

ABRS Series

Air-Bearing Rotary Stage

Direct-drive, slotless brushless servomotor

Zero cogging motor for outstanding velocity stability

Outstanding error motion and wobble performance

Direct coupled, high accuracy rotary encoder

Low profile, planar design

No mechanical contact



Aerotech's ABRS series rotary air-bearing stages provide superior angular positioning, velocity stability, and error motion performance in an exceptionally low-profile package. The ABRS is designed to meet the exacting requirements of wafer inspection, high precision metrology, x-ray diffraction systems, optical inspection and fabrication, and MEMS/nanotechnology device fabrication.

Compact Package

The design of the ABRS series direct-drive rotary stage has been optimized to minimize stage height. The low profile of the stage reduces the effective working height of the system, minimizing "stack-up" related errors. In addition to the low overall height, the ABRS series provides a clear aperture that can be used for product feed-through, laser beam delivery, cable clearance, or application-specific requirements.

Superior Mechanical Design

The ABRS design features large air-bearing surfaces for high stiffness and load capacity, producing not only excellent axial and radial error motions, but outstanding tilt

error motion, as well. The resultant face error motion is significantly better than other rotary air-bearing tables and spindles, greatly benefiting applications requiring exceptional planar performance.

Brushless Direct-Drive

To maximize positioning performance, the ABRS series utilizes Aerotech's S-series slotless, brushless motor. The motor uses an advanced magnetic circuit design to produce high torque output with minimal heat generation. The slotless design is inherently zero-cogging and torque ripple-free. This makes the ABRS stages ideal for applications requiring smooth scan velocities at low or high speeds.

Accurate Positioning

An optical encoder is standard with the ABRS. When coupled with Aerotech's feedback multipliers and controls, resolutions of <0.03 arc second are achievable.

Custom Designs

Custom versions of the ABRS are available for rate table and inertial guidance test-stand applications.

ABRS Series SPECIFICATIONS

Rotary Stages

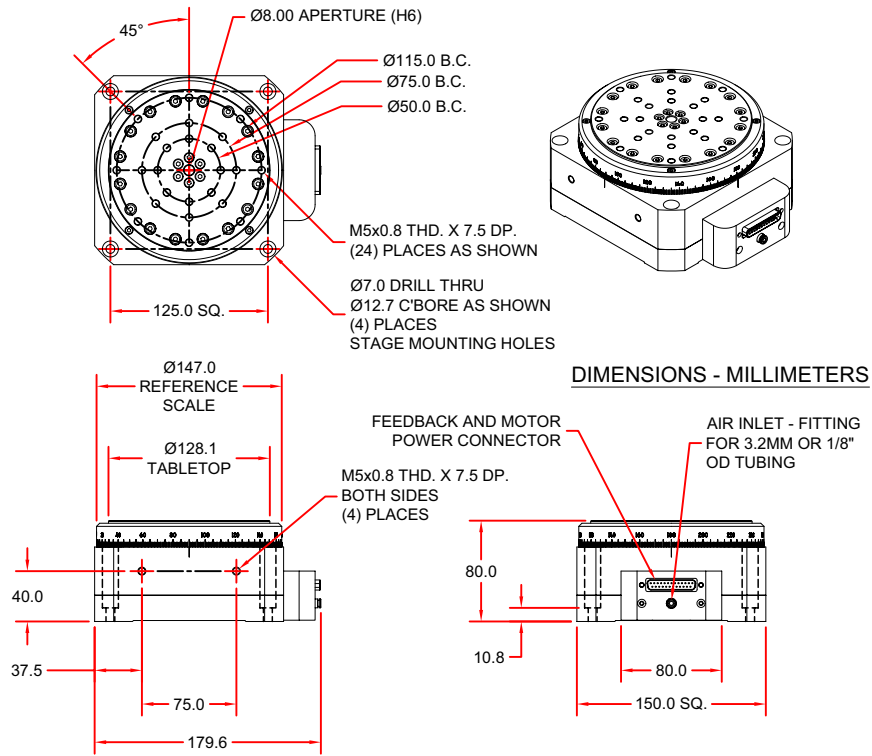
ABRS Series

| ABRS Series | | ABRS-150MP | ABRS-200MP | ABRS-250MP | ABRS-300MP |
|------------------------------------|------------|--|----------------------------|----------------------------|-----------------------------|
| Width | | 150 mm | 200 mm | 250 mm | 300 mm |
| Tabletop Diameter | | 128.1 mm | 178.1 mm | 228.1 mm | 278.1 mm |
| Height | | 80 mm | 90 mm | 100 mm | 110 mm |
| Aperture | | 8 mm | 20 mm | 35 mm | 75 mm |
| Total Travel | | 360° Continuous | | | |
| Motor | | S-50-39-A | S-76-35-A | S-130-39-A | S-180-44-A |
| Stall Torque, Continuous | | 0.20 N-m | 0.53 N-m | 2.36 N-m | 5.99 N-m |
| Peak Torque | | 0.82 N-m | 2.12 N-m | 9.42 N-m | 23.98 N-m |
| BEMF, Line-Line, Max | | 10.3 V _{pk} /Krpm | 32.1 V _{pk} /Krpm | 75.1 V _{pk} /Krpm | 268.7 V _{pk} /Krpm |
| Continuous Current, Stall | | 2.4 A _{pk} | 2.0 A _{pk} | 3.8 A _{pk} | 2.7 A _{pk} |
| | | 1.7 A _{pk} | 1.4 A _{pk} | 2.7 A _{pk} | 1.9 A _{pk} |
| Torque Constant | | 0.09 N-m/A _{pk} | 0.26 N-m/A _{pk} | 0.62 N-m/A _{pk} | 2.22 N-m/A _{pk} |
| | | 0.12 N-m/A _{rms} | 0.37 N-m/A _{rms} | 0.88 N-m/A _{rms} | 3.14 N-m/A _{rms} |
| Bus Voltage | | Up to 340 VDC | | | |
| Resolution ⁽¹⁾ | | 0.873 µrad (0.18 arc sec) | 0.383 µrad (0.079 arc sec) | 0.267 µrad (0.055 arc sec) | 0.174 µrad (0.036 arc sec) |
| Fundamental Encoder Resolution | | 3600 lines/rev | 8192 lines/rev | 11,840 lines/rev | 18,000 lines/rev |
| Max Speed | | 300 rpm | 300 rpm | 500 rpm | 500 rpm |
| Accuracy | Calibrated | ±2 arc sec | | | |
| Repeatability | | <1 arc sec | | | |
| Max Load ⁽³⁾ | Axial | 8 kg | 31 kg | 66 kg | 97 kg |
| | Radial | 4 kg | 15 kg | 36 kg | 51 kg |
| | Tilt | 3 N-m | 10 N-m | 28 N-m | 45 N-m |
| Axial Error Motion (Synchronous) | | <100 nm | | | |
| Radial Error Motion (Synchronous) | | <250 nm | | | |
| Tilt Error Motion (Synchronous) | | <4.4 µrad (<0.9 arc sec) | <3.4 µrad (<0.7 arc-sec) | <2.4 µrad (<0.5 arc sec) | <2.4 µrad (<0.5 arc sec) |
| Axial Error Motion (Asynchronous) | | <20 nm | | | |
| Radial Error Motion (Asynchronous) | | <20 nm | | | |
| Tilt Error Motion (Asynchronous) | | <0.4 µrad (<0.08 arc sec) | <0.3 µrad (<0.06 arc-sec) | <0.2 µrad (<0.04 arc sec) | <0.2 µrad (<0.04 arc sec) |
| Operating Pressure ⁽⁵⁾ | | 80 psig (5.5 bar) + 0 psig (0.0 bar) / - 10 psig (0.7 bar) | | | |
| Air Consumption ⁽⁶⁾ | | <2 scfm | | | |
| Inertia | Unloaded | 3850 kg-mm ² | 13,800 kg-mm ² | 39,100 kg-mm ² | 102,000 kg-mm ² |
| Total Mass | | 4.8 kg | 9.1 kg | 15.6 kg | 24.5 kg |
| Material | | Aluminum | | | |
| Finish | | Hardcoat (62 Rockwell Hardness) | | | |

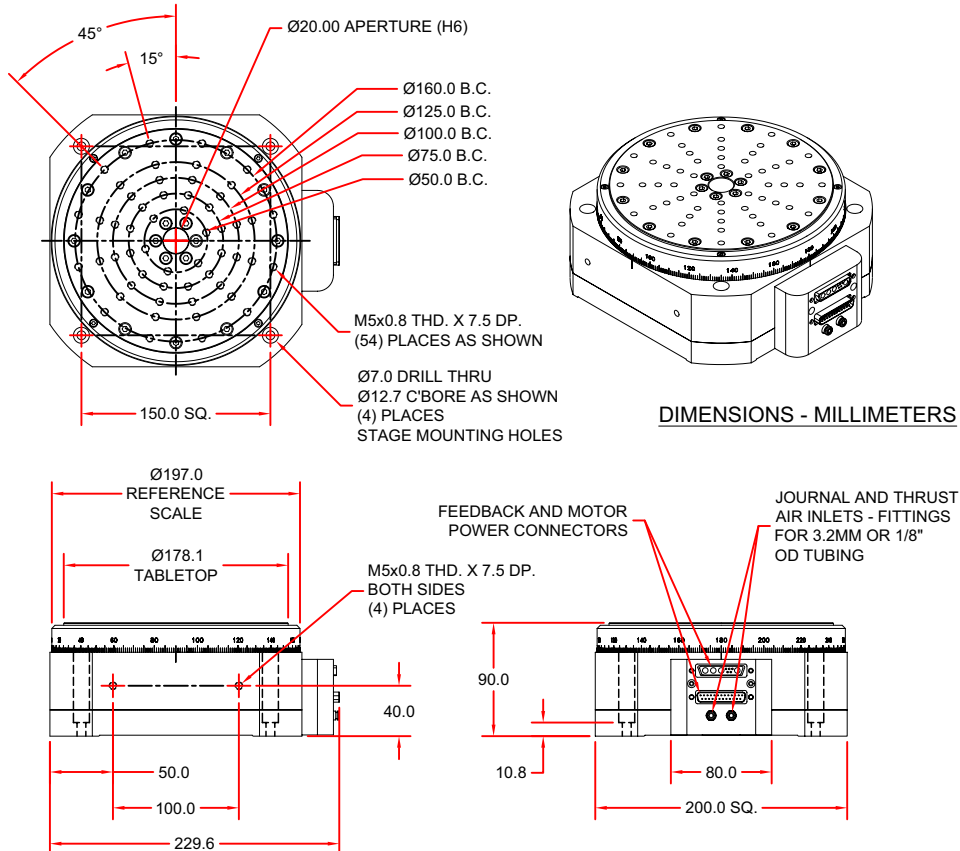
Notes:

1. Maximum resolution presumes A3200 controller using MXH500 multiplication, and accounts for controller quadrature.
2. Maximum speed based on stage capability. Maximum application velocity may be limited by system data rate and system resolution.
3. Maximum loads are mutually exclusive.
4. All error motion specifications measured at 60 rpm.
5. To protect air bearing against under-pressure, an in-line pressure switch tied to the motion controller is recommended.
6. Air supply must be clean, dry to 0° F dew point, and filtered to 0.25 µm or better. Recommend nitrogen at 99.9% purity.

ABRS-150MP



ABRS-200MP

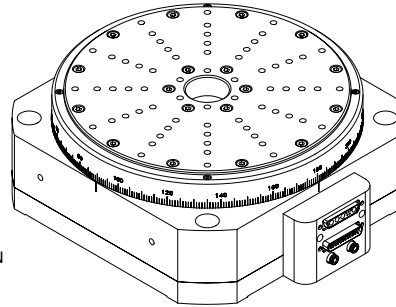
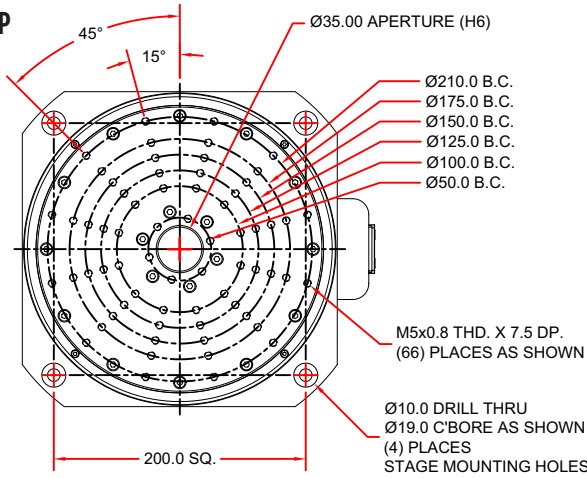


ABRS Series DIMENSIONS

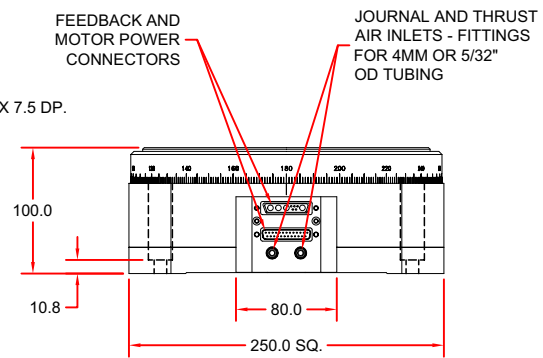
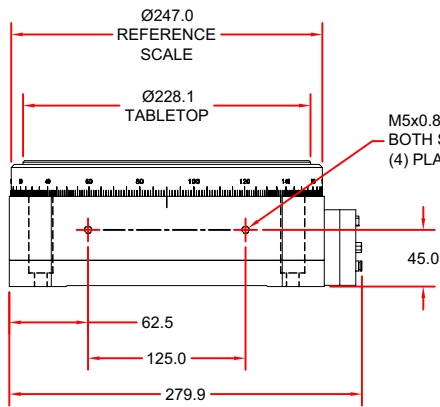
Rotary Stages

ABRS Series

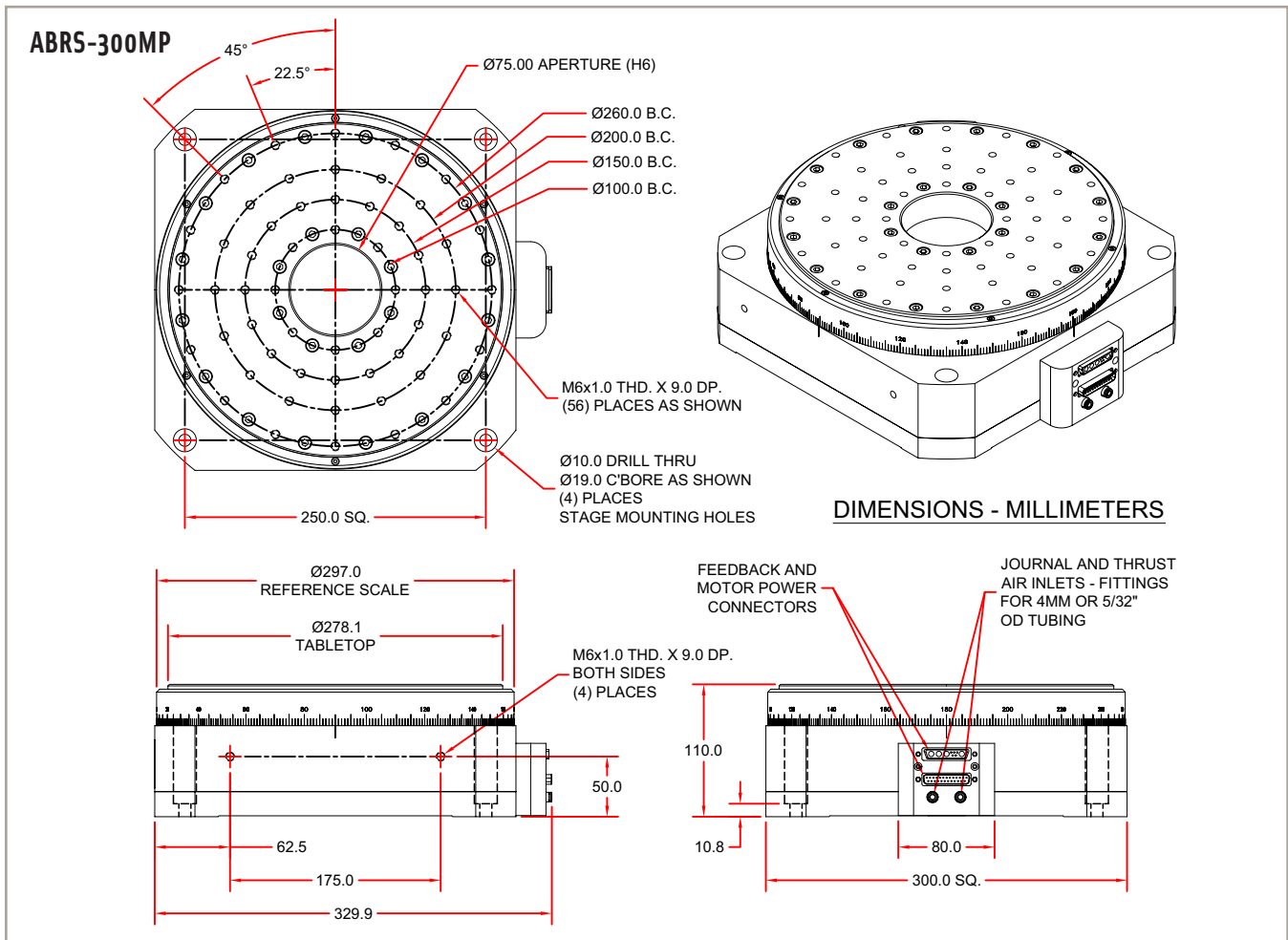
ABRS-250MP



DIMENSIONS - MILLIMETERS



ABRS Series DIMENSIONS and ORDERING INFORMATION



Ordering Example

| ABRS Series | -200MP Width (mm) | -M Mounting Pattern | -AS Position Transducer |
|-------------|-------------------|---------------------|-------------------------|
| | -150MP | | |
| | -200MP | | -AS |
| | -250MP | -M | -X50 |
| | -300MP | | |

ABRS Series Direct-Drive, Air-Bearing, Rotary Stage

| | |
|------------|--|
| ABRS-150MP | 150 mm wide air-bearing rotary stage with 0.82 N-m peak torque output |
| ABRS-200MP | 200 mm wide air-bearing rotary stage with 2.12 N-m peak torque output |
| ABRS-250MP | 250 mm wide air-bearing rotary stage with 9.42 N-m peak torque output |
| ABRS-300MP | 300 mm wide air-bearing rotary stage with 23.98 N-m peak torque output |

Mounting Pattern

-M Metric-dimension mounting pattern and holes

Position Transducer

| | |
|------|--|
| -AS | Standard feedback device, sine wave output; 3600 cycles per rev on ABRS-150MP; 8192 cycles per rev on ABRS-200MP; 11,840 cycles per rev on ABRS-250MP; 18,000 cycles per rev on ABRS-300MP |
| -X50 | Square-wave digital output; 180,000 cycles per rev on ABRS-150MP; 409,600 cycles per rev on ABRS-200MP; 592,000 cycles per rev on ABRS-250MP; 900,000 cycles per rev on ABRS-300MP |

Note: Digital output encoder signals are synthesized with a 16 MHz clock. Care must be taken to ensure that the encoder sample rate on the controller is 16 MHz or higher. Slower clock rates are available upon request.