Squeak & Rattle
Full Vehicle Shaker

MB DYNAMICS
Sound & Vibration Testing Technology

Absolutely realistic, reproducible and quiet simulation of various test tracks in testing, QM and production

Disturbing noises such as rattling, creaking and squeaking are perceived by the customer as a lack of quality and cause high warranty and goodwill costs. Noise analyses in moving vehicles on various test tracks are time-consuming and usually quite difficult. With our vehicle shaker systems, you can get a wide variety of test tracks from all over the world into your testing, QM and production areas. Different excitation states due to different road surfaces, speeds and engines are reproduced absolutely realistically and reproducibly at the push of a button. Targeted excitation and combination of noise-critical driving situations in connection with free mobility in and around the vehicle create ideal conditions for an efficient localisation, analysis and evaluation of Buzzes, Squeaks and Rattles. In addition, the reproducible excitation and freely programmable test sequences based on real excitation data enable targeted Squeak & Rattle ageing tests for systematic analysis and evaluation of the acoustic long-term stability of the vehicles and components.

Features & Benefits:

- Excitation by 2 or 4 compact, quiet, electrodynamic shakers
- Realistic reproduction of various road excitations
- Very high correlation to testing on test tracks
- Reproducible acoustic behaviour of the vehicles and reproducible test results
- Free mobility inside and outside the vehicle
- Freely configurable test sequences for Squeak & Rattle ageing tests
- Excitation in the frequency range from 1Hz to 500Hz
- Vibration displacement up to 25mm pk-pk
- Low integration and maintenance costs, no oil, no seismic masses
- High efficiency and low power consumption
- Robust design, low maintenance, reliable and durable

Typical applications:

- Noise analyses (Squeak & Rattle tests) on complete vehicles, interior and exterior components
- Squeak & Rattle Ageing Tests (endurance test)

Options / Accessories:

- Water cooling for ALPHA shakers
- Climate option for use within a climate chamber (-30°C to +80°C)
- Component testing tables for excitation in 1 to 6 axes
- Mobile BSR SUITE measurement system for Road Load Data Acquisition
- Acoustic test system for the objective evaluation of Buzzes, Squeaks & Rattles

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Reproducible, realistic simulation of different test tracks

The use of two or four extremely quiet, distortion-free electrodynamic vibration exciters to excite the vehicle and the closed-loop control of the actuators by means of a multi-axis vibration control system enables the reproducible and highly realistic simulation of a wide range of test tracks and speeds. Vibrations and noises in the vehicle are not only reproduced very precisely subjectively, they also show a high metrological correlation to road driving. Disturbing noises can be systematically reproduced and analysed on the test bench.

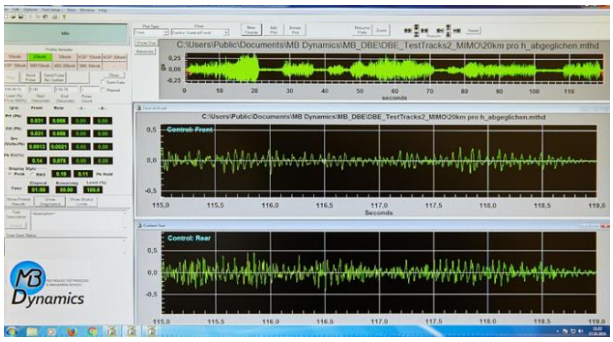

Figure 1: MB Millenium vibration control system for closed-loop control and monitoring of up to four vibration exciters enables reproducible simulation of a wide range of test tracks

Figure 2: Vehicle stand and drive-on ramps. Mobile drive-over bridges with integrated, foldable steps facilitate safe entry and exit into the vehicle.

Safe entry and exit and free mobility in and around the vehicle

The installation of the shakers below the vehicle minimises space requirements and allows free access to the vehicle. Movable drive-over bridges with foldable steps facilitate entry and exit through all doors. The safe stand of the vehicle, the low operating noise of the shakers and the free mobility in the interior and around the vehicle allow the safe operation of the test stand by one person and facilitate focusing on the noise analysis. If necessary, components can be removed or modified during an ongoing test.

Direct Body Excitation by moveable, compact and quiet ALPHA MLB shakers

The vehicles are excited directly at the body by two or four compact and easy to move ALPHA MLB shakers. The integrated electromagnetic clamping enables easy and flexible positioning and connection of the shakers to the vehicle. The high linearity of the electrodynamic actuator and the noiseless and friction-free support of the actuator axis and lever arm provide the basis for a precise reproduction of the excitation signal and realistic simulation of the recorded test tracks. Integrated temperature-controlled quiet fans ensure automatic cooling of the systems as required. For use in a climatic chamber, the systems can optionally be equipped with noiseless water cooling.

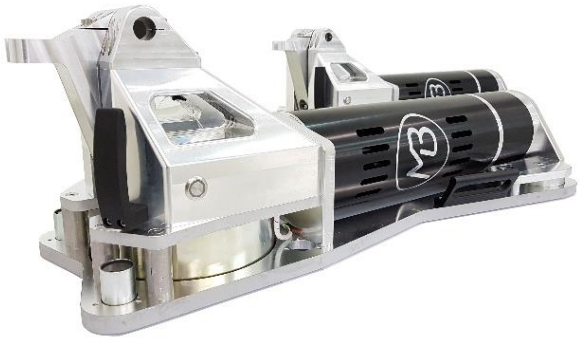

Figure 3: ALPHA 2025 MLB shaker, movable base with integrated electromagnets for flexible positioning and clamping.

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Remote tablet enables operation from inside the vehicle

A remote tablet with touch display enables simple and safe operation of the test stand from inside the vehicle. The user-friendly interface allows the selection of predefined test configurations for different vehicle models, the selection of the desired track profile, start and stop of the test, as well as the change of excitation frequency and excitation level. In order to record and objectively evaluate any disturbing noises that occur, a measurement and analysis of the vehicle interior noise can also be initiated using our BSR SUITE measurement system.

Figure 4: Remote tablet with simplified user interface enables selection of excitation profiles and operation of the test bench from inside the vehicle

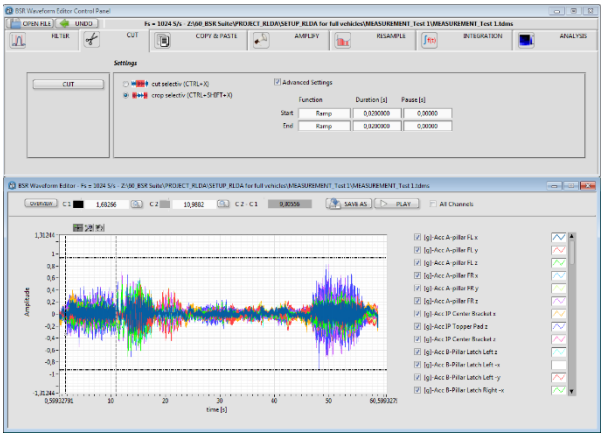

Figure 5: Extensive functions for cutting, filtering and adjustment of recorded excitation data simplify the transfer to the shaker test bench.

Easy setup of recorded test track data

Our BSR SUITE is a tailor-made tool for mobile road load data acquisition. Extensive data processing functions enable the processing and combination of recorded test track data and simplify the transfer to the multi-axis vibration control system. Cut, Copy and Paste of relevant time signal sections from different recordings into a new file is intuitive and easy. Calculation of equivalent PSD-spectra over user selectable time sections, averaging of multiple sensor locations, rescaling and smoothing of the PSD shape is done by only a few clicks. Excitation data from external partners can be imported in standard file-formats such as TXT, CSV and UFF58 or in HDF- or RPC III-format.

Optimum correlation to road testing based on verification and comparison

Disturbing noises like Buzzes, Squeaks & Rattles which are excited on the test track and become audible in the vehicle interior can only be reliably reproduced and analyzed on the shaker test bench if the excitation of the components on the test bench matches the excitation on the test track as precisely as possible. The metrological comparison at different reference measuring points in the vehicle interior and an iterative, optimized alignment of the excitation data enable an extremely realistic reproduction of various test tracks, thus leading to reproducible noise analyses which build confidence in test equipment and test methods!

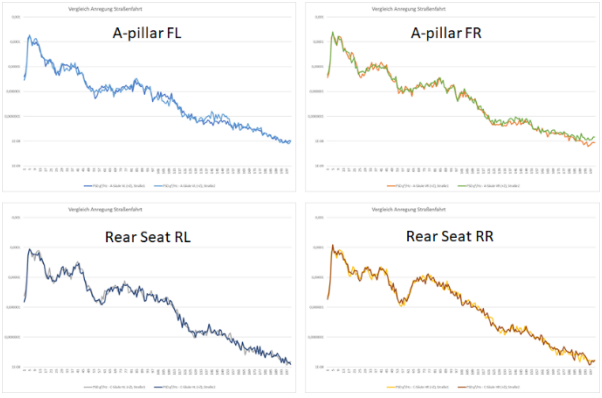

Figure 6: Comparison of the resulting excitation on the test bench with the excitation on the test track at different reference points in the vehicle interior (A-pillar upper door hinge FL & FR and rear seats RL & RR)

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Technical Data:

ALPHA MLB Shaker		
	ALPHA 2025MLB	**ALPHA 4050MLB**
Max. Dynamic Force		
Sine	4000N peak	8000N peak
Random	2400N rms	4800N rms
Time History	8000N peak	16000N peak
Max. Static Force	4000N	4000N
Typical Operating Noise *		
Noise Rating Curve (NR)	NR18, typical	NR18, typical
Sound Pressure Level**	<28dB(A)	<28dB(A)
Time Varying Loudness ***	<0,2 Sone	<0,2 Sone
Max. Displacement	12,5mm pk-pk	25mm pk-pk
Max. Velocity	1m/s	1m/s
Frequency Range	DC-500Hz, useable up to 1000Hz	DC-500Hz, useable up to 1000Hz
Overtravel Protection	Yes	Yes
Overtemp Protection	Yes	Yes
Automatic Load Support	Yes	Yes
Integrated Cooling	Yes, air cooling	Yes, air cooling
Quiet Water Cooling	Optional	Optional
Thermal Insulation	Optional	Optional
Dimensions (W*H*D)	985mm*360mm*332mm	
Weight	110kg	200kg

* Measured at 70cm from the shaker when excited with a typical Squeak & Rattle test profile in the frequency range from 5Hz to 100Hz with an averaged acceleration level of 0.3gRMS

** A-weighted Sound Pressure Level, FAST (125ms), 20Hz to 20kHz

*** N10 Percentile Level, loudness according to DIN45631/A1, measured in accordance with GMW14011