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 active 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 ironless forcer, 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.

WORLD HEADQUARTERS: Aerotech, Inc., United States • Phone: +1-412-963-7470 • Email: sales@aerotech.com
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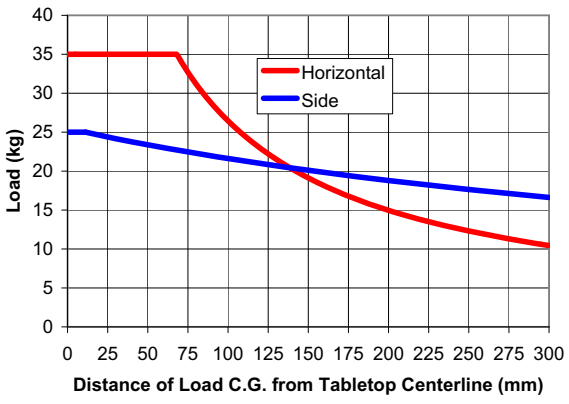
Aerotech GmbH, Germany • Phone: +49-911-9679370 • Email: sales@aerotechgmbh.de
Aerotech KK, Japan • Phone: +81-47-489-1741 • Email: sales@aerotechkk.co.jp
Aerotech China • Phone: +852-3793-3488 • Email: saleschina@aerotech.com

ABL1500 Series SPECIFICATIONS

Basic Model			ABL15005	ABL15010	ABL15020
Total Travel			50 mm (2 in)	100 mm (4 in)	200 mm (8 in)
Drive System			Linear Brushless Servomotor (BLMC-192-A)		
Bus Voltage			Up to 80 VDC		
Continuous Current	A_{pk}		Up to 4.00 A		
	A_{rms}		Up to 2.83 A		
Feedback			Noncontact Linear Encoder (LN or LT)		
Resolution	**LN**		0.001 µm - 0.2 µm (0.04 µin - 8 µin)		
	LT		0.005 µm - 1.0 µm (0.2 µin - 40 µin)		
Maximum Travel Speed[1]			2 m/s (80 in/s)		
Maximum Linear Acceleration			2 g - 20 m/s^2 (768 in/s^2) (no-load)		
Maximum Load[2]			35.0 kg (77.2 lb)		
Continuous Stall Force[3,4]			93.6 N (21.0 lb)		
Peak Force[4]			542.8 N (122.0 lb)		
Overall Accuracy	**LN**[5]	**HALAR**	±0.2 µm (±8 µin)	±0.2 µm (±8 µin)	±0.5 µm (±20 µin)
		Standard	±1.0 µm (±40 µin)	±2.0 µm (±80 µin)	±5.0 µm (±200 µin)
	LT[5]	**HALAR**	±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)
Repeatability	**LN**		±0.1 µm (±4 µin)		±0.2 µm (±8 µin)
	LT		±0.1 µm (±4 µin)		±0.2 µm (±8 µin)
Straightness and Flatness[6]	**Maximum Deviation**		±0.25 µm (±10 µin)	±0.4 µm (±16 µin)	±0.5 µm (±20 µin)
Pitch/Roll/Yaw[6]			±0.5 arc sec	±1 arc sec	±2 arc sec
Operating Pressure[7]			80 psi (5.5 bar) ±5 psig (0.3 bar)		
Air Consumption[8]			<2 scfm		
Stage Mass			14.7 kg (32.4 lb)	16.0 kg (35.3 lb)	18.6 kg (41.0 lb)
Moving Mass (no load)			5.1 kg (11.2 lb)		
Material			Aluminum		
Finish			Hard Coating (62 Rockwell Hardness)		

Notes:
1. Maximum speed based on stage capability; maximum application velocity may be limited by system data rate and system resolution.
2. Maximum load based on bearing capability; maximum application load may be limited by acceleration requirements.
3. Thermal limitations of positioning stage with respect to performance may limit continuous force output.
4. Force may be limited by amplifier output.
5. Values with Aerotech controls and HALAR option.
6. Dependent on flatness of stage mounting surface.
7. To protect air bearing against under-pressure, an in-line pressure switch tied to the motion controller/amplifier E-stop input is recommended.
8. Air supply must be clean, dry to 0° F dewpoint and filtered to 0.25 µm or better; recommend nitrogen at 99.9% purity.
9. Maximum upper axis length is 200 mm when mounting the ABL1500 in an XY configuration.



Cantilever load performance for the ABL1500.

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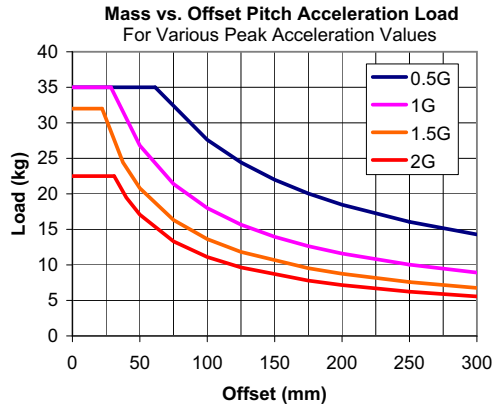
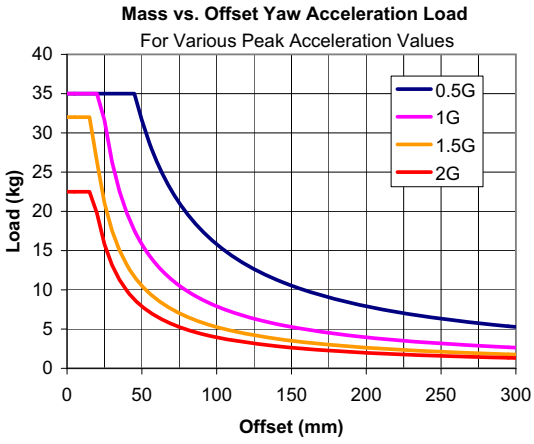
ABL1500 Series SPECIFICATIONS

Basic Model			ABL15030	ABL15040	ABL15050
Total Travel			300 mm (12 in)	400 mm (16 in)	500 mm (20 in)
Drive System			Linear Brushless Servomotor (BLMC-192-A)		
Bus Voltage			Up to 80 VDC		
Continuous Current	A_{pk}		Up to 4.00 A		
	A_{rms}		Up to 2.83 A		
Feedback			Noncontact Linear Encoder (LN or LT)		
Resolution	LN		0.001 µm - 0.2 µm (0.04 µin - 8 µin)		
	LT		0.005 µm - 1.0 µm (0.2 µin - 40 µin)		
Maximum Travel Speed[1]			2 m/s (80 in/s)		
Maximum Linear Acceleration			2 g - 20 m/s^2 (768 in/s^2) (no-load)		
Maximum Load[2]			35.0 kg (77.2 lb)		
Continuous Stall Force[3,4]			93.6 N (21.0 lb)		
Peak Force[4]			542.8 N (122.0 lb)		
Overall Accuracy	LN[5]	HALAR	±0.5 µm (±20 µin)	±0.75 µm (±30 µin)	±0.75 µm (±30 µin)
		Standard	±5.0 µm (±200 µin)	±5.0 µm (±200 µin)	±5.0 µm (±200 µin)
	LT[5]	HALAR	±0.5 µm (±20 µin)	±0.75 µm (±30 µin)	±0.75 µm (±30 µin)
		Standard	±12.0 µm (±480 µin)	±16.0 µm (±640 µin)	±20.0 µm (±800 µin)
Repeatability	LN		±0.2 µm (±8 µin)	±0.3 µm (±12 µin)	
	LT		±0.2 µm (±8 µin)	±0.3 µm (±12 µin)	
Straightness and Flatness[6]	Maximum Deviation		±0.75 µm (±30 µin)	±1.5 µm (±60 µin)	±2.0 µm (±80 µin)
Pitch/Roll/Yaw[6]			±3 arc sec	±4 arc sec	±5 arc sec
Operating Pressure[7]			80 psi (5.5 bar) ±5 psig (0.3 bar)		
Air Consumption[8]			<2 scfm		
Stage Mass			21.3 kg (47.0 lb)	23.9 kg (52.7 lb)	26.5 kg (58.4 lb)
Moving Mass (no load)			5.1 kg (11.2 lb)		
Material			Aluminum		
Finish			Hard Coating (62 Rockwell Hardness)		

Notes:
1. Maximum speed based on stage capability; maximum application velocity may be limited by system data rate and system resolution.
2. Maximum load based on bearing capability; maximum application load may be limited by acceleration requirements.
3. Thermal limitations of positioning stage with respect to performance may limit continuous force output.
4. Force may be limited by amplifier output.
5. Values with Aerotech controls and HALAR option.
6. Dependent on flatness of stage mounting surface.
7. To protect air bearing against under-pressure, an in-line pressure switch tied to the motion controller/amplifier E-stop input is recommended.
8. Air supply must be clean, dry to 0° F dewpoint and filtered to 0.25 µm or better; recommend nitrogen at 99.9% purity.
9. Maximum upper axis length is 200 mm when mounting the ABL1500 in an XY configuration.



Mass versus offset pitch acceleration load for the ABL1500.



Mass versus offset yaw acceleration load for the ABL1500.

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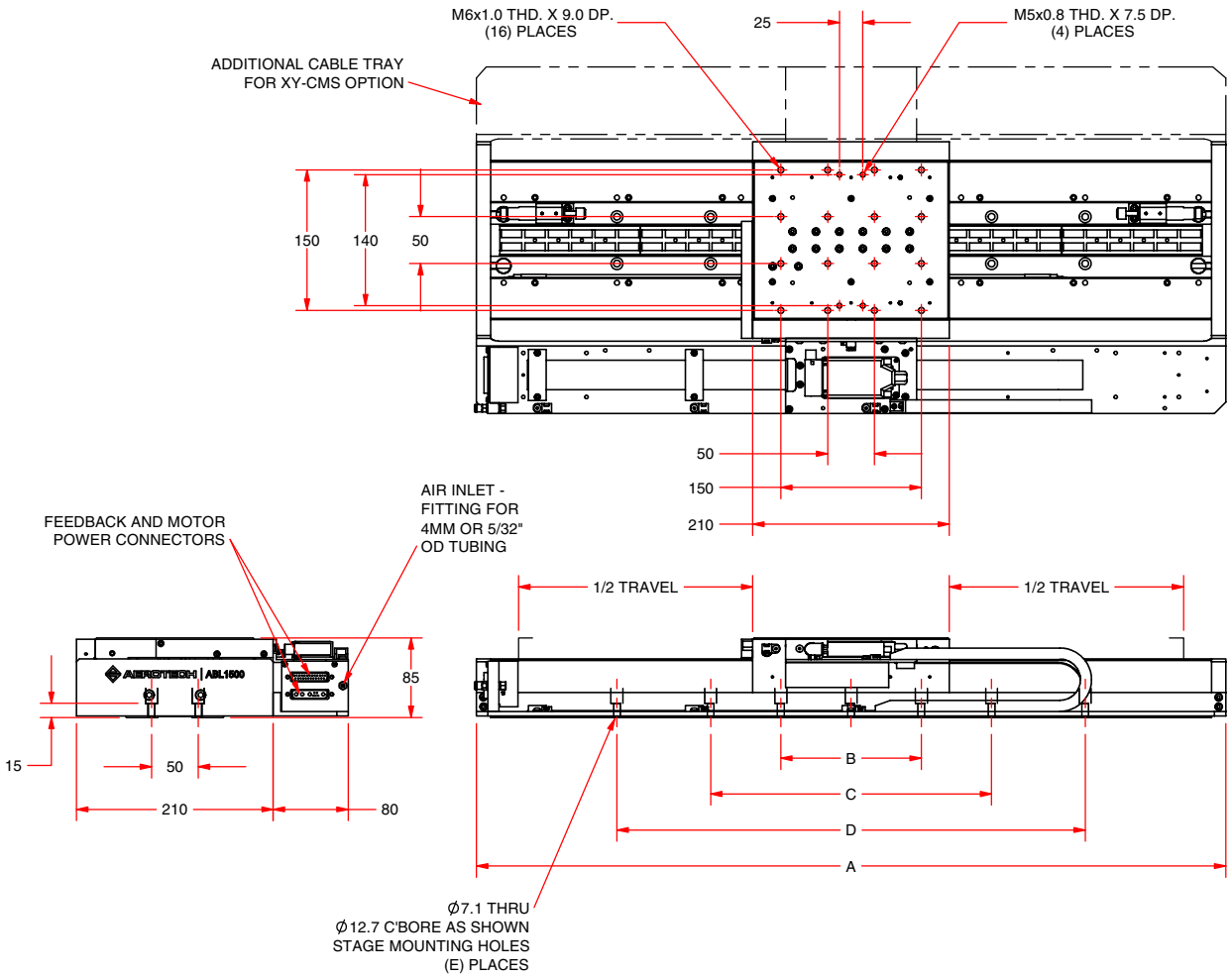
ABL1500 Series DIMENSIONS



BASIC MODEL	TRAVEL	DIMENSIONS - MILLIMETERS				
		A	B	C	D	E
ABL15005	50	350	150	-	-	4
ABL15010	100	400	150	-	-	4
ABL15020	200	500	150	250	-	10
ABL15030	300	600	150	300	-	10
ABL15040	400	700	150	300	450	14
ABL15050	500	800	150	300	500	14

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ABL1500 Series ORDERING INFORMATION

Ordering Example

ABL15	010	-M	-10	-NC	-LN10AS	-SINGLE-CMS
Series	Travel	Mounting and Grid Pattern	Motor	Limits	Linear Encoder	Options
	005 010 020 030 040 050	-M	-10	-NC	-LTnnAS -LTnnX50 -LNnnAS	-SINGLE-CMS -XY-CMS

ABL1500 Series Linear Air-Bearing Stage

ABL15005	50 mm (2 in) travel linear air-bearing stage with linear motor and limits
ABL15010	100 mm (4 in) travel linear air-bearing stage with linear motor and limits
ABL15020	200 mm (8 in) travel linear air-bearing stage with linear motor and limits
ABL15030	300 mm (12 in) travel linear air-bearing stage with linear motor and limits
ABL15040	400 mm (16 in) travel linear air-bearing stage with linear motor and limits
ABL15050	500 mm (20 in) travel linear air-bearing stage with linear motor and limits

Mounting and Grid Pattern

-M	Metric dimension mounting pattern and holes

Motor

-10	Brushless linear motor (BLMC-192-A)

Limits

-NC	Normally-closed end of travel limit switches (standard)

Standard Linear Encoders

-LT05AS	Linear encoder for ABL15005; amplified sine output
-LT10AS	Linear encoder for ABL15010; amplified sine output
-LT20AS	Linear encoder for ABL15020; amplified sine output
-LT30AS	Linear encoder for ABL15030; amplified sine output
-LT40AS	Linear encoder for ABL15040; amplified sine output
-LT50AS	Linear encoder for ABL15050; amplified sine output
-LT05X50	Linear encoder for ABL15005; 0.1 micron line driver output
-LT10X50	Linear encoder for ABL15010; 0.1 micron line driver output
-LT20X50	Linear encoder for ABL15020; 0.1 micron line driver output
-LT30X50	Linear encoder for ABL15030; 0.1 micron line driver output
-LT40X50	Linear encoder for ABL15040; 0.1 micron line driver output
-LT50X50	Linear encoder for ABL15050; 0.1 micron line driver output

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ABL1500 Series ORDERING INFORMATION

High-Accuracy Linear Encoders

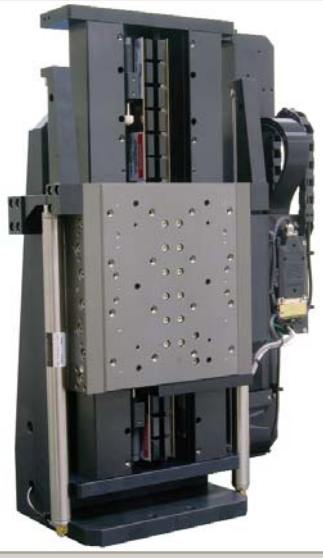
-LN05AS	High-accuracy linear encoder for ABL15005; amplified sine output
-LN10AS	High-accuracy linear encoder for ABL15010; amplified sine output
-LN20AS	High-accuracy linear encoder for ABL15020; amplified sine output
-LN30AS	High-accuracy linear encoder for ABL15030; amplified sine output
-LN40AS	High-accuracy linear encoder for ABL15040; amplified sine output
-LN50AS	High-accuracy linear encoder for ABL15050; amplified sine output

Options

-SINGLE-CMS	Cable management system for single-axis applications
-XY-CMS	Cable management system for X-Y assembly

Accessories (to be ordered as separate line item)

HALAR	High-accuracy system - linear error correction for accuracy and repeatability
ALIGNMENT-NPA	Non-precision XY assembly
ALIGNMENT-PA5	XY assembly; 5 arc sec orthogonal
ALIGNMENT-PA2	XY assembly; 2 arc sec orthogonal



Optional Z-axis configuration with integral counterbalance.

Optional wide-body version for improved flatness and load performance.

Optional environmental protection.

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