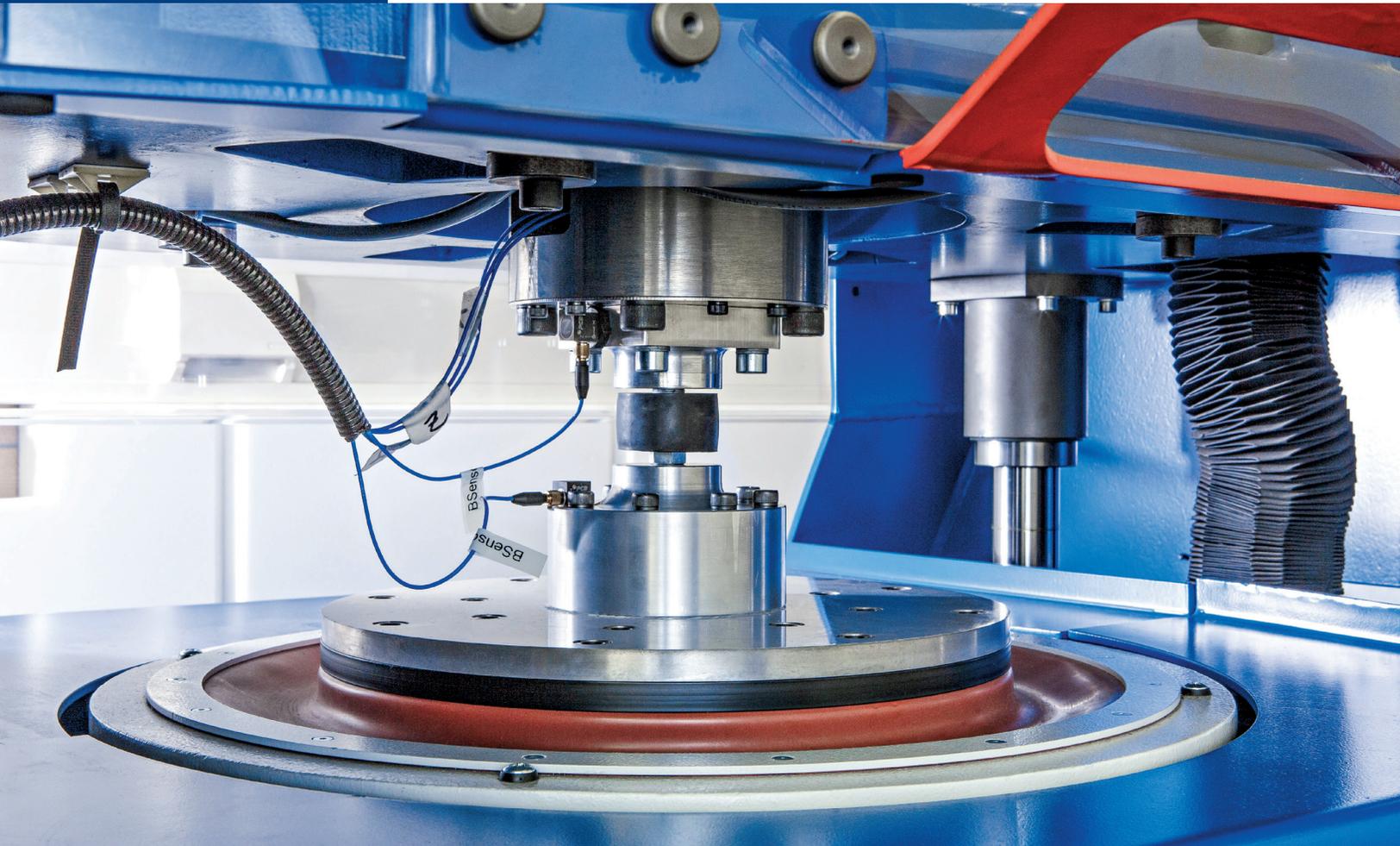




INTERNATIONAL



# High-Frequency Dynamic Stiffness Test Rig for Elastomer Mounts

## m+p HFDST-3000-E

The m+p HFDST-3000-E extends the boundaries in dynamic testing of automotive elastomer mounts. Measuring the dynamic stiffness of automotive elastomer components in frequency ranges up to 3,000 Hz becomes more and more important when designing the acoustic characteristics of modern cars, especially if equipped with an electric motor. A wide range of different engine mounts, chassis mounts, suspension bushes, vibration absorbers, etc. can be characterized with m+p international's high-frequency test rig. The test rig is designed to test the stiffness of the specimen in the range of 1,400 lbf/in to 280,000 lbf/in for frequencies from 50 Hz to 3,000 Hz.

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**High-frequency testing of elastomer mounts**

**Dynamic stiffness from 50 to 3,000 Hz**

**Test specimen from 1,400 lbf/in to 280,000 lbf/in**

**Preload up to 1150 lbf**

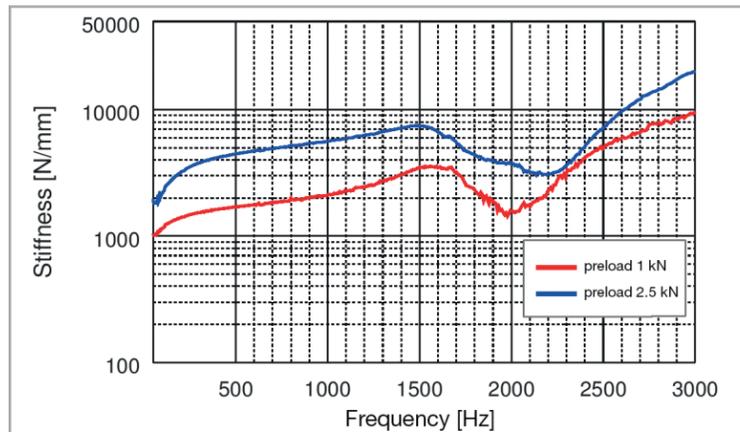
**Closed-loop load control**

# High-Frequency Dynamic Stiffness Test Rig for Elastomer Mounts m+p HFDST-3000-E

## Test concept

The test specimen is mounted between an electrodynamic shaker and a seismic mass. The seismic mass can be lowered to apply a static preload of up to 1,150 lbf. When running a predefined test, m+p VibControl continuously optimizes and controls the acceleration of the shaker, inducing dynamic loading on the elastomer within the frequency range, from 50 Hz to 3,000 Hz. By measuring the input acceleration below the specimen and the resulting dynamic reaction force above the specimen, the dynamic transfer stiffness is calculated.

## Dynamic stiffness



## Safe operation

The test rig has been designed and built in compliance to the requirements of EU Machinery Directive 2006/42/EC. During testing, the specimen is protected by a polycarbonate safety cover which can be easily lifted. The safety cover is mechanically locked and can be opened only if the seismic mass has been protected against sudden lowering. A two-hand control device prevents unsafe operation of the traverse during specimen installation.

## Vibration isolation

Vibration isolation is key to a good measurement result. Special care was taken designing the test rig to isolate the test specimen from surrounding environmental vibrations. The shaker and seismic mass are supported by pneumatic springs with a low stiffness, isolating the specimen from surrounding vibrations above 20 Hz. Thus, only the desired and carefully controlled dynamic loads are applied to the specimen and measured by the accelerometer and force sensor.

## Static preload

The specimen is supported against a seismic mass allowing the user to add an axial preload. Pneumatic springs support the seismic mass on a traverse which can be moved vertically by adjusting the spindle drives. During setup, the preload is applied by lowering the pressure in the pneumatic springs and settling the seismic mass onto the test specimen. The static force is logged and documented in the m+p VibControl system.

## Dynamic force

The dynamic force is measured between the test specimen and the seismic mass, i.e. the output force of the test specimen is measured. Special care was taken in the design of the force sensor: Six piezoelectric load cells are arranged in a circle, supported by two rigid plates, to form a resonance-free force sensor with a high stiffness.

## Test specimen

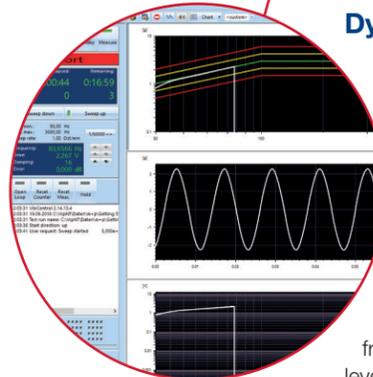
A wide range of different engine mounts, chassis mounts, suspension bushes, vibration absorbers, etc. can be characterized with the m+p high-frequency test rig. Due to this multitude of test specimen with varying geometry and stiffnesses (1,400 lbf/in to 280,000 lbf/in), a suitable test fixture is required to adapt each specimen to the shaker and the force sensor. These fixtures need to be designed carefully with the test frequency range of up to 3,000 Hz in mind. m+p international offers the design and manufacturing of these fixtures as a service along with the test rig.

## Dynamic load

The specimen is attached to the armature of an electrodynamic exciter (shaker) using a suitable test fixture. The shaker is designed to compensate for a static preload of up to 1,150 lbf and automatically offsets the static deflection of the moving element to keep the armature in center position. During testing, a sine force is generated and controlled through the m+p VibControl software to stress the specimen at a predefined level. Operational frequencies range from 50 Hz to a maximum of 3,000 Hz at acceleration levels up to 90 g.

## Control and analysis system m+p VibControl

The m+p VibControl vibration controller offers a wide range of measurement and analysis routines, including features required for safe operation, control and monitoring of the test rig, as well as result documentation. During test operation, the control system logs the accelerations below and the dynamic force above the specimen. The dynamic transfer stiffness and loss factor are calculated and displayed online. All measured data and calculated results are stored in frequency domain with amplitude and phase information for documentation purposes.



## About m+p international

Founded in Hannover, Germany in 1980, m+p international develops and manufactures test and measurement systems for vibration testing, dynamic signal analysis, data acquisition, process monitoring and test stand engineering.

Our state-of-the-art products meet the highest demands on quality and reliability and have a significant market share in numerous key industries worldwide – everywhere where maximum efficiency and shortest time to market are crucial.

The company has its headquarters in Hannover with sales/marketing subsidiaries in New Jersey (USA), England, France and China, along with representatives and agents in around 30 countries.



m+p HFDST-3000-E and m+p VibControl are products of m+p international.

High-frequency dynamic stiffness test rig for elastomer mounts  
m+p HFDST-3000-E



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