ifm electronic

Programming manual
Software for efector octavis

efector800®

VES003

Version 3.0

UK

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Software for efector octavis diagnostic electronic VSExxx

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1.2.1 On-line condition monitoring

The diagnostic electronics VSExxx valuates and monitors max. 24 diagnosis objects (e.g. rolling element bearings, unbalance, gear-mesh, signal input-monitor etc) using the vibration signals of up to 4 connected vibration sensors (Type VSAxxx and IEPE) and the 2 DC inputs (e.g. speed or load). Damage progress can be indicated using binary switching outputs (e.g. early warning and alarm). Alternatively one output can be selected as analogue and the trend can be signalled continuously.

Integration into the production data acquisition system is possible using an OPC interface. An additional software is available (octavis OPC Server, article numbers VOS001...VOS004).

1.2.2 Trend recording (internal history memory)

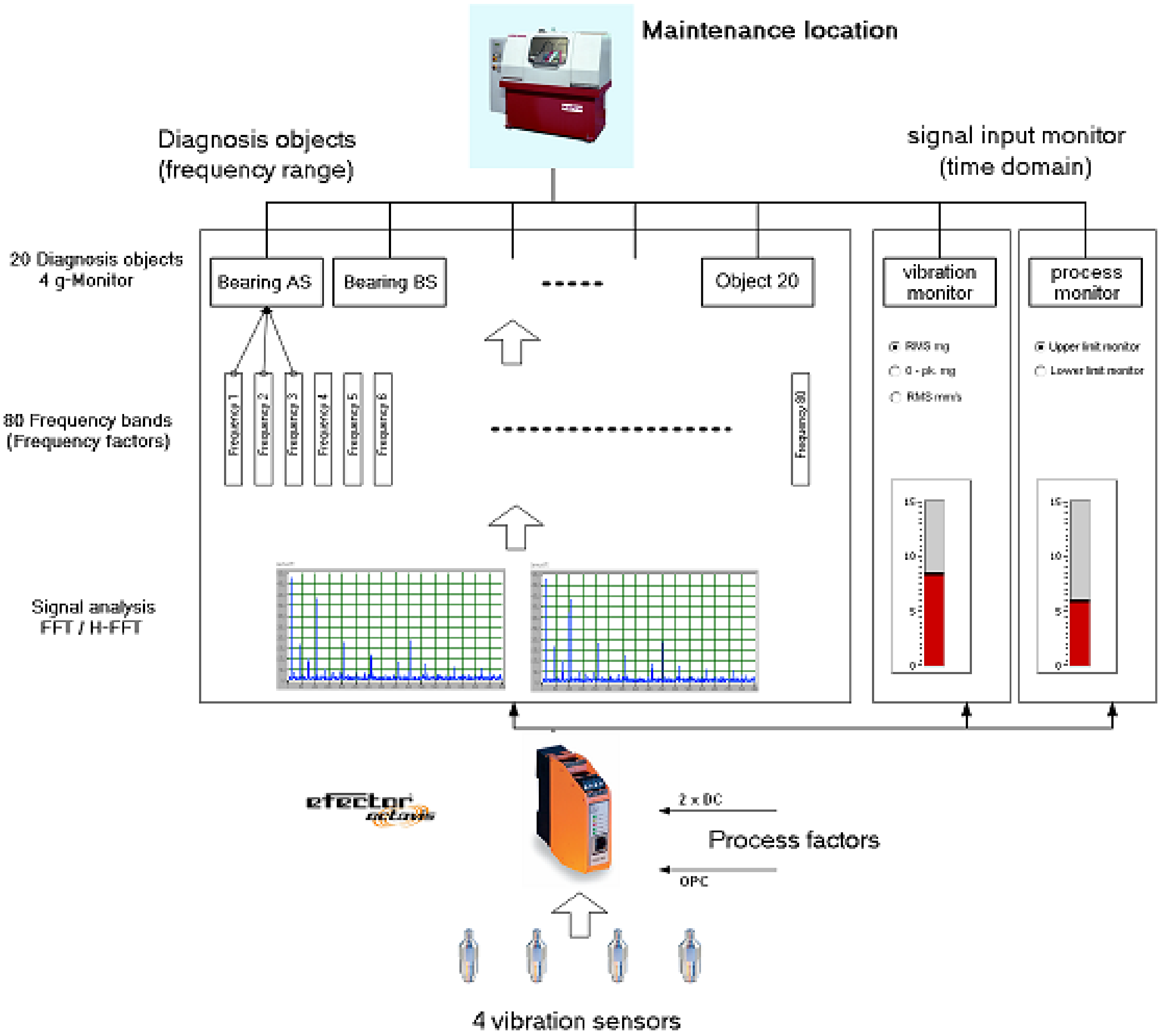
All diagnosis object trends (history) can be stored in the diagnostic electronic (VSE). The integrated battery-backed real-time clock enables time tracking of events.

1.2.3 In-depth diagnosis (FFT mode)

If required a detailed analysis of the measurement data is possible using the FFT mode. Measurements can only be detected and recorded from one sensor at a time. The recorded data can be recalled as measurement data.

1.2.4 Gateway

All diagnosis objects and switching conditions can be integrated into a higher level data acquisition system using the OPC interface. This is realised using an additional software (octavis OPC server article numbers VOS001...VOS004). Furthermore it is also possible to read and write individual parameters using the OPC interface.


Maintenance location
Diagnosis objects
(frequency range)
signal input monitor
(time domain)
20 Diagnosis objects
4 g-Monitor
Bearing AS
Bearing BS
Object 20
vibration monitor
process monitor
RMS mg
0 - pk. mg
RMS mm/s
Upper limit monitor
Lower limit monitor
80 Frequency bands
(Frequency factors)
Frequency 1
Frequency 2
Frequency 3
Frequency 4
Frequency 5
Frequency 6
Frequency 80
Signal analysis
FFT / H-FFT
efector octavis
2 x DC
Process factors
OPC
4 vibration sensors

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2 Important notes

2.1 Factors which influence vibration monitoring

We wish to point out that deviations in and influences to the diagnosis values can generally occur during vibration monitoring. Therefore, for reliable monitoring it is important to pay attention to the following factors:

2.1.1 Selecting the mounting location

- The measuring axis is vertical to the machine surface
- Mount in massive housings only (not on metal cover plates)
- Mount as close as possible to the bearing position to be monitored.

2.1.2 Quality of the measurement signal

- Tighten the vibration sensor (type VSAxxx) with the given tightening torque
- The conus washer (accessory article number E30115) improves the positive locking of the sensor (VSA001). This is recommended for bearing diagnosis.
- Interference originating from the process can influence the diagnosis. We therefore recommend in the case of strongly deviating diagnosis values to limit the monitoring range or to reduce the bandwidth of the diagnosis objects. If the diagnosis values are subject to strong influences (e.g. metal cutting operations) we recommend recording a reference run.

2.1.3 Checking the teach values

The teach values are the reference values used to evaluate the diagnosis values. A teach value which is too high due to pre-damage or signals originating from the process can impede the correct display of the "earling warning" and "alarm" conditions. To check the teach values we recommend after a few days reading out the data recorded by the internal history memory and to make any necessary corrections to the alarm limits and the signal damping.

2.1.4 Evaluating the alarm limits

The given alarm limits for the diagnosis object "rolling element bearing" and "unbalance" are based on experience and relate to an undamaged condition.

3 Function and features

1. The efector octavis diagnostic electronic (VSE) continually monitors the vibration acceleration detected by the vibrations sensors connected thereto, of non-rotating machine surfaces (up to 100,000 values/second). It calculates the acceleration and speed amplitudes of the set damage frequencies (e.g. inner race, outer race and rolling element) of up to 24 different diagnosis objects (incl. signal input-monitor). A total of 128 individual damage frequencies are possible (max. firmware 0.7.255 84 damage frequences). The rolling element bearings or diagnosis objects to be monitored are defined using a PC-software and then transferred as a parameter set via Ethernet to the diagnostic electronic (VSE). The evaluation and condition monitoring of the rolling element bearing is then relative to the Teach value (reference value).
2. efector octavis can also calculate the maximum acceleration (0-peak in [mg]), weighted acceleration (RMS in [mg]) and/or average velocity (RMS in [mm/s]). The evaluation and monitoring is then in absolute limit values without a reference value.
3. Both process values (input 1/input 2) can be monitored separately from the diagnosis objects. They can also be recorded in the history memory.
4. Indication of early warning and main alarm: The diagnosis object or the signal input monitor with the highest degree of damage is indicated via the switching output. The highest diagnosis object value or damage level can also be indicated using a 0/4...20 mA current loop.
5. The damage condition of the diagnosis objects per sensor input is indicated on the diagnostic electronic‘s (VSE) integrated coloured LED display.
6. The diagnostic electronic (VSE) can be used with constant and variable speeds. To ensure correct diagnosis when using variable speeds the current speed has to be supplied via a current loop, pulse signal or Ethernet.
7. For use with variable speeds please ensure that the operational speed related to the set values remains constant for intermittent periods.
8. The recommended range for rolling element bearings in the standard mode (wizard) are operating shaft speeds between 120 rpm and 96,000 rpm. The maximum operating range is between 1 rpm and 100,000 rpm shaft speed.
9. The sensor is mounted via a screw fixture close to the rolling element bearing radial to the rotational axis (see sensor installation instructions).

The diagnostic electronic (VSE) uses own limit values for the set spectral diagnosis objects for early warning (yellow) and main alarm (red). The alarm limit values of the diagnosis objects are always related to the set Teach value and therefore describe a signal fan-out.

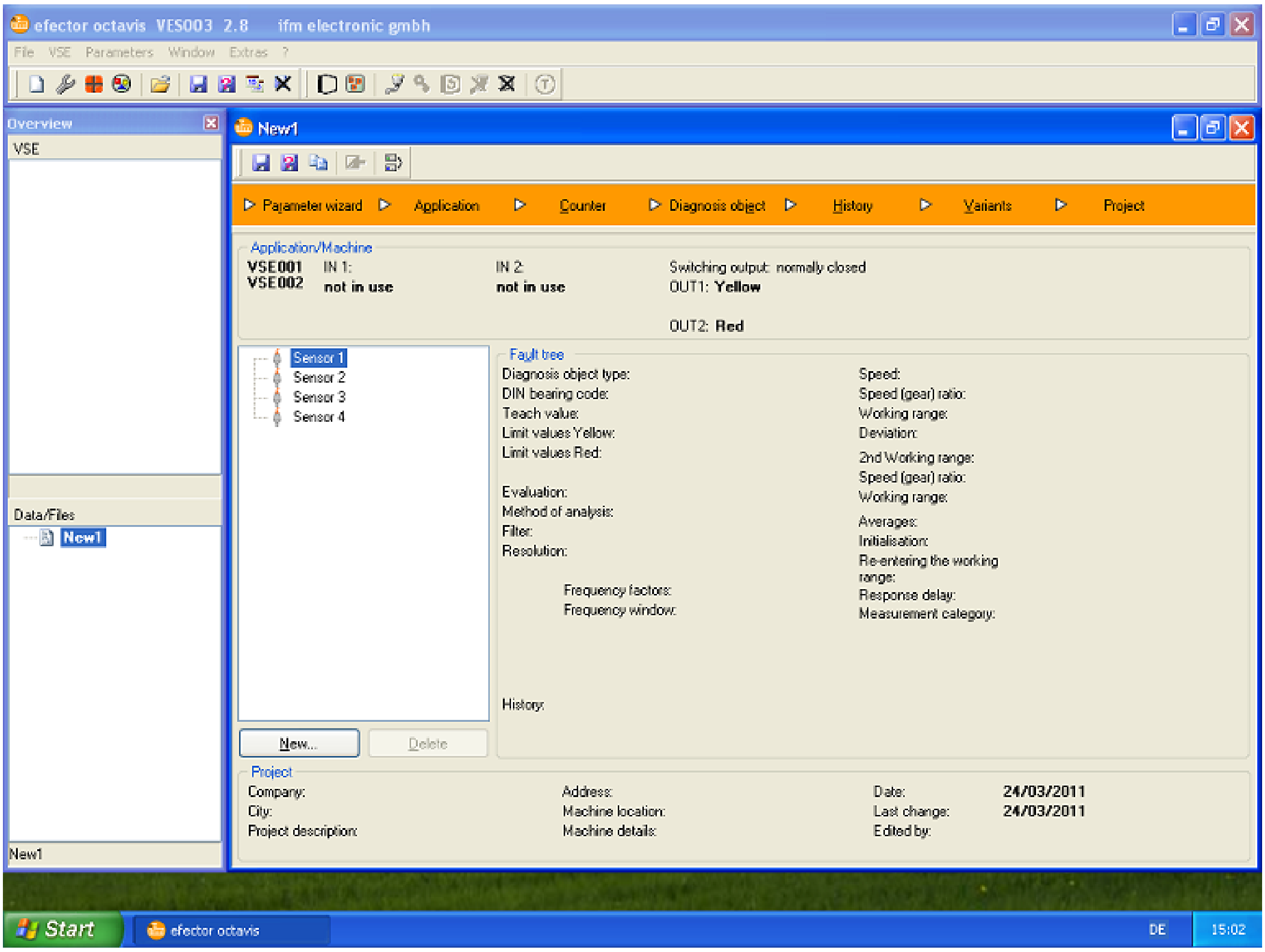
The diagnostic electronic (VSE) uses broad band limit values for the monitoring of the vibration level within the time domain. Contrary to the diagnosis objects these are absolute acceleration (unit [mg]) or velocity (unit [mm/s]) values.

The diagnostic electronic (VSE) also allows monitoring in accordance to ISO 10816 as RMS vibration velocity in the range up to 1 000 Hz.

4 User interface

After program start-up the first screen is divided into three segments:

1. Main menu (top): Program settings and standard window functions.
2. Overview (left): Hardware Overview (top left) indicating the diagnostic electronics (VSE) which are active and/or inactive addresses; File Overview (bottom left) indicating which octavis files are open and have beenused. The files can be parameter files, measurement files and history files.
3. First empty parameter set (center): efector octavis parameter set including the wizard function.

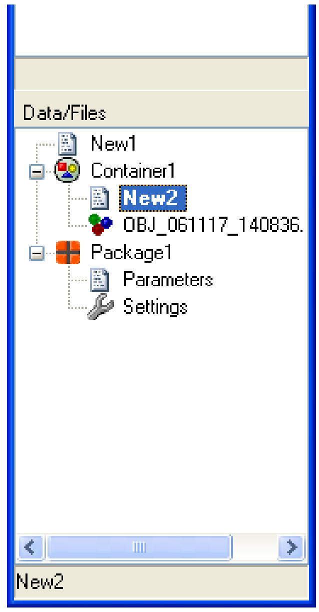


The main window contains the main menu and different tool bars.

In the overview window several diagnostic electronics (VSE) can be visualized in the diagnostic electronic-Overview tree, as well as files in the data/files-Overview tree. Please use the main menu, the toolbars or the appropriate context menu in the overview window. The functions listed in the main menu and the toolbars refer to the entry which is highlighted in the Overview tree (diagnostic electronic (VSE), parameter-file...). The pertinent entry also appears in the status bar below the relevant Overview tree.

When the program is restarted the connections and files last used, reappear in the Overview tree, provided they are still available.

You can access the various data and functions (parameter set, monitoring, history and settings) in a new window by double clicking the appropriate entry of the diagnostic electronic (VSE) listed in the Overview tree.



Connections to the diagnostic electronics can be grouped together. Data and files can be grouped in the container (→ image). The package is a particular type of the contatinter.

If when starting the software it is not possible to display the program on the whole screen you can enter the available screen space for the parameter software VES003 using the start parameters "FRAME_left_top_right_bottom".

5 Settings

5.1 Country settings

The language is selected under [File] > [Language].

5.2 Program settings

Main menu [Extras] >]Preferences...]

The preferred units for length ([mm] or [inch]) and frequencies ([Hz] or [CPM]) can be set here.

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If an edit mode is required, it is possible to show the signal weighting for speed, the 2nd working range of the diagnosis objects as well as the reference value of the signal input monitor.

The search radius for the peak search function is to be given in mesh points. One mesh point corresponds to the resolution set in the monitoring window. If, e.g. the setting was 1.526 Hz and 399.6 Hz is clicked the search function, for a frequency window of 10 mesh points, sets the line on the highest peak between 383.75 Hz (= 399.6 Hz – 10x 1.526 Hz) and 414.86 Hz (= 399.6 Hz + 10x 1.526 Hz).

The number of harmonics and sidebands to be shown can be set here.

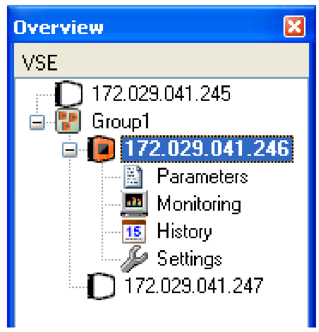
Here it is possible to set whether or not the last connected units are to be reconnected automatically or if the listed units remain unconnected and each unit has to be connected manually.

Contrary to the standard setting it is possible in the VSE overview to include connections with identical IP addresses provided the port numbers are different.

6 Diagnostic electronic VSE

Using the toolbar or context menu in the main menu you can create groups or new connections. Using the connection wizard it is possible to select a new connection as either an active or passive one.

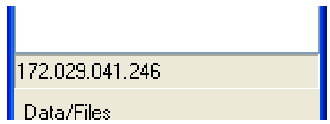
A passive connection contains all the information relevant to the connection. Using a double click it can be activated quickly by connecting either to the "Connection" function in the drop-down menu or to the symbol [Connection] . Equally quickly an active connection can be deactivated using a double click leading to the "Disonnect" function in the drop-down menu or to the symbol [Disconnect] .



The parameter set, monitoring, history and settings are shown as minor nodes. Use a double click to open them as a new window (→ image).

If an IP address is included in the startparameters as "aaa.bbb.ccc.ddd"or "aaa.bbb.ccc.ddd/eeee" (eeee= Port number), then at start up a connection is made to the given diagnostic electronic.

The functions listed in the main menu, tool-bars and context menu (Connect, Register, Reboot, Disconnect, Delete, Teach-In) apply to the highlighted diagnostic electronic or group only, which is also shown in the status bar below the Overview tree (→ image).



Important: Each diagnostic electronic (VSE) can be accessed by 3 different users at the same time, which means that several users can make changes to the VSE-settings/parameters at the same time!

6.1 VSE > Groups

It is possible to collect freely definable "Groups" of connections to diagnostic electronics in the "VSE" overview tree.

The group reference remains after the program has been closed.

6.2 VSE > Connection wizard

6.2.1 DHCP

The default setting for a connection uses a static IP address.

From firmware version 0.6.8 onwards it is possible to assign dynamic IP addresses to the diagnostic electronic (VSE) (DHCP). The connection is then created using the host name.

6.2.2 IP Address

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To connect the diagnostic electronic (VSE) you require the unit‘s IP address and the Port.

Factory setting:
IP address = 192.168.0.1
Port = 3321

Up to 3 different users can access the diagnostic electronic (VSE) at the same time.

6.2.3 Host name

If the network is configured with DHCP it is possible to establish a connection to the diagnostic electronic (VSE) using the host name.

The host name must be previously defined in the network settings.

Factory setting: Connection establishment using a static IP address.
IP address = 192.168.0.1
Port = 3321

Up to 3 different users can access the diagnostic electronic (VSE) at the same time.

6.2.4 Description

The name given to the connection which is shown in the VSE Overview tree.

6.2.5 Connection

It is possible to set up the parameters for the connection to the diagnostic electronic (VSE) without having to activate the network connection straight away.

The connection prepared in the overview can quickly be established via the menu or the symbol [Connection].

6.3 VSE > Connect

Main menu [VSE] > [Connect...] or
symbol  or
Overview-context menu [Connect...].

A network connection is created using the previously defined data of the passive connection.

6.4 VSE > Login

Registration is required when accessing a password protected level if the user and access rights for the diagnostic electronic (VSE) have been limited for the different registration levels.

If the required level has been selected and the valid password has been entered, it is then possible to save the registration details in encoded form. The stored registration details are used for each connection. Otherwise the connection is established using the lowest access level and higher levels have to be accessed manually.

6.5 VSE > Reboot

The diagnostic electronic (VSE) can be rebooted using the software. Although the existing connection is lost. Changes made to network settings (IP Address, host name, subnet masks etc) remain valid. The existing connection is interrupted. If changes have been made to the network settings then a new connection has to be established.

6.6 VSE > Disconnect

Main menu [VSE] > [Disconnect] or
symbol  or
Overview-context menu [Disconnect].

The network connection is interrupted. The passive connection remains in the Overview tree containing the data relevant to the connection.

6.7 VSE > Delete

Main menu [VSE] > [Delete...] or
symbol  or
Overview-context menu [Delete...].

The network connection is interrupted and the diagnostic electronic (VSE) is removed from the Overview tree.

6.8 VSE > Teach-In

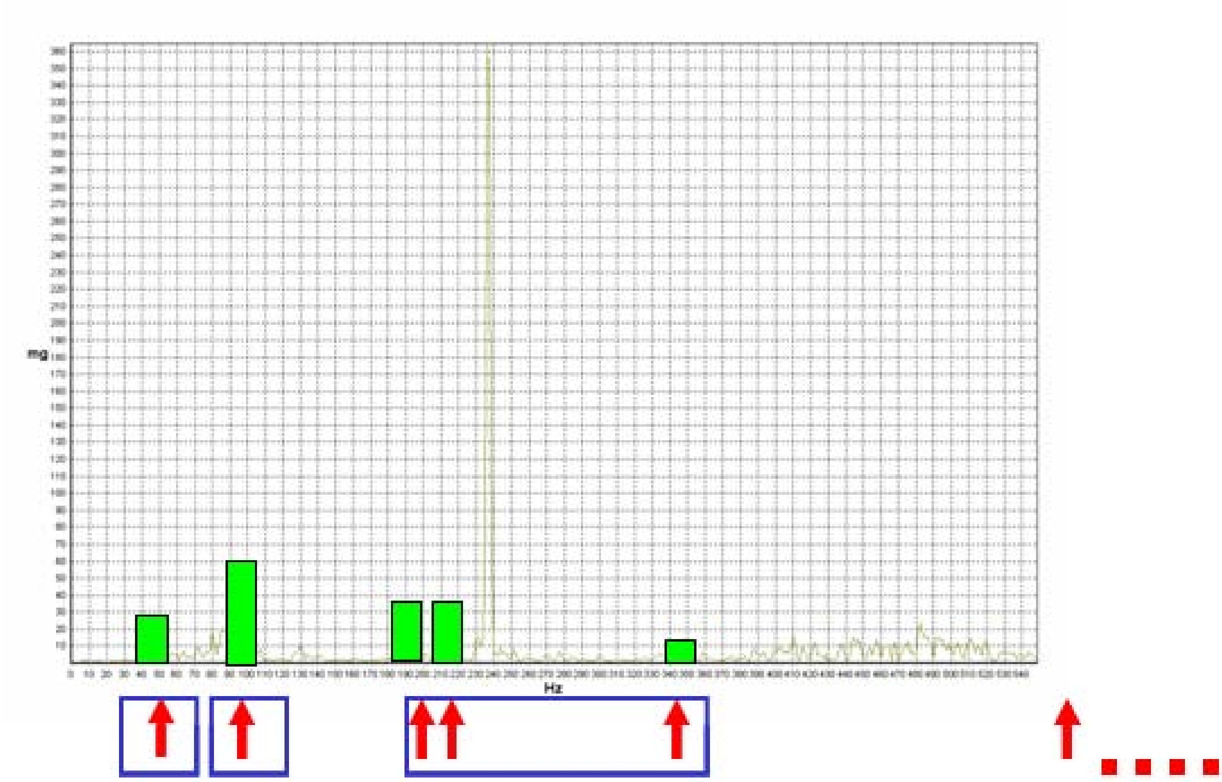
Mainmenu [VSE] > [Teach-In] or
symbol or
Overview-context menu [Teach-In].

The Teach function measures the reference values of the set diagnosis object and stores them in the diagnostic electronic (VSE). Diagnosis information relates to the Teach value. It is therefore necessary to ensure that the Teach measurement is not interrupted and conducted under typical operating conditions.

Reference and alarm values are preset for the diagnosis objects type "Rolling element bearing" and "Unbalance". These can be adjusted manually if so required by the maintenance process.

Diagnosis objects without a set Auto-Teach function cannot be activated in the list. The Teach measurement for each diagnosis object can be started separately or bundled for several diagnosis objects.

When the Teach process is completed the corresponding diagnosis object is marked with a green dot. An on-going Teach process is marked with blinking red dots (→ image).



Notes for the use of Teach values:

1. The evaluation of the diagnosis object condition (e.g. bearing condition, unbalance etc.) is based on a relative signal increase related to the Teach value.
2. The Teach value or reference value can either be determined by measurement (Teach function) or manually entering the value. Typical reference and alarm values are preset for diagnosis objects type "Unbalance" and "Rolling element bearing".
3. If monitoring takes place on machines constructed in the same way and on identical measuring positions, then the Teach value (reference value) is identical. We therefore recommend saving the Teach value in the parameter set so that the same switching thresholds can be achieved on the same machines.
4. If the Teach value is measured please ensure that the machine is operating under typical conditions and in undamaged condition.
5. If Teach values (reference values) are influenced by process factors (e.g. load or speed) we recommend defining a corresponding monitoring window with constant operating conditions. These can be triggered under the working range or variant switching. If a Teach measurement is carried out please ensure that the corresponding constraints (e.g. speed, load window or trigger input) are applied.

6.9 VSE > Parameters

The parameters are updated if another user changes the parameter values of the diagnostic electronic (VSE) using the function "Write parameters" or by teaching the sensor (→ VSE).

As soon as the VSE-parameters have been changed in the wizard or in another property window and have been confirmed with [OK], then a copy of the parameter set is stored under the Overview tree "data/files". The VSE parameter window always indicated the actual unit parameters.

6.10 VSE > Monitoring

When selecting the type of display in the window [Monitor] the measurement values can be visualised in different evaluation levels:

from left to right:

- In/Outputs
- Counters
- Copy diagram to clipboard
- Spectrum monitoring
- Subobjects
- Objects
- Damage level

The values for the "In/Outputs" and “counters” are shown in an extra window. The four alternative evaluation levels "spectrum monitoring", "Subobjects", "Objects" and "Damage level" can then be displayed at the same time.

Use  [copy diagram to clipboard] to paste an inverse coloured image of the diagram to the clipboard

With  the indicated data can be stored continuously (Data-Streaming) and then visualised again. This enables efector octavis to be used as a measuring instrument. In the modes "Subobjects", "Objects" and "Diagnosis value" the measuring values of the diagnosis objects / signal input monitors of all sensors are recorded. The values of the "In/Outputs" are saved in all recordings and be recalled.

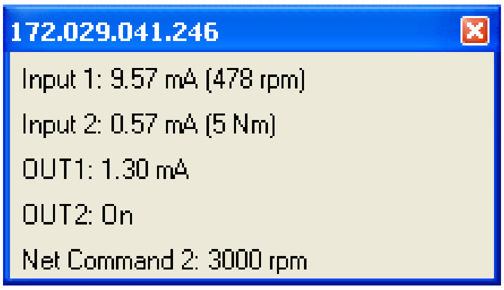
The recording is stored as a symbol in the Overview tree "Data/Files" and can be retrieved for visualisation, stored as a file and/or reloaded.

With  the diagram showing the ingoing values can be stopped for analysis purposes. This does not affect a running recording.

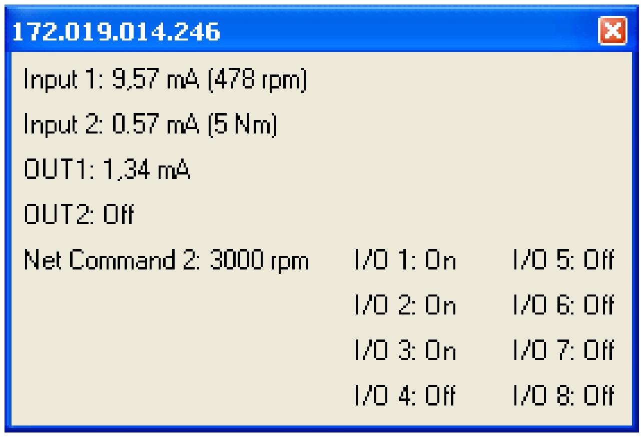
6.10.1 Monitoring > In/Outputs

The measured values forwarded to the VSE in- and outputs are displayed.

Example VSE001 / VSE002



Example VSE100

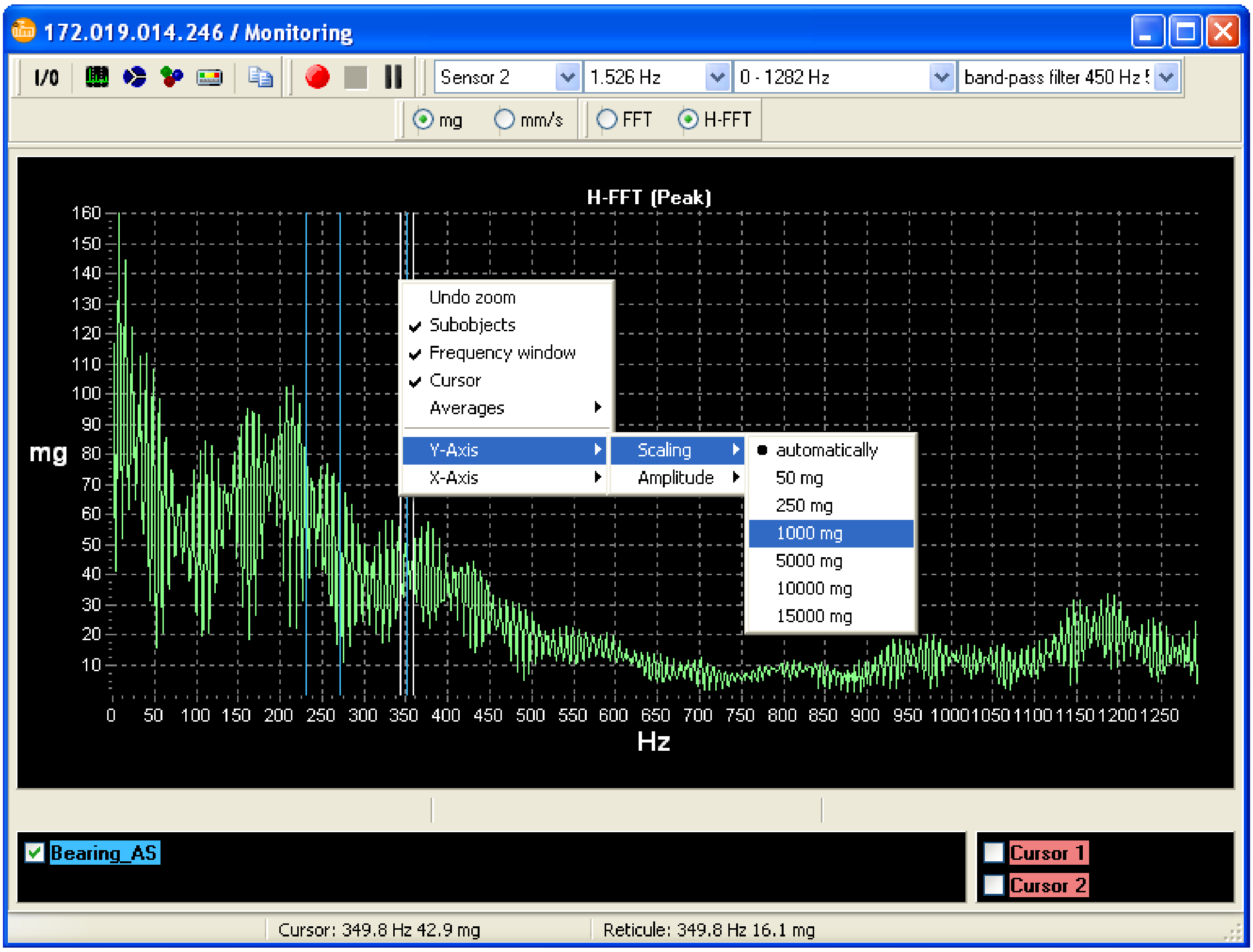


6.10.2 Counters

Shows the current status of the set counters.

6.10.3 Monitoring > Spectrum monitoring

Indicates the linear spectrum (FFT) of each sensor for in-depth diagnosis.



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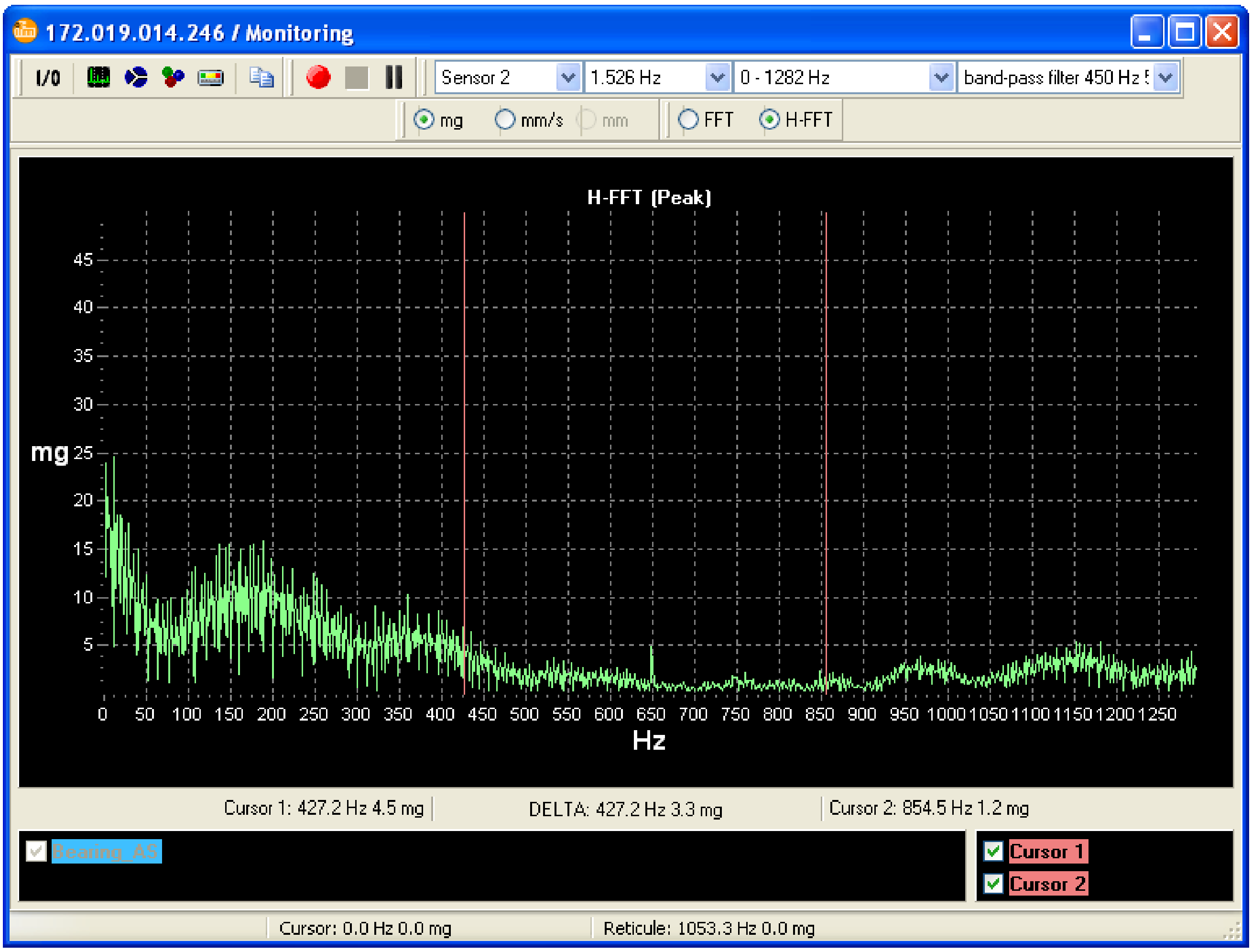
Following settings can be changed:

- Resolution: 0.19...24.4 Hz (11.44...1 464.84 CMP)
- Frequency band: depends on the resolution
- Filter: Select the parameterised filter
- Measuring unit: [mg], [mm/s] and [mm]
- Method of analysis:
  - FFT (Linear spectrum of the raw signal)
  - H-FFT (Linear spectrum of the demodulated curve signals) with selectable envelope filter

The windowing is conducted via a Hanning window.

It is possible to zoom into the diagram by drawing a rectangle (keep left mouse button pressed and drag from top left corner to bottom right corner). To zoom out again repeat in the opposite direction.



Use a right mouse click to select different functions in the context menu.

- Highlight the damage frequencies set in the VSE as coloured vertical lines ([Subobjects]). Use the shown control boxes to limit the selected diagnosis objects. If the drag and drop function has been used to draw a parameter set from the "Overview" window to the monitor window then damage frequencies of the drawn parameter set will be shown.
- Shows the frequency range of the shown subobjects if the cursor is positioned on the line.
- Shows the harmonics. The first harmonic can be determined by mouse click . The search function can be used to determine the position of the highest peak situated closest to the mouse click. The frequency range of this search function and the number of harmonics can be altered in the programme settings.
- Shows the sidebands. The basic band of the sidebands and the first sideband can be determined by mouse click . The search function can be used to determine the position of the highest peak situated closest to the mouse click. The frequency range of this search function and the number of sidebands can be altered in the programme settings.
- Manual highlighting as coloured vertical lines ([Label]). Use the mouse to determine the position of the label . The following pop-up window is used to determine the colour, description of the lines and the dependency of the position on a speed value.
- Shows the cursor field.
- Simulation of the sliding averages (1/1, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256).

Use the arrow keys (arrow right, arrow left) to move the cursor. For large steps use Shift + arrow left or Shift + arrow right. Pos1 or Strg + arrow left moves the input focus to the left cursor. End + arrow right moves the input focus to the right cursor.

Important: In the FFT-Mode the monitoring of diagnosis objects is deactivated so that the switching outputs do not switch. If the IP-connection between the diagnostic electronic (VSE) and the PC is interrupted in the spectral display the diagnostic electronic (VSE) automatically switches back again to the monitoring condition within a few minutes.

6.10.4 Monitoring > Subobjects

Indicates the damage frequencies (e.g. for rolling element bearing diagnosis: inner race, outerrace, ball pass frequencies). In the subobject mode the damage relevant frequency groups with amplitudes and the frequencies found per diagnosis object are displayed. The spectral evaluation can be made from the raw signal or from the demodulated envelope curve time signal. The settings in the diagnostic electronic (VSE) are valid. If the method of analysis is changed then the parameters have to be changed as well.

The diagram corresponds to a frequency factor analysis.

6.10.5 Monitoring > Objects

The unweighted and averaged characteristic values are shown for each set diagnosis object pertaining to the selected sensor. They are grouped according to the selected unit (evaluation of the diagnosis objects). The relevant reference values from the Teach-In are shown additionally as blue bars provided that a Teach-In has already been conducted.

The evaluation can be selected from the raw signal or from the demodulated time signal. The settings of the diagnostic electronic (VSE) are valid. If the method of analysis is changed then the parameters have to be changed as well.

6.10.6 Monitoring > Damage level

The weighted and averaged parameters / timedomain values are indicated for each set diagnosis object/vibration monitor pertaining to the selected sensor. The Teach values for the diagnosis objects are used as reference values.

The evaluation can be selected from the raw signal or from the demodulated time signal. The set parameters in the diagnostic electronic (VSE) are valid. If the method of analysis is changed then the parameters have to be changed as well. As soon as new values have been calculated a new value is then shown.

If no valid value could be determined during the diagnostic interval then the cause is indicated in form of the following abbreviations:

No teach	no valid Teach value
inv T N	no valid reference Teach (speed)
inv T 2	no valid reference Teach (2nd working range)
N dev	speed deviations are too high
N out	speed is outside the working range
Wght N 0	deactivated by signal weighting speed
WR 2 out	value is outside the 2nd working range, deactivated by signal weighting 2nd working range
Err C	calculation error
Err I	internal error
inactive	Deactivated by variant

The limit values indicated correspond to the limit values set in the diagnostic electronic (VSE) and correlate with the LED-display on the diagnostic electronic (VSE).

The weighted and average input values are indicated for each of the process monitors set for the selected input.

6.11 VSE > History

6.11.1 Time-based history

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The efector octavis diagnostic electronic (VSE) has an internal history memory to record the diagnosis object / signal input monitor values.

The integrated real-time clock should be aligned with the computer system time using the function [Settings] > [Others] > [Reset history]. If the clocks have changed during the reporting period, the data stored before the change will also be shown in the currently valid time.

The memory is structured as a ring memory so that the current values are accessable.

The size of the memory amounts to 600 000 values (max. firmware 0.7.255 approx 30.000 values) including time stamp and speed information. These are then segmented according to the active diagnosis objects / signal input monitor. The history memory settings (diagnosis objects / signal input monitor which are to be saved, storage intervals) are freely selectable.

The history data which has been read out is stored in the Overview tree "data/files" and can be stored in file format.

6.12 VSE > Settings

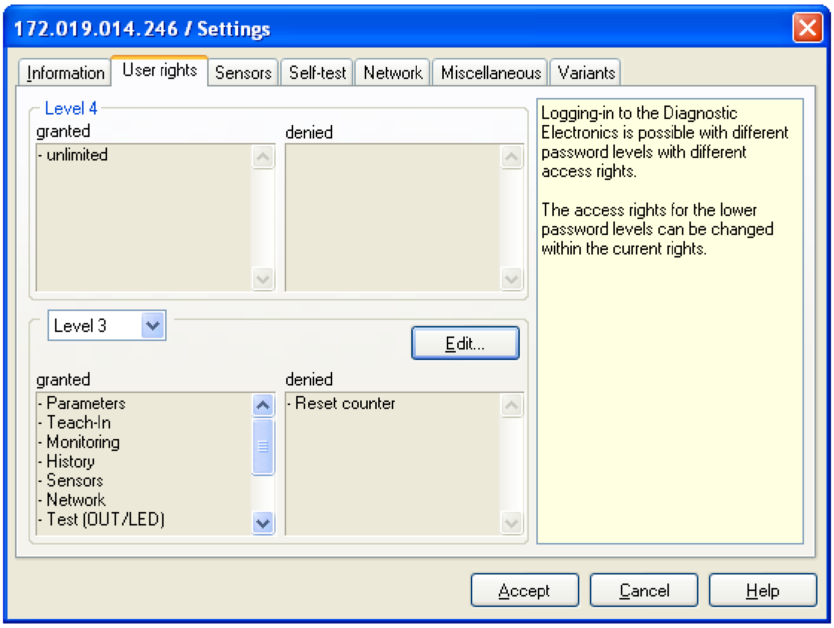
As soon as the "Transfer" function is completed the changed settings are valid immediately in the diagnostic electronic (VSE).

6.12.1 Settings > Info

Data pertaining to the individual diagnostic electronic (VSE): Type, Serial number, Hardware-Version, Firmware-Version, MAC Address.

6.12.2 Settings > Password Protection

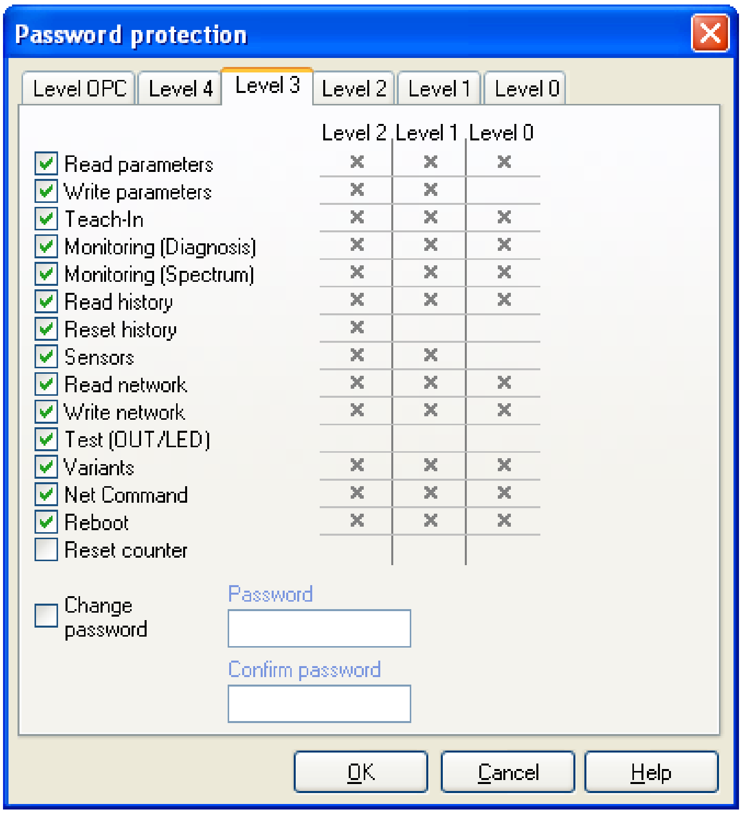
From firmware 0.6.8 onwards it is possible to limit the access rights for different functions at different registration levels using (user) password protection. The user has to be registered in the required level in order to use the various functions.



Both lists in the top two boxes show the valid and withdrawn access rights for the active registration level

The selection box in the header of the bottom group box shows the valid and withdrawn access rights for the available registration levels.

It is only possible to show and edit the registration level rights which are lower than the currently accessed level.



The rights can be hierachically limited from top to bottom. Whereby:

- The top level (level 4) always maintains all rights and serves as administrator
- "Level OPC" uses the octavis OPC server software (article numbers VOS001... VOS004) and can only be set at level 4
- The following levels can only be assigned with access rights which the level above already has (e.g. Level 2 cannot be assigned with access rights which differ to level 3).
- It is only possible to change the access rights for a lower registration level than is currently in use (e.g. registration in level 2 → to change access rights in levels 1 and 0.
- It is possible to overwrite the passwords in the current and lower registration levels.
- Country specific letters such as "ä" or "ê" are NOT possible.

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6.12.3 Settings > Sensors

It is possible to designate a description of up to 31 digits to each sensor.

Scaling means the highest amplitude pertaining to the connected sensor. Please refer to the data sheet. This also applies to the unit of the measured values. Each accelerometer ([mg], [m/s^2], [g]) converts internally with [m/s^2] in order to ensure the vibration velocity is correctly calculated in [m/s].

Important: The diagnostic electronic (VSE) is optimized for use with vibration sensors from ifm electronic, which are based on a micro-mechanical measuring principle and have a dynamic current loop of 0...10 mA (type VSAxxx).

An analogue filter can be used to adjust the time domain monitor to the application.RMS measurements according to ISO 10816 require above 2Hz for speeds > 120 and < 600 rpm and above 10Hz for speeds over 600 rpm.

For VSE002/VSE100 units it is also possible to connect piezo electronic sensors (type IEPE) (max. firmware version 0.7.255 to sensor input 1 only).

Max. firmware-version 0.7.255 it is possible to amplify the IEPE sensor signal by a factor of 10 to increase the sensitivity of the sensor and to distinguish the signals from the noise. In this case the measuring range is reduced e.g. from 500 g pk to a tenth (= 50 g pk).

A sensor self-test cannot be carried out on a IEPE sensor. An integrated selftest is only possible for micromechanical sensors type VSA from ifm electronic.

6.12.4 Settings > Sensor self-test

Please refer to the relevant datasheet to check if the sensor is suitable.

The self-test is carried out as soon as the sensor is powered-up. It can also be set to be carried out automatically in predefined cycles (minimum cycle time 1 min).

Following settings are possible in case of a negative self-test:

- Output OUT1 (provided the analogue output is set in [mA] to emit a 22 mA analogue signal (minimum firmware version required 0.5.19) and/or
- Output OUT2 to be constantly switched or pulsed at 1 Hz
- I/O1...8 to be constantly switched or pulsed at 1 Hz.

6.12.5 Settings > Network

Please enter the IP address and Port number valid for your network for the diagnostic electronic (VSE) as well as the subnet mask for your network. From firmware version 0.6.8 onwards it is possible to assign the diagnostic electronic (VSE) with a dynamic IP address. The connection is established using the host name which is to be entered here. If other subnets should be connected to the diagnostic electronic it is necessary to enter the IP address of the gateway. It is necessary in any case to input the valid subnet masks.

Please note: For technical reasons changes to network settings are only valid after restarting the diagnostic electronic (VSE)!

For comprehensive network operation, gateway computers and firewalls have to be appropriately configured. Some virus detection programs also have to be cleared with the set Port number and/or IP address.

6.12.6 Settings > Miscellaneous

Test switching output

The switching outputs can be manually switched for test purposes. The same applies to the output current loop on OUT1 as variable with values between 0 mA and 20 mA.

Reset the diagnostic electronic (VSE) parameters

All data (not settings) will be deleted including the Teach data. The VSE settings for IP address, sensor name and scaling remain unchanged.

Reset history

When the history has been reset the internal history memory is cleared and the clock in the diagnostic electronic is adjusted to the computer system time.

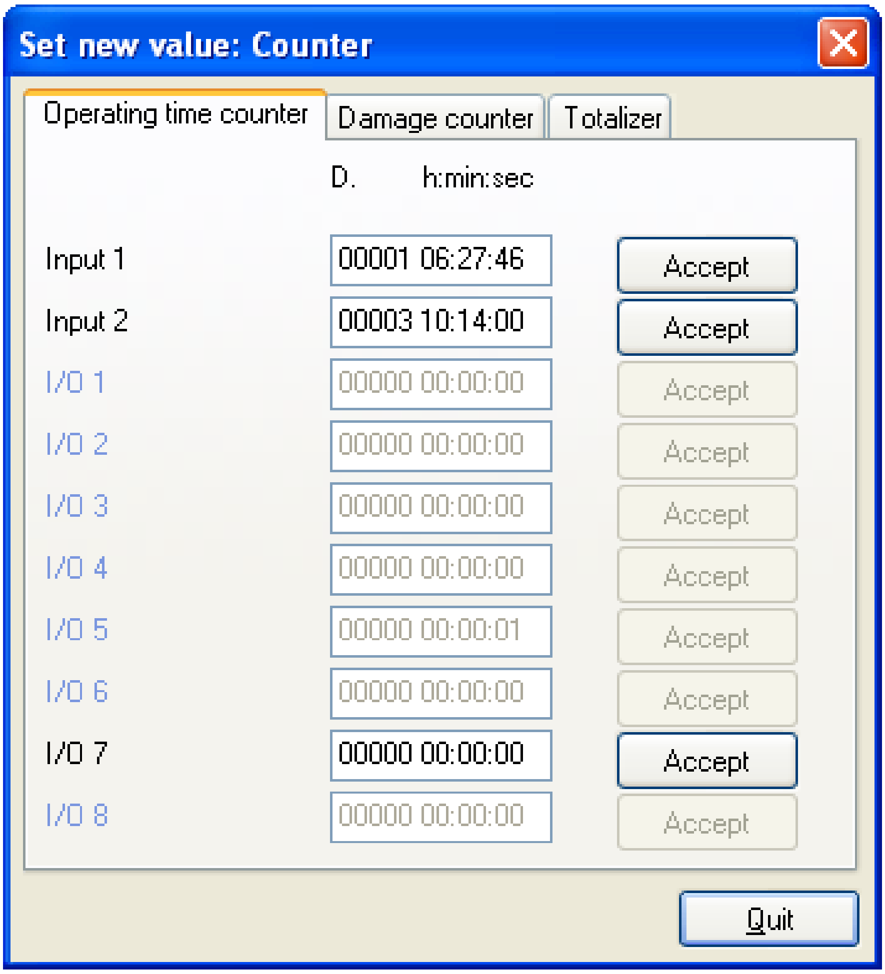
Reset settings

The VSE settings (sensor settings and selt-test, variants) are reset to factory settings. The network settings remain unchanged.

Level 4

At level 4 it is possible to reset all passwords and access rights (from firmware version 0.6.8 onwards).

Set counter (valid from firmware version 0.6.8 onwards)
It is possible to select the values for active counters:



Using [Accept] the corresponding counter level is transferred to the VSE.

6.12.7 Settings > Variants

The variants selection can be used to trigger monitoring of diagnosis objects / signal input monitors. Triggers can be set using the software (Parameter setting software VES003 or using the octavis OPC Server article numbers VOS001... VOS004) as well as the hardware als electrical signals (level-trigger) (only possible using VSE100).

The active variant is displayed. If no variant is set the variant 0 is valid.

7 Data / Files

You can use menu, the symbols or the context menu to create settings, packages, containers or empty parameter sets, and open parameter files, measuring data, packages, history files or, setting files.

Using a double click all open files and parameter sets can be reopened in a new window. When a parameter window is closed data which has not be saved will not be lost. When deleting the parameter node or measuring data node which contains data which has been changed but not saved the save dialog automatically appears on the screen.

The functions listed in the main menu, tool-bars and context menu ([Save], [Save as...], [Remove]) apply to the highlighted parameter node, history or measuring data node only, which are also shown in the status bar below the Overview tree (→ image).

History files from the same diagnostic electronic (VSE) can be merged into one file:

Main menu [File] > [Merge] or
symbol or
in the context menu [Merge]".

This makes it possible to continually store the history data of one unit in the same file over a longer period than is possible for the unit‘s history memory. However, this is dependent on the capacity of the computer used.

7.1 Data / Files > Containers

In the "Data/Files"-Overview tree you can group parameter sets and measurement data which are thematically connected in "Containers".

7.2 Data / Files > Packages

A package contains exactly one parameter set and the corresponding setting.

Use drag and drop to extract a package from a connected VSE. In the same way it is also possible to transfer a package to a VSE.

7.3 Data / Files > Parameters

Parameters are required to configure the diagnostic electronic (VSE) for machine diagnosis.

To create a new parameter set please let the wizard guide you through all the relevant parameter settings.

If you wish to edit a parameter set you can make changes to individual values in the relevant window [preferences] (Application, counter, diagnosis object, signal input monitor, history, variants and project). The window [preferences] contains the parameters of the diagnosis object or signal input monitor which is highlighted in the fault tree.

7.3.1 Parameters > Application

Application parameters relating to the total diagnostic electronic (VSE) are likewise available for each diagnosis object / signal input monitor.

Following application parameters can be adjusted:

VSE type	unit used
Input 1	analogue signal for the first value (e.g. speed 1)
Input 2	analogue signal for a second value (e.g. speed 2)
Switching output	setting the output, setting outputs OUT1, OUT2 (all VSE)
I/O1…4 I/O5…8	setting the binary in- or outputs I/O1…8 (VSE100)

Application > VSE-Types

Available versions:

VSE001 / VSE002:
efector octavis Standard diagnostic electronic for 4 vibration sensors. Signals the condition via 2 outputs. Communication Ethernet TCP. Integration into the production data acquisition system using the efector octavis OPC server (article numbers VOS001...VOS004);

VSE100:
Diagnostic electronic for 4 vibration sensors. Signals the condition via up to 10 outputs; electrical switching of up to 8 different triggers (variant switching). Communication Ethernet TCP. Integration into the production data acquisition system using the efector octavis OPC server (article numbers VOS001...VOS004). Alternative analogue input signal (Input 1/ Ínput 2) and analogue output signal (OUT1) as voltage signal (0...10V).

Application > IN1 / IN2

For applications using variable speeds the speed information has to be supplied to the diagnostic electronic (VSE). This can be done using an analogue signal or pulse input.

Analogue signal:

VSE001 / VSE002: 0/4...20 mA
VSE100: 0/4...20 mA or 0...10 V

When using a pulse input please ensure that a HTL-level compatible signal source is used (e.g. a proximity switch) and that the switching frequency of the used signal source is over 0.7 Hz. If using proximity switches please pay heed to the proximity switchs‘ switching frequencies.

When using a 0/4..20 mA current loop please enter the lowest and highest reference point of the current flow at the appropriate input value (speed).

It is also possible to supply further input values for the second working range or counters (signal value input). In addition to supplying an analogue signal or pulse input it is also possible to use a pulse width modulation (PMW) or evaluate as a counter pulse.

For PWM use the lower and upper reference point of the pulse width for the corresponding input value. It is possible to measure pulse widths between 0.1 Hz and 20 kHz.

When using the pulse counter please ensure that the pulse trigger is higher than 5 µs.

Application > Switching output

The switching outputs of diagnostic electronic (VSE) can be programmed as normally closed or normally open. So that wire break can be recognised we recommend using normally closed.

OUT1: Binary, analogue

OUT2: Binary.

Analogue output (OUT1):

There are several possibilities to use the analogue output:

- Object values (a): The measurement values are signalled for the selected diagnosis objects (measurement value vibration acceleration [mg]). If more than one diagnosis object is selected to be signalled then the highest value is output (overlaying).
- Object values (v): The measurement values are signalled for the selected diagnosis objects (measurement value vibration velocity [mm/s]). If more than one diagnosis object is selected to be signalled then the highest value is output (overlaying).
- Object values (s): The measurement values for the selected diagnosis objects (measurement unit: vibrations path [mm]) are used as output. If several diagnosis objects have been defined as output then the highest value is output (overlaying).
- Vibration monitor (a): The values are signalled for the selected vibration monitor with vibration acceleration [mg]. If more than one vibration monitor is selected to be signalled then the highest value is output (overlaying).
- Vibration monitor (v): The values are signalled for the selected vibration monitors with vibration velocity [mm/s]. If more than one vibration monitor is selected to be signalled then the highest value is output (overlaying).
- Upper limit (unit): The input values of the selected upper limit monitor are signalled in the unit set for the parameters: If more than one process monitor is selected to be signalled then the highest value is output (overlaying).
- Lower limit (unit): The input values of the selected lower limit monitor are signalled in the unit set for the parameters. If more than one process monitor is selected to be signalled then the highest value is output (overlaying).
- Damage levels (absolute): The diagnosis condition of the diagnosis objects are signalled as multiples of the individual reference values (Teach values). If more than one diagnosis object is selected to be signalled then the highest value is output (overlaying). The setting is suitable for diagnosis objects as vibration acceleration as well as for diagnosis objects for vibration velocity or vibration displacement, as the values have no relation to the physical unit ([mg], [mm/s] or [mm]).

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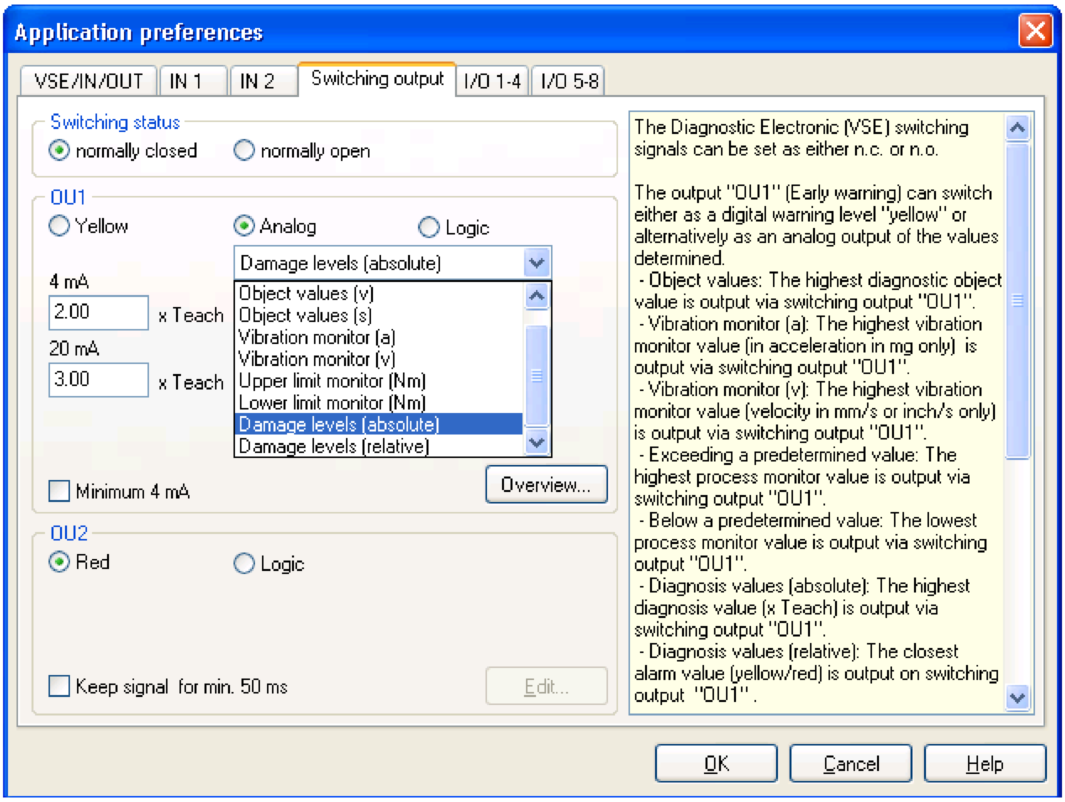
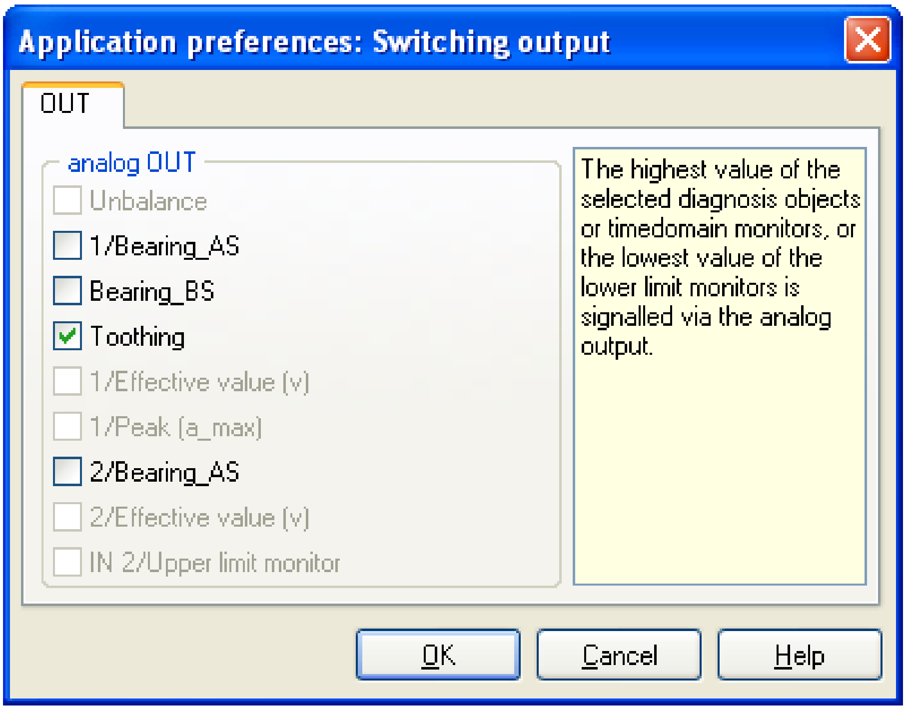
- Damage levels (relative): The relative proximity to the limit values or their exceedance is signalled. If several diagnostic objects/ time domain or process monitors are defined then the value which is closest to its limits is signalled (overlay). The parameter setting is in [mA] at 0, [mA] for yellow and [mA] for red.



A [minimum 4 mA] (or [minimum 2 V]) can be set for wire-break detection, so that a minimal current of 4 mA (or a minimal voltage of 2 V) is not undergone.

Under [Overview...] depending on the select type, the analogue output for diagnosis objects / signal input monitors can be activated or deactivated.



Binary output OUT1 and OUT2:

There are 2 possibilities to use the binary outputs:

- Quick setting "yellow = early warning" and "red = Alarm" for OUT1 and OUT2: If "yellow" or "red" have been selected then all the yellow and red thresholds of the set diagnosis objects and signal input monitors are automatically signalled a summary alarm to the relevant outputs.
- Logic for OUT1 and OUT2:
  The function "Logic" sets a logical AND or OR conjunction for the early warning and alarm thresholds.
  For example an output can be defined as follows:
  OUT2 = bearingAS(red) AND vibration monitor(yellow)

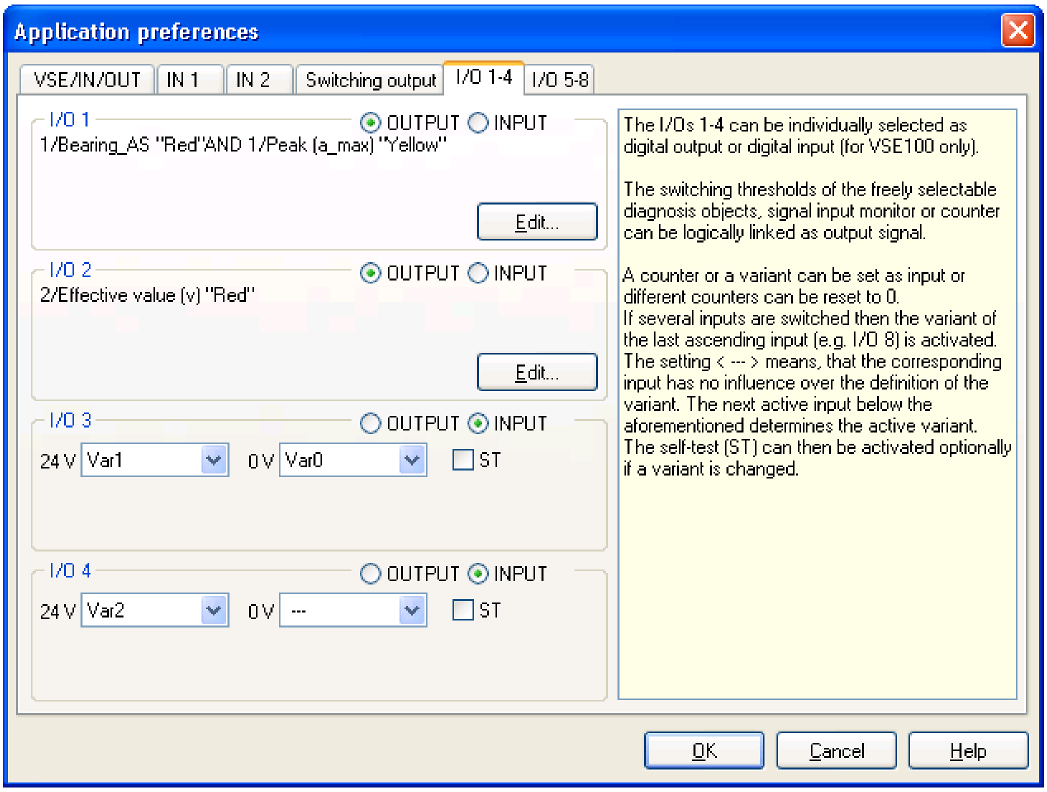
Optionally, a pulse stretching can be activated for very short switching at the output. This pulse stretching maintains a constant output signal for at least 50 ms (firmware 0.7.23 or higher).

Application > In/Outputs

The I/Os 1...8 can be selected as binary outs (OUTPUT) or as digital input (INPUT) (for VSE100 only).

Define as binary output (OUTPUT):

The logic function of the binary switching outputs is to be given under [Edit].

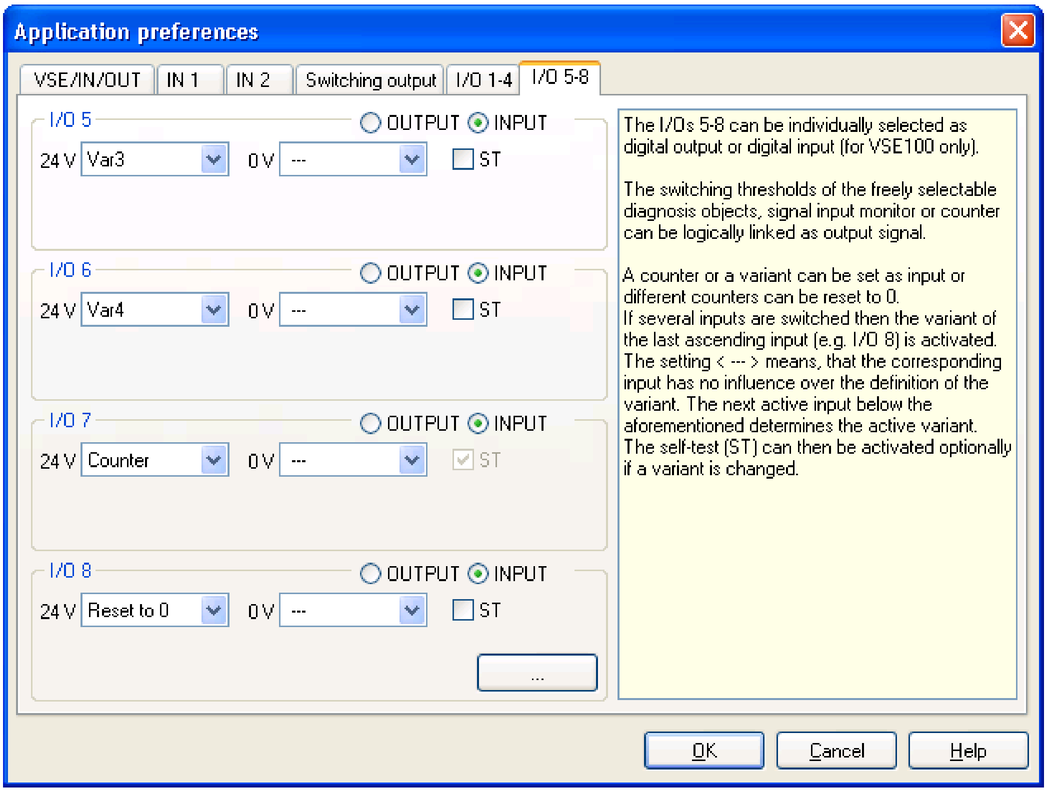


AND or OR conjunctions for the early warning and alarm thresholds can be configured for all set diagnosis objects and signal input monitors. The outputs can also be switched combining a logic OR conjunction for the counter alarm groups.

For example an output can be defined as follows:
Output I/O1 = Bearing_AS (red) AND signal input monitor "a_max" (yellow).

Define as digital input (INPUT):

Triggered measurements (variants) can be activated electrically using the digital inputs. A so-called level-trigger is used for electrical triggering. This means that if the input has a level of 24 V then the selected variant is activated. If the input level is shut off then the alternative variant is switched or the variant of the input with the lowest value.



If several inputs are switched then the variant of the last ascending output (e.g. I/O8) is activated.

If no input is switched then the 0V variant of the last ascending output is activated.

Example:

	Parameters		Switching 1	Switching 2	Switching 3
	24 V	0 V			
I/O3	Var1	Var0	24 V	24 V	24 V (Var1)
I/O4	Var2		0 V	0 V	0 V
I/O5	Var3		0 V	24 V (Var3)	0 V
I/O6	Var4		24 V (Var4)	0 V	0 V

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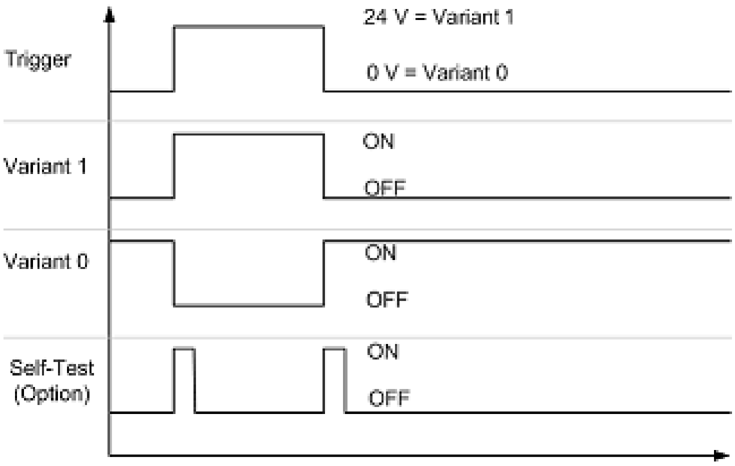
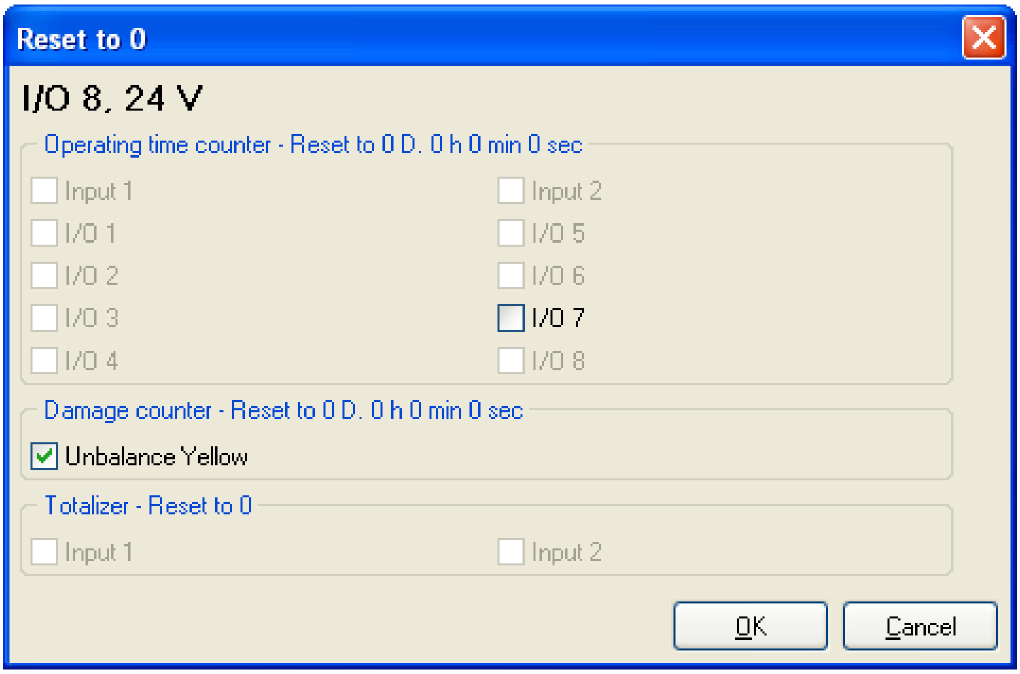
If the variants are changed it is possible as an option to carry out a sensor self-test



The I/O 1…8 can be used to activated the counter for operating hours. The counter can count the operating hours from 24 V or from 0 V onwards.

The I/O 1…8 can be used to reset the counters to 0. Use the input mask to define which count is to be reset to 0 e.g. when changing from 0 V to 24 V.



7.3.2 Parameters > Counter

It is possible to select between an operating hour counter, condition counter or totalisator.

An operating hour counter measures the period during which a certain condition is complied with.

This condition is defined using a working range on input 1 / input 2. On I/O1…8 the condition is defined under the application settings either at 24 V or 0 V.

Condition counters measure the length of time during which a diagnostic condition (yellow/red) exists for a pre-defined diagnosis object.

The totalisator cumulates all counter pulses input on input 1 /input 2 without taking into account the set counter intervall for the pulse density.

The operating hour counter, condition counter and totalisator on input 1 / input 2 have to be activated separately. Whereas the operating hour counters on I/O1…8 are automatically activated when the parameters for the application setting are set to [Counter] at 24 V or 0 V.

If the counter reading is above the set alarm limit the group which has been set as alarm switches according to predefined setting as an alarm output or I/O.

The counter readings are read out together with the history data and stored in the history file and displayed. Using the function [VSE overview] > [Others] it is possible to select the values for the counter readings.

7.3.3 Parameters > Measurement value input

The measurement value input can be used to supply other input values (e.g. Nm, kW, K) for direct monitoring (signal input monitor). Possible value sources are input 1 / input 2, IP-command (octavis OPC server).

Name/Unit

The free-text description of the set measurement value input which enables the information to be located in the parameter set cannot be changed if an analogue value source (input 1 / input 2) is used.

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The unit of the incoming values can be changed at any time. This has no influence over the evaluation and is only used for the display (monitor, history).

Working range

The working range has no influence over the evaluation. It only limits the display in the monitoring mode
lowest value only negative inputs, otherwise 0
upper value: only positive inputs, otherwise 0.

Please ensure that the limits are suitable so that all the relevant values can be displayed in the monitoring mode.

Input using the IP-command (octavis OPC server):
The initial value determines the value to be used after rebooting unit a new value is determined using the first IP-command .

7.3.4 Parameters > Diagnosis objects

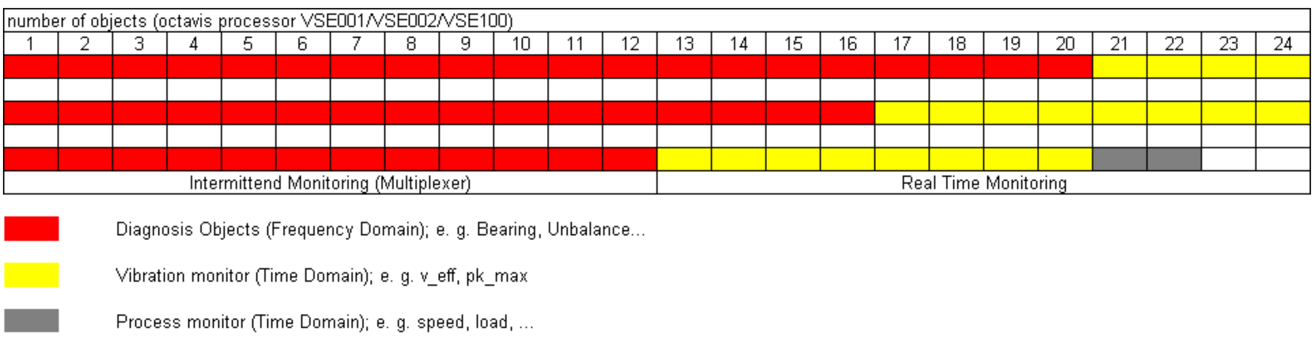
efector octavis sets up an automatic machine diagnosis by defining a machine model using so-called diagnosis objects.

Adjustable diagnosis parameters (frequency range)

- Description: Alphanumeric description of the diagnosis object (e.g. rolling element bearing AS)
- Diagnosis type: Use a diagnosis template (e.g. rolling element bearing)
- Subobjects: Define the individual frequency bands using frequency factors and bandwidths.
- Speed: Speed related information for the diagnosis object
- 2 working range: Further reference value
- Teach / limit values: Teach value and switching thresholds for "yellow" and "red"
- History: Adjusts storage of values in the history memory
- Damping: Averaging the object value, response delay for the object values
- Others: Physical unit, evaluation, analysis method, frequency resolution.

The efector octavis diagnostic electronic (VSE) can monitor up to 24 (incl. signal input monitor) different diagnosis objects simultaneously. A diagnosis object comprises a group of symptomatic damage frequencies (sub objects) which are defined in the form of so-called frequency factors. The rotational frequency multiplied by the frequency factor results in the actual damage frequency. For constant speed applications the damage frequency remains then constant.

Depending on the type of damage the diagnosis object is assigned to a method of analysis. For example unbalance is measured using the FFT method and rolling element bearing damage is measured using the H-FFT method.



All frequency selective diagnosis objects (not the signal input monitor!) are sampled using a multiplexer. The total diagnosis period adjusts itself in addition to the number of sensors, also to the individual diagnosis object characteristics, such as analysis method (FFT or H-FFT), frequency resolution and physical unit ([mg], [mm/s] or [mm]).

Example 1:

1 sensor, 2 rolling element bearings (H-FFT; [mg]),
unbalance (FFT; [mm/s]), frequency resolution 1.52 Hz
Measurement period for calculating the rolling element: 1/frequency resolution = 0.65 s
Measurement period for unbalance: 0.65 s

Total measurement period for a complete diagnosis cycle:
0.65 s + 0.65 s = 1.3 s

Example 2:

2 sensors, each with one rolling element bearing with 1.52 Hz and 0.125 Hz frequency resolution,
one unbalance with 3.05 Hz frequency resolution

Measurement period for rolling element bearing sensor 1:	1/frequency resolution = 0.65 s
Measurement period for unbalance sensor 1:	1/frequency resolution = 0.33 s
Measurement period for rolling element bearing sensor 2:	1/frequency resolution = 8 s

Total measurement period for a complete diagnosis cycle:
0.65 s + 0.33 s + 8 s = 8.98 s

Diagnosis objects > Name / Type

The freely definable description (31 characters) makes it easier to recognise the diagnosis object in the parameter set.

The selection of the diagnosis type [Rolling element bearing], [Unbalance], [RMS] or [Others] automatically provides setting suggestions for machine diagnosis. This automatic configuration greatly simplifies parameter setting. The settings can be subsequently fine-tuned.

By selecting [Others] it is possible to monitor parameters for individual machine damage if it is characterised by assigned symptomatic frequencies / frequency factors.

Diagnosis type [Rolling element bearing]

The parameter setting [Rolling element bearing] determines the rolling element bearing condition from the amplitudes of the ball pass frequencies of:
- Inner race
- Outer race
- Rolling elements

The required frequency factors can be found in the rolling element bearing database or the damage frequencies can be input directly. The damage condition is evaluated based on the Teach values of an intact machine. If the machines are identical with the same place of measurement the Teach values are the same. These can therefore be entered manually into the parameter set. A Teach measurement is not necessary in this case.

Diagnosis type [Unbalance]

The parameters for [Unbalance] determine the machine condition using the amplitudes at rotational frequency. The damage condition is evaluated based on the Teach values of an intact machine. The standard setting for unbalance monitoring is in [mm/s] and RMS. Reference values can also be found for example in the general level information in ISO 10816.

Diagnosis type "A-RMS"

The parameter setting [A-RMS] detects the effective vibration acceleration [mm/s] and RMS.

If a new diagnosis object is created the freely definable frequency range is easy to set: (frequency factors of the "average frequency" x 100 Hz x (100 ± frequency range) / 100).

Diagnosis type [V-RMS]

The parameter setting [V-RMS] detects the effective vibration velocity [mm/s] and RMS. For monitoring in accordance with ISO 10816 the frequency range is preset to 10...1 000 Hz.

If a new diagnosis object is created the freely definable frequency range is easy to set: (frequency factors of the [average frequency] x 100 Hz x (100 ± frequency range) / 100).

Diagnosis type "D-RMS"

The parameter setting "D-RMS" detects the effective vibration displacement [mm] and RMS.

If a new diagnosis object is created the freely definable frequency range is easy to set: (frequency factors of the "average frequency" x 100 Hz x (100 ± frequency range) / 100).

Diagnosis type [Others]

The parameters can be set for any machine damage under the damage type [Others] by entering specific damage frequencies (frequency factors) per diagnosis object (also see: Diagnosis examples).

The damage condition is evaluated based on the Teach values of an intact machine.

Diagnosis objects > Subobjects

Enter the damage frequencies (subobjects) which are to be assigned to a particular type of machine damage (diagnosis object). The description of the damage frequency is made using a so-called frequency factor analysis. Whereby the sought frequency from the frequency factor is multiplied by the current rotational frequency:

damage frequency = frequency factor x rotational frequency

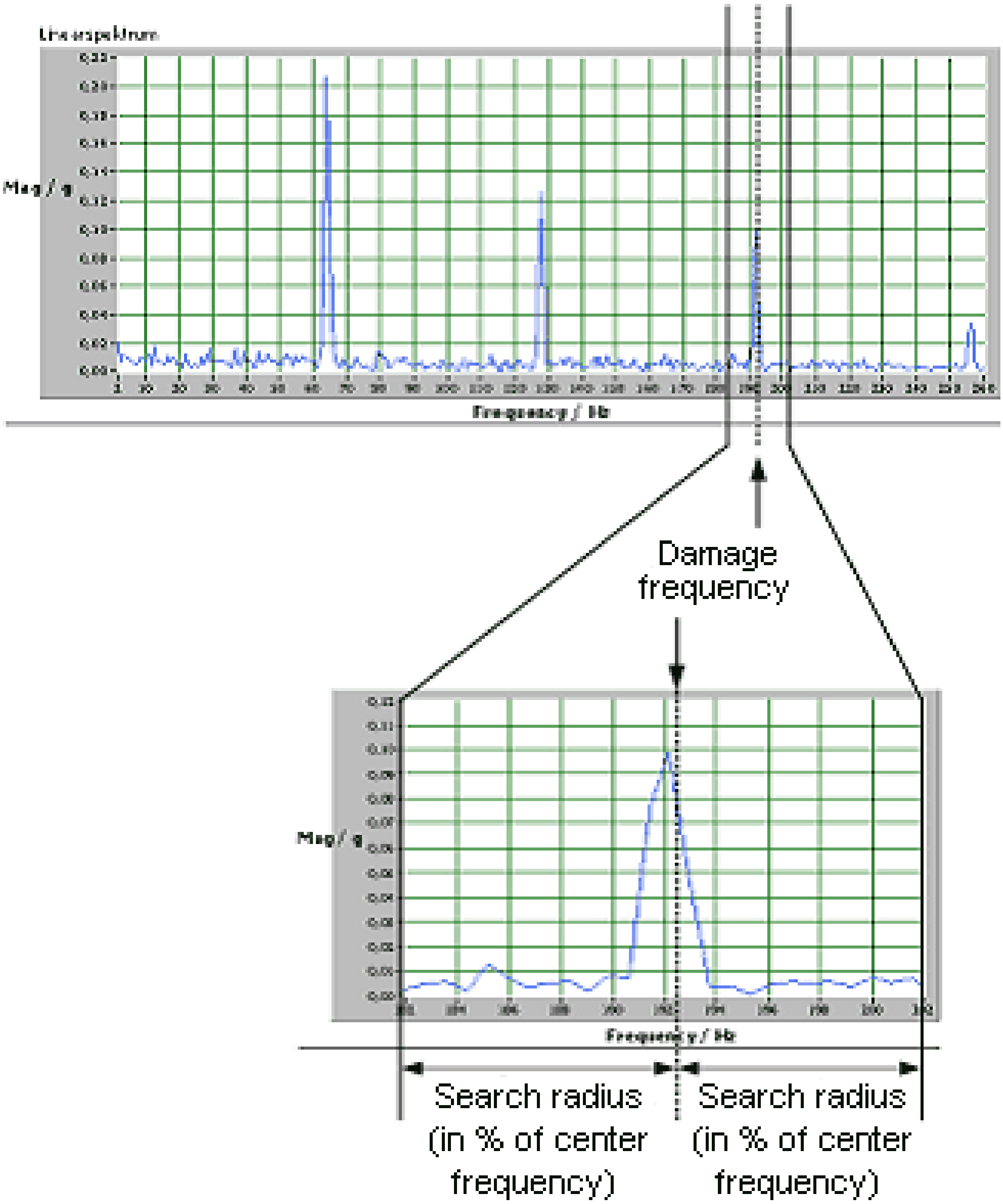
Example:
Frequency factor = 6.23,
rotational frequency = 50 Hz (3 000 rpm)
→ damage frequency = 311.5 Hz

A total of maximum 84 individual subobjects (incl. 1 sub object per signal input monitor) can be defined, which can be assigned to a maximum of 24 (incl. signal input monitor) diagnosis objects. The characteristic data for the diagnosis object is calculated using the summation of the individual amplitudes at the given frequency (object value).

For the diagnosis type [Rolling element bearing] refer to the rolling element database for the fundamental frequencies.

Each subobject has an individual search range (frequency window), in which the damage amplitudes are determined. The frequency window is given as a relative window below and above the calculated damage frequency. If the diagnosis object [Rolling element bearing] has been selected from the rolling element bearing database then the required frequency window is calculated automatically.

Example:
Frequency window = 5 %; damage frequency = 192.23; Resolution 1.25 Hz
192.25 Hz corresponds to spectral lines 153.8 → 153
Search range = spectral lines 145...160 corresponds to 181.25...200.00 Hz
(→ image)



Diagnosis objects > Speed

The rotational frequency used to calculate the damage frequency can be defined as constant speed or supplied to signal inputs IN1 / IN2 during operation or by using a special Internet protocol.

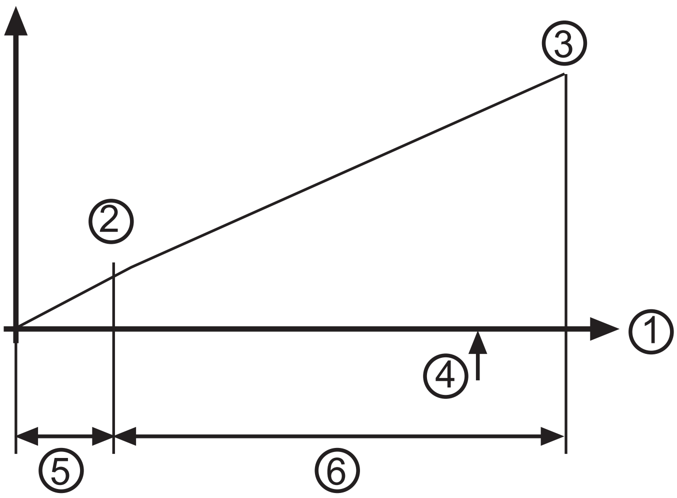
Please ensure that when inputting the constant speed the nominal speed is given under nominal load.

Transferring the speed information using IP-command:
After reboot the set initialising speed remains valid. An IP-command can be used to redefine the speed for the calculation.

Transferring the speed information using analogue inputs:
The gear transmission describes the relation between the speed input from the machine to the speed of the of the monitored diagnosis object.

If the speed values differ more than 5 % immediately before or after the measurement (measure period see frequency resolution) and the deviation monitoring is active, then the measurement results are ignored, a new object value is not determined and therefore a new damage level cannot be calculated.

The condition of the diagnosis object is only monitored and signalled within the speed-working range. So long this speed input is outside the working range no monitoring takes place.



Legend:
1 = speed
2 = lower operating speed
3 = upper operating speed
4 = Teach-In
5 = no monitoring
6 = monitoring

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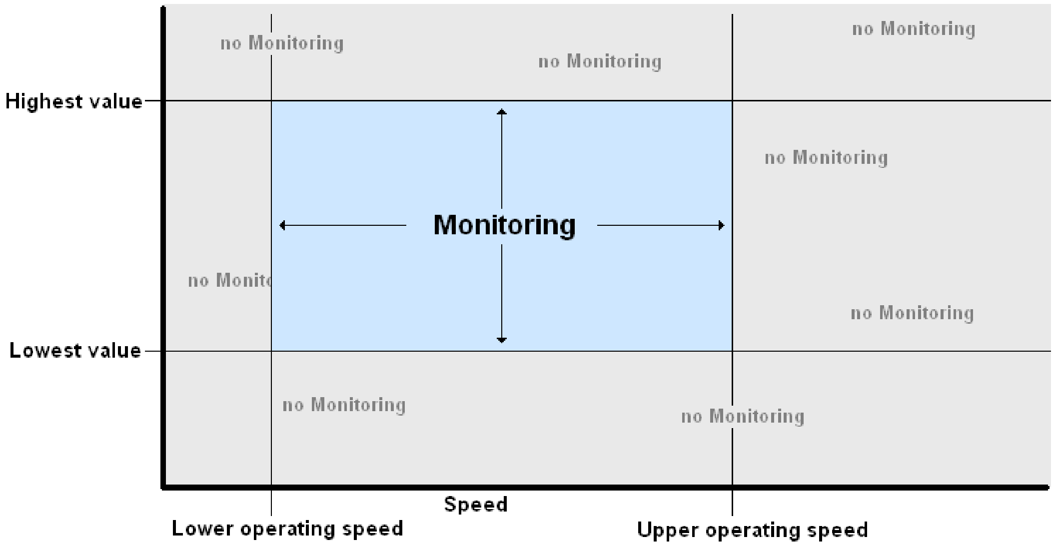
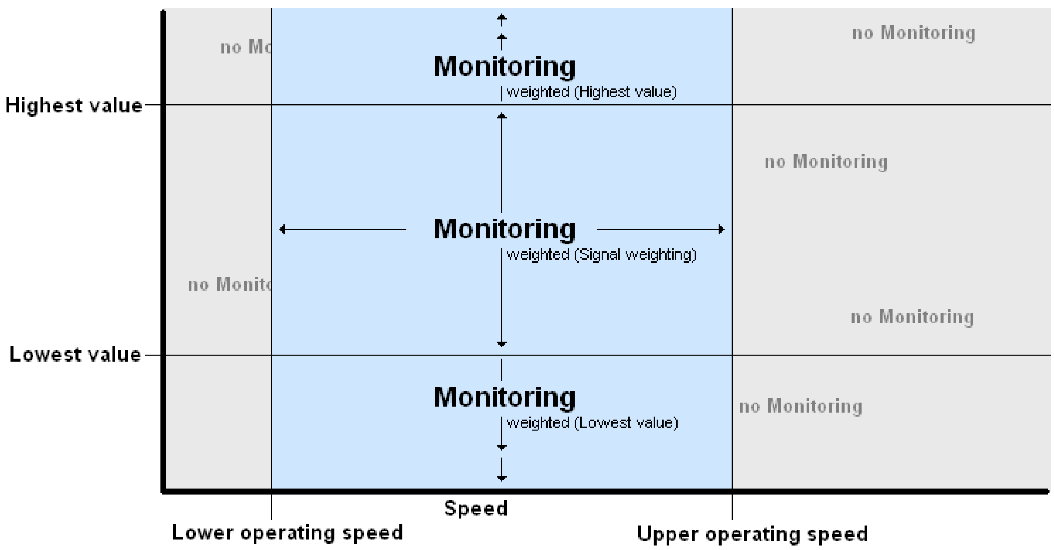
Diagnosis objects > 2nd Working range

The working range described under "Speed" can be extended by an additional input value. This value can be transferred during machine operation using the signal inputs input 1 / input 2 or by using an Internet protocol (octavis OPC server).



Using constant speed monitoring can be determined independent of further input values

When using the signal weighting it is possible to determine if monitoring should take place outside limits of the 2nd working range. In this case the limits of the 2nd working range are used to set the range of the signal weighting to be created. Values outside the working range are weighted according the closest signal weighting point.



Transferring the speed information using IP-command:
After reboot the set initial value remains valid. An IP-command can be used to redefine the speed for the calculation.

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Diagnosis objects > Teach-In / Limit values

The auto-teach function is used to "Teach" the diagnostic electronic (VSE).

If the required Teach values have been calculated or if they are already available for an identical reference machine, they can be used for the parameter set and/or written on to the diagnostic electronic instead of using the Teach function. When creating a diagnosis object a value based on the experience of several factors is automatically input. For variable speed monitoring it is also necessary to give the reference speed for the teach value. The same is valid for the 2nd working range.

If the value "0" is entered the teach values already set in the diagnostic electronic remain unchanged.

efector octavis uses own limit values for all set diagnosis objects for early warning (yellow) and main alarm (red). The limit values always refer to the set Teach value and thus describe a signal multiplication. The limit values for diagnosis types [Rolling element bearing] and [Unbalance] are pre-set.

Diagnosis objects > History

Selective activating / deactivating modifying the integrated history memory for the diagnostic unit.

This is carried out for all diagnostic objects and signal input monitors clearly set out in the history settings for the whole parameter set.

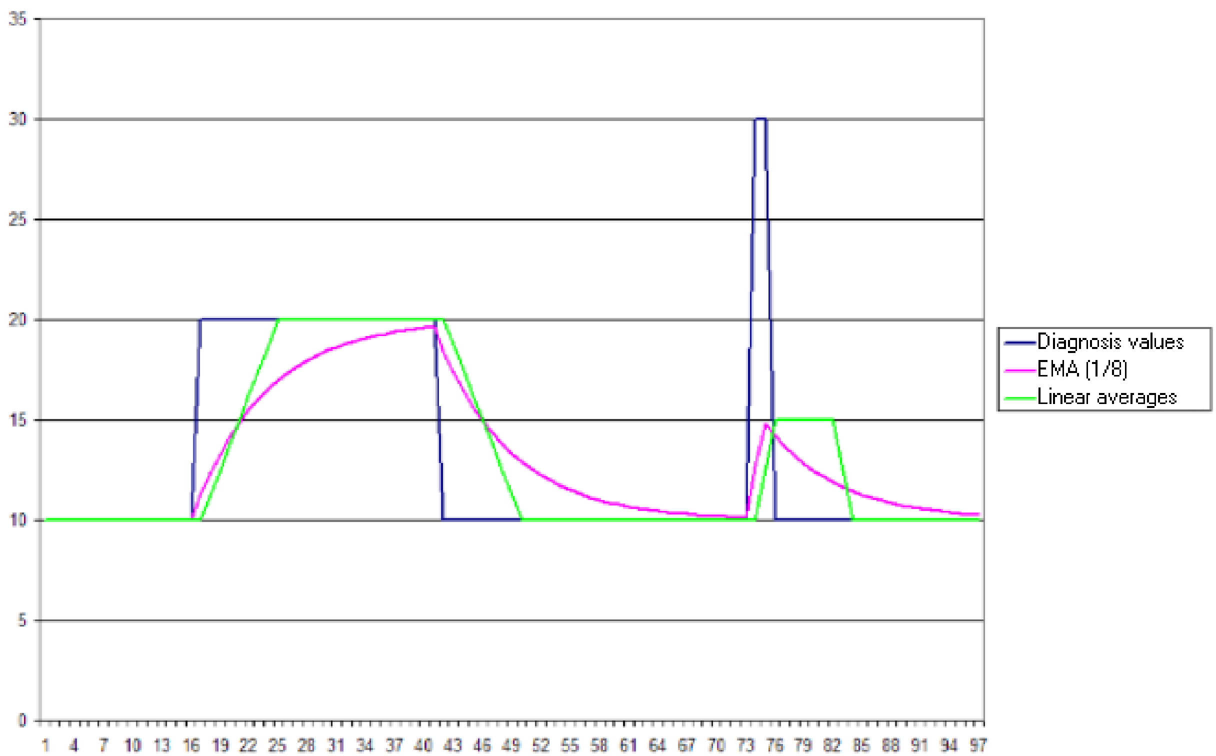
Diagnosis objects > Damping

Averages

The diagnosis object values are sliding averages using an "exponentially weighted moving average" (EWMA). The new diagnosis object value is calculated using the previous diagnosis object value as per following example:

Example:
Set averages: 1/4,
previous diagnosis object value = 17.3 mg,
new measurement = 14.7 mg

→ new diagnosis object value: (17.3 mg x 3/4) + (14.7 mg x 1/4) = 16.65 mg



Initialisation

The process variables for the diagnostic electronic are re-initialised when rebooted, variants have been changed or after parameters or settings have been transferred or after monitoring (for spectral view only). It is then possible to decide at start-up of the measurements whether the diagnosis object values should be continued to be averaged using the last values or if it is necessary to start at "0" again.

Re-entering the working range

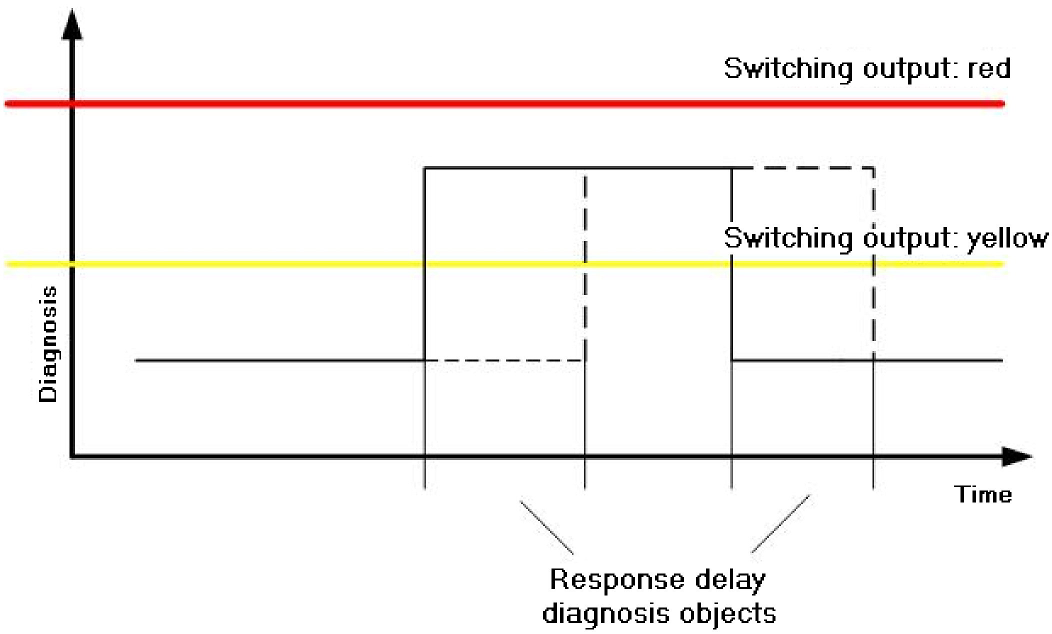
It is possible to decide after re-entering the working range diagnosis object value should be continued to be averaged using the last values or if it is necessary to start at 0 again.

Response delay

To avoid false alarms the response delay has the default setting 5. This means that an increase in the diagnosis value is only shown after 5 increases in succession have taken place. The effectiveness of the diagnosis information is therefore ensured.

You can set the response delay between 1 (no delay) and 100.

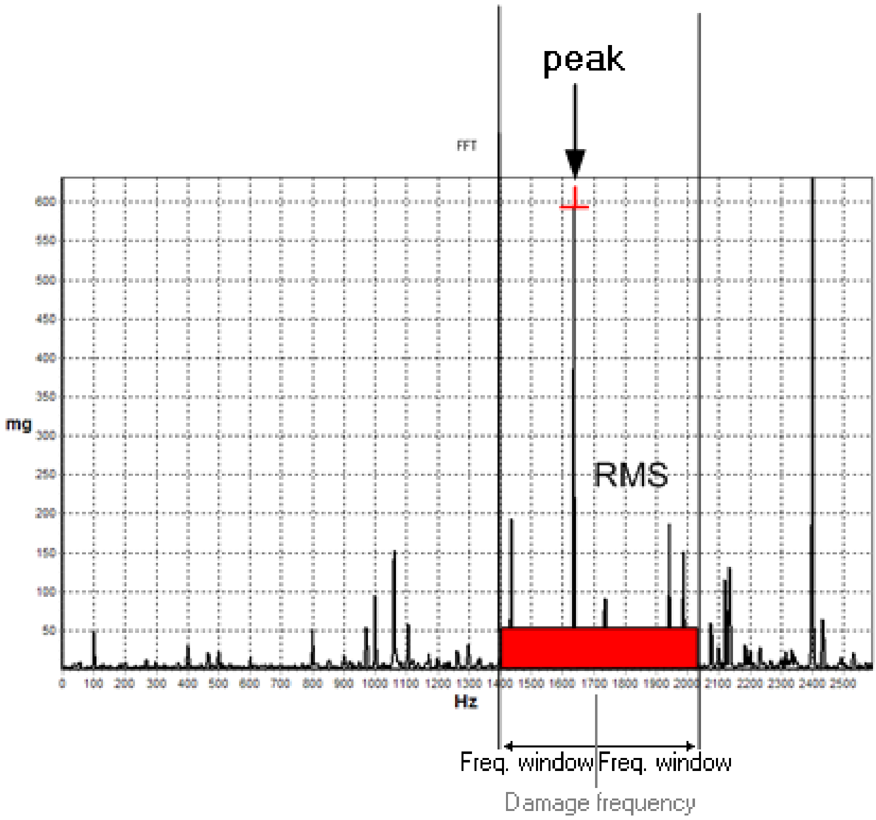
The response delay reacts to deviations around the given limit value and also to frequent deviations above or below this value.



Diagnosis objects > Others

Evaluation

The narrowband characteristics, the Peak-max and the RMS value (average value) can be detected in the search range. Peak analysis is recommended for discrete damage frequencies (e.g. the ball pass frequencies for rolling element damage or unbalance). RMS analysis is recommended for statistical characteristics (e.g. cavitation).



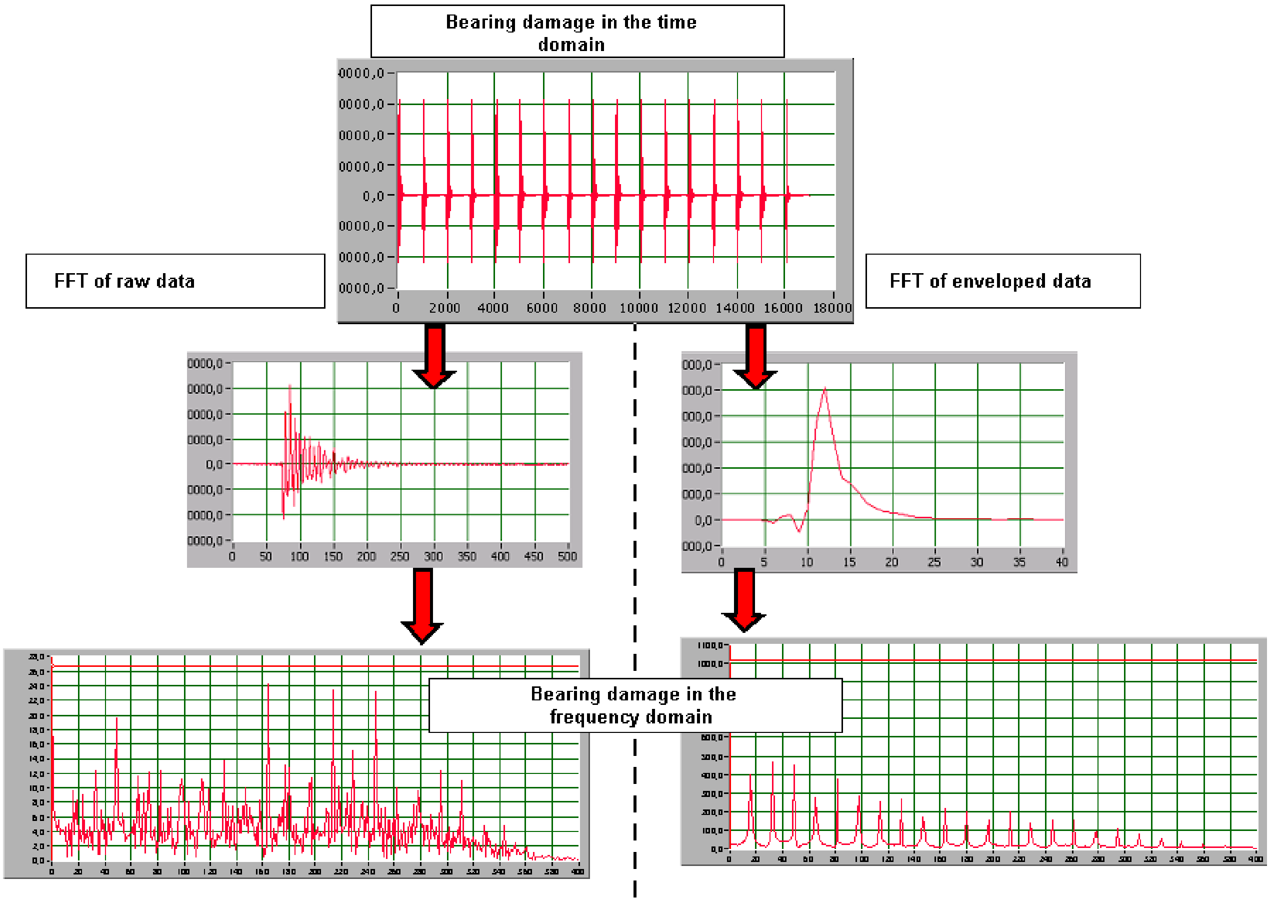
Measurement values

Either the acceleration value [mg], vibration velocity [mm/s] or the vibration displacement [mm] is used for calculation purposes. The physical unit should also be included in the Teach value. For measurement values in RMS and evaluation in [mm/s] it is also possible to define an ISO conform level for effective vibration velocity in a user defined band.

The centre frequency 505 Hz and a relative bandwidth of 98 % result in the effective vibration velocity in a band of 10...1 000 Hz (according to ISO 10816).

Analysis method / Filter

The purpose of the signal analysis is to generate informative characteristics from the raw acceleration data. efector octavis uses fast frequency analysis methods (Fast Fourier Transformation = FFT). The analysis method differentiates between calculating the linear spectrum from the raw acceleration data (FFT) and the envelope of the acceleration data (H-FFT). The selected method of analysis can be assigned individually to each diagnosis object. For example unbalance and rolling element bearing damage can be monitored in one sensor.



- Applications for FFT:
  Evaluating harmonic signals e.g. unbalance, cavitation, resonance, alignment errors.
- Applications for H-FFT:
  Evaluating high frequency peak-shaped signals e.g. rolling element bearings.

When using H-FFT it is possible to select different preset signal filters.

Frequency resolution

The frequency resolution is indirectly proportional to the measurement time. An high frequency resolution requires a long measuring time.

For reliable monitoring at least 1.5 shaft revolutions should occur within one measure time.

Example:

Frequency resolution = 1.52 Hz
→ Measurement time = 0.65 s

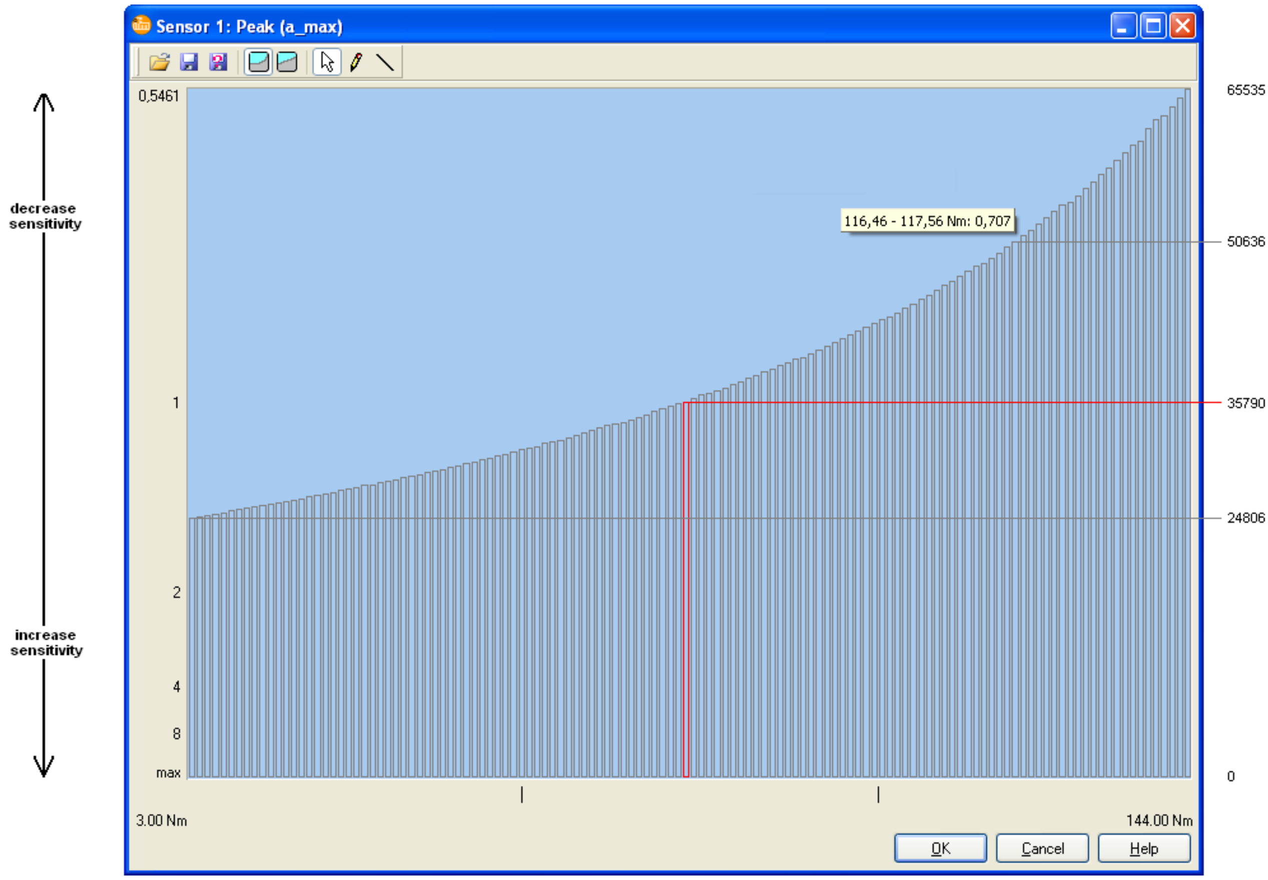
Minimum shaft revolution = 1.52 Hz x 1.5 = 2.25 Hz
2.25 Hz x 60 s/min = 135 rpm

Shortest programmable measurement time: 0.040 s = 24.4 Hz
→ shaft revolution minimum = 2 196 rpm

Longest programmable measurement time: 2.6 s = 0.38 Hz
→ shaft revolution minimum = 34 rpm

Diagnosis objects > Signal weighting

It is possible to correct the measuring value independently of the variable speed and/or the input value of the 2nd working range. The values displayed indicate how the variables of a constant damage change in the working range. During evaluation and calculation the VSE takes this change into account.



The signal weighting comprised 128 values between 0 and 65 535. The Teach value as well as the measured value are weighted using the signal weighting table (see example) – the Teach value using the Teach-In speed, the measured value using the measured speed.

Example calculation:

Teach t at 1500 rpm (35790 in the signal weighting). Object value a at 2450 rpm (50636 in the signal weighting.

The VSE determines the diagnosis value: (a / 50636) / (t / 35790) = diagnostic value.

(a / 50636) x (35790 / t) = diagnostic value.

(35790 / 50636) x a / t = diagnostic value.

(0.707 x a) / t = diagnostic value.

To simplify calculating a signal weighting it is possible to linearly divide the value of the Y-axis . However, the Teach-speed value must be 1.

It is possible to use ready defined curves or to produce or load own curves.

7.3.5 Parameters > Signal input monitor

The purpose of the signal input monitor is to offer additional monitoring of measurement signals or characteristics in the time domain in addition to the frequency selective (i.e. narrow band) measurement of diagnosis objects. This so-called broad band measurement makes it possible to give general information about the total system by evaluating the raw acceleration signal of the sensors for maximum acceleration (RMS in [mg]), average speed (RMS in [mm/s]) or input process values. In contrast to the diagnosis objects this monitoring is in absolute values.

The level values are determined without multiplexing, quasi simultaneously and is permanently available to all connected sensors without interruption. This means that time-critical monitoring such as crash recognition (0_pk_max) or time-critical shutdown functions can be realised using the vibration monitor. Basically up to four peak monitors (0_pk_max) and four RMS ([mm/s] or [mg]) can be simultaneously monitored. If using the RMS value the default setting for the filter range is in accordance with the ISO standards (2...1 000 Hz). The filter range can be freely defined so that individual levels can be calculated.

Adjustable parameters

- Switching points: Swithing thresholds "yellow" and "red" as absolute measurement values.
- Damping: averages, initialisation, response delay,
- Details: Measurement time, filtered / unfiltered measurement.

The **process monitor** is used to directly monitor the speeds of input 1 /input 2 and the input parameters of a measurement value input

Adjustable parameters

- Switching points: Switching thresholds "yellow" and "red" as absolute measurement values.
- Damping: averages, initialisation, response delay,

Signal input monitor > Monitoring

The monitoring mode determine whether the vibration monitor should monitor.

- RMS of the vibration acceleration in [mg]
- Maximum acceleration value in [mg], 0-peak
- RMS of the vibration velocity in accordance to ISO 10816 in [mm/s]

Signal input monitor > Switchpoints

efector octavis uses own limit values to monitor the vibration level within the time domain and the measurement value inputs. Contrary to the diagnosis objects the acceleration values are absolute for acceleration (unit: [mg]) and velocity (unit: [mm/s]), or the relevant set unit for the measurement value input.

Two trigger levels can be defined (yellow and red) which can also be used to switch the outputs.

Units:
1 mg = 0.001 g
1 g = 9.81 m/s² (gravitational acceleration)

Signal input monitor > History

Selective activating /deactivating and modifying of the integrated signal input monitor history memory.

This is carried out for all diagnostic objects and signal input monitors clearly set out in the history settings for the whole parameter set

UK

Signal input monitor > Damping

Averages

The signal input monitor values are sliding averages using an "exponentially weighted moving Average" (EWMA). The new signal input monitor is calculated using the previous signal input monitor value as per following example:

Example:
Set averages: 1/4,
previous signal input monitor value = 1 318 mg,
new signal input measurement = 1 634 mg

→ new signal input value: (1 318 mg x 3/4) + (1 634 mg x 1/4) = 1 397 mg

Initialisation

The diagnostic electronic process variables are reinitialised when rebooted, variants are changed, after transfer of parameters or settings and after monitoring ("spectral view" only). Here it is possible to differentiate whether at start up of the measurements the average of the diagnostic object value is continued with the last determined values. or if the evaluation diagnostic object should start from "0".

Response delay

To avoid false alarms the response delay has the default setting 5. This means that an increase in the diagnosis value is only shown after 5 increases in succession have taken place. The effectiveness of the diagnosis information is therefore ensured.

You can set the response delay between 1 (no delay) and 100.

The response delay reacts to deviations around the given limit value and also to frequent deviations above or below this value.

Signal input monitor > Details

Measurement periods

Longer periods of measurement ensure more stable measurement results. In some applications, however, a shorter reaction time is required. Accelerometers according to ISO 10816 require a minimum measuring time of 333 ms in order to completely detect a vibration of 3 Hz.

Shorter measuring periods have the effect of additional high pass filters. For example, a measurment time of 80 ms can reduce frequencies up to 12.5 Hz.

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Filtering

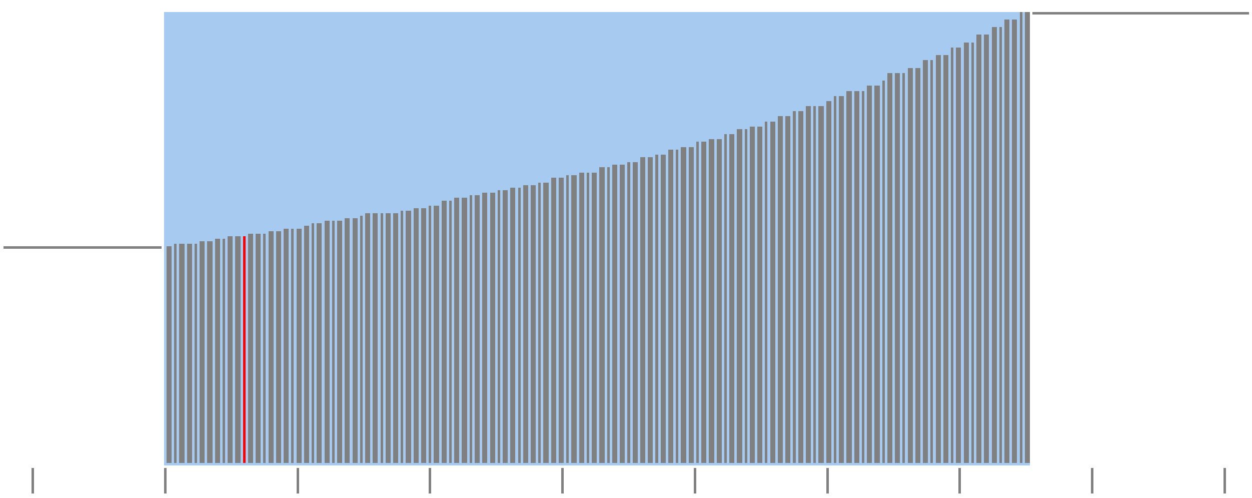
The filter can either be freely adjusted or the peak can be unfiltered over the total frequency range. It can be useful to use an unfiltered measurement for e.g. the monitoring of very slow rotating machinery (< ≈100 rpm).

Signal input monitor > Input value

During operation the input value is taken from the signal inputs input 1 / input 2 or transferred using IP-protocol (octavis OPC-Server).

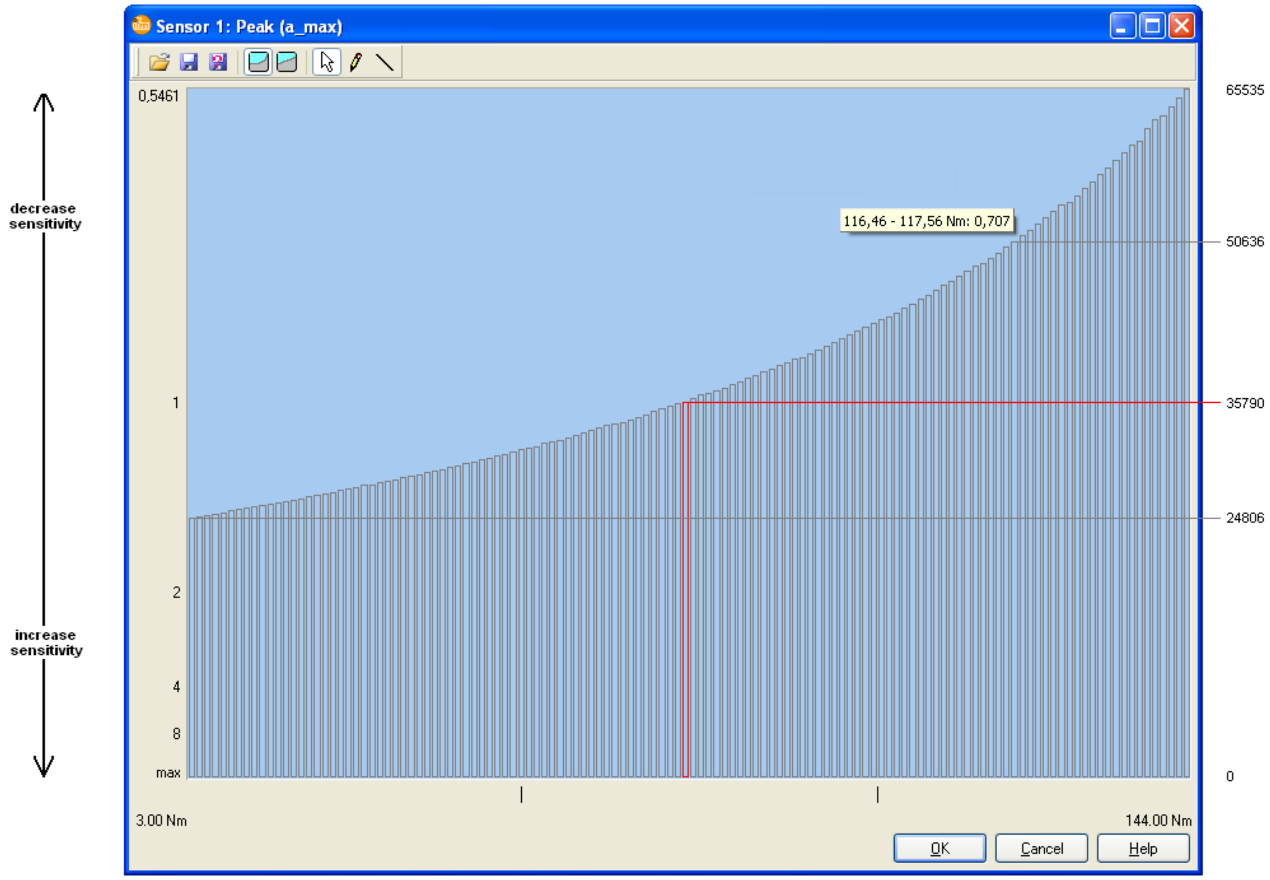
The condition of the signal input monitor is only monitored and signalled within the working range. No monitoring takes place during the periodthe input values are outside the working range.

Using the signal weighting function it is possible to adjust settings to monitor outside the working range limits. In this case the limits for the working range represent the range for which the signal weighting is to be created. The values outside the working range are weighted according to the nearest signal weighting point.



Signal input monitor > Signal weighting

Depending on the input value it is possible to correct the measurement values. The plotted values show how the characteristic values of a constant damage change within the working range. The VSE takes these changes into consideration during evaluation and calculation.



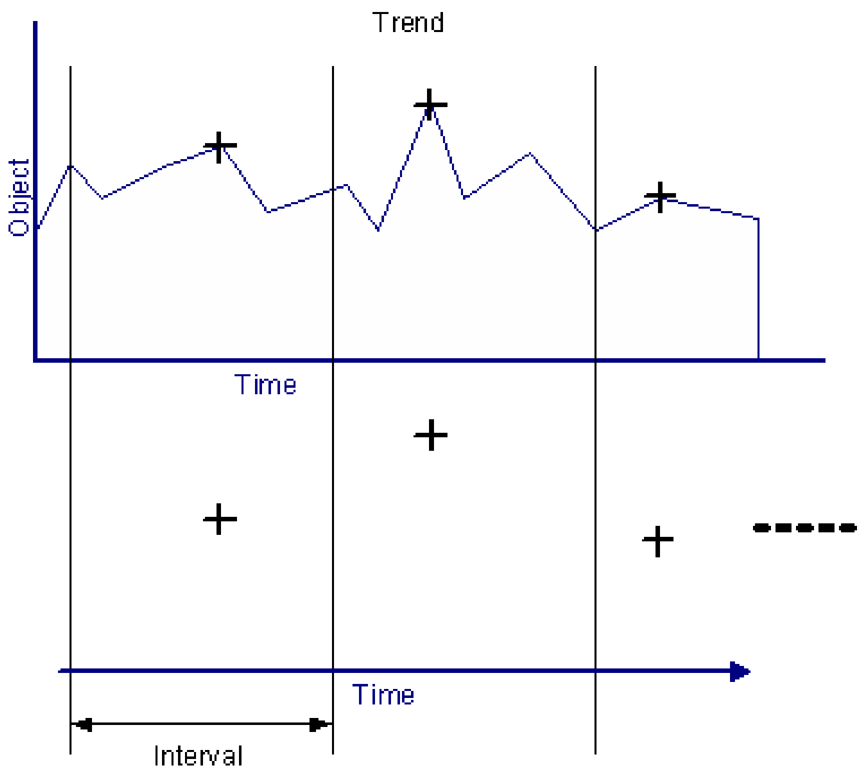
The signal weighting comprises 128 values between 0 and 65535. The reference value and the measured value are weighted according to the signal weighting table (see example) - the reference value according to the given reference and the measured value according to the measured input value.

Example calculation:
Reference r ati 72 Nm (35790 signal weighting),
Signal input monitor value: a at 117 Nm (50636 signal weighting)
VSE determines the measurement value: (a / 50636) / (r / 35790)
= weighted measurement value signal input monitor
(a / 50636) x (35790 / t) = weighted measurement value signal input monitor
(35790 / 50636) x a / t = weighted measurement value signal input monitor
(0,707 x a) / t = weighted measurement value signal input monitor

To facilitat the signal weighting it is possible to linearly divide the values of the Y-axis . However, it only possible the set the reference value at 1.

7.3.6 Parameters > History

Activating and deactivating the integrated history memory.



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The memory size amounts to 30 000 values including time stamp and speed details. These are segmented to the activated diagnosis objects /signal input monitors. The integrated real-time clock is battery-backed; the memory is a ring memory.

The storage intervals are freely definable. The maximum value of the relevant diagnosis object / signal input monitor is stored within one storage interval. To save memory the speed details e.g. diagnostic objects with constant speed can be deleted from the history memory (n).

From firmware 0.5.17 onwards it is possible to include or ignore storing the 2nd working range or reference value (2).

It is possible to adjust settings so that the history records each change to variants (v). However, each history record made due to a change to the variants shortens the time memory available.

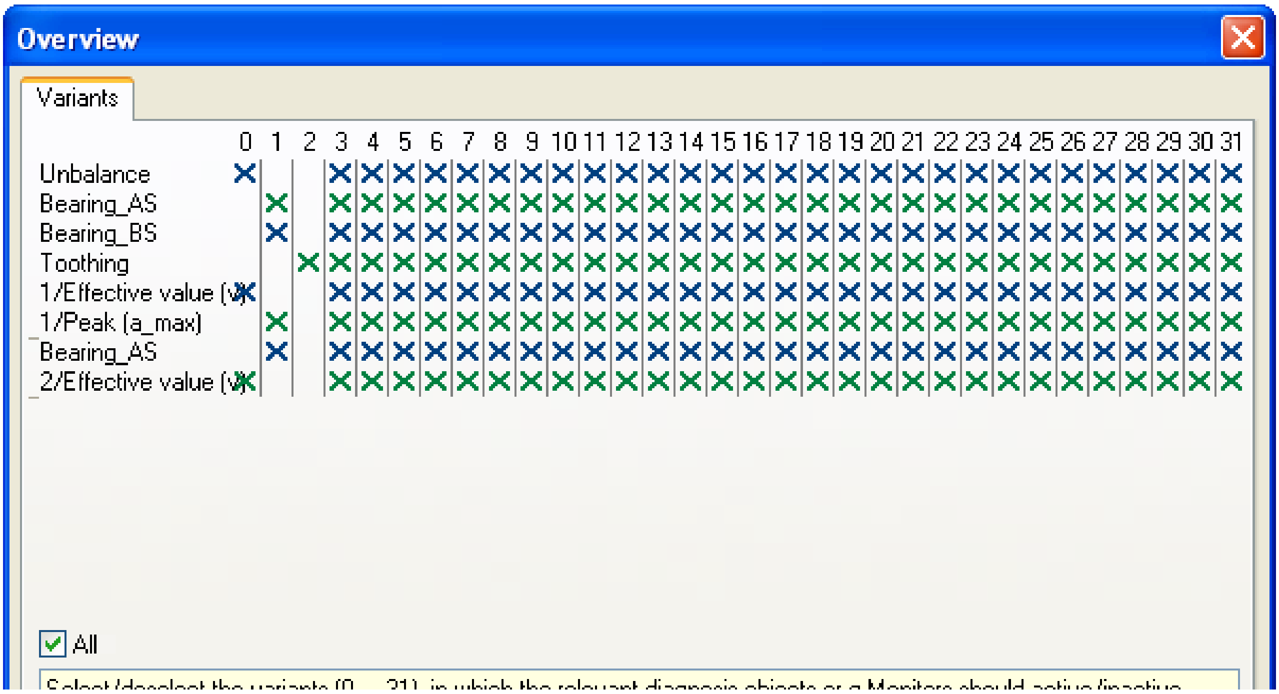
From firmware 0.6.8 it is also possible to store the average value of the values measured during the interval.

From firmware 0.7.11 it is possible to adjust settings so that a history recording is taken each time the limit value for "red" is exceeded (d).

If the measurement value of an object moves quickly between yellow and red alarm (< 250 ms) and each red alarm is documented, these events can shorten the sensitivity of the period the values can be stored. It is possible to interrupt storage of new values for approx 1 sec (min. firmware 0.7.23).

7.3.7 Parameters > Variants

The variant is always the decisive setting. In each of the 32 variants diagosis objects / signal input monitors are activated or deactivated. As a default setting all diagnosis objects /signal input monitors are active in all variants.

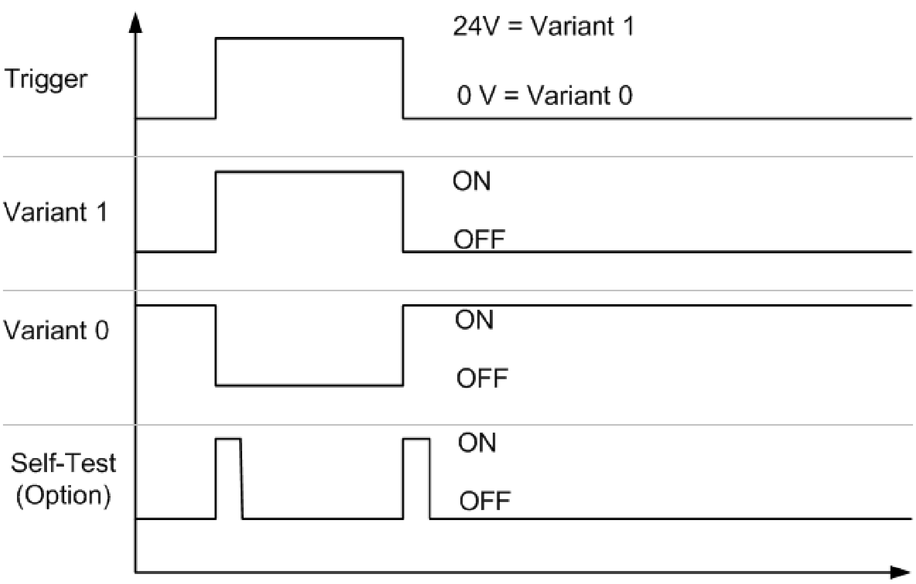


all VSE:

Up to 32 variants can be defined. Each variant can be activated or deactivated using the setting dialogue and the efector octavis OPC Server software.

VSE100 only:

Electrically it is possible to activate or deactivate up to 9 variants using the level-trigger (8 digital inpuots I/O 1…8). An optional setting is available to carry out a self test if a change is made to a variant.



7.3.8 Parameters > Project

The purpose of the header data is to describe the application. The free text inputs are stored in the parameter file and in the diagnostic electronic (VSE).

- Company
- City
- Address
- Machine location
- Machine spec.

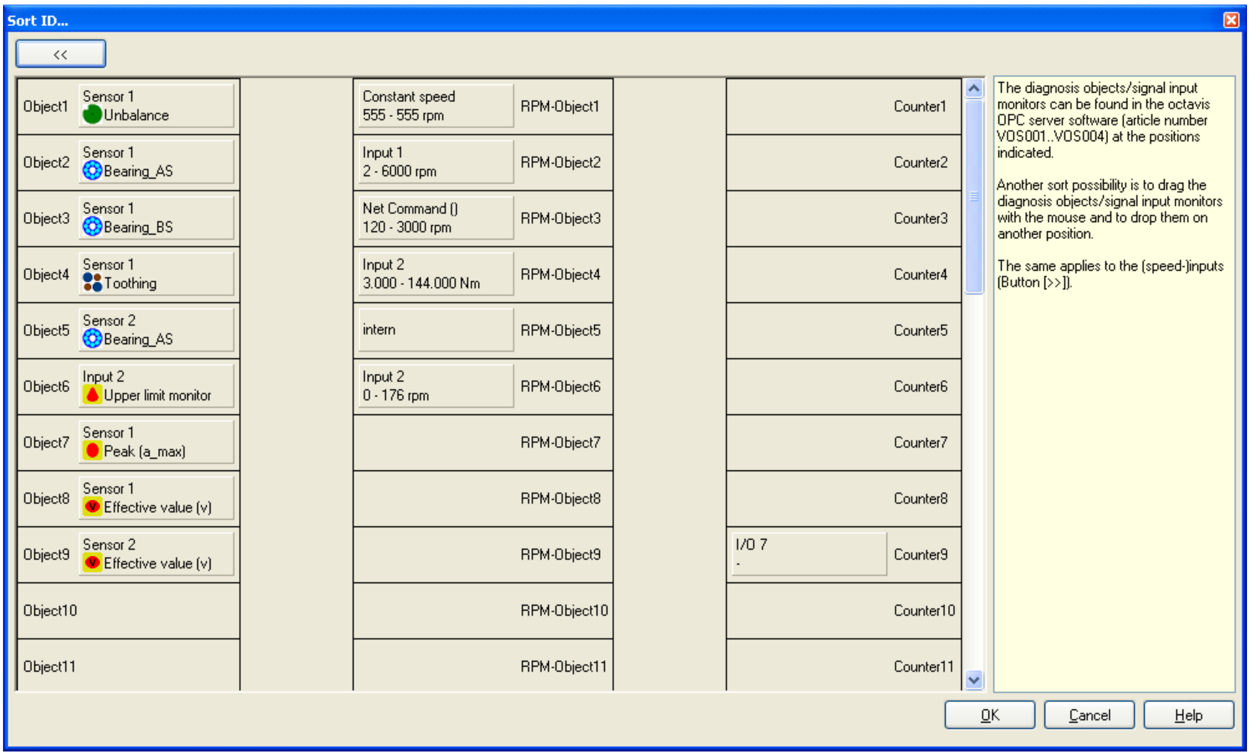
UK

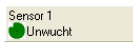
The purpose of the project description is to archive project notes. In the diagnostic electronic (VSE) the first 104 characters are stored, in the parameter file all data is stored.

7.3.9 Parameters > Sort ID

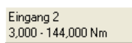
Changes to the parameter sets can lead to a new configuration of the diagnosis objects with reference to their object-ID. This is valid in particular for inputs concerning the RPM-object-ID. Therefore when using the OPC server (article numbers VOS001...VOS004) you should, prior to transfering the parameters to the VSE, align the ID sorts with the configuration of the OPC client in use.

Menu [Parameter] > [Sort ID...] or
symbol 



Use the mouse to move the diagnosis object fields (e.g. 

) to the required ID positions (e.g. "Object8”). If an ID position is already occupied then the diagnosis object fields are swopped.

The same procedure is valid for the input fields (e.g. 

) in the right column.

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7.4 Data / Files > Measuring data

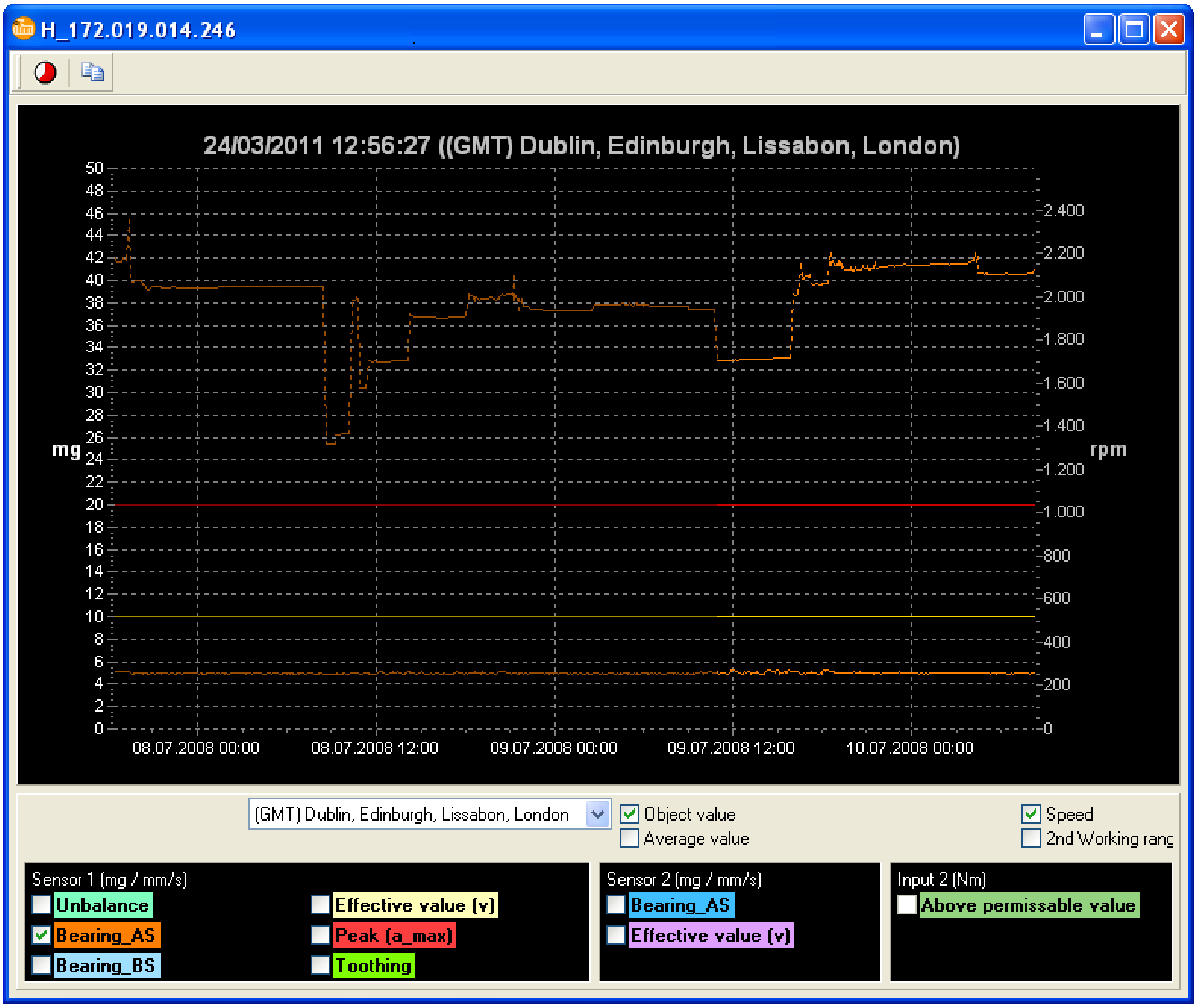
The measuring data window is used to visualise the recorded data in chronological order with ▶. Use the symbol [Pause] ⏸ to "freeze" the recording. The detail screen symbols ⏮ ⏭ enable to switch to the previous or subsequent data set of the recording during standstill.

It is possible to switch to the views of individual sensors for recordings of subobjects, objects and diagnosis values. The recordings contain the measuring values for all sensors. (For technical reasons this is not possible for the spectral display).

Recording of object and diagnostic values can also be shown as line diagrammes similar to the history function.

7.5 Data / Files > History

Displays the history information which is read out and/or stored as a file.



The screen can be extended individually to display several values. If within the given time the parameters (including Teach values) of the shown diagnosis object have been changed, the values which have been recorded before the change has taken place are shown in a slightly darker coloured line.

When the data is imported the time stamp is extrapolated to the relevant local time. The display can be switched to show any time zone.

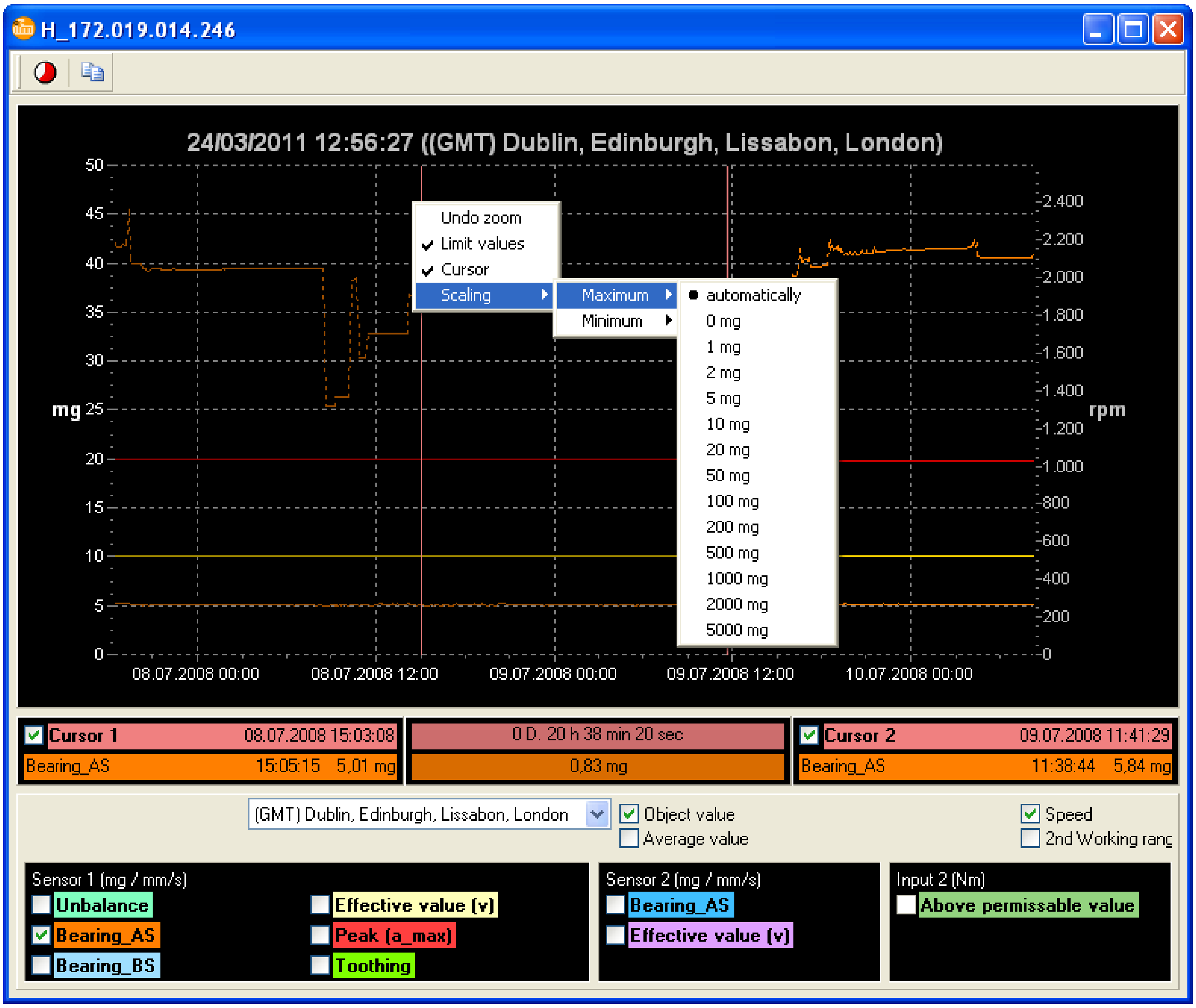
Note: If the clocks have changed during the reporting period, the data stored before the change will also be shown in the currently valid time.

Tip: GMT/UTC has no time difference (summer/normal time).

The relevant measurement time points of the applied speed or – if set – the input values of the 2nd working range can also be displayed (dotted line, scaling axis right).

It is possible to zoom into the diagram by drawing a rectangle (keep left mouse button pressed and drag from top left corner to bottom right corner). To zoom out again repeat in the opposite direction.

Using the right mouse button it is possible to show the limit value of a selected diagnosis object/signal input monitor, the cursor and determine the scaling up and down of the left Y-axis.



The arrow keys ([arrow right], [arrow left]) can be used to move the cursor.
Input focus on the left cursor with [Pos1] or [Strg]+[arrow left],
input focus on the right cursor with [End] or [Strg]+[arrow right].

The symbol [counter] can be used to open a window showing the counter readings.

The symbol [Diagram to clipboard] can be used to copy an inverted copy of the diagram to the clipboard.

UK

7.6 Settings

The diagnostic electronic settings can as for parameters also be created "offline" and forwarded in file format.

Following settings can be predefined:

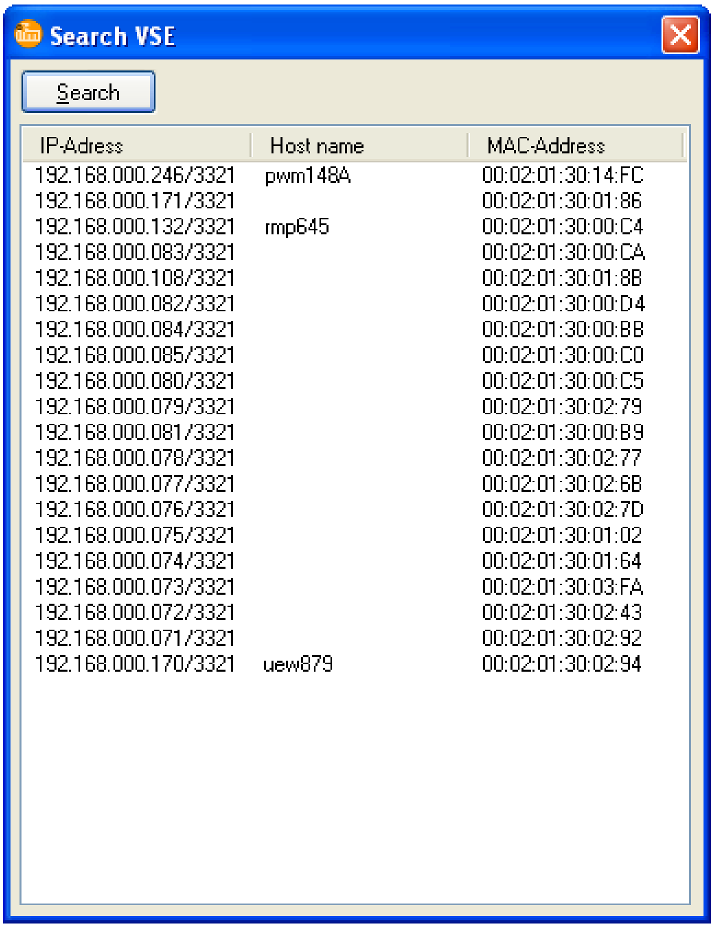
- Password protection
- Sensors
- Sensor self-test
- Network
- Variants.

Settings which have not been specified are not affected when transferred to the diagnostic electronic (VSE). The previous setting remains.

8 Tools

8.1 Tools > Search VSE

Menu [Extras] > [Search VSE…]



The above lists shows only units with firmware version 0.6.8 onwards which are located in this/these subnet(s).

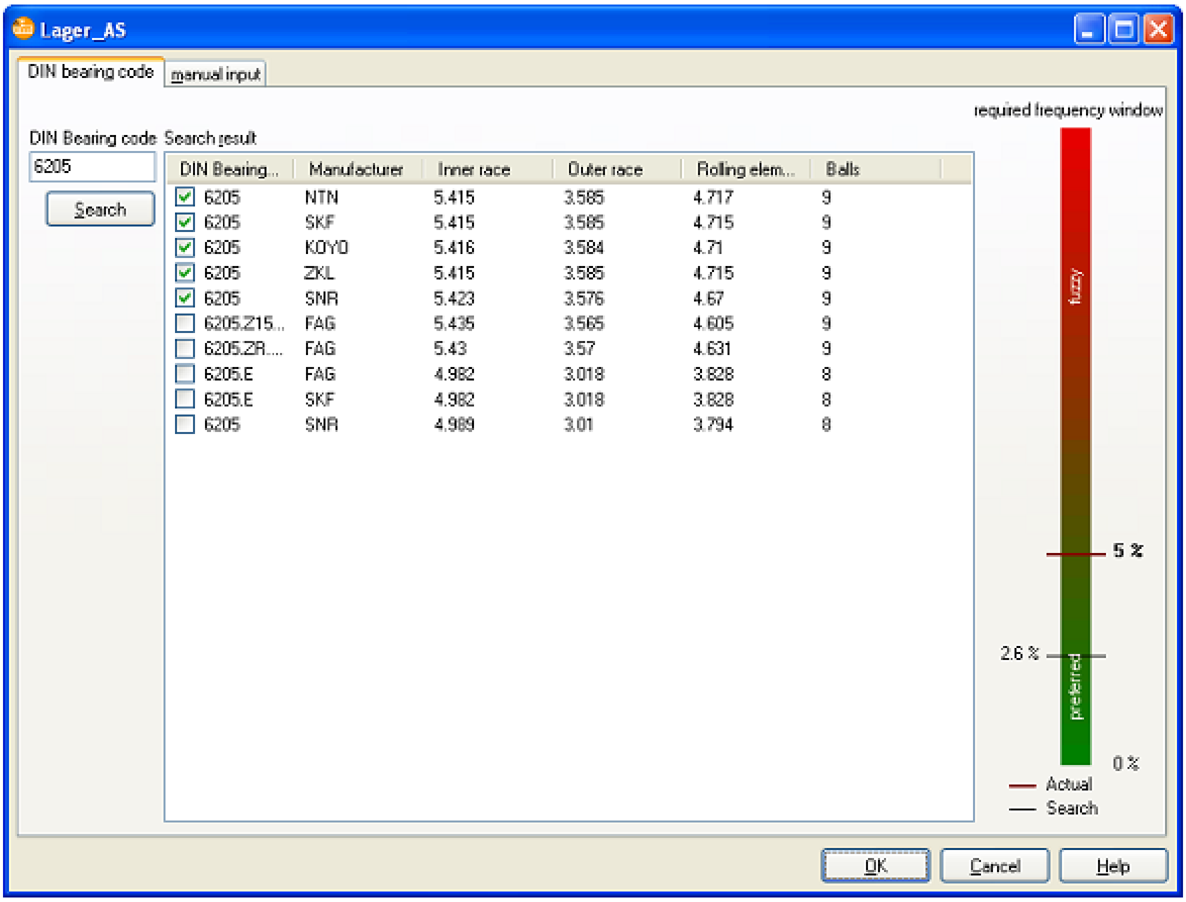
Double click one of the listed units to annex it to the VSE overview tree and to establish connection.

Note: The search can be repeated at will.

UK

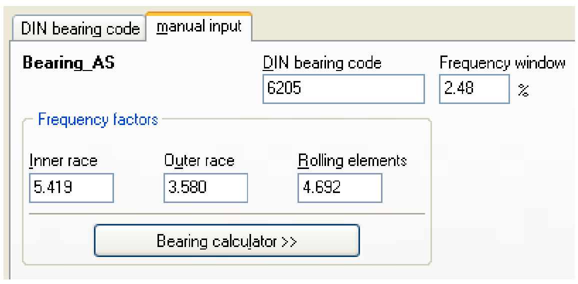
8.2 Tools > Rolling element bearing database

The rolling element database contains the most common rolling element bearings from different manufacturers. These can be defined by inputting the bearing short description.

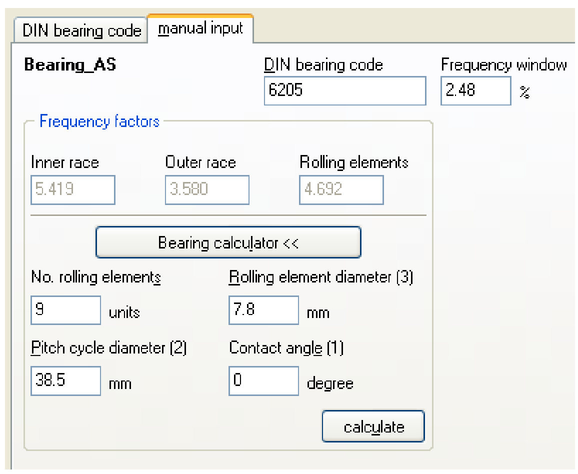


If the required rolling element bearing cannot be found in the database, you can enter the bearing description, the frequency factors and the search radius manually. (→ image).

Please note that some manufacturers' specifications only give half the frequency factors for the rolling elements.



The bearing calculator can be used to calculate the order numbers if the bearing geometry is known.

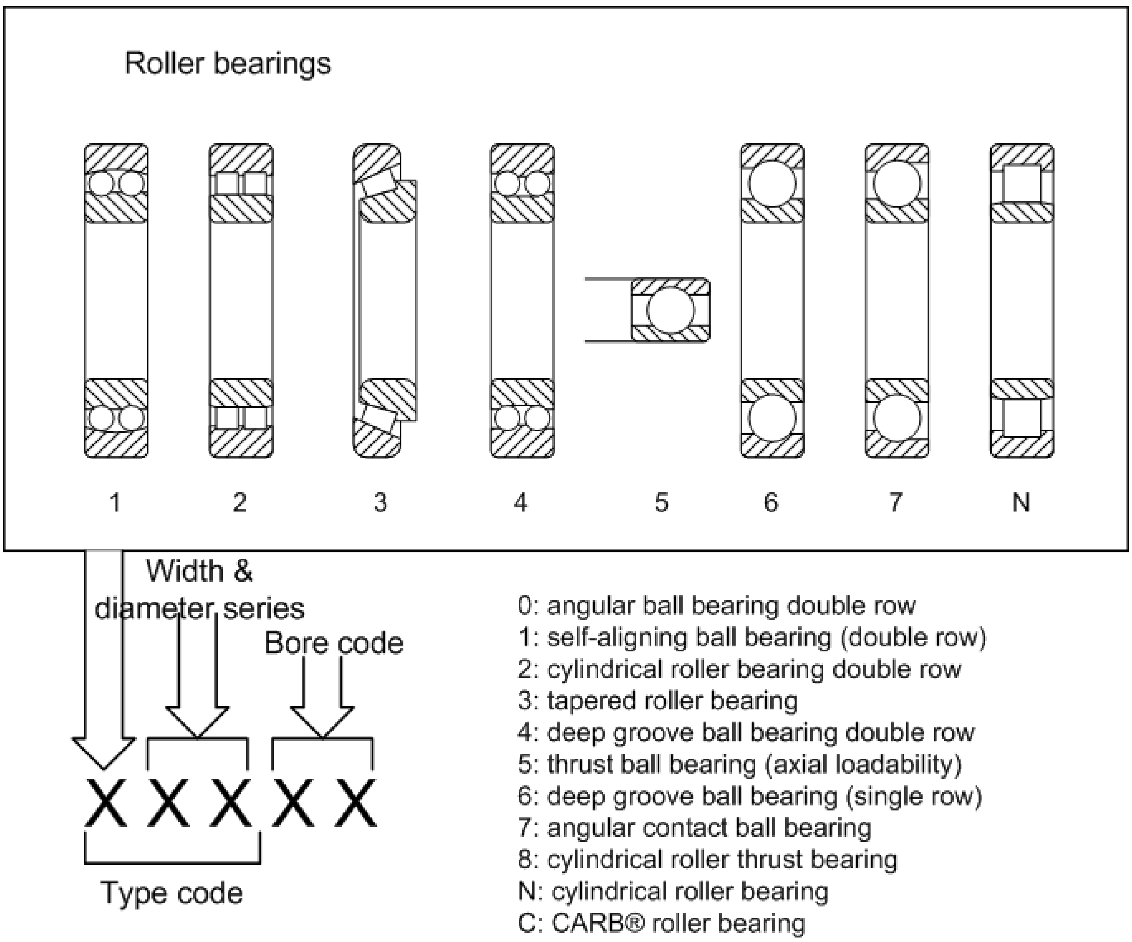


8.2.1 Short description (=DIN)

Each standard rolling element bearing has a short description according to DIN 623 with which it can be clearly assigned to a particular group of bearings. The geometric data can also be identified from the description. The ball pass frequencies are also described.

Suffixes and prefixes normally do not have any influence on the balls pass frequencies. Only the suffix "E" usually indicates a reduced number of rolling elements and is therefore relevant for the ball pass frequency. Differences between the manufacturers are on the whole marginal. Bearing descriptions with more than five digits are special constructions. In this case you should consult the manufacturers‘ database.

UK



The last two digits define the inner diameter of the bearing multiplied by 5:

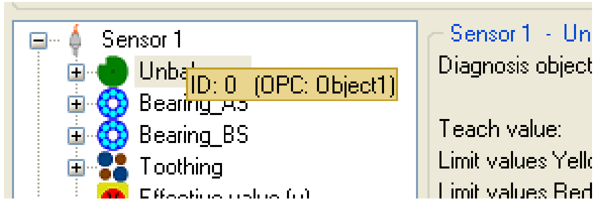
Example:
Bearing 6(0)212:
Inner diameter = 12 x 5 = 60 mm

Important: The data pertaining to the different bearings is a service offerend free of charge. We cannot guarantee the correctness of the data. If in doubt or if the required rolling element bearing is not available please contact the bearing manufacturer.

8.3 Tools > Object-ID

Shows the object-ID used for the octavis OPC server.

Press [Strg] key and using the mouse click on the relevant diagnosis object listed in the diagnosis tree.



8.4 Tools > Start parameters

Following start parameters are available:

Start parameter	Properties
IEPE	For units with board-version 3 or lower it is also possible to set [Sensor 1] as IEPE-sensor
FRAME-left_top_right_bottom	The screen range available for parameter setting software VES003
aaa.bbb.ccc.ddd	A connection to diagnostic electronics VSE is being created with given IP address (aaa.bbb.ccc.ddd)
aaa.bbb.ccc.ddd/eeee	A connection to diagnostic electronics VSE is being created with given IP address (dito, eeee= port number)
IPPORT	It is possible to create connections to the diagnostic electronics VSE with the same IP address provided different port numbers are used.*)
NOCONNECT	At program start-up it is not possible to create an automatic connection to the diagnostic electronics VSE.*)

*) Can also be found under [program settings]

Use:

Start the software using the command line and add the required start parameters. These should be separated by a blank. The order is not important.

Or create a link with octavis VES003.exe. Click on the link using the right mouse button to open the property information.
Input box [Target]: input a blank after the file name and then the start parameter.

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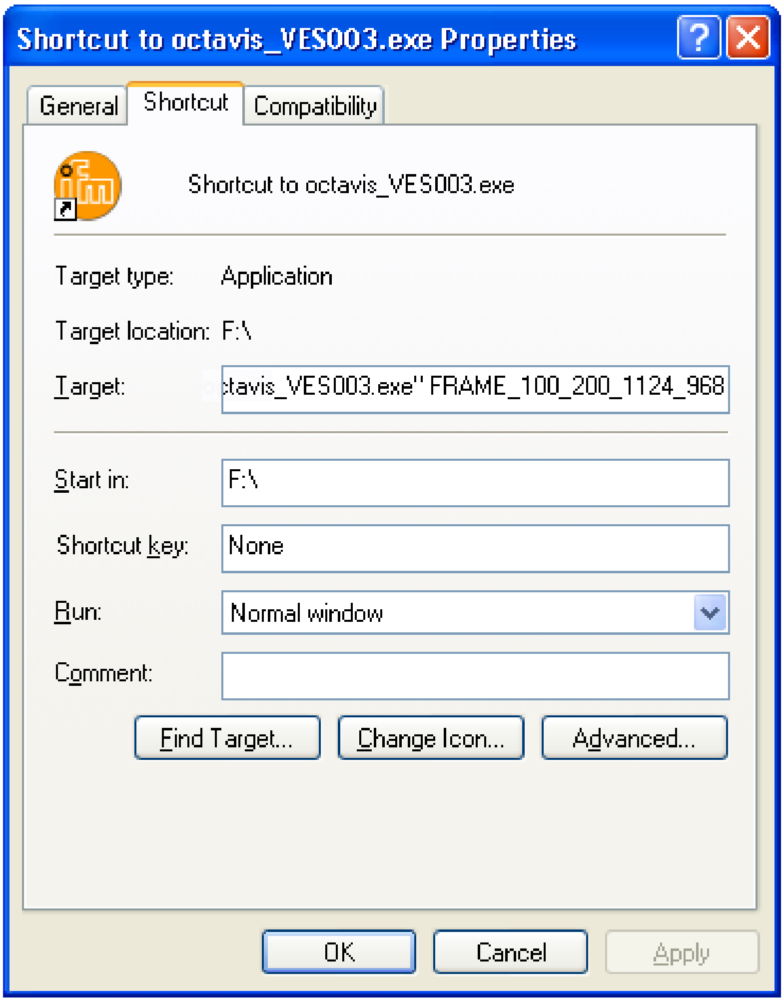
The example given below opens the software at position 100 pixel to the right, 200 pixel down, 1 024 (1 124 - 100) pixel wide and 768 (968 - 200) pixel up.



8.5 Tools > Evaluating the rolling element bearing

The following table can be used to obtain a basic qualitative evaluation of the rolling element bearing condition:

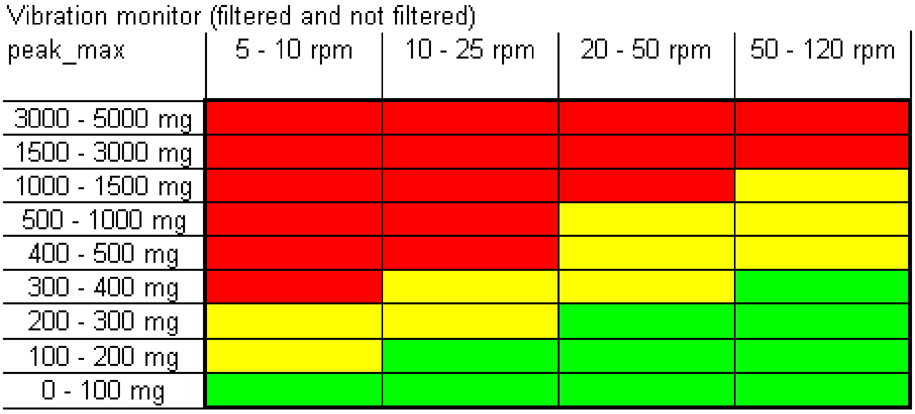
Step 1: Undamaged bearing Raceway: No damage FFT spectrum: no ball pass frequencies H-FFT: no ball pass frequencies Peak_max: low level (usually clearly below 5000 mg)
Step 2: Initial bearing damage Raceway: small surface damage to the raceways (just visable) FFT spectrum: no ball pass frequencies H-FFT: ball pass frequencies (frequency factor 1) of BPFI, BPFO, BSP Peak_max: low level (usually clearly below 5000 m)
Step 3: Spreading bearing damage Raceway: larger surface damage to the raceways (several mm) FFT spectrum: no ball pass frequencies H-FFT: ball pass frequencies (frequency factor 1) of BPFI, BPFO, BSP increased Peak_max: high level with strong deviations
Step 4: Advanced bearing damage Raceway: severe damage to all rolling partners FFT spectrum: harmonics due to increased bearing play H-FFT: ball pass frequencies (also multiples) of BPFI, BPFO, BSP increased, in addition bearing cage frequencies also visible Peak_max: high level with strong deviations (usually above 15g)

In addition to the above the development of the characteristics should be followed over a few weeks (e.g. by reading out the history memory) and then make any necessary adjustments to the limit values.

The absolute measurement values of the bearing condition can be estimated as follows:

octavis object value Bearing (= BPFO+BPFI+BSF)	120-550 rpm	500-1000 rpm	1000-3000 rpm	3000-12000 rpm
> 550 mg	red	red	red	red
450 - 550 mg	red	red	red	red
350 - 450 mg	red	red	yellow	yellow
250 - 350 mg	red	yellow	yellow	yellow
150 - 250 mg	yellow	yellow	green	green
50 - 150 mg	yellow	green	green	green
0 - 50 mg	green	green	green	green

For speeds below 120 rpm we recommend also using the vibration monitor function for peak_max.



If the levels are higher than the recommended alarm limits right from the beginning, then following steps should be taken:

- increase the damping to lower the evaluation of sudden influences
- reduce the search window for the damage frequencies
  → narrower frequency bands are less subject to interference
- as last step it is possible to take diagnosis measurement in the working ranges or using external trigger signals during interference free operation.

Important: Diagnosis measurements (bearing condition, gear diagnosis...) have to be taken under reproducible conditions. Constant detection is not so important as reliable diagnosis information!

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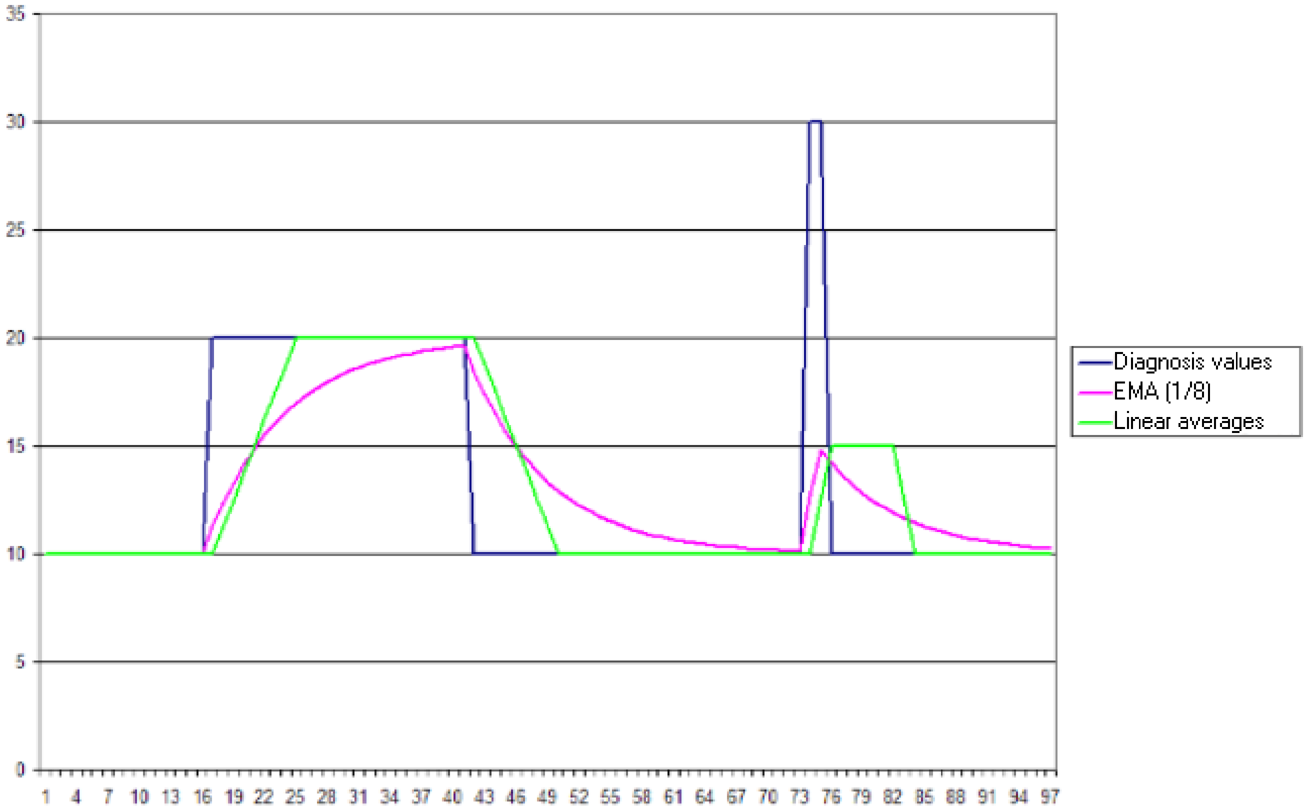
8.6 Tools > EMWA averaging



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8.7 Tools > Time domain evaluation

According to ISO 10816 it is possible to make a basic quantitative time domain evaluation.

Individual diagnosis objects (e.g. unbalance) measured in [mm/s] and RMS can also be orientated on the values.

g-Monitor mm/s RMS (10...1,000 Hz)	Large electric machines		Middle sized electric machines		Pumps with impellers with several blades and seperate drive		Pumps with impellers with several blades and integrated drive	
	P = 300 kW...50 MW		P = 15...300 kW		P > 15 kW		P > 15 kW	
	Machines with shaft height > 315 mm		Machines with shaft height 160...315 mm					
	fixed	flexible	fixed	flexible	fixed	flexible	fixed	flexible
≥ 11.00	D	D	D	D	D	D	D	D
7.10...11.00	D	C	D	D	D	C	D	D
4.50...7.10	C	B	D	C	C	B	D	C
3.50...4.50	B	B	C	B	B	B	C	B
2.80...3.50	B	A	C	B	B	A	C	B
2.30...2.80	B	A	B	B	B	A	B	B
1.40...2.30	A	A	B	A	A	A	B	A
0.00...1.40	A	A	A	A	A	A	A	A

Legend:

A = New machine condition
B = Unlimited long-term operation allowable
C = Short-term operation allowable
D = Vibration causes damage

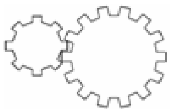
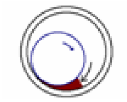
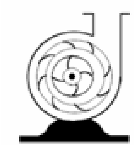
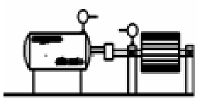
For applications involving fast rotating machines (Machine tool spindles) it is necessary to differentiate between unbalance and time domain monitoring.

Permissible residual unbalances are aligned according to the prescribed unbalance classes (A...D) and are considered acceptable up to 2 mm/s.

Sensible thresholds for time domain monitoring (10...1 000 Hz) in metal cutting processes are approx 10 mm/s for early warning and 15 mm/s for alarm.

8.8 Tools > Extended diagnosis

Diagnosis examples:

	Machine standing evenly; loose fixture	FFT: 1.0 ; 2.0; 3.0 x f_n
	Gear mesh; tooth error Gear mesh; shear force too high	FFT and H-FFT: 1.0 x f_n; FFT: number of teeth x f_n
	Sleeve bearing; instabile lubrication Sleeve bearing; wear	FFT: 0.42 – 0.48 x f_n FFT: 1.0 ; 2.0; 3.0 x f_n
	pump; lobe impeller pump; cavitation	FFT: number of vanes x f_n H-FFT: 1.0; 2.0......n x f_n
	gear; misalignment	FFT: 2.0 x f_n

9 Lexicon

9.1 Net Command

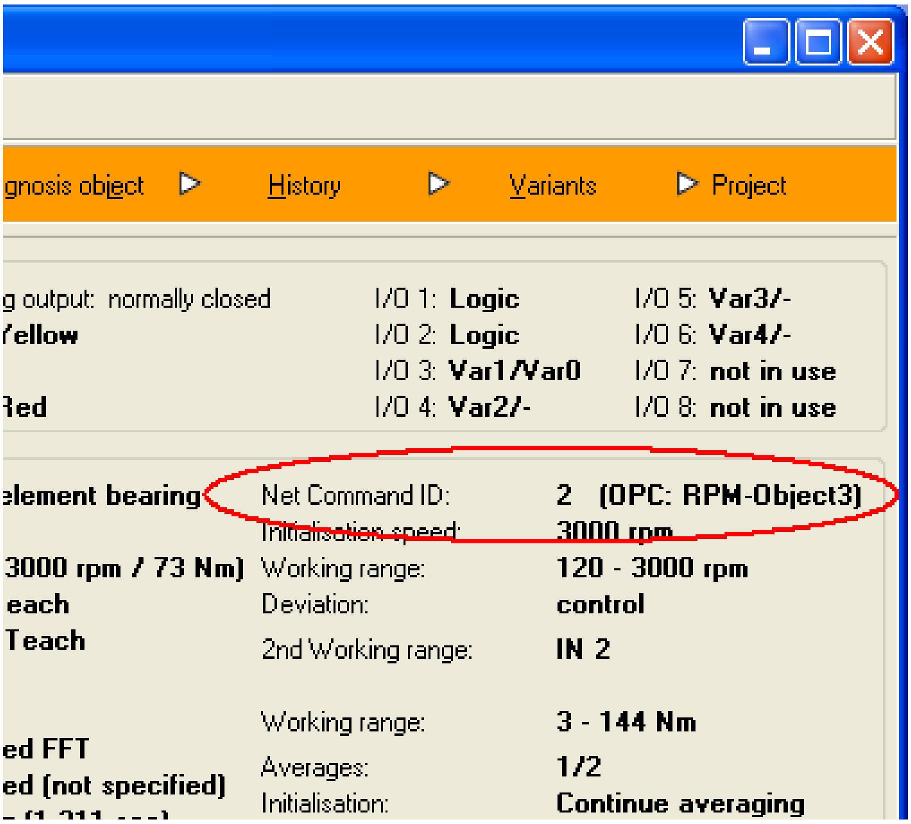
The Net command is a standard TCP/IP protocol. The data to be transferred comprises three parts:

- News-ID
- IP command-ID
- Speed information.

UK

The News-ID is fixed at "38".

The IP command-ID is derived from the diagnosis object in question (→ following screenshot).



The speed information is given as a floating point value in the value range of 4 bit floating point number according to IEEE-standards.

The values to be transferred are composed as follows:

2-byte integer (Little Endian)		2-byte integer (Little Endian)		4-byte floating point to IEEE			
Low byte	High byte	Low byte	High byte				
Message ID		Net Command ID		Speed			
38		2		1500			

9.2 CSV (separator) (*.csv)

9.2.1 CSV > Diagnostic value (LED)

The CSV values are separated using a semicolon (;), as in this example opened with "OpenOffice Calc".

The decimal separator used is the character used in line 1, column N.

Note: The contained data can be shown differently depending on the program used.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1	000	002.002	002.005.0	001	0004	0009	00012	000	001	0002	0011	0005	,	.	.	:					h		00000	0			
2	100.000	000.007.0	000.000.0	1140859891																							
3	0	Sensor 1	m/s^2																								
4	1	Sensor 2	m/s^2																								
5	2	Sensor 3	m/s^2																								
6	3	Sensor 4	m/s^2																								
7	00	2	0	Unbalanc	-1.0000	2.0000	6.0000	1	0	1	00	-01	-01	2	1.0000	Unbalance [x Teach] (Yellow: 2,00 x Teach/Red: 6,00 x Teach) // Unbalance // Sensor #0 (Sensor 1)											
8	01	0	0	Bearing_A	1.0000	5.0000	10.000	0	1	0	01	-01	00	2	0.5000	Bearing_AS [x Teach] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #0 (Sensor 1)											
9	02	0	0	Bearing_	1.0000	5.0000	10.000	0	1	0	02	04	00	2	1.0000	Bearing_BS [x Teach] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #0 (Sensor 1)											
10	03	-3	0	(1) Effect	1.0000	7.0000	11.000	1	0	1	03	-01	02	4	1.0000	Effective value (v) [mm/s] (Yellow: 0,007 [mm/s]/Red: 0,011 [mm/s]) // Sensor #0 (Sensor 1)											
11	04	-2	0	(1) Peak	1.0000	2000.000	6000.000	0	0	0	03	-01	02	4	1.0000	Peak (a_max) [mg] (Yellow: 2000 [mg]/Red: 6000 [mg]) // Sensor #0 (Sensor 1)											
12	05	0	1	Bearing_A	1.0000	5.0000	10.000	0	1	0	01	-01	00	2	0.5000	Bearing_AS [x Teach] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #1 (Sensor 2)											
13	06	-4	4	(IN2) Abo	1.0000	100.000	120.000	0	0	1	03	-01	-01	4	1.0000	Upper limit monitor [Nm] (Yellow: 100 [Nm]/Red: 120 [Nm])											
14	08	-3	1	(2) Effect	1.0000	7.0000	11.000	1	0	1	03	-01	02	4	1.0000	Effective value (v) [mm/s] (Yellow: 0,007 [mm/s]/Red: 0,011 [mm/s]) // Sensor #1 (Sensor 2)											
15	12	1	0	Toothing	-1.0000	4.0000	8.0000	0	0	0	00	-01	-01	1	1.0000	Toothing [x Teach] (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // Others // Sensor #0 (Sensor 1)											
16	000	00	Speed fre	1.0000	5.0000	Speed frequency [mm/s] // Unbalance (Yellow: 2,00 x Teach/Red: 6,00 x Teach) // (Sensor 1)																					
17	001	12	1st Subo	1.0000	5.0000	1st Subobject [mg] // Toothing (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // (Sensor 1)																					
18	002	06		3.0000	0.0000	[€¿@À@¤] // (IN2) Above permissable value (Yellow: 100,00 x Teach/Red: 120,00 x Teach) // ()																					
19	003	01	Inner rac	11.2080	2.0000	Inner race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																					
20	004	01	Outer rac	8.7920	2.0000	Outer race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																					
21	005	01	Rolling el	7.8770	2.0000	Rolling elements [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																					
22	006	02	Inner rac	12.2440	2.0000	Inner race [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																					
23	007	02	Outer rac	9.7560	2.0000	Outer race [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																					
24	008	02	Rolling el	8.4290	2.0000	Rolling elements [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																					
25	011	05	Inner rac	11.2780	2.0010	Inner race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)																					
26	012	05	Outer rac	8.7220	2.0010	Outer race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)																					
27	013	05	Rolling el	7.4330	2.0010	Rolling elements [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)																					
28	03	00000	00000	0.0020	0.1250	0.0000	0.0000	0	0	02	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01
29	00	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	6553
30	00	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	6553
31	00	envelope	0	0.0000	0.0000																						
32	01	GMonitor	0	0.0000	0.0000																						
33	02	GMonitor	0	0.0000	0.0000																						
34	03	envelope	2	0.0000	0.0240																						
35	04	envelope	2	0.0000	0.0240																						
36	05	envelope	2	0.0000	0.0240																						
37	06	envelope	2	0.0000	0.0240																						
38	07	GMonitor	1	0.0390	0.0000																						
39	08	GMonitor	1	0.0390	0.0000																						
40	09	envelope	1	0.0590	0.0000																						
41	10	envelope	3	0.0090	0.1190																						
42	00	00	-01	1			554,510	555,4900																			
43	01	00	00	1			2,0000	6000,0000																			
44	02	00	02	1			120,000	3000,0000																			
45	03	00	-01	1			0,5100	1,4900																			
46	04	01	01	0	Nm		2,9998	144,0002																			
47	Time	ID	Value	Speed	Status	LED	Object-I	OUT 1	OUT 1,2	I/O 1-8	aux 1	aux 2	aux 3	aux 4	aux 5	aux 6	aux 7	aux 8	aux 9	aux 10	aux 11	aux 12	aux 13	aux 14	aux 15	aux 16	aux
48	27.08.20	03	0.1236	00001	00000	000	00	0.0000	000	000	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	0000

The most important header data in this case can be found in lines 7...15 (violet, diagnosis objects) and 42…46 (yellow, speed values).

Violet:

Column	Content
A	identification number (ID) of the diagnosis objects
P	information pertaining to the diagnosis objects in clear text e.g. object name, output unit and limit values

Yellow:

Column	Content
A	identifikation number (ID) of the speed values
E	the unit
F	a description of the value inputs

	A	B	C	D	E	F	G	H	I	J
45	03	00	-01	1			0,5100	1,4900		
46	04	01	01	0	Nm		2,9998	144,0002		
47	Time	ID	Value	Speed	Status	LED	Object-ID	OUT 1	OUT 1,2	I/O 1-8
48	27.08.2010 15:14:14	03	0.1236	00001	00000	000	00	0.0000	000	000
49	27.08.2010 15:14:14	04	23.1003	00001	00000	000	00	0.0000	000	000
50	27.08.2010 15:14:14	08	0.1861	00001	00000	000	00	0.0000	000	000
51	27.08.2010 15:14:14	06	0.0000	00001	00000	000	00	0.0000	000	000
52	27.08.2010 15:14:14	03	0.1157	00001	00000	000	00	0.0000	000	000
53	27.08.2010 15:14:14	04	22.8455	00001	00000	000	00	0.0000	000	000
54	27.08.2010 15:14:14	08	0.3005	00001	00000	000	00	0.0000	000	000
55	27.08.2010 15:14:14	06	0.0000	00001	00000	000	00	0.0000	000	000
56	27.08.2010 15:14:14	03	0.1001	00001	00000	000	00	0.0000	000	000
57	27.08.2010 15:14:14	04	22.7359	00001	00000	000	00	0.0000	000	000
58	27.08.2010 15:14:14	08	0.3497	00001	00000	000	00	0.0000	000	000
59	27.08.2010 15:14:14	06	0.0000	00001	00000	000	00	0.0000	000	000
60	27.08.2010 15:14:14	03	0.0915	00001	00000	000	00	0.0000	000	000
61	27.08.2010 15:14:14	04	20.5649	00001	00000	000	00	0.0000	000	000
62	27.08.2010 15:14:14	08	0.2595	00001	00000	000	00	0.0000	000	000
63	27.08.2010 15:14:15	06	0.0000	00001	00000	000	00	0.0000	000	000
64	27.08.2010 15:14:15	03	0.0733	00001	00000	000	00	0.0000	000	000
65	27.08.2010 15:14:15	04	22.6892	00001	00000	000	00	0.0000	000	000

	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
45														
46														
47	aux 1	aux 2	aux 3	aux 4	aux 5	aux 6	aux 7	aux 8	aux 9	aux 10	aux 11	aux 12	aux 13	aux 14
48	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
49	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
50	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
51	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
52	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
53	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
54	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
55	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
56	00001	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
57	00001	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
58	00001	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
59	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
60	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
61	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
62	00000	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
63	00001	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
64	00001	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000
65	00001	00000	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000

The data being recorded are below the title line (in this case line 47):

Column	Content	
A	time stamp which is exact to the second	
B	ID of the relevant diagnosis objects	
C	measured value in the unit, which is given in the header for the diagnosis object	
D	speed assigned to the diagnosis in [rpm]	
E	more measurement details (as a bit mask):	
F	status of the LED display (as a bit mask):	
	Bit 0: Sens1 Yellow Bit 1: Sens2 Yellow Bit 2: Sens3 Yellow Bit 3: Sens4 Yellow	Bit 4: Sens1 Red Bit 5: Sens2 Red Bit 6: Sens3 Red Bit 7: Sens4 Red
G	diagnosis object ID, the value of which is output on OUT1	
H	output current on OUT1 in [mA]	
I	switching output status OUT1 and OUT2 (as a bit mask):	
	Bit 0: OUT1 switched	Bit 1: OUT2 switched
J	switching output status I/O 1...I/O 8 (as a bit mask):	
	Bit 0: I/O 1 switched Bit 1: I/O 2 switched Bit 2: I/O 3 switched Bit 3: I/O 4 switched	Bit 4: I/O 5 switched Bit 5: I/O 6 switched Bit 6: I/O 7 switched Bit 7: I/O 8 switched
K, L	input values in [rpm] for input 1/2 or in other units	
M...AJ	valid speed values in [rpm] or in other units, which are given under speed in the header: M "aux3" = ID 0 N "aux4" = ID 1 O "aux5" = ID 2...	

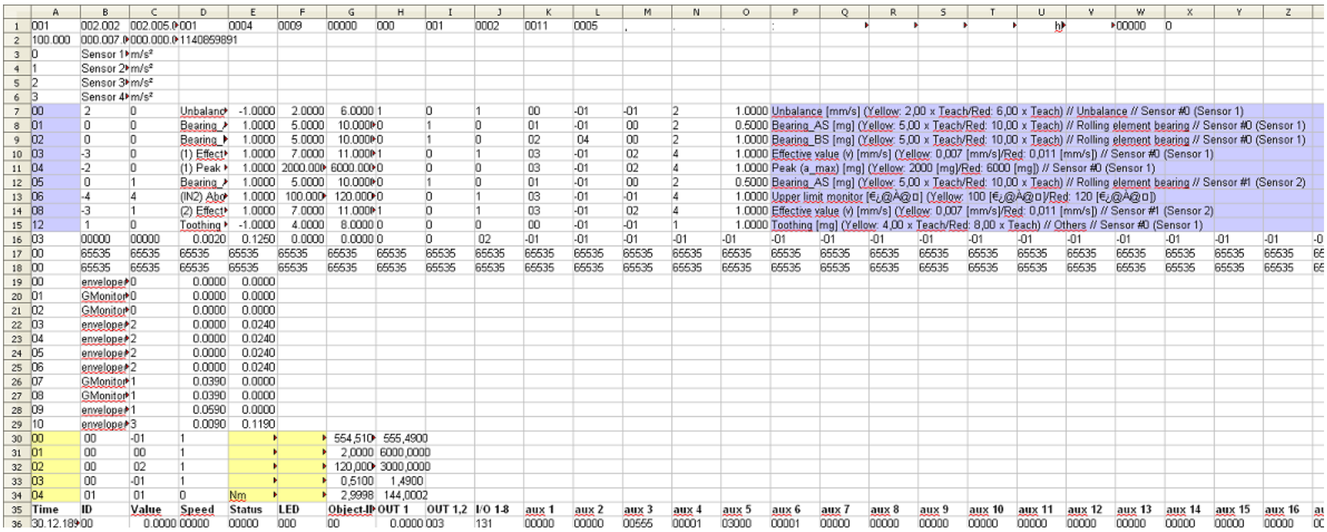
UK

9.2.2 CSV > Objects (OBJ)

The CSV values are separated using a semicolon (;), as in this example opened with "OpenOffice Calc".

The decimal separator used is the character used in line 1, column N.

NOTE: The contained data can be shown differently depending on the program used.



The most important header data in this case are given in lines 7...15 (violet, diagnosis objects) and 30…34 (yellow, speed values).

Violet:

Column	Content
A	identification number (ID) of the diagnosis objects
P	information pertaining to the diagnosis objects in clear text e.g. object name, output unit and limit values

Yellow:

Column	Content
A	identifikation number (ID) of the speed values
E	the unit
F	a description of the value inputs

	A	B	C	D	E	F	G	H	I	J	K	L
32	02	00	02	1			120,000	3000,0000				
33	03	00	-01	1			0,5100	1,4900				
34	04	01	01	0	Nm		2,9998	144,0002				
35	Time	ID	Value	Speed	Status	LED	Object-ID	OUT 1	OUT 1,2	I/O 1-8	aux 1	aux 2
36	30.12.1899	00	0.0000	00000	00000	000	00	0.0000	003	131	00000	00000
37	27.08.2010 15:14:26	01	0.0000	00000	00012	000	00	0.0000	003	131	00000	00000
38	27.08.2010 15:14:26	02	0.9431	03000	00256	000	00	0.0000	003	131	00000	00000
39	27.08.2010 15:14:27	05	0.0000	00000	00012	000	00	0.0000	003	131	00000	00000
40	27.08.2010 15:14:27	12	0.2107	00555	00016	000	00	0.0000	003	131	00001	00000
41	27.08.2010 15:14:28	00	0.0206	00555	00016	000	00	0.0000	003	131	00000	00000
42	27.08.2010 15:14:29	01	0.0000	00000	00012	000	00	0.0000	003	131	00000	00000

	M	N	O	P	Q	R	S	T	U	V	W	X	Y
32													
33													
34													
35	aux 3	aux 4	aux 5	aux 6	aux 7	aux 8	aux 9	aux 10	aux 11	aux 12	aux 13	aux 14	aux 15
36	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
37	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
38	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
39	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
40	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
41	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
42	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000

The data being recorded are below the title line (in this case line 35):

Column	Content
A	time stamp which is exact to the second
B	ID of the relevant diagnosis objects
C	measured value in the unit, which is given in the header for the diagnosis object
D	speed assigned to the diagnosis object in [rpm]
E	more measurement details (as a bit mask):
F	status of the LED display (as a bit mask): Bit 0: Sens1 Yellow Bit 1: Sens2 Yellow Bit 2: Sens3 Yellow Bit 3: Sens4 Yellow Bit 4: Sens1 Red Bit 5: Sens2 Red Bit 6: Sens3 Red Bit 7: Sens4 Red
G	diagnosis object ID, the value of which is output on OUT1
H	output current on OUT1 in [mA]
I	switching output status OUT1 and OUT2 (as a bit mask): Bit 0: OUT1 switched Bit 1: OUT2 switched
J	switching output status I/O 1...I/O 8 (as a bit mask): Bit 0: I/O 1 switched Bit 1: I/O 2 switched Bit 2: I/O 3 switched Bit 3: I/O 4 switched Bit 4: I/O 5 switched Bit 5: I/O 6 switched Bit 6: I/O 7 switched Bit 7: I/O 8 switched
K, L	input values in [rpm] for input 1/2 or in other units
M...AJ	valid speed values in [rpm] or in other units, which are given under speed in the header: M "aux3" = ID 0 N "aux4" = ID 1 O "aux5" = ID 2...

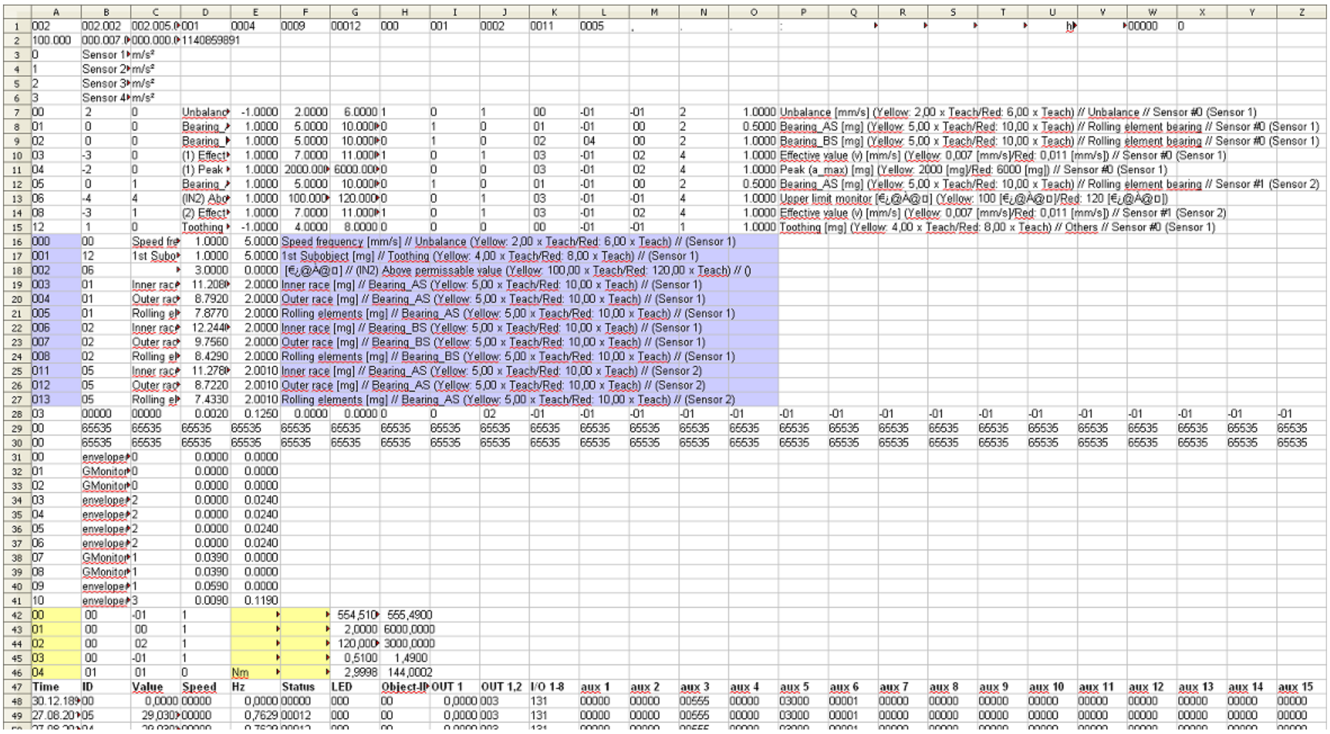
UK

9.2.3 CSV > Subobjects (SUB)

The CSV values are separated using a semicolon (;), as in this example opened with "OpenOffice Calc".

The decimal separator used is the character used in line 1, column N.

NOTE: The contained data can be shown differently depending on the program used.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	002	002.002	002.005.0	001	0004	0009	00012	000	001	0002	0011	0005	.	.	.	:					h		00000	0		
2	100.000	000.007.0	000.000.0	1140859891																						
3	0	Sensor 1	m/s^2																							
4	1	Sensor 2	m/s^2																							
5	2	Sensor 3	m/s^2																							
6	3	Sensor 4	m/s^2																							
7	00	2	0	Unbaland	-1.0000	2.0000	6.0000	1	0	1	00	-01	-01	2	1.0000	Unbalance [mm/s] (Yellow: 2,00 x Teach/Red: 6,00 x Teach) // Unbalance // Sensor #0 (Sensor 1)										
8	01	0	0	Bearing_A	1.0000	5.0000	10.000	0	1	0	01	-01	00	2	0.5000	Bearing_AS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #0 (Sensor 1)										
9	02	0	0	Bearing_	1.0000	5.0000	10.000	0	1	0	02	04	00	2	1.0000	Bearing_BS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #0 (Sensor 1)										
10	03	-3	0	(1) Effect	1.0000	7.0000	11.000	1	0	1	03	-01	02	4	1.0000	Effective value (v) [mm/s] (Yellow: 0,007 [mm/s]/Red: 0,011 [mm/s]) // Sensor #0 (Sensor 1)										
11	04	-2	0	(1) Peak	1.0000	2000.000	6000.000	0	0	0	03	-01	02	4	1.0000	Peak (a_max) [mg] (Yellow: 2000 [mg]/Red: 6000 [mg]) // Sensor #0 (Sensor 1)										
12	05	0	1	Bearing_A	1.0000	5.0000	10.000	0	1	0	01	-01	00	2	0.5000	Bearing_AS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #1 (Sensor 2)										
13	06	-4	4	(IN2) Abo	1.0000	100.000	120.000	0	0	1	03	-01	-01	4	1.0000	Upper limit monitor [€¿@À@¤] (Yellow: 100 [€¿@À@¤]/Red: 120 [€¿@À@¤])										
14	08	-3	1	(2) Effect	1.0000	7.0000	11.000	1	0	1	03	-01	02	4	1.0000	Effective value (v) [mm/s] (Yellow: 0,007 [mm/s]/Red: 0,011 [mm/s]) // Sensor #1 (Sensor 2)										
15	12	1	0	Toothing	-1.0000	4.0000	8.0000	0	0	0	00	-01	-01	1	1.0000	Toothing [mg] (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // Others // Sensor #0 (Sensor 1)										
16	000	00	Speed fre	1.0000	5.0000	Speed frequency [mm/s] // Unbalance (Yellow: 2,00 x Teach/Red: 6,00 x Teach) // (Sensor 1)																				
17	001	12	1st Subo	1.0000	5.0000	1st Subobject [mg] // Toothing (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // (Sensor 1)																				
18	002	06		3.0000	0.0000	[€¿@À@¤] // (IN2) Above permissable value (Yellow: 100,00 x Teach/Red: 120,00 x Teach) // ()																				
19	003	01	Inner rac	11.208	2.0000	Inner race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																				
20	004	01	Outer rac	8.7920	2.0000	Outer race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																				
21	005	01	Rolling el	7.8770	2.0000	Rolling elements [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																				
22	006	02	Inner rac	12.244	2.0000	Inner race [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																				
23	007	02	Outer rac	9.7560	2.0000	Outer race [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																				
24	008	02	Rolling el	8.4290	2.0000	Rolling elements [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)																				
25	011	05	Inner rac	11.278	2.0010	Inner race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)																				
26	012	05	Outer rac	8.7220	2.0010	Outer race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)																				
27	013	05	Rolling el	7.4330	2.0010	Rolling elements [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)																				
28	03	00000	00000	0.0020	0.1250	0.0000	0.0000	0	0	02	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01
29	00	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
30	00	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
31	00	envelope	0	0.0000	0.0000																					
32	01	GMonitor	0	0.0000	0.0000																					
33	02	GMonitor	0	0.0000	0.0000																					
34	03	envelope	2	0.0000	0.0240																					
35	04	envelope	2	0.0000	0.0240																					
36	05	envelope	2	0.0000	0.0240																					
37	06	envelope	2	0.0000	0.0240																					
38	07	GMonitor	1	0.0390	0.0000																					
39	08	GMonitor	1	0.0390	0.0000																					
40	09	envelope	1	0.0590	0.0000																					
41	10	envelope	3	0.0090	0.1190																					
42	00	00	-01	1			554,510	555,4900																		
43	01	00	00	1			2,0000	6000,0000																		
44	02	00	02	1			120,000	3000,0000																		
45	03	00	-01	1			0,5100	1,4900																		
46	04	01	01	0	Nm		2,9998	144,0002																		
47	Time	ID	Value	Speed	Hz	Status	LED	Object-ID	OUT 1	OUT 1,2	I/O 1-8	aux 1	aux 2	aux 3	aux 4	aux 5	aux 6	aux 7	aux 8	aux 9	aux 10	aux 11	aux 12	aux 13	aux 14	aux 15
48	30.12.189	00	0,0000	00000	0,0000	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
49	27.08.20	05	29,030	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000

The most important header data in this case are given in lines 16…26 (violet, subobjects) and 42…46 (yellow, speed values).

Violet:

Column	Content
A	Identification number (ID) of the subbjects
F	information pertaining to the subobjects in clear text e.g subobject name, output unit and affiliation

Yellow:

Column	Content
A	identifikation number (ID) of the speed values
E	the unit
F	a description of the value inputs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
45	03	00	-01	1			0,5100	1,4900																
46	04	01	01	0	Nm		2,9998	144,0002																
47	**Time**	**ID**	**Value**	**Speed**	**Hz**	**Status**	**LED**	**Object-ID**	**OUT 1**	**OUT 1,2**	**I/O 1-8**	**aux 1**	**aux 2**	**aux 3**	**aux 4**	**aux 5**	**aux 6**	**aux 7**	**aux 8**	**aux 9**	**aux 10**	**aux 11**	**aux 12**	**aux 13**
48	30.12.1899	00	0,0000	00000	0,0000	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
49	27.08.2010 15:14:33	05	29,0302	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
50	27.08.2010 15:14:33	04	29,0302	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
51	27.08.2010 15:14:33	03	29,0302	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
52	27.08.2010 15:14:33	08	0,2069	03000	429,5349	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
53	27.08.2010 15:14:33	07	0,4202	03000	492,0959	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
54	27.08.2010 15:14:33	06	0,2691	03000	608,8257	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
55	27.08.2010 15:14:34	13	36,6305	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
56	27.08.2010 15:14:34	12	36,6305	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
57	27.08.2010 15:14:34	11	36,6305	00000	0,7629	00012	000	00	0,0000	003	131	00001	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
58	27.08.2010 15:14:35	01	0,2908	00555	6,1035	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
59	27.08.2010 15:14:35	00	0,0145	00555	7,6294	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
60	27.08.2010 15:14:37	05	29,1868	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
61	27.08.2010 15:14:37	04	29,1868	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
62	27.08.2010 15:14:37	03	29,1868	00000	0,7629	00012	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
63	27.08.2010 15:14:37	08	0,2447	03000	414,2761	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000
64	27.08.2010 15:14:37	07	0,3143	03000	498,1995	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000	00000

The data being recorded are below the title line (in this case line 35):

<table>
<tr><th>Column</th><th colspan="2">Content</th></tr>
<tr><td>A</td><td colspan="2">time stamp which is exact to the second</td></tr>
<tr><td>B</td><td colspan="2">ID of the relevant subobjects</td></tr>
<tr><td>C</td><td colspan="2">measured value in the unit, which is given in the header for the subobject</td></tr>
<tr><td>D</td><td colspan="2">speed assigned to the subobject in [rpm]</td></tr>
<tr><td>E</td><td colspan="2">position in [Hz] peak pertaining to the subject within the spectrum</td></tr>
<tr><td>F</td><td colspan="2">more measurement details (as a bit mask):</td></tr>
<tr><td rowspan="2">G</td><td colspan="2">status of the LED display (as a bit mask):</td></tr>
<tr><td>Bit 0: Sens1 Yellow
Bit 1: Sens2 Yellow
Bit 2: Sens3 Yellow
Bit 3: Sens4 Yellow</td><td>Bit 4: Sens1 Red
Bit 5: Sens2 Red
Bit 6: Sens3 Red
Bit 7: Sens4 Red</td></tr>
<tr><td>H</td><td colspan="2">diagnosis object ID, the value of which is output on OUT1</td></tr>
<tr><td>I</td><td colspan="2">output current on OUT1 in [mA]</td></tr>
<tr><td rowspan="2">J</td><td colspan="2">switching output status OUT1 and OUT2 (as a bit mask):</td></tr>
<tr><td>Bit 0: OUT1 switched</td><td>Bit 1: OUT2 switched</td></tr>
<tr><td rowspan="2">K</td><td colspan="2">switching output status I/O 1...I/O 8 (as a bit mask):</td></tr>
<tr><td>Bit 0: I/O 1 switched
Bit 1: I/O 2 switched
Bit 2: I/O 3 switched
Bit 3: I/O 4 switched</td><td>Bit 4: I/O 5 switched
Bit 5: I/O 6 switched
Bit 6: I/O 7 switched
Bit 7: I/O 8 switched</td></tr>
<tr><td>L, M</td><td colspan="2">input values in [rpm] for input 1/2 or in other units</td></tr>
<tr><td>N...AK</td><td colspan="2">valid speed values in [rpm] or in other units, which are given under speed in the header:
N "aux3" = ID 0
O "aux4" = ID 1
P "aux5" = ID 2...</td></tr>
</table>

UK

9.2.4 CSV > Spectral Display (SPEC)

The CSV values are separated using a semicolon (;), as in this example opened with "OpenOffice Calc".

The decimal separator used is the character used in line 1, column N.

NOTE: The contained data can be shown differently depending on the program used.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	003	002.000	002.005.0	001	0004	0009	00012	001	001	0002	0011	0005	,	.	.	:					h
2	100.000	000.007.0	000.000.0	1140859891																	
3	0	Sensor 1	m/s²																		
4	1	Sensor 2	m/s²																		
5	2	Sensor 3	m/s²																		
6	3	Sensor 4	m/s²																		
7	00	2	0	Unbalanc	-1.0000	2.0000	6.0000	1	0	1	00	-01	-01	2	1.0000	Unbalance [mm/s] (Yellow: 2,00 x Teach/Red: 6,00 x Teach)					
8	01	0	0	Bearing_	1.0000	5.0000	10.000	0	1	0	01	-01	00	2	0.5000	Bearing_AS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach)					
9	02	0	0	Bearing_	1.0000	5.0000	10.000	0	1	0	02	04	00	2	1.0000	Bearing_BS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach)					
10	03	-3	0	(1) Effect	1.0000	7.0000	11.000	1	0	1	03	-01	02	4	1.0000	Effective value (v) [mm/s] (Yellow: 0,007 [mm/s]/Red: 0,011 [r					
11	04	-2	0	(1) Peak	1.0000	2000.000	6000.00	0	0	0	03	-01	02	4	1.0000	Peak (a_max) [mg] (Yellow: 2000 [mg]/Red: 6000 [mg]) // Se					
12	05	0	1	Bearing_	1.0000	5.0000	10.000	0	1	0	01	-01	00	2	0.5000	Bearing_AS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach)					
13	06	-4	4	(IN2) Abo	1.0000	100.000	120.000	0	0	1	03	-01	-01	4	1.0000	Upper limit monitor [€¿@À@¤] (Yellow: 100 [€¿@À@¤]/Rec					
14	08	-3	1	(2) Effect	1.0000	7.0000	11.000	1	0	1	03	-01	02	4	1.0000	Effective value (v) [mm/s] (Yellow: 0,007 [mm/s]/Red: 0,011 [r					
15	12	1	0	Toothing	-1.0000	4.0000	8.0000	0	0	0	00	-01	-01	1	1.0000	Toothing [mg] (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // Ot					
16	00	00	Speed fre	1.0000	5.0000	Speed frequency [mm/s] // Unbalance (Yellow: 2,00 x Teach/Red: 6,00 x Teach) // (Sensor 1)															
17	01	12	1st Subo	1.0000	5.0000	1st Subobject [mg] // Toothing (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // (Sensor 1)															
18	02	06		3.0000	0.0000	[€¿@À@¤] // (IN2) Above permissable value (Yellow: 100,00 x Teach/Red: 120,00 x Teach) // ()															
19	03	01	Inner rac	11.208	2.0000	Inner race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)															
20	04	01	Outer rac	8.7920	2.0000	Outer race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)															
21	05	01	Rolling el	7.8770	2.0000	Rolling elements [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)															
22	06	02	Inner rac	12.244	2.0000	Inner race [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)															
23	07	02	Outer rac	9.7560	2.0000	Outer race [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)															
24	08	02	Rolling el	8.4290	2.0000	Rolling elements [mg] // Bearing_BS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 1)															
25	11	05	Inner rac	11.278	2.0010	Inner race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)															
26	12	05	Outer rac	8.7220	2.0010	Outer race [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)															
27	13	05	Rolling el	7.4330	2.0010	Rolling elements [mg] // Bearing_AS (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // (Sensor 2)															
28	0.0000	1.5259	0	0	850	0	2	-01	Method of analysis: FFT // 0 - 1297 Hz // 1,52588 distance between values // Unit: mg // Filter: (not specified)												
29	03	00000	00000	0.0020	0.1250	0.0000	0.0000	0	0	02	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01	-01
30	00	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
31	00	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
32	00	envelope	0	0.0000	0.0000																
33	01	GMonitor	0	0.0000	0.0000																
34	02	GMonitor	0	0.0000	0.0000																
35	03	envelope	2	0.0000	0.0240																
36	04	envelope	2	0.0000	0.0240																
37	05	envelope	2	0.0000	0.0240																
38	06	envelope	2	0.0000	0.0240																
39	07	GMonitor	1	0.0390	0.0000																
40	08	GMonitor	1	0.0390	0.0000																
41	09	envelope	1	0.0590	0.0000																
42	10	envelope	3	0.0090	0.1190																
43	00	00	-01	1			554,510	555,4900													
44	01	00	00	1			2,0000	6000,0000													
45	02	00	02	1			120,000	3000,0000													
46	03	00	-01	1			0,5100	1,4900													
47	04	01	01	0	Nm		2,9998	144,0002													

The most important header data in this case are given in lines 28 (violet, settings) and 43…47 (yellow, speed values).

Violet:

Column	Content
I	information such as analysis method, frequency band, resolution, measurement value

Yellow:

Column	Content
A	identifikation number (ID) of the speed values
E	the unit
F	a description of the value inputs

	A	B	C	D	E	F	G	H	I	J	K
46	03	00	-01	1			0,5100	1,4900			
47	04	01	01	0	Nm		2,9998	144,0002			
48	**Time**	**Speed[0]**	**Speed[1]**	**Speed[2]**	**Speed[3]**	**Speed[4]**	**Speed[5]**	**Speed[6]**	**Speed[7]**	**Speed[8]**	**Speed[9]**
49	27.08.2010 15:14:44	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000
50	27.08.2010 15:14:45	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000
51	27.08.2010 15:14:46	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000
52	27.08.2010 15:14:46	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000
53	27.08.2010 15:14:47	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000
54	27.08.2010 15:14:48	00555	00000	03000	00001	00000	00000	00000	00000	00000	00000
55	27.08.2010 15:14:48	00555	00001	03000	00001	00000	00000	00000	00000	00000	00000

	L	M	N	O	P	Q	R	S	T	U	V
46											
47											
48	**Speed[10]**	**Speed[11]**	**Speed[12]**	**Speed[13]**	**Speed[14]**	**Speed[15]**	**Speed[16]**	**Speed[17]**	**Speed[18]**	**Speed[19]**	**Speed[20]**
49	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
50	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
51	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
52	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
53	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
54	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000
55	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000

The data being recorded are below the title line (in this case line 48):

Column	Content
A	time stamp which is exact to the second
B...Y	valid speed values in [rpm] or in other units, which are given under speed in the header: B "Speed[0]" = ID 0 C "Speed[1]" = ID 1 D "Speed[2]" = ID 2...

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
46											
47											
48	**Speed[23]**	**LED**	**Object-ID**	**OUT 1**	**OUT 1,2**	**I/O 1-8**	**aux 1**	**aux 2**	**aux 3**	**aux 4**	**aux 5**
49	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000
50	00000	000	00	0,0000	003	131	00001	00000	00555	00000	03000
51	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000
52	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000
53	00000	000	00	0,0000	003	131	00001	00000	00555	00000	03000
54	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000
55	00000	000	00	0,0000	003	131	00000	00000	00555	00000	03000

	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
46										
47										
48	**aux 6**	**aux 7**	**aux 8**	**aux 9**	**aux 10**	**aux 11**	**aux 12**	**aux 13**	**aux 14**	**aux 15**
49	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
50	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
51	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
52	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
53	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
54	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000
55	00001	00000	00000	00000	00000	00000	00000	00000	00000	00000

<table>
<tr><th>Column</th><th colspan="2">Content</th></tr>
<tr><td rowspan="2">Z</td><td colspan="2">status of the LED display (as a bit mask):</td></tr>
<tr><td>Bit 0: Sens1 Yellow
Bit 1: Sens2 Yellow
Bit 2: Sens3 Yellow
Bit 3: Sens4 Yellow</td><td>Bit 4: Sens1 Red
Bit 5: Sens2 Red
Bit 6: Sens3 Red
Bit 7: Sens4 Red</td></tr>
<tr><td>AA</td><td colspan="2">diagnosis object ID, the value of which is output on OUT1</td></tr>
<tr><td>AB</td><td colspan="2">output current on OUT1 in [mA]</td></tr>
<tr><td rowspan="2">AC</td><td colspan="2">switching output status OUT1 and OUT2 (as a bit mask):</td></tr>
<tr><td>Bit 0: OUT1 switched</td><td>Bit 1: OUT2 switched</td></tr>
<tr><td rowspan="2">AD</td><td colspan="2">switching output status I/O 1...I/O 8 (as a bit mask):</td></tr>
<tr><td>Bit 0: I/O 1 switched
Bit 1: I/O 2 switched
Bit 2: I/O 3 switched
Bit 3: I/O 4 switched</td><td>Bit 4: I/O 5 switched
Bit 5: I/O 6 switched
Bit 6: I/O 7 switched
Bit 7: I/O 8 switched</td></tr>
<tr><td>AE, AF</td><td colspan="2">input values in [rpm] for input 1/2 or in other units</td></tr>
<tr><td>AG...BD</td><td colspan="2">valid speed values in [rpm] or in other units, which are given under speed in the header:
AG "aux3" = ID 0
AH "aux4" = ID 1
AI "aux5" = ID 2...</td></tr>
</table>

UK

	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO
46												
47												
48	aux 26	Value	Value	Value	...							
49	00000	0.00000	0.38500	0.29076	0.11862	0.16446	0.18423	0.09277	0.27894	0.40087	0.20289	0.13376
50	00000	0.00000	0.17418	0.06328	0.12311	0.14897	0.10238	0.03588	0.09003	0.06652	0.19568	0.19478
51	00000	0.00000	0.07147	0.08766	0.27658	0.23272	0.05367	0.08912	0.08364	0.13209	0.30191	0.20087
52	00000	0.00000	0.05416	0.08128	0.14941	0.21964	0.17796	0.05581	0.20514	0.37229	0.28083	0.20608
53	00000	0.00000	0.32529	0.11192	0.04444	0.10661	0.14149	0.13959	0.07730	0.04001	0.14758	0.16354
54	00000	0.00000	0.45760	0.34202	0.05859	0.12356	0.17101	0.07853	0.18557	0.17661	0.06189	0.23264
55	00000	0.00000	0.27404	0.16410	0.02663	0.15992	0.16734	0.05600	0.19872	0.13029	0.10148	0.15253

	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	C
46												
47												
48												
49	0.13778	0.08045	0.19499	0.06614	0.11313	0.09795	0.14363	0.10949	0.08399	0.14711	0.17239	0.1
50	0.09341	0.09751	0.11731	0.06182	0.09899	0.13299	0.07353	0.26878	0.29117	0.02015	0.16310	0.1
51	0.08932	0.18274	0.09710	0.09820	0.08421	0.05982	0.17379	0.16319	0.04792	0.06278	0.17541	0.0
52	0.08704	0.13073	0.25039	0.32548	0.19073	0.08769	0.09104	0.09224	0.13235	0.14938	0.08670	0.0
53	0.00902	0.03580	0.03873	0.03117	0.09141	0.14248	0.07844	0.06244	0.15360	0.19801	0.13862	0.2
54	0.26886	0.14821	0.16270	0.21568	0.30764	0.39963	0.40681	0.23884	0.10272	0.06761	0.07171	0.1
55	0.25828	0.22221	0.07323	0.07700	0.07858	0.04386	0.08483	0.26329	0.35765	0.21476	0.17324	0.1

Column	Content
BE...end of line	the individually measured amplitudes on the mesh points startings with the first position of the frequency band spaced according to the resolution (frequeny band and resolution see header data) For example: Frequency band "0…1297 Hz" and resolution "1.52588" Hz": 0Hz, 1.52588 Hz, 3.05176 Hz, 4.57764 Hz etc.

UK

9.2.5 CSV > History (H)

The CSV values are separated using a semicolon (;), as in this example opened with "OpenOffice Calc".

The decimal separator used is the character used in line 1, column H.

NOTE: The contained data can be shown differently depending on the program used.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	H	003.001	002.005.0	0004	0009	0002	,	.	.	:					h		00000	27.08.20	30.12.1899 00:01:09		
2	100.000	000.007.011	000.000.0	1140859891																	
3	0	Sensor 1	m/s^2																		
4	1	Sensor 2	m/s^2																		
5	2	Sensor 3	m/s^2																		
6	3	Sensor 4	m/s^2																		
7	00	Unbalance [m/s] (Yellow: 2,00 x Teach/Red: 6,00 x Teach) // Unbalance // Sensor #0 (Sensor 1)																			
8	2	0	Unbalanc	-1	-1,0000	2,0000	6,0000	1	1	0,000	554,510	555,490	0,000	0,000	0,000		65535	65535	65535	65535	6553
9	01	Bearing_AS [mg] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #0 (Sensor 1)																			
10	0	0	Bearing_A	-1	1,0000	5,0000	10,0000	0	0	3000,00	2,000	6000,00	0,000	0,000	0,000		65535	65535	65535	65535	6553
11	02	Bearing_BS [m/s^2] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #0 (Sensor 1)																			
12	0	0	Bearing_	4	1,0000	5,0000	10,0000	0	0	3000,00	120,000	3000,00	73,000	3,000	144,000		65535	65535	65535	65535	6553
13	03	Effective value (v) [m/s] (Yellow: 0,007 [m/s]/Red: 0,011 [m/s]) // Sensor #0 (Sensor 1)																			
14	-3	0	(1) Effect	-1	1,0000	7,0000	11,0000	1	1	1,000	0,510	1,490	0,000	0,000	0,000		65535	65535	65535	65535	6553
15	04	Peak (a_max) [m/s^2] (Yellow: 19613 [m/s^2]/Red: 58840 [m/s^2]) // Sensor #0 (Sensor 1)																			
16	-2	0	(1) Peak	-1	1,0000	2000,000	6000,000	0	0	1,000	0,510	1,490	0,000	0,000	0,000		65535	65535	65535	65535	6553
17	05	Bearing_AS [m/s^2] (Yellow: 5,00 x Teach/Red: 10,00 x Teach) // Rolling element bearing // Sensor #1 (Sensor 2)																			
18	0	1	Bearing_A	-1	1,0000	5,0000	10,0000	0	0	3000,00	2,000	6000,00	0,000	0,000	0,000		65535	65535	65535	65535	6553
19	06	Upper limit monitor [Nm] (Yellow: 100,000 [Nm]/Red: 120,000 [Nm]) // Measurement value input #4 (Input 2)																			
20	-4	4	Upper lim	-1	3,0000	100,000	120,000	0	1	1,000	0,510	1,490	0,000	0,000	0,000		65535	65535	65535	65535	6553
21	08	Effective value (v) [m/s] (Yellow: 0,007 [m/s]/Red: 0,011 [m/s]) // Sensor #1 (Sensor 2)																			
22	-3	1	(2) Effect	-1	1,0000	7,0000	11,0000	1	1	1,000	0,510	1,490	0,000	0,000	0,000		65535	65535	65535	65535	6553
23	12	Toothing [m/s^2] (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // Others // Sensor #0 (Sensor 1)																			
24	1	0	Toothing	-1	-1,0000	4,0000	8,0000	0	0	0,000	554,510	555,490	0,000	0,000	0,000		65535	65535	65535	65535	6553
25	00	[]																			
26	0	-1	1			554,51	555,490														
27	04	Input 2 [Nm]																			
28	1	1	0	Nm		3,000	144,000														
29	8	I/O 7	0 D., 0 h, 0 min, 0 sec (Alarm limit: 0 D., 1 h, 0 min, 0 sec)																		
30	6	6	0	3600	0																
31	**1/2**	**Time (GMT)**	**VTP/App**	**Diagnos**	**Value/Tea**	**Speed**	**W1**	**W2**	**AV**	**Flags**											
32	1	27.08.2010 11:37:36	000	08	0,0028	-INF	-INF	-INF	0,000	0000000000000000											
33	1	27.08.2010 12:21:34	000	07	0,4207	-INF	-INF	-INF	-INF	0000000000000000											
34	1	27.08.2010 12:17:24	000	06	0,0007	-INF	-INF	-INF	-INF	0000000000000000											
35	1	27.08.2010 11:33:32	000	05	0,0238	-INF	-INF	-INF	-INF	0000000000000000											
36	1	27.08.2010 12:16:19	000	03	0,0001	-INF	-INF	-INF	-INF	0000000000000000											
37	1	27.08.2010 11:43:03	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000											
38	1	27.08.2010 11:08:47	000	08	0,0039	-INF	-INF	-INF	-INF	0000000000000000											
39	1	27.08.2010 10:57:08	000	07	0,4183	-INF	-INF	-INF	-INF	0000000000000000											
40	1	27.08.2010 10:48:46	000	06	0,0006	-INF	-INF	-INF	-INF	0000000000000000											

The most important header data in this case are given in lines 7, 9, 11, ..., 23 (violet, diagnosis objects).

Violet:

Column	Content
A	identification number (ID) of the diagnosis objects
B	information pertaining to the diagnosis objects in clear text e.g. object name, output unit and limit values

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
22	-3	1	(2) Effect	-1	1,0000	7,0000	11,000	1	1	1,000	0,510	1,490	0,000	0,000	0,000		65535	6553
23	12	Toothing [mg] (Yellow: 4,00 x Teach/Red: 8,00 x Teach) // Others // Sensor #0 (Sensor 1)																
24	1	0	Toothing	-1	-1,0000	4,0000	8,0000	0	0	0,000	554,510	555,490	0,000	0,000	0,000		65535	6553
25	00	[]																
26	0	-1	1			554,510	555,490											
27	04	Input 2 [Nm]																
28	1	1	0	Nm		3,000	144,000											
29	8	I/O 7	0 D., 0 h, 0 min, 0 sec (Alarm limit: 0 D., 1 h, 0 min, 0 sec)															
30	6	6	0	3600	0													
31	**1/2**	**Time (GMT)**	**VTP/App**	**Diagnos**	**Value/Tea**	**Speed**	**W1**	**W2**	**AV**	**Flags**								
32	1	27.08.2010 11:37:36	000	08	0,0028	-INF	-INF	-INF	0,000	0000000000000000								
33	1	27.08.2010 12:21:34	000	07	0,4207	-INF	-INF	-INF	-INF	0000000000000000								
34	1	27.08.2010 12:17:24	000	06	0,0007	-INF	-INF	-INF	-INF	0000000000000000								
35	1	27.08.2010 11:33:32	000	05	0,0238	-INF	-INF	-INF	-INF	0000000000000000								
36	1	27.08.2010 12:16:19	000	03	0,0001	-INF	-INF	-INF	-INF	0000000000000000								
37	1	27.08.2010 11:43:03	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000								
38	1	27.08.2010 11:08:47	000	08	0,0039	-INF	-INF	-INF	-INF	0000000000000000								
39	1	27.08.2010 10:57:08	000	07	0,4183	-INF	-INF	-INF	-INF	0000000000000000								
40	1	27.08.2010 10:48:46	000	06	0,0006	-INF	-INF	-INF	-INF	0000000000000000								
41	1	27.08.2010 11:12:30	000	05	0,0246	-INF	-INF	-INF	-INF	0000000000000000								
42	1	27.08.2010 10:48:51	000	03	0,0001	-INF	-INF	-INF	-INF	0000000000000000								
43	1	27.08.2010 11:06:28	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000								
44	1	27.08.2010 09:36:44	000	08	0,0030	-INF	-INF	-INF	-INF	0000000000000000								
45	1	27.08.2010 10:07:44	000	07	0,4118	-INF	-INF	-INF	-INF	0000000000000000								
46	1	27.08.2010 09:24:47	000	06	0,0006	-INF	-INF	-INF	-INF	0000000000000000								
47	1	27.08.2010 09:30:29	000	05	0,0227	-INF	-INF	-INF	-INF	0000000000000000								
48	1	27.08.2010 09:31:12	000	03	0,0002	-INF	-INF	-INF	-INF	0000000000000000								
49	1	27.08.2010 09:31:14	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000								
50	1	27.08.2010 09:02:16	000	08	0,0055	-INF	-INF	-INF	-INF	0000000000000000								
51	1	27.08.2010 09:03:50	000	07	0,3851	-INF	-INF	-INF	-INF	0000000000000000								
52	1	27.08.2010 09:17:40	000	06	0,0007	-INF	-INF	-INF	-INF	0000000000000000								
53	1	27.08.2010 08:45:54	000	05	0,0238	-INF	-INF	-INF	-INF	0000000000000000								
54	1	27.08.2010 08:56:53	000	03	0,0001	-INF	-INF	-INF	-INF	0000000000000000								
55	1	27.08.2010 08:55:58	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000								
56	1	27.08.2010 07:48:10	000	08	0,0232	-INF	-INF	-INF	-INF	0000000000000000								
57	1	27.08.2010 07:23:58	000	07	0,4024	-INF	-INF	-INF	-INF	0000000000000000								
58	1	27.08.2010 07:54:55	000	06	0,0010	-INF	-INF	-INF	-INF	0000000000000000								
59	1	27.08.2010 08:19:30	000	05	0,0232	-INF	-INF	-INF	-INF	0000000000000000								
60	1	27.08.2010 07:54:55	000	03	0,0002	-INF	-INF	-INF	-INF	0000000000000000								
61	1	27.08.2010 07:55:01	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000								
62	1	27.08.2010 06:43:18	000	08	0,0051	-INF	-INF	-INF	-INF	0000000000000000								
63	1	27.08.2010 06:41:57	000	07	0,4137	-INF	-INF	-INF	-INF	0000000000000000								
64	1	27.08.2010 06:30:13	000	06	0,0006	-INF	-INF	-INF	-INF	0000000000000000								
65	1	27.08.2010 06:45:25	000	05	0,0205	-INF	-INF	-INF	-INF	0000000000000000								
66	1	27.08.2010 06:29:45	000	03	0,0001	-INF	-INF	-INF	-INF	0000000000000000								
67	1	27.08.2010 06:30:28	000	00	0,0000	-INF	-INF	-INF	-INF	0000000000000000								
68	1	27.08.2010 05:33:13	000	08	0,0010	-INF	-INF	-INF	-INF	0000000000000000								
69	1	27.08.2010 06:01:57	000	07	0,4047	-INF	-INF	-INF	-INF	0000000000000000								

The history data being recorded are below the title line (in this case line 31):

Column	Content
B	time stamp which is exact to the second **Important:** The time stamp is given in GMT-time and has to be converted to local time.
D	ID of the relevant diagnosis objects
E	the highest measured value in the unit given under diagnosis object in the header
F	speed assigned to the diagnosis object in [rpm] ("-INF" if the speed recording has not been selected)
H	value of the 2nd working range assigned to the diagnosis object
I	the average value measure in the unit given under diagnosis object in the header