DEWESoft®

STRUCTURAL ANALYSIS

MODAL TEST AND ANALYSIS

SOLUTION DATASHEET

Modal test and analysis made simple.
The all-in-one solution for structural assessment.



V24-1

7 YEAR WARRANTY

MODAL TEST AND ANALYSIS

INTRODUCTION

Everything you need to obtain a modal model: from the initial excitation of structure to acquisition of raw signals, determination of frequency response functions, the definition of geometry, and animation to advanced modal analysis parameters calculation. With our solution, you can address a broad range of applications in various industries e.g., automotive, civil engineering, aerospace, or power generation.

FUNCTIONALITY

Modal testing
Modal testing and the acquired test data are the basis for performing modal analysis and making conclusions on the structural dynamics of test objects. Natural (modal) frequencies, modal damping ratios, and mode shapes of the object under test can be determined.
You can perform modal testing with either applied artificial excitation sources, to get the test object to vibrate, or by having the test object running under operational conditions, where in-situ vibrations will be present.

Modal testing is used for:
Troubleshooting
- To reduce excessive vibration levels
- To ensure resonances are away from excitation frequency

Simulation of "what if" scenarios
- Determination of forces
- Response to complex excitation

Structural assembly analysis
- To predict the dynamic behavior of assembled subcomponents

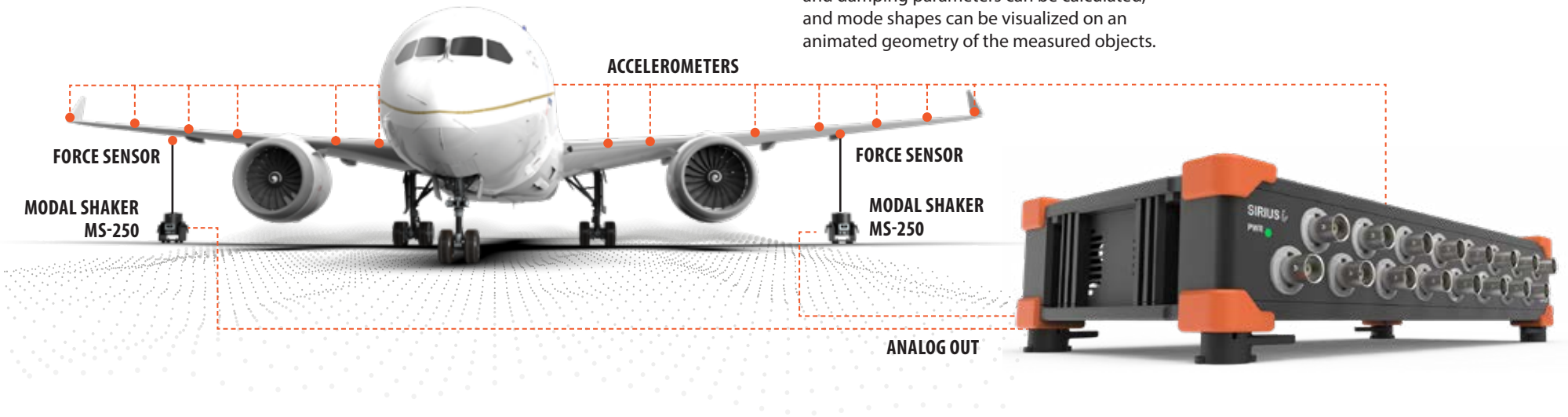
Refinement of Finite Element Model (FEM)
- Validation by testing on prototypes
- Refinement of the FE analytical model by inclusion of damping

Modal analysis
Modal analysis is vital to understand and optimize the inherent dynamic properties of structures - how structures and objects vibrate and how resistant they are to applied forces. This allows your designs to be tested, optimized, and validated, leading to lighter, stronger, and safer constructions, less fuel/power consumption, higher comfort, and better performance.
The frequencies at which vibration naturally occurs and the mode shapes which the vibrating system assumes are properties of the system and need to be determined analytically using modal analysis.

The set of measurements on the structure is used to construct a complete mathematical model of the vibrational properties from which the behavior of the structure can be observed. Natural resonance frequencies of the objects and damping parameters can be calculated, and mode shapes can be visualized on an animated geometry of the measured objects.
Natural resonance frequencies of the objects and damping parameters can be calculated, and mode shapes can be visualized on an animated geometry of the measured objects.

APPLICATIONS

Modal analysis is heavily used in civil engineering, and industries such as aerospace and automotive for a vast range of applications including:
- Ensuring that resonances are away from excitation frequencies
- Prediction of the dynamic behavior of components and assembled structures
- Optimization of the structure's dynamic properties (mass, stiffness, damping)
- Prediction of the responses due to complex excitation
- Inclusion of damping in Finite Element Models
- Damage detection and assessment



BENEFITS

ALL-IN-ONE SOLUTION – MULTIPLE EXCITATIONS
Use the same software to excite the structure using impact hammer, single or multiple shakers, or obtain deflection shapes using ODS to perform machine condition troubleshooting.

INTERFACE – EASY TO USE
DewesoftX software is made for test engineers. Modal test by roving excitation or response points, or control the shaker within a single screen. The software detects the measured frequency response functions.

FUTURE-PROOF – FREE LIFETIME UPGRADES
No hidden fees for software upgrades - backward compatibility guaranteed. Updated multiple times a year, new and exciting functionalities with each release.

FLEXIBLE – AND ALL SYNCHRONIZED
Signature Dewesoft measurement quality, accuracy, and flexibility. Connect additional sensors and measure additional parameters simultaneously, all data synced.

CUSTOMIZABLE – MULTIPLE OPTIONS
Regardless of your number or type of input channels - we got you covered. High customization possibilities of our DAQ systems ensure you get the right configuration for the job.

MANY CHANNELS – MORE SENSORS AT ONCE
The unique solution architecture allows an unlimited number of input channels offering simultaneous acquisition and analysis of data from many sensors.

ADVANCED MODAL ANALYSIS
Estimation of modal parameters using the LSCF algorithm with a curve fitted results shown in a dedicated widget - the stabilization diagram. Here you also can show the complex mode indicator function (CMIF) along with any other vector channel of your choice. AutoMAC to show the correlation between different modes. Support for synthesized FRF calculation and the ability to easily compare them with the measured FRFs.

MODAL GEOMETRY WITH ANIMATION
Geometry with animation is perfectly integrated with both Modal Test and Modal Analysis provides all you need to build a model of your structure. You can easily create a geometry of the measured structure by defining objects, lines, or points. With the interpolation of non-measured points, the ability to animate different mode shapes and compare deflections with the non-excited structure shape gives you a thorough visual representation of the structural dynamics.

MIMO METHOD
Excite complex structures by using multiple shakers, measure and analyze on a virtually unlimited number of channels. Your random, burst random and sine sweep excitation signals are configured directly in the Modal Test setup screen using the Function generator and you can use MCOH (multiple coherence) to validate your shaker setting.

SIMO METHOD
Perform your measurement with the impact hammer (single excitation point or multiple with roving hammer) and any number of response channels makes Dewesoft Modal Test and Modal Analysis a powerful asset for in-depth assessment of the structural dynamics.

AUTOFILL OPTION
Whenever a high number of measured channels is used, adding and removing the excitation and response channels process is made simple with autofill setup functionality.

KEY FEATURES



VISUAL STEP-BY-STEP GUIDANCE
The predefined display will guide you step-by-step through your modal test, track your measurement progress allowing you to reject hits, reset points, and automatically detect double hits. You will have animation of your structure in all three directions and view it in different projections during the measurement.

POST-PROCESSING
Offline calculation using raw signals from accelerometers.

MERGE DATA FILES
No need to measure the entire structure at once. Different parts of the structure can be measured and stored in separate data files and can be later merged into one to analyze and animate the structure and observe the behavior.

ADVANCED MATH
Mode indicator functions (MIF), H1 and H2 estimators, power spectral density (PSD) are fully implemented in Dewesoft and can be used in combination with any other math.

SPECS

ANALYZER: SIRIUSm-4xACC		
Input type	Voltage, IEPE	
ADC type	24bit delta-sigma dual-core with anti-aliasing filter	
Sampling rate	Simultaneous 200kS/sec	
Ranges (Dual Core Low Range)	±10V (±500mV)	±500mV (NA)
Input Accuracy (Dual Core)	±0.1% of reading ±10(1)mV	±0.1 of reading ±1(NA)mV
Dynamic Range@10kS (Dual Core)	140 dB (160 dB)	135 dB (NA)
Typ. SNR@50kS (Dual Core)	107 dB (125 dB)	100 dB (NA)
Typ. CMR @ 50Hz/1kHz	140/120 dB	140/120 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K	
Offset Drift	Typical 0.5 µV/K + 2 ppm of range/K, max 2 µV/K + 10 ppm of range/K	
Gain Linearity	<0.02%	
Inter-Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)	
Channel Cross talk	>160 dB @ 1kHz	
Input Coupling	DC, AC 0.1 Hz,1Hz	
Input Impedance	1 MΩ (270kΩ for AC coupling ≥ 1Hz)in parallel with 100pF	
Overvoltage Protection	In+ to In-: 50 V continuous; 200V peak (10msec)	
Excitation	2, 4, 8, 12, 16 or 20mA	
Compliance voltage	25 Volt	
Output Impedance	>100 kΩ	
Sensor detection	Shortcut: <4Volt; Open: > 19Volt	
Input connector BNC	BNC	
TEDS support	IEPE mode only	
Operating temperature	-10°C to 50°C	
Storage temperature	-40 to 85°C	
IP protection rating	IP40	

TYPICAL CONFIGURATIONS

DEWESOFT-OPT-MODAL-TEST (Automotive)
- SIRIUSm-4xACC: SIRIUS mini
- 1x IH-500N-1 Series Impulse Hammer
- 3x I1A-50G-1 Series Miniature Accelerometer

DEWESOFT-OPT-MODAL-TEST
DEWESOFT-PLUGIN-MODAL-ANALYSIS
- SIRIUSi HD-16xACC
- 1x IH-500N-1 Series Impulse Hammer
- 5x I3A-50G-1 Series Triaxial accelerometer

DEWESOFT-OPT-MODAL-TEST
DEWESOFT-PLUGIN-MODAL-ANALYSIS
DEWESOFT-OPT-FG-MU
(Aerospace, automotive)
- SIRIUSi-HD-16xACC + 8xAO
- 5x I3A-50G-1 Series Triaxial accelerometer
- 1-8x Dewesoft modal exciter MS-20



DEWESoft®

LEARN MORE:
https://dewesoft.com/applications/modal-analysis

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