

EASY TEST SETUP WITH DEWESOFT MODAL SHAKERS, INERTIAL SHAKERS AND PERMANENT MAGNET SHAKERS.



SHAKERS

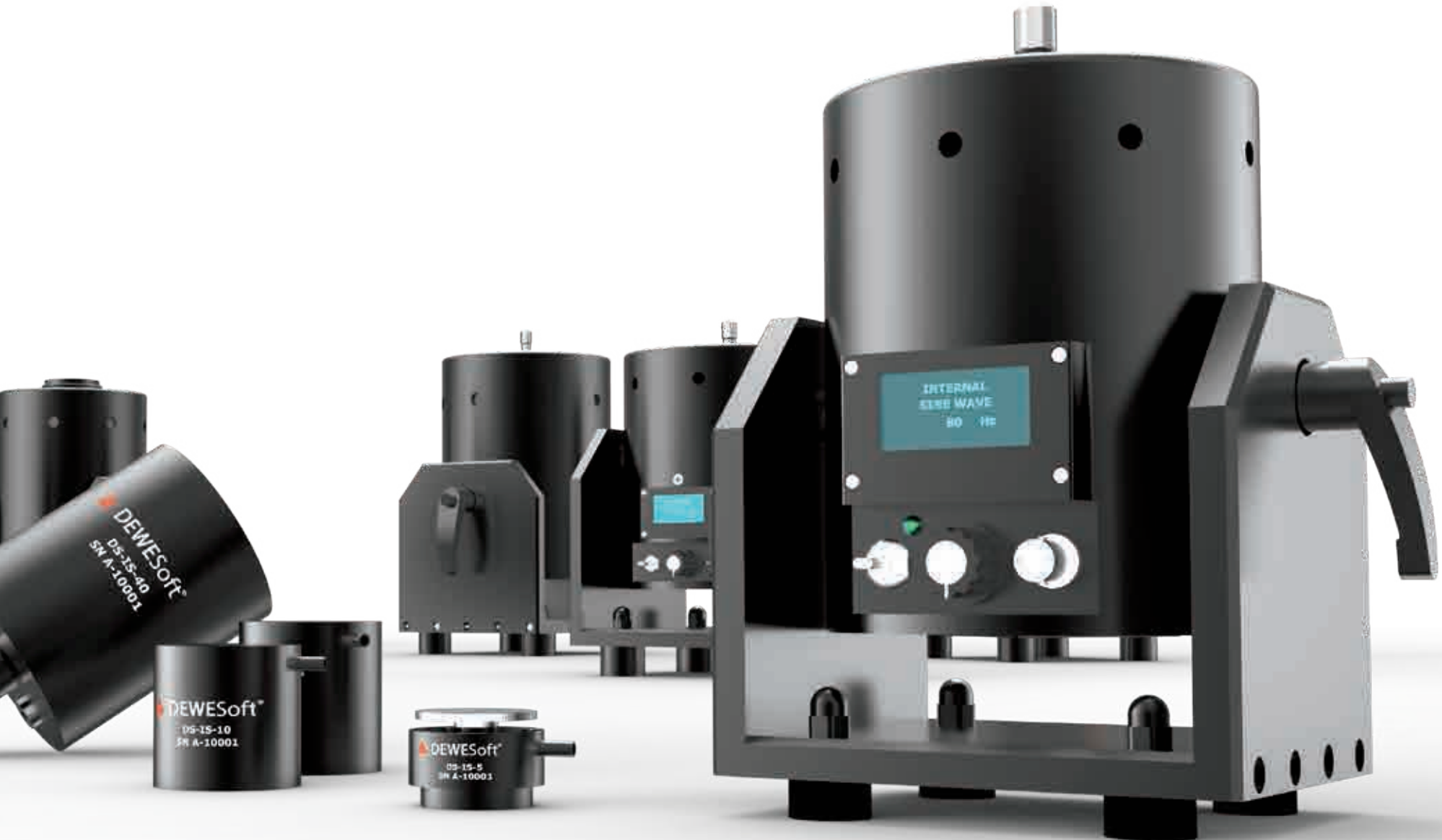
EASY TEST SETUP WITH DEWESOFT MODAL SHAKERS, INERTIAL SHAKERS AND PERMANENT MAGNET SHAKERS.

Shakers are used to simulate predetermined mechanical vibration environments. They transform an input signal into motion and are used for shock and vibration studies, endurance testing and modal testing.

A complete testing system consists of a vibration control system, a shaker, a power amplifier to drive the shaker and one or more accelerometers.

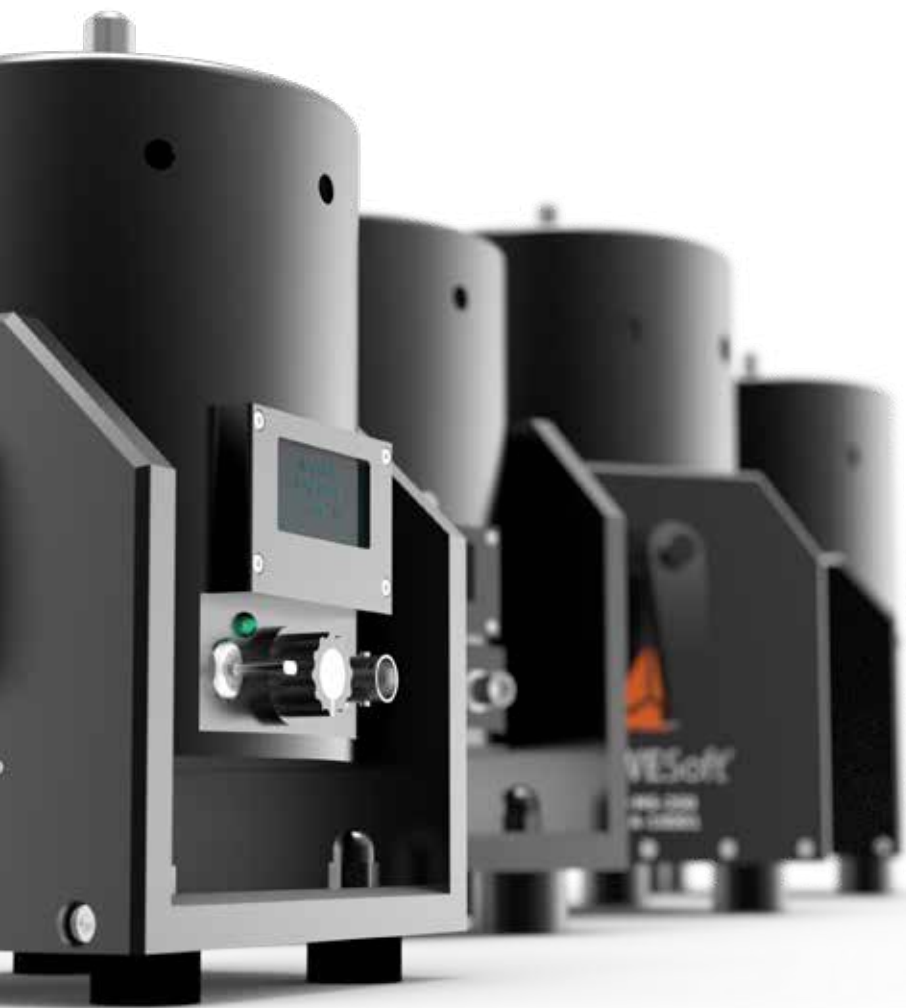
DEWESOFT SHAKERS ARE COMPACT, LIGHTWEIGHT AND POWERFUL GENERAL-PURPOSE SHAKERS WHICH CAN BE USED FOR MODAL AND VIBRATION TESTING. THEY HAVE HIGH DUT CAPACITY DESPITE THEIR SMALL SIZES.





MODAL SHAKERS

DEWESOFT MODAL SHAKERS COVER A WIDE RANGE OF STRUCTURES FOR DYNAMIC CHARACTERIZATION.



INTRODUCTION

Modal testing and analysis are indispensable tools to determine the vibration behavior and characteristics of a structure, its natural frequencies and modes of vibration. Typically, modal shakers are employed to provide a known excitation input force to the structure under test. Transducers are used to measure the input excitation force and the resulting vibration responses. Where structural resonances occur, the response will be amplified allowing calculation and estimation of modal parameters.

Modal shakers are the solution when high frequency excitation content or signal controlled testing is desired. Modal shakers allow for modal testing of larger and more complex structures and the use of various excitation signals.

The Dewesoft series of modal shakers are lightweight and powerful modal shakers, electro-magnetic actuators, which can go up to 12,000 Hz and provide force levels up to 440N with a maximum 25mm stroke. Electro-magnetic actuators are basically voice coils consisting of a permanent magnet and coil. Dewesoft modal shakers have moving coils (driving coils) whose current is controlled for vibration generation.

APPLICATIONS

- **ELECTRONIC BOARDS, SUB-COMPONENTS, MACHINERY, VEHICLES, AIRCRAFT AND CONSTRUCTIONS**

The Dewesoft modal shaker series covers a wide range of structures for dynamic characterization.

- **AEROSPACE AND AUTOMOTIVE**

Modal Testing is a prerequisite for design and product validation in aerospace and automotive industries as well as many others.



MODAL SHAKERS	MS-20	MS-100	MS-250	MS-440
Output force (Sinus)	20 N	100 N	250 N	440 N
Frequency range	0 – 12 kHz	0 – 8 kHz	0 – 5 kHz	0 – 5 kHz
Displacement (Peak to Peak)	5 mm	10 mm	25 mm	25 mm
Max acceleration	40 g	60 g	100 g	100 g
Total mass	4.2 kg	7.5 kg	11.6 kg	11.8 kg
Cooling system	Air convection	Air convection	Forced Air	Forced Air
Suspension	Spring	Spring	Spring	Spring
Max. input current	4A	6A	10A	10A
AMPLIFIER	Integrated	Integrated	External	External
Input Voltage	1 VAC	1 VAC	10 VAC	10 VAC

KEY FEATURES

- Lightweight, durable, portable and easy to use
- Adjustable modal stinger
- Stinger length can be easily adjusted by the through-hole armature
- Adjustable trunnion base provides high flexibility
- All modal shakers have trunnion and handles allowing the shakers to be positioned in any orientation and position.
- Up to 25mm stroke and broad frequency range
- The range of modal shakers can go up to 12,000 Hz and provide force levels up to 440N with a maximum 25mm stroke

• Integrated amplifier

MS-20 and MS-100 shakers have integrated amplifiers. With this integrated amplifier it is very easy to use the shaker. You only need to plug the electric cable and shaker is ready to run.

• Integrated signal generator

MS-20 and MS-100 shakers have integrated signal generator as well. This gives customers the option to try the test system or the shaker or make some simple test to understand structural behavior.

INERTIAL SHAKERS

DEWESOFT INERTIAL SHAKERS ARE SMALL, LIGHTWEIGHT AND EASILY ATTACHABLE – THE DIRECT MOUNTING ON STRUCTURES MAKES THEM WELL-SUITED FOR APPLICATION ON-SITE



INTRODUCTION

The inertial shakers are used for structures requiring excitation in lower frequency bands. The shakers are directly connected to the structure and the inertia motion of the shaker mass provides the necessary forces to the structure. The shakers have a small, lightweight design that provides high mobility. They are fully enclosed, permanent magnet shakers that can be mounted on to structures at any angle – they are entirely self-supporting.

The shakers are used in modal testing and in-flight tests of aircrafts are usually electrodynamic shakers. However, the traditional shakers are not very portable, and the attachment process takes time. The inertial shaker's own body vibrates and the shaker can be fixed directly to the structure.

Dewesoft inertial shakers are easily mounted and have great mobility - they can be used as portable shakers or even hand-held.

The inertial shakers are suited for principally the same fields of application as modal shakers; modal testing as well as a variety of general vibration testing applications. Depending on the dimensions of the structure and the desired excitation frequencies and levels, modal shakers or inertial shakers can be used for vibration testing.

APPLICATIONS

Inertial shakers are used for testing car chassis, squeaks and rattle testing in cars, civil engineering prototype testing, building structures, floor loading resonances, ships' flight decks, helicopters rotor simulation, submarines, geophysical surveys, and vibration cancellation systems.

- **CIVIL ENGINEERING**
- **AUTOMOTIVE**
- **AEROSPACE**
- **SHIPBUILDING**

Modal testing of structures

- **STRUCTURAL DYNAMICS MEASUREMENTS**
- **IMPEDANCE MEASUREMENTS**
- **EXPERIMENTAL MODAL ANALYSIS**
- **EDUCATION AND RESEARCH**



INERTIAL SHAKERS	IS-05	IS-10	IS-20	IS40
Output force	5 N	10 N	20 N	40 N
Maximum peak current	1 A	4 A	4 A	4 A
Frequency range	10-1,000 Hz	10-3,000 Hz	10-3,000 Hz	10-3,000 Hz
Moving assembly mass	0.05kg	0.1 kg	0.1 kg	0.6 kg
Displacement (Peak-to-peak)	1 mm	5 mm	8 mm	12 mm
Dimension H x D	24mm x 32mm	40mm x 42mm	46mm x 44.4mm	86mm x 71mm
Total mass	0.06 kg	0.24 kg	0.3 kg	1.2 kg
Cooling system	Air convection	Air convection	Air convection	Air convection
Suspension	Spring	Spring	Spring	Spring
AMPLIFIER	External	External	External	External
Input voltage	0.5 VAC	1 VAC	1 VAC	1 VAC
Max. Input Current	1A	4A	4A	4A

KEY FEATURES

- **Compact and lightweight design**

The inertial shakers are easily mounted and have great mobility

- **Superior low frequency performance**

Offering optimal force performance over a wide frequency range – the inertial shaker IS series spans from 10 to 3,000 Hz

- **Any angle mounting**

Well-suited for application on-site in small, confined locations or on larger structures

- **Low friction bearing guided**

PERMANENT MAGNET SHAKERS

DEWESOFT PERMANENT MAGNET SHAKERS ARE COMPACT, LIGHTWEIGHT AND POWERFUL GENERAL-PURPOSE SHAKERS WHICH CAN BE USED FOR MODAL AND VIBRATION TESTING.



INTRODUCTION

Tests with permanent magnetic shakers can be driven at different frequencies and amplitudes. In these tests the test specimen can be directly fixed to the shaker armature and vibrating surface area can be enlarged by using a head expander according to the specimen sizes. The vertical excitation can be translated into horizontal excitation by using slip table. In some cases, instead of changing the direction of the motion of the vibration, the part may be rotated and tested. The duration of the test and vibration levels are determined from test standards or real time measurements.

Dewesoft permanent magnet shakers are trunnion-mounted, robust and compact, yet lightweight and powerful general-purpose vibration testing systems, which can be used for modal and vibration testing. Despite their small size their DUT capacity is high and they combine a broad frequency band with high sine force. DYN-PM-20 and PM-100 has an integrated amplifier and a sine wave signal generator where the frequency can be adjusted from 1 Hz to 15,000Hz.

APPLICATIONS

Vibration testing of micro parts, assemblies and electronics Modal te

- **SHOCK TESTING**
- **SENSOR CALIBRATION**
- **SEPARATION AND COMPACTING OF POWDERS**
- **FATIGUE AND RESONANCE TESTING**
- **VELOCITY TRANSDUCER OR HIGH-SPEED ACTUATOR**
- **MECHANICAL IMPEDANCE MEASUREMENT**
- **EDUCATION AND RESEARCH**



PM SHAKERS	PM-20	PM-100	PM-250	PM-440
Output Force (Sinus)	20 N	100 N	250 N	440 N
Output Force (Shock)	40 N	200 N	500 N	880 N
Frequency range	0 – 12 kHz	0 – 8 kHz	0 – 5 kHz	0 – 5 kHz
Displacement (Peak to Peak)	5 mm	10 mm	25 mm	25 mm
Max Acceleration	30 g	45 g	80 g	80 g
Total mass	4.2 kg	7.5 kg	11.6 kg	11.8 kg
Cooling system	Air Con.	Air Con.	Forced Air	Forced Air
Suspension	Spring	Spring	Spring	Spring
Max. Input Current	4A	6A	10A	10A
AMPLIFIER	Integrated	Integrated	External	External
Input Voltage	1 VAC	1 VAC	10 VAC	10 VAC

KEY FEATURES

- **Lightweight, durable, portable and easy to setup and use**
- **Adjustable trunnion base provides a high degree of flexibility**
All PM shakers have trunnion and handles allowing the shaker to be positioned in any orientation and position.
- **Broad frequency range**
PM-20: 0-15 12 kHz, PM-100: 0-10 8 kHz, PM-250: 0-5 kHz and PM-440: 0-5 kHz.

- **Embedded power amplifier**
PM-20 and PM-100 shakers have integrated amplifiers. With this integrated amplifier it is very easy to use the shaker. You only need to plug the electric cable and shaker is ready to run.
- **Integrated signal generator with screen**
PM-20 and PM-100 shakers have integrated signal generator offering the option to try the test system or shaker or to make simple tests to understand structural behavior.

ULTIMATE ALL-IN-ONE TOOL

DUAL CORE HIGH DYNAMIC

Dewesoft Sirius increases signal dynamic to 160 dB by using two ADC converter per channel with different gains. Both - time domain and frequency domain data have an amazing dynamic signal performance.

NO HIDDEN COSTS

Software license is included in every system. Free lifetime software upgrades included. No yearly maintenance or upgrade fees, free online training courses.

TOTAL SOLUTION

Combine your NVH measurements with data recording, electrical power, combustion, vehicle dynamic and other powerful Dewesoft tools.

ALL-IN-ONE

Dewesoft hardware can perform a wide variety of measurement tasks. Every function is available in a single Dewesoft X3 software package.

MODULAR AND EXPANDABLE

Can you imagine FFT analyzer with thousands of channels? We can... Systems can be gradually expanded from one to unlimited number of channels.

PLUG AND PLAY

Any device, sensor or signal. Smart sensors with TEDS are recognized automatically.



EASY TO USE AND VERSATILE

Get your measurements in 30 seconds.

SUPERCOUNTER

Patented Supercounter technology provides perfect angle and angular speed information which is a base to align data from time to angle domain.

DEEP IN FUNCTIONALITY

With an amazing set of features, Dewesoft instruments are used in most advanced research labs around the world; all functions are available at the same time in one software.

FULLY SYNCHRONISED

Data from various sources are perfectly aligned: Analog, Digital, Counter, Vehicle buses, Video, ...



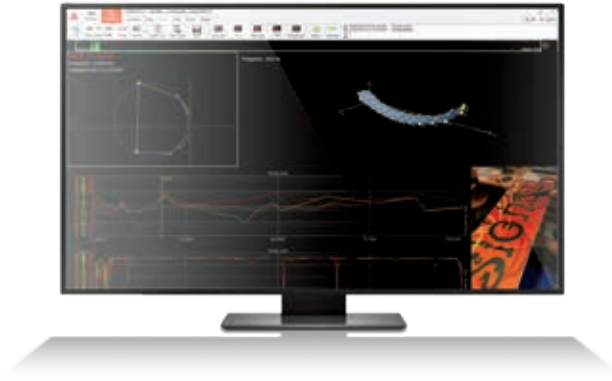


Scan for more information

MODAL ANALYSIS

STRUCTURAL DYNAMICS

MODAL TEST IS AN INDISPENSABLE TOOL TO DETERMINE THE NATURAL FREQUENCIES AND MODE SHAPES OF ANY STRUCTURE - OFFERS EASY TO USE OPERATION WITH FAST SETUP WHILE PROVIDING RICH VISUALIZATION AND ANIMATION OF RESULTS.



SHAKER MODE

In combination with built-in function generator module, the system allows any type of excitation; Sine, Noise, Burst and Chirp.

IMPACT HAMMER MODE

Allows grouping, rejecting and repeating measurement points; multiple reference and excitation points are supported. Ability to move excitation and response points is ensuring full flexibility when performing measurements.

ADVANCED MATH

Operating deflection shapes (ODS), mode indicator functions (MIF) and COLA analysis are fully implemented while operational modal analysis (OMA) and time domain ODS are available with close integration in connection to external software package.

RICH VISUALIZATION

Animation of structures in all three axes, and with different projections is available - both in real time and after measurement. This allows real time quality analysis, as well as the repetition of any measurement at any point. The Modal Circle tool determines the exact resonance, and calculates the viscous or structural damping factor.

UNV IMPORT/EXPORT

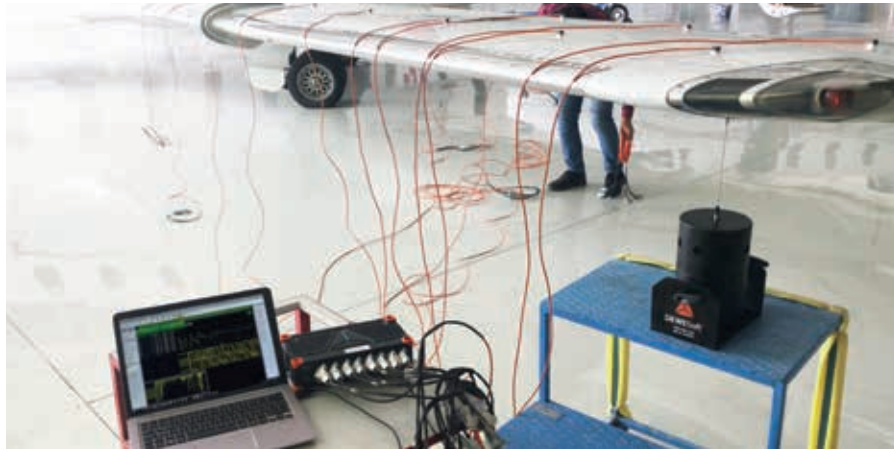
Geometry can be created using either the built-in editor, or imported from a UNV file. All data, from raw time domain to auto spectrums and FRFs can be exported using standard UNV file format.



CASE STUDY

AIRCRAFT WING PAYLOAD MODIFICATION

RMC Engineering, Turkey



An aircraft operating company in Turkey wanted to modify the wing payloads without drastically affecting the flight envelope. Any aircraft is designed for a specific flight speed which is limited by wing flutter. Thus, anything that affects the natural frequencies of the wing has the potential to reduce the flight speed and narrow the flight envelope. This situation is not desired by the aircraft operators as reducing the speed of flight height will increase their operational costs and increase the flight durations.

The customer was a local aircraft operator who required a modal test of an aircraft wing. As the operator did not have an engineering department, they requested this test as an engineering service from the Dewesoft partner in Turkey, RMC Engineering.

The flight envelope of the current configuration was unknown. Therefore, the wing modal test for current and modified configuration was performed. Moreover, it was a case of urgency, as the aircraft was only available for a very narrow time frame of two days. First of all, the pressure of the tires of the aircraft were lowered in order to have the aircraft boundary conditions similar to the flight. The tests had to be performed very fast where preliminary modal analyses were performed on site only for data validation. The whole data acquisition and excitation process was completed with **Dewesoft Sirius data acquisition (Sirius HD and Sirius STG with analog outputs)** and **Dewesoft modal shaker MS-440 (440 N output force)**. Through the ease of use of the combined Dewesoft hardware and software the task could in fact be accomplished.

SIRIUS DAQ is a USB and EtherCAT data acquisition system designed to be flexible, modular, expandable, and secure. This simple to use device prevents frequent errors

during the measurement process and offers virtually unlimited configuration possibilities. Slices are available from 1 to 16 analog channel configurations that can be daisy-chained together. An array of different analog amplifiers is available giving the possibility to connect virtually any sensor.

In this case the wing was instrumented with several uni-axial accelerometers and a modal shaker was attached to the tip of the wing. The structure was at first graphically defined in the **software geometry editor**. Then the points of excitation and response were selected. The modal shaker provided force input and acceleration sensors the measurement of the response, acceleration output. The test points were excited while the software collected the data. The wing was excited with burst random excitations for 50 averages where acceleration signals were collected.

The preliminary mode shapes which were selected from the peaks of the Frequency Response Functions (FRF) were animated in Dewesoft FRF module. This gave a quick insight of the quality of the measurements.

The **Dewesoft FRF software module** is a plugin for **DEWESOFT X3** data acquisition software. The FRF module is designed for analysis of e.g. mechanical structures or electrical systems to determine the transfer characteristic (amplitude and phase) over a certain frequency range.

The FRF module was used to generate burst random signals to the shaker and preliminary mode shapes were animated by choosing the peaks in the FRF plots. FRF plots are automatically calculated during the measurements allowing a visualization of the phase and coherence of the measurement locations. Visualizing the preliminary mode shapes ensured the confidence on the quality of the measurements. The detailed analyses were performed later in the RMC head office.

The FRF module is part of the **Digital Signal Analyzer (DSA) package** along with a range of other modules e.g. Order tracking and Balancing. Along with the small and handy instruments it constitutes a portable solution when coping with failure detection.

The modal tests and analyses concluded that the aircraft operator could use the aircraft with the payload modification. As the tests lasted only for two days the operations of the aircraft were not affected.

The modal testing of a wing of an aircraft normally takes a long preparation and execution time such as at least 2 weeks. However, the ease of use of Dewesoft data acquisition system with its modal shakers allowed us to **complete the challenge in just two days.**

Output Force(Sinus)	20 N	
Frequency Range	0-12 kHz	
Displacement(Peak to Peak)	5 mm	
Maximum Acceleration	40 g	
Total Mass	4.2 kg	
Cooling System	Air Convection	
Suspension	Spring	
Max. Input Current	4 A	
Amplifier	Integrated	
Input Voltage	1 VAC	
System Components : Electrodynamic Shaker + Power Adapter + Signal Cable(5 meter) +Stinger Set + User Manual		All dimensions in mm
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Output Force(Sinus)	440 N		Blower	
Frequency Range	0-5 kHz			Amplifier
Displacement(Peak to Peak)	25 mm			
Maximum Accelation	100 g			
Total Mass	11.8 kg			
Cooling System	Forced Air			
Suspension	Spring			
Max. Input Current	10 A			
Amplifier	External			
Input Voltage	10 VAC			
System Components : Electrodynamic Shaker + Amplifier + Cooling System(with 5 meter hose) + Shaker Power Cable + Amplifier Power Cable + Signal Cable(5 meter) + Stinger Set			All dimensions in mm	
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TECHNICAL DRAWINGS DS-PM

DEWESOFT PERMANENT MAGNET SHAKER (DS-PM-20)

Output Force(Sinus)	20 N
Output Force(Shock)	40 N
Frequency Range	0-12 kHz
Displacement(Peak to Peak)	5 mm
Maximum Accelation	30 g
Payload (Vertical)	0.8 kg
Total Mass	4.2 kg
Cooling System	Air Convection
Suspension	Spring
Max. Input Current	4 A
Amplifier	Integrated
Input Voltage	1 VAC

DETAIL A

System Components : Electrodynamic Shaker + Power Adapter + Signal Cable(5 meter) + M4 Stainless Bolt+User Manual

All dimensions in mm

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DEWESOFT PERMANENT MAGNET SHAKER (DS-PM-100)

Output Force(Sinus)	100 N
Output Force(Shock)	200 N
Frequency Range	0-8 kHz
Displacement(Peak to Peak)	10 mm
Maximum Accelation	45 g
Payload(Vertical)	1.5 kg
Total Mass	7.5 kg
Cooling System	Air Convection
Suspension	Spring
Max. Input Current	6 A
Amplifier	Integrated
Input Voltage	1 VAC

DETAIL A

System Components : Electrodynamic Shaker + Power Adapter + Signal Cable(5 meter) + M4 Stainless Bolt + User Manual

All dimensions in mm

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DEWESOFT PERMANENT MAGNET SHAKER(DS-PM-250)

Output Force(Sinus)	250
Output Force(Shock)	500
Frequency Range	0-5 kHz
Displacement(Peak to Peak)	25
Maximum Accelation	80 g
Payload (Vertical)	2 kg
Total Mass	11.6 kg
Cooling System	Forced Air
Suspension	Spring
Max. Input Current	10 A
Amplifier	External
Input Voltage	10 VAC

DETAIL A

Blower

Amplifier

System Components : Electrodynamic Shaker + Amplifier + Cooling System(with 5 meter hose) +Shahr power cable(5 meter) + Amplifier Power Cable + Signal Cable(5 meter) + M6 Stainless Bolt

All dimensions in mm

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DEWESOFT PERMANENT MAGNET SHAKER(DS-PM-440)

Output Force(Sinus)	440
Output Force(Shock)	880
Frequency Range	0-5 kHz
Displacement(Peak to Peak)	25
Maximum Accelation	80 g
Payload (Vertical)	2.5 kg
Total Mass	11.8 kg
Cooling System	Forced Air
Suspension	Spring
Max. Input Current	10 A
Amplifier	External
Input Voltage	10 VAC

DETAIL A

Blower

Amplifier

System Components : Electrodynamic shaker + Amplifier + Cooling System(with 5 meter hose) +Shahr Power Cable(5 meter) + Amplifier Power Cable + Signal Cable(5 meter) + M6 Stainless Bolt

All dimensions in mm

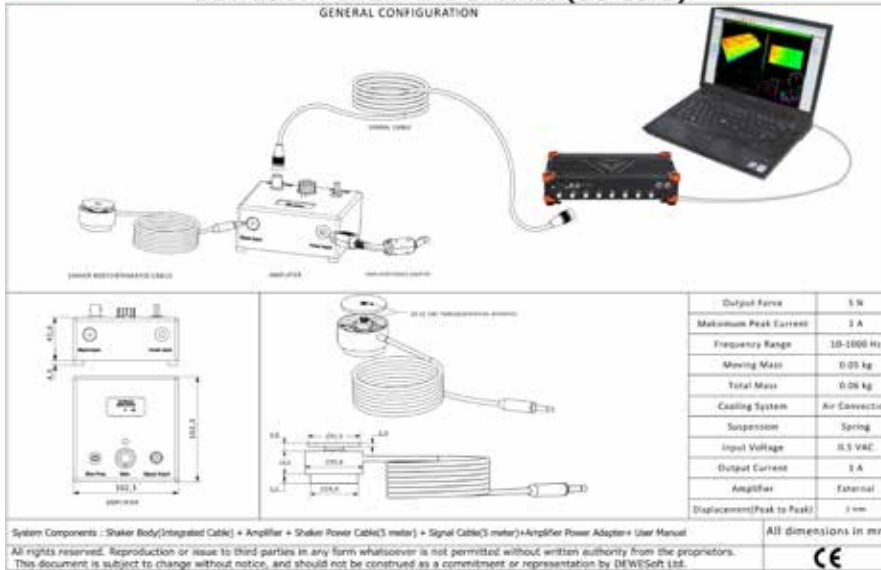
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DS-IS TECHNICAL DRAWINGS

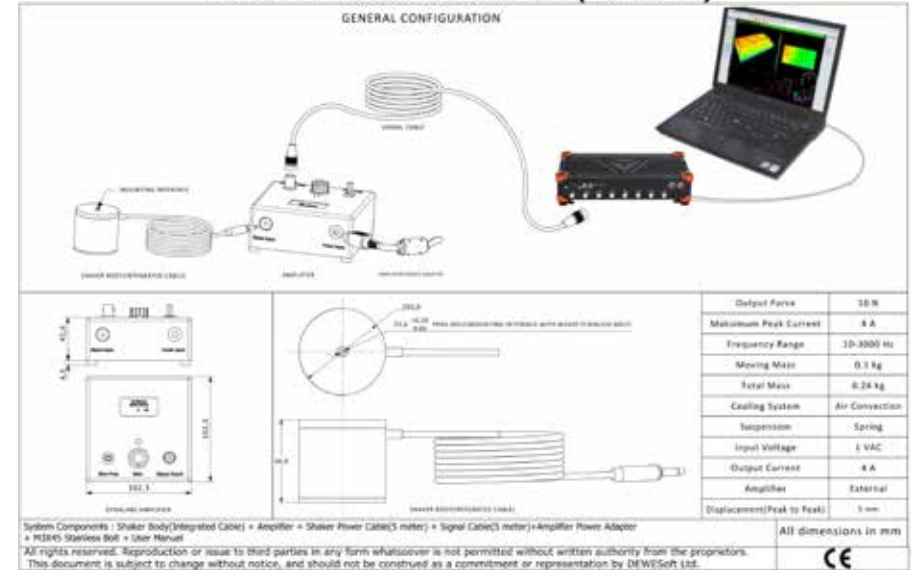
DEWESOFT INERTIAL SHAKER(DS-IS-5)

GENERAL CONFIGURATION



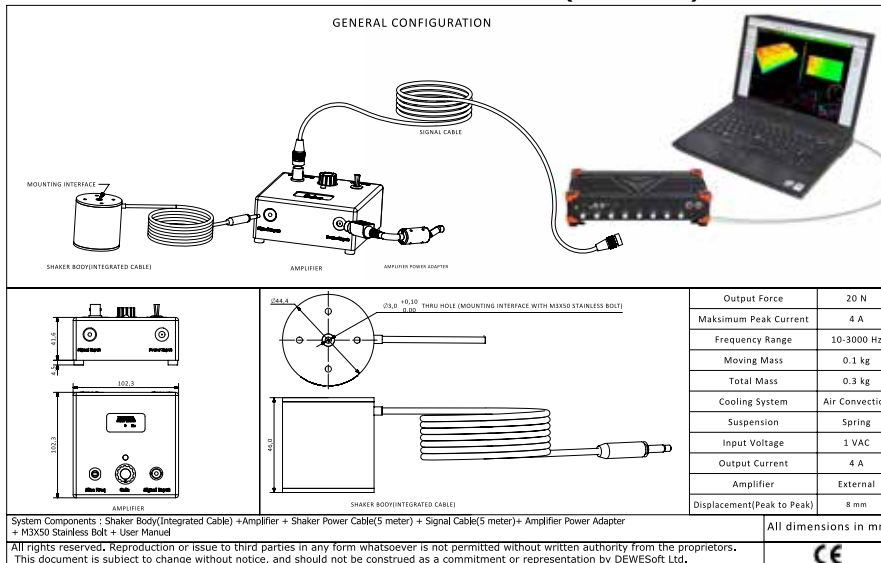
DEWESOFT INERTIAL SHAKER(DS-IS-10)

GENERAL CONFIGURATION



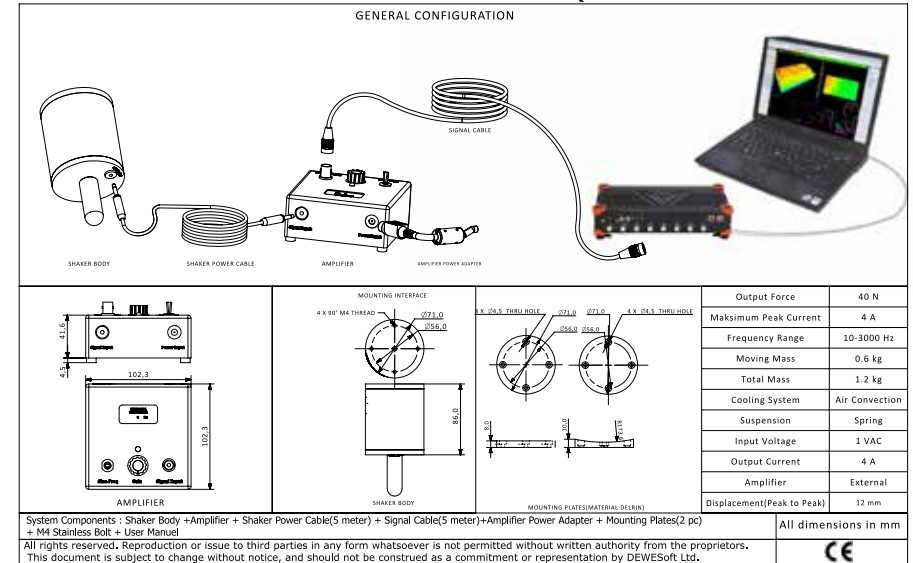
DEWESOFT INERTIAL SHAKER(DS-IS-20)

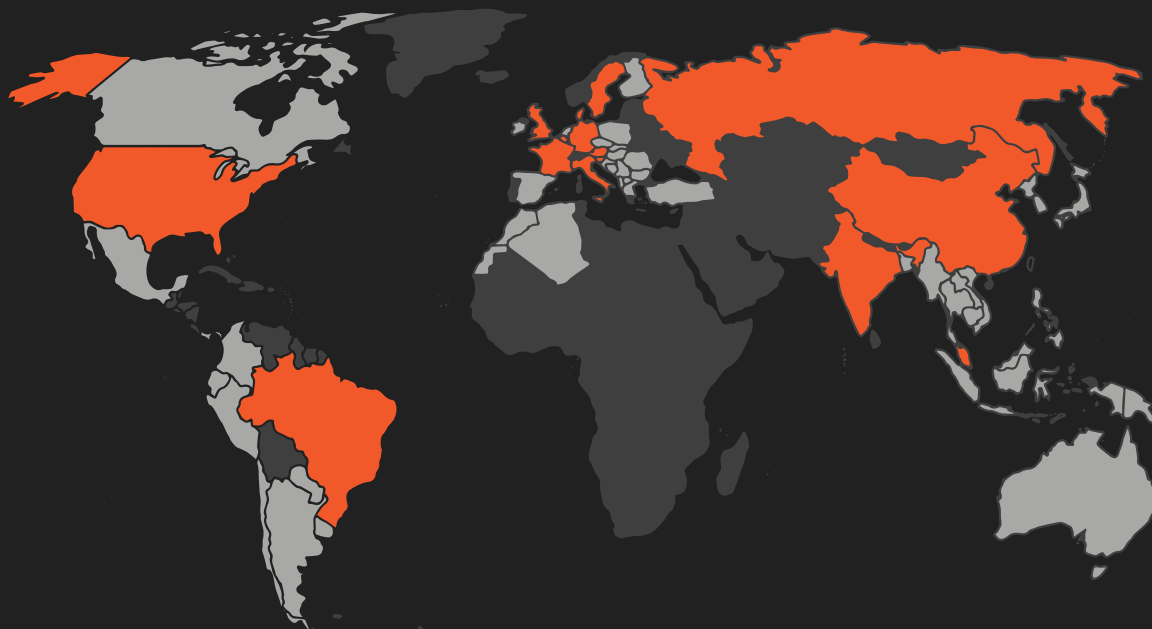
GENERAL CONFIGURATION



DEWESOFT INERTIAL SHAKER(DS-IS-40)

GENERAL CONFIGURATION





DEWESOFT® WORLDWIDE: SLOVENIA, Austria, Brasil, China, Denmark, France, Germany, Hong Kong, Italy, India, Russia, Singapore, Sweden, UK, USA, BELGIQUE and PARTNERS IN MORE THAN 50 COUNTRIES

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