



DIGITAL INDUSTRIES SOFTWARE

Simcenter vibration qualification testing

Solution brief

Use Simcenter SCADAS Mobile and Simcenter Testlab to enhance vibration qualification testing.

Leverage streamlined and highly efficient product certification procedures.

Vibration qualification testing helps engineers certify and qualify products for survivability. The Simcenter™ software vibration qualification testing solution provides accurate closed-loop shaker control for standard sine, random and shock excitation. It allows operators to conduct vibration qualification tests with full confidence. It also scales to multiple engineering needs with powerful analysis

tools that enable the user to get more insights out of test data.

This vibration qualification offering combines Simcenter Testlab™ software with predefined templates in conjunction with the compact multi-channel Simcenter SCADAS™ Mobile hardware for data acquisition. This bundle has been especially developed for certification measurements, delivering reliable and accurate results. Moreover, this bundle is designed to spread the knowledge and capability across the entire team to gain time, flexibility and detailed insights into the sound and vibration phenomena.

The Simcenter vibration qualification certification offering provides all the tools to perform single-axis vibration control tests, a reliable, high-quality and affordable technology that has also been proven

Challenges

- Make certification testing more efficient and safer
- Comply with a variety of vibration qualification standards

Solutions

- Provide classic control modes for shock, sine and random excitation
- Use advanced methods like tracked sine dwell
- Predefine testing procedures with automatic, sequential execution

Results

- Streamline guided procedures and enable any team member to conduct these measurements
- Comply with worldwide standards and in-house procedures
- Convert real-life data into shaker profiles for more realistic vibration qualification testing

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[siemens.com/simcenter](https://www.siemens.com/simcenter)

Solution focus

in the high-end markets, such as spacecraft testing. The package includes random, sine, shock and dwell control modes for four to eight control channels. Furthermore, it allows you to define test sequences for efficient development of certification, verification or qualification testing programs. As such, the team can perform all possible vibration qualification tests using a single, affordable and operator-oriented solution.

Both products are part of the Xcelerator portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software.

Random excitation

Simcenter Testlab Random Control provides all the necessary features to define and control a random excitation to match a predefined power spectral density (PSD) profile. The excitation profile is defined with a measured PSD or is created using the profile editor. The profile editor allows you to define the left and right slopes for each breakpoint and automatically derives intersections. Unit mixing is supported in a consistent way for all control and measurement channels. Support is provided for all control and measurement channels during random control simultaneous acquisition, processing and visualization of PSD, frequency response function (FRF) (with phase) and coherence, including:

- Single and multi-point control strategy (minimum, maximum, average)
- Online viewing of PSD, FRF, coherences and time history data
- Response limiting (spectral and root mean square) on any channel as an optional feature
- Up to 25,600 spectral lines



Sine excitation

Simcenter Testlab Sine Control supports a user-friendly way to complete the closed-loop shaker control process. The system implements a safe, easy, fast, accurate and reliable control algorithm.

- Control from 0.1 to 40 kilohertz (kHz)
- Single or multi-point control strategy (minimum, maximum, average, contribution profiles)

- Scale up or down your test profile harmonic, root mean square (RMS), peak or average estimators
- User-defined buildup mode
- Online viewing of spectra, drive, inverse transfer function (ITF) and total harmonic distortion (THD)
- Notching on any channel



Shock excitation

Simcenter Testlab Shock Control allows real-time closed loop control of shock events, online viewing of instantaneous and averaged time histories, spectra, FRFs and shock response spectrum (SRS). Half-sine, triangle, rectangle and trapezoid reference pulses (classical shock) can easily be defined along with the appropriate tolerance limits (MIL-STD and GAM-EG-13). The use of a stored pulse as a reference waveform for control (a measurement or the result of a synthesis exercise) as opposed to a classical waveform such as a half sine pulse is also supported.

- Online viewing of instantaneous and averaged time histories, spectra, FRFs and shock response analysis (SRA)
- Quick and easy import reference pulse utility for measured pulse
- Online SRA measurements
- Pre and post pulse compensation on measured pulses
- User definable peak amplitude and duration (0.06 milliseconds to 30 seconds)



Tracked sine dwell

With Simcenter Testlab Tracked Sine Dwell you can excite any structure at a fixed frequency, or at a resonance frequency with frequency tracking. The test duration can be a fixed amount of time or a fixed number of cycles. Abort criteria for both control and response levels provide the highest level of safety. They can be combined with abort in case the tracked dwell is out of predefined frequency ranges. Arbitrary sequences of dwell frequencies can be easily defined using the resonance identification tool.

- Acceleration, velocity or displacement control
- Visualize acceleration, velocity or displacement as function of time or cycles
- Advanced modal parameter estimation for a best resonance search
- User defined buildup modes

Shock response processing

Using Simcenter Testlab Shock Response Spectrum enables offline calculation of the SRS from any acceleration time history using Simcenter Testlab Process Designer or Simcenter Testlab Interactive Analysis. Twenty-seven instances of the SRS are calculated (with the possibility of a simultaneous calculation of the nine combinations of amplitude/instance). Input data typically is the acceleration response

measurement acquired during a shock test on the shaker (Simcenter Testlab Shock Control) or a measured time history collected using Simcenter Testlab Transient Capture or time data stored in any of the formats Simcenter Testlab supports. This method can be combined with any other Simcenter Testlab method for postprocessing shock response spectra.

- From direct current (DC) to 1 megahertz (MHz)
- Q factor 0.01 up to 1,000
- Simultaneous calculations of SRS using different instances and amplitudes

Test sequencing

Simcenter Testlab Environmental Test Sequencing enables a user-friendly to automatically perform a sequence of environmental control tests. Set up your most complex test schedule and interface with external hardware (like climatic chambers) for advanced and combined environmental tests:

- Create a sequence of sine, random, shock and combined modes
- Interface with external hardware (for example, climatic chambers) for combined vibration and temperature or humidity tests
- Digital input/output interface



Simcenter SCADAS DAC shut down control unit.



Simcenter SCADAS SCM201V with eight-channel acquisition module.

SCADAS Mobile

Simcenter SCADAS Mobile is a dedicated modular front-end system for vibration control applications. It accommodates two 24-bit signal generator outputs, connectivity for hardware emergency stop and four or eight input channels. The Simcenter SCADAS Mobile vibration control frame uses high-speed serial Ethernet with a throughput rate maximum of 14 mega (M) samples per second to transfer data for all channels to the host.

The Simcenter SCADAS Mobile vibration control frame is equipped with 24-bit effective dialog-to-analog conversion (DAC) output. The system supports a controlled shutdown (tapered startup and shutdown) procedure in case of emergency stop, communication loss with the host or even a power failure.

- Ultra-compact size, low weight and rugged housing for rough environments
- Modular system with precision signal conditioning and channel count independent sampling frequency

- Accommodates four or eight input channels as a single frame configuration
- Twenty-four-bit effective DAC output for vibration control with 40 kHz real-time control bandwidth
- Includes tapered startup and shutdown
- Status output for advanced synchronization purposes
- Safely control via hardware emergency stop and DC power watchdog
- Wide operational temperature range from 20 Celsius (°C) to +55 °C
- Ultra-quiet, fan-less cooling

Make your product compliant with new markets.

Using Simcenter simulation and test applications helps you engineer innovation where today meets tomorrow.

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