SIEMENS

Ingenuity for life

Siemens PLM Software

Simcenter Testlab

Unrivaled suite of solutions for durability, noise and vibration engineering

siemens.com/simcenter

Driving innovation and productivity in test-based engineering

Even with today's massive shift to upfront simulation in the development process, it is crucial that the product performs as expected in the real world, and to be able to optimize the design within the constraints of shorter testing cycles. Testing departments around the world count on Simcenter™ testing solutions to increase test efficiency and productivity, maintain the utmost quality and ultimately achieve a higher return on investment from existing testing facilities.

Simcenter Testlab data analysis software

"It is particularly easy to check values and to find back-measured data. The engineers get a complete overview of the measured data in the easiest way."

Henrik Christensen
Aarenstrup
Project Engineer
Kverneland Group

Simcenter Testlab™ software offers an integrated solution for test-based engineering, combining multichannel data acquisition with a full suite of integrated testing, analysis and reporting tools.

The Simcenter Testlab software suite is seamlessly integrated with the Simcenter SCADAS™ Data Acquisition hardware systems portfolio. Known for swift measurement performance, every Simcenter SCADAS system delivers optimal measurement quality and precision in the lab and field.

Simcenter Testlab covers the extensive testing requirements of noise and vibration engineers, offering seamlessly integrated tools for structural dynamics testing, rotating machinery testing, acoustic testing and sound quality engineering.

Simcenter Testlab can be used to bundle unmatched expertise in durability testing, with an end-to-end solution for (road) load data acquisition and processing.
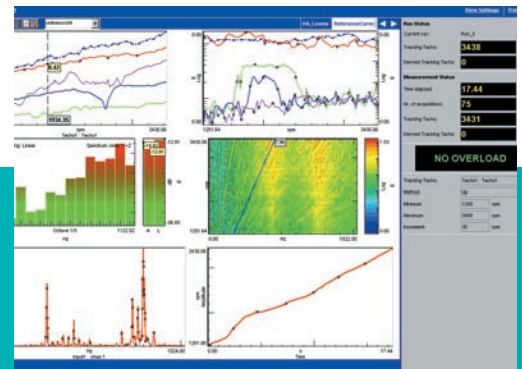
Built-in productivity

With its unique workflow-based interface, Simcenter Testlab sets new standards for ease of use, productivity and data consistency. The software guides the user through the steps of the test campaign, suggesting optimal settings for measurement and analysis. Seamless data sharing between different applications delivers tremendous efficiency gains. Embedded analysis during acquisition accelerates the testing process and guarantees optimal data quality.

Right to the source of noise and vibration issues

Simcenter Testlab guides users directly to the source of the problem using comprehensive analysis capabilities. It enables testing teams to efficiently troubleshoot design problems and trace the root cause of a problem directly to the source. It supports easy what-if analyses to quickly evaluate possible fixes and solve the problem effectively, cost efficiently and quickly.

Adapted to the changing world of testing

By testing existing components and benchmarking competitive products, Simcenter Testlab is extensively used to frontload data into the simulation process. It also provides loading information and feedback to update virtual models. It is systematically used to provide test-derived models for component and subassemblies that are too complex to model virtually. Easy to integrate into Simcenter Amesim™ software, Simcenter Testlab software provides critical support for making virtual simulation efficient and realistic.
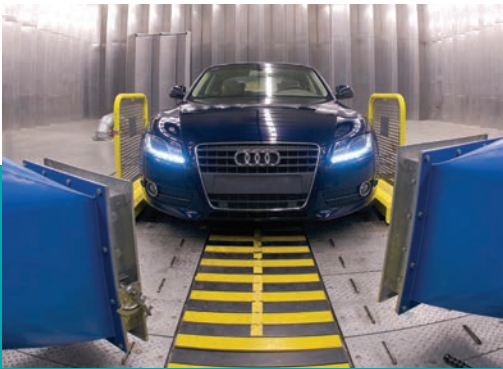
Simcenter SCADAS data acquisition hardware

Flexibility, performance and precision for lab and mobile testing

Test engineers around the world count on Simcenter SCADAS systems to deliver the data quality and format required to get the job done right the first time in the lab or the field with a personal computer (PC) or recording autonomously.

With a large variety of supported transducers and signal conditioning, Simcenter SCADAS systems are optimally tuned to meet specific needs for noise, vibration and durability testing, and can be seamlessly integrated with Simcenter Testlab for accelerated measurement setup and correctly formatted results.

Lab mobility allows users to supplement a rack-mounted Simcenter SCADAS Lab system with a selection of Simcenter SCADAS mobile or recorder units for additional channel capacity on-demand or for specialty work that requires different signal conditioning. The Simcenter SCADAS suite gives users a scalable solution to meet their capacity needs and sophisticated testing requirements.

Simcenter SCADAS XS
Compact and powerful pocket-size data acquisition system

- More than 12 channels
- More than six hours of battery autonomy (typical use)
- Set up, monitor and validate on the go
- Use in standalone mode with a tablet or with a PC (tablet is standalone mode, PC is not); replay in full standalone mode

Simcenter SCADAS Mobile
Maximum mobile measurement power

- Accommodates eight to 216 channels in a single frame
- Compact size and low weight for optimal mobility
- Rugged design qualified for rough conditions and high temperatures

Simcenter SCADAS Recorder
Simcenter Testlab Sound Power Testing solution helps you measure and analyze the acoustic power generated and radiated by a machine or tool for certification and advanced engineering purposes.

- On-the-spot validation prevents errors and annoying reruns
- Autonomous recording on CompactFlash cards
- Wireless operation using tablet

Simcenter SCADAS Lab
Simcenter Testlab Acoustic Material and Component Testing is a complete solution for identifying the acoustic properties of materials as well as elements such as doors, panels and mufflers.

- Easy 19-inch rack mounting mainframe
- Configurable from eight to hundreds of channels
- Arbitrary mix-and-match with additional Simcenter SCADAS
- Lab/mobile/recorder mainframes

Covering a broad range of engineering applications

Structural dynamics testing
Simcenter Testlab Structures software is a comprehensive structural dynamics and modal testing and analysis software suite, scalable from impact testing of small structures to large-scale campaigns using hundreds of measurement channels. Powerful analysis tools enable engineers to identify root causes of vibration problems and to explore the best solution for practically every structural weakness.

Transfer path analysis
Simcenter Testlab Transfer Path Analysis software helps to effectively identify vibro-acoustic problems and their origins, and to quickly evaluate design improvements. Transfer path analysis (TPA) provides a systematic approach to test-based engineering and assists engineers in troubleshooting issues and setting performance targets for critical components.

Acoustic testing
Simcenter Testlab Acoustics software provides highly integrated test-based acoustic engineering tools, covering all possible acoustic testing domains: acoustic qualification testing, material and component testing, sound power and pass-by noise testing, sound source localization, vibro-acoustic engineering, as well as sound quality and brand sound engineering.

Rotating machinery testing
Simcenter Testlab Rotating Machinery software empowers vibration analysis in systems such as engines, compressors, electrical motors, pumps and shafts. This comprehensive toolset includes waterfall mappings, order tracking, time data acquisition and processing functions to analyze and visualize large data sets. Torsional vibration and acoustic measurements can be combined to investigate operational behavior and instabilities in the rotating equipment.
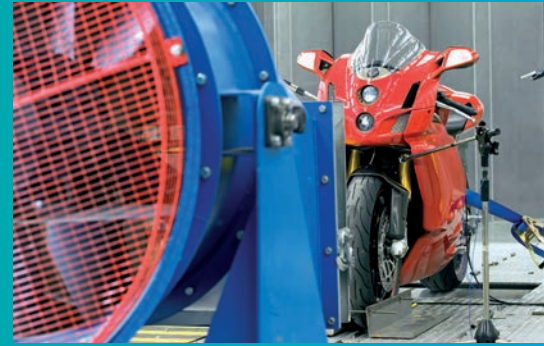
Durability testing
The Simcenter SCADAS Recorder hardware and Simcenter Testlab are ideal companions for accurate (road) load data acquisition. Universal signal conditioning enables easy setup of a large variety of tests. On-the-spot data validation prevents errors and annoying test reruns. Simcenter Tecware software provides an integrated approach to durability data processing, allowing flexible target setting and accelerated test schedule definition as input for virtual and physical product validation and optimization.

Dynamic environmental testing
Simcenter Testlab Environmental software comprises a high-speed, multi-channel vibration control system for dynamic environmental testing for spacecraft verification and validation. This system can be expanded to hundreds of control, measurement and limiting channels. The solution is easy to use for routine random, shock, sine and combined modes testing. Simcenter Testlab is designed for parallel acquisition and online reduction of vibration channels during random or sine closed-loop vibration control testing.
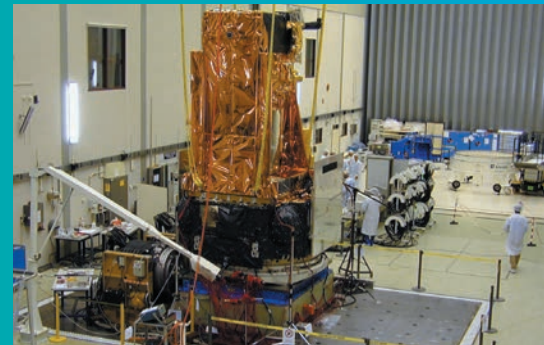
Vibration control testing
Closed-loop vibration control testing with Simcenter Testlab Vibration Control software helps engineers easily certify and homologate products, ensuring they can operate under external excitation and vibration conditions. Simcenter Testlab Vibration Control combines optimal ease of use with the performance and reliability of an advanced system. The system offers accurate closed-loop shaker control and built-in safety mechanisms that minimize the risks of damaging costly test items.

Simcenter Testlab Desktop and Data Management

The amount of data that is produced in a testing department is enormous. Converting, visualizing and analyzing test data results are time-consuming tasks and often require specific application knowledge. Simcenter Testlab Desktop and Data Management applications are the perfect tools to streamline data acquisition, analysis and reporting. The solution helps you transform test data into concise reports, reduce time spent on converting and avoid losing vital information in the process. You can effortlessly access and distribute test data across different departments.
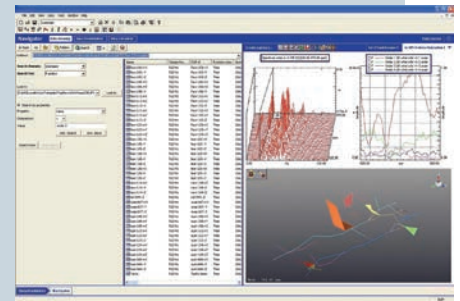
Simcenter Testlab Desktop and Data Management
Simcenter Testlab Desktop and Data Management allows you to easily interpret and compare results, create convincing test reports and presentations, reproduce company standard plots using Microsoft Office and gain test insight through application-tuned graphics.
As the amount of test data grows, it is crucial to organize and keep track of it. You need a system that makes data annotation consistent and speeds up data search and retrieval, which supports engineering departments with data acquisition, annotation, storage and sharing.

Standard desktop

Designed for ease-of-use and flexibility, Simcenter Testlab Desktop – Standard provides tools for efficient, test-based noise, vibration and harshness (NVH) engineering. As the dedicated starting point for most Simcenter Testlab applications, it provides step-by-step guidance throughout test procedures.

- Simultaneous access to different applications and multiple projects
- Automatic setup of operator-specific environment
- Automatic data selector accesses all data formats
- Numerous possibilities for data annotation, viewing, interpretation and conditioning
- Creation and management of displays
- Optional driver for the ASAM-ODS ATF/ATFX file format

Advanced desktop

Simcenter Testlab Desktop – Advanced is the gateway to advanced data postprocessing options with a simple interface and streamlined reporting capabilities and includes all the functionalities of Simcenter Testlab Desktop – Standard.

- All Simcenter Testlab Desktop – Standard features
- Data calculator and data block editor functions
- Cursor-driven processing for fast waterfall diagram analysis
- Controlled data access with parameter-locking function
- Batch reporting and absolute scale formatting for organized and customized printing
- Audio replay of recorded data
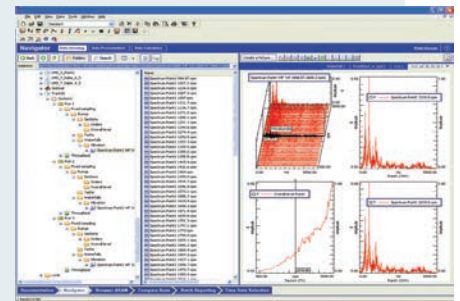
Windows automation

Simcenter Testlab Windows Automation Support is used to direct, monitor and integrate Simcenter Testlab with other software or within a test rig environment.

- Ability to drive and monitor Simcenter Testlab solutions from external applications
- Integration with in-house algorithms
- Simcenter Testlab integration with external software
- Easy-to-learn and well-known programming language
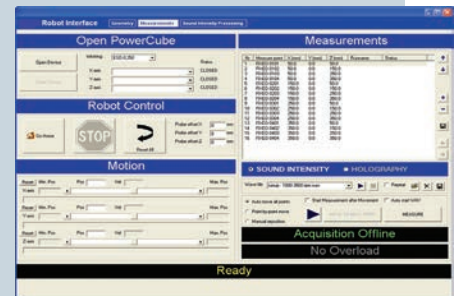
Data management

Simcenter Testlab Data Management features extensive test data management capabilities that support engineering departments with data acquisition, annotation, storage and exchange.

- Extensive data annotation with index and relevant meta information
- Data access restrictions
- Data check-in and check-out on a central server
- An open platform

11
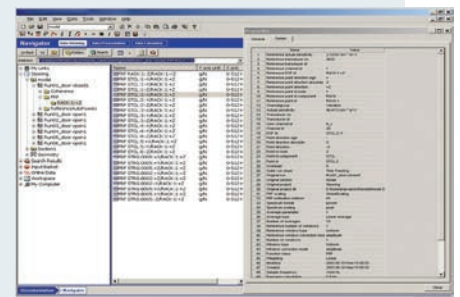
Simcenter Testlab Durability Acquisition

Simcenter Testlab Durability Acquisition is an integrated, end-to-end solution for road load data acquisition. From a single software platform, you have complete control of the full load data acquisition process. The application combines universal, multichannel data acquisition with a full suite of channel setup, measurement, validation, reporting and data sharing tools. Seamless integration with the Simcenter SCADAS data acquisition systems hardware allows you to complete durability acquisition processes more confidently, in less time and with fewer errors.

With its unique workflow-based interface, Simcenter Testlab Durability Acquisition sets new standards for ease of use, productivity and data consistency. The durability software naturally follows the test campaign process in three basic steps:

• Set up channels
• Measure and validate
• Report and share

Simcenter Testlab Durability Acquisition makes testing more efficient and convenient. As the ideal tool for future-focused durability testing departments, Simcenter Testlab Durability Acquisition offers the right balance between ease of use and functional flexibility.

Fast and accurate, semiautomatic measurement setups
Simcenter Testlab Durability Acquisition is specifically tuned for challenging test setups. A single software platform supports all signal conditioning provided by Simcenter SCADAS frontends. Specify the channel list for any measurement setup with the click of a button. Real-time signal checks on all channels allow you to configure and start your measurement with confidence.
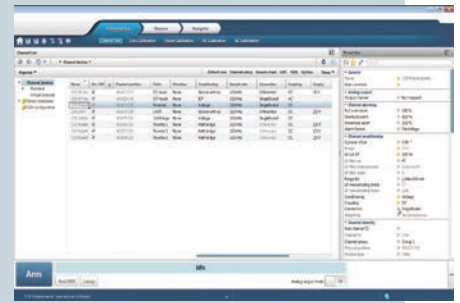
Measure and validate in real time
Simcenter Testlab Durability Acquisition calculates everything during the acquisition run without losing data or slowing down measurements. Online displays keep you up-to-date on measurement progress. You can compare incoming results against reference curves or previously stored data sets. Immediately after the run, you can browse through a detailed pivot table of data and statistics
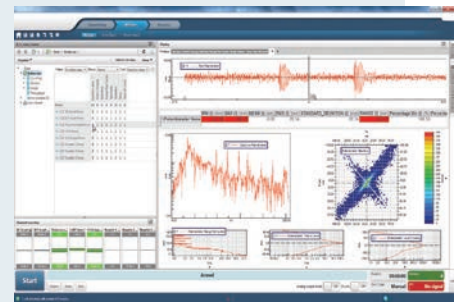
Transform data into actionable and shareable reports
Sharing test results is indispensable in developing a quality product. Simcenter Testlab Durability Acquisition keeps you from losing vital information in the process. Test reports are easily distributed across different departments as you create and share active reports with a click of the button. Additionally, you can export data to a wide range of binary formats.
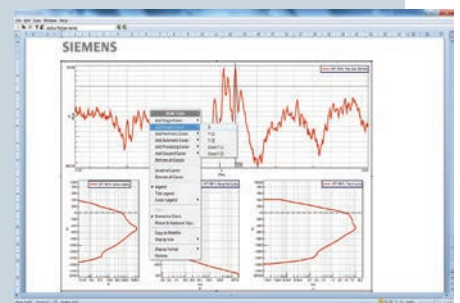
Systematically annotate and organize durability tests
When you work with vast amounts of data, traceability is vital in maintaining an efficient development cycle. Simcenter Testlab Durability Acquisition enables you to add key information to raw data, relating measurement results to product structure. Better documentation means your data will retain its value long after the testing phase is completed.
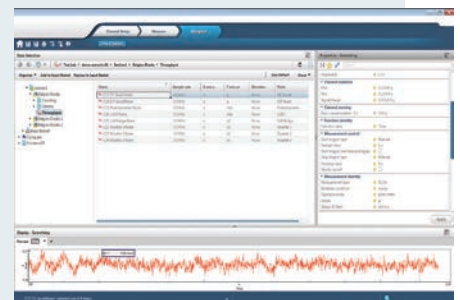
Customized user experience
Built around three basic steps – set up channels, measure and validate, and report and share – the Simcenter Testlab Durability Acquisition user interface will guide you through the durability acquisition process from start to finish. In addition to the interface, you can fully customize tables, graphs and views to meet your requirements.
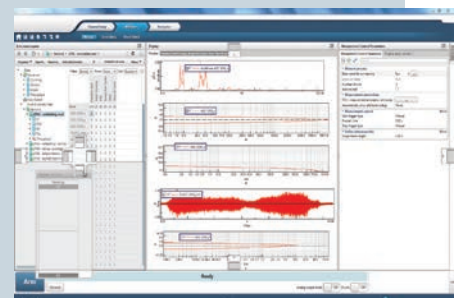
Simcenter Testlab Acoustics

Simcenter Testlab Acoustics solutions provide you with a powerful set of highly integrated tools for test-based acoustic engineering. From the signal conditioning of microphones and interfacing with digital heads to the acquisition of sound power levels, real-time octaves and the latest high-tech tools for sound quality engineering, Simcenter Testlab Acoustics conforms to the latest international standards and engineering practices.

Directly addressing a wide variety of test-based acoustic engineering challenges that you face on a daily basis, Simcenter Testlab Acoustics offers a complete and unique suite of software and hardware solutions for acoustics testing and analysis in specific domains such as straightforward acoustic analysis, material and component testing, sound power and pass-by noise testing, sound source localization, vibro-acoustic engineering and sound quality and brand sound engineering. Scalable according to project requirements, each acoustic solution offers task-specific advantages in terms of return on investment. For more complex root-cause analysis and proven countermeasures, you can rely on advanced acoustic and vibro-acoustic engineering tools and services.

Sound intensity testing and analysis

Simcenter Testlab Sound Intensity Testing and Analysis is a solution you can rely on for efficient product certification according to International Organization of Standardization (ISO) standards as well as for in-depth sound engineering, including identification and quantification of critical sound sources.

- 2D and 3D visualization using colored mesh displays
- Simultaneous narrow-band fast Fourier transform (FFT) and time-based octave sound intensity results

- Amplitude and phase calibration
- ISO 9614 field indicator support

High-definition acoustic camera

Simcenter Testlab High Definition Acoustic Camera is the most comprehensive sound source localization solution, providing extremely fast results in time-critical applications.

- Unique solution for far-field and near-field measurements
- Acoustic beamforming, near-field focalization and irregular near-field acoustic holography
- Accurate detection of secondary sources by eliminating the prime source using a reference signal

- Separation of combustion noise from mechanical noise (cyclic Wiener filtering)
- Localization of aero-acoustic sources: symmetrization, deconvolution and wind-speed correction
- Identification of noise emitting from rotating sources

Array-based holography and focalization

Simcenter Testlab Array-based Holography and Focalization is a sound source localization solution that features unique and innovative techniques to increase source localization accuracy and applicable frequency range.

- Highest spatial resolution for sound source localization in low frequencies
- Intelligent combination of multiple measurement patches for stationary and nonstationary signals
- Propagation pressure-to-pressure as well as pressure-to-intensity for quantitative results

- Propagation for a single frequency, frequency range or octave band
- Animated displays showing intensity/pressure as a function of frequency/time
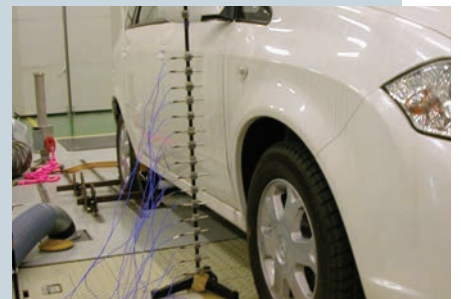
Interior sound source localization

Simcenter Testlab Interior Sound Source Localization is a complete solution for ultra-fast source localization in highly complex interiors such as truck cabins, car interiors, aircraft cockpits or train cores.

- Solid sphere design for improved dynamic range and spatial resolution
- Maximum accuracy via actual geometry information

- Improved data quality in low-, mid- and high-frequency ranges
- Highly visual results with 3D photorealistic views

Exterior pass-by noise testing

Simcenter Testlab Exterior Pass-by Noise Testing is designed to help you measure vehicle noise emission levels on an exterior test track and allows you to analyze the results in compliance with specific standards.

- Complete support from setup to reporting
- Online monitoring of sound pressure levels according to track distance and measurement status indicators
- In-vehicle graphical interface for monitoring speed, revolutions per minute (RPM), position and weather conditions
- One-person operation

- Fully certified system – hardware: International Electrotechnical Commission (IEC) 61672:2002 (class 1 sound-level meter) norm; position sensing: ISO 362 requirements
- Commercial off-the-shelf or customizable solution for industry or customer-specific requirement

In-room pass-by noise testing

Simcenter Testlab In-room Pass-by Noise Testing is a comprehensive, future-proof solution that helps you simulate and analyze vehicle pass-by noise in a controlled laboratory environment.

- Compliance with industry pass-by noise standards for cars, light vehicles and trucks
- Complete support from setup to automatic reporting

- Microphone position validation
- Time-data calculation corresponding to outdoor pass-by noise microphone positions

Sound quality testing

Simcenter Testlab Sound Quality Testing is a solution for acoustic benchmarking and sound quality assessment that helps you evaluate the objective and subjective product sound quality.

- Extensive listening and filter capability for subjective evaluation
- Replay controls: single loop, looped or toggled between sounds
- Psychoacoustic and other sound quality related metrics

- Support of analog and digital artificial binaural heads
- Online graphical editing of filters

Virtual car sound

Simcenter Testlab Virtual Car Sound is a solution for sound design and quality target setting as well as advanced vibro-acoustic troubleshooting in vehicle refinement stage.

- Interactive real-time multimedia engineering environment
- Single measurement to simulate sound under different driving conditions
- One-click interior noise decomposition from time data recordings
- Data measurement, decomposition, sound quality evaluation (SQE) model creation and simulation on one platform
- Multiple driving modes: free interactive driving, drive control by file and drive scenarios

Octave testing

Simcenter Testlab Octave Testing provides a complete solution for efficient acoustics qualification testing based on octave and fractional-octave band testing techniques.

- Octave filtering according to American National Standards Institute (ANSI) S1.11 and IEC 61260 standards
- 1/1, 1/3, 1/12 and 1/24 octave filters
- Sound level meter compatible results including Leq according to IEC 61672-1
- Psychoacoustic metrics online and during processing
- Real-time data processing with derived channels
- Tracking technology for transient or stationary applications

Sound power testing

Simcenter Testlab Sound Power Testing solution helps you measure and analyze the acoustic power generated and radiated by a machine or tool for certification and advanced engineering purposes.

- Commercial off-the-shelf or customizable solution for industry- or customer-specific requirement
- Focus on productivity for every industry standard
- Integrated reporting with export to Microsoft Office solutions

Material and component testing

Simcenter Testlab Acoustic Material and Component Testing is a complete solution for identifying the acoustic properties of materials as well as elements such as doors, panels and mufflers.

- Absorption testing in impedance tube according to standards ISO 10534 and ASTM E1050
- Absorption testing in room according to standards ISO 354 and ASTM C423
- Sound transmission loss on mufflers including sample diameter
- Sound transmission loss according to standard ISO 140 (room method)
- Advanced transparency testing using quantitative holography techniques
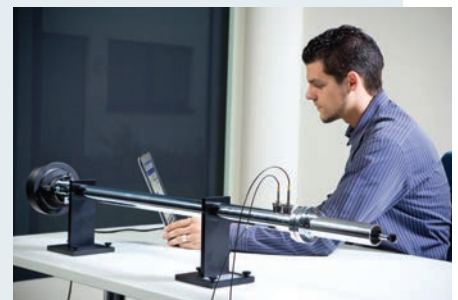
Simcenter Testlab Structures

Simcenter Testlab Structures is a comprehensive suite of structural dynamics and modal testing and analysis software. Characterizing the structural dynamics of a structure used to be a long and complex process involving extensive trial-and-error and time-consuming test setups. This is no longer the case. With Simcenter Testlab Structures and the Simcenter SCADAS system, it's easier to perform large-scale modal surveys – in hours rather than days.

You can focus on identifying root causes of vibration problems and apply powerful analysis tools to explore the best solution for practically every structural weakness. Our modal testing experience, from impact testing of small structures to large-scale campaigns using hundreds of measurement channels, helps you maximize testing efficiency.

Impact testing

Simcenter Testlab Impact Testing provides you with a complete solution for modal testing using an impact hammer. The solution allows a roving hammer with fixed accelerometer or a fixed hammer point with all accelerometers on the structure. It yields transfer functions for experimental modal analysis or for transfer path analysis.

- Embedded expert mode for impact parameter settings
- Roving/fixed hammer modes
- Comparison of point mobility and online dynamic stiffness to reference curves

- Immediate visualization of frequency response function (FRF) measurements on 3D geometry
- Double impact detection to avoid incorrect measurements
- Audio feedback

MIMO FRF testing

Simcenter Testlab MIMO FRF Testing gives you a productive state-of-the-art modal testing solution, ranging from random, pseudo, periodic random excitation and to replay measured time signals as excitation signals, up to 16 shakers.

- Structure excitation by up to 16 shakers in parallel
- Online decorrelation of excitation inputs
- Parallel measuring of multiple responses
- Comparison of driving point FRF, point mobility and dynamic stiffness with online reference curves

- Immediate 3D visualization of FRF measurements
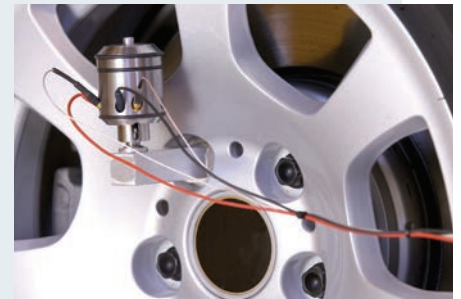
Operational deflection shape and time animation

Simcenter Testlab Operational Deflection Shape and Time Animation provides you with a mobile and lab solution to measure and visualize the structural deformation of test items under operational loads.

- Real-time monitoring of the acquisition progress
- Animation of 3D geometry from all angles
- Ability to scroll through axes using movie or stroboscope displays at fixed operating conditions

- Deformation pattern recording at critical time and/or operating conditions
- Seamless test analysis integration with optional simultaneous analysis tools
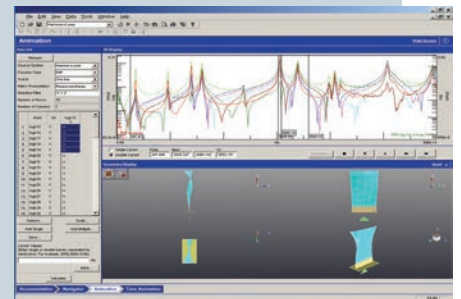
Modal analysis

Simcenter Testlab Modal Analysis offers you the tools and functions required for experimental modal analysis. The tools help you easily create FRF sets, perform fast and easy modal parameter estimation, validate modal models and compare original FRFs with synthesized ones.

- Fast, accurate single or multiple reference parameter estimation algorithms
- Automatic organization of FRF data for comprehensive view of data
- Ability to facilitate FRF selections and deselections
- Various sum and mode indicator functions to stabilize diagram interpretation and pole selection

- Data analysis in multiple formats such as acceleration, velocity and displacement
- Calculation and display of FRFs sums and mode indicator function
- Modal parameter estimation based on Least-Squares Complex Exponential (LSCE) method

Operational modal analysis

Simcenter Testlab Operational Modal Analysis provides an in-operation testing solution for modal parameter identification – starting from user-selected segments of time data measured on a structure in operating conditions.

- Online spectral analysis while recording continuous time data
- Cross-spectra analysis
- Embedded test setup definition

- Parameter estimation on any user-selected data segment
- High-channel count for high performance
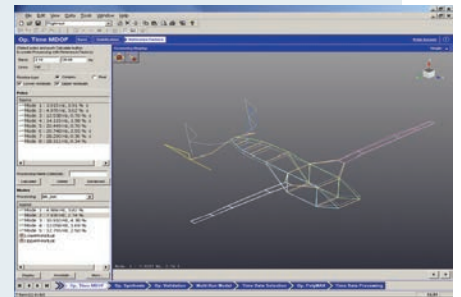
Order-based modal analysis

The Simcenter Testlab Order-based Modal Analysis is designed to help you investigate the structural dynamic behavior of rotating machinery under run-up or coast-down operating conditions.

- Direct visualization of operational deflection shapes of orders
- Easy data selection with minimal user interaction
- Calculation of operational deflection shapes

- State-of-the-art modal parameter estimation with clear stabilization diagrams using Simcenter Testlab Polymax
- Ability to compare order-based modal model with experimental and operational models
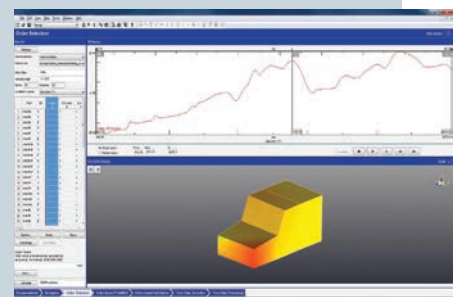
MIMO sine sweep testing

Simcenter Testlab MIMO Sine Sweep Testing provides you with a complete solution for multiple input and multiple output sweep sine excitation for modal testing of large and complex structures with higher excitation levels and for nonlinearity assessment.

- Definition of amplitude/phase versus frequency profiles for up to 16 Digital-to-analog (DAC) outputs or up to 16 target control channels
- FRF, coherence, autopower and crosspower measurement functions
- High signal-to-noise ratio of sine excitation and broadband testing measurement speed

- Accurate sine extraction results in leakage-free response spectra
- System identification step prior to sine sweep to help control excitation levels and increase dynamic range
- Harmonic distortion spectra and excitation level control for analysis of nonlinear behavior
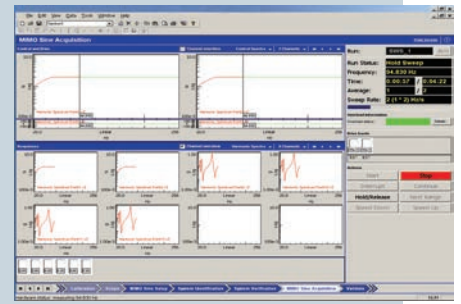
Stepped sine testing

Simcenter Testlab Stepped Sine Testing provides you with an open- or closed-loop multiple input stepped sine excitation to measure multiple input and output frequency response functions used for modal analysis.

- Availability of 16 exciters with different level control types
- Fixed exciter voltage levels for nonlinearity characterization
- Fine and coarse frequency resolution with ability to concatenate for response spectra

- Amplitude and force control integrated in the frontend for optimal control loop time
- Two control modes: amplitude and amplitude/phase
- Possibility to use logarithmic or linear x axis

MIMO normal modes testing

Simcenter Testlab MIMO Normal Modes Testing is an intuitive solution for modal testing that allows you to measure resonance frequency, damping and mode shapes of a structure in one measurement run.

- Excitation with up to 16 shakers
- Automatically adjusts amplitude and phase and mode shapes
- Manual and automatic resonance tracking and force appropriation techniques
- Ability to vibrate a complete structure according to a desired mode
- Pretest force ratio calculation with extended Asher's method, mode indicator and inverse mode indication function method

- Manual and automatic resonance tuning
- Safety limits on maximum acceleration response and exciter levels
- Frequency sweep around resonances to determine damping ratio and modal mass

Ground vibration testing

Simcenter Testlab Ground Vibration Testing gives you capabilities to obtain experimental vibration data of the whole aircraft structure for validating and improving its structural dynamics model, including assessment of the aircraft structure's linear or nonlinear behavior.

- Handles up to 16 exciters
- Performs open- and closed-loop control
- Measures transfer functions with random, swept sine and stepped sine excitation
- Measures resonance frequency, damping ration and deflection directly with normal mode excitation
- Supports nonlinearity study

Modification prediction

Simcenter Testlab Modification Prediction provides modal system synthesis techniques that help you evaluate structural modifications (mass, stiffness and damping) of elements such as mass, spring-damper and tuned absorber on the dynamic behavior of a mechanical structure.

- Visualize the effects of dissipating vibration energy with a tuned absorber
- Predict structural modification effects and global impact of selected modifications without physically changing the structure
- Evaluate a large number of alternative design variations without repeated testing
- Remove masses at all points and predict accurate natural frequencies
- Verify overall structural integrity
- Increase overall engineering productivity
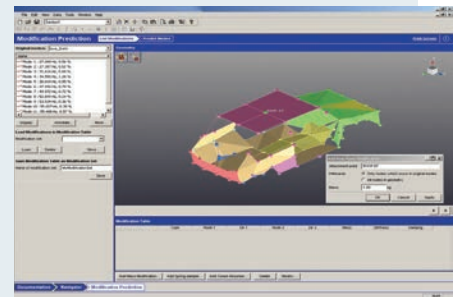
Rigid body properties calculator

The Simcenter Testlab Rigid Body Properties Calculator offers well-known FRF measurement techniques to help you extract essential parameters of rigid body properties such as center of gravity, moments and principal axes of inertia.

- Ability to create and visualize geometries, center of gravity and principal axes
- Capabilities for immediate animation of rigid body modes
- Optimized data selection for easy FRF selections and better visualization
- Three mass line methods for calculation of rigid body properties
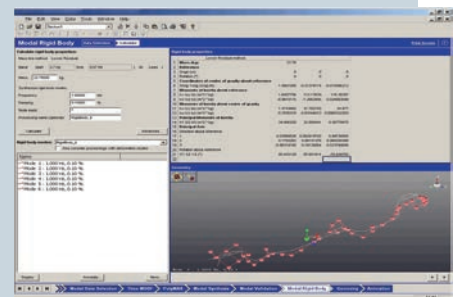
Simcenter Testlab Rotating Machinery
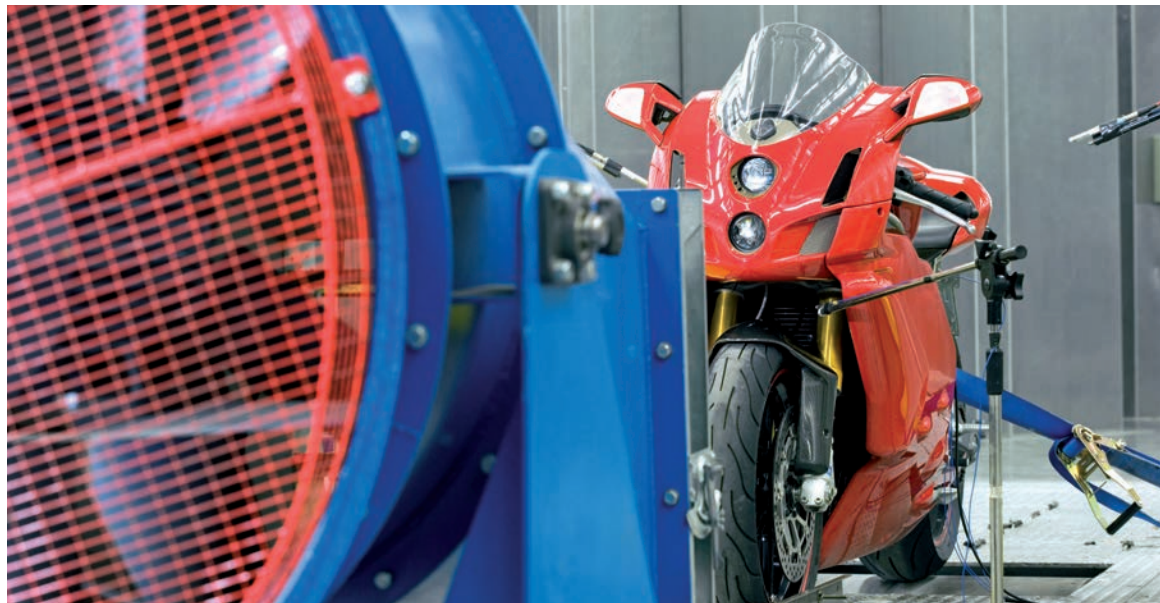
Simcenter Testlab Rotating Machinery provides you with a comprehensive suite of machinery vibration analysis solutions that helps you develop quiet, efficient and reliable products. Targeted applications in the Simcenter Testlab Rotating Machinery toolset can help you master the complex process of machinery vibration analysis in systems such as engines, compressors, electrical motors, pumps and shafts.

If you focus on vibro-acoustic troubleshooting and product refinement, Simcenter Testlab Rotating Machinery offers a comprehensive selection of tools, including waterfall mappings, order tracking, time data acquisition and processing functions and specialized modules to help you analyze and visualize the vast amounts of data that are generated.

Within your global engineering team, the ability to collaboratively share data provides you with significant benefits in time and cost saving efficiencies.

Signature testing

Simcenter Testlab Signature Testing provides you with online and offline harmonic analysis based on narrow band waterfall spectra and color maps. The solution allows you to perform vibro-acoustic testing of rotating equipment in any operating condition.

- Support of data acquisition systems/ frontends
- Simultaneous recording and measurement of data
- Online and offline order analysis with reference to measured or derived tacho channels

- Online check against reference curves
- Derived channels with basic/advanced calculator functionality
- Intelligent displays for transparent coupling of measured results to underlying data

Time data acquisition and processing

Simcenter Testlab Time Data Acquisition and Processing gives you a tool for continuous and multichannel recording of time data in laboratory or field conditions with online monitoring and real-time user configurable processing functions.

- Support for data acquisition systems/ frontends
- High precision, high bandwidth multichannel recording directly to PC
- No physical size limitations
- Integrated signal conditioning
- Overview of all dynamic and static channels

- Online monitoring of spectra, waterfalls and color maps, octave displays and order sections
- Simultaneous multiple runs with batch throughput processing

Order tracking

Simcenter Testlab Order Tracking offers advanced harmonic analysis on your rotating equipment in any operating condition. Order sections are obtained from data sampled synchronously with RPM, resulting in leakage-free, razor-sharp order cuts.

- Simultaneous measurements of leakage-free, synchronously-sampled order sections and fixed sampled spectra
- Immediate validation of time histories for all channels
- Online monitoring of root mean square (RMS) levels, spectra, waterfalls and color maps, octave displays and order sections

- Simultaneous recording of raw-time data
- Online checking against reference curves
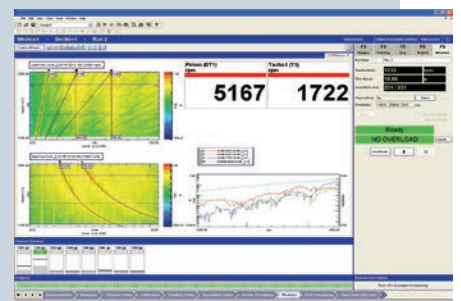
Turbine testing

Simcenter Testlab Turbine Testing provides you with a highly advanced all-digital solution to help you meet the stringent performance requirements for testing and certification of turbines and compressors.

- All-digital networked dynamic data acquisition and analysis
- Perfect error-free configuration traceability
- Easy reconfiguration
- Excellent signal quality

- Full measurement chain control
- Uninterrupted recording of all channels with real-time monitoring
- Consolidated data on central server for processing and archiving

Torsional vibration analysis

Simcenter Testlab Torsional Vibration Analysis provides highly accurate torsional vibration analysis of rotating machinery with single or multiple shafts. You can extract the order sections from fixed sampled frequency spectra as well as from data sampled synchronously with RPM.

- High-precision, high-bandwidth torsional vibration measurements
- Simultaneous calculation of leakage-free, synchronously-sampled order sections and noise and vibration signals
- Convenient calculation of angular velocity and shaft torsion
- Accurate pulse correction for missing and nonequidistant teeth

- Butt joint correction for measurements based on zebra tape correction algorithm
- Online monitoring of angular velocity irregularities, spectra, waterfalls and color maps, octave displays and order sections
- Real-time observations of shaft angular displacements, speed or acceleration, torsion over shafts, belt transmission errors or other specific metrics
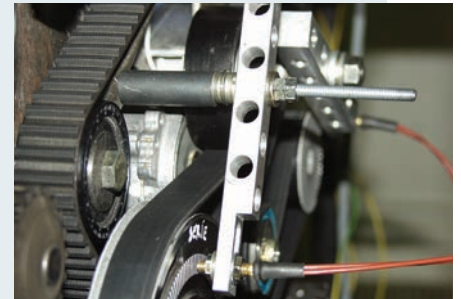
Angle domain processing

Simcenter Testlab Angle Domain Processing supports your in-depth analysis of engine or reciprocating machinery data with correlation to noise or vibration issues. It provides for time data conversion to angle data and data alignment with the system duty cycle.

- Support for all Simcenter SCADAS frontends with incremental encoders for up to 200 kilohertz (kHz) pulse rates and intelligent tacho to correct for missing pulses
- User definable angle domain resampling with advanced automated or manual zero reference definition

- Parallel processing of angle and fixed sampled data with broad list of cycle or gate statistics
- Intelligent, powerful displays

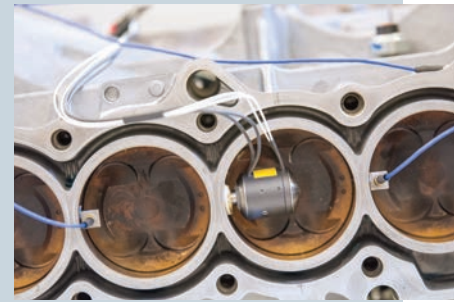# Simcenter Testlab Transfer Path Analysis

Simcenter Testlab Transfer Path Analysis provides you with a systematic approach to test-based engineering processes and focuses engineering efforts on the components that matter the most. As a method to fully understand vibro-acoustic behavior, transfer path analysis (TPA) assists in troubleshooting vibro-acoustic issues and setting performance targets for each critical component. Simcenter Testlab Transfer Path Analysis is a highly efficient solution to identify noise problems and their origins.

Simcenter Testlab Transfer Path Analysis focuses on ease-of-use and productivity. It supports fast and efficient data processing and results interpretation. The clear graphical displays facilitate the understanding of path contribution. You can interactively modify loads and/or transfer paths and visually evaluate modifications in real time, comparing multiple scenarios.

Single reference tranfer path analysis

Simcenter Testlab Single Reference Transfer Path Analysis helps you trace the flow of vibro-acoustic energy from a source. You can identify path contribution and analyze the variables that can have an effect on the vibro-acoustic results and deploy different data sets and operating scenarios for comparing and evaluating results.

- Efficient TPA solution for optimizing vibro-acoustic levels
- Workflow-oriented solution with point-by-point user guidance
- Context sensitive display layouts and contribution analysis (4D displays)

- Convenient comparison of multiple data sets
- Support of acceleration and strain sensors for load estimation

Advanced desktop

Simcenter Testlab Multi-reference Transfer Path Analysis allows you to examine path contribution for multisource noise and vibration issues, which is particularly useful for road-noise analysis. You can evaluate independent, uncorrelated sources with singular value decomposition and recombine results to evaluate combined effects on the target location.

- Workflow oriented
- Solution for single and multisource issues
- Convenient source-transfer-receiver model and data management

- Many load identification techniques, including strain sensors support
- Context-sensitive display layouts and contribution analysis

Windows automation

Simcenter Testlab OPAX gives you a fast, test-based procedure that supports the efficient troubleshooting of vibro-acoustic problems. The solution allows you to identify root causes of vibrations.

- Convenient source-transfer-receiver model and data management
- Single degree-of-freedom (SDOF) and band parametric models for estimating loads

- Ability to include indicators for better accuracy and missing path compensation
- Context-sensitive display layouts and contribution analysis (4D displays)

Time domain transfer path analysis

Simcenter Testlab Time Domain Transfer Path Analysis gives you an accurate identification of transfer paths related to a specific event in the time domain with specific applicability to semi-stationary transient phenomena.

- Effective analysis of transient phenomena
- Ease-of-use with workflow-oriented solution

- Correlation of joint model definition with frequency-domain TPA
- Access to a wide range of load-identification tools
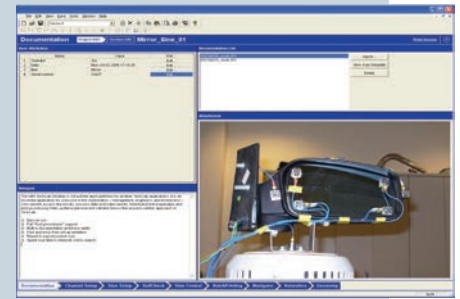
Simcenter Testlab Vibration Control

Simcenter Testlab Vibration Control provides a complete four- to eight-channel solution for closed-loop vibration control testing. The vibration control system helps you easily certify and homologate products, ensuring products can operate under external excitation and vibration conditions. Conditions can range from normal to very extreme and include rough transportation circumstances.

Simcenter Testlab Vibration Control combines optimal ease of use with the performance and reliability of an advanced system. The vibration control system offers accurate closed-loop shaker control and provides built-in safety mechanisms that minimize the risks of damaging costly test items. With user guidance and secure automation capabilities, Simcenter Testlab Vibration Control helps you achieve maximum productivity and meet critical deadlines. The software is designed to work with Simcenter SCADAS hardware. This tight integration of software and hardware delivers optimal loop speed and maximum safety.
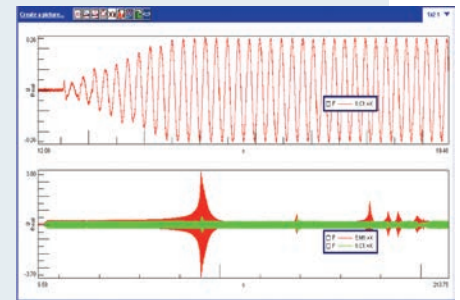
Vibration control testing

Simcenter Testlab Vibration Control offers a complete solution for the certification and qualification of products and components. The vibration testing software includes a test sequencing scheduler for secured automated testing.

- Scheduler for swept sine, random and shock test modes
- Remote communication
- Communication with external equipment
- Test status report via email or short message service (SMS)
- Parameter locking
- Workflow tuning

Premium control options

Simcenter Testlab Vibration Control comes with a number of premium control options that will help you test more efficiently and safely, including single axis waveform replication, kurtosis control, sine notching, random response limiting and more.

Simcenter SCADAS hardware options

Simcenter Testlab Vibration Control is tightly integrated with the Simcenter SCADAS hardware platform. Simcenter SCADAS fully supports the vibration control application with a range of tailor-made features.

- Shut down control unit
- Mobile-vibration control
- Environmental testing remote control

Vibration control analysis

Simcenter Testlab Vibration Control provides vibration control analysis options that help you determine if a product will withstand normal to extreme operating or transportation conditions.

- Shock-response synthesis
- Mission synthesis
- Time recording
- Geometry creation
- Operational deflection shape and time animation

Simcenter Testlab Environmental Testing

Simcenter Testlab Environmental provides you with a powerful, high-speed multichannel vibration control system for dynamic environmental testing, certified for spacecraft testing. The vibration control systems can be expanded to hundreds of control, measurement and limiting channels. The solution is easy to use for routine random, shock, sine and combined modes testing and has everything you need for state-of-the-art control and extensive data analysis.

The environmental testing solution delivers a complete solution for qualification and acceptance testing on large and sensitive structures, including spacecraft, satellites and system prototypes. It is designed for parallel acquisition and online reduction of vibration channels during random or sine closed-loop vibration control testing, in reverberant rooms and for high frequency transient capture in deployment testing. The environmental testing solution also helps you test and validate the robustness of spacecraft design to guarantee load launch survivability by accurately reproducing launch acoustic environment levels in a large reverberation room.

Qualification testing compliant with defense standards

Simcenter Testlab MIL-STD Vibration Testing provides a complete solution for vibration qualification testing compliant with defense standards United States Military Standard (MIL-STD), guerre air mer, études generals (GAM-EG.13) and United Kingdom Defense Standardization (DEF-STAN). The solution supports swept sine, random, shock, software requirements specification shock response synthesis (SRS), combined modes and time replay-based qualification.

- Swept-sine control
- Random control
- Shock control (classical pulse, measured pulse and shock response analysis)
- Single axis waveform replication
- Shock-response synthesis
- Combined modes
- Mission synthesis (optional)
- Easy test setup
- Tolerance profiles from standards
- Fast analysis and reporting
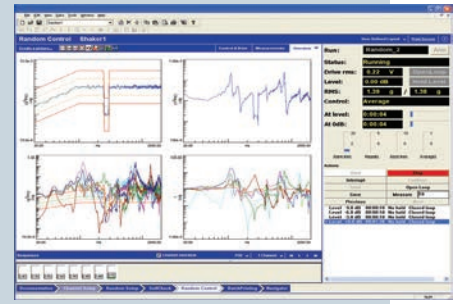
Qualification and acceptance testing for space hardware

Simcenter Testlab Space Application Testing provides a complete solution for closed-loop vibration control with random, sine and shock test modes to safely, accurately and quickly reproduce target qualification reference profiles.

- Swept-sine control with sine notching
- Random control with random response limiting
- Shock control (classical pulse, measured pulse and shock response analysis)
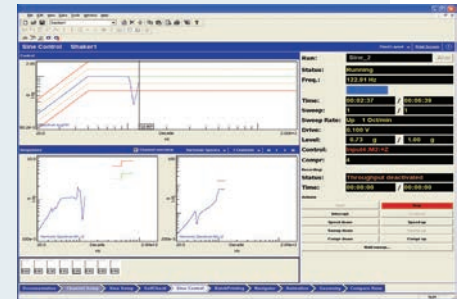
Advanced vibration testing

Simcenter Testlab MIMO Random Control is a user-friendly solution for advanced vibration testing and closed-loop multishaker control that implements a fast and accurate control algorithm.

- MIMO random control setup on any number of channels (more than the number of shakers)
- MIMO random control loop (real-time adaptive control loop)
- Self check with extensive safety features (system identification and verification, drive limitations and safety checks on overall vibration level of individual channels), MIMO measurements on all channels, online interactions during test sequence
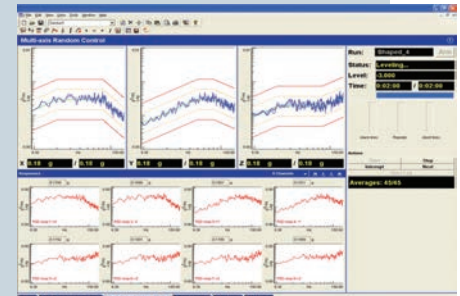
Premium data reduction

Simcenter Testlab Data Reduction Premium delivers a complete solution for qualification and acceptance testing and post-test analysis data on large and fragile structures such as spacecraft and satellites.

- Online random and acoustic reduction
- Online sine reduction
- Transient capture
- Parallel time recording in all measurement modes
- Online spectrum measurements in all modes
- Productive batch printing with automatic peak cursors
- Data available for post-test analysis immediately after test
- Integrated high-channel count online reduction capability
- Full and automatic test logging
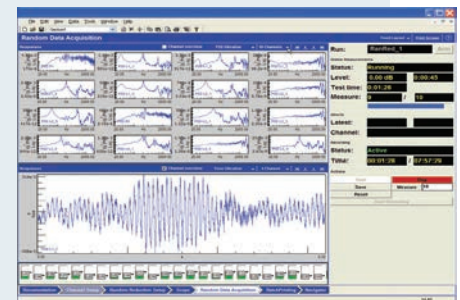
About Siemens PLM Software
Siemens PLM Software, a business unit of the Siemens Digital Factory Division, is a leading global provider of software solutions to drive the digital transformation of industry, creating new opportunities for manufacturers to realize innovation. With headquarters in Plano, Texas, and over 140,000 customers worldwide, Siemens PLM Software works with companies of all sizes to transform the way ideas come to life, the way products are realized, and the way products and assets in operation are used and understood. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

Headquarters: +1 972 987 3000
Americas: +1 314 264 8499
Europe: +44 (0) 1276 413200
Asia-Pacific: +852 2230 3333