SOFTWARE FOR EMC IMMUNITY TESTING
ICD.CONTROL

APPLICATION NOTE
IEC 61000-4-39

AMETEK®
COMPLIANCE TEST SOLUTIONS

TESEQ
Advanced Test Solutions for EMC

SOFTWARE FOR EMC IMMUNITY TESTING
ICD.CONTROL

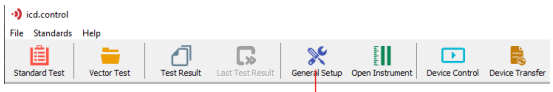
APPLICATION NOTE
IEC 61000-4-39

This application note requires icd.control version 7.1.1 or newer.

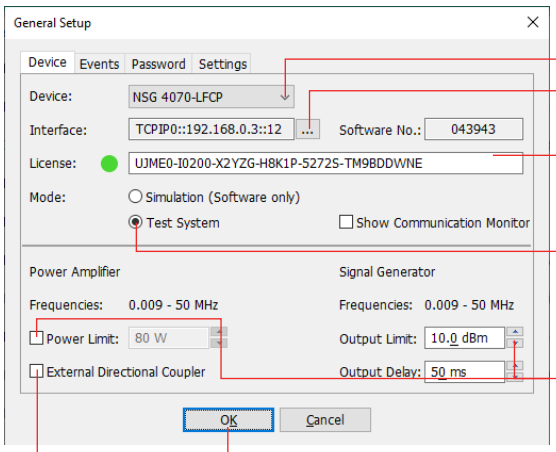
CONTENT

1. EXAMPLE IEC 61000-4-39 LF TEST WITH NSG 4070C-LFCP

1.1. Basic settings



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



Select the appropriate generator model.

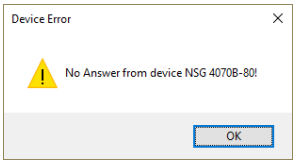
If necessary, configure the interface.

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.

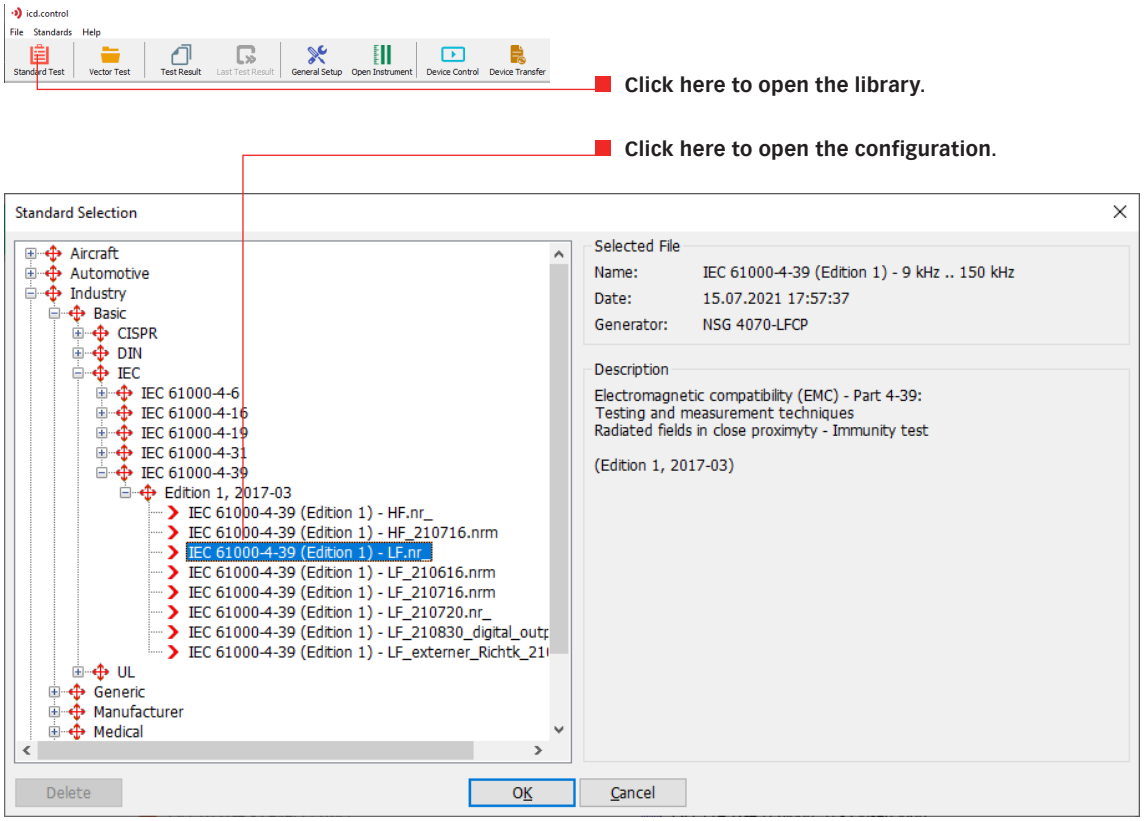
When leaving the menu with “OK“, the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



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

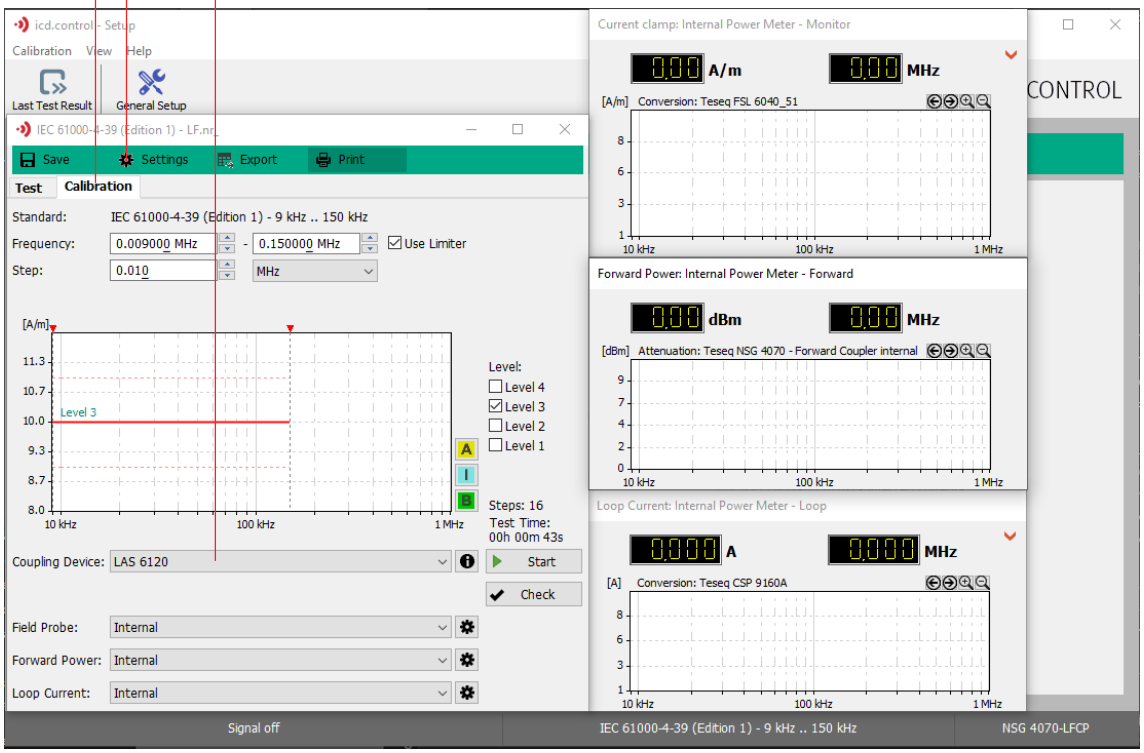
If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

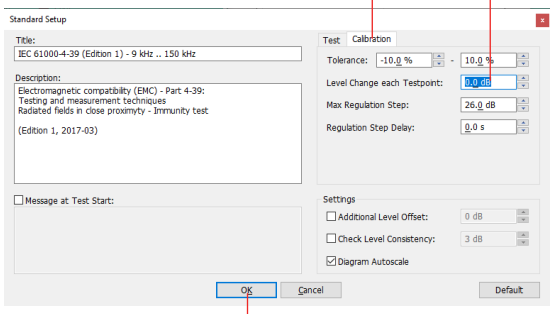
1.2. Selecting and loading the test configuration



1.3. Calibration (test level adjustment)

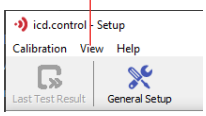
- Select “Calibration” to set the test level setting for the connected hardware.
- Select “Setup Standard” to change the basic settings for this test. See the example below.
- Select here the LAS 6120.

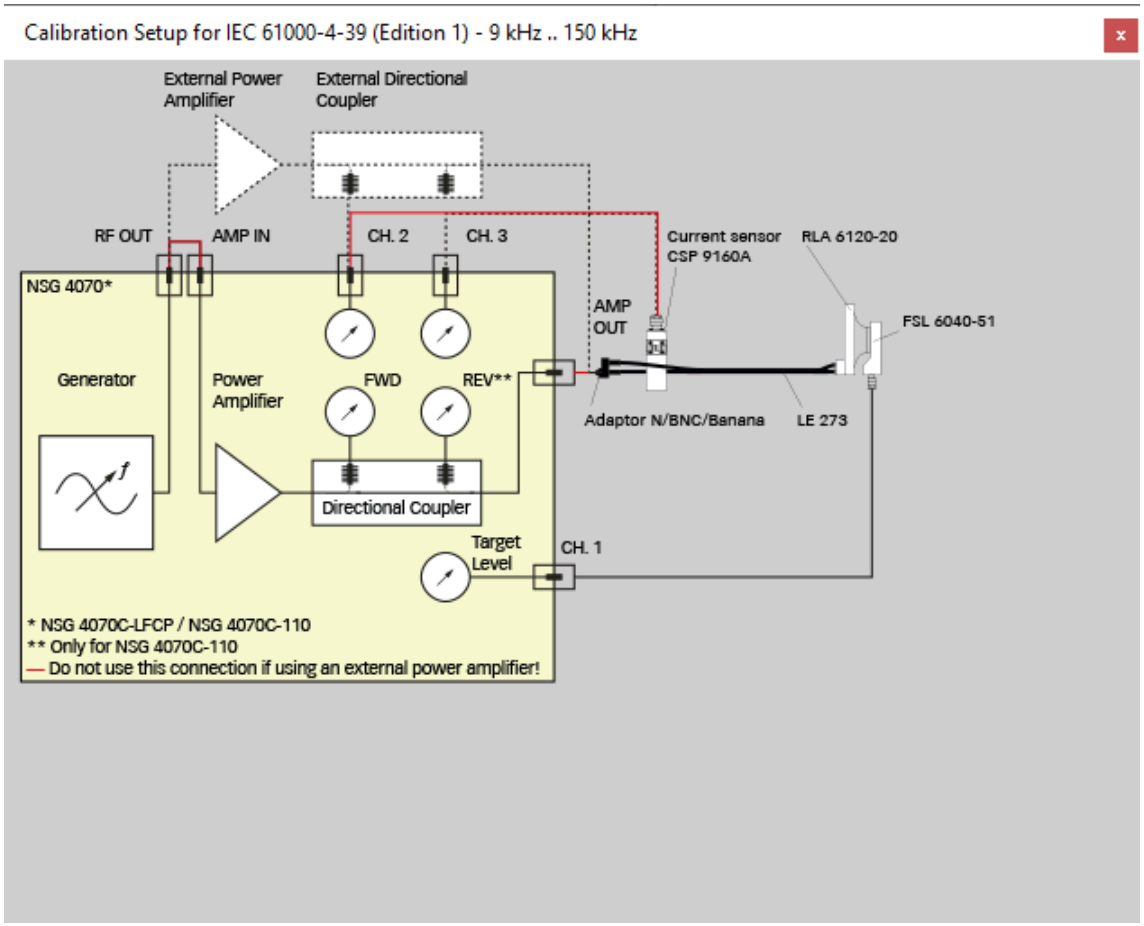




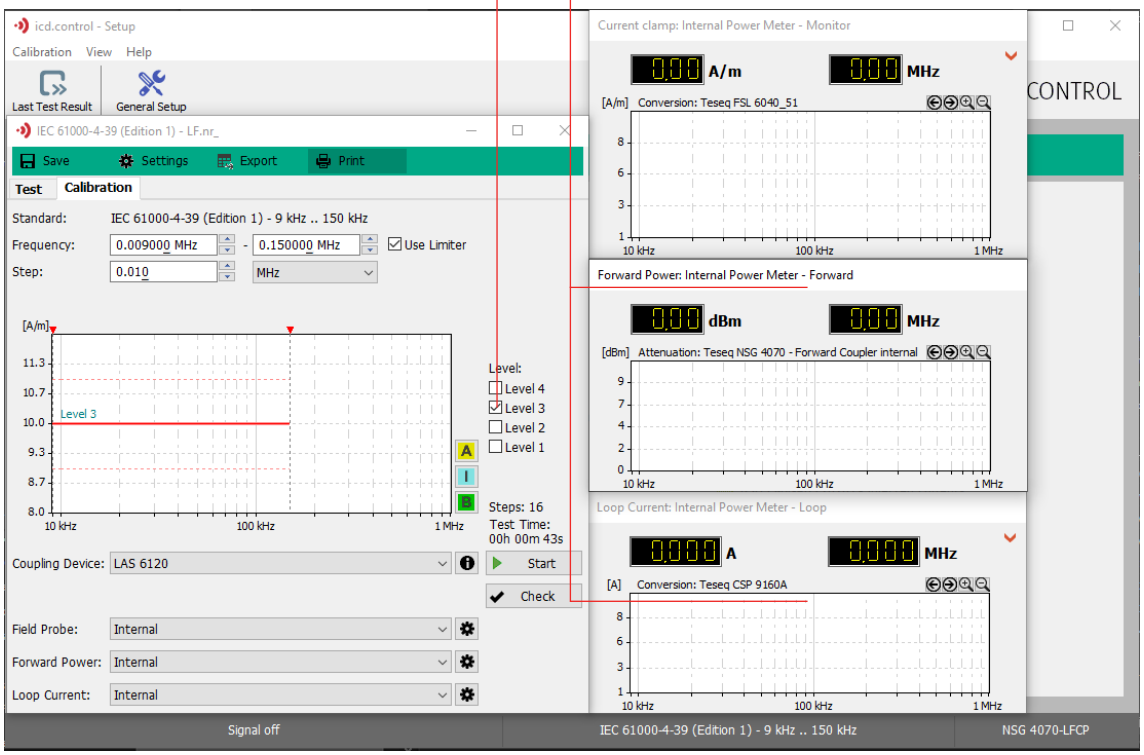
- Choose “Calibration”.
- With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do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

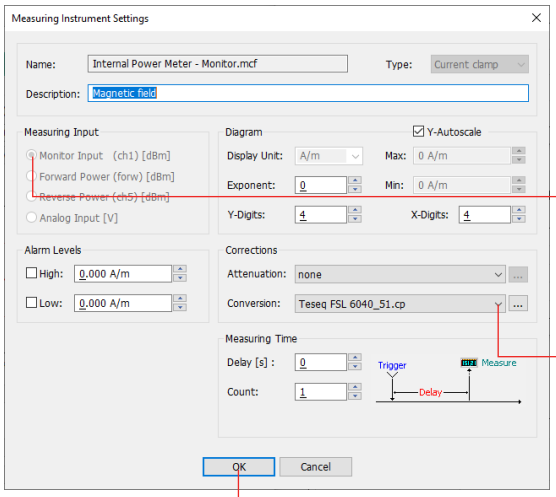
- **Select "View" and "Show Test Setup" to display a sample image for the test setup.**



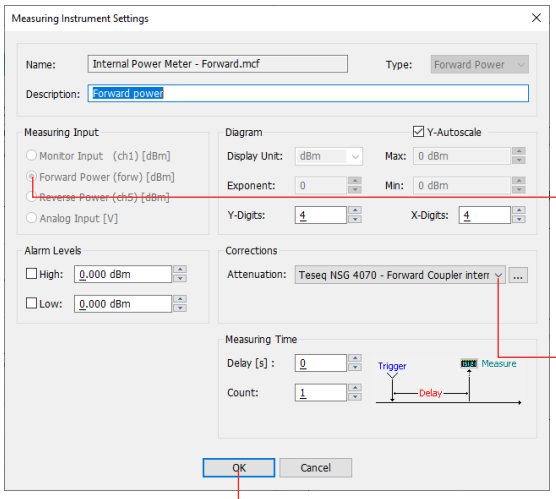


- Set the test level.
- A double-click into the diagram opens the following menus.

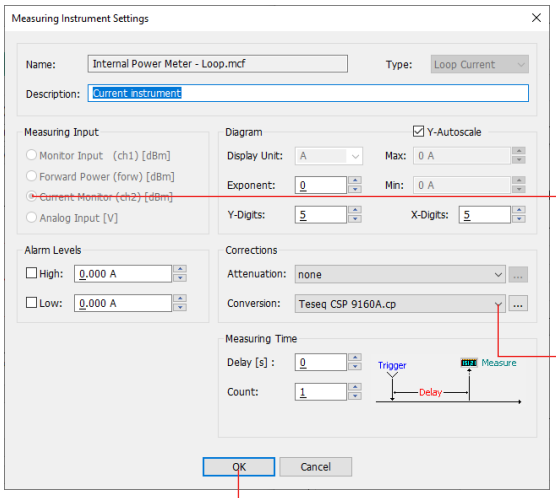




- Please note, this window is valid for power meter channel 1. It means, the sensor loop needs to be connected to power meter channel 1.
- Select here the file which contains the correction data for the loop sensor. Clicking on the icon ... opens the file.
- Click “OK” to save the settings.

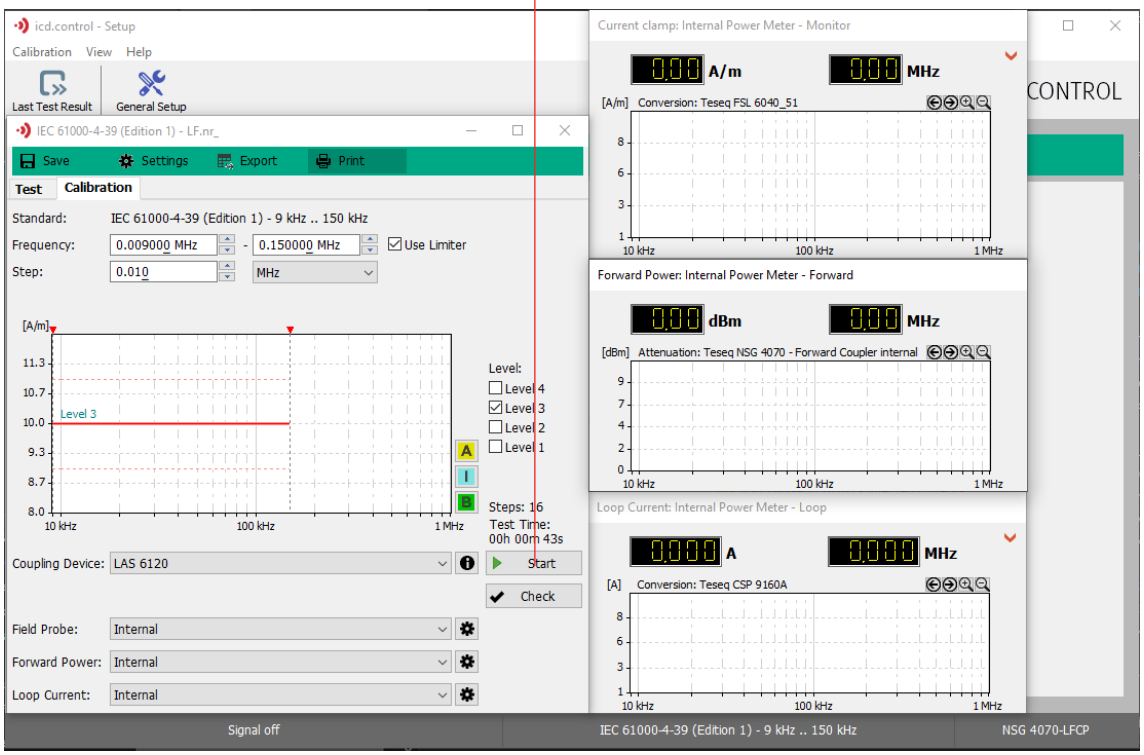


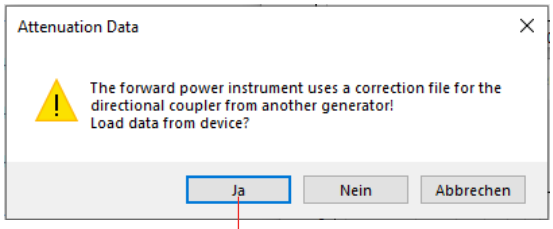
- **Please note, this window is valid for the internal power meter, which is used for measuring the forward power.**
- **Select here the file Teseq NSG 4070 - Forward Coupler internal.los. The correction data is automatically updated at calibration or test start.**
- **Click "OK" to save the settings.**



- **Please note, this window is valid for power meter channel 2. It means, the current clamp needs to be connected to power meter channel 2.**
- **Select here the file which contains the correction data for the current clamp. Clicking on the icon ... opens the file.**
- **Click "OK" to save the settings.**

Click on “Start” to execute the calibration..

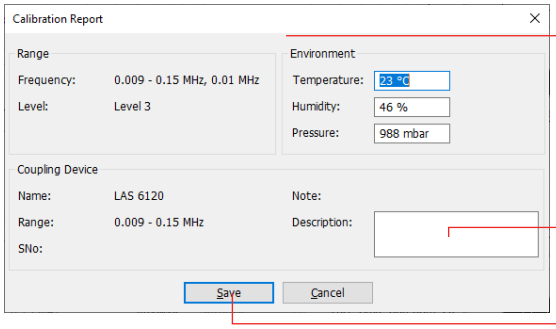




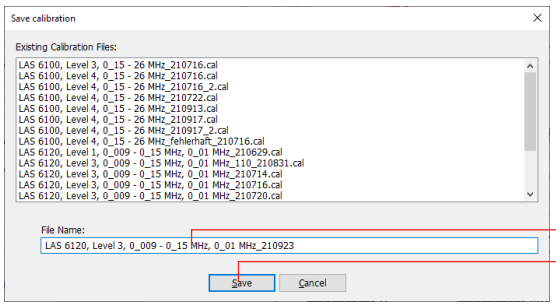
Click “Yes” to load the directional coupler from the NSG 4070 to the file Teseq NSG 4070 - Forward Coupler internal.los.

- **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, read level, loop level, forward power and generator power.**
- **The instrument shows the measured magnetic field strength with the loop sensor.**

- **The instrument shows the measured current.**
- **The instrument shows the measured forward power.**

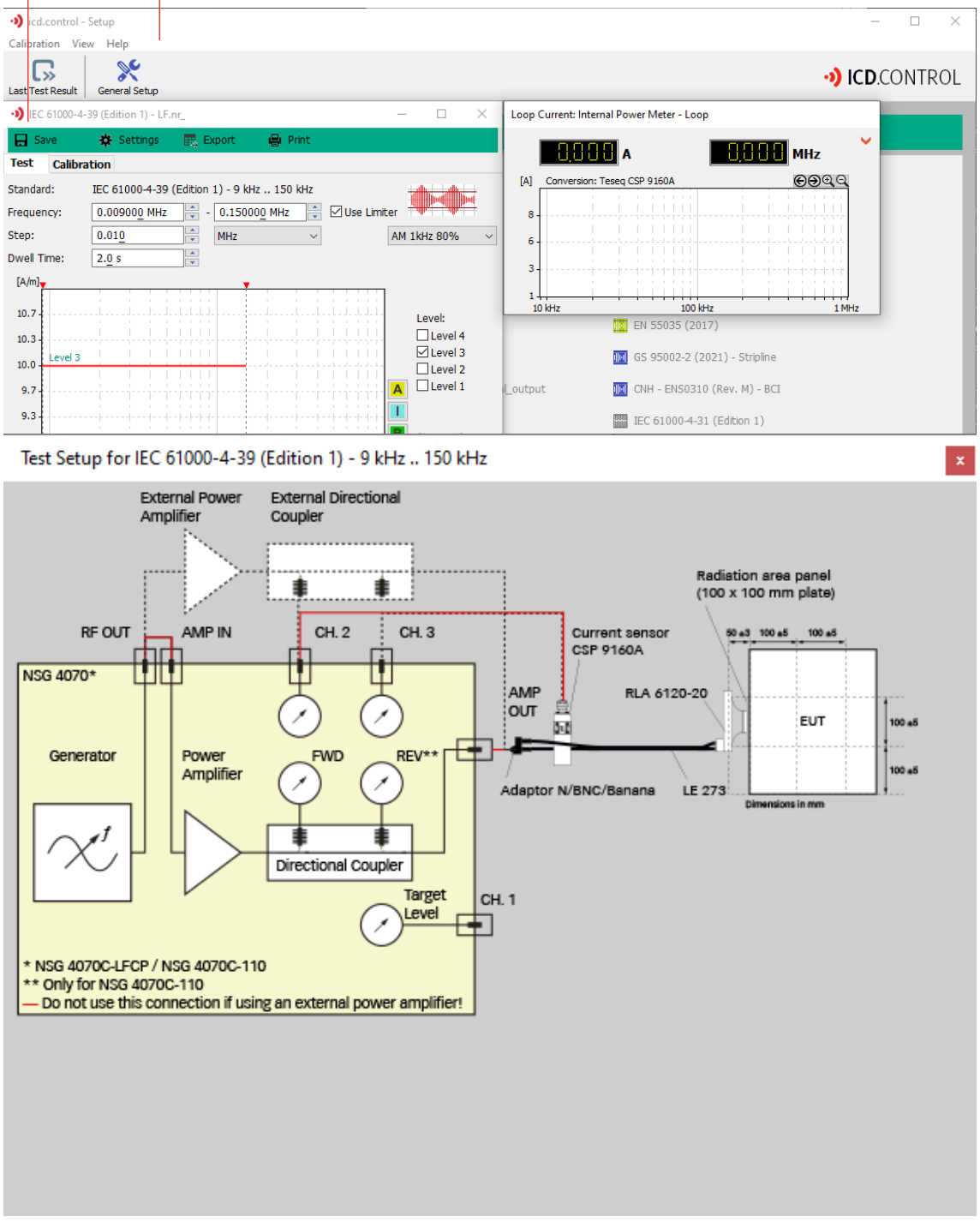


- **After successful calibration, the operator is prompted to save the file.**
- **A comment can be inserted.**
- **Click “Save” to save the settings.**

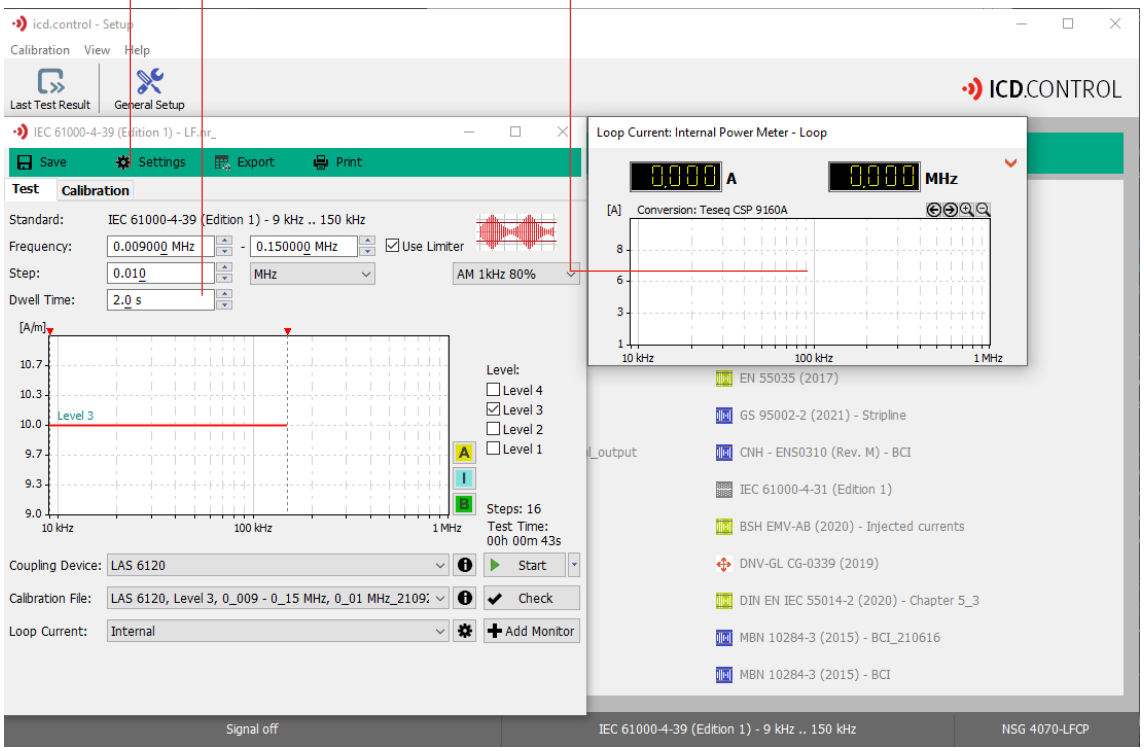


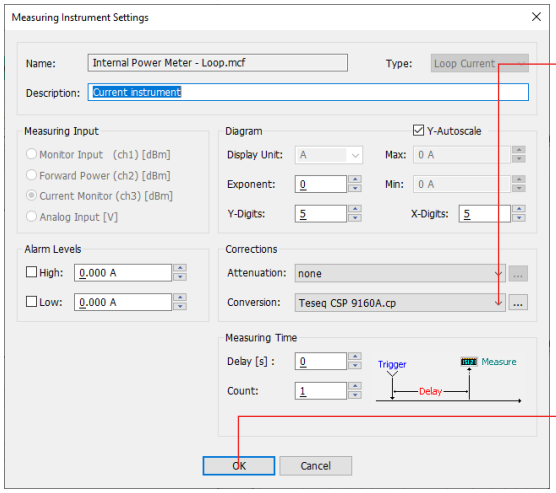
- **A file name must be assigned.**
- **Click “Save” to save the calibration.**

- Select “Test” to switch to the test mode.
- Select “View” and “Show Test Setup” to display a sample image for the test setup.



- **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.**
- **Change the dwell time according to the standard specification.**
- **A double click into the diagram opens the following menu for selecting the current probe.**

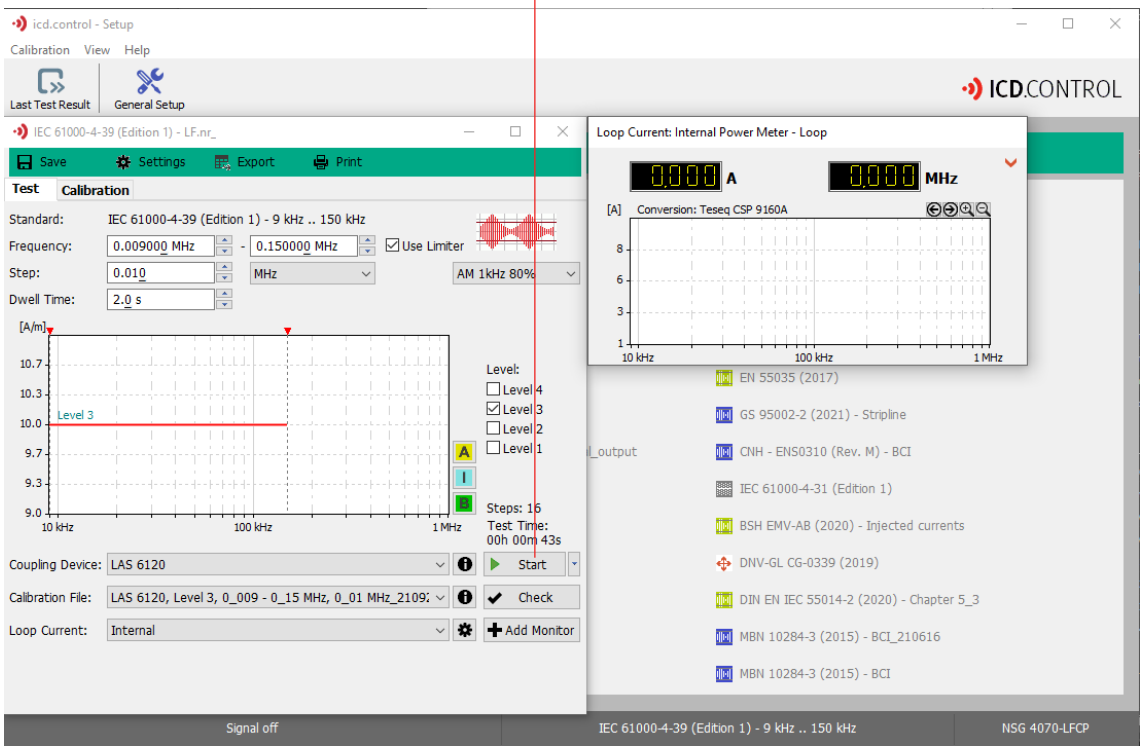




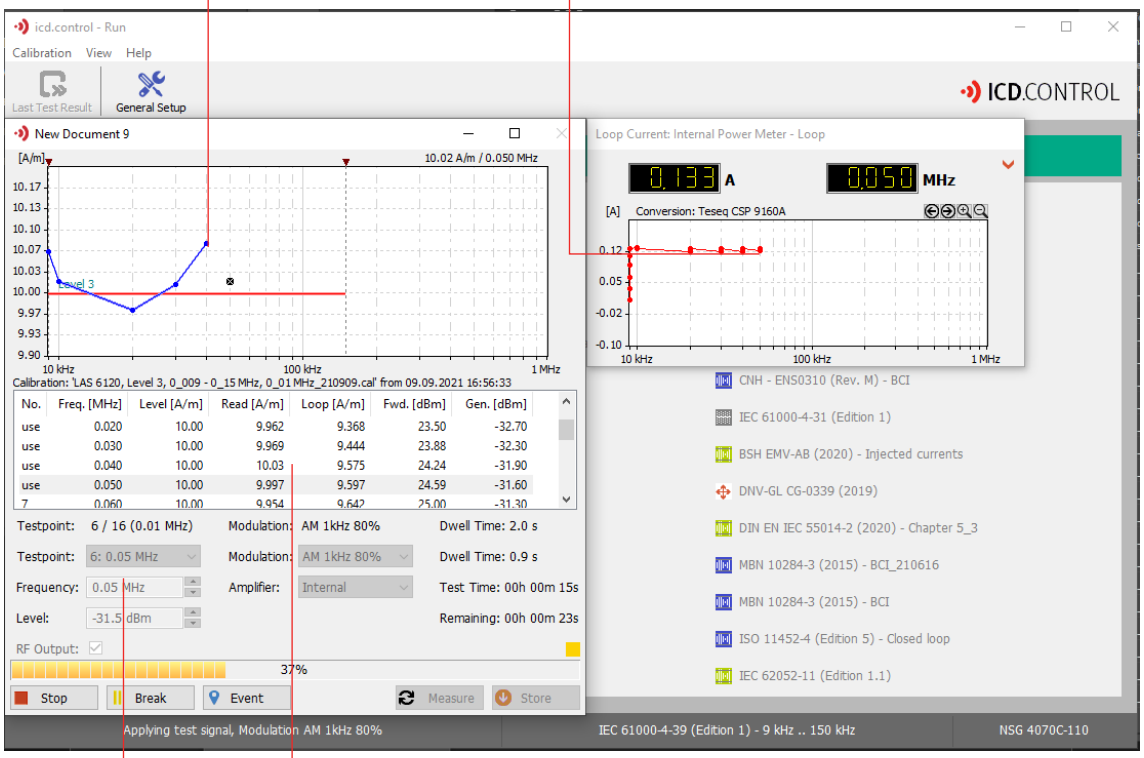
Select here the file containing the correction data of the CSP 9160A. Clicking on the icon ... opens the file.

Click "OK" to save the settings.

Click on "Start" to run the test.

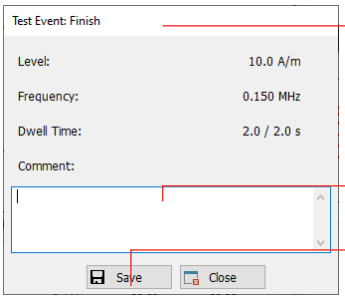


- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The instrument displays the current measured through the CSP 9160A.**

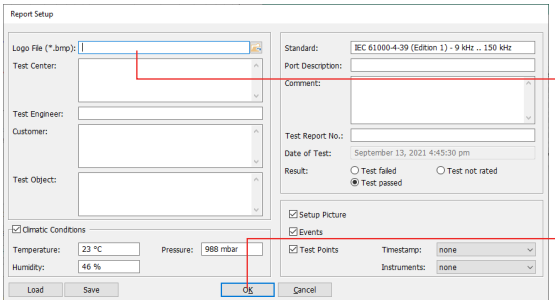


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button Break can be used to switch directly to the manual mode, for example, to check at a specific frequency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

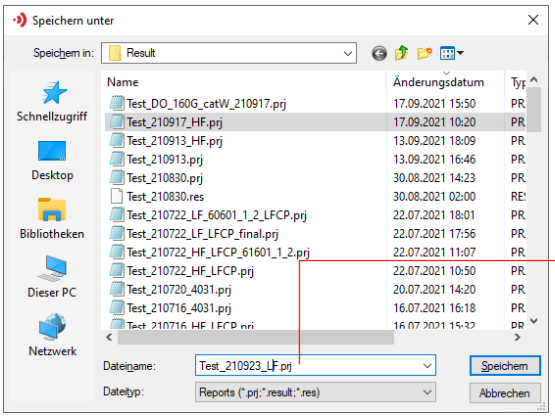
1.5. Test end and report creation



- 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.



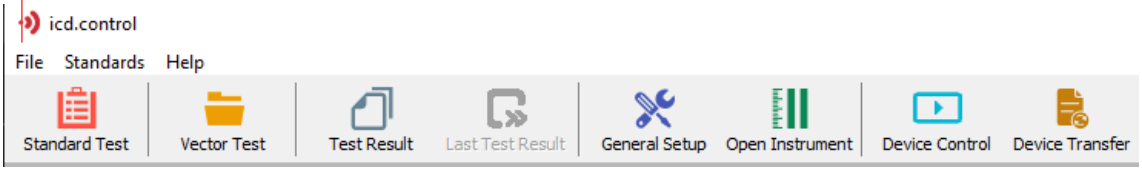
- Corresponding fields can be filled out and comments inserted.
- Click on “OK” to apply the settings.



- Give a proper file name and press “Save”.

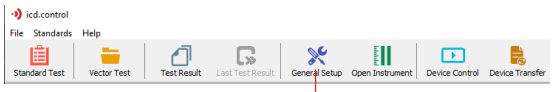
1.6. Save the configuration

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

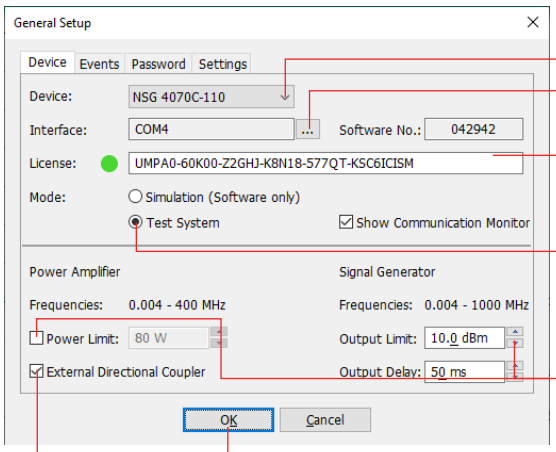


2. EXAMPLE IEC 61000-4-39 HF TEST WITH NSG 4070C-LFCP

2.1. Basic settings



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



Select the appropriate generator model.

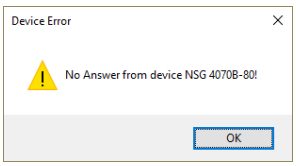
If necessary, configure the interface.

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.

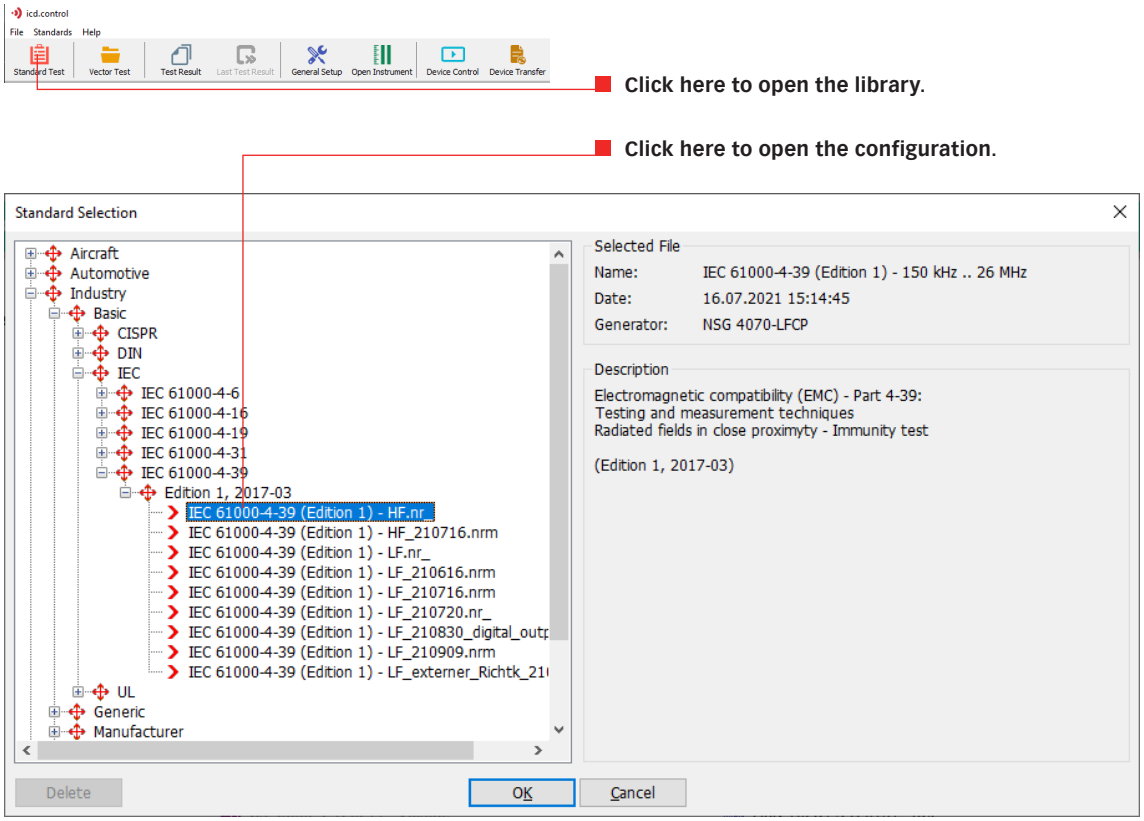
When leaving the menu with “OK“, the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



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

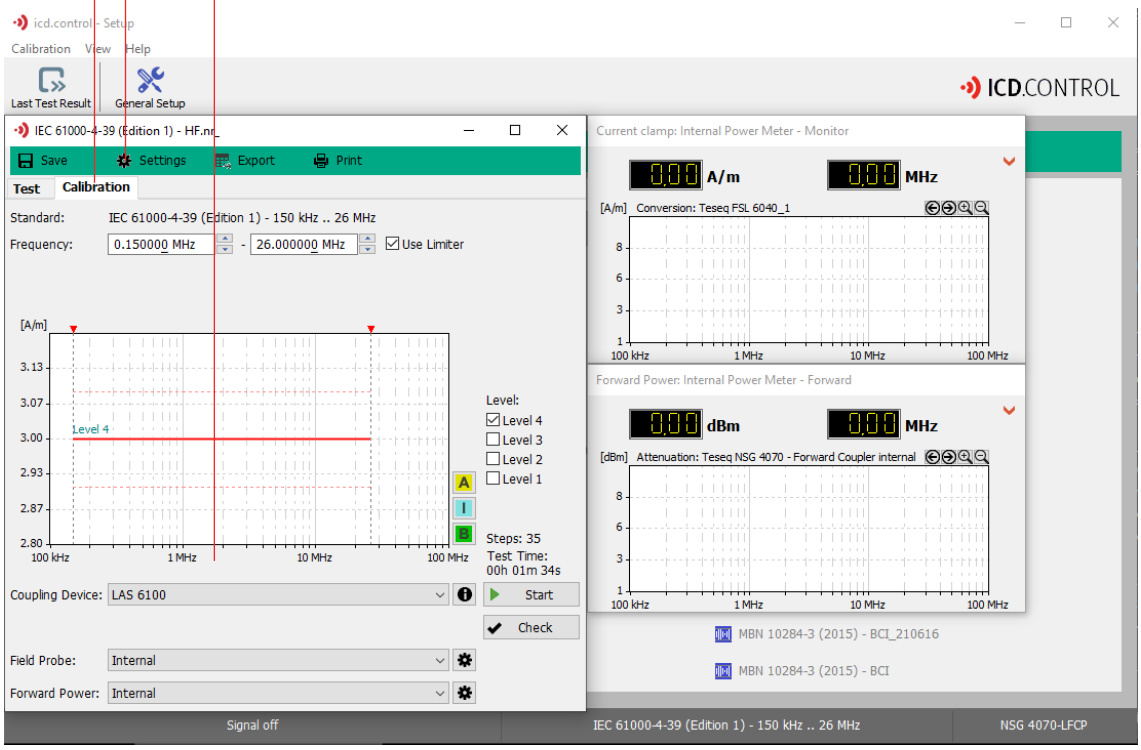
If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

2.2. Selecting and loading the test configuration

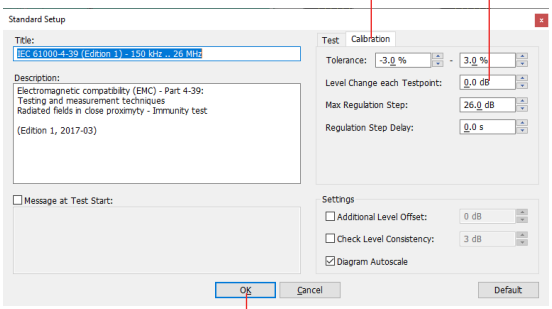


2.3. Calibration (test level adjustment)

- Select “Calibration” to set the test level setting for the connected hardware.
- Select “Setup Standard” to change the basic settings for this test. See the example below.
- Select here the LAS 6100.

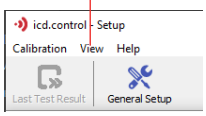


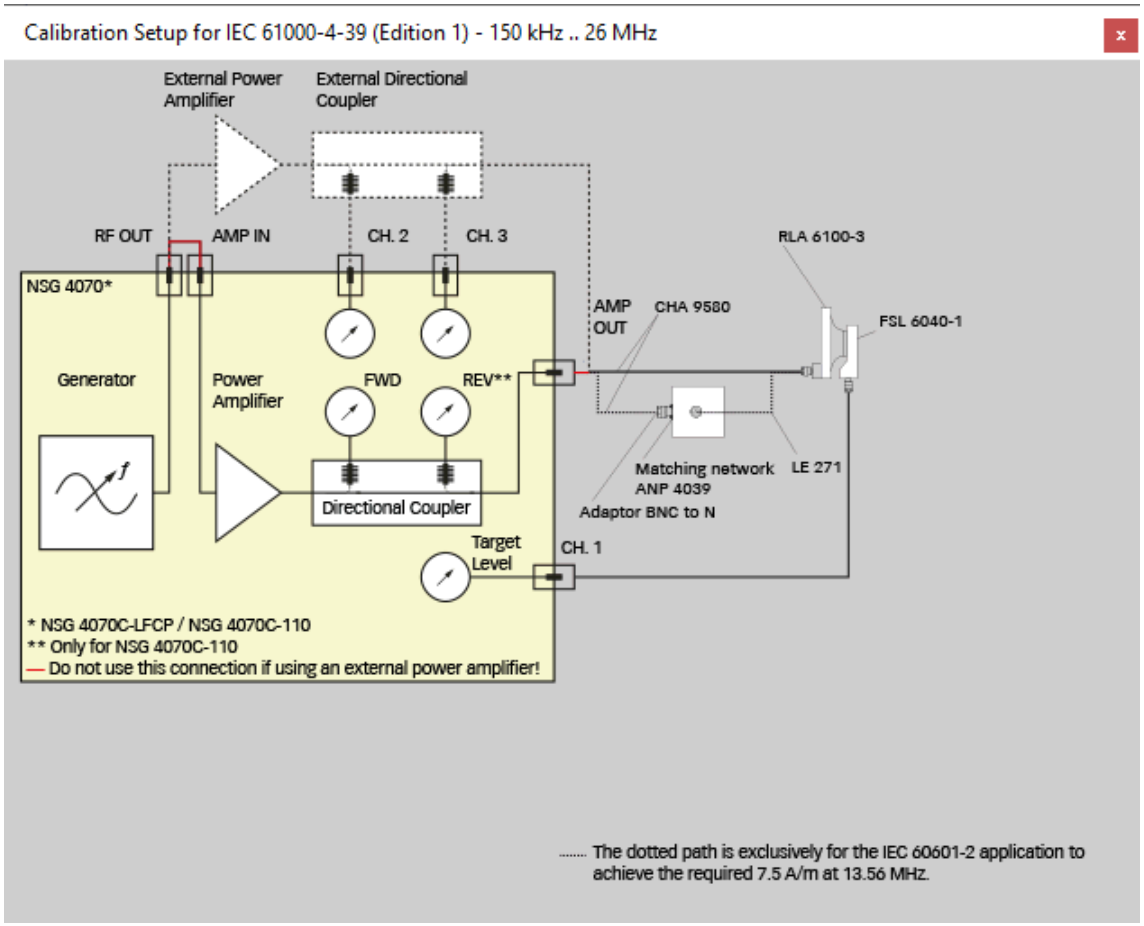
- Choose “Calibration”.
- With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do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



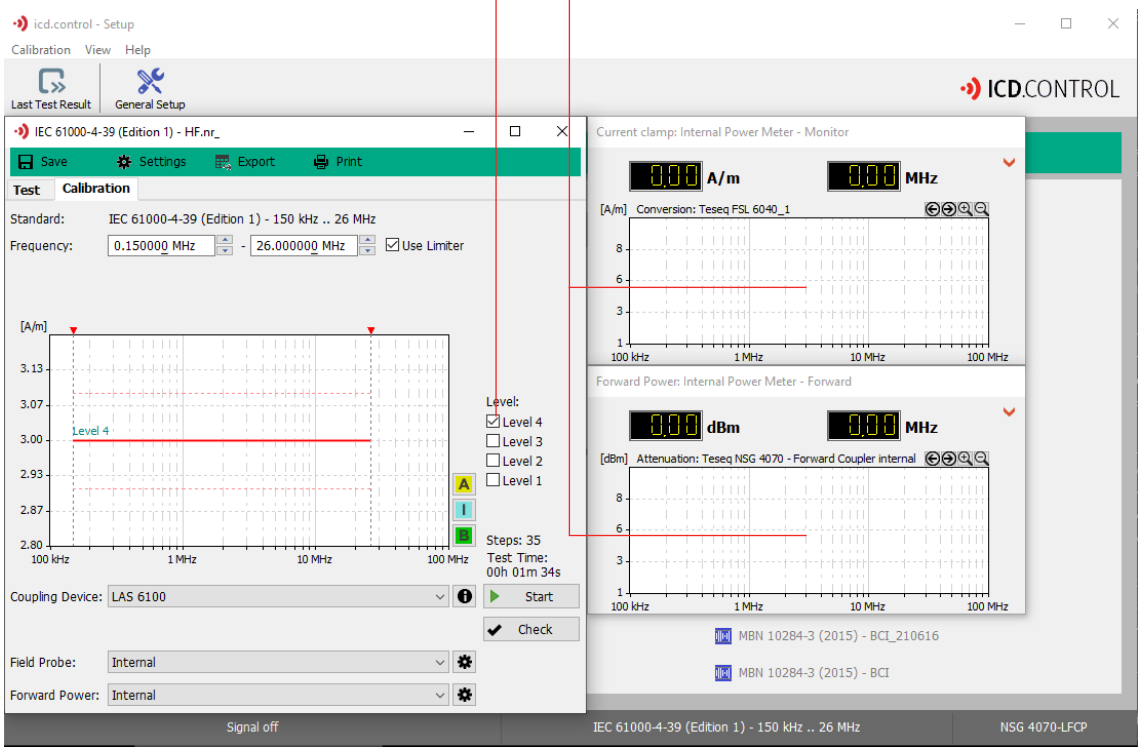
- Click “OK” to save the settings.

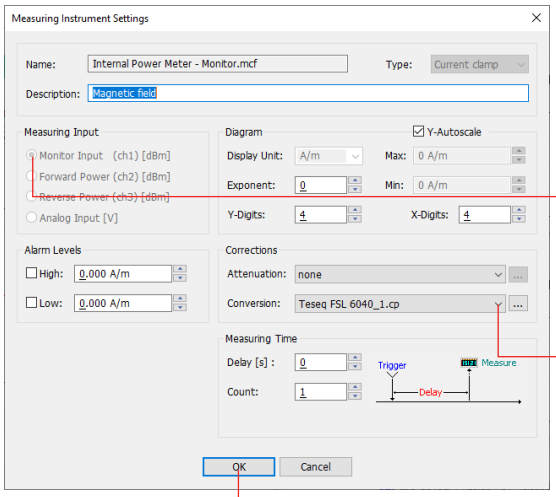
Select "View" and "Show Test Setup" to display a sample image for the test setup.



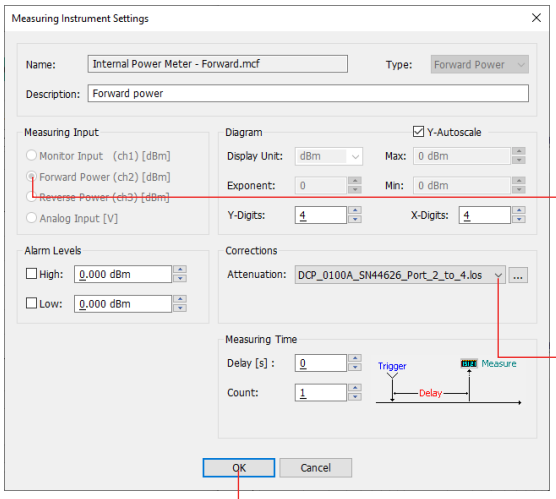


- Set the test level.
- A double-click into the diagram opens the following menus.



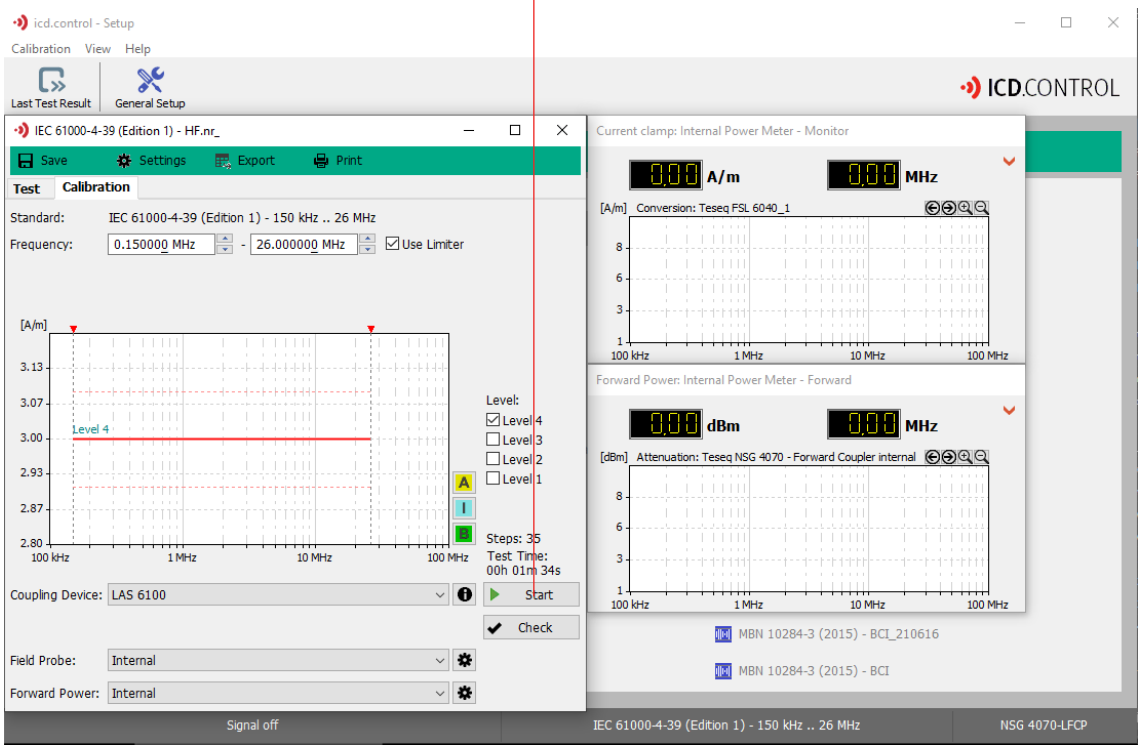


- Please note, this window is valid for power meter channel 1. It means, the sensor loop needs to be connected to power meter channel 1.
- Select here the file which contains the correction data for the loop sensor. Clicking on the icon ... opens the file.
- Click “OK” to save the settings.

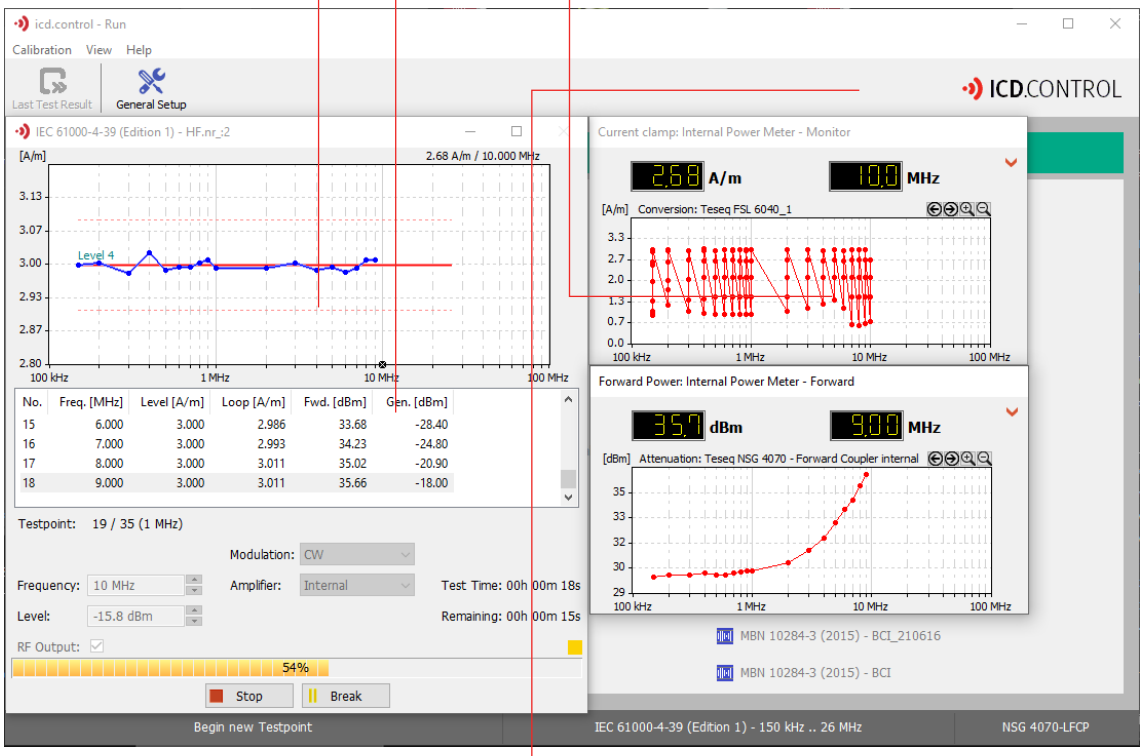


- **Please note, this window is valid for power meter channel 2. It means, the forward power port of the external directional coupler needs to be connected to power meter channel 2.**
- **Select here the file which contains the correction data for the path used for measuring the forward power of the external directional coupler. Clicking on the icon ... opens the file.**
- **Click "OK" to save the settings.**

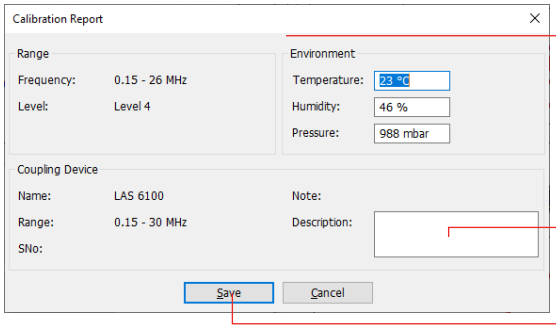
- **Click on "Start" to execute the calibration..**



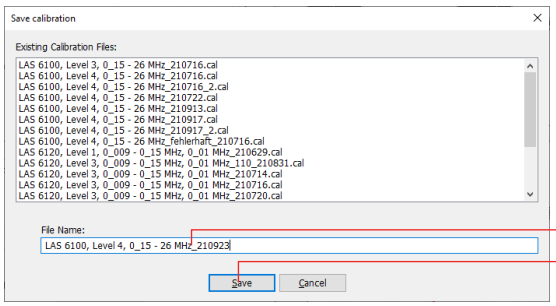
- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **Below the diagram, a table displays the values of frequency, target level, read level, loop level, forward power and generator power.**
- **The instrument shows the measured magnetic field strength with the loop sensor.**



- **The instrument shows the measured forward power.**



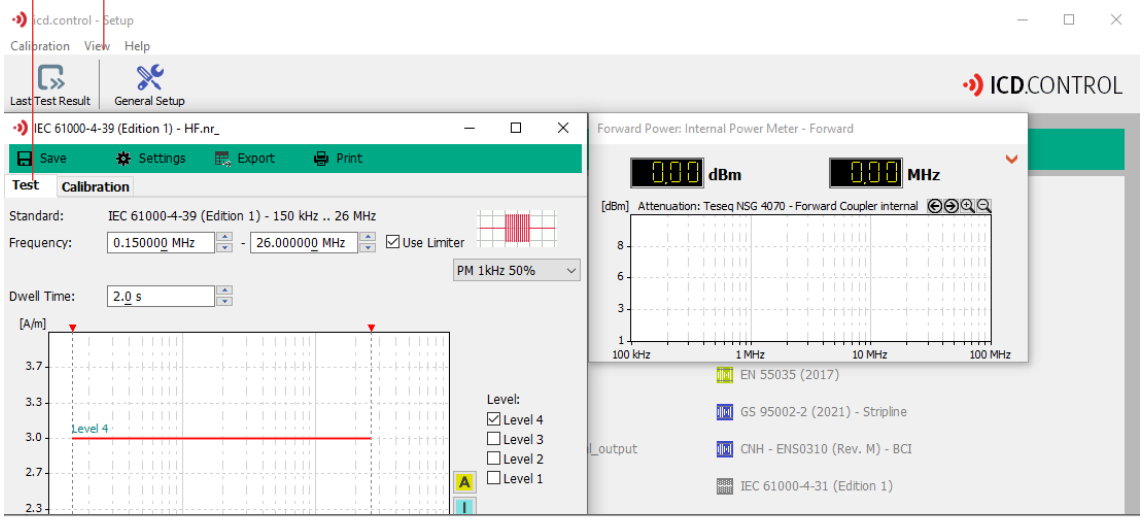
- **After successful calibration, the operator is prompted to save the file.**
- **A comment can be inserted.**
- **Click “Save” to save the settings.**

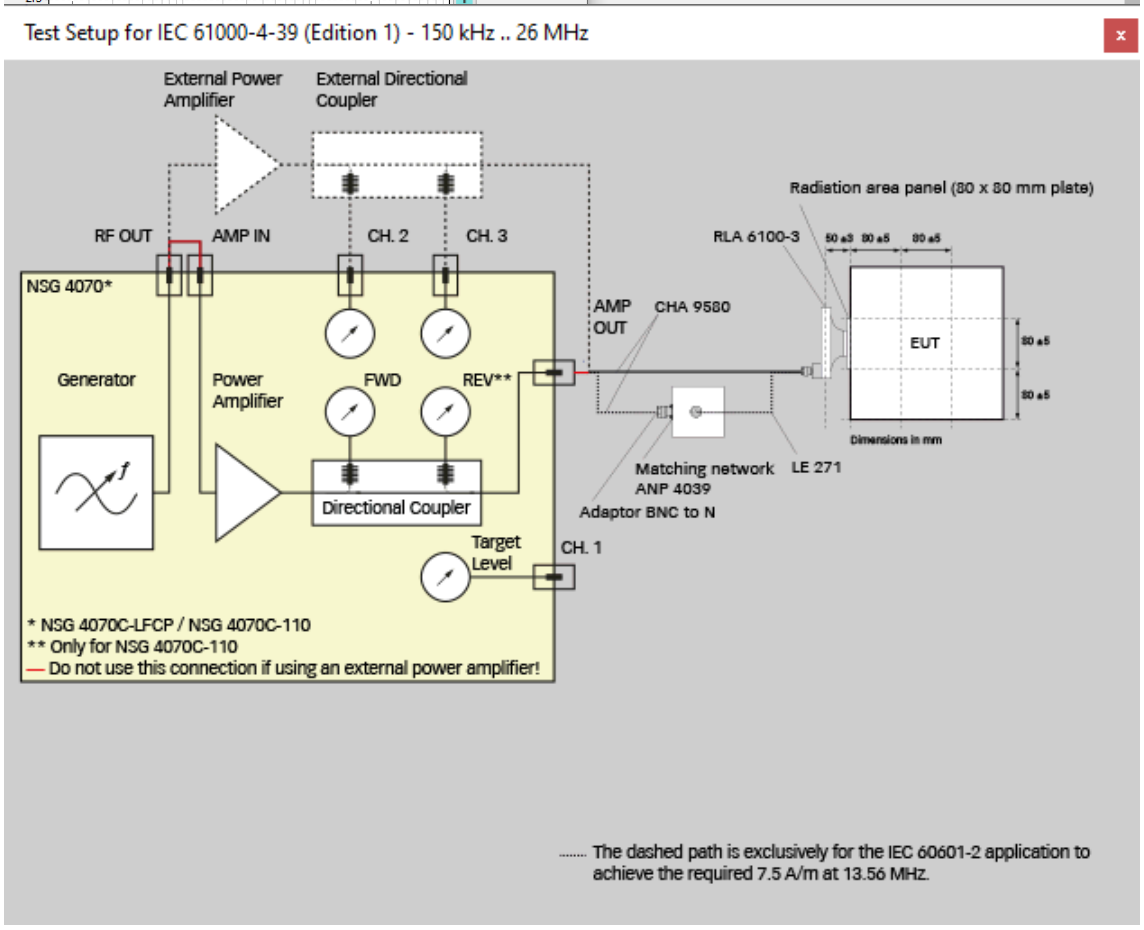


- **A file name must be assigned.**
- **Click “Save” to save the calibration.**

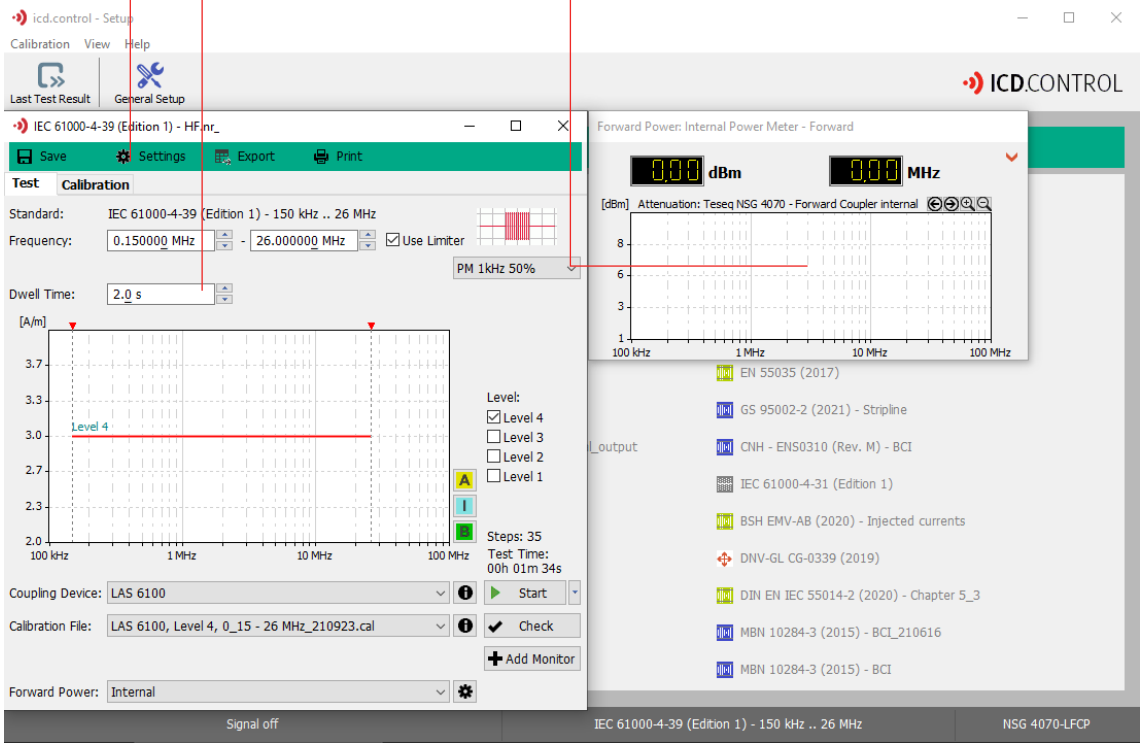
2.4. Test

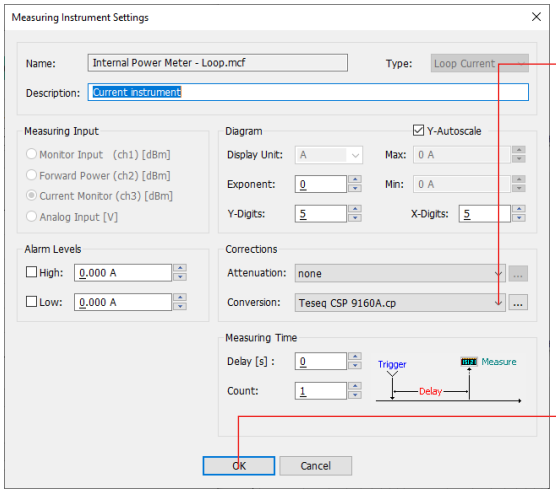
- Select “Test” to switch to the test mode.
- Select “View” and “Show Test Setup” to display a sample image for the test setup.





- **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.**
- **Change the dwell time according to the standard specification.**
- **A double click into the diagram opens the following menu for selecting the current probe.**

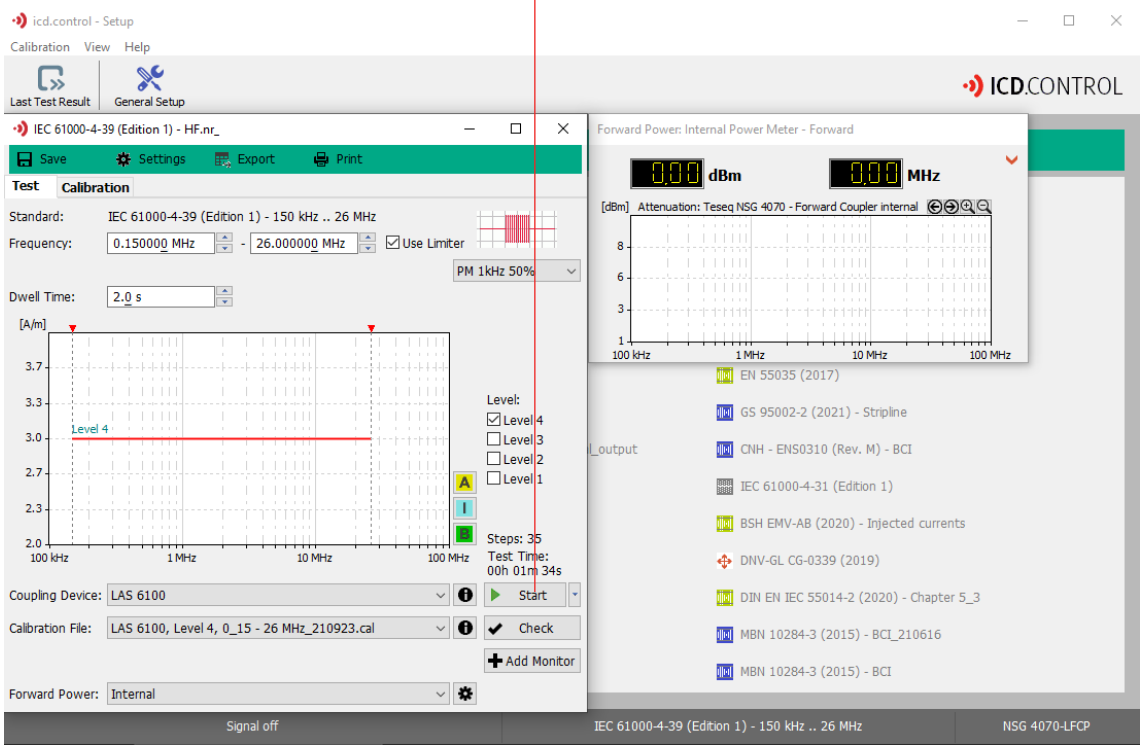




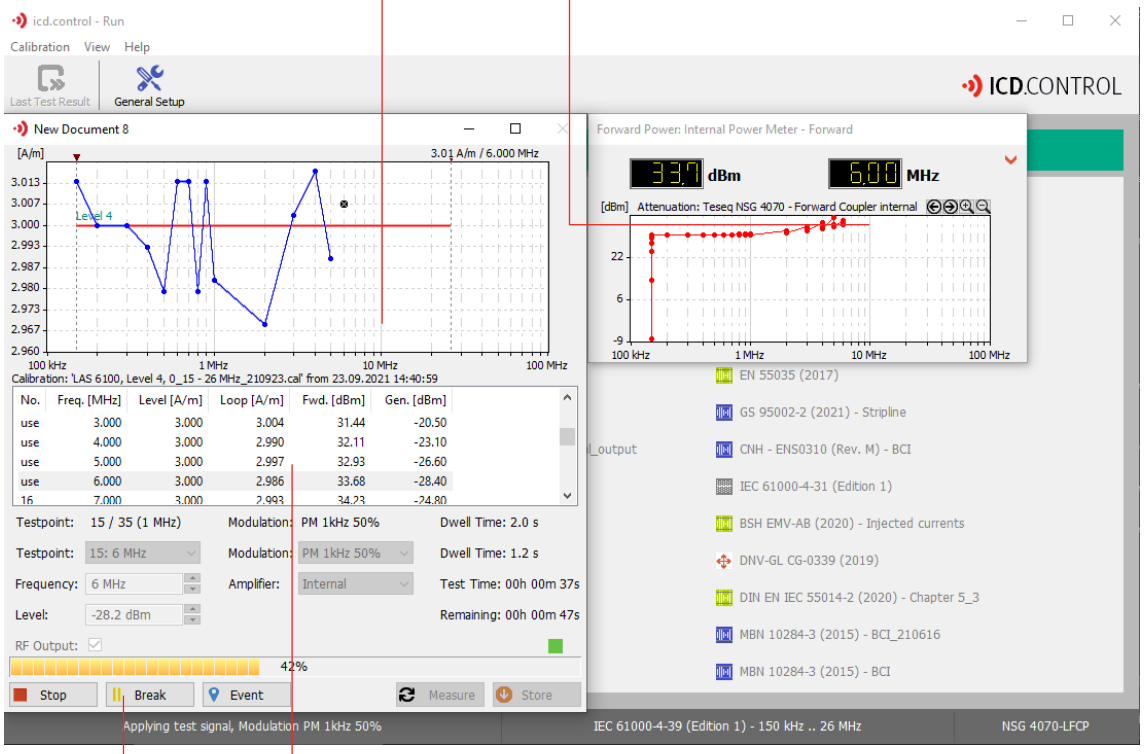
Select here the file containing the correction data of the CSP 9160A. Clicking on the icon ... opens the file.

Click "OK" to save the settings.

Click on "Start" to run the test.

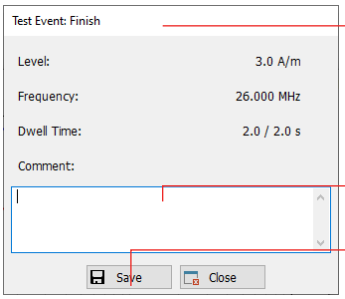


- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The instrument displays the current measured through the CSP 9160A.**

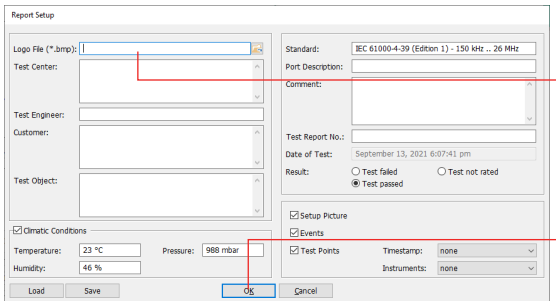


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button Break can be used to switch directly to the manual mode, for example, to check at a specific frequency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

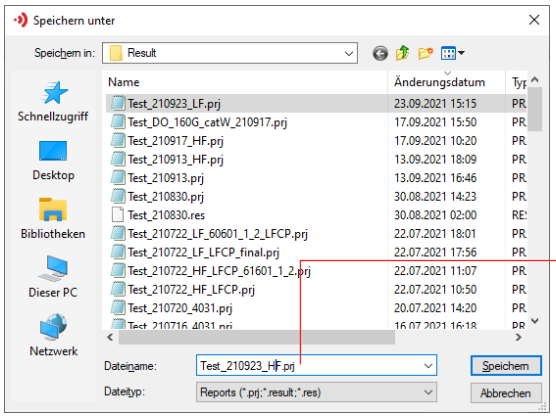
2.5. Test end and report creation



- 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.



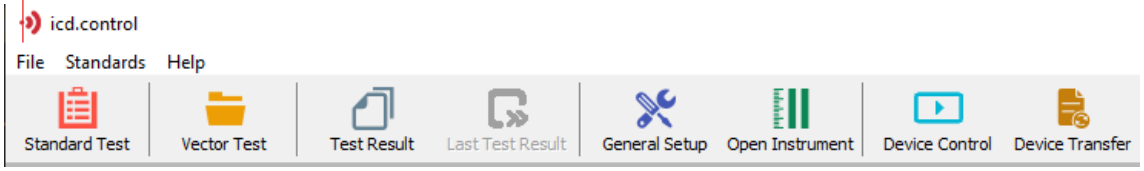
- Corresponding fields can be filled out and comments inserted.
- Click on “OK” to apply the settings.



- Give a proper file name and press “Save”.

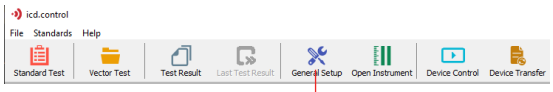
2.6. Save the configuration

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

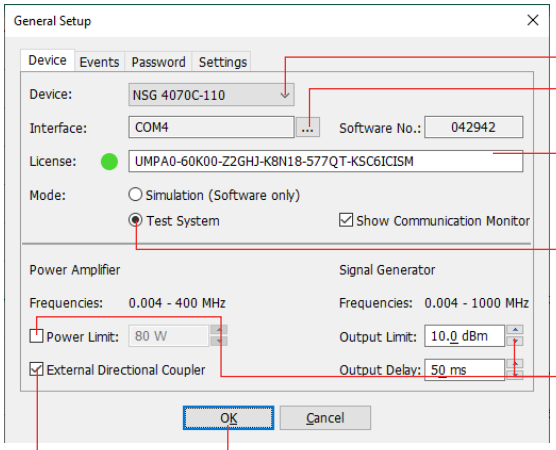


3. EXAMPLE IEC 61000-4-39 LF TEST WITH EXTERNAL DIRECTIONAL COUPLER AND AMPLIFIER

3.1. Basic settings



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



Select the appropriate generator model.

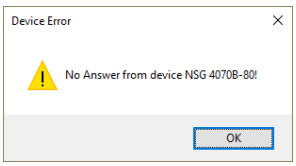
If necessary, configure the interface.

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.

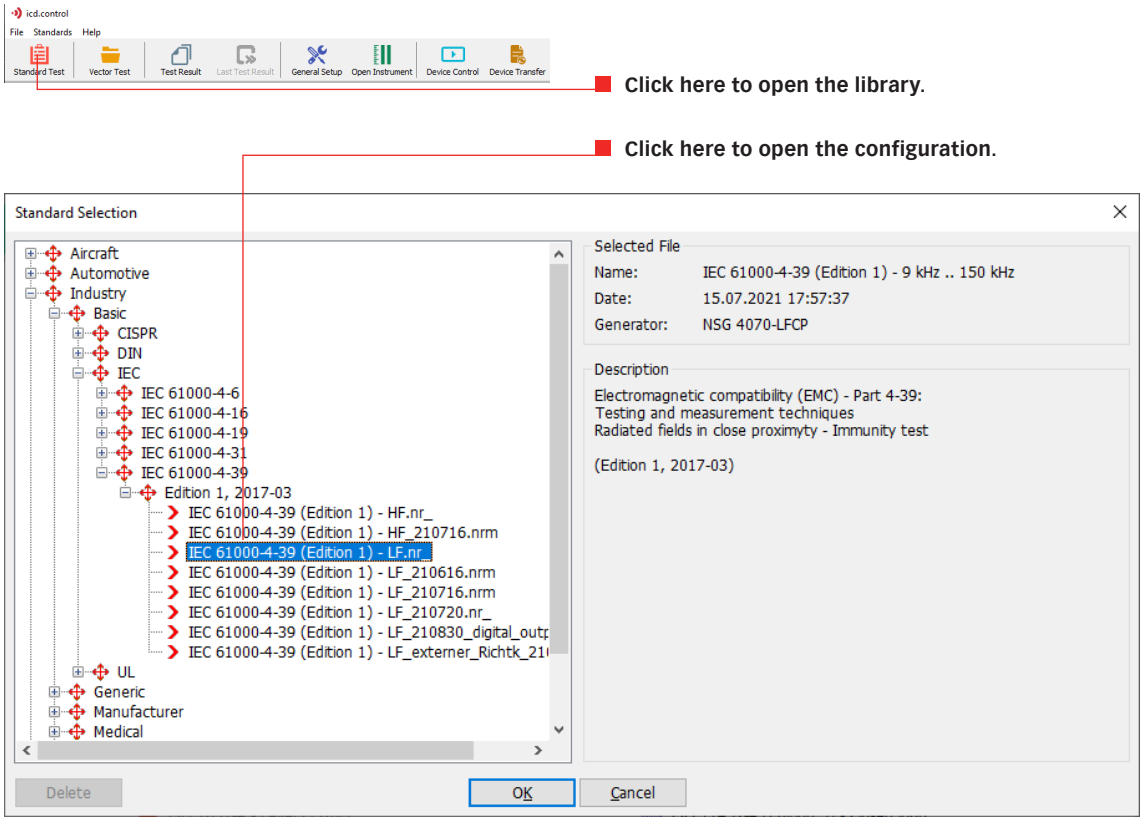
When leaving the menu with “OK“, the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



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

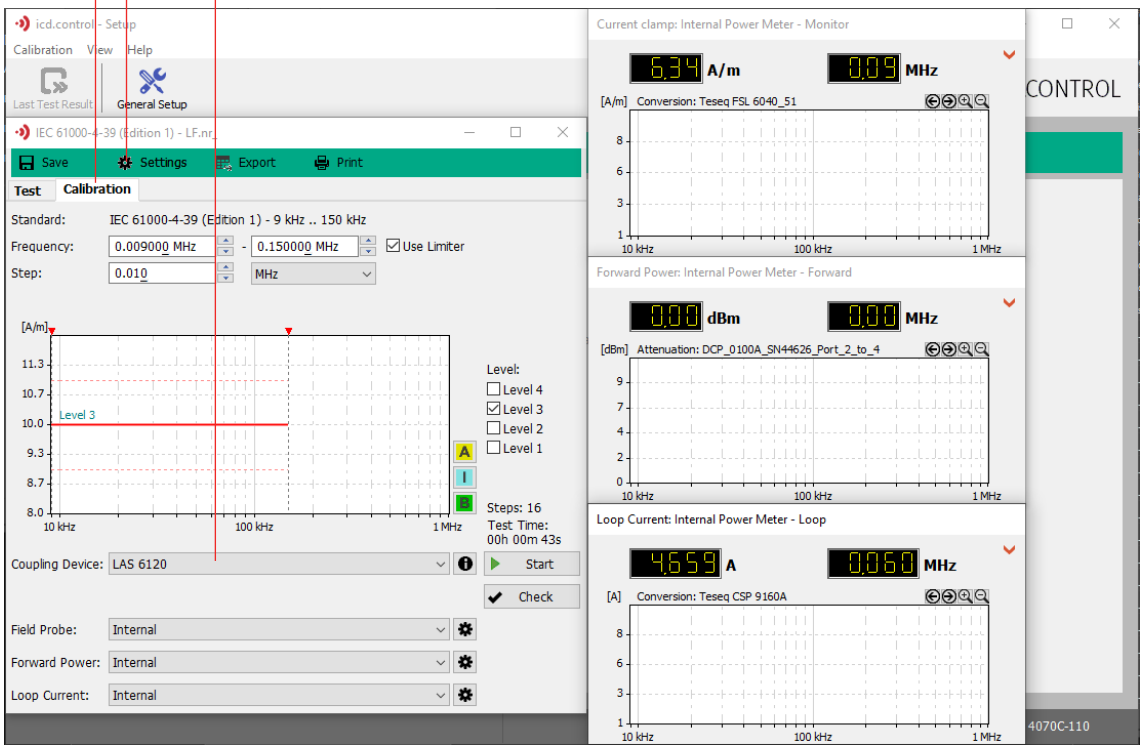
If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

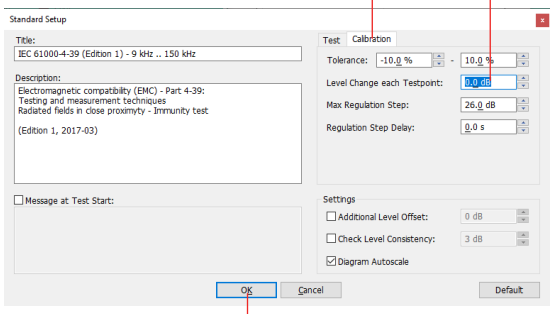
3.2. Selecting and loading the test configuration



3.3. Calibration (test level adjustment)

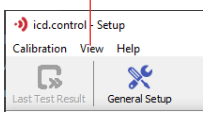
- Select “Calibration” to set the test level setting for the connected hardware.
- Select “Setup Standard” to change the basic settings for this test. See the example below.
- Select here the LAS 6120.

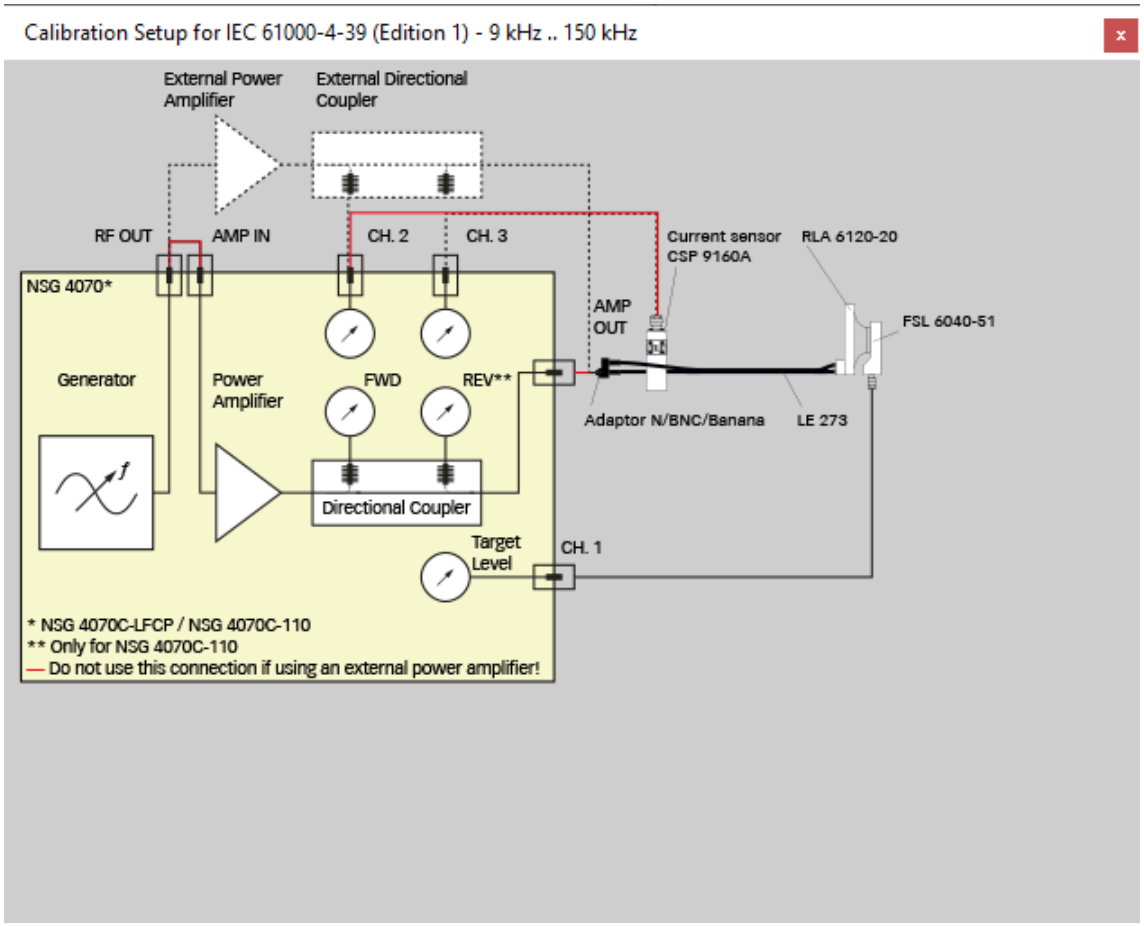




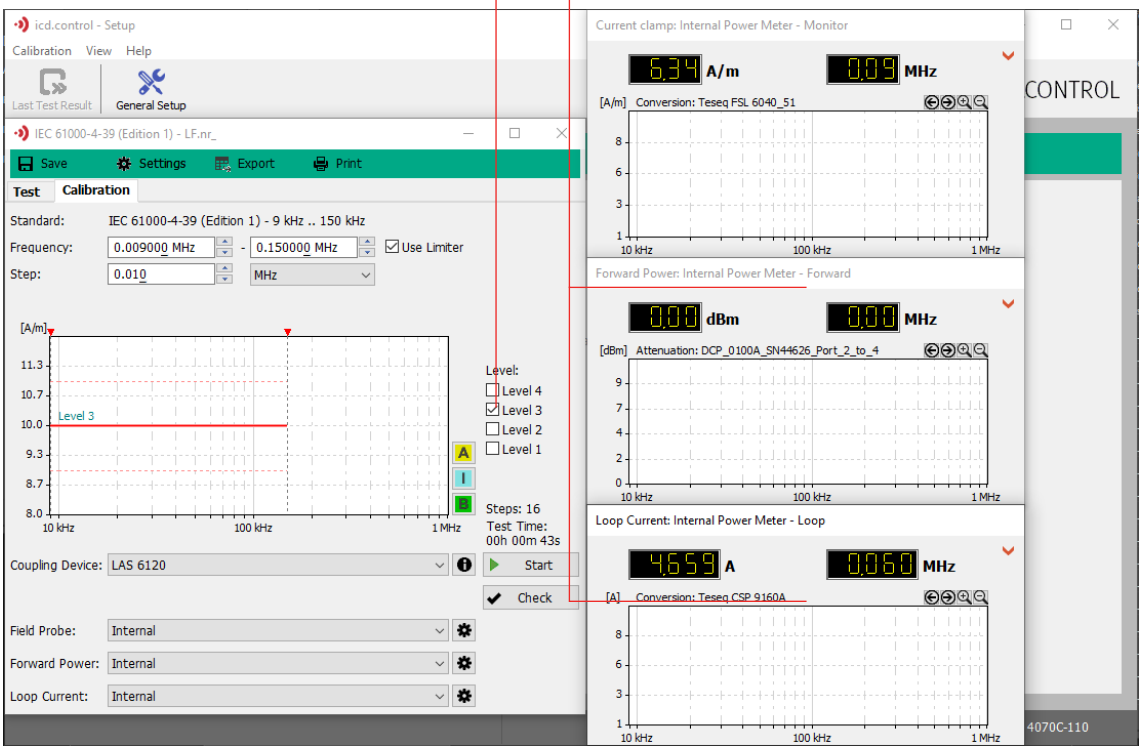
- Choose “Calibration”.
- With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do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

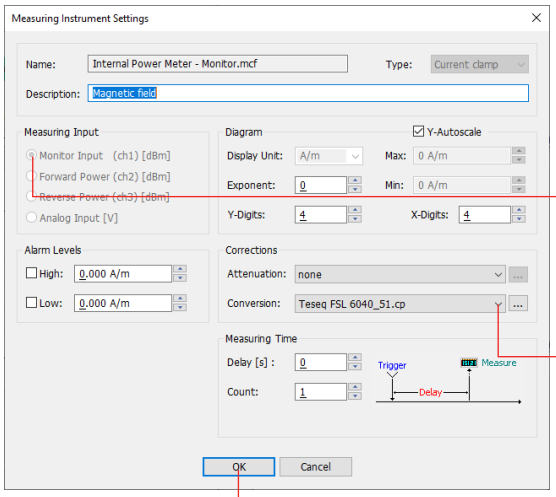
- **Select "View" and "Show Test Setup" to display a sample image for the test setup.**



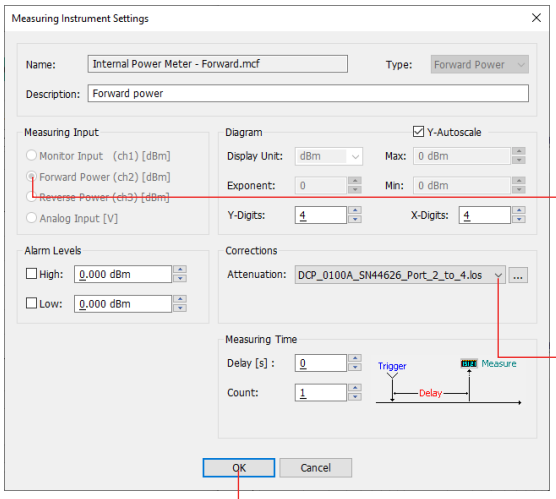


- Set the test level.
- A double-click into the diagram opens the following menus.

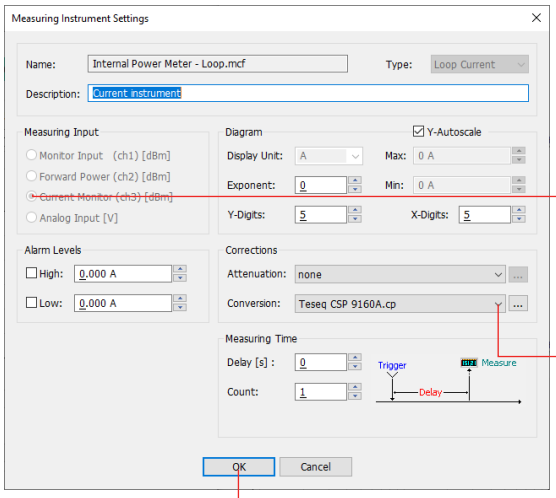




- Please note, this window is valid for power meter channel 1. It means, the sensor loop needs to be connected to power meter channel 1.
- Select here the file which contains the correction data for the loop sensor. Clicking on the icon ... opens the file.
- Click “OK” to save the settings.

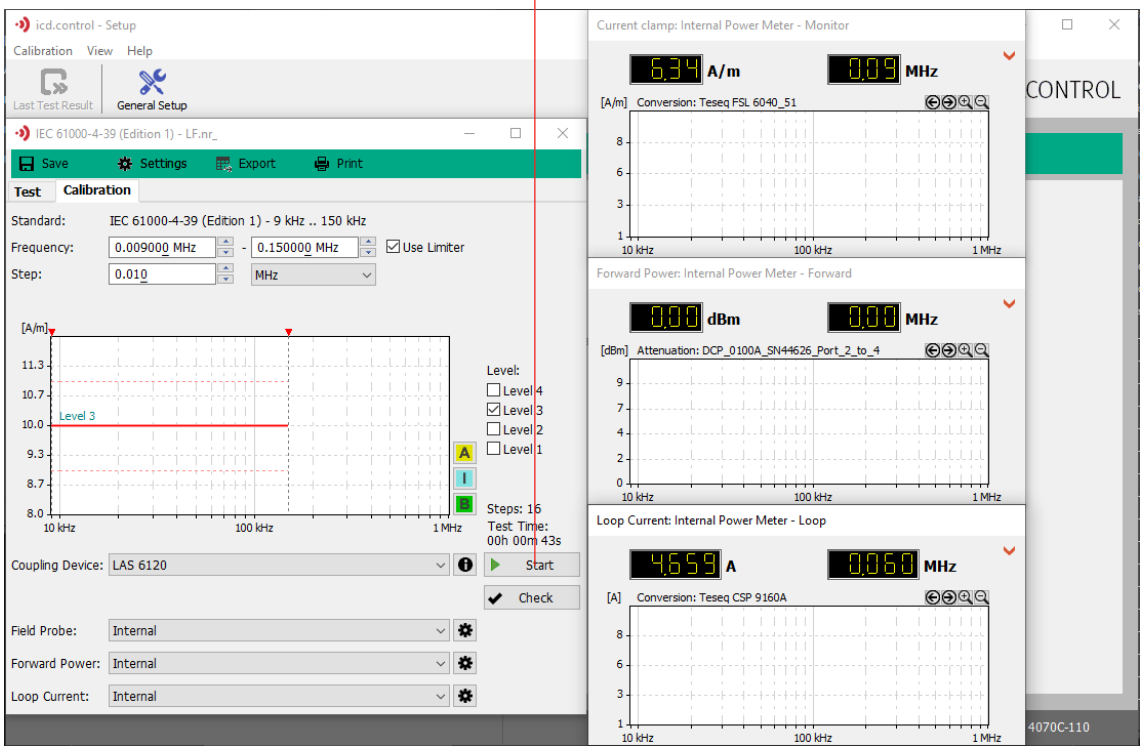


- **Please note, this window is valid for power meter channel 2. It means, the forward power port of the external directional coupler needs to be connected to power meter channel 2.**
- **Select here the file which contains the correction data for the path used for measuring the forward power of the external directional coupler. Clicking on the icon ... opens the file.**
- **Click "OK" to save the settings.**

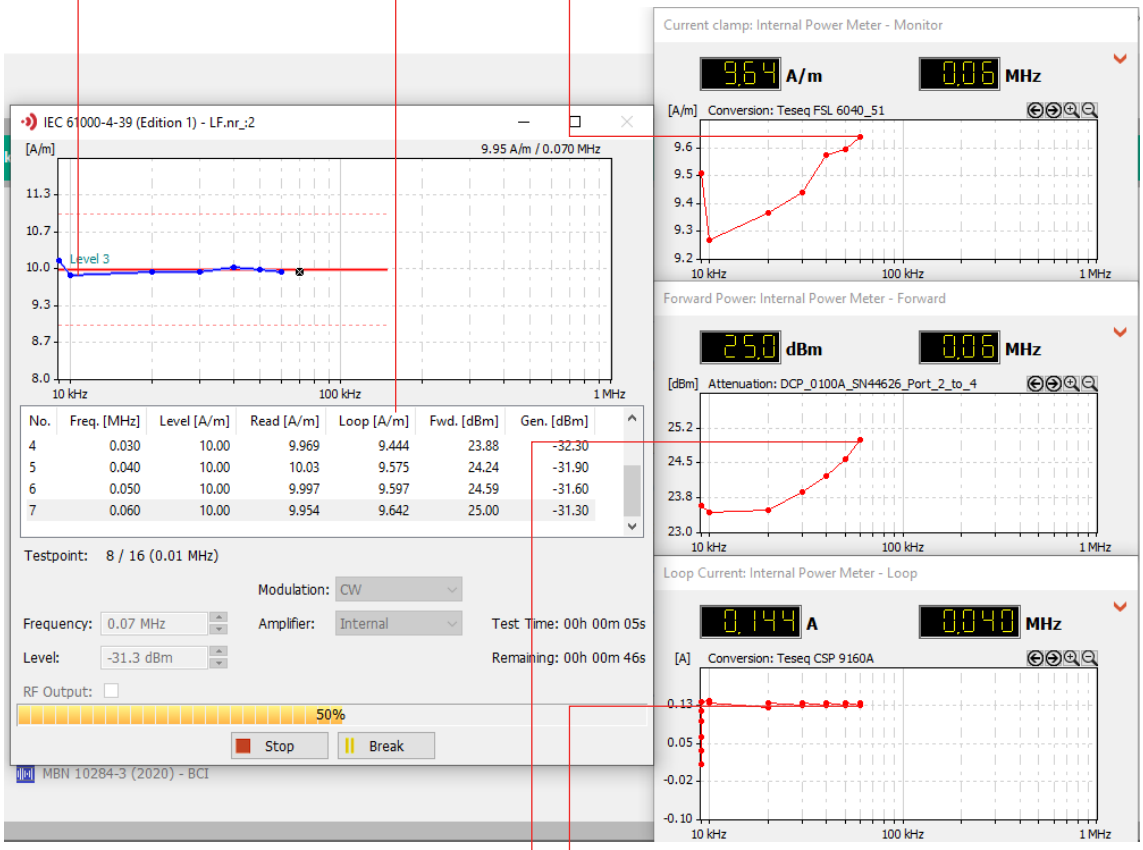


- **Please note, this window is valid for power meter channel 3. It means, the current clamp needs to be connected to power meter channel 3.**
- **Select here the file which contains the correction data for the current clamp. Clicking on the icon ... opens the file.**
- **Click "OK" to save the settings.**

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, read level, loop level, forward power and generator power.**
- **The instrument shows the measured magnetic field strength with the loop sensor.**



- **The instrument shows the measured current.**
- **The instrument shows the measured forward power.**

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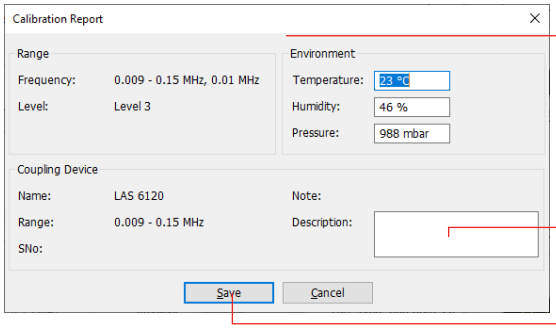
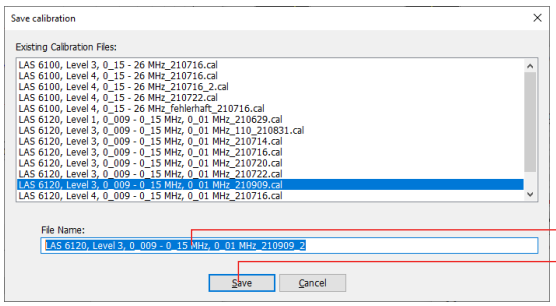
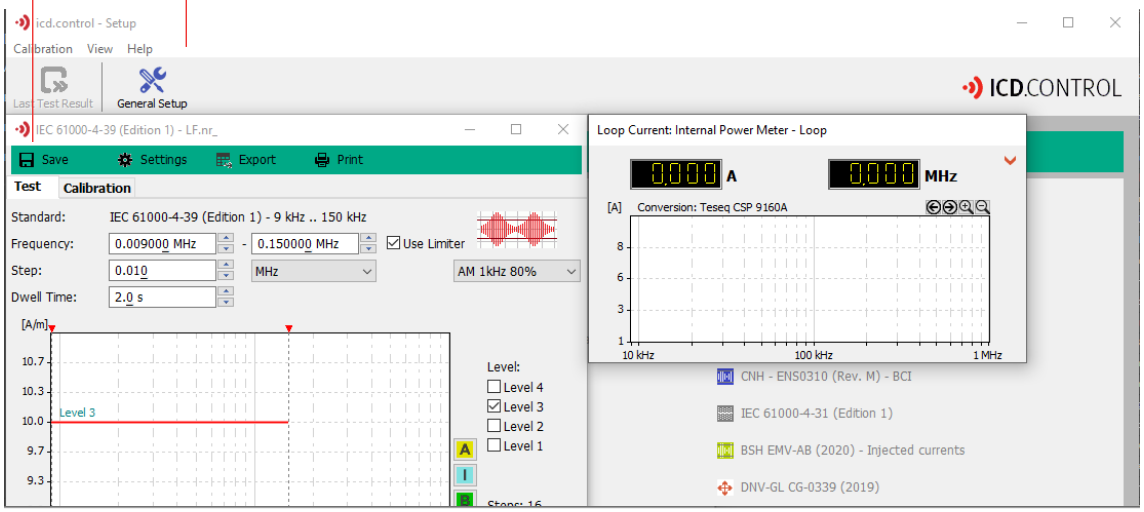


- **After successful calibration, the operator is prompted to save the file.**
- **A comment can be inserted.**
- **Click “Save” to save the settings.**

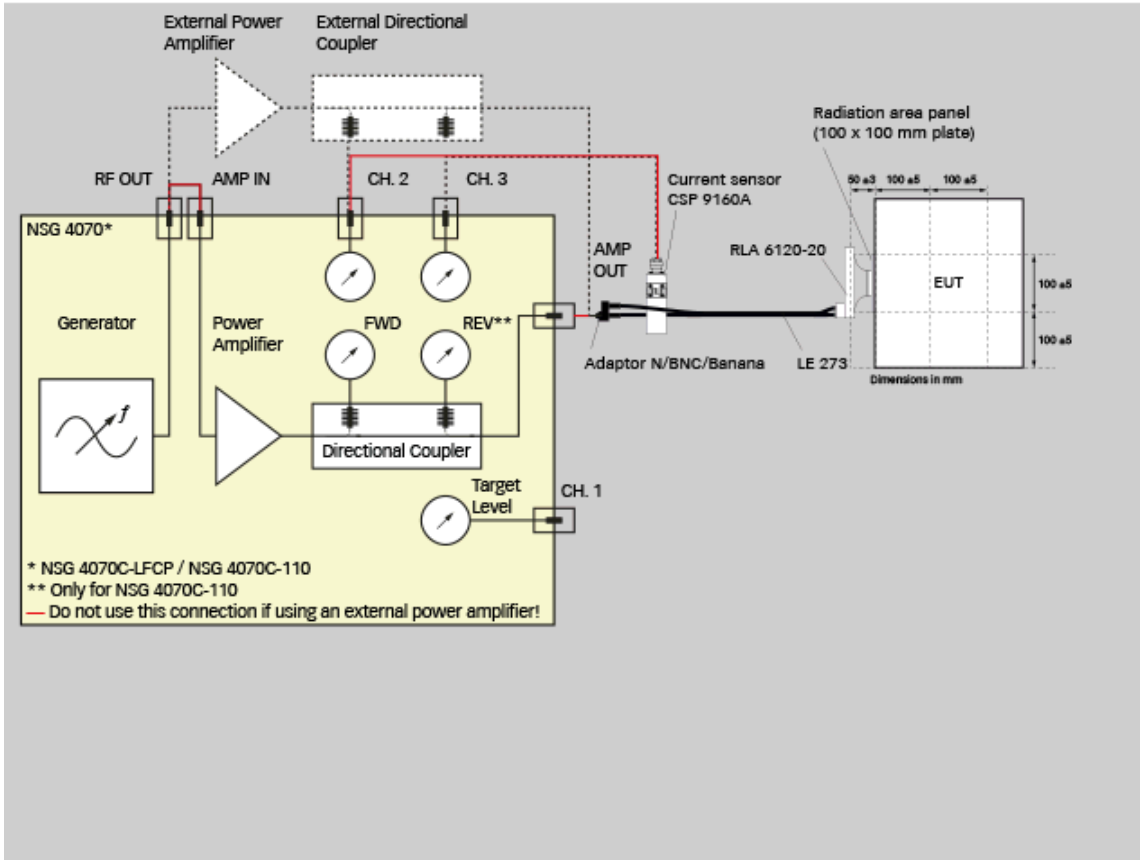


- **A file name must be assigned.**
- **Click “Save” to save the calibration.**

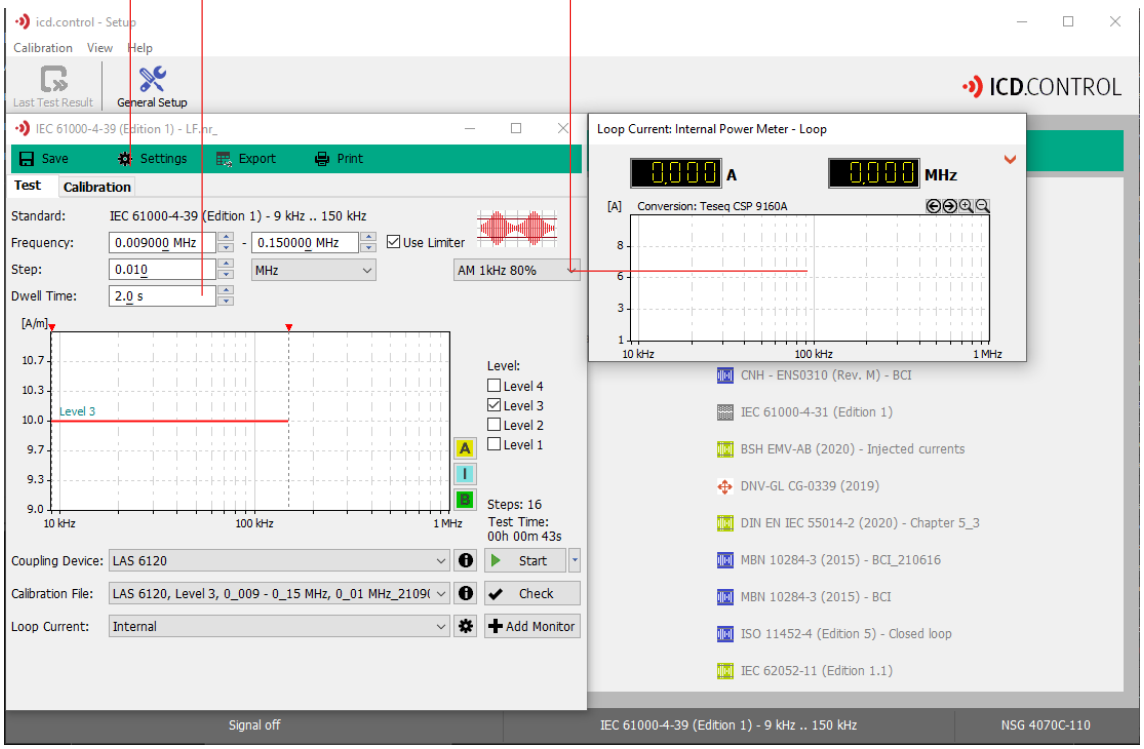
- Select “Test” to switch to the test mode.
- Select “View” and “Show Test Setup” to display a sample image for the test setup.

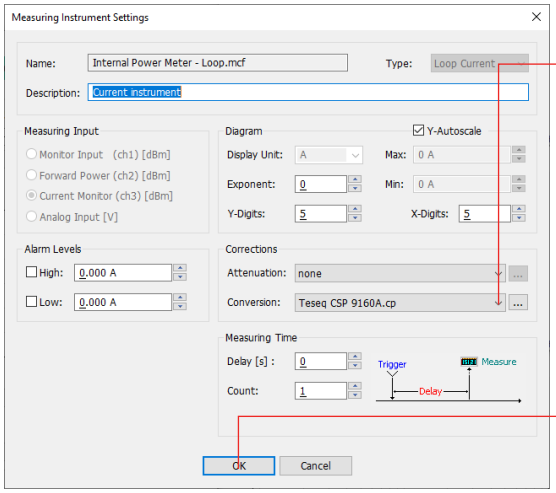


Test Setup for IEC 61000-4-39 (Edition 1) - 9 kHz .. 150 kHz



- **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.**
- **Change the dwell time according to the standard specification.**
- **A double click into the diagram opens the following menu for selecting the current probe.**

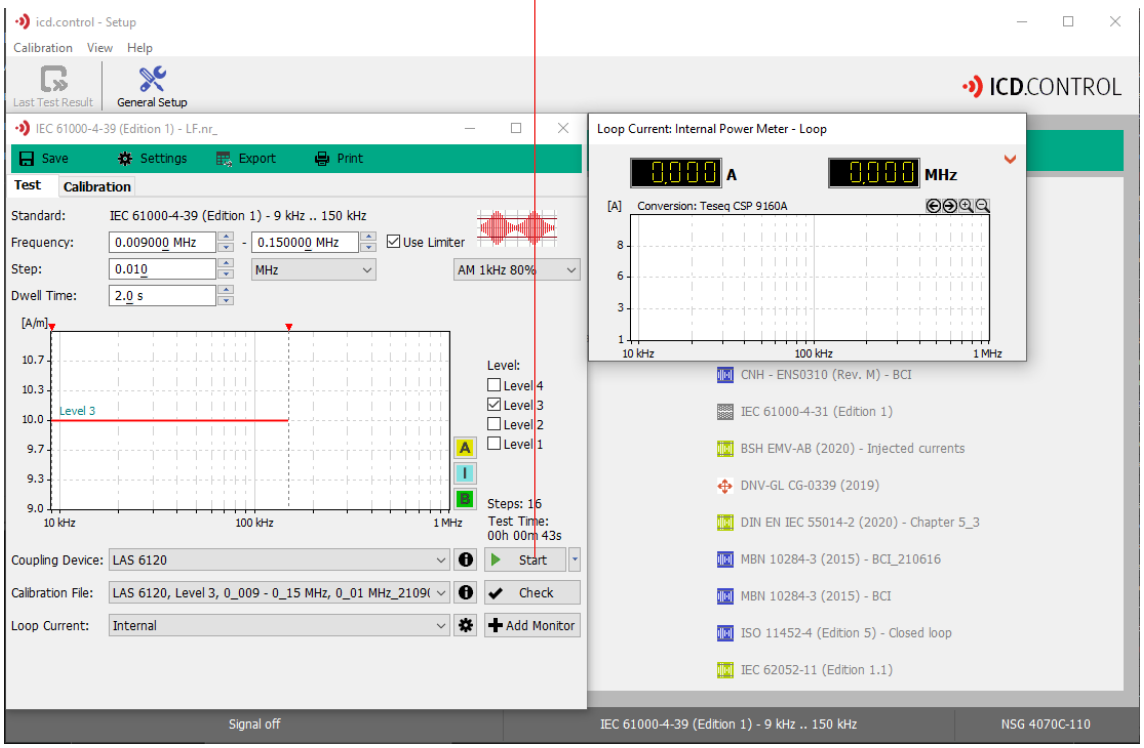




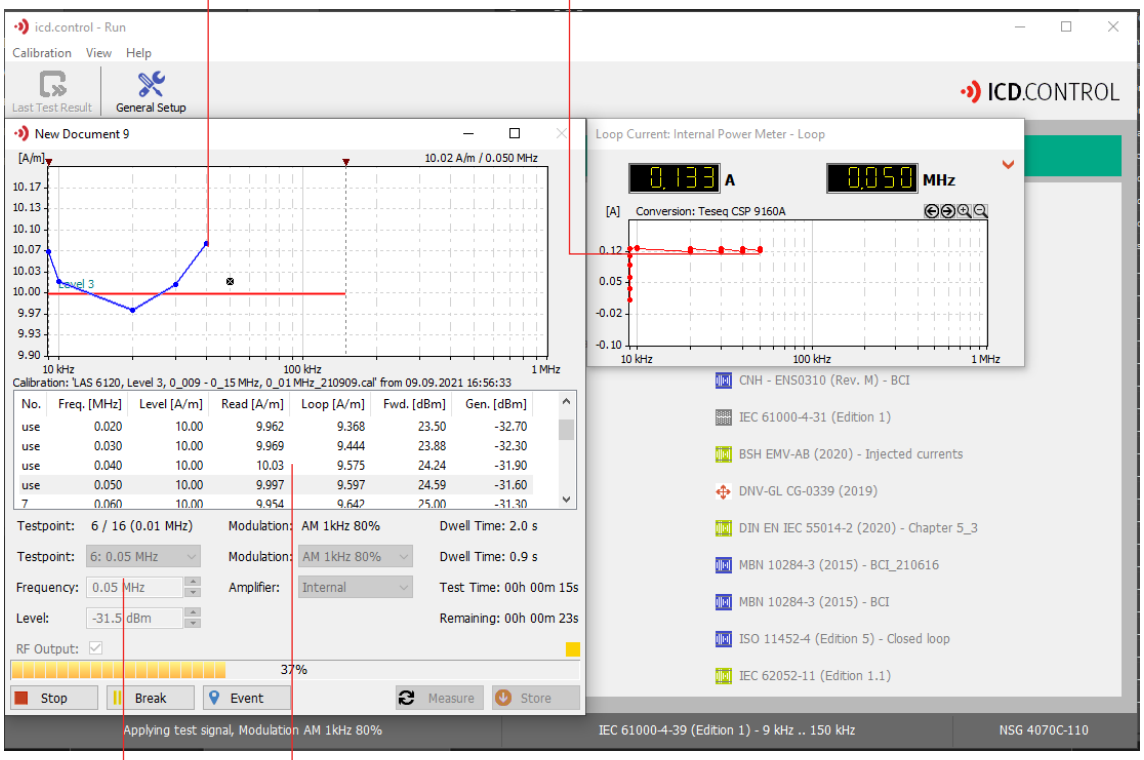
Select here the file containing the correction data of the CSP 9160A. Clicking on the icon ... opens the file.

Click "OK" to save the settings.

Click on "Start" to run the test.

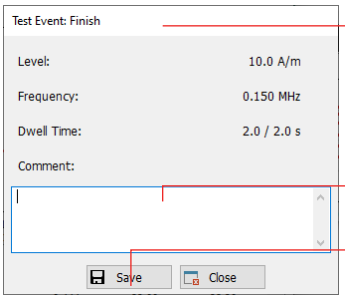


- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The instrument displays the current measured through the CSP 9160A.**

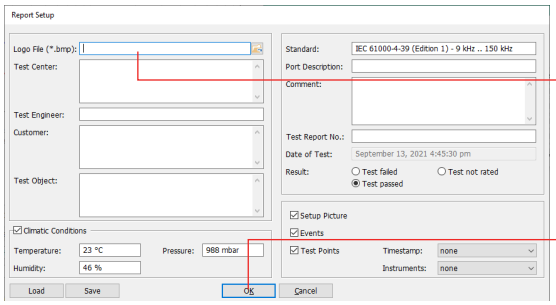


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button Break can be used to switch directly to the manual mode, for example, to check at a specific frequency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

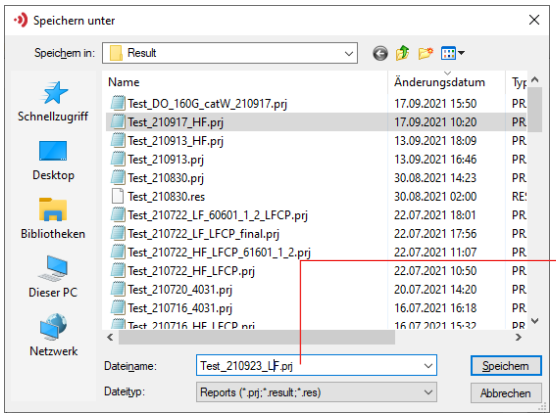
3.5. Test end and report creation



- 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.



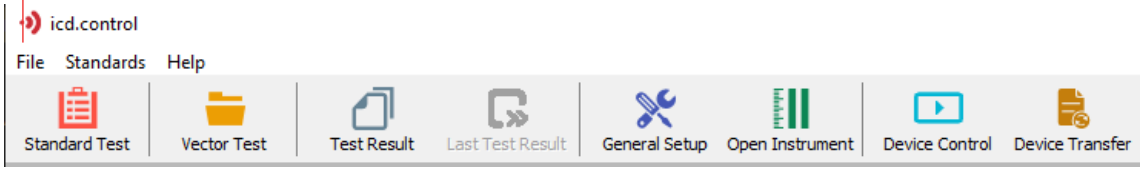
- Corresponding fields can be filled out and comments inserted.
- Click on “OK” to apply the settings.



- Give a proper file name and press “Save”.

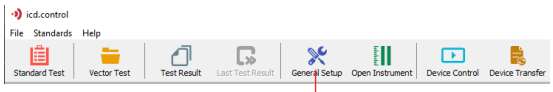
3.6. Save the configuration

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

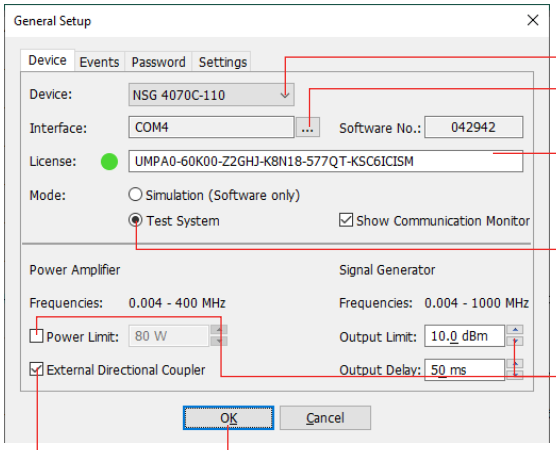


4. EXAMPLE IEC 61000-4-39 HF TEST WITH EXTERNAL DIRECTIONAL COUPLER AND AMPLIFIER

4.1. Basic settings



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



Select the appropriate generator model.

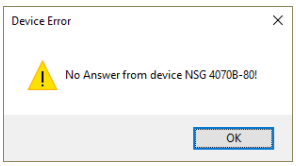
If necessary, configure the interface.

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.

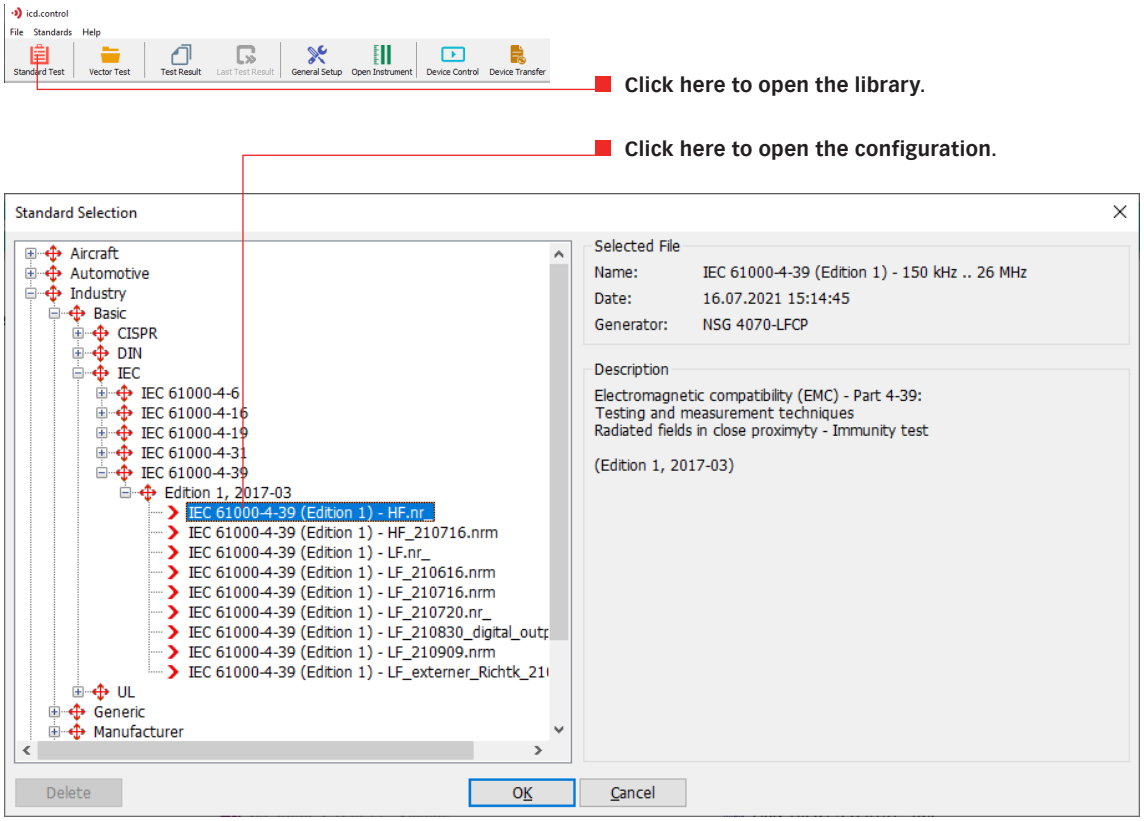
When leaving the menu with “OK”, the *idn? Command is sent to the device. If the answer is correct, the program changes to the main menu. If there is no connection, an error message appears. example:



By clicking on “OK” the program changes again into the settings.

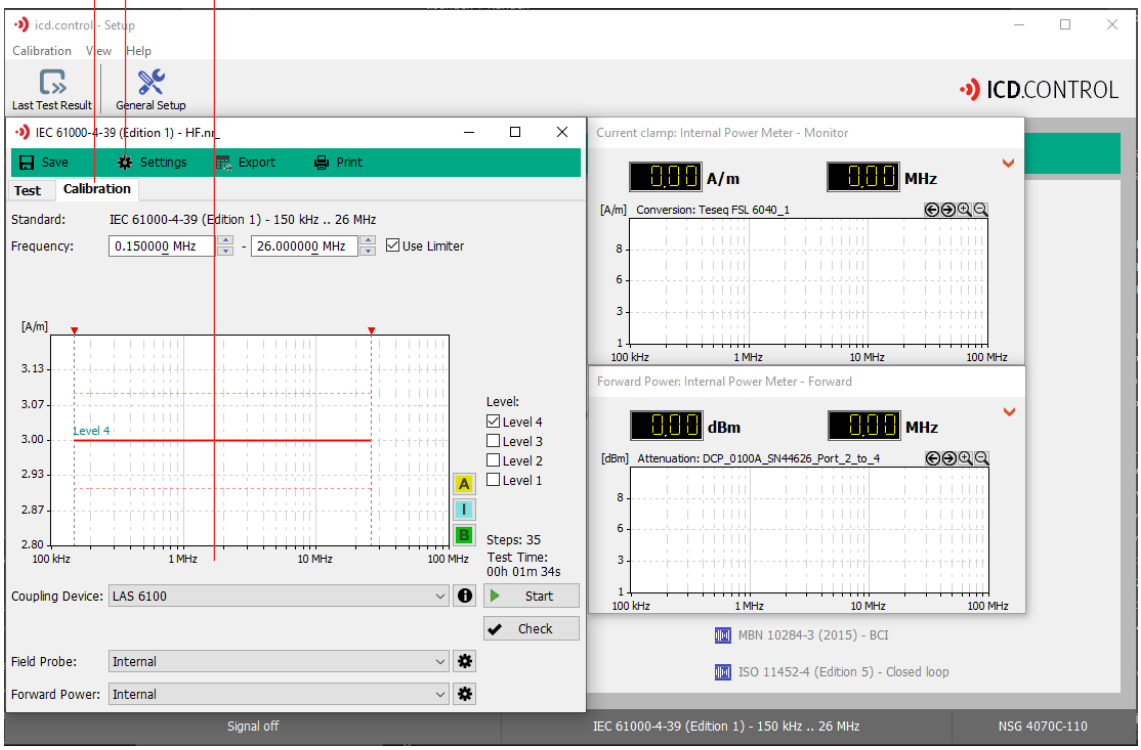
If the hacking is set, the NSG 4070 expects the forward power at channel 2. For operation with the internal power amplifier and internal directional coupler, the hook must not be set.

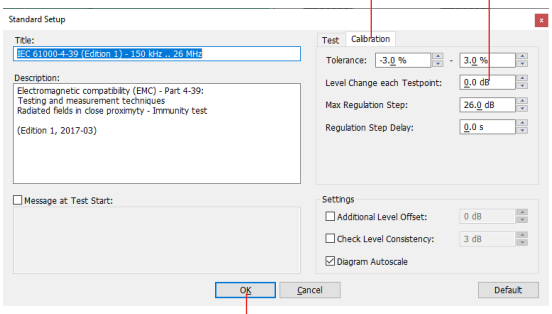
4.2. Selecting and loading the test configuration



4.3. Calibration (test level adjustment)

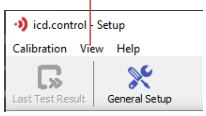
- Select “Calibration” to set the test level setting for the connected hardware.
- Select “Setup Standard” to change the basic settings for this test. See the example below.
- Select here the LAS 6100.

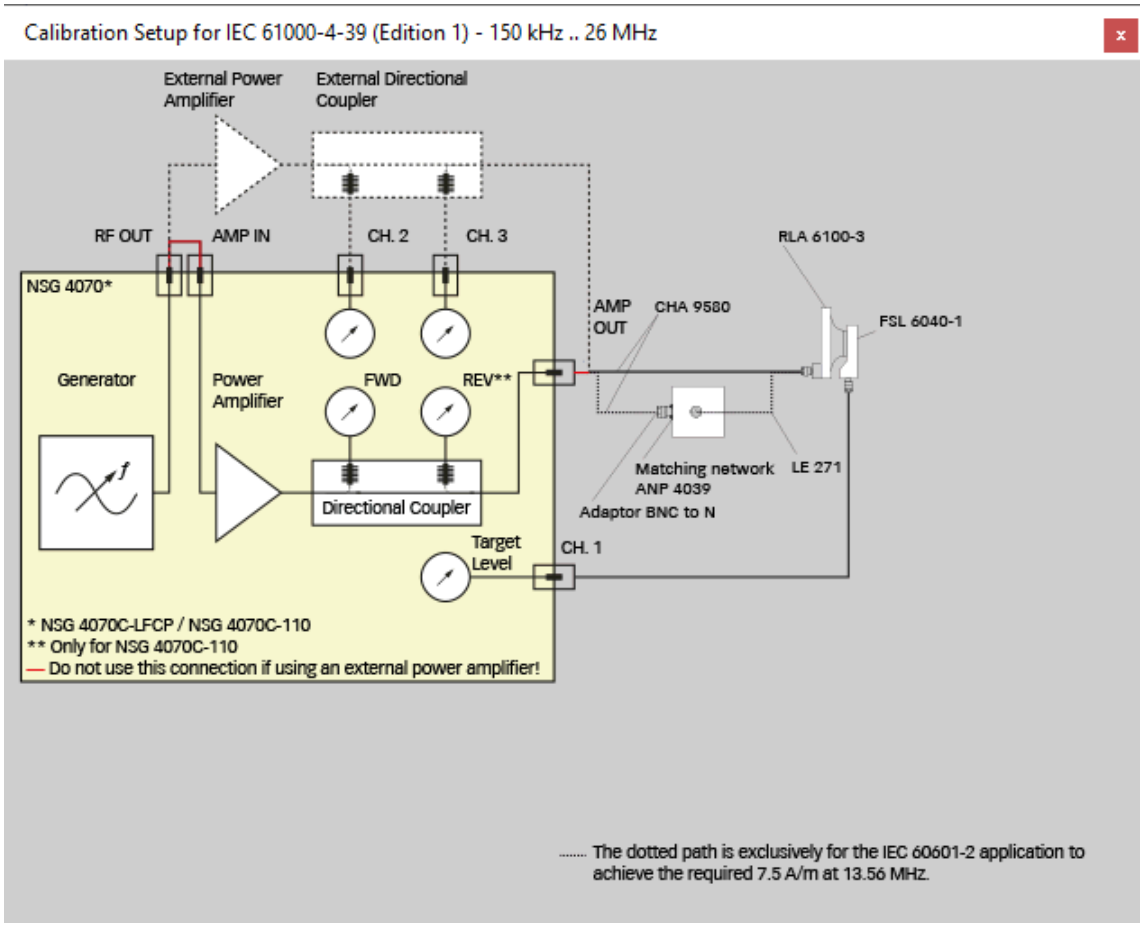




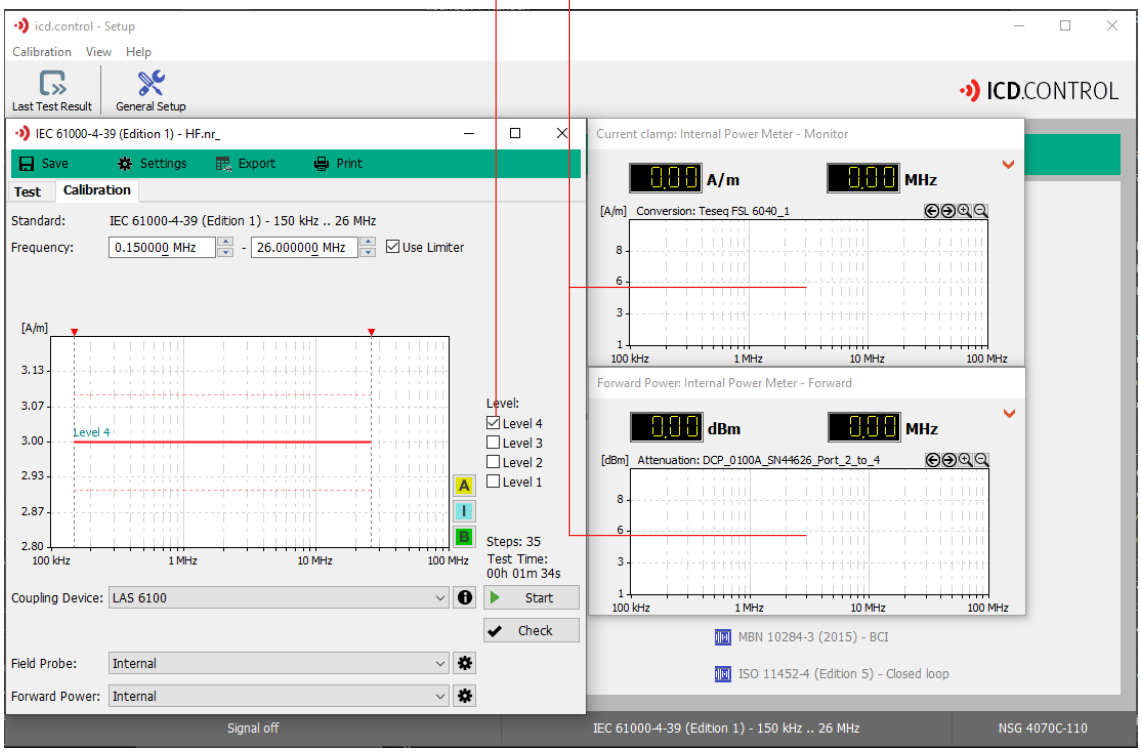
- Choose “Calibration”.
- With a value of, for example, -6 dB, the level would be lowered by 6 dB at each frequency step and then gradually increased to the target level. A level reduction may be required by the standard. During calibration (procedure for setting the test level) these requirements do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

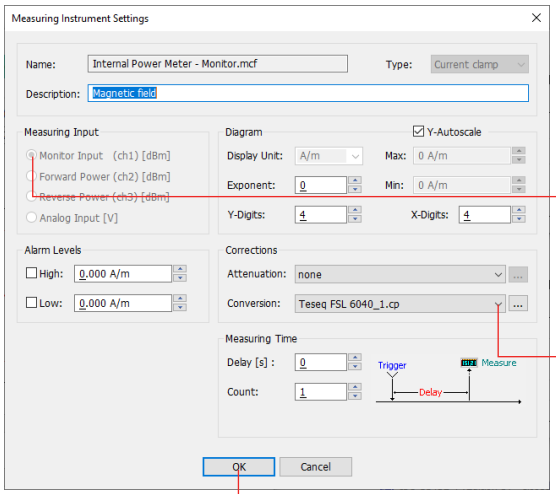
Select "View" and "Show Test Setup" to display a sample image for the test setup.



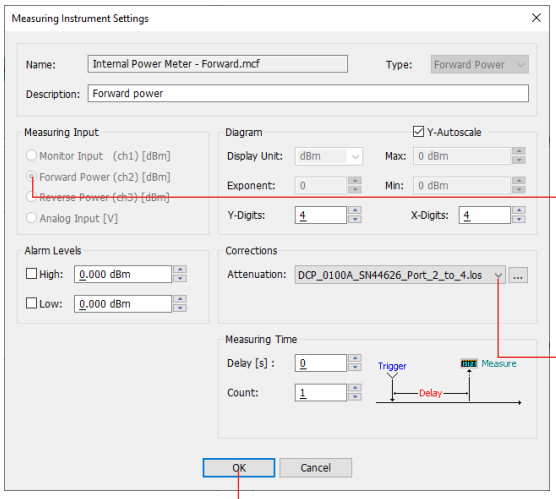


- Set the test level.
- A double-click into the diagram opens the following menus.



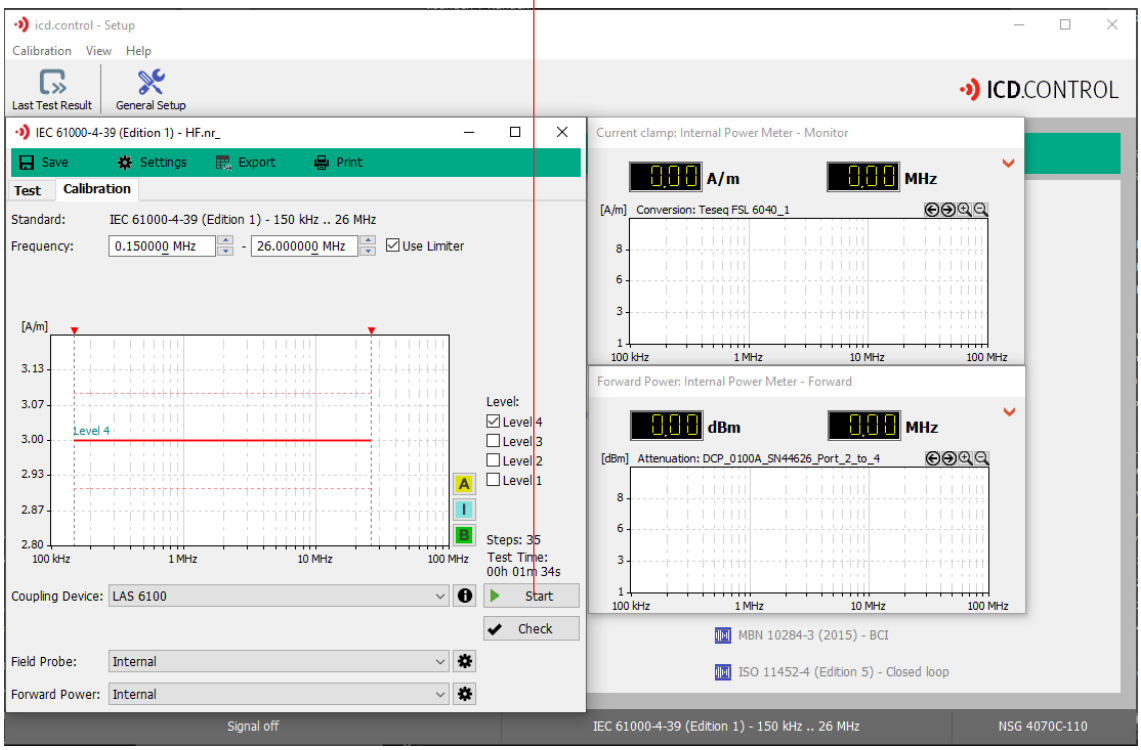


- Please note, this window is valid for power meter channel 1. It means, the sensor loop needs to be connected to power meter channel 1.
- Select here the file which contains the correction data for the loop sensor. Clicking on the icon ... opens the file.
- Click “OK” to save the settings.

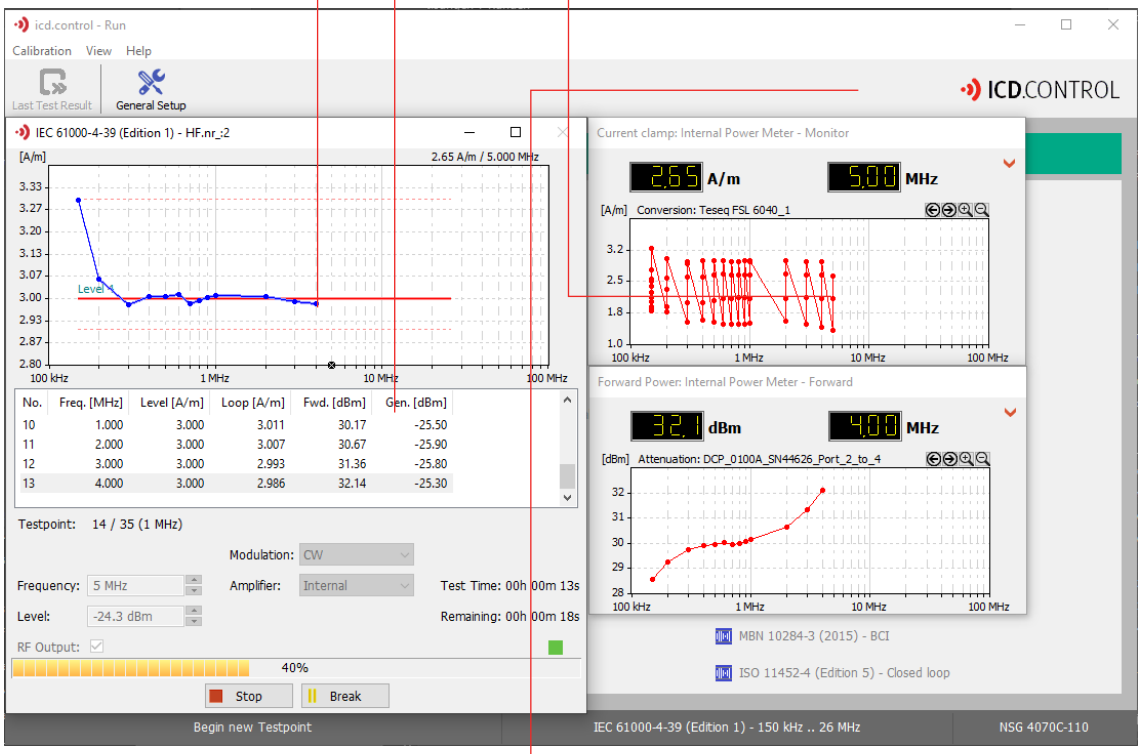


- **Please note, this window is valid for power meter channel 2. It means, the forward power port of the external directional coupler needs to be connected to power meter channel 2.**
- **Select here the file which contains the correction data for the path used for measuring the forward power of the external directional coupler. Clicking on the icon ... opens the file.**
- **Click "OK" to save the settings.**

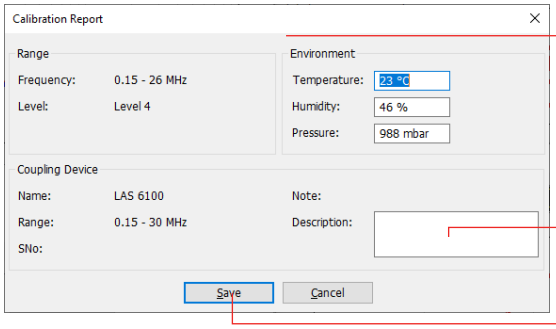
- **Click on "Start" to execute the calibration..**



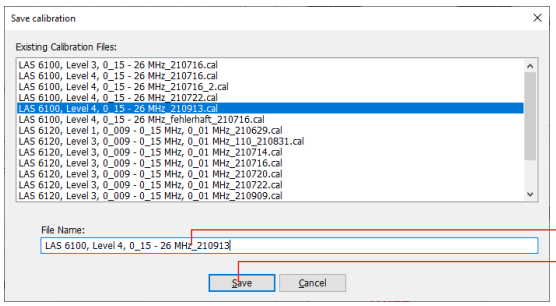
- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **Below the diagram, a table displays the values of frequency, target level, read level, loop level, forward power and generator power.**
- **The instrument shows the measured magnetic field strength with the loop sensor.**



- **The instrument shows the measured forward power.**



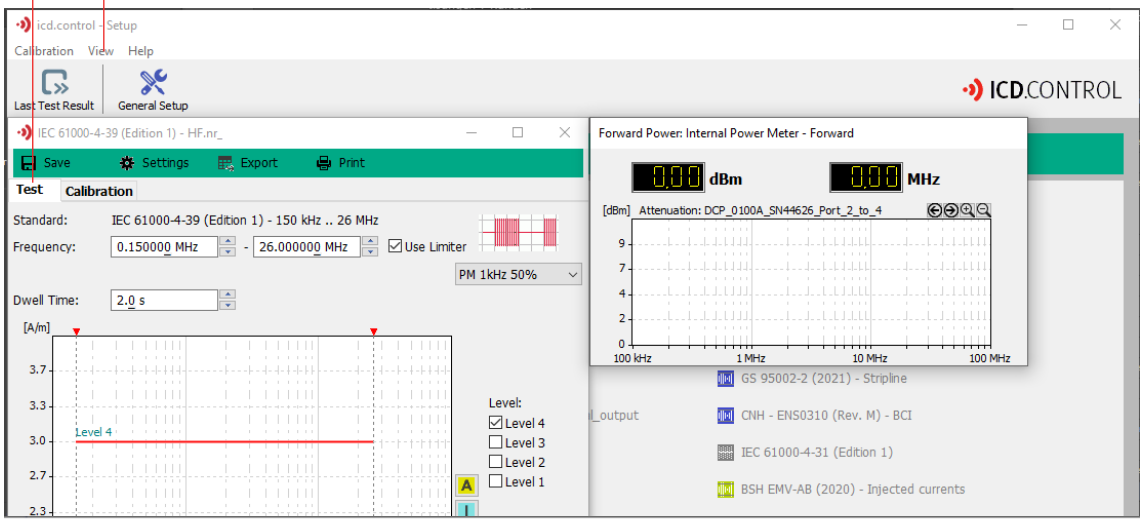
- **After successful calibration, the operator is prompted to save the file.**
- **A comment can be inserted.**
- **Click “Save” to save the settings.**

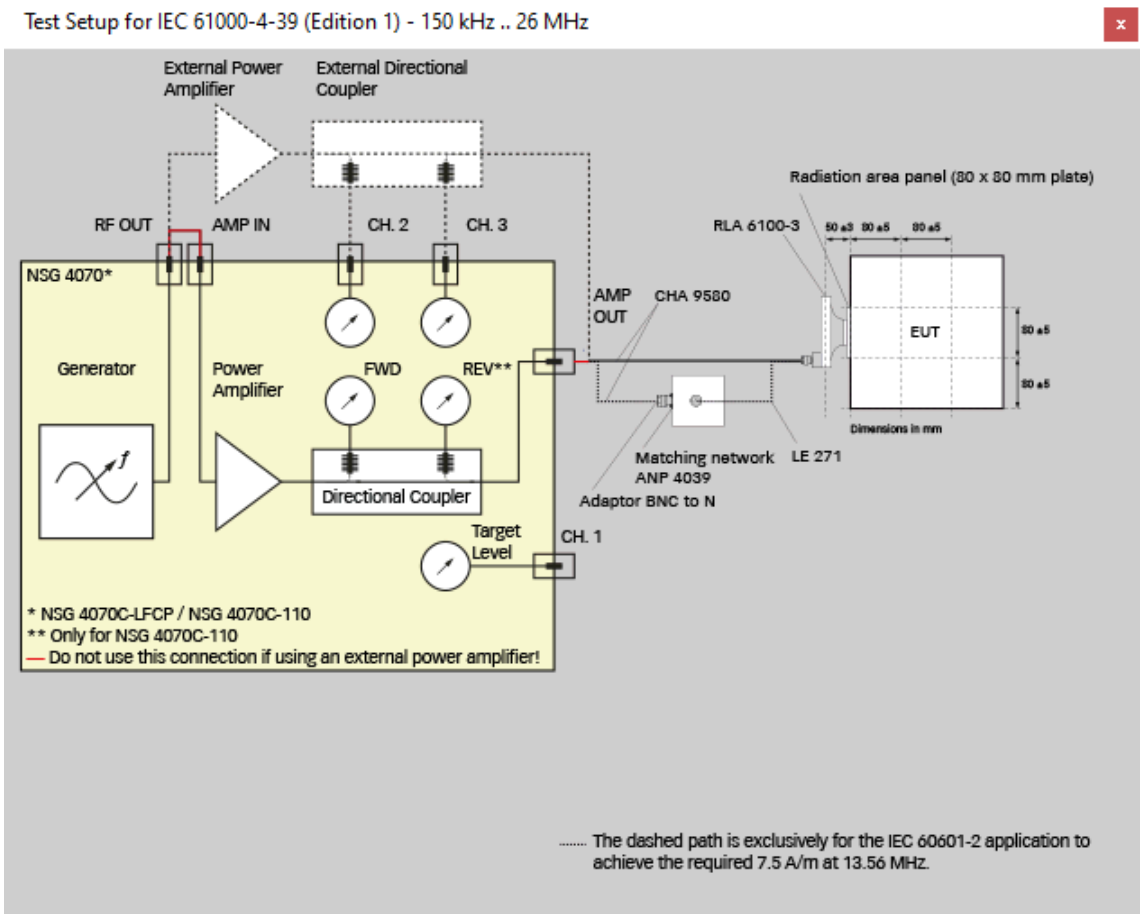


- **A file name must be assigned.**
- **Click “Save” to save the calibration.**

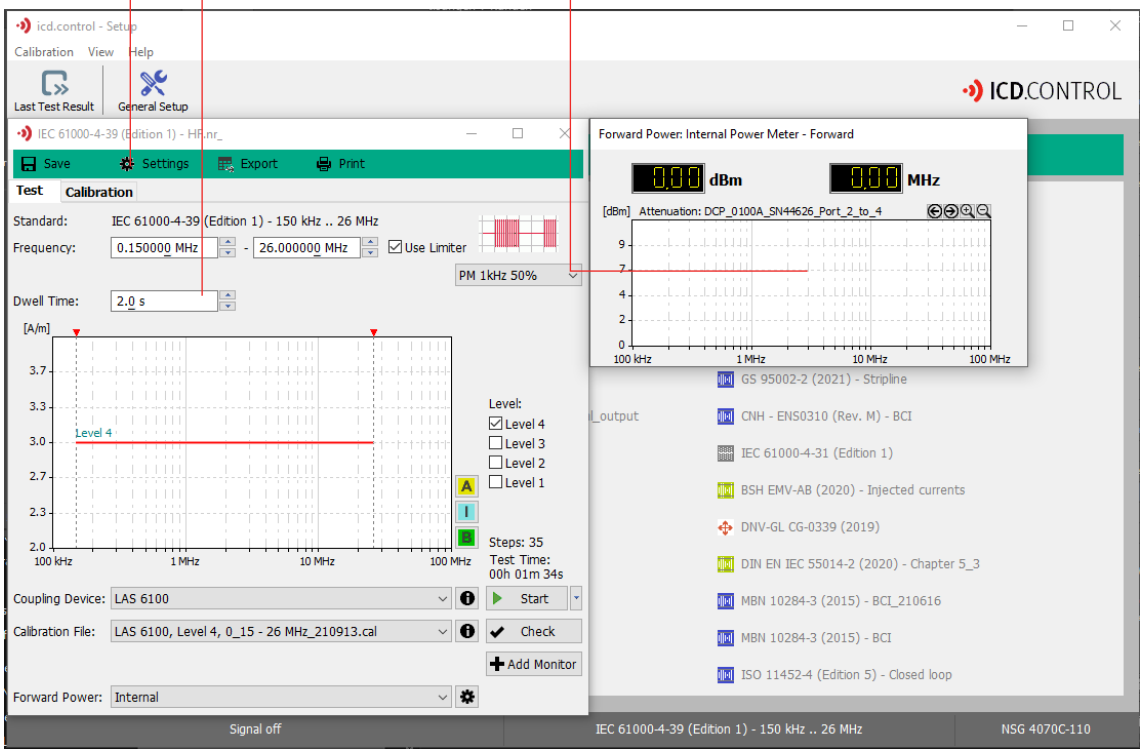
4.4. Test

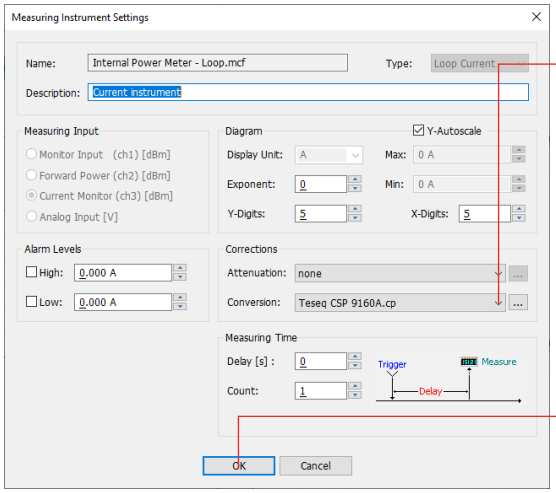
- Select “Test” to switch to the test mode.
- Select “View” and “Show Test Setup” to display a sample image for the test setup.





- **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.**
- **Change the dwell time according to the standard specification.**
- **A double click into the diagram opens the following menu for selecting the current probe.**

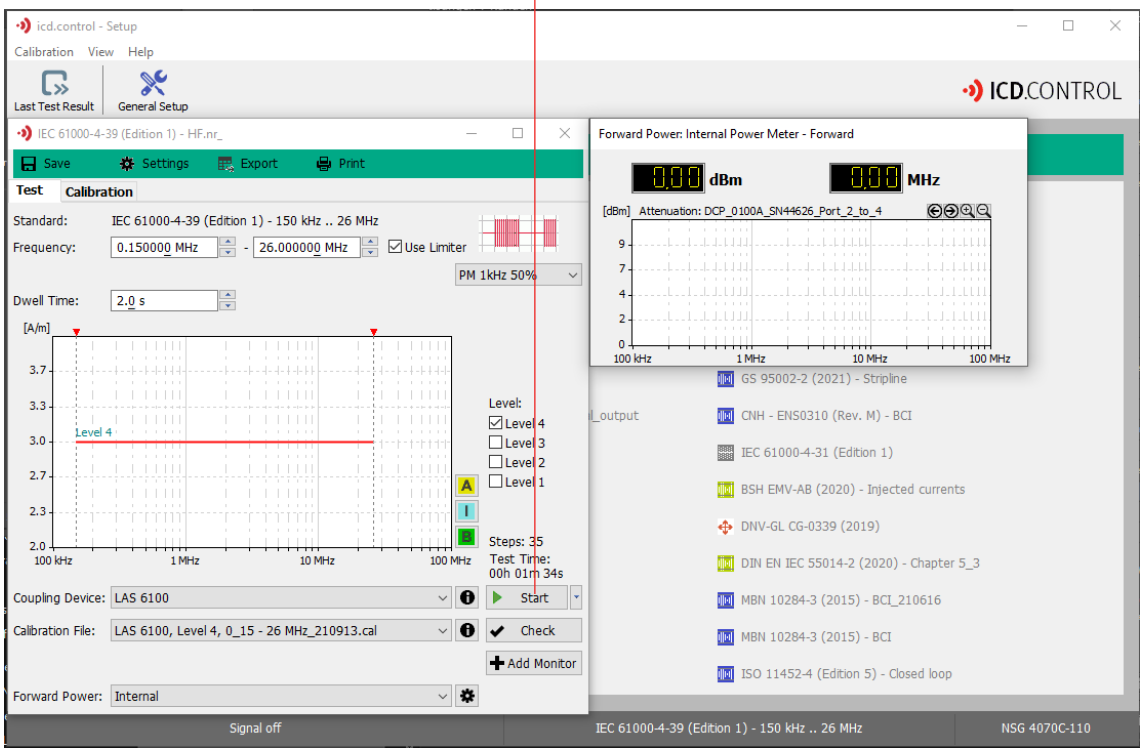




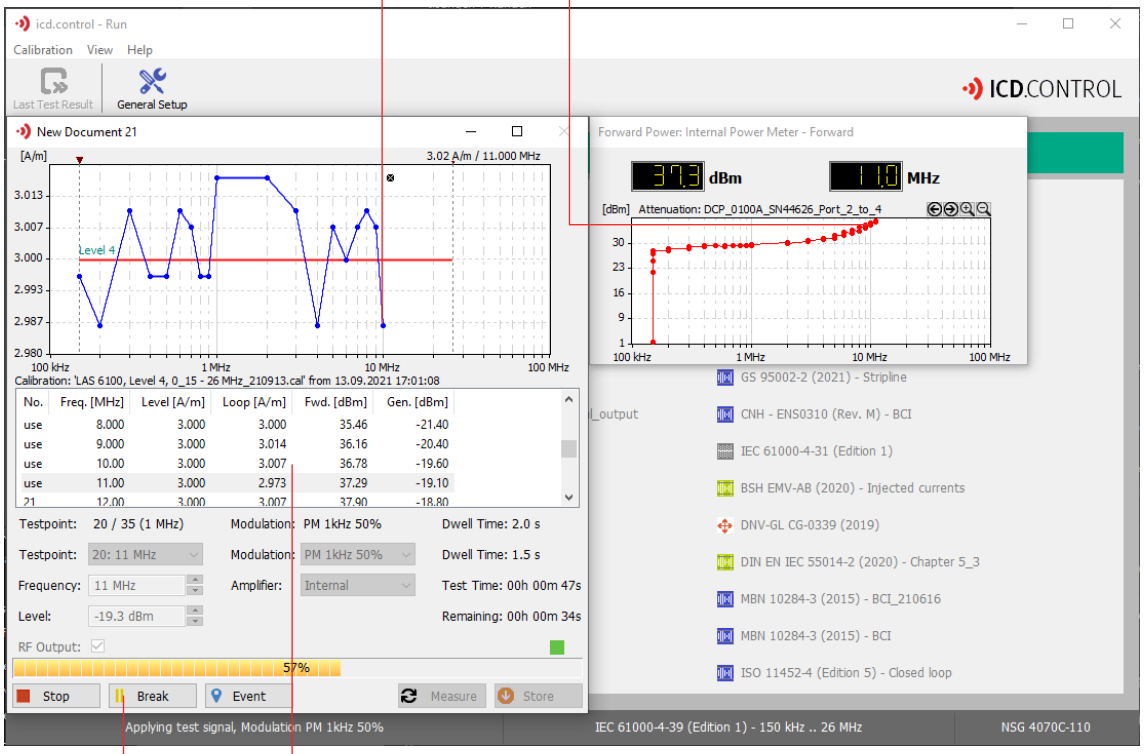
Select here the file containing the correction data of the CSP 9160A. Clicking on the icon ... opens the file.

Click "OK" to save the settings.

Click on "Start" to run the test.

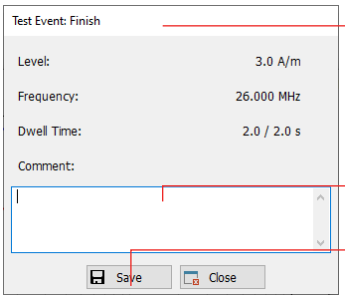


- **In the diagram, the achieved levels are displayed as blue dots and the target values as a red line.**
- **The instrument displays the current measured through the CSP 9160A.**

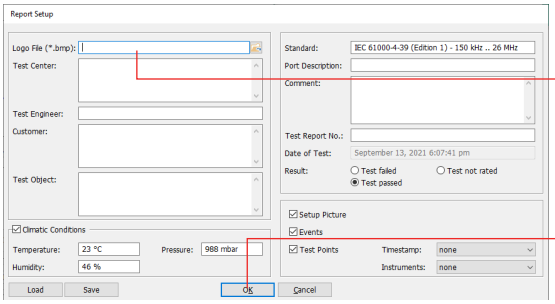


- **The table shows the currently used values of the calibration file.**
- **The status area displays the test time, remaining test time, dwell time, and the status of the modulation and level. The button Break can be used to switch directly to the manual mode, for example, to check at a specific frequency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

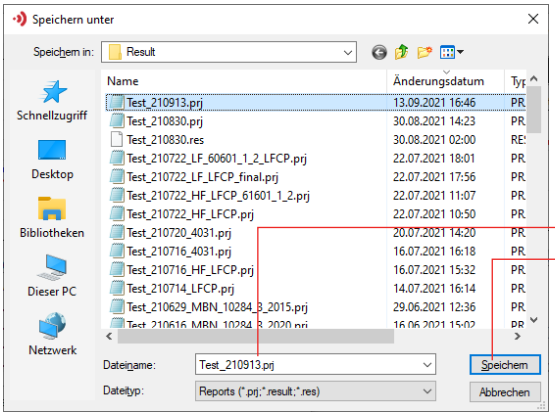
4.5. Test end and report creation



- 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.



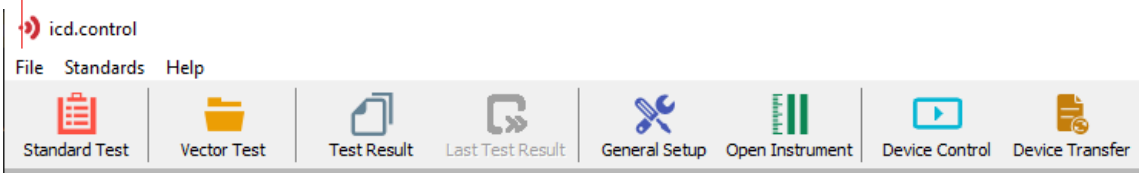
- Corresponding fields can be filled out and comments inserted.
- Click on “OK” to apply the settings.



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

4.6. Save the configuration

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



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