graphs.

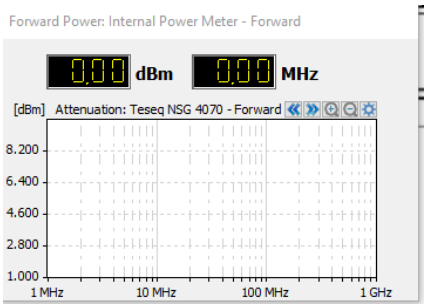


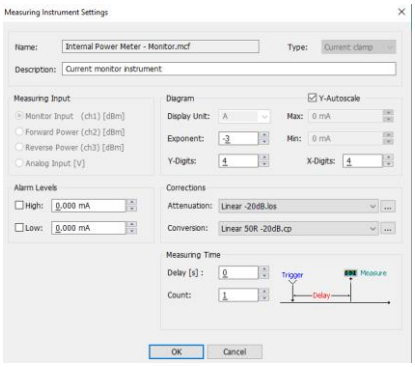
7. In the Measuring Instrument Settings (as shown on right). In the field **Attenuation**, select the file containing the correction data of the attenuator connected on the power meter channel 1 of the NSG 4070, e.g. -20 dB for a 20 dB attenuator. This file can be supplemented with the attenuation values of the connected cable, recommended for long lines. For attenuation values, the software expects a minus sign before the numerical value. Clicking on the ... icon opens the file.



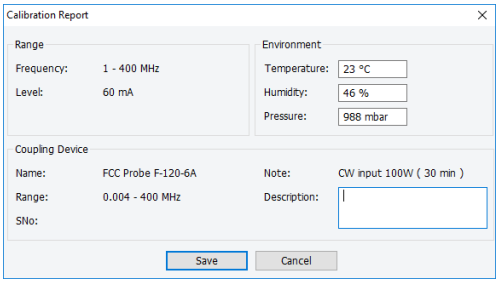
8. In **Conversion** field, Select the file which allows the correction data for current measurement in the 50 ohm jig, e.g. Linear 50R.cp. Clicking on the ... icon opens the file. Click **OK** to save settings.

9. Press **Start** to begin calibration.



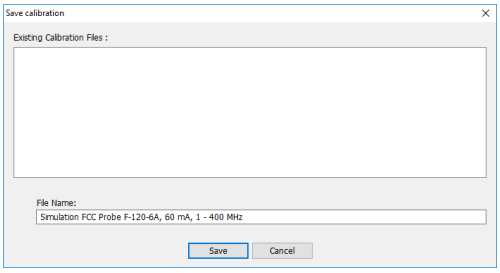


10. Enter a description and the ambient parameter and press **Save**.

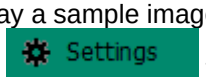


11. The icd.control will make a proposal for the calibration file name.

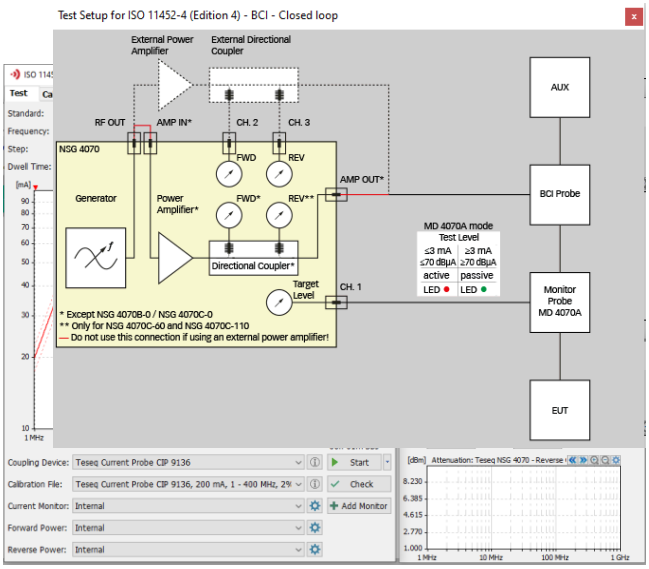
12. Press **Save**.



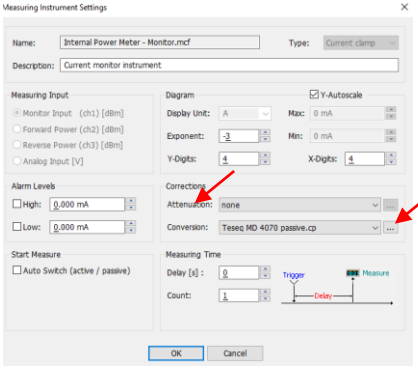
Start the test (Closed loop method)

1. Immediately after calibration and saving the results, the program enters the Test mode.
2. Select “**View**“ and “**Show Test Setup**“ to display a sample image for the test setup.
3. Click 

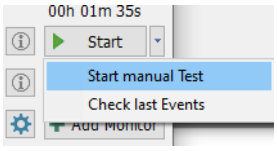
to set the test level change setting for the connected hardware.
4. In the field, **“Level Change each Testpoint”,** the test level can be changed e.g., -6dB. Also, the Max Power level can be set above the calibrated power.



5. Select the **Test** tab below the diagram.
6. Choose a **Calibration File**. Immediately after calibration and saving the results, this file is used for the test. If necessary, select another calibration file. Click on the “**i”** icon to display the content.
7. A double click into the diagram of “ **Current clamp**” or a simple click on the settings symbol opens the following menu for selecting the MD 4070. After selecting the right options, click “**OK**”



8. Select **Dwell Time** for the duration for one cycle of DUT behavior (as needed by standard).
9. Select the **Test** tab below the diagram.
10. Choose a **Calibration File**.
11. Press **Start** to begin the test procedure. For Manual start, click on down arrow next to **Start** and select as shown on right side.



12. The test starts after a short process.

The topical test point:

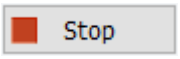
FWD, REW and Net power:

Test bench transfer impedance: Shows the current impedance of the test setup. A value of 100 ohms represents the same ratios as previously calibrated. Values above 100 ohms increase the output power up to a limit of four times the calibrated power.

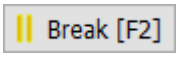
Point table of calibration file:

Frequency, level and test point, duration:

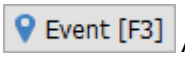
13. Use following buttons



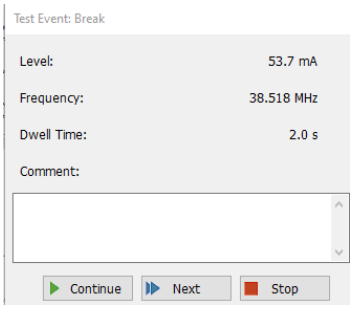
to stop the test.



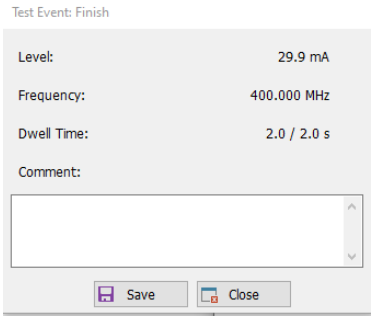
to break.



Allows you to place a marker to indicate an event during testing.



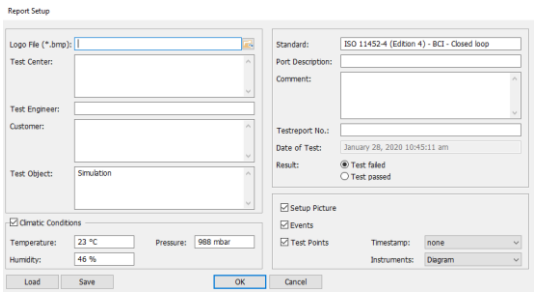
At the end of the test the stop window appears.



14. Enter a comment for the test complete documentation.

15. Press **Save** to save the test for using the data in a report.

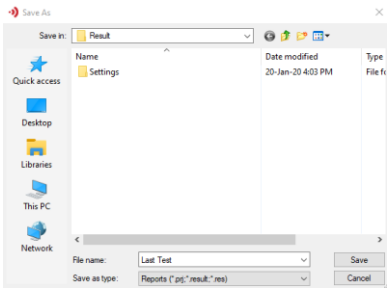
16. The selected report settings can be changed, saved or overwritten by loading another .rep file.



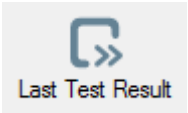
Report setting files contains following data:
- Company logo (max. 256 color .bmp file)
- Test center and test engineer
- Customer name and address
- Tested object
- Used standard
- Result with comment
- Climatic conditions
- Visible elements for the report

17. Confirm with **OK**.

18. Save the test under any name.
The file will be saved with the extension .prj.



19. The test result file will be quickly available by pressing **Last Result**.

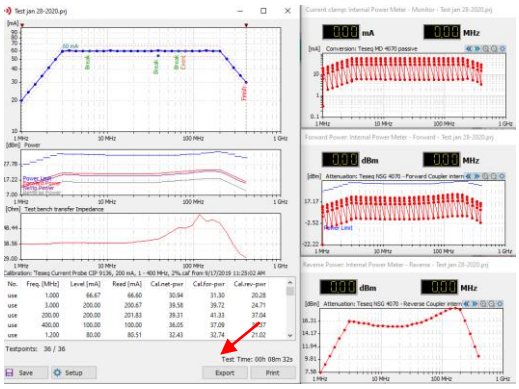


Report functions refer chapter **Viewing the results**

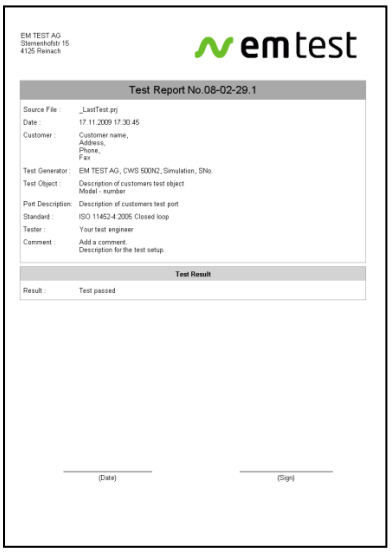
Viewing the results

1. The viewer window will open and shows the following windows:
   - Test report window including:
     - The topical test points.
     - The graph with the power and the indicated power limit.
     - The EUT impedance characteristic.
   - Instrument panels with the measured values.

   Within the test point diagram, you can ask for a frequency and voltage on the topical cursor position by clicking the left mouse-key.



2. To create a report, press **Export** for direct save into a pdf or rtf file.
   To open a report preview window for printing press **Preview Report**. Reports can be saved into pdf or rtf files in the report preview, too.



EM TEST AG
Sternenholzstr 15
4125 Reinach

emtest

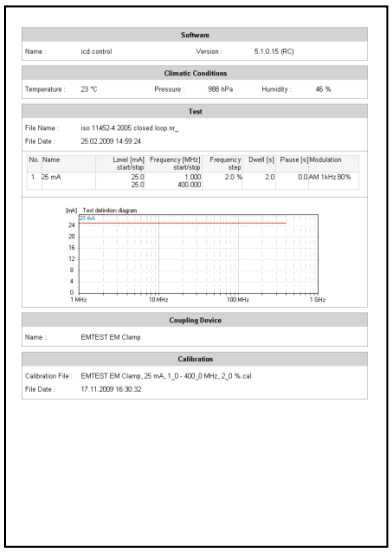
Test Report No.08-02-29.1

Source File :	_LastTest.prj
Date :	17.11.2009 17:30:45
Customer :	Customer name, Address, Phone, Fax :
Test Generator :	EM TEST AG, CWS 500N2, Simulation, SNo.
Test Object :	Description of customers test object Model - number
Port Description :	Description of customers test port
Standard :	ISO 11452-4:2005 Closed loop
Tester :	Your test engineer
Comment :	Add a comment. Description for the test setup.

Test Result

Result :	Test passed

(Date) (Sign)



Software

Name : icd.control Version : 5.1.0.15 (RC)

Climatic Conditions

Temperature : 23 °C Pressure : 988 hPa Humidity : 46 %

Test

File Name : iso 11452-4 2005 closed loop.nr_
File Date : 25.02.2009 14:59:24

No.	Name	Level [mA] start/stop	Frequency [MHz] start/stop	Frequency step	Dwell [s]	Pause [s]	Modulation
1	25 mA	25.0 25.0	1.000 400.000	2.0 %	2.0	0.0	AM 1kHz 80%

[mA] Test definition diagram

25 mA

Coupling Device

Name : EMTEST EM Clamp

Calibration

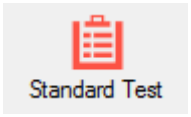
Calibration File : EMTEST EM Clamp_25 mA_1_0 - 400_0 MHz_2_0 % cal
File Date : 17.11.2009 16:30:32

3.2.3. Magnetic Field Test as per ISO 11452-8

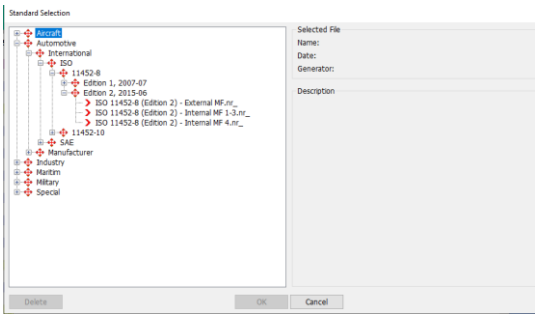
The following pages describes how to proceed a H-Field ISO 11452-8 standard test with a radiation loop coil. For detailed screen information please refer to the separate chapters.
Magnetic Field Test as per ISO 11452-8

Setup

1. Click on the **Standard Test** button in the toolbar to open the standard manager window.



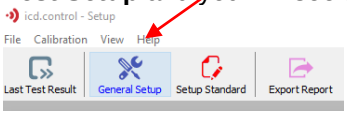
2. Select the desired standard group on the **left** window.
   Automotive / International / ISO/ 11452-8 / Edition 2, 2016-06
   On the right side the stored standard files of the selected standard appear.



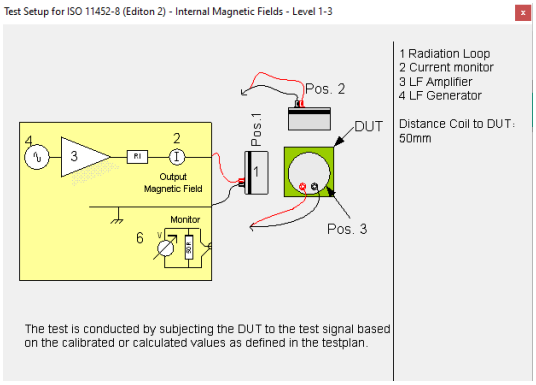
4. Select the desired standard
   ISO 11452-8 (Edition 2) Internal-1-3.nr_ on the right side of the window.

5. Click to the **open** button for change to the test windows.

For the first test we propose to use the following test setup as shown in the figure (as a example) :
In order to view the test setup, click on **View> Show Test Setup** and you will see the diagram on right.

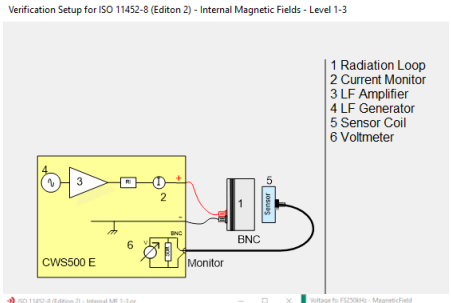


- CWS 500N3
- Radiating loop
- Radiating loop sensor



Proceed the setup and calibration procedure

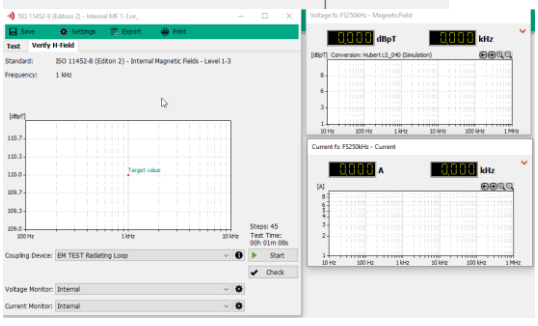
6. Connect the **Radiation loop** together with **the Sensor loop** and connect the measuring cable to the BNC monitor input plug.



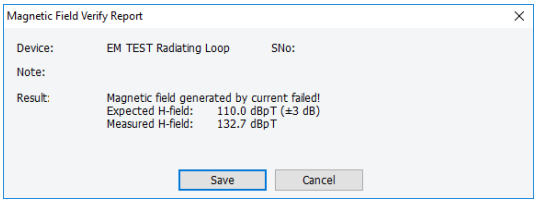
7. Select to the **Verify H-Field** tab below of the diagram to perform a verification.

8. Click to the **Start** button to begin the verification.

9. The message box appears who informs, that the supply power line will be switched off. Disconnect the DUT if you are running a calibration.

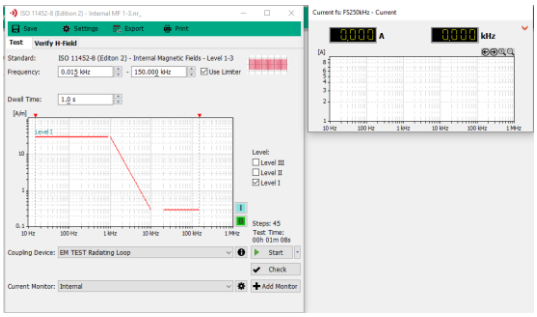


10. A window with this verification result appears. Click the **Save** button. icd.control makes a proposal for the filename.



Start the test

1. Click on the tab **Test and** Select **Level I** in the **Level** array.



2. Select in the field **Coupling Device** the antenna model.

3. Select the **Current Instrument**.

Press **Start** to begin test.

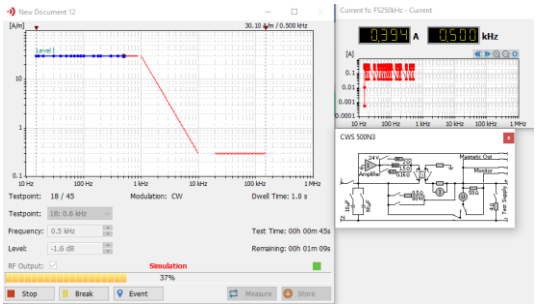
The test will be started after a short process.

During this process a diagram-window with the CWS 500N3 settings opens on display.

The topical test point will be shown in the main diagram.

Frequency, level and test point number will be shown in the bottom status line.

At the right side is the current instrument

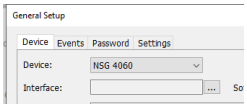


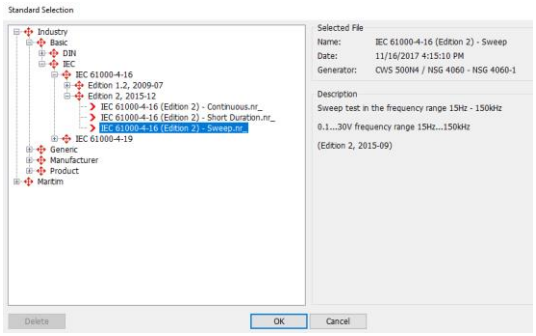
3.2.4. Frequency Sweep Test as per IEC 61000-4-16

The following pages describes how to proceed a Sweep IEC 61000-4-16 standard test.

Setup

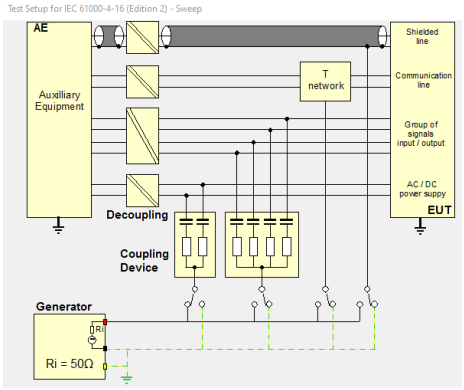
For the first test we propose to use the following test setup as shown in the figure (as an example).
As explained in the tests above, choose the right Signal Generator, e.g., NSG 4060 in the



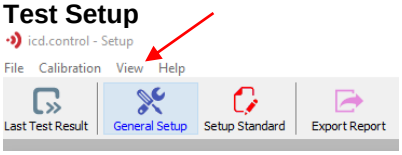


Select right coupling e.g. NSG 4060-1. See picture in 4.1

1. Click on the **Standard Test** button in the toolbar to open the standard manager window.
2. Select the desired standard group on the **left** window.
   Basic / IEC / IEC 61000-4-16 / Edition 2, 2015-12
   On the right side the stored standard files of the selected standard appears.
3. Select the desired standard
   IEC 61000-4-16 (Edition 2) - Sweep.nr_ on the right side of the window.
4. Click to the **open** button for change to the test windows.

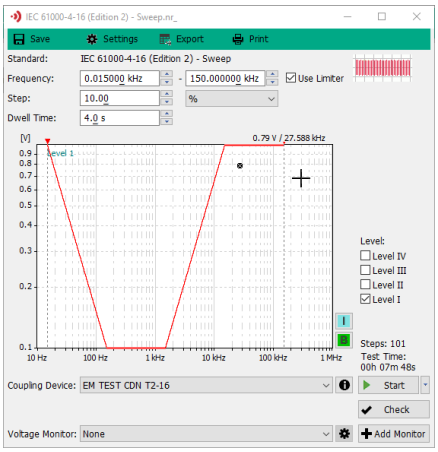


In order to view the test setup, click on **View> Show Test Setup**



Start the test

1. Select **Level I** in the **Level** array.
2. Select in the field **Coupling Device** the CN model.
3. Press **Start** to begin test.

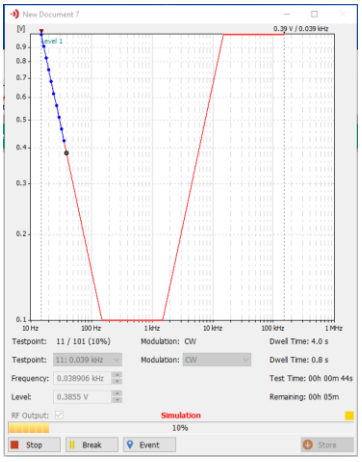


The test will be started after a short process.

During this process a diagram window opens on display.

The topical test point will be shown in the main diagram.

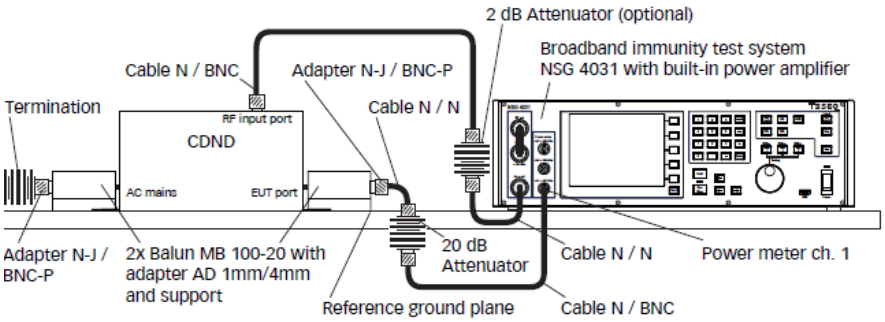
Frequency, level and test point number will be shown in the bottom status line.



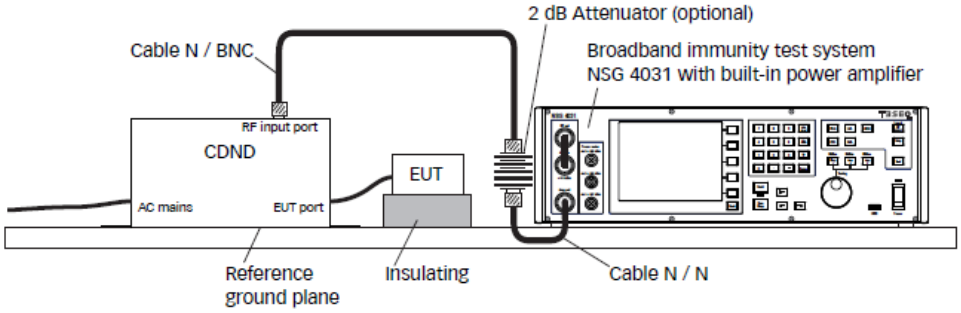
3.2.5. NSG 4031 testing for the IEC 61000-4-31

This chapter describes the testing procedure of NSG 4031 with icd control software.

Before the test, if the equipment must be calibrated by using the following level setting process. The picture shows the NSG 4031 with build in power amplifier. Calibration is recommended to be done on the device.

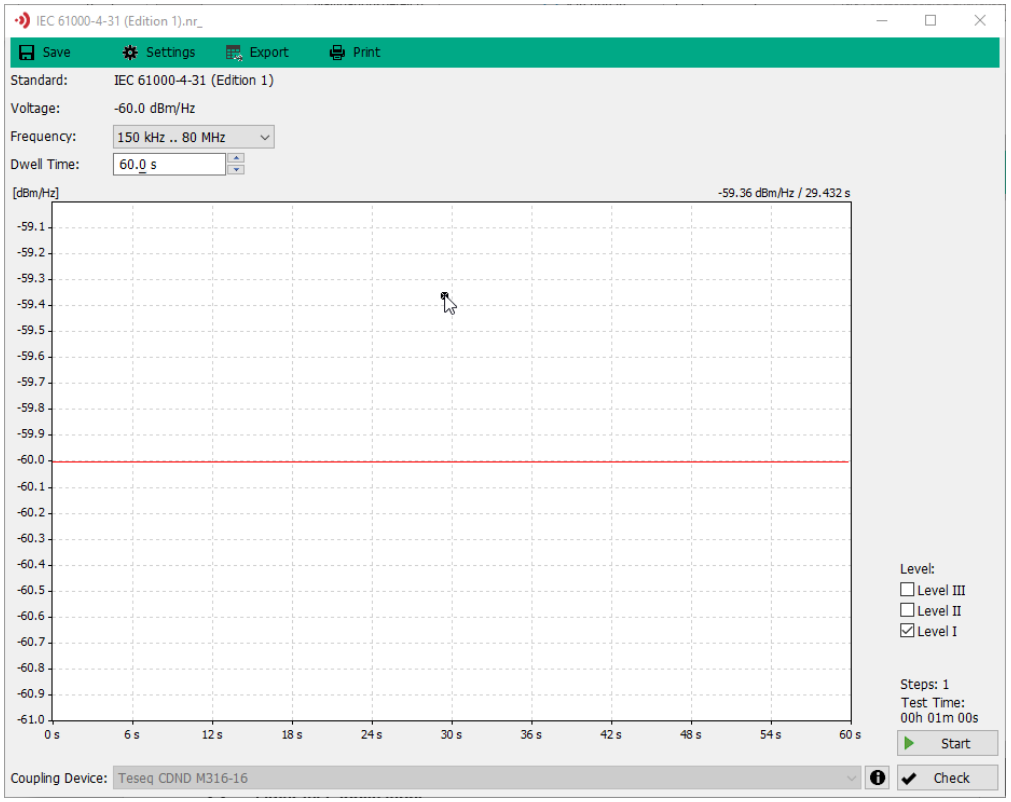


For testing, the following test set up is applied after calibration.



As first step, start the icd control software, select the NSG 4031 under the Device option of **General Setup.** Then choose the correct standard under the **Standard Test** option.

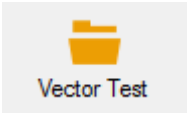
1) Select the Frequeny range for the test
2) Choose the Dwell time
3) Select the required Level
4) The coupling device is selected by defaul
5) Click on **Start** .
6) After the test is finished click on **Save** to store the results.



3.3. Other test applications

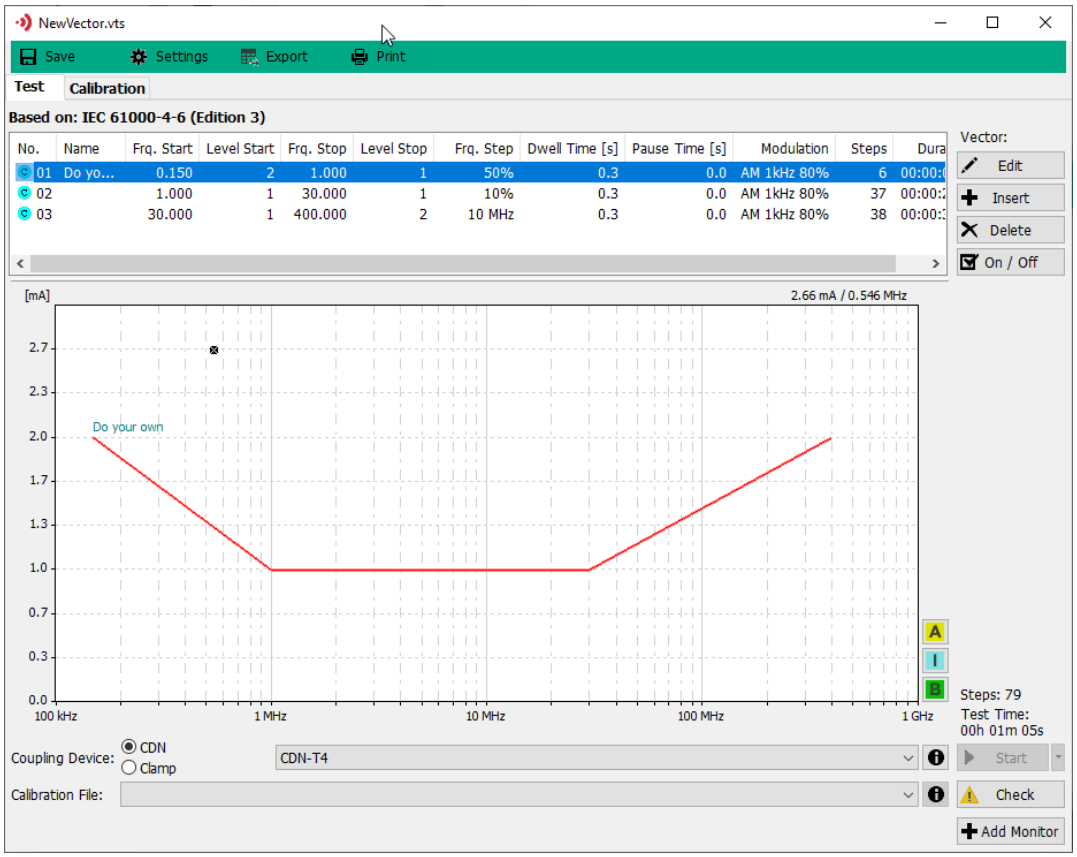
3.3.1. Vector test

1. Click on the **Vector Test** button in the toolbar to open the vector editor window.



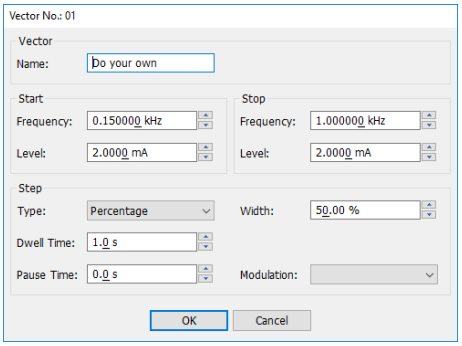
2. The insert window for the definition of the test process parameters appears.

   The vector test is always based on the active standard displayed in the window and on the bottom of the icd.control desktop. Another reference standard can be selected with the standard manager.

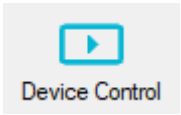


3. Change the test parameters by **Edit** or **Insert**.

Note: At least one Vector must be active, so it can be shown in the diagram and be used for the test. Switch on the option field **Enabled**.

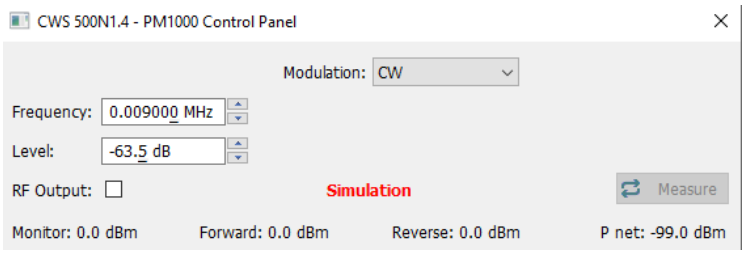


3.3.2. Device Control Panel

1. 

Click on the button *Device Control* on the menu bar.

2. The window with the panel for manual control appears.
3. In manual operating mode the user can operate the selected device

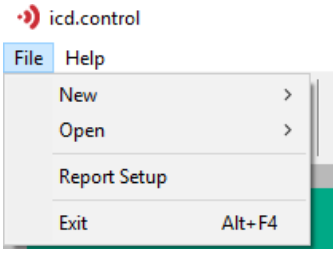


Restrictions by operating with the Device Control Panel:

- The panel does not use any calibration file of a coupling device.
- The measured instrument value is not matched with a transfer impedance of the measuring device.

4. File

The setup menu offers different menus for configuring the software to the system. The configuration is available on the main desktop.



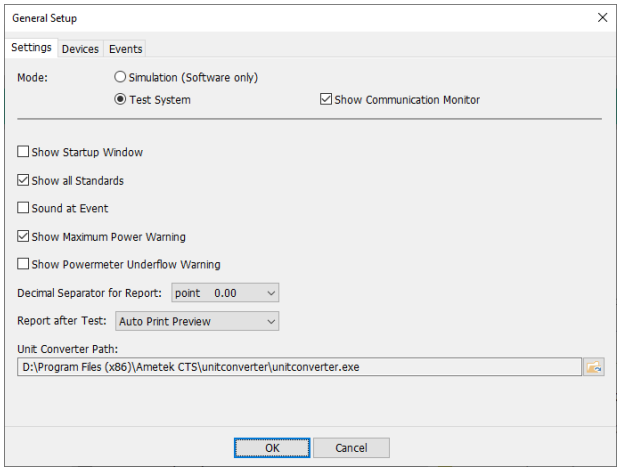
New:	Lets the user to create new configuration files such as report settings, coupling device, instruments, attenuation and correction files
Open:	opens existing configuration files for editing.
Report Setup:	Opens the report setup
Exit:	Closes the software

4.1. General Setup

The configuration fixes the basic adjustments of icd.control. It can only be activated if there is no test window open. The configuration dialogue creates a file with the name icdcontrol.ini in the installation directory.

Choose the topic of interest from the list. With the first start this will be the topic “Settings”.

Settings
Device
Events

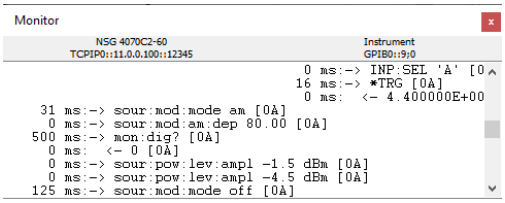


4.1.1. Settings

Mode:
When opening a test file, icd.control tests whether the communication with an attached instrument is possible. In case that icd.control finds no instrument it switches automatically to the operating mode ”Simulation”.

Simulation:
You can simulate the icd.control without a connected instrument. Of course, all the functions which are based on a connected instrument are not available anymore, i.e. the loading of calibrations files.
Test System:
The icd.control communicates with the connected generator.

Show Communication Monitor:
Enables or disables the interface monitor. The monitor is a helpful tool for interface analysis in case of troubleshooting. The window size can be adjusted as needed.



Show Startup Window:
If this option is enabled the icd.control opens the Startup Window every time when the icd.control starts.

Show all Standards:
If this option is disabled (recommend) the Standard Manager shows you only the appropriate standards to the selected generator.
If this option is enabled all available standards will be displayed.

Sound at Event:
As soon as the test is finished, an acoustic signal will be given (Fail, Stop and Limit).

Show Powermeter Underflow Warning (CWS500x only):
Should the expected measuring signal be lower than the specified noise floor of the power meter a warning will appear to prevent of wrong measurements.

Show Maximum Power Warning:
If the generator reaches its maximum power the icd.control shows a warning message, which can be suppressed by this option.

Report after Test:
Will configure the behavior of the report after the test.
There are three possible settings:

- *Open manually*
  After the test has finished the test window will be closed and the report has to be opened manually from the menu bar.

- *Auto Print Preview*
  After finishing the test a window will open which shows the print preview.

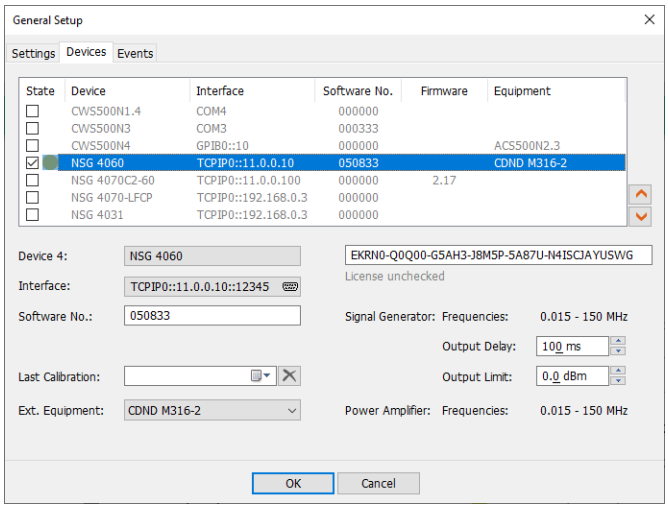
- *Auto Export to PDF/RTF*
  The report will be automatically exported to a PDF or RTF file. A dialog will appear to enter the desired file path.

Unit Calculator Path:

Press to the field  to find the path the desired Unit Calculator. This program will be executed if the menu entry Help -> unit.converter is pressed.

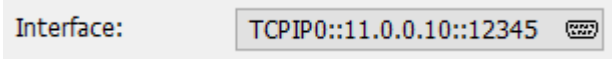
4.1.2. Device

Click on drop down under **Device** and Select the correct generator from the device list.



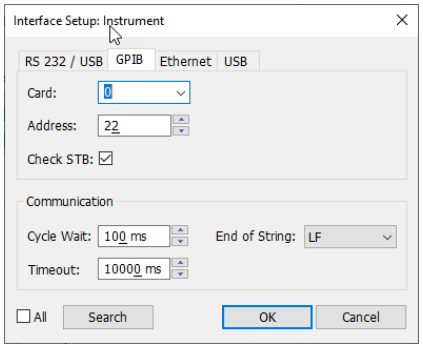
Interface

Shows information's about the actual configured communication interface.



Setup:

A click on the button "  " opens the Interface Setup window. An example of Interface setup for NSG 4070C is shown on the right side.



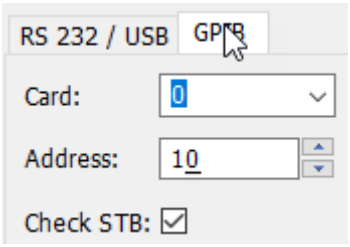
Definition of the communication interface GPIB, USB/RS232, Ethernet, USB.

GPIB:
If you run an IEEE 488-card in your computer, choose this set-up. The IEEE address will be set in the Device setup screen.
Test the correct function of your IEEE-card using the analysis tools attached by the manufacturer of the card. (Hardware and software test program).

USB/RS 232:
USB communication or RS232 communication through a 9-pole cable, not crossed.
Using the USB/RS 232 interface the selected COM port and baud rate will be displayed.

Ethernet:
Communication through a Ethernet cable.

IEEE setup:
Actually, EM TEST supports the cards manufactured by **National Instruments**.

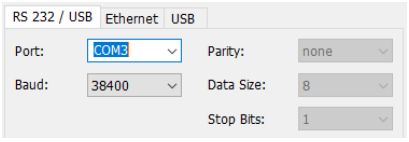


The option **Check STB** (Status Bit) allows an efficient communication (not supported by all devices)

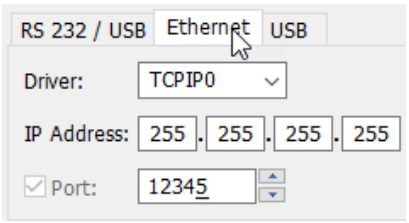
Card configures the corresponding card address of the installed National Instruments GPIB adapter. The actual address may be obtained from the National Instruments card driver configuration software “Measurement & Automation Explorer”.

Device address by using a IEEE-488 card.
Enter the correct IEEE-address of your Generator. Values from 1 to 30 are allowed.

USB / RS232 setup:
Interface COM: Choose the used COM interface.
Baud rate: Make sure that the baud rate in the Generator corresponds to the one set in the icd.control.



Additionally, the **Parity** Bit, **Data size** and number of **Stop Bits** can be set.
Ethernet setup:
Select the used Ethernet protocol TCPIP.
IP Address: Choose the IP address of the generator.



User with more than one generator
The icd.control Software can handle different generators. The different generators can be connected to the same IEEE interface network, but only one generator can be served. For change the model select the model in the device setup. After change the generator model exit and restart the icd.control software.

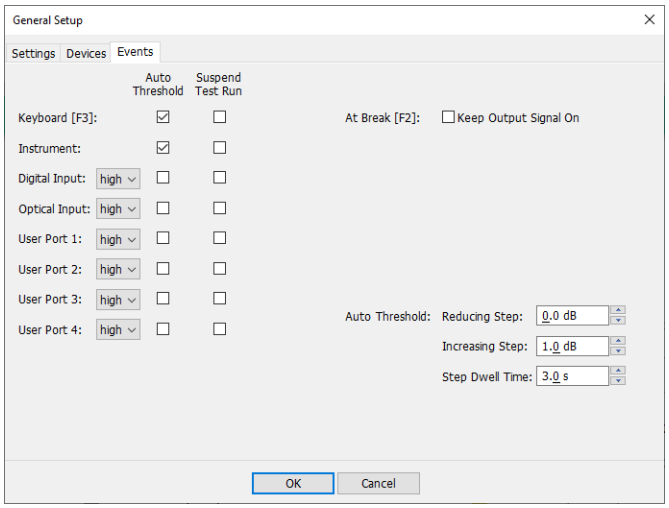
Serial number
Serial number is only used for the report.

4.1.2.1. License

The license field was explained earlier in the icd software setup section.

4.1.3. Events

Defines the reaction of icd.control in case of a hardware Fail2 or software Trigger. An example on right side is shown for NSG 4070C



Suspend Test Run
If you check this box, the test will stop at all those events. Otherwise, the test will continue as by defined parameters.

Auto Threshold (reducing step: -3dB / Increasing Step +1dB):
If the **Auto Threshold** value is set, then at the occurrence of a Trigger event, the output will be reduced by -3dB steps till the fail disappears or the output level reaches the minimum power. Thereafter the output will increase till the fail2 will appear again. Then icd.control will continue with the next step frequency with the original set output level.

After each Fail2/Trigger, icd.control continues with one of the following procedure:

Continue: The test frequency will be changed to next test point.

Repeat: The actual test point will be repeated.

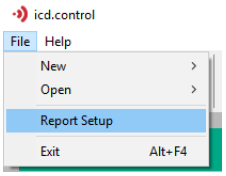
Stop: The test will be stopped. The stop dialogue appears.

If the parameter **Reducing Step** is set to 0, then if a trigger is occurred the next frequency will be tested directly.

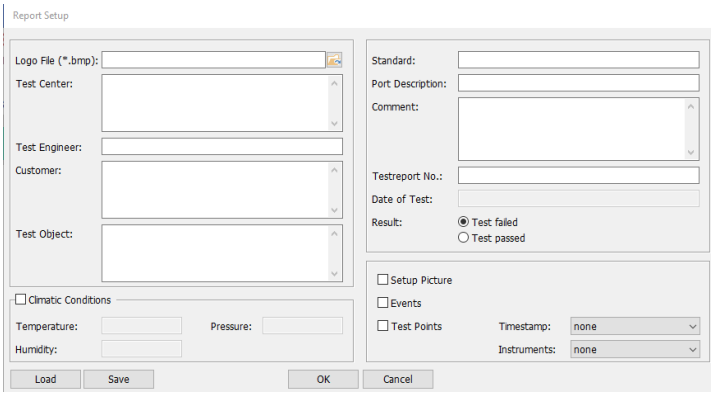
4.2. Report Settings

The standard report configuration has the advantage for fill out all standard forms of the automatic generated report. This will save a lot of time to generate the reports in future.

Choose menu ***File -> Report Setup***



This will open the form for enter the default report information. Fill out the blank fields if there is always the same entry.



Logo File: Company logo for print on the first page. File must be in the BMP format.

Test Center: Address of the test house

Test Engineer: Name of the person who is responsible for the test.

Customer: Customer Address

Test Object: Test object description

Standard: Normally the applied standard is automatic insert into the report.

Port Description: The description of the EUT port.

Comment: Comment to the test

Testreport No: May be the first letters of the report number (date). After the test the user can complete the report number.

Date of Test: This field will be automatic set from the computer internal date and time.

Result: Default setting will be automatically overtaken in each report.

Temperature: Actual temperature

Humidity: Actual humidity

Pressure: Actual pressure

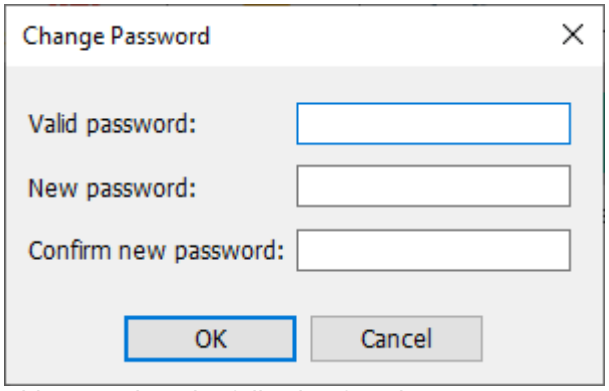
Setup Picture: If activated, a picture of the test setup will be inserted into the report.

Events: If activated, the events may be occurred during test will be listed in the report.

Test Points: If activated, a list of each test point will be inserted into the report.

Instruments: Allows option to show the instrument values in different ways.

4.3. Password Setup



This setup has the following functions:
- Change of the password
- Enable/ disable the Password dialogue at the startup

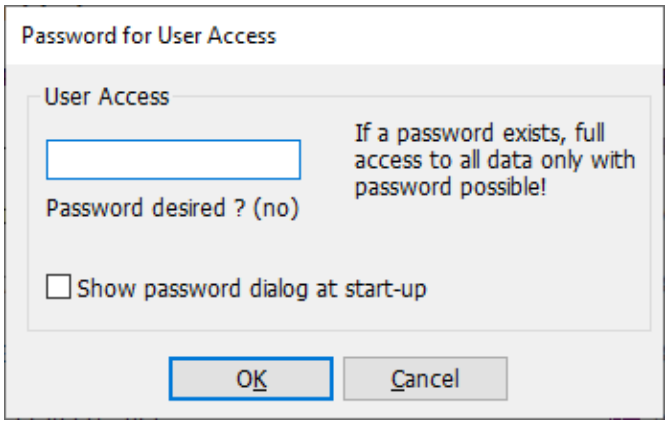
Using a password can protect to overwrite test files.

Number of Passwords:	There can be used only one password.
Procedure:	Once the full access mode is protected by a password you must use this password at the beginning of each full access session. In the other case the software continues working in the low access mode.
Full access mode:	Changing and saving all files is possible. A password is merely wanted, when defined before. In case there is a password defined and not entered, only the low access mode will be accessible.
Reduced access mode:	(Low Access): Test- and calibration files cannot be saved. All other functions for testing are available.
Forgotten password:	The icd.control software must be newly installed.
Password changes:	The password can only be changed in full access mode in General Setup menu
Disable password:	To disable a password make no entry in the field new password.

Change the password
1. Enter the valid password. If no password exists, press the *Enter* key
2. Enter the new password,
   Press *Enter.*
3. Confirm the same password; Press *OK*

4.3.1. Password Setup

Show Password dialogue at start-up switches the password log-in dialogue on or off when starting the icd.control software.



4.4. Measure Instrument

see chapter 8

4.5. Attenuation File

The attenuation is the decrease in transmitted signal power resulting from the insertion of a cable or used attenuators. It is usually expressed relative to the signal power delivered to that same part before insertion. Insertion loss is usually expressed in decibels (dB).
A certain amount of signal will be lost as it travels through coaxial cable. This loss is dependent on two factors: the type of cable used, and the frequency of the signal being carried. Losses are greater at higher frequencies; therefore loss compensation should be made at frequencies higher than 200MHz.

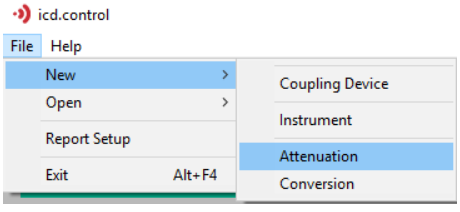
icd.control software compensate the insertion loss in the measuring cable in function of the frequency. The insertion loss of a measuring cable is stored in the insertion loss file *.los.

4.5.1. Create a new Attenuation File with manual data input

1. Select the menu **File / New / Attenuation**

2. An empty window appears, where you have the possibility to enter the insertion loss data of the cable or define used attenuators in front of the measuring channel.

   Format: **xxxx.xxxMHz** **yyy.yydB**



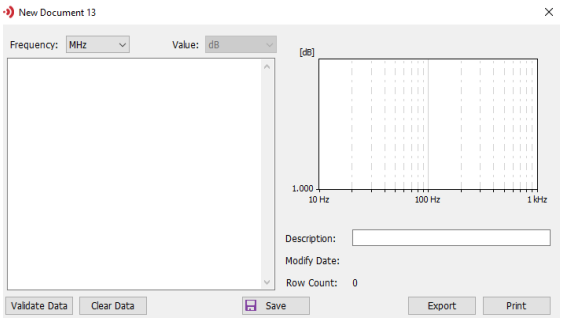
3. Enter the **data** into the table in the following mode:
   Frequency[MHz]; TAB or space; loss value[dB]
   Continue until the list is complete

4. Enter the **Description** (cable type and length)

5. Click to **Validate Data** for drawing the graph in the diagram window.

6. Select the **save icon** and enter the filename

7. The file will be stored with the extension ***.los**



4.5.2. Create a new Attenuation File with data input from txt file

Much easier is to create an insertion loss file from a file like you can get from network analyzers. This file must have the following **data format:**

Frequency [Hz] TAB (as separator) loss value [dB]

Example:

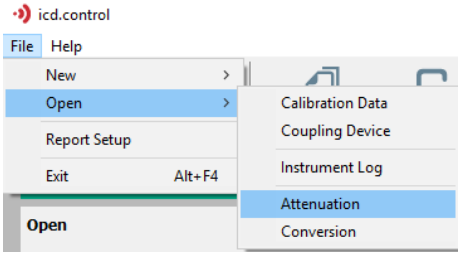
9000	→	-2.97550577670336E-02
9144.9462890625	→	1.83761510998011E-02
9292.2265625	→	1.77272483706474E-02
9441.87890625	→	1.87315847724676E-02
9593.94140625	→	3.77311147749424E-02
9748.4521484375	→	4.12851050496101E-02

..
.

icd.control will automatically convert this data into the correct form

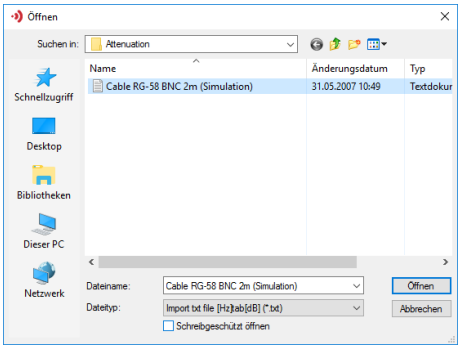
Procedure for make a new attenuation file from a text file

1. Select the menu
   File / Open / Attenuation



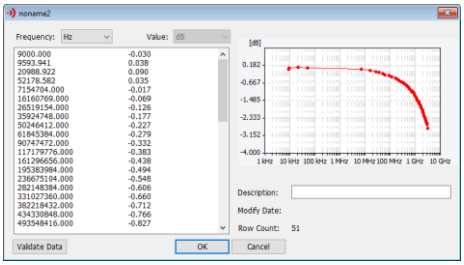
2. Select the filetype: **Import txt file[Hz] tab [S21dB] (*.txt)**
   This file is created by a network analyzer using the parameter S21.

   Note: For more information about the S21 parameter refer to your network analyzer manual.



3. Select the file you like to convert into an insertion loss file.
4. Press open for create the insertion loss file.

A new window opens with the converted data and graphic display.



5. Enter the **Description** (cable type and length).

6. Select the **save icon** and enter the filename.

The file will be stored with the extension ***.los**.

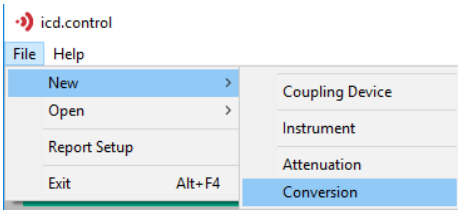
4.6. Setup Conversion

The conversion reflects the frequency behavior of a connected current probe. This data must be taken from the used calibration certificate. icd.control offers a list of current probes, calJig and other sensors. All this data are approximative data from the device used by EM Test/ TESEQ.

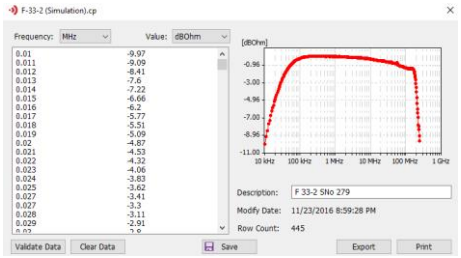
For correct measurement it is mandatory to adjust the installed transfer impedances with the calibrated data from the used probes.

4.6.1. New conversion file

1. Select the menu
   File / New / Conversion

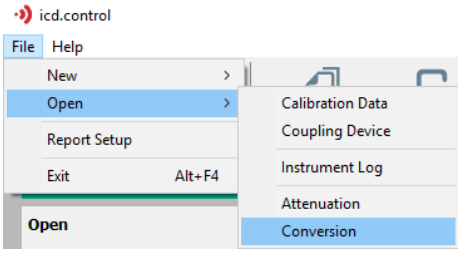


2. Select the **unit** of your frequency steps.
3. Select the **unit** of the transfer impedance
   This unit will be displayed later in the parameter list and as title in the graphic.
4. Enter the **Description** (device and serial number)
5. Enter the **data** into the table in the following mode:
   Frequency [kHz / MHz]; TAB or space; value[unit]
   Continue until the list is complete
6. The file will be stored with the extension ***.cp**

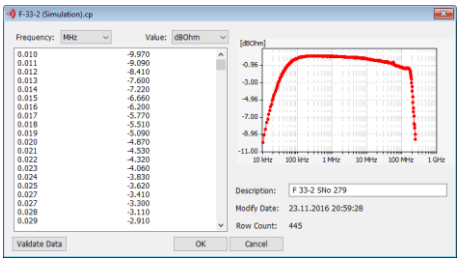


4.6.2. Edit or open a conversion file

1. Select the menu
   File / Open / Conversion
2. **Select** the **transfer impedance file** you like to Open or Edit for modify.



3. **Select** the **transfer impedance file** you like to Open or Edit for modify.
4. **Select** the **parameter** at the desired frequency for modify the value according the **actual used** transfer impedance.
5. Change the **description** if necessary.
6. Select the **save button** and enter the filename and save the file as .cp file



4.7. Setup Coupling Device

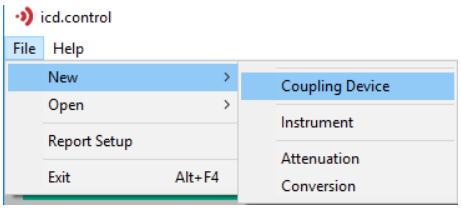
A coupling device file describes the parameters and behavior of each individual coupling device. During a calibration icd.control software takes all information from this file (exception CDN calibration of *.cdn files). Also, the used frequency information for a frequency range check will be taken from this file.
If the user expands the range of used coupling devices it is necessary to make a file with the information about the new coupling device.

There are four different types of coupling devices. The user can separate the type of coupling device from the extension.

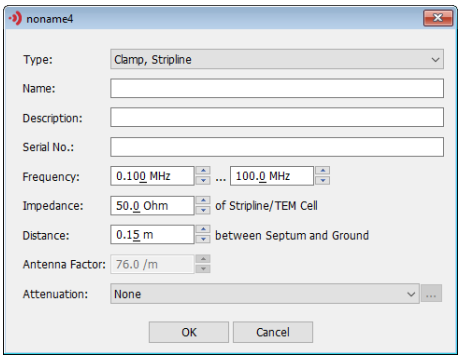
Extension	Coupling device
*.1xx	CDN
*.2xx	Clamp, Striplings, Cells
*.3xx	Devices for CWS 500N3 model
*.4xx	Devices for CWS 500N4 / NSG 4070 model

4.7.1. New coupling device

1. Select the menu
   File / New / Coupling Device



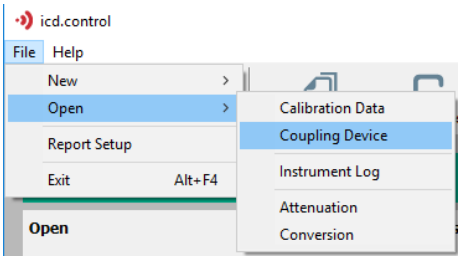
2. Fill in the parameters of the coupling device and safe the file.



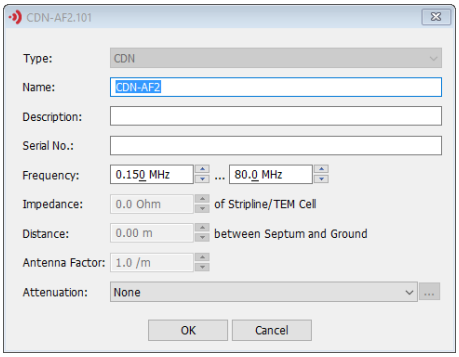
4.7.2. Open coupling device

1. Select the menu
   Setup / Open / Coupling Device

2. Open the coupling device you like to modify.



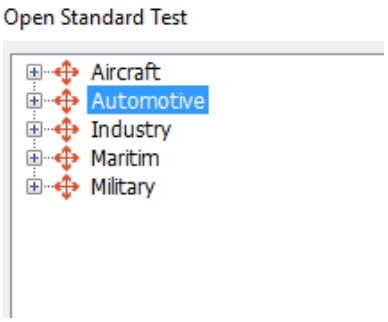
3. Change or modify the parameters of the coupling device and save the file.



5. Standard Tests

The standard tests manager shows all programmed standards you can test with your connected equipment.

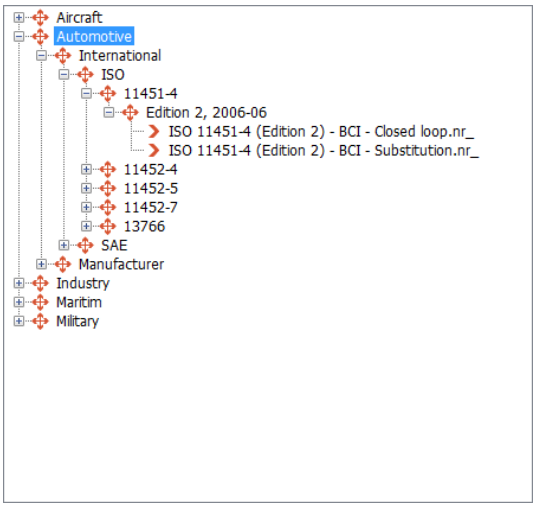
A device specific routine filters the applicable standards for the devices:
- CWS 500 C series
- CWS 500 D
- CWS 500 E
- CWS 500 N1
- CWS 500 N2
- CWS 500 N3
- CWS 500 N4
- NSG 4060
- NSG 4070 series



5.1. Benefit of the standard tests manager

The manager organizes the tree structure of the different standards. It looks like the Windows Explorer but reduces the activities to the necessary one.
The standard tests manager is responsible for the basic setup according to the selected standard.
You can organize your one standard tree according to your demands. It is based on the file and folder structure in the ...\icdcontrol\Standard\ directory. For creating folders or copying files between folders, you should use a file manager.

I.e. you can create folders with the necessary test's for all of your Product's.

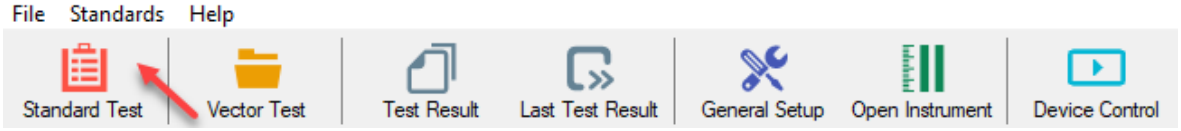


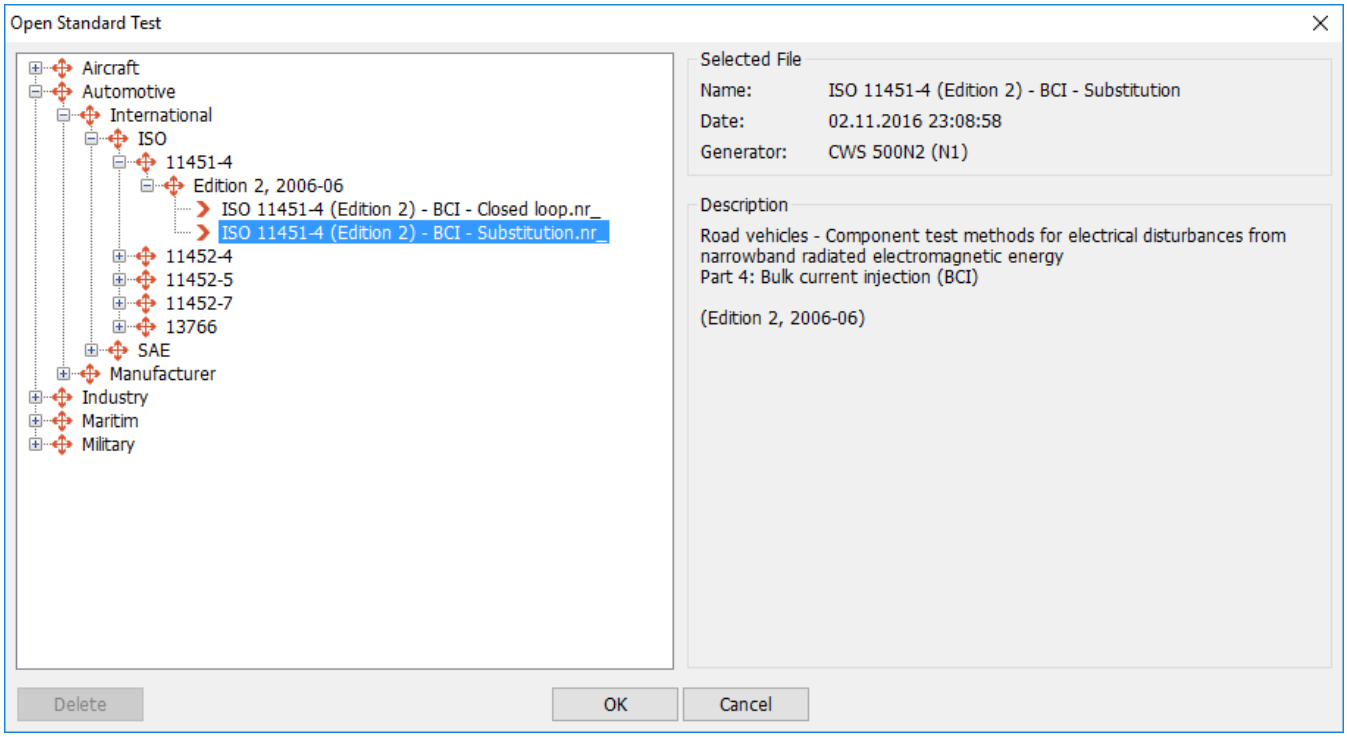
This tree was created by using a file manager (Windows Explorer).
Example: Create a structure in the standard folder of the icd.control, as follows

[..\ icdcontrol \ Standard]
Create sub folder: **[Products]**
Create sub folder: **[TV]**
Copy from IEC **EN61000-4-6**
EN55020 loudspeaker
EN55020 input output

5.2. Using the standard test manager

1.) Open it with a click on

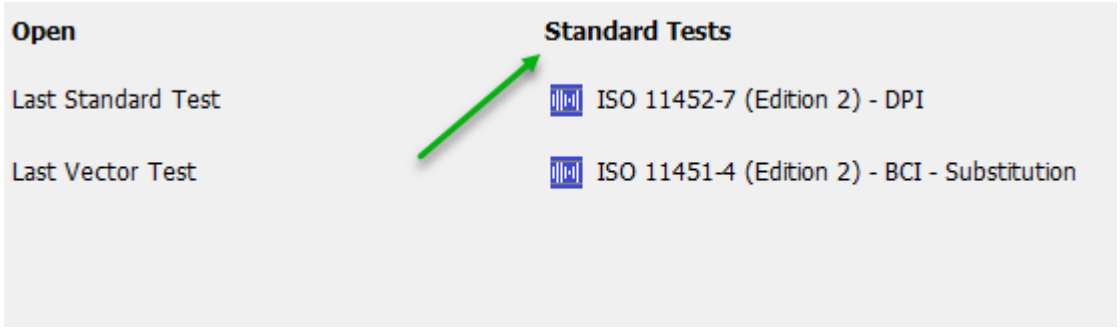




Select and double click on a standard or click **OK**.

5.3. Favorite standards

The last 26 standard tests are listed on the desktop for quick selection.



6. Test

The procedure for a standard test application includes the following steps:

Action	*Remarks*	*Window*
Standard selection	Loading the standard test from the standard manager.	Standard Manager
DUT Parameter setting	- **Test Level** - **Frequency step** - **Dwell time**	Test
Setup	- **Coupling device** - **Port selection** - Calibration file of the used coupling device - Measuring instrument	Setup
Calibration (if no cal file exist)	- Create a calibration file	Calibration
Check the setup	-	Setup
Start the test	-	Test

6.1. Test definition window

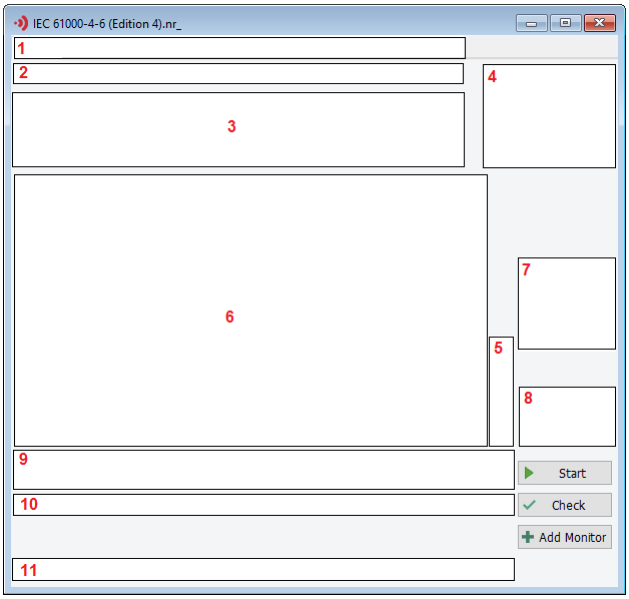
This window delivers the information about the test procedure. All modifications of the test parameters are selectable in this window.

A test can be start when the following conditions are ok.

- The focus of the program shows to the test definition window (click in the window to activate)

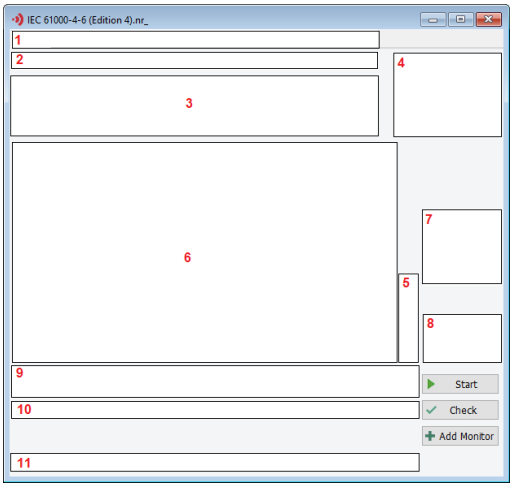
- Field above the setup button is green colored (click to the setup button and adjust the setup)

6.1.1. Areas in the Standard control window



Areas in the standard control window

1 Procedure selection
2 Applied standard
3 Parameter field
4 Modulation control
5 Control box for breakpoints, amplifier and instrument switch
6 Diagram window
7 Level control
8 Test time overview
9 Coupling device
10 Used coupling device calibration file
11 Used measuring instruments



Areas in the standard control window

1 Procedure selection
2 Applied standard
3 Parameter field

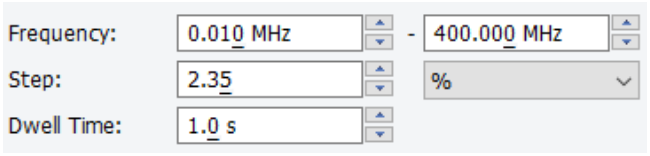
1 Procedure selection

Enables the customer to switch between the procedures Test and Calibration. If specified in the corresponding standard also Amplifier Saturation Test, Source Impedance and Verify H-Field are displayed.

2 Applied standard

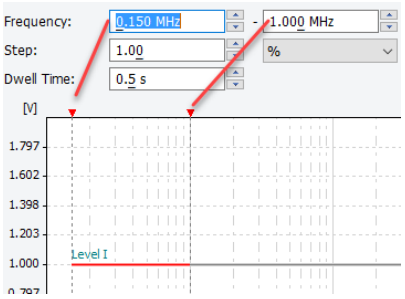
Name of the applied standard with reference to the version and date of the standard. This standard is also displayed in the information line at the bottom of the icd.control window.

3 Parameter field



Selectable parameters (input box)
For adjust the test parameters to the DUT behavior.

Frequency :
Range of the selected standard. The default value equals to the frequency range specified in the actual standard. For development and analysis purposes the range can manually be limited.

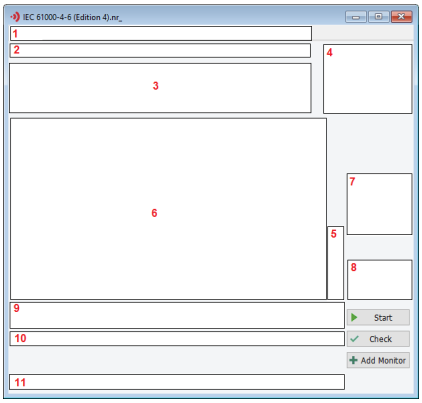


The limited active range which will be tested is indicated by red markers above the diagram.

➔ The limitation may easily be changed by clicking moving the red marker.

Step : Frequency step between two frequencies. A change of this parameter will change all vectors related to this standard which are not customized vectors.
- % : Step in percent based on the previous applied frequency.
- MHz / kHz : Fix frequency step between each frequency.
- points/decade : Points per decade. Number of frequency steps per decade.

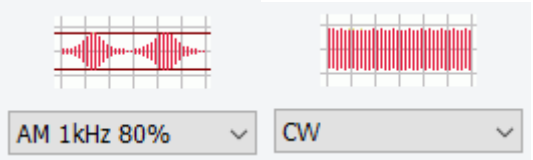
Dwell Time : Application time of the interference signal to the coupling device.



Areas in the standard control window

4 Modulation control
5 Control box for breakpoints, amplifier switch

4 Modulation control



Some standards recommend different modulation modes for the test. A list box allows to select from all necessary modulation modes.

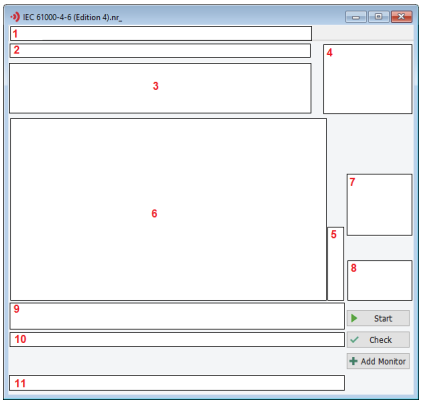
AM1kHz80% : Amplitude Modulation 1kHz 80%
CW : Continuous Wave

The modulation control changes only the active vectors! (See vectorlist)

5 Control box for break points, amplifier and instrument switch

A breakpoint will interrupt the actual test procedure for modify the test setup or test equipment. For generate a breakpoint the user has to click to one of the triangle buttons left side of the diagram window. icd.control offers different kind of breakpoints with the following meaning.

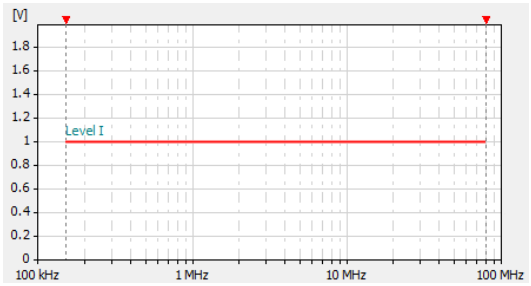
Picture	Color	Breakpoint	Remark
	yellow blue green	create breakpoint	blue: - Instrument switch yellow: - Amplifier switch for change amplifier green: - User defined during the test or - Coupling device for calibration and test
	yellow	Amplifier switch	Change automatically between two connected amplifiers
	green	Universal Breakpoint	A user defined breakpoint who breaks a test. If the option “Calibrated setup change” is active the program makes a break during a calibration procedure for change coupling devices.
	blue	Instrument switch	Breakpoint for changing one of the measuring instruments in use for either the calibration or test.
	olive	Standard defined	Breakpoint is defined in the standard procedure for modify the test setup. User can’t create or delete this type of breakpoint.
	red	Frequency sweep limiters	Markers for limiting the test frequency range.



Areas in the standard control window

6 Diagram window
7 Level control
8 Test time overview
9 Coupling device
10 Used coupling device calibration file
11 Used measuring instruments

6 Diagram window



The diagram window shows the selected standard test vectors. If more than one level is selected, each level is displayed and marked as a separate vector.

The range setting is controlled by the icd.control software.

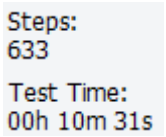
During the test icd.control will display the diagram with the applied and measured test points.

7 Level control

Some standards offer different levels for testing.
Select the desired standard level for testing.

Note: Only one Level at a time can be selected.

8 Test time overview

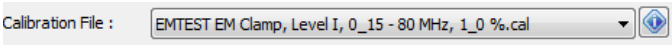


Display of the number of steps for the complete test procedure.
The approximate test time is calculated from the number of steps and the test duration with a certain time for communication and generator setting.

9 Coupling device

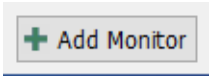
Indication of the actual applied coupling device for the test. The icd.control software cannot check if the correct coupling device is selected

10 Used coupling device calibration file



Indication of the actual used calibration file.

11 Add Monitor



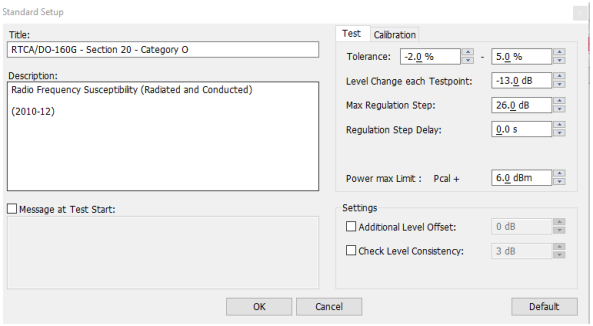
Allows you to select monitoring options from a list of already selected devices.

12 Used measuring instruments

List of the used measuring instrument.

6.1.1. Other functions in the Standard control window

With the menu **Setup Standard** the user can modify standard related settings. There are different settings available.



Standard related settings:

Level Change at each Testpoint
Before changing to the next frequency, icd.control reduces the power of the applied signal. After the measurement icd.control calculates the next values to apply the signal in a tolerance of +10% -1%.

Max Regulation Step
Max output change during regulation.

Regulation Step Delay
Pause between each regulation step.

Power max limit
icd.control will limit the maximum power at the value $P_{calibration}$ + setted value [dB]

Fix current limitation
Max. allowed rf current. Limitation at this level.

Additional Level Offset
Adds an additional offset to the configured test level. The resulting test level will be calculated as follows: Vector level + additional offset.

Fast Test Run Mode (IEC61000-4-6 Ed. 3 only)
Improves the run mode to achieve the shortest possible test time.

Default
Reset of the values to the default standard settings.

6.1.2. Breakpoint

A breakpoint will interrupt the actual test procedure for modify/change the test setup or test equipment. icd.control offers different kind of breakpoints with the following meaning.

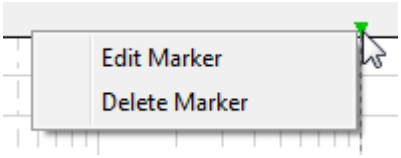
Picture	Color	Breakpoint	Remark
	yellow	Amplifier switch	Change automatically between two connected amplifiers
	green	Universal Breakpoint	A user defined breakpoint which breaks a test. If the option “Calibrated setup change” is active the program makes a break during a calibration procedure for change coupling devices.
	blue	Instrument switch	Breakpoint for changing one of the measuring instruments in use for either the calibration or test.
	olive	Standard defined	Breakpoint is defined in the standard procedure for modify the test setup. User can’t create or delete this type of breakpoint.

Create a breakpoint

For create a breakpoint click into one of the triangle buttons left side of the diagram window. A window appears for enter the frequency and other parameters.

yellow: - Amplifier switch for change amplifier
blue: - Instrument switch
green: - User defined during the test or
- Coupling device for calibration and test

Edit or delete a breakpoint

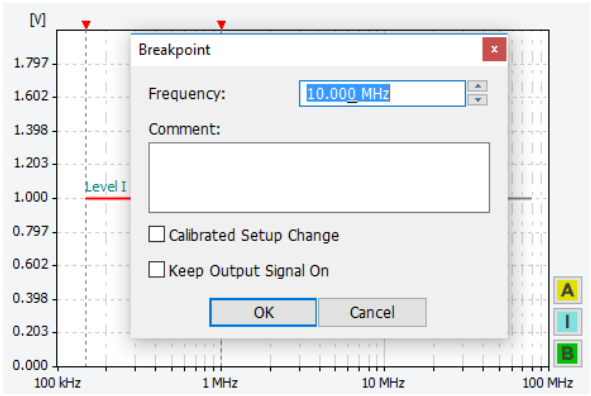


Select Edit Breakpoint with a click on the right mouse button to the triangle in the graphic window. The edit field appears, and the user can modify or delete the breakpoint.

Note: With a left mouse click you will move the breakpoint frequency. Therefore, it is necessary to click with the right mouse.

6.1.2.1. User defined breakpoint

The user defined breakpoint breaks the test at the selected frequency.



A window appears on the screen with the entered message.

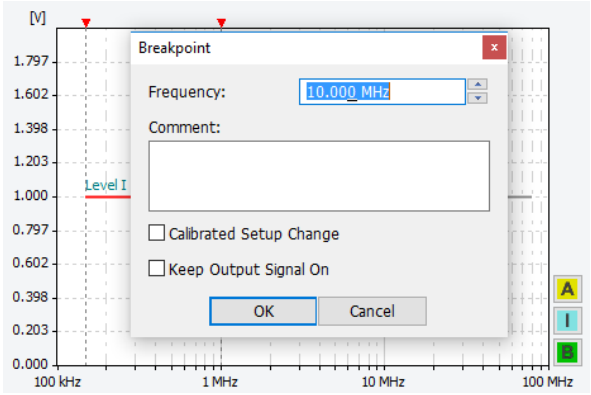
Click into **OK** button to **continue** the test.

User defined breakpoint

6.1.2.2. Setup Change breakpoint

The user defined setup change breakpoint breaks during the calibration and test at the selected frequency. The user can change the setup (i.e. coupling device) at this break.
To create a setup change breakpoint:

1. Create a user defined breakpoint.
2. Click the field “Break for setup change”.
3. Enter your comment into the comment field.



A window appears on the screen with the entered message.

Click into **OK** button for **continue** the test.

User defined setup change breakpoint

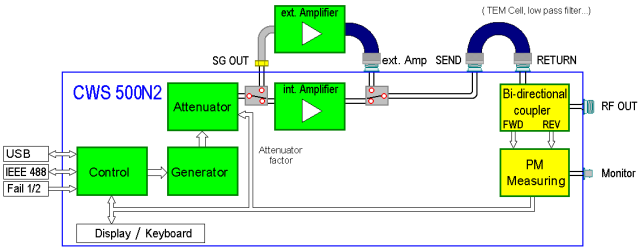
Note:
To recognize the two coupling devices in report, the user has to create a new coupling device file where both coupling devices are described. This new coupling device must be selected in the test setup.

6.1.2.3. Breakpoint for amplifier switch

A breakpoint for amplifier switch will change the used amplifier.

Amp 1 = internal built in amplifier
Amp 2 = external amplifier

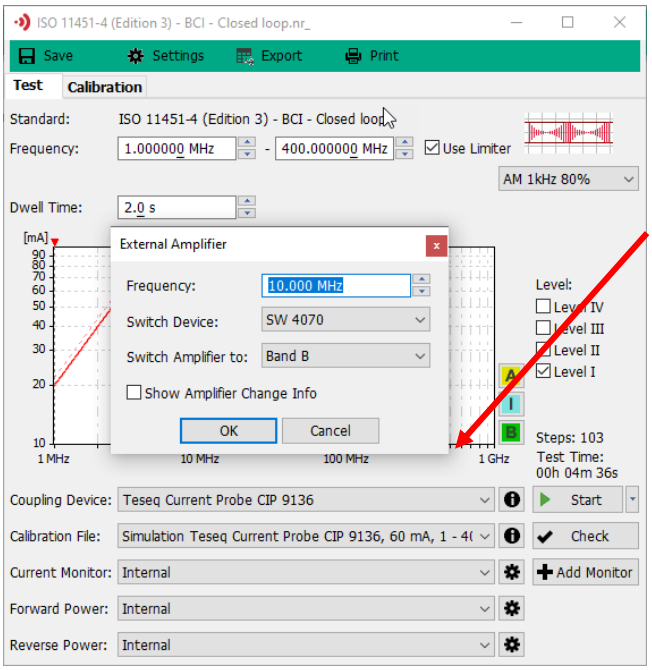
icd.control will change the amplifier and continues with testing with no break.



With the external amplifier the user expands the frequency- or power range of the generator.

The Amplifier switch change the RF signal between the internal and external Amplifier.

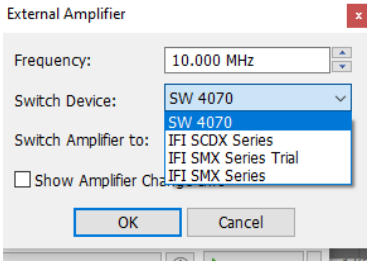
It is important, that the calibration happens with the correct amplifier.



For frequencies higher or equal the displayed frequency, icd.control will switch to the selected amplifier.

The external amplifier is marked with **Ext.Amp** at the bottom of the window.

The user can also use the SW 4070 switch and use external amplifiers with switching function.



In order to make a change in setup, such as Band change of amplifiers, user can access the filers C:\ProgramData\Ametek CTS\icd.control\Instrument and make necessary changes.

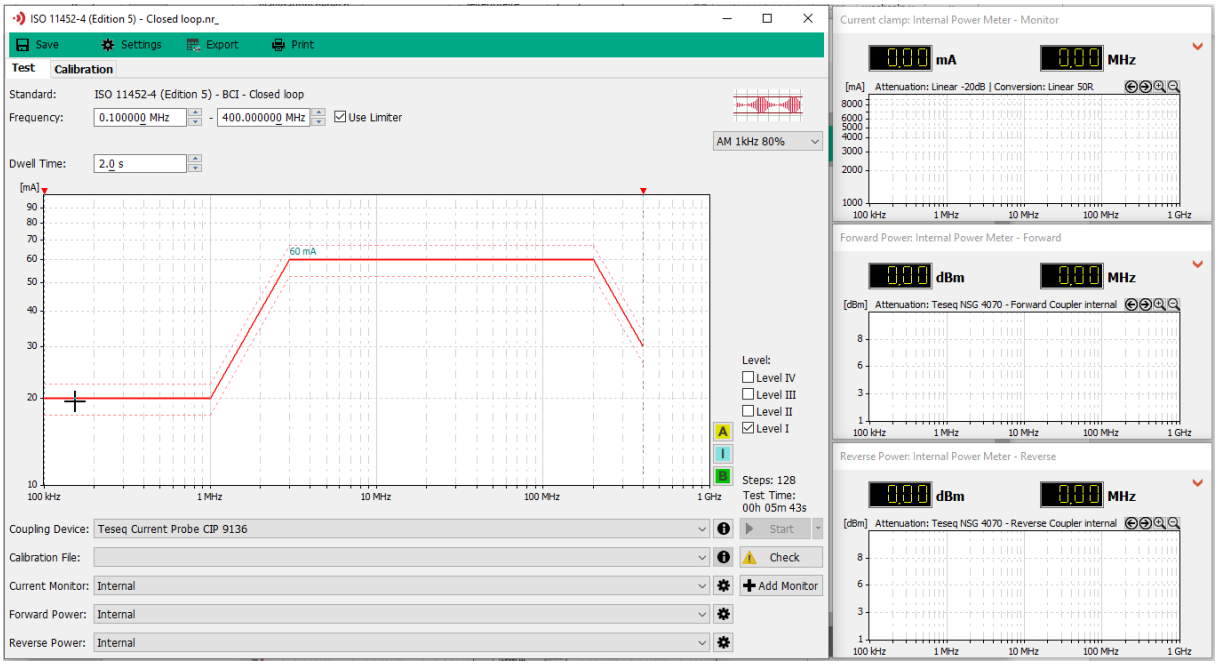
6.1.2.4. Instrument breakpoint: “Directional Coupler”

In case of changing the amplifier during the testing, it is convenient to change the measurement instrument for the forward and reverse power by adding and instrument switch and choosing a directional coupler. The losses for the forward path can be chosen. The software will change the power meter reading for forward and reverse power to channel 2 and channel 3, respectively.
In case a current loop is used e.g., in IEC 61000-4-39 LF standard, the forward power will be measured using channel 3.

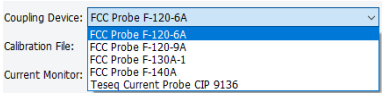
6.1.2.5. Standard defined breakpoint

Standard defined breakpoints are generated direct from the icd.control software. It is not possible to eliminate the breakpoint.
The test will stop at the breakpoint frequency for modify the test setup according to the standard.
Click **OK** to continue the test.

6.2. Test setup configuration

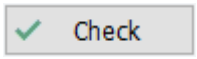


Coupling Device:



Selection of the coupling device
The properties of a coupling device is defined in a file with the extension
*.1xx : CDN
*.2xx : CLAMP, Stripline
*.3xx : Coupling devices (CWS 500N3)
*.4xx : Coupling devices (CWS 500N4, NSG 4060)
You can edit this files with a standard file editor.

Frequency range check status

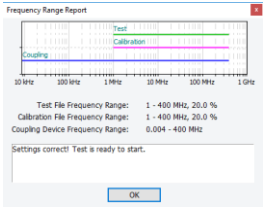


This indicator here shows if the frequency ranges of the test match with the calibration file and the used coupling device.

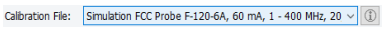
Calibration file and coupling device matches with the test.

You cannot start any test because of a frequency mismatching.
A click on this indicator Shows the range check diagram with frequencies of :

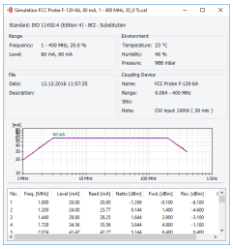
- Test file
- Calibration file
- Coupling device



Calibration file:



Select a calibration file.
Note :The calibration method is selected in the File type
***.cal** : Calibration files with power meter
***.cdn** : Calibration files
The calibration file has to be in the corresponding standard directory.



Shows the data of the selected calibration file.

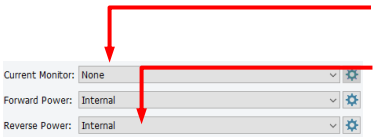
The list with all individual calibration measurements is attached at the bottom of the diagram.

Tab Calibration

Opens the calibration window to create a new calibration according to the standard and the current test parameters.
This calibration will be executed according the description in the standard.

Measuring instruments

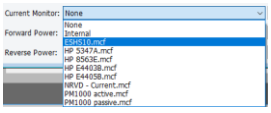
icd.control will display automatically the necessary measuring instruments for the test. In general, icd.control will use the internal instruments.



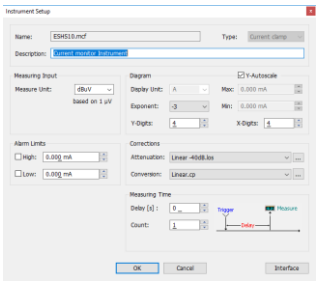
- Facultative instrument for this test setup

- Parameter file for the selected external instrument

Select an instrument from drop-down-list

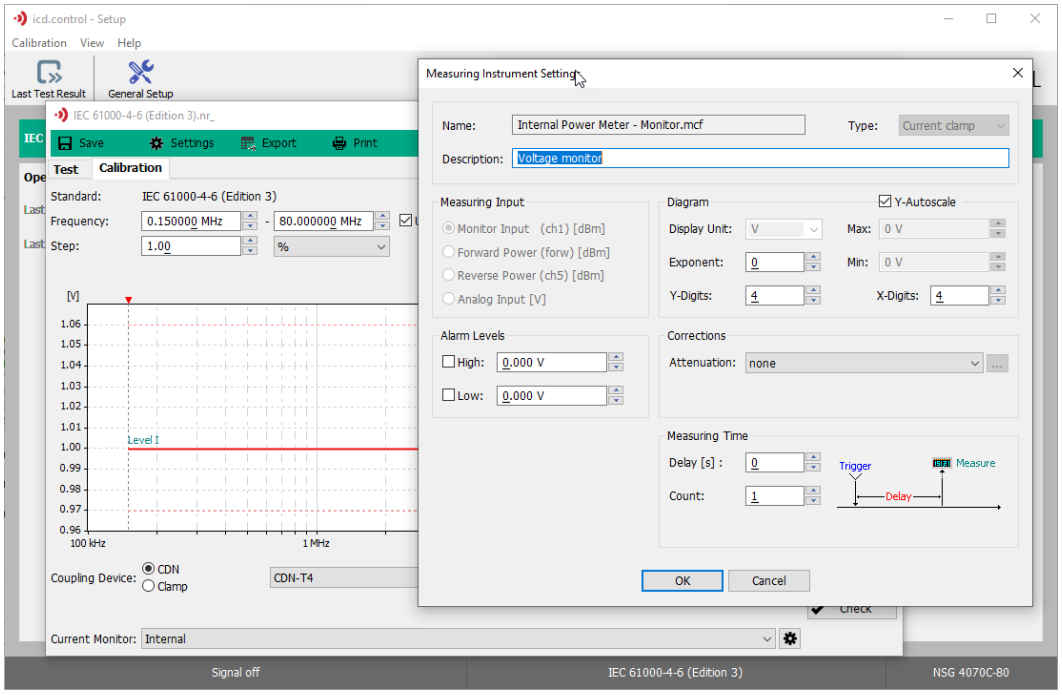


Shows the instrument setup



6.2.1. Current clamp selection

For using a current clamp, icd.control must be adjusted to the transfer characteristic of the installed current clamp. icd.control offers a wide range of different probe characteristics. Most transfer impedances in the software are typical curves of used probes. To adjust please refer to the original calibration data and match the curve to the used current probe.



For selecting the used current probe proceed the following steps.

1. **Select the used measuring instrument**
   – use internal
   – external instrument according the table

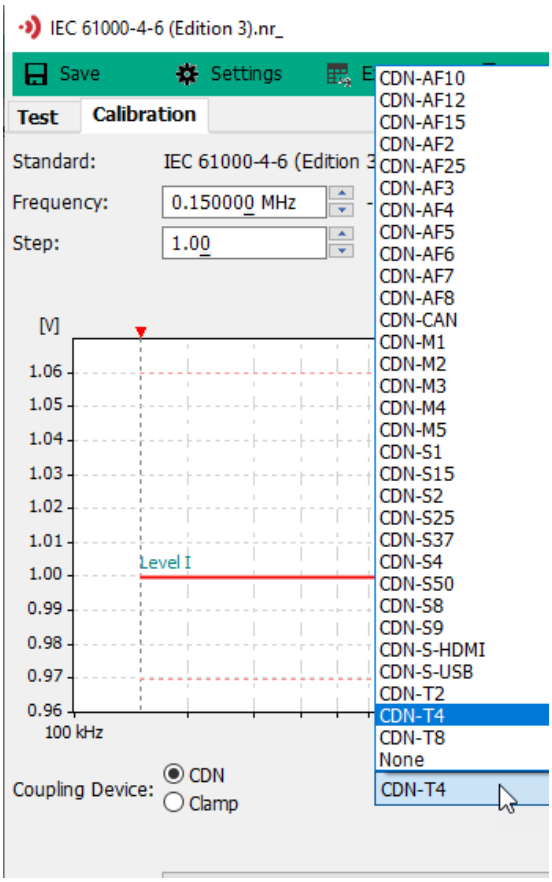
2. Click to the **button**  for open the instrument setting window

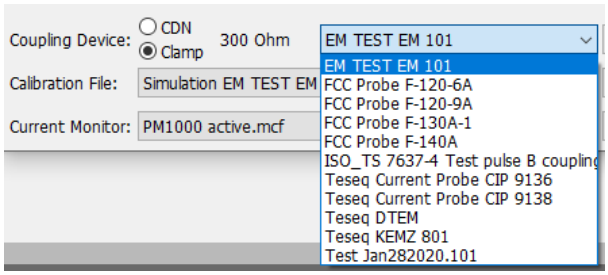
3. **Click to the Button** for open the drop-down-list and select the transfer impedance file for the used current probe.

4. **Press** the button **OK** for close the window

6.2.1. Setup as per IEC 61000-4-6 for CDN and clamps

For the setup for testing according IEC 61000-4-6 and other standards with relation to this basic standard, the user has to select the right coupling device.



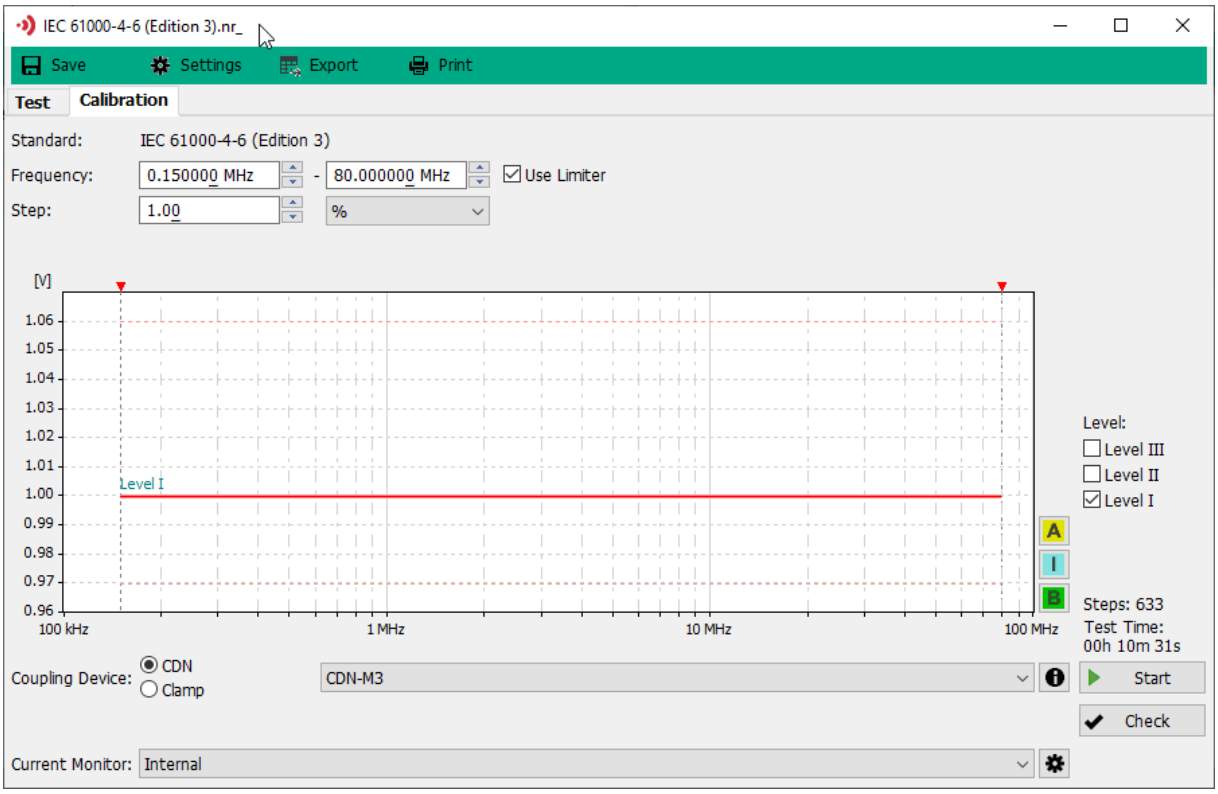


Coupling in to

Select the button for coupling device
- **Clamp**: Clamp or BCI
- **CDN**: Coupling decoupling network

Select the coupling network out of the offered list.

6.3. Calibration Window



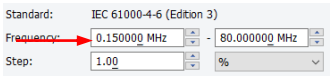
Start calibration

Start button for the calibration.
Remark: After finishing a calibration successfully the tab changes automatically to mode test. Afterwards a test may be started without modifying any parameter.

Parameter fields

The parameters are defined in the test window or in the coupling device file

Calibration frequency range and frequency step

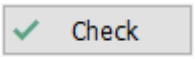


Coupling device
Calibration instruments

Frequency range check status

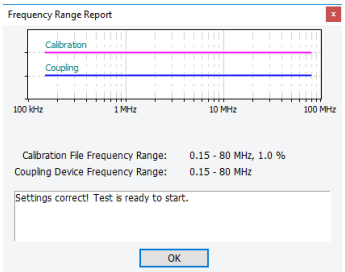
This indicator here shows if the frequency ranges of the test match with the calibration file and the used coupling device.


:The coupling device matches the calibration frequency and level.

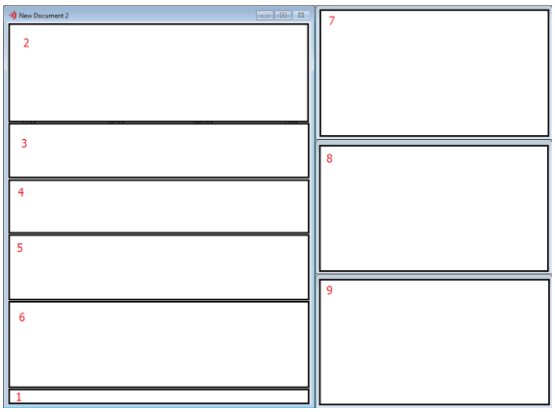



:You can not start the calibration because of a frequency mismatching.

A click on this indicator Shows the range check diagram with frequencies of :
Calibration file
Coupling device



6.4. Window during a test



Areas in the test window

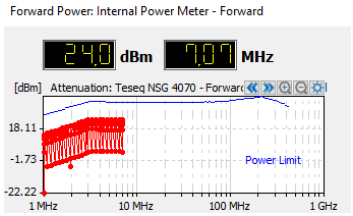
1 Control buttons
2 Test point window
3 Power window
4 EUT impedance window (only if recommended)
5 Calibration file information
6 Test parameter/status information
7 Instrument 1 : Forward power *
8 Instrument 2 : Reverse power *
9 Instrument 3 : Current clamp *

* The number of instruments depends on the test setup

Measuring values

The actual measured values are marked during the test. The test frequency and measured values are displayed on the right side above the window.
The same happens by clicking the mouse in the window.

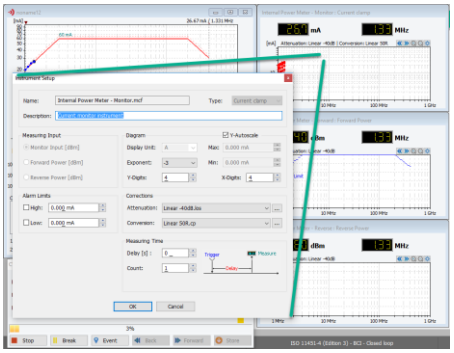
Measuring point with related data



Edit measuring parameter window

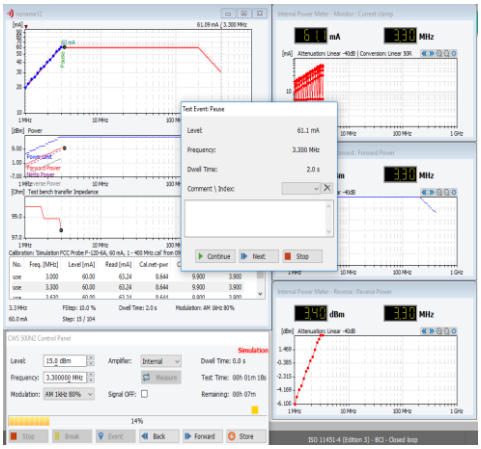
During a test it is possible to change the parameters of the measuring instrument. After closing this window, icd.control will continue with the changed parameters

1. Double-click with the mouse in the scale area of a measuring instrument or click on settings icon
2. Change the desired parameters in the edit window.
3. Close the window with **OK** or **Cancel**



Pause or Fail event

During **Stop, Break or Event** a window appears to insert a comment and the control panel can be used as an analysis tool.

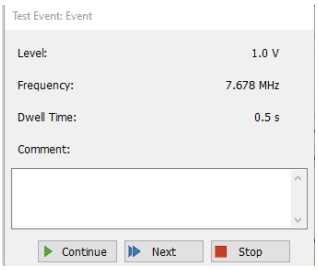


Test Event

The window appears after stop or fail displays the following parameters, who are automatically added in the report.

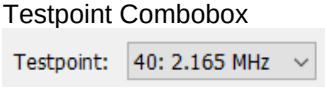
1. Enter your description to the event in the box. There are 10 indexes who allows to reload the last comments in the comment box.
2. Close the window with **Continue**, **Next** or **Stop**

Automatic registered parameters: Level, Frequency, Dwell time



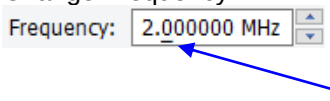
6.4.1. Control the analysis panel

Testpoint Combobox



Jumps as a **single step** to the next or prior test point as defined in the testfile. The step is defined in the setup screen of the test. The next step uses the calibration data for the specific test point. The test parameters are synchronized with the regular test.

Change Frequency

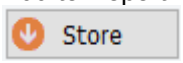


Increase or decrease the test frequency for detailed frequency analysis near the test frequency.

The step frequency is defined by the underlined number in the frequency step. In this example the console frequency step is 100kHz.

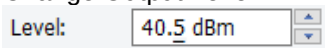
Change frequency by mouse
1. Click in the frequency display and keep the mouse.
2. Move the pressed mouse up or down on the screen.

Add to Report



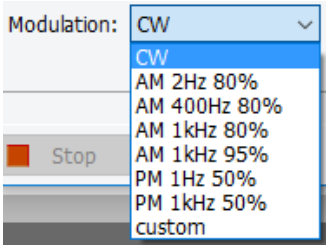
The Store value button sets a Marker in the Report. If you manually change test points, through the test, a step to the next point is automatically done when closing the Report box with OK. This means the test will continue again at the point it was interrupted.

Change Output Level

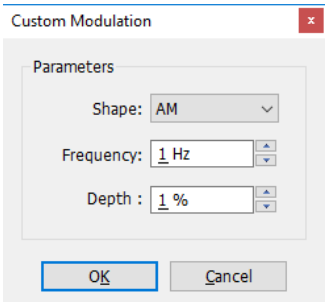


Increase or decrease the test power. Same behavior as the frequency control.

Modulation



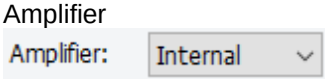
Preselected settings applied by the most standards.



Selecting “custom” opens a window to set individual modulations.
Shape: CW, AM, PM
Frequency: 1Hz...3000Hz step 1 Hz
Modulation depth: 1%...99%

Remark : These settings are not factory calibrated. The accuracy of the settings is approx. 5%

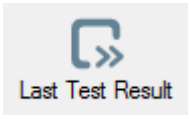
Amplifier



Internal: CWS 500D / CWS 500N2 internal / CWS500N2-MF AMP1
External: External / CWS500N2-MF AMP2

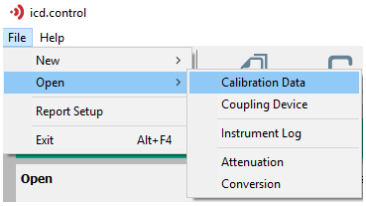
7. Report Window

To open a report file (*.prj) press one of the following buttons:



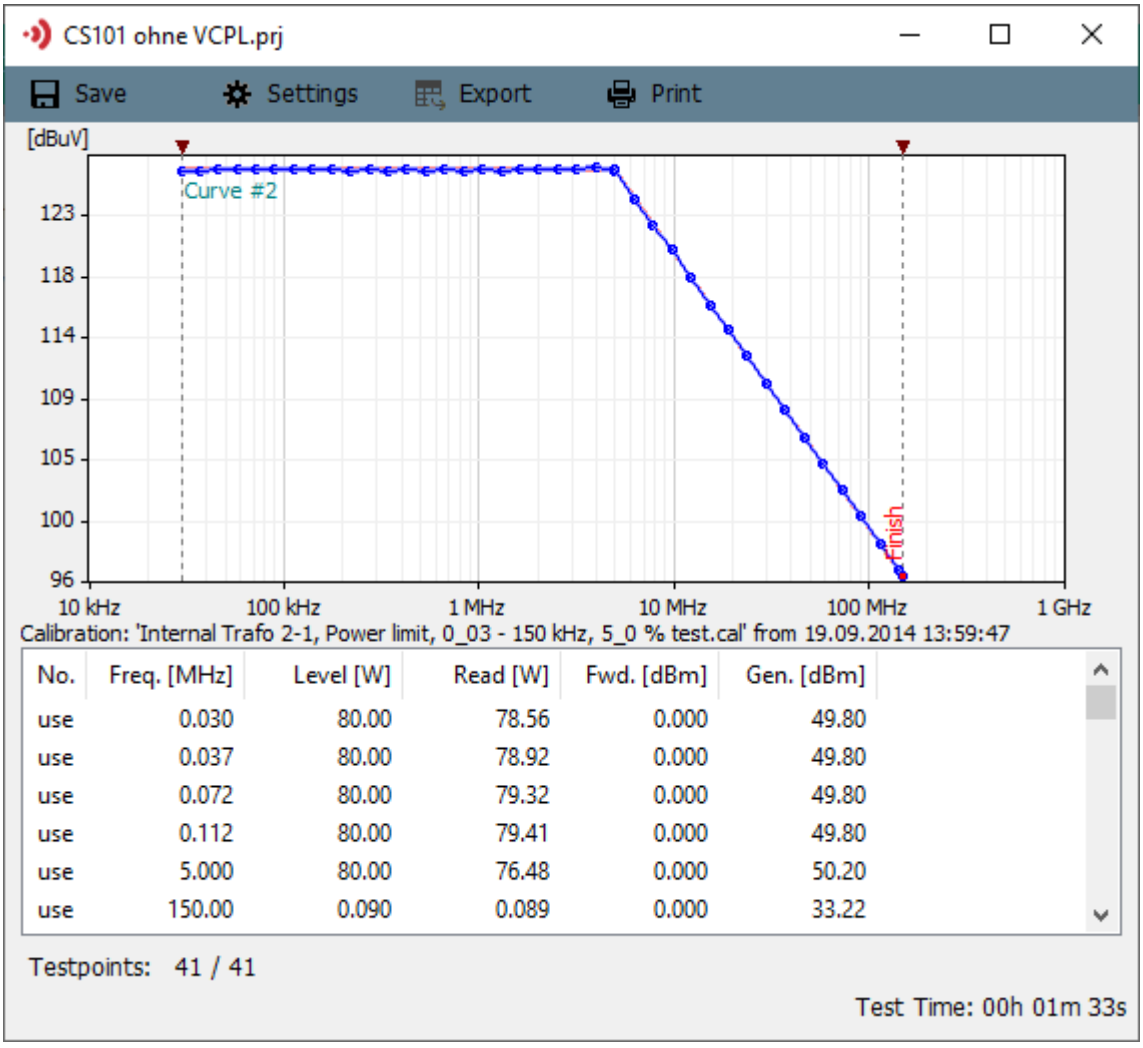
Change to the report window and open
- the last test result or
- the last edited and saved report.

Open a file explorer to select a saved test result.

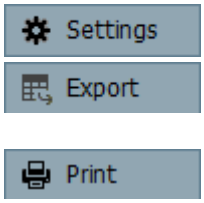


Open the calibration report.

7.1. Report Menu



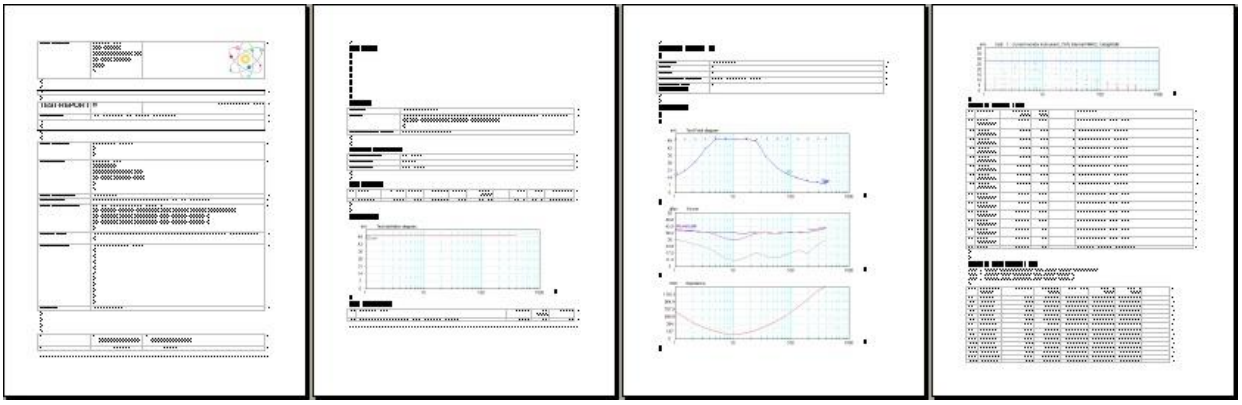
7.2. Report export as RTF file



Click on **Settings** to change settings on the report and format.

Press the button **Export** for export the report as a rtf file. icd.control will start a word processor program. In this program the user can complete the report.

Click on **Print** to view the report or print it.



7.2.1. Sources of the report data

The report is composed from data of different origin. For modify the report data the user can
- edit in the RTF file report.
- change at the source of the data in the correspond window or file.

Item	Where to modify	
Test Center Logo Test report No	Standard report description	Test house
Standard	Standard manager (selected test)	

Test object	Standard report description	Customer / EUT
Customer		
Test engineer	Standard report description	Test house
Recorded	Computer date / time	
Description	Standard report description	Result
Result		

Test plan

Testfile

Name
Path
Modification date

Climatic condition

Temperature	Standard report description	Test house
PathHumidity		
Pressure		

Test values
Test summary

Coupling device

Model	Origin in : Config coupling device
Sno	Data from calibration file (created during the calibration)
Note	
Frequency range	
Coupling port	Setup screen

Diagrams

Test Point diagram	Created during a test from icd.control program
Power	
Impedance	
Instr 1	

Table of events

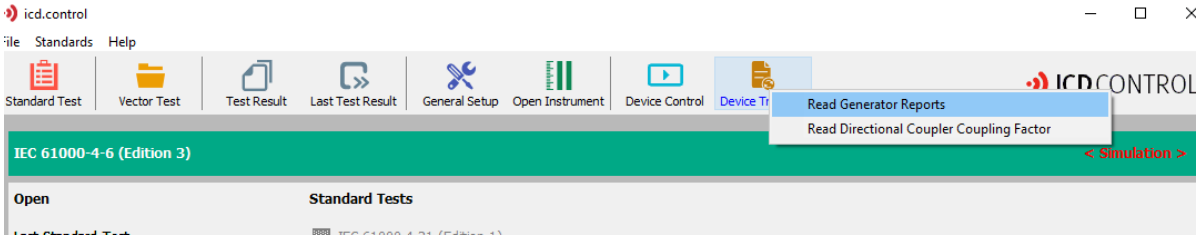
Breaks End of test	Created during a test . Input at break or tested

Table of Test points

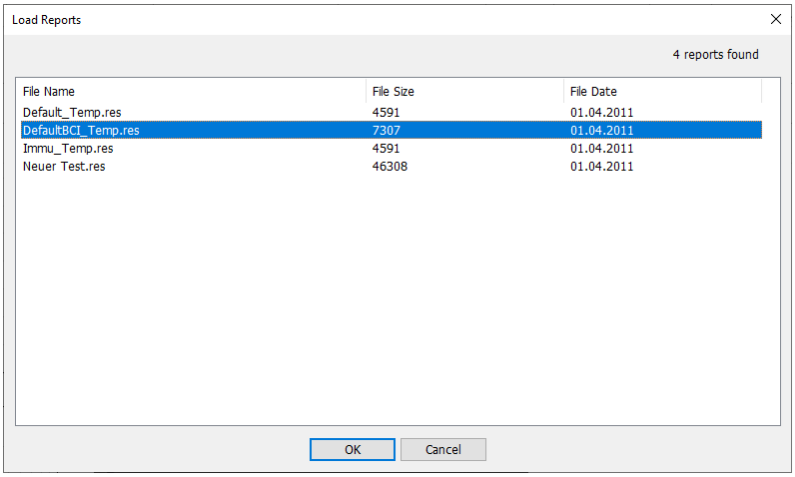
Instrument List	Used instrument (Description in instrument configuration Measured values

7.2.2. Import report from NSG 4070 and NSG 4060

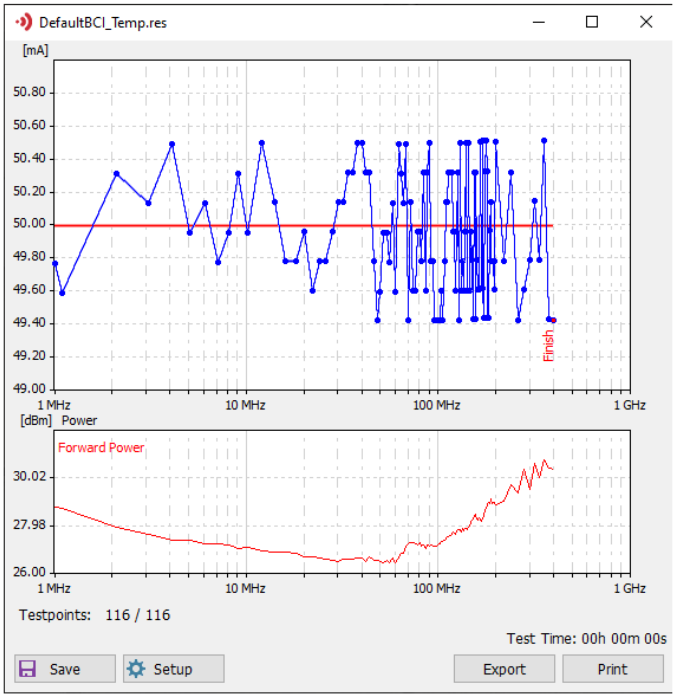
The icd control software allows the user to import test files stored in the NSG 4070 / 4060 generators and view them in the icd control software.
In order to import the report, click on the **Device Transfer** button and then select the option of **Read Generator Reports**

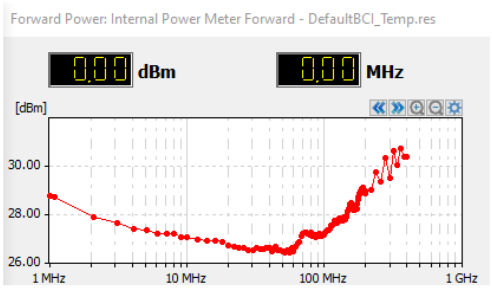


Then select the file you would like to view and import in icd control.



Then the report is shown as follows:

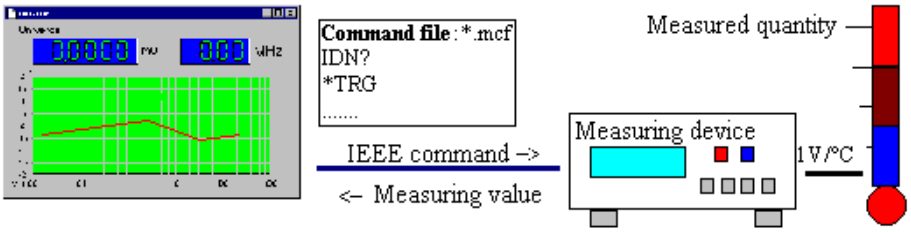




It can then be saved, exported or printed as required.

8. Introduction Additional Monitoring

Additional monitors are used to register the measuring values.
The source of measuring values is any measuring equipment that has an IEEE or RS232 interface available.
The measuring equipment can communicate with icd.control, i.e. icd.control can be informed in case a measured value exceeds the preset limit. The icd.control can react on it.



The additional monitor panel communicates through the IEEE interface with the measuring equipment. The IEEE communication commands for the measuring equipment are explained in a command file. That makes the data logger independent from a specific measuring equipment. The user must know the art of communication commands. For this purpose, please consult the manual from the manufacturer.

The actual measuring values can be shown in a display. The characteristic of a measuring signal throughout time or frequency will be shown on a diagram. The measuring values will be saved in a file and are ready for further adaptation. The timing for data collection of the measurement will be prepared by the software. These and other parameters must be configured. For this purpose the configuration dialogue is available.

The additional monitor can send commands to icd.control and vice versa. That allows a flexible test set-up. Innumerable application possibilities arise without a firm bond on one prescribed test set-up. Please note, that each measuring equipment needs its own IEEE-address.

8.1. Measuring instrument

8.1.1. Internal PM current monitor

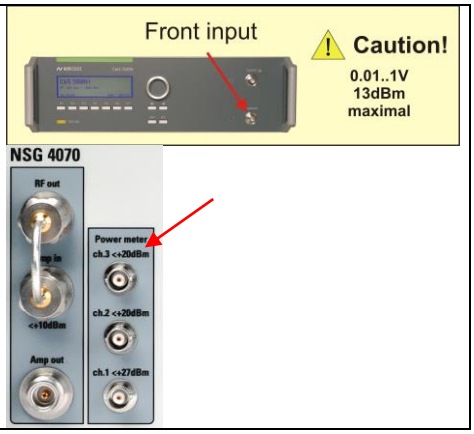
Depending of the model and option the following internal instruments are available:
- Monitor input → all other applications
- Forward power → bi directional coupler
- Reverse Power → bi directional coupler

With the internal RF meter, it is possible to perform a current clamp test with BCI applications or where it is necessary to measure the current.

Attention !
Voltages higher than 1V can destroy the measure input on Front side of CWS.

For NSG 4070, please carefully check the connecting port value before making the connection.

Damages caused an overvoltage of this input are excluded from guaranty work.



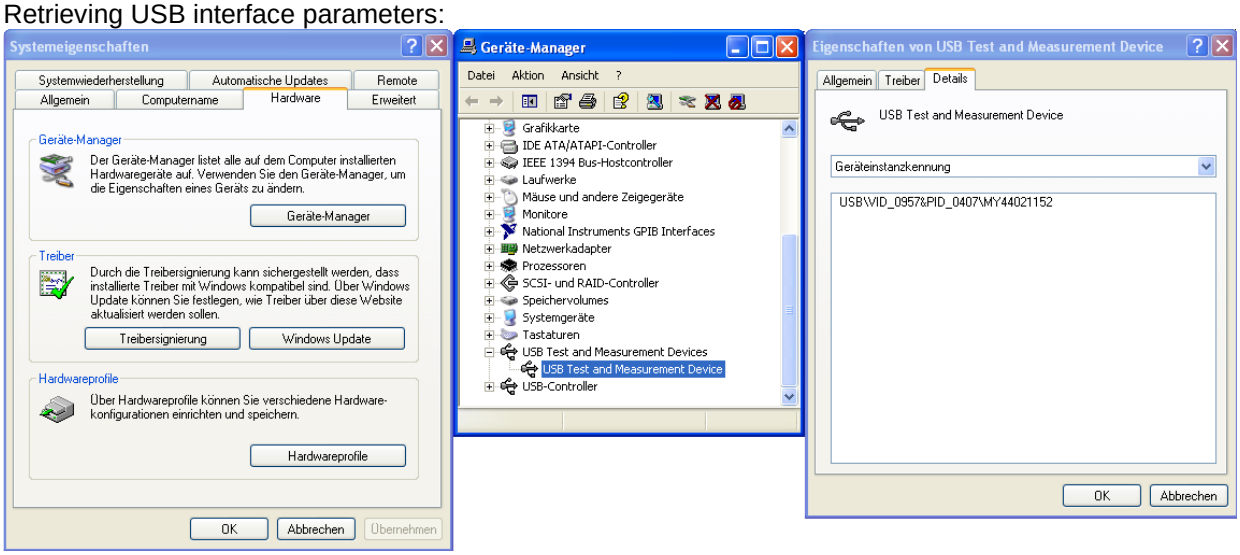
8.1.2. External instrument

The measuring instrument must have an interface. A measuring instrument is such instrument that can send back a value on request (Trigger).

8.2. Configuration of a measuring instrument

The simplest way to define a new instrument is to copy an existing instrument definition file. By changing the IEEE and diagram parameters it is simple to create a new measuring equipment.
This can be done in the Interface Setup dialog. The default value is 10s and will be set automatically after creating.

Retrieving USB interface parameters:



To create a new instrument, proceed according the following steps:

A: Copy an existing instrument

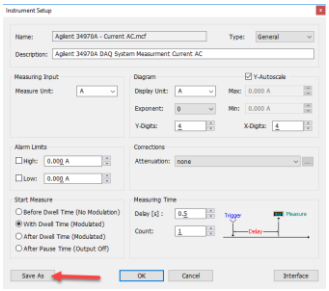
Generator Internal
Select the check box for internal or external instrument.
To make a instrument definition for internal measuring instrument this filter must be enabled. All external instruments are disabled. icd.control supports the current clamp measuring instrument.

4.) **a)** Double click into the Instrument field

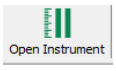
b) Enter the parameters for Measurement filter, Description, Vertical settings, Trigger and Pass / Fail threshold

c) Configure the instrument commands and Interface setup

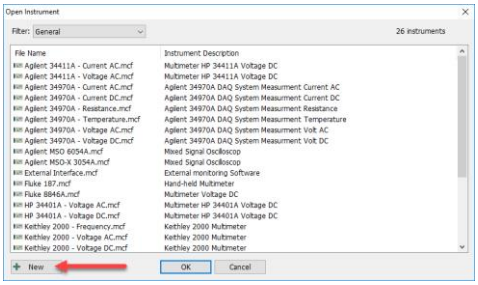
d) Press **Save As** button for save the create a new instrument name.



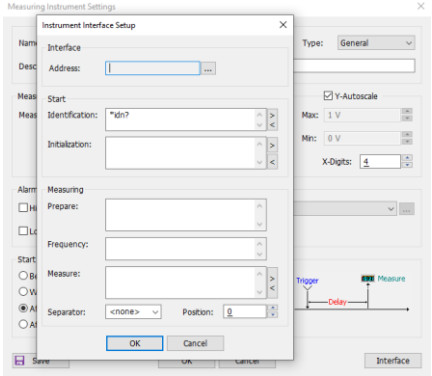
B: Create a new instrument

- Click 

and then "**New**" button

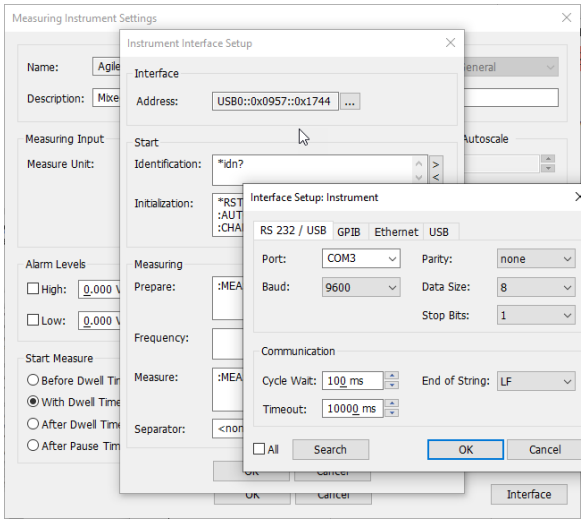


- Enter the interface parameters
- Enter the control commands for control the new instrument.
- With Send and Receive button  , the command executes immediately. This is useful for test the commands.
- Press **OK** button for close the window of the new instrument.



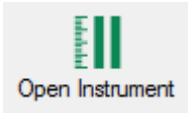
8.2.1. Instrument Timeout

For match the icd.control instrument timeout to long dwell time, it can be necessary to adjust the timeout duration. This can be done in the Interface Setup dialog.
The default value is 10s and will be set automatically after create.



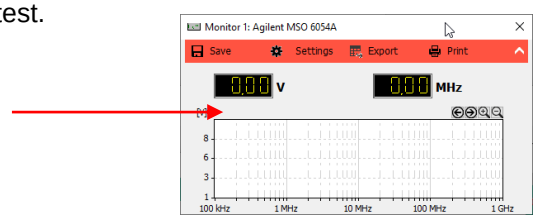
8.3. Configuration Dialogue

Click the *Open Instrument* in the Tool button

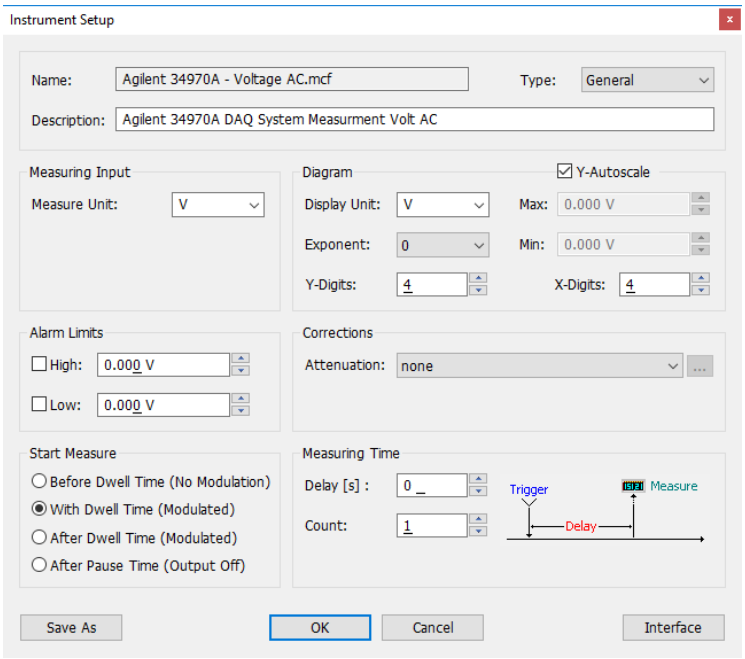


or

double click in the center of the *Instrument* during the test.



Dialogue window for measuring instrument parameter.
The possibilities of entering elements remind to a cathode-ray oscilloscope (CRO) with vertical and horizontal deflection.



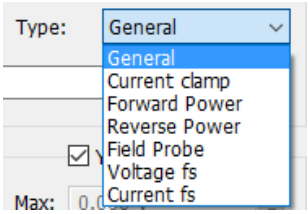
While working with icd.control the horizontal deflection and the frequency of icd.control have to be synchronized.

8.3.1. Buttons

OK	The settings will be applied **for only this test**, but are not saved for later measurements.
Save As	The settings will be stored and used for later measurements
Cancel	Cancel all changes
Interface	Definition of the IEEE commands

8.3.2. Type of measurement (Create an instrument)

Your measuring instrument has to be informed about what kind of measuring task (Measuring type) you assign it to. The icd.control reacts differently according to the task.
There are seven measuring types to choose from.



8.3.2.1. General measuring instrument

The measuring instrument records the values in a file and put them into a diagram. According to the alarm settings, the measuring instrument can send an eventmessage to icd.control. For this reason, it reacts according to **EVENTS** set-up.
See icd.control, Configuration, Reaction **EVENTS**

8.3.2.2. Current clamp measuring instrument

The measuring instrument is used for control of flowing current in the EUT. This set-up is chosen while working with a current clamp example closed loop controlled. When the icd.control realizes that the current exceeds I > Imax = Uo/150Ω, Uo will be reduced to I <= Imax.
The alarm - functions are disabled in this mode. Instead of that you must state U/I-factor.

8.3.2.3. Forward Power / Reverse Power

Measuring the forward or reverse power of a bi-directional coupler. The internal instrument gets the result from the built-in bi-directional coupler of the generator.

8.3.2.4. Calibration measuring instrument (icd.control Calibration High Resolution)

Must be set-up when doing the calibration with the monitor input or an external measuring instrument

8.3.2.5. Field Probe

This instrument is using a linear field probe with a fiber optic RS 232 modem. The software supports a frequency linearization file for the probe.

8.3.3. Description

Description of configuration file (*.mcf).

Information about the measuring instrument and its set-up which will be sent via the interface. The text is displayed as instrument description when you select an instrument from the library.

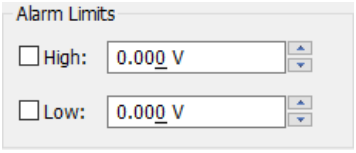
8.3.4. Trigger

Delay

After a successful triggering through the icd.control, there is a preset time before the first measurement is released. In this case the length of the rest time must be long enough for icd.control!
This delay allows you to wait until the transient phase of the sample is elapsed.
Then the icd.control waits until all measuring instruments signalize the end of the measuring. Then no measuring errors can occur during the interval-phase.

8.3.5. Alarm

By exceeding the High- resp. Low level the icd.control can be alarmed. This happens by sending a Fail3-message to the icd.control.



High [Hi]

Maximum allowed level. Fail3 will be released when level is exceeded.

Low [Lo]

Minimum allowed level. Fail3 will be released when signal goes below.

8.3.6. Current Probe Transformer Impedance for current probe

The icd.control anticipates that the measuring value represents a current. As a rule, the current is intercepted with a current-probe delivering a certain voltage as the measured value. With the help of the transfer impedance the data logger can convert the voltage into a current and compensate the frequency dependence of the clamp.

For IEC measurement with a current limit icd.control matches the measuring value I_{ist} with the maximum allowed current, that results from the formula

$I_{max} = U_o / 150\Omega$

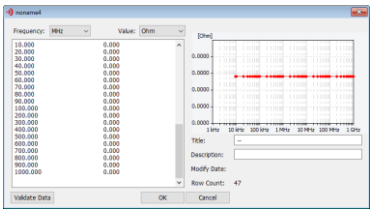
$I_{ist} >= I_{max}$? -> U_o reduced = $U_o * I_{max} / I_{ist}$

8.3.7. Current Probe Transfer Impedance

The Current (transformer) clamp transfer impedance file contains the factor across the frequency band to convert the voltage into current.

Refer to the manual of your clamp manufacturer to get the list of the factors, or read them out of the transfer curve diagram.

The factor can be entered in Ohm or dBOhm.
To enter the list use the TAB or SPACE bar, it expands the values with the unit (Hz, kHz, MHz, Ohm or dBOhm).
Between the defined points the icd.control use a log interpolation to get the correct factor for each frequency. Outside of the definition, the nearest factor is taken.



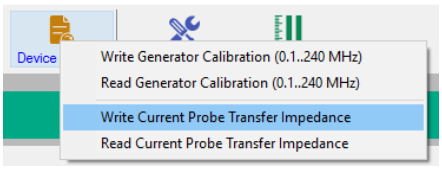
CWS 500C/N1 user

If you use a CWS 500C/N1 with internal PM current monitor, icd.control make a download of the table with the transfer impedance to the CWS500C/N1 memory. The icd.control software uses always the CWS500C/N1 memory for measurement.

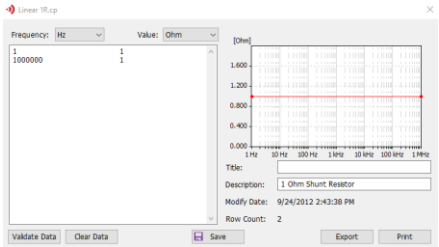
It is possible to up- and download two different current clamp files to storage CP1 or CP2. For testing without icd.control you can use the stored current clamp file. In the window.

8.3.7.1. Download a Current Probe Transfer Impedance to Device (CWS 500C/N1 user)

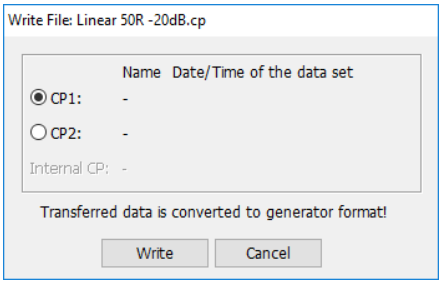
1. Select the *Device Transfer* button and select *Write Current Probe Transfer Impedance*



2. Select the desired CP file After loading the transfer impedance characteristic file is presented on the desktop.



3. Select the CP Store CP1 or CP2 in the CWS
4. Press “Write” button

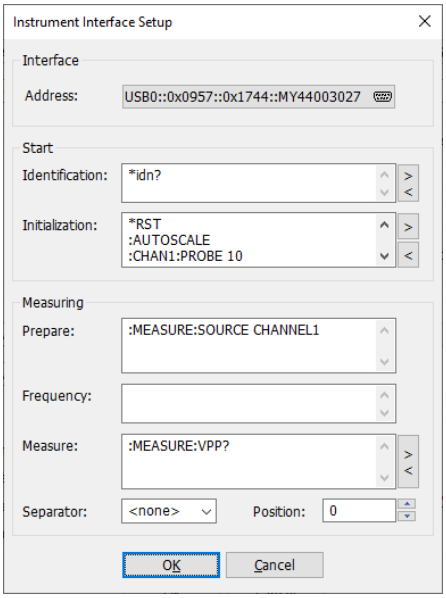


Note: The CWS 500C/N1 will limit the frequency range of the CP-file to 100kHz... 250kHz (see picture after upload).

8.4. Configuration file of measuring equipment

This dialogue is shown if:
1.) the key ”Interface” in the configuration dialogue is pressed.
2.) by setting up a new measuring instrument with the selection dialogue.

A measuring instrument with an interface has a set of commands. This set of commands helps the measuring instrument to communicate with other instruments.
There are different standard commands in the world of IEEE488. Standard IEEE488.2 and the language SCPI are being mostly used. This is not mandatory in the presented case.
The commands set the measuring instrument in an intended operating mode through the interface IEEE or RS232. It is possible to read information about the status and the measuring values.
The procedure for setting up the communication as a rule is the same for all instruments. In any case there must be **a manual of the particular measuring instrument** available.
The data logger sends first (one way/single action after start) the information from the ”Search string” field.
Then (one way/single action after start) the ”Initialize string”
And after that the ”Trigger string”. for each measurement



1.) Interface setup: (open with button *Setup*)
Set the IEEE-Addresses correctly (supposition for all following steps).

Interface commands

2.) Identification:
Search and identify instrument at this IEEE-Address.

3.) Initialization:
Initializes the instrument. Set channel, measuring range, measuring size, correction i.e. 6dB.

Receiving string

4.) Position
Position of the interested value in the received string. For filter the result out from the string.

Check: Sends the corresponding string to the measuring instrument and displays the feedback string.

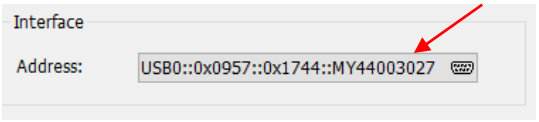
The strings can be composed from various symbols, they will be sent string by string.

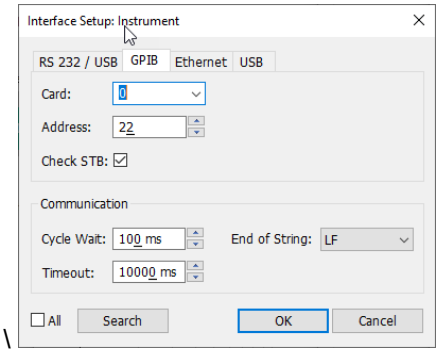
8.4.1. Filename configuration file

The configuration file will be saved under the given name. The names will be shown in the measuring instrument selection table.

8.4.2. Interface set-up

Shows the interface configuration in a short form.
The set-up key starts the interface configuration dialogue.
Here you define the setting of interface to your measuring instrument.





End of string :	End of the received string (LF or CR)
Timeout [s] :	5s...9999s values below 5s will be set automatically to 5s
IEEE Interface :	Instrument address (1...30)
RS 232 :	Interface, Baud rate Parity, Size, Stop bit

8.4.3. Search String

The instrument on the configured IEEE address should identify itself.
Command according to IEEE488: ***idn?**
An instrument receiving this string goes in remote-operation and sends its denotation resp. its designation back.
From now, the instrument is ready to receive further commands via IEEE-interface.

8.4.4. Initialize String

The instrument on the configured IEEE-address should set itself into the transmitted operating mode.
Example for command according to SCPI:

volt:ac:range 1 AC-Voltage with 1V-measuring range.

From now on the instrument will run in the 1V-AC measuring range.

For initialize an instrument it is possible to add more than one command in the initialize string.
Example:

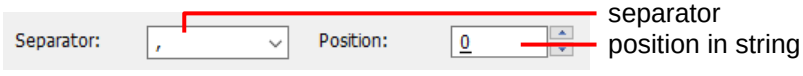
```
*CLS
DISP:TEXT:CLE
DISP:TEXT 'DC VOLT'
VOLT:AC:RANGE:AUTO ON
```

8.4.5. Prepare String

The instrument on the configured IEEE-address should perform a measurement and prepare it on the interface.
Command according to SCPI: **func 'volt:ac';:read?**
Invites the measuring instrument to perform a measurement and to write the measuring result on the interface.

8.4.6. Receiving String

Sometime it is necessary to separate the characters with the values from the received return string.
icd.control offers a function for filter out the data of interest.



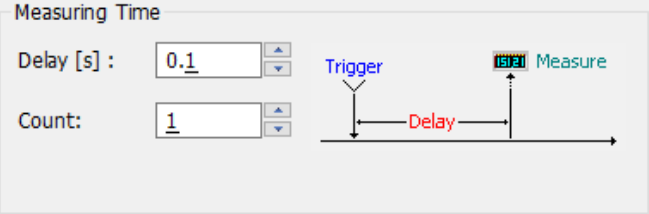
Number of sign	Integer value range [0....49] for the position of the data
Signature	The separator character Can be any character or one of the offered selection ["," "." ";" ":"] .
Example	Part of interest after : **2** and **;** Received string : VOLTAGE 123;700;**200**;235LF Data for icd.control : 200 (value after the second separator character ";")

8.4.7. Additional parameter (optional)

The icd.control works in RF-frequency range. For many RF-measuring instruments it is necessary to specify frequency at which the measurement should be done. icd.control offers two kind of commands to send this information to the measuring device:

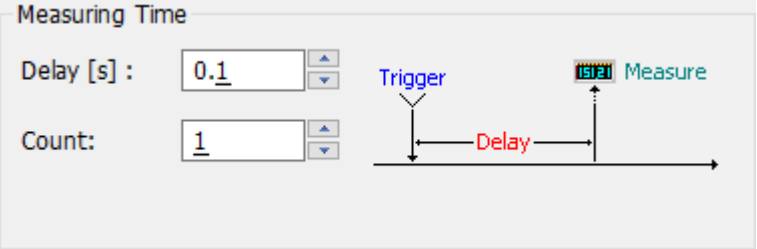
1. Add frequency information using for power meter

The instrument on the configured IEEE-address should perform a measurement at the transferred frequency spot. The measured value must be corrected with the correction factor at the specified frequency.

Command according to SCPI:	**SENS:CORR:FREF %0.2E**
Timing of the command	

2. Prepare used for Scopes and Spectrum analyzers

This command is to set for example the time base of a scope depends on the actual frequency. icd.control offers a Math. compiler where the user can calculate the values, transferred to the instrument.

Command	According the instrument language
Timing of the command	

Separator	# is the separator for the icd.control compiler
Functions	XPARAM : Applied frequency [Hz] YPARAM : Applied Generator output level CHANNEL : Instrument channel index
Mathematical functions	Using {} allows to add the existing mathematical functions ADD or + : Addition SUB or - : Subtraction MUL or * : Multiplication DIV or / : Division P10 : Powers of base 10 L10 : Logarithmic of base 10 ( ) : For prioritizing calculations
Examples	SENS:FREQ:CENT {XPARAM * 3} SENS:FREQ:SPAN {XPARAM * 5} C1:TRLV {YPARAM*400} TDIV {XPARAM}

#	For formatting output value (needs always 2: begin and end)
Example:	gen:level {XPARAM*10#.1f#}; will be "gen:level 65.5"

3. Wait command used for wait till the instrument is ready for the next command

The software offers the following order for wait till the instrument has finished his actual process. Available commands for waiting:

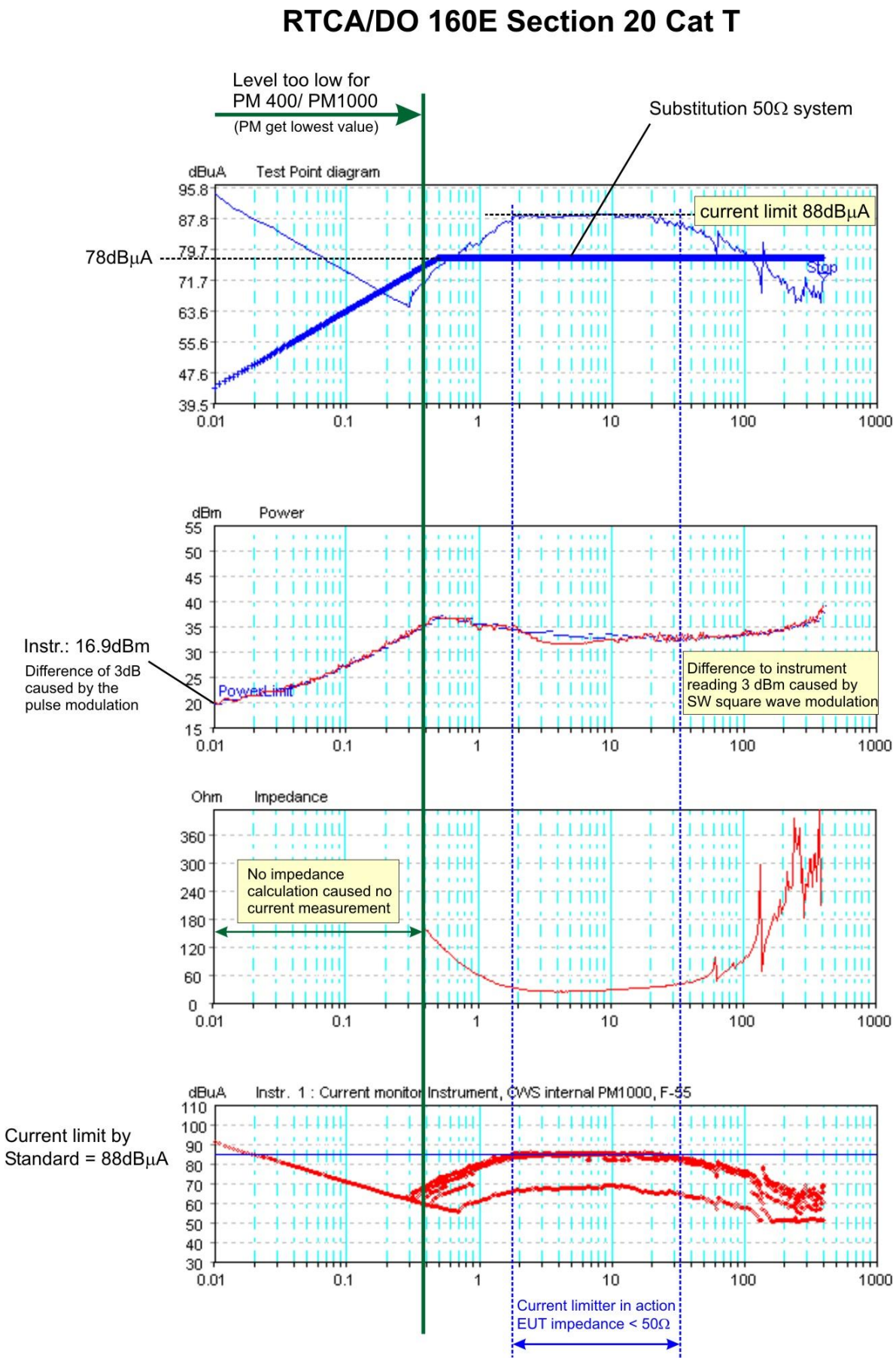
***OPC?**	waits for receiving 1 on the bus
ICD:COM:WAIT [ms]	waits a time in ms Example : ICD:COM:WAIT 500

4. Additional commands used to send informations to external devices as displays

ICD:INIT:STANDARD	Name of the actual standard
ICD:PARAM:FRQ	Frequency
ICD:PARAM:LEV	Test Level
ICD:PARAM:MOD	Modulation
ICD:MEAS:LEV	Current Clamp Value
ICD:MEAS:FPOW	Forward Power
ICD:MEAS:RPOW	Reverse Power
ICD:CAL:LEV	Calibrated Level
ICD:CAL:FPOW	Calibrated Forward Power
ICD:CAL:RPOW	Calibrated Reverse Power

Example:"Forward Power: {ICD:MEAS:FPOW*2} dBm"

8.5. Report understanding the graph behavior in a report



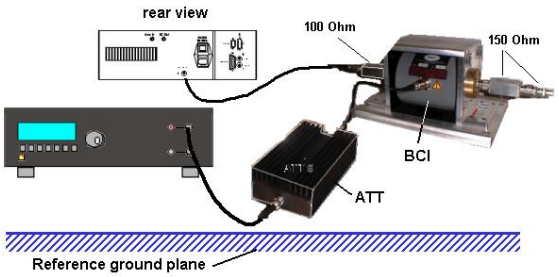
8.6. CWS 500C / CWS 500N1 calibration setup for EM clamp and BCI clamp

This chapter describes the calibration acc. IEC 61000-4-6 using a CWS 500C or a CWS 500N1.There is **no different between the built in power meter** (standard instrument or optional built in power meter PM 402) .

Setup

The calibration setup is according the figure on the right side. The calibration setup is a 300Ω system and therefore the calibration jig is terminated with resistors of 150Ω and 100Ω in series with the 50Ω of the PM 402 impedance.

Connect the measuring cable to the **CAL INPUT** on the **rear side** of the CWS 500C or CWS 500N1



icd.control setup

icd.control will make all settings automatically for calibration with clamps (BCI or EM clamp). The figure shows the setting for using the generators CWS 500N1 and CWS 500N2 with different calibration setup for each generator model.