

# 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 <math><0.03</math> 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

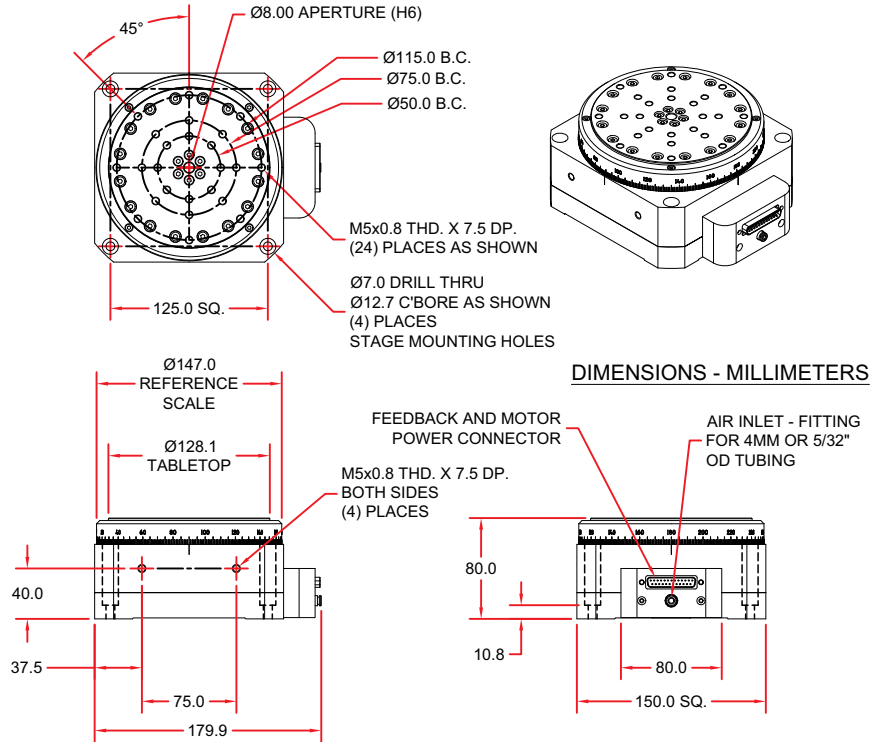
ABRS Series	ABRS-150MP	ABRS-200MP	ABRS-250MP	ABRS-300MP	
Width	150 mm	200 mm	250 mm	300 mm	
Tabletop Diameter	128.1 mm	178.1 mm	228.1 mm	278.1 mm	
Height	80 mm	90 mm	100 mm	110 mm	
Aperture	8 mm	20 mm	35 mm	75 mm	
Total Travel	360° Continuous				
Motor	S-50-39-A	S-76-35-A	S-130-39-A	S-180-44-A	
Stall Torque, Continuous	0.20 N-m	0.48 N-m	2.36 N-m	5.99 N-m	
Peak Torque	0.82 N-m	1.92 N-m	9.42 N-m	23.98 N-m	
BEMF, Line-Line, Max	10.3 V <sub>pk</sub> /Krpm	29.1 V <sub>pk</sub> /Krpm	75.1 V <sub>pk</sub> /Krpm	268.7 V <sub>pk</sub> /Krpm	
Continuous Current, Stall	2.4 A <sub>pk</sub>	2.0 A <sub>pk</sub>	3.8 A <sub>pk</sub>	2.7 A <sub>pk</sub>	
	1.7 A <sub>pk</sub>	1.4 A <sub>pk</sub>	2.7 A <sub>pk</sub>	1.9 A <sub>pk</sub>	
Torque Constant	0.09 N-m/A <sub>pk</sub>	0.24 N-m/A <sub>pk</sub>	0.62 N-m/A <sub>pk</sub>	2.22 N-m/A <sub>pk</sub>	
	0.12 N-m/A <sub>rms</sub>	0.34 N-m/A <sub>rms</sub>	0.88 N-m/A <sub>rms</sub>	3.14 N-m/A <sub>rms</sub>	
Bus Voltage	80 VDC				
Resolution <sup>(1)</sup>	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 <sup>(2)</sup>	300 rpm	300 rpm	500 rpm	500 rpm	
Accuracy <sup>(3)</sup>	±3 arc sec	±2 arc sec			
Repeatability (Bi-Directional)	<2 arc sec	<1 arc sec			
Max Load <sup>(4)</sup>	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)	<175 nm	<100 nm			
Radial Error Motion (Synchronous)	<450 nm	<250 nm			
Tilt Error Motion (Synchronous)	<9.7 μrad (<2.0 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 <sup>(6)</sup>	80 psig (5.5 bar) + 0 psig (0.0 bar) / - 10 psig (0.7 bar)				
Air Consumption <sup>(7)</sup>	<56.6 SLPM (<2 SCFM)				
Inertia	Unloaded	3850 kg-mm <sup>2</sup>	13,800 kg-mm <sup>2</sup>	39,100 kg-mm <sup>2</sup>	102,000 kg-mm <sup>2</sup>
Total Mass		4.8 kg	9.1 kg	15.6 kg	24.5 kg
Material	Aluminum				
Finish	Hardcoat (62 Rockwell Hardness)				

Notes:

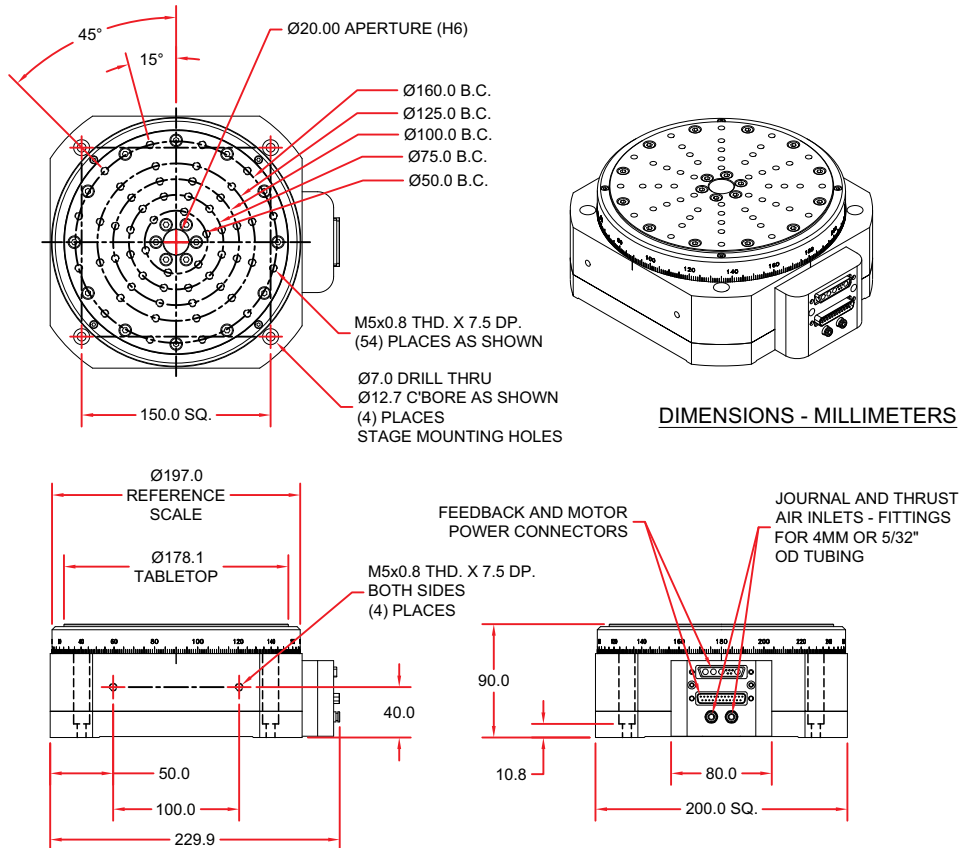
1. Maximum resolution presumes A3200 controller using MXH500 multiplication, and accounts for controller quadrature.
2. Maximum speed based on stage capability. Maximum application velocity may be limited by system data rate and system resolution.
3. Certified with each stage. Requires the use of an Aerotech controller.
4. Maximum loads are mutually exclusive.
5. All error motion specifications measured at 60 rpm.
6. To protect air bearing against under-pressure, an in-line pressure switch tied to the motion controller is recommended.
7. 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 Series DIMENSIONS

### ABRS-150MP

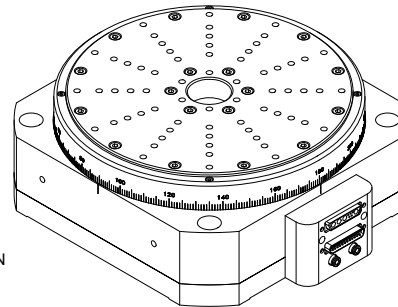
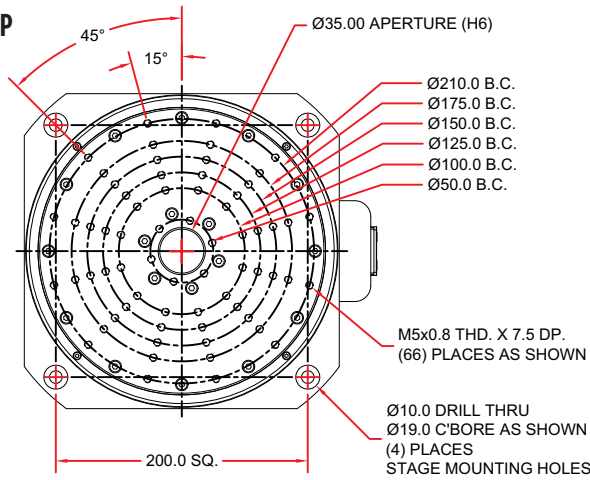


### ABRS-200MP

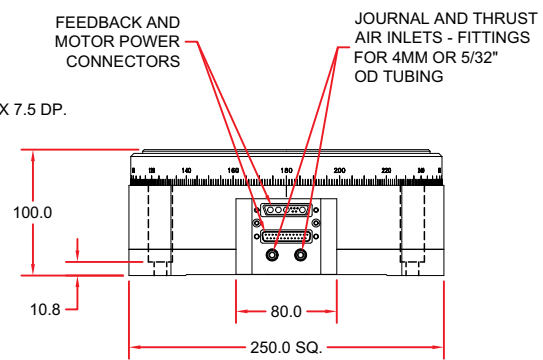
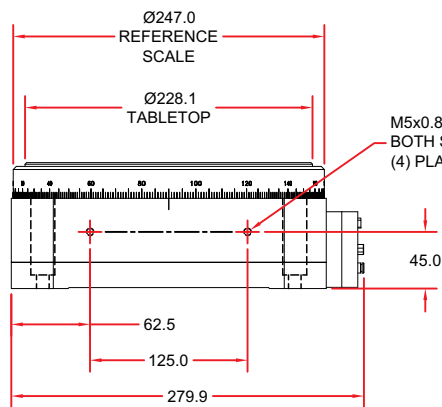


# ABRS Series DIMENSIONS

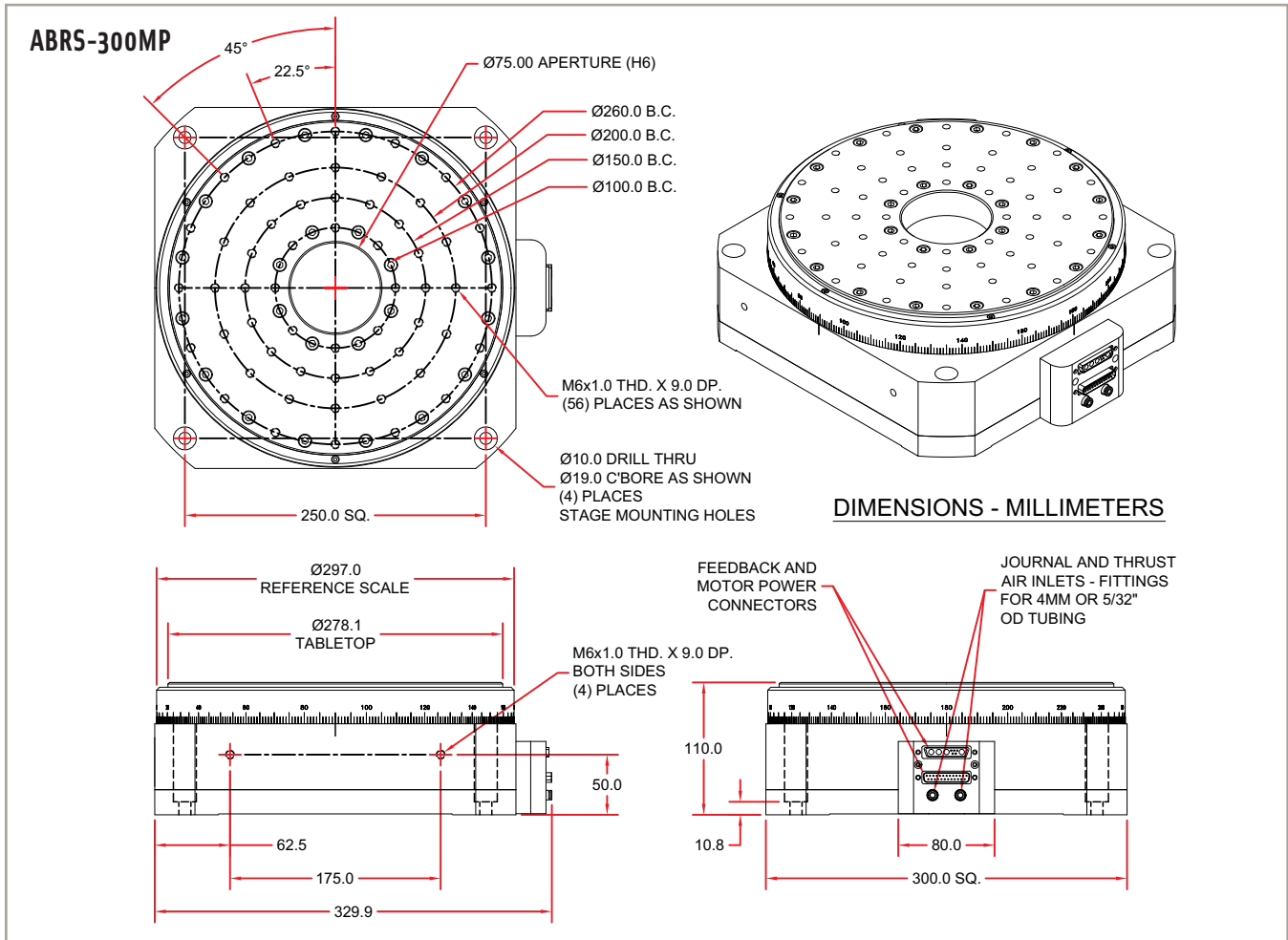
## ABRS-250MP



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.