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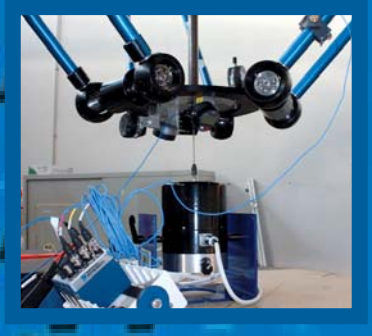
SO Analyzer

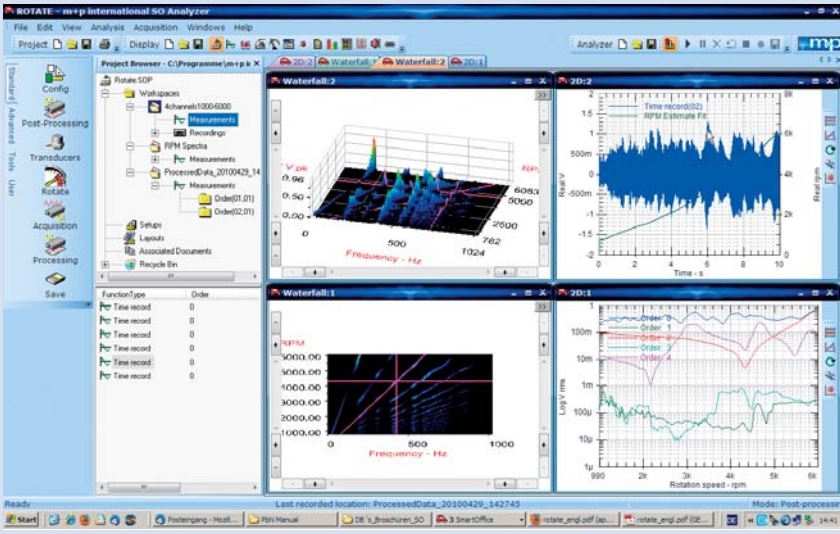
Noise and Vibration Measurement, Analysis and Reporting



SO Analyzer

With the SO Analyzer, m+p international has developed a dynamic signal analyzer that takes full advantage of the constant improvements in hardware and software technologies.

It is the perfect choice for accurate and efficient noise and vibration measurements, third-party data import/export, data analysis and reporting of your results in a single package.

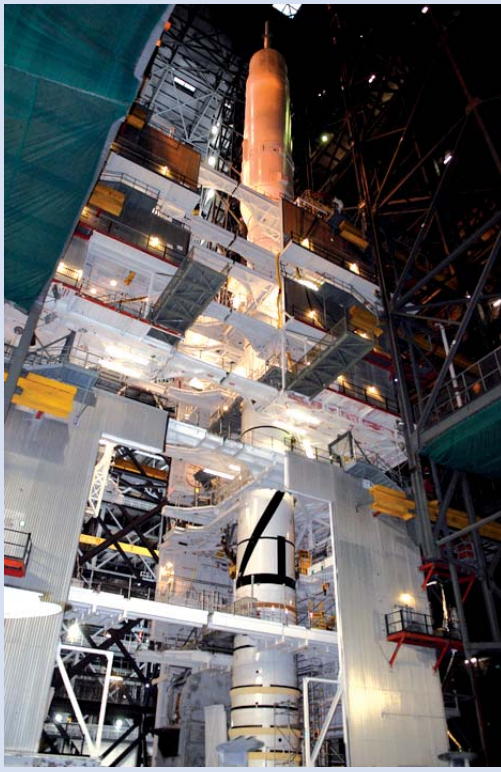


Analyzing rotating machinery data

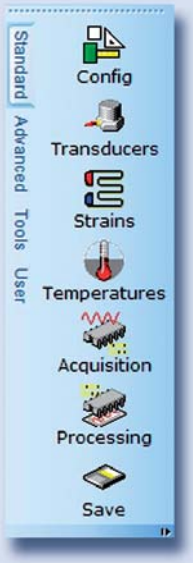
Comprehensive Application Coverage

A multitude of measurement and analysis software modules covers the widest range of applications in today's dynamic signal analysis (DSA):

- **Real-time FFT and time history data acquisition (throughput to disk)**
- **Structural analysis** including
  - Modal analysis
  - Single/Multiple Degree of Freedom (SDOF, MDOF)
  - Impact testing
  - Operating Deflection Shape (ODS)
  - Multiple Input/Multiple Output (MIMO)
  - Swept and stepped sine analysis
  - Ground vibration testing
- **Rotating machinery**
- **Acoustic analysis** including
  - Octave analysis
  - Sound power analysis
  - Sound intensity measurement
  - Acoustic intensity mapping
  - Sound quality
  - Human vibration
- **Environmental testing**
- **Vehicle pass-by-noise testing**


Modal tests on Ares I-X test rocket, photo credit: NASA

SO Analyzer runs on a desktop PC or laptop and is designed for noise and vibration applications in the field, in the test laboratory and in the office. For highest system flexibility it supports a range of measurement frontends (USB, PCI, PXI, VXIbus) enabling applications from 4 to hundreds of input channels. Software and hardware modularity allows you to tailor the SO Analyzer to your specific needs, meaning maximum performance for minimum investment and a common user interface across all applications.



Easy and Safe Operation

Ease of use was one of the key objectives when developing the SO Analyzer. Therefore the SO Analyzer has a Microsoft Windows like user interface which simplifies the integration into your company's network system. Test data and setups from multiple sources can be stored into one common workspace or multiple workspaces that also allow creation of substructures to manage different data views or analyze data sets. Drag & drop operation helps to exchange data quickly between workspaces, thus enabling simple or complex data structures to be saved as one project.

The SO Analyzer software provides you with comprehensive capabilities for browsing, viewing, editing, analysing and reporting data. Full ActiveX compliance allows you to rescale and analyze test data in Microsoft Word and PowerPoint on any PC and to share the active documents with colleagues using the free SO Viewer software. Integrated wizards will guide you step by step through the set-up of all measurement parameters, simplifying use and minimizing setup errors.

SO Analyzer with pocket-sized USB hardware

Wide Variety of Frontend Technology

A large range of highly accurate measurement frontends is available – from ultra-portable USB to high-channel count, high-performance VXIbus – handling multiple signal sources from simple voltage and IEPE to full strain gage signal conditioning.

SO Analyzer supports pocket-sized hardware from National Instruments with 24-bit resolution and self-powered USB 2.0 connectivity for precise mobile and lab testing. m+p international's own VibPilot frontend provides market leading dynamic range and outstanding real-time performance via high-speed USB interfacing. Several of these compact, fan-less frontends can be synchronized by means of the clock in/clock out circuitry with no loss of their excellent measurement performance.

With National Instruments PCI/PXI data acquisition cards you get maximum flexibility of measurement options and interfacing: The SO Analyzer software provides a complete off-the-shelf and fully supported solution that can be used with any PC from an embedded PXI controller to a portable laptop to a desktop as required by your application. For high-channel count noise and vibration applications, the SO Analyzer is operated with VXIbus hardware from VTI Instruments. No matter how many channels are connected, the system provides highly precise cross channel measurements, gap-free throughput to disk recording and reliable online and offline analysis.

8-channel VibPilot

As well as dynamic signal acquisition low-speed temperature monitoring can be integrated to provide overlays of thermal conditions directly with dynamic results. Support for a range of thermocouples and RTD sensors is available.

SO Analyzer software can be easily switched between different hardware frontends and the intuitive user interface is consistent across all platforms. This means that many more applications can be covered at a lower cost and with reduced training requirements.

Core Concept

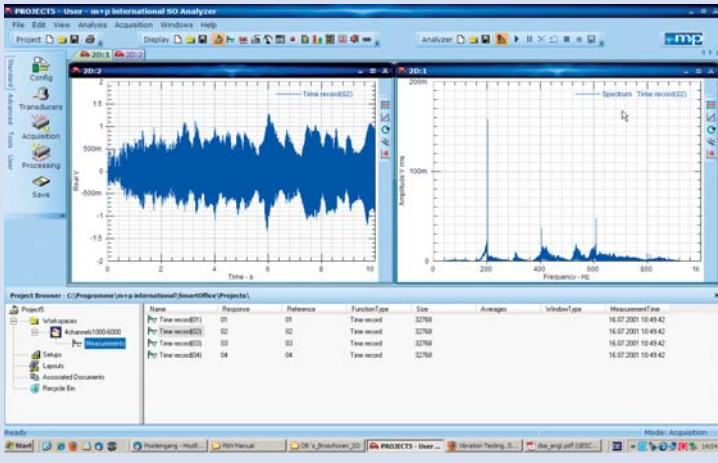
The SO Analyzer enables the engineer to manage large sets of noise and vibration test data and analysis results regardless of origin, format or location.

For ease of use, you do real-time data acquisition, import third-party N+V data formats, analyse the results and create your reports within a common user interface.

SO Analyzer is made up of three core modules for General Data Acquisition, Central Management & Reporting and General Data Analysis. All optional modules for advanced noise and vibration applications are used in combination with these three core modules.

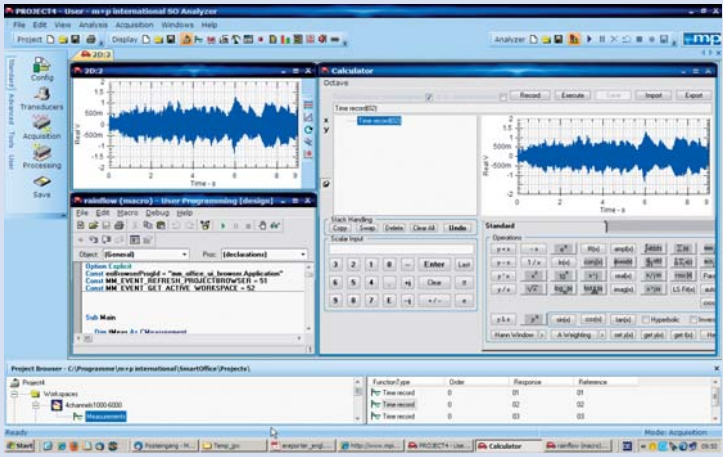
General Data Acquisition

The General Data Acquisition module acquires multi-channel FFT and time history data while displaying the data in real time for general FFT analysis and optional structural analysis, rotating machinery, acoustics and many other advanced applications. For maximum system flexibility it supports a range of industry-standard measurement frontends, from 4-channel portable USB to high-channel count VXIbus hardware.



- Multi-channel FFT data acquisition
- Acquisition of multi-channel time history data from any source, use file as “virtual frontend”
- Continuous or triggered measurements
- Peak and rms time history data reduction
- Real-time acceleration to velocity and displacement computations
- Display and storage of all intermediate results
- Time history recording to memory or file, replacing conventional tape recorders
- Unlimited throughput to disk acquisition with scheduled time data recording
- Post-processing from throughput files for analysis of large measured or imported time data files with batch processing of multiple files

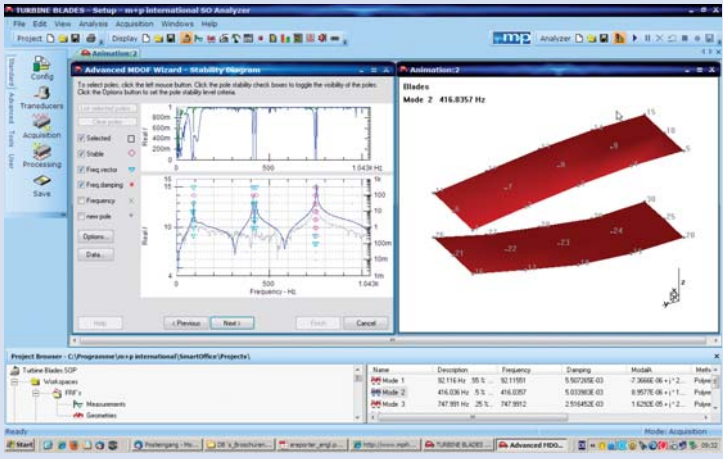
e-Reporter



e-Reporter is the powerful data management and reporting tool within the SO Analyzer. It provides test engineers with comprehensive capabilities for browsing and viewing data, copying & pasting data to ActiveX applications, importing test data from many third-party N+V systems and automating repetitive tasks. This full functionality is available without any measurement front-end connected.

- Central management, analysis and reporting of all noise and vibration data
- Browse, view, rescale, analyze, calculate, organize measurement and mode shape results
- Data import/export from/to many popular N+V formats for common analysis
- 2D, 3D (waterfall) charts, animation display for mode/deflection shape
- Mathematical operations with built-in calculator
- Automated ActiveX reporting to Microsoft Word and PowerPoint
- Rescaling and analyzing test data in Microsoft Word or PowerPoint on any PC with the free SO Viewer software
- Visual Basic compatible programming for automating repetitive tasks and implementing your own functions

General Data Analysis



No matter whether the data was acquired using the SO Analyzer measurement hardware or imported from third-party systems, the General Data Analysis module post-processes this data in the same way supporting a large number of analysis functions.

- High-resolution online FFT analysis using the 2D/3D viewers of the e-Reporter
- Copy & paste to ActiveX applications
- Data import/export

Advanced Measurement and Analysis Applications

The modular design of the SO Analyzer allows you to adjust the software to your specific needs, adding the solutions you require when you need them.

SO Analyzer supports a full range of optional modules covering various noise and vibration measurement and analysis applications. These optional modules are used together with the three core modules for data acquisition, analysis and reporting.

Structural Acquisition and Analysis

The structural dynamics package provides a complete set of tools for observing, analysing and documenting the vibrational behavior of machines and mechanical structures. It includes modules for advanced modal analysis, guided impact hammer testing, MIMO acquisition as well as for ODS, SDOF and MDOF analysis. SO Analyzer offers a wide range of measurement techniques including impact hammer and source modes (e.g. random, burst, sweep, arb etc.) for shaker excitation. Multiple sources are available with open- and closed-loop amplitude control. Swept and stepped sine analysis is typically used for single- or multi-shaker excitation of larger structures and for this normal mode tuning is also available. Modal model validation is used for mode comparisons between tests or between tests and FE results.

Structural dynamics testing during a parabolic flight, photo credit: German Aerospace Center (DLR)

The software makes it very simple to create the structure's geometry and calculate modal parameters including mode shape animation. The experimental modal data are obtained by curve fitting a set of FRF measurements. Wizards take you through a simple series of steps to complete the acquisition and analysis process and also make intelligent estimates of all analysis options. The MDOF wizard, for example, handles the most sophisticated modal analysis tasks like detecting repeated or closely spaced modes.

Standard	Advanced
• Impact testing (modal hammer) • Creation of component-based geometries • ODS (Operating Deflection Shape) analysis	• Advanced modal analysis • SDOF (Single Degree of Freedom) analysis • MDOF (Multiple Degree of Freedom) analysis • Operating modal analysis • Modal model validation (MAC graph and table) • MIMO analysis incl. multi-source outputs • Swept and stepped sine online analysis • Ground vibration testing • Interface to FEMtools for SDM analysis

Rotating Machinery Acquisition and Analysis

This software package is designed for rotating machinery diagnostics, troubleshooting and analyzing noise or vibration problems related to speed characteristics of rotating or reciprocating machines in operation. Specifications include processing of analog and digital tacho signals, RPM or time-dependant triggering, real-time and computed order tracking, real-time waterfall display, tacho spline fit, RPM spectral map and frequency order tracking. The orbit analysis wizard is used for the study of shaft displacement on rotating machinery.

Acoustic Analysis


Testing A340 winglets at Stirling Dynamics, UK

Noise is increasingly the subject of new regulations for the protection of human health and safety as well as for improving the environment in general. SO Analyzer provides a comprehensive range of applications from basic 1/3 octave spectrum analysis to the latest human factor analysis for sound engineering, product refinement and comparative product ranking. It serves as a real-time acoustic analyzer for fractional octave analysis according to ANSI S1.4 and IEC 60651 type 1.

The online sound intensity measurement module uses a standard dual microphone intensity probe to measure sound pressure, intensity and pressure-residual intensity index. Unlike standard single microphone pressure measurement this technique can be used in difficult environments that have high background noise or multiple sources to calculate sound power and perform sound source localisation. The acoustic intensity mapping option uses a 3D model and guided sound intensity measurements to quickly develop a 3D color contour map for source localisation. SO Analyzer's sound power module provides you with a range of standard methods, using either pressure or intensity measurements, to determine sound power emission levels and also includes the sound transmission loss calculation wizard. Sound quality is becoming more and more important: Product designers and developers have to find the "right" sound that attracts their customers. The SO Analyzer sound quality analysis module based on Zwicker loudness offers a range of functions to assess perceived sound quality and also includes pitch and warble analysis.

For protection from mechanical vibration, exposure limits have been defined, for example, for the use of hand-held power tools or riding in vehicles. SO Analyzer's human vibration module enables the evaluation of hand-arm and whole body vibration according to the latest ISO and BS standards.

Environmental Vibration Testing

SO Analyzer provides independent or additional monitoring channels for vibration control with both online and offline sine reduction. This mimics the tracking filter analysis used on shaker controllers so providing a cost-effective measurement channel extension.

Classical Shock data capture and Shock Response Spectrum (SRS) analysis is used to examine the effects of short-duration peak stresses and accelerations (e. g. on drop tables) and to evaluate the damage of shock pulses on a structure. Overlays of target specification limits provide a complete test reporting capability.

SO Analyzer can also be used for advanced analysis of shaker test data that can be directly imported from m+p international's VibControl shaker control system and integrated with other data sources for automated analysis and report generation.

Vehicle Pass-by-Noise Testing

Manufacturers have to certify that their vehicles comply with the strict international noise emission standards. Our market-leading pass-by-noise testing system based on SO Analyzer uses GPS components for both position and velocity information, thus providing maximum accuracy and repeatability. It allows full operation from within the car and by just one person. The portable system frees the user from cumbersome and error-prone manual triggers and radar guns and allows immediate reverse runs and instantaneous pass/fail criteria.


Pass-by-noise testing at Cooper Tire, USA

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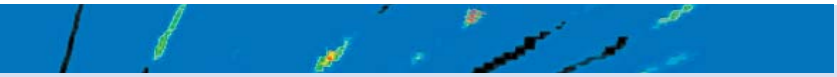

SO Analyzer

m+p international's SO Analyzer is the next generation of dynamic signal analyzers for professional noise and vibration applications in the field and in the laboratory. Thanks to its exceptional flexibility, the SO Analyzer supports a full range of frontends from ultra-portable USB to PCI/PXI and high-channel count VXIbus for measurements from 4 to hundreds of input channels. Just choose your measurement frontend, combine it with your preferred computer platform and select the SO Analyzer software tailored to your requirements.

Within a single software package, you perform real-time data acquisition, analyse the results and create your reports. For rapid familiarization the user interface is modelled on the Microsoft Windows and Office environment and the wizard-driven set-up of all measurement parameters ensures quick and safe operation, minimizing the probability of operator errors. SO Analyzer provides all the tools needed for sophisticated N+V analyses including multi-channel FFT analysis in real time, unlimited throughput to disk recording, modal analysis, impact testing, rotating machinery analysis, acoustic analysis, analysis of vibration control data and vehicle pass-by-noise measurement. The power of the SO Analyzer even allows multiple capture modes to operate in parallel, e. g. do real-time spectrum analysis to the graphics display as well as recording (throughput) the raw time history data to disk for later post-processing as well as online order analysis.

And if you also use noise and vibration measurement systems from other manufacturers, you benefit from the compatibility of the SO Analyzer: Data can be imported from many sources so that all your test data are managed, analyzed and reported from one user environment.

m+p international develops and manufactures test and measurement systems for vibration control, dynamic signal analysis, data acquisition, process monitoring and test stand engineering.

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