

MOBI-PACK™

The field all in one instrument for rotating and structural analysis

Introduction

The Mobi-Pack™ is a multichannel all-in-one vibration analyzer. It combines all the functionalities and performances of the OROS 3-Series analyzers in a package made for the field: tough and rugged.

Using its 16 channels will let you carry your tests for a minimum downtime and minimized number of machine stops.

Mobi-Pack™ is the right choice for measurement in harsh environments (mud, oil, rain) without impacting the OROS instrument.



Industries

- > **Energy & Process**
 - o Power generation
 - o Oil & Gas
- > **Marine**
- > **Aerospace: Flight testing**

Machines

- > **Turbines & Compressors**
- > **Diesel Engines**
- > **Motors & Generators**
- > **Gearboxes**

Applications

- > **Field testing:** Acceptance and Troubleshooting
- > **Flight testing**
- > **On-board testing**
- > Rotating analysis: Spectrum, Orbit, Shaft centerline, Bode & Polar, Torsion
- > Structural analysis: end winding testing on generators, ODS

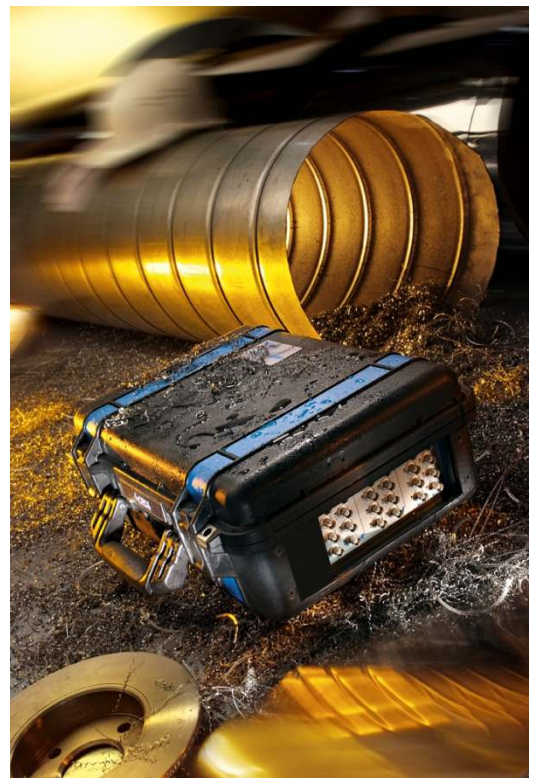


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Main Features

- > All-In-One Analyzer
- > Up to 16 input channels
- > Portable
- > Designed for the field
- > Real-time bandwidth: 40kHz
- > PC Based, 100 Mbits/s Ethernet Connection
- > Touch and measure: Tablet Operation
- > ± 40V, AC/DC inputs for proximity probes.
- > 24 bits, TEDS, ICP®
- > Accelerometers, Velocimeters, Proximity Probes, Microphones, Dynamic pressure.
- > 2 to 6 external trigger/tachometer inputs
- > 2 to 6 generator outputs
- > 4 DC process channels: temperature, static pressure, torque, load
- > Data Recording: Removable 60GB Mobi-Disk™
- > Single Cord Power supply and battery
- > Remote Control
- > Desktop extension leaf
- > FFT, Order analysis and multiple diagnostic tools
- > Dimensions (w.h.d.) mm: 470 x 180 x 360
- > Dimensions (w.h.d.) inches: 18.5" x 7" x 14"
- > Weight: 12 kg (26.5 lbs) with the controller PC.



Description

Portability

Mobi-Pack™ is designed for noise and vibration specialists traveling everywhere to troubleshoot issues from an offshore platform to the turbine side of a power plant. It can be practically carried and used in the field thanks to its rugged design. With its lightweight and compact dimensions, it is the ideal companion on your trips around the world.



Rough, rugged and reliable

Mobi-Pack™ thrives in dirty, dusty, humid, and magnetically loaded situation without compromise on the precision of the instrument. Its rugged and compact design will let it be easily transported. Moreover, the Mobi-Pack™ will even continue acquiring data with the same precision in high shock and vibration environments.

High end acquisition & processing

The tough look of the Mobi-Pack™ hides a wonder of technology improving your comfort and allowing accurate tests. The high input range ($\pm 40V$) allows to directly connecting proximity probes. The 24 bit ADC brings a huge 120 dB dynamic range so that tests can be carried out without worries about the noise floor.



With or Without PC: Real-time analysis and recording

Mobi-Pack™ can be operated with or without PC. When used without PC, the acquisition can be driven from the control panel.

In particular, Mobi-Pack™ can both analyze on-line or record raw time data for later post-processing. The removable 60 GB Mobi-Disk™ allows efficient sharing of acquired data. Features such as the desk extension leaf or the tablet PC operation possibility make its operation very handy. Tools such as macro edition and automatic reporting are available to carry efficient batch post-processing.



Control panel and Direct-Recording (D-rec) operation



Removable Mobi-Disk™ compartment

All in one

Mobi-Pack™ allows carrying and using the instrument all in one box: it includes the controller PC, the power supply, associated cables, and documents. In that way the user can be sure to keep everything packaged together in one place.

Opening the BNC cover and using it for the mouse as an extension leaf, will let you use the system on any surface including the ground.



Adaptable to the measurement configuration



Tablet operation
& Mouse extension leaf

- > Get closer to the machine
- > Reduce cable lengths
- > Leave your system unattended



PC Remote connection

Mobi-Pack™ is connected to the PC through an Ethernet cable. Based on that technology the system can be positioned closer to the sensors, thus reducing cable lengths. The PC can then interface with the analyzer allowing the user to work from a more comfortable environment. During unattended measurement the instrument can be locked preventing unexpected users to act on the system.

Simple set-up: One cord power management

On the field, it is immediately operational. Mobi-Pack™ can just be powered from the battery or by plugging one single power cord to the mains. The PC can be powered from the AC outlet provided out of the side of the Mobi-Pack™. In addition, a dedicated space is available to store the PC power supply as shown on the figure below.



All-in-one power



One cord power: PC powering

Specifications

The following specifications concern Mobi-Pack₂™ multi-analyzers/recorders. These systems consist of an OROS 3-Series instrument containing optional inputs and processing modules, a PC with an Ethernet interface, and NVGate® software with optional plug-in analyzers.

Modules

Feature	Description	
Front-end slots	Dynamic and/or parametric analog inputs	4 slots of 4 inputs (BNC)
	Dynamic analog outputs	1 slot of 2 outputs (BNC)
	Externals sync	1 slot of 2 trigger/tachometer inputs (BNC)
	Auxiliary	2 slots of 2 inputs/outputs for optional outputs, Ext. sync or DC (parametric) inputs (BNC)
Auxiliary slots	1 slot for: TEDS	
Processor slots	PC interface	1 slot of 1 DSP (Ethernet)
	Disk management	1 slot of 1 DSP
	Trigger / tachometer / monitoring	1 slot of 1 DSP
	Processing power	4 slots of 1 DSP
Miscellaneous	Internal Hard drive	1 60 GB removable disk with USB 2.0 port
	Remote control (on/off, NVTerm™)	1 RS232 cable connection (RJ11)

Basic hardware configuration

Hardware unit contains at least the following modules. All the other modules are optional.

Feature	Description
Font end	4 analog inputs, 2 analog outputs, 2 trigger/tachometer inputs
Processors	1 Ethernet DSP module for PC interfacing.
	1 disk DSP module for disk management.
	1 master DSP module for Trigger / tachometer / monitoring.
	1 computation DSP module
Disk	1 removable disk with USB 2.0 port

PC requirement

Feature	Description
Minimum	Pentium 4/ 2 GHz / 256 ¹ MB RAM with Windows XP or 512 ¹ 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
Recommended (for laptop)	Intel Core 2 Duo / 2 GHz / 1 GB of RAM with XP/7, 2 GB of RAM with Vista / Graphics video with 256 MB dedicated (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
Connection	Type: Ethernet 100base TX , 100 Mbit/s - Connector: RJ45 For removable disk: USB 2.0 - At least one USB port for dongle key.
Recommended Size	W x H x D: 285 mm * 35 mm * 230 mm (11.22 In x 1.37 In x 9.05 In)
Operating systems	Windows XP Pro Service Pack 3 (recommended), Windows Vista Business Service Pack 2, Windows 7

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

Case

Mechanicals

Feature	Description
Weight	10.7 kg (23.5 lb) power supply and accessories included (without PC)
Dimensions	Overall (w.h.d) 470 mm x 180 mm x 360 mm (18.5 in x 7.08 in x 11.81 in)

Power supply

Feature	Description
Power	< 60 VA
External AC	Voltage 100 to 240 VAC
Power supply	Frequency 47 to 63 Hz
DC	Range 10 V to 28 V
	Overload protection 31 V (over this voltage DC poles are short-circuited)
Battery	Type NiMh (no memory effect)
	Autonomy 30 min (1 h for systems with 4 ch. & 1 computation DSP)
	Charge time 2 h (typical)
	Charge conditions DC power supply > 18 V

Environmental / Compliance with standard

Feature	Description
CE	Indicates compliance with EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC
Safety	EN 61010-1 June 2001 Safety requirements for electrical equipment for measurement, control and laboratory use.
	Over-voltage Cat. II (Local level mains, appliance, and portable equipment)

	Pollution Degree	2: Do not operate in environments where pollutants may be present.
EMC Emission	EN 50081-1	Generic emission standard: Residential, commercial and light industry.
	EN 50081-2	Generic emission standard: Industrial environment.
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	CISPR 22	Radio disturbance characteristics of information technology equipment. Class B limits.
EMC Immunity	FCC Rules	Complies with the limits for a Class B digital device.
	EN 50082-1	Generic immunity standard: Residential, commercial and light industry.
	IEC 61326-1	Electrical equipment for measurement control and laboratory use EMC requirements.
	EN 50082-2	Generic immunity standard: Industrial environment.
Temperature	Linear input response range on interference	max slew rate on input: 5 V/ μs
	Mobi-Pack Operating	0°C to 50°C (32°F to 122°F)
	Storage	-20°C to 65°C (-4°F to 149°F)
Humidity	Absolute maximum rating ^{II}	-35°C to 70°C (-31°F to 158°F)
	Max 80 % RH at 40°C non condensing	
Shocks	Complies with IEC 68-2-27	
	Operating	100 m/s² (11 ms, ½ sine) and 700 m/s² (3 ms, ½ sine)
	Storage	200 m/s² (11 ms, ½ sine) and 1 000 m/s² (3 ms, ½ sine)
	Absolute maximum rating ^{II}	1 000 m/s² (3 ms, ½ sine)
Vibrations	Complies with IEC 68-2-6	
	Operating	10 m/s², 5-500 Hz, 5mm
	Storage	25 m/s², 5-500 Hz, 5mm
	Absolute maximum rating ^{II}	30 m/s², 5-500 Hz, 5mm
Enclosure	Type	IP 31

Radio frequencies sensibility

	Input measured with 50 Ω terminator
Radiated RF: 80-1000 MHz, 80% AM 1 kHz, 10 V/m	< 20 μV
Conducted RF: 0.15-80 MHz, 80% AM 1 kHz, 10 V	< 100 μV
Magnetic field: 30 A/m, 50 Hz	< 2 μV

Removable Disk

Feature	Description	
HDD	type	1.8" - 60 GB - 4 200 RPM
	Shock	Operating: 50 m/s² , 1 ms / Non operating: 120 m/s² , 1 ms
	Vibrations	Operating: 20 m/s² - 15 to 500 Hz / non operating 50 m/s²
	Throughput	Max: 32 ch. @20 kHz BW (40 kHz in 16 bits) - 5h 20min
SSD	type	1.8" - 32 GB - SLC NAND Flash Memory
	Shock	10 000 m/s² -, 0.5 ms
	Vibrations	200 m/s² - 40 to 2 000 Hz
	Throughput	Max: 24 ch. @20 kHz BW – 2 h gap free
Case	Case (w.h.d)	83 mm x 20 mm x 97 mm (3.24 in x 0.78 in x 3.79 in)
	Weight	0.250 kg (0.55 lb)
Connection	Into the analyzer	High speed 32 bit parallel IDE bus
	To the PC	USB 2.0 480 Mbit/s
Power supply	On PC	USB powered
	On analyzer	Internal power supply

Front-end

Each front end slot of the Mobi-Pack™ (4 BNC) can be occupied by one of the following inputs type:

- > Dynamic inputs
- > Parametric inputs
- > Universal inputs

The universal inputs gather both dynamics and parametric input in the same board and connector. The type of use of the universal inputs is selectable by software (NVGate®) during the analyzer operations. The universal inputs fulfill all the performances, precision and operability of each specific input type.

Dynamic inputs

Feature	Description	
Sampling	Sampling frequencies (Additional decimators allow analysis bandwidth down to 0.8 Hz)	102.4 kHz, 65.536 kHz, 51.2 kHz, 37.768 kHz, 25.6 kHz, 16.384 kHz, 12.8 kHz, 8.192 kHz, 6.4 kHz, 5.12 kHz, 4.096 kHz, 3.2 kHz, 2.048 kHz
	Converters	One 24 bit sigma-delta ADC for each input
	Frequency relative precision	$0.5 \cdot 10^{-4}$ (typical $1 \cdot 10^{-5}$)
	Synchronization	All inputs synchronized on the same sampling clock
Anti-aliasing filter	Type	Over-sampled digital filters
	Slope	> 400 dB/octave
	Pass band ripple	< ± 0.005 dB
	Rejection of parasites bands	> 100 dB (@ frequency > 0.57 x FS)
Range (peak)	Effective bandwidth	0.45 x FS (ex: 23.4 kHz @ 51.2 kS/s)
	With amplifier (included)	±100 mV, ±300 mV, ±1 V
	Direct	±10 V
Absolute accuracy	With attenuator (included)	±40 V
	Resolution	24 bits (144 dB)
	All input ranges at 1 kHz	±0.05 dB (typical ±0.015 dB)
DC offset	Temperature variability	< 0.002 dB / 10 °C
	±100 mV, ±300 mV and ±1V ranges	< ± 100 µV
	±10 V range	< ± 1 mV
Frequency flatness and phase response	±40 V range	< ± 2 mV
	<i>Includes channel to channel match with different ranges</i>	
	±10 V range, DC to 20 kHz	< ±0.02 dB / < ±0.02 °
	±10 V range, 20 kHz to 40 kHz	< ±0.05 dB / < ±0.05 °
	±0.1 V, ±0.3 V and ±1 V ranges, DC to 20 kHz	< ±0.02 dB / < ±0.1 °
	±0.1 V, ±0.3 V, ±1 V ranges, 20 kHz to 40 kHz	< ±0.1 dB / < ±0.5 °
Cross-talk	±40 V range, DC to 20 kHz	< ±0.1 dB / < ±0.4 °
	±40 V range, 20 kHz to 40 kHz	< ±0.1 dB / < ±0.8 °
	<i>Between N (N is odd) and N+1 inputs:</i>	
Signal to noise ratio	@ 1 kHz: < -120 dB , @ 20 kHz: < -96 dB , @ 40 kHz: < -90 dB	
	<i>Between any inputs excluding: N (N is odd) and N+1 inputs:</i>	
	@ 1 kHz: < -140 dB , @ 20 kHz: < -114 dB , @ 40 kHz: < -108 dB	
Input noise	<i>With 50 Ω terminators:</i>	
	Thermal input noise	20nV/√Hz
	±100 mV and ±300 mV ranges	20 kHz BW < 3.5 µV rms , 40 kHz BW: < 5 µV rms
	±1 V range	20 kHz BW < 5.4 µV rms , 40 kHz BW: < 8.5 µV rms
Impedance	±10 V range	20 kHz BW < 44 µV rms , 40 kHz BW: < 70 µV rms
	1 MΩ ±1 %, < 100 pF	
Protection	Overvoltage	±60 V peak without damage - On any inputs¹
Dynamic	Spectral domain	> 120 dB (typical >130 dB)
Coupling	AC	Cut-off frequency 0.35 Hz ±10% (analog filter)
	DC	
	ICP	2 mA or 4 mA power supply with AC coupling (±10%)
	ICP + TEDS	ICP + reverse current on TEDS reading operations
	GND	Shortcut to ground- Automatic current limitation to 50 mA
Floating	Coupling	AC or DC - Signal ground is floating
	Common mode voltage (all ranges)	Max: ±12 V
TEDS	Standards	IEEE 1451.4 2001 revision 1

Supported templates	Accelerometer/Force meter (25) ~Microphones (27, 28 and 29)
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Parametric (DC) inputs

The following parametric inputs can be added to the standard hardware configuration as follows:

- > On the **auxiliary slot** by set of 2 inputs (max 4)¹
- > As replacement of 4 dynamics inputs (max 12)

The following specifications apply to the universal inputs.

Feature	Description	
Sampling	Bandwidth / Sampling	-3 dB @ 3.5 Hz Independent from dynamic sampling clock
	Converters	One 24 bit sigma-delta ADC for each input
Range (peak)	Direct	±10 V
	With attenuator (included)	±40 V
Frequencies rejection	Notch filters frequencies	50 Hz & 60 Hz @ ±1%
	Rejection	> 120 dB
	Effective resolution	22 bits (out of noise)
Amplitude	Linearity	Typ. 0.0003 % of input range peak
	Gain drift	20 ppm of input range peak/°C typ.
	Offset	±10 V range: < ±1 mV / ±40 V range: < ±2 mV
Offset	Offset drift	±10 V range: < 40 µV/°C / ±40 V range: < 160 µV/°C
	Impedance	1 MΩ, 5 nF typ.
Protection	On any input ¹	±60 V peak
Input Noise	<i>With 50 Ω terminators, excepted ±40 V range:</i>	
	Input noise	< 4 µV rms in 0.1 to 2 Hz BW – Typ 2 µV rms
	Max. Deviation	< 6 µV peak

Dynamic outputs

Feature	Description	
Sampling	Converters	One 24 bit DAC for each output
	Synchronization	Same sampling clock as the dynamic inputs
Range	Direct	±10 V peak
	With attenuator (included)	±1 V peak
	Clipping	User selectable in the output range
	Digital gain	From 10⁻⁵ to 10³
Absolute accuracy	Resolution	24 bits (144 dB)
	All output ranges at 1 kHz	±0.05 dB
	Temperature variability	< 0.1 dB / 10 °C
<i>Variation relative to 0 dB @ 1kHz</i>		
Frequency response	All ranges, at 10 kHz	< ±0.05 dB
	All ranges, at 20 kHz	< ±0.15 dB
	All ranges, at 40 kHz	< ±0.8 dB
Noise floor level	10 V range, 20 kHz bandwidth	-110 dB of full scale, spurious lines < -125 dB of full scale
	10 V range, 40 kHz bandwidth	-105 dB of full scale, spurious lines < -125 dB of full scale
	1 V range, 20 kHz bandwidth	-99 dB of full scale, spurious lines < -110 dB of full scale
	1 V range, 40 kHz bandwidth	-94 dB of full scale, spurious lines < -110 dB of full scale
Impedance	User selectable	50 Ω, 600 Ω or Grounded
Current	Max	±10 mA
Protection	Sum of injected + generated voltages	±15 V peak , On any output ¹
		Permanent short circuit supported
Total harmonic distortion	THD @ 1 kHz	< 0.002% or -94dB at 20 kHz BW
	THD @ 5 kHz	< 0.005% or -86dB at 20 kHz BW
Cross-talk	Output 0 dBV to 50 Ω terminated input	Lower than measurable noise

¹ DC inputs on auxiliary slots features 16 bit dedicated converters, see previous instrument specifications(M002-19-4) for details

External Sync

Feature	Description	
Sampling	Frequencies	64 times over-sampling of the current input sampling (up to 6.4 MHz)
	Converters	High speed voltage comparator and time counter
Ranges (peak)	±300 mV, ±1 V, ±3 V, ±10 V, ±40 V	
Resolution	Amplitude accuracy	±1% of range
	Hysteresis	1% (of input range) to input range
Setting	Hold off	0 s to 500 s
	Slope	Rise or fall
	Hardwired pre-divider	1 to 255
Accuracy	Time resolution	> 160 ns (0.06° at 1 kHz and 1.2° at 20 kHz)
Pulse rate	Max	375 kpulse/s
Coupling	AC	Cut-off frequency 0.35 Hz ±10% (analog filter)
	DC	
Impedance		1 MΩ, < 100 pF
Protection	on any external sync ⁱⁱ	±60 V peak without damage

Digital computation

The following table details the optional DSP modules that can be added to Mobi-Pack™ hardware to fit analysis mode calculation needs.

Signal Processing Units

SPU (Signal Processing Units): the following table gives the characteristics of each analysis mode and the associated SPU consumption. For multi-analysis purpose, add the corresponding SPUs of each mode used simultaneously and increase the sum by 10%. “Real-time” means that the analysis speed is faster than the input rate and does not miss any sample.

Feature	Description
FFT	Real-time FFT analysis with:
	401 lines (for 801, 1601, 3201, 6401 lines, multiply requested SPU respectively by 1.25, 1.5, 2, 3)
	20 kHz bandwidth (Requested SPU are proportional to bandwidth)
	0% overlap 1 channel processing requires 1 SPU
Order analysis	Real-time order spectrum analysis (re-sampled time signal) with:
	Any duration of visualization, any averaging
	20 kHz bandwidth (Requested SPU are proportional to bandwidth) 1 channel processing requires 3 SPUs
Time Domain	Real-time time domain monitor and statistical analysis with:
	Simultaneous time view and statistical extraction. Any duration of visualization, any averaging
	20 kHz bandwidth (Requested SPU are proportional to bandwidth) 1 channel processing requires 1 SPU
1/n Octave	Real-time filter based 1/n octave analysis with:
	1/3rd octave (for 1/12 th and 1/24 th octave multiply requested SPU respectively by 2 and 4)
	20 kHz bandwidth (Requested SPU are proportional to bandwidth) 1 channel processing requires 3 SPUs
Recorder	Gap free recording with:
	51.2 kHz sampling rate 1 channel processing requires 0.75 SPU

Special DSPs modules

The following DSPs are always integrated in Mobi-Pack™ hardware.

Feature	Description	
Master DSP module	Monitor computations	FFT 401 lines (max 4 Channels)
	Time domain detectors	DC, Max, Min, RMS, Kurtosis (on the monitor Channels)
	Events	Threshold detections, combinations
Disk DSP	File management and recovery	

module	On-line computation (compression) of recorded raw data overview
	Samples compression 32 or 16 bits (user selectable)
Ethernet DSP module	Connection to PC
	D-rec management

Computation DSPs modules

The following computation DSP modules are optional. DSP mix is not allowed; All DSPs must be of the same type in one instrument.

Standard DSP

Feature	Description	
Type	Sample size	32 bit floating
	Computation words	32/40 bits
	Internal memory	4 MSamples
Power	Computation capability	12 SPU / DSP module
Input sharing	Inputs per DSP	8 max

ForceDSP

Feature	Description	
Type	Sample size	32 bit floating
	Computation words	32/40 bits
	Internal memory	16 MSamples
Power	Computation capability	Up to 48 SPU / DSP module
Input sharing	Inputs per DSP	8 max

Minimum and maximum configuration

Feature	Description	
Minimum	1 Computation DSP module	12 SPU / 48 SPU
Max.	4 Computation DSP modules	48 SPU / 192 SPU

Notes

The previous specifications describe all the guaranteed capacities and performances of the instrument and are applicable to a Mobi-Pack₂[™]-16 hardware powered for more than 15 minutes at a stabilized room temperature of 23°C ±5°C and calibrated since less than one year.

ⁱ Prepared for future use: the related specifications or options are in development.

ⁱⁱ Exceeding absolute maximum ratings damages the system and voids guarantee.

Ordering Information

Typical configurations:

Reference	Description
ORNVS-ORBI-16	Turbomachinery vibration Mobi-Pack [™]
ORMP-FREQ-16	16 ch. FFT Mobi-Pack [™]
ORMP-ORD-16	16 ch Order tracking Mobi-Pack [™]
ORMP-OCT-16	16 ch 1/n Octave Analysis Mobi-Pack [™]

Recommended options:

Reference	Description
ORNVS-ORBI	Turbomachinery vibration
ORNVS-BAL-FL	Balancing
ORNV-IVC	Torsion
ORNVS-MOD300	ODS (Operating Deflection Shape)
ORNVS-MOD380	ODS+EMA+OMA
OR36/8-DSK	Additional 60 GB dual port removable disk
ORAC-MPCTRL	Mobi-Pack [™] controller HP TC4400 or later Recommended controller PC dimensions: (W 285 mm, H 35 mm, D 230 mm).
ORSC-SNY-3	Serenity 3: 3 years full warranty on new systems or 2 years of full warranty extension

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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