Noise and Vibration Analysis

SO Analyzer
Noise and Vibration Measurement, Analysis and Reporting

m+p international listens to customers... www.mpihome.com
SO Analyzer Products
... for Professional N+V Applications

Next Generation Dynamic Signal Analyzers

• Measure … Analyze … Report within the same software
• Complete range of advanced N+V applications with common user interface
• Fully scalable from two to high-channel count systems
• Equally at home in the field, in the lab and in the office
• Easy operation using familiar Microsoft Windows and Office environments
• Full ActiveX compliance for active reports and user customization
• Wide variety of frontend measurement hardware supported
• Comprehensive third-party data import/export
• Future-proofed software with regular updates and expert support
Comprehensive Application Coverage

- Time, frequency and wavelet analysis
  - 2D, 3D, animation, orbit and Nyquist displays
- Structural testing
  - Impact testing, multi-shaker excitation, normal mode tuning
  - Random, swept and step sine, burst source modes
  - ODS, SDOF/MDOF modal analysis, MIMO
- Rotating machinery analysis
  - Condition monitoring trends
  - Spectral maps, order tracking and orbit analysis
- Acoustic analysis
  - Sound pressure and intensity analysis (to 1/24th octave)
  - Sound quality and human factors
  - Source mapping
- Environmental vibration testing
  - Classical & SRS shock capture and analysis
  - Shaker vibration analysis with PSD and COLA tracking swept sine
  - Collection and analysis of field trial data
Tailor Your Acquisition Hardware to Your Needs

**VibPilot**
- 4 or 8ch modules
- Portable, rugged housing
- USB interface

**VibRunner**
- From 8 input channels to high-channel count distributed measurements
- Standalone or 19” rack mounting
- High-speed Ethernet interface

**SO Analyzer USB**
- 4 input channels pocket size
- Self-powered USB interface

**National Instruments hardware**
- CompactDAQ USB, PCI and PXI modules
- Thermocouples, RTDs, strain gauges, load cells, accelerometers, microphones, etc.
Compact Acquisition Hardware Made by m+p international

- All-in-one device for N+V analysis, vibration testing and data acquisition
  - Supports SO Analyzer, VibControl and Coda S/W
- Modular
  - Synchronisation of up to 4 VibPilot units
  - Move units around to suit measurement needs
- 2 sources per unit
  - Random, swept + stepped sine, burst modes, arb
- Use on the bench and in the field
  - Compact and durable
  - AC/DC power flexibility
- Latest IC technology
  - High-precision measurement
  - Outstanding real-time performance
Key Features

- 4 or 8 input channel units
- Up to 32 input channels with clock sync
- AC/DC/ICP sensor conditioning with TEDS support
- 102.4 kHz simultaneous sampling, 24-bit A/D
- 2 sources, safety shutdown
- 2 tacho inputs
- AC/DC supply, 20 W power consumption
- Compact, dust-proof, rugged housing
- Operation indoors and outdoors even under harsh conditions
- Fan-less, noise-free operation
- 8 digital inputs, 8 digital outputs
- USB 2.0 host interface
High-Performance and Cost-Effective Acquisition Hardware from m+p international

- Designed for the specific needs of dynamic measurements
  - Supports SO Analyzer, VibControl and Coda S/W
- Up to 24 input channels per module
- Multiple sources and tacho inputs
- 19” mainframe: standalone or rack mounting
  - Flexible system configuration
- Multiple VibRunner synchronization
  - Distributed daisy chain connection (to 100 m)
  - High-channel count measurements, expandable
  - Minimum transducer cabling
- 1 Gbit/s Ethernet interface, independent subnet
  - High data throughput, safe communication
  - > 100 ch at 102 kHz throughput to disc
Key Features

- Standalone or 19” rack mounting, 1 U, 3 slots, BNC connectors
- Internal multi-range AC and external DC power supply
- Synchronization by means of daisy chain and master clock
- 1 Gbit/s Ethernet interface
- 8 - 24 analog input channels per VibRunner, 24 bit, 102.4 kHz max. sampling rate
- True differential and single-ended user selection
- AC/DC/ICP sensor conditioning, TEDS support
- 2 - 12 floating source output channels per VibRunner, safety shutdown
- 8 digital inputs and 8 digital outputs per VibRunner
- Silent operation, temperature-controlled fan (can be turned off)
SO Analyzer Products
SO Analyzer USB

Ultra-Portable Analyzer
- No external power supply required
- 51.2 kHz/channel sample rate, 24-bit A/D
- Voltage or ICP supply per channel
- 4 input channels, 5 Volt input
Seamless Integration with National Instruments DAQ Hardware

- Rugged CompactDAQ modules
- USB, Ethernet & Wireless options
- PCI modules installed into a PC slot for low cost
- PXI chassis and modules for higher channel counts
- Flexible sensor measurements: thermocouples, resistance temperature detectors (RTDs), strain gauges, load cells, accelerometers, microphones, etc.
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Software Concept

General Data Acquisition
- Frontend Control
- Set-Up
- Online Analysis
- Online Display
- Time Recording/Throughput to Disc
- Post-Processing

e-Reporter
- Data Management
- Viewing
- Analysis
- Reporting
- User Programming
- Data Import/Export

General Data Analysis
- Analysis
- Online Display
- Printing/Plotting
Real-Time Measurement and Display

- Multi-channel time history and FFT data acquisition
- Continuous or triggered measurements
- Parallel processing for simultaneous narrowband, octave and rotational results
- Time history data reduction such as peak and RMS, acceleration, velocity and displacement
- Real time filtering, int. and double int.
- Unlimited throughput recording to disc replacing conventional tape recorders
- Comprehensive post-processing from time history files
- Integrated signal sources
Powerful Data Management, Analysis and Reporting

- Browse, view, rescale, analyze, calculate, organize measurement and mode shape results
- Import and export many popular third-party N+V data formats for common analysis
- 2D, 3D (waterfall and colour map), orbit & Nyquist charts
- Multiple cursors, harmonic, band, value table calculator, labels and legends
- Mathematical operations with built-in array calculator
- Automated ActiveX reporting to Microsoft Word and PowerPoint
- Free SO Viewer for use on any PC
Comprehensive N+V Data Analysis

- High-resolution FFT analysis using the 2D/3D viewers
- Large number of analysis functions
- Viewing, storing and printing test results
- Comparing measured data and imported N+V data in the same way
- Post-processing measured or imported time history data of any size
- Built-in VB for user functions and macros
# Structural Acquisition and Analysis

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<td>• Advanced modal analysis</td>
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<td>• Interface to FEMtools for SDM analysis</td>
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Modal: Impact Testing

- Simple measurement guidance wizard based on geometry
- Automated operation with audible status indicators for hands-free operation of the software
- Double impact detection/rejection
- Automatic save, auto-range, undo last measurement
- Roaming hammer or response points
- User window selection and auto-correction (force/exponential)
- Typical Impact Testing window layout for fast setup (pulse time and PSD, FRF and coherence)
Modal: Shaker Testing
- SIMO and MIMO analysis functions
- Uncorrelated random sources
- Chirp, periodic, pseudo burst modes
- Swept & stepped sine
- Tracking filter swept sine analysis
- Closed-loop source level control

Modal: Normal Mode Tuning
- Pre-test MIF tuning with auto sweep
- Multiple shaker outputs with amplitude and phase tuning
- Real-time mode animation display
- Stepped sine analysis
SO Analyzer Products
Advanced Applications

Geometry Editor
Modal Analysis

- Operating Deflection Shape
  - Mode shape animation from time, spectral or FRF data
- SDOF curve fitter
  - Quadrature and finite difference
- MDOF curve fitter
  - Polyreference time and frequency method pioneered by Univ. of Cincinnati, USA
  - Easy to use wizard guide
  - Compute freq, damping and Modal-A
- Modal Model Validation
  - Modal Assurance Criteria with 3D map
  - Compare different analysis runs or with imported FE results
  - Compute wide range of generalized modal parameters
- Operational Modal Analysis
  - Use self excited vibration response data with the MDOF curve fit wizard
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Advanced Applications

Rotational Dynamics Measurement and Analysis

- Analog and digital tacho signals
- RPM or time-dependent triggering
- Real-time and computed order tracking
- Real-time waterfall display
- Tacho spline fit wizard
- RPM spectral colour map
- Frequency order tracking
- Narrowband and octave analysis
- Throughput recording and post-processing
- Orbit post-process wizard
- Audio replay and filtering
Machinery Condition Monitoring

- Test to numerous specifications such as ISO 13373, ISO 7919, ISO 10816, VDI 2056, ISO 2372, NF 90-300/310, BS 4675 or the API acceptance testing series, etc.
- Fixed and variable speed analysis
- Time histories of acceleration, velocity and displacement peak, peak-peak and rms from one sensor
- Pre-filter to user selected band
- Time based order tracking analysis with amplitude and phase results
- Use analog or digital tacho inputs
- Spectral mapping
- Orbit analysis
- Time history recording and post-processing
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Advanced Applications

Acoustic Analysis

- Real-time acoustic analyzer for fractional octave analysis according to ANSI S1.4 and IEC 60651 Type 1
- Online sound intensity measurement
- Acoustic intensity source mapping
- Sound power to ISO-374x and 9614
- Sound quality metrics based on Zwicker loudness (DIN-45631)
- Warble & Pitch assessment
- Tonality to ECMA 74 standard
- Human factors assessment
Environmental Vibration Testing

- Independent monitoring or additional analysis channels on shaker test systems
- Online and offline random and sine reduction
- Advanced shaker swept sine analysis with tracking filter locked to COLA signal
- Shock analysis incl. SRS (shock response spectrum)
- Shock capture with limits overlays for shock machine recording and reporting
- Field trials data acquisition and analysis for test development
Vehicle Pass-by-Noise Testing

- Specially developed GPS system for position and velocity information
  - Maximum accuracy and repeatability
  - Reduced test equipment
- Single-operator operation from within the car
- Ease of use, quick analysis and access to test results
- Standard report formats and data export
- Use portable acquisition systems for all other N+V applications
- Latest ECE & ISO test procedures
Modal testing of a wind turbine blade and condition monitoring of the operational wind turbine at Narec, Blyth/UK
Rim testing at Porsche, Stuttgart/Germany
SO Analyzer Applications
Modal Testing

Testing of A340 winglets at Stirling Dynamics, UK
Modal Analysis on Multi-Joint Systems at INSA Université, Rennes/France
Impact testing on helicopter rotor blades, Tsinghua University, Beijing/China
SO Analyzer Products
Rotational Dynamics

Machinery condition monitoring, Cummins Generator Technologies, UK
Your Benefits

• Full application coverage
• Large range of measurement frontends for highest system flexibility
• From two to high-channel count applications
• In the lab, in the field and in the office
• Easy and secure operation, familiar Microsoft Windows like user interface
• Automated ActiveX reporting to Microsoft Word or PowerPoint
• Third-party data import/export for common analysis
• Regular software updates