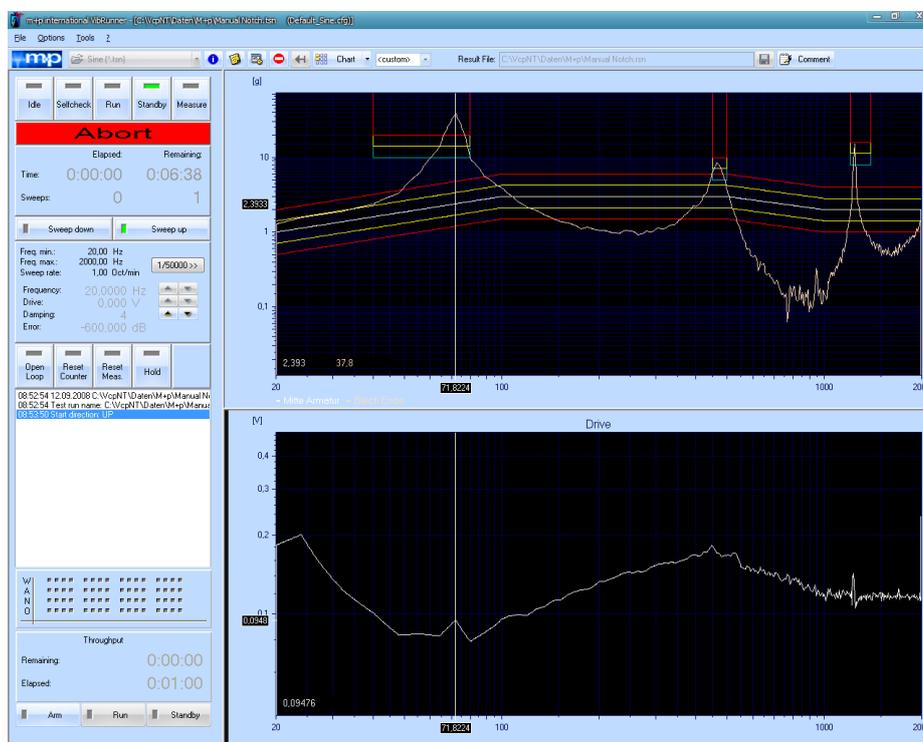


m+p VibControl

Sine Vibration Control

m+p VibControl is m+p international's proven software for carrying out a wide variety of vibration tests. Its Sine control mode is one of the basic and most common excitation modes for environmental shaker testing and performs real-time closed-loop control of swept sine vibration.



Sine test

Key Features

- Fully compliant with ISO, DIN and MIL-STD 810 standards
- Support on electrodynamic and hydraulic shakers
- Frequency range up to 20 kHz or 40 kHz, hardware dependent
- All input channels available as control, watchdog and/or measurement channels
- Control strategy: average, maximum, minimum
- Notching/force limiting
- True multi-tasking without loss of real-time control
- Profile defined with up to 1,024 or 4,096 breakpoints
- Control on acceleration, velocity, displacement and force
- Throughput time data recording
- Online frequency and time data displays
- Seamless import/export of test results into applications such as Microsoft Word or Excel and m+p Analyzer
- Measuring and monitoring DC signals for functional testing

Applications

Sine testing is used for proving product reliability and for structural resonance search in all kind of applications such as automotive, electronics, aerospace, consumer products and military. m+p VibControl also performs strain measurements using m+p hardware (m+p VibRunner, m+p VibMobile). Available bridges are full bridge, half bridge, quarter bridge, measuring either bending or Poisson's ratio.

Sine Vibration

m+p VibControl's Sine testing applies a sinusoidal signal to the specimen under test sweeping in a user-defined frequency range, at a defined sweep rate for a number of sweeps or total test time. Here a continuous frequency sweep is generated, measured, analyzed and controlled. The amplitudes at the excitation frequencies are defined in a reference spectrum with a, v, d or force values. The reference spectrum can be entered manually and copied/pasted from the Microsoft Windows clipboard. The total number of breakpoints of the reference spectrum exceeds 1,024 or 4,096. The reference spectrum editor provides for easy cross-over frequency calculation (e.g. constant displacement into constant velocity for shaker performance tests) based on fixed amplitude criteria of different dimensions. The response of each channel can be analyzed using four amplitude estimators (Filter, Average, RMS or Peak) or combination for advanced analysis. For maximum flexibility of the Sine control test, a sweep table is available for programmed sweep rate, sweep mode, sweep direction and compression speed changes during an ongoing test.

Input Channels

All input channels can be allocated as control, watchdog, measurement or any combination. A measurement channel just measures the response and does not influence the control at all. A watchdog channel checks for not to exceed response amplitudes for system shutdown (tolerance) or for not to exceed response amplitudes for drive signal reduction (notching/limiting). The tolerance watchdog channel checks its response versus tolerance amplitudes. The notch watchdog channel checks its response versus a notch spectrum, broadband or narrowband. A control channel is always in the control loop and its response is always fed into the control algorithm defined with control strategy average, maximum or minimum.

m+p VibControl's Sine control mode allows for re-calculation of the notch spectra based on the response at the notch channels of previously ran tests at lower levels than the final test. This feature guarantees minimal notch profile overshoot, hence protecting the specimen under test at the critical notch frequencies.

Further notching features provided are:

- **Momentum Notching:** Online measurement and notching of overturning moment responses during the measurement based on the response of force transducer and their location relative to the structure under test. This momentum control is achieved using virtual channels with a definition of the x, y coordinates of the force transducers
- **RSS Vector Notching:** This notching feature is typically used with a triax sensor. The amplitudes of the three measurement directions (x, y and z) are merged to one resulting vector which can be used for notching
- **Summed Force Notching:** Force transducers are summed digitally to eliminate the need for an external summing junction as well as to ensure all transducers are within limits. The option offers a signed weighting function which enables you to weight the involved vectors differently

Test Set-Up & Test Run

The test set-up is very intuitive and easy to use. It is split up into four separate parts: reference spectrum editor, shaker/specimen information, level schedule and channel information including notch profiles. Typical set-up parameters like reference spectrum, notch spectra, channel descriptions, channel sensitivities and channel EU (Engineering Unit) can easily be copied and pasted from any application, m+p VibControl software (for easy transfer of information from other tests and/or modes of excitation) using the Microsoft Windows clipboard. Also complete column copy and paste of data series is supported.

While the test is running, all information important to the closed-loop control can be seen at a glance for fast and direct monitoring. Routine testing is done by simple automatic controls. Advanced manual controls for diagnostic test applications may be disabled for production use. A comprehensive system selfcheck is performed prior to running the test to ensure that sensors and drive signals are in place avoiding potentially dangerous and damaging situations. A date and time stamped test log is created showing details of the selfcheck and every test event. The test safety is assured with open loop detect, alarm/abort profile checks, overall grms control checks, drive level limit, individual channel grms high/low limits. The optional m+p VibUtil/m+p Advanced VibUtil tools enable test sequencing and digital channel control features (e.g. for controlling a climatic chamber).

Sine Swept & Stationary

- Standard frequency range from 0.1 Hz to 20 kHz or 40 kHz, hardware dependent
 - up to 20 kHz using m+p VibPilot hardware
 - up to 40 kHz using m+p VibRunner hardware
 - up to 50 kHz possible for special solutions
- Sweep profile defined with up to 1,024 or 4,096 breakpoints
- Measurement filters: RMS, peak, averaged or digital tracking filter
- Breakpoint defined by acceleration, velocity, displacement or force
- Constant acceleration, displacement or velocity slopes with auto-calculation of cross-over frequencies
- Independent alarm and abort profile table plus overall g limits
- Unlimited user-selectable sweep rate in Oct/min, Hz/min or Dec/min
- Fixed frequency dwell function (sweep hold)
- User sweep rate table varies rate and direction by frequency bands
- User-defined number of sweeps, rate, sweep time or test time, others calculated
- Time data display
- Time history recording to throughput disk
- Complete tape recorder replacement possible
- Sine peak calculation
- Notching options available (Momentum notching, Vector RSS notching, Summed Force notching)
- Notch table import
- User-defined measurement storage rate (store every n sweeps up/down)

- Measurement channel can be any signal type incl. DC for display and correlation with sweep data
- User-defined start-up time and limit plus rampdown time
- Test duration unlimited
- Manual sweep direction, hold, rest, open loop, level up/down, frequency controls during test (functions can be disabled)
- Online spectrum rescaling
- Transducer calibration using the optional SensCal program
- Sine data include magnitude and phase information to perform Operating Deflection Shapes (ODS) in m+p Analyzer

Sine Resonance Search, Track & Dwell

- Specifications as per swept sine
- Online data display as frequency data or as time data
- Sine dwell peak table import to VibEdit
- Dwell schedule table allows 50 dwell points to be defined
- Control criteria: fixed frequency, fixed phase, defined phase, auto phase, peak amplitude
- Each dwell independently defines control (ref) and measurement channels
- Dwell at each point for user-selectable seconds, minutes or cycles
- User-controlled measurement data storage rate
- Stepped sine function can be selected as dwell criterion

Notching, Force Limiting (FVLT); Sine Force, Displacement and Velocity Control

- Notching (limiting) profiles may be defined for each watchdog channel individually
- Minimal notch profile overshoot
- Sine displacement and velocity control is used with sine tests starting at very low frequencies (displacement transducers can be used); at a defined frequency the control changes automatically from displacement transducer to accelerometer transducer

Vector Notching Sine

- Software module including the notching features: Momentum Notching, Summed Force Notching, RSS Vector Notching

Sine Data Reduction

- Track and online analysis of taped swept sine data using the COLA signal
- Evaluation and storage of the taped signals on a second vibration control system during the test run
- Post-processing of time data throughput files (*.sot)

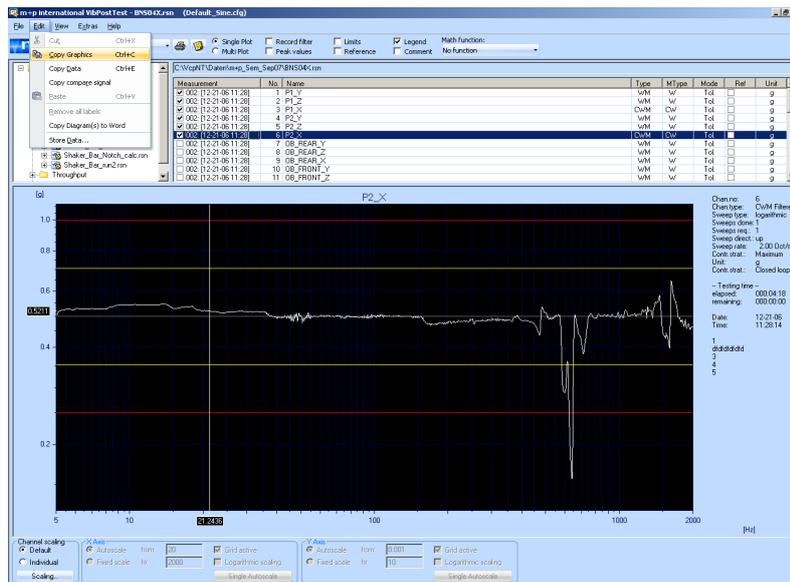
High Frequency Sine Control

- Up to 20 or 40 kHz frequency range for drive signal, depending on hardware and purchased software module

Post-Processing & Reporting

m+p VibControl's Advanced Post-Processing package is provided with any software module you purchase. Its post-testing includes extensive data handling, analysis, single and multiple data graphing and custom report formatting including company logo or other custom styles. These together with advanced cursor functions, peak search, mathematical functions and transfer function analysis mean high-quality reports are completed easily and quickly.

The Multiplot function extends the post-test analysis even further with the ability to display and plot data from different test types, several test runs or multiple test specimens in a single window. Data filtering is available to quickly select the most relevant data from all that was stored during the test. Data and graphics can be copied and pasted to Microsoft Office applications. For even more advanced analysis and reporting functionality, all m+p VibControl test results can be directly exported to the m+p Analyzer eReporter package.



Post-test analysis

Post-Processing

- Transfer function:
Relating the behaviour of control and measurement channels in the test run
- Mathematical functions:
Converting the measured acceleration signal into velocity and displacement, or vice versa
- Peak value analysis:
Peak values will be marked automatically in the graphics and listed with their numerical data in a table. Q-factor calculation
- Graphical and numerical measurement and reference data analysis:
 - Control and response spectra with reference, alarm, abort and notch limits
 - Error
 - Drive
 - FFT amplitude and phase
 - Double cursor with zoom-in function
 - Horizontal cursor

Printout

- Multiplot:
 - Displaying and printing several traces in one graphic
 - Minimum and maximum labels for all traces
 - Peak search over all traces
- Autoplot:
 - Automatically printing a preselected series of graphics
- Printing a list of preselected test parameters
- Printing directly to Microsoft Word using a customer defined template
- One-click printing to a Word document of all or a selection of result data

Reporting

- Interface to m+p Analyzer software for comprehensive analysis and reporting
- Copy and paste of all or a selection of result data to Excel for matrix analysis
- Export of all or a selection of result data in Universal File Format
- Export of complete binary result file into ASCII file

Operating System

- Microsoft Windows 7 Pro and Windows 10 Pro 32 or 64 bit

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