



USER MANUAL

DDS



Content:

Installation	7
System Requirements	7
Processor Requirements	7
What is needed to run the free version of DDS?	7
What is needed to run the full (licensed) version of DDS?	7
License Key	7
Upgrading	8
DDS Installation	9
Language selection.....	9
Main Menu visage.....	9
Data Structure	11
Tree.....	11
Tree Item and Data Cell.....	11
Route and Online Data Collection	12
Database Files Options	12
Machine Label.....	12
Measurement Point.....	13
Where are Data stored on the computer	13
The Demo Tree.....	14
Tree section	16
New Tree (new database)	16
Open Tree.....	16
Close Tree	17
Expand All, Collapse All.....	17
Tree Filter.....	18
Preview	19
Summary.....	20
Notes.....	20
DataList.....	20
Icons	21
Extended.....	21
Selection section.....	22
Save.....	22
Use.....	22
Manage	22
Items section	23
Add Tree Item	23
Properties.....	23
1D, 2D, 3D tabs (Tree Item Properties).....	24
Sensor Properties	26
Sensor properties changes for many items at once	26
Why sensor definition over the point?.....	27
Speed.....	27
User Notes	29
Bearings.....	30
Labels	31
Bands.....	32
Point Groups	33
2D Settings	34
ISO 20816.....	35
Other	35
Selection of tree items	37
Items Moving in the Tree	37
Add the Data Cell.....	38
Limits for Static	40
Limits for FASIT	44

Limits for Spectrum	44
Limits for Orders	46
Data	47
Reference	47
Delete Item.....	48
Reset User Graph Settings	48
Export of data.....	48
Import of data.....	49
Set speed.....	50
Copy Data Cell Properties	51
Set Limits by Statistics	51
Confirm, Remove Confirmation, Undo Confirmation	53
Next Machine, Next Point	53
Date interval.....	54
Edit section.....	55
Copy.....	55
Cut	55
Paste.....	55
Tree Window section.....	56
Tile	56
Reading (Measurement) Properties	57
Vibration Readings.....	57
Other Readings	59
Record and it's Analysis	60
Other types	60
Drawing of graphs.....	61
Screen Areas	61
Plot/Report Area and Pages	61
Preview Page.....	61
Plot Page	62
Template Page.....	63
Report Page.....	64
Notes Page	64
Next functions for Pages.....	64
Summary item.....	64
Copying of the graph to clipboard.....	65
Drag and Drop the Data Cell to Drawing Area	65
Static Data Cell Graph	65
Spectrum Data Cell Graph.....	65
Waterfall.....	68
Amplitude + Trend	69
Amplitude + Trend (Amplitude / Speed)	69
Amplitude Stacked.....	69
Spectrograph	69
MinMax spectra.....	70
Order analysis graph	70
Orbit Data Cell Graph	71
Center line graph	71
FASIT Graph.....	72
Density Graph.....	73
Graph tab	75
Cursor section.....	76
Cursor Type	76
Locate peak	76
Find Harmonics.....	76
Find Sidebands	76
Lock	77

Align	77
Spec. Cursors	77
Setting section.....	79
Graph Type	79
Y-Unit	79
X-Unit	79
Quantity	79
Set Speed	79
Grid	80
Band View	80
Trend Limits	80
Zoom	80
Autoscale	80
Data Selection	80
Families.....	80
Create Multigraph	80
Min/Max graph	86
Set as Reference	86
View Reference.....	87
Autocorrelation.....	87
Graphs section	88
Tile	88
Labels section	89
Add To Cursor.....	89
Change Group	89
Scroll Lines	89
Display User.....	89
Delete All User	89
Induction Motor	89
Sound section	90
Play, Stop, Loop.....	90
Tab section	91
Previous, Next.....	91
Machine Labels.....	92
Speed.....	98
Adding Gears	106
Bearings.....	110
User Bearing Database	110
Bearings Tab in Properties	112
Bearings on gear stages.....	114
Labels Selection in Spectrum	117
Labels in Spectrum	118
Labels Selection in Time Signal.....	124
Labels in Time Signal	125
Data Postprocessing.....	128
Saving of trend.....	128
Spectrum data cell data removal	129
Data selection using static data cell.....	129
Display important data only	131
Data reduction.....	131
Labels in graph.....	133
User Labels.....	133
Edit of user label	133
Generated Labels (Bearings, Vanes, Gear, General)	133
Families.....	136

Using of families.....	137
Family Searching and next buttons	138
Reporting	140
User Reports.....	140
Machine Reports.....	140
Predefined Reports	145
Report section	146
New.....	146
Open	146
Expand.....	146
Save.....	146
Save as Report	147
Save as Template.....	147
Save All as Report	147
Print.....	147
Rename	147
Close.....	147
Delete.....	147
Add section.....	148
Text	148
Time	148
Image	148
Machine Report section	149
Open	149
View	149
Predefined Reports Section.....	150
Basic	150
Alarms	151
Structure	151
Statistics.....	151
Failures	152
Last Monitored Machines.....	153
FASIT Report	153
Printing of report colors.....	153
Route tab.....	154
Basic Operations.....	154
Route section	154
Route List.....	155
Instrument section.....	156
Data download to and from the instrument	158
Route upload to the instrument.....	158
Route download from instrument to DDS	158
Download of off-route data	159
Instruments Window	159
Run	160
Online tab.....	162
Data Collection section	162
Setting section	162
Units section	162
Refresh section	162
Data section	163
Manual section.....	163
Measure&Save	163
Tools tab	164

- Settings section.....165**
 - Sensors 165
 - Bearings..... 165
 - Alarms (Alerts) 167
 - Icons 168
 - Globals..... 168
 - Shortcuts..... 174
- Tools section.....175**
 - Defragmentation 175
 - Synchronization 175
 - Backup and Restore 176
 - Time Interval Export..... 176
 - Reduce Data 176
 - Bit Compression..... 180
 - Move Data..... 180
 - Delete Data by Time 180
- User Permission section.....182**
 - Manage 182
 - Log In 182
 - Log Out 182
- Vibration visualization tab183**
 - Vib. Visual. section..... 183
 - Four steps for best results in vibration visualization: 186
 - Advanced settings..... 187
 - Camera and computer hardware requirements 189
- Help tab.....190**
 - Help..... 190
 - About..... 190
 - License..... 190
 - Update 190
- Appendix A – QR codes generation.....191**
 - How to generate QR code 191

Installation

System Requirements

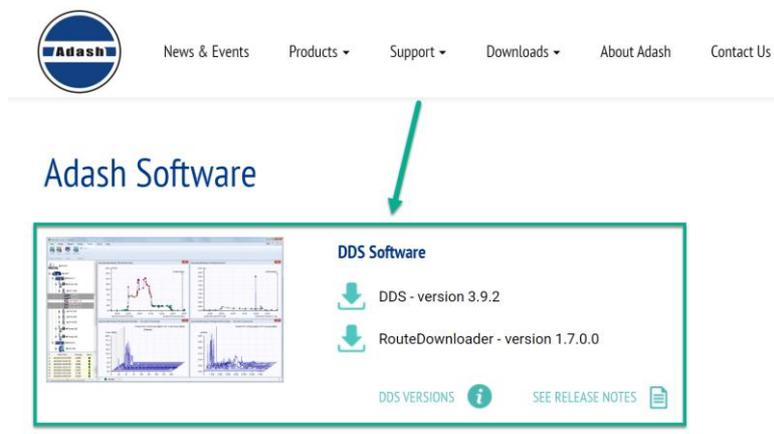
DDS is designed for MS Windows 7 and higher systems.

Processor Requirements

This requirement is not related directly to DDS but to its license key. It is necessary to have device (computer) with x86 processor. Otherwise, the drivers for the license key (Sentinel dongle key) will not be working. **Windows ARM machines with the ARM64-based processors do not support Sentinel dongle keys!**

What is needed to run the free version of DDS?

You need only to download the installation file from <http://adash.com/downloads/adash-software> and run it.



What is needed to run the full (licensed) version of DDS?

You need the following things to run the full version of DDS for the first time:

1. Run the installation file (you received it on the USB drive).
2. Keep the **USB drive** inserted during the first run of DDS as the license file is being imported to DDS.
3. Insert the **USB License Key** (dongle) to the other computer USB port; the license key is there.

Note! During the first run of DDS, the USB drive with installation files and license file needs to be inserted. During other runs of DDS, you don't need the USB drive there anymore.

The hardware USB License Key (dongle) has to be inserted every time you run DDS!

License Key

Please be aware that your license is saved in USB License Key (dongle). Actually, you buy the dongle key – license is related to this key. Software itself is free of charge (free version has limitations). To run DDS with the Vibrio M or the Lubri you do not need the dongle – free DDS version is enough for these devices. There is only a small limitation – it can only handle **one tree** with a maximum size of **200 MB**.



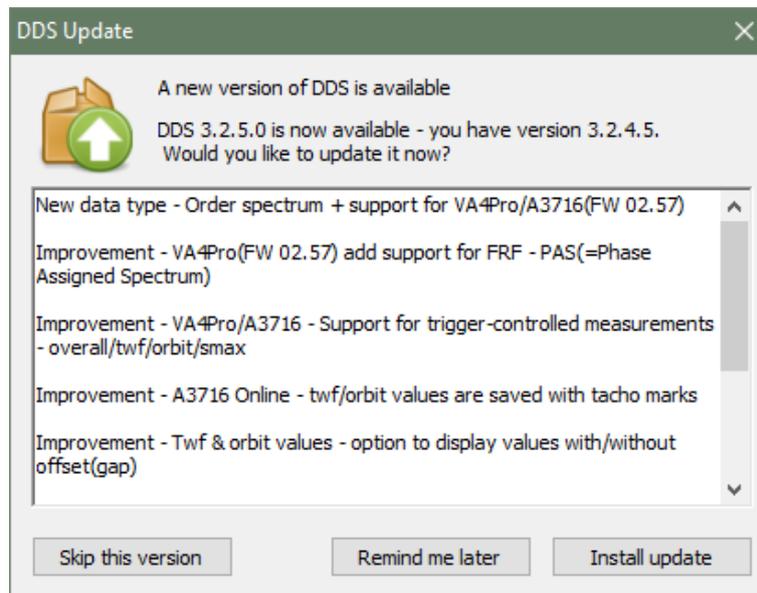
You can install DDS to many computers, but you can only run it when the USB License Key (dongle) is found by the computer – basically dongle has to be connected to the computer. This is the advantage compared to a PC-based license file. You can simply move the license key between the computers.

A network LAN dongle is also available for DDS running on more computers simultaneously. Contact your dealer or us for details.

Note! If you have more Adash software products, you only need one USB License Key (dongle). All additional details about the products properties are saved in the file with the .lic (.aky for older products) extension in the main DDS directory (folder). **If you contact us regarding licenses, please always send the dongle serial number to us.**

Upgrading

When you run the DDS, then it checks the newer version on Adash website. If the newer version is available, you can install it. In such a case you get following window in DDS.



Install update – the new version will be downloaded and installed. The DDS has been closed before updating.

Remind me later – skipping of an update and the new version will be offered again in next run of DDS.

Skip this version – This version will not be installed and DDS will not remind you again about this version.

Manually you can check new version by **Help/Update** button.



If you wish to change the checking for new updates after the application start, set it based on your preferences in the global settings (**Tools/Global Settings/General tab/Application section/Check for updates**).

The latest version you can also find directly on www.adash.com.

DDS Installation

DDS

You can always find the installation file on the Adash website <http://adash.com/downloads/adash-software> . You need appropriate computer system rights to running the installation file (if you have problem to run installation, contact your IT administrator). Then follow the installer instructions.

DDS will be installed to this location **C:\Program Files(x86)\Adash\DDS** or **C:\Program Files\Adash\DDS**. It depends on whether you have 32 or 64bit system. You can also choose another specific location.

Check the option “always use the DDS to open .ndb file”, if you wish to run DDS by double-clicking on the .ndb file name/icon.

IMPORTANT: The license file is usually provided on a flash drive. The DDS tries to import it in the first run. The license can be later changed/imported using the dialog in **Help/Licenses/Import**.

USB License (dongle) Key Driver

The driver (HASP driver) is also on the flash drive. You can also download it from the Adash website <http://adash.com/downloads/third-parties-software>. Choose **USB License Key Driver** for your Windows version).

Note! Drivers for dongle are compatible with x86 processors. Windows ARM machines with the ARM64-based processors do not support Sentinel dongle keys!

Language selection

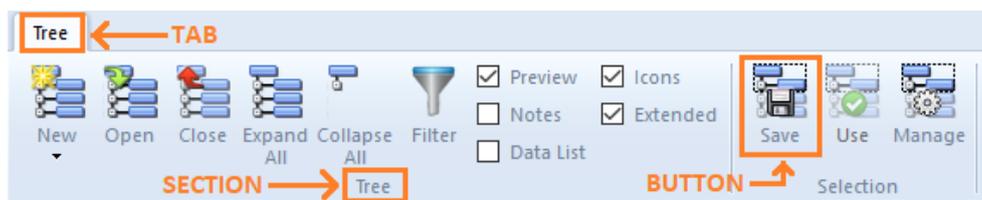
DDS asks which language to use in first run (on PCs, where DDS has not been installed before).

Use the **Tools/Globals/General/Application/Language**. If the proper language file is not found (removed by user), then the default English version is used.

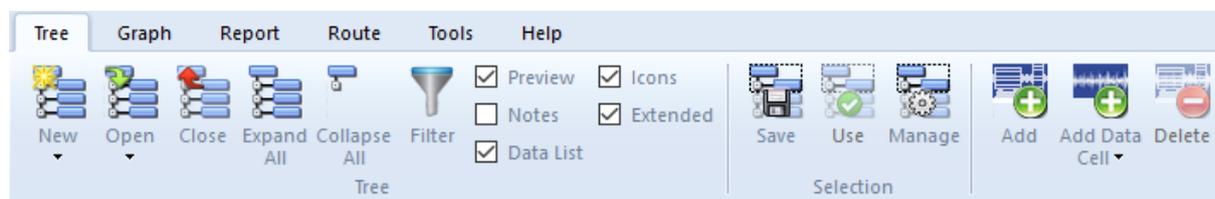
Main Menu visage

The main window appears after run. The main menu is at the top (Tree, Graph, Route, ...). Every menu **TAB** contains a set of functions (SECTIONS) which are displayed in the panel below the menu.

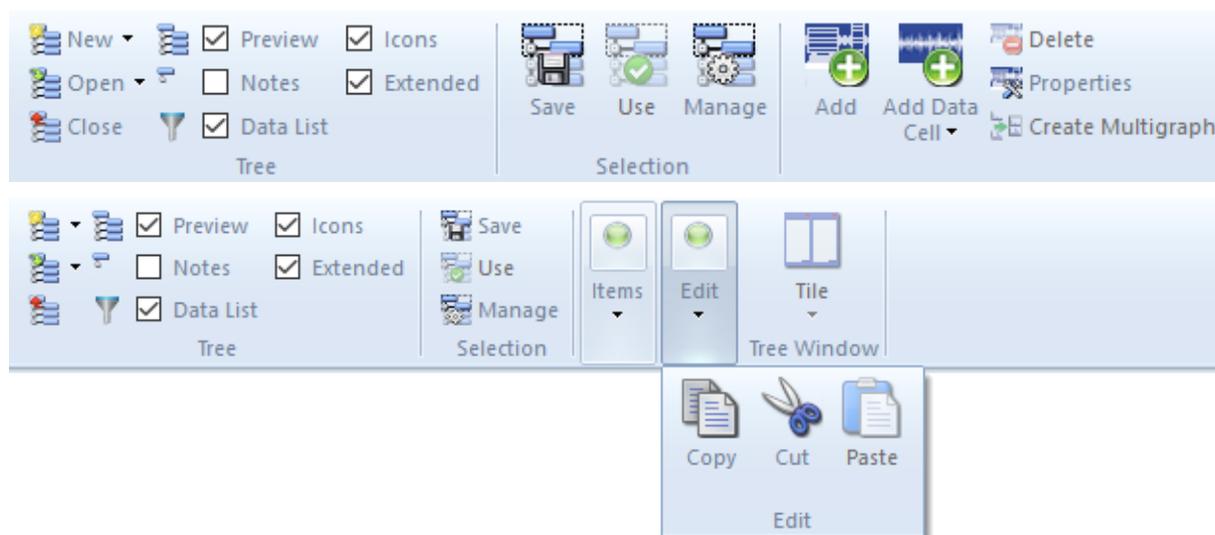
The section contains function **BUTTONS**. We will use the **Tab/Section/Button** sequence in description of functions (e.g., Tree/Selection/Save).



The number of functions is large and you can use various monitor **resolution**. That is why the windows system modifies the icons. If you have large resolution then the big icons with text description appear.



For lesser resolution the small icons with text appear. The next step is small icons without text. The next step is small icons alone. In the last phase is complete section hidden in one button (combo box), see the Edit section in last picture. The procedure to make icons smaller and display text or not can be different for each individual section. It means text is in one section and is not in next section.



Data Structure

Tree

The base data structure is the **TREE**. You can call it database, if you want. The tree is built up by tree items. The tree size is limited for free version (200 MB). The tree structure is hierarchical. The number of levels of the tree is not limited.

Tree structure example:



Tree Item and Data Cell

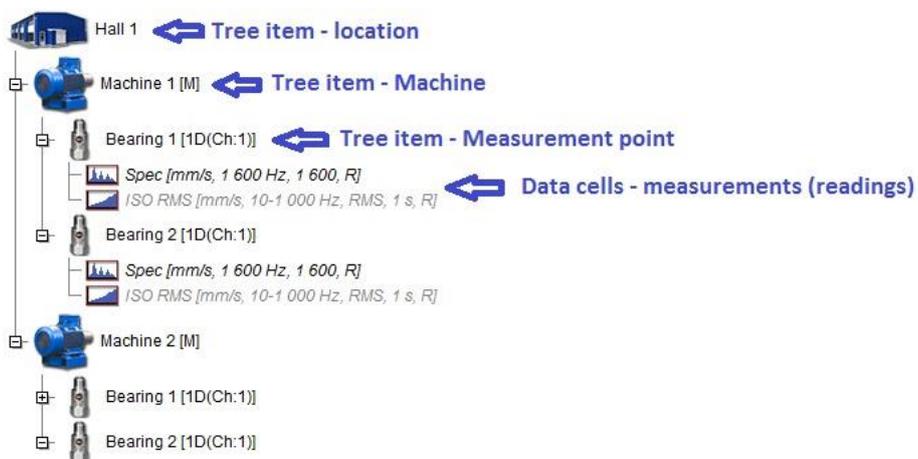
Two different tree items are in the tree.

Tree item

This is used for developing the tree structure (e.g., site, production line, machine, machine parts, points, ...). The tree item doesn't contain readings (measurements).

Data Cell

This item contains readings (overalls, spectra, time waveforms, ...). Typically, the data cells are created under the Measurement Points. However, data cells can be created anywhere, e.g., the speed data cell is usually in the machine.



Static and Dynamic Data Cells

Two kinds of data cells exist:

Static data cell: it contains readings where data contains one value only. For example, an overall, speed or process value. The value may be complex (real+imaginary parts, XY gap values, ...) and may also contain some condition information (usually the speed).

Dynamic data cell: contains readings where data contains array (many) of values; for example, spectrum (many lines), time waveform (samples) or order analysis (orders).

Route and Online Data Collection

The DDS is uniquely designed for collection of readings by portable instruments and online units. Usually, producers have special software for each of them. All data from Adash units are completely compatible.

Database Files Options

There are 3 options of tree (database) files available.

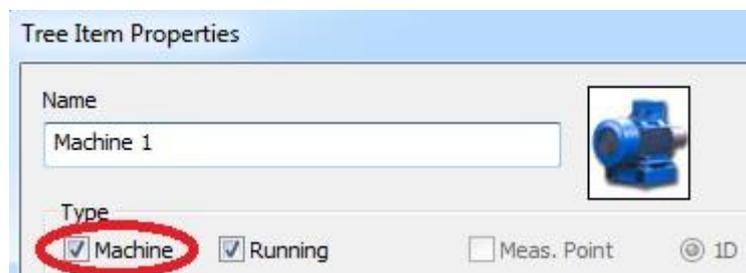
Most of the users use the database which is saved in one file with .ndb extension. It enables simple handling in computer. The database type is **SQLite**. This type works perfectly for **route measurement**. It cannot be used for online measurement.

The DDS can also work with SQL Server databases. It is necessary **for online measurements**. Online measurement is used for continuous data collection with online units. The DDS installation disc contains the **MySQL Connector ODBC 8.0 win32** driver (necessary for correct function of SQL server). See more details in Adash 3716 manual.

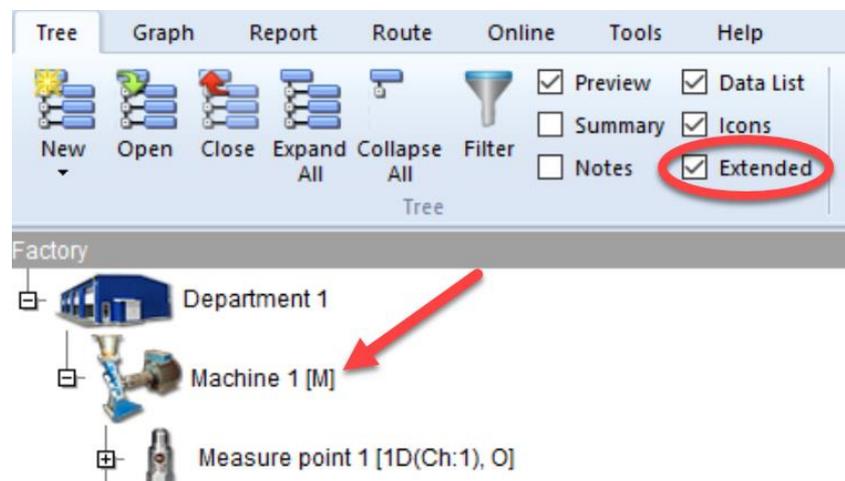
You can use also Microsoft SQL server (licensed). You can use the full license (if you have it) or just **MS SQL Server Express** (free, but with some limitations). DDS offers the MS SQL Server option only if the appropriate driver is installed (SQL Server, Native Client 10.0/11.0) and the **Allow MS SQL Server** is set to yes (**Tools/Globals/General/Other**).

Machine Label

Somewhere in the tree hierarchy you need to define which tree items are machines. It is important for route, which contains list of machines. Use the Machine checkbox for that.

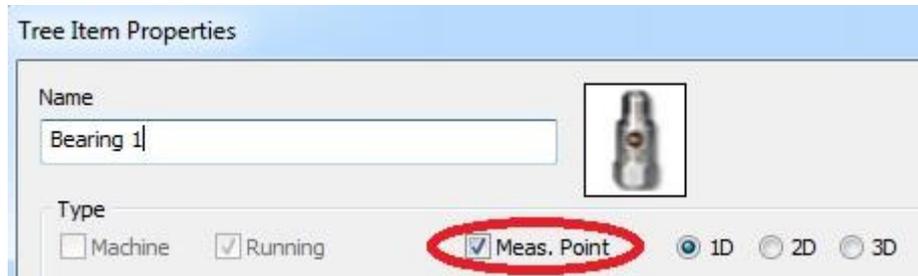


The capital M you will see behind the tree item name. The **Extended** function must be checked.



Measurement Point

Under the machine you should define the measurement points. The point is a location on the machine surface, where the sensor is put. You can define one (1D - usually accelerometer), two (2D - usually two proximity probes) or three (3D - triaxial accelerometer) measurement axes in the point. Use the Meas.Point checkbox for that.



The following properties are available for the point:

- Technical - bearings, gears, speed conversion, ...
- Reading - default sensor, default RPM, ...
- Alerts - bands, overalls, ...

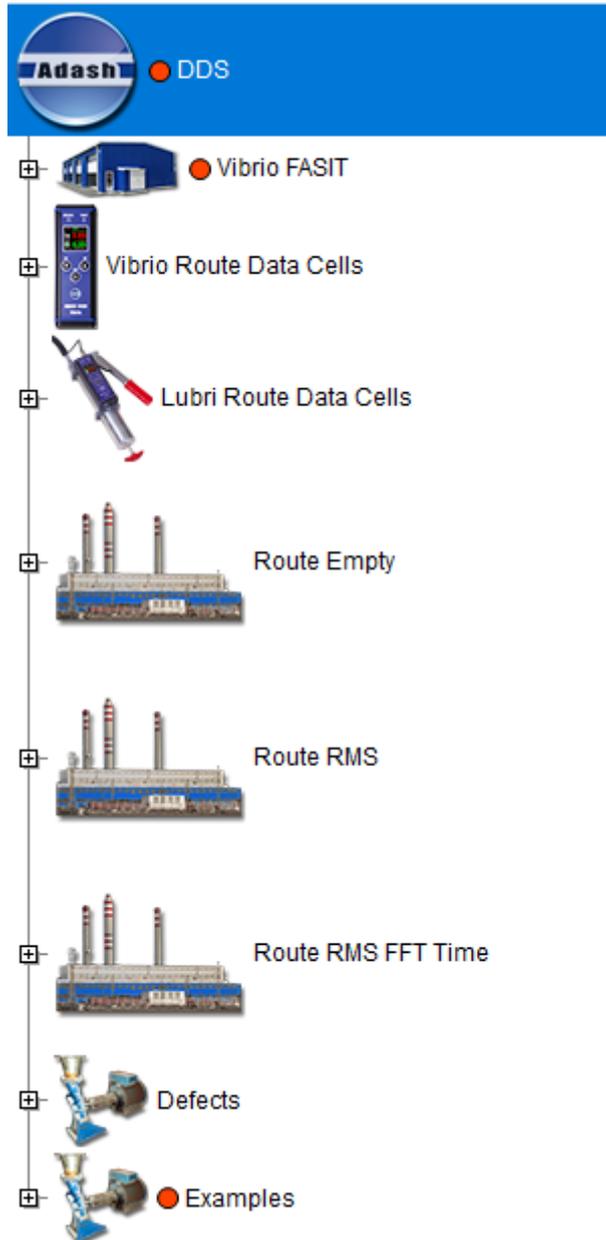
Where are Data stored on the computer

The default location of the SQLite databases for all users is in **C:\ProgramData\DDS\DB**. You can use any other user location.

If you need to find the location of a tree (*.ndb file) then select the **Open Tree** function. The window with the list of trees appears. Right click on any tree and choose Open folder with database.

The Demo Tree

The DDS demo tree appears after installation. It contains examples of the tree items with data.



Vibrio FASIT

Sample structure of the route using the FASIT expert system only.

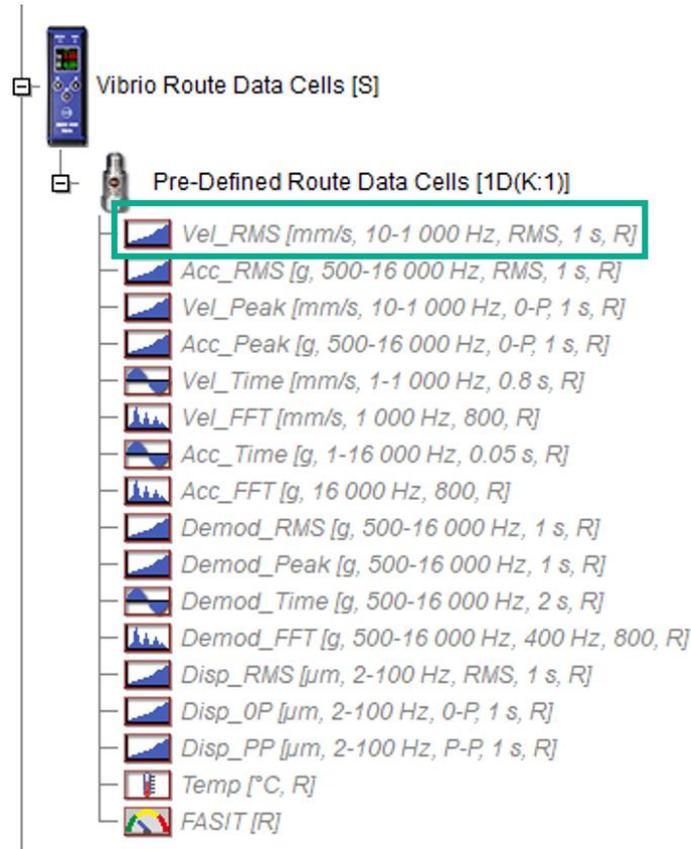
Vibrio Route Data Cells

Definitions of all data cells, which can be used with A4900 Vibrio M unit.

Vibrio M data cells (readings) are predefined and it is not possible to change its parameters such as frequency range, number of lines, etc. **Only these predefined measurements can be measured with Vibrio M.** See below Vibrio M data cells.

Explanation of the first data cell *Vel-RMS* (green frame in the picture below):

Measurement of Velocity, RMS in mm/s in 10 Hz to 1000 Hz frequency range.



Route Empty

Example of route structure without data cells.

Route RMS

Example of route structure with data cells for overall (wideband) readings.

Route RMS FFT Time

Example of route structure with data cells for overall (wideband) readings, spectra and time waveforms.

Defects

Example of readings with unbalance, looseness, misalignment, bearing failure (fault frequencies).

Examples

Example of all possible data types available in full DDS version, with example data.

Tree section

This section is contained in Tree tab. Tree tab menu appears by default:



You can work with the tree by using the mouse or the keyboard.

You can select the Tree Item by left-clicking on it. You open/close the branches of Tree Item by double-clicking on it.

Use the up/down arrows to move up/down along the displayed tree items.

To open/close the branches of the tree item push Enter. The Enter button opens (closes) just one branch below the tree item.

To expand or close all branches below the tree item press the + or - button. The right arrow opens the branch. Left arrow closes the branch.

If you wish to move down along the tree items of the same type (machines, meas. points) press TAB. To move up along those tree items press SHIFT+TAB. If the data cell is selected and you push TAB, you will move to the next data cell of the same type and same physical value (even if it is in next machine). By pushing TAB+SHIFT you will move up in the same way.

You can select the same data cells in all measurement points in the machine. Hold Ctrl + Shift and select required data cell. All data cells with the same type and name will be selected.

By pressing space bar, you can move between Tree and Graph (when data cell is selected).

Note! Only one tree is allowed in free DDS version. That is why the New/Open/Close Tree options are not available.

New Tree (new database)

Select the Tree in the menu and the 'New' icon. In the next window define the name of new tree (the top item) and location. For beginners we recommend the default location (see the chapter Data Structure/ Where are Data stored in the computer).

DDS icon for new database:



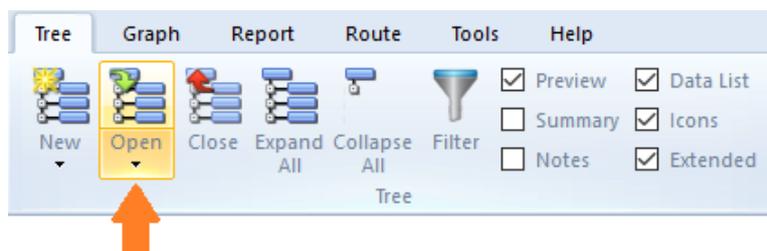
Open Tree

We use the user list of often used trees. The opening of tree is faster, because you only need to select one tree from the list. You don't need to waste your time to find every tree on your hard drive by Explorer. Once you create a new tree, it is automatically included to the list. If you received some external tree from other user e.g. by email, then you need to add the tree file (with .ndb extension) into the list manually.

DDS icon to open the tree:



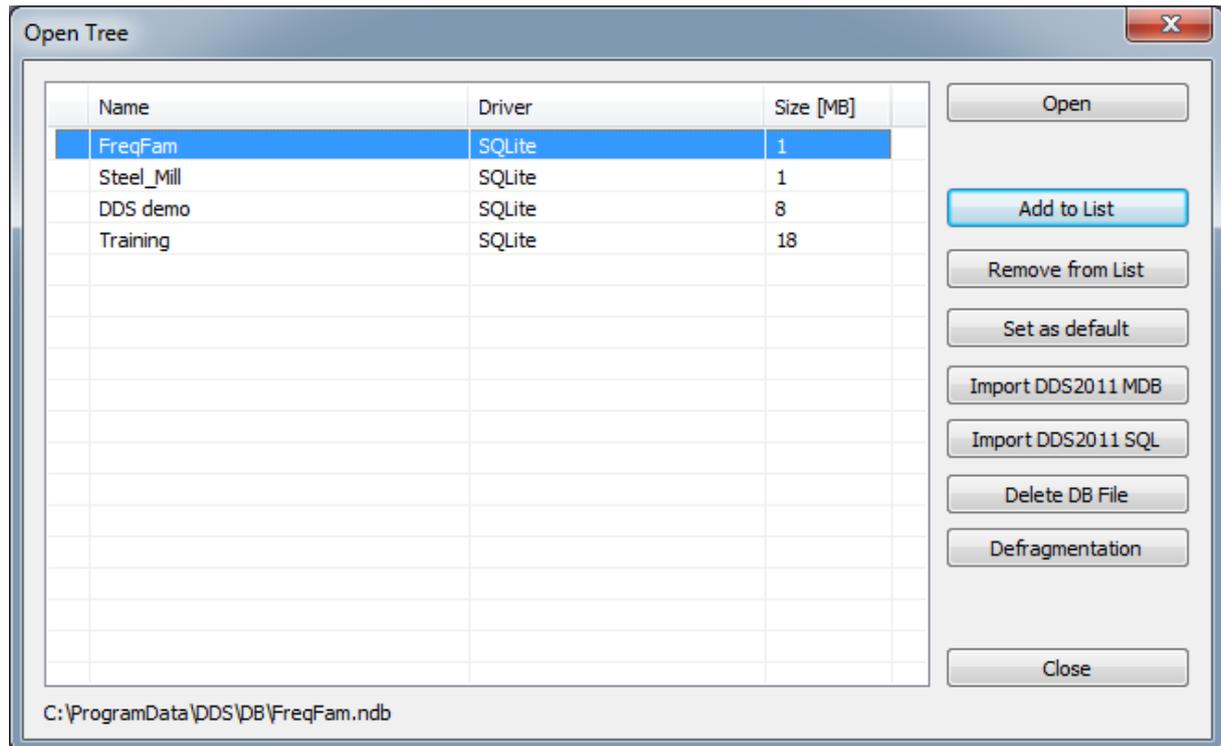
When you click on the arrow aside the Open icon, the user list appears and you can select required tree.



When you click on the Open icon, the next *Open Tree* window appears. It contains the list; you can select required tree and press Open or use double right click directly in the list.

The *Open Tree* window contains following functions:

Add to List	you add next tree to the user list (it adds the next .ndb file)
Remove from List	removes the tree from list (not from the computer)
Set as default	the default tree is opened when you run the software
Import MDB DDS2011 MDB, Import MDB DDS2011 SQL	for user of old DDS software to import old databases
Delete DB File	removes the .ndb file from computer
Defragmentation	defragments the .ndb file



Close Tree

Closes the opened tree and closes the tree window.

DDS icon to close the tree:



Expand All, Collapse All

Opens or closes all branches in the tree. The keyboard shortcut "*" has the same effect.

Note! There is also shortcut "+" that expands only selected tree item.

DDS icons:

Expand all:



Collapse all:



Tree Filter

This function enables to select only part of the tree. Push the Filter button or press Ctrl+F. You can find tree items or data cells, which are matching to entered conditions (text, type...).

DDS icon for filter:



Filtering and selection are *two main available options*. Filtering displays **only tree items which are in compliance with defined conditions**. The selection **displays complete tree** and items in compliance with defined conditions are selected (makes active - blue colored).

You can use also the Filtering first and then use the Selection in filtered tree.
If case sensitive searching is required, use the checkbox.

The screenshot shows the 'Tree Filter' dialog box with the following fields and options:

- Case sensitive (highlighted with a red box)
- Keep Original Selection
- Tree Item** section:
 - Find text: [text input]
 - All, Machine, Point
- Data Cell** section:
 - Find text: [text input]
 - Find type: [dropdown menu]
 - Find equal or higher alert then: [dropdown menu with '< None >']
- Route** section:
 - [dropdown menu with '< None >']
- Date/Time** section:
 - From, To
 - From: [date/time input: 16.03.2025 0:00:00]
 - To: [date/time input: 17.03.2025 23:59:59]
- Saved filters**: [empty list box]
- Buttons at the bottom: Filter, Turn Off Filter, Select, Close, Save, Delete

'Keep Original Selection' checkbox is used when you want the filtering window to remember tree item where you do the filtering. Following filtering/selection will be done under this tree item when filtering window is opened again. This option can be turned off in the filtering window above (unmark the checkbox 'Keep Original Selection') or in the submenu of the filtering (this option is shown only when the function is used).

Tree item searching

Write required text to the 'Find text' box in 'Tree Item' section. You can search in all tree items or only in Machines or only in Points. If you write e.g., 'fan', then all items, which contain the 'fan' in the name will be selected.

If you need to use more than one text strings, then use the '+' (plus) symbol between them. E.g., 'fan+pump' means finding all fans and pumps (it means the name contains 'fan' or 'pump' or both).

You can also use the advanced conditions, which enables to define items and also their parent items. You use the '/' symbol. E.g., if you enter LineA/motor, then will be selected all items which contains 'motor' and at least one of parents contains 'LineA'. This system is similar like folders system in computer.

You can also select the Route and to search of items only in that route.

Data Cell searching

Write required text to the 'Find text' box in Data Cell section. If you write e.g., 'NDE', then all cells, which contain the 'NDE' in the name, will be selected.

If you need to use more than one text strings, then use the '+' (plus) symbol between them. E.g., 'NDE+DE' means finding all NDEs and DEs.

You can also use the advanced conditions, which enables to define items and also their parent items. You use the '/' symbol. E.g., if you enter motor/NDE, then will be selected all items which contains 'NDE' and at least one of parents contains 'motor'. This system is similar like folders system in computer.

Additionally, you can define also required data cell type. Next data cell keywords can be used:

all	all data cells
oa	overall (wideband)
dmd_oall	overall demodulated (enveloped)
time	time waveform
dmd_time	time waveform demodulated (enveloped)
spec	spectrum
dmd_spec	spectrum demodulated (enveloped)
speed	speed
dc	discrete current or voltage or manually entered cell for process values
orbit	2D waveform
order	order analysis
acmt	compressed time signal, see VA4 manual for more details
ap	amplitude + phase
smax	maximum of displacement for shaft vibration
cplxsmax	maximum of displacement for shaft vibration and its phase
cl	center line
ps	phase shift
img	image
rec	record
bal	balancing
fasit	fasit
frf	frequency response function

If you need to use more than one keyword, then use the '+' (plus) symbol between them.

Finally, you can select only data cells which are over then some alert limit. Use the function 'Find equal' or 'Higher alert then'.

The route name can be selected in Route section. Then the filtering or selection will be done only on that route items.

Date/Time

Filtering based on measurement date and time. Only data measured between From and To are shown after filtration.

Filter, Select and Turn OFF filter

Push the 'Filter' or 'Select' to apply the rules for selection. Push the Turn OFF filter for canceling of filter. When no corresponding item is found then the message 'Not found' is displayed. The filter rules are always applied to complete tree.

Save Filter

The complete Window Filtering setting can be easily saved and later used for another part of the tree. In the right part of the Filtering window there is a list of already saved settings. Double-click on the name to apply saved settings. Click the Save button to save the window settings.

Preview

The 'Preview' page is switched on or off. See the Plotting of Graphs chapter for more details about screen areas and pages.

Checkbox 'Preview' can't be checked together with 'Summary' checkbox. The default state of both checkboxes is in the global settings (Tools/Globals/tab General/section Other/Preview/Summary on Startup).

Summary

If the 'Summary' checkbox is on (checked), the function Item Summary is applied immediately after selection of tree item.

Checkbox 'Summary' can't be checked together with 'Preview' checkbox. The default state of both checkboxes is in the global settings (Tools/Globals/tab General/section Other/Preview/Summary on Startup).

Notes

The 'Notes' page is switched on or off.

There are the notes displayed in this tab, which are saved under and above the selected tree item.

E.g., if there is the data cell selected, you will see the notes from the Point and Machine at the same time. If there is Machine selected, you will see the notes from all Points of the Machine.

DataList

The data list is below the tree, when data cell is selected.

The screenshot shows the software interface with a tree view on the left and a 'Data list' table on the right. The tree view shows a hierarchy: Tree > Mach1_test [M] > Point01 [1D(Ch:1), O]. The 'Data list' table is highlighted with a green border and contains the following data:

#	Date/Time	Value [mm...]	Alarm	Instrument
1	28.04.2023 14:47:08.446	1,97	●	A4300 VA3 Pro
2	28.04.2023 14:47:29.022	5,79	●	A4300 VA3 Pro
3	28.04.2023 14:47:40.024	7,46	●	A4300 VA3 Pro
4	28.04.2023 14:47:50.025	0,094	●	A4300 VA3 Pro
5	28.04.2023 15:10:45.032	8,67	●	A4300 VA3 Pro
6	28.04.2023 15:10:55.983	2,61	●	A4300 VA3 Pro

It is list of readings with their properties:

Id number #

Date/Time of reading

Value (only for static reading)

Speed

- measured by tachometer

- inherited from parent tree items, the symbol * is used Reached Alert Instrument, which was used for reading.

Alarm (the color of reached limit)

Instrument used for the measurement

The reading can be changed or deleted. The new static reading can be also added.

Icons

The icons are displayed in the tree.

Extended

If it is ON then the text information is added to tree items. Every letter of alphabet has next meaning:

M	machine is checked
1D, 2D, 3D	points dimension and channel number (if checked)
S	the speed is defined
B	the bearing is defined
R	will be transferred to the route
!	expired data cell, new reading should be taken
Ch	list of channels
T	tacho here
On	online meas. point

The data cell extended info contains unit, range, lines number, etc...

Selection section

Selection section is contained in Tree tab.

Save

Any tree selection (selected item set) can be saved and then recalled. This function can be used for example, when you create protocol repeatedly on the same items or when you view the same group of data cells frequently. It is useful in cases where filtration is not possible.

DDS icon:



Create a selection of the tree that you want to recall later. Push Selection/Save. Enter the name of the selection and confirm.

Save function is also available in the right mouse-click menu on the tree.

Use

When you want to recall the saved selection, click the Selection/Use and select the name of the saved selection.

DDS icon:



Use function is also available in the right mouse-click menu on the tree.

Note! If there is no saved selection in DDS, this button is greyed out and cannot be used (once any selection is created, the button becomes available).

Manage

If you want to see the list of all saved selections, click the Selection/Manage button. You can use buttons for operating with individual items.

DDS icon:



Items section

Item section is contained in Tree tab.

Add Tree Item

Select the tree item and you can create a new item bellow it (the child item). Push Add and the following Tree Item Properties window appears.

DDS icon:



Properties

DDS icon:



Select the tree item and push the Properties button. Or use the right click on tree item and select Properties in the menu.

Property	.1D
Name	< None >
Sensitivity [mV/g]	
Offset [mV]	
Unit	
ICP	
Angle [°]	
Direction	
Input	
Settling prolongation [s]	

Description of particular fields is below:

Name

The name of item.

Icon

Every tree item can have own icon (image). In the Tree Item Properties window, it is displayed next to the name. Click on that and the Icon Setting window appears. You can select one icon from the list or push the 'No Icon' button. Use the Tools/Icons for management of this list of icons.

Machine

Check it, if the item is the machine. That is important for route, because the route is the list of machines.

Running

If this checkbox is off, then the machine is not running and it will not be loaded to route. It is useful, when the machine is not running for a long time. **It enables to not load it to route.**

Meas. Point

Check it, if the item is the point. The Point is the basic term for reading. It is the place, where the sensor is mounted. The machine is the list of points in the route. Several different point types are available. The 1D, 2D, 3D property is our new approach to the point.

1D It means one sensor used in one direction/orientation/axe. Typically, it is the accelerometer.

2D It means use of two sensors in one point. Typical use of 2D is the shaft displacement reading, when two proximity (eddy current) sensors are used. To be precise, it is not point - it is the plane. The directions are marked as A and B.

3D This point is designed for tri-axial sensor. The directions are marked as X, Y and Z.

1D – 2D – 3D check boxes

If the item is the point, select the type of it.

1D, 2D, 3D tabs (Tree Item Properties)

When you have defined the dimension of point, then one of these tree tabs leaves in window.

An example of 1D point, accelerometer is used as sensor.

Tree Item Properties
✕

Name

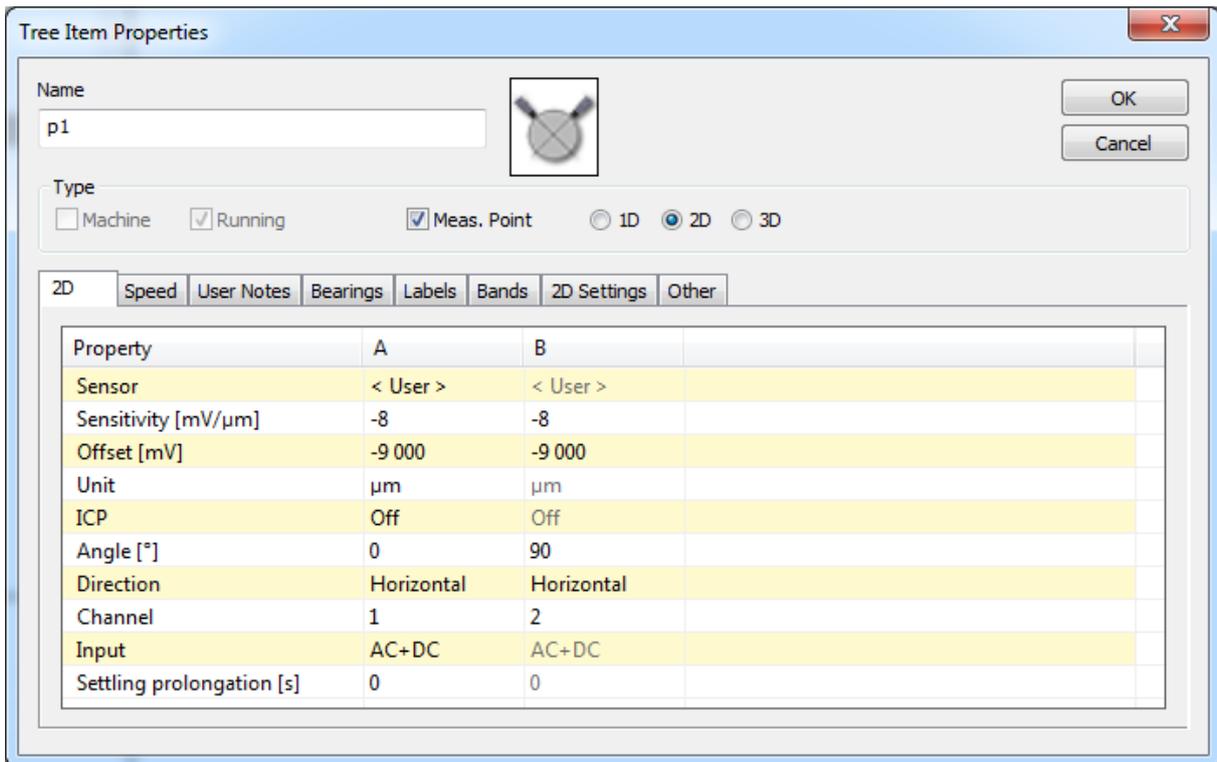


Type
 Machine
 Running
 Meas. Point
 1D
 2D
 3D

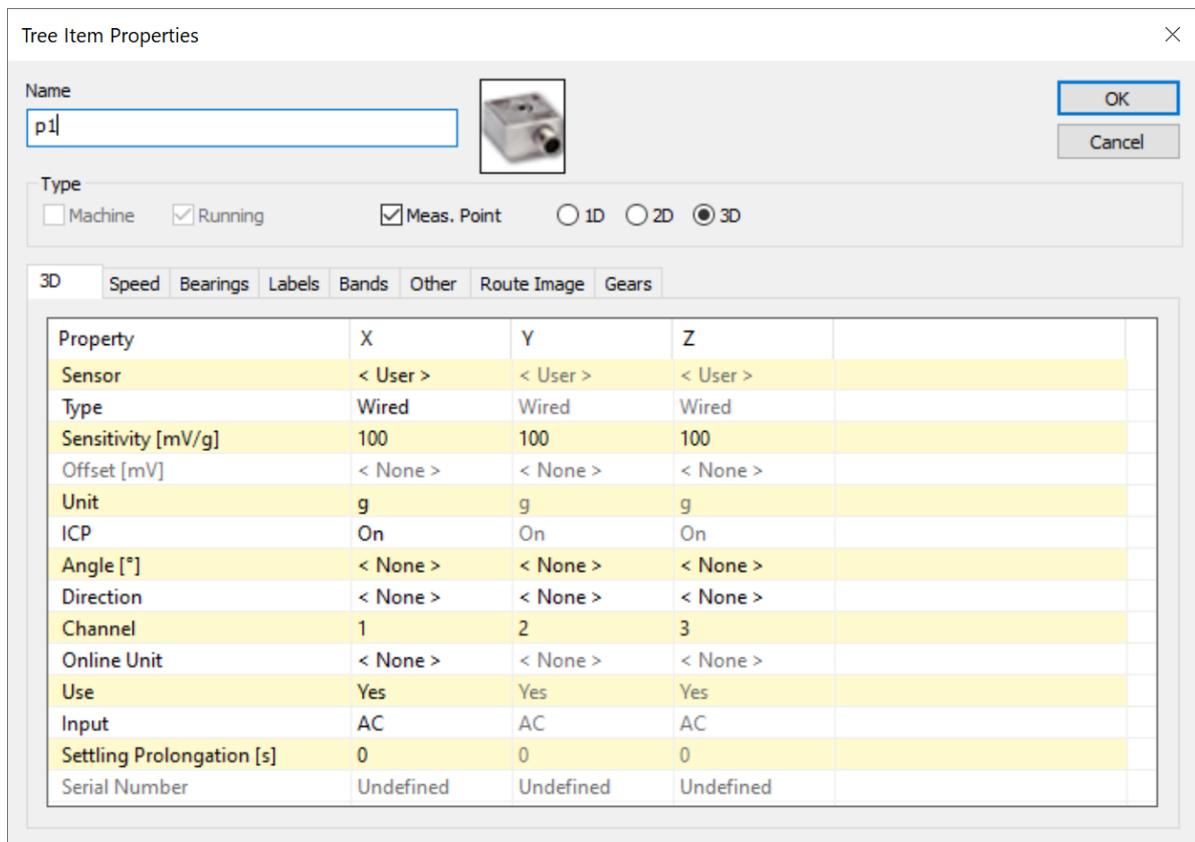
1D
2D
3D
Speed
Bearings
Labels
Bands
Point Groups
ISO 20816
Other
Route Image

Property	1D	
Sensor	< User >	
Type	Wired	
Sensitivity [mV/g]	100	
Offset [mV]	< None >	
Unit	g	
ICP	On	
Angle [°]	< None >	
Direction	< None >	
Input	AC	
Settling Prolongation [s]	0	
Serial Number	Undefined	
Axis	Z	

An example of **2D** point, two eddy current proximity sensors.



An example of **3D** point, triaxial accelerometer.



Sensor Properties

Sensor

- < User >** all parameters have to be entered manually by you
- < None >** if option 'None' is chosen, sensor parameters will be defined in some tree item above and inherited.
- < Inherited >** all parameters are inherited from the tree item **above** this item. You can see also the name of that item.
- < some name >** the sensor from the predefined sensors list is used (see *the chapter Tools/Sensors*). If you change any parameter manually, then the Sensor changes to < User >. Such change has no effect in sensors list.

Type

Wired/Wireless Type of used sensor.

Sensitivity

Sensitivity of sensor.

Offset

Some sensors (typically eddy current proximity sensors) need to add or subtract the offset voltage value to obtain the correct result.

Unit

Physical unit.

ICP

on/off powering of sensor.

Angle

Angle in degrees of sensor (typically eddy current proximity sensors).

Direction

Horizontal/ vertical just information, no effect in evaluation.

Channel

Channel number, which will be used for measurement.

Input

AC, DC, AC+DC gap voltage frequency type of measurement.

Settling prolongation

Time in seconds, which will be added to standard measurement initialization time.

Sensor properties changes for many items at once

You can select more tree items and modify sensor properties at once for all of them. If the value **<Various>** is displayed, it means that this property has various values for selected items. This property is ignored, when you save the new entered values of other properties.

.1D		Speed	Bearings	Labels	Other
Property	1D				
Name	< User >				
Sensitivity [mV/g]	< Various >				
Offset [mV]	< None >				
Unit	g				
ICP	On				
Angle [°]	< None >				
Direction	< None >				
Channel	< Various >				
Input	AC+DC				
Settling prolongation [s]	0				

Why sensor definition over the point?

Now you probably want to ask why it is possible to define the sensor in every tree item. You expected it in Point only, didn't you?

The DDS enables the inheriting of many properties. E.g., when you define the sensor type in the root (top) tree item, then this sensor will be used for all points. There is no need to define it individually in every point item. But if the individual sensor is defined directly in the Point, then it is preferred and no inheriting is used.

Generally, you can define all three options (1D, 2D and 3D) in root item ONLY on the top of tree. Then these parameters will be used for all points in the tree (depending of type 1D or 2D or 3D). To be precise it will be used for all points which do not contain individual definition of sensor parameters.

It enables to define sensors, default speed, bearings, bands, etc. in proper items and then inherit them down in the tree.

Speed

1D		2D	3D	Speed	Bearings	Labels	Bands	Point Groups	ISO 20816	Other	Route Image
Tacho <input type="radio"/> On Input <input type="radio"/> On Output <input checked="" type="radio"/> Not Used											
Property	Value		Value								
Default Output Speed [RPM]	< None >										
Gear Ratio	1										
Min. Speed [RPM]	30										
Speed For Meas [RPM-RPM]	< None >		< None >								
Point Location	Output										

Tacho

When tacho is used on the selected item you need to mark where it is located. You have options Tacho On Input, On Output and Not Used. The speed on other tree items (over and bellow) is defined by **Gear ratio** factor.

Default Output Speed

This value is set only for **route measurements** where speed value is not measured! It means that it is set only for data which were imported into DDS tree **without** speed value (speed value is zero/none). If the speed was measured with tacho or manually entered in a route, then the measured or manually entered speed value is not changed by this parameter.

Example: Imagine that you loaded the route into the VA5 device. You went to measure the data and you did it. There was no tacho probe to measure the speed and also you did not enter the speed value manually. You store the measured data into DDS but without the speed. Now you can manually enter speed value into data cell properties – Speed tab – Default output speed. But this value is not set to the data you have measured earlier. **These was imported to DDS without the speed value.** The set value (Default Output Speed) will be used for the data measured next time you go for the route.

The speed value set in properties (Default Output Speed) is saved to the measurement in the moment of data import from VA5 to DDS. It does not affect already imported data.

Note! If you need to **set** the speed value for data already imported in DDS without the speed, you need to use the Set Speed icon (more information in **Set speed**).

The **Default Output Speed** is always the speed on the **OUTPUT** of selected tree item.

You can select one of these options:

- <None>** speed is inherited from parent tree items (if exists)
- <Value>** write the speed value directly (e.g., 3000).

Two additional options are available for machines:

- <Detected>** the instrument runs the speed detection procedure before first reading
- <Manually Entered>** the instrument requires the manually entered speed before first reading. Window to enter the speed value appears in the device (VA5). Measurement is started once the speed value is entered.

Note! Detected and Manually Entered speed has a priority for routes over Default Output Speed set in a tree item below machine!

Property	Value	Value
Default Output Speed [RPM]	3 000	
Gear Ratio	< None >	
Min. Speed [RPM]	< Detected >	
Speed For Meas [RPM-RPM]	< Manually Entered >	< None >

Gear Ratio

It enables to define the ratio between the input and output speed of tree item. For example, when the input speed is 1500 RPM and output speed is 525 RPM, then the ratio is 0.35.

If more gear ratios are over the point, then ratio are used step by step for speed calculation on each tree item.

E.g., Let suppose gearbox with 3 gears. The tacho is mounted on the 2nd gear output shaft. Then the Gear factor enables to get correct speed also on input and output shaft of gearbox.

E.g., the default speed is defined in the motor item and the reading is taken on gearbox output. The gear ratio enables to get correct speed value on all lower tree items.

Note: Up to the version 3.1.6 was used the **Tacho factor** for multiplying of measured speed by tacho and the **Gear factor** for multiplying of **Default Output Speed**. Now is the **Gear factor** used for both options. Additionally, you have to define the position of tacho sensor. Older databases are automatically converted, when you open them by new version.

Min. speed

The lowest speed value, which is expected. The reading is not taken for lower values. The 1/100 Hz is the minimum value.

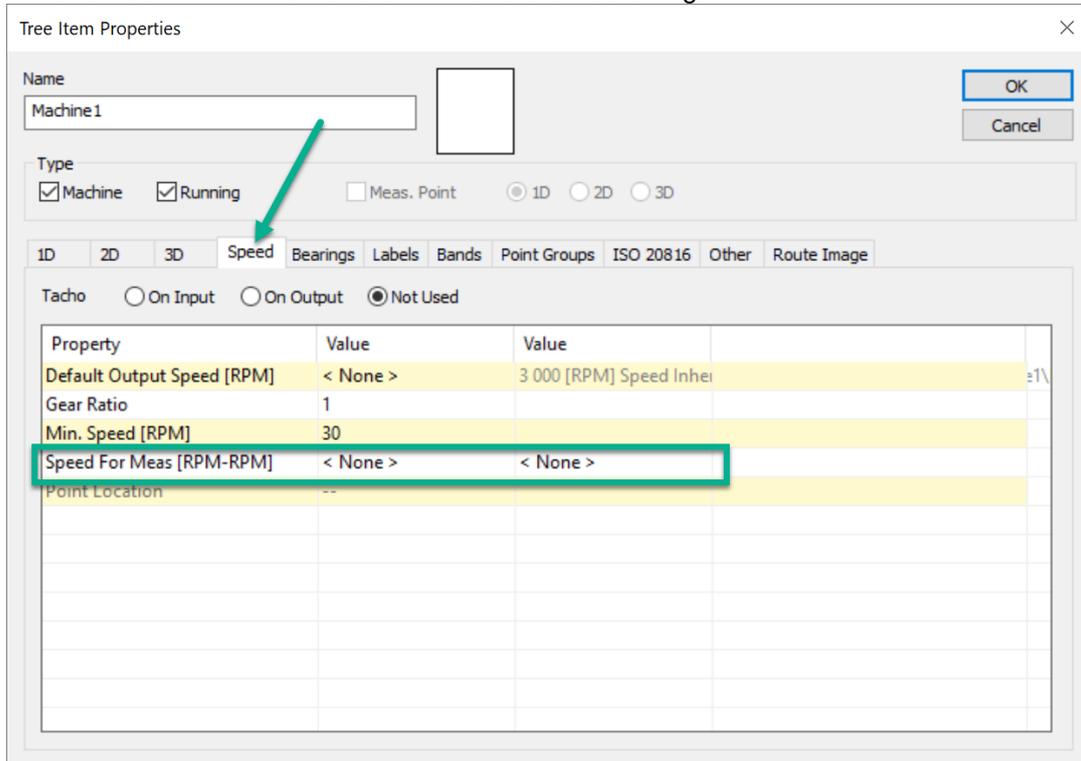
It has direct relation to the tacho pulse waiting timeout. We expect one pulse per one rotation. Two pulse is required for speed calculation. If the Min.Speed = 0.5Hz, then the max waiting time could be 2 sec. If two pulses did not come in that 2 sec, then **NoSpeed** warning appears. Be careful of the 1/100 Hz as the minimum value. When you will use this minimum and the tacho cable would be broken, then waiting time will be 100 sec.

Speed For Meas

This is parameter only for online databases. It is not visible for portable devices. You can define the speed interval, in which you want to analyze the vibration. It is excellent solution for machines, which changes speed. It is good to set the speed interval, where the vibrations reach the highest value. Such high values are much better for analysis than "noise" values.

Note! It is working correctly only when tacho probe is connected!

Firstly, **stop** the data collection to set this parameter. Click on machine in the tree structure with right mouse button. Click on **Properties**. Go to tab '**Speed**'. You can set here the minimum and maximum speed interval. Confirm with OK and **start** the data collection again.



The screenshot shows the 'Tree Item Properties' dialog box for 'Machine1'. The 'Speed' tab is selected, and the 'Speed For Meas [RPM-RPM]' property is highlighted with a red box. The 'Tacho' section is set to 'Not Used'. The 'Speed For Meas' row in the table below has the value '< None >' in both columns.

Property	Value	Value
Default Output Speed [RPM]	< None >	3 000 [RPM] Speed Inher
Gear Ratio	1	
Min. Speed [RPM]	30	
Speed For Meas [RPM-RPM]	< None >	< None >
Point Location	--	

If speed is out of this interval, then '**Machine speed out of bounds**' information is shown in the graphs.

Point Location

Select the position of the measurement point. If the point is in the input/output/general. There is also option "Stage" if the gearbox is defined.

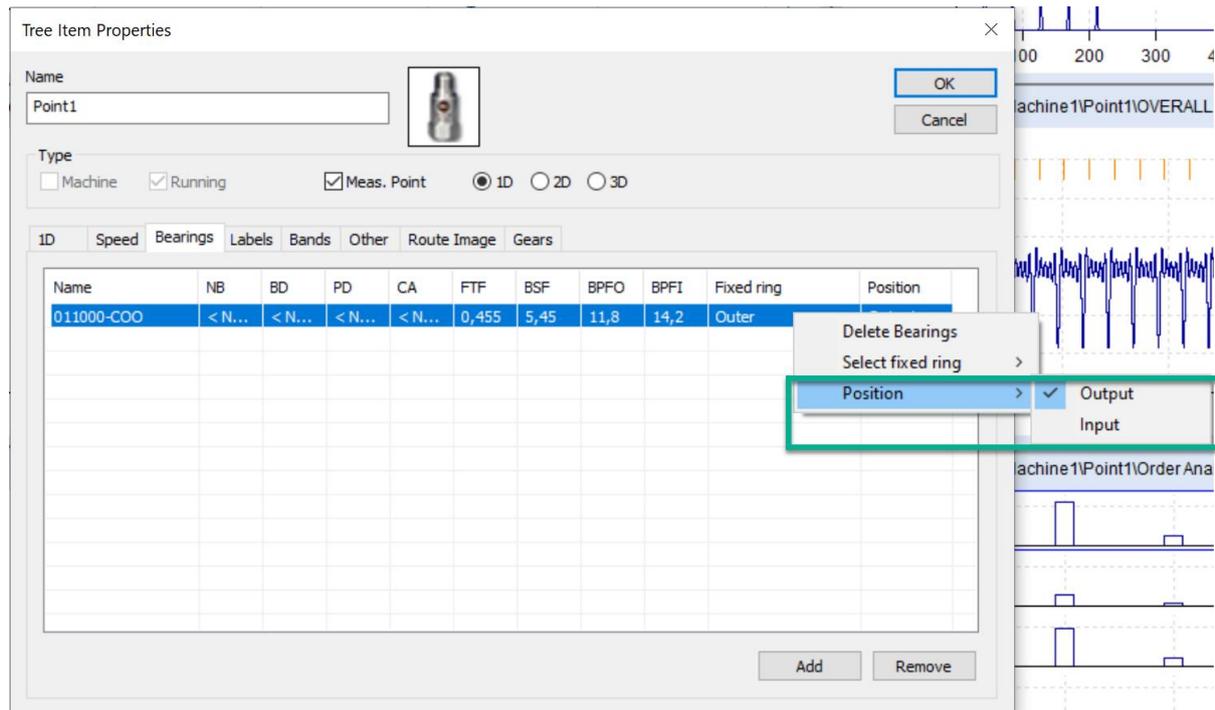
User Notes

You can create text notes in this Tab, which are linked to the tree item. You can use them for description of the actual condition or to make a note of a task which needs to be done (e.g. "faulty bearing", "grease the bearing").

If the **Failure** and **Severity** are entered, then these notes will be printed in **Failures Report**.

If the **Confirm** is checked, then the note is settled and is not included in reports.

Click on the bearing with right mouse button and you get more options.



Delete Bearings – deletes the selected bearings from the list.

Select fixed ring – Inner/Outer – selects the fixed ring of the bearing.

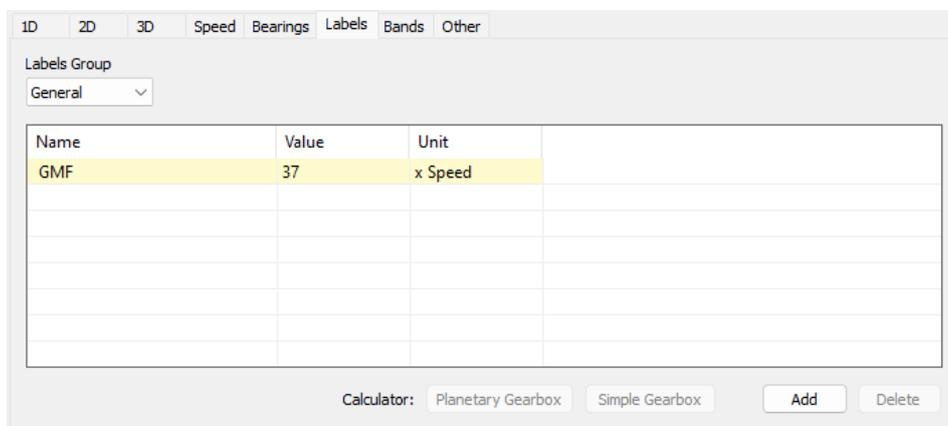
Position – Output/Input – chooses the bearing position. It is an option only for the tree items where gear ratio is defined.

Labels

You can define labels for special frequencies. They will be drawn to every spectrum graph in this tree item.

The labels are divided into three groups - General, Gear and Vanes. The general group should contain all labels except gears and vanes frequencies. But you can e.g. save all your labels only to general group. The dividing to 3 groups has one meaning. When you push the Graph/ Labels/ Change Group then all the defined groups are displayed circularly. The user labels are displayed always together with them.

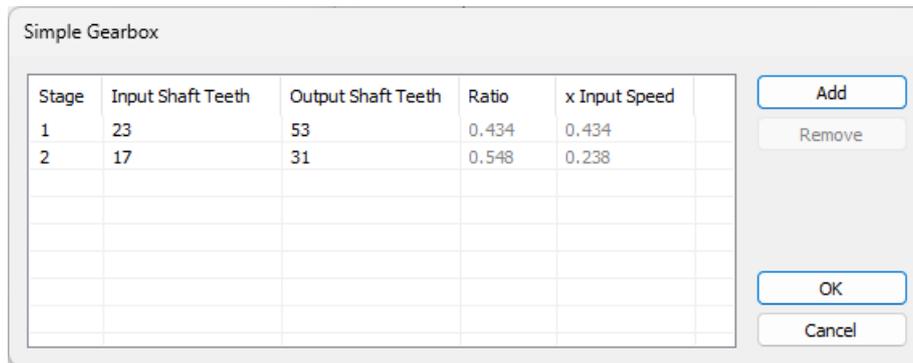
See the Labels in Graph chapter for more details.



Gearbox Calculator

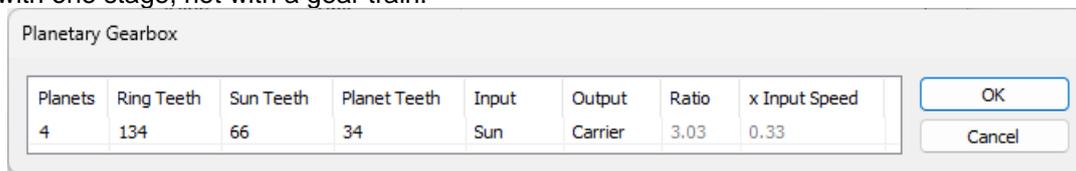
System provides a simple way how to calculate gearbox forcing frequencies. The input speed of gearbox is used for all formulas.

Push **Simple Gearbox** button. Push **Add** to define new stage. You can edit **Input shaft teeth** and **Output shaft teeth** for each stage of gearbox (use double click on value, which you want to edit).



Planetary Gearbox Calculator

The same can be done for planetary (epicyclic) gearbox. Here, you may define the number of Planets and the number of teeth for each element of the gearbox. Most importantly, it is necessary to decide which element of the gearbox is the **Input** and which is the **Output**. Planetary Gearbox calculator works only with one stage, not with a gear train.



Planetary gearbox has multiple important forcing frequencies:

SPD – Output speed frequency

R/P – Ring tooth contacts any planet

S/P – Sun tooth contacts any planet

P/R – Planet tooth contacts the ring

P/R+S – Planet tooth contacts the ring or the sun

GMF R/P – Gearmesh frequency between the ring and a planet. It is equal to gearmesh frequency between the sun and a planet.

GMF R/nP – Gearmesh frequency between the ring and all planets. It is equal to gearmesh frequency between the sun and all planets.

GMF R/P* – Gearmesh frequency between the ring and a planet (unequal load)

Name	Value	Unit
SPD	1	x Speed
R/P	4	x Speed
S/P	8.12	x Speed
P/R	3.94	x Speed
P/R+S	7.88	x Speed
GMF R/P	134	x Speed
GMF R/nP	536	x Speed
GMF R/P*	132	x Speed

Bands

Bands are the function for spectrum evaluation. Usually are used for spectral alarm bands use. Bands should be defined originally in data cells, but the inheriting function enables to define them in other tree items. That is why it is available to use in any item. See the **Add the Data Cell** chapter for more details.

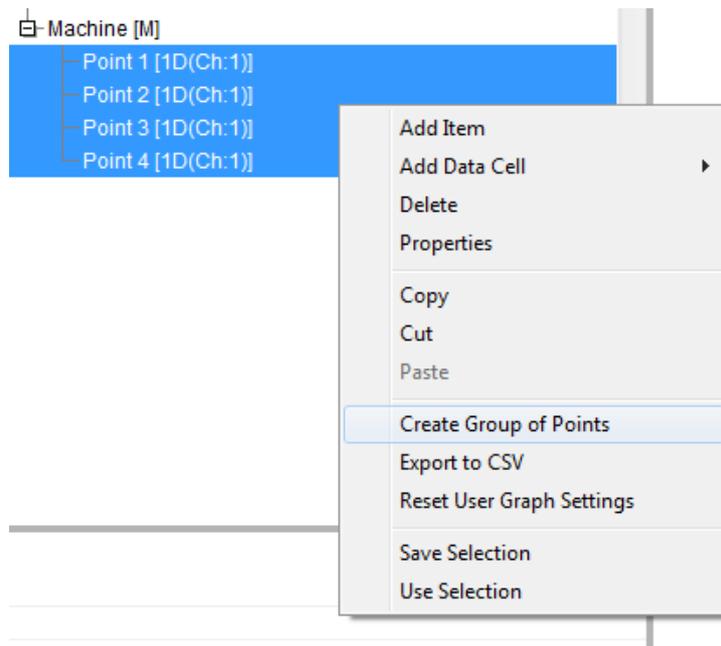
Used	Name	Min	Max	Detect Type	Unit	Inherited From
<input checked="" type="checkbox"/>	Speed 2x	48	52	RMS	Hz	
<input checked="" type="checkbox"/>	Speed 1x	24	26	RMS	Hz	

Point Groups

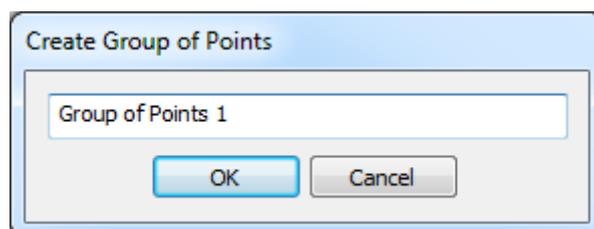
Point group is a set of points on one machine that are in route measured together (simultaneously). Such reading uses more channels.

The procedure of group of points creation begins in the tree. Select all points which you want to measure together (multi-selection). All selected points must be in one machine they have not to be in existed point group.

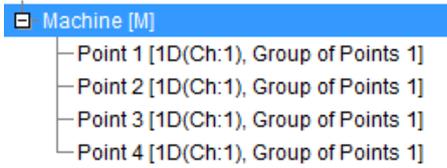
Apply the right click and select **Create Group of Points**.



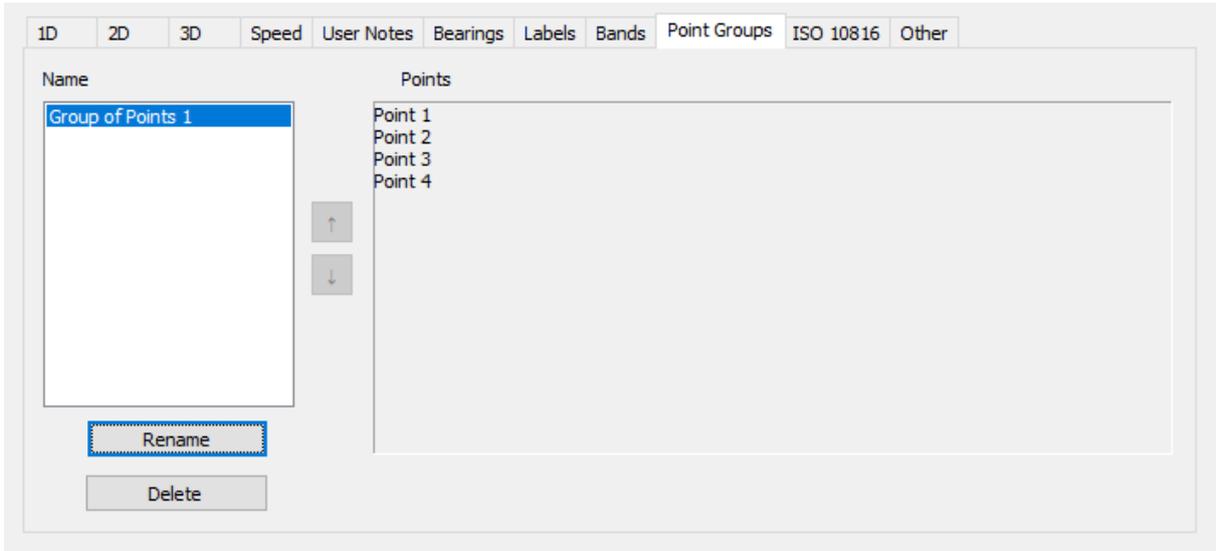
Enter the name of point group in next window.



You can see the group name in the tree.

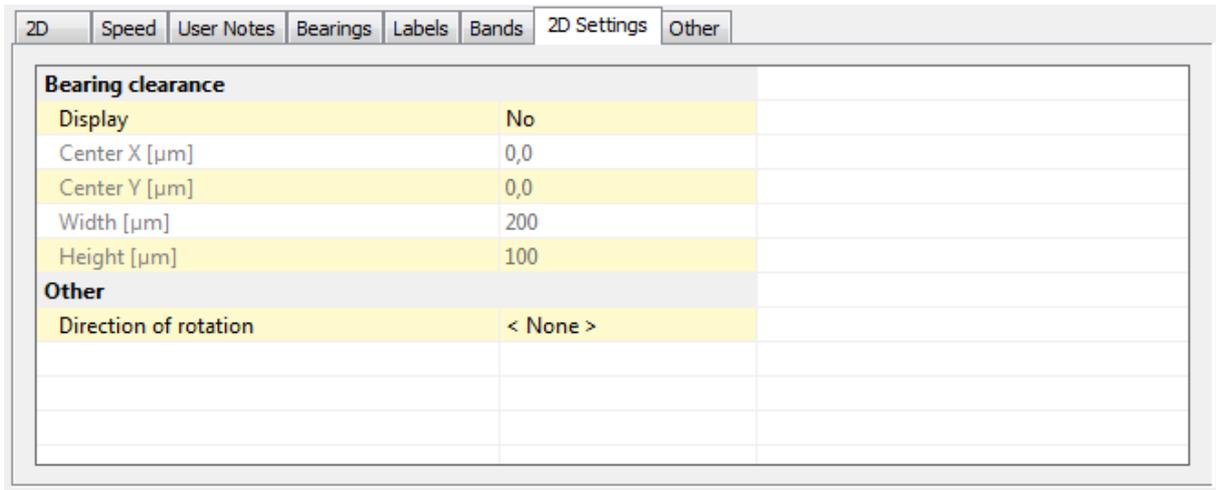


When open the **Properties** window of the Machine (which contains selected points) and select the Point Groups tab. You can see the list of groups (only one group exist yet). If you select the group, then you can see points of that. Here you can also delete or rename Point Group or change their order in a route.

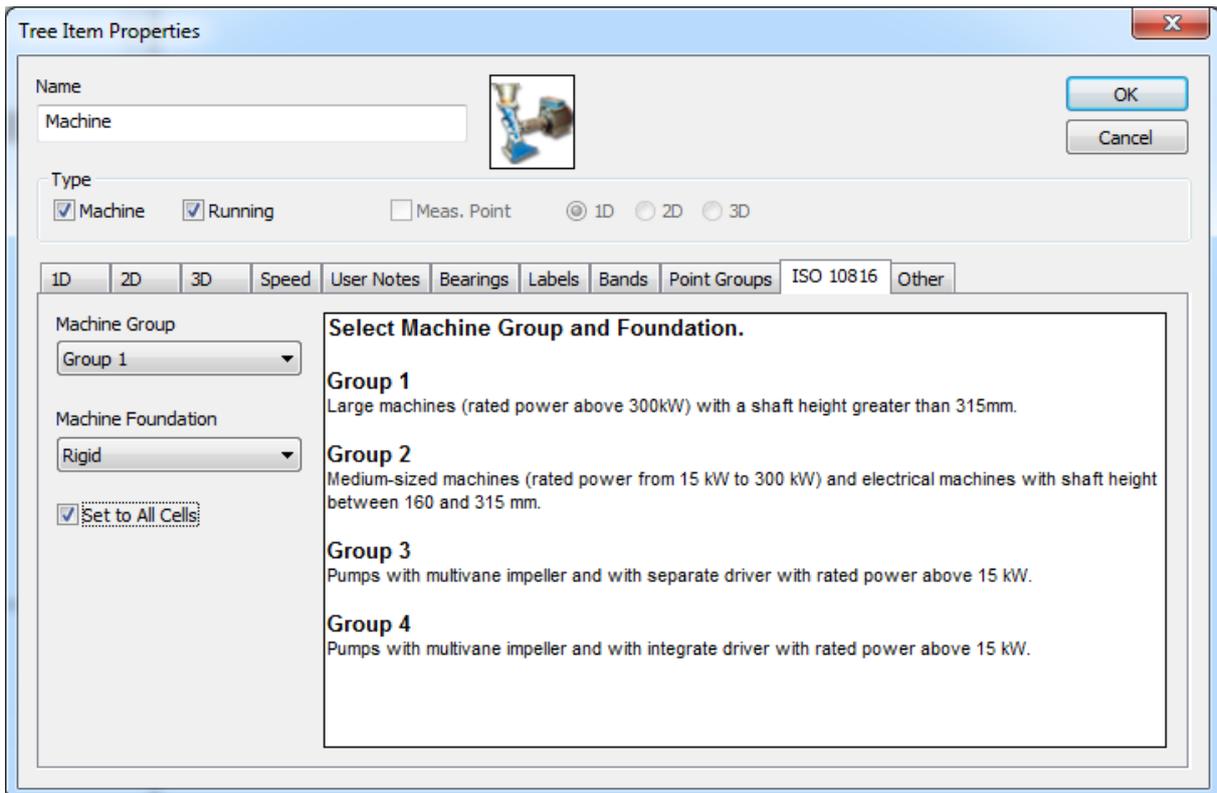


2D Settings

When the point is 2D dimension, then the journal **Bearing clearance** and **Direction of rotation** can be set.



ISO 20816



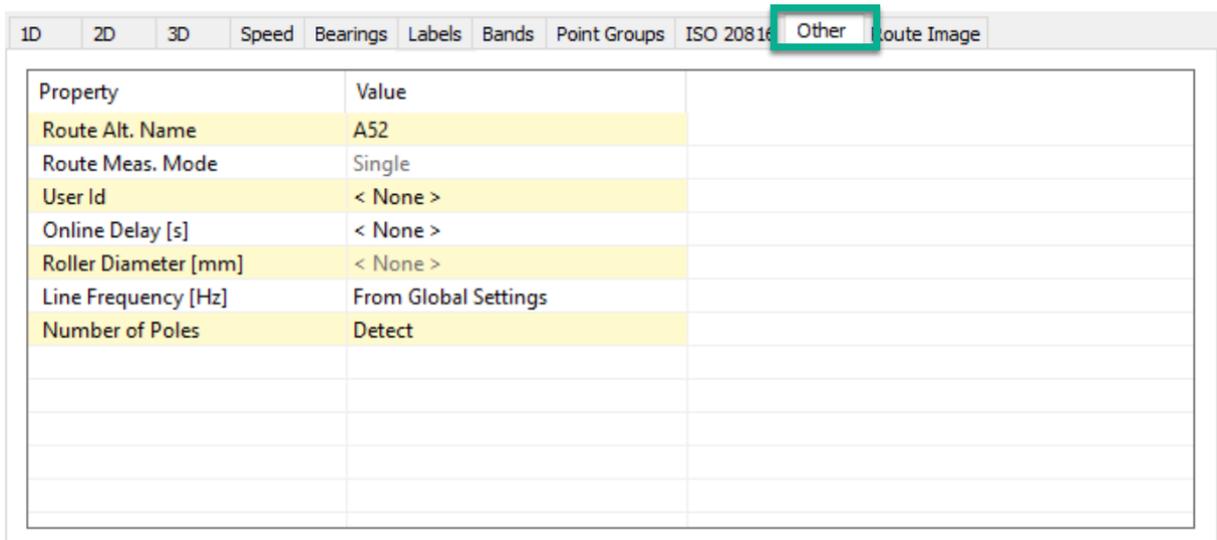
If you want to use ISO 20816 limits for velocity data cells, you must define the machine group and foundation.

Set to All Cells when you check it, then the ISO 20816 limits will be set to all velocity cells in the machine.

Other

This tab is available for tree items and center line data cell.

Tree item – Properties – Other:



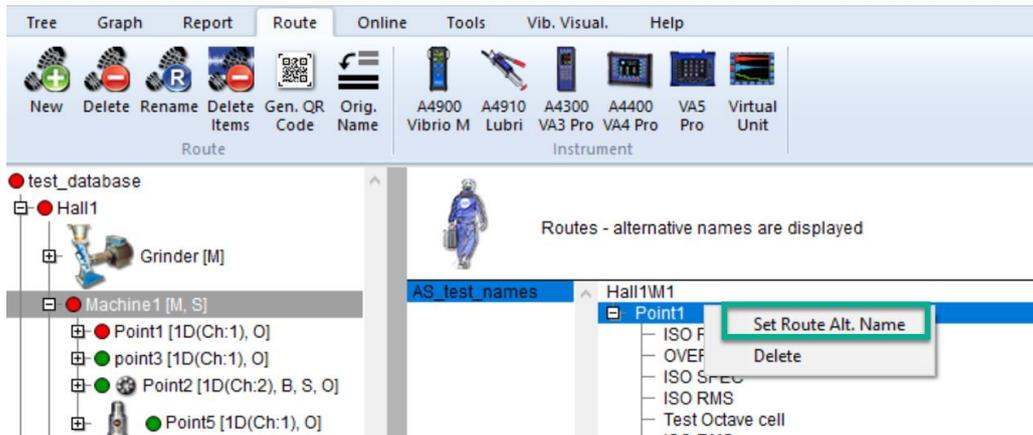
Route Alt. Name

It enables to use alternate name for tree item, which will be used in the route. If it is not used, then the name of route item is created from all items in the route path. For example, if the Pump of cooling system

A52 is used in the tree, then it is too long for using in the instrument. You can use only A52 as **Route Alt. Name** and only these three characters will be transferred to instrument.

This alternate name can be set in **Tree item Properties – Other – Route Alt. Name**.

Or you can set it directly with menu in Route window. Just click with right mouse button to change the **Route Alt. Name** for the required item.



Route Meas. Mode

(Single, Retrig, Continual Saving) - Enables route data collection in measurement point to be measured in different modes

- Single – it measures only once and save this value.
- Retrig – device keeps measuring and after is manually stopped saves last value.
- Continual saving – device is saving all values until is manually stopped (like runup)

Use In Route Path

(Yes, No), if some tree items in the point route path are not required to transfer to the instrument, then select **No**. This item is not available for Machine and Point (both of them must always be in the route).

User Id

If you have some ID system of machines and their parts in your factory, then this ID enter here. It will be used in all reports.

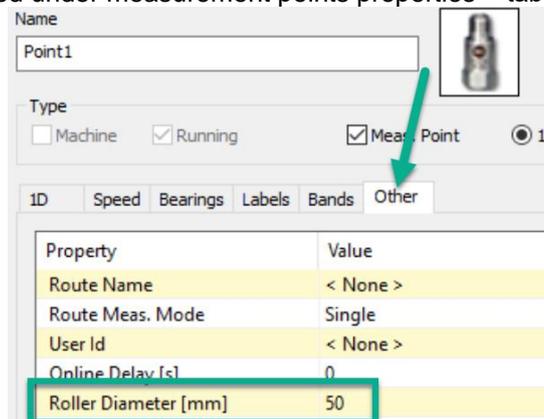
Online delay

Setting for online measurement: If the value rises above the noise level, values will not be stored for a given time (in seconds).

Roller diameter

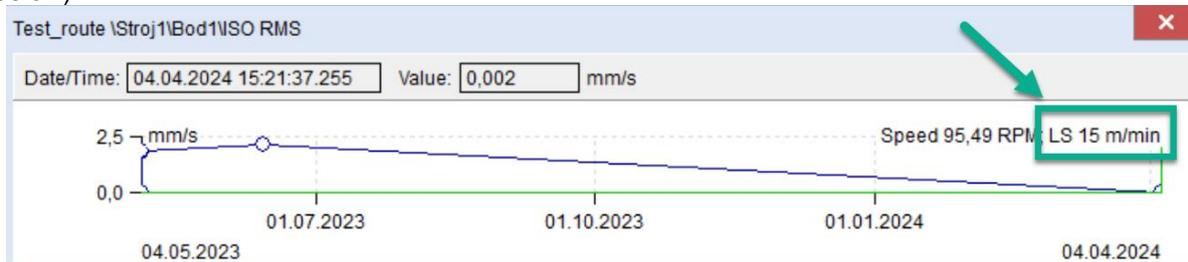
This parameter is used in case of machines which used rollers, e. g. paper mills machines. These machines are working with the linear speed (how much does the paper move per minute, m/min). DDS is not working with unit m/min. It is working with Hz. So, this feature was made to recalculate the measured speed in m/min to Hz.

This roller diameter is defined under measurement points properties – tab **'Other'**.



Once the measurement point has roller diameter defined, you get in VA5 device the window to enter the linear speed when you start the measurement. This linear speed is defined for the whole machine afterwards.

Once you load the measured data into DDS software, you can see the linear speed [m/min] in DDS measurement header. It is always marked with abbreviation LS and linear speed value (see in the picture below).



More information about the linear speed is included in VA5 manual.

Data cell: Center line – Properties – Other:

Gap Refer definition, it is initial position of shaft before runup.

Type	Value
GAP A [μm]	703
GAP B [μm]	-500

Selection of tree items

The selection is made by single click of mouse. Use the Ctrl or Shift buttons for selection of more items.

Items Moving in the Tree

By Mouse

You can move one or more items together by drag and drop.

Two symbols are displayed when you move the mouse cursor inside tree:

- Left arrow The selected item will be moved to the new position with all child items.
- [+] The selected item will be copied, in the next window you will decide whether to copy with recordings or not. You can change also the function to *Move*.
- Two rectangles The selected item will be moved, in the next window you change the function to *Copy*.

By Clipboard

You can copy/move selected items by standard Copy/ Cut/ Paste functions. The items in Clipboard are in red color. Clear it using Esc.

Multi copying

One tree item you can copy to many other items at once.

Example:

Follow next steps to copy of one data cell to many other points.

- select one data cell and press Ctrl+C or Tree/Copy,
- select all target points (Ctrl + mouse left click)
- press Ctrl+V or Tree/ Paste.

Add the Data Cell



Select the tree item and press the Add Data Cell button (or use right mouse click). The list of available readings appears. Some types are available only for data cells, some are available also for all tree items. The availability also depends of point dimension (1D, 2D, 3D).

Select one of them and next window with several tabs appears. Various tabs are displayed for various data cell types. Enter the name of data cell.

Type	Value
Quantity	Velocity [mm/s]
Trigger Control	Off
Length[s]	1
Fmin[Hz]	10
Fmax[Hz]	1 000
Detect Type	RMS
Averaging Type	Linear
Avg	Off

If you add data cell to 2D or 3D point and the measurement uses only one channel (overall, time signal, spectrum...) then you can check the **Copy to all inputs of meas. point**.

Type	Value
Quantity	Velocity [mm/s]
Input	X
Trigger Control	Off
Length[s]	1
Fmin[Hz]	10
Fmax[Hz]	1 000
Detect Type	RMS
Averaging Type	Linear
Avg	Off

The data cell will be created on all channels/inputs of the point. Channel/input character is also added to the cell name.

```

└─ Point 5 [3D(Ch:1,2,3), Group of Points 1]
  └─ ISO RMS X [mm/s, 10-1 000 Hz, RMS, 1 s, R]
  └─ ISO RMS Y [mm/s, 10-1 000 Hz, RMS, 1 s, R]
  └─ ISO RMS Z [mm/s, 10-1 000 Hz, RMS, 1 s, R]
    
```

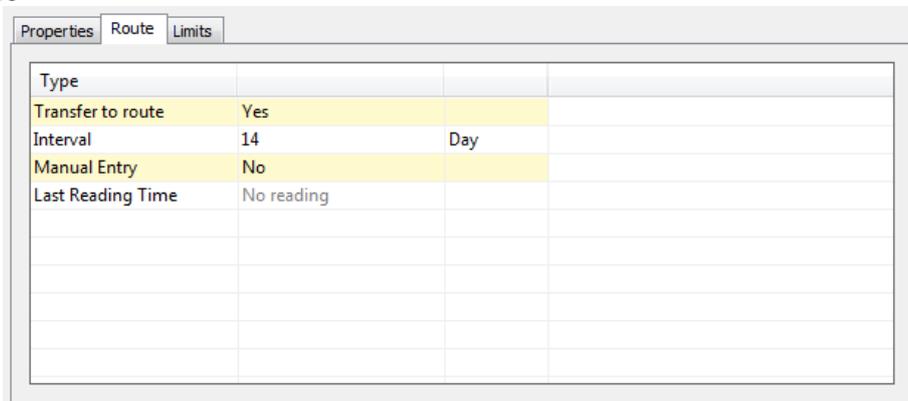
Templates list

For every data cell you need to define the reading properties. It means numbers of lines or samples, frequency interval, averaging, It can be done in Properties tab directly or you can select one of predefined templates. The parameters of selected template are copied to the properties tab, where you can edit them. You can also save your parameters as template.

Properties

Define the reading properties. See chapter Reading (Measurement) Properties for details.

Route



Transfer to Route Interval

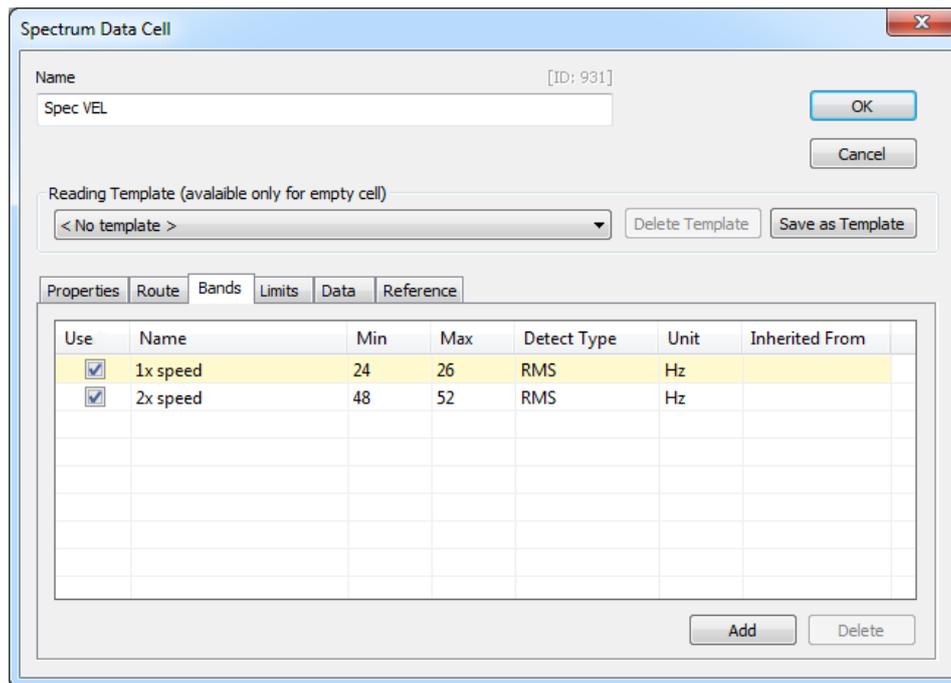
No means the cell will not be loaded to route required time interval for readings. If **< None >**, then the cell is always loaded to instrument. If the for example **Interval = 1 week**, then cell is loaded to the instrument only if last reading is older than 1 week.

Manual Entry Last Reading Time

the value is manually entered in route info about last reading

Bands (available only for spectrum cell)

Precisely speaking it is set of spectrum alarm bands. It is the special function applied only to spectrum. The Bands tab contains the list of bands (or it is empty).



Push the **Add** button and enter the band name. Enter the band parameters:

Use	this checkbox enables to switch on/off the band use
Name	the name is drawn in spectrum graph
Min, Max	frequency interval
Detect Type	RMS, Max line the type of value which is calculated. The Max line means the top line in band.
Unit	frequency unit
Inherited from	the band inherited from parent items

Limits for Static

Limits give a notice to you, when measured value is over the limit. When it happens, then colored circle is drawn aside from data cell name. The color matches the alarm type (defined in Tools/Alarms). The colored circle with the highest achieved alarm is inherited up to the root item in tree.

Three ways how to create limit is available for static data cells.

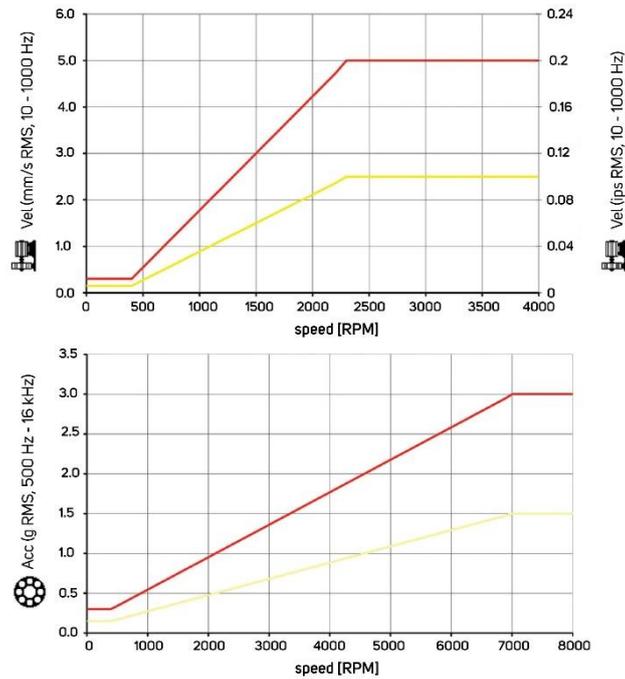
ISO 20816

The limits are defined according the ISO 20816 standard and are available only for velocity readings in frequency interval 10-1000Hz. The **Machine Group** and **Machine Foundation** (ISO 20816 tab) has to be defined before the using this standard.

Adash

The limits are derived from Adash rules, which are developed for more than 25 years of Adash history. These limits require to know the speed value. That is the key point, we do not think, that one limit value can work well for wide speed range defined in ISO 20816. Adash limits are available for two data cells types:

- velocity readings in frequency interval 10-1000Hz, which forks very well for unbalance, misalignment and looseness detection (3 levels see below)
- acceleration readings in frequency interval 500 - 16 000 Hz (higher frequency then 16 kHz is accepted too).



The colored circles are used in the trends only, not the limit lines. It is because of the relation to speed. Each reading can have different speed.

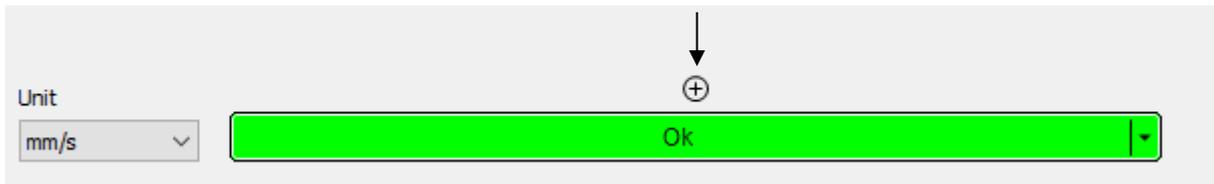
DDS allows to adjust limit levels for velocity and acceleration readings

- **Low** – limits as in graph above
- **Medium** – limits for Low * $\sqrt{2}$
- **High** – limits for Low * 2
- Or enter directly the factor for multiplying the Adash limit levels (Low)

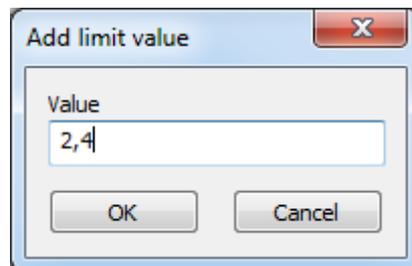
User

The user can also define own limit values. Look to the example.

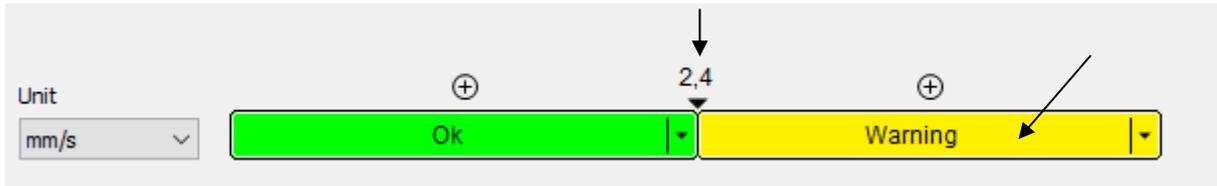
Select one or more data cells. Open the **Properties** and **Limits**. Check the **User**. Now the limit in the bottom is available (active) to use.



Click on the + symbol. New window appears. Enter the limit value and press **Ok**.

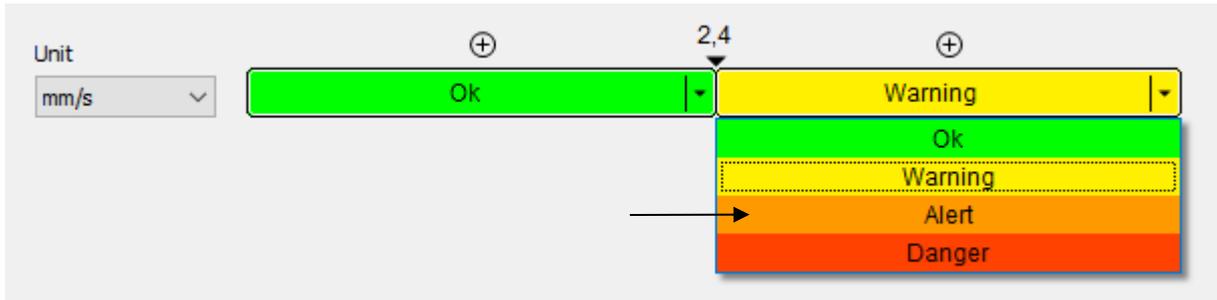


The 2.4 value appears in bar. The alarm color is used automatically (the next above Ok color).



You can change value too. Use the right click and choose **Edit** or left double click on the value and enter new value. The **Delete** option is available too.

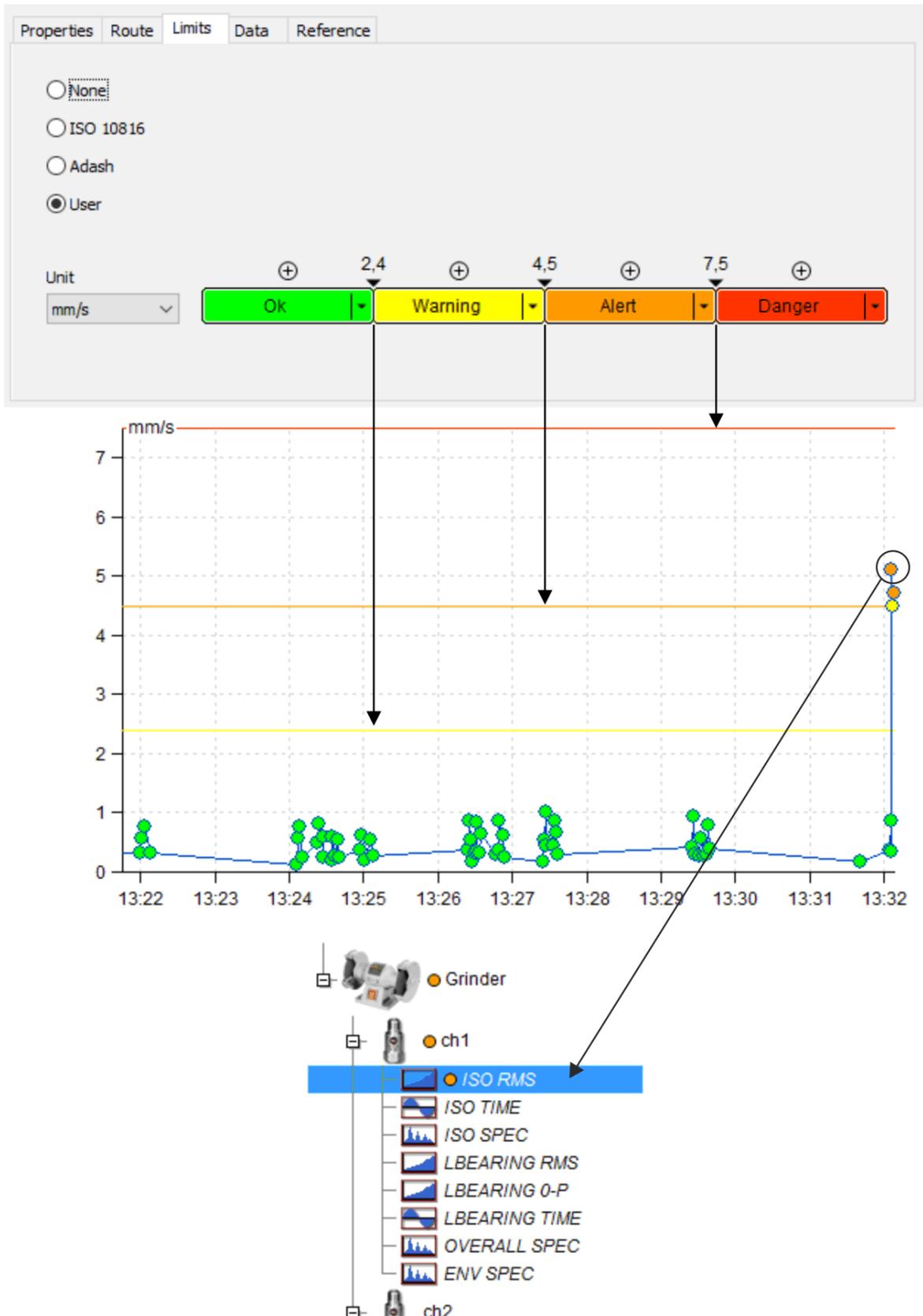
When you want change the alarm color, then click in the colored area. The list of available alarm colors appears (defined in **Tools/ Alarms**). Select new alarm color.



This procedure repeat until all limits are defined.

You can also change the unit of limits for example from mm/s to inch/s.

When you close the **Properties** window, then the new limits are drawn.

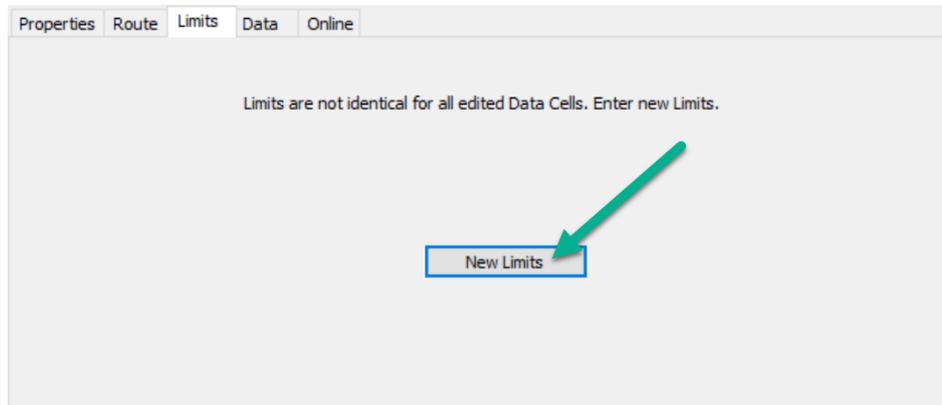


The **User** limits can user change also directly in the trend graph (**Limit value edit in graph**).

Multi edit of limits

Select more data cells of the same type, e.g., more static cells ISO RMS. Display the properties and the Limits tab. It looks like the tab of one selected cell. Now you can edit values and the changes will be made in all selected cells.

If limits are not identical in all selected data cells, then you can enter the new identical limits for all selected cells.



Limit value editing in graph

The limits edit you can do also directly in graph. Open graph, use right mouse button click and set the Limits to ON. Then limits are displayed (of course some limits must be defined for data cell).

Addition of new limit value

1. Press and hold Ctrl key (button in keyboard), make left double click on required Y value in graph, standard window appears, edit parameters and press OK.
2. Open right click menu and select Limits/ Add

Value editing for existed limit

Move the cursor to limit line. The cursor symbol is changed and the value of limit appears.

1. Use left mouse button, drag the line and move it to required value (position).
2. Open right click menu and select **Edit**

Delete of limit

Move the cursor to limit line. The cursor symbol is changed and the value of limit appears. Open right click menu and select Delete

Limits for FASIT

For FASIT data cells the limits are used automatically. There as an option to adjust (multiply) the Adash limit levels for velocity and acceleration (see Limit Levels for Static/Adash above)

Limits for Spectrum

The limits for spectrum are related to defined spectral alarm bands. The limit values are defined individually for every band. The first step you need to do is to define one or more bands.

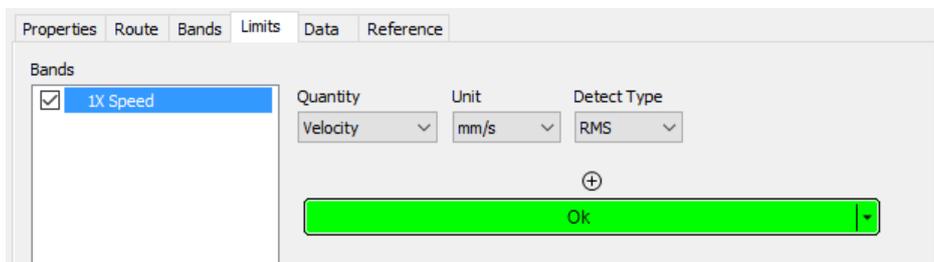
Used	Name	Min	Max	Detect Type	Unit	Inherited From
<input checked="" type="checkbox"/>	1X Speed	23	27	RMS	Hz	
<input checked="" type="checkbox"/>	Harmonics	45	260	RMS	Hz	

Two bands are created. **1X speed** for speed frequency which is 25Hz for this machine. The second band **Harmonics** contains 10 harmonics (50, 75, 100, 125, ..., 250).

Now open the **Limits** tab. It is empty.



Push **Add** and select band for limits entering.



Now you define Quantity, Unit and Detect Type. Enter limit values by the same way as in static data cells.

Now we explain two kinds of Detect Type. The first Detect Type is defined in **Bands** tab. Two possible choices are available. The **RMS** means the rms value, which is calculated from all frequencies in band ($\text{rms} = \sqrt{f_1^2 + f_2^2 + \dots + f_N^2}$). The **Max line** means the top peak in band.

The second is the spectrum Y axe Detect Type in the **Limits**. It can be **RMS**, **0-P** or **P-P**.

Example: the band Detect Type is **Max line** and for specific spectrum the Max line can be used as $2,5g^{\text{RMS}}$ or $3,52g^{0-P}$ ($0-P=1,41 \cdot \text{RMS}$) or $7,05g^{P-P}$ ($P-P=1,41 \cdot 0-P=2,82 \cdot \text{RMS}$).

Band and limit edit in spectrum graph

Display bands with limits in graph (right click menu - Bands/ With limits).

Add band

Two possible procedures exist.

1. Press and hold Ctrl button. Make left double click. Standard band window appears. The minimum a maximum frequency in this window depends on the location, where you made the click.
2. Open right click menu and select **Limits/ Bands/ Add**. Again, the minimum a maximum frequency in this window depends on the location, where you made the click.

Edit band frequencies

Two possible procedures exist.

1. Move cursor to band and make left double click or open right click menu and select **Edit Band**.
2. Move cursor to left or right frequency border, drag the border by left mouse button and move.

Delete band

Move cursor to band, open right click menu and select **Delete Band**.

Add limit value to the band

Two possible procedures exist.

1. Move cursor inside band to the position, where you want to create the limit value. Make right click menu and select **Add limit value**. If you need, change the value in window.
2. Move cursor inside band to the position, where you want to create the limit value. Press and hold Ctrl button. Make left double click. If you need, change the value in window.

Edit limit value

Move cursor to band limit position. Cursor symbol is changed and limit value is displayed.

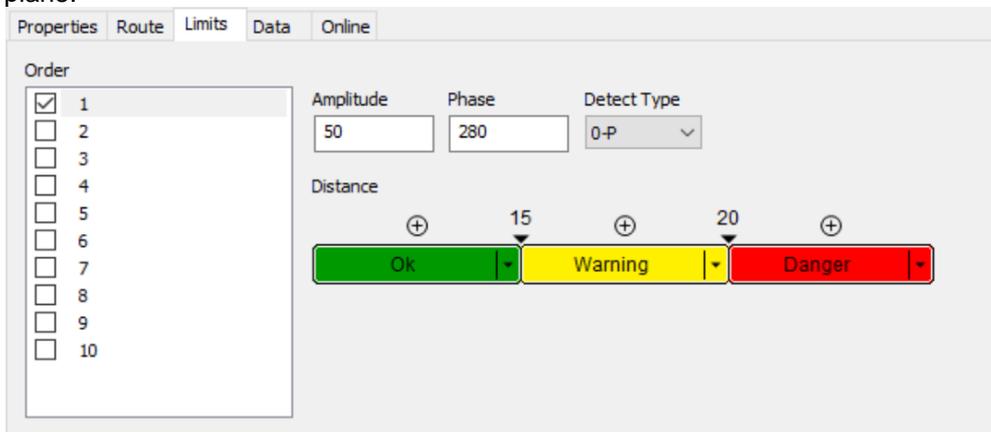
1. Drag the limit and move it.
2. Open right click menu and select Edit Limit Value.

Delete limit value

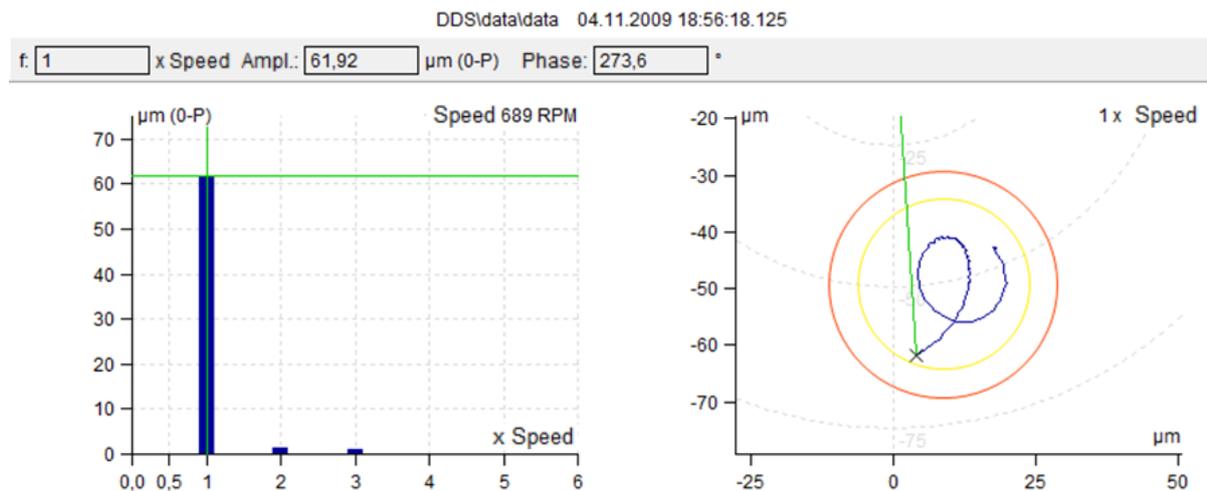
Move cursor to band limit. Cursor symbol is changed and limit value is displayed. Open right click menu and select Delete Limit Value.

Limits for Orders

Limits for order analysis are related to each order individually. Setting of the limit is very similar to spectrum limits. The difference is that band are orders and limits are distance from the points in the complex plane.



When displayed in a polar graph, the limits are displayed in the form of circles.



Data

It contains list of all readings. You can edit them or delete.

#	Date/Time	Value	Speed	Instrument
1	4/17/2010 2:24:09.531	0.5549 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
2	4/17/2010 2:24:10.531	0.5579 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
3	4/17/2010 2:24:11.531	0.5503 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
4	4/17/2010 2:24:12.531	0.5436 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
5	4/17/2010 2:24:13.531	0.5366 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
6	4/17/2010 2:24:14.531	0.5331 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
7	4/17/2010 2:24:15.531	0.5428 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
8	4/17/2010 2:24:16.531	0.5528 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
9	4/17/2010 2:24:17.531	0.5561 [mm/s]	1,503 [RPM]	A4400 VA4 Pro
10	4/17/2010 2:24:18.531	0.5703 [mm/s]	1,503 [RPM]	A4400 VA4 Pro

Buttons: Set Reference, New, Edit, Delete

Any static and spectrum reading can be labeled as Reference. This value is downloaded to the route and used in instrument. Select required reading and press Set Reference button. The ® appears after the reading number in first column.

The DC Offset can be manually entered for time signals and orbits. Select required reading, push Edit and enter value.

Reference

Any static and spectrum reading can be labeled as Reference. This value is downloaded to the route and used in instrument. Select required reading and press Set Reference button. Selected value is also displayed in Reference tab, where you can disable it e.g., for limited time.

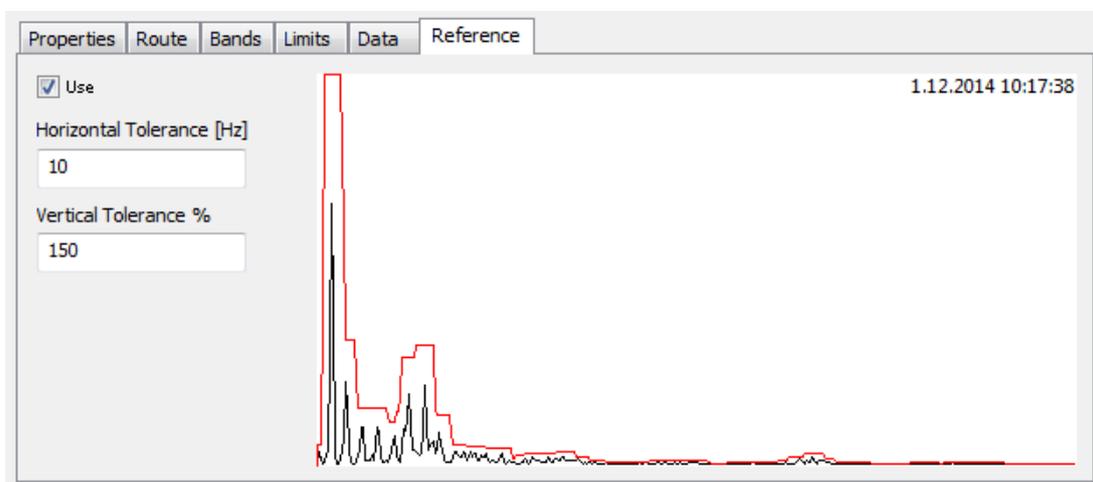
Static Reference

Defined reference value is displayed in graph.

Properties	Route	Limits	Data	Reference
<input checked="" type="checkbox"/> Use Amplitude 5,0 [mm/s]				

Spectrum Reference

Select the reference spectrum (Data tab). Use the tolerance values for reference spectrum development.



Delete Item



It deletes selected tree items.

Reset User Graph Settings



When you use right click on the tree item, the Reset User Graph Settings function is in the list. Button for this function can be also found in the 'Tree' tab.

You define properties for every data cell. E.g., the mm/s in the Global list, but you define ips for one data cell. Then this definition has the priority and graph will use ips.

When you want to remove such special defined properties, then use the 'Reset User Graph Settings' function. Then global option will be used again.

Export of data



Data are exported in csv format, which enables easy import to other software. 'Export to CSV' function is used for this. It is under 'Tree' tab in DDS.

Select tree items you want to export. Select Tree\Export to CSV item in main menu. If the item contains data, then next window is displayed.

All – all data from all data cells will be exported

Last (day, month, year...) – only data from N last days/weeks/months/years will be exported

Last N readings – last N readings from each cell will be exported

Date interval – only readings from selected time interval will be exported. You can use one of them empty.

Data Type – you can select export of static readings only (overall value, speed etc.) or dynamic readings (spectrum, time signal etc.).

Target folder – path to the folder, where csv file will be saved.

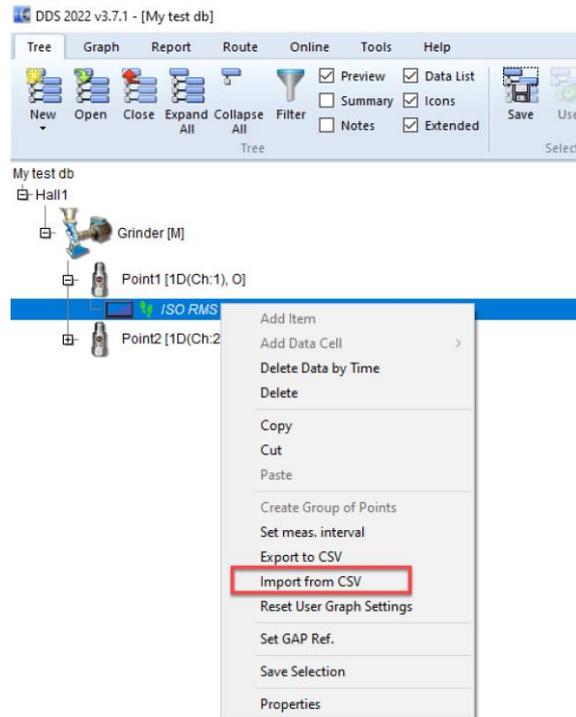
The export function creates structure of folders, which is the same as the structure of tree.

Each static data cell creates one csv file.

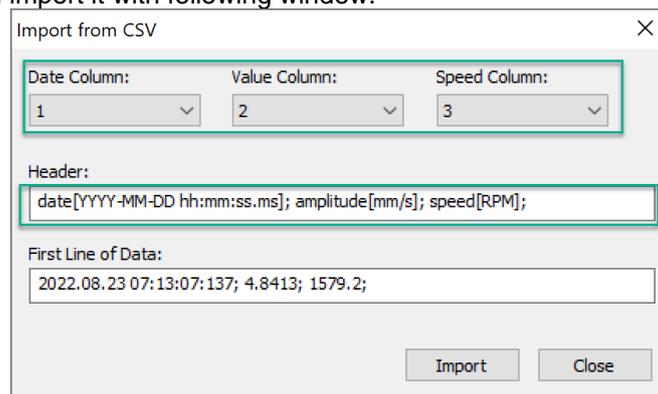
Dynamic cell creates one csv file for each measurement, all saved in new folder.

Import of data

Data can be also imported into DDS. You can import them in CSV format. Click on empty data cell where you want to import data with right mouse button and choose 'Import from CSV'.



Find your CSV file and import it with following window.



Format of CSV file needs to look like this:

// user:header_username	sample:317	
date[YYYY-MM-DD hh:mm:ss.ms]	amplitude[mm/s]	speed[RPM]
2022.08.23 07:13:07:137	4.8413	1579.2
2022.08.23 07:14:15:1415	4.7841	1593.3
2022.08.23 07:14:37:1437	4.7503	1593.3
2022.08.23 07:14:59:1459	4.7779	1593.3
2022.08.23 07:15:21:1521	4.7891	1593.6
2022.08.23 07:15:43:1543	4.8045	1593.6
2022.08.23 07:16:05:165	4.774	1593.3
2022.08.23 07:16:27:1627	4.7709	1593.6
2022.08.23 07:16:48:1648	4.7486	1593.6
2022-08-23 07:17:11.040	4.8076	1593.6

Set speed

When the tachometer is used during the readings or the speed value is entered manually during route measurements, then the speed value is saved directly to the measurement. This function allows you to add (change) the speed value to readings manually.

Note! Keep in mind, that if the speed was already measured by tachometer or entered manually in the device, it is saved to the measurements data and imported to DDS with it. **If you set the speed value in Set Speed dialog, then the tachometer measured value (or manually entered one) is overwritten with the value set in this window for all measurements!**

DDS icon:

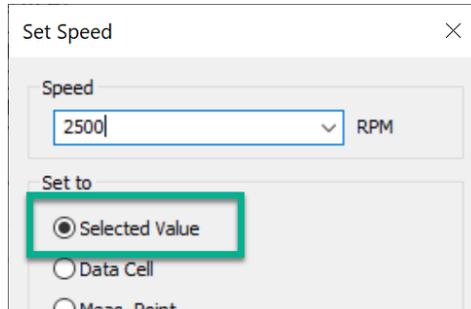


Select a tree items (machine and below) and press **Set speed**.

Enter the **speed** (in dialog window). Select if this speed is set to **Data Cell**, Meas. Point or whole Machine. Set it for the Last Values or **In Interval (From, To)**. Press OK and DDS saves the speed into all readings in this time interval. In a dropdown menu are available options to set multiply or divide

suggested value by 2 and 4. If “Apply Gear Ratio” is checked all speed values in readings will be recalculated according to gear ratios in a tree. If not, all values will have this exact speed value.

If you want to set speed only for one spectrum differently, it is possible. Just click in the spectrum graph and turn on the cursor. Find the required position. And click on 1x Set Speed. Now you are able to set the speed value only to the one Selected Value (this option is greyed out in the screenshot above).



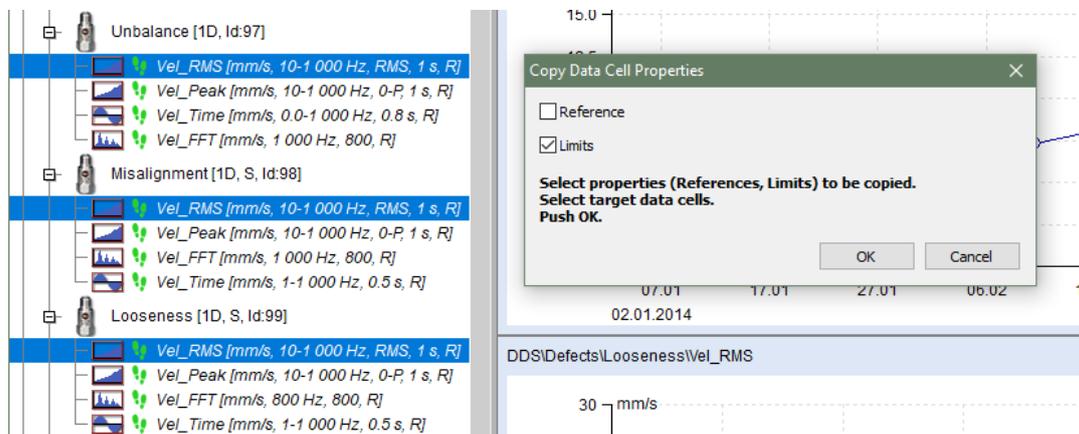
Copy Data Cell Properties

The limits and references (for static data cells and spectra) can be copied from the source item.

DDS icon:



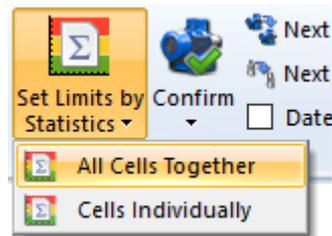
1. Select the source data cell.
2. Edit limits and/or bands. Save it (push OK).
3. Click to *Tree/Copy Data Cell Properties* button. In the next window select what you want to copy (Reference, Limit, Bands).
4. Select the target data cells (you can use the Filter function). Copy Data Cell Properties window remains opened. Then push OK.



Set Limits by Statistics

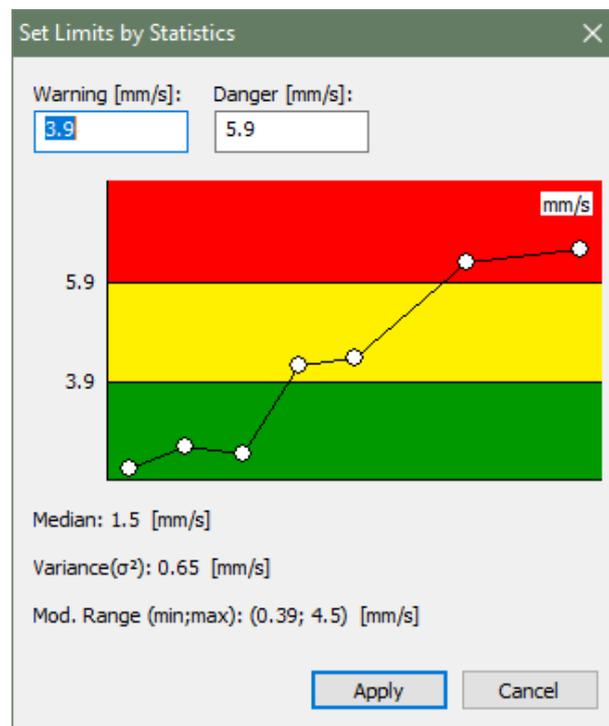


The using of statistics is the next way how to define limits static data cells. You can use two functions; each is suitable for another use case. For proper functionality you should have sufficient number of measurements for that (we recommend more than 15 readings).



All Cells Together – the same limits will be set to all compatible data cells (the same type of measurement). The statistical analysis is made from all readings from all data cells together.

Select the data cell or more data cells (e.g. from the same machines type). The Filter function is useful for that. Push the Tree/Set Limits by Statistics/All Cells Together. The windows with calculated limits will appear.



You can manually modify the values if you want. Limits are set when you press the Apply button.

Limits math algorithm:

$$\sigma^2 = \frac{1}{N} * \sum_{i=1}^N (X_i - \text{median } X)^2$$

$$\sigma = \sqrt{(\sigma^2)}$$

$$\text{warning} = \text{median } X + 3 * \sigma$$

$$\text{alert limit} = 1.5 * \text{warning limit}$$

Cells Individually - the limits are set individually for every static data cell. Select tree item(s), you set limits for all static data cells under this tree item(s). Or select group of data static data cells (you can use the Filter function). Now Push the Tree/Set Limits by Statistics/Cells Individually. The calculations may take a longer time. Once the limits are calculated and their setting is over, you can display window with details.

Data Cell	Warning	Danger	Median	Variance	Min	Max
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-NDE/ H-VEL OVR ISO HOR	3.37 mm/s	5.05 mm/s	1.61 mm/s	0.345 mm/s	0.758 mm/s	3.2 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-NDE/ H-ACC OVR HOR	0.315 g	0.473 g	0.141 g	0.003 g	0.001 g	0.29 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-NDE/ ch2/ V-VEL OVR ISO VERT	4.35 mm/s	6.5 mm/s	1.94 mm/s	0.635 mm/s	0.891 mm/s	3.86 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-NDE/ ch2/ V-ACC OVR VERT	0.388 g	0.581 g	0.169 g	0.005 g	0.001 g	0.301 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-NDE/ ch3/ Ax-VEL OVR ISO AX	3.52 mm/s	5.27 mm/s	1.82 mm/s	0.32 mm/s	0.93 mm/s	2.82 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-NDE/ ch3/ Ax-ACC OVR AXIAL	0.434 g	0.652 g	0.199 g	0.006 g	0.144 g	0.389 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-DE/ H-VEL OVR ISO HOR	3.04 mm/s	4.56 mm/s	1.47 mm/s	0.273 mm/s	0.943 mm/s	3.05 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-DE/ H-ACC OVR HOR	0.335 g	0.502 g	0.131 g	0.005 g	0.001 g	0.291 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-DE/ ch2/ V-VEL OVR ISO VERT	3.73 mm/s	5.6 mm/s	1.46 mm/s	0.577 mm/s	0.925 mm/s	3.49 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-DE/ ch2/ V-ACC OVR VERT	0.32 g	0.479 g	0.154 g	0.003 g	0.003 g	0.238 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-DE/ ch3/ Ax-VEL OVR ISO AX	2.18 mm/s	3.27 mm/s	1.21 mm/s	0.104 mm/s	0.837 mm/s	1.95 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/MOTOR/MTR-DE/ ch3/ Ax-ACC OVR AXIAL	0.662 g	0.994 g	0.292 g	0.015 g	0.104 g	0.577 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-DE/ H-VEL-NDE-OVR	1.49 mm/s	2.23 mm/s	1.02 mm/s	0.025 mm/s	0.7 mm/s	1.29 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-DE/ H-ACC-NDE-OVR	0.309 g	0.464 g	0.118 g	0.004 g	0.061 g	0.326 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-DE/ ch2/ V-VEL-NDE-OVR	1.36 mm/s	2.04 mm/s	0.861 mm/s	0.028 mm/s	0.678 mm/s	1.24 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-DE/ ch2/ V-ACC-NDE-OVR	0.128 g	0.192 g	0.074 g	0.0 g	0.051 g	0.108 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-DE/ ch3/ Ax-VEL-NDE-OVR	2.41 mm/s	3.62 mm/s	1.02 mm/s	0.214 mm/s	0.614 mm/s	2.3 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-DE/ ch3/ Ax-ACC-NDE-OVR	0.117 g	0.175 g	0.065 g	0.0 g	0.017 g	0.091 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-NDE/ H-VEL-NDE-OVR	1.39 mm/s	2.08 mm/s	0.866 mm/s	0.03 mm/s	0.769 mm/s	1.39 mm/s
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-NDE/ H-ACC-NDE-OVR	0.426 g	0.639 g	0.172 g	0.007 g	0.11 g	0.438 g
POWER STATION/TRANSPORT LINE/ CB035 B27/BELT 27/GBOX INPUT-NDE/ ch2/ V-VEL-NDE-OVR	2.11 mm/s	3.17 mm/s	1.05 mm/s	0.125 mm/s	0.798 mm/s	2.11 mm/s

All statistic values (median, variance, min, max) are calculated from modified measurements array. From array are removed all values, which have a value greater than 3x median.

Confirm, Remove Confirmation, Undo Confirmation



If the limit values are used, the tree contains the warning colors. When the high vibration value occurs, then this color is e.g. red. We repair the machine and vibration value get back to the low value. But in the tree, we still see red color, because the high value exists. We need to set the time stamp in trend and the readings before that time would be ignored in warning/alerts evaluation. Only readings after that time will be used for warning color evaluation. The **Confirm** function do that.

Confirm function can be used on any tree item or data cell. To use the Confirm function, select the tree item (e.g. machine) and push the button Tree/Items/Confirm. The calendar appears and you need to choose the date.

In case the data cell is selected and the graph is displayed, the time of the selected reading is used as the time of Confirmation (the reading must be chosen by cursor in the trend graph). If the Confirm function is applied on the data cell, all the other data cells in the same Tree Item (Point) will be confirmed.

The information about the time of Confirmation is saved in the tree item as a note. The note can be displayed in tab Tree Item properties/Notes or in tab Notes in graph section (tab Notes must be switched on).

In case you need to remove the Confirm function, use the function Remove confirmation (you need to open the menu of Confirm button).

If you made the wrong confirmation, you can us the Undo function and to return back. It is very useful when you work with many tree items together (multiselection).

Next Machine, Next Point

DDS icons:



Next machine:

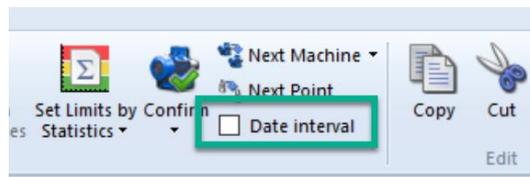


Next meas. point:

You can move only to machines/point which contain readings from defined time interval. All other machines will be skipped. Check the box **Time Interval** in ribbon panel and use the **Time interval** button (bottom part of **Next Machine** button) to specify time interval. You can specify both times or one time only (**From** or **To**).

Date interval

Check the box **Time Interval** in ribbon panel, when you want to define and use the time interval settings for next machine or point.



Edit section

Edit section is contained in Tree tab.

Copy



You can copy the tree item and then paste it to another tree item.

Cut



You can cut the item from the tree.

Paste



You can paste tree item into another tree item.

If you use main menu, select the tree item to be copied/moved and click on the menu button Tree/Edit/Copy or Cut. The selected tree item changes color to red. Now select the tree item into which you want copy/move previously selected the tree item and click on the menu button Tree/Edit/Paste.

If you use keyboard:

Ctrl + C for Copy

Ctrl + X for Cut

Ctrl + V for Paste

Tree Window section

Tree Window section is contained in Tree tab.

Tile

If you have open more than one database, you can distribute all database windows for better comfort.



Horizontal tiles – the windows side by side.



Vertical tiles – the windows above.



Cascade –the windows into cascade from the top left corner to the bottom right corner.

Reading (Measurement) Properties

The readings are saved in data cell, which is special tree item. It differs from other tree items like Machine, Point, etc. which don't contain measured data.

Vibration Readings

The most often used readings in route are in the following list. Usually for all of them the accelerometer is used. The main properties will be mentioned for each of them.

Overall, Demod Overall

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Trigger Control	see VA5 manual
Length	reading length in seconds
Fmin	highpass filtering frequency, Fmin and Fmax define the frequency band
Fmax	lowpass filtering frequency
Detect Type	RMS, True 0-P, True P-P, Scaled 0-P, Scaled P-P, Kurtosis, Crest, AVG
Component	AC+DC, AC, DC – only for Demod Overall data cell
Averaging	Linear, Peak Hold
Averaging Type	Linear, Min, Max, Median
Avg	Off or number of averages

Time (time waveform)

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Length	reading length in seconds
Fmin	highpass filtering frequency, Fmin and Fmax define the frequency band
Fmax	lowpass filtering frequency
FS	sampling frequency may be calculated from Fmax or increased(oversampling)
Avg	Off or number of averages

Demod Time

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Length	reading length in seconds
Fmin	highpass filtering frequency, Fmin and Fmax define the frequency band
Fmax	lowpass filtering frequency

Spectrum

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Fmin	highpass filtering frequency
Range	spectrum range, lowpass filtering frequency (Fmax)
Lines	number of lines
Window Type	Hanning, Rectangular, Transient, Exponential
Averaging	Linear, Peak Hold, Time Synchro
Avg	Off or number of averages
Overlap	percentage overlapping
Zoom Spectrum	yes, no
Full Spectrum	yes, no

Demod Spectrum

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Range	spectrum range, lowpass filtering frequency (Fmax)
Lines	number of lines
Demod Fmin	highpass filtering frequency, Demod Fmin and Demod Fmax define the frequency band
Demod Fmax	lowpass filtering frequency
Avg	Off or number of averages
Averaging	Linear, Peak Hold, Time Synchro
Overlap	percentage overlapping

ACMT

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Length	reading length in seconds
Fmin	highpass filtering frequency
ACMTFs	the sampling frequency for ACMT evaluation.

VFD Bearing

Quantity	physical quantity (acceleration, voltage)
VFD Fmin	highpass filtering frequency
VFD Fmax	lowpass filtering frequency
Averaging Type	Linear, Min, Max, Median
Avg	Off or number of averages

Orbit

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Input A	valid only for 2D point - signal selection
Input B	valid only for 2D point - signal selection
Length	reading length in seconds
Fmax	lowpass filtering frequency
FS	sampling frequency may be calculated from Fmax or increased(oversampling)
Avg	Off or number of averages

Smax

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Input A	valid only for 3D point - signal selection
Input B	valid only for 3D point - signal selection
Length	reading length in seconds
Fmax	lowpass filtering frequency
FS	sampling frequency may be calculated from Fmax or increased(oversampling)
Averaging Type	Linear, Min, Max, Median
Avg	Off or number of averages

Complex Smax

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Input A	valid only for 3D point - signal selection
Input B	valid only for 3D point - signal selection
Length	reading length in seconds
Fmax	lowpass filtering frequency
FS	sampling frequency may be calculated from Fmax or increased(oversampling)
Averaging Type	Linear, PeakHold
Avg	Off or number of averages

Amplitude + Phase

Quantity	quantity (acceleration, velocity, displacement, ...)
Averaging	Linear, Peak Hold
Avg	Off or number of averages
Resolution	required FFT resolution (take care of signal length), see VA4 manual for details
Order/Frequency	selection between tracking of x speed or exact frequency
Value	value of tracked frequency or x speed

Centerline

Quantity	quantity (displacement, ...)
Averaging	Linear, Peak Hold

Phase Shift

Avg	Off or number of averages
Frequency	Tacho or manual entering of speed
Resolution	required FFT resolution (take care of signal length), see VA4 manual for details
Order/Frequency Value	selection between tracking of x speed or exact frequency value of tracked frequency or x speed

FRF (Frequency Response Function)

Range	response range (lowpass filtering frequency (Fmax))
Lines	number of lines
Window Type 1,2	Hanning, Rectangular, Transient, Exponential
Result type	H1, H2, H3
Avg	Off or number of averages
Overlap	overlapping percentage

Orders

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Averaging	Linear, Peak Hold
Avg	Off or number of averages
Orders	(1/2,1-5), (1-5), (1/2,1-10), (1-10)
Resolution	required FFT resolution (take care of signal length), see VA4 manual for details

Filtered Orbit

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Averaging	Linear, Peak Hold
Avg	Off or number of averages
Orders	(1/2,1-5), (1-5), (1/2,1-10), (1-10)

Order Spectrum

Quantity	physical quantity (acceleration, velocity, displacement, ...)
Fmax	lowpass filtering frequency
Lines	number of lines
Orders	number of orders
Averaging	Linear, Peak Hold
Avg	Off or number of averages

MinMax (available only in online database)

Duration	total duration of measurement in [HH:MM] format
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Density (available only in online database)

Duration	total duration of measurement in [HH:MM] format
Interval	division into octaves or decades. The octave is an interval between two values whose ratio is 2:1. The decade is an interval between two values whose ratio is 10:1
Bands per Interval	interval (octave or decade) is divided into the bands. This enables more precise division of the x axis

Other Readings**Speed**

Avg	Off or number of averages
Averaging	Linear, maximum, minimum, median

Pulses per rotation (available only in online databases) – one or more pulses per one rotation

Process

Quantity	physical quantity (voltage, current, power, ...)
Avg	Off or number of averages
Averaging	Linear, maximum, minimum, median
Manual entry	yes, no

FASIT

Description is in Drawing graphs, FASIT below.

Temperature

Measurement from instrument's non-contact IR temperature sensor (VA3/Vibrio M)

Ultrasound

Ultrasound frequency range measurements. You can set limits for the measurement. It is possible to generate Basic report from ultrasound measurement.

Record and it's Analysis

It enables route measurement of record (in VA4 Pro) and it's later analysis in the office. You need to install VA4Pro Virtual Unit before using this function. Download VA4Pro Virtual Unit from Adash website www.adash.com. Define the link to VA4 Pro Virtual Unit in DDS software (Globals / General / Application).

To analyze transferred record in DDS software, choose Record (in section Data/Data Cell Properties) and press button Analyze (accessible also via right click menu in record graph, or double click on a data cell if there is only one record in it). The software VA4Pro Virtual Unit will be run and you can analyze the record and make the measurement by the same way you do it with analyzer VA4 Pro. Note. maximum record size stored in a tree is 500 MB.

Record

Length	reading length in seconds
FS	sampling frequency
AC,DC	AC,DC inputs settings

Other types

Image

The PNG, JPEG, and BMP formats are supported.

File

You can save any binary file into the database and export it from the database whenever you want.

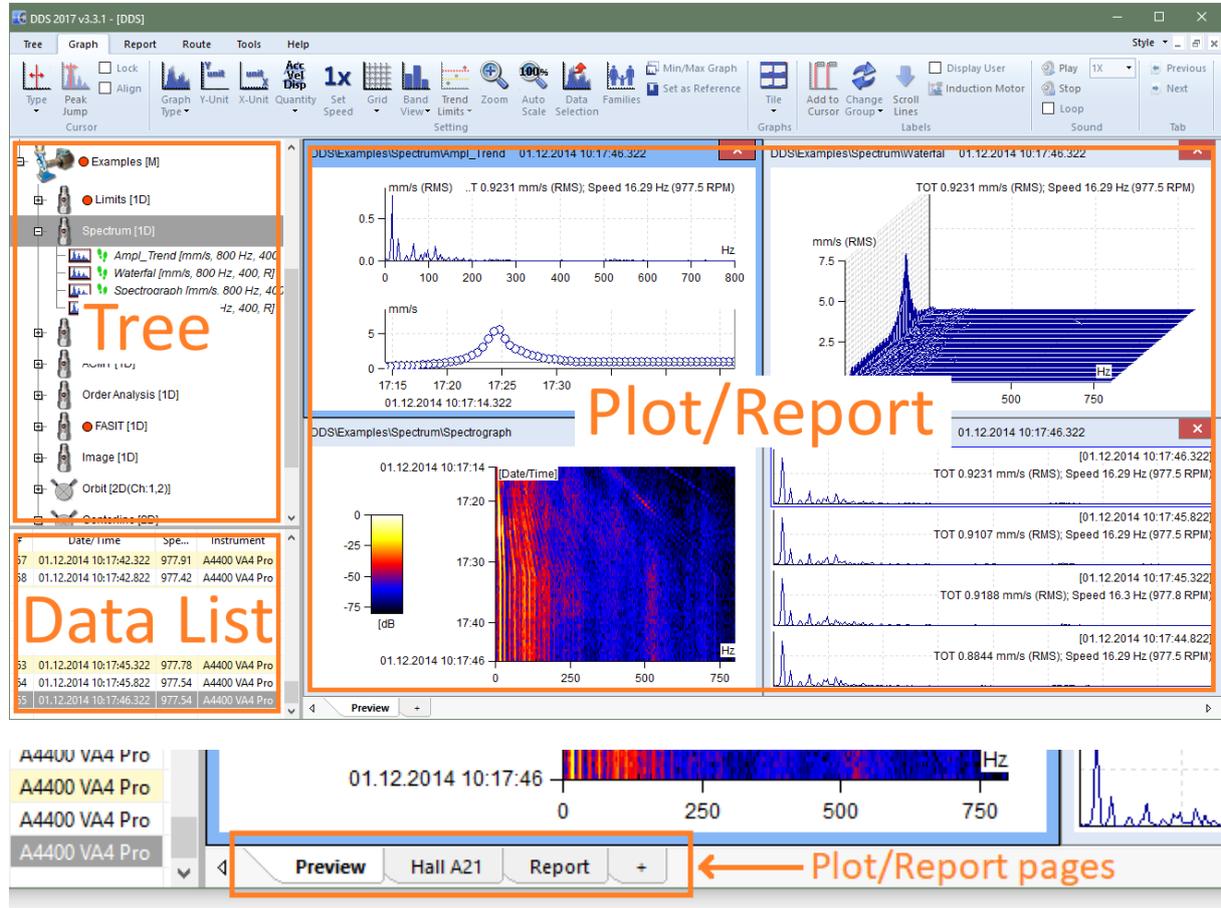
Balancing

The balancing report imported from VA4 or VA3 instrument.

Drawing of graphs

Screen Areas

The screen is divided into 3 main areas. The tree area is on the upper left side. The data area (DataList of readings) is below the tree on the left side. The Plot/Report areas on the right side are prepared for drawing of graphs and reports.



Plot/Report Area and Pages

The Plot/Report area contains pages (like in MS Excel). Various graphs can be plotted in each page. The texts and images can be added in report pages.

The Preview page is the basic plot page. It enables fast preview of readings.

Preview Page

Use the checkbox Preview in Tree section to create Preview page. This page is a default plot page for graphs plotting. If we open the branch in the tree, then the several basic plotting are available:

One reading or trend

Select one data cell in point. The static cell (e.g. overalls) creates the trend graph. The dynamic cell (e.g. spectra) creates the graph with last reading or waterfall.

All data cells from one point

Select the Point with several data cells. All cells graphs will be created together in the Preview.

User multiselection

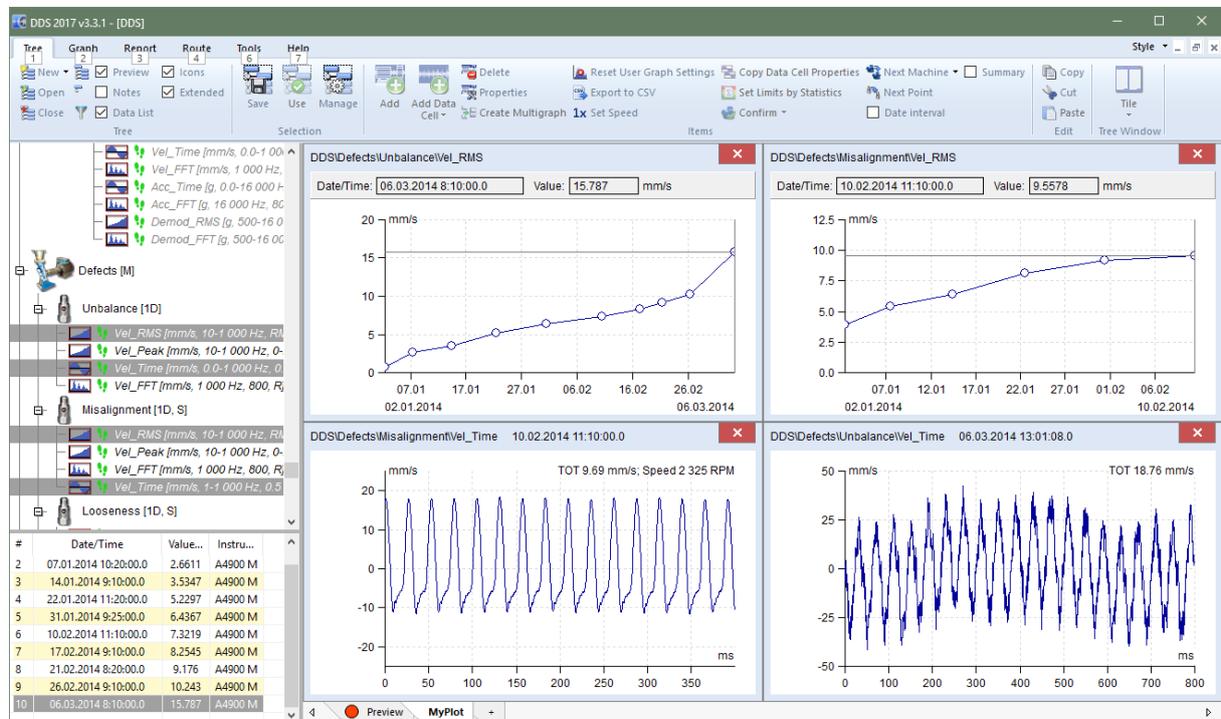
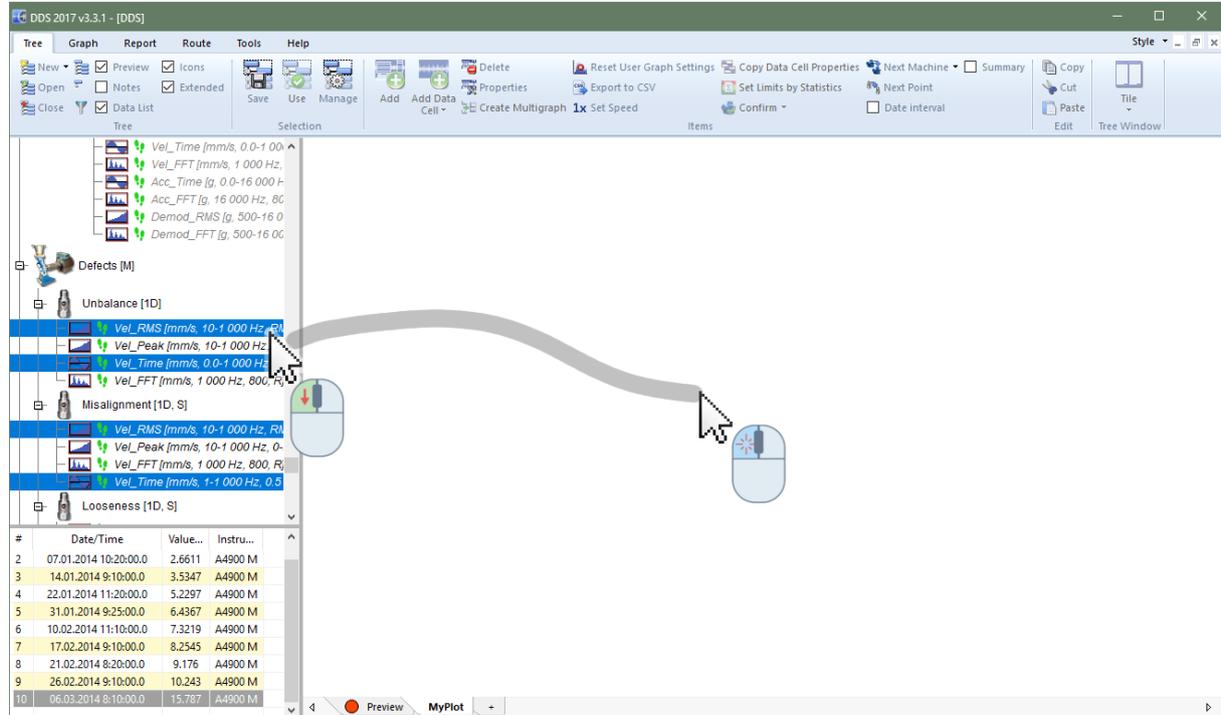
Use the standard Windows buttons (Shift, Ctrl) for multiselection in tree. All selected cells graphs will be created together in the Preview.

Plot Page

The graphs are drawn in plot pages. Create the new plot page using the “+” (in the bottom of page).



Drag the data cell from the tree and drop it on required position in plot page.

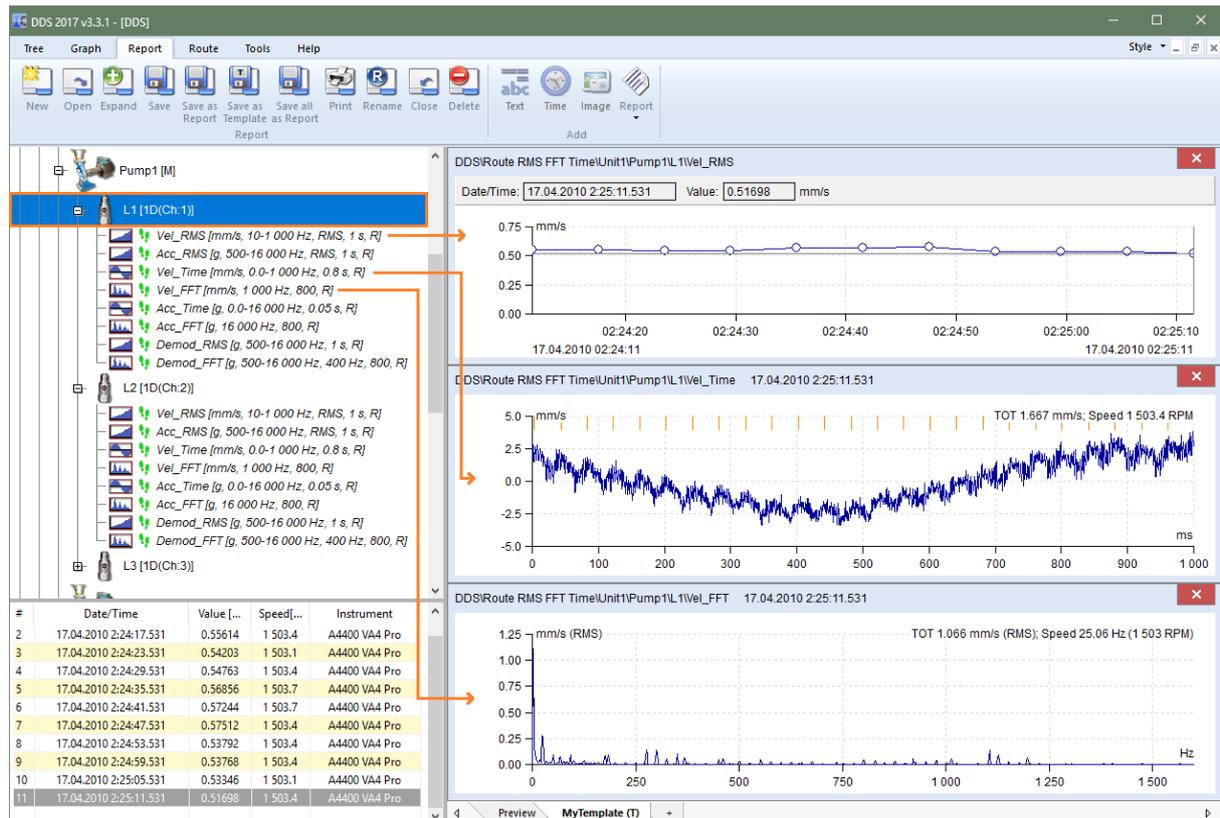


Use the Graph/Graphs/Tile  to organize them.

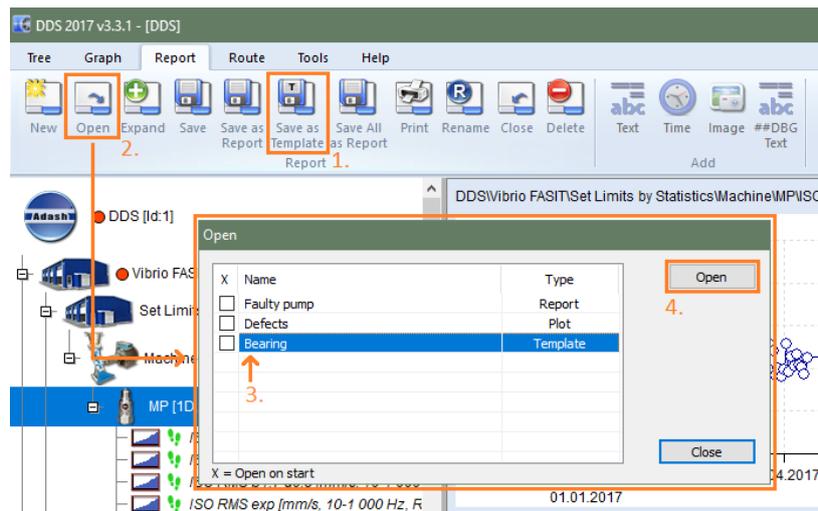
If you select more compatible data cell in the tree, then you can create multigraph by **Tree/Create Multigraph** or by right click menu **Create Multigraph**. You can also drag the multiselection by mouse, move the cursor to the plot page, push and hold the **Ctrl** button and drop it. The multigraph will be created. Without holding **Ctrl** individual graphs will be created.

Template Page

This page type is designed for display a predefined set of data cells from **one** measurement point. For example, create template page and drag data cells ISO RMS, ISO SPEC and ISO TIME from tree into template page. If you then click to next point which contains data cells with same names and quantities, then graphs in template will be filled with data from this point. Used data cells must be from one measurement point.



If you have created the plot page and you have put the graphs into, then you can save this page as template. The templates functions are in **Report** tab, **Report** section. Use the **Save as template** function to save the page as template.



Use the **Report/ Report section/ Open** to open the template again.

Report Page

See the Reporting chapter.

Notes Page

The notes can be written in each tree item (Item Properties/ Notes). All notes from selected item and from all its children items are displayed in the Notes page.

Next functions for Pages

Use the mouse right click on the page name and the items menu appear.



Rename

Renames the page.

Print

Prints page.

Clear

Removes all graphs and cleans the page area.

Close All

Closes all pages except Preview and Notes.

Properties

Show message with information about the tab type.

Close

Closes one page. Click by middle mouse button on the page tab is another way to close the page.

Summary item

This function enables to create quickly the pages (according to data cell selection), which contain same type of data cell and physical quantity. DC data cells are exception, they are grouped in one page.

Copying of the graph to clipboard

To copy the graph as a bitmap to the clipboard do the right mouse click on the graph and select the option *Export/Print->Copy to clipboard*. The other option is to use Ctrl+C (graph needs to be active).

Drag and Drop the Data Cell to Drawing Area

When you created new page then use the mouse for selection of data cells and drag and drop them to the drawing area.

If only one data cell is dropped to page, then one window is created for that cell.

If more data cells, which are the same type, are selected in the tree, then two options are available:

if they are dropped by mouse to the page, then the new window will be created for every cell,

if "Ctrl" is pressed it will create one Multigraph(if available) instead of separate windows

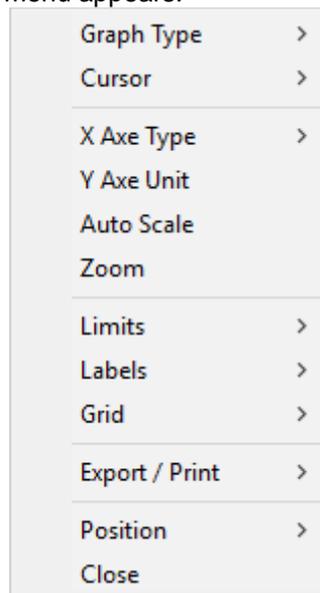
if the Create Multigraph command is used (mouse right click menu on any selected item), then all graphs are drawn in one window. It enables to work with cursor, zoom and other properties together in all graphs.

If more data cells, which are not the same type, are selected in the tree, and dropped by mouse to the page, then the new window will be created for every cell.

Static Data Cell Graph

If the static data cell is selected then the trend graph appears.

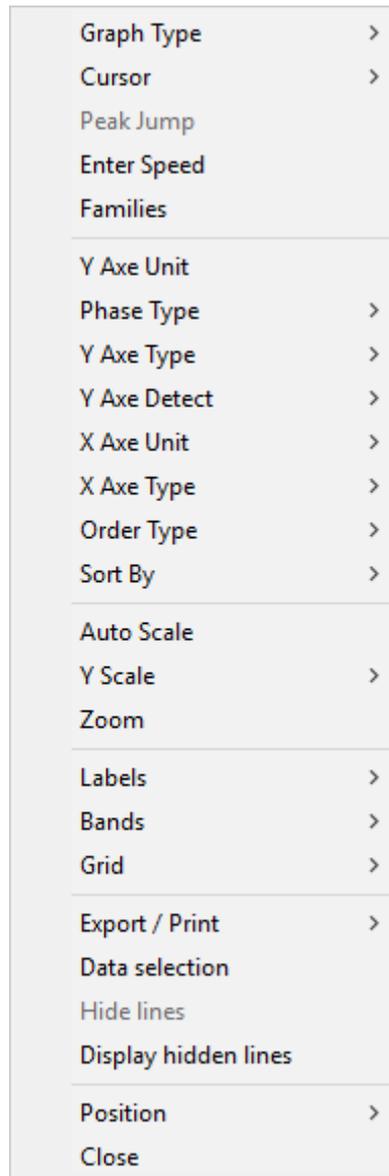
Use the right click on graph and next menu appears.



See Graph chapter for details.

Spectrum Data Cell Graph

Use the Preview page or drag and drop the spectrum data cell to new page. Use right click and the menu appears.



The special items only are described:

Locate Peak move the single cursor to some position and select the Locate Peak function. The cursor will be moved to the nearest exact peak position. The algorithm is based on FFT features and finds the position also between lines. It is useful for precise detection of speed.

Enter Speed enables to enter the speed value to the header of spectrum data. This place has the most priority level for data acquisition. If the cursor is used, then its position is offered.

Families see Families chapter for details

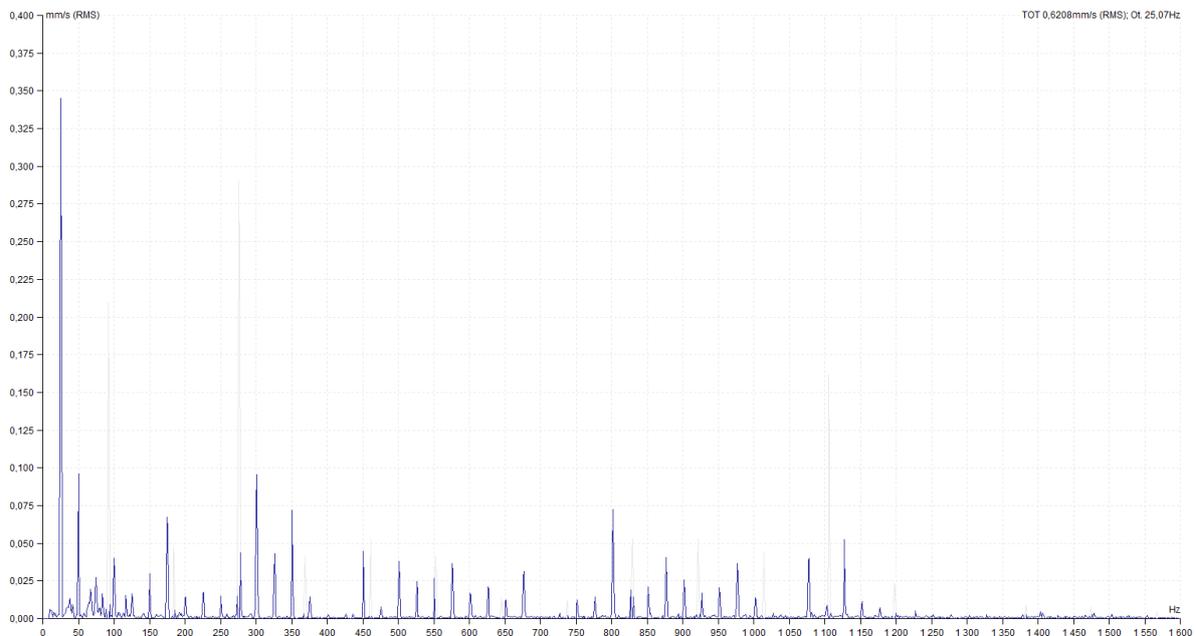
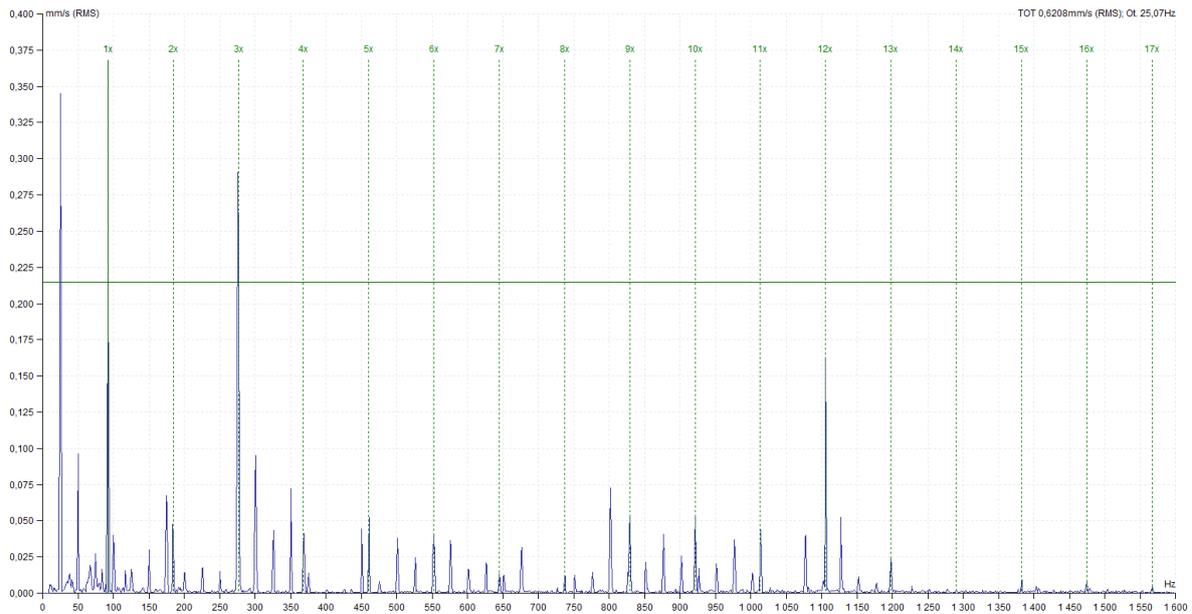
X/Y Axe Type to switch between the types of axis (linear, logarithmic, decibels – just for Y-axis)

Phase Type ranges (-180, 180), (0, 360) and AUTO are available. The AUTO creates special range without graph oscillation between top and bottom of scale.

Labels See Labels in Graph chapter for details.

Data Selection the list off all readings appears and you can do the selection.

Hide Peak(s) If any cursor type is on, then this function hides all lines under cursor frequencies. It means, that all harmonic frequencies are hidden when harmonics cursor is selected. Using of sideband or delta cursor works similarly. Hidden frequencies are drawn in grid color.



Display hidden peak(s) switches off the hidden peaks and all lines are visible again.

Fine cursor movement between lines

In case of harmonic cursor or sideband cursor use, main cursor movement according to existing spectrum lines can be a restricting factor. If the real rotation frequency lays between two frequency lines we cannot achieve correct position of harmonic components. The higher multiple harmonic component is, the higher difference from the real value we get. The DDS program solves this situation by the main cursor movement between existing frequency lines.

The first method is positioning the cursor by arrows. If you use the right/left arrows only, the cursor moves with corresponding measurement step. When you use these arrows with the **Ctrl** key pressed the cursor movement is 10 times finer. This allows precise placement of the harmonic component on the corresponding spectrum peak.

The second method solves the problem from the opposite side but with the same result. If there is necessary to place e.g. 10th harmonic components to specified spectrum position, drag it by the mouse and place it. The main cursor position is then changed proportionally. You can work the same way with the sideband cursor.

Default cursor

When no cursor is displayed in spectrum graph, then you can click the left button on required position. The cursor selected in Tools/Globals/All graphs/Cursor/Default spectrum cursor will be displayed. Position of cursor is defined by mouse position and the Locate Peak function is automatically applied.

Quick switch to the sideband cursor

If there is a cursor in spectral graph, hold SHIFT button and use left click in graph on required position. Cursor is changed to sideband cursor and first sideband is moved to mouse position.

Waterfall

This plot works with spectra.

Maximum number of readings

The maximum number of readings in waterfall is defined in Tools/ Globals/ All Graphs / Waterfall. If e.g. this number is 32 and you select more recordings (e.g. 320) then only 32 readings will be displayed (each 10th). The "filtered" is written aside from Y unit.

Properties

You can control the properties of the plot by the mouse. We need to define several positions for next explanations. Every axis has the beginning (min value) and the end (max value). We will use following positions: Xmin, Xmax, Ymin, Ymax, Zmin, Zmax.

Xmin, Ymax, Zmin Move the cursor to this point. You can (drag and drop) change the size of Y axis. When you move the end point, the % of max size is displayed.

Xmin, Ymin, Zmax you can change the size of Z axis and its angle.

Xmax, Ymin, Z anywhere You can look the times of readings. In compressed view case you look the time intervals which are averaged to one spectrum.

Cursors

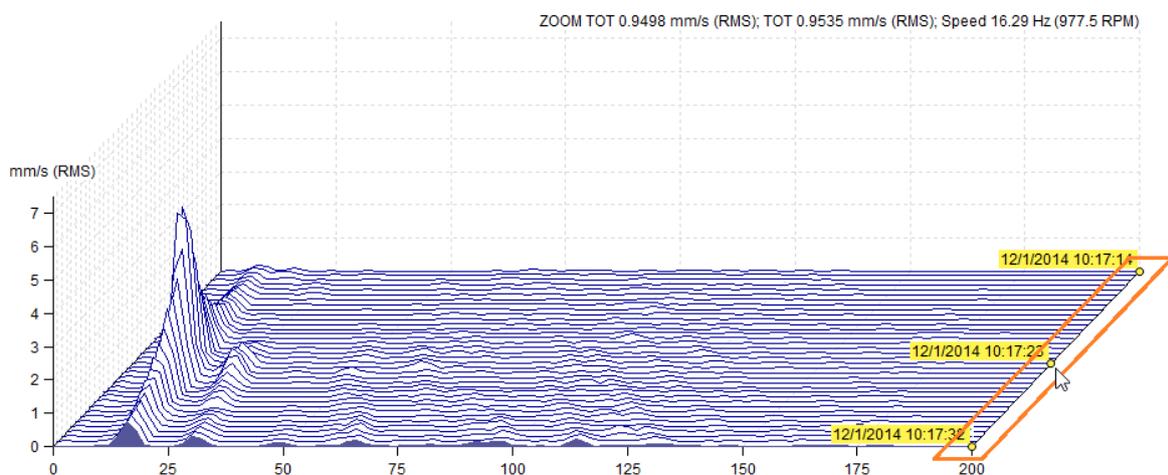
All cursors work also in waterfall. Additionally you see the cuts through all spectra. If you use the delta cursor, then the delta cut is drawn in cursor position.

Draw Style Outline or Gradient

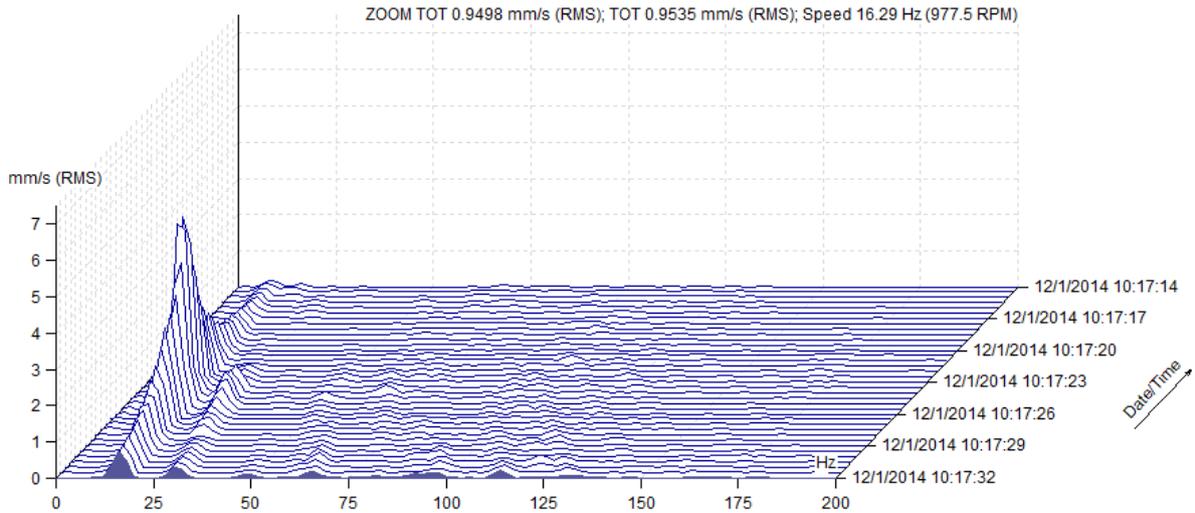
Two draw styles are available for waterfall. Set required style in Global Settings / All Graphs / Waterfall / Draw Style.

Z Axis Labels

Labels of Z axis are displayed when you move mouse cursor nearby to end of X axis of one graph (e.g. spectrum). The first and last label are always displayed and label closest to mouse cursor.



If you want always to display Z axis labels, set the option in the global settings (Global Settings/tab All Graphs/section Waterfall/Always Display Z Info) to **on**. If this option is on, the labels are displayed until there is a free area.



Amplitude + Trend

This plot works with spectra.

The amplitude spectrum is drawn in the top half and the trend overall value in the bottom half. Trend is displayed over the time scale on x axe. Initially the overall values are displayed in the trend.

Use the delta cursor to define different frequency range.

If the single cursor is displayed, then the trend on cursor frequency is drawn.

If bands are defined, then their trends are drawn. Use the band cursor for selection.

Amplitude + Trend (Amplitude / Speed)

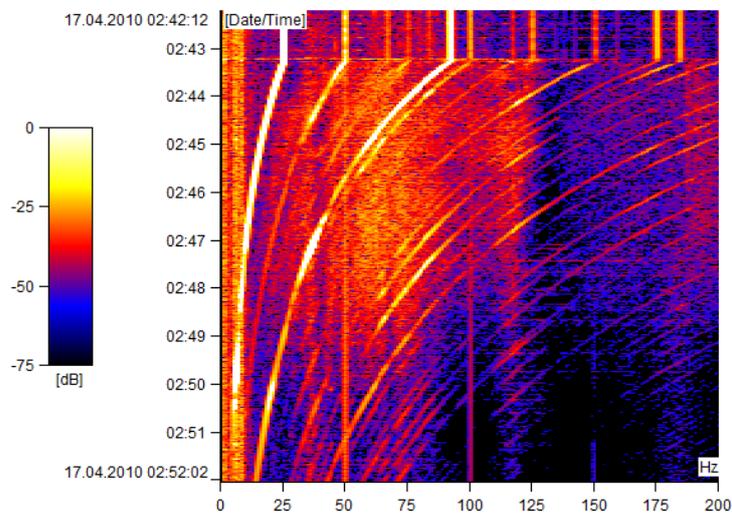
This is option of previous paragraph. When the speed is measured together with vibration, the trend can be displayed over the speed scale on x axe.

Amplitude Stacked

Several spectra are displayed in one window. Use the mouse or arrows to change the selection. All functions like cursor operation, zoom, ... will be done at all spectra at once.

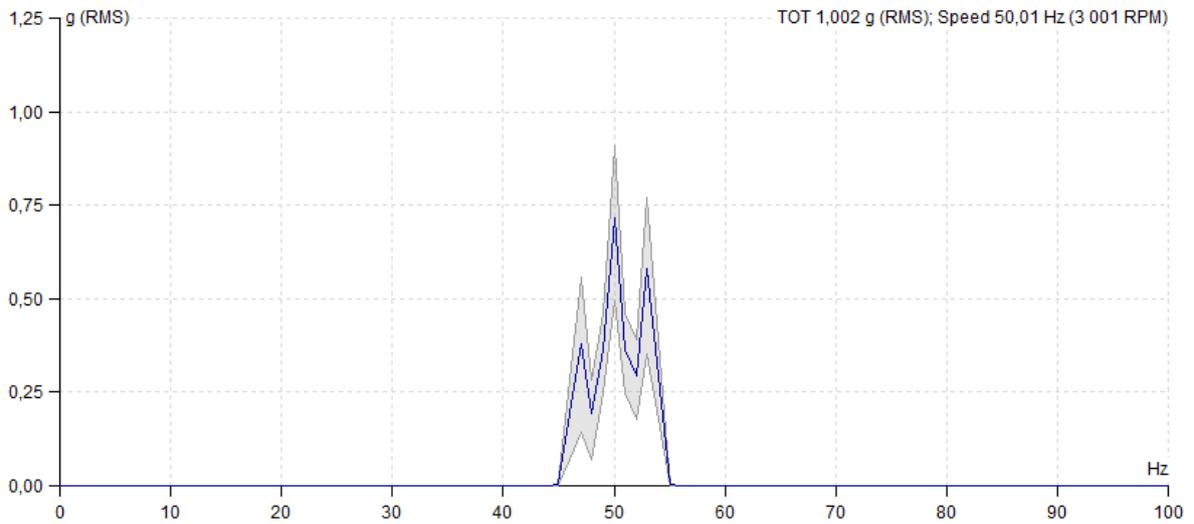
Spectrograph

Two-dimensional (2D) graph of spectra. You can imagine it as the view to waterfall from the top. The color is related to amplitude value. To change the dB range, go to Global settings (Tools/Global Settings/Dynamic Graphs/Range[dB]) or do the right mouse at local menu graph (item Range).



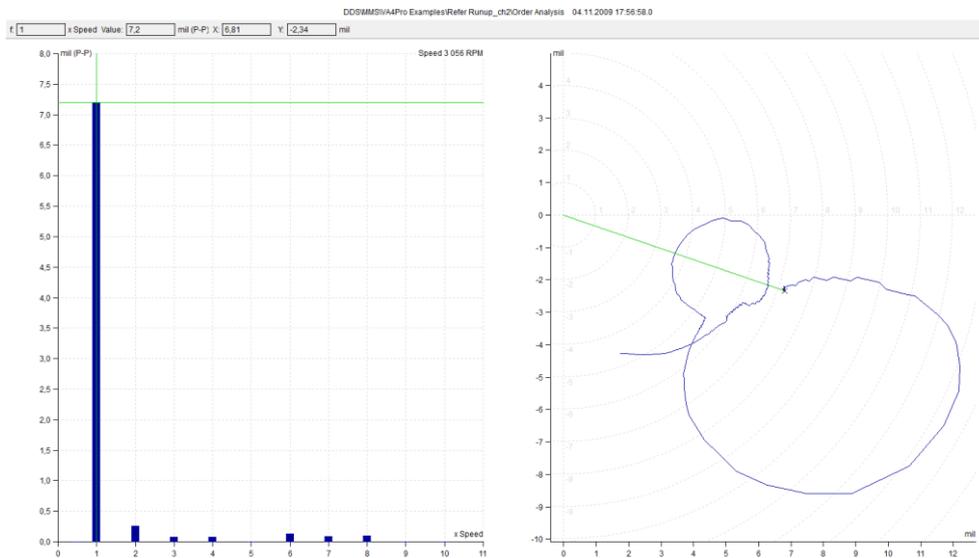
MinMax spectra

Spectrum plot from MinMax data cell draws also the minimal, maximal and average value.



Order analysis graph

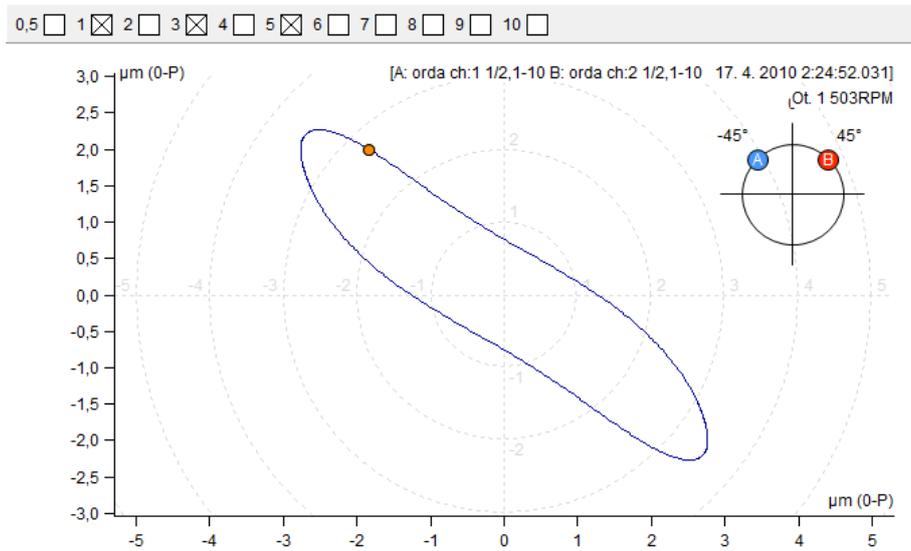
The graph is similar to spectrum graph. Most of functions are the same (Amplitude, Amplitude and Phase, Amplitude Stacked). Order analysis contains additional graph properties Polar, Amplitude+Polar, Amplitude + Phase Trend. The polar graph is always drawn from cursor position order.



Filtered orbit graph

It is available for Filtered orbit data cell. You can check the orders, which will be used for orbit drawing. The graph contains the mathematical extrapolation using pure sine waves (with the amplitude and phase of each selected order).

Tis graph type is also for two independent orders data cells. Select two cells with orders. Select function in Tree menu. See more information in Create Multigraph section.



Orbit Data Cell Graph

The right click menu contains similar items like time signal. The Graph Type contains special items.

Display offset display with DC value measured with data (on/off)

Graph Type

- Time A / Time B** time signal on selected channel is displayed
- Orbit** the orbit from two time signals is displayed (be careful of correct settings of sensor angles in 2D point)
- Orbit A B** orbit and both time signals are displayed together

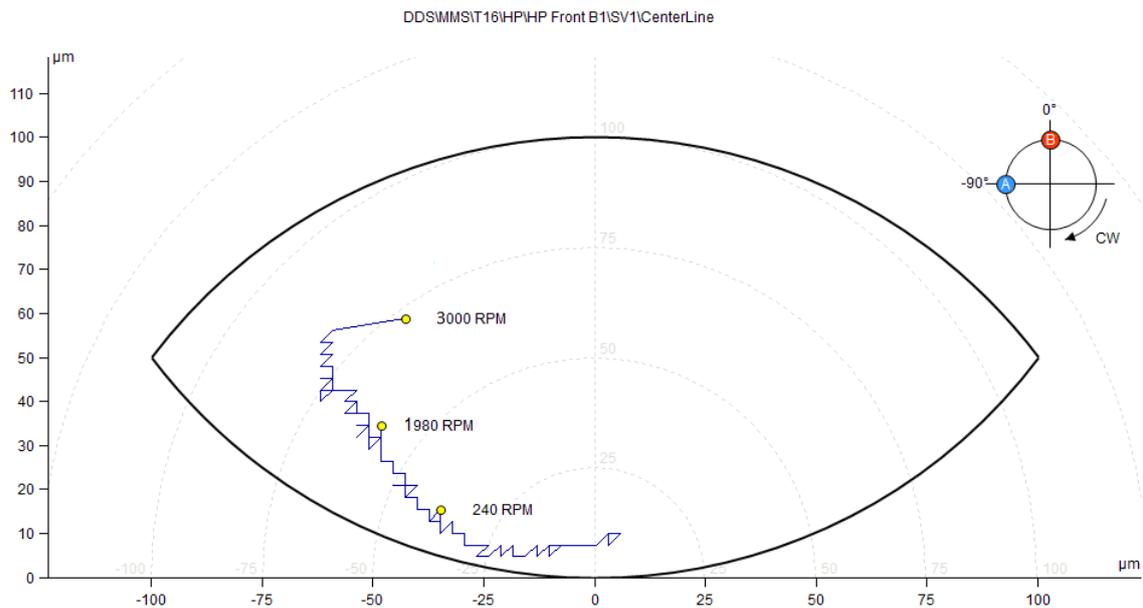
Center line graph

Graph Type

- Gap A / Gap B** Gap A and Gap B trends
- Center line** Gap A and Gap B in one 2D graph

Center line graph displays the real radial position of shaft in journal bearing. The bearing clearance shape is defined in **Other** tab in Properties window.

Use the double click to display the speed value in graph. Use the double click again to remove the mark.



FASIT Graph

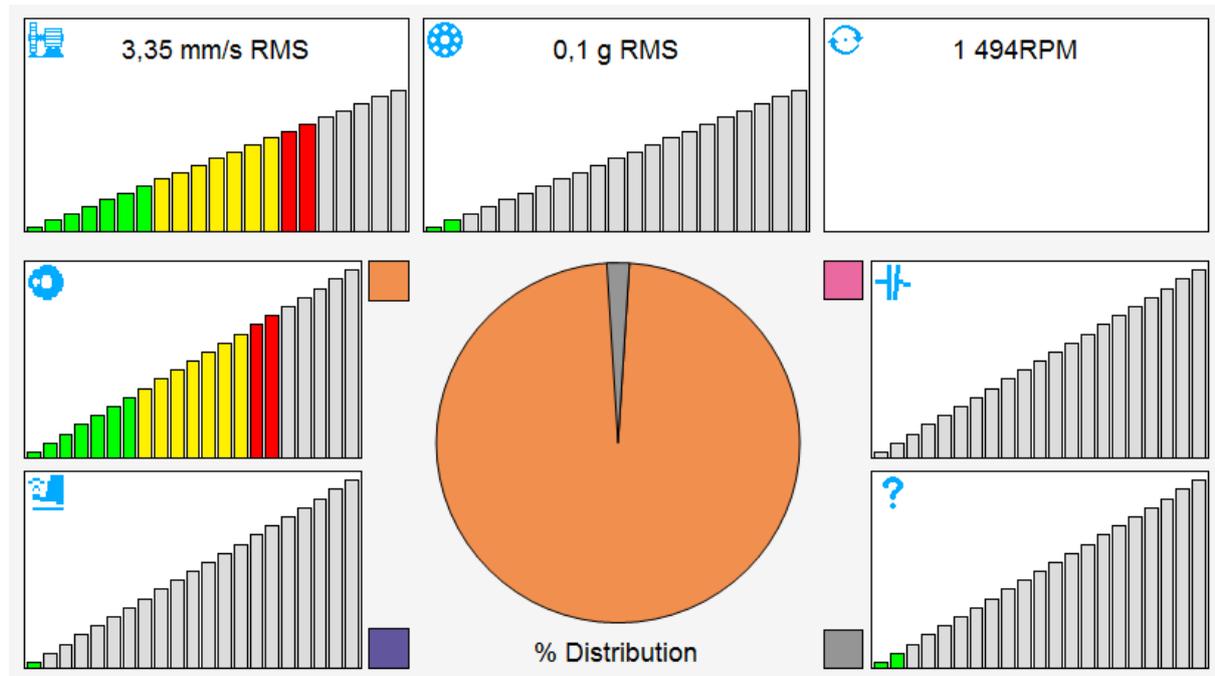
FASIT means **FA**ult **S**ource **I**dentification **T**ool. It helps to find the source of problem. The graph contains several parts. Each partial bar graph contains the alarms colors (see Tools/ Setting/ Alarms)

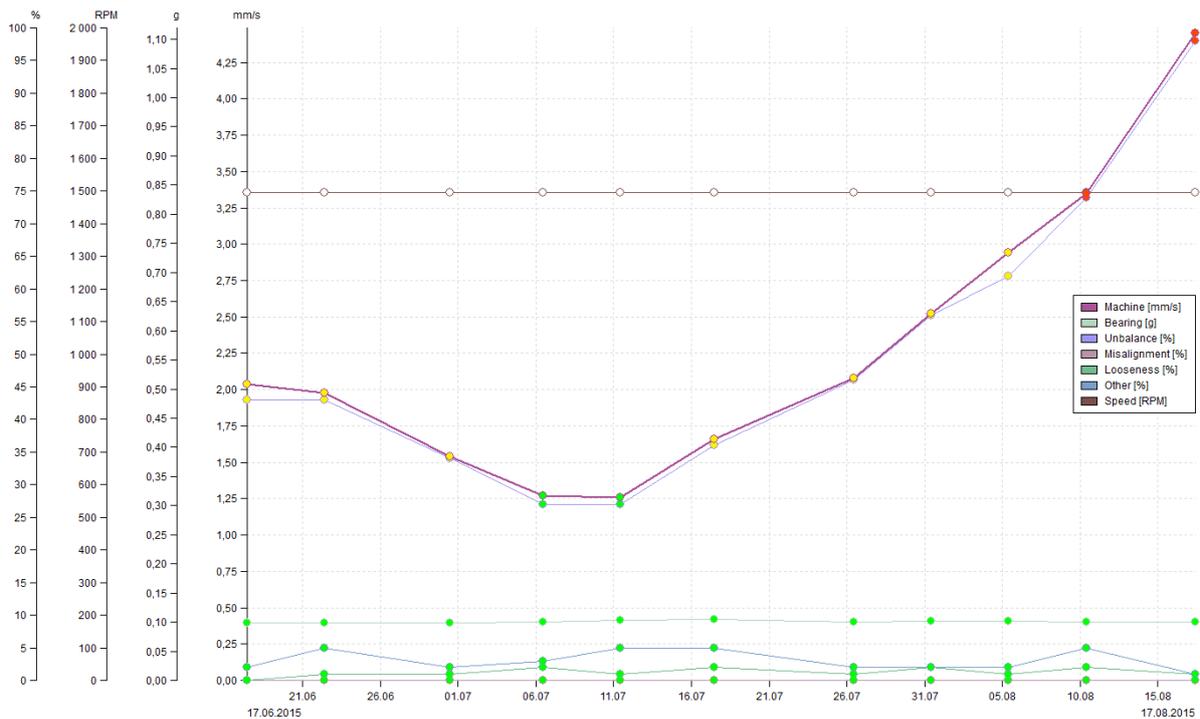
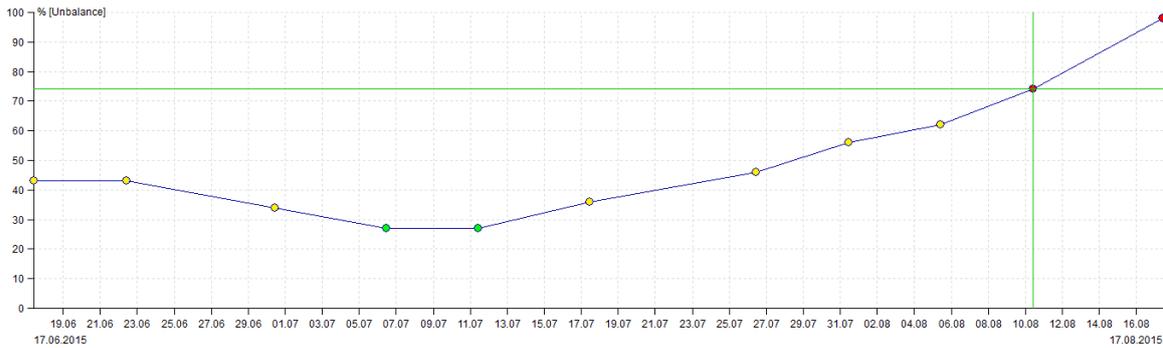
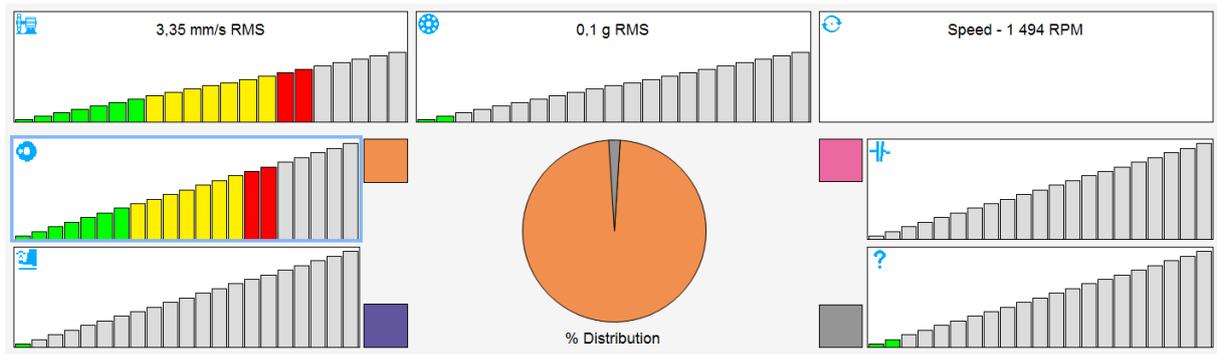
The color tells you the severity of problem (failure). The circle contains sections, which are related to probability of every fault source.

-  The total vibration severity of machine
-  Bearing condition
-  Speed (value only, no severity indication)
-  Severity of unbalance
-  Severity of looseness
-  Severity of misalignment
-  Severity of other sources

Graph Type

- FASIT** only FASIT displayed (the same view as on instrument screen)
- Fasit+Trend** FASIT + the trend of selected parameter, use the mouse click for selection
- Trend** trends of all FASIT parameters in one multigraph





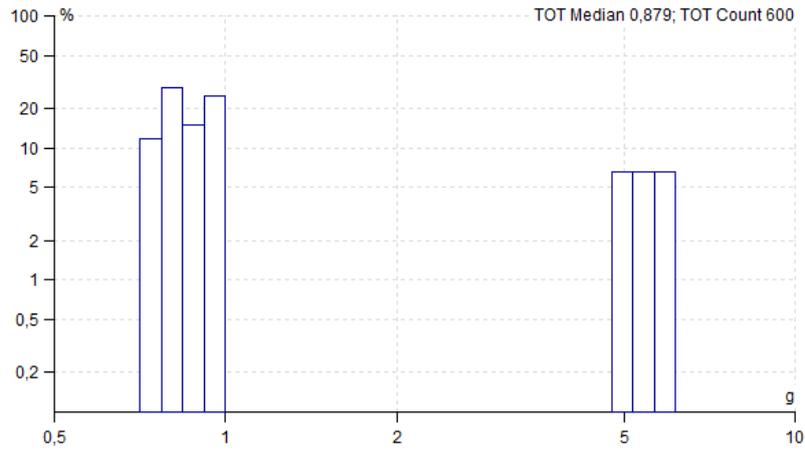
Density Graph

Density is statistically processed trend of one value(static) readings. Value range is split into intervals and density traces how many times the reading value occurred in each interval. It is roughly similar to what is known as histogram in photography.

Graph Type

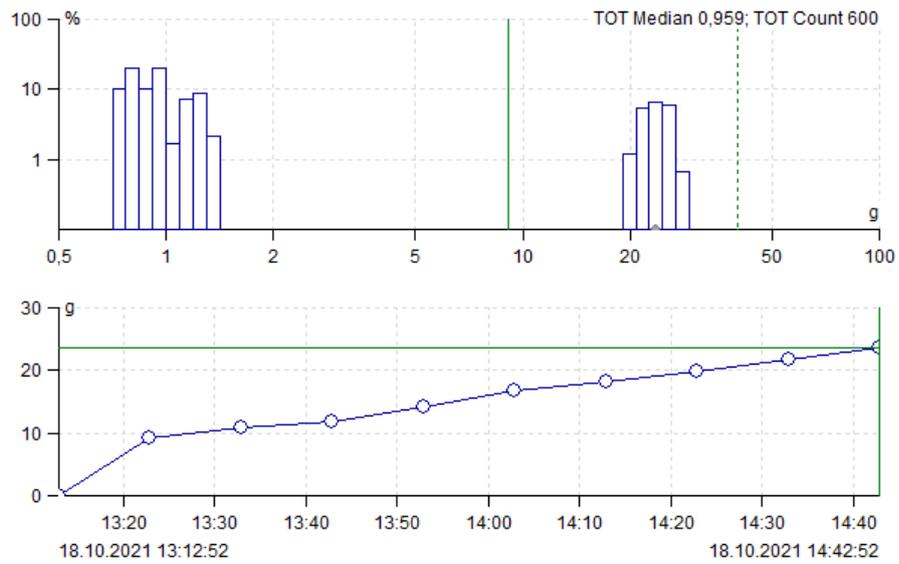
Amplitude

On X axe are represented intervals and on Y axe is a bar displaying the proportion of how many times the values from interval appeared in all readings. On top right corner of graph is also the information about median from all readings and their count.



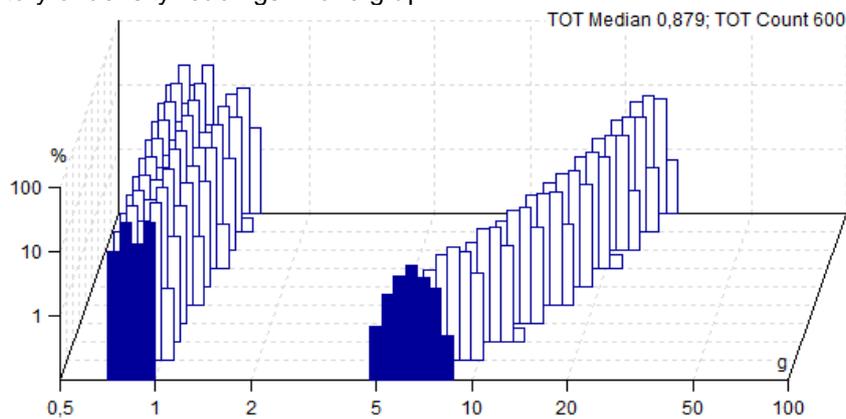
Amplitude + Trend

Is available only if more than one density reading is available. On top is displayed the same graph as in type above and on the bottom is displayed the trend of values. These values are calculated according to a selected cursor. If no cursor is selected the trend value is a median from whole density measurement, if delta cursor is selected the value is median values only from selected interval(s) and case the single cursor is used it tracks only the percentage of the selected interval.



Waterfall

Displays the history of density readings in one graph.



Graph tab

The main target of vibration diagnostics is to recognize the condition of machines. The graphs drawing and evaluating is the main tool how to do that. Especially checking of the trends is usually useful way for that.



Cursor section

Cursor section is contained in Graph tab.

Cursor Type

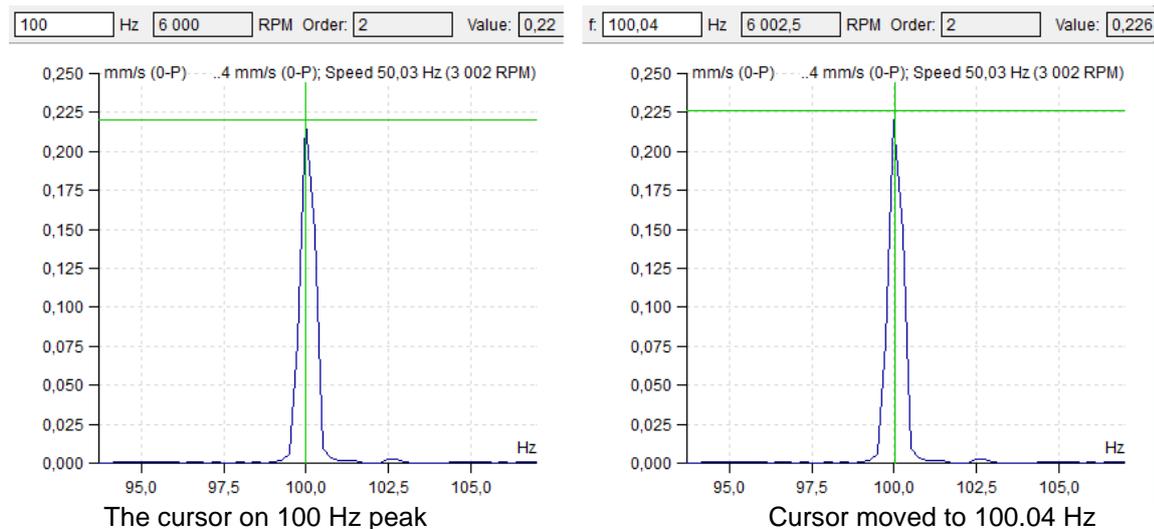


None	no cursor displayed
Single	one cursor line only
Harmonic	1X, 2X, ..., NX frequencies
Sideband	central frequency and sidebands in spectrum
Periodic	for frequency evaluation in time waveform
Delta RMS	RMS, 0-P, P-P value of delta frequency interval in spectrum (related to detect type)
Delta Max	max peak value (highest line) of delta interval in spectrum
Delta 0-P, Delta P-P	amplitude ranges for time signal
Band	band value in spectrum

Locate peak



The spectrum contains lines with some resolution, for example 1Hz. But the real speed can have any value, not only on these lines. The FFT has the property, which enable to determine exact speed value. Place the cursor to the peak line in spectrum and push Locate Peak. It finds the accurate peak position (frequency) in spectrum and the amplitude on that frequency is displayed as well. If the sideband cursor is selected and there is a peak near sideband 1x the delta is adjusted as well.



Find Harmonics



Detects harmonic families in spectrum and places there a harmonic cursor. If more harmonic families were found, repeat the button pressing and harmonic cursor will toggle between them.

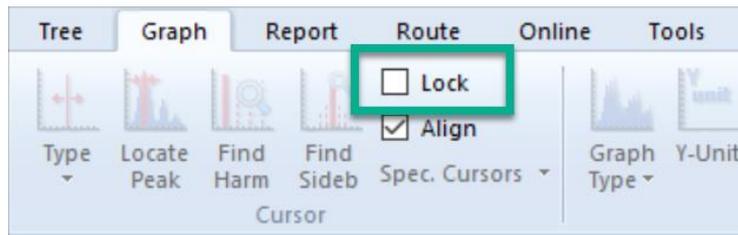
Find Sidebands



Finds sidebands with given delta f in spectrum. If more sidebands were found pressing this button again toggles between them.

Lock

Check the Lock checkbox.



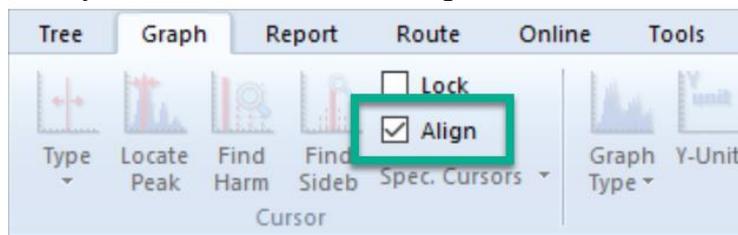
When more graphs of one type are plotted in the page (e.g.6 spectra cells) then you can move with cursor position in one graph and the cursor moves also in other graphs. The movement is not continuous, but all new positions are plotted after you release the mouse button.

If you change cursor type then selected type is applied to all graphs.

If you uncheck the Lock, then each cursor is separated from the others.

Align

This feature is turned on by default. The checkbox for Align is marked.

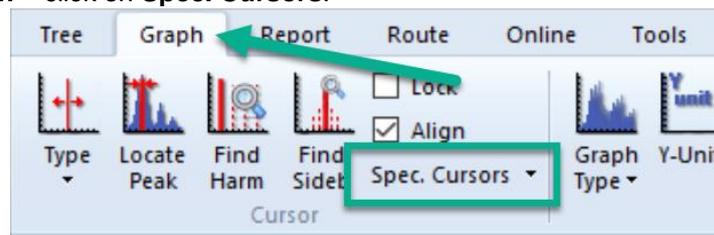


The same (similar) time of reading is kept on displayed graphs. E.g. when there are displayed 2 graphs: trend of overall values and spectrum and we move with cursor in trend of overall values, the reading with same (or nearest similar) time will be displayed in spectrum. It works the other way around as well, when we change the spectrum graph, the cursor in trend of overall values is changed accordingly. It works for both static and dynamic graphs.

Spec. Cursors

It is possible to add next cursors for the spectrum graphs. It is necessary turn on some cursor in the spectrum graph to use this function.

Then go to tab **Graph** – click on **Spec. Cursors**.



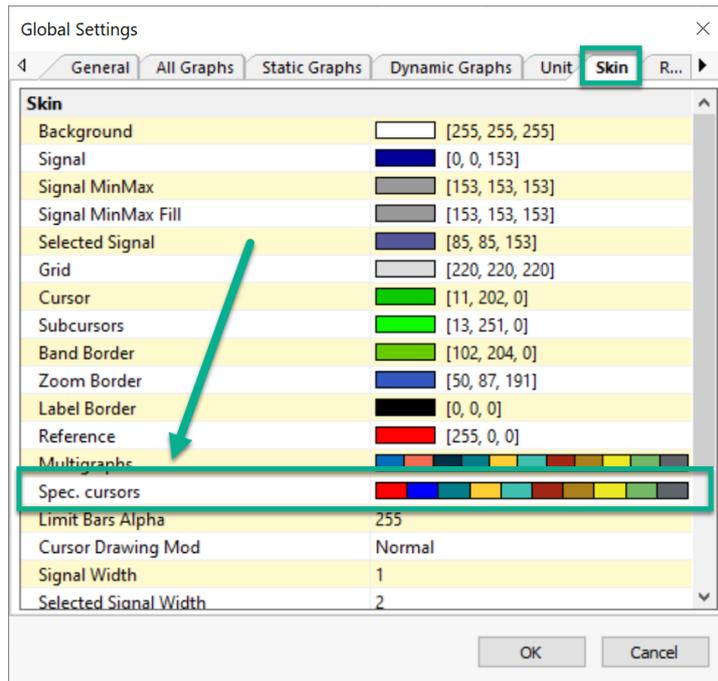
More options are shown:

Add – adds a new cursor the same type as the active one.

Switch – switches between the cursors (changes the active cursor).

Remove – removes the active cursor.

Cursor color is changed in DDS settings. Go to **Tools** tab – **Globals** – **Skin** – **Spec. Cursors**.



Setting section

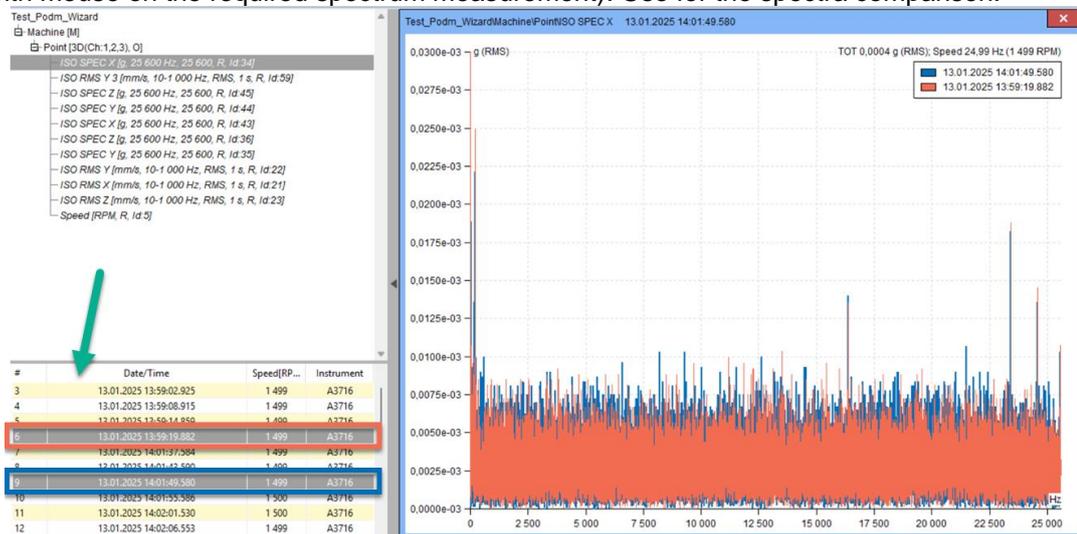
Setting section is contained in Graph tab.

Graph Type



For spectra only.

- Amplitude** single spectrum standard graph
- Amplitude + Phase** spectrum graph contains amplitude and phase
- Amplitude + Trend** spectrum graph contains amplitude and trend of cursor or overall value
- Amplitude Stacked** several graphs in one window (the max number is defined in Globals / All Graphs / Other / Graph Count in Stacked)
- Waterfall Spectrograph** more spectra plotting in 3D
- Overlay** more spectra from one data cell shown in one graph. You can select how many spectra you want to see in this graph – select them in Data List (press Ctrl + click with mouse on the required spectrum measurement). Use for the spectra comparison.



Y-Unit



Next window appears. The selection of Y axis unit. Integrated units of original reading are available for spectrum.

X-Unit



Selection of X axis unit. When you push the down arrow, then you can select unit from the list.

Quantity



It enables shifting between acceleration, velocity and displacement.

Set Speed



The manual entry of speed to the reading data head. The cursor position is offered and can be manually changed. Explained more in **Set speed**.

Grid



It enables to draw several types of grids.

Band View



If band is defined, then three display modes are available - Off, Basic, With Limits

Trend Limits



This checkbox switches the limits displaying on/off. It is available only for static data cells, where the trend graph is possible.

Zoom



Standard zoom definition.

Mouse zooming is also available. When you operate with mouse in the plot, then both axes are zoomed. When you operate below the X axis, then only the X zoom is applied. When you operate on the left of Y axis, then only the Y zoom is applied.

The mouse zoom works normally when the cursor is off. If the cursor is on, then the mouse has the cursor priority. The mouse zoom is available with CTRL button on keyboard.

When you place the mouse symbol inside the plot area, then also the mouse wheel (roller) can be used for zooming.

Autoscale



Cancellation of zoom.

Data Selection



The list of readings appears. You can make the selection.

Families



See Families chapter for more information.

Create Multigraph



Multigraph is the set of graphs created from several data cells which can be compared to each other. The multigraph behaves the same way as the normal graph, but there are several functions which enable to compare the graphs easily.

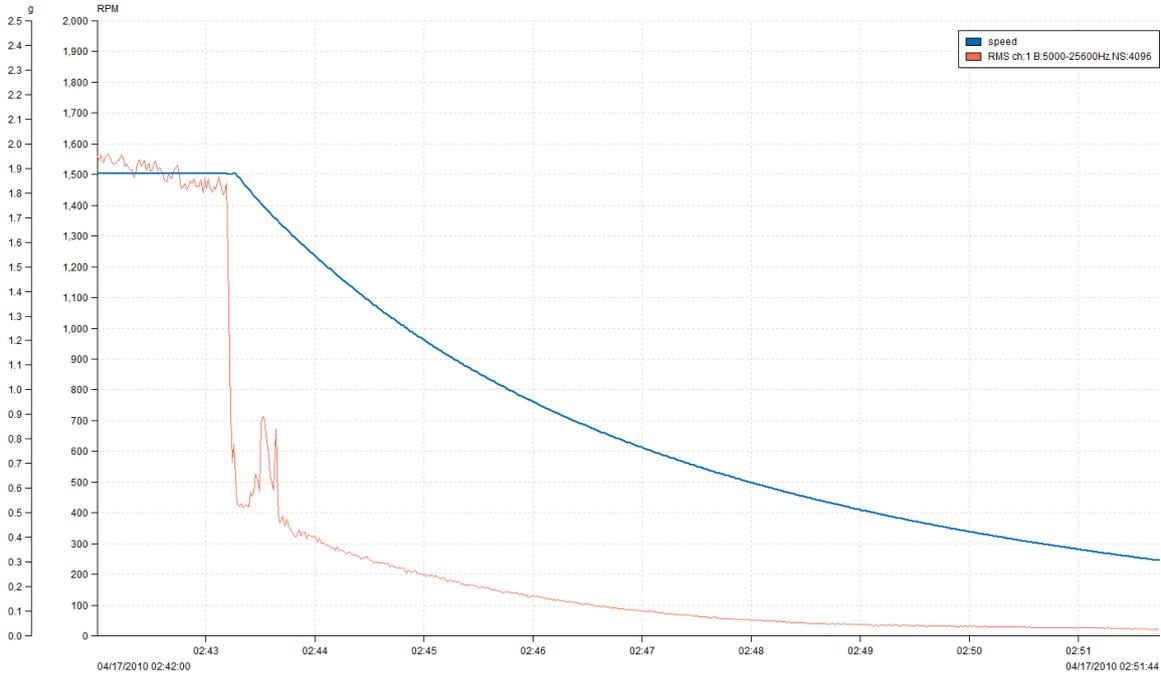
Basic features of multigraph are following: certain views are changed for easier comparison of readings from data cells, actual reading of cursor values from all viewed data cells, the zoom of axis is same on the axis with the same unit.

To create multigraph, choose the data cells from the tree (those which can be compared). Click on icon Create multigraph in section Graph or do the right click on tree and choose Create multigraph.

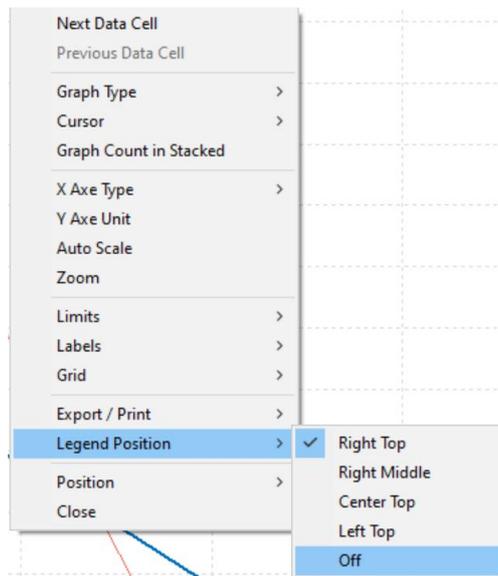
Multigraph of static cells

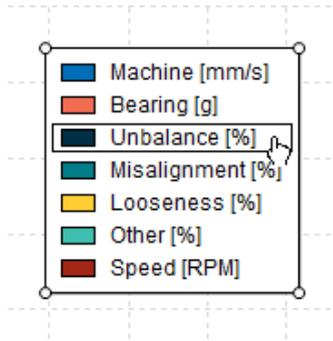
All basics functions of trend graph are same as for the usual graph.

Amplitude – trends are overlaid. There are axes with units on the multigraph left side. The active trend has bold line. You can change it by pushing Shift + Arrow Up/Down. The order of the y-axes is changed by active trend selection (the right y-axis always belongs the active trend). The maximum number of y-axes is set in *Global settings/All Graphs/section Other/Graph Count in Stacked*. If the limit is exceeded, the y-axis of active data is shown only.

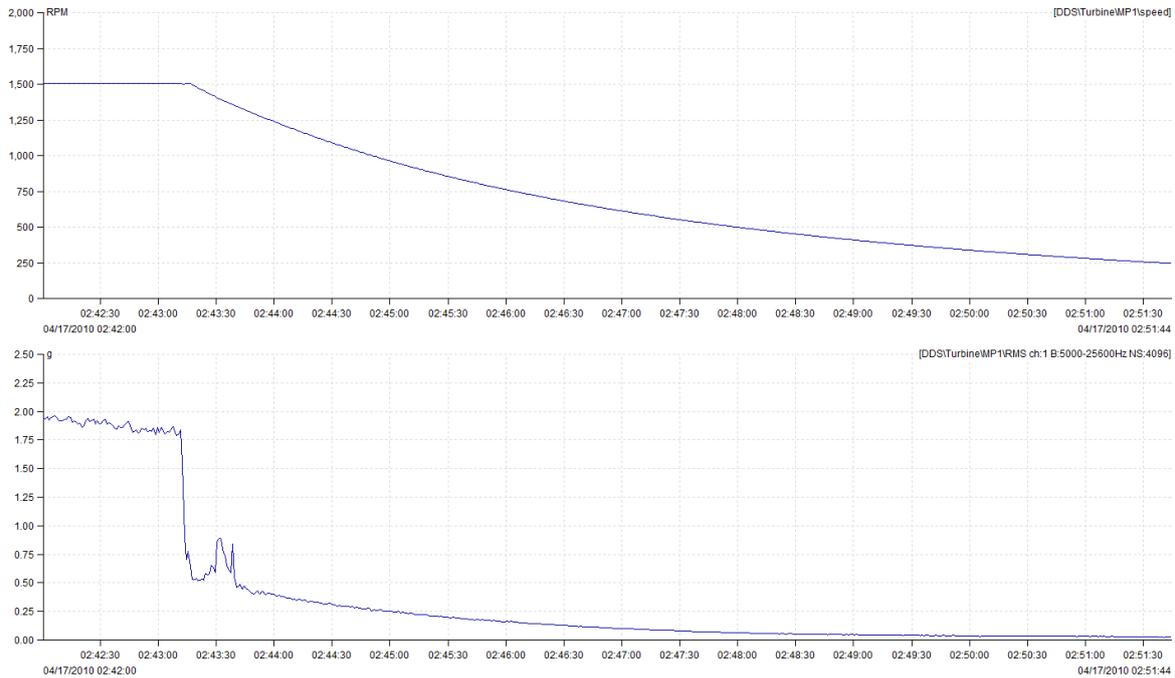


If you want to activate one trend in multigraph, simply click on trend name in the legend. If you want to change position of the legend in the graph, open context menu on graph (right mouse click) and select where the legend should be displayed (submenu Legend Position). You can also turn the legend off – it will not be shown in the graph.

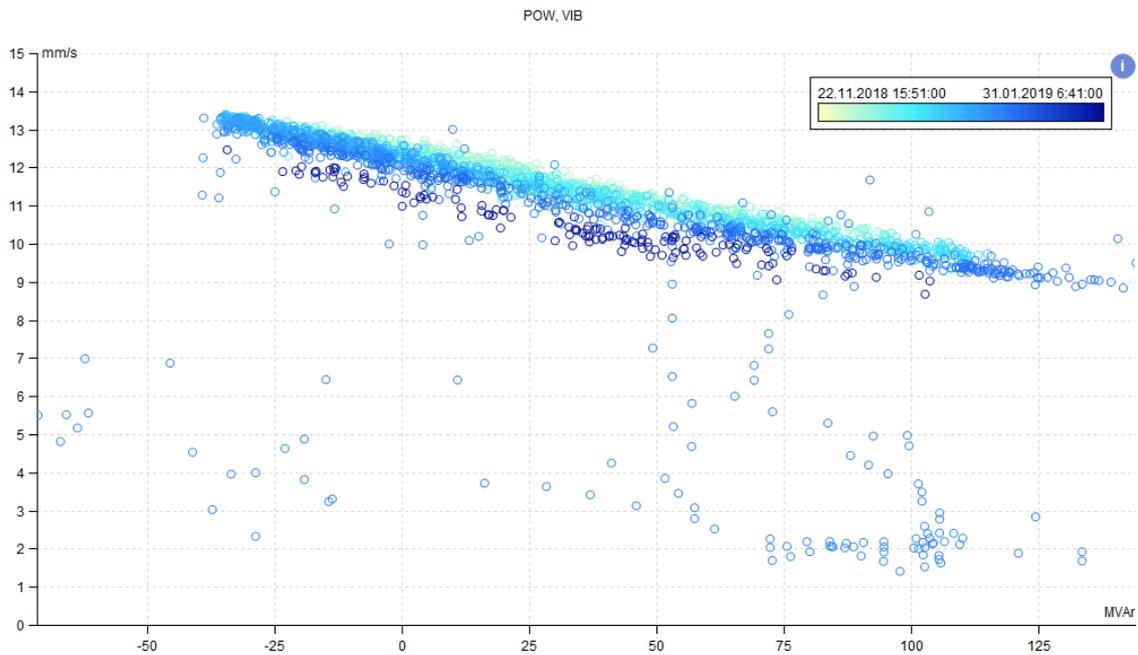




Amplitude Stacked - you can see the set of graphs in one window. Each graph represents one data cell. To activate the data cell, click on it with left mouse button or use Shift + Arrow Up/Down.



Y Unit Relation – this graph enables to evaluate relations between units on Y axes. E.g., if we have speed trend and vibration trend, we can show the graph showing relation between speed and vibration. The unit on X axe must be selected by user. If the data are not taken at the same times, the values are approximated. Time of measured values is represented by color gradient. The timeline legend appears, when you move the mouse cursor to “i” icon in the top-right corner of graph. In the image example you can see relation between vibration and power. Dark circles are the latest measurements, the lightest are oldest.

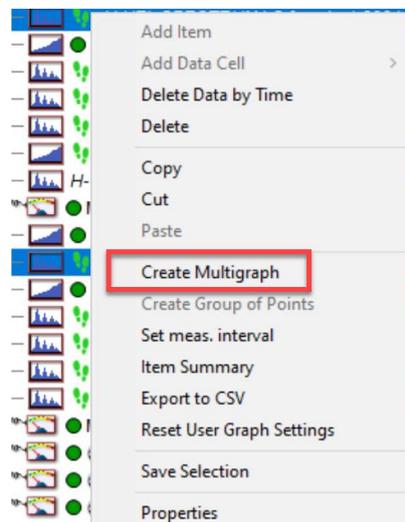


Multigraph of dynamic data cells

To create the Multigraphs from dynamic data cells, select several data cells and push **Create Multigraph** from main menu in tree section.



Or you can select data cells for multigraph and click with right mouse button – you choose option 'Create Multigraph' there.

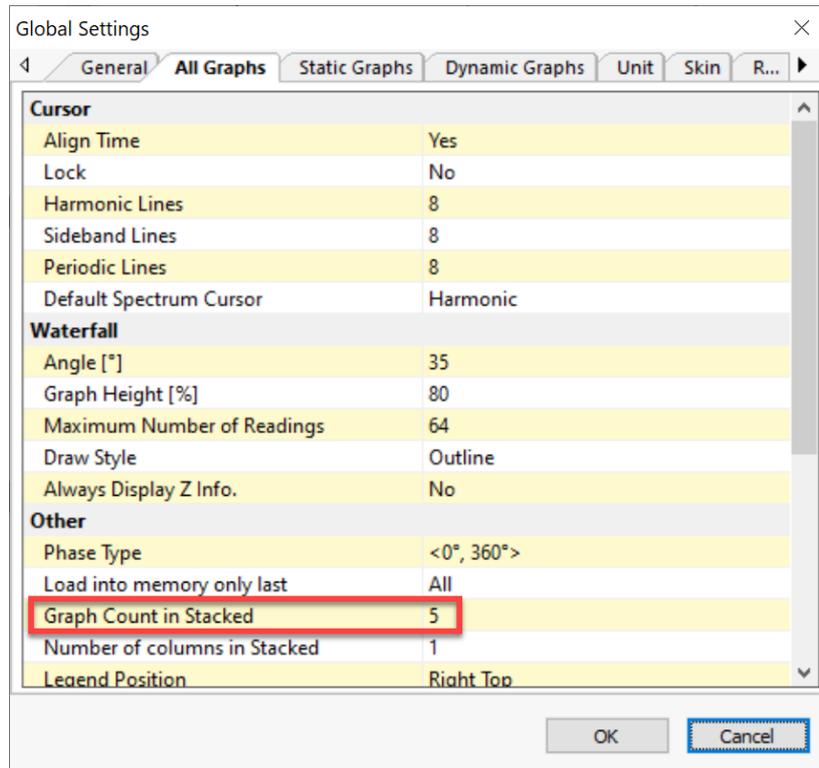


You can create the multigraphs just from the data cells which can be compared (same data type and same physical value).

For example, if you choose 4 spectrums and create the multigraph, you can select from following Graph type options.

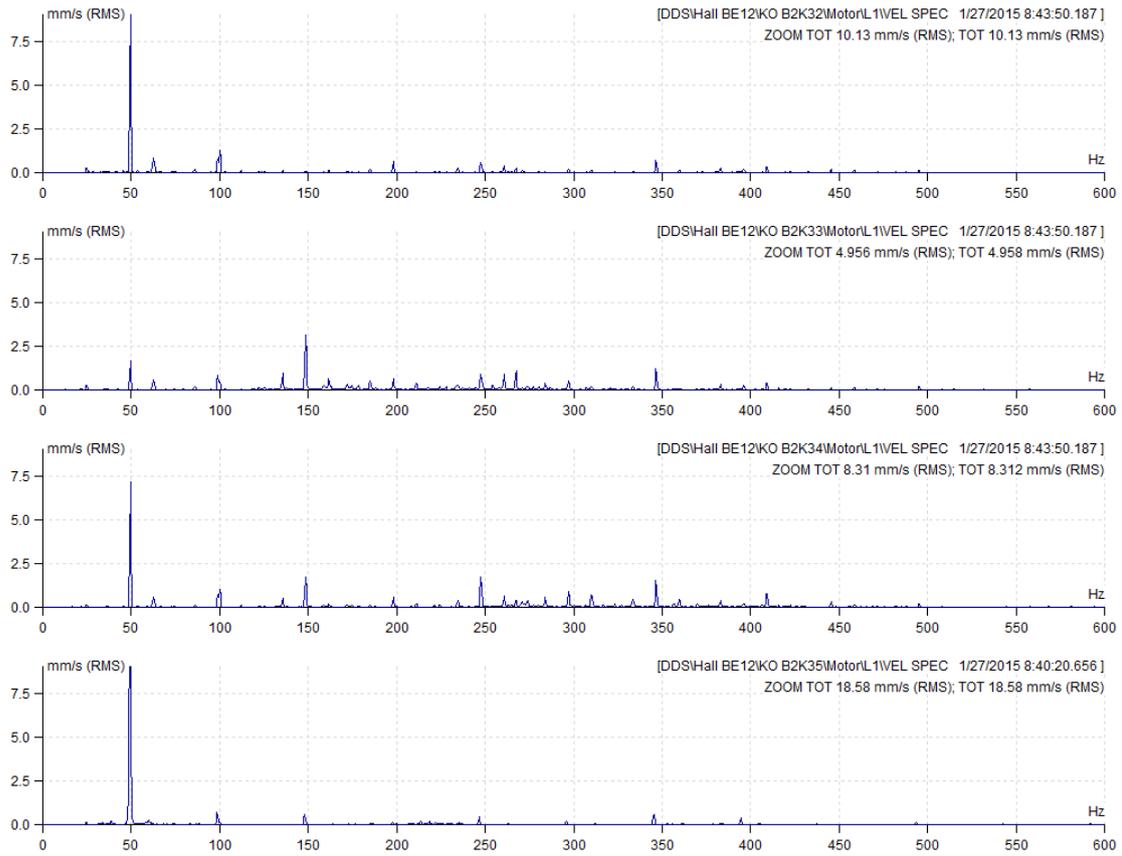
Amplitude – it shows the amplitude of just one selected (active) data cell. You can see the information about the active data cell in the header of the graph. To change the active data cell push Shift + Arrow Up/Down. To switch between the readings, use Arrow Up/Down.

Amplitude Stacked –the group of the several graphs is displayed in one window. Each graph contains reading of one data cell. The number of displayed graphs is limited by choice in global settings (General/All Graphs/section Other/Graph Count in Stacked).



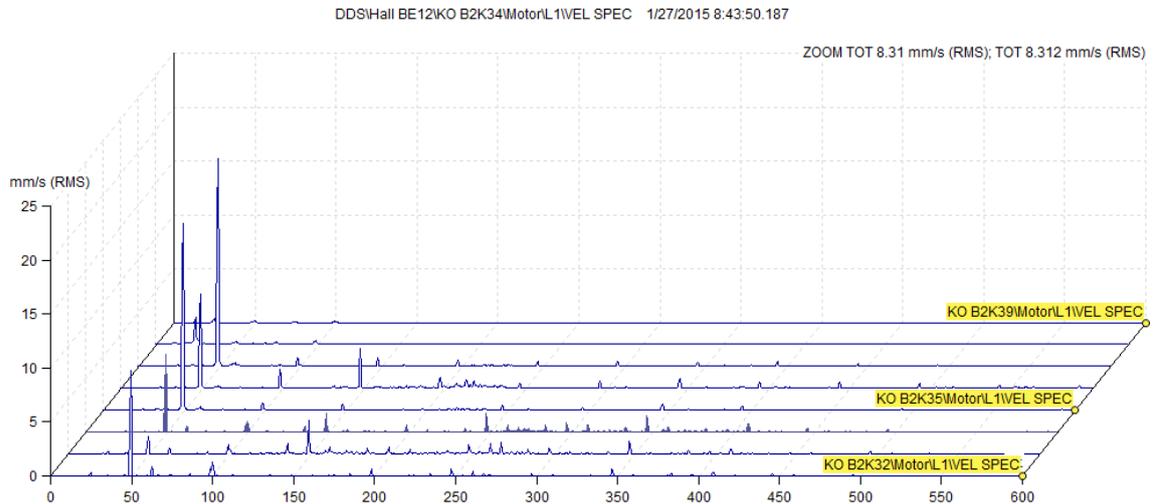
E.g., if you create multigraph from 10 data cells and the limit in global settings is 5, there will be 5 graphs displayed on the screen. You can view the rest of the graphs by changing the active data cell (Shift + Arrow Up/Down). Push Page Up/Down for faster switching between the data cells. It activates each n-data cell (n is the limit value from global setting).

Active data cell is the leading data cell (is it highlighted by border). You can switch between readings in leading data cell by pushing Arrow Up/Down button. The nearest time reading is chosen in other data cells.

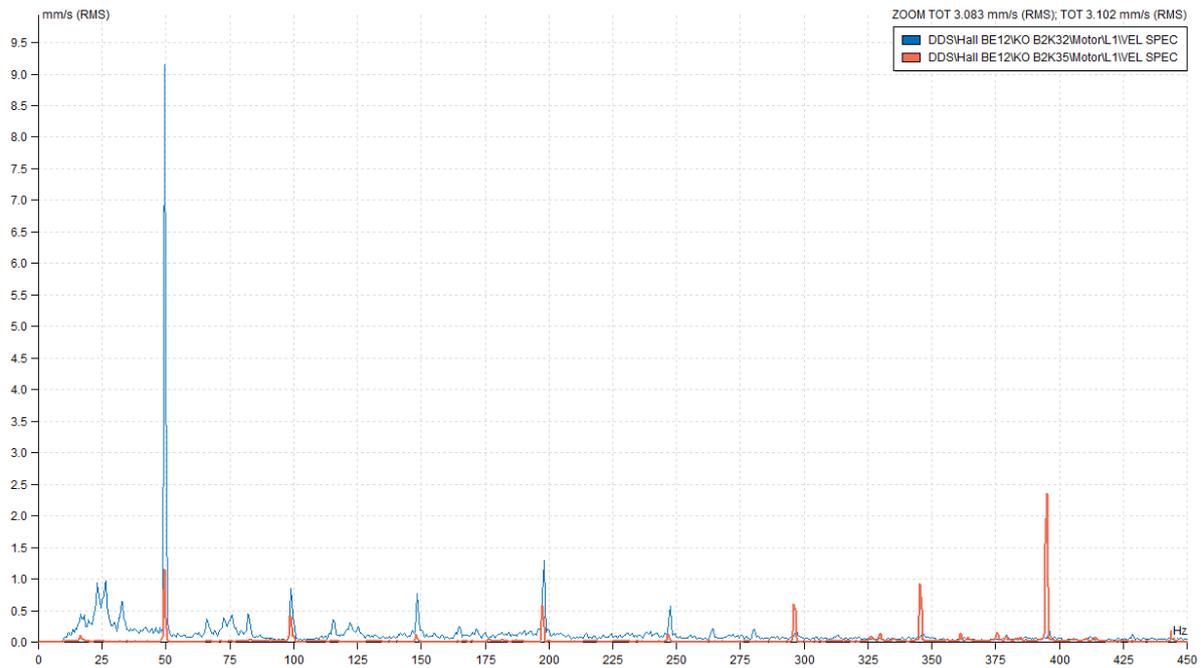


Waterfall – there is one reading of each data cell in waterfall multigraph displayed. To change active data cell push Shift + Arrow Up/Down. To switch between the readings, push Arrow Up/Down.

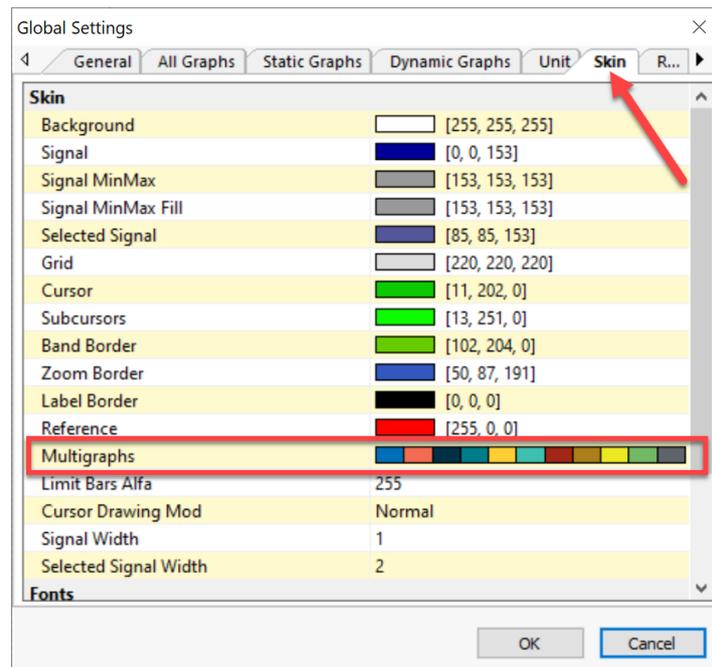
The information about active data cell is shown in header of the graph window. Information about other readings you obtain by moving the mouse beyond the end of x-axis of reading.



Overlay – display of spectra over each other (each one has a different color).



Colors of individual spectra can be set in Global Settings / Skin tab / Multigraphs.



Min/Max graph



It maximizes the size of the graph window or return it to the previous size.

Set as Reference



This function will set current reading as a reference. If it is a static value, the reference value will be the value selected by cursor. See Spectra data limits / Reference

View Reference

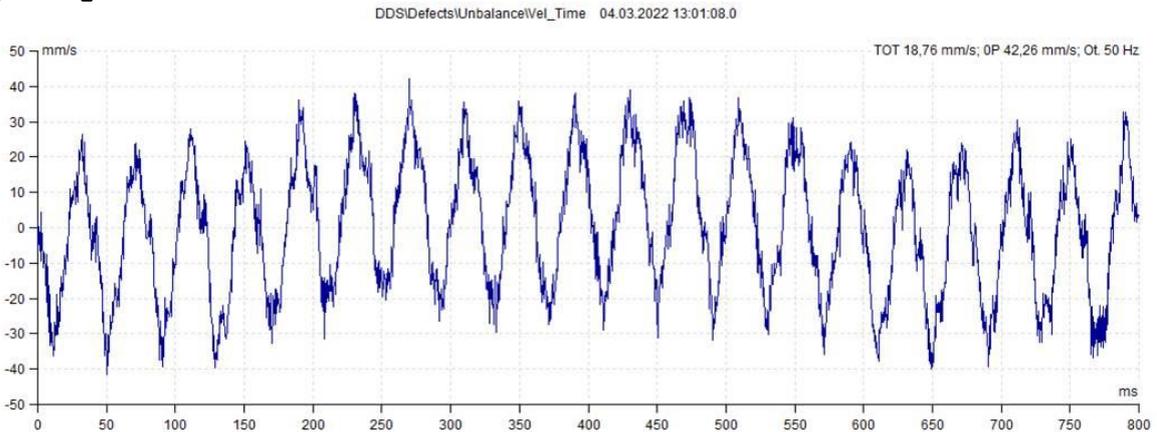
Quickly show/hide reference on all displayed graphs.

Autocorrelation

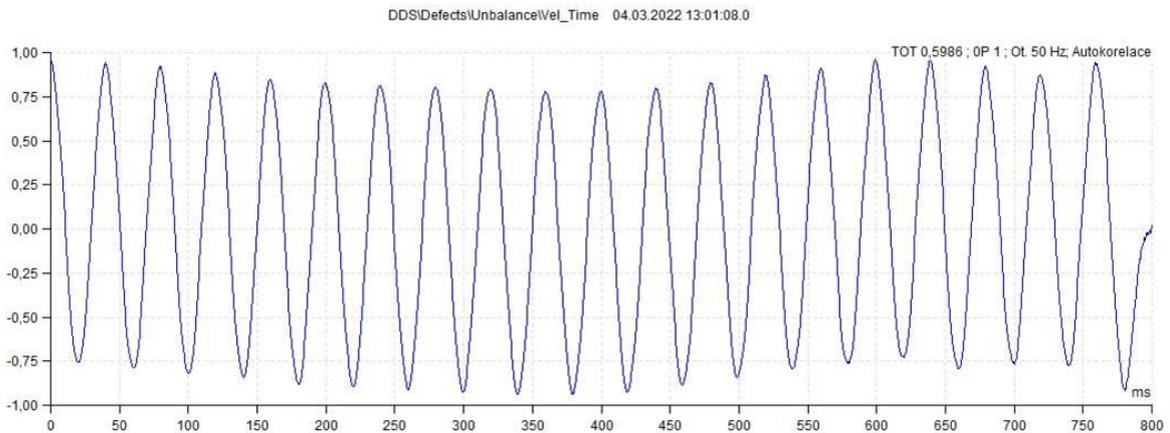
Autocorrelation is an analysis technique in time signals which can show repeating patterns and periodicity. Time signal is compared with a delayed version. Autocorrelation shows how the signal correlates with itself over time.

It is useful for filtering of random noise and displaying the periodicity in signals.

Original signal:



Autocorrelation:



Graphs section

Section is contained in Graph tab.

Tile

If you have open more than one graph, you can distribute all graph windows for better comfort.



Tile – distribute graphs in tiles.



Tile Horizontal – the graphs side by side.



Tile Vertical – the graphs above.



Cascade – the graphs into cascade from the top left corner to the bottom right corner.

Labels section

Section is contained in Graph tab. Please see the special chapter Labels in Graph for details.

Add To Cursor



Add user label linked to the cursor position. Cursor must be displayed.

Change Group



Displays labels defined in Labels and Bearing tabs in Tree Item Properties and change the groups (bearing, general, gear, vanes, off).

Machine labels are an excellent tool for recalculating speed frequencies in machines with gears. They also allow us to calculate gear mesh frequencies of gears and various fault frequencies of bearings. It does not matter which part of a machine has gears inside or which shaft has a bearing or bearings. With Machine labels, we can then show these frequencies in spectrum or time signal measurements. Most importantly, we can display frequencies measured or calculated anywhere on the machine in any single spectrum or time signal measurement in the tree of the machine. A fully comprehensive explanation is given in a separate chapter **Machine Labels**.

Scroll Lines



If more bearings are defined, then it scrolls them.

Display User

Display On/Off of user labels.

Delete All User

Removes all of the user labels in time signal and the spectrum.

Induction Motor



Displays FL with FL+/-FP sidebands on spectrum graph. Option is available only on spectrum measured in current or voltage.

Sound section

Section is contained in Graph tab.

Play, Stop, Loop



When the waveform or record graph is selected, then we can listen the waveform on headphones output. If the Loop is checked, then the waveform is replayed again and again until the Stop button is used. You can control the speed of playback (0.1x, ..., 10x)

Note: If there is delta cursor selected, DDS plays the sound only from the selected part.

Tab section

Section is contained in Graph tab.

Previous, Next



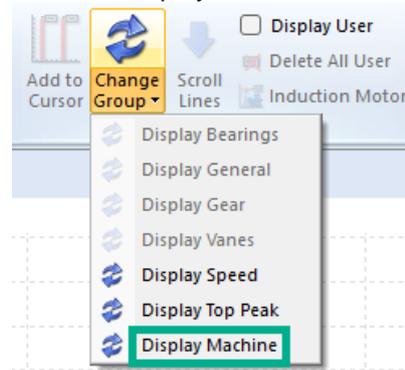
If more Tabs are opened, you can move along them by pressing Previous or Next button.

Machine Labels

Machine Labels in DDS is a universal tool which can show various machine frequencies important for diagnostics. These are speed frequencies, gear mesh frequencies and bearing fault frequencies.

Machine Labels approach is more complex than other label options. It can display frequencies related to any measurement point in any spectrum or a time signal (measured anywhere on machine). For example, we can display bearing fault frequencies from Point 8 in a spectrum measured on Point 1.

To display Machine Labels, just go to any measured spectrum or a time signal on the machine. Use the Graph tab, go to Change Group and select Display Machine.

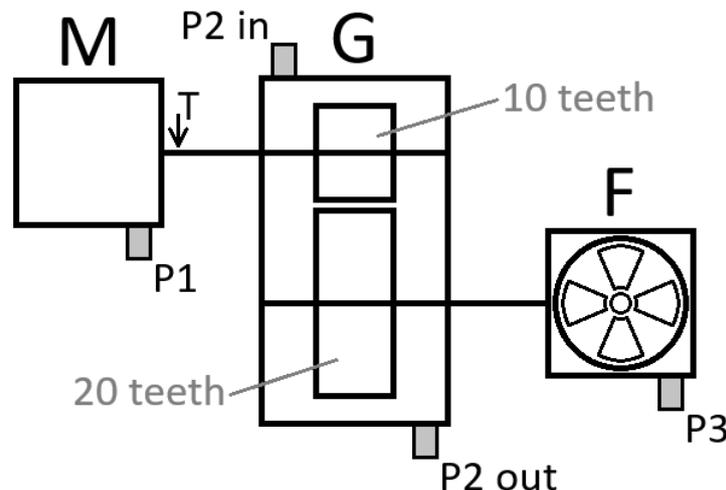


This option may be appropriate for complex machines. It means for machines with gearboxes where we have many shafts with different speeds and bearings on those shafts.

Machine Example

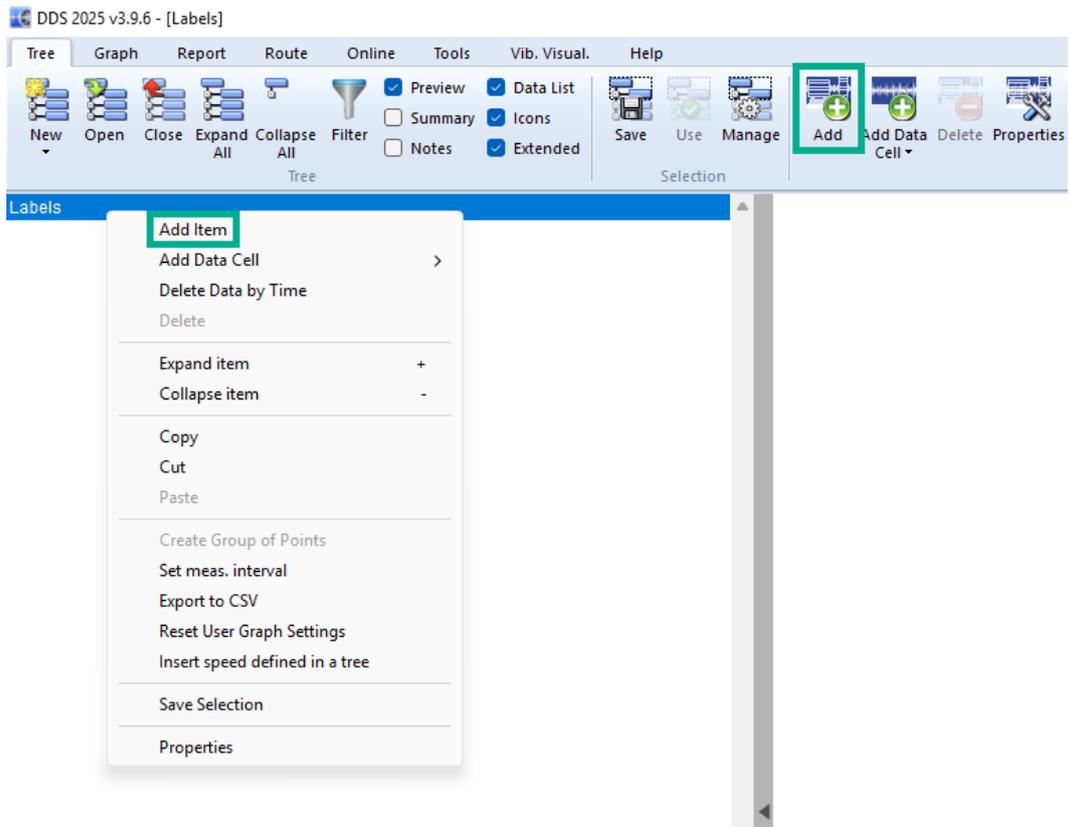
We will create a simple machine as an example for introduction and explain settings.

The machine contains a motor (M), a gearbox (G) and a fan (F). Tacho (T) marks the position of a tacho probe that measures speed. It measures on the output shaft of the motor. We measure spectra at four points (P1 at the motor, P2_in and P2_out at the gearbox, and P3 at the fan). The gearbox slows down the speed to half. There are two gears inside. Input wheel with ten teeth and output wheel with twenty teeth.

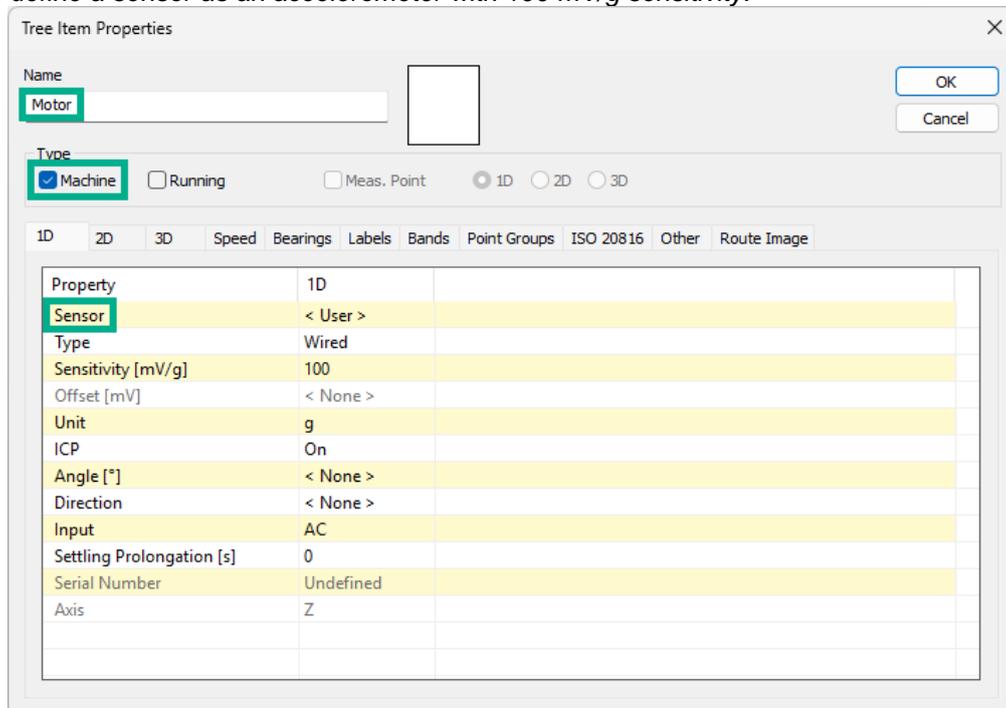


We must first create a database in DDS. Let's name it Labels.

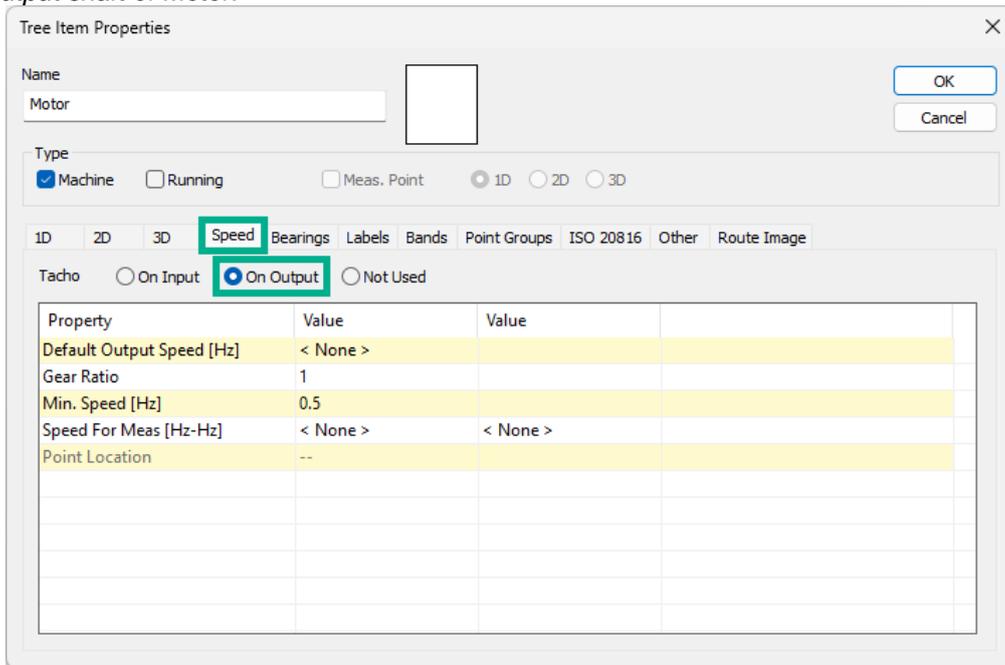
Then we create the motor. There are two ways to add a motor to the database. We may right click the name of the database in the tree (Labels), and select Add Item. Or we may select the database by a left click and use the Add function in the Tree tab.



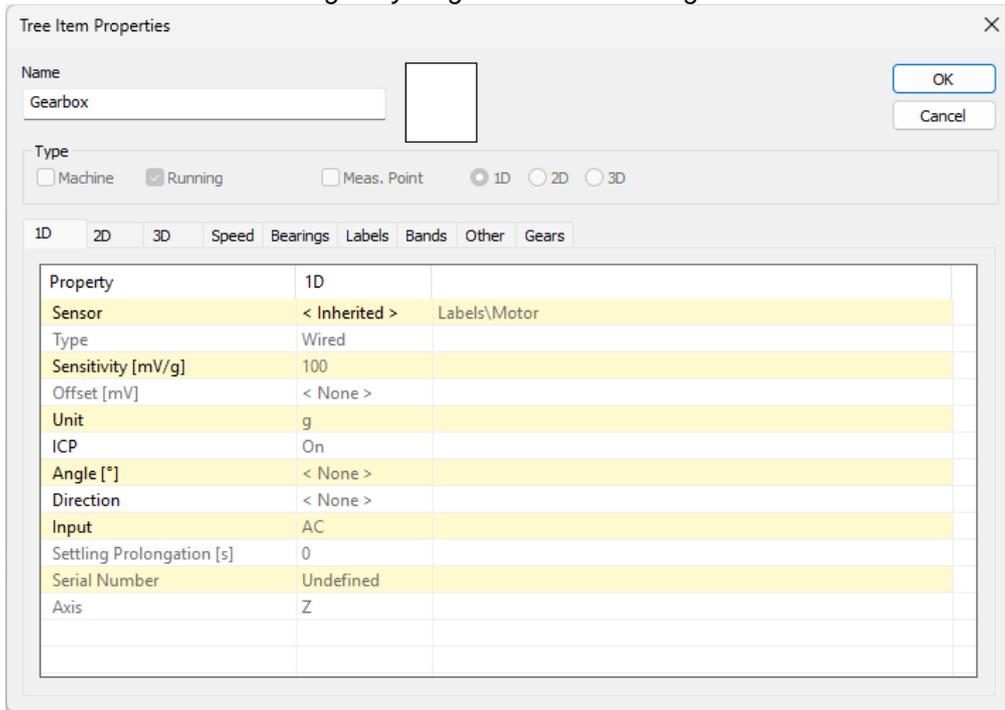
Then a Tree Item Properties Window appears. We enter the name (Motor) and we check the Machine checkbox. We also define a sensor as an accelerometer with 100 mV/g sensitivity.



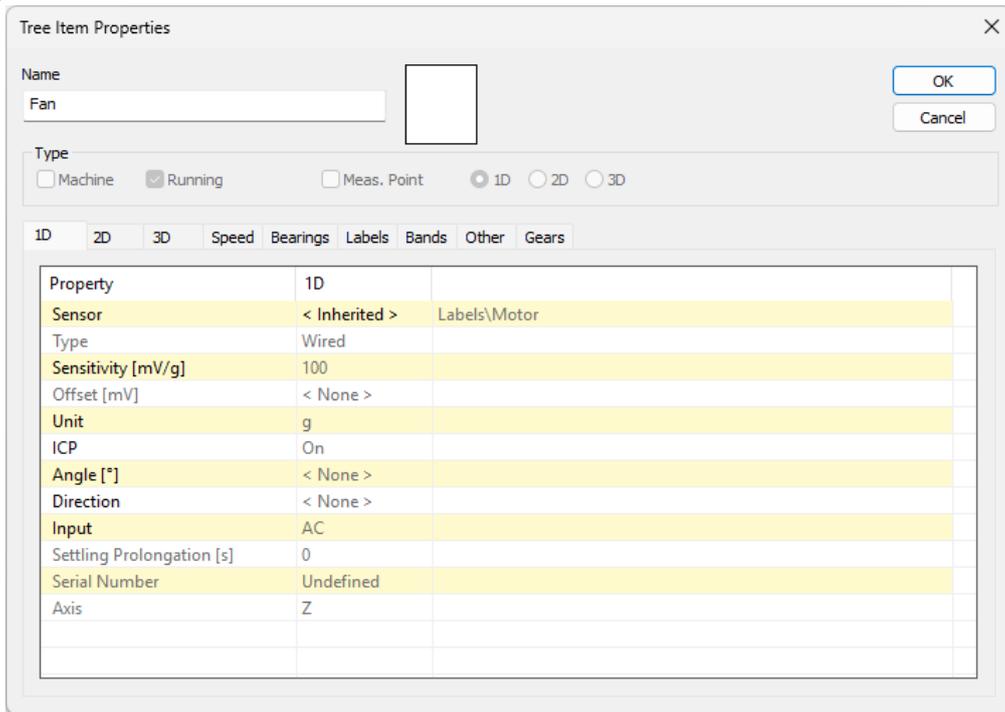
Then we switch to the Speed tab and define Tacho as On Output. It means that tacho sensor is mounted on the output shaft of Motor.



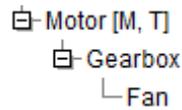
Next, we add the Gearbox after the Motor. This is done by the same way as adding Motor to the Labels database. There is no need to change anything from default settings.



Then we add the Fan to the Gearbox by the same way (Add Item). As before, no change of default settings.

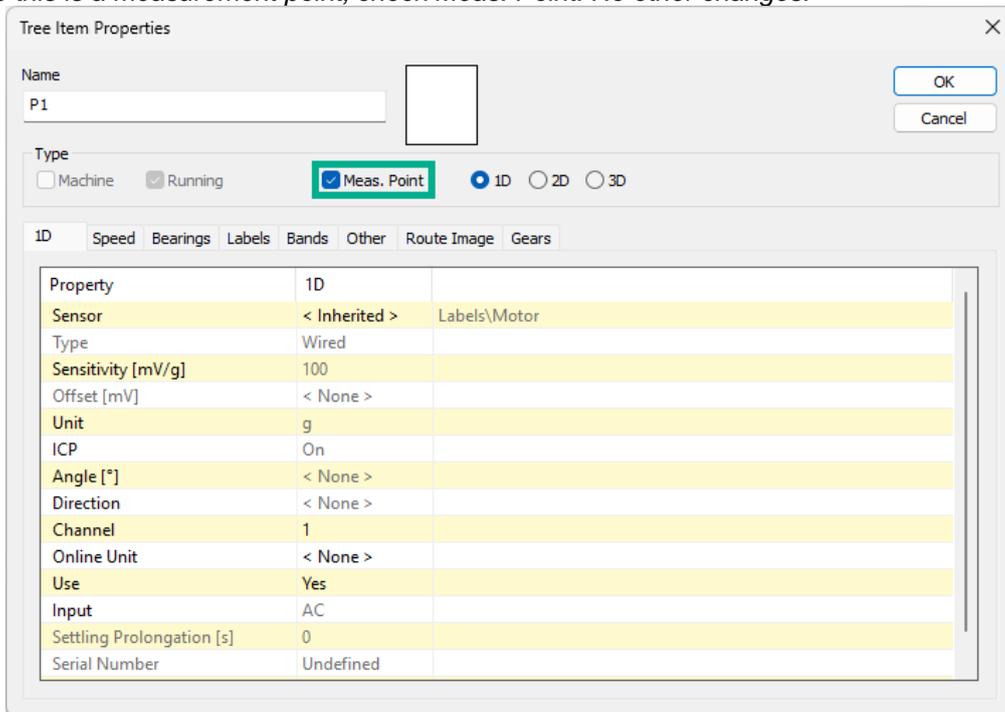


Our tree now looks like this:

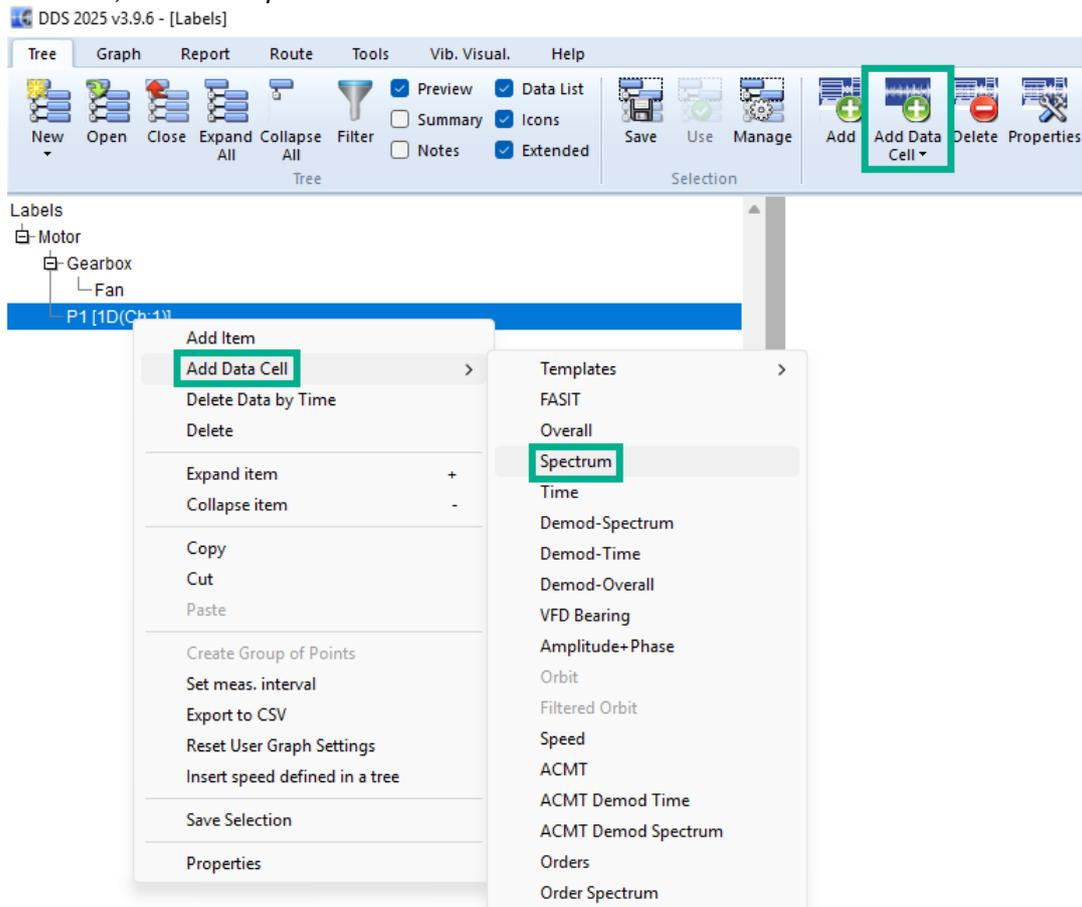


Now we add the Measurement Points. We create the point P1 at the Motor. Select the Motor and choose Add Item as before.

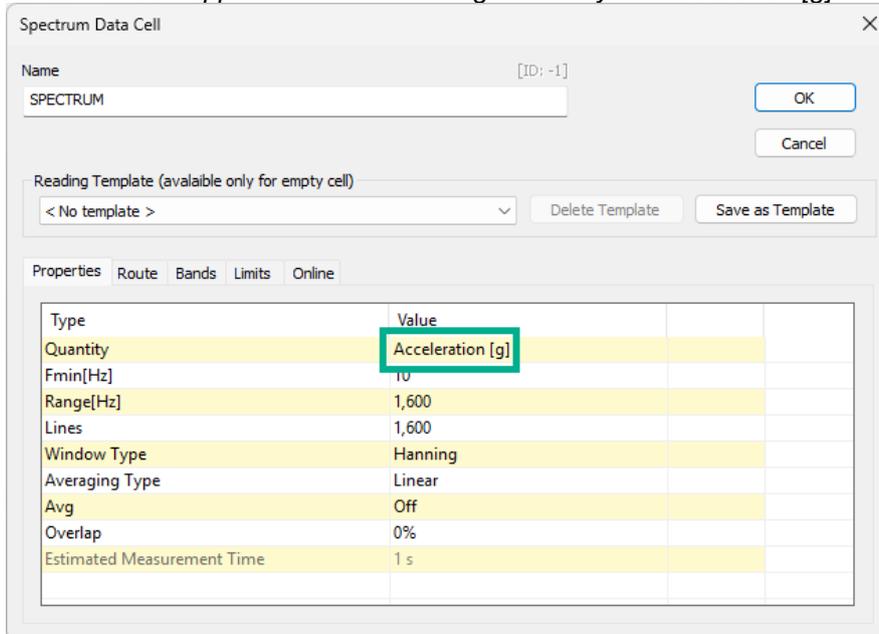
Because this is a measurement point, check Meas. Point. No other changes.



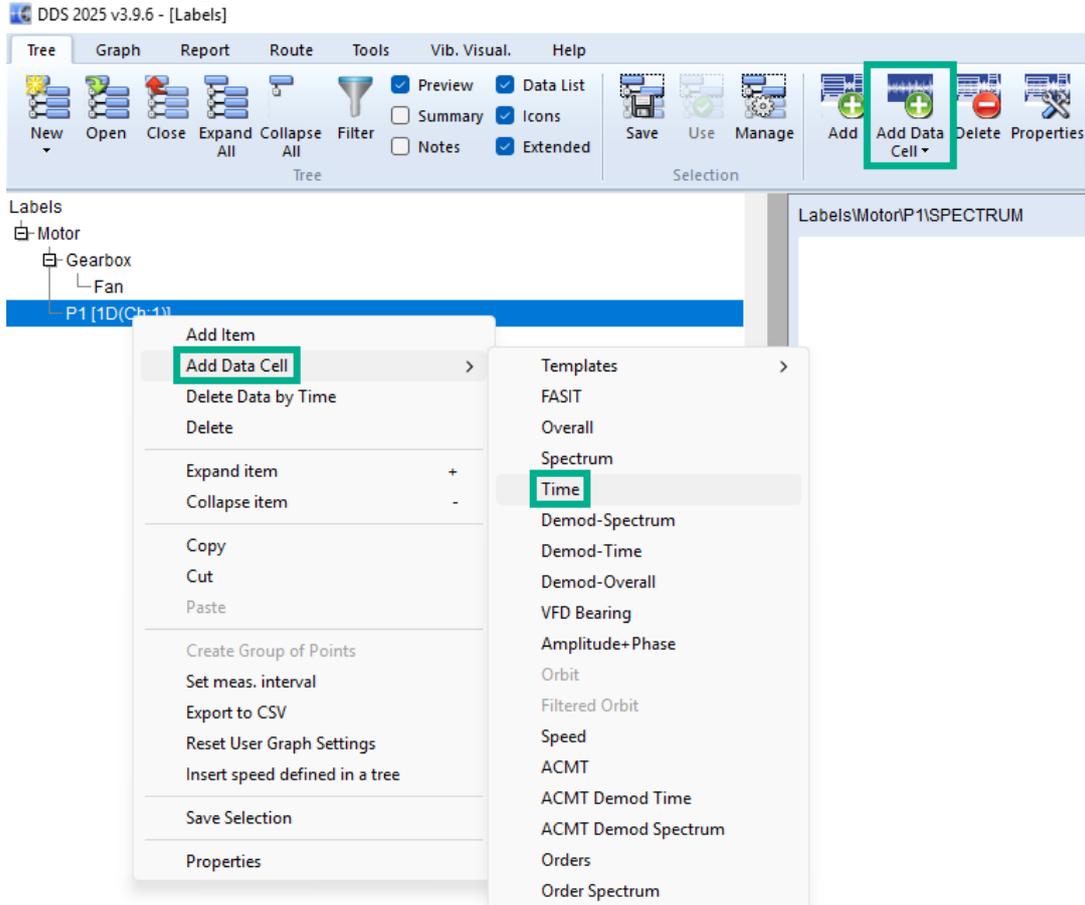
Then we add a spectrum data cell to P1. We select P1 and use Add Data Cell function. From the list of measurements, we select Spectrum.



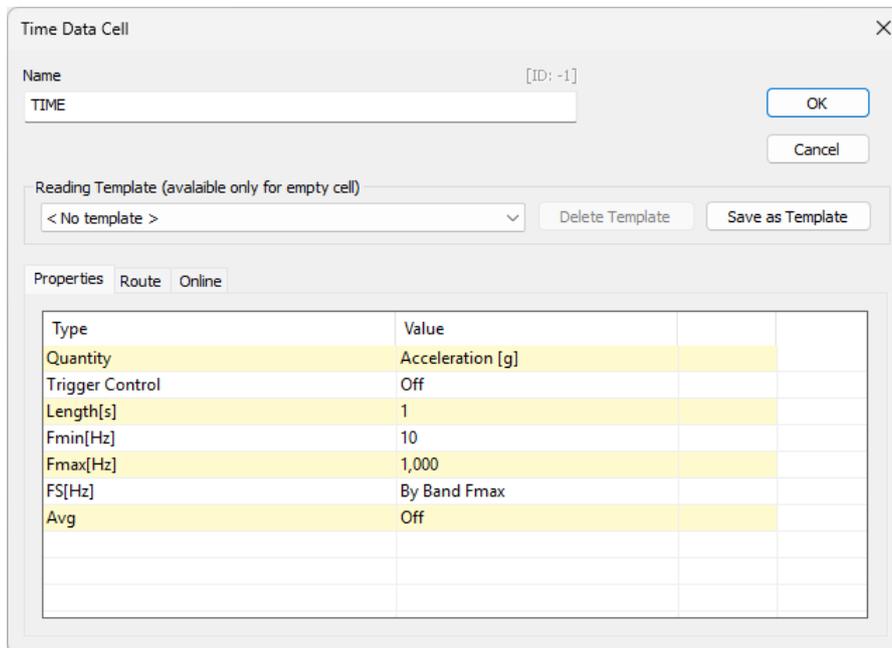
A spectrum data cell window appears where we change Quantity to Acceleration [g].



Then we add a time signal data cell to P1. We select P1, use Add Data Cell function. And choose Time.



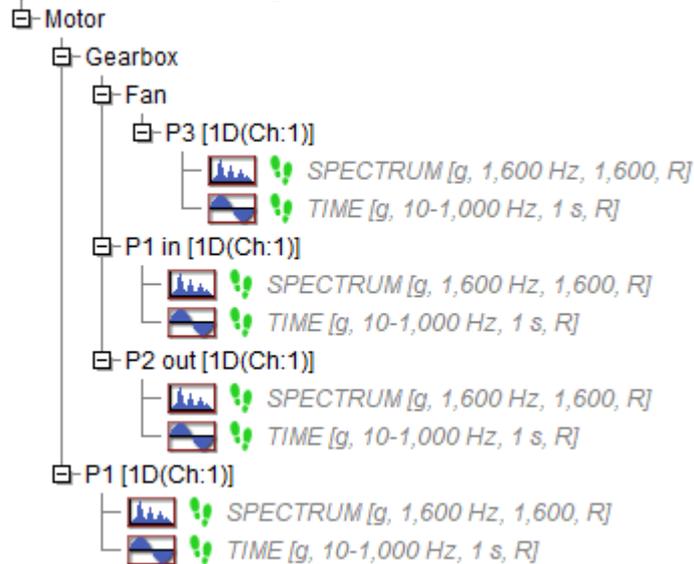
A time signal data cell window shows up. We do not need to change any settings here, so just press OK.



Now the tree looks like this:



Now we copy the P1 point to other positions. We create the P2_in and P2_out on Gearbox. And we create the P3 on the Fan. This is the resulting tree:



Speed

The most important value that must be known for labels is the speed frequency. It is because all frequencies of machine faults depend on it. They could not be calculated without knowledge of the value of speed frequency.

There are three ways how to get and save the speed frequency into spectrum data. We can do it during measurement, or later when route data are transferred into database.

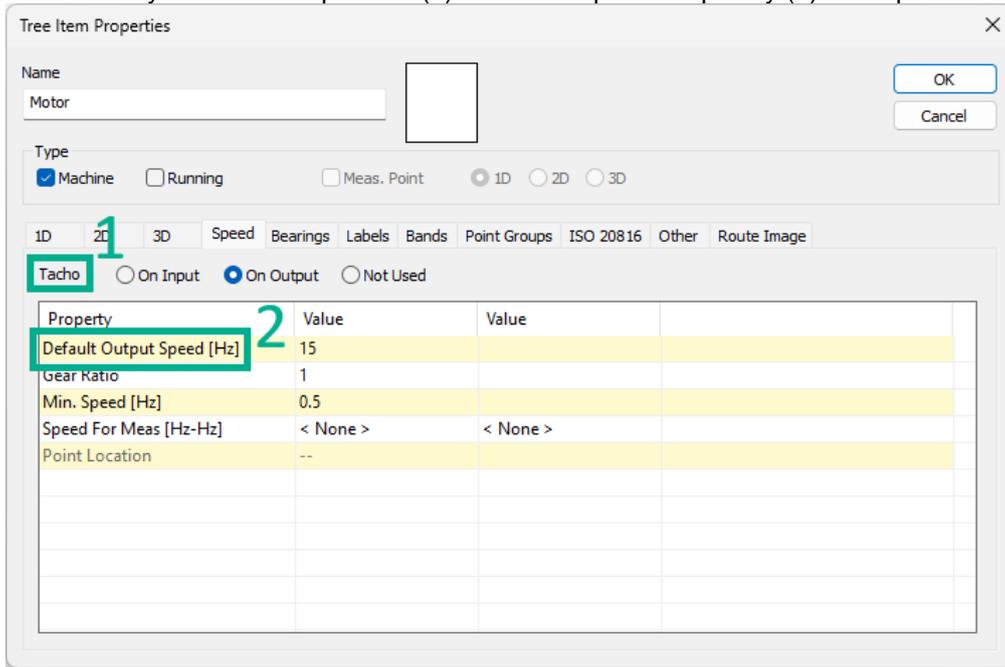
The first way is to measure speed with a tacho probe. But using the tacho probe during route is lengthy. The second way is to enter the machine speed frequency manually during a route measurement to analyser.

The third way is to set Default Output Speed value at a Tree item or at a Point. Name of this value implies that it is understood as the output speed of tree item. If we enter the value just on Machine item, then we enter the gear ratios (if they exist) on points or other items. It is also possible to enter the speed for every point, but it is not practical.

When the route is downloaded to database, the speed value is saved to every spectrum data. If the gear ratio exists, the speed is recalculated and then saved. For example, if the machine speed is measured by tacho or entered manually during route, then it is recalculated for every measurement (if gear ratios exist) and saved to spectrum data.

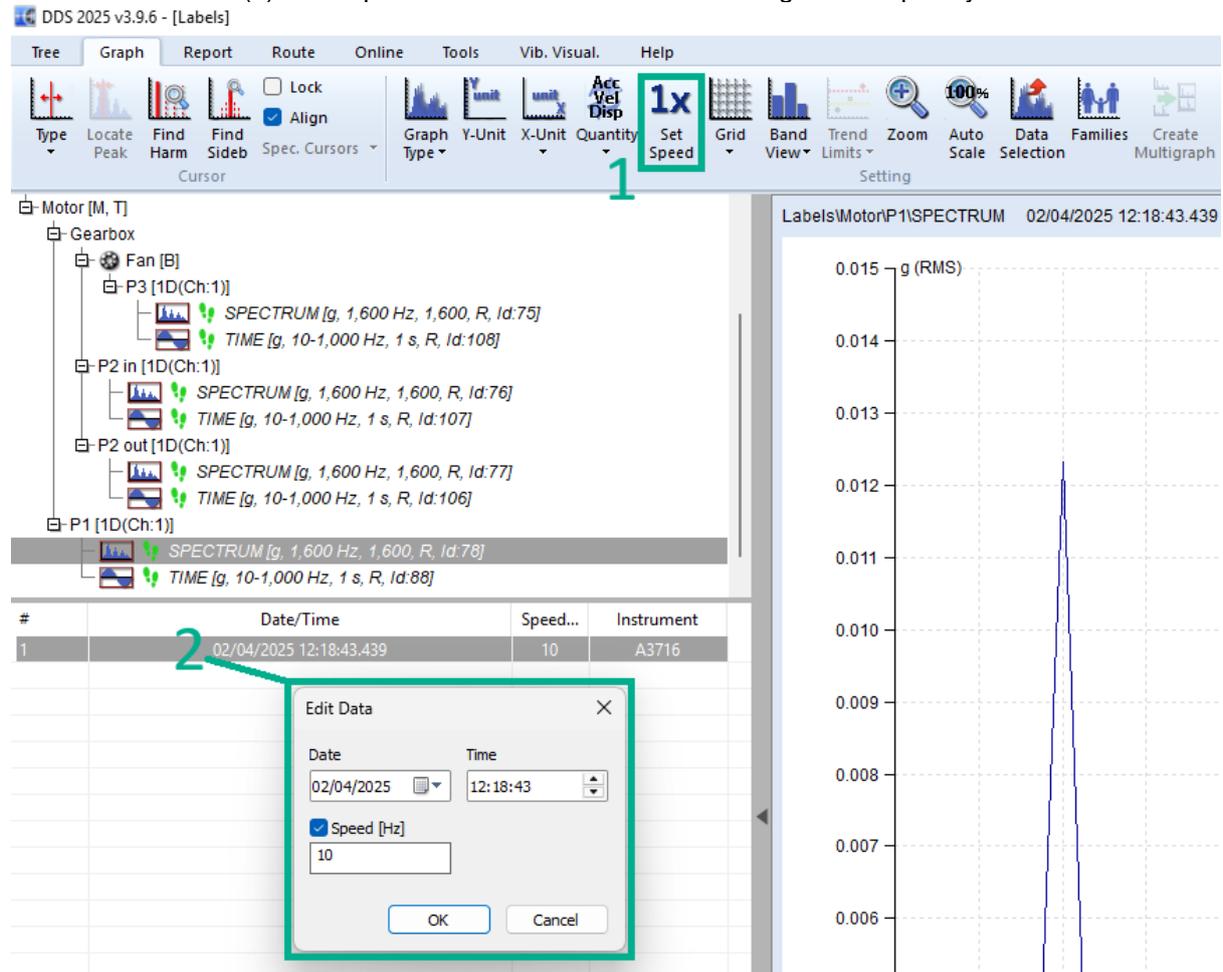
If no speed comes from route, then the Default Output Speed value is used and again recalculated and saved.

This is where we may define tacho position (1) or default speed frequency (2) in Properties.



Once the speed frequency is saved into a measurement, there is no way to tell which of the three options had been used to define it. After a measurement is saved, changing Default Output Speed does not change the saved speed frequency.

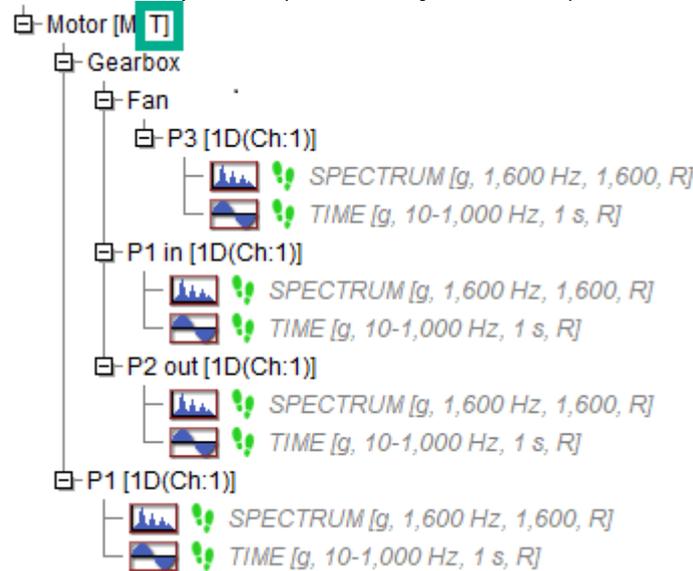
We can then change it by the 1x Set Speed function in the Graph tab (1) or by double-clicking a measurement itself (2). This opens a window where we can change the frequency.



We explain the speed recalculation once more. If there are gear ratios defined in a machine, DDS does not save measured or defined speed frequency value. It takes gear ratio and saves recalculated value. That is why we must know where the tachometer probe is located. Or more accurately, on which shaft it is located.

Example - Speed Frequency Calculation

We have already defined that Tacho position (indicated by the letter T) is the output shaft of Motor.



In this example, gearbox slows the speed frequency down to half of its value. We can define the speed change by Gear Ratio or by number of teeth.

First, we describe using Gear Ratio values in point properties. We need speed values for 4 points. The speed value is measured on the output of Motor (tachometer position). That is why we set the ratio of P1 to 1, ratio of P2_in is 1 again (it is the same shaft), ratio of P2_out is 0.5 (slowed down to half), and ratio of P3 is also 0.5. Understand that every recalculation is made by multiplication of tachometer speed (motor) and gear ratio in point properties. In this case all gear ratios in other tree items are equal to 1.

Point P1 Properties

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.5	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	General	

Point P2_in Properties

Tree Item Properties

Name: P2 in

Type: Machine Running Meas. Point 1D 2D 3D

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.5	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	General	

Point P2_out Properties

Tree Item Properties

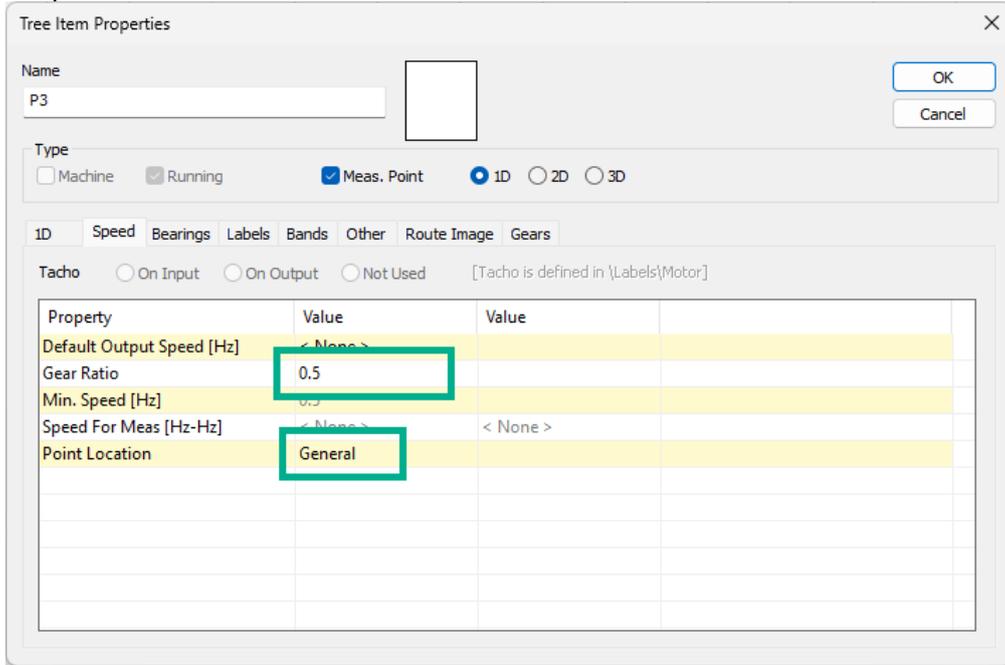
Name: P2 out

Type: Machine Running Meas. Point 1D 2D 3D

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	0.5	
Min. Speed [Hz]	0.5	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	General	

Point P3 Properties

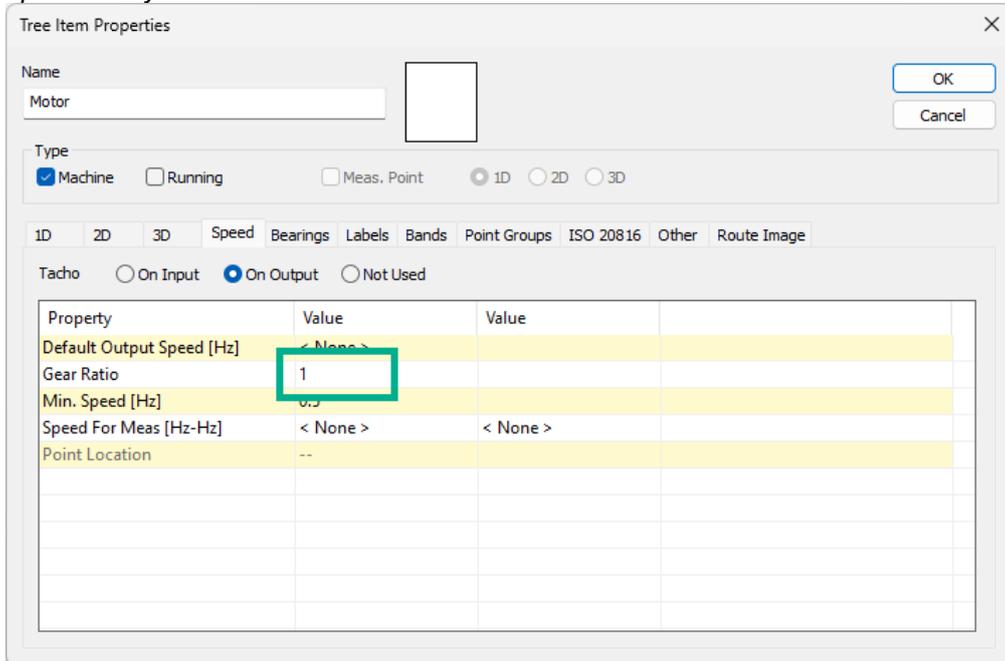


Gear ratios at Tree Items

The same situation can be created by setting gear ratios at Tree Items instead of Points. This is more straightforward. We set this up in the Speed tab of our Tree Items.

First, we change all ratios in points back to 1. The Gearbox has a gear ratio of 0.5. We select the Gearbox item and define the ratio as 0.5. For Motor and Fan, the gear ratio is 1. Gear ratio at every Point is now 1.

Motor Properties stay the same as before.



For Gearbox Properties, set gear ratio to 0.5.

Tree Item Properties

Name: Gearbox

Type: Machine Running Meas. Point 1D 2D 3D

1D 2D 3D Speed Bearings Labels Bands Other Gears

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	0.5	
Min. Speed [Hz]	0.5	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	--	

In Fan Properties, gear ratio is 1.

Tree Item Properties

Name: Fan

Type: Machine Running Meas. Point 1D 2D 3D

1D 2D 3D Speed Bearings Labels Bands Other Gears

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.5	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	--	

But now we must add the information about point location. We set location for Points P1 and P3 to General, because it does not matter where the points are. The speed is the same everywhere on motor or fan. But for point P2_in we must set location to Input. For point P2_out we must set it to Output. Note that if we set a location other than General, then point gear ratio is set to 1 and cannot be edited. It is correct, the ratio is defined on Gearbox item.

Point P1 Properties

Tree Item Properties

Name: P1

Type: Machine Running Meas. Point 1D 2D 3D

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.0	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	General	

Point P2_in Properties

Tree Item Properties

Name: P2 in

Type: Machine Running Meas. Point 1D 2D 3D

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.0	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	Input	

Point P2_out Properties

Tree Item Properties

Name: P2 out

Type: Machine Running Meas. Point 1D 2D 3D

1D Speed Bearings Labels Bands Other Route Image Gears

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.0	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	Output	

Point P3 Properties

Tree Item Properties

Name: P3

Type: Machine Running Meas. Point 1D 2D 3D

1D Speed Bearings Labels Bands Other Route Image Gears

Tacho: On Input On Output Not Used [Tacho is defined in \Labels\Motor]

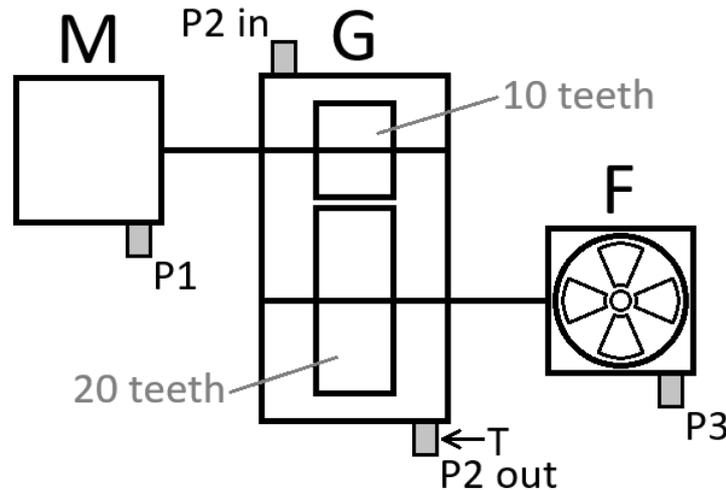
Property	Value	Value
Default Output Speed [Hz]	< None >	
Gear Ratio	1	
Min. Speed [Hz]	0.0	
Speed For Meas [Hz-Hz]	< None >	< None >
Point Location	General	

Note: For simplicity, we strongly do not recommend defining gear ratios for Tree Items and for Points simultaneously. It would still work, but could very be confusing, especially for more complex machines.

Changing Tacho Position

What if we change Tacho position? We may directly measure speed at any given Tree Item or Point, depending on which is accessible for a tacho probe. For example, let's move Tacho to Point P2_out. If

we have defined ratios on points, then we must edit them to new values. But if we have defined them on tree items (not points), then everything works correctly. We do not need to change anything.



Gear Ratio at Measurement Points

If we have set gear ratios at points, we must change them accordingly. If we do not do that, the measured speed at points will be incorrect. It is because in this case, gear ratios depend on where we measure speed.

Original gear ratios were 1 for P1 and P2_in, and 0.5 for P2_out and P3.

We moved Tacho to P2_out. The new gear ratio at this point must be 1, because we measure speed there. It is also 1 at P3, because it has the same speed. We know the Gearbox slows speed frequency down to half the original value. We are already measuring the slower speed, so gear ratio for P1 and P2_in must be 2.

Gear Ratio at Tree items

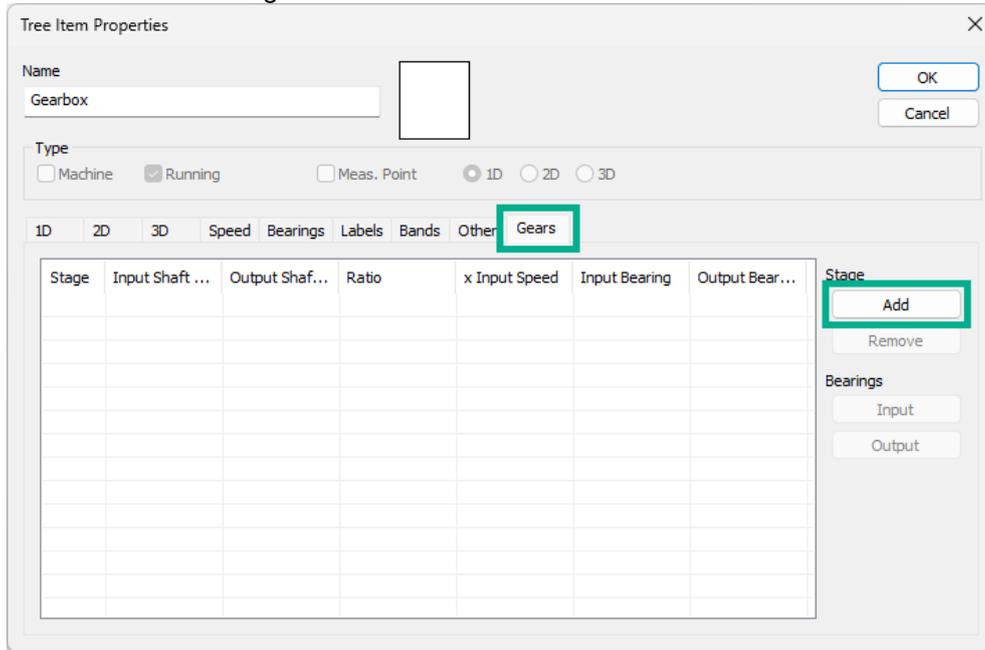
If we have set gear ratios at Tree Items and not points, they stay the same regardless of Tacho position. Speeds are calculated correctly.

Adding Gears

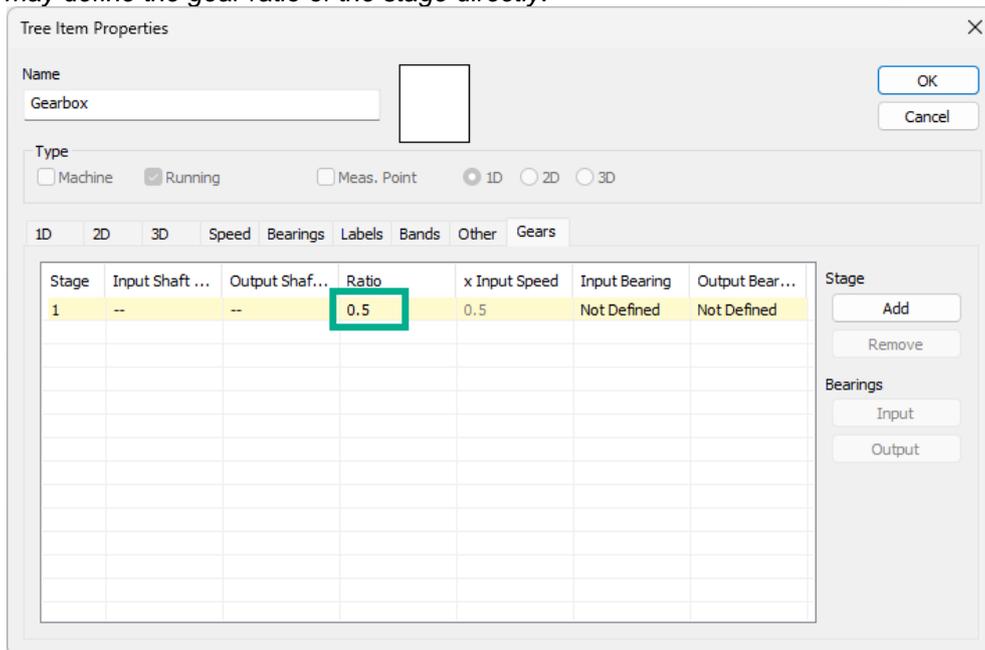
There is another way to define gear ratios. It is better than doing it directly in the Speed tab of Properties. We may use the Gears tab to define a gear by its gear ratio, or by the number of teeth on the input shaft and the output shaft. We may define any number of stages at a single Tree Item, creating a multistage gearbox this way. Each stage may be defined by the number of teeth or by gear ratio. Gear ratio for the entire gearbox is then calculated.

Example

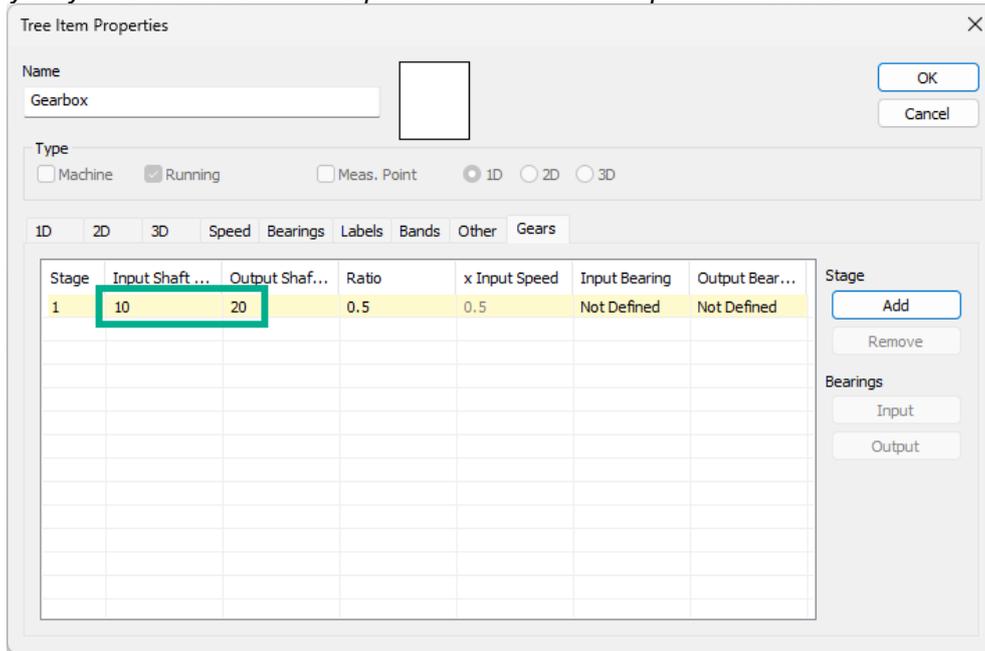
We modify our example where we defined gear ratios on Tree Items. Go to the Gears tab of Gearbox and press Add. This adds a stage.



Then we may define the gear ratio of the stage directly.

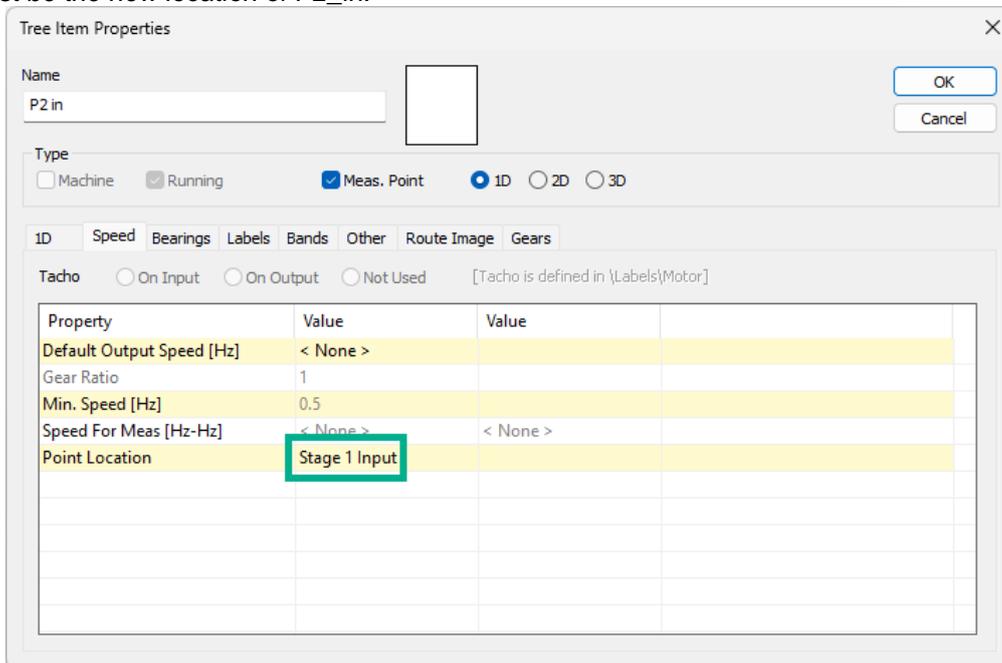


Or we may may define the number of Input Shaft Teeth and Output Shaft Teeth.

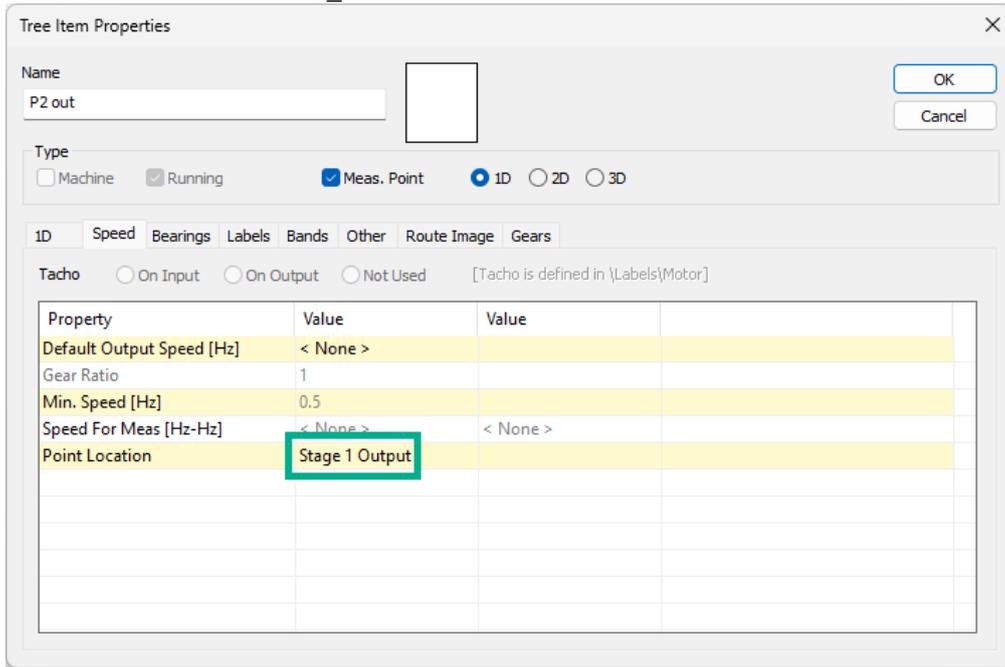


Beware, if we define gears in the Gears tab of Gearbox, we must set correct Point Locations of the points on Gearbox (P2_in and P2_out). This is because it is no longer possible to set them as Input or Output as we have before. There is now a stage on the Gearbox. We must set them to Stage 1 input and Stage 1 Output. Imagine the gearbox with more stages. We may define a point at any shaft. It will be very useful later, when we will add bearings.

This must be the new location of P2_in.

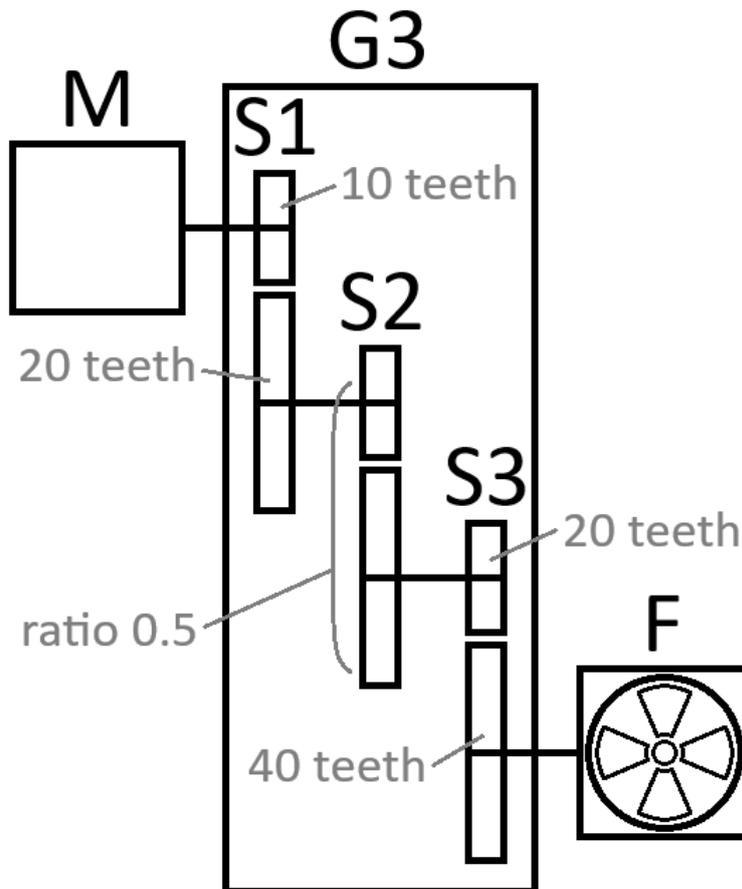


This must be the new location of P2_out.

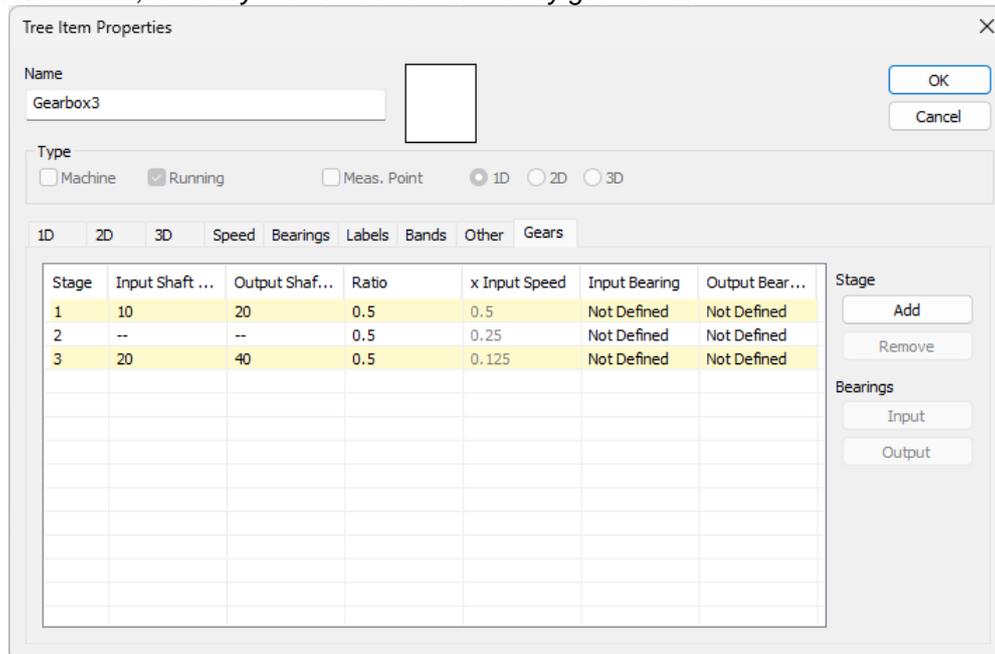


Multistage Gearbox

If we have a machine with a gearbox that has more stages, it may look something like this.



We could of course define each stage as a separate Tree item, but the tree of such an arrangement in DDS could look complicated. It is much more straightforward to define more stages in a single Tree Item using the Gears tab, either by the number of teeth or by gear ratios.



In this example we know the number of teeth for stage 1 and 3. We know just ratio for stage 2. No problem, we can set just the ratio.

What if we wanted to measure speed at the output of the second stage? DDS does not allow us to define tacho position directly there. Tacho can only be placed on the Input or Output of the whole Tree Item. If we really need it, we need to split gearbox to two tree items.

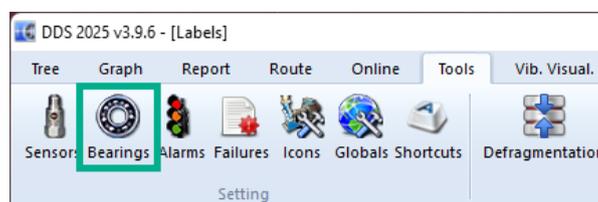
Bearings

If we want to display bearing fault frequencies, we must define bearings in our machine. DDS has a database of bearing types for this purpose. We can also define our bearings, if they are not in the DDS database.

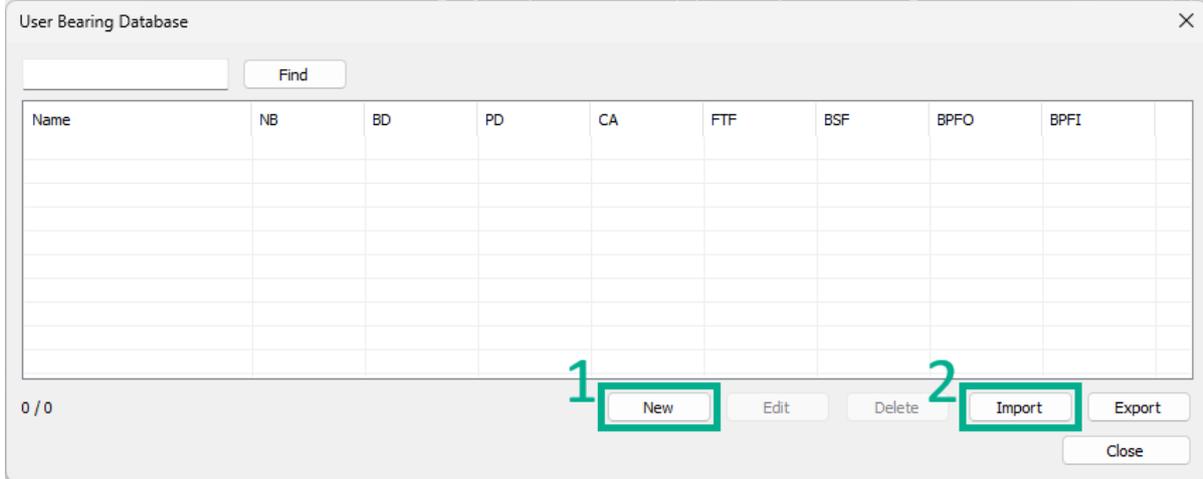
We explained how to evaluate right speed for every measurement point. Now we will show how to define bearing (or bearings) to each point.

User Bearing Database

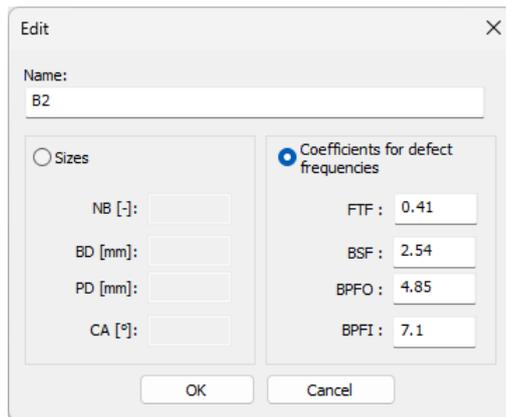
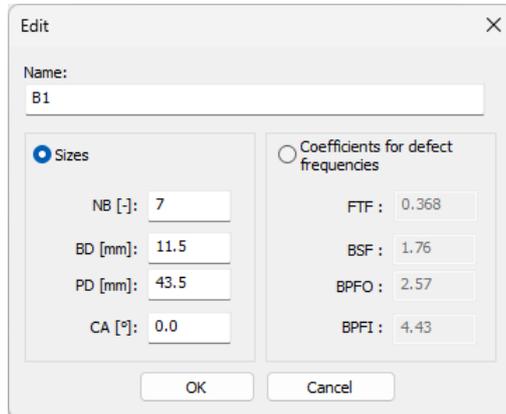
First, we must create the User Bearing Database for each database. The database name is the name of root item (we have a database name Labels in our example). We use the Tools tab and Bearings button.



We can either define our own bearing by its parameters (1), or import bearings from the database (2).



A new bearing can be defined by its dimensions, where NB is the number of roller elements, BD is the roller element diameter, PD is the pitch diameter, and CA is the contact angle. It may also be defined by coefficients for fault frequencies. If the coefficients are multiplied by speed, we get the fault frequencies.



For bearings imports from bearing database press the Import button.

Bearings.lbr

Find

Name	NB	BD	PD	CA	FTF	BSF	BPFO	BPFI
7016 ACD-SKF	< None >	< None >	< None >	< None >	0.437	3.53	8.74	11.3
7016 CD-SKF	< None >	< None >	< None >	< None >	0.433	3.53	8.65	11.3
7016-KOY	< None >	< None >	< None >	< None >	0.443	3.75	8.86	11.1
7016-NSK	< None >	< None >	< None >	< None >	0.44	3.93	9.23	11.8
7016-NTN	< None >	< None >	< None >	< None >	0.443	3.75	8.86	11.1
7016AC	20	13.5	103	25	0.44	3.75	8.81	11.2
7016AC-SKF	< None >	< None >	< None >	< None >	0.44	3.75	8.81	11.2
7016ACD-SKF	< None >	< None >	< None >	< None >	0.437	3.53	8.74	11.3
7016B-KOY	< None >	< None >	< None >	< None >	0.45	3.76	8.99	11
7016C	20	13.5	102	15	0.436	3.74	8.73	11.3
7016C-KOY	< None >	< None >	< None >	< None >	0.436	3.74	8.73	11.3
7016C-NTN	< None >	< None >	< None >	< None >	0.436	3.74	8.73	11.3
7016C-SKF	< None >	< None >	< None >	< None >	0.436	3.74	8.73	11.3

12204-GPZ, 12207-GPZ, 12418-GPZ, 240/630CA, 5314-NTN

Add Close

Now we have list of bearings in the User Bearing Database.

User Bearing Database

Find

Name	NB	BD	PD	CA	FTF	BSF	BPFO	BPFI
12204-GPZ	11	6.5	33.5	0.0	0.403	2.48	4.43	6.57
12207-GPZ	13	9	53.5	0.0	0.416	2.89	5.41	7.59
12418-GPZ	12	34	158	0.0	0.392	2.21	4.7	7.3
240/630CA	28	72	778	10.8	0.455	5.36	12.7	15.3
5314-NTN	< None >	< None >	< None >	< None >	0.4	2.08	3.2	4.8
7016AC	20	13.5	103	25	0.44	3.75	8.81	11.2
B1	7	11.5	43.5	0.0	0.368	1.76	2.57	4.43
B2	< None >	< None >	< None >	< None >	0.41	2.54	4.85	7.1

1 / 8

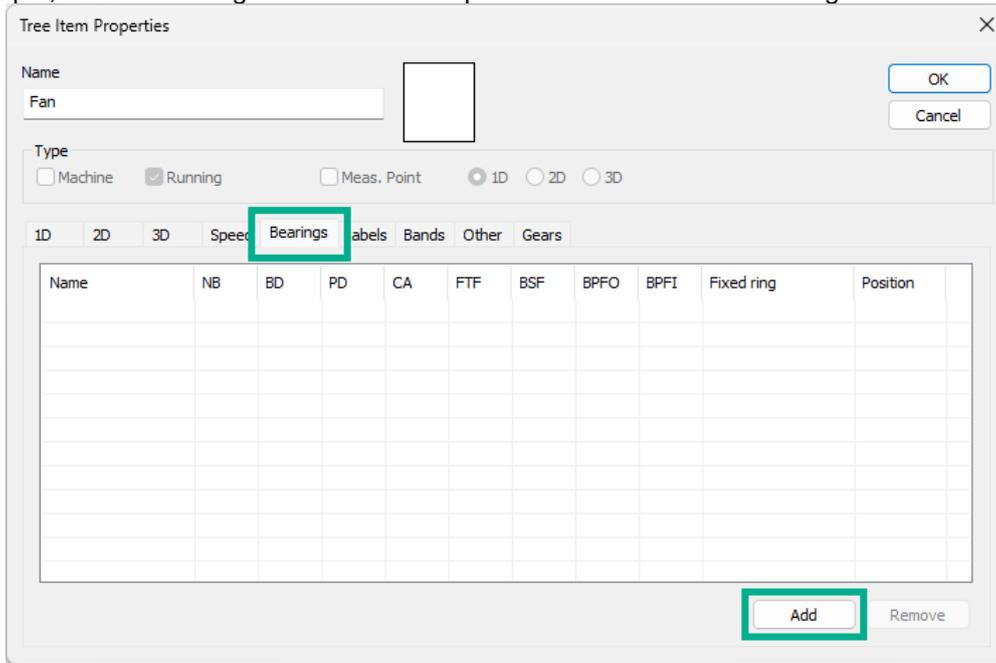
New Edit Delete Import Export

Close

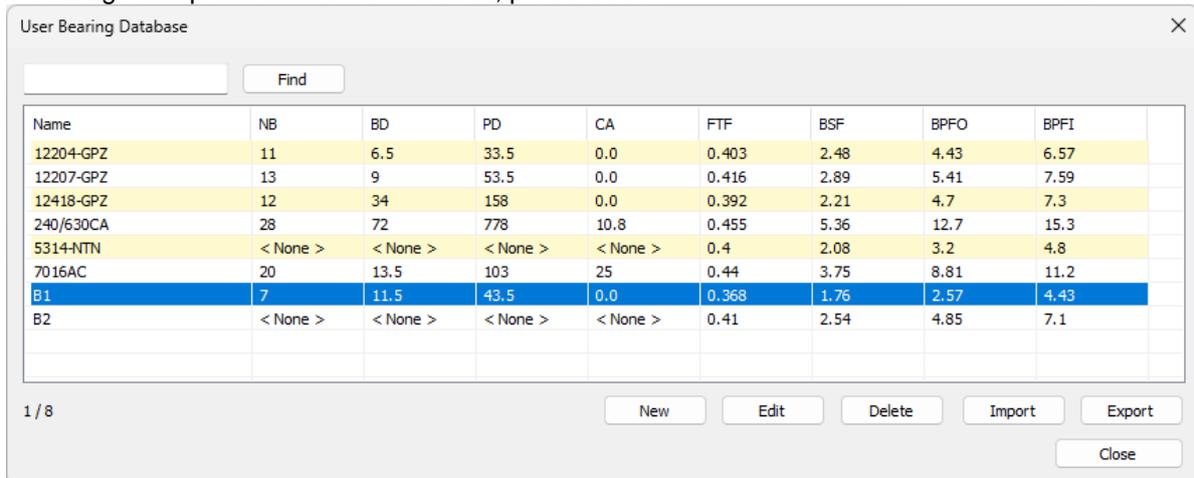
Bearings Tab in Properties

There are two ways to define Bearings at Tree Items or Points. The first way is to use the Bearings tab in Properties.

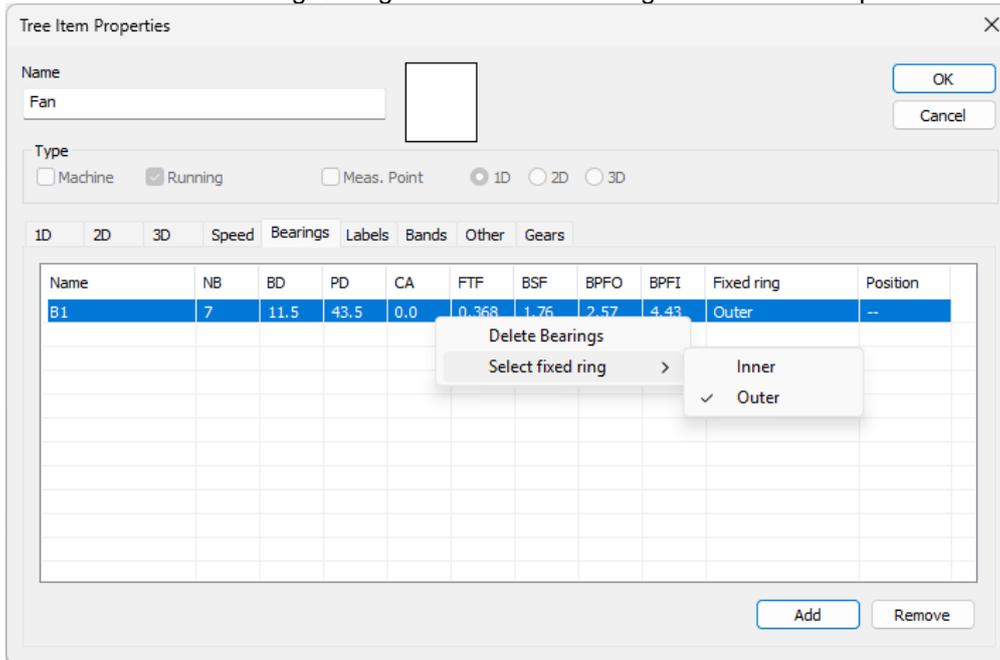
For example, we add bearings to Fan item. We press the Add button in Bearings tab.



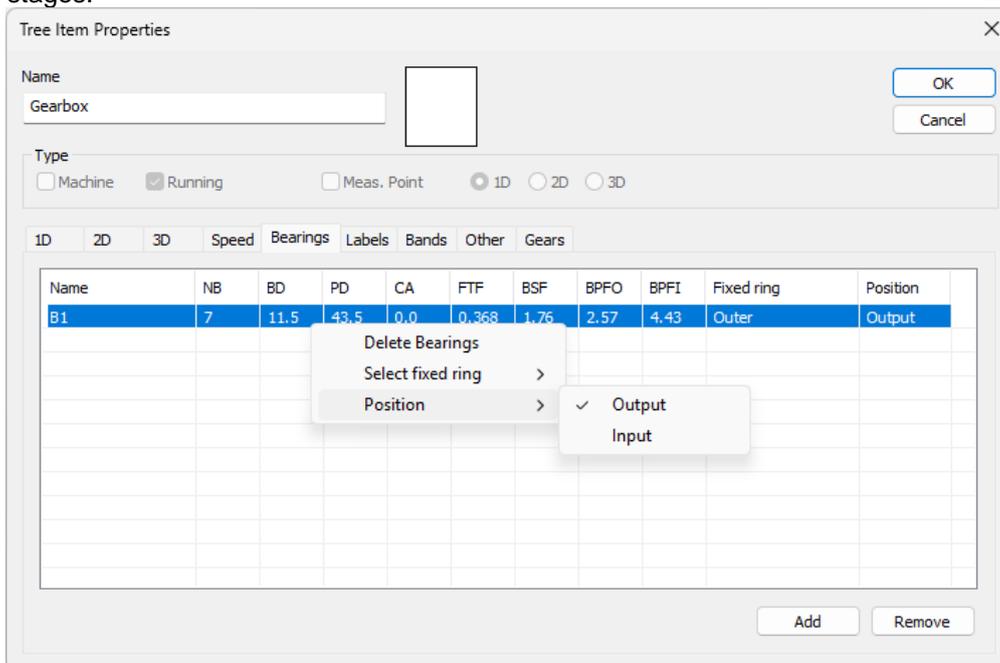
This opens the User Bearing Database, which we have created in the previous step. Select a bearing or bearings and press Add. When finished, press Close.



Now we need define the fixed ring. Do right-click on the bearing and select one option.



If the bearing is in a gearbox with one or more stages, or if gear ratio is defined directly, we select the bearing position as Output or Input. The Bearings tab does not allow us to define bearings at individual gearbox stages.

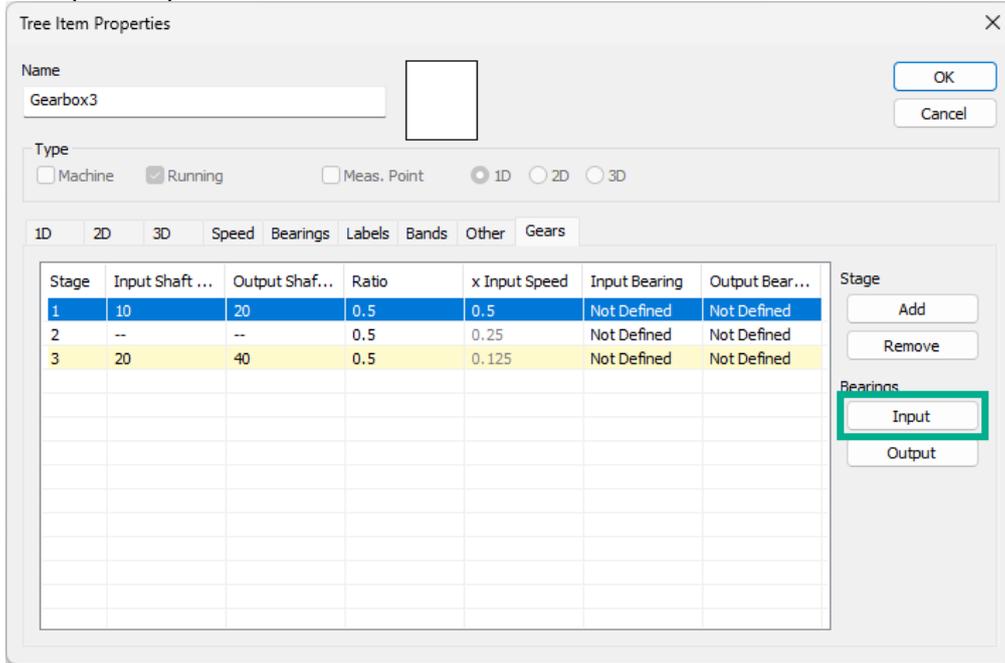


Bearings on gear stages

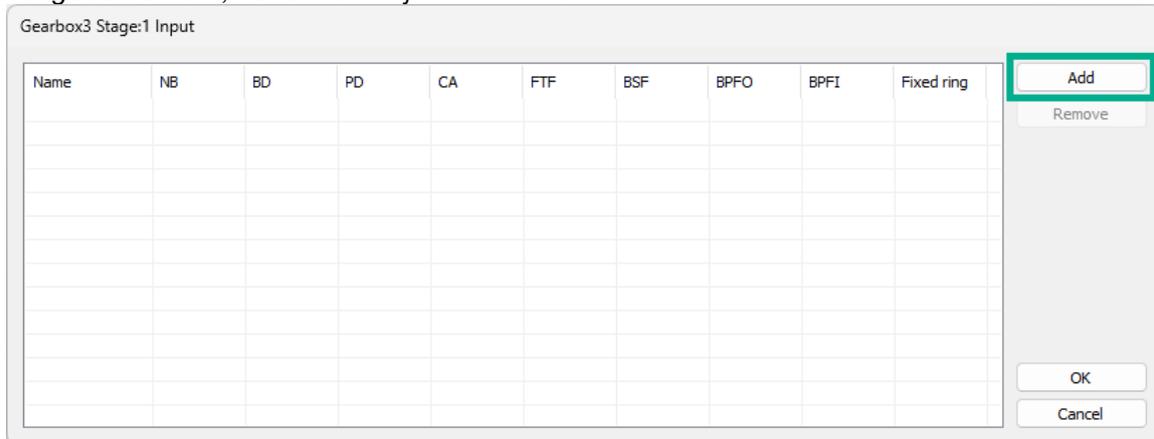
The other way to define bearings at our machine is to use the Gears tab. This is the option for gearboxes with defined stages, because we can define bearings at the input and output shafts of every stage.

Example

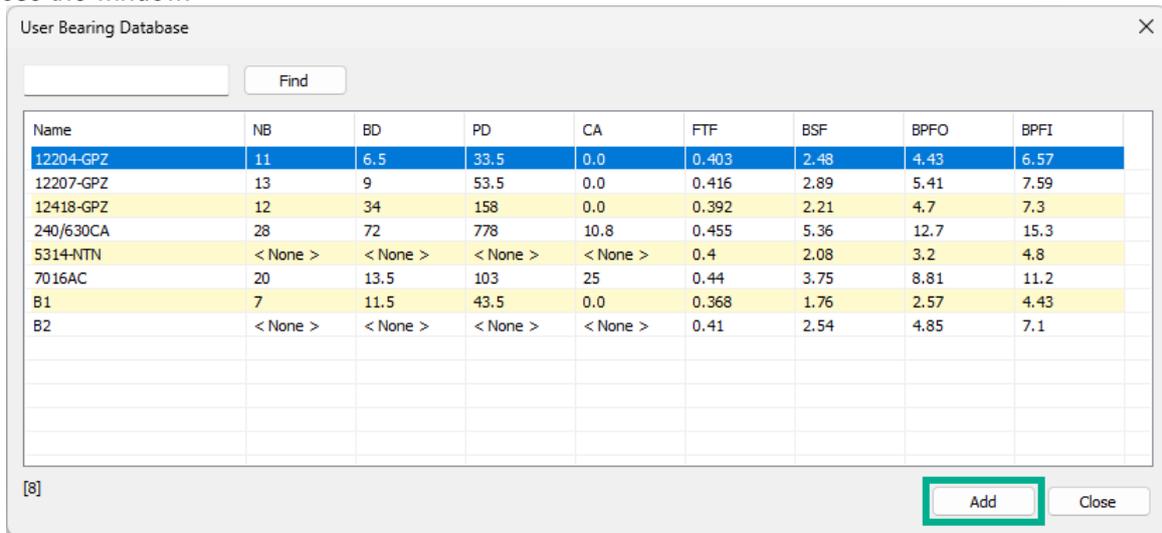
We will use the Gearbox3 item, which we have already set up as having three gear stages. We will define bearings for each stage. We start by adding a bearing to the input shaft of the first stage. Choose the stage and press **Input**.



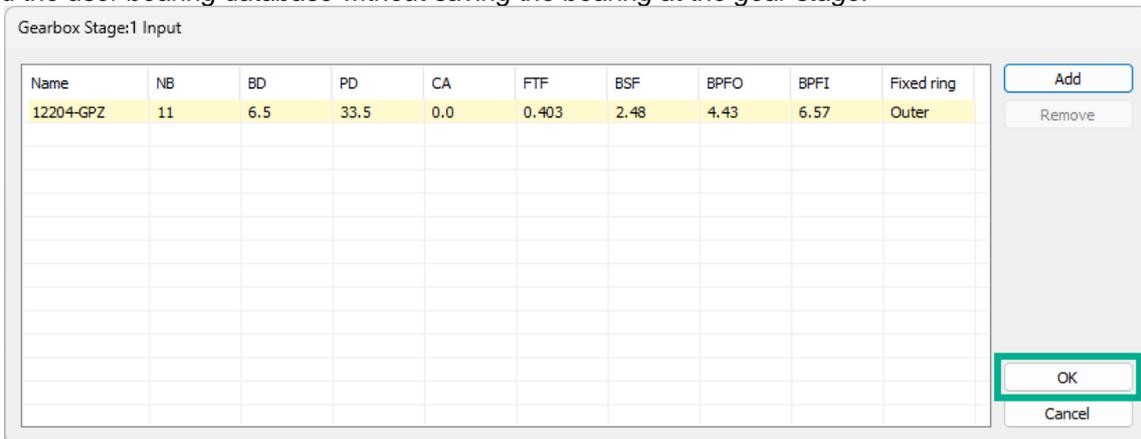
This opens a window where we add bearings to the input shaft of the first stage. We may add as many bearings as we want, but let us add just one. Press **Add**.



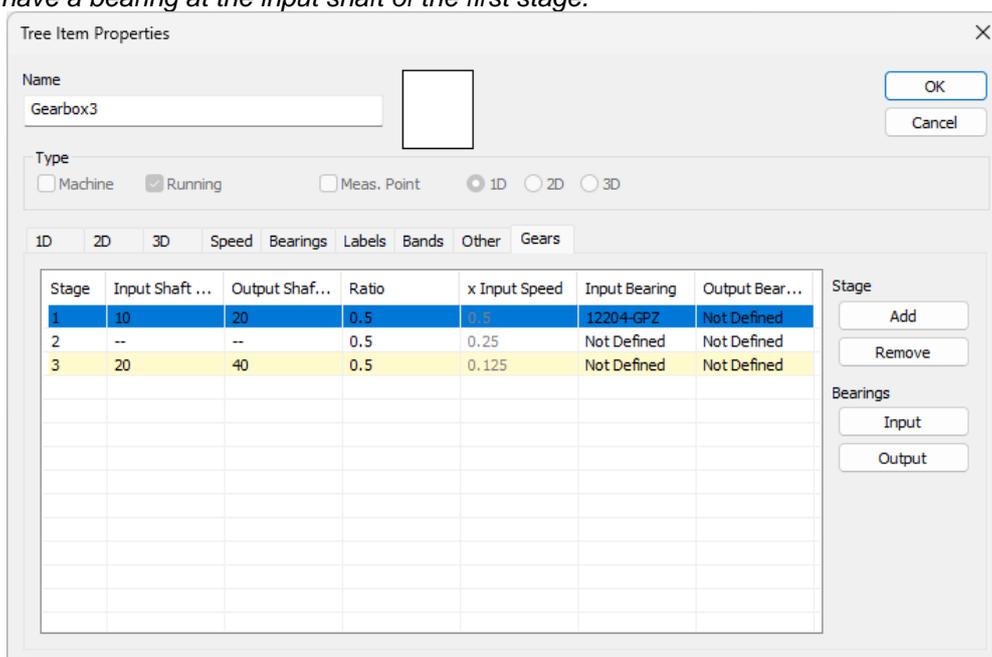
This opens the User Bearing Database of our DDS database. We select bearing, we press Add and close the window.



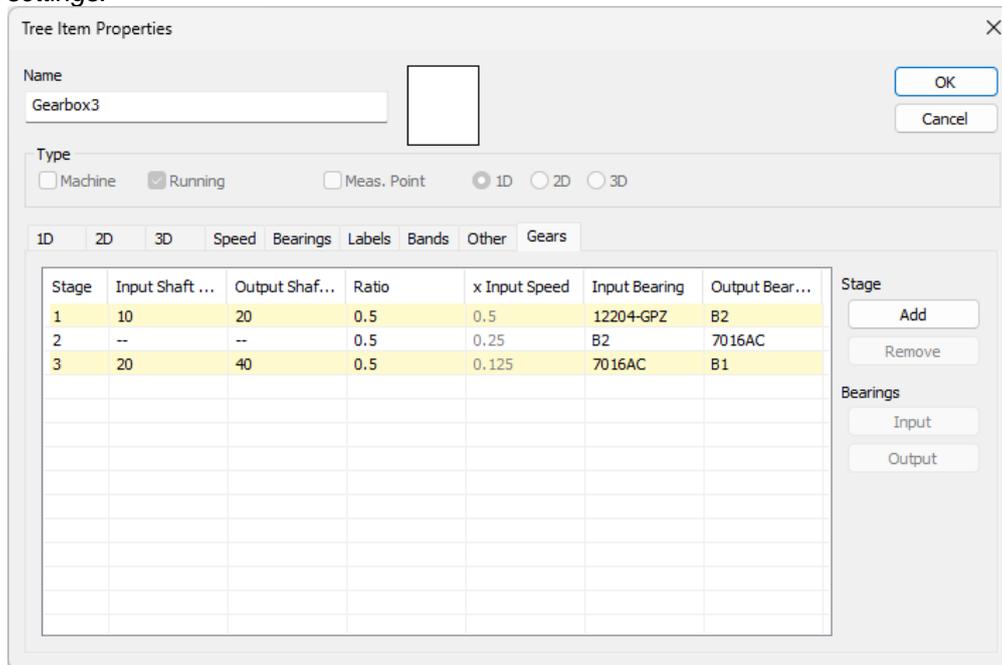
Then we press OK to add the bearing to the stage. Do not press Cancel. This would close the window and the user bearing database without saving the bearing at the gear stage.



Now we have a bearing at the input shaft of the first stage.

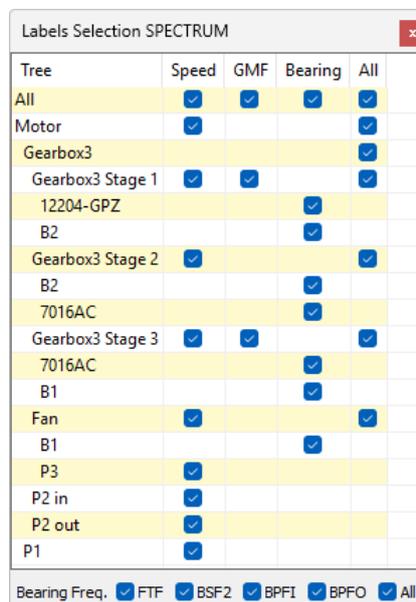


Now we use the same procedure to add bearings the output shaft and to all other stages as well. It is also possible to add bearing by double clicking the Input or Output Bearing for a given stage. These are the final settings.



Labels Selection in Spectrum

For a spectrum, this is what Labels Selection window may look like. What does it show us? It lists all available labels that may be displayed. These are labels for any given machine part or Measurement Point.



Speed labels show speed frequencies.

GMF are labels for gear mesh frequencies.

Bearing are labels for individual bearings. We can decide which bearing fault frequencies are displayed in the Bearing Freq. row at the bottom. FTF is fundamental train frequency, BSF2 is twice the ball spin frequency, BPF1 is ball pass frequency relative to the inner race and BPFO is ball pass frequency relative to the outer race.

The All column represents all labels for a given machine part, for example, the entire Gearbox3. These are all Speed, GMF, and Bearing labels.

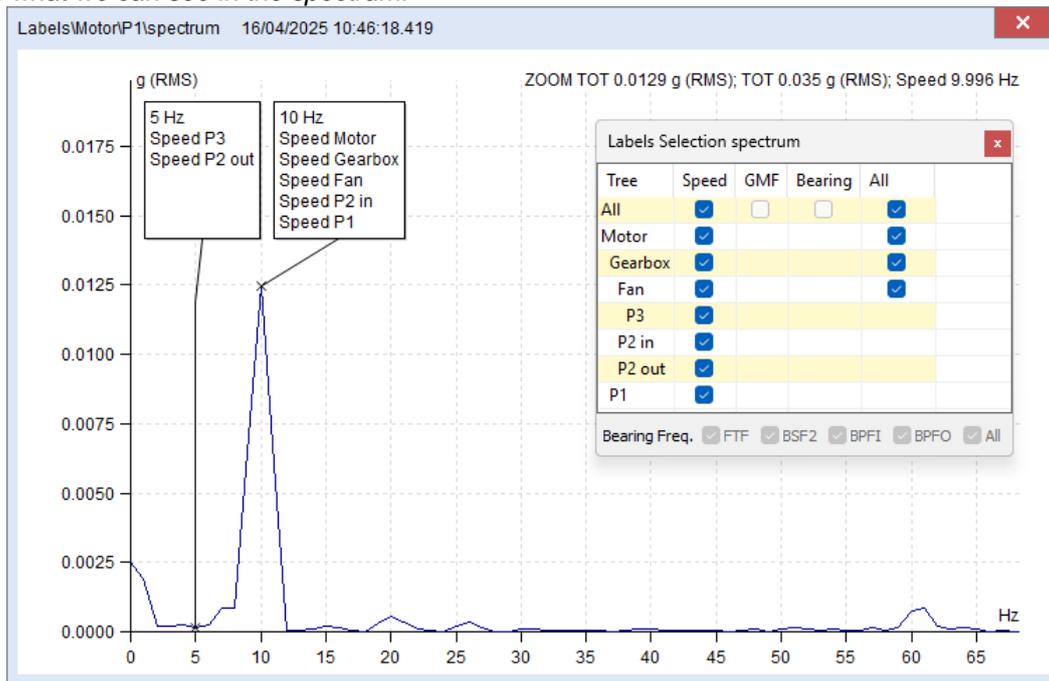
In case of a more complicated machine, we see too many labels. This may be difficult to read. If this happens, we simply uncheck labels we do not want to see. We also do not have to manually uncheck all of them one by one. For example, if we do not want to see labels for Gearbox3, we uncheck it in the All column.

Labels in Spectrum

Example 1: Gear Ratios defined at points

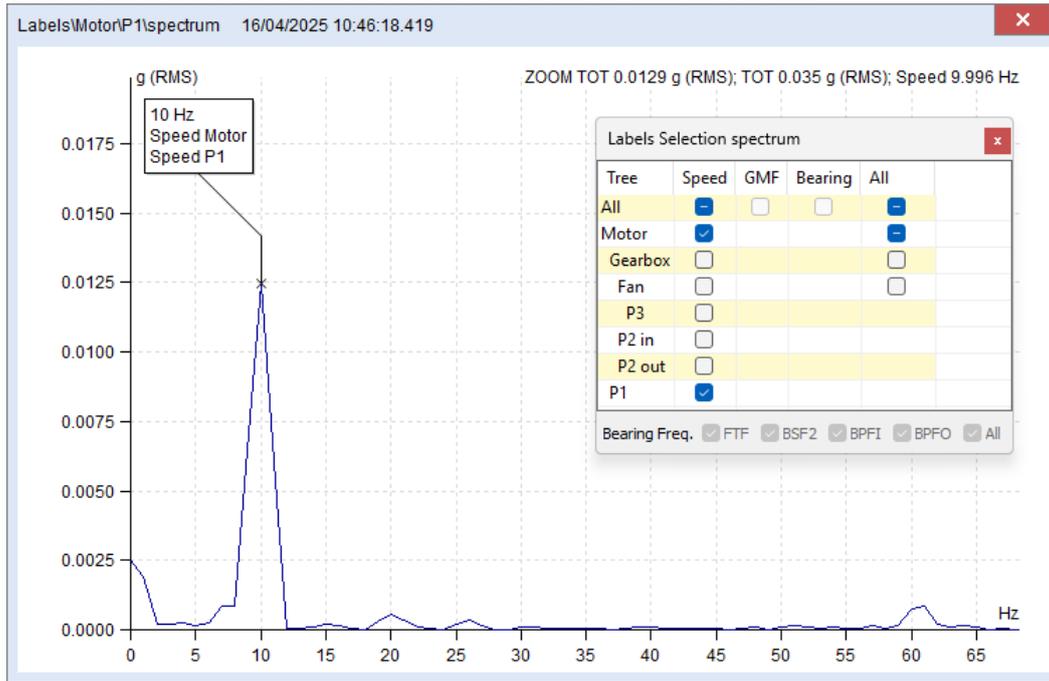
Let's start with the first example of a machine with no defined gears or bearings. All gear ratios are defined at Points. We select one point and display the spectrum. Then we switch to the Graph tab and push Change Group and select Display Machine.

This is what we can see in the spectrum.



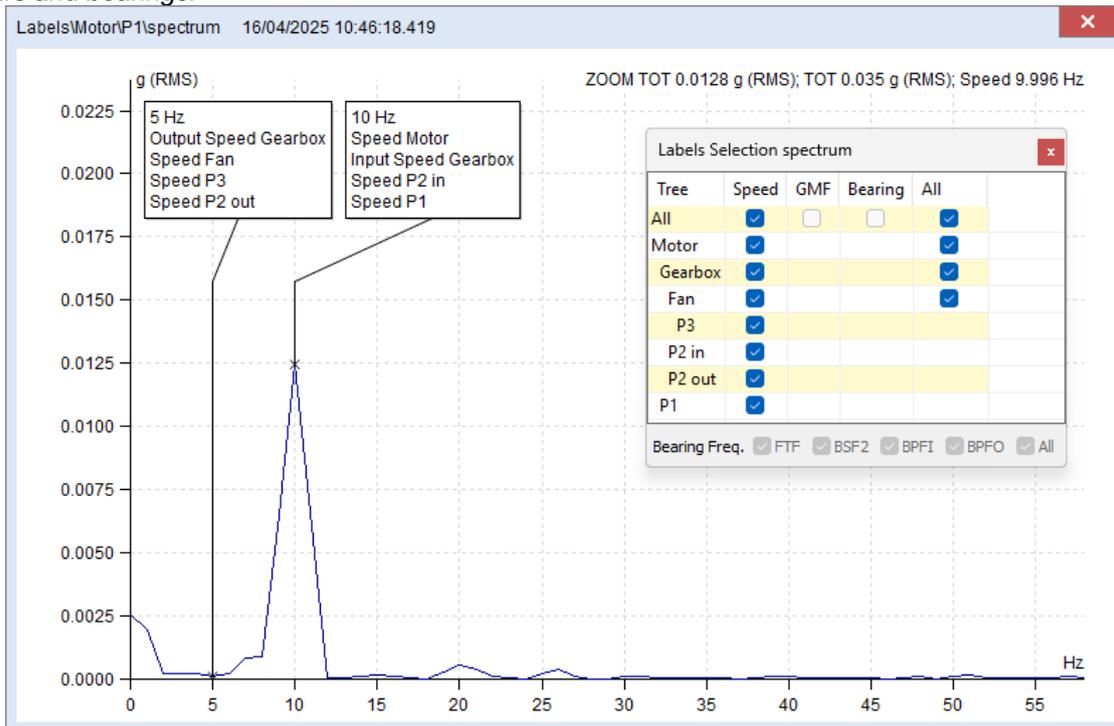
The Labels Selection window shows us which frequencies are displayed in labels. By default, this is all of them. We can see labels for speed frequencies of every Tree Item and Measurement Point. Identical frequencies are always shown in a single label.

We can select what labels we want to see. We uncheck all unwished items.



Example 2: Gear ratios at Tree Items

We show labels for the example with gear ratios defined at Tree Items (not at Points), but still without gears and bearings.



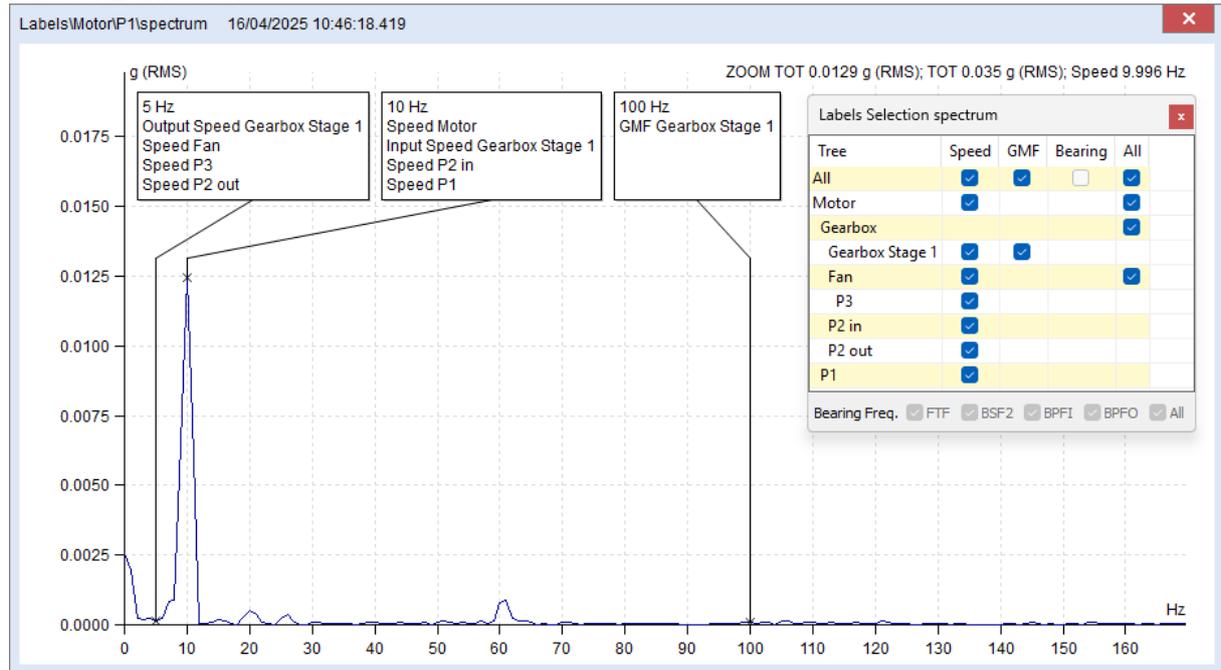
Gearbox now has two frequencies shown in labels. One for its input speed and the other for its output speed.

Example 3: Gearbox with defined stage

Let's move on to the example. We defined the gear stage for our gearbox.

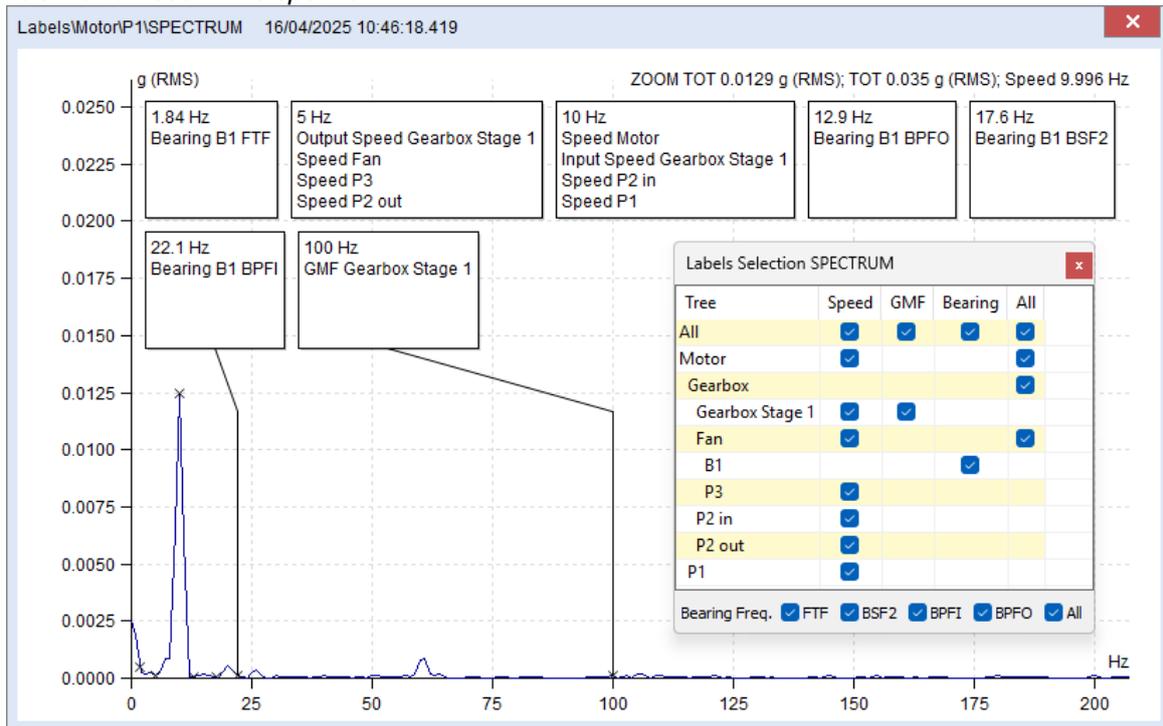
1D	2D	3D	Speed	Bearings	Labels	Bands	Other	Gears
Stage	Input Shaft ...	Output Shaf...	Ratio	x Input Speed	Input Bearing	Output Bear...		
1	10	20	0.5	0.5	Not Defined	Not Defined		

The spectrum we get shows speed frequencies as before, but with two additions. We see output and input speed frequencies of the whole gearbox as before. Now, we see them for each stage as well. There is only one stage in this case. It means, that we can see the input and output twice. Ones for complete gearbox and ones for stage. The spectrum newly shows a gear mesh frequency at 100 Hz. Gear mesh frequency is the product of input frequency and the number of input shaft teeth. In this case, it is 10 Hz times 10.

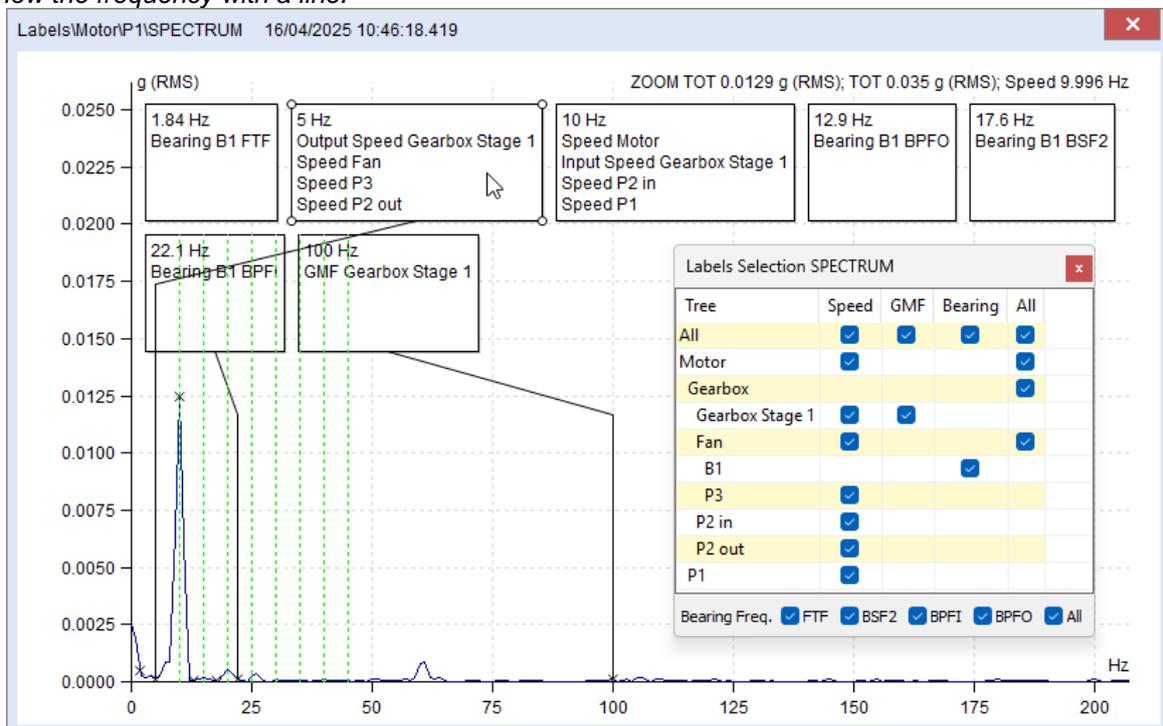


Example 4: Bearing at Fan

Now, we show an example with a gear stage defined at Gearbox and a bearing at Fan. This is what labels we can see in the spectrum.

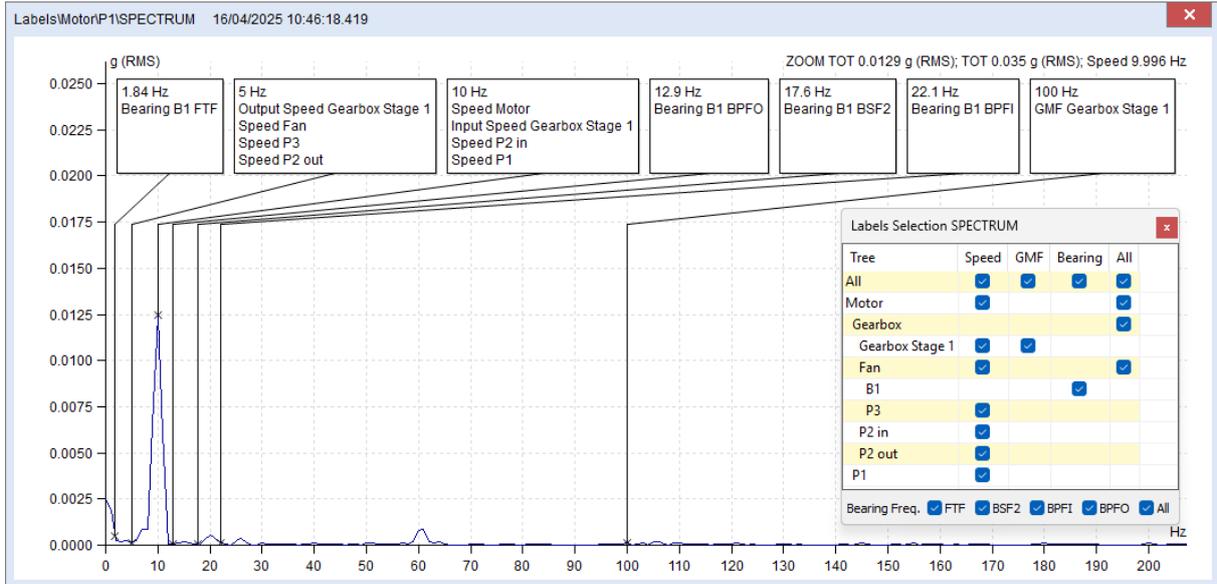


There are now too many labels to show in one row. Only the labels in the second row are connected to spectral lines. There are ways to see the others. The first option is to move the cursor into the label for which we want to see the frequency in the spectrum. For example, the 5 Hz label. This will force it to show the frequency with a line.

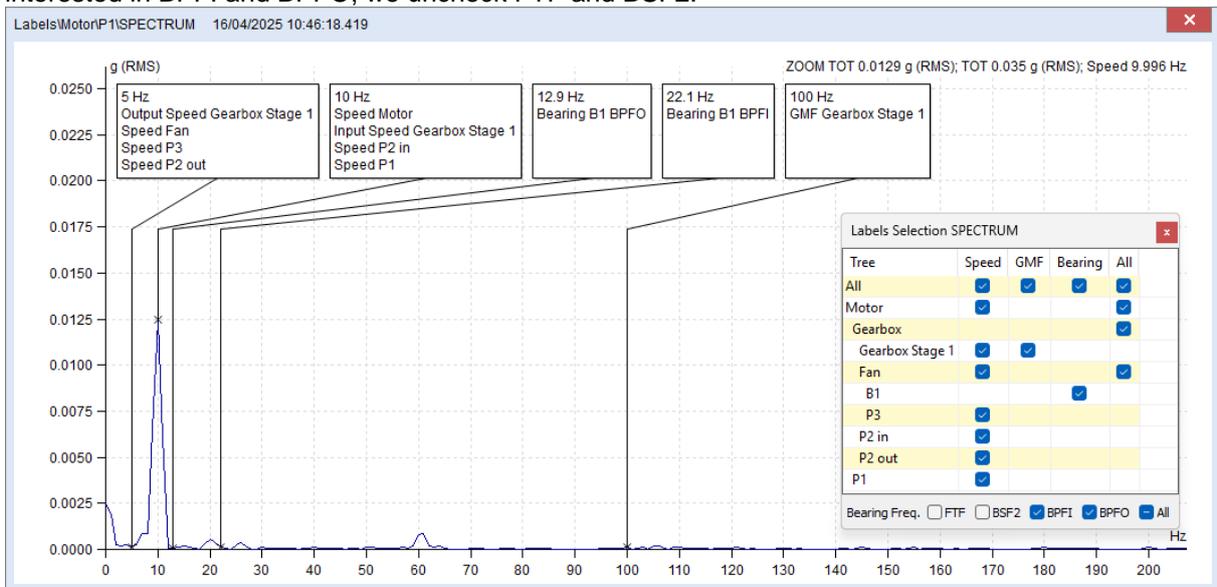


The second option is to uncheck labels we do not want to see. The third option is widening the graph window, but this may not be practical for more complex machines with large number of fault frequencies.

This is what a wider window looks like for the same machine.



We may choose which specific bearing fault frequencies we want to see. For example, if we are only interested in BPFI and BPFO, we uncheck FTF and BSF2.

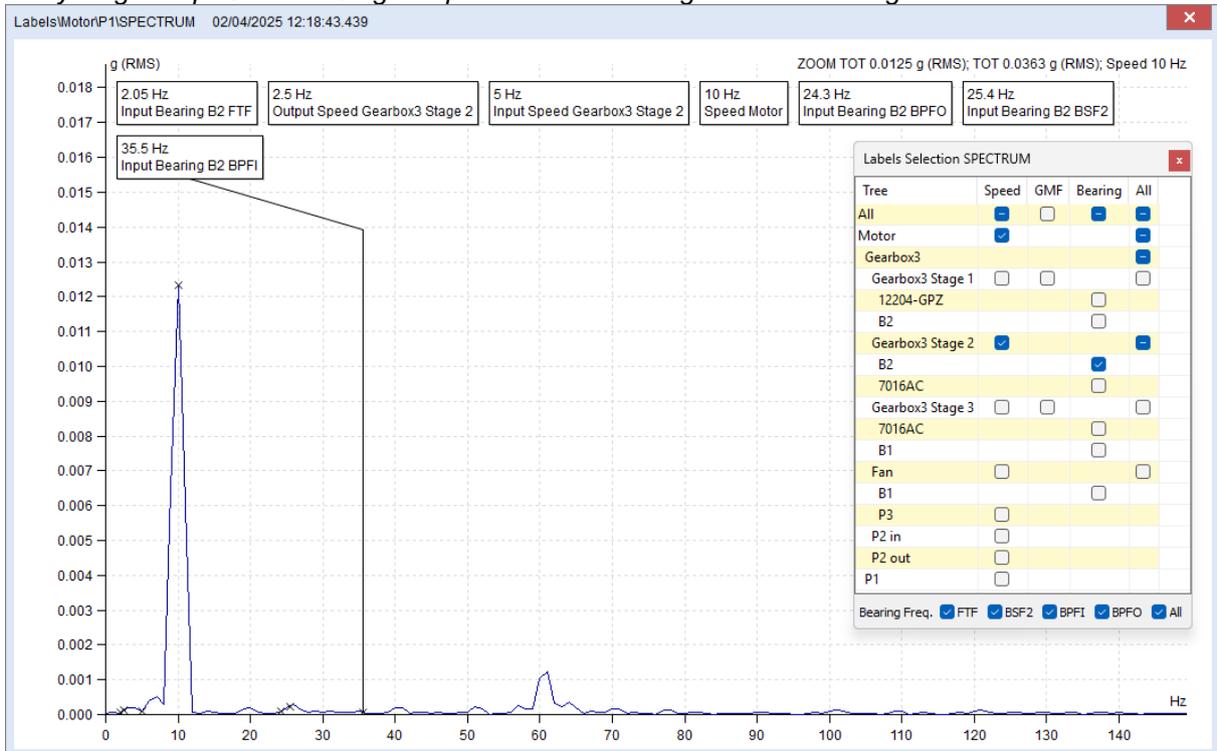


Example 5: Multistage gearbox

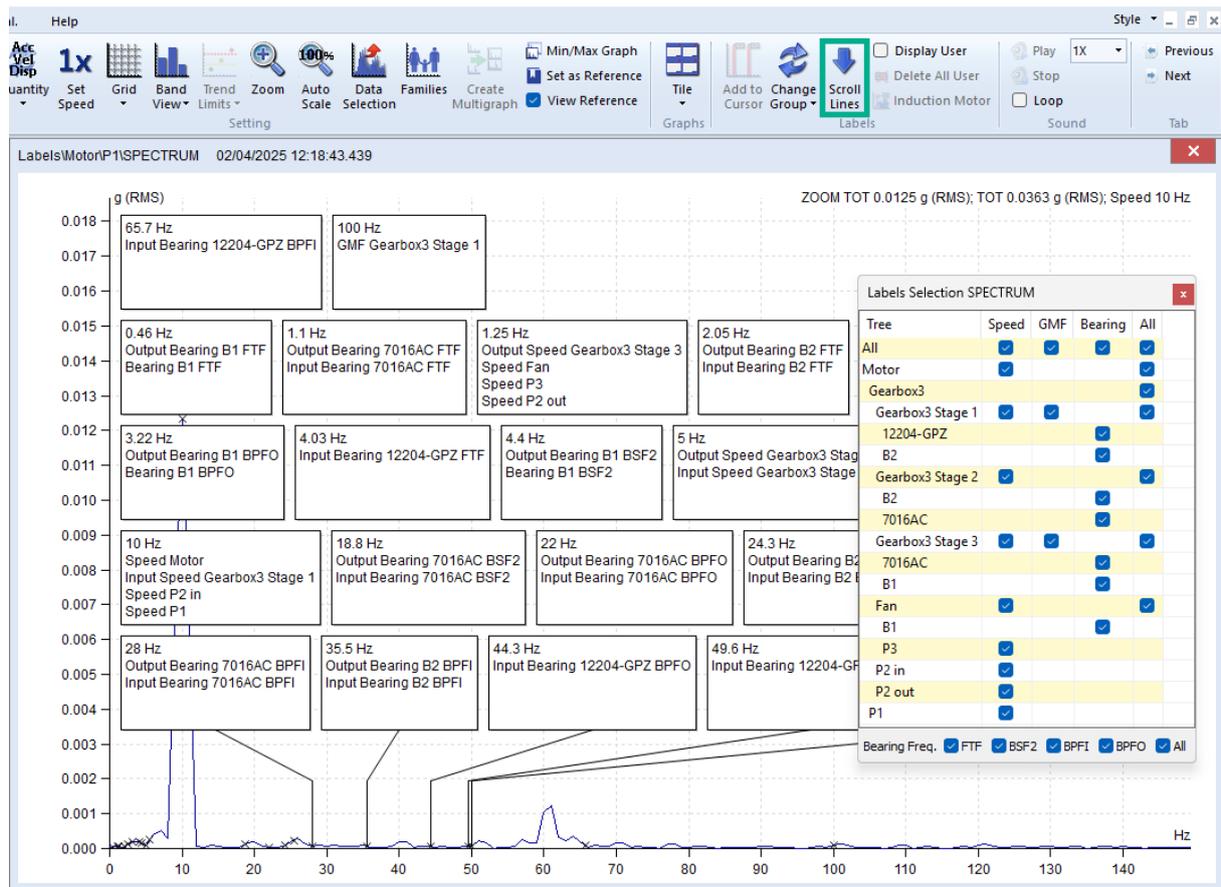
Let us look at the most complicated example now. We have defined three stages in Gearbox, each with a bearing at input and output shafts. We also have a bearing defined at Fan.



It may seem overcomplicated, but this is exactly the kind of example where Machine Labels are the most useful. We can just uncheck what does not interest us in the moment. For example, let us uncheck everything except Gearbox Stage 2 speed and B2 bearing at the same stage.



It is possible to scroll rows. Use the Scroll Lines function in the graph tab. This moves the last row before the first.



Labels Selection in Time Signal

In a time signal measurement, the Labels Selection window may look like this. It lists all labels that can be displayed, just like for a spectrum. Select a time signal measurement, go to the Graph tab, push Change Group and select Display Machine. These are labels for any given machine part or Measurement Point.

Tree	Input Speed	Output Speed	GMF	FTF	BSF2	BPFI	BPFO
Motor		<input type="radio"/>					
Gearbox3	<input type="radio"/>	<input type="radio"/>					
Gearbox3 Stage 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
12204-GPZ				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B2				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gearbox3 Stage 2	<input type="radio"/>	<input type="radio"/>					
B2				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7016AC				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gearbox3 Stage 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
7016AC				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B1				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fan	<input type="radio"/>	<input type="radio"/>					
B1				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P3		<input type="radio"/>					
P2 in		<input type="radio"/>					
P2 out		<input type="radio"/>					
P1		<input type="radio"/>					

Input Speed and Output Speed labels show speed frequencies. GMF labels show gear mesh frequencies. Bearing fault frequencies (FTF, BSF2, BPFI, and BPFO) labels are controlled individually. There is no label option to see all of them simultaneously.

There is a difference between how Labels Selection work in a spectrum and in a time signal measurement. For spectrum, we can check as many labels as we want. For a time signal measurement, only one label can be checked and displayed. Machine Labels in a time signal measurement work like a periodic cursor. It does not show frequency directly. Instead, it shows several periods. The number of lines shown is defined in Tools > Globals > All Graphs > Periodic Lines. The number of periods is smaller by one.

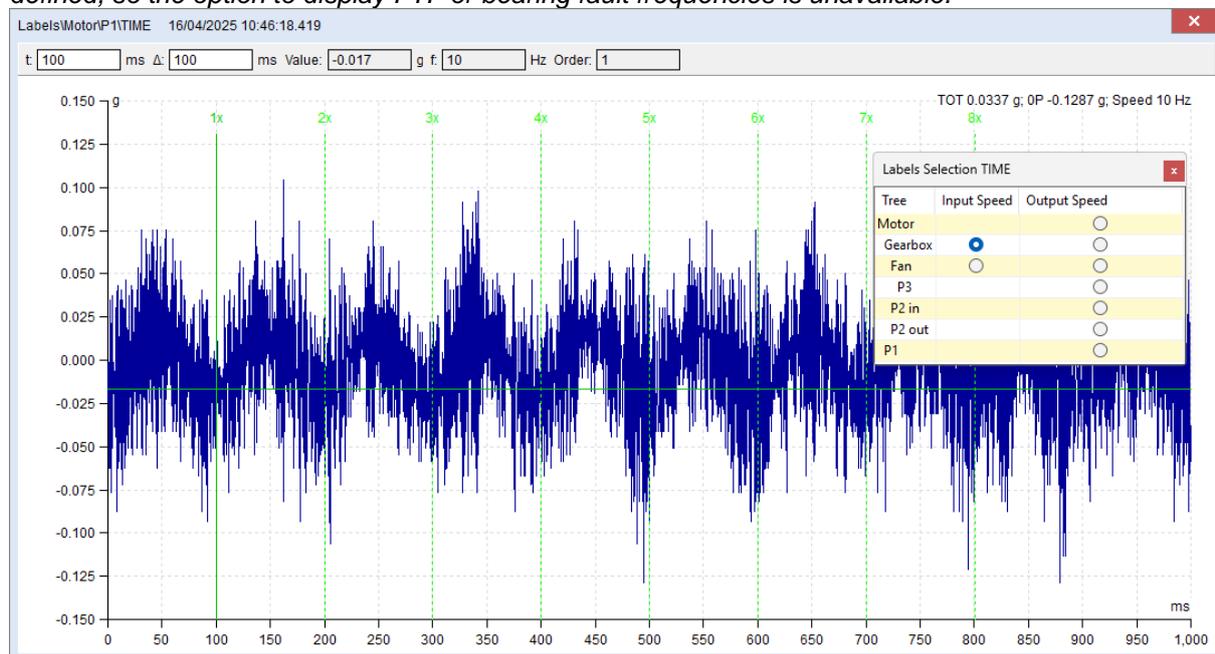
If there are no gears or bearings defined in the machine, the columns for their frequencies are not displayed.

Labels in Time Signal

Example 1: Speed frequencies

The first example is a simple machine without gears or bearings defined.

This is what we can see in the time signal measurement. This machine does not have gears or bearings defined, so the option to display FTF or bearing fault frequencies is unavailable.

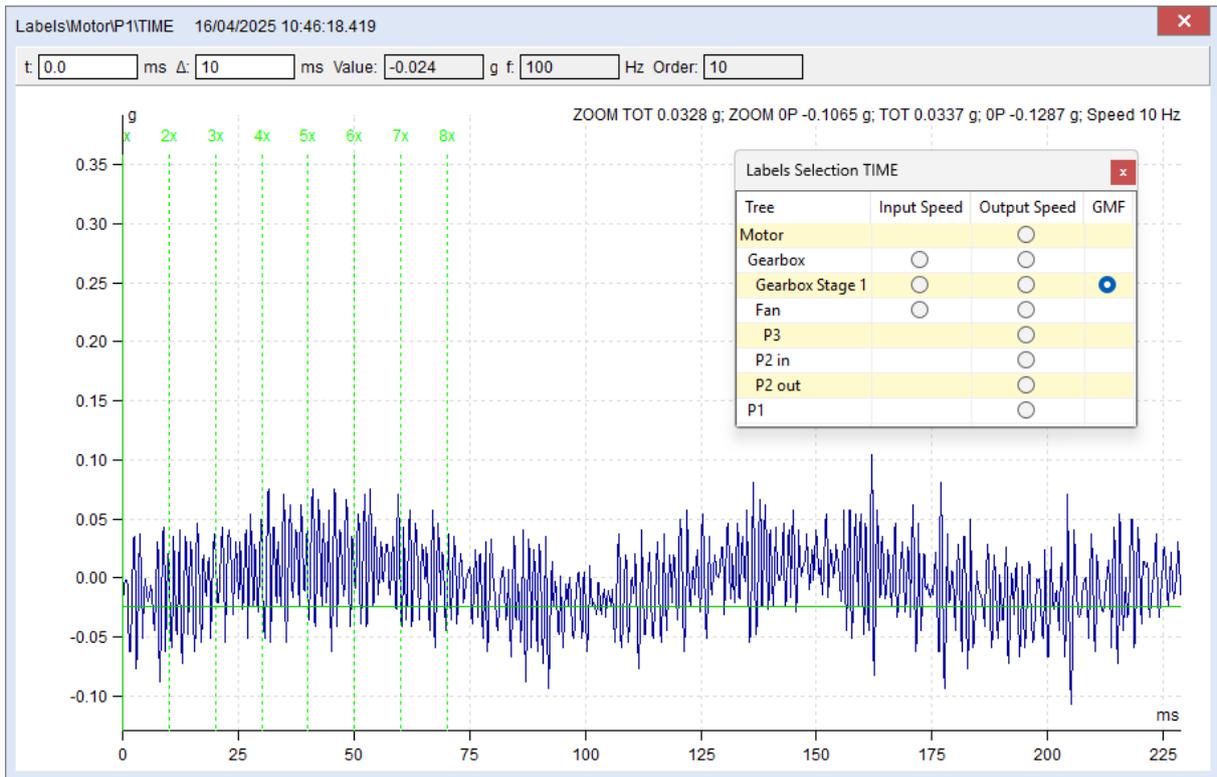


The Labels Selection window shows us which frequency is displayed by a periodic cursor. Only one frequency at a time can be selected.

We can display any machine frequency in any time signal measurement on the machine, which is the same principle as for showing labels in a spectrum. Points only have one speed frequency.

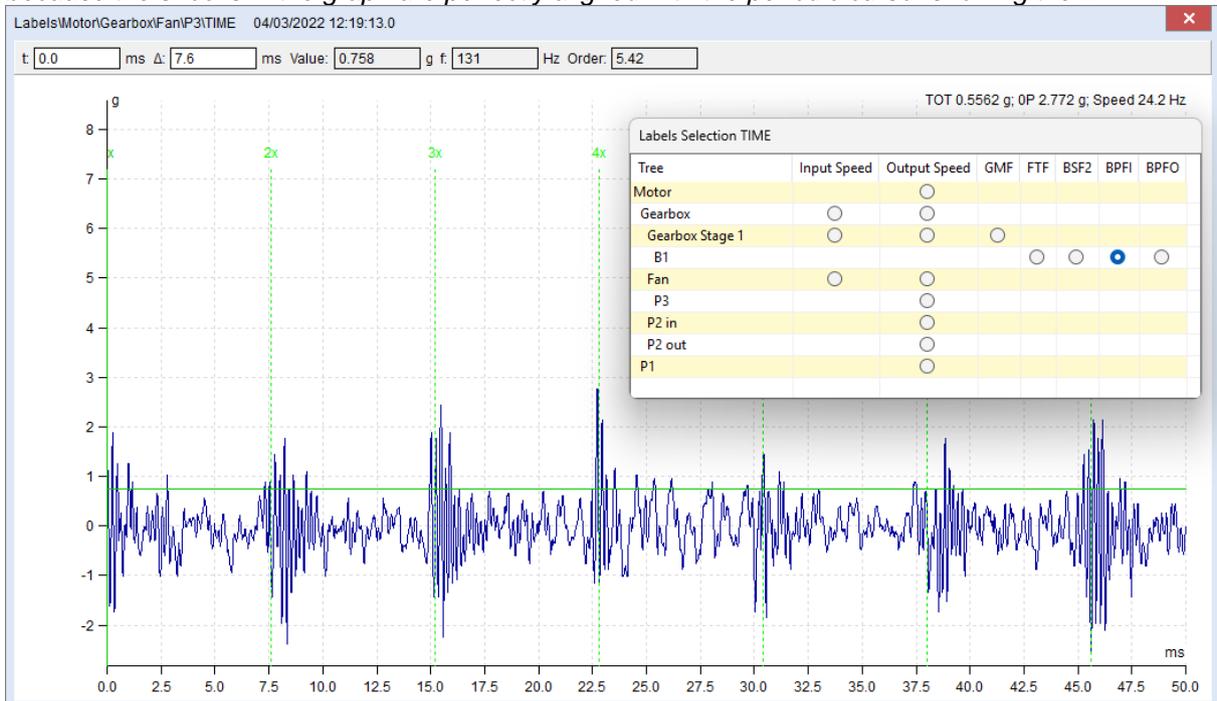
Example 2: Gear mesh frequencies

If a machine has gears defined, the Labels Selection window allows us to display gear mesh frequencies in addition to speed frequencies. This is what gear mesh frequency of the Gearbox Stage 1 looks like when shown by a periodic cursor.

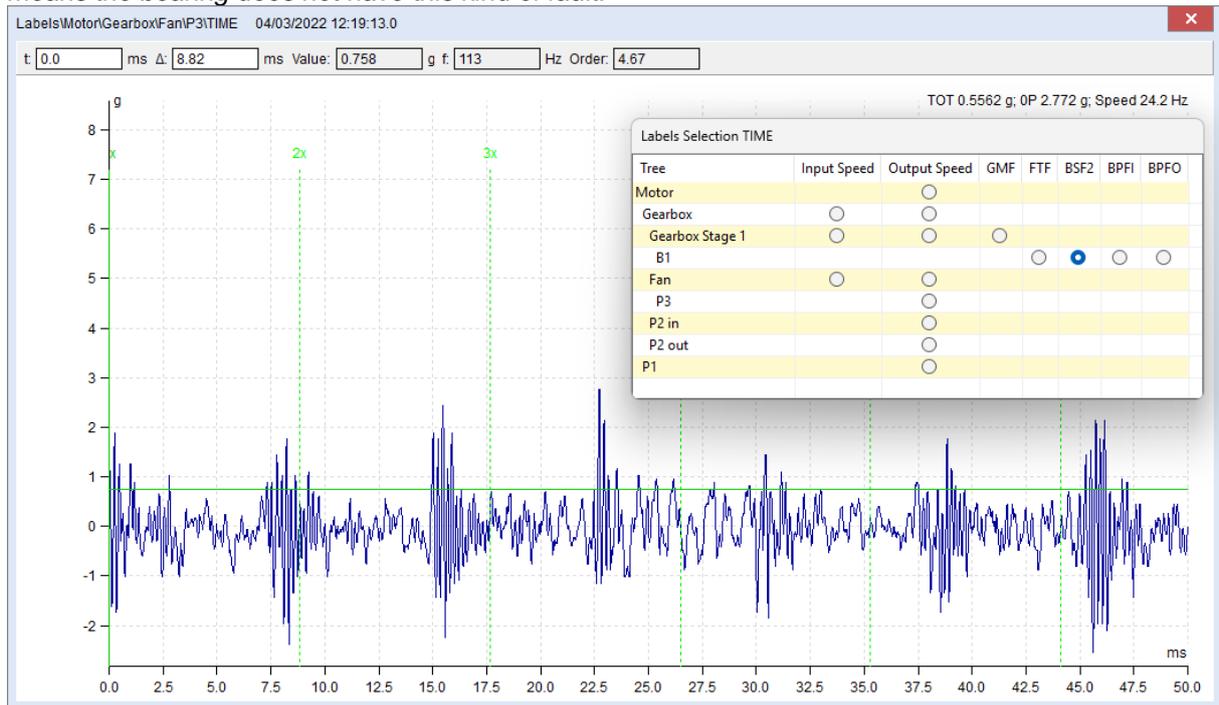


Example 3: Bearing fault frequencies

If we have a bearing defined in the machine and measure a time signal, we may detect shocks from bearing faults. We may also display fault frequencies of the bearing using Machine Labels. For example, we show the BPF1. In this case, the bearing's inner race indeed has faults. This is obvious, because the shocks in the graph are perfectly aligned with the periodic cursor showing the BPF1.



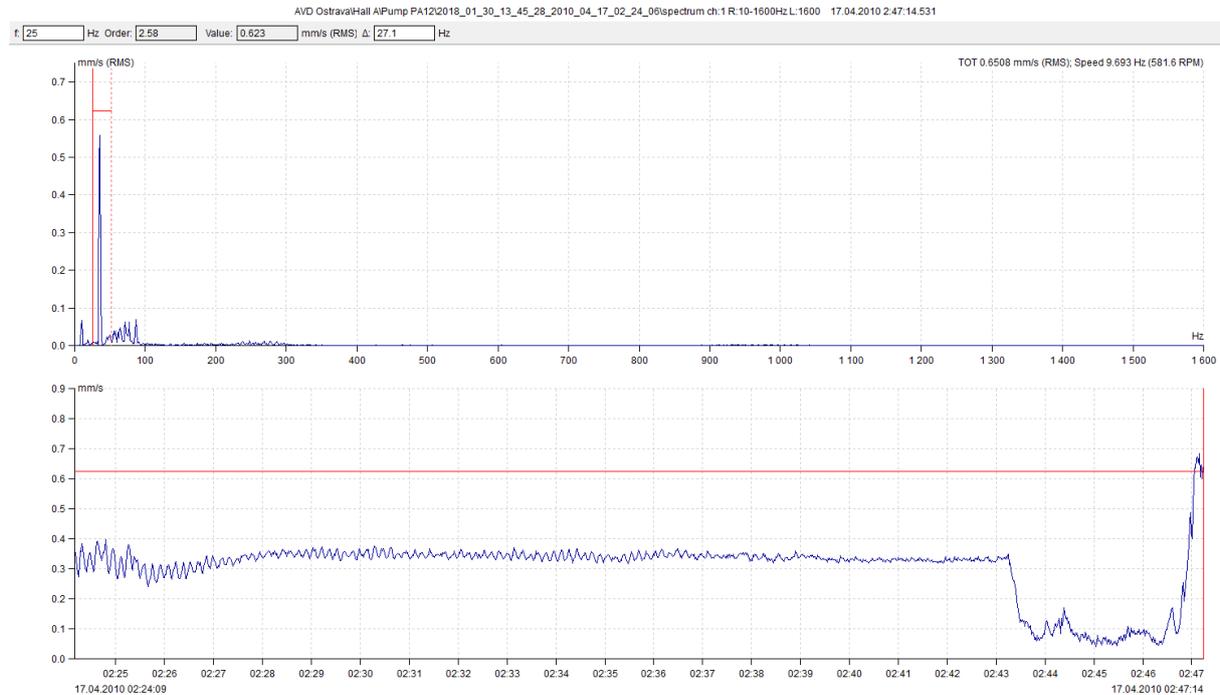
But if we decide to display, for example, BSF2, it does not align with any shocks in the graph. This means the bearing does not have this kind of fault.



Data Postprocessing

This feature allows to create a trend from spectrum data cell or remove selected readings (measurements) from spectrum cells.

Take a look at the spectrum graph with Amplitude + Trend graph type to see how the trend is being created. Turn the cursor on (simple or delta), and you can see that the trend is created from the cursor values on each data cell measurement. On example below we see the development of the overall value in 20-30 Hz frequency band.



The Postprocessing feature creates this trend too and enables its additional filtering. Filtered trend data you can save to new static data cell.

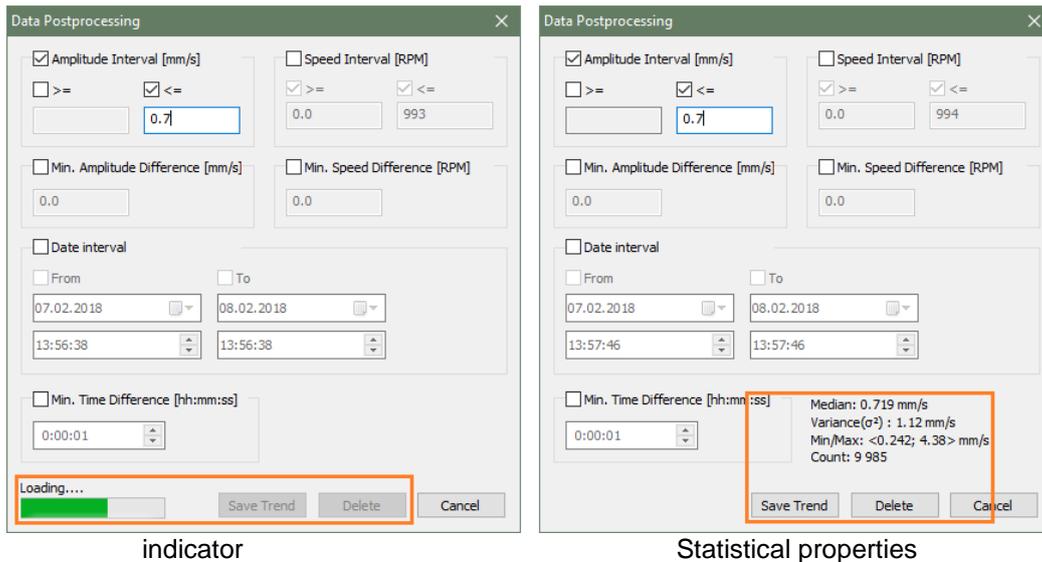
Saving of trend

Open the spectrum graph, switch the cursor on and press right mouse button. Select the Data Postprocessing item. Next window with parameters appears.

If the data cell contains a larger number of readings, then the loading indicator appears on the bottom left corner and the buttons are not available. But you can work with the window parameters during loading process. When the loading is completed, then the indication disappears. Statistical properties of the trend data (Median, Variance, min / max, Count) appears on the bottom right corner.

You can set up several filter parameters in the postprocessing window. This filter is then applied to the trend.

After setting of required filter parameters, click Save Trend button. You will be informed how many values matches with your parameters; it means remain in trend. You can still go back and change the parameters. If you are satisfied, confirm the information window and enter the name of the new data cell. The data cell will be created in the same measurement point as the spectrum over which you started Postprocessing.



Postprocessing window parameters:

Amplitude Interval – trend will contain only values inside this interval.

Speed interval – trend will contain only readings with speed inside this interval.

Min. Amplitude Difference – required minimal difference between two neighboring trend values.

Min. Speed Difference – required minimal difference of speed between trend values.

Date interval – trend will contain only values inside this time interval.

Min. Time Difference – required minimal time difference between two neighboring trend values.

Spectrum data cell data removal

Deleting readings from a spectrum data cell is made by the same way as when saving a trend. Just do not click the Save Trend button, but Delete button. You will be informed how many readings will be deleted. If you really want to delete these readings, confirm by clicking Delete.

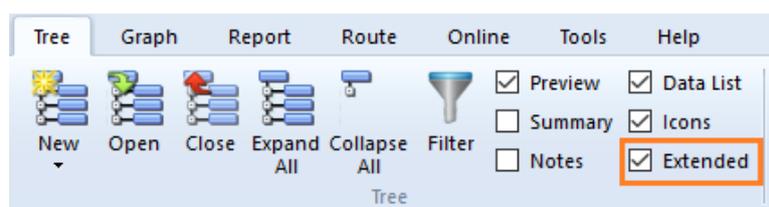
Attention! This action is not reversible. All spectra whose cursor value matches with applied filter will be deleted.

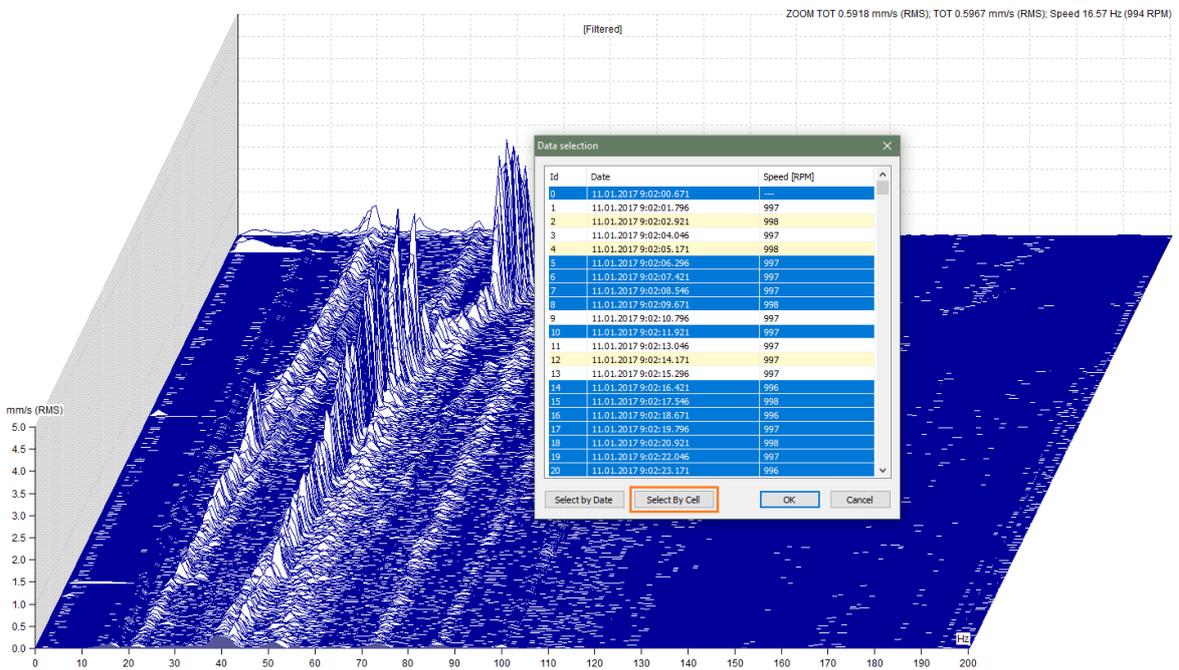
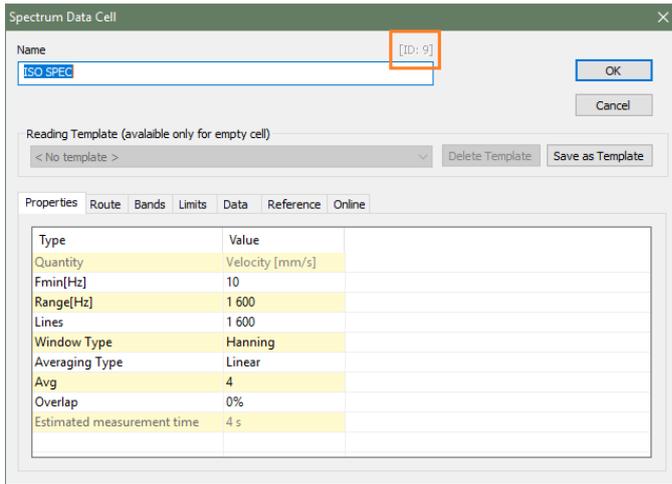
Data selection using static data cell

In the spectrum graph it is possible to select the set of data you want working with. E.g. you can select the data from last month only. This function is called Data Selection (Graph tab / Settings / Data Selection). The Data Selection window allows you also to select those readings which have the same measurement time as measurement times of other data cell (the control cell).

Use the Select by Cell button (in the Data Selection window). Enter the ID of control cell. You can find the cell ID in the Data Cell Properties window or right next to the tree name (Tree / Extended option has to be enabled).

By combining Postprocessing, Save Trend, Select by Cell, we have a powerful tool in hand.



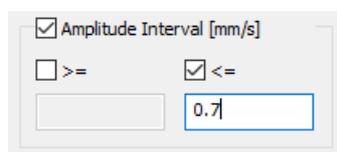


Example:

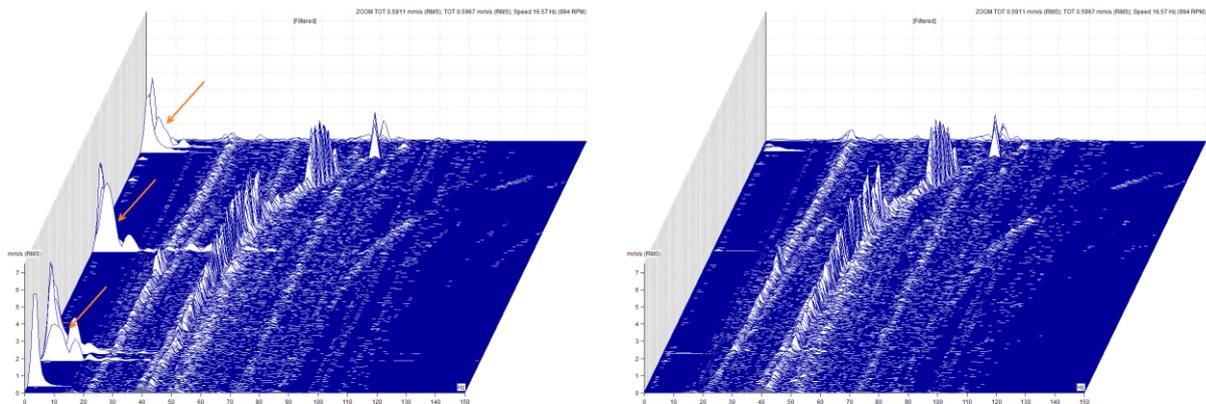
We measured machine vibrations for a few hours using Run Up mode in VA4Pro device.

When displaying a waterfall spectra graph, you can notice several spectra with high amplitude in the

0-18 Hz band. These wrong measurements were caused by badly mounted sensor. To view a graph without these spectra we can use Data Selection. However, if measurement was made for several hours, the number of readings could be tens of thousands. So, we use the Data Postprocessing function. We open spectrum graph and set the delta cursor to 0 Hz to 18 Hz. We open the Data Postprocessing window and select that we are interested only in amplitude values less than 0.7 mm/s.



Click Save Trend button and enter the name of the data cell to be created. Now we will find the ID of created data cell. Find the data cell ID in the Properties window, next to the name or it is visible directly in the tree (Extended function enabled). Now we go back to the spectrum graph, select the Data Selection function and click Select By Cell button. Enter the data cell ID and confirm the window. Now we can display the waterfall and we see that unwanted measurements are no there.



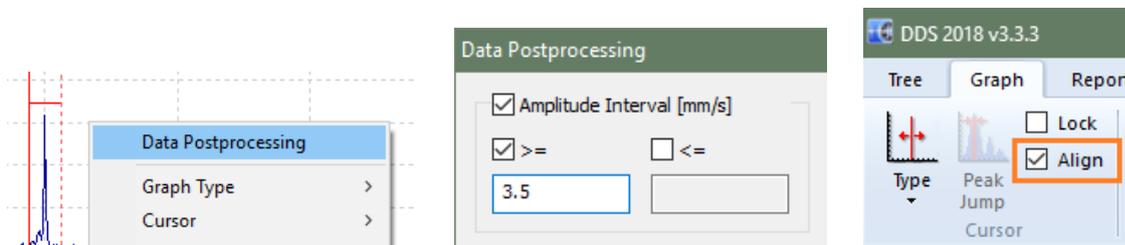
Display important data only

Data Postprocessing also allows you to quickly move between large amount of measured data and only between those measurements which are interesting for you.

Example: Let's have a measurement point with spectra, time signals and static data cells. Let's presume that we are interested to see only the data which were measured at the same time and when there was overall RMS value in spectrum in range of 20-30 Hz higher than 3.5 mm/s.

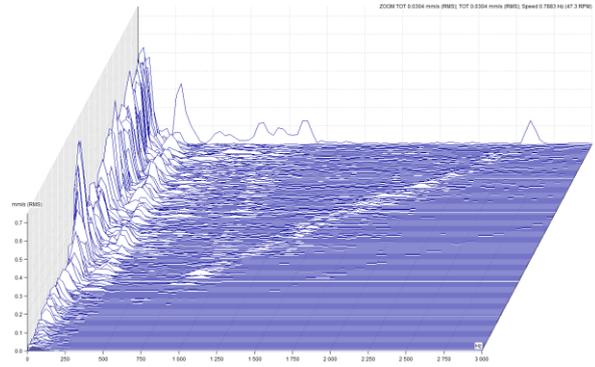
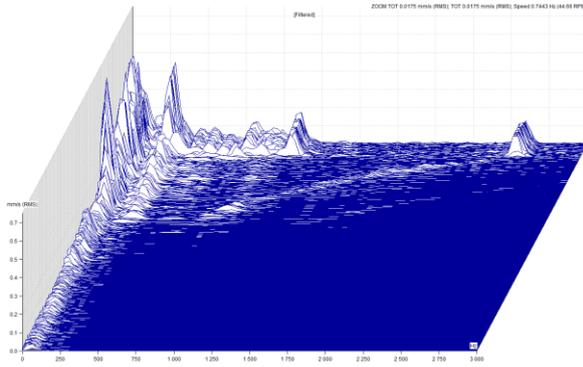
Open the spectrum graph, set the delta cursor on 20-30 Hz range and run the Data Postprocessing.

Set the amplitude value higher than 3.5 mm/s and save it as trend. Select the measurement point from the tree (all readings from the point will be displayed in Preview). Enable Align Cursor function in Graph type.



Data reduction

With Postprocessing, you can also reduce data by amplitude or speed. For example, if we measure coast down, where the speed will slowly decrease and the data will be measured very often, we will get a large number of measurements with the same speed. If we will look at waterfall spectra, the data will not be "well readable". There is simply too much of them. You can argue that the property of the waterfall view is that if there is too much of data, then it is "reduced" by itself. Yes, but this reduction is linear and does not depend on the speed value. The difference in speed between two spectra at the beginning of measurement will be significantly smaller than in the middle of set where the speed is steeply decreasing. Therefore, it is more appropriate to create a trend using Postprocessing that will have the Min parameter Speed Difference, e.g. 5 RPM, and then use it in Data Selection (Select by Cell).



The same way we can work with the required Min Amplitude Difference and Min. Time Difference between every neighboring values.

The last possibility of data reduction is to specify a required time interval. The resulting trend will only contain the values from the spectra measured in this interval. If you run Data Postprocessing function in the Amplitude + Trend spectrum graph view, the Date Interval parameter is set according to the X-axis zoom in the trend graph, and the Amplitude Interval parameter is set according to the Y-axis zoom in the amplitude graph.

Data Postprocessing ✕

Amplitude Interval [mm/s]

>= <=

Speed Interval [RPM]

>= <=

Min. Amplitude Difference [mm/s]

Min. Speed Difference [RPM]

Date interval

From To

Min. Time Difference [hh:mm:ss]

Median: 0.068 mm/s
Variance(σ^2): 0.045 mm/s
Min/Max: <0.007; 0.796> mm/s
Count: 1.095

Save Trend Delete Cancel

Labels in graph

You can add short text labels into the graphs, which can be connected to the certain value in the graph. There are two types of labels which can be added to the graph: user labels and generated labels.

User Labels

You can enter the text and choose the position of the label. To enter the user label, do the double click on the graph (the window with label settings appears) or do the right click on the graph and you will receive the menu where select Labels/Add Label. You can add the label to the position of the cursor. The cursor needs to be switched on and you can add the label by doing the right click and selecting Add label or you can add the label through the main menu Graph/Labels/Add to Cursor.

To edit existing label do double-click on the label or do the right click on the label and select Edit from menu displayed. To change the position of the label, drag it with mouse.

The user labels are saved together with certain reading (e.g. spectrum) and they are displayed together. In view type Waterfall the labels are not displayed.

Edit of user label

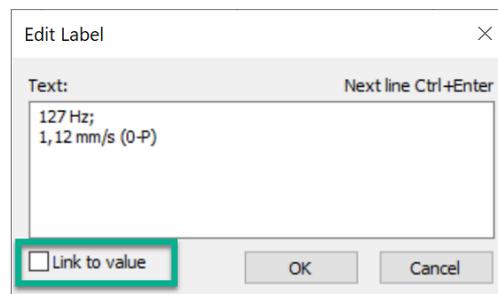
The position of label rectangle can be changed by mouse.

The position on the X axe change by mouse. Drag the small cross which is on the bottom end of line and move anywhere.

Use the right click on user label and select Edit (double click on label has the same effect). The new window appears. You can change the text.

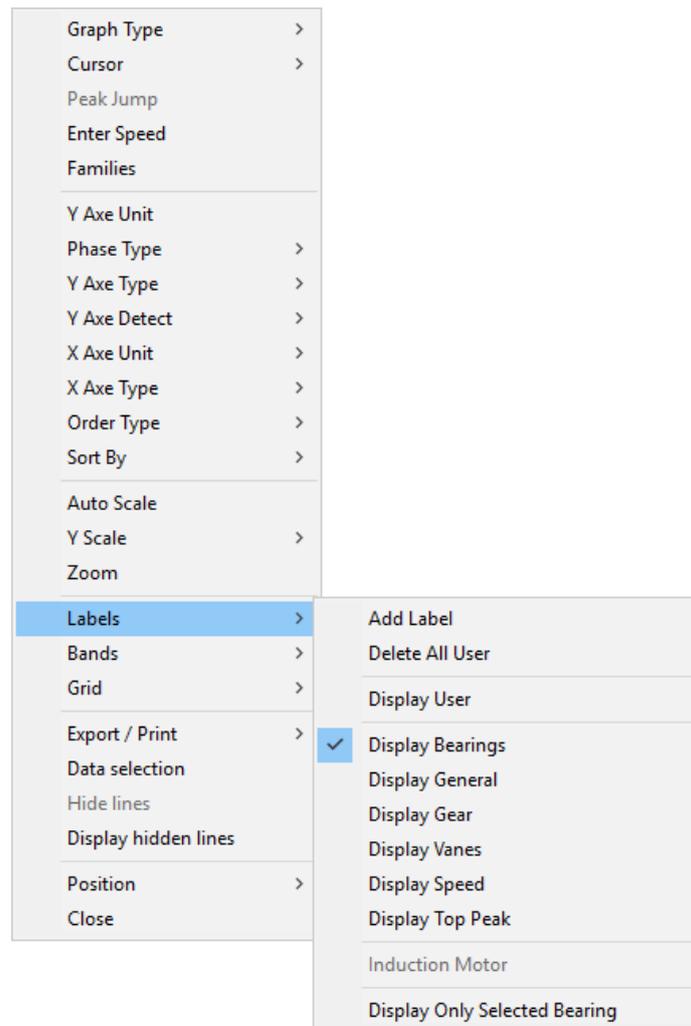
Use Ctrl+Enter for new line in text.

If the checkbox **Link to value** is off, then the line from label rectangle to graph will not be drawn.



Generated Labels (Bearings, Vanes, Gear, General)

The other labels are generated labels. The text and position is generated from parameters defined by user (which can be changed in window Tree item properties). Those labels are displayed in groups between which you can switch (in main menu tab Graph/section Labels/Change group or use right mouse click and select Labels).



Bearings

The fault frequencies of bearings are displayed. They are defined in any tree item above the data cell (window Tree item properties/Labels). The labels are displayed in case that the speed is known in spectrum or it is inherited from the tree item above the data cell.

The failure frequencies are displayed for each bearing. If you want to display the selected bearing labels then push right mouse button and select **Labels/Display Only Selected Bearing**. The speed value is required for failure frequencies detection. This value can be measured, manually entered (Default speed in Properties) or inherited from higher tree item.

FTF - Fundamental Train Frequency

BPFI - Ball Pass Frequency of Inner ring

BPFO - Ball Pass Frequency of Outer ring

BSF2 - Ball Spin Frequency * 2 = Ball defect frequency

BSF2 is the bearing failure frequency which you can see exactly in the spectrum, because spinning defective ball hits the bearing twice during one ball revolution: once hits outer ring and once inner ring.

General, Gear, Vanes

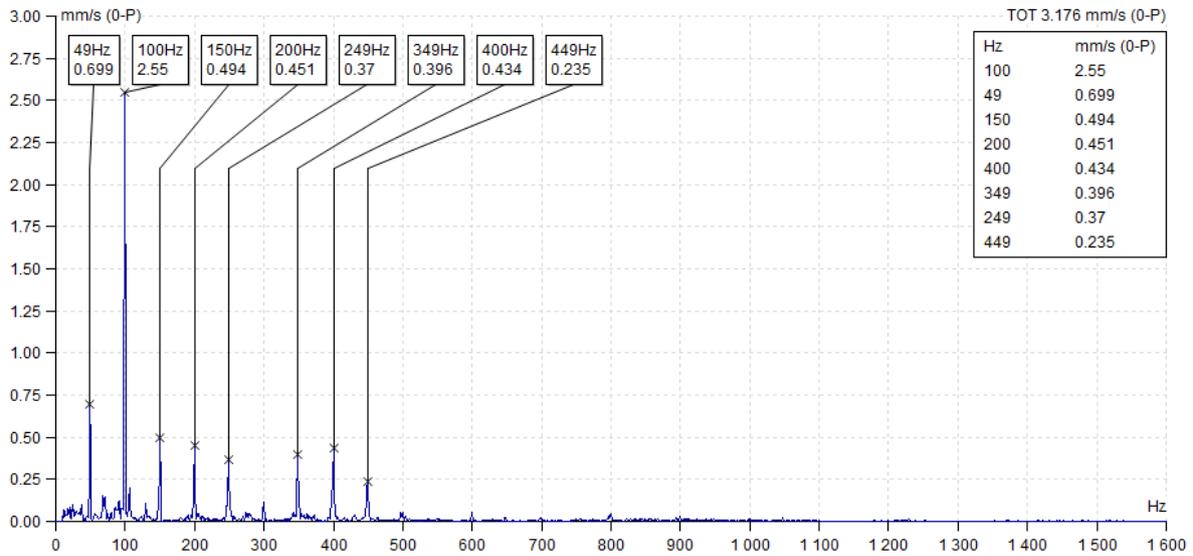
The position is defined by frequency entered by user. Those labels are defined in Tree item properties/tab Labels. When the unit is **x Speed**, then it is related to the **OUTPUT** speed of item. It is important for gearboxes. Groups Gears and Vanes could be defined in group General, but there would be overlapping of the labels and it could be confusing. For this reason, it is better to divide the labels into the groups and switch between them.

Speed

Displays speed frequency, which can be measured or entered in Properties.

Top Peaks

The list of N top peaks is displayed. The number N is defined in Global settings / Dynamic Graphs / Other / Top Peaks Count.



Induction (asynchronous) Motor

Displays FL with FL+/-FP sidebands on spectrum graph. The proper spectrum resolution is also required (at least two lines between line frequency and sideband). Option is available only on spectrum measured in current or voltage.

Defect frequencies of the asynchronous electric motor:

fL: line frequency

fP – pole pass frequency (= slip frequency * poles number)

fS: slip frequency (real speed must be measured together with spectrum)

fL+/-fP: side-band frequency (indicates interrupted rotor rod)

The side bands should be at least 40dB less than line frequency line. If not, then interrupted rotor bars are probable.

Display only selected bearing

Displays only one (selected) bearing in spectrum. Normally are displayed all bearings defined in Properties, which can confuse the reader of reports.

Families



Families are a powerful tool for frequency spectrum analysis. This feature enables quicker identification of the significant peaks in the spectrum.

Peak definition:

The peak contains 5 lines with the middle line being the highest and those next to it decreasing in size (the 1st and 5th line are the lowest lines).

Pure math Peak definition:

The spectrum contains lines f_i ($i=1,..,N$), which have the amplitudes a_i . If k exists, for which the following is true: $a_{k-2} < a_{k-1} < a_k > a_{k+1} > a_{k+2}$, then the f_k is the Peak.

Noise limit (threshold):

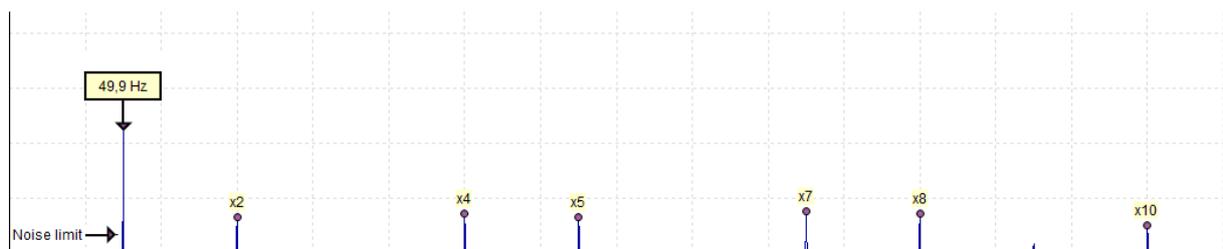
The noise limit is in RMS - 0.1g, 0.1mm/s, 10um or 1% of TOT of spectrum (depends of which value is higher). For example, when the TOT = 3mm/s, then 1% of that is 0.03mm/s, because it is lower than 0.1mm/s, then the 0.1mm/s will be used. When TOT=20mm/s, then 1% is 0.2mm/s. It is higher than 0.1mm/s and the 0.2mm/s will be used as noise limit.

Definition of Frequency family:

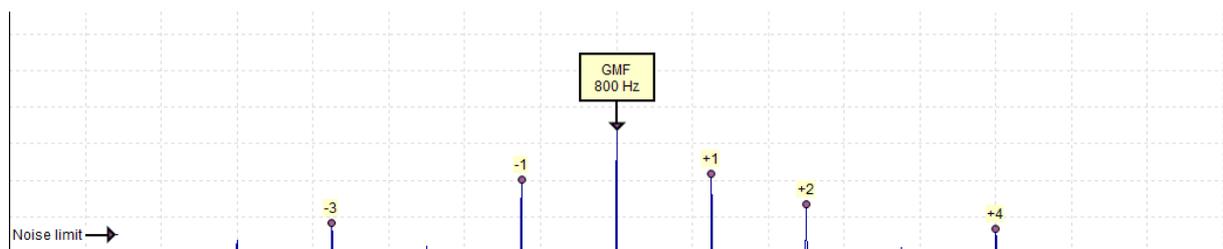
It the set of frequencies in spectrum, which are related to the carrier frequency. The relation can be harmonic or sideband. The sidebands also can be around each harmonic frequency. The individual line is included to set only when the peak also exists on that line and the amplitude is higher than noise limit.



Family with only carrier frequency.



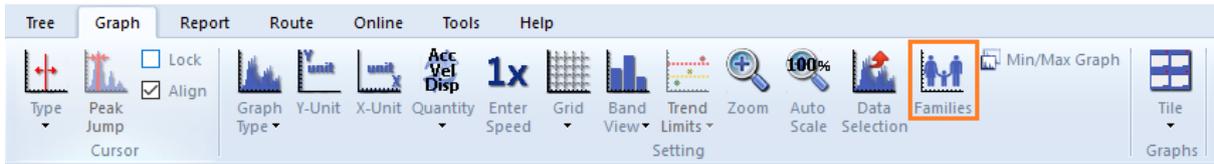
Family with harmonics. The 3rd, 6th and 9th harmonics are missing, because there is not peak or the peak is lower than noise limit.



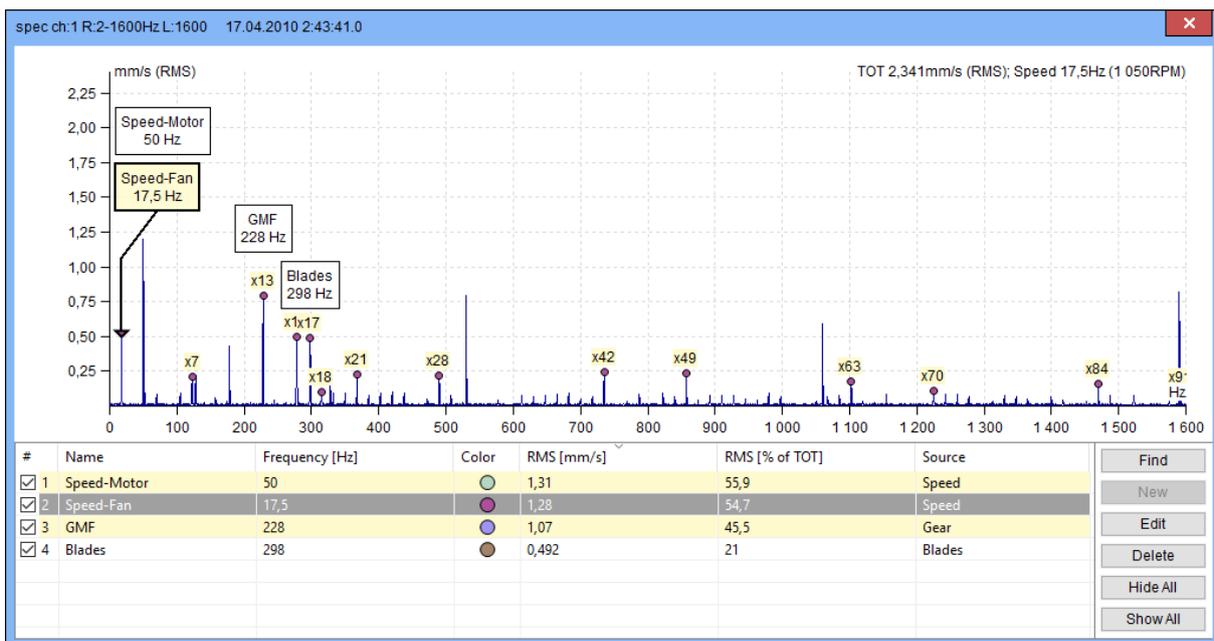
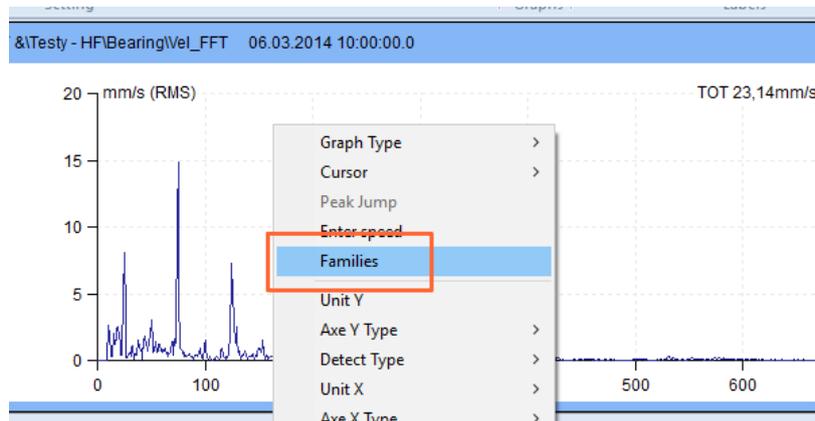
Family with sidebands, some of them are missing.

Using of families

To display the frequency families, select the Graph tab and then the Families button.



Or select Families in the local spectrum menu (right mouse click).



When the Families function is switched on, the window is split into two parts. The spectrum with the labels on the selected frequencies of families is in the upper window. A detailed list of families with their parameters is in the bottom part. Initially this list contains all frequencies, which are defined in Properties of all items in machine path.

Family parameters are the following:

Name – name of the family

Frequency – peak frequency

Color – color of the family label (generated randomly)

RMS – total RMS of family (RMS of one frequency is counted from 5 lines)

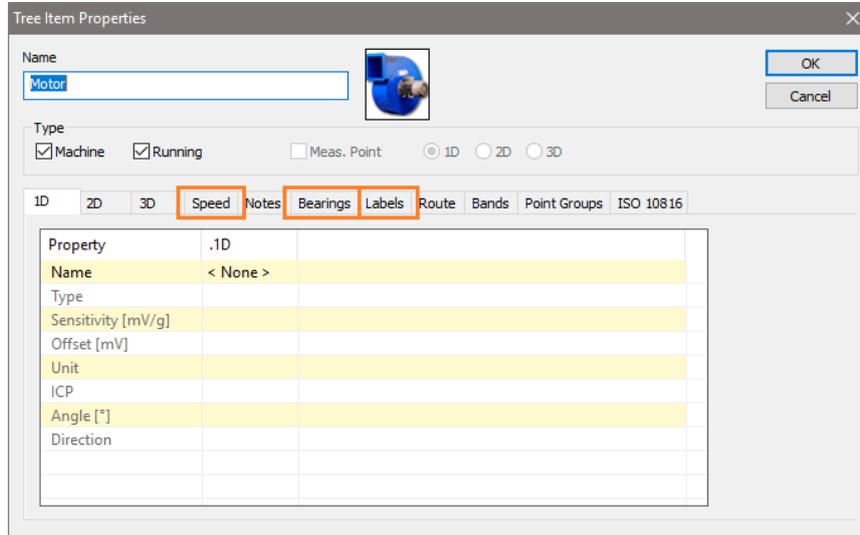
RMS [% of TOT] – percentage of the family RMS, when 100% is RMS of complete spectrum. You can see, the sum is not equal 100%. It is correct because many peaks are contained in more than one family.

Source – family source (Speed, Bearings, General, Gear, Labels, Found, User)

Which families are displayed in the spectrum? All checked families (first column in the list) are displayed. The selected frequency the list or frequency selected by cursor is highlighted.

If the family is not displayed (the first column is unchecked), then the family frequencies peaks are hidden.

You can change the order of the families in relation to each column. Click on the name of the column.



Family Searching and next buttons

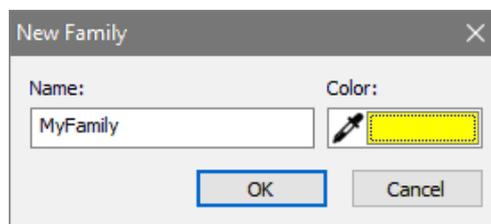
Other families that exist in the spectrum can be found with the **Find** button (the button is on the right, next to the list of families).

#	Name	Frequency [Hz]	Color	RMS [mm/s]	RMS [% of TOT]	Source	Find
<input checked="" type="checkbox"/>	1 Speed-Motor	50		1,31	55,9	Speed	<input type="button" value="Find"/> <input type="button" value="New"/> <input type="button" value="Edit"/> <input type="button" value="Delete"/> <input type="button" value="Hide All"/> <input type="button" value="Show All"/>
<input checked="" type="checkbox"/>	2 Speed-Fan	17,5		1,28	54,7	Speed	
<input checked="" type="checkbox"/>	3 GMF	228		1,07	45,5	Gear	
<input checked="" type="checkbox"/>	4 Blades	298		0,492	21	Blades	

Press the **Find** button. The procedure will find next families in the spectrum. The new frequencies with their labels appear in the spectrum. These frequencies have next needed properties:

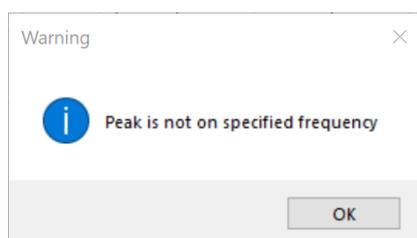
- The **Peak** exists on the frequency,
- The amplitude value is higher the **Noise Limit**.

You can also create new family manually. Display the cursor and move it to required frequency. It does not matter what type of cursor you use. Press the **New** button to open the window with Family parameters and enter required values. Press OK button to confirm the parameters.



When you select the frequency, which is used by other existed family, then the warning window appears and new family will not be created.

When on selected frequency is not peak or the amplitude is lower than noise limit, then warning appears and new family will not be created.

**Next buttons:**

Edit – opens the window to edit name or color of the selected Family.

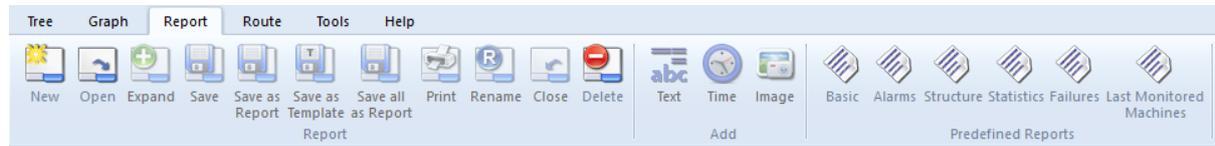
Delete – deletes the selected Families in the list.

Hide All – unchecks the first column of all Families.

Show All – checks the first column of all Families.

Reporting

Reports are used to present the measured data. In the Report tab are tools for report making. One report corresponds to one DDS page (more about DDS pages see chapter Drawing of graphs -> Plot/Report Area and Pages).



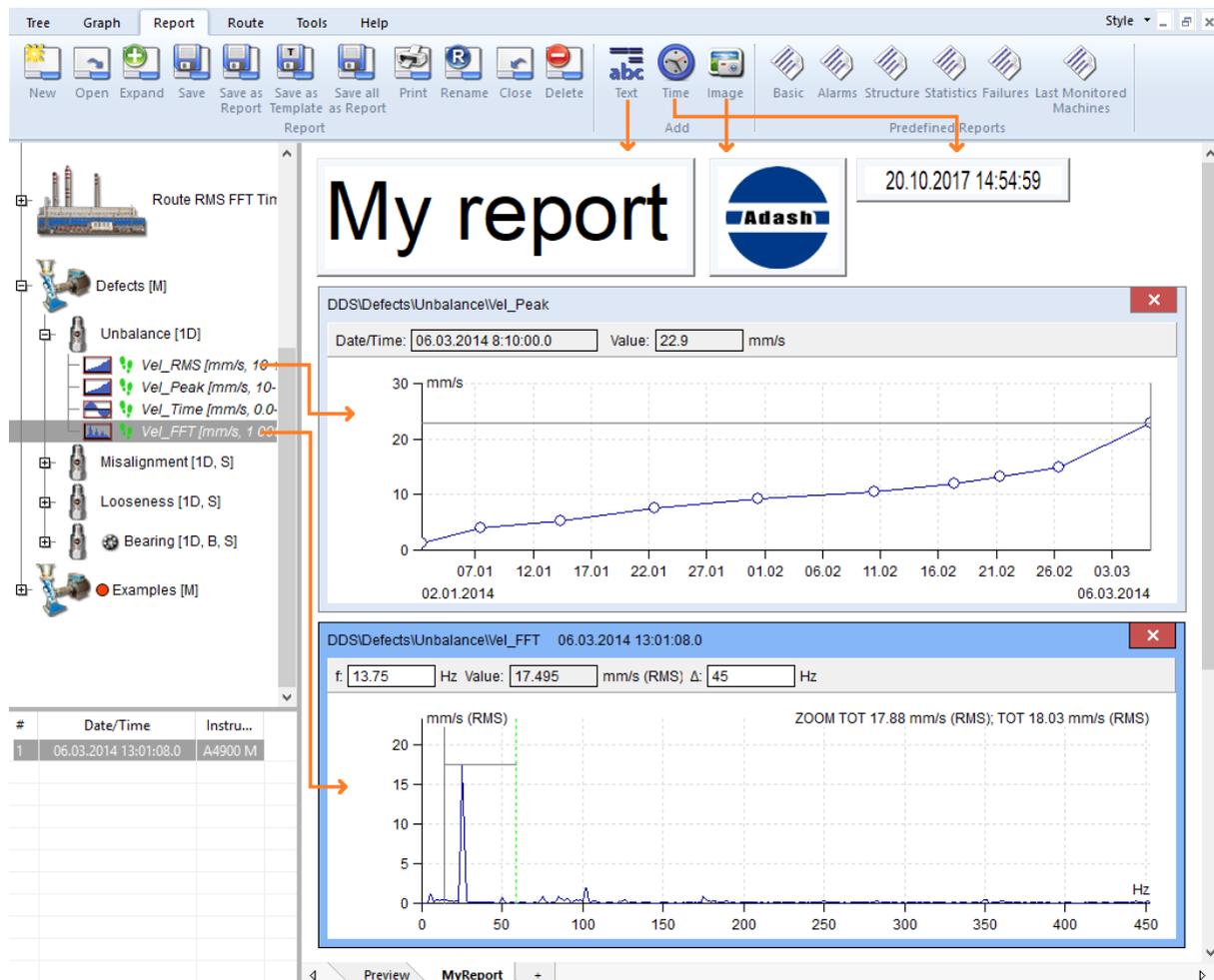
User Reports

You can create own reports. You can add into texts, images and graphs. Graphs are alive and you can work with them as in Preview page or plot page.

Page format for printing you can set in Tools/Setting/Global/General/Report/Page Format.

Functions for creating report page, saving and other function are in Report section.

The function for inserting report objects is in Add section.



Machine Reports

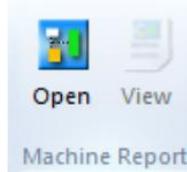
Machine report is located under tab 'Report'. You can see 'Machine Report' section.

This feature allows to create a simple tree structure with machine and measurements points. It enables also to add the image that visualizes where the measurement points are located on the machine. After

the measurement is taken, it can produce new report that contains the machine image with measurement points and readings taken in the table.

All reports are saved in this folder **c:\ProgramData\DDSMachReports**.

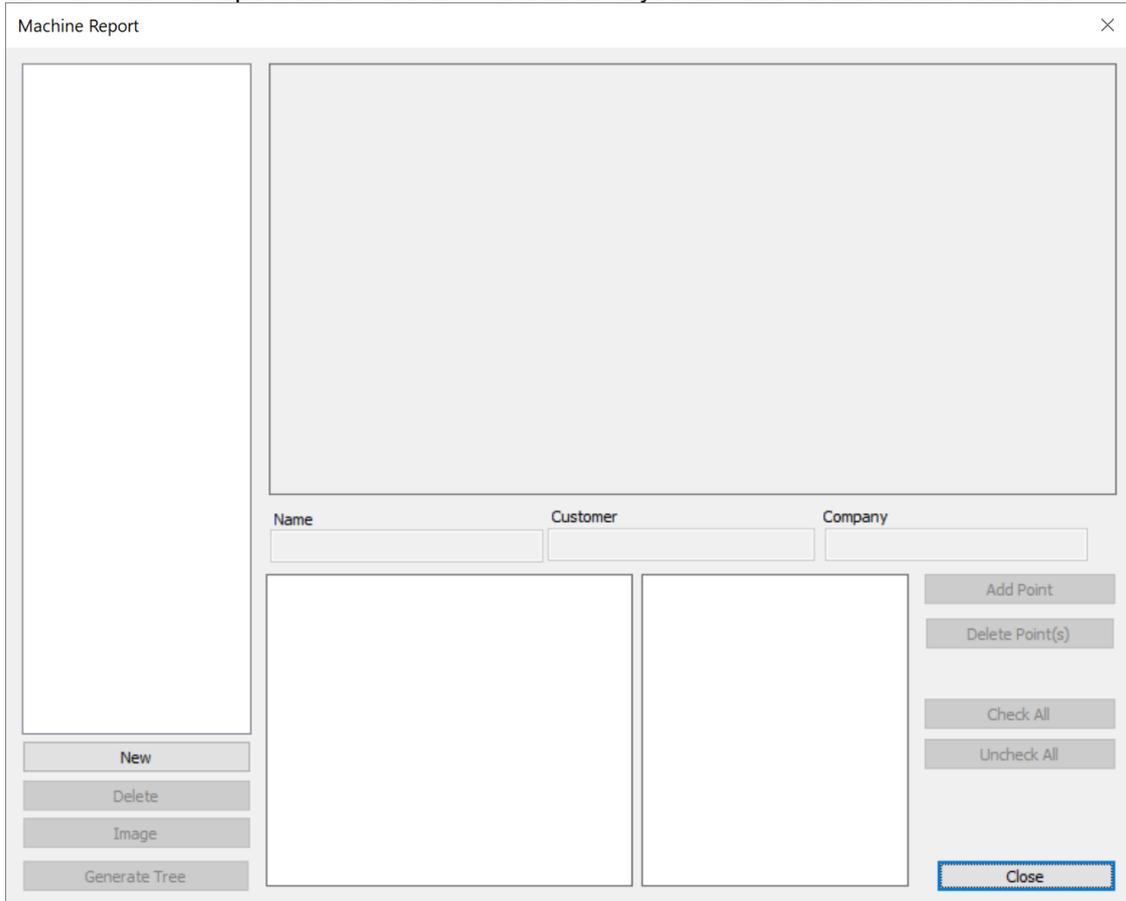
You have two icons in '**Machine Reports**' section.



Note! 'View' icon is available once the report is created.

Buttons explanation

Window for machine report looks like this. All the buttons you can see here are described below.



New – generate new report

Delete – delete the chosen report from the list

Image – select .jpg or .png image of your machine

Generate Tree – generate machine tree in DDS (Machine with points and in each point is defined set of measurements)

Add Point – add points to an image

Delete Point(s) – deletes selected points form the report

Check/Uncheck All – mark or unmark all the measurements in the box (this box is shown later)

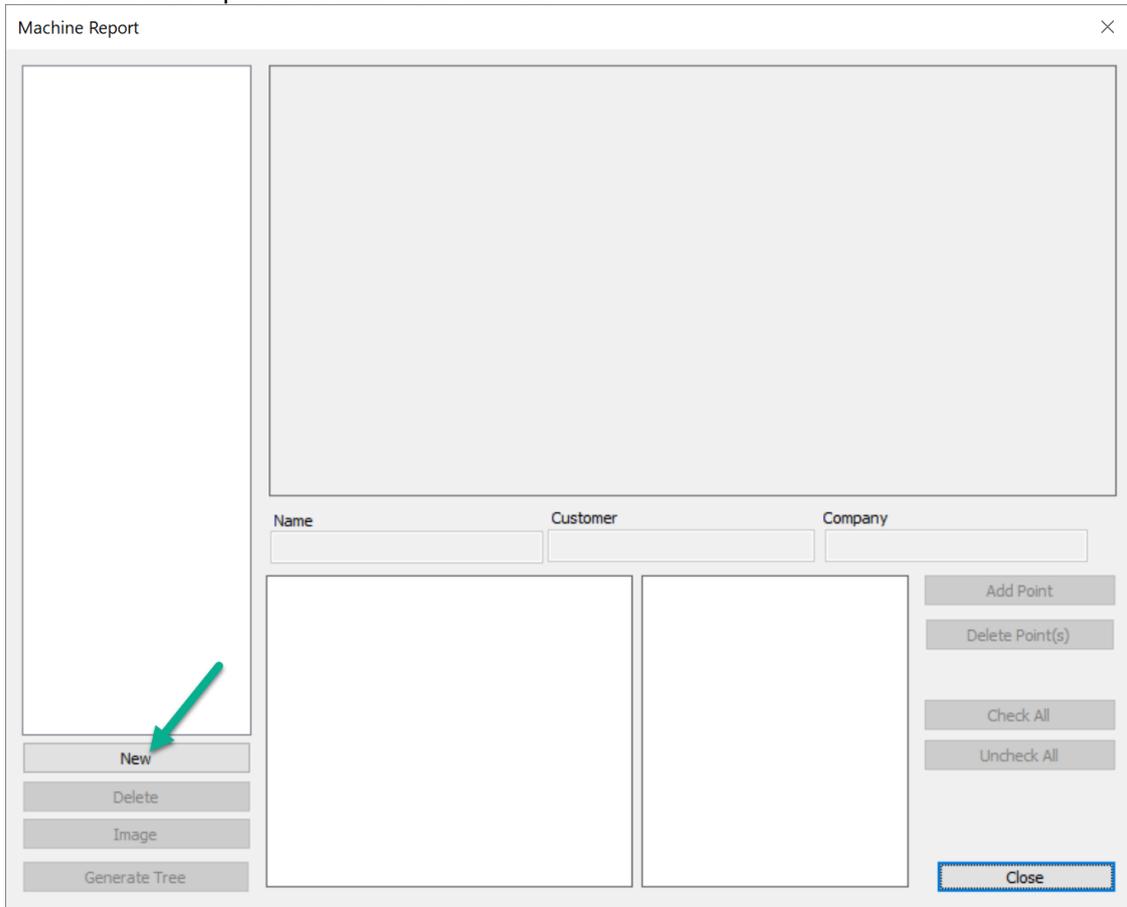
Customer – your customer

Company – your company name

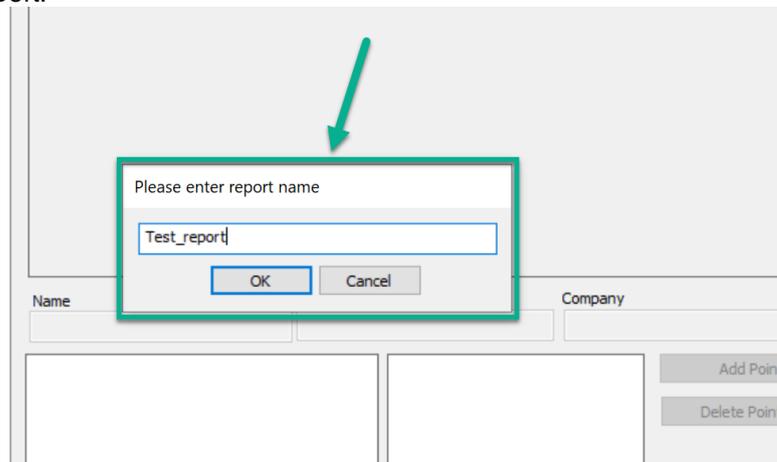
Note! Point position in image can be moved via mouse – drag and drop.

Report creation

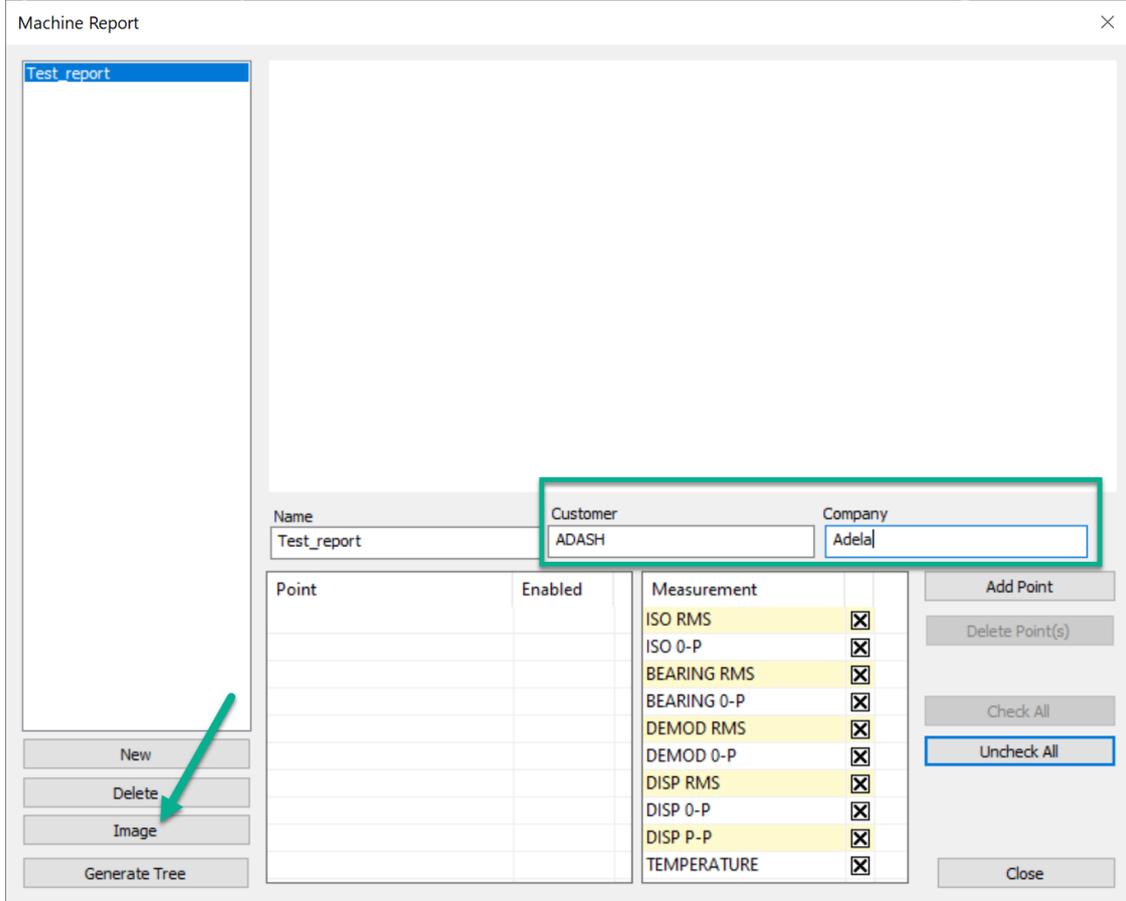
Go to DDS and click on tab 'Report'. Click on icon 'Open' in 'Machine Report' section. This window pops up. You create new report here with 'New' button.



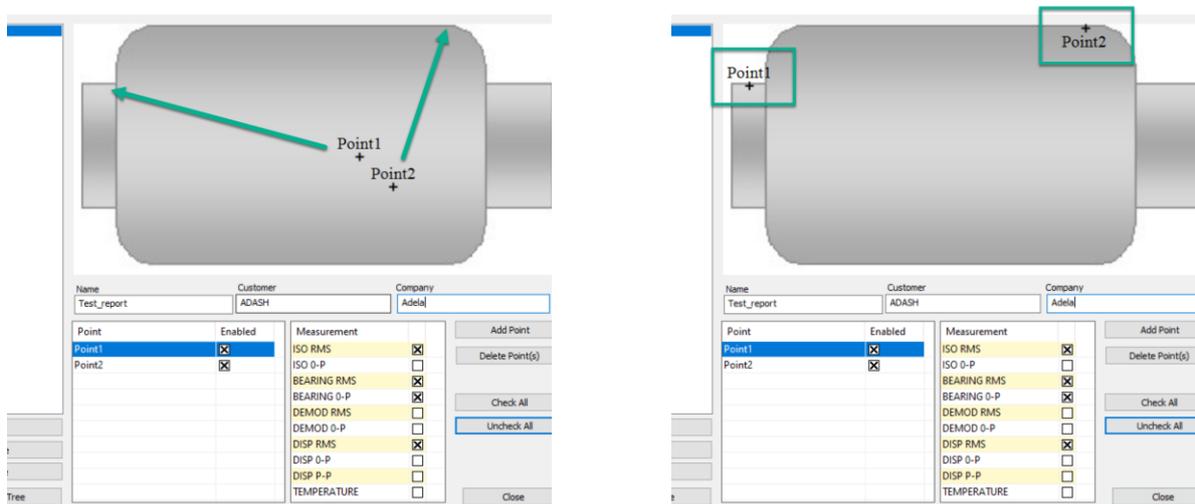
Fill in name of new report.



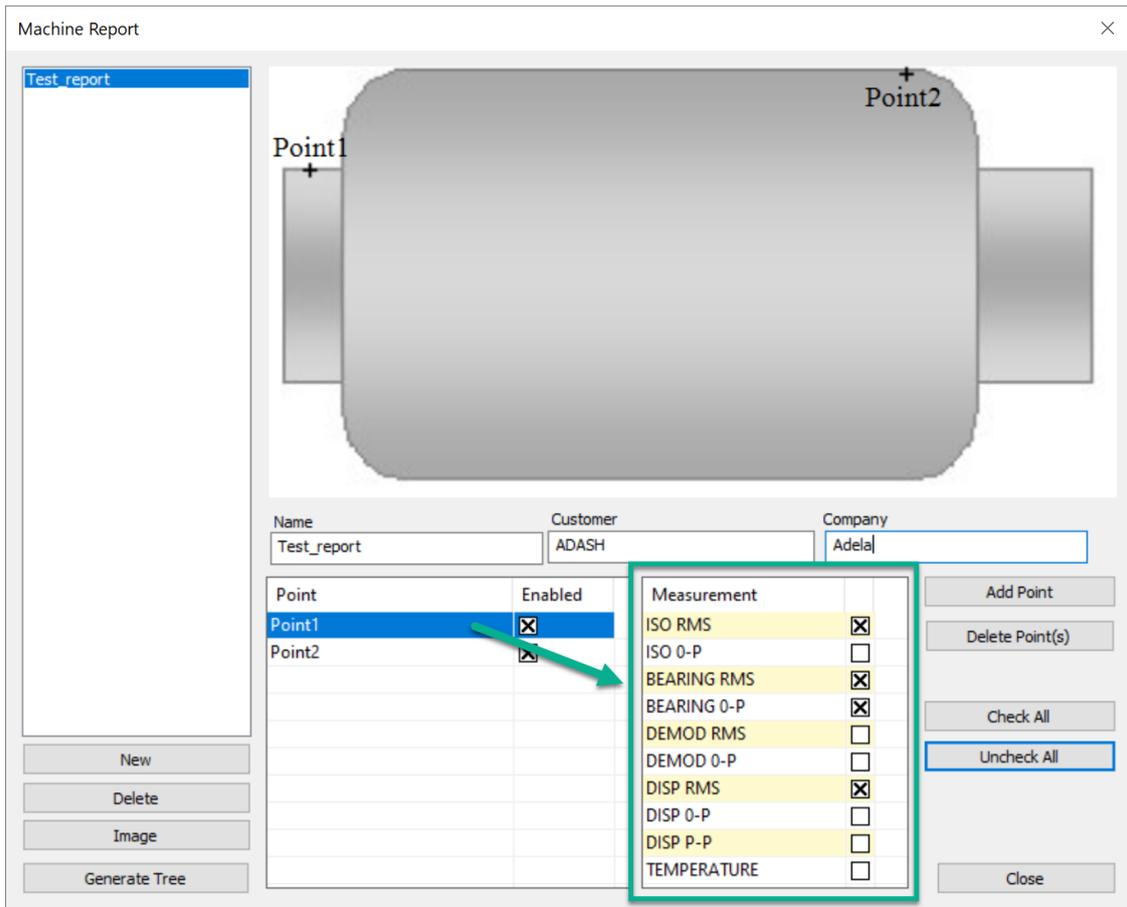
Now you can see the report in the left column. Fill in needed information and add image of the machine.



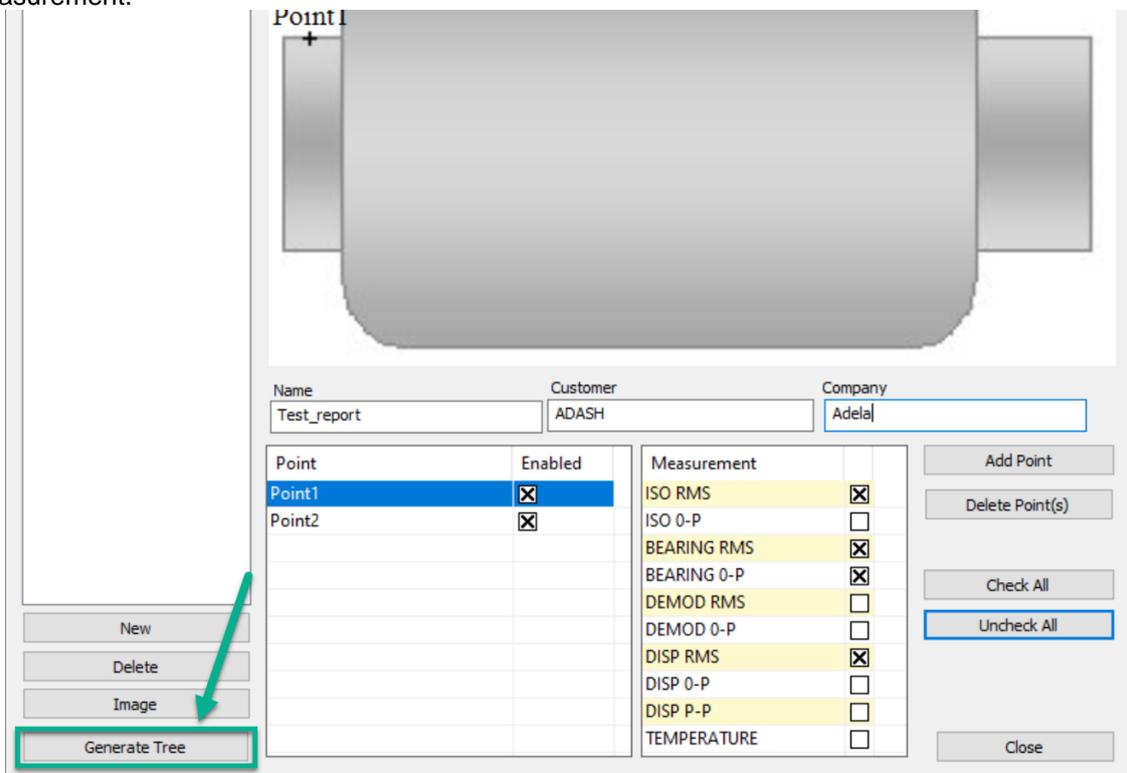
We can add the measurement points with 'Add Point' button. Created points will be automatically added in the picture. With right mouse button (drag and drop) you can move them as it really is on the machine.



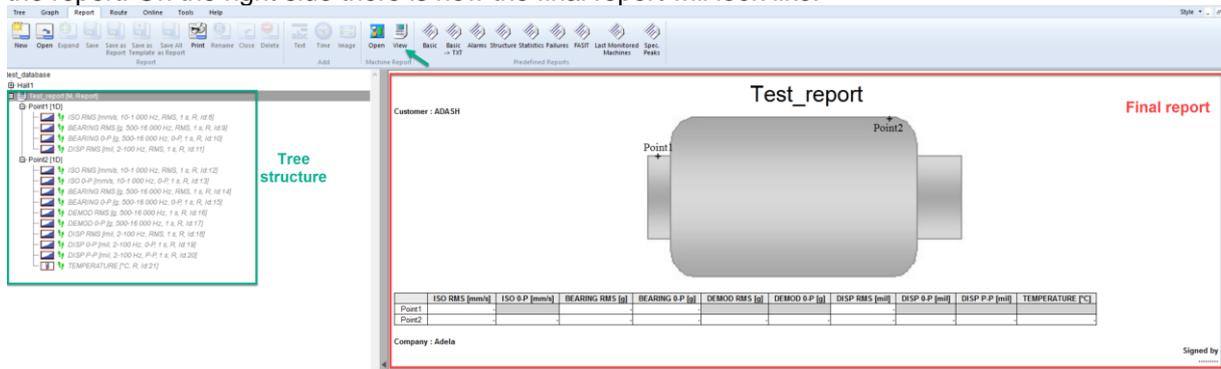
You can choose which measurements should be taken for the particular points. It can be done in this 'Measurement' box. These measurements will be shown afterwards in the table generated in the report.



When you have measurements picked for the point choose option '**Generate Tree**'. This report will be generated to DDS structure and you can load it to your measurement device and go for the measurement.



This is basically how it looks like in DDS completely. On the left side you can see DDS tree structure of the report. On the right side there is how the final report will look like.



Predefined Reports

The process of making reports is always the same. First, you select set of tree items, containing the required data and click on one button of predefined reports. Second, change settings of specific report and click Ok. The report is created as new page. Please, try to create all report types and look for content.

Basic Report

Database: Main factory
 Report Date: 20.10.2017
 Report Interval: Last 1 values
 (Ok - O, Warning - W, Alert - A, Danger - D)

Name	Date	Value	Unit	Alarm
FACTORY A3012 J23\CB035 B28				
BELT 27\MOTOR\WTR-NDE\H-VEL OVR ISO HOR	07.05.2015 9:08:59	2.15	mm/s	
BELT 27\MOTOR\WTR-NDE\H-ACC OVR HOR	07.05.2015 9:08:59	0.136	g	
BELT 27\MOTOR\WTR-NDE_ch2\ V-VEL OVR ISO VERT	07.05.2015 9:08:59	1.4	mm/s	
BELT 27\MOTOR\WTR-NDE_ch2\ V-ACC OVR VERT	07.05.2015 9:08:59	0.137	g	
BELT 27\MOTOR\WTR-NDE_ch3\ Ax-VEL OVR ISO AX	07.05.2015 9:08:59	1.67	mm/s	
BELT 27\MOTOR\WTR-NDE_ch3\Ax-ACC OVR AXIAL	07.05.2015 9:08:59	0.316	g	
BELT 27\MOTOR\WTR-DE\H-VEL OVR ISO HOR	07.05.2015 9:09:49	1.68	mm/s	
BELT 27\MOTOR\WTR-DE\H-ACC OVR HOR	07.05.2015 9:09:49	0.291	g	
BELT 27\MOTOR\WTR-DE_ch2\ V-VEL OVR ISO VERT	07.05.2015 9:09:49	2.55	mm/s	
BELT 27\MOTOR\WTR-DE_ch2\ V-ACC OVR VERT	07.05.2015 9:09:49	0.16	g	
BELT 27\MOTOR\WTR-DE_ch3\ Ax-VEL OVR ISO AX	07.05.2015 9:09:49	1.95	mm/s	
BELT 27\MOTOR\WTR-DE_ch3\Ax-ACC OVR AXIAL	07.05.2015 9:09:49	0.577	g	
BELT 27\GBOX\INPUT-DE\H-VEL-NDE-OVR	07.05.2015 9:10:41	1.18	mm/s	
BELT 27\GBOX\INPUT-DE\H-ACC-NDE-OVR	07.05.2015 9:10:41	0.173	g	
BELT 27\GBOX\INPUT-DE_ch2\ V-VEL-NDE-OVR	07.05.2015 9:10:41	0.809	mm/s	
BELT 27\GBOX\INPUT-DE_ch2\ V-ACC-NDE-OVR	07.05.2015 9:10:41	0.058	g	
BELT 27\GBOX\INPUT-DE_ch3\AX-VEL-NDE-OVR	07.05.2015 9:10:41	1.75	mm/s	
BELT 27\GBOX\INPUT-DE_ch3\AX-ACC-NDE-OVR	07.05.2015 9:10:41	0.056	g	
BELT 27\GBOX\INPUT-NDE\H-VEL-NDE-OVR	07.05.2015 9:11:35	0.769	mm/s	
BELT 27\GBOX\INPUT-NDE\H-ACC-NDE-OVR	07.05.2015 9:11:35	0.171	g	
BELT 27\GBOX\INPUT-NDE_ch2\ V-VEL-NDE-OVR	07.05.2015 9:11:35	0.99	mm/s	
BELT 27\GBOX\INPUT-NDE_ch2\ V-ACC-NDE-OVR	07.05.2015 9:11:35	0.07	g	
BELT 27\GBOX\INPUT-NDE_ch3\AX-VEL-NDE-OVR	07.05.2015 9:11:35	3.29	mm/s	
BELT 27\GBOX\INPUT-NDE_ch3\AX-ACC-NDE-OVR	07.05.2015 9:11:35	0.084	g	
BELT 27\GBOX\OUT MOT-DE\H-VEL-NDE-OVR	07.05.2015 9:12:10	1.28	mm/s	

Navigation buttons: Preview, Basic Report, +

Report section

Section is contained in Report tab.

New



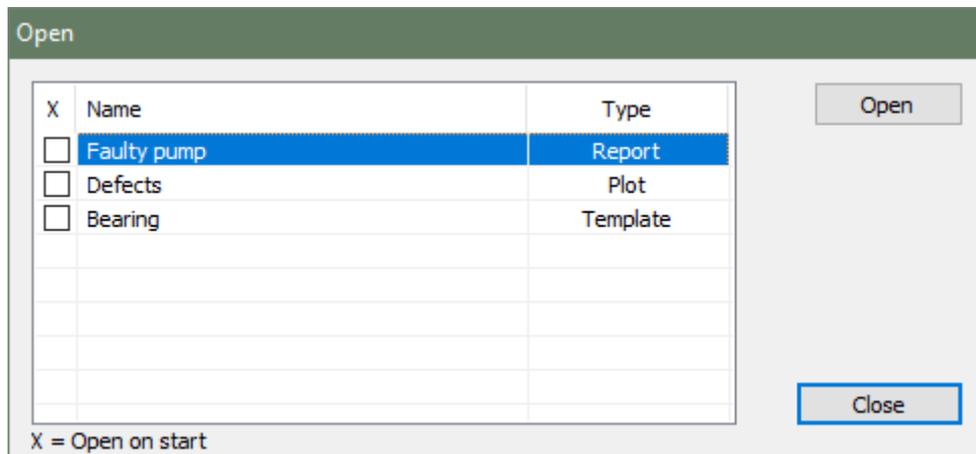
Click on the button New and enter the report page name. You must always create report page by this **New** function. The report functions are not available in standard Plot page (created by "+").

Open



The list of saved report/template pages appears. Select one of them and open it.

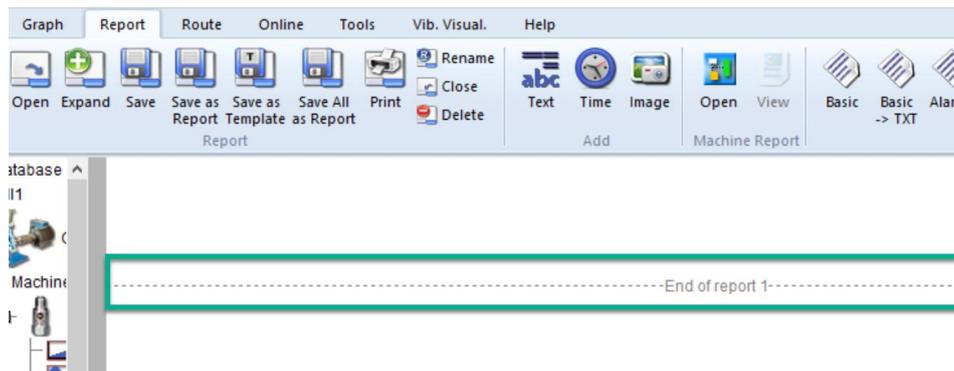
Checked Reports (on the beginning of each line in the list) will be opened automatically after tree opening.



Expand



When you create a new reporting report, then only the first printing page is created. In the process of report development, you will probably need a longer document. The Expand function makes the document longer and creates new empty space for writing. The page separators are also displayed (see below).



Save



It saves the selected page. It uses the page name.

Save as Report



Enter the new name and save the selected page as report.

Save as Template



Enter the new name and save the selected page as template.

Save All as Report



Save all open pages under one name.

Print



It prints selected page.

Rename



It renames selected page.

Close



It closes the selected page in plotting area.

Delete



The list of saved pages appears. Select one of them and delete it.

Add section

Section is contained in Report tab.

Text



It adds the empty text box into the report. Use the right click and select the Edit or do the double click in the box. Next edit window appears. Write your comments, use formatting of text.

Use the drag and drop to move the box.

Use the right click and select the Delete to remove the box.

Time



It adds the date+time box with actual date and time. Use the drag and drop for moving of box. Use the double click to update the value.

Use the right click and select the Delete to remove the box.

Image



It adds the image into the report. Initially the empty box is created and the window Image Select appears. Initially it contains the empty list. Use the Add button and select image file or images from the computer. Selected images are added to the list and saved to the tree. If the list contains required image select it and press OK. The image appears in the image box.

Use the right click and select the Select Image or do the double click in the box for change of image.

Use the drag and drop for moving of box.

Order of objects

All objects in report can be moved forward and backward to place them with correct order. Use right click and the **Position** command.

Machine Report section

Section is located under 'Report' tab.

Open



Opens the window for the report creation. You see here also the list of the created reports.

View



View the report you created.

Predefined Reports Section



Select the tree item and click on one button from predefined report. Define time interval in next window. Select columns, which you want to see in report in next window. You can hide this window by check the checkbox “Don’t ask me again”. You can display this window again by settings in Global Settings/tab General/section Report/Basic – Select Columns Window or Alarm – Select Columns Window.

If you wish to show the reduce paths to the tree items in report (machine – meas.point – data cell), set up the option **Reduce path** to Yes. It is in **Tools / Globals / General / Report / Reduce Paths**.

Basic

Interval

This report enables to print (Interval section below):

- all static readings from defined time interval
- last static readings
- static readings from last N days (N is manually entered – it is 7 in the screenshot below)

Settings of Basic Report

Max. Number of Disp. Readings: 10

Format: Rows Columns

Interval

Last Readings

Last Days: 7

Date interval

From: 24.03.2025 0:00:00

To: 25.03.2025 23:59:59

Other: Undercolour Alarm, Open in Browser, Insert Image of Machine

Show Alarm Limits: Warning, Alert, Danger

Columns:

- Name
- Date/Time
- Date
- Value
- % Last/Prev
- Unit
- Alarm Limits
- Over Alarm
- Freq. Range
- Detect Type
- Avg
- Measurement Parameters
- Db ID
- User Id
- Note

Columns Order: Name, Date, Date/Time, Value, Unit, Alarm Limits, Freq. Range, Detect, Avg, Type, Over Alarm, Note, User Id, Db ID, % Last/Prev

OK Cancel

Basic report – Format

The format of the basic report you can modify with the parameters Max. Number of Disp. Readings (how many values are displayed in the report) and Format (choose Rows or Columns).

Columns

You can choose which parameters will be shown in the basic report. See the Columns on the right with the checkbox. By default, checkbox for **Name**, **Value**, **Unit** is marked and it cannot be unchecked. You can also see that **Date/Time** (you can choose only **Date** below this option for the report) and **Over Alarm** are checked also, but this is optional and you can uncheck them.

% Last/Prev – percentage change between the last measured and the previous value.

Alarm Limits – measurement limit values – each alarm value is in individual column (Warning, Alert, Danger). You can modify which alarms will be shown in the report by button ‘Show Alarm Limits’.

Over Alarm – shows you which alarm is reached with the last measured value – if the value is OK, warning (W), etc.

Freq. Range – includes measurement frequency range into the report.

Detect Type – measurement detect type (e.g. RMS).

Avg – measurement averaging information.

Measurement Parameters – it is summary of measurement parameters in one column (there is unit, detect type, etc.) – e.g. **Ovr, mm/s, RMS, 10 - 1 000 [Hz], 1 [s], Avg Off**.

Other

Undercolour Alarm – values get the color according to the reached alarm value. Example: if the value is higher than the Danger value, then the value is shown in the red color.

Open in Browser – opens the report in your web browser. This should fix the problem with the report color printing.

Insert Image of Machine – If the report is generated for only one machine, then it pastes Route Image to the report begging (this image has to be added in Tree Item (e.g. Machine)/Properties/tab Route Image).

Buttons

Show Alarm Limits – selects which alarm limits are shown in the report. Each alarm limit has its own column. Alarm Limits are shown when you mark the check box Alarm Limits.

Columns Order – defines the order of particular columns of the report.

Alarms

It develops the list of all alarms of the selected tree item and its all children. If the selected item is below the machine, then all alarms of that machine will be displayed.

Structure

It develops the text print with the tree structure of the selected tree item and its all children.

Statistics

Creates the list of statistic parameters of all static data cells. List contains following stats:

Average – average of values

Median – average alternative, elimination of extremes is advantage here

Weighted average - the time interval between readings is used as the weight. If for example we have one reading per day, then 1 day is the weight. If in this data cell we have one reading in one week (we missed others) then this one reading have the weight 7 days. In the average it is used seven times.

Relative variation AVG - responds to the variation of readings in data cell. If all readings have the same value, then it is 0. It is the percentage variation weighted to the average.

$$EX = \frac{1}{n} \times \sum_{i=1}^n x_i$$

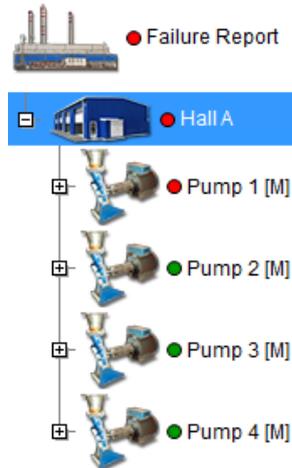
$$v = \frac{1}{n} \times \sum_{i=1}^n |x_i - EX|$$

$$var \% = \frac{v}{EX}$$

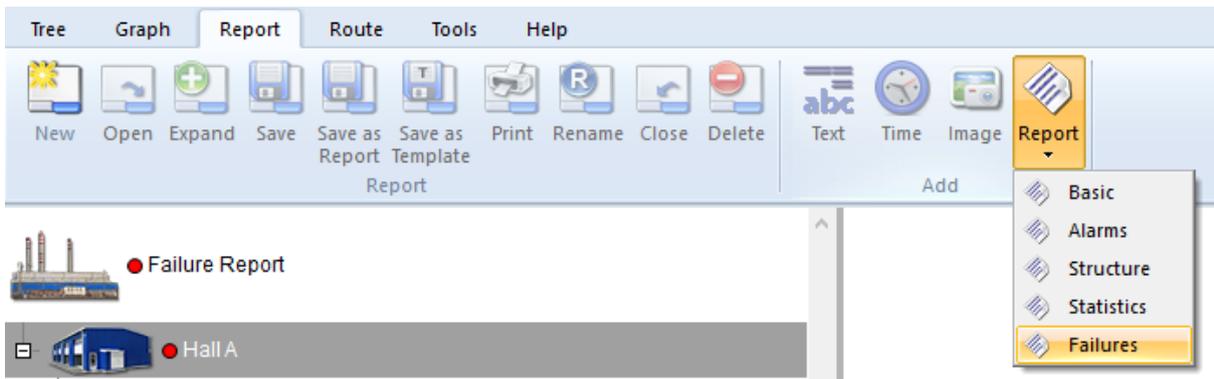
Failures

The Failures report is created. Follow next steps:

Select tree item (Hall A).



Select Report/ Add/ Report/ Failures.



Enter severity limit. Only higher severities will be included to report. Check whether you want report which contain FASIT or User Notes or both. You can choose failure type or the time interval for the report (From-To). Press OK:

Failures Report ✕

Failure
 Severity

None
40%

From
 To

28.03.2025
28.03.2025

Note text

Confirm
 No

Type

FASIT

 Note

OK
Cancel

Failures Report

09.09.2016

FASIT Severities

Machine	Last Meas. Date	Failure	Severity	Alarm
Failure Report\Hall A\Pump 1	01.06.2015	Unbalance	98%	
Failure Report\Hall A\Pump 4	03.11.2015	Looseness	91%	
Failure Report\Hall A\Pump 3	03.12.2015	Misalignment	89%	
Failure Report\Hall A\Pump 5	23.01.2016	Other	77%	

User Notes

Tree Item	Date	Failure	Text	Severity	Alarm
Failure Report\Hall A\Pump 4	12.09.2016	Looseness	Repair!	100%	
Failure Report\Hall A\Pump 1	09.09.2016	Unbalance	Repair!	100%	

Alarm colors are used in % intervals <0,33), <34,66), <67,100).

Last Monitored Machines

It is list of machines, which have at least one reading in defined time interval. The last reading is printed in table. The ID of machine is defined in Properties of machine.

FASIT Report

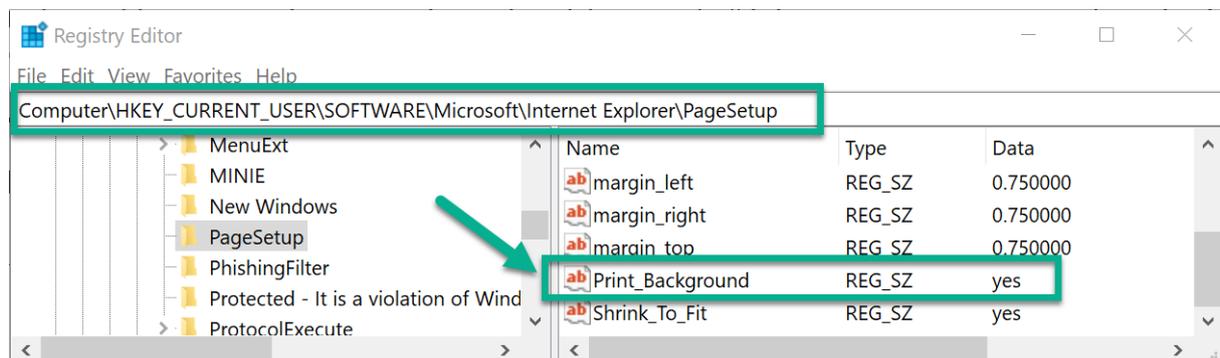
Report is focused only on FASIT data cells. The user selects a part of the tree, selects the time interval and chooses which information from FASIT will be displayed. Data cells that do not contain any data will also be displayed (for easy comparison with the previous reports).

Printing of report colors

When you print reports, you can switch on or off the colors printing. If the color printing of the report is not successful, you need to change registry settings in your PC (Registry Editor). Just change the 'Print_Background' parameter value:

Path: **[HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer\PageSetup]**

Parameter: **"Print_Background"="yes"**



Note! This setting could be previously changed in the MS Internet Explorer settings. Since IE browser is not supported anymore, it is necessary to change it directly in the Registry Editor.

Route tab

Select the Route menu item. The plotting area is closed and the list of saved routes appears. Each route is the list of machines. You can expand every branch in the list by mouse.



Basic Operations

Create New Route

Drag the required part of the tree on the left and drop it to Routes area (right DDS part).

If you drop it to empty area (the cursor symbol is arrow), then you manually enter the name and new route appears in the list.

Add next machines or point to the route

Drag the machine from the tree on the left and drop it to selected route in the list. The cursor symbol is [+]). You can add only machine; it is not possible to add for example the point.

Route section

New



Creates new empty route. The machines must be added (drag and drop) separately. This is the correct way how to define route. Firstly, create the new route in **Routes** list and then move machines by mouse from the tree to the route.

Delete



Deletes selected route(s) in the routes list.

Rename



Renames selected route in the route list.

Delete Items



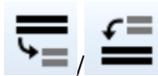
Deletes selected items from one route.

Gen. QR Code



Generate the QR code to the machines. See more information in **Appendix A – QR codes generation**.

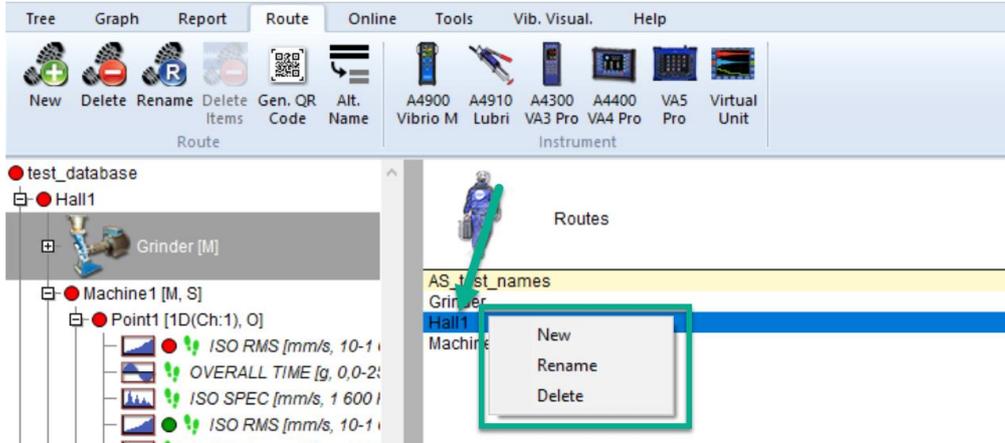
Alt. Name/Orig. Name



Shows alternative route names or switch back to their original names (from the tree) in the route window. You can use it for example to shorten the path to the individual points – e.g. instead of Machine1, you can use M1, instead of Point1 – P01, etc. See more information in **Route Alt. Name**.

Route List

You can see the list of your saved routes in the right DDS window. Routes (in route window) are ordered by the alphabet. Click with right mouse button on the route in Route window and see the menu options.:



New – creates new route in the route window.

Rename – changes the name of your selected route in the route window.

Delete – removes the selected route from the route list in the route window.

Note! In previous versions routes were ordered by the creation date. This can be changed in configuration file of DDS. Change the following parameter:

[Other_v2]

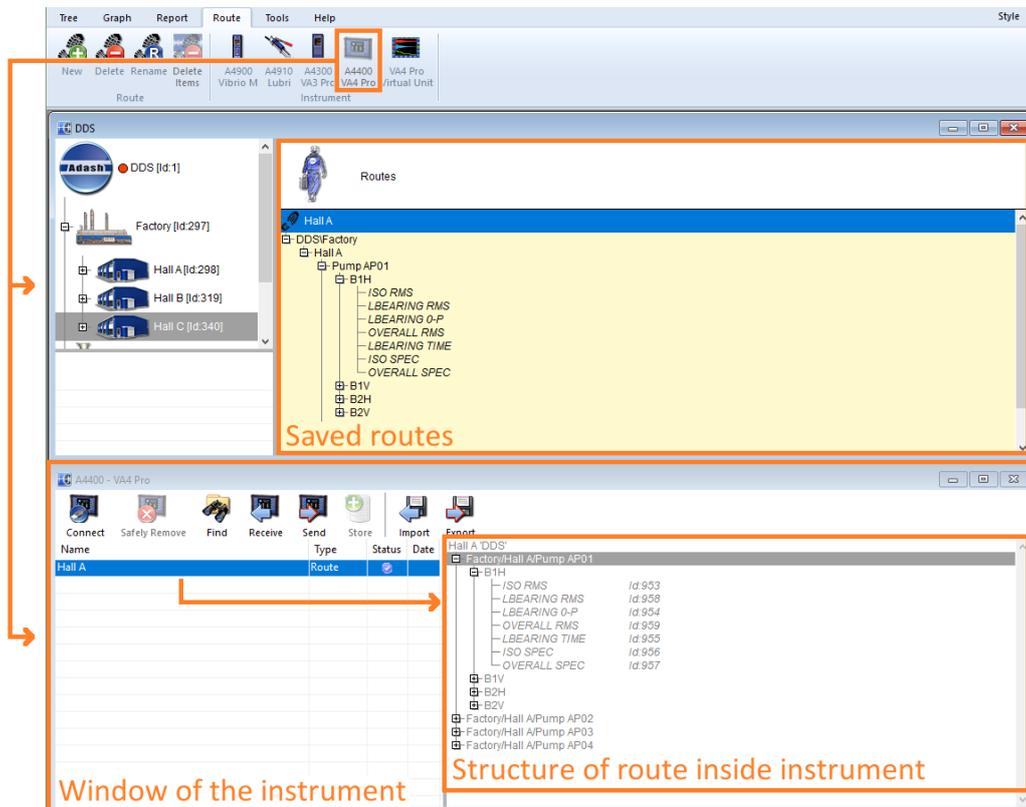
RouteSort=1

1...stands for the sorting by the alphabet,

0...stands for the sorting by the route creation date.

Instrument section

Section is contained in Route tab. Each button from this section, represents one of the measurement instruments.



Press the button and instrument window appears. You can find in the next chapter how to work with this window.

A4900 Vibrio M



Opens A4900 Vibrio window. This instrument is free option in DDS.

A4910 Lubri



Opens A4910 Lubri window.

A4300 VA3 Pro



Opens A4300 VA3 Pro window.

A4300 VA3 Lite



Opens A4300 VA3 Lite window. This instrument is free. It enables to use only subset of all measurement types in VA3. It enables to to use only readings which are available in A4900 Vibrio unit.

A4400 VA4 Pro



Opens A4400 VA4 Pro window.

VA5 Pro

Opens A4500 VA5 pro window.

VA5 Pro Virtual Unit

Opens VA5 Virtual Unit window. This unit is free. It enables to run the VA5 Pro firmware in the PC.

Data download to and from the instrument

Download procedure is very similar for all instruments. We describe how to work with the instrument VA4 Pro. The differences between the instruments will be described.

Route upload to the instrument

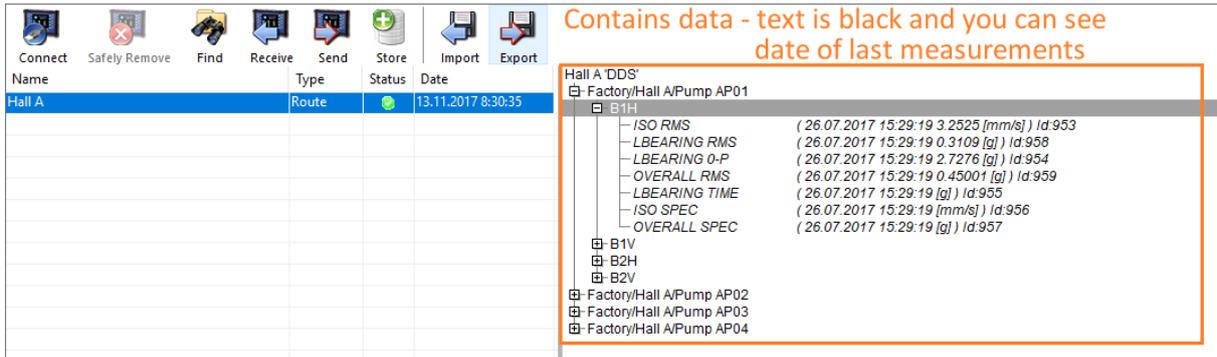
1. Connect instrument by USB cable.
The VA3/4/5 can be switched on or off. The Vibrio and Lubri must be switched on.
2. Open the instrument window (push the button with instrument icon). Press the **Connect** button to open connection with instrument. DDS automatically download structure of data which are saved in instrument.
*The Vibrio and Lubri are connected directly, without **Connect** button.*
3. Drag and drop selected route from **Routes** list to the instrument window.
*You can drag and drop selected machine(s) directly from the tree. But it is better to create the route in the **Route** list. You can use it repeatedly. It is also better for large routes.*
4. Select one or more routes in the instrument window (blue colored). Press **Send**. Routes are uploaded to the instrument.
The Vibrio and Lubri can use only one route. Be careful, the new route overwrites the old one.
5. Press the **Safely Remove** button and disconnect the USB cable.
6. Now you are ready to measure the route.

Route download from instrument to DDS

1. Connect instrument by USB cable.
The VA3/4/5 can be switched on or off. The Vibrio and Lubri must be switched on.
2. Open the instrument window (push the button with instrument icon). Press the **Connect** button to open connection with instrument. DDS automatically download structure of data which are saved in instrument.
*The Vibrio and Lubri are connected directly, without **Connect** button.*
3. Select the route. The offroute data also are in the list. Look at the **Type** and search the **Route** text. In the right window area, the route structure is displayed. Press **Store** button. Data are copied to the DDS tree. When the route items are gray colored, then no data are saved in the instrument. If item contain data, then is black colored and the date and time of last reading is displayed.

The screenshot shows the DDS software interface. At the top, there is a toolbar with buttons: Connect, Safely Remove, Find, Receive, Send, Store, Import, and Export. Below the toolbar is a table with the following columns: Name, Type, Status, and Date. The table contains one row: Hall A, Route, [Status icon], [Date]. To the right of the table is a tree view showing the data structure. The tree view is titled 'Hall A DDS' and contains the following items: Factory/Hall A/Pump AP01, B1H, ISO RMS (Id:953), LBEARING RMS (Id:958), LBEARING 0-P (Id:954), OVERALL RMS (Id:959), LBEARING TIME (Id:955), ISO SPEC (Id:956), OVERALL SPEC (Id:957), B1V, B2H, B2V, Factory/Hall A/Pump AP02, Factory/Hall A/Pump AP03, and Factory/Hall A/Pump AP04. The items B1H, B1V, B2H, and B2V are highlighted in gray, indicating they have no data saved in the instrument. A text label 'No data - text is gray' is positioned above the tree view.

Gray items, no data saved in the instrument.



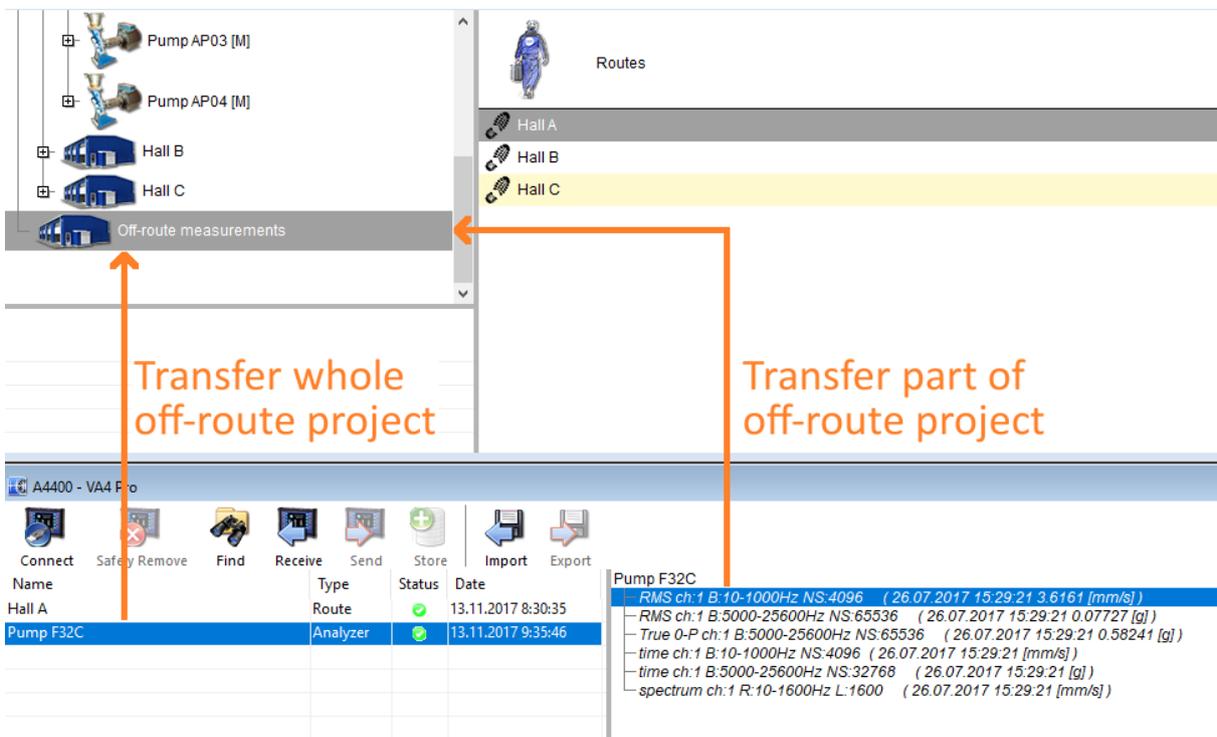
Black items with data and date and time of last measurement.

4. Press the **Safely Remove** button and disconnect the USB cable.
5. Now you are ready to analyze data in DDS.

Download of off-route data

You can make measurements also in other modules then Route. These data are saved in the instrument and you can download them to the DDS.

1. Connect instrument by USB cable.
The VA3/4/5 can be switched on or off. The Vibrio and Lubri must be switched on.
2. Open the instrument window (push the button with instrument icon). Press the **Connect** button to open connection with instrument. DDS automatically download structure of data which are saved in instrument.
*The Vibrio and Lubri are connected directly, without **Connect** button.*
3. The **Type** of data is displayed for every item in the list. It tells you, in what module were data measured. Select required item. You can see the structure in the right side. The date and time of last measurements are displayed. You can drag the item from the left list or item(s) from right list and drop it directly to the required position in the tree.



Instruments Window

The window contains:

- menu with buttons (Connect, Safely Remove, etc.),
- list of projects in the left side,
- structure of selected project in right side.

The **Status** information exist for every project. Four colors exist.

- blue** the project was only in the list in DDS, it is not uploaded to the instrument yet,
black the project is uploaded to the instrument already, but it is empty (no measurements),
green the project contains readings, which can be downloaded to DDS.
red the project file in instrument is damaged. An unexpected error occurred when loading.

Status	Date
	
	
	9. 12. 2014 10:56:26
	

Connect



Open the connection (interface) with instrument. It reads projects from the instrument.

Safely Remove



Always use the safely remove button before you disconnect the USB cable.

Find



The exploring of path to Virtual Unit data folder or path to the copy of instrument files folder.

Receive



Reads the projects from instrument.

Send



Sends selected project(s) to the instrument.

Store



Saves route(s) to the DDS. It works only for routes.

Export and Import



The **Route Downloader** software enables upload and download routes to the instrument without DDS software. It is suitable for remote data collection. You create the **Export** file (.rvi for Vibrio M and Lubri and .rdi for VAxPro instruments) for selected route and this file you send by email to the person, which will measure the route. This person uses the **Route Downloader** software (free) and uploads route to the instrument. Then he can make measurements. By using the **Route Downloader** software again he creates the file (.rvx for Vibrio M and Lubri, .rdx for VAxPro instruments) with data. This file he sends by email back to the office. You use the **Import** function to download the route data to the DDS. See the **Route Downloader** manual for details.

Run



This button is available only in Virtual Unit window. It runs the Virtual Unit software. Then you can analyze records saved in computer.

Program Virtual Unit is currently being delivered as an installation package. If it is correctly installed, DDS automatically detect Virtual Unit paths. If the Virtual Unit was copied manually to computer, you have to set Virtual Unit paths to DDS global settings manually. If you cannot open instrument window Virtual Unit or you cannot run program Virtual Unit (icon Run in interface window), make sure that paths are set correctly. DDS needs to know the location of two Virtual Unit folders.

Main folder – folder contains binary files of the Virtual Unit. Inside you can find folder named *bin* and file *VA4.ini*. The path is usually **C:\Program Files (x86)\Adash\Virtual Unit** (applies to Windows 7 and later, 64bit).

Data folder – into this folder the Virtual Unit saves all measurement data. The path is usually **C:\ProgramData\Virtual Unit** (applies to Windows 7 and later, 64bit). If you are not sure where this folder is located, you can read this information from the file *VA4.ini* in main folder (key *PATHS.ver.Virtual Unit 2.57* and later).

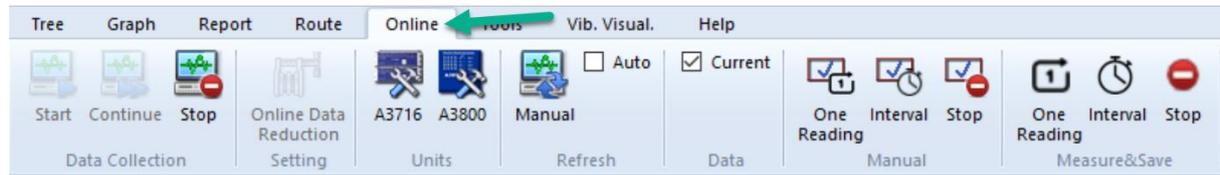
Both Virtual Unit paths are saved in DDS Global settings:

Tools/Globals/tab General/section Application/VA4 Virtual Unit Path (main folder)

Tools/Globals/tab General/section Application/VA4 Virtual Unit Data Folder (data folder).

Online tab

Tab Online is displayed **only if online database is opened**. In a case of route database, the online tab is hidden. Online database is special type of database, which is designed for continuous online data collection from instruments series three thousand (A3716, A3800).



Data Collection section

Start



Send configuration into all connected online instruments and run data collection. Data collection is started from the beginning with this button. If any data was saved into online unit's memory after Stop button was used, they will be lost.

Continue



Continue with data collection (with data measured before the collection was stopped). When data collection was stopped (with Stop button in DDS), the data was saved into online unit's memory. When you press Continue, these data are firstly downloaded into DDS database. Then data collection is restarted (just in case that some setting changes was made) and collection continues. No data are lost.

Stop



Stop data collection from all connected online instruments.

Setting section

Online Data Reduction



Open window for data reduction parameters setting. More information can be found in manual for online monitoring systems.

Units section

A3716



Open window for management of online units A3716.

A3800



Open window for management of online units A3800.

Refresh section

Manual



Manual refresh of opened graphs. It downloads data from online unit immediately. Works only for PC where online collection was started.

Auto

Turn on/off auto refresh of data in opened graphs.

Data section

Current

Opens page for displaying static measurements, which are measured right now. Data isn't read from the database, but directly from the online instruments. See more details in manual for Online monitoring.

Manual section

One Reading



Takes one reading for the data cells which are set as "Manual".

Interval



Starts data collection for the set time interval. This time interval is applied for data cells which are set as "Manual".

Stop



Stops data collection for data cells which are set as "Manual".

Measure&Save

Once you click on any button in Measure&Save section you start the measurement and save it. No matter what data saving parameters are set in DDS. This function is applied to all data cells when you use it.

One Reading



One reading is taken and saved in all data cells.

Interval



Set time interval in which all measurements are saved.

Stop



Stops the 'Measure&Save' feature.

Tools tab

The Tools menu item contains functions for settings of DDS.



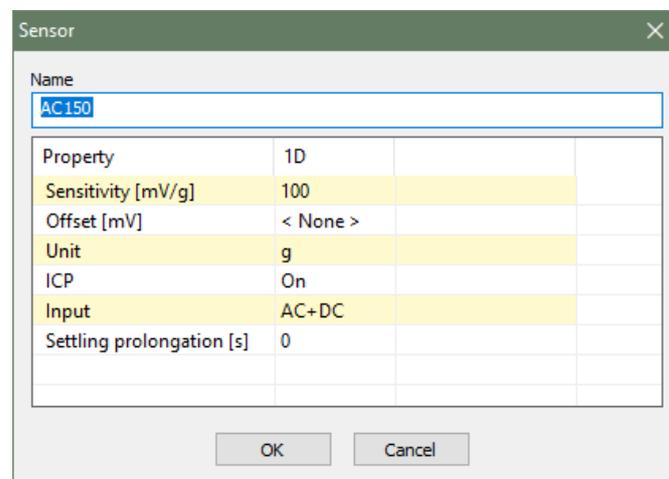
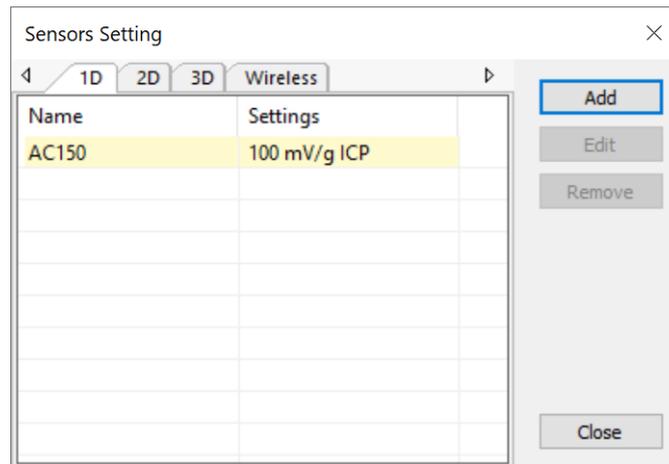
Settings section

It is contained in Tools tab.

Sensors



The list contains predefined sensors, which can be used in Point properties definition. Push the **Sensors** icon. The new window with sensors list or empty box appears. Push **Add** and define the new sensor. You can edit the existing sensors by **Edit** button or by double click. If the predefined sensor is used in Route, then its name is also displayed. It should simplify the handling with sensor in route.



Bearings



After the installation of the DDS, there is file **bearings.lbr** in installation folder of DDS\data. It contains approx. 30 000 bearings. It is large number and to work with such long list would be difficult. That is why the user can create his own database of bearings, which contains the subset of complete list. This database contains all bearings which are used in the Tree. The User's list of bearings is empty in the new Tree. The required bearings need to be imported firstly from bearing database (file bearing.lbr).

Press **Export** to export all/selected bearings into new bearing database file for instruments VA4Pro or VA5. Save exported bdx01.va4 file into root directory of VA(45)_DISC drive. After instrument restart, the firmware overwrites the old instrument bearing database with new one.

Name	NB	BD	PD	CA	FTF	BSF	BPFO	BPF1
00000-TMK	< None >	< None >	< None >	< None >	0,382	1,98	3,82	6,18
011000-COO	< None >	< None >	< None >	< None >	0,455	5,45	11,8	14,2
01104-COO	< None >	< None >	< None >	< None >	0,405	2,54	4,05	5,95
01106-COO	< None >	< None >	< None >	< None >	0,405	2,54	4,05	5,95

Alarms (Alerts)

Introduction



The DDS uses a new approach. We use this term for limits of reading values. This new concept enables to define user number of alerts. The only two alerts (e.g. warning and danger) are usually enough in many applications. But if we need more, we can define them. You should understand that in this moment we define only alert types (generally they are the **words**, which will be used). The limit values for each type will be defined individually for each data cell.

Example:

In Alerts types we defined the Warning and Danger alerts types. The OK alert is default type.

For two data cells we can define exact limits:

overall velocity	5 mm/s (0.2 ips) for Warning,	9 mm/s (0.35 ips) for Danger
overall acceleration	0.5 g for Warning,	1 g for Danger

Create the alert type

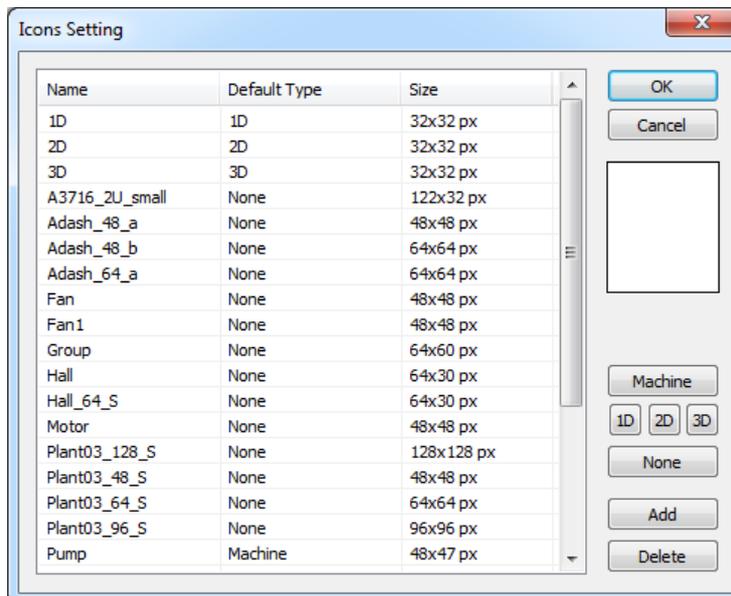
Push the **Alarms** button. The **Alarm list** window appears with the list of types. The default first type is OK, which cannot be deleted. You can only change the name and color of OK.

Push the **Add** button for new type. Define the new name and select the color. You can change the severity (order) in the list.

Icons



Every tree item can have own icon. Push the **Icons** button.



The window contains the list of available icons.

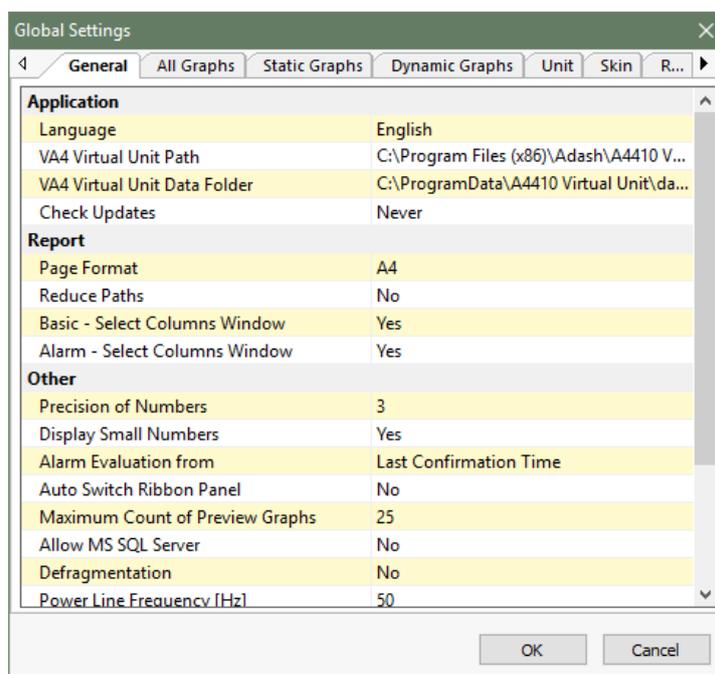
Push **Add** to add the new icon to the list. Push **Delete** to remove icon from the list.

You can also define the default icons for machine, 1D point, 2D point and 3D point. Such default icon is automatically used for each items type. Use the **Machine**, **1D**, **2D**, **3D** buttons to define it.

Globals



In the Global window you can define many parameters, which enable to customize DDS or define defaults parameters.



All Graphs

Cursor

Align Time – it keeps same (similar) time of reading in all displayed graph (see the chapter Graph menu item/Align)

Lock –synchronizes the position of the cursors in all graphs

Harmonic Lines – number of harmonic cursors

Sideband Lines – number of sideband cursors

Periodic Lines – number of periodic cursors

Default Spectrum Cursor – default type of the spectral cursor.

Default Time Cursor – default type of the time signal cursor.

Auto. Locate Peak in Spectrum – automatically locates the peak in spectrum based on your click in the graph.

- **First Time** – peak is automatically located only with the first click into the graph.
- **Every Time** – peak is located every time you click next to it into the graph.
- **Disabled** – function is disabled, peak is not located automatically.

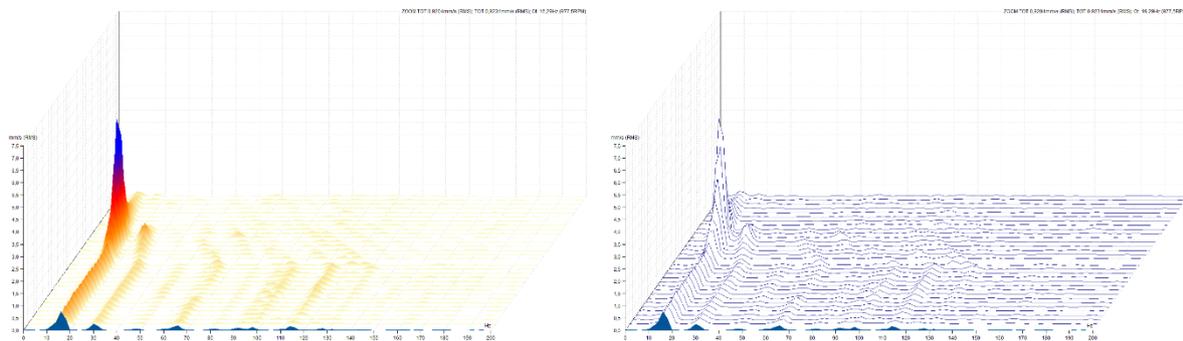
Waterfall

Angle [°] – angle of waterfall z axe

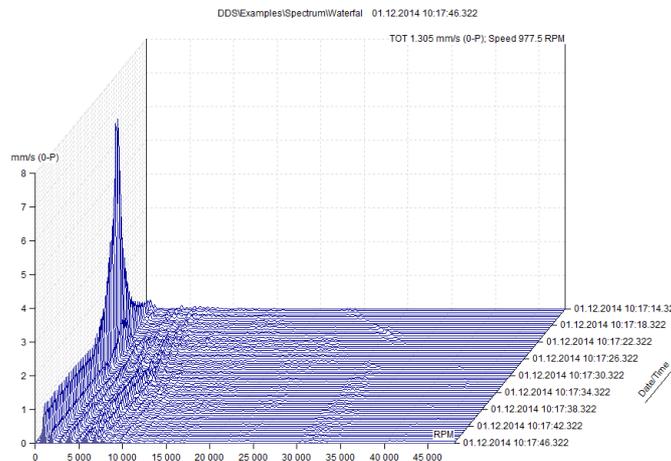
Graph Height [%] – the height of waterfall graph, defined as percentage of total height

Maximum Number of Readings – maximum possible number of graphs in waterfall

Draw Style - outline or gradient



Always Display Z Info - time labels in cascade on Z axis will be always displayed on the right side of the graph (according to reading sorting type).



Other

Phase Type – Y axis range, < -180°, 180° >, < 0°, 360° >, < Auto >. The < Auto > is special format, when the drifts +/-180 or 0/360 do not occur in graph.

Load into memory only last – data cell is showing the day/week/month/year before the last measured data (including the last measured data). If you enter the number directly, data cells show the last N measured data. If you enter number and character “h” (e.g. 12h), data cells show the last N hours measured data.

Graph Count in Stacked – maximum number of graphs displayed in tiles

Number of columns in Stacked – 1 is default value

Legend Position – where legend is placed in the graph.

Display User Labels – the initial status, you can display/hide them always from menu

Grid – the type of grid in graphs

Display References – disables/enables display of reference values in graphs. Reference values are defined in data cell properties, in Reference tab.

Display Graph Resize dlg. – click with right mouse button on the window header shows the dialog window to set the size of the graph window.

Fixed Scale

Enable Fixed Scale – yes, no – in next lines you specify initial default range for every unit.

Acceleration [g] – fixed scale for acceleration graph.

Velocity [mm/s] – fixed scale for velocity graph.

Displacement [mil] – fixed scale for displacement graph.

Demod Acceleration [g] – fixed scale for demod acceleration graph.

Demod Voltage [mV] – fixed scale for demod voltage graph.

Static Graphs**View Type**

Amplitude + Phase – the default graph type of Amplitude+Phase data cell

Smax – the default graph type of Smax data cell

FASIT – the default graph type of FASIT data cell

Centerline – the default graph type of Centerline data cell

Other

Display Limits – initial display type of limits (Off, Lines, Bars)

Display X-axis Unit – switches off/on the x-axis legend for static graphs

Hide Meas. Circles – yes, no – each measured value in trend is signed by circle, when huge number of values exist, then circles are not displayed

Show Units in Legend – yes, no

X Range – format type of Date-time range for static graphs

Default Time Scale – for trends. It shows all the data in the trend and use zoom for some time e.g. last 24 hours (week, month, etc.).

Display Centerline Bearing Shape – bearing shape drawing, to watch the position of the shaft relative to the center of the bearing. For type Centerline.

Dynamic Graphs

View Type

Time – Amplitude, Amplitude Stacked

Spectrum – Amplitude, Amplitude + Phase, Amplitude + Trend, Amplitude Stacked, Waterfall,

Spectrum Multigraph – Overlay, Amplitude Stacked, Waterfall

Order - Amplitude, Amplitude + Phase, Amplitude + Trend, Amplitude + Phase Trend, Amplitude Stacked, Waterfall

Orbit – Time A, Time B, Orbit, Orbit A B

Other

Spec. Y-axis Type – it switches between linear/logarithmic/decibel axes in spectrum graph

Spec. X-axis Type – it switches between linear/logarithmic axes in spectrum

Density X-axis Type – X-axis type (linear, logarithmic) for Density measurement.

Sort By – readings are ordered according to time/speed/order

Order Type – Ascending, Descending

Acc. Detect Type – RMS, 0-P, P-P

Vel. Detect Type – RMS, 0-P, P-P

Disp. Detect Type - RMS, 0-P, P-P

Band View Type – displaying of bands in spectrum graphs

off	bands are not displayed
simple	bands displayed as bar, the height is related to value
with limit values	all limits value are displayed in bar

Display Generate Labels – group of generated labels is displayed (the group which is active, see chapter Labels in Graph for more information)

Top Peaks Count – number of peaks in the table.

Display Top Peaks Labels – if the function is on Yes, then the label with value is displayed under the local maximum

Range – initial range for logarithmic y-axis

Display Tacho Marks – yes, no Switches on/off tacho marks in time waveforms and orbits.

Display Orbit Bearing Shape – bearing shape drawing, to watch the position of the shaft relative to the center of the bearing. For type Orbit.

Unit

You can set up the system of units and default units for selected physical values.

Skin

Setting of display of the graph

Route

Data Cells

Transfer to Route - initial value of *Transfer to Route* function

Interval Type + Interval – required time interval for route readings

Route Parameters

Show Parameters Dialog – the dialog with question what should be transferred to the analyzer

Send Data Cells – transfers the data cells with expired interval/all to the route

Add All Alarmed – the points with reading in alarm (not OK) are always load to the instrument, regardless of time interval

Send as Reference – type of reference value, which is sent to analyzer

Reference Version – enables sending reference values in much faster way into supported devices (VA3 FW 1.30+, VA4 & VA5 FW 2.80+)

Display Route Report – show detailed information about sending/receiving route

Send Limits to Route – the values of the set limits can also be sent to the device with the route. The alarms are then displayed in the device according to the limits set in the DDS.

Send Last Values to VAx – the last database value is sent to the device (route).

Online

These parameters are described in **A3000 series manual**.

Email

General

Send email if limits exceed – Yes/No

Send email when data collection started – Yes/No

Sender – sender email address

Sender Name

Recipient – recipient of email notification (separate multiple addresses with a semicolon)

Subject – subject of email notification

Min. Time Between Emails [min] - interval reducing repetitive alerts from one machine (minutes)

SMTP Server

Address – address of SMTP server (e.g. smtps://smtp.gmail.com:465)

User – user name (my.mail@gmail.com)

Password –password of email account

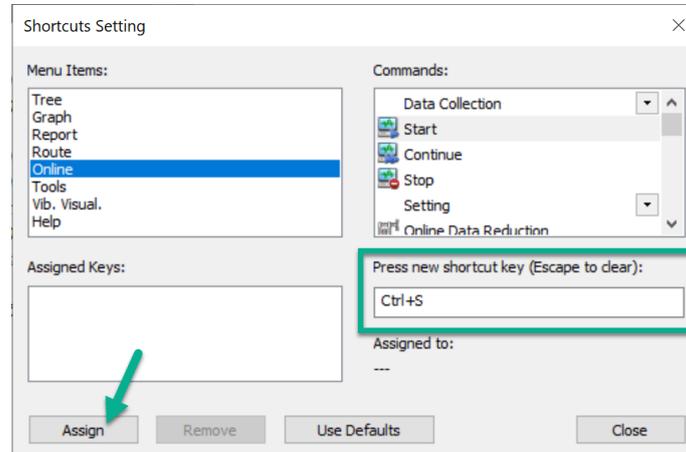
Test

Email – if you click it will send a test email

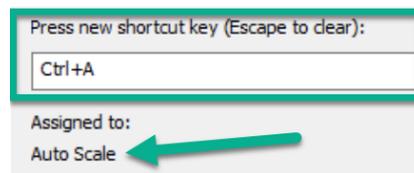
Shortcuts



You can define the shortcut for any command. Push the **Shortcuts** button. Select the Menu Item and command. Enter new key and press **Assign**.



During this procedure you are informed whether your new key is already used or not. If it is used, then there is also command for which it is used displayed.



You can define more keys for one command.

You can remove any already assigned key using the delete button.

Default shortcuts

S	Single cursor
D	Delta RMS cursor
H	Harmonic cursor
B	Sideband cursor
N	cursor OFF
Ctrl+P	Locate Peak
Ctrl+E	tree item properties
Space	switches the focus between tree and graphs
Tab	select next item
Shift+Tab	select previous item
Ctrl+F	Filter (tree menu item)

Tools section

Section is contained in **Tools** tab.

Defragmentation



Use this function to compress the size of the tree file (database file). This function is available only for Route tree (SQLite database) not for online trees.

Synchronization

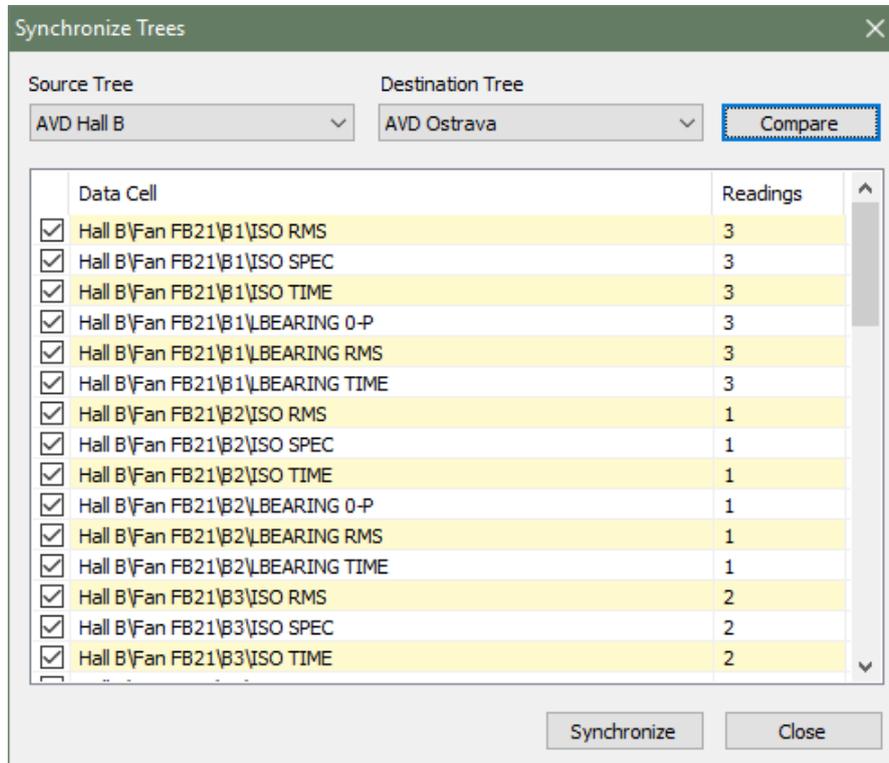


The example situation is good for understanding. The company makes measurements on many locations. The people are traveling to that places with notebooks and data collectors. The main tree database is saved in the office server in headquarter location. When people go to the field trip, they copy that tree to their notebooks. They make readings and after several days they return back to the office. In every notebook they have new measurements. It means that in each notebook is different database. All new readings have to be saved to the office server. It is clear, that standard copy function does not enable that.

The synchronization function can do it. In the notebook is the **SOURCE** tree. The office server tree is the **DESTINATION** tree. When you run it, then all new readings will be copied to the office tree.

Select source tree and destination tree. Press **Compare** and the list of new readings in source tree appears. Exactly that is the list with all readings, which are not in destination tree. They can be older. Now you can uncheck some data cells which you do not want copied to destination tree. Press **Synchronize** and all checked readings from the list will be copied.

If you push **Synchronize** firstly (not the **Compare**) then all data cells will be synchronized and the list appears after it.



Backup and Restore

These functions are available **only in full DDS version** (not in the free of charge version).



Backup saves complete tree to a single file with .bkp extension.



Restore is the inverse function. It is necessary to create new database into which the backup file is restored.

Note: Tree in SQLite database format is saved in single file and you can save that file as backup directly. The Backup and Restore function are designed primarily for SQL database formats.

Time Interval Export



This function is available **only in full DDS version** (not in the free DDS version).

Export creates a tree copy that includes only data from selected time interval and selected tree items(optional). Exported data can be also deleted from the original tree. This enables e.g. to create tree with the data only from particular runup or remove older data from the tree (if the tree is smaller, then it speeds up the work with tree).

Reduce Data



This function is used to reduce a number of measurements in the database and therefore reduce its size. However, this is not a simple dilution of values.

Reduction Method	Reduce data older than	Time interval	Relative significant change
Static (short time reduction)	30D	1h	10%
Static (long time reduction)	60D	6h	20%
Dynamic (short time reduction)	10D	8h	
Dynamic (long time reduction)	20D	1D	

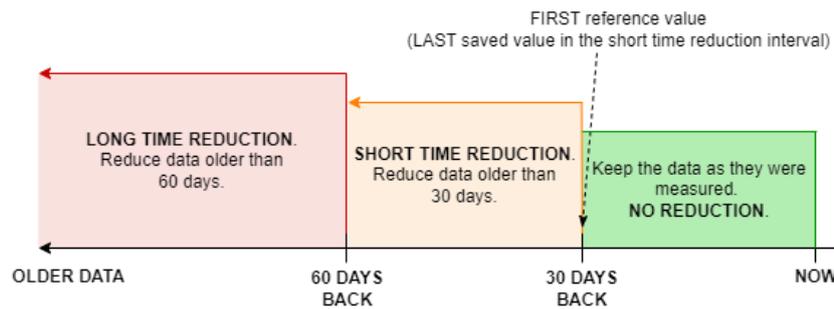
We have two types of data cells – static and dynamic. How the reduction is done to each one of them is described below.

Static data cells

Static data cells reduction is managed by two parameters. The first is time interval between the measurements. The second one is percentage change of measurement.

The main idea is to compare older measured values with the reference value (based on the mentioned parameters). But it will be explained later in this chapter.

Firstly, we will show how static data reductions are divided on the timeline. Static reductions are divided into short time reduction and long time reduction.



Now, principle of the static data reduction will be described.

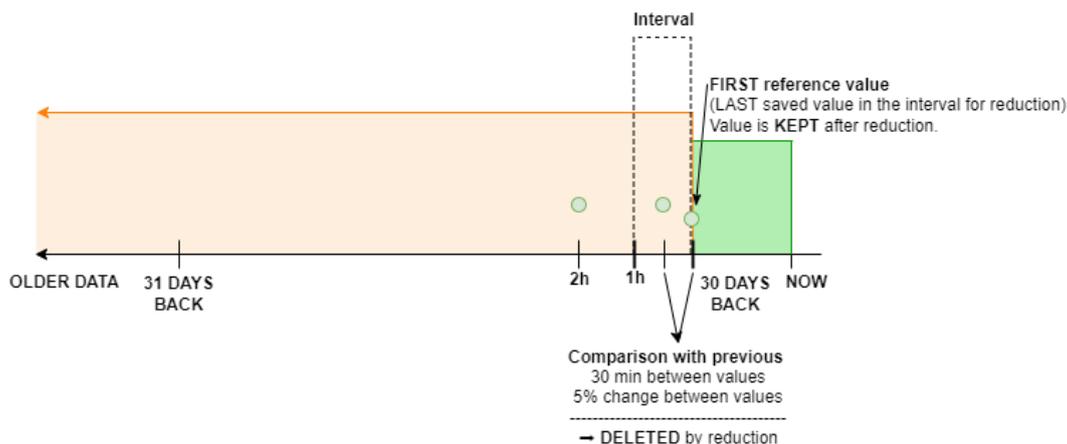
The **reference value** is always the last saved value in the interval for reduction (or it can be defined as the first value included in data reduction as we are going back in time, we are not going forward but backwards). The reference value is compared with the previous (older) value. Then it depends, if the condition of time interval **OR** percentage change is met.

See pictures below for better understanding.

Data without any reduction are shown in the green part of the timeline. Parameters were set based on the picture above. Data in last 30 days – it means from now to 30 days back – are kept as they were measured. No data reduction has been applied here.

The orange part is the part where data reduction has been applied (to be exact, short data reduction has been applied here). Data reduction starts on 30th day back from now – as it was set in the parameter window above. So, this last value (30 days back) is kept and set as the 'reference' value.

Now we go BACK in time, it means to the previous (older) value. You can see it in the picture.

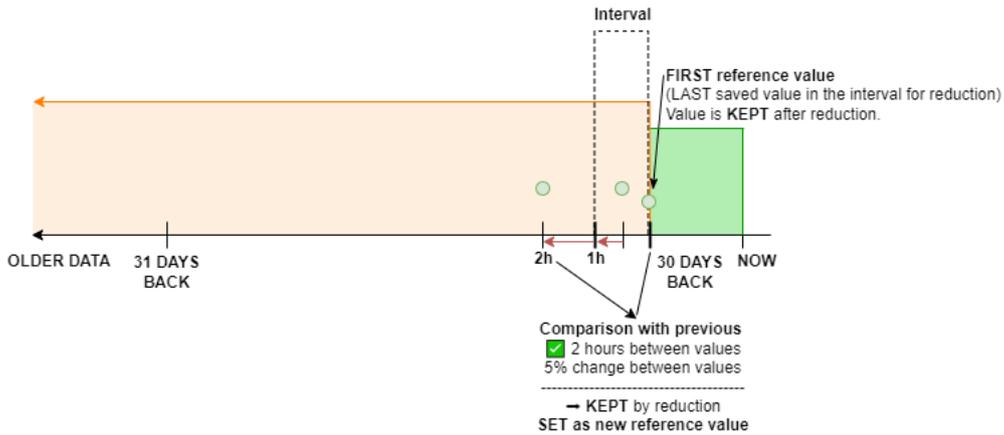


There is a comparison between the first reference value and the previous one. We know that we want to keep values in time interval 1 hour OR values with change 10%.

Based on information in the picture (interval is 30 minutes: shorter than set value for interval; and change is 5% between measurements: smaller than set value for change) this value will be removed by reduction as we set it. The same value still remains as a reference.

Now, data reduction carries on to the next previous value and compare it with the reference one.

Note! You can see that in set 1 hour interval (we set it in DDS) there is no measurement. In such a situation, reduction is searching for the closest measurement to this time interval. In case of the large amount of data collected in the database – e.g. data collected and saved every minute/every second/etc.; it will not happen that you do not have any measurement in 1 hour interval. So, there would be a value at least every 1 hour (if no percentage change occurred before this interval condition is met).



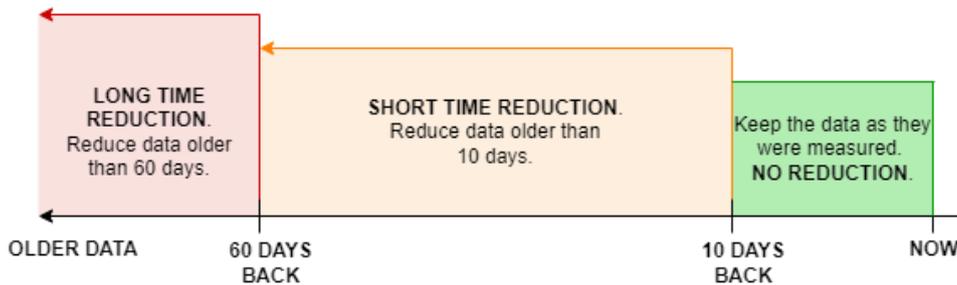
We can see that the closest measurement is 2 hours from the reference one; and change is 5% in the picture. The condition of interval is met. It means that this value is kept by data reduction process. AND this value is set as new reference value. The next value will be compared with this one. And this is basically how static data reduction works. It takes value by value and evaluate if it will be kept or not related to the reference value.

Note! Keep in mind, that we go back in time with the measurements – it means from the last (the newest) measurement saved to the older ones (previous values).

Dynamic data cells

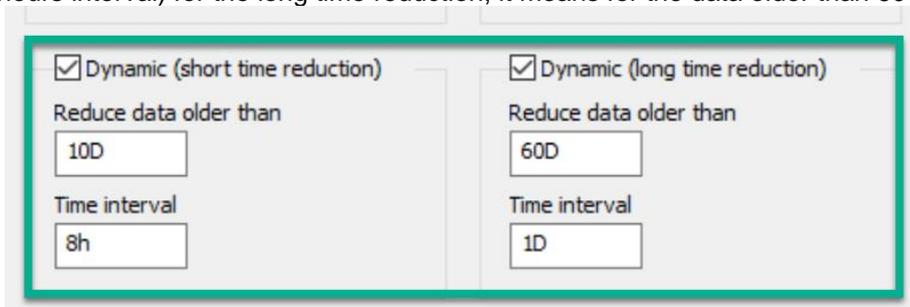
Dynamic data cells reductions are working differently. They don't work with the comparison of the reference value with the previous ones. There is only one parameter for dynamic reduction – this one parameter is time interval. You can see this difference in the window for reduction parameter setting (this window is shown at the beginning of data reduction chapter).

You can see how reductions are divided on the timeline. This is the same as for static reductions.

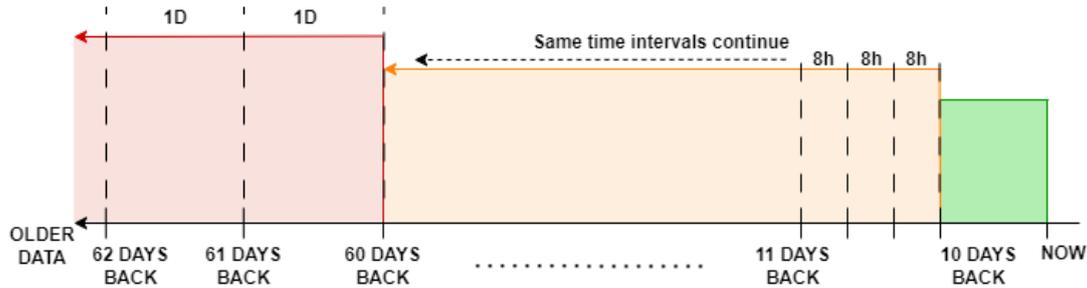


The main idea here is to find the maximum value in the set time interval. This maximum value is named TOT in DDS software. See the explanation how it works below.

The timeline is divided into smaller parts – time intervals. This time interval is set in DDS setting window. In this case, for short time reduction it is 8 hours interval for data older than 10 days. And it is 1 day interval (24 hours interval) for the long time reduction, it means for the data older than 60 days.



Imagine that the timeline is now separated like this:



Based on the parameters from DDS you can see that green part is without reduction. Reduction starts on 10th day back from now (orange part of the graph – it is **short time reduction** to be exact). It is set in DDS parameter 'Reduce data older than 10D'. This short time reduction timeline is separated into smaller intervals – each of them lasts 8 hours (8h in the picture). Time of intervals is changed when **long time reduction starts**. Based on our parameters, it is on the 60th day from now (red part of the graph). It is set with the parameter 'Reduce data older than 60D' under Dynamic (long time reduction). Now, each interval is 1 day long (1D in the picture).

Now, when the timeline is separated into smaller time intervals, the reduction is searching for the maximum value in each time interval. This interval's maximum is kept after reduction. Then it can be proceeded to the previous time interval (and search for maximum value here).

Table of quantifiers for particular measurements

What is the quantifier? It was not mentioned in reduction explanations above, so it is necessary to do it here. When you think of static data (e.g. overall value), it is clear how measurements will be compared with each other. Static measurements are basically “one number” value/measurements. But in case of dynamics, it is not that easy. Dynamic measurements are arrays of values. It is not one value as in static measurements. So, what will be evaluated in such a measurement?

Each measurement in DDS (also the static ones) has its quantifier. It is basically that “one value” for dynamics as static has.

See the table below to know what exactly the quantifier is in particular measurement types. You can see TOT value as a quantifier for dynamics. It is total effective value.

Measurement type	Reduction principle	Data reduction quantifier
Overall	Static	Amplitude
Spectrum	Dynamic	TOT
Time	Dynamic	TOT
Demod Overall	Static	Amplitude
Demod Spectrum	Dynamic	TOT
Demod Time	Dynamic	TOT
FASIT	Dynamic	The highest percentage fault of the overall machine's/bearing's condition
Amplitude+Phase	Static	This is evaluated differently: saved only in time interval.
Speed	Static	Amplitude
ACMT Time	Dynamic	TOT
ACMT Demod Spectrum	Dynamic	TOT
ACMT Demod Time	Dynamic	TOT
Orders	Dynamic	TOT
Orders Spectrum	Dynamic	TOT
Orbit	Dynamic	TOT of signal A + TOT of signal B
Octave Spectrum	Dynamic	TOT
DC	Static	Amplitude

Bit Compression



This function can reduce the database size to one-fourth of its original size. Only dynamic data cells are compressed. If you run this compression, all saved dynamic data cells in database will be compressed. Future data are not compressed and this function must be applied again.

Note! Online database store all dynamic data already compressed.

Move Data



Allows you to move data from one data cell to another. It also works for any tree item. But the tree items must have the same structure.

Example of use

If you measure route and it happens that you measured the meas. point in the wrong place. You do not have to go back and measure one point. You can move the all data from wrong point to correct point in DDS software.

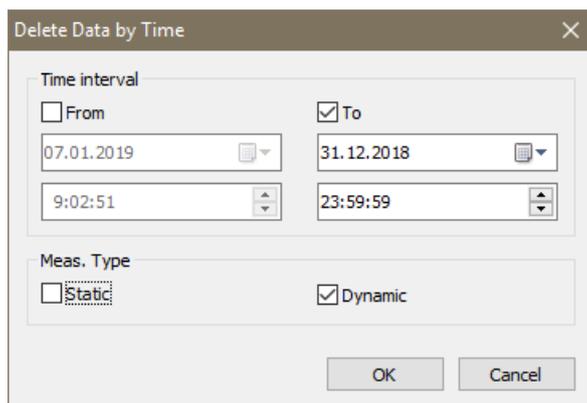
1. Select wrong measured point (tree item) and point (tree item) where you want to transfer data.
2. Go to the Tool tab (main menu) and click on button Move Data (section Tools).

3. Select source tree item and specified which readings will be moved. You can choose last N readings or all reading in date interval. If you check Make Copy, readings will be only copied.

Delete Data by Time

Complete deleting of measurements in the time interval. Select tree items (e.g. machines, points, machine group, ..), right click on this item(open the local menu) and click to function named *Delete Data by Time*. Now set time interval for data deleting.

E.g. uncheck *From* (since the beginning of time), check *To* and set date to 31.12.2018 and time to 23:59:59. Uncheck *Meas. Type Static*.



The dialog box is titled "Delete Data by Time" and contains the following elements:

- Time interval:**
 - From: 07.01.2019 9:02:51
 - To: 31.12.2018 23:59:59
- Meas. Type:**
 - Static
 - Dynamic
- Buttons: OK, Cancel

If you confirm this dialog, all dynamic data older than 31.12.2018 23:59:59 will be deleted. Newer data are kept (measured after 31.12.2018 23:59:59).

User Permission section

Section is contained in Tools tab. If many people work with DDS, then it is recommended to assign user permissions to them. Not everybody should have full access to all available functions.

Manage



Opens dialog which allows turns on and off the user permission and sett passwords for all security levels. All default passwords are 1234.

Admin	full access to all functions
Power	cannot create new database and cannot edit user permissions
Route	cannot modify tree structure, cannot switch on/off online readings
View	can only view data

Log In



If user permissions are on, you use this button to log in.

Log Out

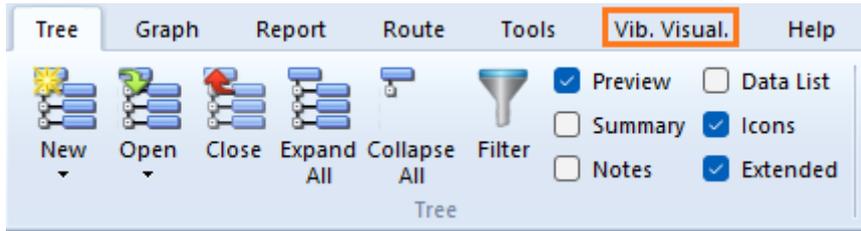


If user permissions are on, you use this button to log out.

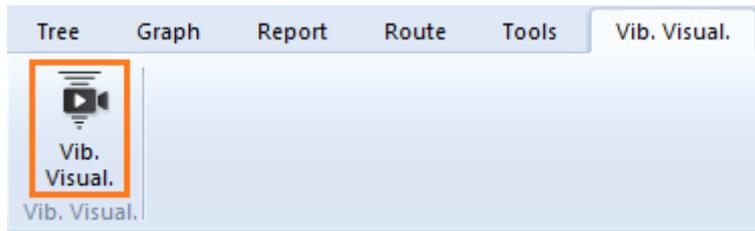
Note! These permissions work only on one PC where you set it! If someone opens DDS on different computer, the permissions are not there, no need to login (if these permissions are not set also on this computer).

Vibration visualization tab

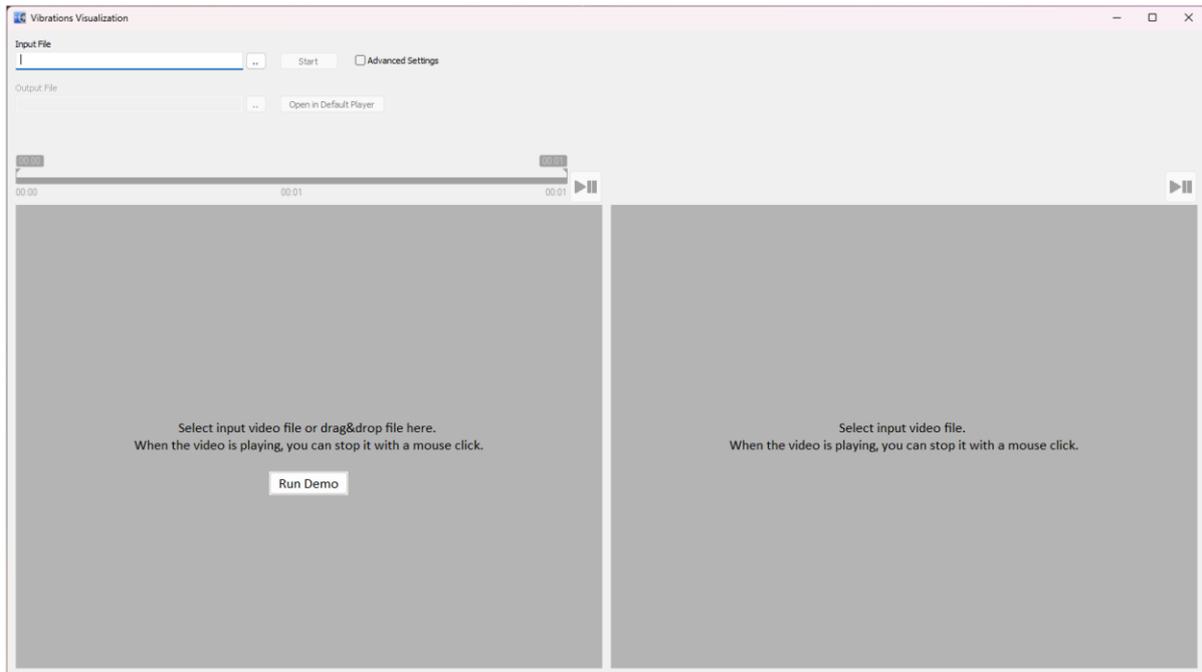
Vibration Visualization is used to show the vibrations of a machine in a video recording. The Vibration Visualization tab is located in the Main Menu.



Vib. Visual. section



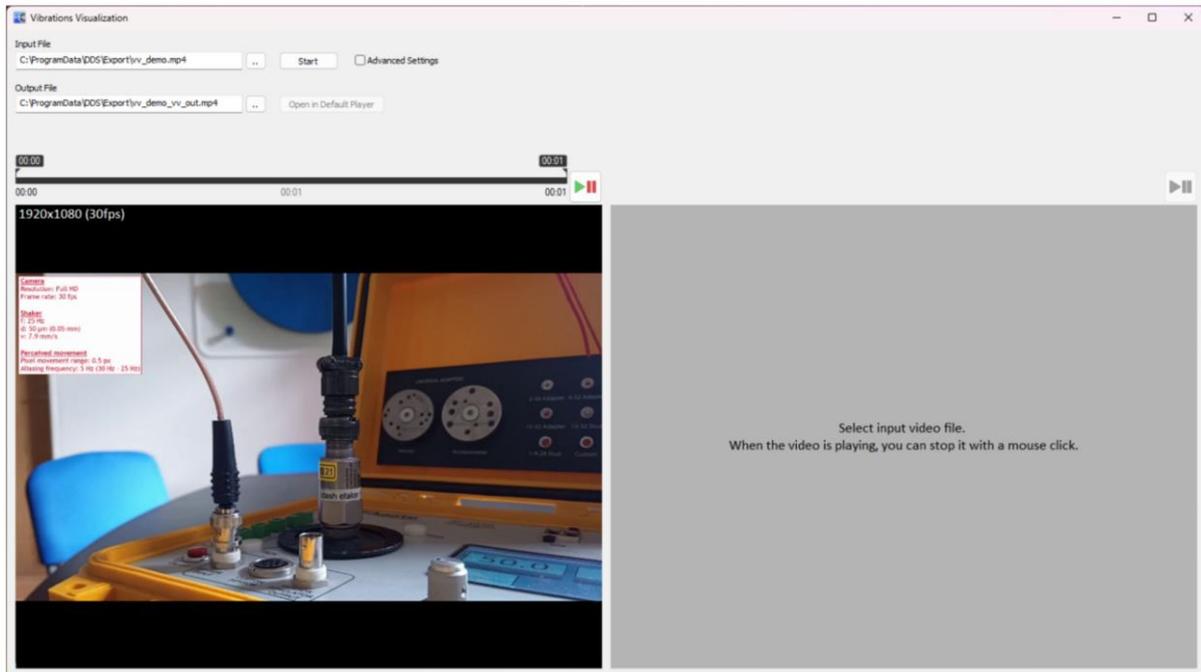
Click the Vib. Visual. icon in the section to open the Vibration Visualization window:



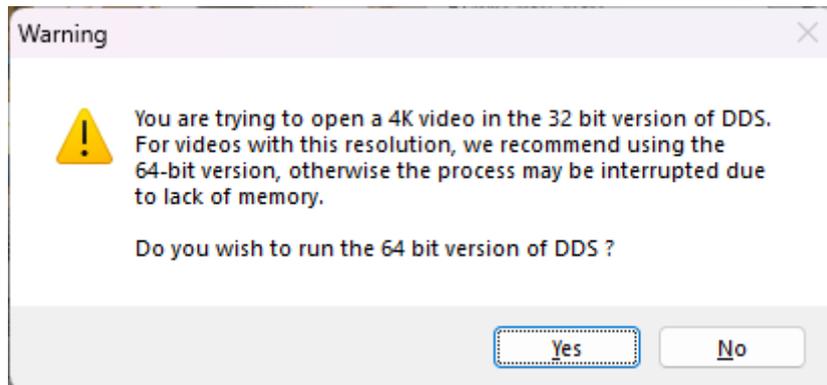
Drag and drop a video file anywhere in the left panel or enter a path to the file manually:



DDS includes a demo video for vibration visualization. The Run Demo button in the middle of the left panel opens it.

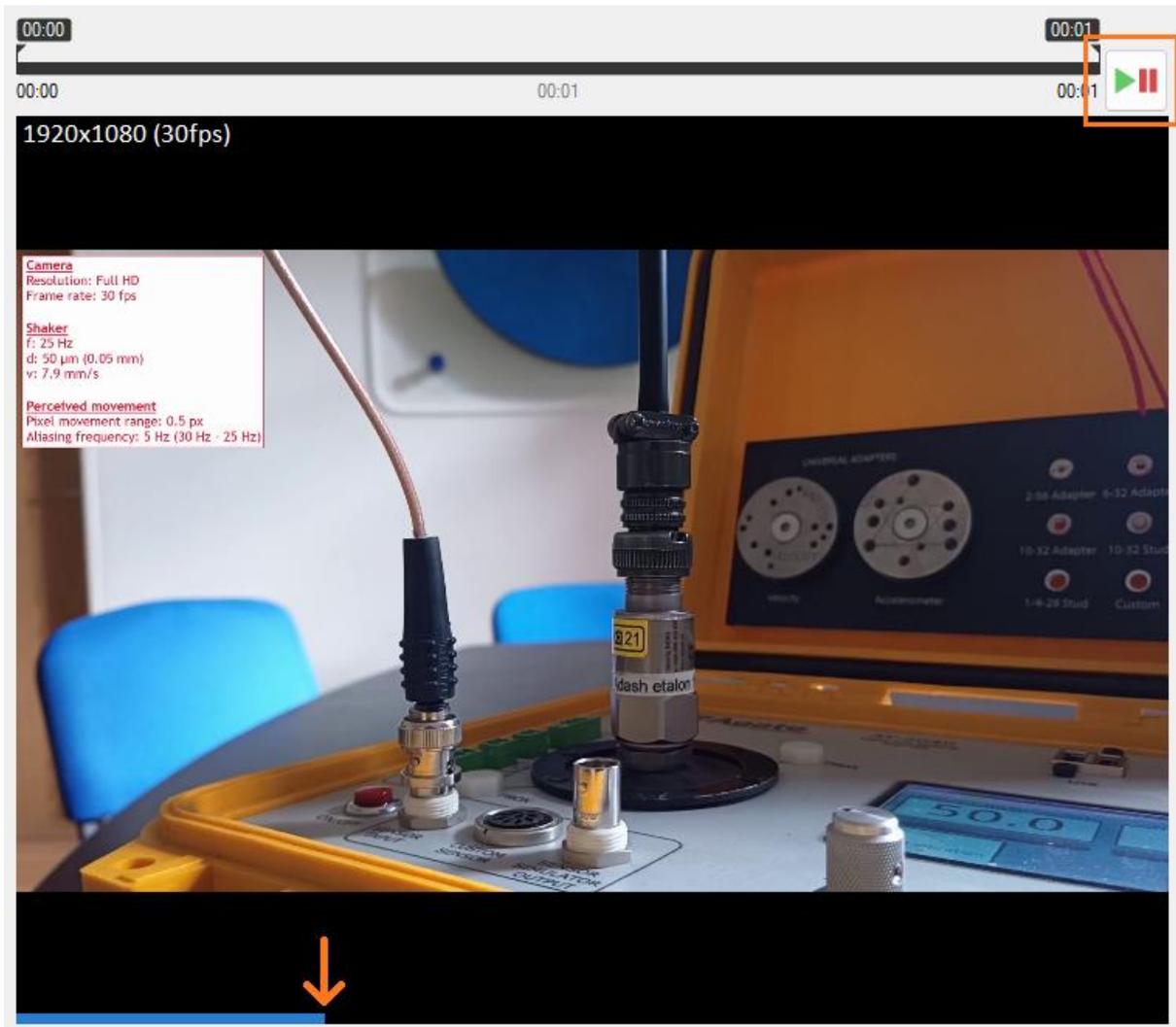


Selecting a video or opening the demo will display it in the left panel. If you are using the 32bit version of DDS and try to open a high-resolution video, this warning will appear:



Just click Yes and run the 64-bit version of DDS.

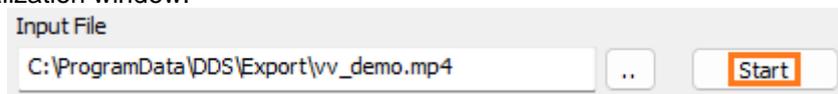
The video is played or paused by clicking anywhere in the left panel or by clicking the Play/Stop button. The blue bar at the bottom indicates the video is playing. It will be played in a loop.



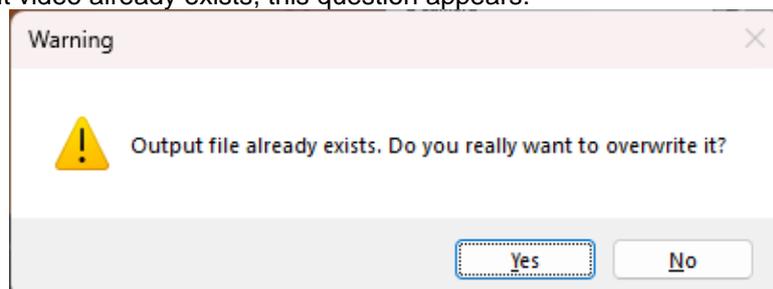
For longer videos, the length of the output video can be manually adjusted by dragging the markers to the desired position. They indicate which part of the input video will be used for vibration visualization.



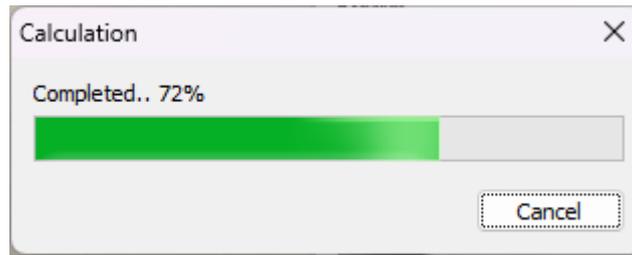
The Vibration Visualization process is then initialized by clicking the Start button in the upper part of the Vibration Visualization window.



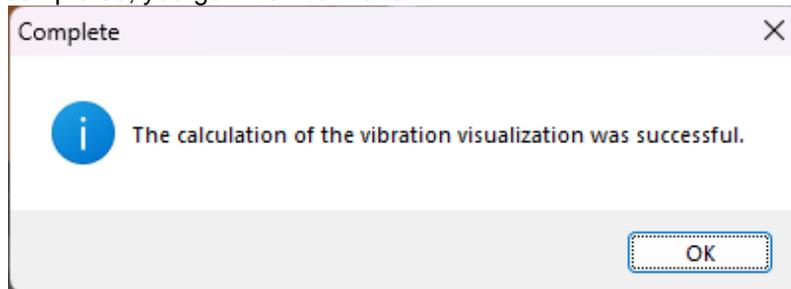
The output file has the suffix `_vv_out` in its filename. The default location is the same as for the input video. If the output video already exists, this question appears:



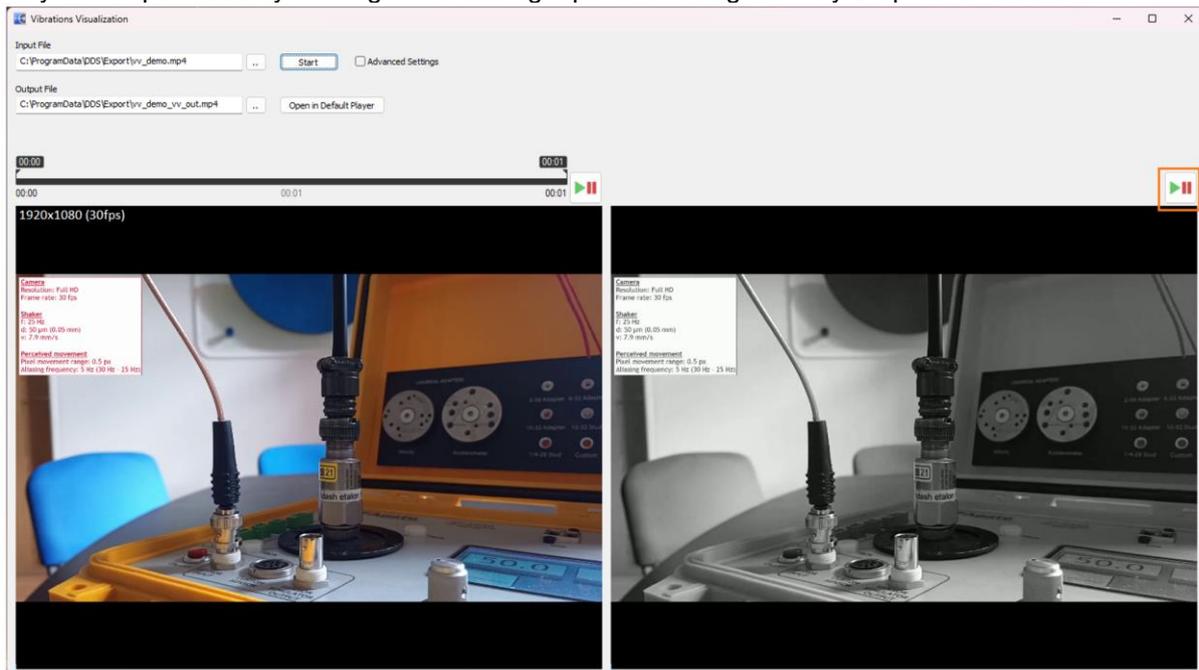
When started, a window will pop up showing the progress of the vibration visualization.



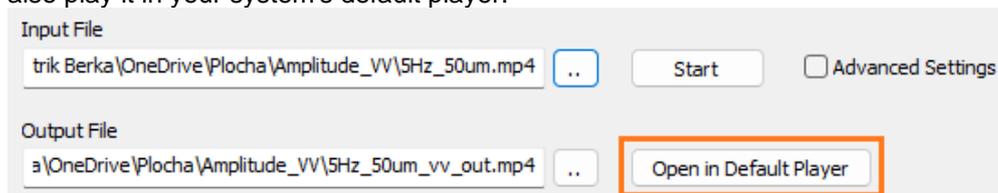
When process is completed, you get this information:



Play the output video by clicking at it in the right panel or using the Play/Stop button above it:



You can also play it in your system's default player:



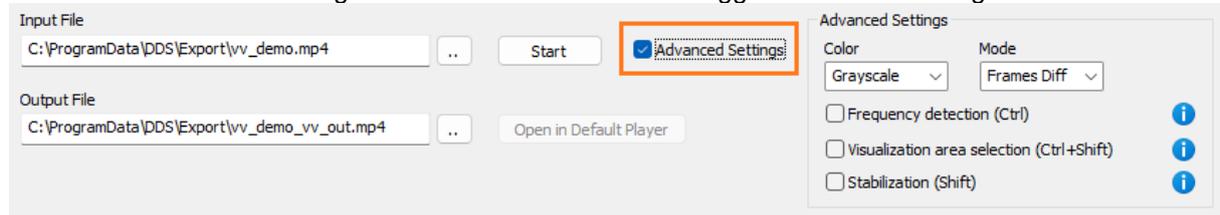
Four steps for best results in vibration visualization:

1. Make sure the camera is stable (use a tripod or a stand that is placed on a solid, non-vibrating surface).
2. Provide adequate lighting: Reduces noise.

3. The better the recording device, the better the visualization result.
4. Additional image stabilization if needed (use DDS stabilization or third-party stabilization software before loading the video into Vibration Visualization).

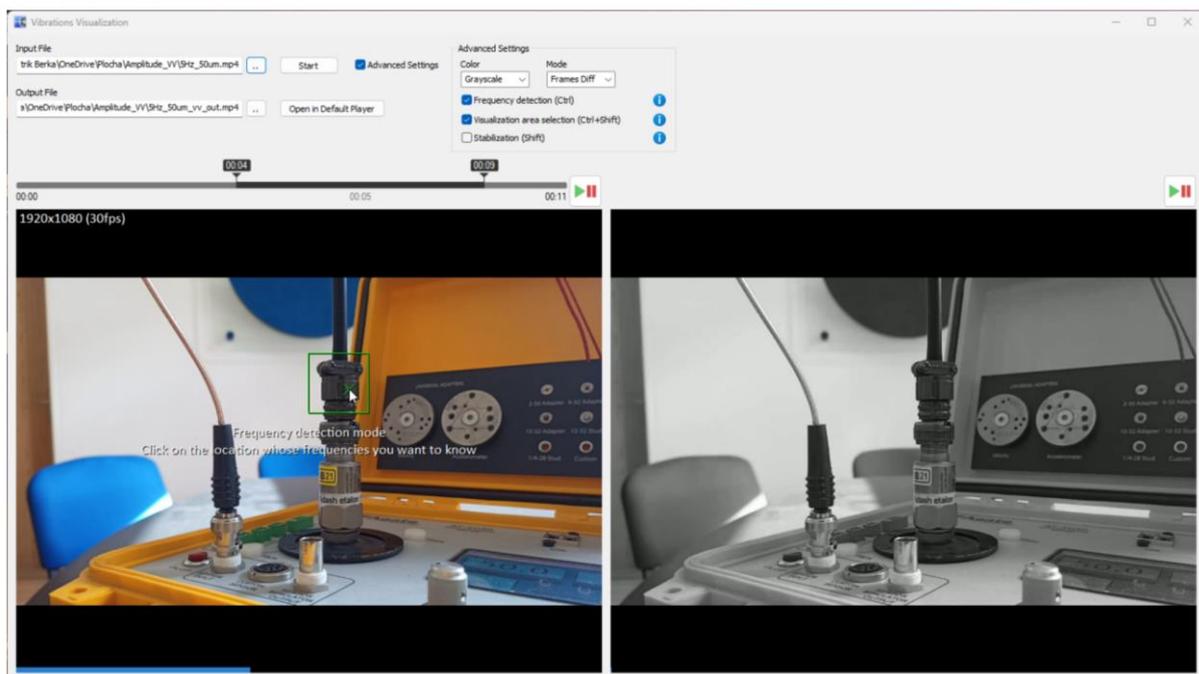
Advanced settings

DDS offers additional settings for Vibration Visualization. Toggle Advanced Settings to show them:



- The default colors of the output video are in grayscale. Vibration Visualization may produce a colored video if chosen.
- Mode defines how the vibrations are visualized. Frames Diff calculates difference between consecutive frames. Max Diff looks for two nearby frames with the highest difference between them.
- **Frequency detection**

This option allows detection of vibration frequency from movement. Toggle it on, hold down Ctrl and click on the area where you want to detect the frequency. It should be an area with high vibrations. The video must contain at least 64 frames for Frequency detection to work. Green square marks the area for Frequency detection.

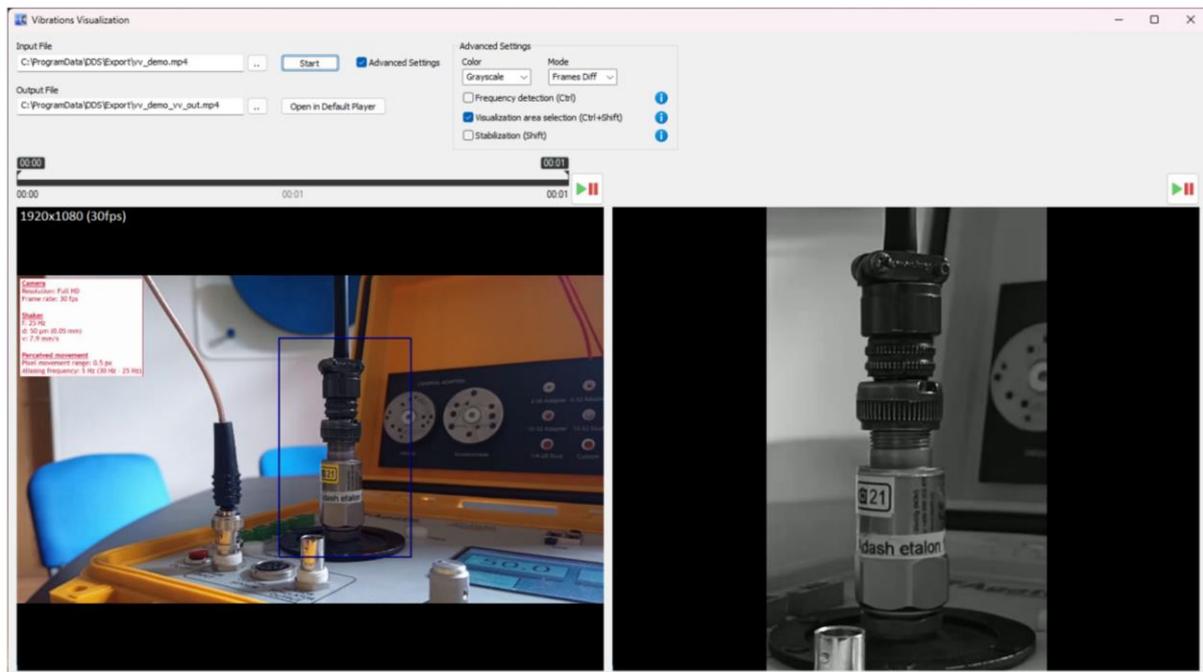


After processing, Detected Frequencies appear next to Advanced Settings. Main Freq. is found in the spectrum. Machine vibrations are often quicker than the usual video frame rate. Main Freq. may therefore be shown only due to aliasing. Actual vibration frequency may be a lot higher. It is listed below in a range of Possible Frequencies.



- **Visualization area selection**

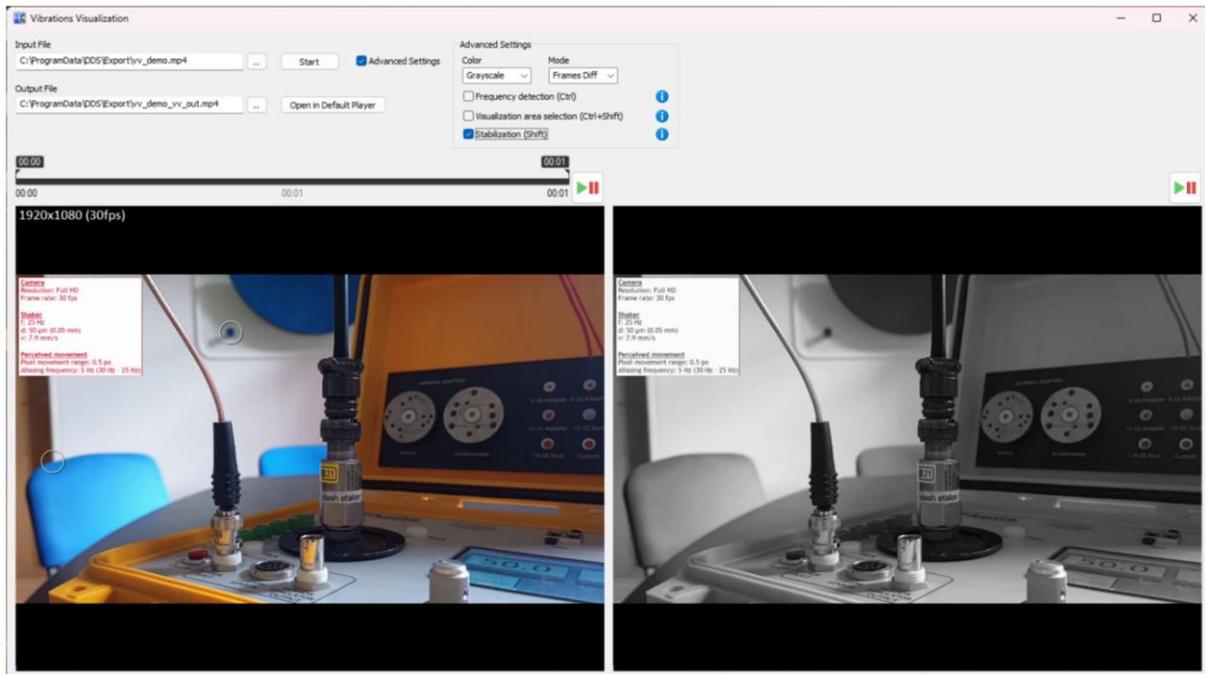
Only a small area of the video may be chosen for Vibration Visualization. This is advisable for long or high-resolution videos. Toggle Visualization area selection and hold down Ctrl and Shift. Then use the mouse to select the area. Blue rectangle marks it.



- **DDS Stabilization**

If the provided input video is not stable enough, Vibration Visualization offers an optional built-in stabilizer. To stabilize the input video, toggle Stabilization on.

Hold down Shift and click on the input video to select a point. Click the same point again to deselect it. Up to four points may be chosen. If no points are selected, no stabilization will be applied. The selected point(s) represent non-moving, non-vibrating objects in the real scene captured by the camera (usually walls, floor, roof, windows, pillars...). Selected points are displayed as white circles:



Points can be selected while the video is playing, but they will be selected from the first frame. Stabilization finds where these points will be in every other frame and transforms next frames to keep the selected points in the same position.

Stabilization applies a transformation to each frame of the video so that the selected points become motionless. If only one point is selected, Stabilization moves each video frame vertically and horizontally. If two points are selected, frames may also be rotated and zoomed. If three out of four points are selected, the frames may be more distorted.

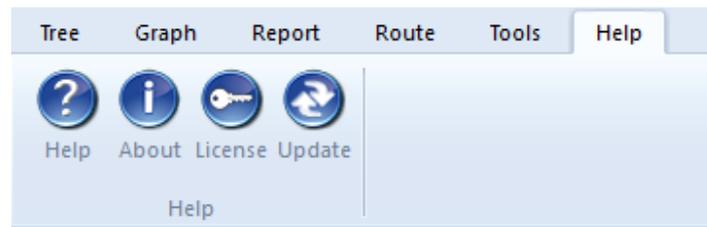
For these reasons, three conditions must be met for the Stabilizer to work:

1. The points must be in high-contrast areas, such as corners.
2. One point should be far away from another.
3. Three or more points must not be in a straight line.

Camera and computer hardware requirements

1. Camera fps rate **must not be equal** to the vibration frequency. If it was equal, vibrations would not be visible because the vibrating machine parts would be in the same position in every frame.
2. Resolution of the recording should be at least **Full HD**.
3. Processor speed at least **1.44 GHz**. The higher the speed, the less time it takes Vibration Visualization to process the video. Slower processor will still work, but it will take long.

Help tab



Help



Opens the help file.

About



The version details of DDS.

License



Contains license information. It enables import of license if you buy full version.

Update



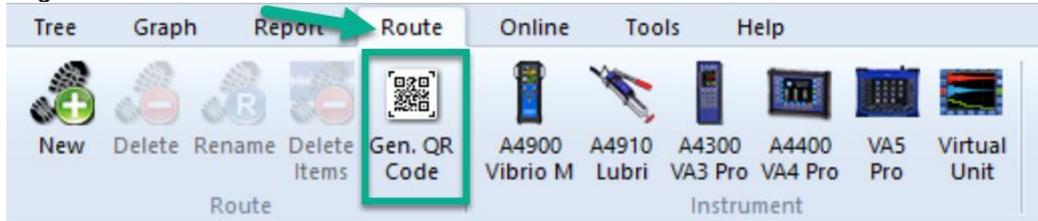
Checks for the new DDS update. It will offer its download and installation, if the new version is available.

Appendix A – QR codes generation

This feature will definitely make your route measurements easier – each QR code identifies one machine in a route. After you scan it, the instrument opens the right machine.

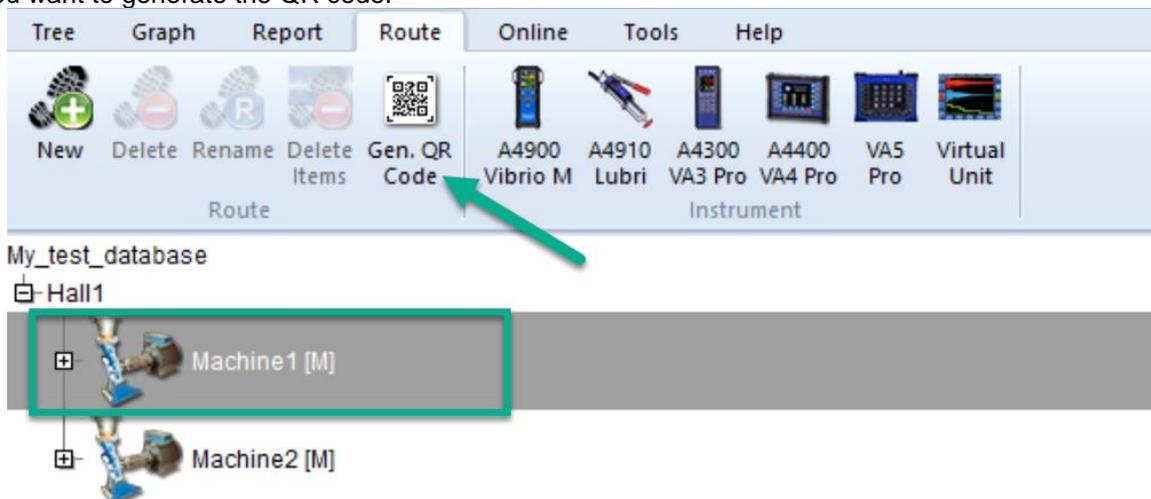
Note! This feature is available only for VA5 device.

Option to generate the QR code is located in DDS under 'Route' tab.

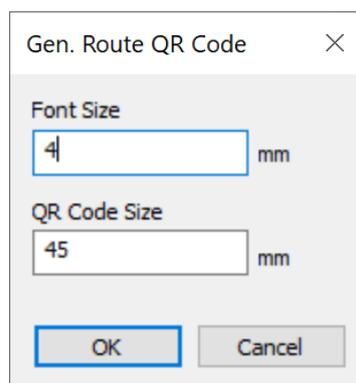


How to generate QR code

It is actually very easy. Just go to 'Route' tab in DDS. Now choose the machine in the tree for which you want to generate the QR code.

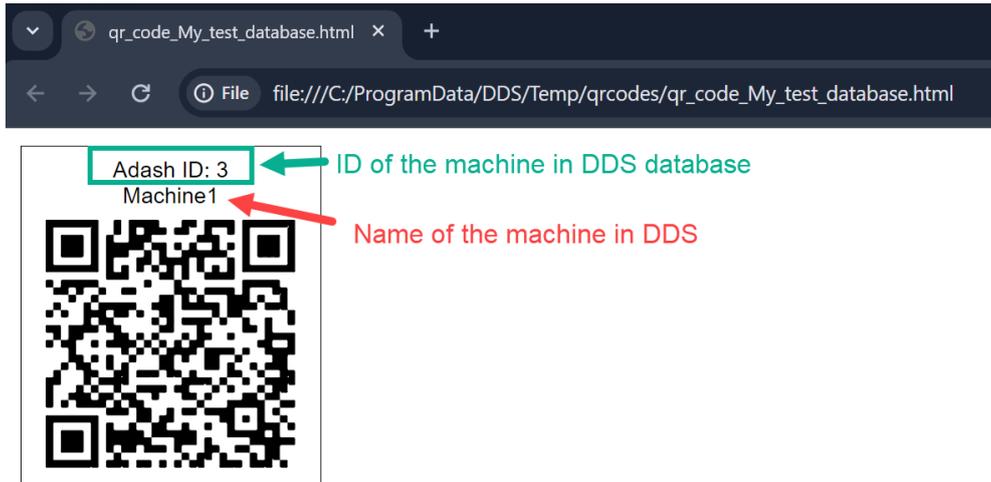


Once you click on the icon for QR code generation you get this window. Parameters should be set based on your preferences.

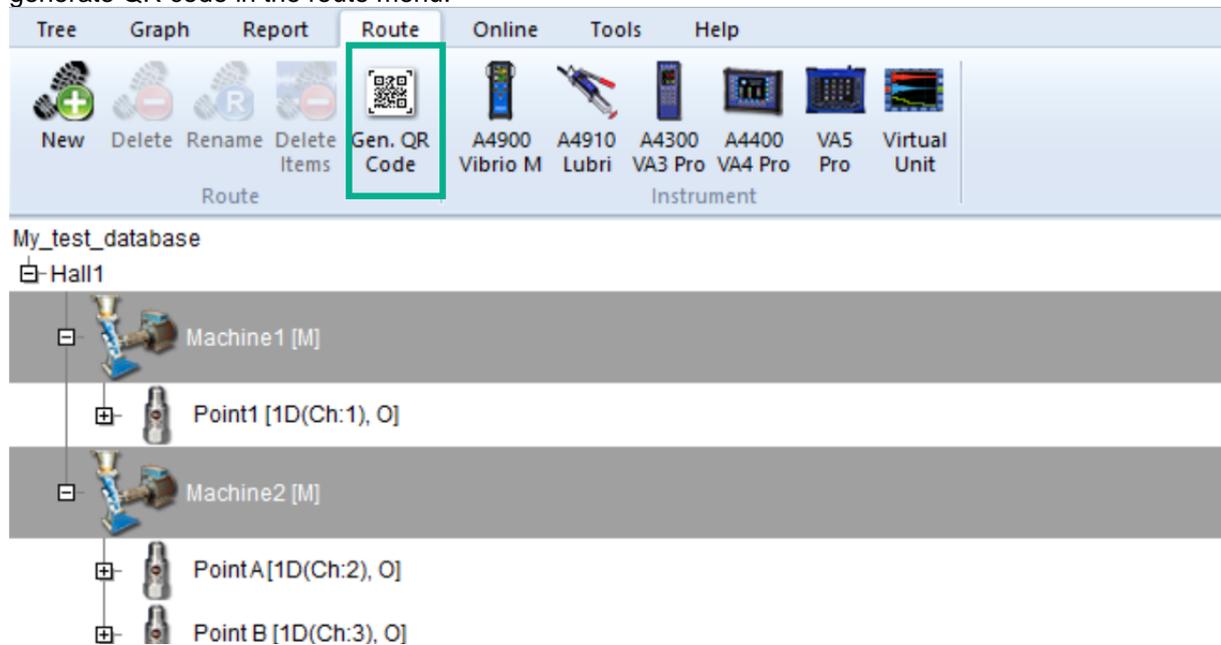


Note! These parameters set how your QR code will look like. Parameters do not affect the function of the QR codes.

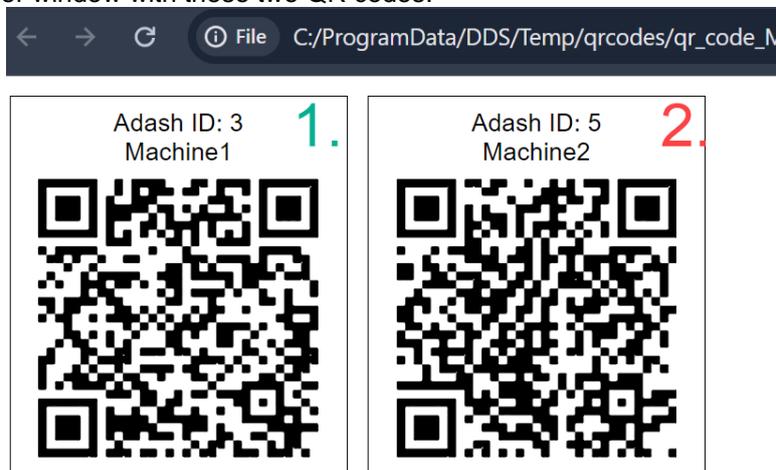
Once you confirm this window with parameters, new browser window will pop up and you can see the generated QR code.



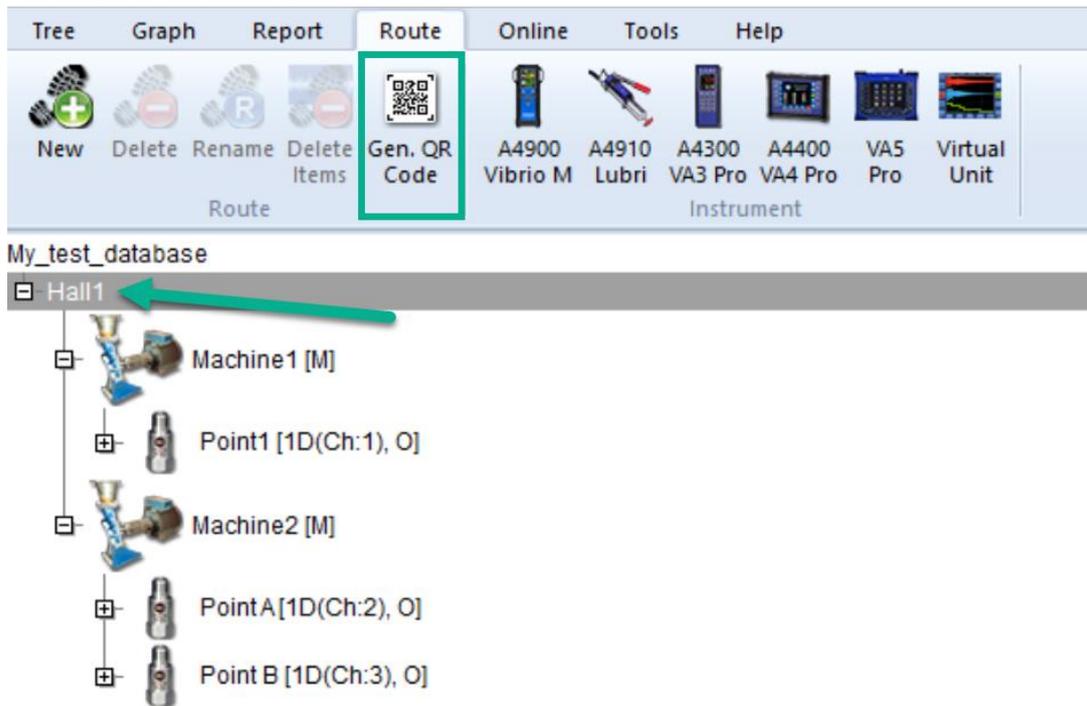
You can create more QR codes in the same time. Mark more machines in DDS tree and click on generate QR code in the route menu.



You get the browser window with these two QR codes.



When you click on the department and generate the QR code, you get the QR codes for all the machines in this structure at the same time.



Note! Keep in mind that QR codes are generated for the machines. It means when you click on the tree structure lower than 'machine' (for example you click on the measurement point as in the picture below), you get this error message.

