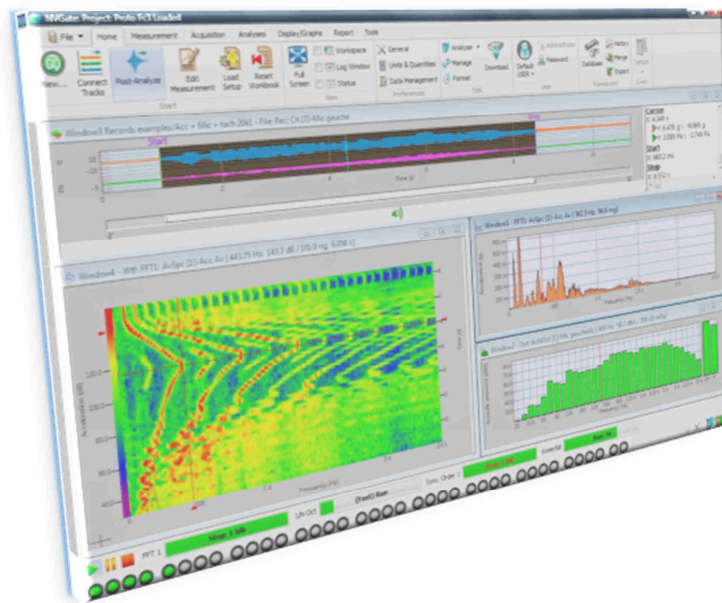


# NVGate<sup>®</sup>

## Software Platform for OROS 3-Series



## Table of Content

---

Table of Content .....	2
General description .....	3
Modules .....	3
Signal sources .....	5
Front-end .....	5
Recorder / Player.....	7
Recorder .....	7
Player .....	8
Plug-ins analyzers .....	10
Time Domain Analysis - TDA .....	10
Fast Fourier Transform analysis - FFT.....	11
Constant Band Order Tracking Add-on (CBT) .....	12
Diagnostic Add-on (FFTDiag).....	13
Synchronous Order Analysis (SOA).....	14
Diagnostic Add-on (SOADiag).....	15
1/n octave constant percentage band filter analysis - OCT .....	16
Overall acoustics sound level meter - OVA.....	17
Options .....	18
Instantaneous angular Velocity Converter (IVC).....	18
Angular sampling (A-Samp) .....	18
Virtual inputs (VIn) .....	18
Virtual parameter (VDC).....	19
Combined tachometer editor (CTE) .....	20
General purpose analysis.....	21
Monitor.....	21
Waterfall .....	21
Shared ressources .....	23
Triggering .....	23
Output signals.....	24
Filters.....	25
Notes .....	26

## 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. This specification applies for NVGate version 9.00 and Teamwork instruments. The detailed features of analyzer hardware and metrological information are available in *OROS 3-Series 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.

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

<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 and cross correlation, DC, Min/Max, Pk, pk/pk and crest factor.</b>	Set of functions dedicated to the diagnostics of industrial 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>SOADiag (SOA Add-on)</b>	<b>Copstrum™</b> , Auto and cross <b>correlation</b> , Revolution <b>synchronous statistics</b> , Order transmission Function ( <b>ORF™</b> ), <b>X</b> functions	Set of diagnostic functions based on the synchronous order analysis for rotating part transmission and forced vibration extraction.
<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	Torsional measurements from 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
<b>A-Samp</b>	Angular sampling for SOA	Real-time Angular sampling of inputs

### PC requirements

<b>Minimum</b>	1 GB <sup>1</sup> of RAM / 250 MB free on HD + storage for measurements and signals / 1024 x 768 display
<b>Recommended (for laptop)</b>	<b>Dual/quad core processor</b> (e.g.: Intel Core i5) / > 2.5 GHz / <b>4 GB</b> of RAM / GPU / 1368 x 768 display / 1 GB free on HD + storage for signals
<b>Recommended (for desktop)</b>	<b>Quad core processor</b> (e.g.: Intel Core i7) / <b>6 GB</b> of RAM / GPU / <b>1920 x 1080 display</b> / 1 GB free on HD + storage for signals
<b>Connections</b>	Type: <b>Ethernet 100/1000 BASE-T</b> , 1 Gb/s : Connector: <b>RJ45</b> For removable disk: <b>USB 3.0</b> / For dongle key: <b>USB 2.0</b>
<b>Operating systems</b>	Windows <b>Vista</b> Service Pack 2 / Windows <b>7</b> / Windows <b>8 &amp; 8.1</b> / <b>MS Office 32 bits</b> only

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

<sup>1</sup>) Waterfall depth depends on available memory.

## 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 2,048 S/s or 65.536 kS/s to 3,200 S/s</b>
	LEMO <sup>2</sup> connectors management	<b>200 V</b> polarization <b>on/off</b> per block of 8 input
	Coupling <sup>3,4</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>3</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>3,4</sup>	Any physical quantity can independently be associated to inputs.
	Sensitivity <sup>3,4</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>3</sup>	<b>Gain</b> - <b>polarity</b> - <b>offset</b> .
	Filter <sup>3</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>3</sup>	<b>AC</b> (0.35 Hz) - <b>DC</b>
	Information <sup>3</sup>	Label
	Physical quantity <sup>3,4</sup>	Any physical quantity can be associated to inputs.
	Sensitivity <sup>3,4</sup>	User defined in <b>V/unit</b> .
	Range <sup>3</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>3</sup>	<b>Gain</b> , <b>offset</b> .
	Edge detection <sup>3</sup>	<b>Threshold</b> (in associated unit) - <b>Edge</b> (rise, fall) - <b>Hysteresis</b> - <b>hold off</b> (sec)
	Pre-divider <sup>3</sup>	<b>Hardware</b> - <b>1 to 255 pulses</b> – accept up to <b>375 kpulses/sec</b>
	Post-multiplier <sup>3</sup>	<b>1 to 50 pulses/trigger</b> - Generate higher frequencies on low rate triggers. (ex. GPS)
	Tachometer mode <sup>3</sup>	<b>Pulse per rev</b> : 0.5 to 4096 - <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>2</sup> : Instantaneous angular velocity converter	<b>Pulse per rev</b> : 1 to 4096 - <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 5, <b>Missing pulses detection</b> : 1 to $\pm 20\%$ of previous pulses duration - <b>Filters</b> (dt, dt <sup>2</sup> , 1/dt)
	Angular sampling <sup>2</sup> : multi-pulse/rev clock used for signal sampling	for <b>SOA</b> - <b>Pulse per rev</b> : 1 to 4096 continuously (no power of 2 limitation) - Real time, in line <b>anti-aliasing</b> - <b>Missing pulse number</b> : 0 to 5, <b>Missing pulses detection</b> : 1 to $\pm 20\%$ of previous pulses duration – <b>Phase reference</b> : Any tachometer including same input

<sup>2</sup> Optional features

<sup>3</sup> Independent for each input

<sup>4</sup> Linked with the transducer database

## Front-end (continued)

<b>Outputs</b>	Sampling	Same as dynamic inputs
	Generated signals <sup>3</sup>	Any <b>outputs signals</b> , see §outputs - play-back of signal file tracks - DC levels - Inputs playback (Delay > 256 samples)
	Filters <sup>3</sup>	<b>Any NVGate</b> filter can independently be applied to each dynamic output (See Filters §)
	Impedance <sup>3</sup>	<b>50 <math>\Omega</math>, 600 <math>\Omega</math></b> (only OR36 and OR38) or grounded
	Gain <sup>3</sup>	<b>-100 dB to + 120 dB</b>
	Synchronization <sup>3</sup>	<b>Free run</b> or <b>linked</b> to acquisitions <b>runs</b>
	Level and phase transition <sup>3</sup>	No ( <b>Steps</b> ) - controlled ( <b>ramp</b> ) - user selectable ramp time
	Clipping	User selectable - <b>protects shaker</b> and <b>amplifier</b> .
	Events (can trig analysis or record) <sup>3</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>12.3 to 12,8 S/s</b> - 10 Hz to 100 Hz harmonics rejection
	Information <sup>3</sup>	Label
	Physical quantity <sup>3,4</sup>	Any physical quantity can be associated to inputs.
	Sensitivity <sup>3,4</sup>	User defined in V/unit.
	Range <sup>3</sup>	Pk to pk expressed in the associated unit (taking in account sensitivity) - <b>linear</b> or <b>dB</b>
	External conditioner compensation <sup>3</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 &amp; connections

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

<b>Dynamic inputs &amp; torsional<sup>1</sup> inputs</b>	Monitoring <sup>3</sup>	Time domain instantaneous signal - Size <b>256 samples</b>
	Status led <sup>3</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>3</sup>	To any: <b>plug-in analyzer channel, monitor channel, Virtual inputs, recorder track, edge event detector &amp; tachometer</b>
<b>Ext. Sync inputs</b>	Monitoring <sup>3</sup>	Time domain <b>instantaneous status</b> (1 = threshold crossed, 0 = no event) - Size <b>256 samples</b> .
	Connection <sup>3</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 waterfall acquisition. To <b>torsional, tachometer &amp; angular sampling</b>
<b>Parametric<sup>1</sup> (DC) inputs &amp; CAN<sup>1</sup> parameters</b>	Monitoring <sup>3</sup>	<b>Profiles</b> versus time ( <b>160 ms to 163 sec</b> user selectable), and <b>digital/analog view meter</b> .
	Status led <sup>3</sup>	<b>Overloaded</b> = red - <b>ok</b> = yellow - <b>under load</b> (20 dB below range) = Cyan
	Connection <sup>3</sup>	To any: <b>recorder track, waterfall reference (Z/X axis)</b> and <b>profiles, level delta level detectors</b> and <b>virtual DC</b>

<sup>5</sup> For OR36, OR38 and Mobi-Pack only



## Recorder / Player

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

- Record time domain signal, torsional inputs, 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-Disk™ 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</b> ( <b>40 kHz</b> to <b>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</b> ( <b>50 Hz</b> rejection) - <b>15 S/s</b> ( <b>60 Hz</b> rejection)
<b>Tracks</b>	Number	<b>14 tracks</b> <sup>6</sup> (8 + 6 ext. sync) or <b>38 tracks</b> <sup>7</sup> (32 + 6 ext. Sync) Sum of connected licenses using multiple hardware
	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</b> compensation.
<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</b> to <b>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</b> to <b>available space on active drive</b> (PC or OR3x).
	Time to stop	Memorize the <b>earliest x seconds</b> - Stop = <b>stop</b> or any <b>activated event</b> - Duration <b>10 ms</b> to <b>2 GSamples</b> (limited by the drive 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 SSD	Up to <b>40 channels</b> (32 inputs + 6 ext. sync or DC)/instruments - max bandwidth <b>3.2 MS/s</b> (12.5 MB/s)
	Format	<b>Normal: 32 bits/sample</b> - <b>Compressed 16 bits/sample</b>

<sup>6</sup> For OR34, OR35 and Office-8 licenses.

<sup>7</sup> For OR36, OR38 and Office licenses.

## Recorder settings (continued)

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

## Mobi-Disk™

OR36 Mobi-Pack 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 3.0 link	<b>Download 15 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® <b>recorded files</b> - <b>Imported files</b> - located on <b>instrument SSD, Mobi-Disc™</b> or on <b>PC HDD</b> .
	Record selection	<b>Record number selection</b> (for multi record files)
	Section definition	User selectable <b>Start</b> and <b>stop offsets</b> (in sec.) - available in the <b>file overview window</b> (marker and slider)
	Duration	<b>Play backed duration</b> (User information)
	Repeat	<b>On/off</b> - repeat continuously the selection (available only for playback on analyzer output)
<b>Mode</b>	File swap	<b>Swap loaded files with same tracks number</b> - applies <b>identical post-analysis</b> 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	<b>Up to 352</b> according to user's fleet
	Type	<b>Dynamic input</b> record (2 sampling frequencies), <b>parametric</b> (DC) input record and <b>ext. sync</b> record.
	Fixed setting (information) / track	<b>Label, Coupling, external gain, input range, sampling frequency</b> and <b>signal bandwidth</b>
	Modifiable measurement point information settings (apply for post analysis or re-recording) / track	<b>Component - node number - direction - type</b>
	Modifiable settings (apply for post analysis or re-recording) / track	Associated <b>transducer - unit - sensitivity - offset</b> compensation



### Player settings (continued)

<b>Listening</b>	File location	<b>Analyzer HD - Mobi-Disk™</b> connected with USB or inside the analyzer - <b>PC HD</b>
	Playback	One track - from cursor position - repeat displayed signal
<b>Markers</b>	Display	Recorded markers are available in the <b>file overview</b>
	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 &amp; torsional Tracks</b>	Preview (multiple file simultaneously)	<b>Entire file fast overview</b> (pre-compressed at recording time) - <b>Track contents preview</b> , independently (multi-graph display)
	Monitoring (loaded file only)	<b>Zoom</b> on selected <b>play-back section</b>
	Connection3 (loaded file only)	To any: <b>plug-in analyzer channel, monitor channel, recorder track, edge event detector and tachometer</b>
<b>Ext. sync Tracks</b>	Preview (multiple file simultaneously)	<b>Entire file fast overview</b> (pre-compressed at recording time) - <b>Track contents preview</b> , independently (multi-graph display)
	Monitoring (loaded file only)	<b>Zoom</b> on selected <b>play-back section</b>
	Connection <sup>3</sup> (loaded file only)	To any: <b>start or stop averaging</b> of plug-in analyzers, recorder <b>start or stop recording, waterfall start or stop acquisition, new block trigger</b> for FFT and SOA and <b>new slice</b> for <b>waterfall</b> acquisition. To <b>torsional, tachometer &amp; angular sampling</b>
<b>Recorded parametric<sup>1</sup> (DC) inputs &amp; CAN parameters</b>	Preview (multiple file simultaneously)	Entire file <b>fast overview</b> - <b>Track contents preview</b>
	Monitoring (loaded file only)	<b>Profiles</b> versus time and <b>digital or analog view meter</b> .
	Connection <sup>3</sup> (loaded file only)	To any: <b>recorder track, waterfall reference (Z/X axis) and profiles, level and delta level events</b> .

## 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> (sampling oscillator 102.4 kS/s to 2,048 S/s)
	Oscillator 2	<b>512 mHz to 25.6 kHz</b> (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</b> (27 hours) - <b>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> 32 to 256 in <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 - Kurtosis</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 - Kurtosis</b> - computed on the Time span – All values available for <b>View-meter</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> (sampling oscillator 102.4 kS/s to 2,048 S/s)
	Oscillator 2	<b>512 mHz to 25.6 kHz</b> (sampling oscillator 65.536 kS/s to 3,277 S/s)
<b>Resolution</b>	Lines	<b>101, 201, 401, 801, 1601, 3201, 6401, 12801<sup>9</sup> and 25601 lines</b>
	Frequency resolution	<b>80 µHz</b> (512 mHz/6401 lines) 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, MP & OR38 analyzers	<b>32 to 256 ch.</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® event</b> plus <b>manual</b> and <b>free run</b>
	End averaging	Any <b>NVGate® event</b> plus <b>manual</b> and <b>free run</b>
	New block	Any <b>NVGate® event</b> 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

<sup>9</sup> With force DSP

## 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> - averaged <b>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</b> view-meter
<b>Monitoring<sup>10</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>10</sup> These results 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. Up to 4 FFTDiag can operate on 4 different FFT plug-in at the same time.

This option adds settings and results to the FFT Plug-ins.

### FFTDiag Settings

<b>Envelop demodulation</b>	Activation	Enable/disable on all channels - requires <b>zoom activation</b>
	Averaging	Spectral domain - FDSA
	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 – up to 800 with <i>ForceDSP</i></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 – 1601 with <i>ForceDSP</i></b>
	Order resolution	<b>1 - ½ - ¼ - 1/8 - 1/16 - 1/32</b>
<b>Averaging</b>	Domain	<b>Spectral</b> (power) - <b>revolution</b> (re-sampled blocs)
	Type	<b>Exponential - linear - repeated linear - peak hold</b>
	Size	<b>Number of blocks</b> , unlimited size
	Overlap	<b>0 to 31 revolutions</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, CAN, 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 – up to 800 with <i>ForceDSP</i></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</b> - 32 to 256 in <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>	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® event</b> plus <b>manual</b> and <b>free run</b>
	End averaging	Any <b>NVGate® event</b> plus <b>manual</b> and <b>free run</b>
	New block	Any <b>NVGate® event</b> 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
<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>800</b> with <b><i>ForceDSP</i></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</b>
	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</b>
	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)

## Diagnostic Add-on (SOADiag)

Order based Diagnostic is an optional add-on to the SOA plug-in analyzers. This add-on computes a set of useful synchronous order transmission extraction tools and analyses. Up to 2 SOADiag can operate on 2 different SOA plug-in at the same time.

This option adds settings and results to the SOA Plug-ins.

### SOADiag Settings

<b>Cross-functions</b>	Reference selection	<b>Full</b> or <b>partial matrix</b> available (all channels can be references) - order domain averaging only.
<b>Angular Correlation</b>	Activation	Enable/disable on all channels - All other SOA results are affected simultaneously
	Weighting window	<b>Uniform</b> - <b>Left</b> zero padding - <b>Centred</b> zero padding

### SOADiag Results

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

<b>Rev. synchronous Scalars</b>	Min/Max	Minimum and maximum amplitude per trigger block (n rev.)
	RMS, DC	Per trigger block (n rev.)
	Peak detectors	<b>Peak level</b> - <b>Peak to Peak level</b> - <b>Crest Factor</b> - per trigger block (n rev.)
<b>Others</b>	Copstrum™	<b>Cepstrum</b> of the order spectra
	Cross-functions	<b>Instantaneous order cross-spectra</b> - averaged order <b>cross-spectra</b> - <b>ORF™</b> H1 / H2 - <b>Coherence</b> – <b>angular</b> or <b>order</b> domain averaging.
	Angular Correlation	<b>Auto-correlation</b> block - <b>Cross correlation</b> block - angular averaged
	Re-sampled Shaft view	Time domain signal on first rotation – <b>angular representation</b> - <b>instantaneous</b> or <b>revolutions</b> averaged

## 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> 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> 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> per plug-in for <b>on line</b> - 32 to 256 in <b>post-analysis</b>
	OR34 & OR35 analyzers	<b>8 channels</b> for <b>on line</b> and <b>post-analysis</b>
<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>
	Repeat averaging	On <b>new start</b> or <b>end of averaging</b>
<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> per plug-in for <b>on line</b> - 32 to 256 in <b>post-analysis</b>
	OR34 & OR35 analyzers	<b>8 channels</b> for <b>on line</b> and <b>post-analysis</b>
<b>Averaging</b>	Linear	<b>User selectable</b> duration - <b>repeat</b> mode
	Short leq	<b>1/8 s - 1 s</b> - User selectable duration
<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>
	Repeat averaging	On <b>new start</b> or <b>end of averaging</b>
<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 pts. 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 4096</b> - Up to <b>1 E6</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 5</b> consecutive pulses <b>integer or fractional</b>
	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)	350 µRad (20 mdegres) @ 8000 RPM, up to order 10
<b>Pre-processing</b>	Smoothing	Sliding average - <b>1 to 32</b> samples
	Filtering	<b>Any NVGate</b> filter (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-divider	Max RPM = $36 \text{ e6/Pulse per rev}$ - 12 000 RPM @ 200 pulse/rev

#### 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

### Angular sampling (A-Samp)

The angular sampling option allows localizing accurately the order phenomenon angle on cyclic rotating machineries. It uses the pulses delivered by an encoder (or zebra tape or gear teeth) to resample the inputs and torsional signal in the SOA plug-in. This option operates real-time computation and operations are possible on-line or in post processing.

#### IVC Settings & specs

See front-end/ext. Synch § for details

### 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. A static twist computation based on phase comparison is also available with the Vin + IVC options.

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 32 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
<b>Twist</b>	Type	Phase comparison – output in plane angle
	Correction (zeroing) offset	-360° to +360°
	Output	Plane angle or torque with conversion factor

## 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	12 Operators
	Type	New item in the DC inputs/track list
	Synchronization	0° phase shift with sources and analyzed signal
	Magnitude	User defined
<b>Sources</b>	Number	1 to 32 channels
	Type	Analyzer DC inputs or recorded DC inputs
<b>Editor</b>	Type	Text
	Variables	Real values
	Operators	+, -, x, /, ^, = (affectation)
	Predefined	Ch x (Channels signals), Pi, e
	Trigonometric functions	Sine, Cosine, Tangent - with Arc and Hyperbolic combination
	Logarithmic functions	Log2, Log10, Ln, Exp
	Miscellaneous	Sqrt, Abs, Min, Max, Sum, Avg
<b>Output characterization</b>	Limits	Min and max: +/- 1 E9 - In current unit
	Information	Label (text)

## 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	<b>2</b>
	Type	<b>Any NVGate tachometer</b> – excepted another CTE
<b>Output</b>	Type	New item in the active tachometers list
	Synchronization	<b>0° phase shift</b> with sources and analyzed signal
<b>Editor</b>	Type	Text
	Variables	<b>Real</b> values
	Operators	<b>+, -, x, /, ^, =</b> (affectation)
	Predefined	Rmp1, Rpm2 (sources speed), <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, Sign, If, Rint</b>
	Rotation	Clock wise or counter clock wise
	Average	<b>Sliding</b> - <b>1</b> to <b>256</b> revolution
	Speed limits	Min: <b>0 RPM</b> - max: <b>1 200 000 RPM</b>
	Information	Label (text)

### CTE Results

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

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



## 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</b> (power)
	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</b> (20 ms) to <b>unlimited</b>
<b>Overall analysis</b>	Pass band filter	<b>Butterworth</b> order <b>2 to 10</b> - <b>IIR</b> type - <b>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>Time domain</b>	Play back	On any output generator - hot swappable
<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</b> : <b>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</b> (3D) - <b>2 panes</b> (3D + YZ view or 3D + XY view) , <b>3 panes</b> (3D + YZ + XY + Extraction view) windows - automatic or user selectable <b>pane arrangement</b> - <b>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</b> (YZ, XY or Extraction)
<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.</b> - <b>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 FFT 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</b> - <b>C law</b> - any NVGate filter
	Slope	<b>Rise</b> - <b>fall</b>
	Hold off	<b>0</b> to <b>36000</b> s
	Hysteresis	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</b> - <b>Run down</b>
	Hysteresis	<b>0</b> to <b>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</b> - <b>run down</b> - <b>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</b> / <b>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</b> - <b>Synchronized</b> with analyzer.
	Number	<b>2</b> periodic events
<b>Combination</b>	Sources	<b>Any event</b> - <b>2</b> different sources defined as <b>A</b> and <b>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</b> - <b>A AFTER B</b> - <b>A AND B</b> (occur in the same bloc)
	Number	<b>2</b> event combination
<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</b> - <b>random noise</b> - <b>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 <math>\mu</math>Hz to 40 kHz</b> - smooth variation between step - resolution <b>10 <math>\mu</math>Hz</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 $\mu$ s to 10 s - <b>Stabilization time</b> 0 s to 1000 s
	Sweep speed	Linear: <b>300 mHz/s to 20 kHz/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</b> - <b>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</b> - <b>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 <math>\mu</math>s to 10 s</b>
	Resolution	<b>125 mHz to 400 Hz</b> - <b>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</b> to <b>10 s</b>
	Type	<b>White - pink</b>
	Burst	<b>0 to 100%</b> - Step <b>1%</b> - Bloc duration: <b>2.5 ms</b> to <b>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</b> to <b>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

In addition to these predefined signal, any recorder or imported signal file can be generated synchronously on front-end the outputs.

## 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>11</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>11</sup> ABW : the analysis bandwidth, of the plug-in or front end where the filter is in use.

## Notes

---

The above specifications describe all the guaranteed capacities and performances of the NVGate V8.00 software installed in a PC running Windows 7 pro (recommended configuration). Functionalities may change depending on operation mode (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, MP & OR38.

OROS reserves the right to modify the specifications without notification.



# OROS, Leadership through Innovation

### About Us

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.

### Our Philosophy

Reliability and efficiency are our ambition everyday. We know you require the same for your measurement instruments: comprehensive solutions providing performance and assurance, designed to fit the challenges of your demanding world.

### Our Emphasis

Continuously paying attention to your needs, OROS collaborates with a network of proven scientific affiliates to offer the latest of the technology, always based on innovation.

### Worldwide Presence

OROS products are marketed in more than 35 countries, through our authorized network of representatives, offices and accredited maintenance centers.

### Want to know more?

OROS headquarters	OROS Inc	OROS French Sales Office	OROS GmbH	OROS China
Tel: +33.811.70.62.36	Tel: +1.888.200.0ROS +1.703.478.3204	Tel: +33.169.91.43.00	Tel: +49.261.133.96.50	Tel: +86.10.59892134
Mail: info@oros.com	Mail: info@orosinc.com	Mail: info@orosfrance.fr	Mail: info@oros-deutschland.com	Mail: info@oroschina.com
Web: www.oros.com	Web: www.oros.com	Web: www.oros.fr	Web: www.oros-	Web: www.oros.com

