SOFTWARE FOR EMC IMMUNITY TESTING
ICD.CONTROL

APPLICATION NOTE
IEC 61000-4-6

AMETEK®
COMPLIANCE TEST SOLUTIONS

TESEQ
Advanced Test Solutions for EMC

SOFTWARE FOR EMC IMMUNITY TESTING
ICD.CONTROL

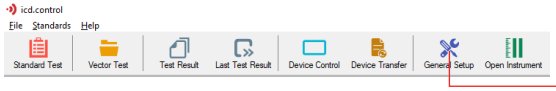
APPLICATION NOTE
IEC 61000-4-6

This application note requires icd.control version 6 or newer.

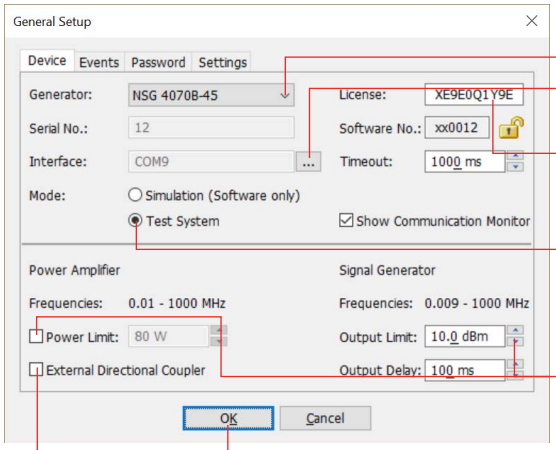
CONTENT

1. EXAMPLE IEC 61000-4-6 CDN TEST WITH INTERNAL AMPLIFIER

1.1. Basic settings



Clicking on "General Setup" opens the generator settings menu.



Select the appropriate generator model.

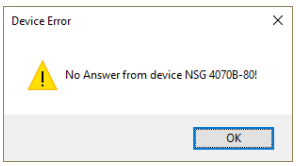
If necessary, configure the interface.

Enter the license number from the license certificate. The associated serial number is displayed in the left field.

Select "Test system" for operation with connected generator. Choose simulation to control the settings, to get to know the program especially if there is no hardware.

If necessary, set limits for the connected hardware. "Power Limit" limits the forward power. This avoids that in case of error, e.g. Power meter for the measurement of the target level not connected, the generator fully controlled and thus the power amplifier gives full power and thus the connected hardware is damaged. „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.

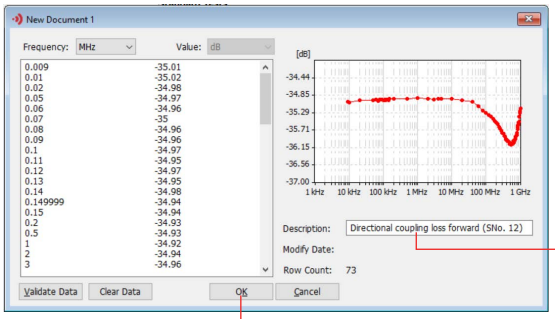
When leaving the menu with "OK", the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



By clicking on "OK" the program changes again into the settings.

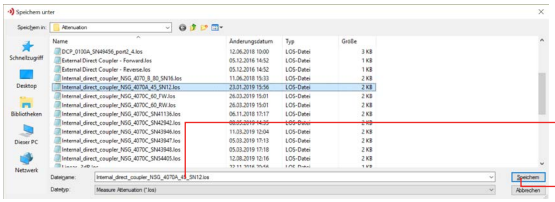
If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

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



A comment can be inserted or changed.

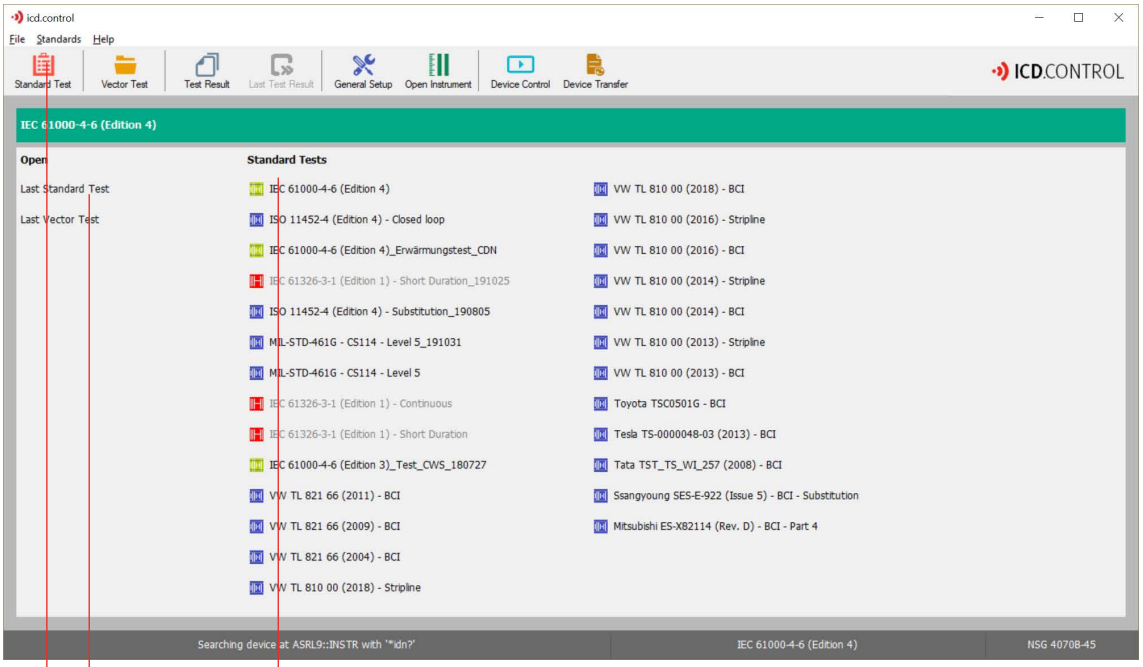
Clicking on "OK" allows the program to assign a file name.



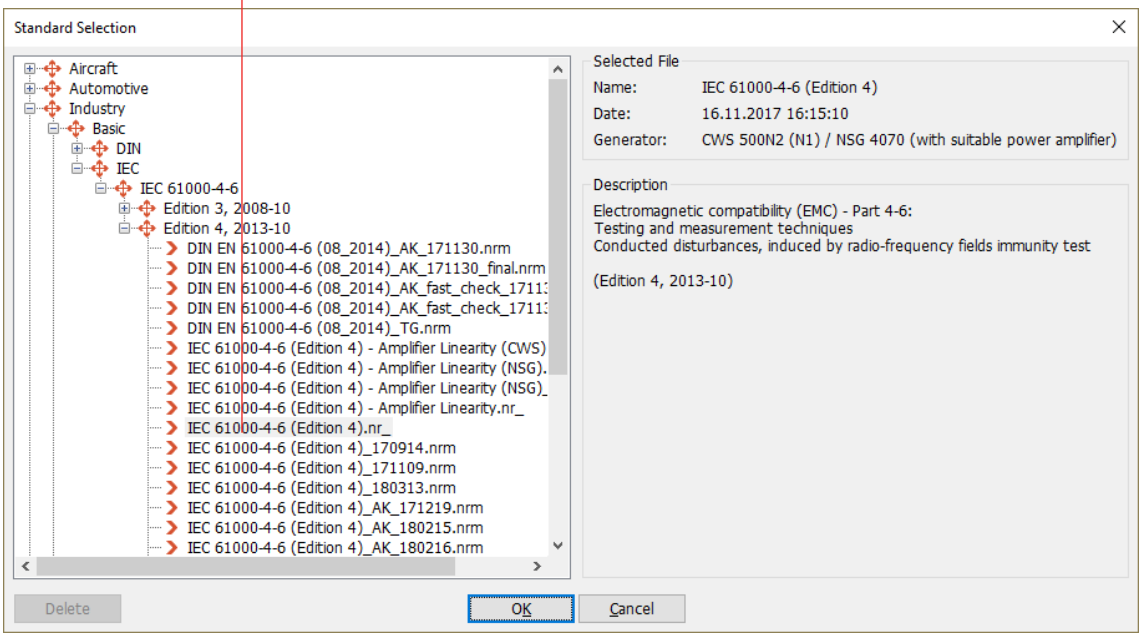
A file name must be assigned.

Click on "OK" to save the file.

1.2. Selecting and loading the test configuration

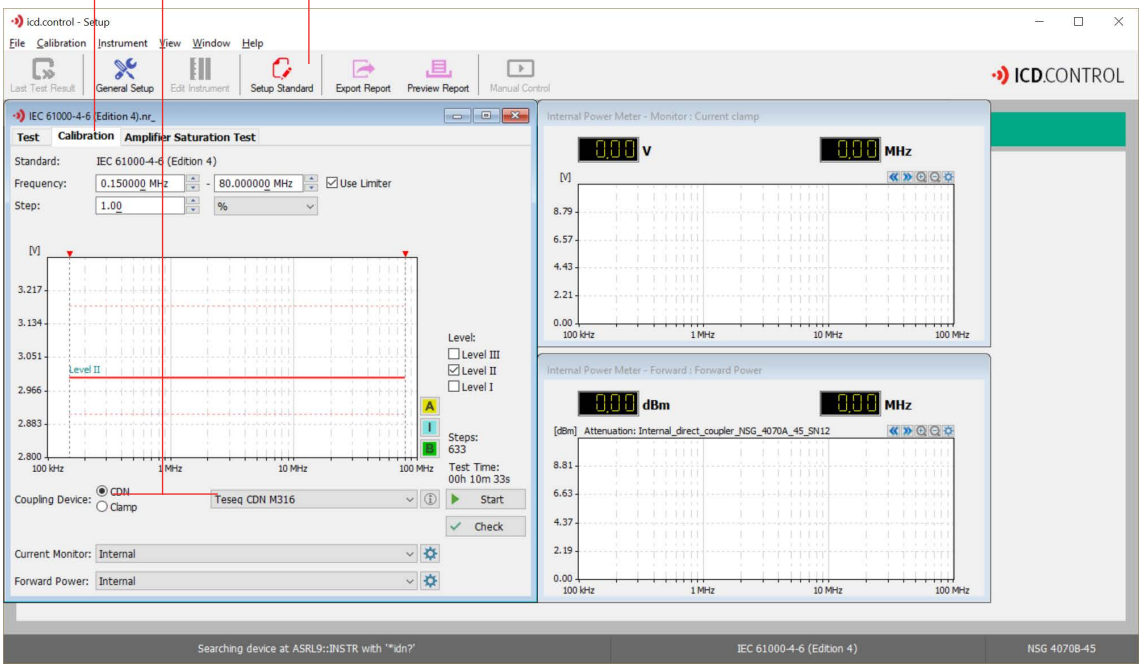


- **Click here to reopen a previously used test.**
- **Click here to open the last standard or vector test.**
- **Click here to open the library.**
- **Click here to open the configuration.**

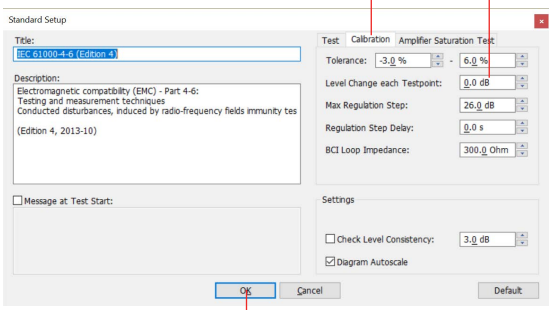


1.3. Calibration (test level adjustment)

- **Select "Calibration" to set the test level setting for the connected hardware.**
- **Select here the appropriate coupling network.**
- **Select "Calibration" to set the test level setting for the connected hardware.**

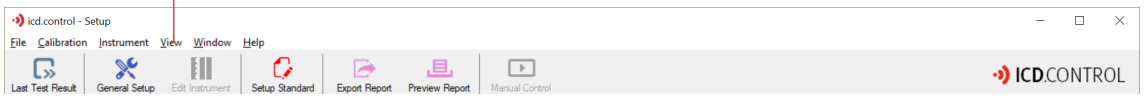


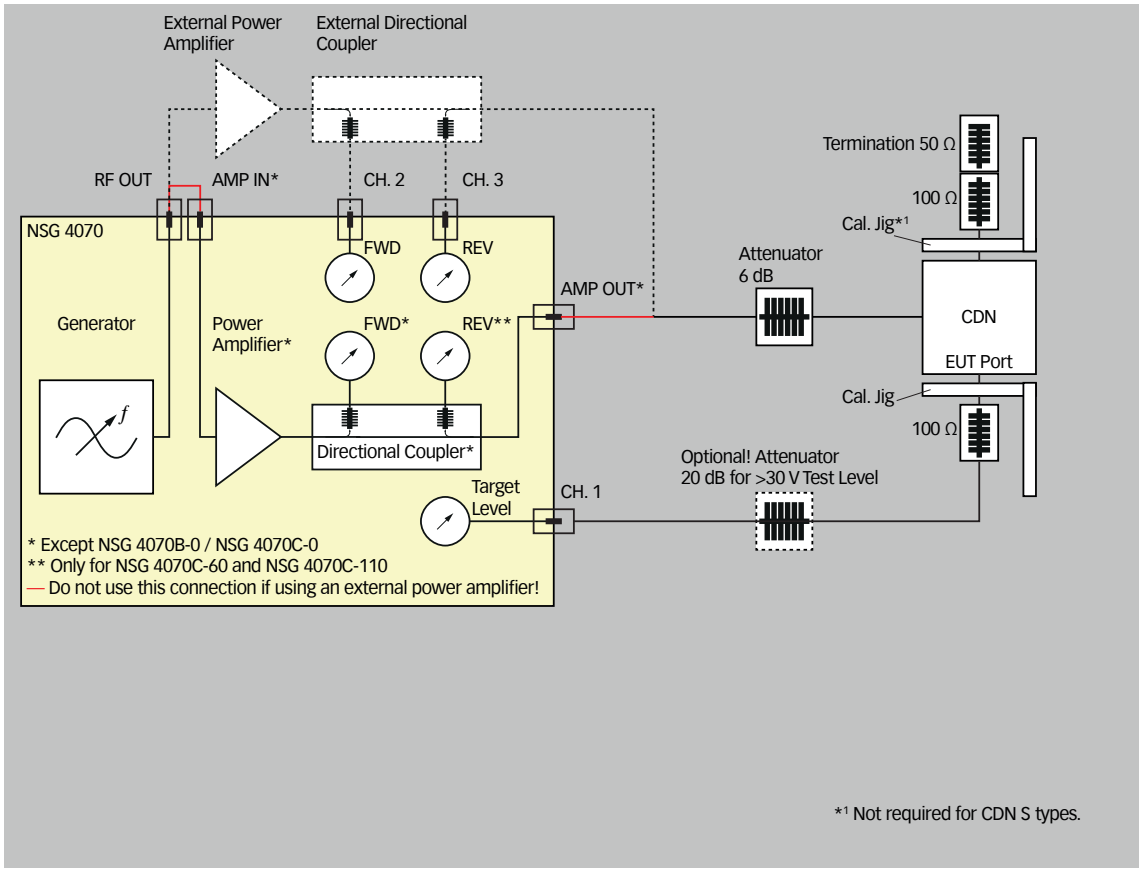
- **Choose "Calibration".**
- **With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements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



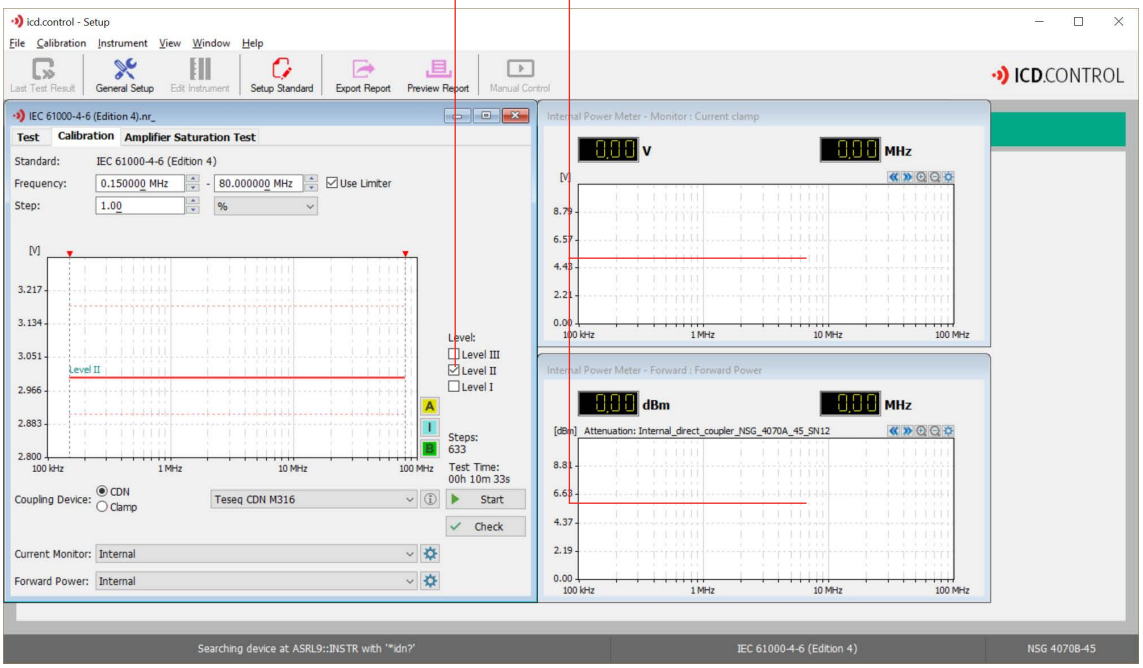
- **Click "OK" to save the settings.**

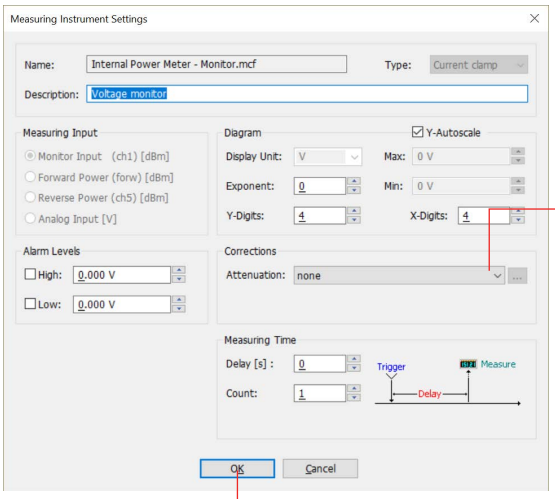
Select "View" and "Show Test Setup" to display a sample image for the test setup.



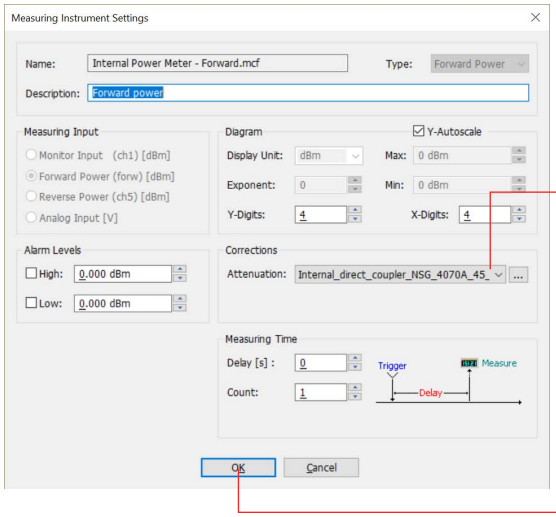


- Set the test level.
- A double-click into the diagram or a simple click on the settings symbol ⚙ opens the following menus.





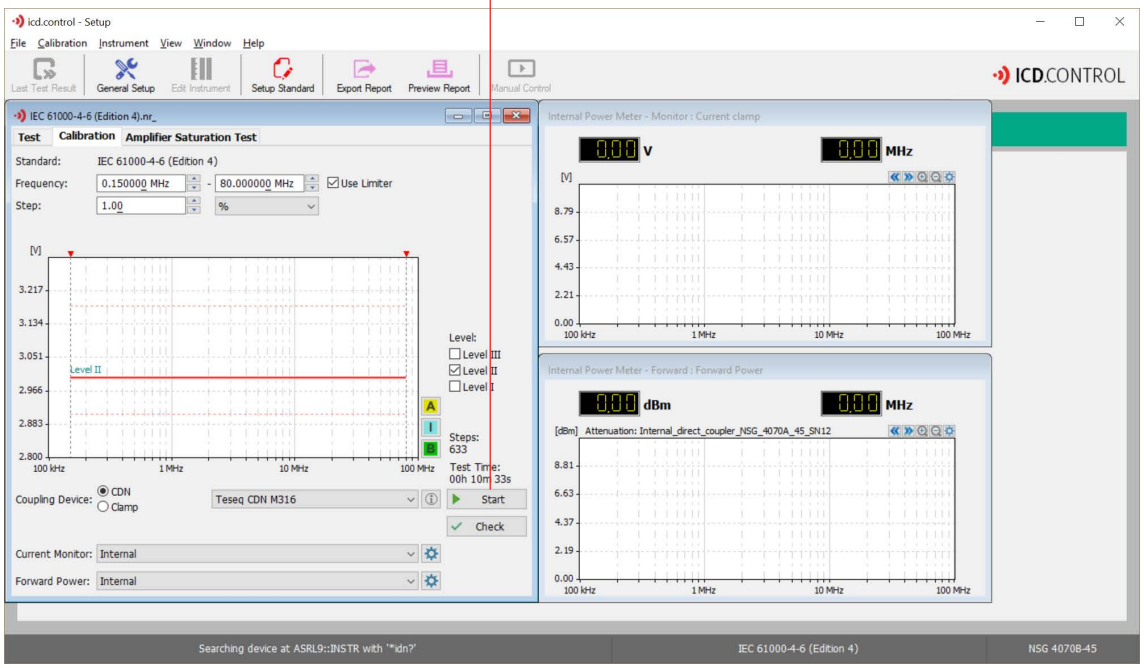
- Here, select the file containing the correction data of the attenuator connected on the power meter channel 1 of the NSG 4070, e.g. -20 dB for a 20 dB attenuator. This file can be supplemented with the attenuation values of the connected cable, recommended for long lines. For attenuation values, the 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" to save the settings.



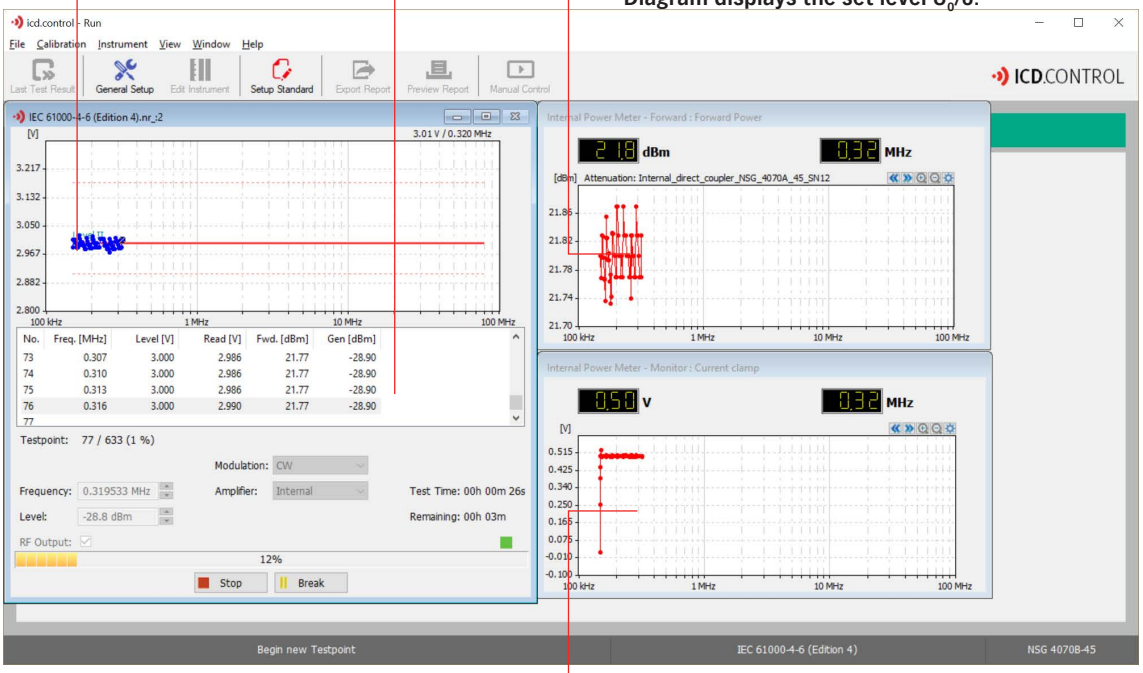
- **Select here the file containing the correction data of the internal directional coupler for measuring the forward power.**

- **Click "OK" to save the settings.**

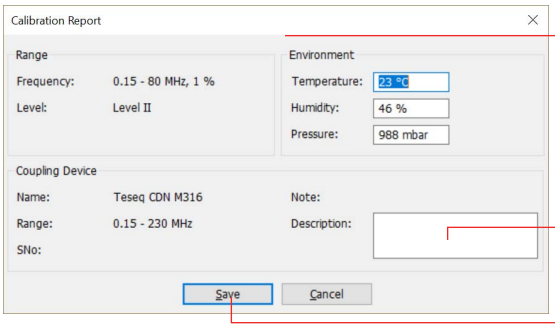
- **Click on "Start" to execute the calibration.**



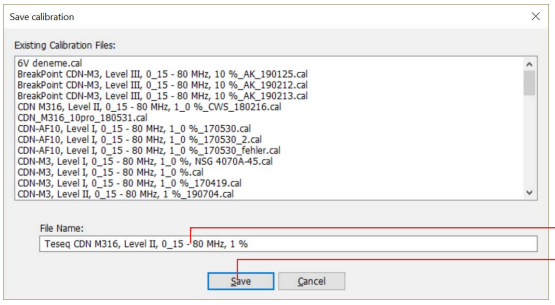
- In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.
- Below the diagram, a table displays the values of frequency, target level, set level, net, forward, reverse (not used here) and generator power.
- The Internal Power Meter - Monitor: Current Clamp Diagram displays the set level $U_0/6$.



- The Internal Power Meter - Forward Power Diagram shows the required forward power for each level.



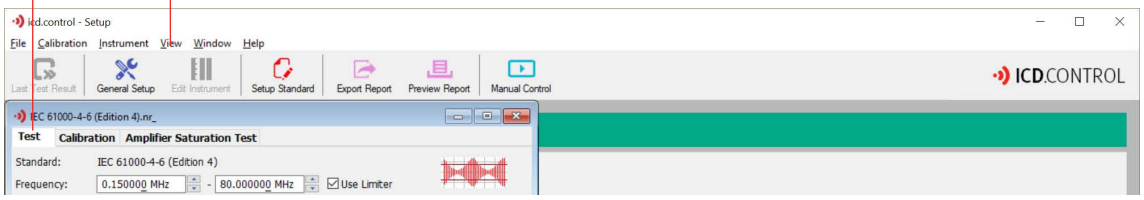
- After successful calibration, the operator is prompted to save the file.
- A comment can be inserted.
- Click "Save" to save the settings.

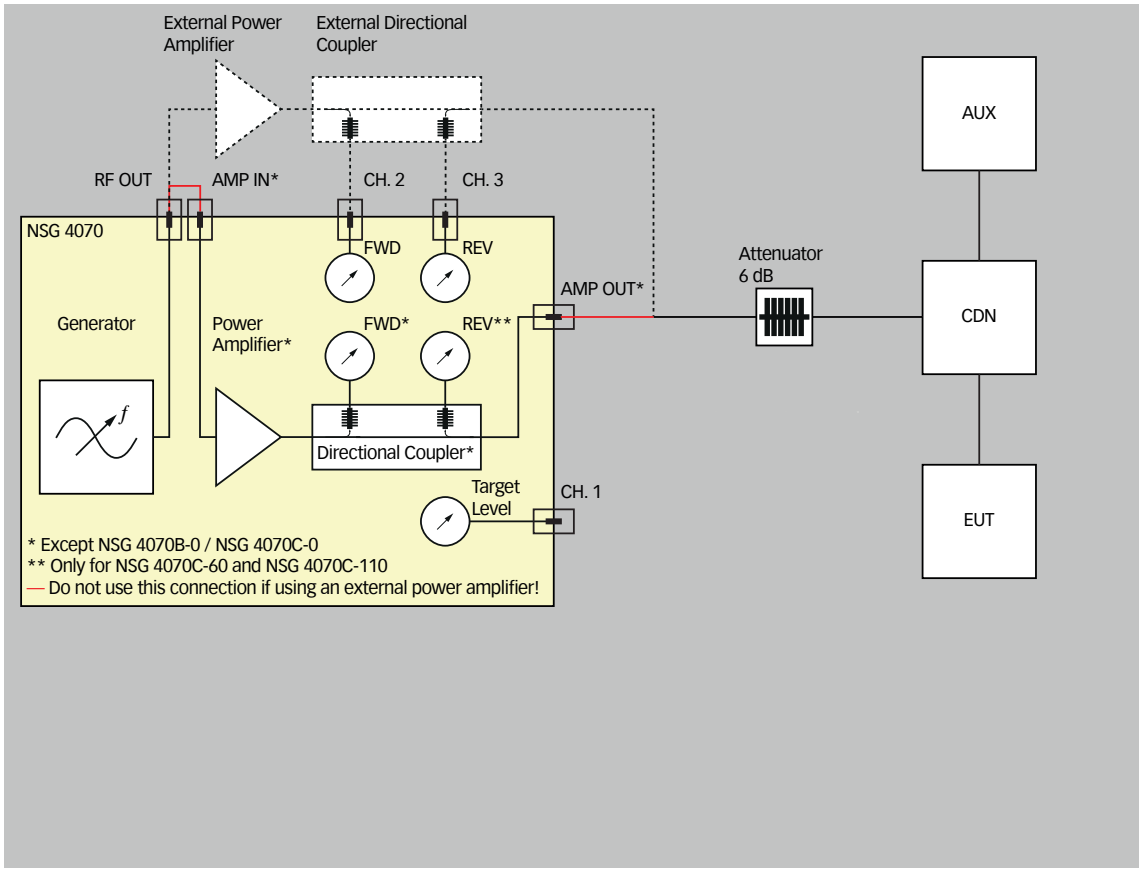


- A file name must be assigned.
- Click "Save" to save the calibration.

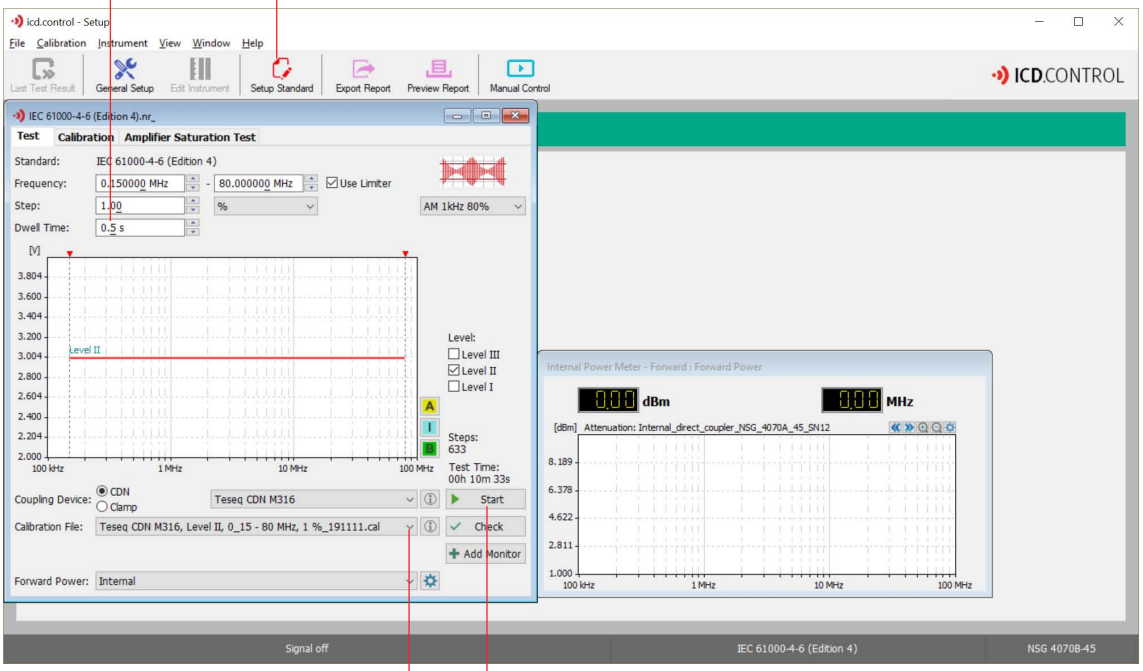
1.4. Test

- **Immediately after calibration and saving the results, the program enters the test mode.**
- **Select "View" and "Show Test Setup" to display a sample image for the test setup.**

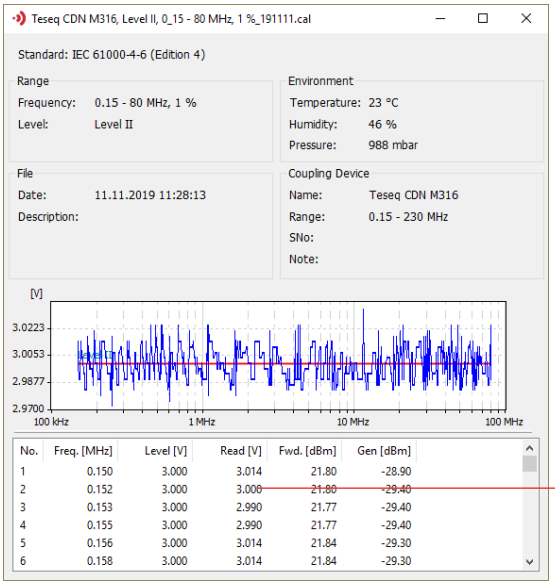




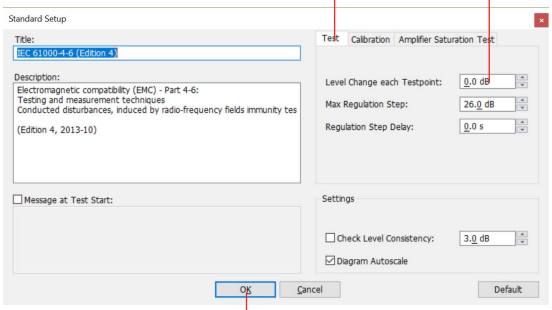
- **Change the dwell time according to the standard specification.**
- **Change in "Setup standard" eg. the lowering of the level per frequency step according to the standard specification. Click on the edge of the window if the Setup Standard switch is greyed out.**



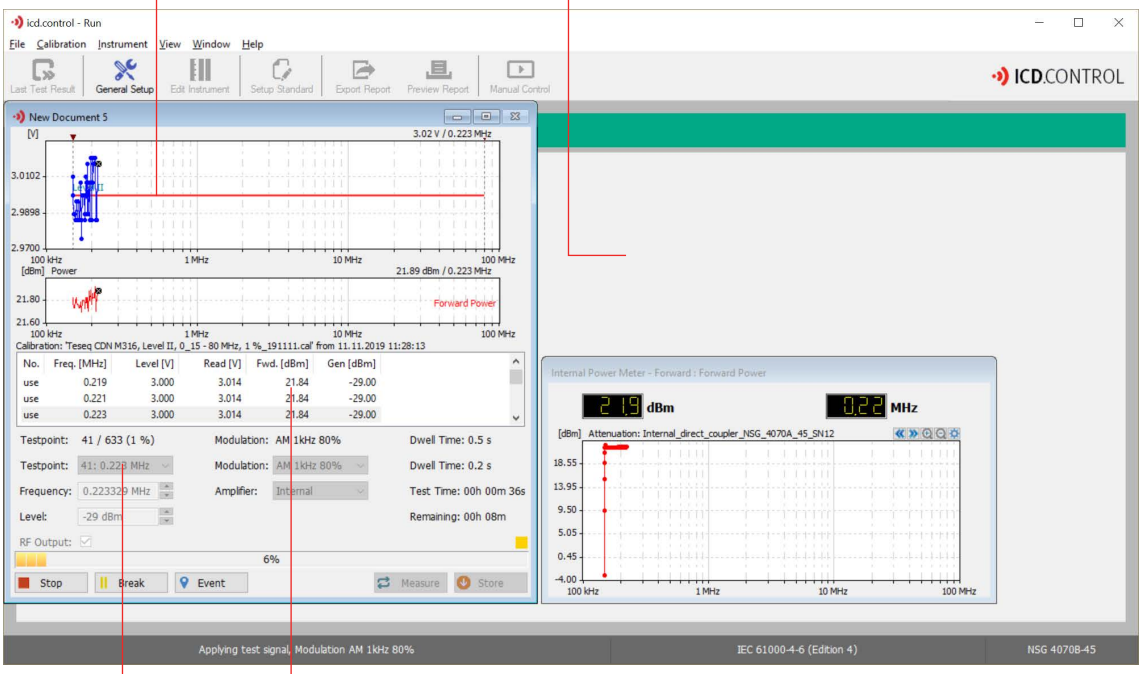
- **Click on "Start" to run the test.**
- **Immediately after calibration and saving the results, this file is used for the test. If necessary, select another calibration file. Click on the icon to display the content.**



- **Example of a calibration file.**

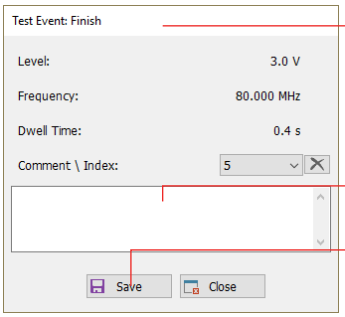


- **Select „Test“.**
- **With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. It influences the required test time.**
- **Click “OK” to save the settings.**
- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The Internal Power Meter - Forward Power Diagram displays the set forward power for each frequency step.**

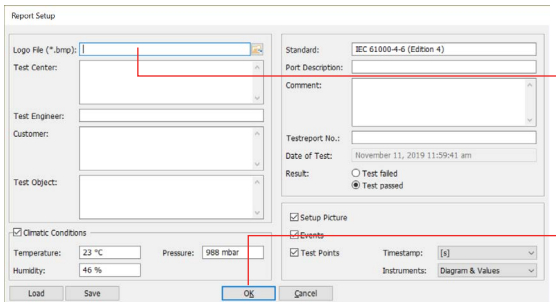


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button** Break **can be used to switch directly to the manual mode, for example, to check at a specific frequency with lowered level.**

1.5. Test end and report creation



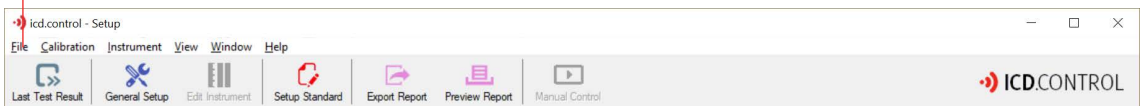
- The completion of the test run is indicated by the appearance of the "Test Event" window.
- A comment can be inserted.
- By clicking "Save" the generation of the test report is started.



- Corresponding fields can be filled out and comments inserted.
- Click on "OK" to apply the settings.

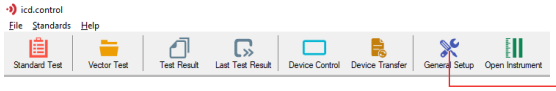
1.6. Save the configuration

- By clicking on "File", "Save as" and assigning a file name, the settings are applied.

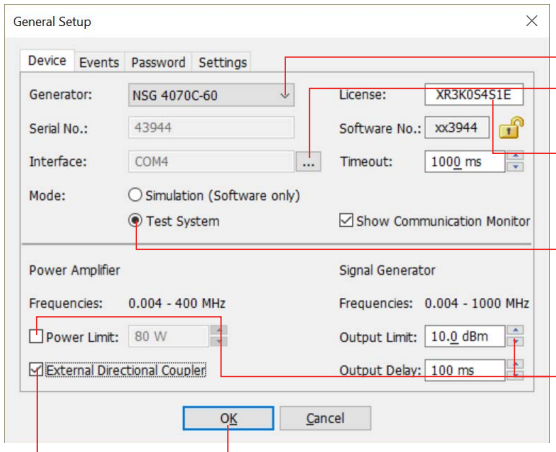


2. EXAMPLE IEC 61000-4-6 CDN TEST WITH EXTERNAL DIRECTIONAL COUPLER AND AMPLIFIER

2.1. Basic settings



Clicking on "General Setup" opens the generator settings menu.



Select the appropriate generator model.

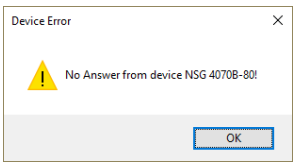
If necessary, configure the interface.

Enter the license number from the license certificate. The associated serial number is displayed in the left field.

Select "Test system" for operation with connected generator. Choose simulation to control the settings, to get to know the program especially if there is no hardware.

If necessary, set limits for the connected hardware. "Power Limit" limits the forward power. This avoids that in case of error, e.g. Power meter for the measurement of the target level not connected, the generator fully controlled and thus the power amplifier gives full power and thus the connected hardware is damaged. „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.

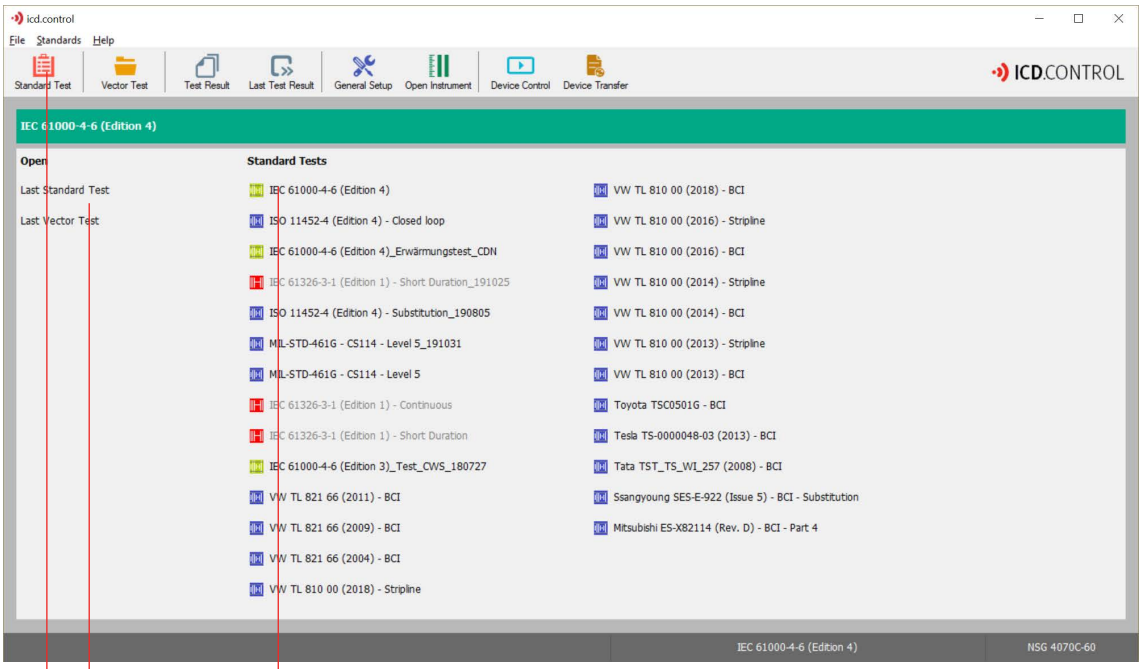
When leaving the menu with "OK", the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



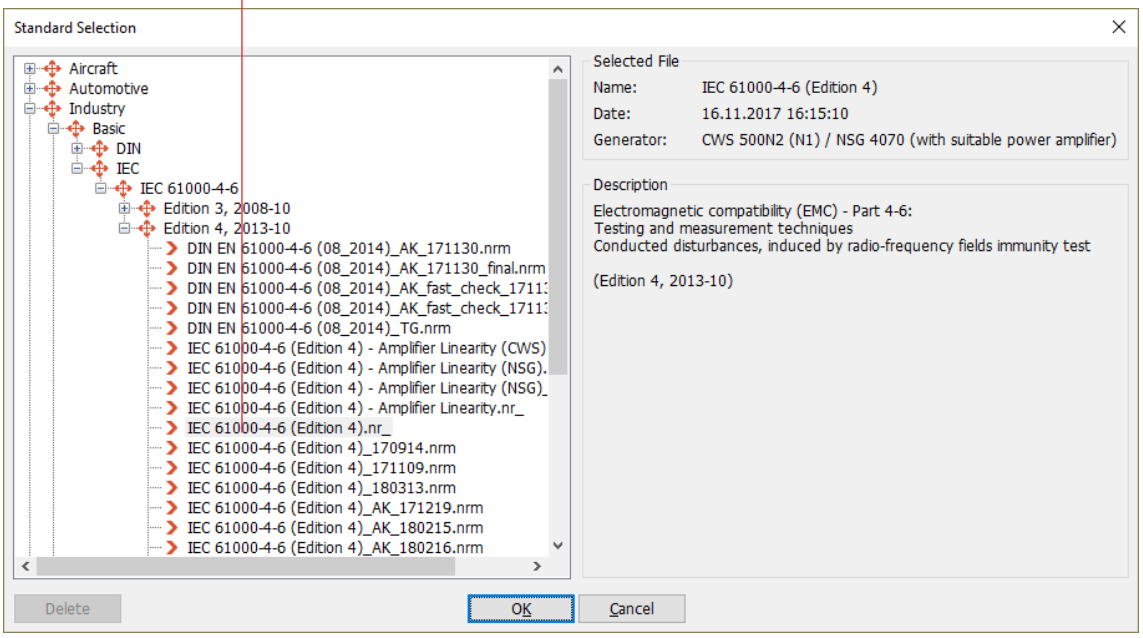
By clicking on "OK" the program changes again into the settings.

If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

2.2. Selecting and loading the test configuration

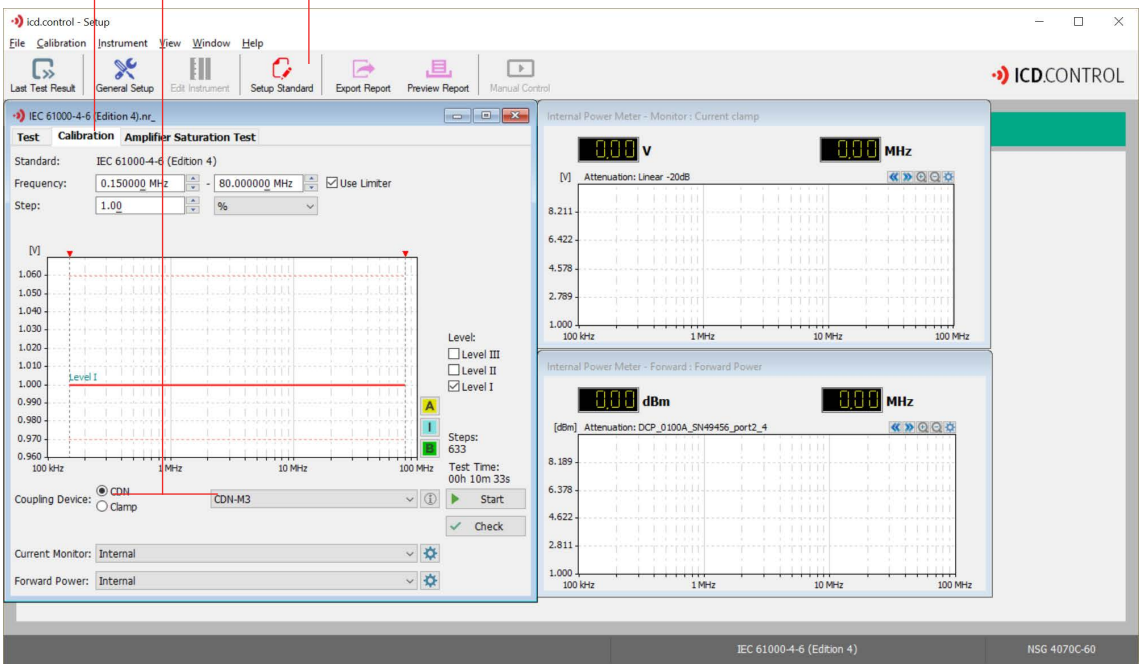


- **Click here to reopen a previously used test.**
- **Click here to open the last standard or vector test.**
- **Click here to open the library.**
- **Click here to open the configuration.**

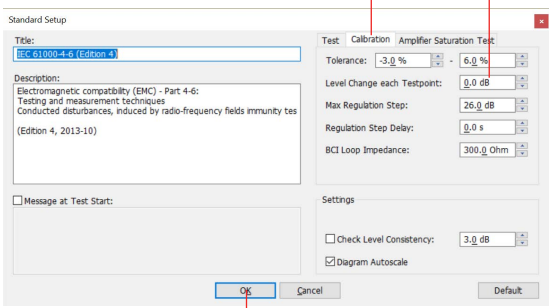


2.3. Calibration (test level adjustment)

- Select “Calibration” to set the test level setting for the connected hardware.
- Select here the appropriate coupling network.
- Select “Calibration” to set the test level setting for the connected hardware.

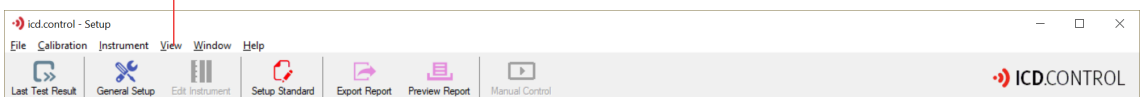


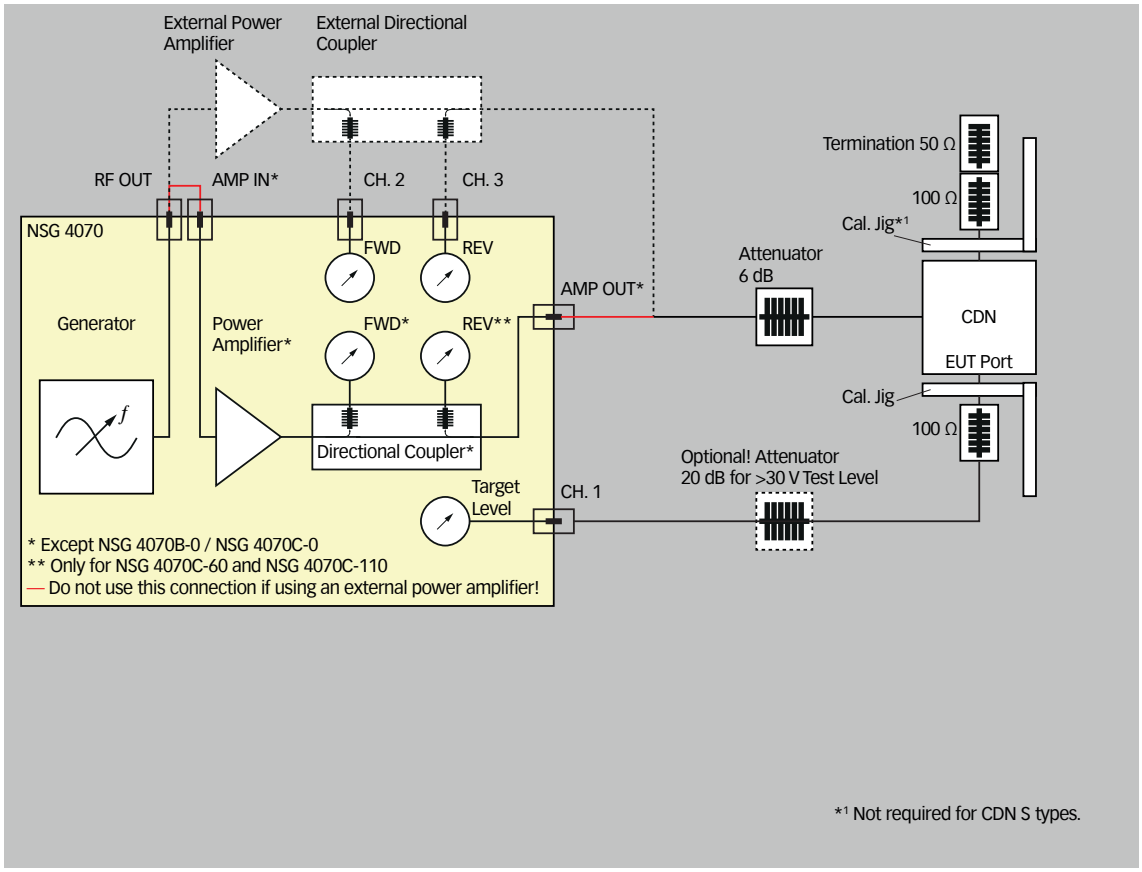
- Choose “Calibration”.
- With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do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



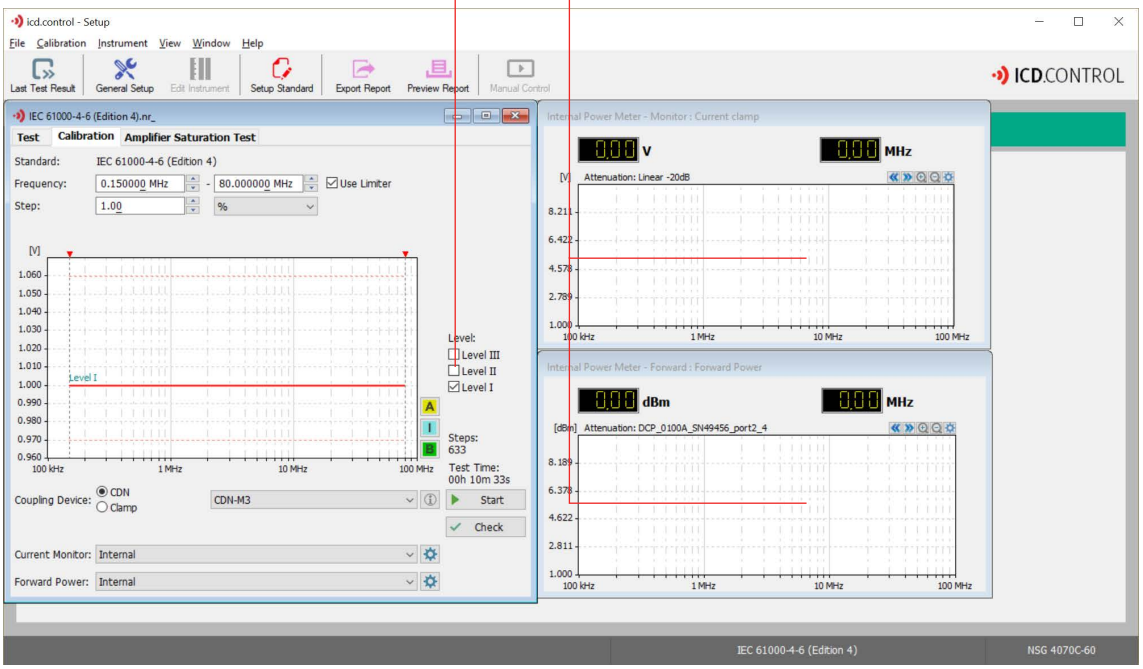
- Click “OK” to save the settings.

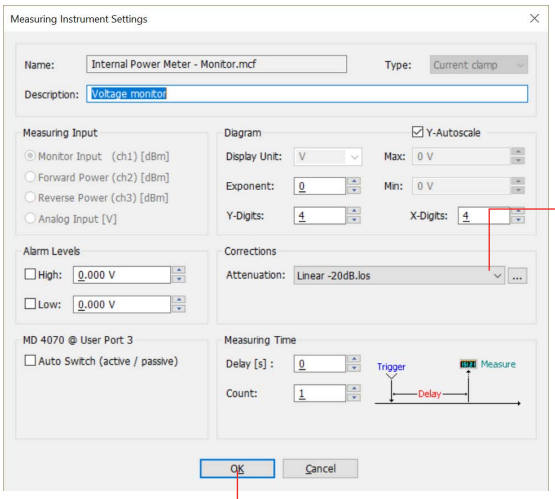
Select "View" and "Show Test Setup" to display a sample image for the test setup.



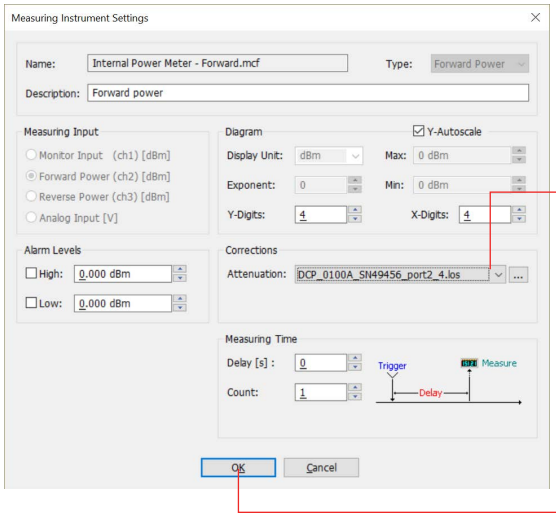


- Set the test level.
- A double-click into the diagram or a simple click on the settings symbol ⚙ opens the following menus.





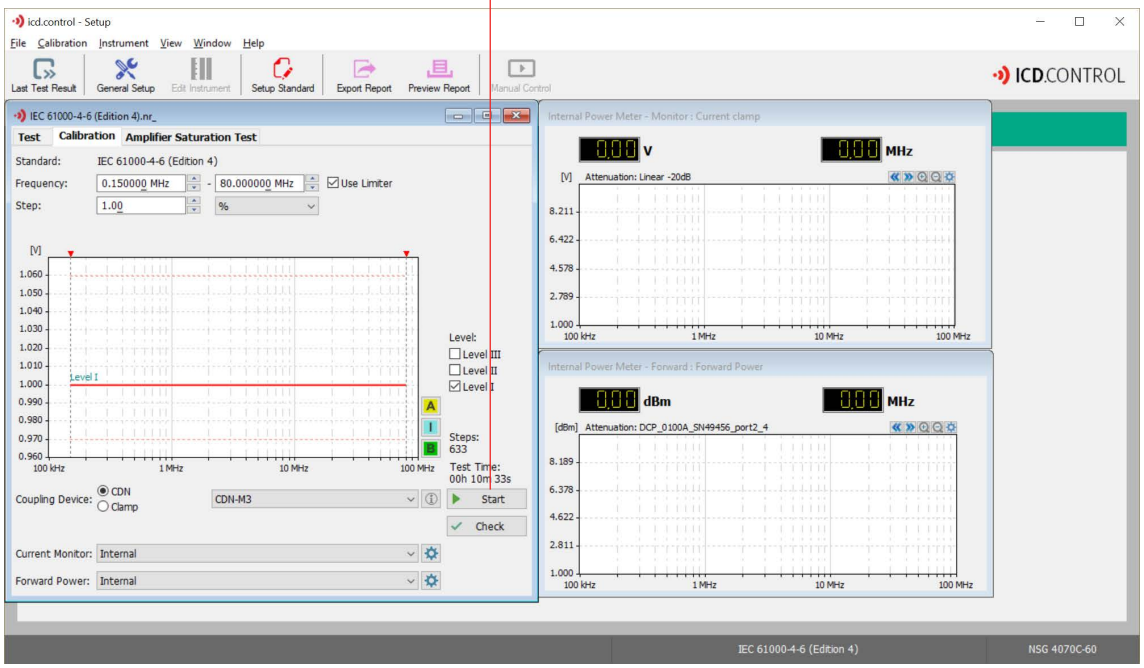
- Here, select the file containing the correction data of the attenuator connected on the power meter channel 1 of the NSG 4070, e.g. -20 dB for a 20 dB attenuator. This file can be supplemented with the attenuation values of the connected cable, recommended for long lines. For attenuation values, the software expects a minus sign before the numerical value. Clicking on the icon ... opens the file.
- Click “OK” to save the settings.



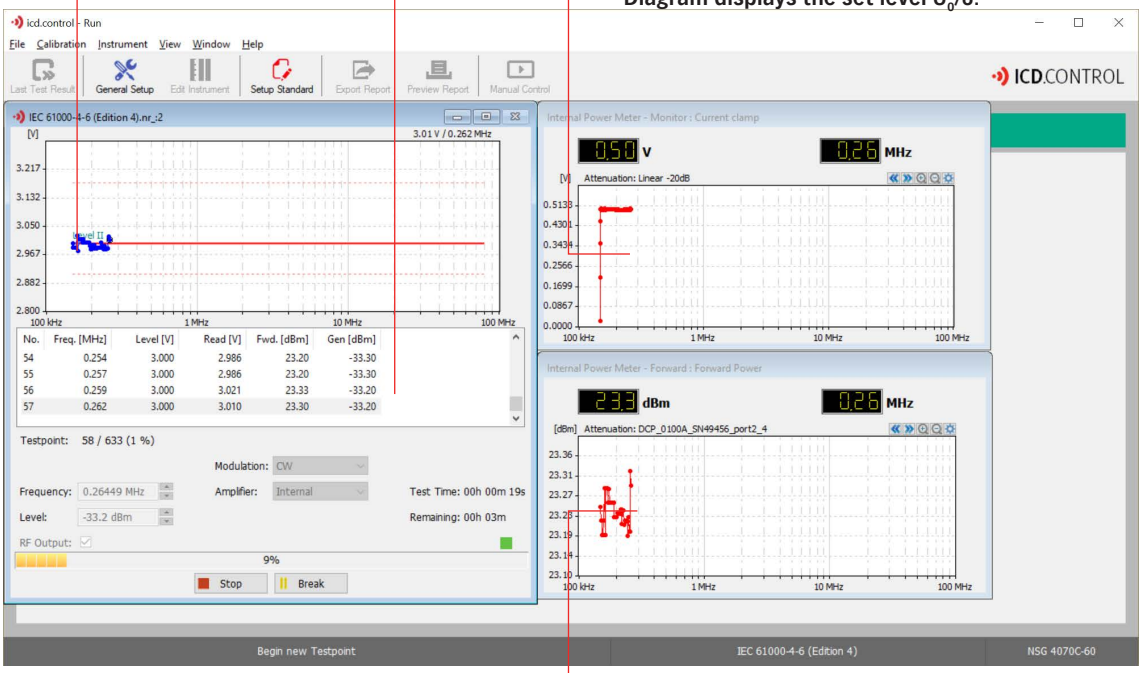
- **Select here the file containing the correction data of the internal directional coupler for measuring the forward power. For the correction data of a 40 dB directional coupler, the software expects a minus sign before the numerical value.**

- **Click "OK" to save the settings.**

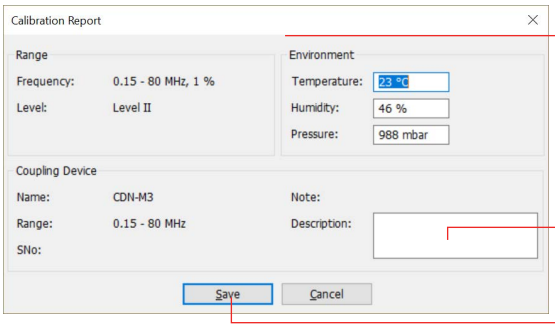
- **Click on "Start" to execute the calibration.**



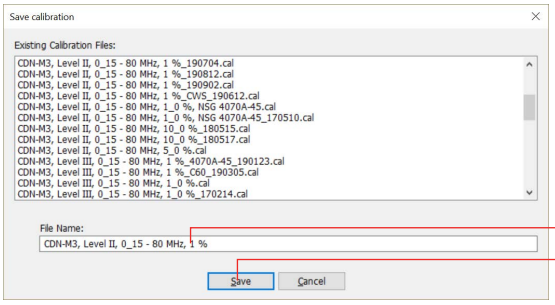
- In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.
- Below the diagram, a table displays the values of frequency, target level, set level, net, forward, reverse (not used here) and generator power.
- The Internal Power Meter - Monitor: Current Clamp Diagram displays the set level $U_0/6$.



- The Internal Power Meter - Forward Power Diagram shows the required forward power for each level.



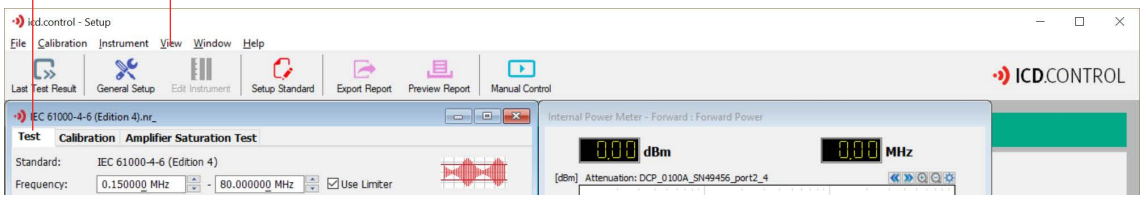
- After successful calibration, the operator is prompted to save the file.
- A comment can be inserted.
- Click “Save” to save the settings.

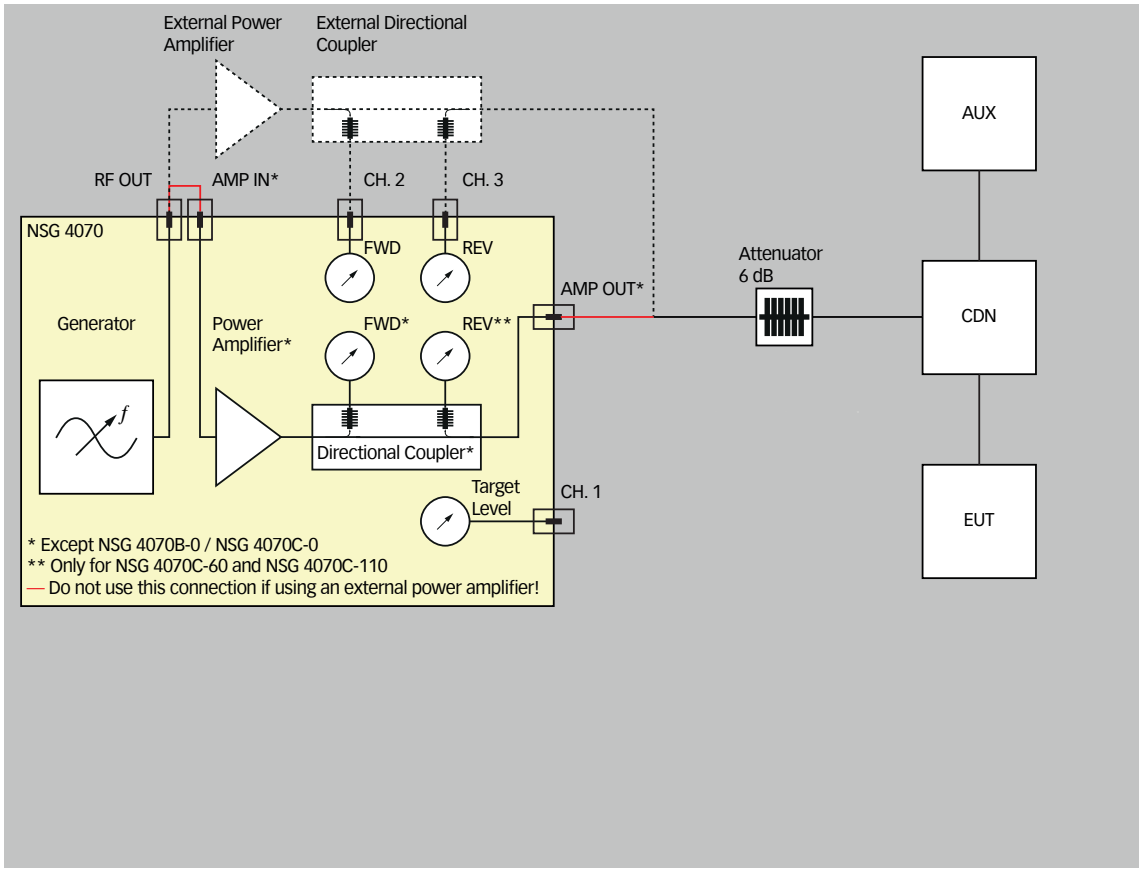


- A file name must be assigned.
- Click “Save” to save the calibration.

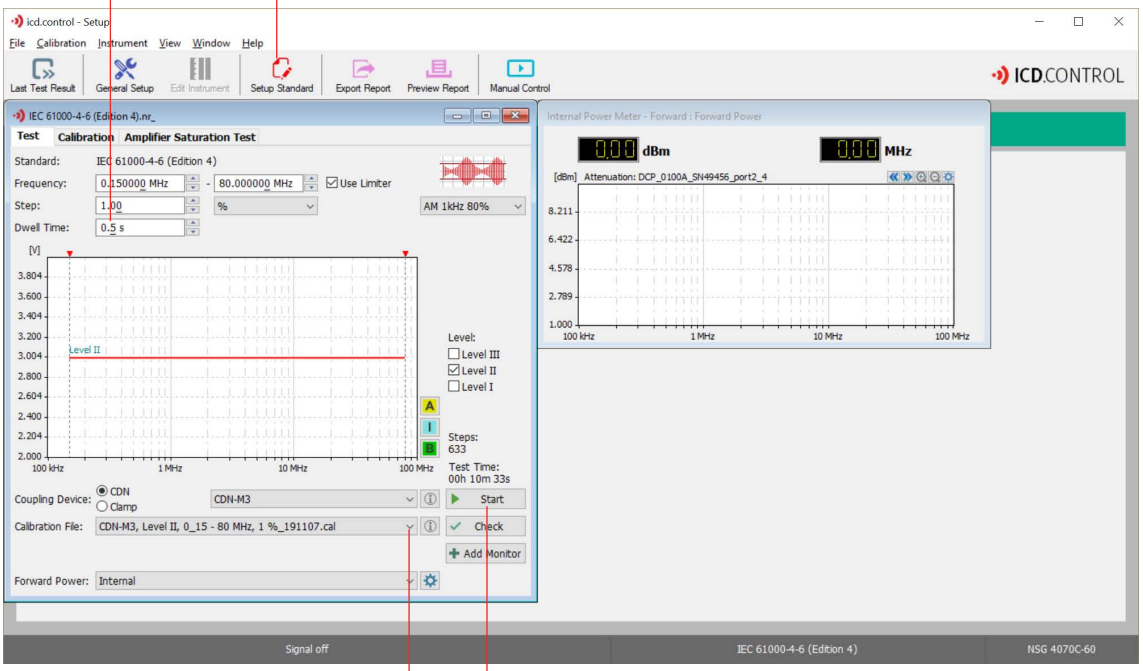
2.4. Test

- **Immediately after calibration and saving the results, the program enters the test mode.**
- **Select "View" and "Show Test Setup" to display a sample image for the test setup.**

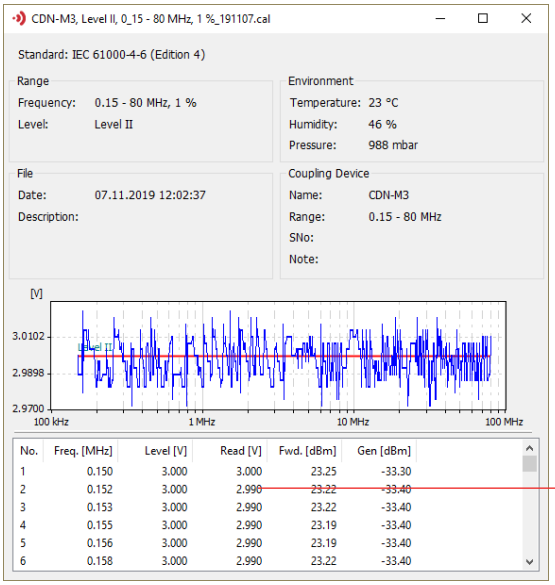




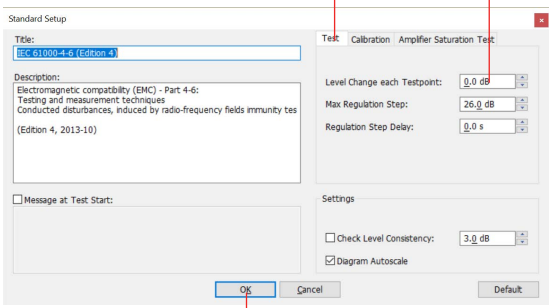
- Change the dwell time according to the standard specification.
- Change in “Setup standard” eg. the lowering of the level per frequency step according to the standard specification. Click on the edge of the window if the Setup Standard switch is greyed out.



- Click on “Start” to run the exam.
- Immediately after calibration and saving the results, this file is used for the test. If necessary, select another calibration file. Click on the icon to display the content.

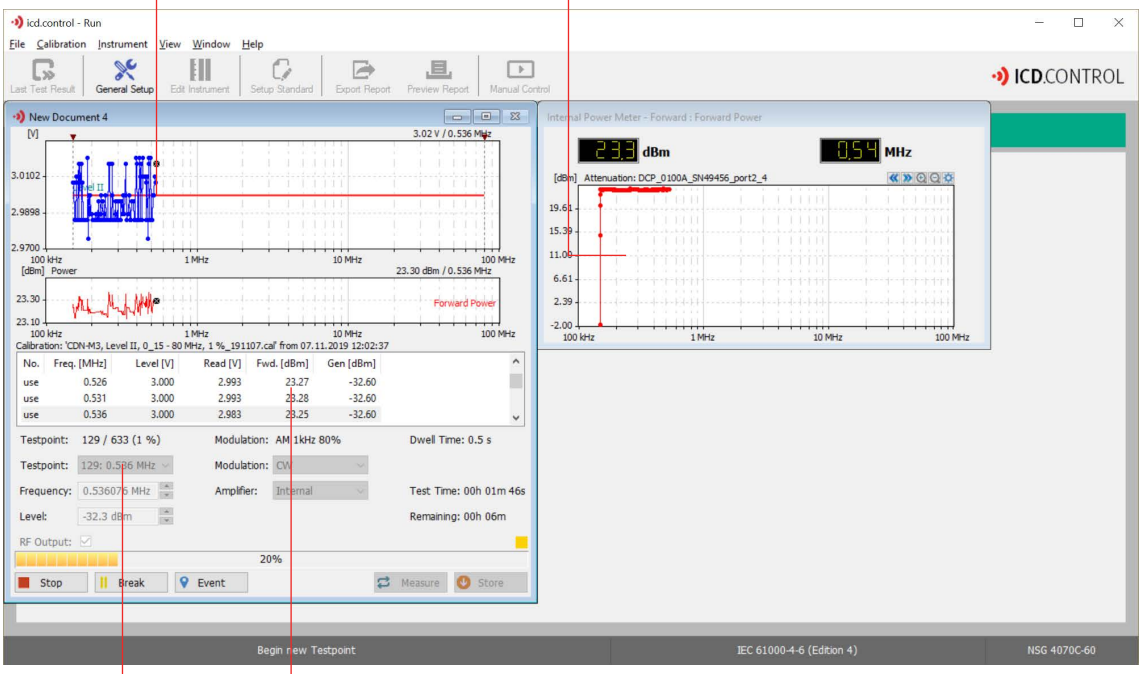


- Example of a calibration file.



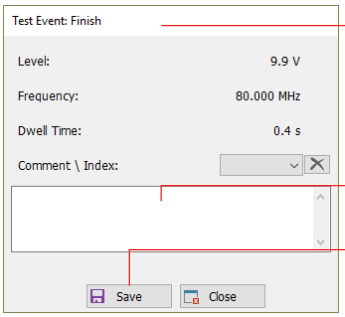
- **Select „Test“.**
- **With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. It influences the required test time.**
- **Click “OK” to save the settings.**

- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The Internal Power Meter - Forward Power Diagram displays the set forward power for each frequency step.**

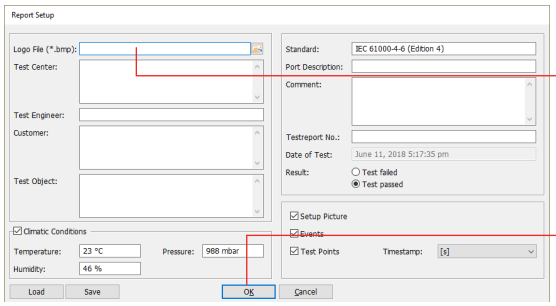


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button Break can be used to switch directly to the manual mode, for example, to check at a specific frequency with lowered level.**

2.5. Test end and report creation



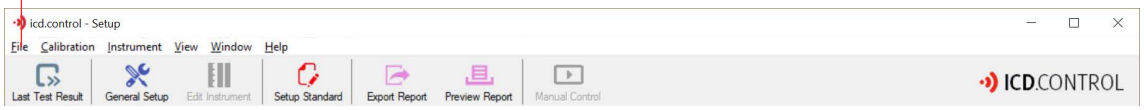
- The completion of the test run is indicated by the appearance of the "Test Event" window.
- A comment can be inserted.
- By clicking "Save" the generation of the test report is started.



- Corresponding fields can be filled out and comments inserted.
- Click on "OK" to apply the settings.

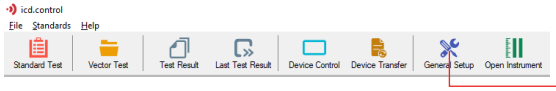
2.6. Save the configuration

- By clicking on "File", "Save as" and assigning a file name, the settings are applied.

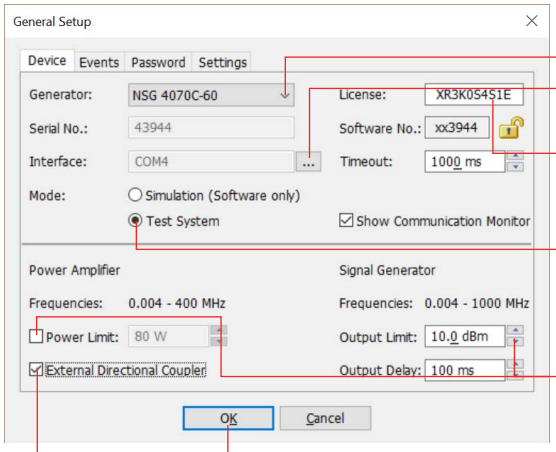


3. EXAMPLE IEC 61000-4-6 CLAMP TEST WITH EXTERNAL DIRECTIONAL COUPLER AND AMPLIFIER

3.1. Basic settings



Clicking on "General Setup" opens the generator settings menu.



Select the appropriate generator model.

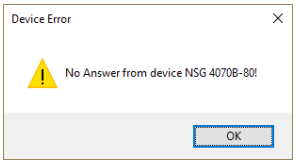
If necessary, configure the interface.

Enter the license number from the license certificate. The associated serial number is displayed in the left field.

Select "Test system" for operation with connected generator. Choose simulation to control the settings, to get to know the program especially if there is no hardware.

If necessary, set limits for the connected hardware. "Power Limit" limits the forward power. This avoids that in case of error, e.g. Power meter for the measurement of the target level not connected, the generator fully controlled and thus the power amplifier gives full power and thus the connected hardware is damaged. „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.

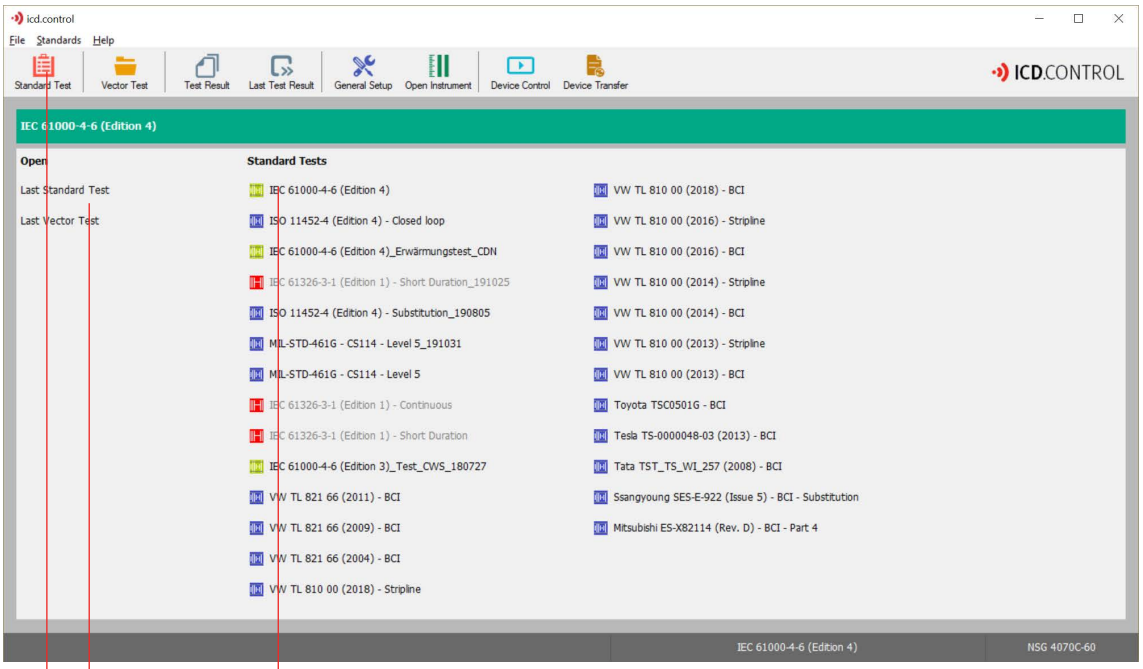
When leaving the menu with "OK", the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



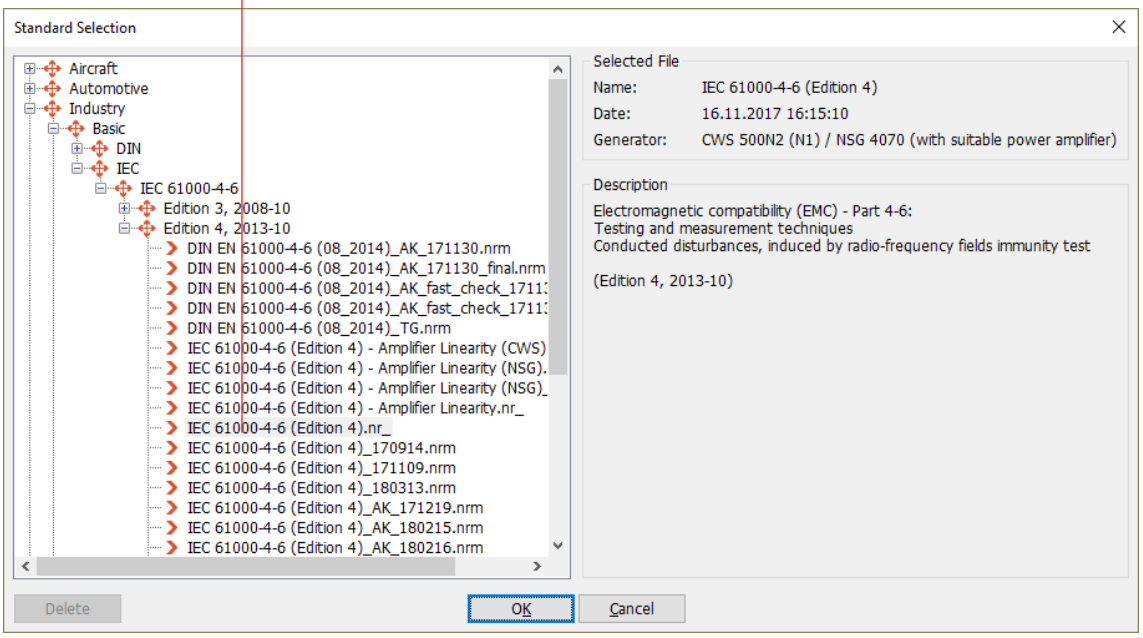
By clicking on "OK" the program changes again into the settings.

If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

3.2. Selecting and loading the test configuration

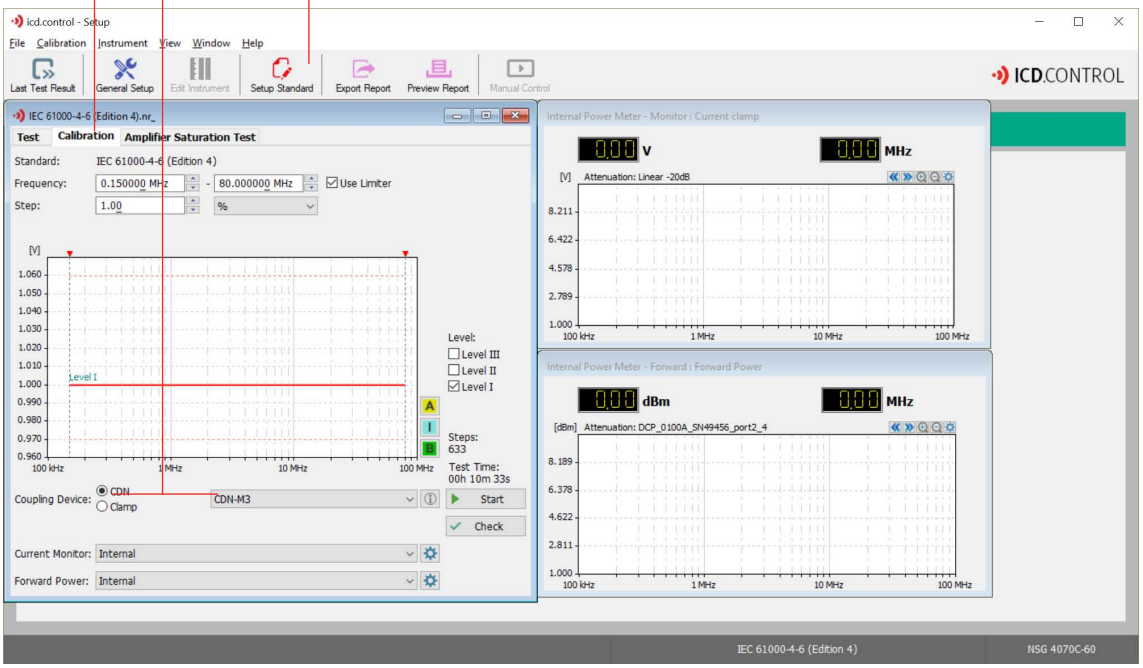


- **Click here to reopen a previously used test.**
- **Click here to open the last standard or vector test.**
- **Click here to open the library.**
- **Click here to open the configuration.**

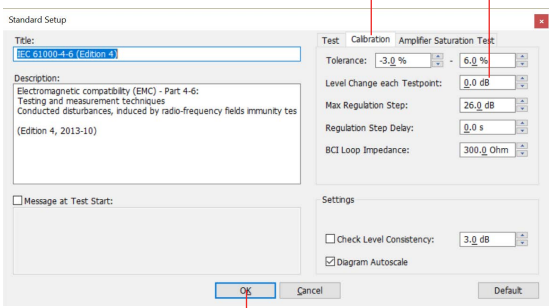


3.3. Calibration (test level adjustment)

- **Select "Calibration" to set the test level setting for the connected hardware.**
- **Select here the appropriate coupling network.**
- **Select "Calibration" to set the test level setting for the connected hardware.**

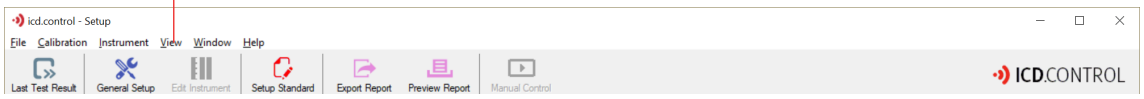


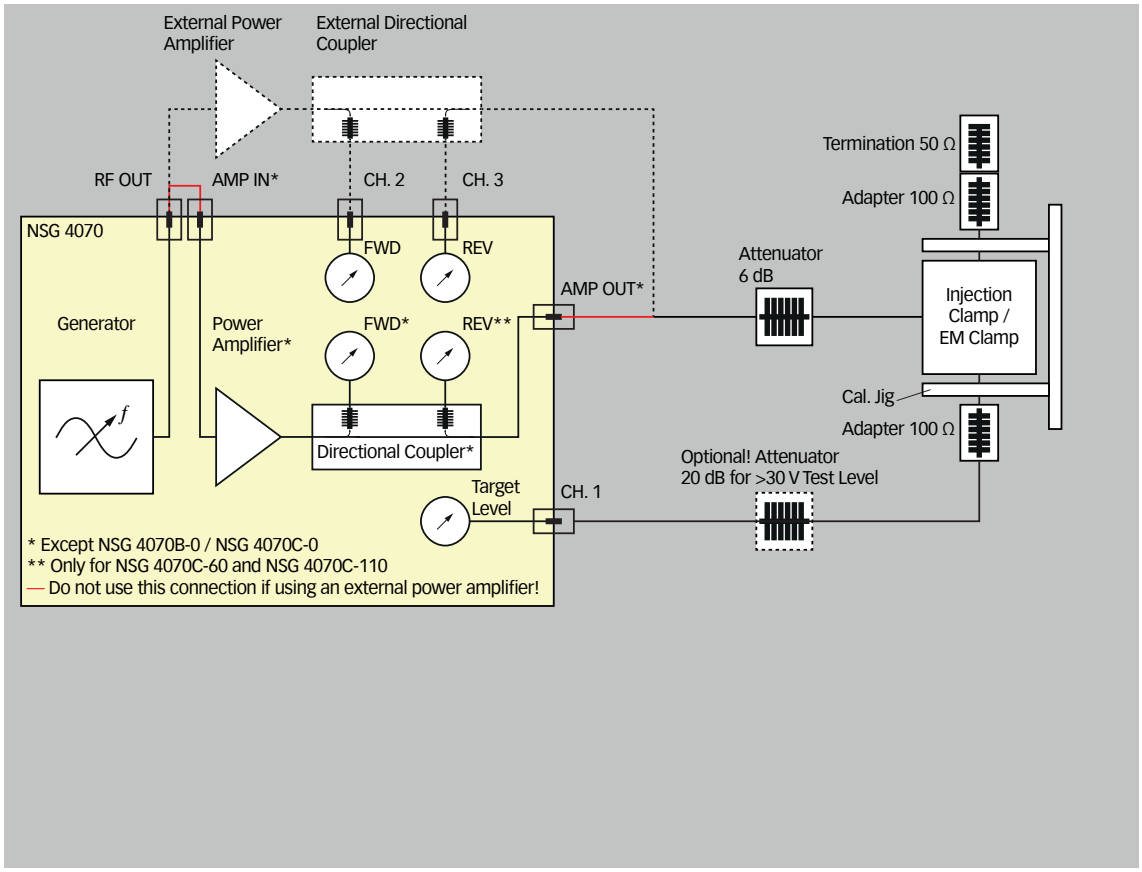
- **Choose "Calibration".**
- **With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements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



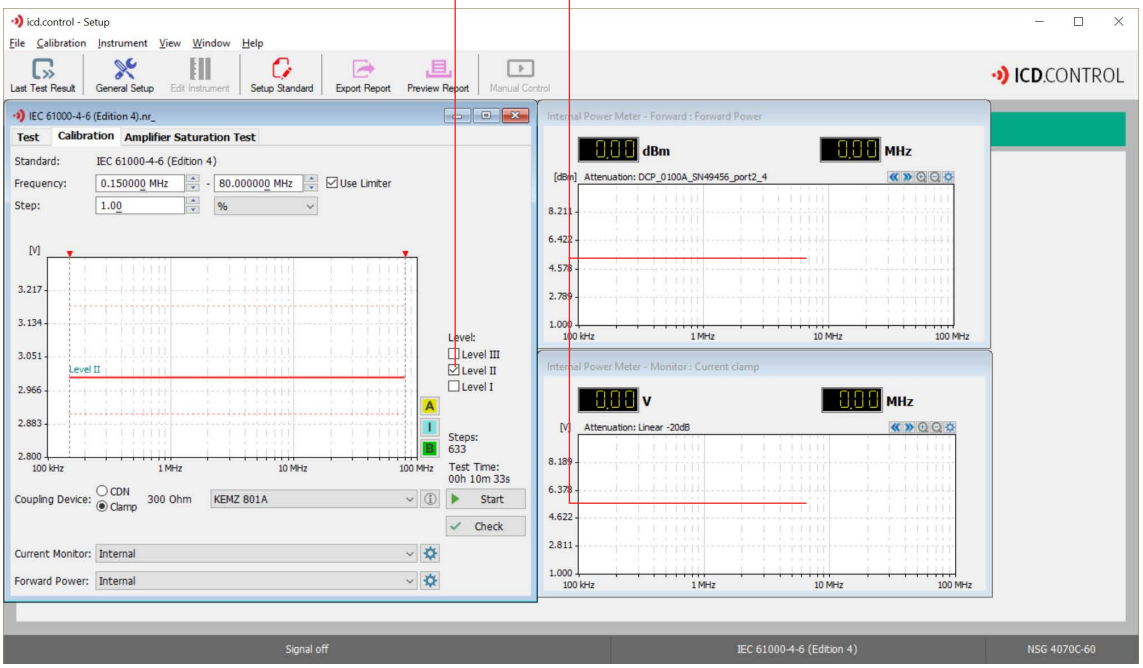
- **Click "OK" to save the settings.**

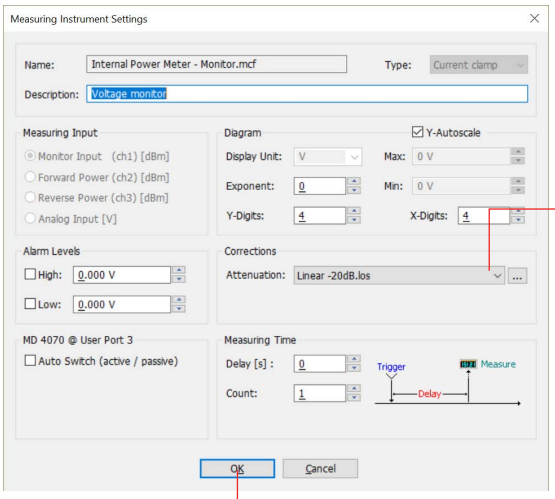
Select "View" and "Show Test Setup" to display a sample image for the test setup.



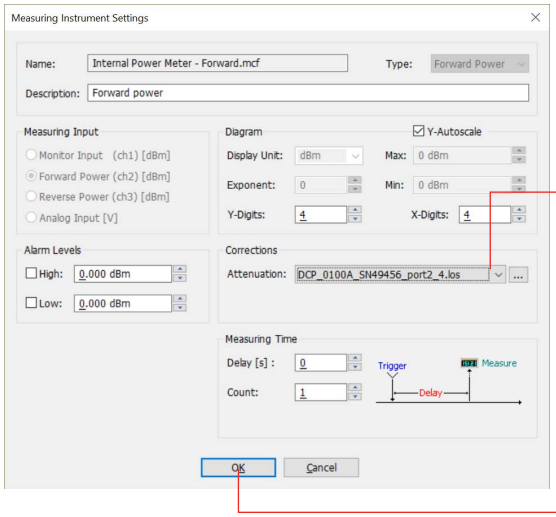


- Set the test level.
- A double-click into the diagram or a simple click on the settings symbol opens the following menus.





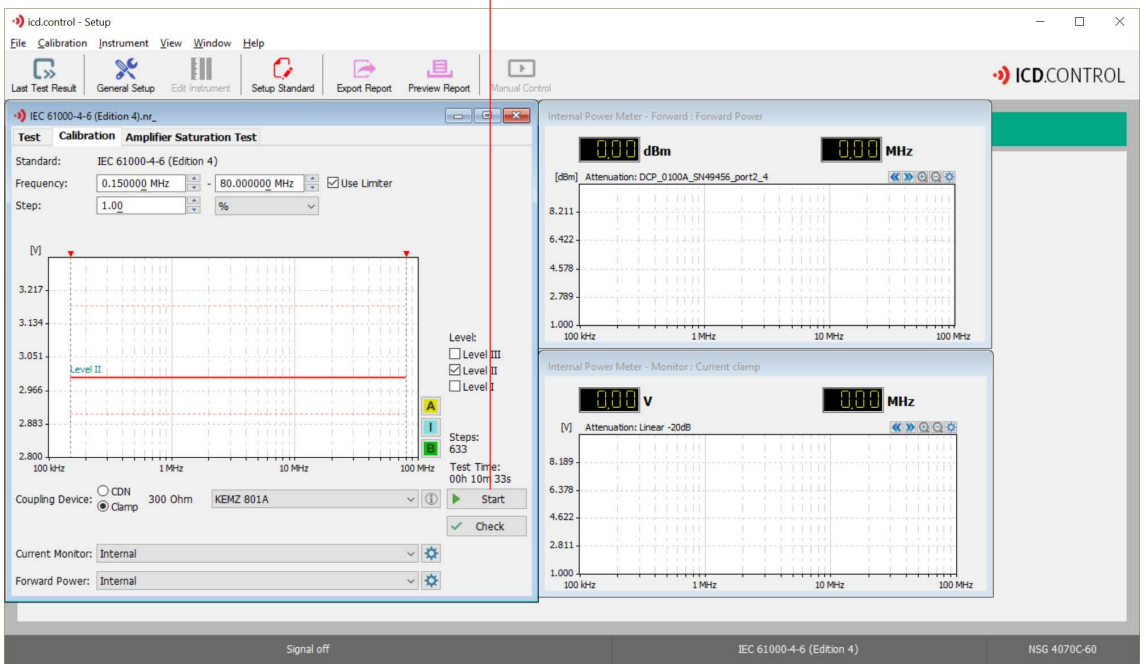
- Here, select the file containing the correction data of the attenuator connected on the power meter channel 1 of the NSG 4070, e.g. -20 dB for a 20 dB attenuator. This file can be supplemented with the attenuation values of the connected cable, recommended for long lines. For attenuation values, the software expects a minus sign before the numerical value. Clicking on the icon ... opens the file.
- Click "OK" to save the settings.



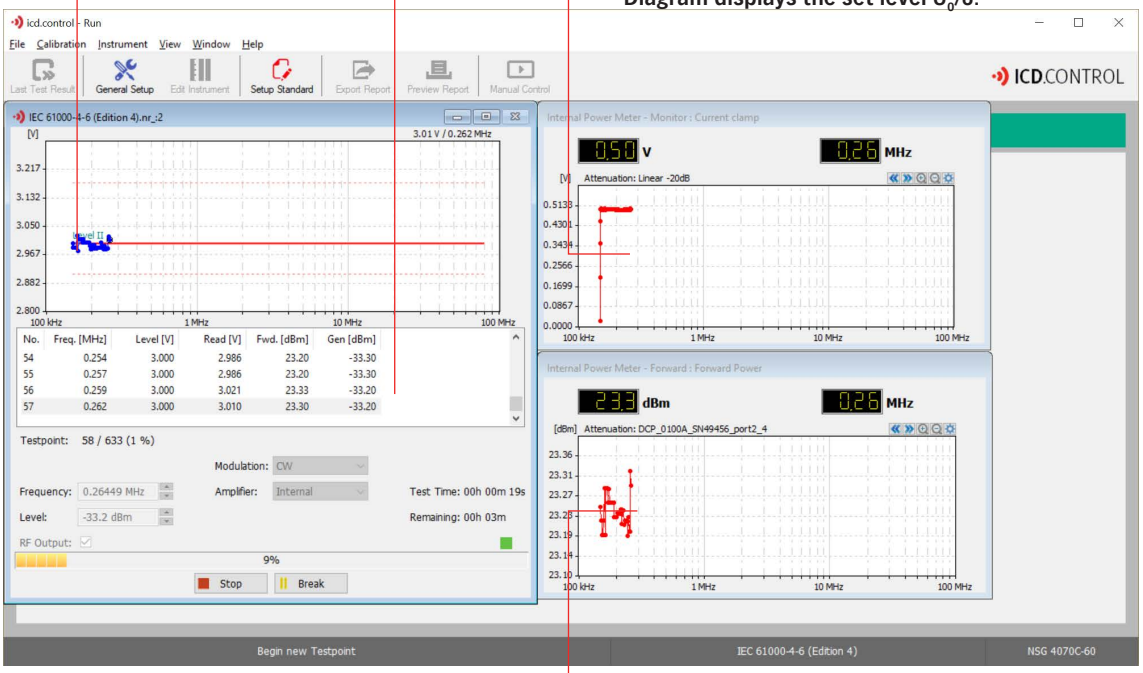
Select here the file containing the correction data of the internal directional coupler for measuring the forward power. For the correction data of a 40 dB directional coupler, the software expects a minus sign before the numerical value.

Click "OK" to save the settings.

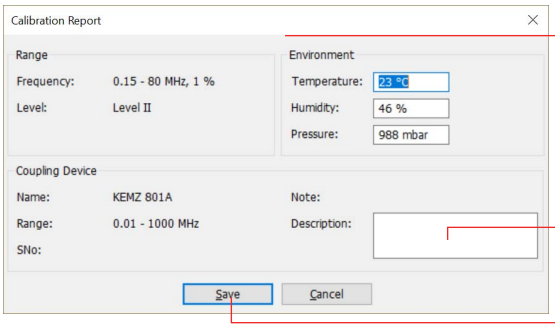
Click on "Start" to execute the calibration.



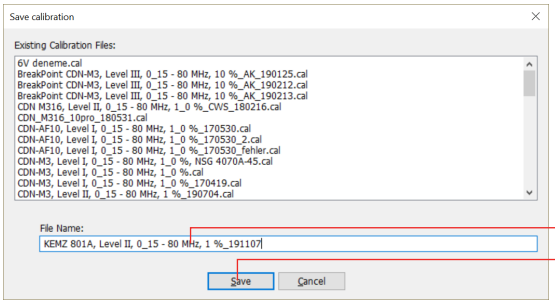
- In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.
- Below the diagram, a table displays the values of frequency, target level, set level, net, forward, reverse (not used here) and generator power.
- The Internal Power Meter - Monitor: Current Clamp Diagram displays the set level $U_0/6$.



- The Internal Power Meter - Forward Power Diagram shows the required forward power for each level.



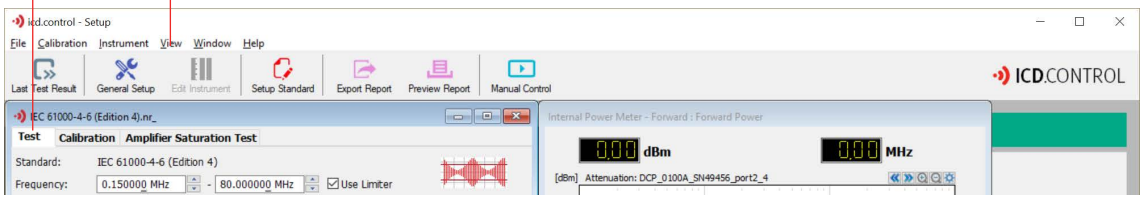
- After successful calibration, the operator is prompted to save the file.
- A comment can be inserted.
- Click "Save" to save the settings.

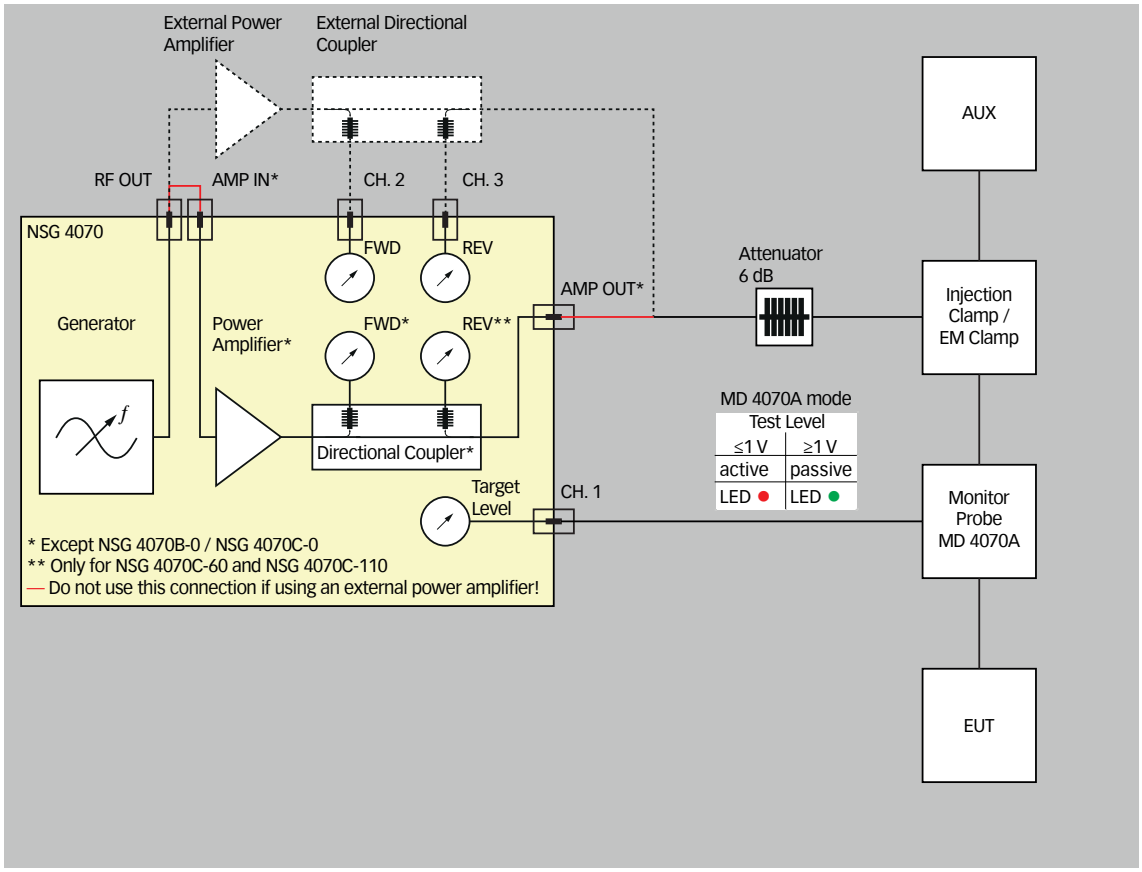


- A file name must be assigned.
- Click "Save" to save the calibration.

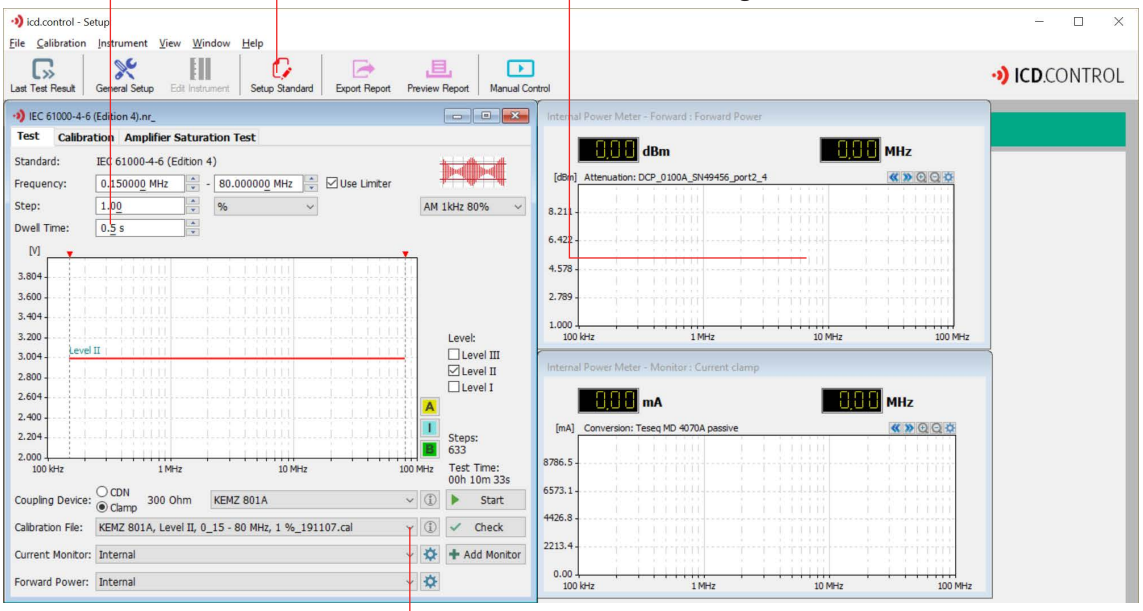
3.4. Test

- **Immediately after calibration and saving the results, the program enters the test mode.**
- **Select "View" and "Show Test Setup" to display a sample image for the test setup.**

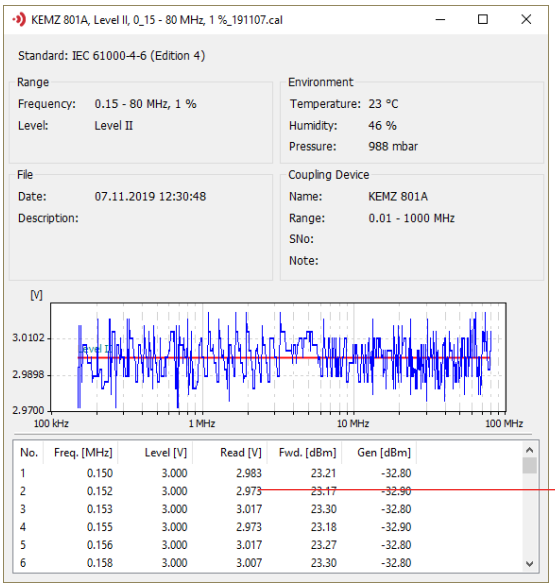




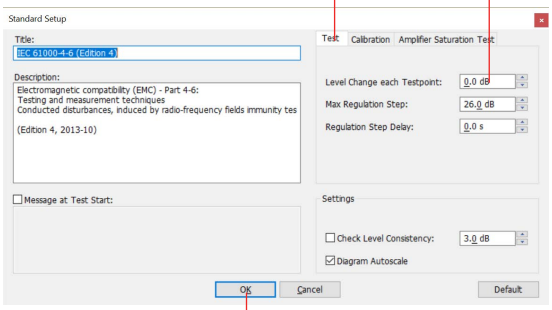
- **Change the dwell time according to the standard specification.**
- **Change in "Setup standard" eg. the lowering of the level per frequency step according to the standard specification. Click on the edge of the window if the "Setup Standard" switch is greyed out.**
- **A double click into the diagram or a simple click on the settings symbol ⚙ opens the following menu for selecting the MD 4070.**



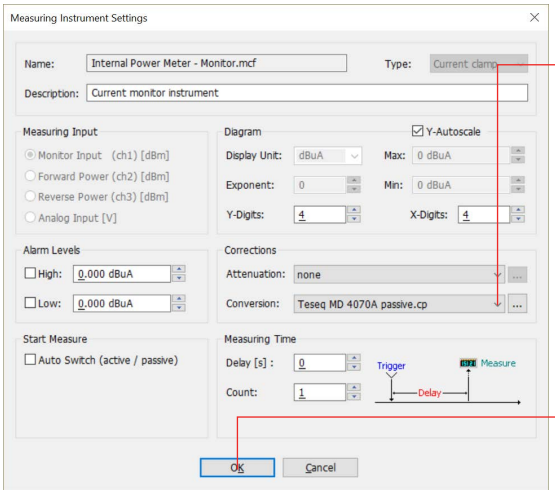
- **Immediately after calibration and saving the results, this file is used for the test. If necessary, select another calibration file. Click on the icon ⓘ to display the content**



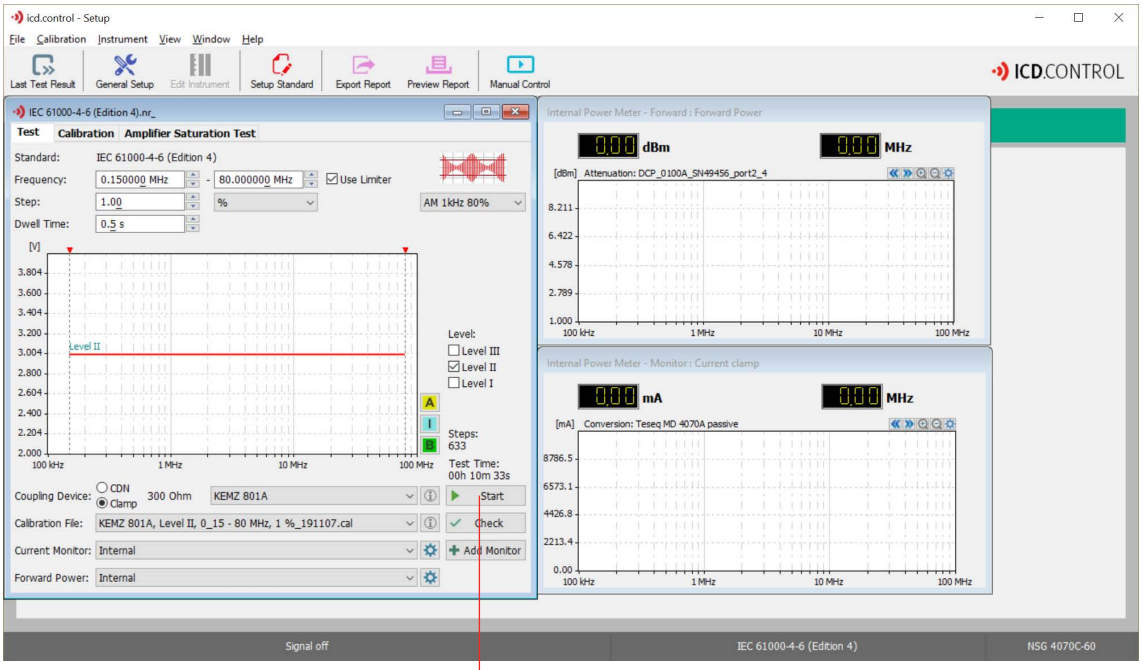
- **Example of a calibration file**



- **Select „Test“.**
- **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. It influences the required test time.**
- **Click “OK” to save the settings.**

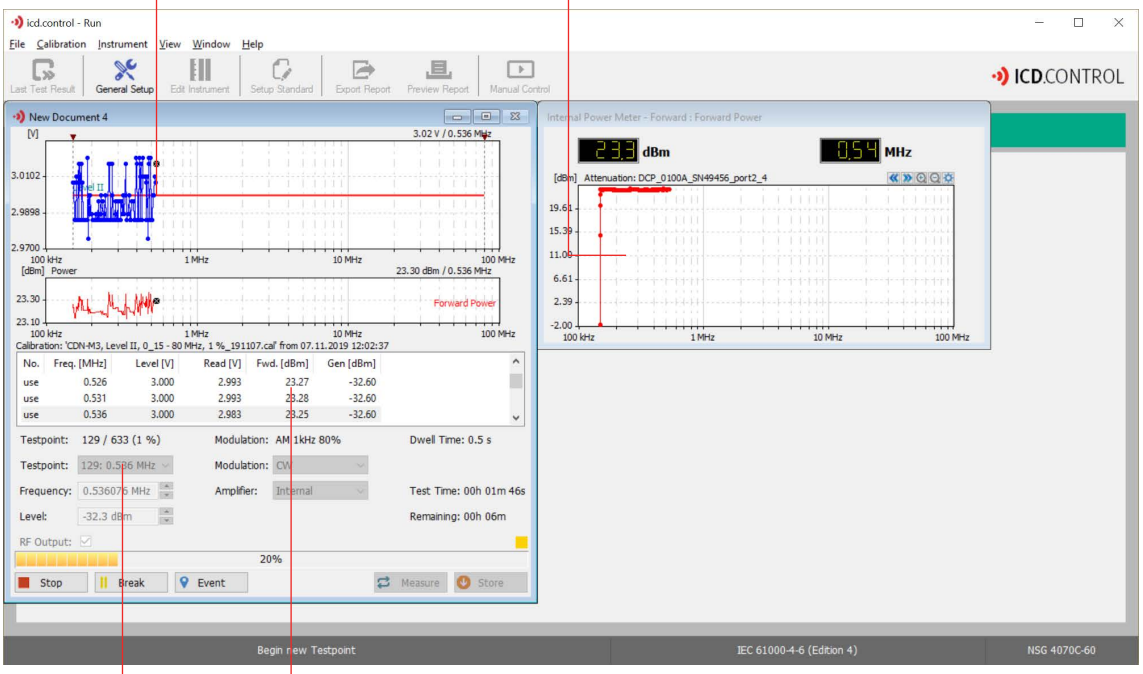


- **Select here the file containing the correction data of the MD 4070A for the passive mode. Clicking on the icon ... opens the file.**
- **Click “OK” to save the settings.**



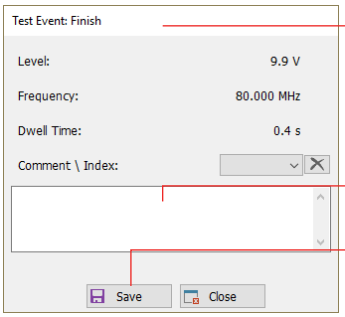
- **Click on “Start” to run the test.**

- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The Internal Power Meter - Forward Power Diagram displays the set forward power for each frequency step.**

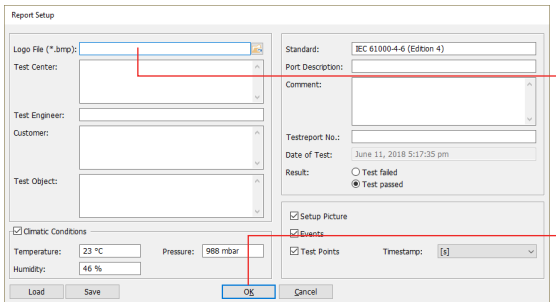


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button** Break **can be used to switch directly to the manual mode, for example, to check at a specific frequency with lowered level.**

3.5. Test end and report creation



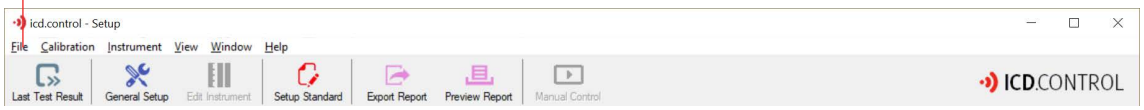
- The completion of the test run is indicated by the appearance of the "Test Event" window.
- A comment can be inserted.
- By clicking "Save" the generation of the test report is started.



- Corresponding fields can be filled out and comments inserted.
- Click on "OK" to apply the settings.

3.6. Save the configuration

- By clicking on "File", "Save as" and assigning a file name, the settings are applied.



Manufacturer
AMETEK CTS Europe GmbH
12623 Berlin, Germany
Landsberger Str. 255
T +49 30 5659 8835
F +49 30 5659 8834
sales.cts.eu@ametek.com
www.ametek-cts.com

China
AMETEK Commercial Enterprise (Shanghai) Co., Ltd. Beijing Branch
T +8610 8526 2111
F +8610 8526 2141
sales.cts.cn@ametek.com

Japan
AMETEK Co., Ltd. Nagoya Office
T +81 52 709 5501
cts-japan.sales@ametek.com

Taiwan
AMETEK Taiwan Corp. Ltd
T +886 3 575 0099
taiwansales.cts@ametek.com

USA
AMETEK CTS US
T +1 732 417 0501
Toll free +1 888 417 0501
usasales.cts@ametek.com

Europe
AMETEK CTS Europe GmbH
T +49 2307 26070-0
sales.cts.eu@ametek.com

Singapore
AMETEK Singapore Pte Ltd
T +65 6484 2388
singaporesales.cts@ametek.com

To find your local partner within Teseq's global network, please go to
www.ametek-cts.com

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