

THE MEASURABLE DIFFERENCE.



DEWETRON

▼

OXYGEN Training Modal Test





- General Features
- Creating a Modal Test
- Setting up a Test Object
- Select Input channels & groups
- Configure Trigger & FRF
- Modal Test Screen
- Trigger Warnings
- Modal shape animation

GENERAL FEATURES



Benefits of a Modal Test:

- > Simple setup of test object
- > Easy assignment data channels to excitation and response nodes
- > Intuitive definition of trigger settings, FFT and FRF calculation
- > Visualization via Modal Test Screen:
 - Excitation spectra
 - Response spectra (Amplitude, Phase)
 - Coherence, MIF
- > Recording and export of modal test data

- In addition to the great measurement functions of OXYGEN, the MODAL-option enables the setup and recording of data for a modal test:
 - Excitation: input raw, spectra
 - Response: input raw, spectra, FRF single, FRF average, Coherence
 - MIF (Mode indicator function)



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CREATING A MODAL TEST

- 1 Open the channel list
- 2 Open the channel setup to configure and scale the respective data channels
- 3 OPTIONAL: Change the channel name
- 4 Select the appropriate sensor type (IEPE)
- 5 Define the scaling/sensitivity of your sensor with its unit (e.g. N, g, m/s²)
- 6 Adjust the measurement
- 7 OPTIONAL: Adjust the coupling (high pass filter)

The screenshot displays the DEWETRON software interface for configuring a channel. The channel list on the left shows 'AI 2/1' selected. The main configuration area is divided into three sections:

- AMPLIFIER OPTIONS:** Mode is set to IEPE (4), Range is 0.5 V (6), LP filter is Auto, Coupling is 160 MHz (7), and Sensor delay is 0 ms.
- IEPE SETTINGS:** Excitation is Current at 8 mA.
- SENSOR SCALING:** Scaling type is Sensitivity (5), Unit is N, Sensitivity is 0.0025 V/N, and Offset is 0.022375241659596 N.

The PREVIEW window shows a waveform plot with the following statistical data:

Parameter	Value
MAX	0.125 N
AC RMS	0.233 N
AVG	0.015 N
MIN	0.195 N
MIN	0.152 N



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CREATING A MODAL TEST

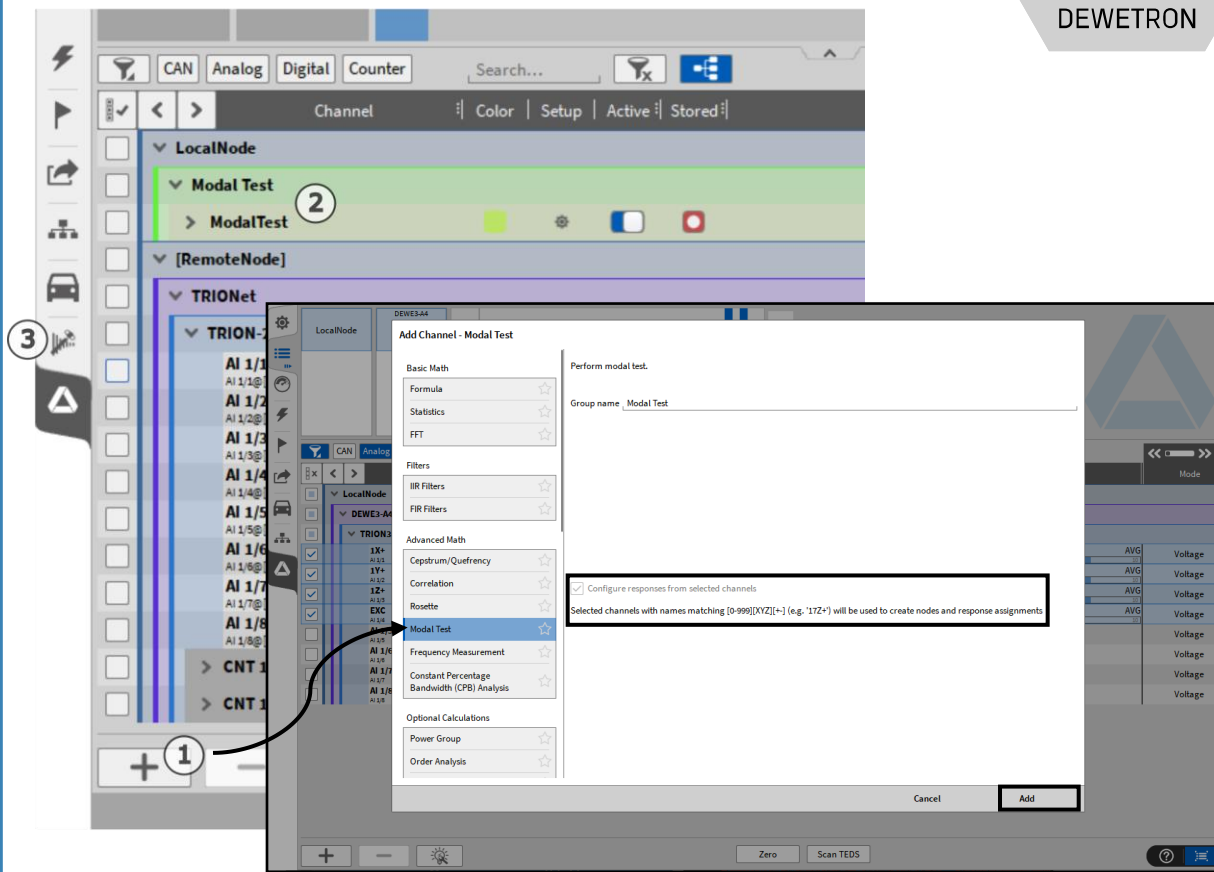
① Click on the (+) and press “Add” to create a modal test channel. The Modal Test is found in the Advanced Math options.

OPTIONAL: If the naming convention [0-999][XYZ][+/-] for the channels is met, the checkbox “Configure responses from selected channels” and some channels are selected, the checkbox is ticked.

After pressing “Add” you are forwarded to the Model Editor

② The previous action creates the Modal Test channel in the channel list

③ Additionally, the Modal Test tab is created in the Menu Bar, which can be clicked/swiped to access the Model Editor





SETTING UP A TEST OBJECT

- 1 If not already open, go to the Model Editor via the Modal Test tab
- 2 In the Model Editor, the Modal Test Object must be defined
- 3 Click (+) to add a Modal Test object and (-) to remove the selected object.
- 4 Vertices, Contour and Measured nodes are used to further define the Modal Test object
- 5 Import of custom Modal Test objects as *.uff or *.unv.
- 6 Export the selected Modal Test object as *.uff or *.unv.
- 7 Define the number of excitation and response positions and their directions. This can be edited in the "Measured Nodes" tab.

The screenshot shows the 'Model Editor' software interface. The 'Measured Nodes' tab is active, displaying a table of objects. The table has columns for '#', 'Name', 'Setup', 'Transformation', 'Object CS', and 'Content'. The first row is selected, showing '1', 'elevation_v1-1', 'Cartesian', 'Vertices', and 'Nodes'. The 'Add Object' dialog box is open, showing the following fields:

- Object type: Quick Setup
- Object name: Object-1
- Excitation nodes: 0 .. 100
- Response nodes: 5
- Directions: X+, Y+, Z+

A red arrow points from the '+' button in the toolbar to the 'Add Object' dialog box.

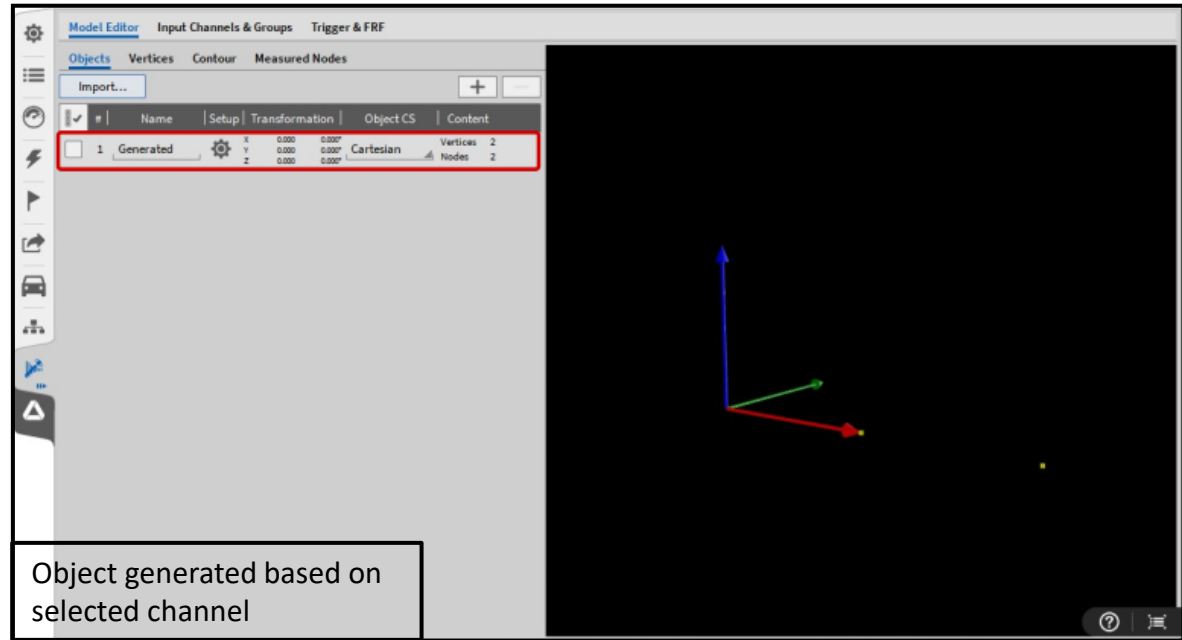
Note: This setup assumes no selected channels when creating a Modal Test

SETTING UP A TEST OBJECT



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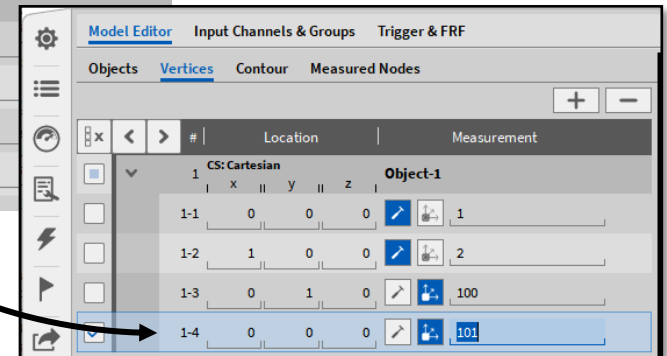
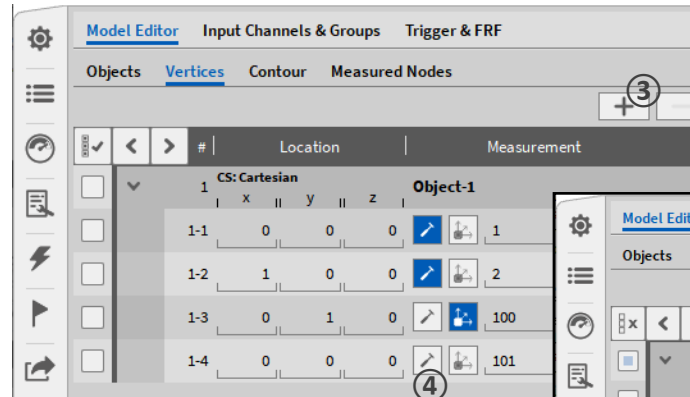
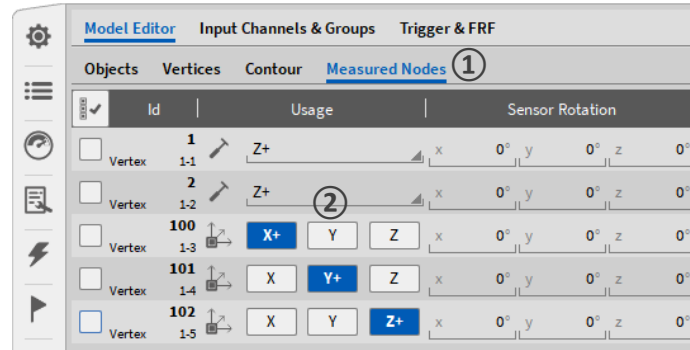
Note: This view would pop up after adding a Modal Test if you selected channels. Which automatically creates a test object





SETTING UP A TEST OBJECT

- ① The measurement directions of excitation/response nodes can be edited in the “Measured Nodes” tab.
- ② Define the direction for excitation and response nodes.
- ③ To add a new node, click the (+) button.
- ④ This creates a new node, which can be defined to be an excitation (hammer icon) or response node (axes icon)





SELECT INPUT CHANNELS & GROUPS

- ① Drag and Drop the Excitation channel to the Excitation field
- ② Either drag and drop the response channels or use the "Auto assign" button, which adds the channels in the selection order to the response fields.

In this case Acc X+, Acc Y+ and Acc Z+, are assigned to 100X+, 101Y+ and 102Z+.

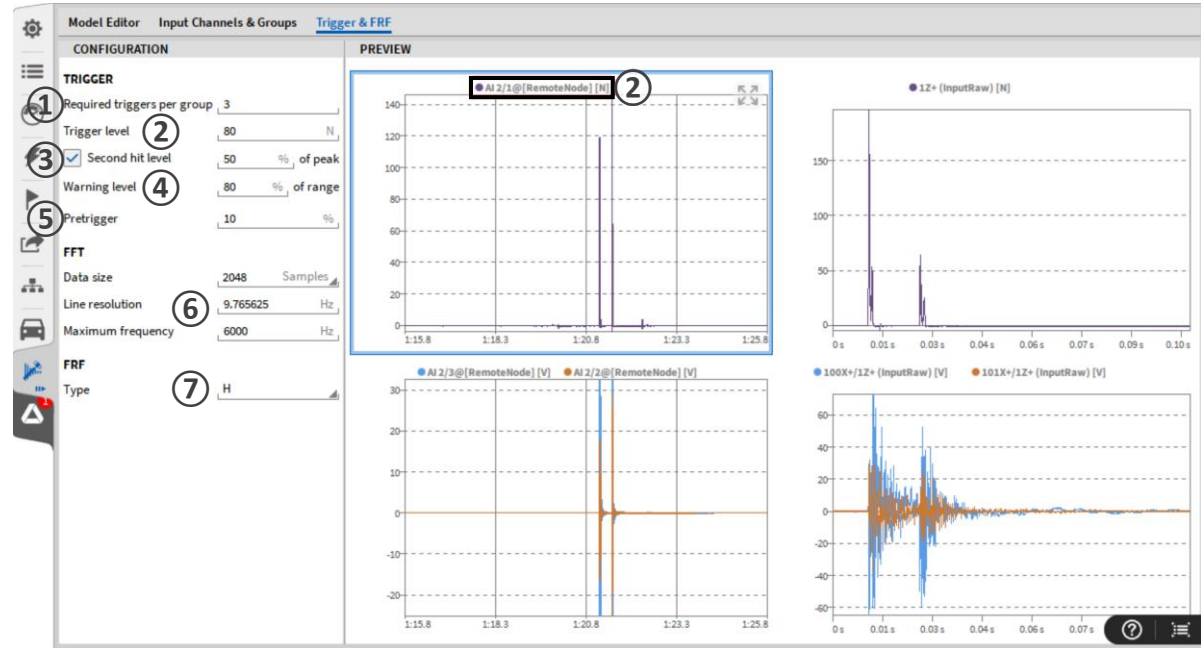
Responses	Excitations	1Z+	2Z+	3Z+
100X+	Acc X+	100X+/1Z+	100X+/2Z+	100X+/3Z+
101Y+	Acc Y+	101Y+/1Z+	101Y+/2Z+	101Y+/3Z+
102Z+	Acc Z+	102Z+/1Z+	102Z+/2Z+	102Z+/3Z+



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CONFIGURE TRIGGER & FRF

- 1 Define the number of triggers to be averaged for one modal test group
- 2 Set the trigger level based on the preview window. The preview window can be scaled by clicking on the label.
- 3 To get a warning if in a short interval a second hit is recorded, enable the "Second hit level". This warning is triggered when the threshold of the hit peak is surpassed
- 4 Choose the level at which a range warning is issued
- 5 Set the percentage of the recorded data size, which is recorded prior to the trigger
- 6 Configure the FFT calculation
- 7 Choose the frequency response function calculation



Current signal:
(top) Excitation node
(bottom) Response node

Recorded trigger event:
(top) Excitation node
(bottom) Response node



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MODAL TEST SCREEN

- ① Switch to the Instrument Screen, Create a Modal Test Screen
- ② Check the “Active” button to arm the trigger. To record the data, press the red record button
- ③ To discard the last triggered data, press the “Reject last” button
- ④ Toggle “Single” to show a single amplitude response into the amplitude response plot ⑭
- ⑤ Toggle “MIF” to show the mode indicator function into the coherence plot ⑮
- ⑥ Overview of the modal group
- ⑦ Bar indicator, showing saturation of response nodes
- ⑧ Live signal of Excitation
- ⑨ Live signal of Response nodes
- ⑩ Excitation signal of last excitation event





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MODAL TEST SCREEN

- ①① Response signal of last excitation event
- ①② Excitation spectrum of last excitation event
- ①③ Response spectrum of last excitation event
- ①④ Bode diagram of response amplitude / excitation amplitude
- ①⑤ Bode diagram of response phase / excitation phase
- ①⑥ Coherence and optional MIF
- ①⑦ Modal shape animation for a selected frequency

The screenshot displays the 'Modal@ModalTest' software interface. At the top, a timeline shows the test duration from 0:00.0 to 0:50.0, with a current time of 0:35.943. The main area contains several plots:

- 8**: Time-domain plot of 'Exc [N]' (Excitation signal).
- 9**: Time-domain plot of response signals (Z+, X+, Y+, 27...).
- 10**: Time-domain plot of '6Z- (InputRaw) [N]'.
- 11**: Time-domain plot of response signals.
- 12**: Frequency spectrum plot of '6Z- (Spectrum) [N²/Hz]'.
- 13**: Frequency spectrum plot of response signals.
- 14**: Bode diagram showing response amplitude / excitation amplitude.
- 15**: Bode diagram showing response phase / excitation phase.
- 16**: Coherence plot for the selected frequency.
- 17**: Modal shape animation showing a red structure with numbered nodes (27, 29, 30, 31, 32, 33, 39, 40, 41).

On the right side, there is a control panel:

- 1**: 'Create Modal Test Screen' button.
- 2**: 'Active' button.
- 3**: 'Reject last' button.
- 4**: 'Single' button.
- 5**: 'MIF' button.
- 6**: 'Resp. \ Exc.' table with columns for '1X+' and '6Z-'. The table contains rows for '27X+', '27Y+', and '27Z+'.
- 7**: Legend for response signals: 27X+ (blue), 27Y+ (cyan), 27Z+ (light blue).

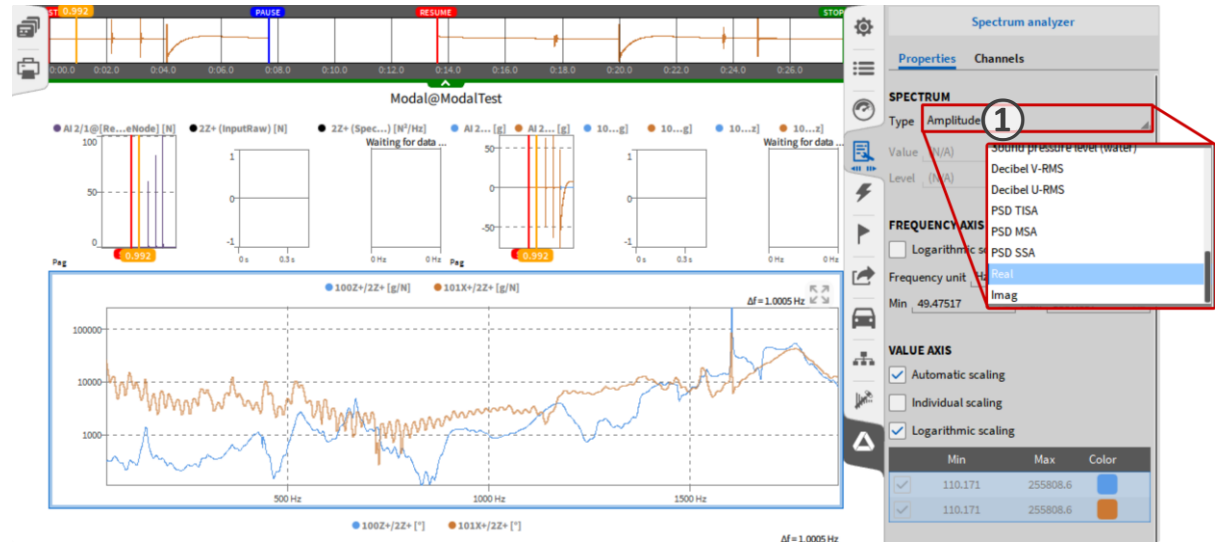
At the bottom, there is a system tray with a play button, a sync button, the date and time (08:14:19 (UTC+2) 22.10.2024), and various system icons.



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MODAL TEST SCREEN

- ① Switch to the Instrument Screen, Create a Modal Test Screen
- ② Check the “Active” button to arm the trigger. To record the data, press the red record button
- ③ To discard the last triggered data, press the “Reject last” button
- ④ Toggle “Single” to show a single amplitude response into the amplitude response plot ⑧
- ⑤ Toggle “MIF” to show the mode indicator function into the coherence plot ⑩
- ⑥ Overview of the modal groups
- ⑦ Overview of the number of hits to be averaged for a modal group
- ⑧ Amplitude response plot
- ⑨ Phase shift response plot
- ⑩ Coherence plot



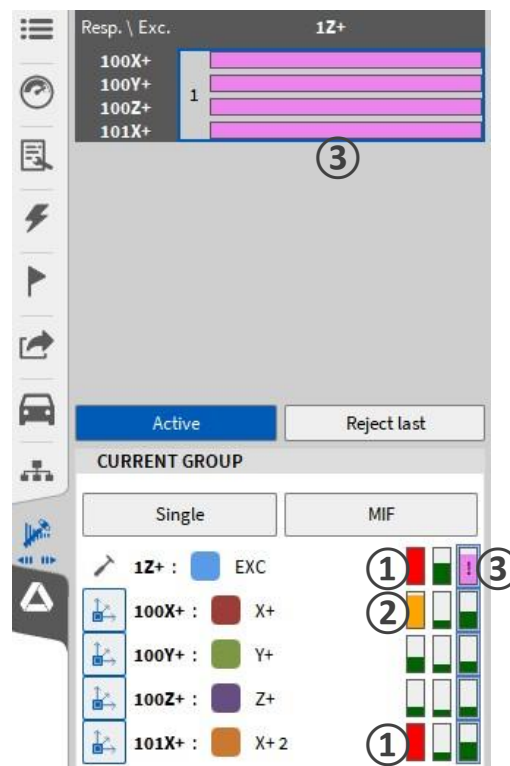
TRIGGER WARNINGS



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- ① To indicate an incorrect measurement, when the measurement range is surpassed, the bars turn red
- ② An orange bar indicates an exceeding of the set range (Trigger & FRF tab)
- ③ The double hit is indicated by a pink bar with an exclamation. This warning can be enabled in the trigger & FRF tab





MODAL SHAPE ANIMATION

- 1 Select the excitation point of whom the response is animated. By default, this is the first excitation.
- 2 Select the frequency by manual input, slider, or from an instrument on the page. To select frequency based on a instrument, click into the instrument and move the cursor to the desired frequency.
- 3 Start, stop the animation in addition to increasing speed and amplitude of animation
- 4 Reset the camera if the model object is out of focus and hide model object components.
- 5 One or multiple animation cycles can be exported as *.mkv video of the animation or the whole modal test screen

The screenshot displays the DEWETRON software interface for a modal test. The main window is titled "Modal Test" and is divided into several sections:

- Excitation (1):** A dropdown menu is set to "Auto". A red box highlights this dropdown, with a callout showing the available options: "Auto", "Auto", "1X+", and "6Z-".
- Frequency (2):** The frequency is set to "From linked instruments on page" with a value of 605.46875 Hz. A red box highlights this section, with a callout showing the selection options: "Manually specified", "From linked adjacent instruments", and "From linked instruments on page".
- Deflection (3):** This section contains controls for "Animation speed" and "Amplitude scale", both with sliders. A red box highlights this entire section.
- View (4):** This section includes a "Reset" button for the camera and checkboxes for "Vertices", "Labels", "Lines", and "Surfaces". A red box highlights this section.
- Video Export (5):** This section includes a field for "Animation cycles" set to 1, a checked checkbox for "Export entire screen", and an "Export..." button. A red box highlights this section.

The background shows a spectrum plot with a peak at 27 Hz, and two time-domain plots showing the response over time. The interface also features a toolbar with various icons for navigation and control.



SDOF Circle Fit / Nyquist Plot

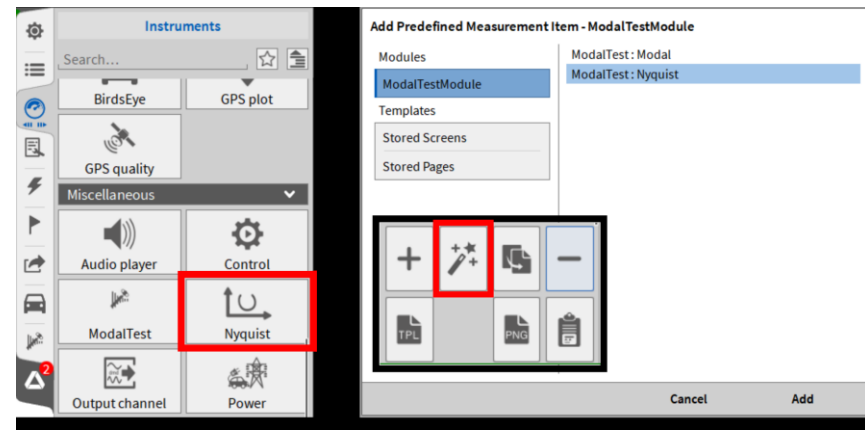
The Nyquist plot can be either added by the Miscellaneous Instruments of by the use of the predefined templates in the screens tab.

① The Nyquist Plot instrument need at least one reference frequency. This is can be done manually or by a linked spektrum analyzer instrument with the same channels.
Three options are available to select the frequency, single cursor, double cursor, triple cursor.

② In case of the frequency selection based on a linked instrument, place one/two/three marker in a linked bode plot

③ Select the type of fitting, either no fitting, fitting by the coordinate system or by radius and center.

④ The calculated natural frequency and loss factor can be copied to the clipboard.



	Nat...ncy	Loss factor
100X+1...m/s ² /N	0.1418	
100Y+1...m/s ² /N	0.0537	
100Z+1...m/s ² /N	0.1106	

	Nat...ncy	Loss factor
100X... ² /N	763.36Hz	3.79%
100Y... ² /N	760.99Hz	4.67%
100Z... ² /N	760.81Hz	4.43%

FREQUENCY RANGE
From linked instruments on page 1

FITTING PARAMETERS
Circle fitting: Center and radius

VALUE AREA
Automatic scaling: Off
Center and radius

STYLE
Transparent background:
Line width: 2

CROSS HAIRS
Use cursor cross hair:
Line width: 1