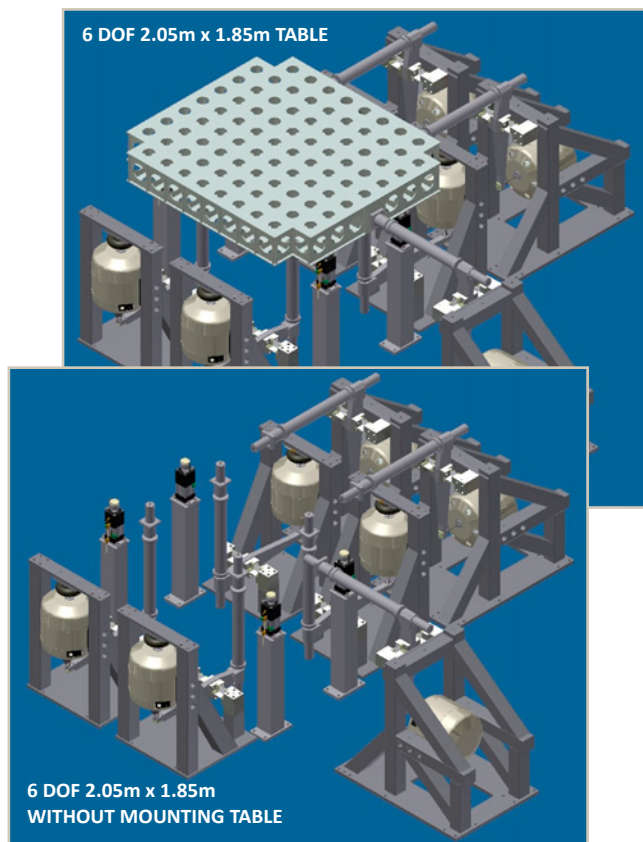


Key Differentiators

- **Quiet:** Background Noise ≤ 1.5 Sones (N10) running typical GMW14011 S&R test
- **Quiet:** Meets GMW14011 and 7293 Background Noise specs like all MB Energizers
- **Quiet:** Test equipment noise does not mask S&Rs
- **Quiet:** Effective for objective S&R measurements and subjective evaluations
- **Test Lab Productivity and User Convenience:** Rapid changeover in sequential directions, < 10 seconds with only a GUI menu pick and no hardware wrenching
- **No Hydraulics:** Uncooled electrodynamic Energizers for S&R work
- **High Uptime and Low Maintenance:** No wear parts; no hydraulics; no 200 bar oil
- **Multi-Axis Versatility:** Simultaneous 6 DOF enhances realism beyond GMW14011; Sequential 3 DOF fulfills all aspects of GMW14011
- **Simulate All Vehicle Environments:** Perform S&R tests in quiet room; in chamber at -40 degC to +50 degC; below thermal chamber; under environmental hood
- **Versatile:** Quiet for S&R; powerful enough for S&R Aging with on-demand cooling
- **Test Lab Versatility:** Energizers are mobile; use for DBE for full vehicle S&R tests
- **Effective S&R Detection:** Reproduces and performs closed-loop control of road-load acceleration time histories, PSD random, and sine vibration
- **Electrodynamic Exciters:** MB Quiet 6 DOF uses 7 MB Energizers w/lever arms: 4 SILVERs vertical; 1 SILVER lateral; 2 SILVERs fore-aft
- **Large Mounting Table:** 2.05m x 1.85m; allows testing of 1/2 bucks
- **Mounting Table Resonance, Bare:** 185 Hz $\pm 2\%$
- **Frequency Response:** DC to 100 Hz; usable at higher frequencies
- **Payload:** 550kg; size allows testing of 1/2 bucks
- **Reaction Mass:** 5m x 5m x 2m (100T) set on MB-supplied Isolator Assemblies
- **Time History, PSD Random and Sine Vibration Control Errors:** Typically under 5% and often as low as 2% for Time History & Sine Control; ± 1 dB for Random
- **Man-Rated:** Inherently safe by its design & functions; S&R requires much smaller forces and accelerations than durability tests; short strokes; electrodynamically actuated not hydraulically actuated

6 DOF Durability S&R Test Systems

Best in Class Quiet™ · 24/7 Testing



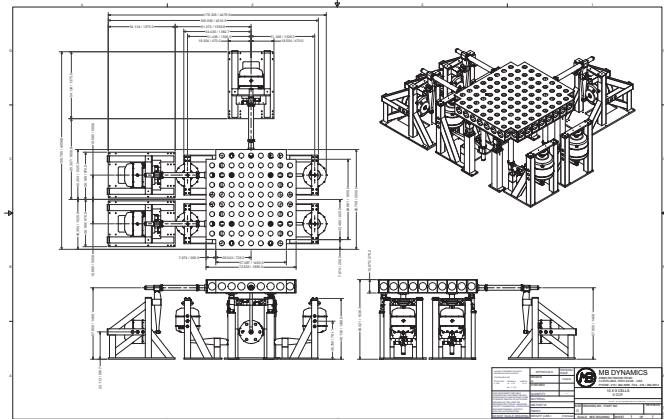
MB Dynamics has earned a worldwide reputation for innovative Buzz, Squeak & Rattle (S&R) test solutions, helping customers detect, diagnose, and eliminate these annoying sounds before the vehicle rolls off the assembly line. Our next-generation S&R testing technology with Durability Squeak & Rattle (DSR) systems are built quiet for S&R, powerful for durability and multi-axis for realism -- enabling performing durability and S&R testing on the same equipment.

The technology yields quiet testing for S&Rs, then testing at elevated acceleration levels to simulate accumulated mileage. Test cycles can be repeated endlessly – on the same equipment – for significant productivity advantages. Shorter test times. Fewer hassles juggling test items and schedules. No hydraulics. By using permanent magnets rather than field coils, heat is minimal and the distracting sounds associated with cooling exciters is eliminated. MB's patented flexures and innovative fixture design further reduce test equipment noise. The nearly silent operation allows for easier detection of road-induced annoying noises, resulting in MB Dynamics S&R Test Systems being best-in-class quiet™.

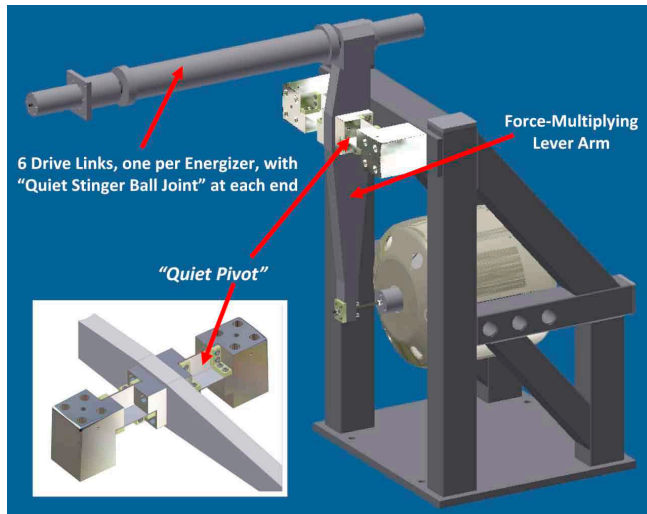
Equipment and Specifications

- Capable of mounting test items or modules (Instrument panel, Consoles, Body Bucks, Cockpits, Seats, Front & Rear Side Doors, HVAC System, Sunroofs, Headliners, Steering Columns, Airbag Modules, Seat Belt Retractors and Roof Rails) in the "in-vehicle" mounting position or orientation
- Background Noise complies with GMW14011: ≤ 1.5 Sones (N10) running typical GMW14011 S&R test
- All Energizer exciters are electrodynamic, not hydraulic
- Frequency range of system: 5 - 100 Hz, for S&R; usable from 1 - 200 Hz
- No Exciter cooling needed during S&R tests
- Module Mounting Table size: 2.05m x 1.85m
- Mounting Table Bolt-hole Grid Pattern: 150mm square using M10-1.5 threads
- Mounting Table is stiff but lightweight, fabricated from magnesium
- Reaction Mass: 5m x 5m x 2m (100T) set on MB-supplied Isolator Assemblies
- Time History, PSD Random and Sine Vibration Control Errors: Typically under 5% and often as low as 2% for Time History & Sine Control; ± 1 dB for Random
- Displacement: 25mm p-p vertical; 25mm p-p fore-aft; 16mm p-p lateral
- Man-Rated: Inherently safe by its design & functions; S&R requires much smaller forces and accelerations than durability tests; short strokes; electrodynamically actuated not hydraulically actuated

Payload and g's: S&R and S&R Aging; 2m x 1.85m Table, 7 SILVERs; 4 vertical				
	Quiet S&R		S&R Aging	
	g's RMS	g's Pk	g's RMS	g's Pk
Vertical				
0kg	2.8	11	4.2	12
50 kg	2.5	10	3.7	11
100 kg	2.2	9	3.3	10
225 kg	1.7	6.5	2.5	8
550 kg	1.1	4.5	1.6	5
Horizontal				
0kg	1.2	5	1.8	5.5
50 kg	1.1	4.4	1.6	5
100 kg	0.9	3.5	1.4	4.5
225 kg	0.7	3	1.1	3.5
550 kg	0.45	2	0.7	2.5

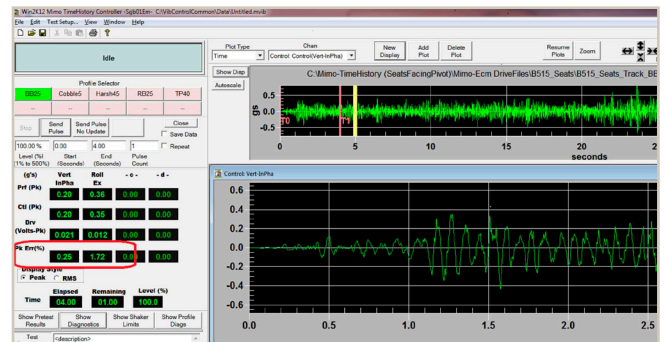


MB Quiet 6 DOF S&R System - Drawings



Lever Arm, "Quiet Pivot" and Drive Link

MB uses no ball & socket joints and no rolling element bearings that wear, have backlash & make noise



The MB Millennium™ MIMO Controller provides superior Time History control as displayed in this 4-axis test

			1st	2nd	3rd	4th	5th	Average
GMW 14011 - Seat	Vertical direction	Original	CH 1	0.62	0.64	0.68	0.66	0.66
		sones	CH 2	0.73	0.77	0.78	0.63	0.69
	Fore-aft direction	Original	CH 1	0.92	0.83	0.84	0.94	1.00
		sones	CH 2	0.83	0.76	0.72	0.74	0.77
	Lateral direction	Original	CH 1	0.47	0.47	0.48	0.51	0.52
		sones	CH 2	0.41	0.38	0.38	0.37	0.38

Above is an example of data from a similar system but NOT the 6DOF that is the subject of this data sheet.

MB Dynamics, Inc.

25865 Richmond Road · Cleveland OH · 44146 USA
phone +1 216 292 5850 · fax +1 216 292 5614
www.mbdynamics.com