

ALPHA 4050 MK2

Vibration Exciter



MB DYNAMICS
Sound & Vibration Testing Technology

Quiet electrodynamic 4kN shaker with 50mm stroke,
including active load support and integrated quiet fans

With excitation forces of 4kN Sine Peak or 2400N Random RMS, the ALPHA 4050 MK2 is one of the most powerful permanent magnet shakers available. The high efficiency and the weight of only 92kg allow the construction of powerful, compact vibration tables for simultaneous excitation in 1 to 6 axes. The robust, low-maintenance construction and the low operating noise allow the universal use of the ALPHA 4050 shakers for Squeak & Rattle tests on passenger cars, vans and minibuses and larger vehicle components. Integrated temperature-controlled quiet fans, active pneumatic load support for centering the moving element in zero position independent of the applied payload and extensive safety and monitoring functions ensure reliable and safe continuous operation even with higher excitation forces. Naturally, the ALPHA 4050 MK2 meets the strict requirements of GMW 14011, BMW PR311-4 and TPJLR.00.187 as well as other Squeak & Rattle test specifications for the maximum permissible operating noise of the shaker used. The monitoring of the shakers and the control of the associated power amplifier is done conveniently and easily from the central test bench computer via a supplied control application.



Features & Benefits:

- Compact design, easy integration into a wide range of test benches
- Robust design, low maintenance, reliable and durable
- Extremely quiet, ideal for Squeak & Rattle
- Max. force: 4000N Sine Peak
- Max. displacement: 50mm pk-pk
- Frequency range: DC-1000Hz
- Frictionless guidance of the moving element
- Integrated active load support
- Integrated air spring for generating static preloads
- Integrated overtemperature protection
- Integrated overtravel protection
- Temperature-controlled quiet fans
- Remote control and monitoring via RS-485 network
- Optional water cooling enables noiseless cooling even with high excitation forces in continuous operation
- Low magnetic stray fields

Typical applications:

- Vibration test systems for excitation in 1 to 6 DOFs
- Squeak & Rattle testing on complete vehicles, vans, minibuses interior- & exterior components
- Testing of battery modules
- Material- and component testing
- Fatigue test systems
- Static and dynamic tension, compression and bending tests

Options / Accessories:

- Trunnion base for vertical and horizontal alignment
- Mounting tables in various sizes
- Horizontal moving tables
- Multi-axis vibration tables for sequential or simultaneous excitation in 1 to 6 axes
- Quiet water cooling
- Climate-option for use within climate chamber in the temperature range from -40°C to +80°C
- Upgrade to ALPHA 6050MK2

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Technical specifications:

| ALPHA 4050 MK2 vibration exciter | |
|---|--|
| Maximum dynamic force | |
| Sine | 4000N pk |
| Random | 2400N RMS |
| Time History | 8000N pk, instantaneous peak |
| Maximum static force | 2000N, continuous |
| Operating noise * | |
| Noise Rating Curve (NR) | NR18, typical |
| Sound pressure level ** | <28dB(A) |
| Time Varying Loudness *** | <0,2 Sone |
| Maximum displacement | 50mm pk-pk |
| Maximum velocity | 1,2m/s |
| Frequency range | DC-1000Hz |
| Maximum payload vertical | 130kg |
| Maximum payload horizontal | 16kg |
| ∅ Mounting table | 278mm, other sizes on request |
| Moving mass including 278mm ∅ mounting table / without mounting table | 25,3kg / 22,1kg |
| Overtravel protection | Yes, integrated laser position sensor, automatic system shutdown in case of inadmissibly high displacements |
| Overtemperature protection | Yes, integrated temperature sensor, automatic activation of cooling and, if necessary, system shutdown in the event of further inadmissibly high heating |
| Integrated cooling | 2 integrated, temperature-controlled quiet fans |
| Automatic load support | Yes |
| Dimensions (∅ * height) | 270mm ∅ * 803mm |
| Weight | 92,2kg |
| Temperature range during operation, standard | +5°C to +40°C |
| Temperature range during operation, with optional climate package | -40°C to +80°C |
| Maximum coil current | 18A RMS / 63A pk (instantaneous) |
| Coil resistance | 2*20hm |

* 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

Alternative vibration exciters:

| Type | Force, Sine / Random | Displacement | Frequency Range |
|-----------------------|----------------------|--------------|-----------------|
| ALPHA 2025 MK2 | 2000N pk / 1200N RMS | 25mm pk-pk | DC-2000Hz |
| ALPHA 2050 MK2 | 2000N pk / 1200N RMS | 50mm pk-pk | DC-1000Hz |
| ALPHA 3025 MK2 | 3000N pk / 1800N RMS | 25mm pk-pk | DC-2000Hz |
| ALPHA 6050 MK2 | 2000N pk / 1200N RMS | 50mm pk-pk | DC-1000Hz |

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MB A2500 power amplifier

The ALPHA 4050 MK2 shaker is controlled by the associated MB A2500 power amplifier. The low background noise and the very low harmonic distortion of these amplifiers enable distortion-free excitation and minimize the operating noise of the ALPHA shakers. The high efficiency of the amplifiers of up to 85%, the uncompromising selection of components and the solid circuit design of the power electronics according to criteria from the aerospace and automotive industries enable high output currents and high excitation forces of the ALPHA MK2 shakers in continuous operation. Extensive safety and monitoring functions prevent possible overloads and guarantee reliable and safe operation. The operation, parameterization and monitoring of the shakers and power amplifiers is handled by the associated CU-4 Control Unit via an RS-485 network.

Technical specifications:

| MB A2500 power amplifier | |
|--------------------------------------|--|
| Frequency range | DC-20kHz |
| Number of separate inputs | 2 |
| Number of separate outputs | 2 |
| Maximum Gain factor | 32dB, adjustable |
| Maximum output power @ 20Ohm load | > 8000W, per channel |
| Maximum instantaneous output current | 125A pk, per channel |
| Maximum instantaneous output voltage | 190V pk, per channel |
| THD, 1kHz at 4 Ohm and -3dB | <0,03% |
| Latency time (input to output) | 0.000ms |
| Signal Limiter | Yes |
| Monitoring max. output current | Yes, adjustable limit value for max. current |
| Cooling | 3 temperature-controlled fans |
| AC-mains monitoring | Yes |
| AC-mains input | 180VAC to 265VAC, protected by 16A fuse |
| Inrush current | 10A soft start |
| Dimensions (w*h*d) | 483mm*88mm*290mm |
| Weight | 10kg (22lbs) |



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Accessories / Options for ALPHA 4050 MK2 vibration exciters

| | |
|---|--|
| <p>Mounting table, 278mm diameter</p> <p>Diameter: 278mm M6 threaded inserts on 50mm*50mm hole grid Weight: 3,2kg</p> | |
| <p>Trunnion base</p> <p>Allows the shaker to be rotated 90° from vertical to horizontal Dimensions: 900mm*650mm*600mm (W*H*D) Weight: approx. 200kg</p> | |
| <p>Horizontal vibration table</p> <p>Magnesium mounting table, air-bearings Mounting surface of 300mm*450mm M6 thread inserts on 75mm*75mm grid Moving mass of the table: approx. 9kg Maximum payload: 50kg Dimensions: 410mm*415mm*530mm (W*H*D) Weight: approx. 236kg</p> | |
| <p>Water cooling</p> <p>Enables silent cooling of the ALPHA 4050 MK2 shaker even at high excitation forces in continuous operation. Water cooling is a prerequisite for the climate option. Includes air-cooled heat exchanger with a cooling capacity of approx. 3000Watt as well as 10m supply line and quick couplings.</p> | |
| <p>Climate option</p> <p>Enables the use of the ALPHA 4050 MK2 shaker within a climatic chamber in the temperature range from -40°C to +80°C. Includes thermal insulation of the ALPHA 4050 MK2 shaker and constant temperature control through an external combined heating/cooling unit.</p> | |
| <p>Upgrade to ALPHA 6050 MK2</p> <p>Includes water cooling option for ALPHA 4050 MK2 and the upgrade to a more powerful amplifier.</p> | |