Introduction

Noise and vibration tests play a major role in the performance and reliability of industrial machinery. It is even critical to the safety of aircraft, or ships, and power generation reliability. The vibration test checks the level of noise and vibration transmitted to the structure by the rotating parts. The goal is to check that these excitations do not match with the main resonance frequencies of the structure to avoiding damaging it.

A source of vibration of rotating machinery comes from the instantaneous angular velocity variation of the rotating parts, called torsional vibrations. This widespread phenomenon appears on reciprocating machinery (diesel engines, pumps, compressors), air/water propellers, wind turbines and their transmission. Such vibrations have to be checked for test, validation and diagnostics. The measurement of torsional vibration is achieved with specific hardware and software parts, usually separated from the noise and vibration analyzer.

OROS, as a specialist of dynamic measurements on rotating machinery, offers torsional vibration functions integrated in the 3-Series analyzers.

Industries

> Automotive
> Marine
> Energy & Process
> Aerospace

Machines

> Engines
> Transmissions
> Belt Chain
> Generators / Alternators

Applications

> Marine propulsion certification and Maintenance.
> Wind turbines, gearboxes and transmissions monitoring and maintenance.
> Electric power generators maintenance.
> Engine service belt drive (alternators, compressors, pumps) R&D.
> Aircraft propellers engines and transmissions R&D.
> Industrial drive train tests, monitoring, maintenance and noise diagnostics.
> Hybrid Vehicle Transmission.
Description

Integrated Frequency to Voltage Converters

The common way to measure such instantaneous velocity is to install a coding wheel or a rotary encoder on the shaft. Then the rate of pulse delivered is directly proportional to the RPM speed during the last pulse interval. This type of measurement needs a specific converter (usually an external box) which transforms the pulses train in a continuous voltage proportional to the RPM.

The 3-Series analyzers integrate the frequency to voltage converters based on the existing Ext. synch. inputs, used for the measurement of torsional vibrations. The Instantaneous angular Velocity Converter (ORNV-IVC) software option converts it in an angular velocity signal available for the analysis plug-ins. With NVGate®, the software platform for OROS 3-Series analyzers, the analyses can be real-time and/or post-processed.

The angular velocity can be converted to angular position or to angular acceleration using the digital integration and differentiation filters. The obtained angular signal is processed as any other input (or recorded track) of the analyzer. The typical analysis modes are FFT, order tracking, time domain analysis and waterfall/color spectrogram.

Shaft View and Cross Phase Tracking

Some special features (included in the FFTDiag option) are available for the analysis of this angular signal:

The shaft view shows the instantaneous angular signal along one or multiple revolution.

The cross-phase tracking extracts the cross-phase order by order between one reference channel and all the others. It is useful for the identification of torsional resonances at specific orders and the evaluation of their amplitudes.
### Main Features

- **Integrated:** 2 inputs included in the standard 3-Series analyzers
- **Upgradeable to 4 or 6 torsional inputs per analyser**
- **Example @ 20,000 RPM - 120 pulses/rev**
  - Resolution = 3°
  - Accuracy = ±0.02°
- **Up to 4096 pls/rev. up to 1, 200 kRPM**
- **Record and analyze synchronously with standard AC/DC/ICP/bridge inputs**
- **Real-time and post-processing**
- **Torsional vibrations export (UFF, MAT, txt, SDF, wav, ASAM etc...)**
- **Spectral, order, time domain, overall, waterfall analyses of the torsional channels**
- **Fractional missing pulses management**
- **Direct angle, angular velocity and angular acceleration with dt, dt², 1/dt filters.**
- **Static and dynamic shaft twist measurements**

### Specifications

- **Integrated high speed digital inputs with 4 modes:** Trigger, Tachometer, Torsional & angular sampling
- **Pulse rate up to 51.2 kHz**
- **0.5 to 4096 pulse/rev**
- **1 to 256 pre-division for higher pulse/rev encoder – Pulse rate up to 375 kHz**
- **Edge resolution down to 160 ns (6.4 MHz over sampling)**
- **0 to 3 consecutive (fractional) missing pulses management with adjustable 0-20% time lap detection**
- **Jitter free signal with sliding average (1 to 32 periods)**
- **AC or DC coupling**
- **DC offset compensation**
- **Adjustable hold off, hysteresis, slope**
- **User define individual phase shift**

### Ordering Information

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
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<tbody>
<tr>
<td>ORNV-IVC</td>
<td>Integrated Instantaneous angular Velocity Converter for OR36 &amp; OR38 (up to 6 ext. Synch). Online and off-line processing (ORNV-IVC-2 for OR34 &amp; OR35)</td>
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<tr>
<td>OR36/8-TRG</td>
<td>Additional 2 Ch. trigger / tach / torsional module - 6.4 MHz over sampling.</td>
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<tr>
<td>ORNV-ORD</td>
<td>Synchronous order analysis plug-in</td>
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<tr>
<td>ORNV-ORDiag</td>
<td>Diagnostic Toolset for the SOA Plug-in - Includes the shaft view and the cross-phase tracking.</td>
</tr>
<tr>
<td>ORNV-TDA</td>
<td>Time Domain Analysis plug-in. Long term profile, statistical extraction of time domain data.</td>
</tr>
<tr>
<td>ORNV-ASAMP</td>
<td>Angular sampling option for ORNV-ORD and ORNV-ORDiag allows on-line and off-line processing</td>
</tr>
<tr>
<td>ORNV-VI-DC</td>
<td>Virtual input option for channels computation</td>
</tr>
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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.

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