

ABSOLUTE AND RELATIVE ORDER REFERENCE

What is it, where is it useful, and how to switch

Absolute vs. Relative Order Axis

When displaying an order spectrum, there are two possibilities for the x axis scaling: '*absolute*' and '*relative*' orders.

The Mix spectrum is the reference for '*absolute*' orders. '*Relative*' orders refer to the rotor for which the spectrum is displayed.

Example: if the Mix spectrum uses the speed of the input side of a gearbox, input shaft orders define the '*absolute* order scale'.

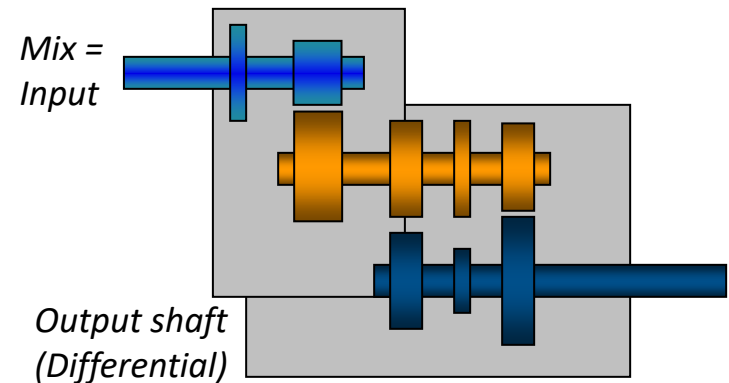
For this example, let's assume that the output side ('Differential') has a transmission ratio of 0.333 (so the Differential turns at 1/3 of the input shaft speed).

The Differential gear shall have 72 teeth, so there will be an according peak in the spectrum of the output shaft as well as in the Mix spectrum.

In the Mix spectrum, this peak will be at order 24 ($= 72 \times \text{ratio } 0.333$).

If the synchronous spectrum of the output shaft is displayed with *absolute* order scale, in that spectrum the peak will be at 24 as well, because all orders are shown with reference to the Mix spectrum.

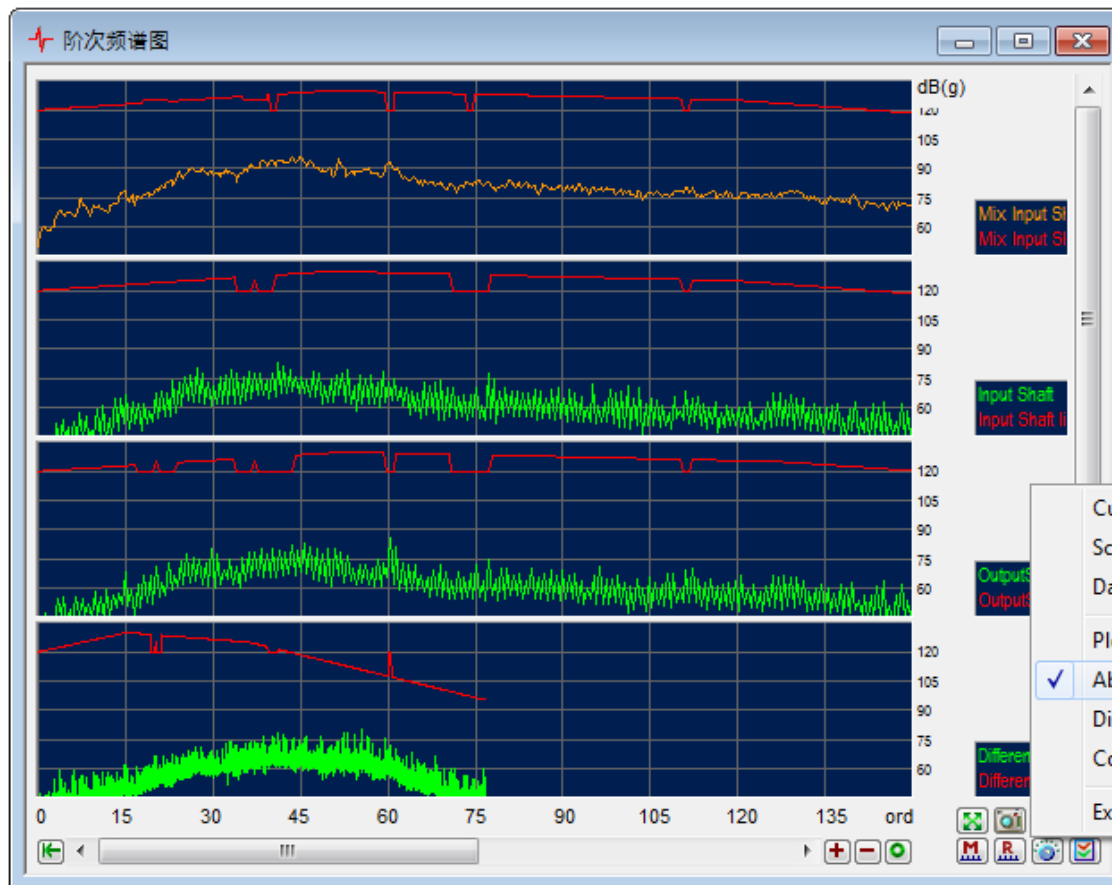
If the synchronous spectrum is displayed with *relative* order scale, the peak shows at 72 (the gear teeth number of the Differential gear).



Switching the order reference in TasAlyser

In the measurement application *TasAlyser*, the display can be switched between absolute and relative order reference in the 'Scope' window which shows the spectra. Right-Click within the right (grey) area of the Scope window to call up the context menu

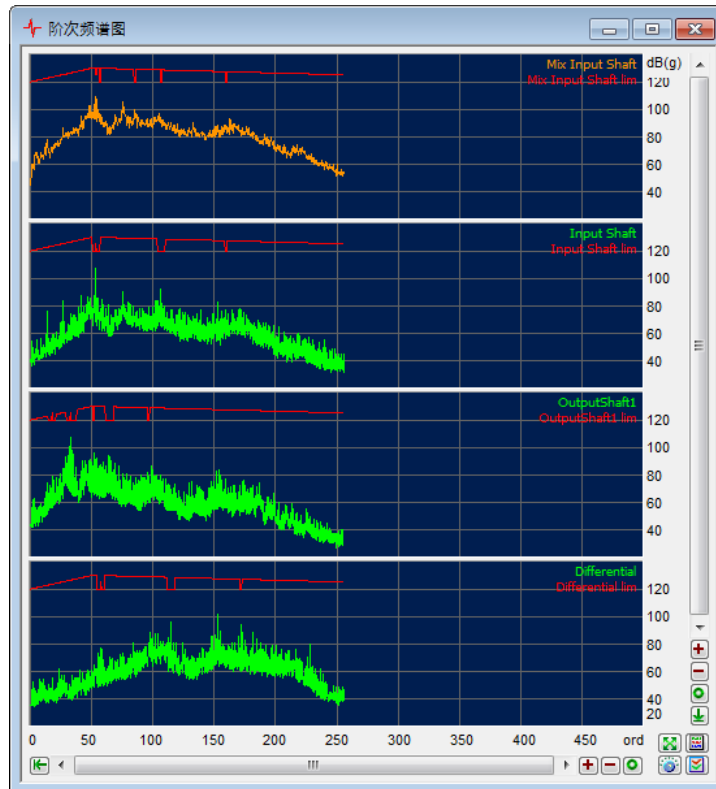
and switch on or off the check mark at 'Absolute x axis':



This switch also works for the rotationally synchronous time signal display.

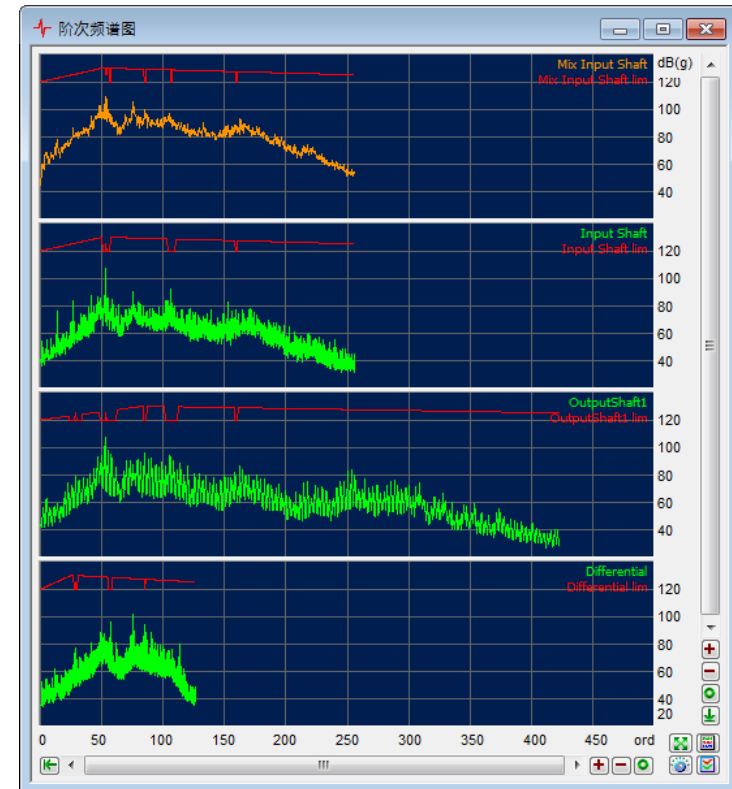
These pictures show the same spectra in both scalings:

Relative order scale:



All rotors are analysed up to their respective (= relative) order 256. Peaks in sync. spectra appear at teeth numbers.

Absolute order scale:

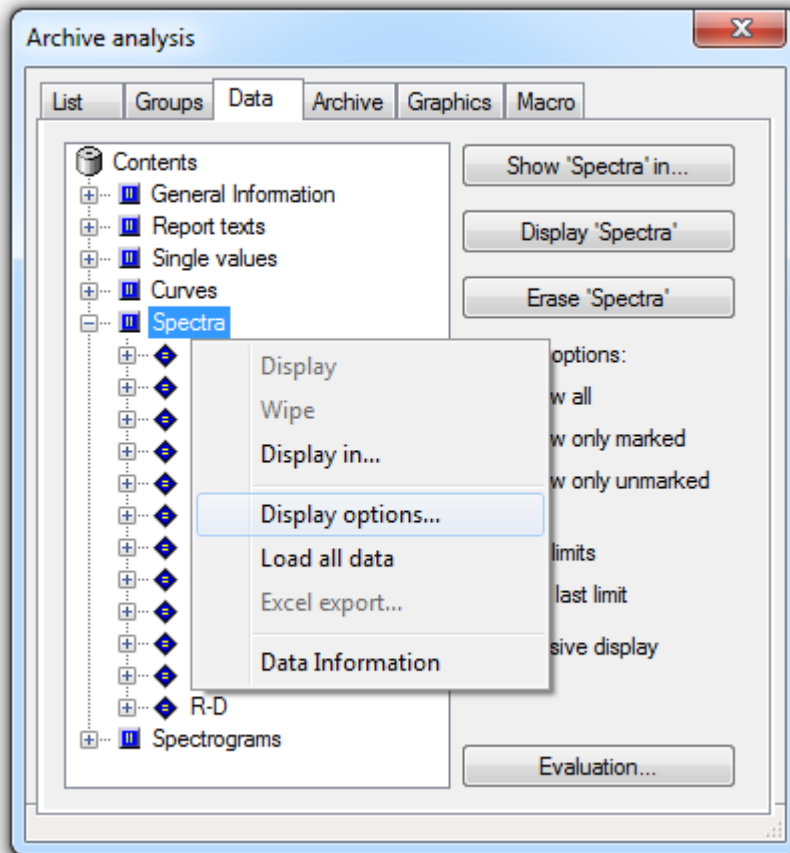


The intermediate shaft turns faster than the input shaft, so it's absolute orders go higher. The output shaft turns slower, so the absolute orders are scaled down.

Display Options in Presentation

Also in Presentation/Marvis, spectra can be displayed either with absolute or with relative order reference.

This setting is global for all displayed spectra (on all pages).

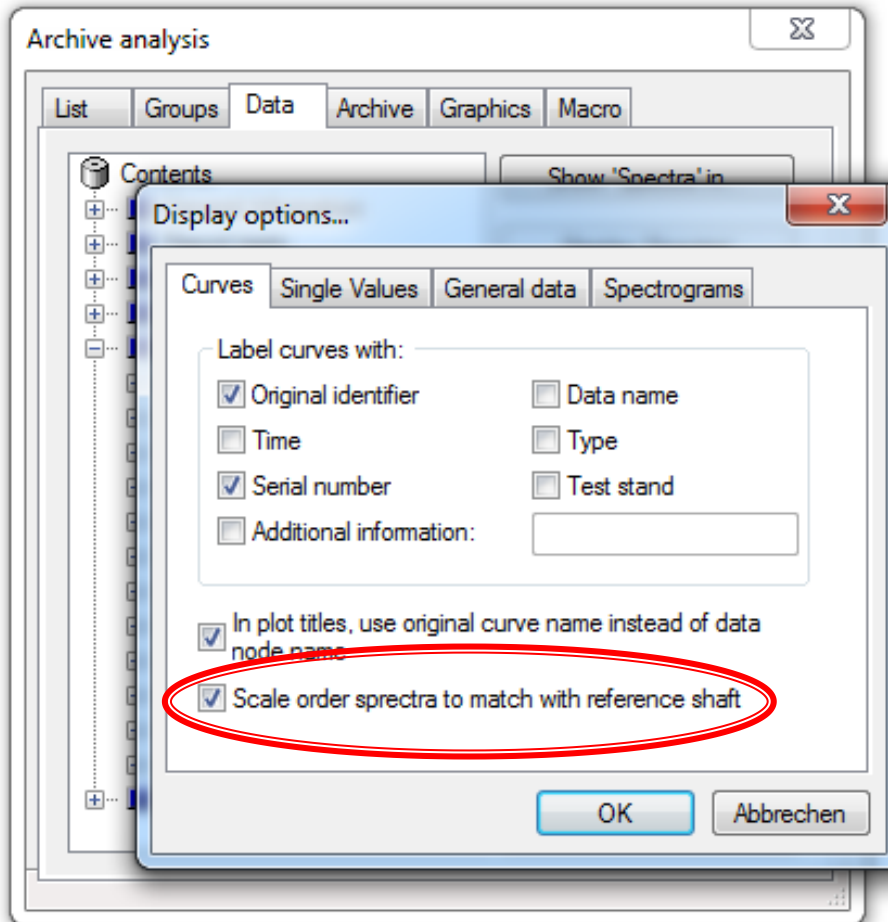


In the 'Experts' control window, switch to section 'Data'. Right-click onto the base node 'Spectra' and, from the context menu, select 'Display Options'.

This will open the Display Options Settings dialog, as shown on the next page.

Switching in Presentation

Turn on the option 'Scale order spectra to reference shaft' in order to switch to absolute order axis:



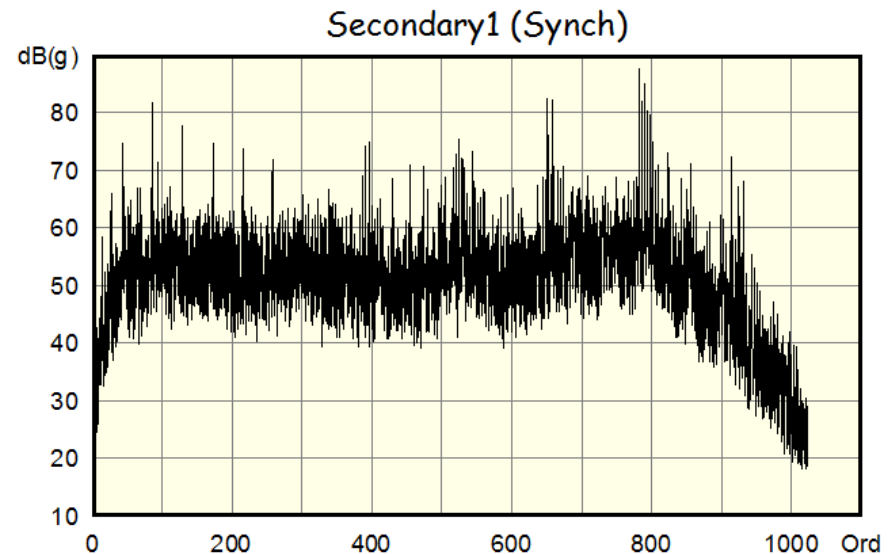
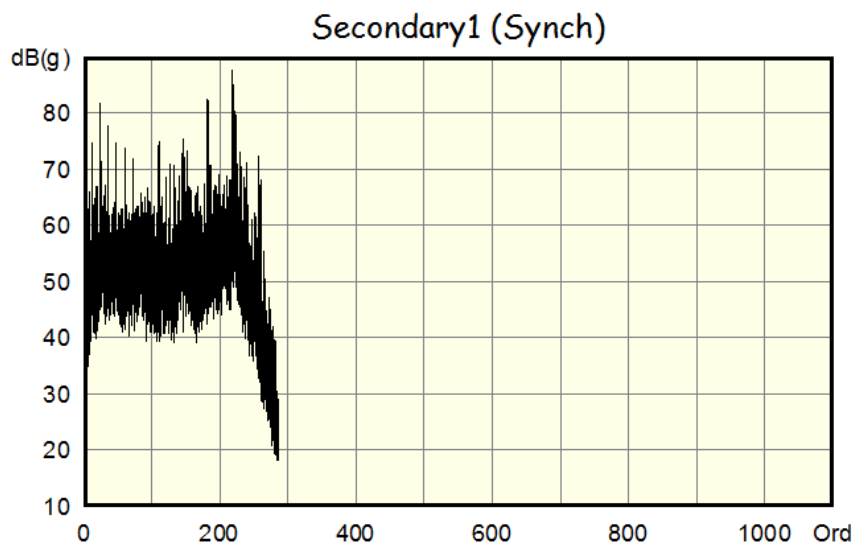
After changing this setting, re-display the spectra to see the effect (see picture on next page).

Some Presentation macros have the option to switch between relative and absolute order axis. These macros are setting or unsetting the option in the dialog.

Absolute and relative axis also influences the excel export of spectra.

Comparison

These graphs show the same data with absolute (left) and relative (right) order axis:



Switching between absolute and relative order axis has obviously no effect for Mix spectra and for sync spectra for rotors with the same speed (typically the input shaft).

Only for sync spectra of rotors with a ratio $\neq 1$ (with respect to the Mix rotor), there will be a difference.