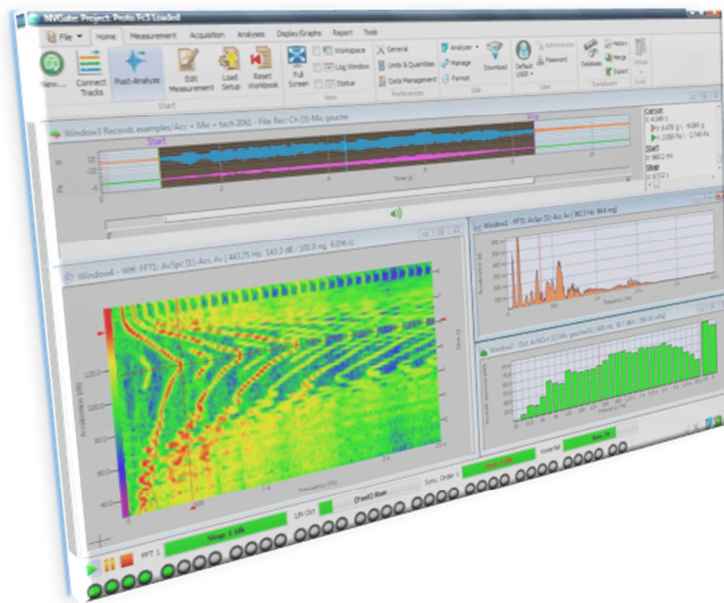


# NVGate®

**ALAVA**  
INGENIEROS  
*Tecnología a su medida*

**OROS**  
TECHNICAL  
SPECIFICATIONS

## Software Platform for OROS 3-Series



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## General description

The following specifications concern NVGate® software for OR34, OR35, OR36, OR38 and Mobi-Pack® multi-analyzer instruments. These specifications apply for on-line analysis and post analysis with or without the instrument connected to the PC. The detailed features of analyzer hardware and metrological information are available in *OR3X multi-analyzer/recorder instruments specifications* documents.

### Modules

NVGate® software is based on a general-purpose platform where optional analysis modules called plug-in analyzers are added.

The FFT plug-in features specific add-on for specialized analysis.

#### NVGate® Platform

NVGate® platform provides a comprehensive set of tools for noise and vibration acquisition, recording and analysis.

These functions are arranged in 4 parts:

- **Signal sources** that condition, provide and store time domain signals.
- **Shared resources** that apply simultaneously or independently on distributed signal to plug-in analyzers.
- **Operational tools** that increase measurement efficiency and reliability.
- **General-purpose analysis** for monitoring and result tracking.

|                                 |                               |   |
|---------------------------------|-------------------------------|---|
| <b>Signal sources</b>           | <b>Front-end</b>              | Controls dynamic inputs, generators, external synchronization/tach. input and parametric (DC) inputs.   |
|                                 | <b>Recorder</b>               | Record and store time domain signal on analyzer or PC hard disc. Records dynamic, parametric (DC) and ext. synch/tach inputs with multiple frequencies. |
|                                 | <b>Player</b>                 | Visualize, listen, playback on output or generate signals for post-analysis purpose. Based on recorded or imported time domain signal file.             |
| <b>Shared resources</b>         | <b>Filters</b>                | High/low pass, Band/Stop pass, single and double integrator, differentiator, A and C acoustic laws  |
|                                 | <b>Events</b>                 | Edge detection, DC levels, Delta DC levels, RPM, Delta RPM, Manual, Time period, combinations.  |
|                                 | <b>Weighting windows</b>      | Programmable Force and response, Hanning, Hamming, Kaiser Bessel, flat-top, uniform.  |
|                                 | <b>Tachometers</b>            | Compute RPM from ext. sync, DC and input pulses. Fractional, simulated and combined tach.   |
| <b>Operational tools</b>        | <b>Transducers management</b> | Automatic calibration, database management, calibration history, automatic setup of inputs, TEDS management.  |
|                                 | <b>Masks</b>                  | Mask editor for spectra, profiles, 1/n octave, order spectra  |
|                                 | <b>Report</b>                 | On-line report editor, automated report generation, word files.   |
|                                 | <b>Automation tools</b>       | Macros, sequence from Excel® sheet, alarms based on mask comparison, customizable control panel, restricted user profiles, remote controller interface. |
| <b>General purpose analysis</b> | <b>Monitor</b>                | 4 channels FFT analyzer with input hot swap. Statistical extraction (RMS, Max, Min, Kurtosis) from time domain with programmable band-pass filter.      |
|                                 | <b>Waterfall</b>              | Synchronized stack for 2D (spectra) and scalar (order, overall). 3D, color map and profiles displays. Extraction capabilities.                          |

### NVGate® Plug-ins analyzers

In addition to the standard functions featured in the software platform, NVGate® can receive additional plug-in analyzers that offer flexible configuration of independent analysis modes.

NVGate® features the following Plug-ins analyzers:

|                    |   |  |
|--------------------|---|--|
| <b>FFT</b>         | <b>Fast Fourier Transform</b> - Time to Frequency conversion with multiple average domains, combinable trigger, zooms and cross functions.  | General-purpose frequency analysis, machinery signature, modal analysis acquisition (hammer or shaker), machinery diagnostic.  |
| <b>FFT Add-ons</b> |   |  |
| <b>CBT</b>         | <b>Constant Band Tracking</b> - Order extraction at constant bandwidth  | Gears mesh analysis, gearboxes noise and vibration tracking.   |
| <b>FFTDiag</b>     | <b>Cepstrum, Auto</b> and cross <b>correlation, DC, Min/Max, Pk, pk/pk</b> and <b>crest factor</b> .  | Set of functions dedicated to the diagnostics of industrial rotating machineries.  |
| <b>TDA</b>         | <b>Time Domain Analysis</b> –Time view (oscilloscope). True statistical extraction, averaging.  | Machinery diagnostic, long term acquisition monitoring, critical acquisition control, large structure damping control, shocks determination, machinery health control, trend analysis. |
| <b>SOA</b>         | <b>Synchronous Order Analysis</b> - Time to Order re-sampling with angle or order averaging, acoustic weightings, multiple tach management. | Rotating machinery balancing. In vehicle order to noise correlation R&D. Pump, compressors, turbines and speed reducer/multiplier test.  |
| <b>OCT</b>         | <b>1/n Octave Constant Percentage Band filters</b> - 1/n octave detectors set with multiple averaging modes.                                | General-purpose industrial noise analysis. Vehicle acoustics R&D. Noise test.  |
| <b>OVA</b>         | <b>Overall Acoustics Detectors</b> - 3 detectors + 1 peak detection per channel with parallel averaging and acoustic weightings.            | Industrial acoustic, sound power measurements. Machinery with cycles, R&D and test.  |

### NVGate® Options

Beside the plug-ins analyzers and their add-on, the 3-Series analyzers software features options:

|            |  |  |
|------------|--|--|
| <b>IVC</b> | Instantaneous angular velocity converter | Torsionnal and acyclic measurements from multiples/rev tachometer/encoder with Ext. Synch inputs |
| <b>CTE</b> | Combined Tachometer editor               | Tachometer math editor – 2 inputs, 1 output  |
| <b>VIN</b> | Virtual inputs                           | Real-time math combination of dynamic inputs   |
| <b>VDC</b> | Virtual DC                               | Real-time math combination of parametric inputs  |

### PC requirements

|                                  |   |  |
|----------------------------------|---|--|
| <b>Minimum</b>                   | Pentium 4/ 2 GHz / 2561 MB RAM with Windows XP or 5121 MB with Windows Vista/ Graphics video with at least 32 MB dedicated (not shared) memory / 100 MB free on HD + storage for measurements and signals, CD ROM drive, 1024 x 768 display (XGA), DirectX 8.0                              |  |
| <b>Recommended (for laptop)</b>  | Intel <b>Core 2 Duo</b> / 2 GHz / 1 GB of RAM with XP/7, <b>2 GB of RAM with Vista</b> / Graphics video with <b>256 MB dedicated</b> (not shared) memory / 100 MB free on HD + storage for measurements and signals, CD or DVD ROM drive, 1400 x 1024 display (SXGA+), DirectX 10           |  |
| <b>Recommended (for desktop)</b> | Intel <b>Core 2 Duo / 2.6 GHz</b> or <b>AMD Athlon 64 X2 Dual-Core 6000+</b> / <b>3 GB</b> of RAM / Graphics video with <b>512 MB dedicated</b> (not shared) memory / 100 MB free on HD + storage for measurements and signals, CD or DVD ROM drive, 1600 x 1200 display (UXGA), DirectX 10 |  |
| <b>Connection</b>                | Type: <b>Ethernet 100base TX</b> , 100 Mbit/s - Connector: <b>RJ45</b><br>For removable disk: USB 2.0 - At least one USB port for dongle key.   |  |
| <b>Operating systems</b>         | Windows <b>XP Pro</b> Service Pack 3 (recommended), Windows <b>Vista Business</b> Service Pack 2, Windows 7   |  |

1) Waterfall depth depends on available memory. Minimum configuration does not allow waterfall storage.

## Signal sources

NVGate®/OROS 3-Series multi-analyzers platform can process signal coming from different sources. These sources are detailed in this section as modules.

### Front-end

The front-end module gathers the different input and output settings available in the instrument unit. In addition, the front-end module generates virtual signals (synthesized) when running the office mode (no unit connected to the PC) which is useful for set-up.

#### Front-end settings

|  |   |  |
|--|---|--|
| <b>Dynamic inputs</b>  | Sampling clock  | <b>102.4 kS/s to 3,200 S/s</b> or <b>65.536 kS/s to 2,048 S/s</b>  |
|  | LEMO <sup>1</sup> polarization  | <b>200 V on/off</b> per block of 8 dynamic input   |
|  | Coupling <sup>2,3</sup>   | <b>AC</b> (0.35 Hz) - <b>DC</b> - <b>ICP</b> - <b>ICP + TEDS</b> - <b>AC float</b> - <b>DC float</b> - <b>Grounded</b>   |
|  | Node information <sup>2</sup>   | <b>Label</b> - <b>component</b> - <b>node</b> - <b>direction</b> ( $\pm X, Y, Z$ ) - <b>type</b> (translation, rotation)   |
|  | Physical quantity <sup>2,3</sup>  | Any physical quantity can independently be associated to inputs.   |
|  | Sensitivity <sup>2,3</sup>  | User defined in <b>V/unit</b> .  |
|  | Range <sup>2</sup>  | <b>Pk to pk</b> expressed in the associated unit, (taking in account sensitivity) - <b>linear</b> or <b>dB</b>   |
|  | External conditioner compensation <sup>2</sup>  | <b>Gain</b> - <b>polarity</b> - <b>offset</b> .  |
|  | Filter <sup>2</sup>   | <b>Any NVGate</b> filter can independently be applied to each dynamic input (See Filters §)  |
| Auto-range   | Enable/disable auto-ranging independently on any input  |  |
| <b>Ext. sync inputs</b>  | Sampling  | over-sampled 64 time the dynamic inputs sampling   |
|  | Coupling <sup>2</sup>   | <b>AC</b> (0.35 Hz) - <b>DC</b>  |
|  | Information <sup>2</sup>  | Label  |
|  | Physical quantity <sup>2,3</sup>  | Any physical quantity can be associated to inputs.   |
|  | Sensitivity <sup>2,4</sup>  | User defined in <b>V/unit</b> .  |
|  | Range <sup>2</sup>  | <b>Pk to pk</b> expressed in the associated unit, (taking in account sensitivity) - <b>linear</b> or <b>dB</b>   |
|  | External conditioner compensation <sup>2</sup>  | <b>Gain</b> , <b>offset</b> .  |
|  | Edge detection  | <b>Threshold</b> (in associated unit) - <b>Edge</b> (rise, fall) - <b>Hysteresis</b> - <b>hold off</b> (sec)   |
|  | Pre-divider   | <b>Hardware</b> - <b>1 to 1024</b> pulses – accept up to <b>375 kpulses/sec</b>  |
|  | Post-multiplier   | <b>1 to 50 pulses/pulse</b> - Generate higher frequencies on low rate triggers. (ex. GPS)  |
|  | Tachometer mode   | <b>Pulse per rev</b> (0 to 1024) - <b>average</b> (n rev) - <b>min</b> (detect stopped shaft) and <b>max RPM</b> speed - <b>hold off</b> (in % of revolution) - <b>rotation</b> (clockwise/counterclockwise) |
| Torsional mode <sup>1</sup> : Instantaneous angular velocity converter | <b>Pulse per rev</b> (1 to 1024) - <b>min</b> (detect stopped shaft) and <b>max RPM</b> speed - <b>sliding average</b> (1 to 20 samples) - <b>Missing pulse number</b> (0 to 3), <b>Missing pulses detection</b> (delay of 0 to $\pm 20\%$ of previous pulses duration) - <b>Filters</b> (dt, dt <sup>2</sup> , 1/dt) |  |
| <b>Outputs</b>   | Sampling  | Same as dynamic inputs   |
|  | Generated signals <sup>2</sup>  | Any <b>outputs signals</b> , see §outputs - play-back of signal file tracks - DC levels - Inputs playback (Delay > 256 samples)  |
|  | Filters <sup>2</sup>  | <b>Any NVGate</b> filter can independently be applied to each dynamic output (See Filters §)   |

<sup>1</sup> Optional features

<sup>2</sup> Independent for each input

<sup>3</sup> Linked with the transducer database

Front-end (continued)

|   |   |  |
|---|---|--|
| <b>Outputs</b>                            | Impedance <sup>2</sup>                            | <b>50 Ω, 600 Ω</b> (only OR36 and OR38) or grounded  |
|   | Gain <sup>2</sup>                                 | <b>-100 dB to + 120 dB</b>   |
|   | Synchronization <sup>2</sup>                      | <b>Free run</b> or <b>linked</b> to acquisitions <b>runs</b>   |
|   | Level and phase transition <sup>2</sup>           | No ( <b>Steps</b> ) - controlled ( <b>ramp</b> ) - user selectable ramp time                           |
|   | Clipping <sup>2</sup>                             | User selectable - <b>protects shaker</b> and <b>amplifier</b> .  |
|   | Events (can trig analysis or record) <sup>2</sup> | Outputs <b>stabilized</b> - new <b>step reached</b> - <b>start &amp; stop sweep</b>                    |
|   | Controls  | <b>Emergency stop</b> - <b>mute/un-mute</b> all  |
| <b>Parametric<sup>1</sup> (DC) inputs</b> | Sampling  | <b>12.5 S/s (50 Hz rejection) - 15 S/s (60 Hz rejection)</b>   |
|   | Information <sup>2</sup>                          | Label  |
|   | Physical quantity <sup>2,3</sup>                  | Any physical quantity can be associated to inputs.   |
|   | Sensitivity <sup>2,4</sup>                        | User defined in V/unit.  |
|   | Range <sup>2</sup>                                | Pk to pk expressed in the associated unit (taking in account sensitivity) - <b>linear</b> or <b>dB</b> |
|   | External conditioner compensation <sup>2</sup>    | <b>Gain</b> (-120 dB to +20 dB) - <b>polarity</b> - <b>offset</b> (< range).                           |
|   | Auto-range  | <b>Enable/disable</b> auto-ranging <b>independently on any input</b>                                   |
| <b>Auto-ranging</b>                       | Type  | <b>Normal</b> - on <b>Peak</b> detection   |
|   | Margin  | Select the first highest range with <b>0 dB - 3 dB</b> or <b>20 dB</b> margin                          |
|   | Duration (apply for normal auto-range)            | <b>0 to 10 sec.</b>  |
|   | Peak detection                                    | User select input were to detect peak, auto-range applies on all enabled input at each peak detection. |
|   | Peak parameters settings                          | <b>1 to 10 peaks</b> - <b>sensitivity</b> (low, normal, high) - <b>rise, fall</b> or <b>any edge</b> . |
| <b>Checking</b>                           | ICP <sup>5</sup>                                  | Test and report ( <b>Open, shortcut, ok</b> ) all enabled inputs.                                      |
|   | TEDS  | Transducers automatic recognition - Complies with <b>IEEE 1451.4 2004 Rev. 1.0</b>                     |

Front-end results & connections

The following results are available for monitoring and connection to analysis mode (plug-in analyzers)

|   |  |  |
|---|--|--|
| <b>Dynamic inputs</b>                     | Monitoring <sup>2</sup>                      | Time domain instantaneous signal - Size <b>256 samples</b>   |
|   | Status led <sup>2,4</sup> (docking tool bar) | <b>Overloaded</b> = red - <b>overload occurred since last start</b> = red with yellow center - <b>ok</b> = green - <b>under load</b> (20 dB below range) = green with yellow center  |
|   | Connection <sup>2</sup>                      | To any: <b>plug-in analyzer channel, monitor channel, recorder track, edge event detector</b> and <b>tachometer</b>  |
| <b>Ext. Sync inputs</b>                   | Monitoring <sup>2</sup>                      | Time domain <b>instantaneous status</b> (1 = threshold crossed, 0 = no event) - Size <b>256 samples</b> .  |
|   | Connection <sup>2</sup>                      | To any: <b>start</b> or <b>stop averaging</b> of plug-in analyzers, recorder <b>start</b> or <b>stop recording, waterfall start</b> or <b>stop acquisition, new block trigger</b> for FFT and SOA and <b>new slice</b> for <b>waterfall</b> acquisition. |
| <b>Parametric<sup>1</sup> (DC) inputs</b> | Monitoring                                   | <b>Profiles</b> versus time ( <b>160 ms to 163 sec</b> user selectable), and <b>digital/analog view meter</b> .  |
|   | Connection <sup>2</sup>                      | To any: <b>recorder track, waterfall reference (Z/X axis)</b> and <b>profiles, level</b> and <b>delta level detectors</b> .  |

<sup>1</sup> Optional features  
<sup>2</sup> Independent for each input or output  
<sup>3</sup> Comes automatically from transducer database  
<sup>4</sup> Available in the remote controller display  
<sup>5</sup> Not supported on OR34 & OR35

## Recorder / Player

OROS 3-Series/NVGate instruments feature a recorder and a player module that allows users to:

- Record time domain signal, trigger and parametric input.
- Export or import time domain files.
- Playback time domain files on analyzers outputs during analysis
- Listen recorded tracks on the PC speakers.
- Post-analyze time domain files in the available plugs-in.

## Recorder

The recorder module memorizes time domain signal into files located on 3-Series analyzer HD, Mobi-Disc™ or PC HD. This is available on 2 different modes:

- **On-line record**, the chosen inputs (Dynamic, ext. sync, parametric) are recorded at selected sampling frequency during acquisition. Real-time analysis is available simultaneously.
- **Time and tracks split**, the chosen recorded tracks (from signal file) are played back in the recorder using the post-analysis mode. The sampling frequency, duration, and/or track arrangement can be changed.

### Recorder settings

|                    |                                     |  |
|--------------------|-------------------------------------|--|
| <b>Bandwidths</b>  | Dynamics inputs                     | <b>2 groups</b> of user selectable sampling frequency - From <b>102.4 kS/s</b> to <b>2.048 S/s (40 kHz to 800 mHz)</b> - available simultaneously  |
|                    | Ext. sync inputs                    | <b>Automatic selection</b> at Front-end sampling frequency - Resolution is <b>64 time Front-end sampling frequency</b>   |
|                    | Parametric (DC) inputs              | <b>12.5 S/s (50 Hz rejection) - 15 S/s (60 Hz rejection)</b>   |
| <b>Tracks</b>      | Number                              | <b>14 tracks<sup>5</sup></b> (8 + 6 ext. sync) or <b>38 tracks<sup>6</sup></b> (32 + 6 ext. Sync)  |
|                    | Saved settings / track              | <b>Label - Coupling - External gain - Input range - Sampling frequency and signal bandwidth - Component - Node number - Direction - Type - Associated transducer - Unit - Sensitivity and Offset compensation.</b> |
| <b>Modes</b>       | Start to time                       | Start recording on run or any activated event - <b>Stop recording when duration ends</b> - Duration <b>10 ms to available space on target HDD.</b>   |
|                    | Start to stop                       | <b>Start recording on run or any activated event</b> - Stop recording on stop on any activated event - Start and stop event can be the same - Duration <b>10 ms to available space on target HDD (PC or OR3x).</b> |
|                    | Time to stop                        | Memorize the <b>earliest x seconds</b> - Stop = <b>stop</b> or any <b>activated event</b> - Duration <b>10 ms to 2 GSamples</b> (limited by the HD available space)  |
| <b>Triggering</b>  | Start recording (new record)        | Any <b>NVGate® event</b> plus <b>manual</b> and <b>free run</b>  |
|                    | Stop recording (end current record) | Any <b>NVGate® event</b> plus <b>manual</b> and <b>free run</b>  |
|                    | Start delay                         | Positive = <b>unlimited</b> - negative = <b>128 kSamples</b>   |
|                    | Stop delay                          | Positive = <b>unlimited</b> - negative = <b>0</b>  |
| <b>Markers</b>     | Saved in the record files           | Added by tool bar or shortcut - <b>comment fields</b> editable during record or at end of acquisition  |
| <b>Signal file</b> | Record on PC HDD                    | Up to <b>10</b> dynamic inputs – Up to 4 parametric inputs - max total bandwidth <b>512 kS/s</b> - (2 MB/s)  |
|                    | Record on Analyzer HDD              | Up to <b>40 channels</b> (32 inputs + 6 ext. sync or DC) - max bandwidth <b>1.8 MS/s</b> (7.2 MB/s)  |
|                    | Format                              | <b>Normal: 32 bits/sample - Compressed 16 bits/sample</b>  |

<sup>5</sup> For OR34, OR35 and Office-8 licenses.

<sup>6</sup> For OR36, OR38 and Office licenses.

|                   |                       |   |
|-------------------|-----------------------|---|
| <b>Management</b> | Download              | Discard Analyzer HDD on PC HDD - <b>Batch download</b> available - Rate <b>4 MB/s</b> |
|                   | Upload                | Load PC HDD records on the analyzer HDD - Rate <b>1.4 MB/s</b>                        |
|                   | Location              | All records accessible from the project manager tree                                  |
|                   | Hard drive management | <b>Format HDD - Selective delete - Sorting tools</b>                                  |

### Mobi-Disk™

OR36 and OR38 multi analyzers/recorders feature a removable hard drive with 2 ports:

- Parallel High speed port for direct data throughput to the Mobi-Disk™.
- USB 2.0 port for post processing and data management without the instrument.

|                   |                           |   |
|-------------------|---------------------------|---|
| <b>Connection</b> | 1 to 8 Mobi-Disc™         | Up to <b>8 Mobi-disc</b> connected - Active Mobi-Disc: <b>1</b> (user selectable) - <b>hot swap</b> |
| <b>Transfer</b>   | Based on the USB 2.0 link | <b>Download 9 MB/s</b>  |

### Recorder monitoring

The following displays are available during real-time or post-analysis.

|               |                     |  |
|---------------|---------------------|--|
| <b>RMS</b>    | Overall RMS / input | <b>Digital or analog view-meter</b>  |
| <b>Signal</b> | Real-time           | <b>Compressed view of entire</b> recorded signals - Automatic update of time axis. |

### Player

The player module plays the recorded signal files. This is achieved following 2 different ways:

- **Post analysis**, the player tracks take place of the corresponding inputs (Dynamics, Ext. Sync and parametric) to be processed by the plug-in analyzers, recorder, trigger and tachometer
- **Playbacks**, the recorded dynamic input are generated on the instrument outputs simultaneously with standard analysis of the inputs.



### Player settings

|                       |   |  |
|-----------------------|---|--|
| <b>Played section</b> | File selection  | NVGate® recorded files - Imported files - located on instrument HDD, Mobi-Dsic™ or on PC HDD.                          |
|                       | Record selection  | Record number selection (for multi record files)   |
|                       | Section definition  | User selectable Start and stop offsets (in sec.) - available in the file overview window (marker and slider)           |
|                       | Duration  | Play backed duration (User information)  |
|                       | Repeat  | On/off - repeat continuously the selection (available only for playback on analyzer output)                            |
| <b>Mode</b>           | File swap   | Swap loaded files with same tracks number - applies identical post-analysis setup to multiple files.                   |
|                       | Playback  | Continuous or step by step (5 ms to 360,000 s)   |
|                       | Bandwidth   | All tracks at lowest frequency (compatible with all plugs-in) or initial record frequencies (no track mix in plugs-in) |
| <b>Tracks</b>         | Number  | 38 tracks (32 + 6 ext. Sync) for all licenses.   |
|                       | Type  | Dynamic input record (2 sampling frequencies), parametric (DC) input record and ext. sync record.                      |
|                       | Fixed setting (information) / track   | Label, Coupling, external gain, input range, sampling frequency and signal bandwidth                                   |
|                       | Modifiable measurement point information settings (apply for post analysis or re-recording) / track | Component - node number - direction - type   |
|                       | Modifiable settings (apply for post analysis or re-recording) / track                               | Associated transducer - unit - sensitivity - offset compensation   |
| <b>Listening</b>      | File location   | Analyzer HD - Mobi-Disc™ connected with USB or inside the analyzer - PC HD   |
|                       | Playback  | One track - from cursor position - repeat displayed signal   |
| <b>Markers</b>        | Display   | Recorded markers are available in the file overview  |
|                       | Use   | Set the start and stop playback offset (user selectable)   |

### Player connections

The following table describes the available connections to the analysis modes (plug-in analyzers and recorder) during post-analysis operation:

|  |  |   |
|--|--|---|
| <b>Dynamic inputs Tracks</b>                       | Preview (multiple file simultaneously)     | Entire file fast overview (pre-compressed at recording time) - Track contents preview, independently (multi-graph display)  |
|  | Monitoring (loaded file only)              | Zoom on selected play-back section  |
|  | Connection <sup>7</sup> (loaded file only) | To any: plug-in analyzer channel, monitor channel, recorder track, edge event detector and tachometer   |
| <b>Ext. sync Tracks</b>                            | Preview (multiple file simultaneously)     | Entire file fast overview (pre-compressed at recording time) - Track contents preview, independently (multi-graph display)  |
|  | Monitoring (loaded file only)              | Zoom on selected play-back section  |
|  | Connection <sup>2</sup> (loaded file only) | To any: start or stop averaging of plug-in analyzers, recorder start or stop recording, waterfall start or stop acquisition, new block trigger for FFT and SOA and new slice for waterfall acquisition. |
| <b>Recorded parametric<sup>1</sup> (DC) inputs</b> | Preview (multiple file simultaneously)     | Entire file fast overview - Track contents preview  |
|  | Monitoring (loaded file only)              | Profiles versus time and digital or analog view meter.  |
|  | Connection <sup>2</sup> (loaded file only) | To any: recorder track, waterfall reference (Z/X axis) and profiles, level and delta level events.  |

<sup>7</sup> Independently on each track.

## Plug-ins analyzers

The following plug-in analyzers are available as options of NVGate® software platform.

### Time Domain Analysis - TDA

The TDA plug-in analyzer provides time domain based analyses and visualizations. This plug-in analyzer computes statistical extractions and data compression of long duration oscilloscope views. All results are real time and operations are possible on-line or in post processing. The TDA plug-ins can operate free run or synchronized with the other plug-in analyzers.

#### TDA Settings

|   |                        |   |
|---|------------------------|---|
| <b>Bandwidths</b>                           | Oscillator 1           | <b>800 mHz to 40 kHz</b><br>(sampling oscillator 102.4 kS/s to 2,048 S/s)   |
|   | Oscillator 2           | <b>512 mHz to 25.6 kHz</b><br>(sampling oscillator 65.536 kS/s to 3,277 S/s)  |
| <b>Time views</b>                           | Depth                  | <b>7200/ABW<sup>8</sup> sec to 100 000 sec (27 hours) - Independent</b> on each channel   |
|   | Time base (resolution) | <b>Depth/2048- Independent</b> on each channel  |
| <b>Time span for extraction (averaging)</b> | Type                   | Continuous sliding with refresh each 256 samples ( <b>Exponential</b> ) - One shot ( <b>Linear</b> ) - Repeated shot ( <b>Repeated linear</b> ) |
|   | Duration               | <b>1/ABW to 2 10<sup>6</sup>/ABW</b> (ex: 50 ms to 1000 sec @ 2 kHz)  |
| <b>Channels</b>                             | OR36 & OR38 analyzers  | <b>32 channels</b> per plug-in for <b>on line</b> and <b>post-analysis</b>  |
|   | OR34 & OR35 analyzers  | <b>8 channels</b> per plug-in for <b>on line</b> and <b>post-analysis</b>   |
| <b>Filters</b>                              | On each channel        | <b>Any NVGate</b> filter can independently be applied to each dynamic input (See Filters §)   |
| <b>Triggering</b>                           | Start analysis         | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>   |
|   | End analysis           | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>   |
|   | Repeat analysis        | On <b>new start</b> or <b>end of averaging</b>  |
|   | Trigger delay          | Positive = <b>unlimited</b> - negative = <b>32k Samples</b>   |

#### TDA Results

The following results are available for real time or post-analysis display, report and saving.

|                    |                    |   |
|--------------------|--------------------|---|
| <b>Time Views</b>  | Overview           | <b>Signal envelope:</b> Min/Max line for each time step -   |
|                    | Statistical values | <b>DC - RMS - Min- Max - Peak - Peak to Peak - Crest factor - Skewness - Kurtosys</b> - computed on a user defined area of the time view  |
| <b>Extractions</b> | Statistical values | <b>DC - RMS - Min- Max - Peak - Peak to Peak - Crest factor - Kurtosys</b> - computed on the Time span – All values available for <b>Viewmeter</b> and/or <b>Waterfall profiles</b> |

<sup>8</sup> ABW: the plug-in Analysis Bandwidth.

## Fast Fourier Transform analysis - FFT

The FFT plug-in analyzer features multiple vibrations results depending on applied setting. This type of plug-in analyzers computes real-time (on-line or post-processing) Fast Fourier Transform algorithms with multiple averaging domain and trigger capabilities. Up to 4 FFT plug-ins can operate at the same time.

### FFT Settings

|                                 |                                  |  |
|---------------------------------|----------------------------------|--|
| <b>Bandwidths</b>               | Oscillator 1                     | <b>800 mHz to 40 kHz</b><br>(sampling oscillator 102.4 kS/s to 2,048 S/s)  |
|                                 | Oscillator 2                     | <b>512 mHz to 25.6 kHz</b><br>(sampling oscillator 65.536 kS/s to 3,277 S/s)   |
| <b>Resolution</b>               | Lines                            | <b>101, 201, 401, 801, 1601, 3201 and 6401 lines</b>   |
|                                 | Frequency resolution             | <b>80 µHz</b> (512 mHz/6401 lines)<br>to <b>400 Hz</b> (40 kHz/101 lines)  |
| <b>Averaging</b>                | Domain                           | <b>Spectral</b> (power) - <b>time</b> (with phase) - <b>FDSA</b> (Synchronized with one frequency)   |
|                                 | Type                             | <b>Exponential - linear - repeated linear - referenced peak hold</b> (eq. to tracking filter locked on reference channel frequency) - <b>peak hold</b> |
|                                 | Size                             | <b>Duration</b> or <b>number of blocks</b> , unlimited size  |
|                                 | Overlap                          | <b>0% to 99.9%</b> depending on block size - <b>retrigger</b>  |
| <b>Channels</b>                 | OR36 & OR38 analyzers            | <b>32 channels</b> per plug-in for <b>on line</b> and <b>post-analysis</b>   |
|                                 | OR34 & OR35 analyzers            | <b>8 channels</b> per plug-in for <b>on line</b> and <b>post-analysis</b>  |
| <b>Weighting</b>                | General                          | <b>Uniform - Hanning - Hamming - Kaiser Bessel</b>   |
|                                 | Modal acquisition                | User defined <b>Force</b> (rect.) and <b>Response</b> (Rect. + exp)  |
|                                 | Assignment                       | Independently on any channels  |
| <b>Filters</b>                  | On each channel                  | <b>Any NVGate</b> filter can independently be applied to each dynamic input (See Filters §)  |
| <b>Cross functions</b>          | Reference selection              | <b>Full</b> or <b>partial matrix</b> available (all channels can be references)  |
| <b>Zoom</b>                     | Magnification factor             | <b>2 to 128</b> by step power of 2   |
|                                 | Min., max and center frequencies | Graphically selectable on wide band spectrum   |
| <b>Triggering</b>               | Start averaging                  | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>  |
|                                 | End averaging                    | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>  |
|                                 | New block                        | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>  |
|                                 | Repeat averaging                 | On <b>new start</b> or <b>end of averaging</b>   |
|                                 | Trigger delay                    | Positive = <b>unlimited</b> - negative = <b>32k Samples</b>  |
| <b>Blocks rejection Overall</b> | Automatic                        | Reject <b>overloaded blocks</b>  |
|                                 | Manual                           | <b>Accept</b> or <b>Reject</b> after preview of averaged results (FRF, Coherence)  |
|                                 | Normal                           | <b>Accept</b> all blocks   |
| <b>Overall</b>                  | Detector                         | <b>Quadratic sum of spectra lines</b> taking in <b>account weighting window equivalent noise bandwidth</b>   |
|                                 | Lower and upper frequencies      | Selectable into the current FFT bandwidth  |

### FFT Results

The following results are available for real time or post-analysis display, report and saving.

|  |                       |  |
|--|-----------------------|--|
| <b>Time averaging</b>                                | Time domain           | <b>Filtered signal - Triggered block - Averaged Triggered block - Weighted Block - Lissajoux of triggered blocks</b>                       |
|  | Spectra               | <b>Complex spectra</b>   |
|  | Cross-functions       | Instantaneous <b>cross-spectra</b> - averaged <b>cross-spectra</b> - <b>FRF H1 - FRF H2 - Coherence</b>                                    |
|  | Overall               | <b>Overall RMS value</b> in specified band - <b>Overall RMS profile</b> in specified band.   |
| <b>Spectral averaging</b>                            | Time domain           | <b>Filtered signal - Triggered block - Weighted Block - Lissajoux of triggered blocks</b>  |
|  | Spectra               | Instantaneous <b>complex spectra</b> - averaged <b>power spectra</b>   |
|  | Zoomed spectra        | <b>Zoomed</b> instantaneous <b>complex spectra</b> - <b>zoomed averaged power spectra</b>  |
|  | Cross-functions       | Instantaneous <b>cross-spectra</b> - averaged <b>cross-spectra</b> - <b>FRF H1 - FRF H2 - Coherence</b>                                    |
|  | Zoomed cross-function | Instantaneous <b>zoomed cross-spectra</b> - <b>averaged zoomed cross-spectra</b> - <b>zoomed FRF H1 - zoomed FRF H2 - zoomed Coherence</b> |
|  | Overall               | <b>Overall RMS value</b> in specified band - <b>Overall RMS profile</b> in specified band.   |
| <b>Synchronous averaging on one frequency (FDSA)</b> | Time domain           | <b>Filtered signal - Triggered block - Averaged Triggered block - Weighted Block - Lissajoux of triggered blocks</b>                       |
|  | Spectra               | Instantaneous <b>complex spectra</b> - time domain averaged <b>power spectra</b>   |
|  | Overall               | <b>Overall RMS value</b> in specified band - <b>Overall RMS profile</b> in specified band.   |

### Constant Band Order Tracking Add-on (CBT)

Constant band order tracking is an optional add-on to the FFT plug-in analyzers. This add-on computes spectrum lines power related to RPM speed. This option adds settings and results to the FFT Plug-ins. Up to 4 constant Band tracking can operate on 4 different tachometers at the same time.

#### CBT Settings

|                      |                       |  |
|----------------------|-----------------------|--|
| <b>Tracked Order</b> | Number                | <b>8 per channels</b>  |
|                      | Max                   | <b>0.001 to 800</b>  |
|                      | Constant bandwidth    | <b>User selectable per channel</b> - minimum depend on weighting windows |
| <b>Computation</b>   | Associated tachometer | <b>Any front end, recorded or virtual tachometer</b>                     |
|                      | Peak tracking         | On/Off <b>center bandwidth on nearest peak</b>                           |
|                      | Order amplitude       | Weighting windows eq. noise bandwidth correction                         |

#### CBT Results

The following results are available for real time or post-analysis display, report and saving.

|                               |                                      |  |
|-------------------------------|--------------------------------------|--|
| <b>Scalar</b>                 | Tracked order                        | <b>Digital</b> (magnitude and phase) or <b>analog</b> view-meter   |
|                               | Cross phase tracking                 | <b>Order phases are relative</b> to the same order from a ref. channel   |
|                               | Overall                              | <b>Digital</b> or <b>analog view-meter</b>   |
| <b>Monitoring<sup>9</sup></b> | Continuous profiles of tracked order | <b>Profiles vs. time - profiles vs. RPM</b> - max depth <b>2048 pts</b> - user selectable <b>delta time</b> - user selectable <b>delta RPM</b> |
| <b>Profiles</b>               | One shot acquisition                 | Tracked order (complex), cross phase orders and overall level can be collected by the <i>waterfall</i> profiles.                               |
|                               | References                           | Time, RPM and DC levels  |

<sup>9</sup> These result cannot be saved

## Diagnostic Add-on (FFTDiag)

FFT Diagnostic is an optional add-on to the FFT plug-in analyzers. This add-on computes a set of useful analysis for machinery diagnostic. This option adds settings and results to the FFT Plug-ins. Up to 4 FFTDiag can operate on 4 different FFT plug-in at the same time.

### FFTDiag Settings

|                             |                  |   |
|-----------------------------|------------------|---|
| <b>Envelop demodulation</b> | Activation       | Enable/disable on all channels - requires <b>zoom activation</b>    |
|                             | Averaging        | <b>Spectral domain - FDSA</b>                                       |
|                             | Bandwidth        | <b>½ of zoom span - ¼ of FFT bandwidth</b>                          |
| <b>Correlation</b>          | Activation       | Enable/disable on all channels - All other FFT results are affected |
|                             | Weighting window | <b>Uniform - Left zero padding - Centred zero padding</b>           |

### FFTDiag Results

The following results are available for real time or post-analysis display, report and saving.

|               |                |   |
|---------------|----------------|---|
| <b>Scalar</b> | Min/Max        | Minimum and maximum amplitude per trigger block                           |
|               | Peak detectors | <b>Peak level - Peak to Peak level - Crest Factor</b> - per trigger block |
| <b>Others</b> | Cepstrum       | <b>Cepstrum - Zoomed cepstrum</b>   |
|               | Correlation    | <b>Auto-correlation block - Cross correlation block</b>                   |
|               | Shaft view     | Time domain signal on first rotation – angular representation             |

## Synchronous Order Analysis (SOA)

The SOA plug-in analyzer features several results depending on applied settings. Up to 2 SOA plug-ins can operate in parallel.

### SOA Settings

|                      |                       |  |
|----------------------|-----------------------|--|
| <b>Bandwidths</b>    | Order span            | <b>6.25 to 400</b>   |
|                      | Frequency bandwidth   | Up to <b>40 kHz</b>  |
|                      | RPM span              | Up to <b>192 000 RPM – Ratio of 64</b> between Min & Max RPM   |
| <b>Resolution</b>    | Lines                 | <b>101 - 201 - 401 - 801</b>   |
|                      | Order resolution      | <b>1 - ½ - ¼ - 1/8 - 1/16 - 1/32</b>   |
| <b>Averaging</b>     | Domain                | <b>Spectral (power) - revolution (re-sampled blocs)</b>  |
|                      | Type                  | <b>Exponential - linear - repeated linear - peak hold</b>  |
|                      | Size                  | <b>Number of blocks</b> , unlimited size   |
|                      | Overlap               | <b>0 to 31 revolution</b> depending on resolution – <b>0 to 359°</b> into revolution – Retrigger on <b>multi-pulse/rev</b> |
| <b>Tachometer</b>    | Computation base      | Any <b>NVGate® tachometer</b> (ext. sync, regular input, DC input, simulated, Fractional, and combined tach.)              |
|                      | Phase reference       | Tachometer pulse <b>edge</b> or pulse <b>center</b> requires to analyze the tachometer input                               |
|                      | 0° Phase reference    | Cosine or sine   |
| <b>RPM</b>           | Max speed variation   | <b>1 to 99%</b> per analyzed block - blocks with higher variation are rejected. No control (set @ 100%)                    |
|                      | RPM range             | User selectable <b>max &amp; min RPM</b> , under and over speed blocks are rejected  |
| <b>Tracked order</b> | Number                | <b>Up to 8</b> per channels  |
|                      | Min-Max               | <b>1/32 to 400</b>   |
|                      | Cross phase tracking  | <b>Order phases</b> are <b>relative</b> to the same order from a ref. channel  |
| <b>Channels</b>      | OR36 & OR38 analyzers | <b>32 channels</b> per plug-in for <b>on line and post-analysis</b>  |
|                      | OR34 & OR35 analyzers | <b>8 channels</b> per plug-in for <b>on line and post-analysis</b>   |

**SOA Settings (continued)**

|                   |                           |  |
|-------------------|---------------------------|--|
| <b>Weighting</b>  | Windows selection         | <b>Uniform - Hanning - Hamming - Kaiser Bessel</b> Applied independently on any channels                         |
| <b>Filters</b>    | On each channel           | <b>Any NVGate</b> filter can independently be applied to each dynamic input (See Filters §)                      |
| <b>Triggering</b> | Start averaging           | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>  |
|                   | End averaging             | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>  |
|                   | New block                 | Any <b>NVGate®</b> event plus <b>manual</b> and <b>free run</b>  |
|                   | Repeat averaging          | On <b>new start</b> or <b>end of averaging</b>   |
|                   | Trigger delay             | Positive = <b>unlimited</b> - negative = <b>1/order res</b> revolution   |
|                   | Trigger block phase shift | <b>+/- 720°</b> - independent for each channel (with FFTDiag)  |
| <b>Overall</b>    | Detector                  | <b>Quadratic sum of order spectra lines</b> taking in account <b>weighting window equivalent noise bandwidth</b> |
|                   | Lower and upper orders    | Selectable into order span - from <b>0,03125</b> to <b>400</b>   |

**SOA Results**

The following results are available for real time or post-analysis display, report and saving.

|                                   |                           |  |
|-----------------------------------|---------------------------|--|
| <b>Revolution averaging</b>       | Time domain               | <b>Filtered signal</b>   |
|                                   | Angle domain (Revolution) | <b>Triggered block - Averaged Triggered block - Weighted block - Shaft view</b> (with FFTDiag) |
|                                   | Order spectra             | <b>Complex spectra</b>   |
|                                   | Tracked orders            | <b>Digital</b> (magnitude & phase) view-meter - <b>Analog</b> view -meter                      |
|                                   | Overall                   | <b>Overall RMS value</b> in specified order band (digital or analog view-meter)                |
| <b>Spectral (order) averaging</b> | Time domain               | <b>Filtered signal</b>   |
|                                   | Angle domain (Revolution) | <b>Triggered block - Weighted Block - Shaft view</b> (with FFTDiag)                            |
|                                   | Order spectra             | Instantaneous <b>complex order spectra</b> - averaged <b>power order spectra</b>               |
|                                   | Tracked orders            | <b>Digital (module and phase)</b> and/or <b>Analog</b> view-meter.                             |
|                                   | Overall                   | <b>Overall RMS value</b> in specified order band (digital or analog view-meter)                |

**1/n octave constant percentage band filter analysis - OCT**

The OCT plug-in analyzer features multiple acoustic results depending on applied setting. This plug-in analyzer computes real-time signal (on-line or post-processing analysis) based on digital filters (CPB) and detectors.

**OCT Settings**

|                   |  |  |
|-------------------|--|--|
| <b>Bandwidths</b> | Sampling oscillator 1 (102.4 kS/s to 2,048 S/s)  | Center of <b>highest 1/3<sup>rd</sup></b> band = <b>40 kHz</b><br>Center of <b>lowest 1/3<sup>rd</sup></b> band = <b>100 mHz</b> |
|                   | Sampling oscillator 2 (65.536 kS/s to 3,277 S/s) | Center of <b>highest 1/3<sup>rd</sup></b> band = <b>25 kHz</b><br>Center of <b>lowest 1/3<sup>rd</sup></b> band = <b>100 mHz</b> |
|                   | Frequency span                                   | Highest Band / lowest band < <b>2000</b> (ex. 10Hz - 20kHz)  |
| <b>Resolution</b> | 1/n Octave                                       | <b>1, 1/3<sup>rd</sup>, 1/12<sup>th</sup>, 1/24<sup>th</sup></b>   |
| <b>Averaging</b>  | Basic  | <b>Linear &amp; repeated linear</b> (20 ms to 60,000 s) <b>exponential</b> (20 ms to 60s)  |
|                   | Acoustics  | <b>Short LEQ 1 s, Short LEQ 1/8 s, Fast, Slow, Impulse</b>   |
|                   | Constant Bandwidth * Time                        | <b>B*T = 0.2dB, 0.5 dB, 1 dB, 2 dB</b>   |
| <b>Standards</b>  | Detectors  | Complies with <b>IEC 651, IEC 804, IEC 61-672 class 1</b>  |
|                   | CPB filters                                      | Complies with <b>IEC 1260 class 1</b>  |

### OCT Settings (continued)

|                   |                       |   |
|-------------------|-----------------------|---|
| <b>Channels</b>   | OR36 & OR38 analyzers | <b>32 channels</b> for on line and post-analysis                        |
|                   | OR34 & OR35 analyzers | <b>8 channels</b> for on line and post-analysis                         |
| <b>Triggering</b> | Start averaging       | Any NVGate® event plus manual and free run                              |
|                   | End averaging         | Any NVGate® event plus manual and free run                              |
|                   | Repeat averaging      | On new start or end of averaging  |
| <b>Overall</b>    | Detectors             | <b>2 parallel overall detectors</b> linear and weighted (time domain)   |
|                   | Weighting             | <b>A, C, or Z</b> (none) applicable in <b>10 kHz - 40 kHz</b> bandwidth |

### OCT Results

The following results are available for real time or post-analysis display, report and saving.

|                |                    |   |
|----------------|--------------------|---|
| <b>Spectra</b> | 1/n Octave spectra | <b>Instantaneous</b> spectra, <b>averaged</b> spectra   |
|                | Holden spectra     | <b>Minimum &amp; maximum</b> spectra  |
| <b>Overall</b> | Linear             | <b>Digital &amp; analog</b> view meter of time domain overall detector, exact bandwidth is informed   |
|                | Weighted           | <b>Digital &amp; analog</b> view meter of <b>A</b> or <b>C</b> weighted overall levels computed in time domain, exact bandwidth is informed |

### Overall acoustics sound level meter - OVA

The OVA plug-in analyzer features class sound pressure level measurement according to IEC 61-672 standard. This plug-in analyzer computes real-time signal (on-line or post-processing analysis) based on digital filters and detectors.

### OVA Settings

|                   |                       |   |
|-------------------|-----------------------|---|
| <b>Type</b>       | Standard              | <b>IEC 61-672-1 - IEC 651 - IEC 804</b>   |
|                   | Class                 | <b>1</b>  |
|                   | Bandwidths            | <b>10 Hz to 40 kHz</b> - Adjustable   |
| <b>Channels</b>   | OR36 & OR38 analyzers | <b>32 channels</b> for on line and post-analysis  |
|                   | OR34 & OR35 analyzers | <b>8 channels</b> for on line and post-analysis   |
| <b>Averaging</b>  | Linear                | <b>User selectable</b> duration - repeat mode   |
|                   | Short leq             | <b>1/8 s - 1 s</b> - User selectable duration   |
| <b>Triggering</b> | Start averaging       | Any NVGate® event plus manual and free run  |
|                   | End averaging         | Any NVGate® event plus manual and free run  |
|                   | Repeat averaging      | On new start or end of averaging  |
| <b>Detectors</b>  | Peak                  | <b>1 peak detector/Ch.</b> - <b>A, C</b> or <b>Z</b> (none) weighting - <b>Independent</b> for each channel   |
|                   | Weighting             | <b>3 overall detectors/Ch.</b> - <b>A, C</b> or <b>Z</b> (none) weighting - <b>Fast, Slow, Impulse</b> and <b>linear</b> time weighting - <b>Independent</b> for each channel |

### OVA Results

The following results are available for real time or post-analysis display, report and saving. The following levels can be tracked in profiles up to 100 000 pt each.

|            |               |  |
|------------|---------------|--|
| <b>SPL</b> | Time weighted | Instant - max hold - min Hold            |
|            | Averaged      | Short leq - leq                          |
|            | Peak          | Peak - Time weighted - max hold min hold |

## Options

### Instantaneous angular Velocity Converter (IVC)

The IVC option converts frequency to voltage from the External synch inputs. It covers torsional and acyclism measurements. The converted signals are made available as standard inputs (or player tracks). This option operates real-time computation and operations are possible on-line or in post processing.

#### IVC Settings & specs

|                        |                       |   |
|------------------------|-----------------------|---|
| <b>Rate</b>            | Pulse/rev             | <b>0.5 to 1024</b> - Up to <b>262 144</b> with pre-divider            |
|                        | Pulse/rev Frequency   | <b>&gt; 40 kpulse/sec max</b>   |
|                        | Pre-divider           | <b>1 to 255</b> - hardware decimation (pulse are not measured)        |
|                        | Pre-divider frequency | <b>375 kpulse/sec max.</b>  |
| <b>Missing pulses</b>  | Number                | <b>0 to 3</b> consecutive pulses                                      |
|                        | Hold off              | <b>2</b> consecutive pulses   |
|                        | Generated signal      | <b>1<sup>st</sup> order interpolation</b>                             |
| <b>Tach. phase ref</b> | No missing pulse      | First random - continuous offset further                              |
|                        | missing pulse > 0     | Last known edge before missing pulse                                  |
| <b>Resolution</b>      | Time                  | <b>160 ns</b> : 1/(SF x 64)   |
|                        | Angular (with SOA)    | <b>350 µRad (20 mdegrees) @ 8000 RPM</b> , up to order 10             |
| <b>Pre-processing</b>  | Smoothing             | Sliding average - <b>1 to 32</b> samples                              |
|                        | Filtering             | <b>Any NVGate filter</b> (See Filters §) incl. dt and 1/dt            |
| <b>Max Speed</b>       | Without pre-divider   | Max RPM = $2.4 \text{ e6/Pulse per rev}$ - 12 000 RPM @ 200 pulse/rev |
|                        | With pre-divier       |   |

#### IVC Results

The following results are available for real time or post-analysis.

|                |           |   |
|----------------|-----------|---|
| <b>Signals</b> | Number    | <b>1 to 6</b> (depends on the number of available ext. synch)                             |
|                | Use       | Same as <b>dynamic inputs</b> or <b>recorded</b> dynamic inputs                           |
|                | Magnitude | <b>Torsional</b> acceleration, velocity & angle – separated from angular magnitudes (RPM) |
| <b>View</b>    | Type      | Signal - filtered signal - <b>256 samples</b> frame                                       |

### Combined tachometer editor (CTE)

The CTE option combines 2 actual tachometers with math to generates a calculated angular velocity (new tachometer). It covers various unreachable rotating parts and more specially the CVT gear chain measurements. The combined tachometers are made available as standard tachometer. This option operates real-time computation and operations are possible on-line or post processing.



### CTE Settings

|                                |                         |   |
|--------------------------------|-------------------------|---|
| <b>Sources</b>                 | Number                  | 2   |
|                                | Type                    | Any NVGate tachometer – excepted another CTE                |
| <b>Output</b>                  | Type                    | New item in the active tachometers list                     |
|                                | Synchronization         | 0° phase shift with sources and analyzed signal             |
| <b>Editor</b>                  | Type                    | Text  |
|                                | Variables               | Real values   |
|                                | Operators               | +, -, x, /, ^, = (affectation)                              |
|                                | Predefined              | Rmp1, Rpm2 (sources speed), Pi, e                           |
|                                | Trigonometric functions | Sine, Cosine, Tangent - with Arc and Hyperbolic combination |
|                                | Logarithmic functions   | Log2, Log10, Ln, Exp  |
| <b>Output characterization</b> | Miscellaneous           | Sqrt, Abs, Min, Max, Sum, Avg                               |
|                                | Rotation                | Clock wise or counter clock wise                            |
|                                | Average                 | Sliding - 1 to 256 revolution                               |
|                                | Speed limits            | Min: 0 RPM - max: 1 200 000 RPM                             |
|                                | Information             | Label (text)  |

### CTE Results

The following results are available for real time or post-analysis

|                |           |   |
|----------------|-----------|---|
| <b>Signals</b> | Number    | 4   |
|                | Use       | Same as on-line Tachometer or recorded tachometer |
|                | Magnitude | Angular velocity (RPM)                            |
| <b>View</b>    | Types     | View meter - 1 to 100 s rolling profile           |

### Virtual inputs (VIn)

The virtual input allows combining front end inputs with polynomial operations to generate a signal (new input). This option covers numerous applications such as vector strain calculation with rosette or dynamic twist measurement on machinery transmission. The virtual inputs are made available as standard dynamic input. This option operates real-time computation on raw or recorded signal.

### VIn Settings

|                           |                 |   |
|---------------------------|-----------------|---|
| <b>Output</b>             | Number          | 12 Operators  |
|                           | Type            | New item in the active inputs/tracks list                                   |
|                           | Synchronization | 0° phase shift with sources and analyzed signal                             |
|                           | Magnitude       | Automatic or voltage if unresolved  |
| <b>Sources</b>            | Number          | 1 to 12 channels  |
|                           | Type            | Analyzer dynamic inputs or recorded dynamic inputs                          |
| <b>Output adjustment</b>  | Type            | (Input * Coeff + Offset) ^power - independent on each output                |
|                           | Offset          | Any real value from -1 e9 to 1 e9 - ex: -5.67                               |
|                           | Coefficient     | Any real value from -1 e9 to 1 e9 - ex: 12                                  |
|                           | Power           | Any real value from -4 to 4 - ex: 0.5                                       |
| <b>Sources adjustment</b> | Type            | Filtering [ (input * Coeff + Offset) ^ power] - independent for each source |
|                           | Offset          | Any real value from -1 e9 to 1 e9 - ex: -5.67 e-5                           |
|                           | Coefficient     | Any real value from -1 e9 to 1 e9 - ex: 1200                                |
|                           | Power           | Any real value from -4 to 4 - ex: -2.4567                                   |
|                           | Filtering       | Any NVGate filter   |
| <b>Operators</b>          | Type            | Product - Sum - independent on each operator                                |

## Virtual parameter (VDC)

The virtual parameter (VDC) allows combining front-end parametric inputs (DC) with math operations to generate a calculated parameter (new DC). This option covers numerous applications such as averaged temperature or non linear response transducers. The virtual parameters are made available as standard DC input. This option operates real-time computation on raw or recorded signal.

### VDC Settings

|                                |                         |  |
|--------------------------------|-------------------------|--|
| <b>Output</b>                  | Number                  | <b>12 Operators</b>  |
|                                | Type                    | <b>New item</b> in the DC inputs/track list                                      |
|                                | Synchronization         | <b>0° phase shift</b> with sources and analyzed signal                           |
|                                | Magnitude               | <b>User defined</b>  |
| <b>Sources</b>                 | Number                  | <b>1 to 12 channels</b>  |
|                                | Type                    | Analyzer <b>DC inputs</b> or <b>recorded</b> DC inputs                           |
| <b>Editor</b>                  | Type                    | Text   |
|                                | Variables               | <b>Real</b> values   |
|                                | Operators               | <b>+, -, x, /, ^, =</b> (affectation)  |
|                                | Predefined              | <b>Ch x</b> (Channels signals), <b>Pi, e</b>                                     |
|                                | Trigonometric functions | <b>Sine, Cosine, Tangent</b> - with <b>Arc</b> and <b>Hyperbolic</b> combination |
|                                | Logarithmic functions   | <b>Log2, Log10, Ln, Exp</b>  |
| <b>Output characterization</b> | Miscellaneous           | <b>Sqrt, Abs, Min, Max, Sum, Avg</b>   |
|                                | Limits                  | Min and max: <b>+/- 1 E9</b> - In current unit                                   |
|                                | Information             | <b>Label</b> (text)  |

## General purpose analysis

The following modules are available as standard features of NVGate® software platform; they feature additional analysis capabilities to regular plug-in analysis module.

### Monitor

The monitor is an independent (dedicated processor) module that processes continuously FFT analysis on 4 channels at the maximum available bandwidth. The aim of this module is to monitor in both domains (time and spectral) 4 inputs and to compute basic indicators for monitoring and triggering purpose.

#### Monitor settings

|                         |                         |   |
|-------------------------|-------------------------|---|
| <b>Fixed setup</b>      | Bandwidth               | <b>ABW = Sampling freq / 2.56</b>   |
|                         | Resolution              | <b>401 lines</b>  |
|                         | Average domain          | <b>Spectral (power)</b>   |
|                         | Overlap                 | <b>0%</b>   |
|                         | Average type            | <b>Exponential</b>  |
|                         | Weighting windows       | <b>Hanning</b>  |
|                         | Trigger                 | <b>Free run</b>   |
| <b>Channels</b>         | Number                  | <b>4</b>  |
|                         | Swap                    | Between <b>any active dynamic input - hot swap</b> capable  |
| <b>Average</b>          | Duration                | <b>Instantaneous (20 ms) to unlimited</b>   |
| <b>Overall analysis</b> | Pass band filter        | <b>Butterworth order 2 to 10 - IIR type - Bypass</b> function   |
|                         | Upper & lower frequency | <b>User defined</b> - can be graphically modified   |
|                         | Computed indicators     | <b>DC - Max - Min - RMS - Skew - Kurtosis</b> - Into defined pass band - <b>overall</b> if bypass is on |
|                         | Average                 | <b>User defined</b> duration - <b>independent</b> from spectral averaging                               |

#### Monitor results and connections

The following results are available for real time or post-analysis display, connection to other modules.

|                          |  |  |
|--------------------------|--|--|
| <b>FFT analyzer</b>      | Trigger bloc                           | <b>1024 samples</b> - time domain <b>analyzed bloc</b>                               |
|                          | Spectra                                | Instantaneous <b>complex spectra</b> - averaged <b>power spectra</b>                 |
| <b>Overall detectors</b> | Display (digital or analog view-meter) | <b>DC - Max - Min - RMS - Skew - Kurtosis</b>  |
|                          | Connection                             | To <b>level</b> and <b>delta level</b> event detector - to <b>waterfall profiles</b> |

### Waterfall

The waterfall module operates as a stack for plug-in analyzers results. Waterfall module features advanced graphics for 3D and profiles, including extraction tools. It can synchronize results coming from multiple plug-in analyzers and sources in one result.

#### Waterfall settings

|                   |                              |   |
|-------------------|------------------------------|---|
| <b>Mode</b>       | Continuous                   | <b>Circular buffer</b> of results   |
|                   | One shot                     | Fill stack and stop waterfall acquisition   |
| <b>Triggering</b> | Start acquisition            | Any <b>NVGate® event</b> plus <b>manual</b> and <b>free run</b>   |
|                   | Stop acquisition             | Any <b>NVGate® event</b> plus <b>manual</b> and <b>free run</b>   |
|                   | New slice (point or spectra) | Any <b>NVGate® event</b> - <b>manual</b> - <b>free run</b> - availability of <b>connected results</b> - <b>periodic</b> |

### Waterfall settings (continued)

|                 |  |  |
|-----------------|--|--|
| <b>Size</b>     | Number of result per acquisition   | Up to <b>95 results + Time</b>   |
|                 | Depth  | <b>2 to 100,000</b> slices or points - depend on PC available memory and requested result - <b>automatically adjusted</b> before acquisition   |
|                 | Depth for stand-alone acquisition  | Up to <b>3 MSamples</b> per computation DSP  |
| <b>Channels</b> | <b>Type scalar</b> (the following results are connectable to waterfall channels)   | <b>Overall levels</b> (lin and weighted) from OvA and 1/n OCT - <b>Monitor indicators</b> (DC, Max, Min, RMS, Kurtosis) - <b>Orders</b> (from CBT and SOA) - <b>Complex orders</b> (magnitude & phase) - <b>Overall levels</b> in selected BW from FFT & SOA (order or frequency) - <b>TDA scalar: DC, Min/max, RMS, Kurtosis, peak, peak-peak, crest factor</b> |
|                 | <b>Type 2D - FFT</b> (the following results are connectable to waterfall channels) | <b>Triggered block - Averaged Triggered block - Weighted Block - Complex spectra - Power spectra - Cross-spectra - FRF H1 - FRF H2 - Coherence - Zoomed complex spectra - zoomed power spectra</b>   |
|                 | <b>Type 2D - OCT</b> (the following results are connectable to waterfall channels) | <b>Instantaneous spectra - averaged spectra - max &amp; min hold spectra</b>   |
|                 | <b>Type 2D - SOA</b> (the following results are connectable to waterfall channels) | <b>Triggered block - Averaged Triggered block - Weighted block - Complex order spectra - Power order spectra</b>   |

### Waterfall results

The following results are available for real time or post-analysis display, report and saving. All stacked result can be saved.

|                 |  |   |
|-----------------|--|---|
| <b>3D</b>       | Display                                    | <b>1 pane (3D) - 2 panes (3D + YZ view or 3D + XY view) , 3 panes (3D + YZ + XY + Extraction view)</b> windows - automatic or user selectable <b>pane arrangement - Real or imaginary</b> part and <b>module or phase</b> for complex results |
|                 | Z axis (X axis for extraction and YZ view) | <b>Any reference - time</b> - independent for any window - swap reference at any time   |
|                 | Saving selection                           | <b>Entire 3D data</b> and / or any active <b>section (YZ, XY or Extraction)</b>   |
| <b>Profiles</b> | Display                                    | Profile of any scalar - <b>Real or imaginary</b> part and <b>module or phase</b> for complex results  |
|                 | X axis                                     | <b>Any reference - Time - Slice</b> - independent for any window - swap reference at any time   |

### Waterfall Tools

The following results are available for real time or post-analysis display, report and saving.

|                       |  |   |
|-----------------------|--|---|
| <b>Sections</b>       | YZ Sections (Profiles vs. Ref)                 | Any order/frequency - <b>Power - Peak</b> - on selected bandwidth   |
|                       | XY Sections (Spectra)                          | Any position in the current ref. - <b>Min - Max - Average</b> - on selected range or all slices                           |
|                       | Order/Frequency extraction (profiles vs. Ref.) | Any order/frequency extraction - <b>user selectable tach. - Power - Peak</b> - on selectable bandwidth - <b>Max order</b> |
|                       | Number of sections                             | <b>Unlimited</b> - available on result or real-time waterfalls  |
| <b>Linked cursors</b> | General  | <b>Single or dual</b> cursor in each view - <b>linked</b> with other graphs   |
|                       | Linked by value                                | Linked cursors <b>track the same X value</b> in different windows.  |
|                       | Linked by reference                            | Linked cursors <b>track the same acquisition slice</b> in different waterfall windows <b>with different X or Z-axis</b> . |

**References are:** Time - Slice number - DC channels (expressed in physical quantity) - TDA scalars - Monitor levels- any Tachometer

## Shared resources

The following resources are available for each plug-in analyzer (when it is compatible). For example once a trigger is activated it can be applied to FFTx and SOA: Then modifying the trigger setting in the resources will apply on all corresponding plug-in.

### Triggering:

Each plug in analyzer (and recorder) can be started, stopped or triggered (new block) with events defined in the Event module.

#### Event settings

|                                 |                 |   |
|---------------------------------|-----------------|---|
| <b>Edge detector</b>            | Source          | <b>Any dynamic input</b> - Any recorded dynamic input   |
|                                 | Label           | String for <b>event identification</b> (Ex. "Impact" for a hammer impact detection)   |
|                                 | Threshold       | Between <b>min and max range</b> - use <b>source unit</b> (ex. g for an accelerometer)  |
|                                 | Pre-filtering   | <b>A law - C law</b> - any NVGate filter  |
|                                 | Slope           | <b>Rise - fall</b>  |
|                                 | Hold off        | <b>0 to 36000 s</b>   |
|                                 | Hystersis       | Into source <b>input range</b> - use <b>source unit</b> (ex. g for an accelerometer)  |
|                                 | Number          | <b>2</b> edge detectors   |
| <b>RPM speed detector</b>       | Source          | <b>Any tachometer</b> - computed from <b>dynamic input</b> or <b>ext.sync</b> - any recorded pulses (through tachometer)        |
|                                 | Label           | String for <b>event identification</b> (Ex. "start speed" for a run up initial triggering)                                      |
|                                 | Threshold       | Detection into source tachometer RPM range  |
|                                 | Slope           | <b>Run up - Run down</b>  |
|                                 | Hysteresis      | <b>0 to source max RPM</b>  |
|                                 | Interpolation   | <b>On</b> interpolate event occurrence <b>into revolution</b> - <b>Off</b> event occur <b>at revolution ends</b> (new pulse)    |
|                                 | Number          | <b>2 to 6</b> RPM speed detector  |
| <b>Delta RPM speed detector</b> | Source          | <b>Any tachometer</b> - computed from <b>dynamic input</b> or <b>ext.sync</b> - any recorded pulses (through tachometer)        |
|                                 | Label           | String for <b>event identification</b> (Ex. "Each 100 RPM" for a run up triggering)   |
|                                 | Lower velocity  | <b>Minimum</b> RPM speed - Events occurs only for higher source speed   |
|                                 | Higher velocity | <b>Maximum</b> RPM speed - Events occurs only for lower source speed  |
|                                 | Delta velocity  | Define <b>velocity step</b> - <b>event occur each time</b> source speed increase or decrease by delta velocity                  |
|                                 | Slope           | <b>Run up - run down - first</b> , first slope is automatically selected - <b>any</b> , event occur on any slope                |
|                                 | Interpolation   | <b>On</b> , interpolate event occurrence <b>into revolution</b> - <b>Off</b> , event occur <b>at revolution end</b> (new pulse) |
|                                 | Number          | <b>2 to 6</b> delta RPM speed detector  |
| <b>Level detector</b>           | Source          | Any <b>parametric (DC)</b> input - <b>Monitor scalar</b> - <b>Filtered</b> monitor scalar (Band Pass)                           |
|                                 | Label           | String for <b>event identification</b> (Ex. "temp A" for a recording trigger)   |
|                                 | Type            | Monitor scalar - DC - RMS - Max - Min - Kurtosis  |
|                                 | Status          | <b>Above / below</b> - Detection level - available in <b>lin</b> or <b>dB</b>   |
|                                 | Number          | <b>1 to 4</b> level detectors   |

Event settings (continued)

|                                   |   |  |
|-----------------------------------|---|--|
| <b>Periodic event</b>             | Label                                     | String for <b>event identification</b> (Ex. "Hourly" for 1 hour time interval)   |
|                                   | Time interval                             | <b>2 ms to 11 days - Synchronized</b> with analyzer.   |
|                                   | Number                                    | <b>2 periodic events</b>   |
| <b>Combination</b>                | Sources                                   | <b>Any event - 2</b> different sources defined as <b>A and B</b>   |
|                                   | Label                                     | String for <b>event identification</b> (Ex. "Time/RPM variation" for a mix between periodic and delta RPM)   |
|                                   | Combination                               | <b>A OR B - A AFTER B - A AND B</b> (occur in the same bloc)   |
|                                   | Number                                    | <b>2 event combination</b>   |
| <b>Plug-in synchronization</b>    | FFTx result available                     | Occurs at each <b>new spectra availability</b> - Occurs at <b>end of linear averaging</b> (repeat and linear) - One event per active FFT plug in (FFT1 to FFT4)                                      |
|                                   | OCT result available                      | Occurs at each new 1/n spectra availability - Occur at <b>end of linear averaging</b> (leq, short leq, linear repeat)  |
|                                   | SOAx result available                     | Occurs at each <b>new spectra availability</b> - Occurs at <b>end of linear averaging</b> (repeat and linear) - One event per active SOA plug in (up to 2)   |
|                                   | TDA result available                      | Occurs at each new level set ( RMS, DC, etc) availability - Occur at <b>end of linear averaging</b> (repeat and linear)  |
|                                   | OVA result available                      | Occurs at each new set of overall level (short LEQ) availability - Occur at <b>end of short averaging</b> (repeat and linear)  |
| <b>Generators Synchronization</b> | Event synchronized with <b>blocks of:</b> | <b>Multi-sine - random noise - chirps</b>  |
|                                   | <b>Swept sine</b> generator event:        | <b>Swept sine stabilized</b> (output amplitude established) - <b>step sine stabilized</b> (occur x sec after step frequency is reached) - <b>pure tone stabilized</b> (output amplitude established) |

Output signals:

NVGate® proposes a set of generator signals.

Output signals

The following output signals are available as standard and can be independently applied to the front-end outputs.

|                   |                   |   |
|-------------------|-------------------|---|
| <b>Sine</b>       | Type              | Pure tone - Swept sine - Step sine  |
|                   | Frequency         | <b>100 µHz to 40 kHz</b> - smooth variation between step - resolution <b>10 µHz</b>   |
|                   | Frequency control | Start & stop frequencies - pause/release during sweep - adjustment during pause - step  |
|                   | Cycle control     | One shot - One cycle - continuous sweep between boundaries  |
|                   | Amplitude control | <b>Settling time</b> 100 µs to 10 s - <b>Stabilization time</b> 0 s to 1000 s   |
|                   | Sweep speed       | Linear: <b>300 mHz/s to 20 kH/s</b> - Log: <b>5 mOct/s to 330 Oct/s</b>   |
|                   | Step control      | <b>Synchronized with analysis end</b> - free run  |
|                   | Gain control      | <b>-15 dB to +60 dB - Independent</b> for each output - Amplitude <b>variation controlled</b> by settling time (1 ms to 1000 s)   |
|                   | Phase control     | Offset $\pm 360^\circ$ - <b>Independent</b> for each output - phase <b>variation controlled</b> by phase speed (1.5°/s to 360°/s) |
|                   | Number            | <b>2 to 6</b> sine generated simultaneously - with <b>independent phases and amplitudes - synchronized</b> frequencies            |
| <b>Multi-sine</b> | Frequency span    | From <b>125 mHz to 40 kHz</b>   |
|                   | Amplitude         | <b>0 to 2.5 Vrms</b> - Settling time <b>100 µs to 10 s</b>  |
|                   | Resolution        | <b>125 mHz to 400 Hz - 101 lines to 6401 lines</b>  |
|                   | Phase             | <b>Fixed</b> (all sine have same phase) - <b>Random</b>   |
|                   | Burst             | <b>0 to 100%</b> - Step <b>1%</b>   |
|                   | Number            | <b>2 to 4 independents</b> multi-sine   |

**Output signals (continued)**

|                     |                |   |
|---------------------|----------------|---|
| <b>Random noise</b> | Frequency span | From <b>125 mHz</b> to <b>40 kHz</b> - independent lower and upper frequencies  |
|                     | Amplitude      | <b>0 to 2.5 Vrms</b> - Settling time <b>100 µs to 10 s</b>                      |
|                     | Type           | <b>White - pink</b>   |
|                     | Burst          | <b>0 to 100%</b> - Step <b>1%</b> - Bloc duration: <b>2.5 ms to 100 s</b>       |
|                     | Number         | <b>2 to 6 independent</b> and <b>uncorrelated</b> random noises                 |
| <b>Chirp</b>        | Frequency span | From <b>3.125 Hz</b> to <b>40 kHz</b> - independent lower and upper frequencies |
|                     | Amplitude      | <b>0 to 7,07 Vrms</b> - Settling time <b>100 µs to 10 s</b>                     |
|                     | Size           | <b>256 - 512 - 1024 - 2048 - 4096 - 8192 - 16384</b>                            |
|                     | Burst          | <b>0 to 100%</b> - Step <b>1%</b>   |
|                     | Number         | <b>2 to 6 independents</b> chirps   |

**Filters:**

The following filters apply on front-end inputs, plug-ins analyzers and output generators.

|                        |                     |   |
|------------------------|---------------------|---|
| <b>High pass</b>       | Type                | <b>Butterworth – IIR type</b>   |
|                        | Order               | <b>1 to 6</b>   |
|                        | Cutoff frequency    | <b>ABW<sup>10</sup> to ABW/1024</b>   |
| <b>Low pass</b>        | Type                | <b>Butterworth – IIR type</b>   |
|                        | Order               | <b>1 to 6</b>   |
|                        | Cutoff frequency    | <b>ABW to ABW /102.4</b>  |
| <b>Stop/pass band</b>  | Type                | <b>Butterworth – IIR type</b>   |
|                        | Order               | <b>2 to 10</b>  |
|                        | Cutoff frequencies  | <b>ABW to 0.055 * ABW</b>   |
|                        | Bandwidth           | <b>ABW/2 to 0.0075 * ABW</b>  |
| <b>Integrators</b>     | Type                | <b>HP, Single or double</b>   |
|                        | High pass frequency | <b>ABW<sup>1</sup>/10 000 or ABW<sup>1</sup>/2 000</b>                        |
|                        | Integration time    | <b>2 ms to 500 s</b>  |
| <b>Differentiators</b> | Type                | <b>Single</b>   |
|                        | Average             | <b>Sliding - 0 to 2 s</b>   |
| <b>Weightings</b>      | Laws                | <b>A &amp; C laws</b>   |
|                        | Bandwidths          | <b>10 kHz to 40 kHz</b>   |
| <b>All</b>             | By-Pass             | <b>Apply/bypass</b> without stabilisation time - independently on each filter |
|                        | Application         | Same filters set for each plug-in   |
|                        | Label               | Each filter features a user define name                                       |

<sup>10</sup> ABW : the analysis bandwidth, of the plug-in or front end where the filter is in use.

## Notes

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The above specifications describe all the guaranteed capacities and performances of the software installed in a PC running Windows XP Pro SP3 (recommended configuration). Functionalities may change depending on mode operation (connected to a 3-Series unit or office). Plug-in analyzers, options and channel number availability depend on purchased options.

The instruments hardware are described separately in the “Instruments specifications” data sheet for OR34 & OR35 and OR36 & OR38.

OROS reserves the right to modify the specifications without notification.



# OROS, Leadership through Innovation

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Now approaching 30-years in business, OROS' designs and manufacturing have been renowned for providing the best in noise and vibration analyzers as well as in specific application solutions.

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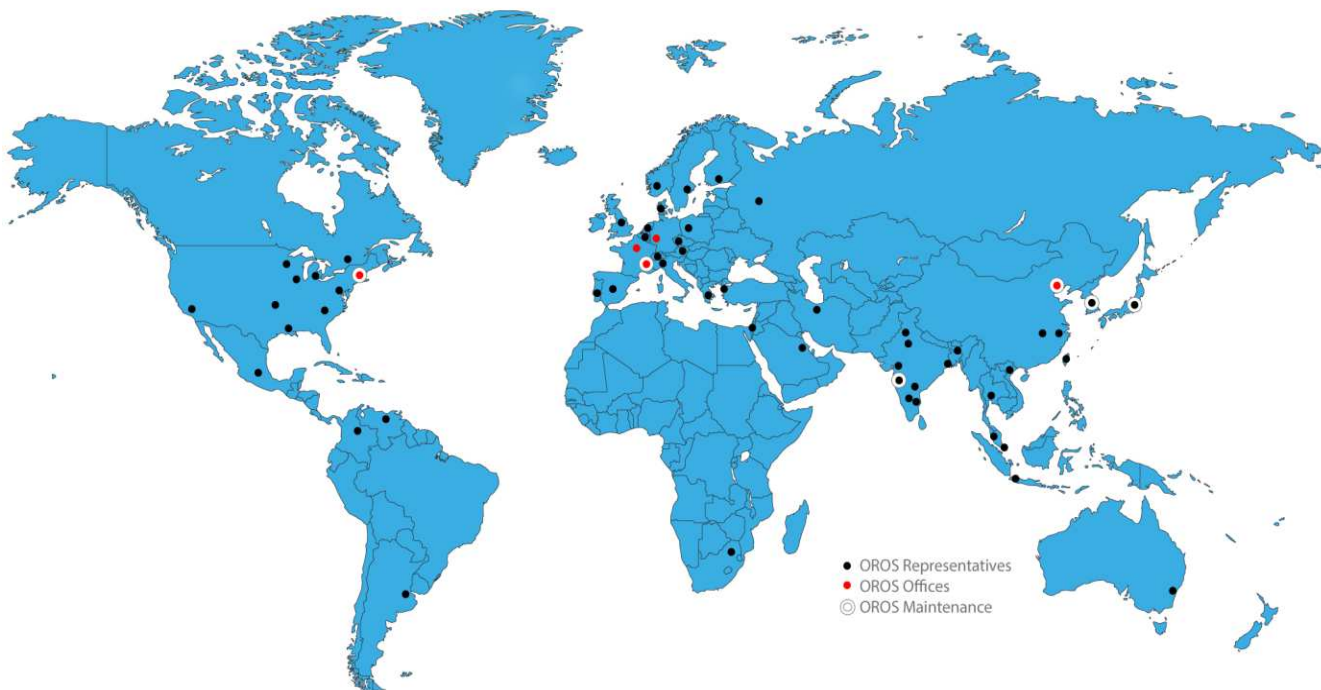
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