

# ABL1500 Series

## Air Bearing, Linear Motor Stage

Designed for high-performance scanning and inspection

Active air preload on all air-bearing surfaces

Linear encoder feedback provides sub-nanometer resolution

High stiffness for heavy loads and excellent geometrical performance

Travel up to 500 mm

Leading-edge manufacturing, particularly in the semiconductor and data storage industries, demands positioning tolerances beyond the capability of conventional ball-screw and mechanical-bearing positioning systems. The ABL1500, with its fully active preload, exceptionally high stiffness, and excellent geometric characteristics was designed specifically to meet those demands.

### Air-Bearing Design for High Dynamic Performance

The ABL1500 incorporates an air-on-air preload on both the vertical and horizontal surfaces. The opposing thin-film pressure maintains the bearing nominal gap tolerance. This design, in addition to the large air-bearing surface that distributes the load over a large surface area, results in a stage with outstanding stiffness that is ideal for heavy or offset loading.

Proprietary manufacturing techniques result in a stage with unsurpassed geometrical characteristics. The air bearing has an inherent averaging effect that maximizes performance. The thin film will fill small surface voids and allow for other irregularities. This characteristic yields superior pitch, roll, yaw, straightness and flatness specifications.

### Linear Motor Drive

The driving force behind this stage is Aerotech's BLMC series brushless linear servomotor. Aerotech's long history and experience as a motor manufacturer is reflected in this design. The BLMC utilizes an ironlessforcer, which means there is zero cogging and no attractive forces, resulting in



unsurpassed smoothness of motion. Capable of generating high force and velocity, the BLMC represents the ultimate combination of power and performance.

### Zero Maintenance

Our totally noncontact air bearing, noncontact linear motor drive, and noncontact feedback device ensure years of maintenance-free operation at the high performance levels that are expected of Aerotech equipment. Because there is no mechanical contact between moving elements, the ABL1500 experiences no wear or reduction in performance over time. Service life is virtually unlimited and since there is no lubrication – only clean, dry gas – air bearings are ideal for cleanroom and medical applications.

### Cable Management

We carefully optimize the cable bend radius to ensure years of trouble-free operation. In the unlikely event of failure, Aerotech's modular design makes cable replacement quick and easy with minimal downtime.

We include all customer-required cables, air hoses, etc. in our CMS bundle to facilitate integration into the final system. Both ends are fully connectorized for simple integration into the customer's machine.

Mechanical Specifications			ABL1500-050	ABL1500-100	ABL1500-200
Travel			50 mm (2 in)	100 mm (4 in)	200 mm (8 in)
Accuracy <sup>(1)</sup>	E1	Calibrated	±0.3 µm (±12 µin)	±0.3 µm (±12 µin)	±0.5 µm (±20 µin)
		Standard	±2.0 µm (±80 µin)	±4.0 µm (±160 µin)	±8.0 µm (±320 µin)
	E3	Calibrated	±0.2 µm (±8 µin)	±0.2 µm (±8 µin)	±0.4 µm (±16 µin)
		Standard	±1.0 µm (±40 µin)	±2.0 µm (±80 µin)	±5.0 µm (±200 µin)
Repeatability (Bi-Directional) <sup>(1)</sup>			E1	±0.2 µm (±8 µin)	
			E3	±0.05 µm (±2 µin)	±0.05 µm (±2 µin)
Straightness <sup>(1)</sup>			±0.25 µm (±10 µin)	±0.4 µm (±16 µin)	±0.5 µm (±20 µin)
Flatness <sup>(1)</sup>			±0.25 µm (±10 µin)	±0.4 µm (±16 µin)	±0.5 µm (±20 µin)
Pitch			±0.5 arc sec	±1 arc sec	±2 arc sec
Roll			±0.5 arc sec	±1 arc sec	±2 arc sec
Yaw			±0.5 arc sec	±1 arc sec	±2 arc sec
Maximum Speed			2 m/s (80 in/s)		
Maximum Acceleration			2 g - 20 m/s <sup>2</sup> - 768 in/s <sup>2</sup> (No Load)		
Maximum Force (Continuous)			93.6 N (21.0 lb)		
Load Capacity <sup>(2)</sup>			Horizontal	35 kg (77.2 lb)	
			Side	25 kg (55 lb)	
Operating Pressure			80 psi (5.5 bar) ±5 psig (0.3 bar)		
Air Consumption			24-30 SLPM @ 551 kPa (0.85-1.06 SCFM @ 5.51 bar)		
Moving Mass (No Load)			5.1 kg (11.2 lb)		
Stage Mass			14.7 kg (32.4 lb)	16.0 kg (35.3 lb)	18.6 kg (41.0 lb)
Material			Aluminum		
MTBF (Mean Time Between Failure)			30,000 Hours		

Notes:

1. Certified with each stage.
2. Axis orientation for on-axis loading is listed.
3. Specifications are for single-axis systems measured 25 mm above the tabletop. Performance of multi-axis systems is payload and workpoint dependent. Consult factory for multi-axis or non-standard applications.
4. To protect air bearing against under-pressure, an in-line pressure switch tied to the motion controller/amplifier E-stop input is recommended.
5. Air supply must be clean, dry to 0° F dewpoint and filtered to 0.25 µm or better; recommend nitrogen at 99.9% purity.
6. For XY configurations, the maximum upper axis travel is 200 mm. For upper axis travels greater than 200 mm but less than or equal to 500 mm, an ABL1500WB is required as the lower axis.

Mechanical Specifications			ABL1500-300	ABL1500-400	ABL1500-500
Travel			300 mm (12 in)	400 mm (16 in)	500 mm (20 in)
Accuracy <sup>(1)</sup>	E1	Calibrated	±0.5 µm (±20 µin)	±0.6 µm (±24 µin)	±0.6 µm (±24 µin)
		Standard	±12.0 µm (±480 µin)	±16.0 µm (±640 µin)	±20.0 µm (±800 µin)
	E3	Calibrated	±0.4 µm (±16 µin)	±0.5 µm (±20 µin)	±0.5 µm (±20 µin)
		Standard	±5.0 µm (±200 µin)	±5.0 µm (±200 µin)	±5.0 µm (±200 µin)
Repeatability (Bi-Directional) <sup>(1)</sup>			E1	±0.3 µm (±12 µin)	
			E3	±0.15 µm (±6 µin)	±0.2 µm (±8 µin)
Straightness <sup>(1)</sup>			±0.75 µm (±30 µin)	±1.5 µm (±60 µin)	±2.0 µm (±80 µin)
Flatness <sup>(1)</sup>			±0.75 µm (±30 µin)	±1.5 µm (±60 µin)	±2.0 µm (±80 µin)
Pitch			±3 arc sec	±4 arc sec	±5 arc sec
Roll			±3 arc sec	±4 arc sec	±5 arc sec
Yaw			±3 arc sec	±4 arc sec	±5 arc sec
Maximum Speed			2 m/s (80 in/s)		
Maximum Acceleration			2 g - 20 m/s <sup>2</sup> - 768 in/s <sup>2</sup> (No Load)		
Maximum Force (Continuous)			93.6 N (21.0 lb)		
Load Capacity <sup>(2)</sup>			Horizontal	35 kg (77.2 lb)	
			Side	25 kg (55 lb)	
Operating Pressure			80 psi (5.5 bar) ±5 psig (0.3 bar)		
Air Consumption			24-30 SLPM @ 551 kPa (0.85-1.06 SCFM @ 5.51 bar)		
Moving Mass (No Load)			5.1 kg (11.2 lb)		
Stage Mass			21.3 kg (47.0 lb)	23.9 kg (52.7 lb)	26.5 kg (58.4 lb)
Material			Aluminum		
MTBF (Mean Time Between Failure)			30,000 Hours		

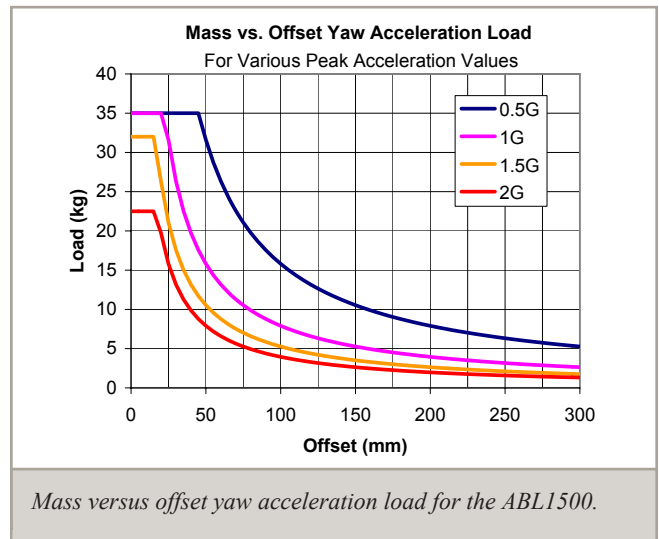
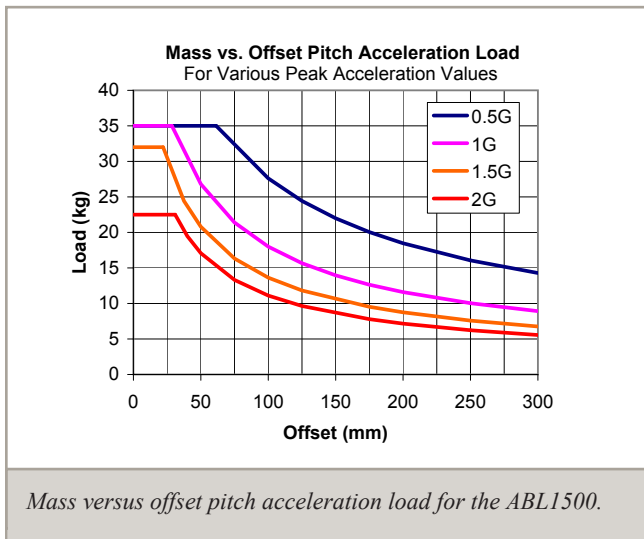
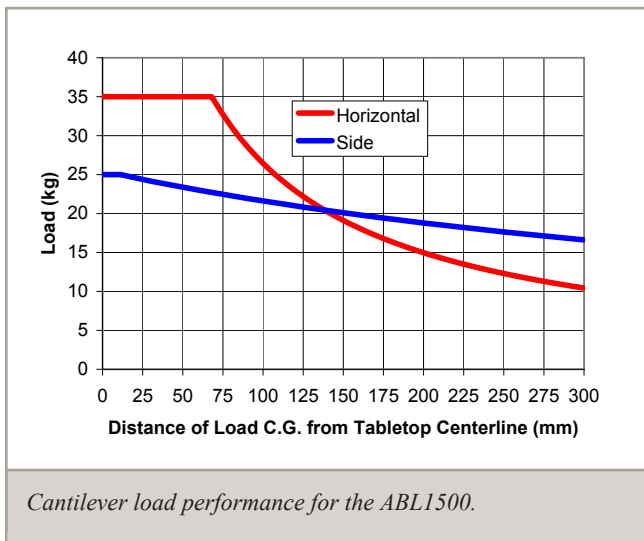
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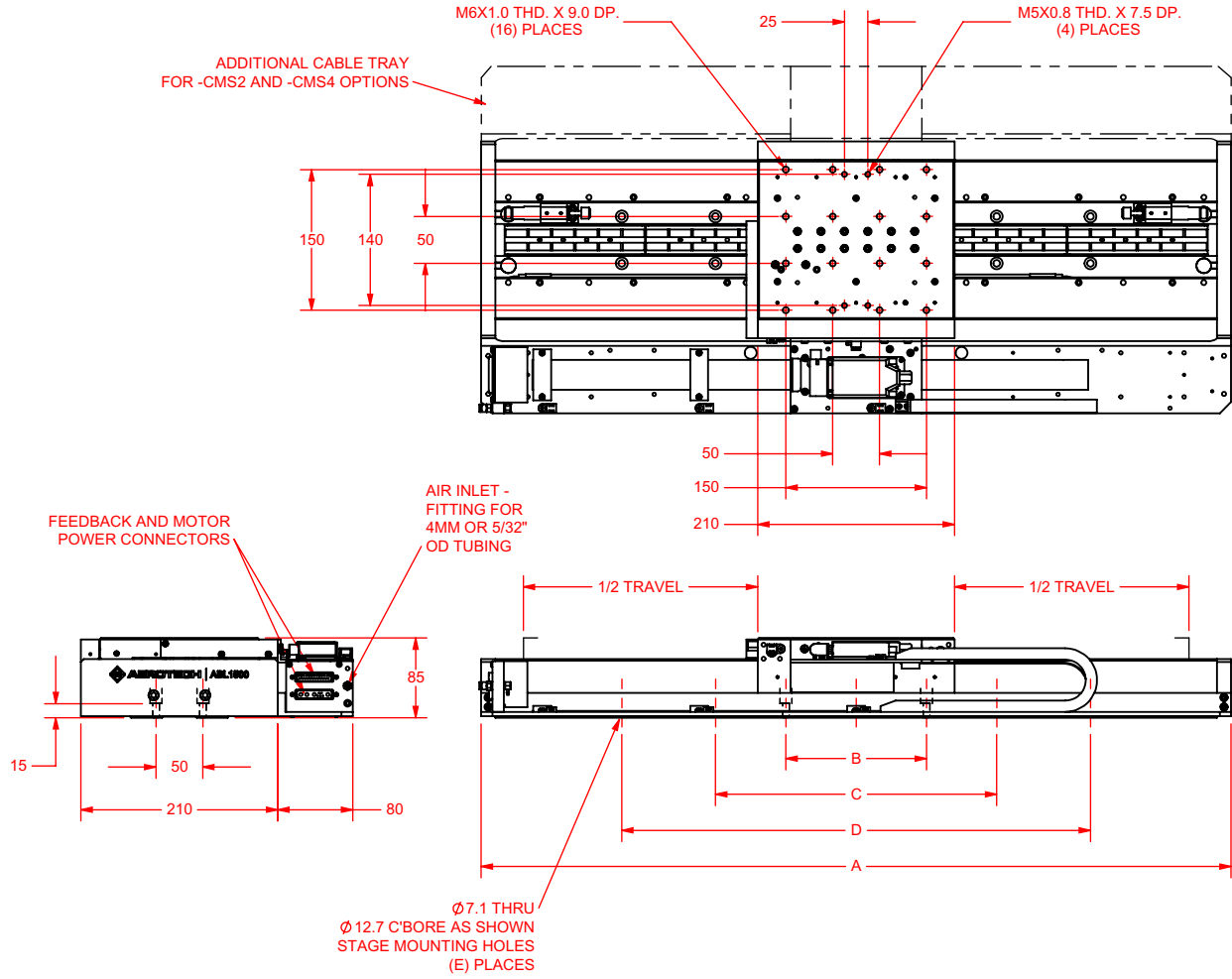
# ABL1500 Series SPECIFICATIONS

Electrical Specifications	
Drive System	Brushless Linear Servomotor
Feedback	Noncontact Linear Encoder (see signal period options on Order Information page)
Maximum Bus Voltage	up to 80 VDC
Limit Switches	5 V, Normally Closed
Home Switch	Near Center

Recommended Controller		
Multi-Axis	A3200	Ndrive MP/Ndrive CP/Ndrive HLe/Npaq MXR
	Ensemble	Ensemble MP/Ensemble CP/Ensemble HLe/Epaq
Single Axis	Soloist	Soloist MP/Soloist CP/Soloist HLe



# ABL1500 Series DIMENSIONS



BASIC MODEL	NOMINAL TRAVEL	ELEC LIMIT TRAVEL	MECH LIMIT TRAVEL	DIMENSIONS - MILLIMETERS				
				A	B	C	D	E
ABL1500-050	50	60	105	350	150	-	-	4
ABL1500-100	100	110	155	400	150	-	-	4
ABL1500-200	200	210	255	500	150	250	-	10
ABL1500-300	300	310	355	600	150	300	-	10
ABL1500-400	400	410	455	700	150	300	450	14
ABL1500-500	500	510	555	800	150	300	500	14

## ABL1500 Series ORDERING INFORMATION

### Travel (Required)

-050	50 mm travel
-100	100 mm travel
-200	200 mm travel
-300	300 mm travel
-400	400 mm travel
-500	500 mm travel

### Feedback (Required)

-E1	Incremental linear encoder, 1 Vpp amplified sine output
-E2	Incremental linear encoder, 0.1 $\mu$ m TTL line driver output
-E3	High-accuracy incremental linear encoder, 1 Vpp amplified sine output

### Cable Management (Required)

-CMS1	Single axis cable management system
-CMS2	Cable management system for XY assembly
-CMS3	Cable management system for Y axis, upper axis only
-CMS4	Cable management system for YZ assembly, upper axis only

### Metrology (Required)

-PL1	Metrology, uncalibrated with performance plots
-PL2	Metrology, calibrated (HALAR) with performance plots

### Integration (Required)

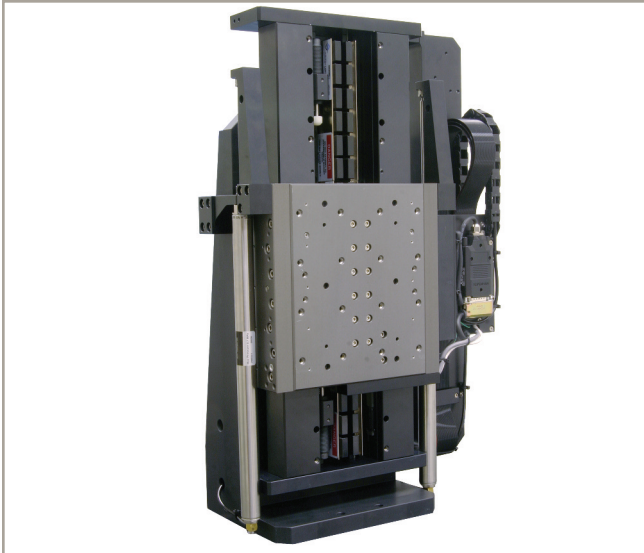
Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

-TAS	<p><b>Integration - Test as system</b></p> <p>Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration.</p>
-TAC	<p><b>Integration - Test as components</b></p> <p>Testing and integration of individual items as discrete components. This is typically used for spare parts, replacement parts, or items that will not be used or shipped together (ex: stage only). These components may or may not be part of a larger system.</p>

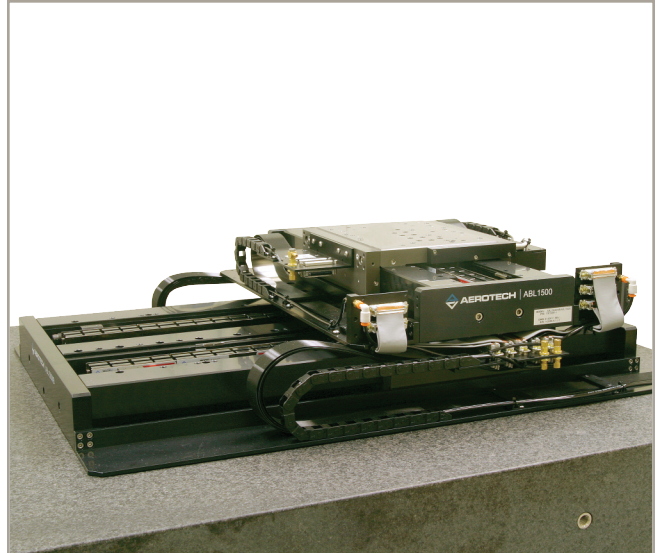
### Accessories (to be ordered as a separate line item)

ALIGN-NPA	Non-precision XY assembly
ALIGN-PA10	XY assembly; 10 arc sec orthogonality. Alignment to within 7 microns orthogonality for short travel stages.
ALIGN-PA5	XY assembly; 5 arc sec orthogonality. Alignment to within 3 microns orthogonality for short travel stages.
ABF	Air-bearing filtration kit

### ABL1500 Series ORDERING INFORMATION



*Optional Z-axis configuration with integral counterbalance. See the ABL1500Z data sheet.*



*Optional wide-body version for improved flatness and load performance. See the ABL1500WB data sheet.*



*Optional environmental protection.*