

# HexGen HEX300-230HL

## Hexapod Six-DOF Positioning System

Six degree-of-freedom positioning with linear travels to 60 mm and angular travels to 30°

Precision design with guaranteed positioning accuracy specifications

Minimum incremental motion to 20 nm in XYZ and 0.2  $\mu$ rad in  $\theta_x\theta_y\theta_z$

Flexible configurations and customization

Vacuum preparation available upon request

Powerful controls and software with visualization of work and tool coordinate systems

Aerotech's HexGen® hexapods represent the next-generation in six degree-of-freedom (DOF) positioning performance. The HEX300-230HL is the premier medium-load, ultra-precision hexapod for many applications ranging from sensor testing to synchrotron sample manipulation.

### Performance Unique to the Market

Many trade-offs exist in the design and specification of a motion system. With its high speeds and sub-micrometer precision, the HEX300-230HL eliminates compromises on application specifications. Aerotech's HexGen hexapods are the only hexapods on the market today that provide guaranteed positioning accuracy specifications below 5  $\mu$ m.

### Superior Structural Design

The HEX300-230HL is actuated with six high-accuracy struts built with precision preloaded bearings, ball screws, and drive components. Unlike competitive hexapods driven by DC brushed servomotors, the HEX300-230HL is driven by Aerotech's AC brushless, slotless servomotors that maximize device lifetime and performance. Directly coupling the AC brushless servomotors to the ball screw enables increased drive stiffness, higher positioning accuracy, and better minimum incremental motion (20 nm in XYZ and 0.2  $\mu$ rad for  $\theta_x\theta_y\theta_z$ ) when compared to competitive designs using belts, gearheads, or compliant couplings. Specially engineered strut pivot-joints provide low friction and high stiffness enhancing the overall hexapod performance.



*The HexGen HEX300-230HL is ideal for precision six DOF positioning.*

### Design Flexibility

The HEX300-230HL's design optimizes flexibility and customization options for the user. The platform and base can be easily modified with user-specific features or mounting patterns. The HEX300-230HL features a 100 mm diameter clear aperture in the platform while a 60 mm diameter clear aperture in the base allows workpiece access from the bottom. The base mounting holes adapt directly to English or metric optical tables.

### Vacuum Options Available

Aerotech hexapods can be vacuum prepared for demanding applications such as synchrotron sample or optics manipulation, semiconductor manufacturing and inspection, or satellite sensor testing.

### Powerful Controls and Software

Driving the HEX300-230HL is Aerotech's award-winning A3200 motion control software. Built on years of experience with difficult kinematics applications, the A3200 controller allows easy programming and control of the hexapod in any user-defined coordinate system.

Aerotech's HexSim™ software gives users the ability to easily visualize and simulate the available workspace. Tight integration between HexSim™ and the A3200 motion controller provides real-time motion visualization in any user-defined coordinate system. An intuitive graphical interface permits selection of the active coordinate system for easy virtual pivot-point programming and motion.

Mechanical Specifications			HEX300-230HL					
Axis			X	Y	Z	A (θx)	B (θy)	C (θz)
Travel <sup>(1)</sup>			55 mm	60 mm	25 mm	15 deg	15 deg	30 deg
Axis Positioning Accuracy <sup>(2,3)</sup>	Over Full Travel	Standard	±4 μm	±4 μm	±3 μm	±50 μrad (±10.3 arc-sec)	±50 μrad (±10.3 arc-sec)	±25 μrad (±5.2 arc-sec)
		ULTRA	±1 μm	±1 μm	±0.75 μm	±10 μrad (±2.1 arc-sec)	±10 μrad (±2.1 arc-sec)	±5 μrad (±1.0 arc-sec)
	Over any 10 mm (X, Y, Z) or 3 deg (A, B, C)	Standard	±1.25 μm	±1.25 μm	±1.25 μm	±12.5 μrad (±2.6 arc-sec)	±12.5 μrad (±2.6 arc-sec)	±7.5 μrad (±1.5 arc-sec)
		ULTRA	±0.75 μm	±0.75 μm	±0.5 μm	±5 μrad (±1.0 arc-sec)	±5 μrad (±1.0 arc-sec)	±2.5 μrad (±0.5 arc-sec)
Resolution (Minimum Incremental Motion)			20 nm	20 nm	20 nm	0.2 μrad (0.04 arc sec)	0.2 μrad (0.04 arc sec)	0.2 μrad (0.04 arc sec)
Bidirectional Repeatability, pk-pk <sup>(3)</sup>			±0.75 μm	±0.75 μm	±0.35 μm	±2 μrad (±0.4 arc sec)	±2 μrad (±0.4 arc sec)	±2 μrad (±0.4 arc sec)
Unidirectional Repeatability, pk-pk			±0.35 μm	±0.35 μm	±0.15 μm	±1 μrad (±0.2 arc sec)	±1 μrad (±0.2 arc sec)	±1 μrad (±0.2 arc sec)
Maximum Speed <sup>(4)</sup>			50 mm/s	50 mm/s	25 mm/s	15 deg/s	15 deg/s	30 deg/s
Load Capacity, All Positions <sup>(5)</sup>		Vertical	45 kg (Push); 40 kg (Pull)					
		Horizontal	21 kg					
Holding Capacity, De-Energized <sup>(6)</sup>			14 kg					
Stage Mass			12.0 kg					
Material			Anodized Aluminum Platform and Base; Steel Used in Joints and Inside Struts					

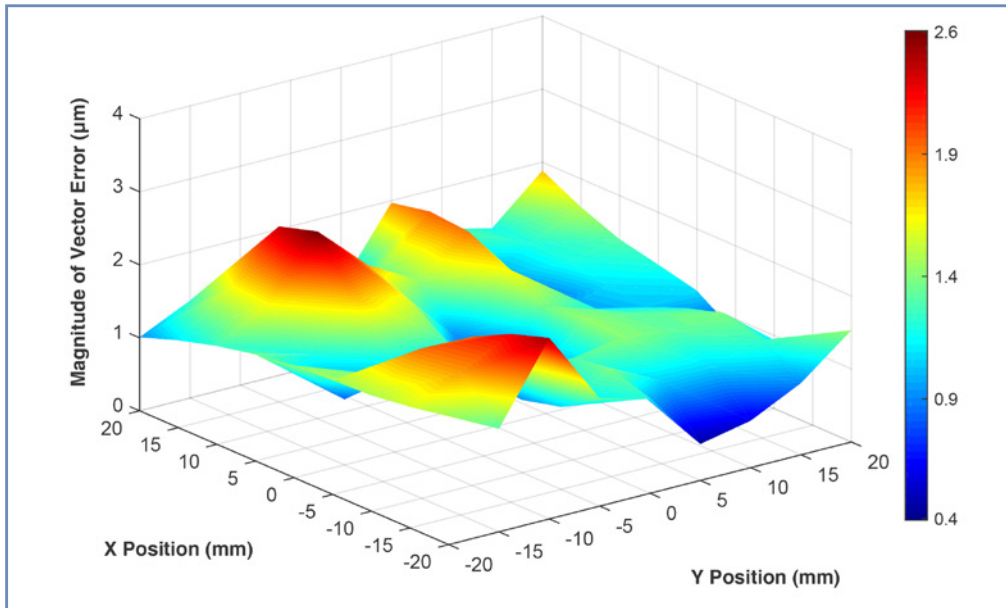
Notes:

1. Travels are mutually-exclusive. Consult our HexGen workspace simulator for detailed workspace sizing.
2. Measured with single-axis moves at a height of 50 mm above the moving platform. Results can be payload and workpoint dependent.
3. X, Y, Z performance certified as standard. X, Y, Z, A, B, C performance certified with ULTRA.
4. Requires the selection of an appropriate amplifier with sufficient voltage and current.
5. Centered loading – consult load curves.
6. Horizontal base plate, centered loading – consult load curves.

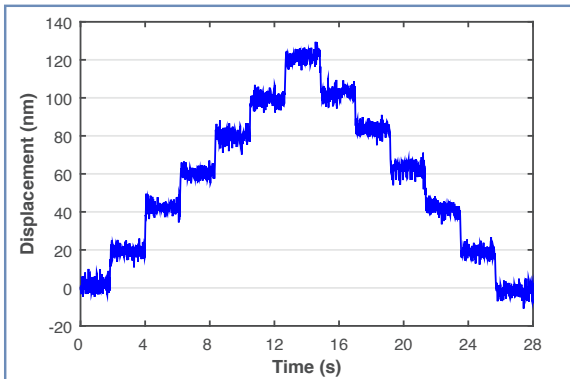
Electrical Specifications	
Drive System	Precision Ball Screw, Brushless Servomotor
Feedback	Noncontact Encoder – Incremental and Absolute Options
Maximum Bus Voltage	80 VDC
Limit Switches	5 V, Normally-Closed (Located on Each Strut)

Recommended Controller		
Multi-Axis	Standard	HEX RC
	Optional	Npaq, Ndrive CP, Ndrive HLe

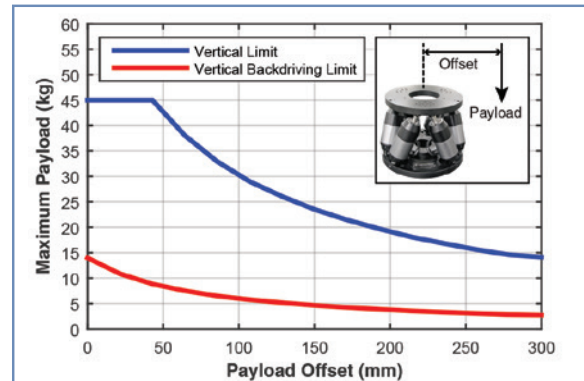
## HEX300-230HL SPECIFICATIONS



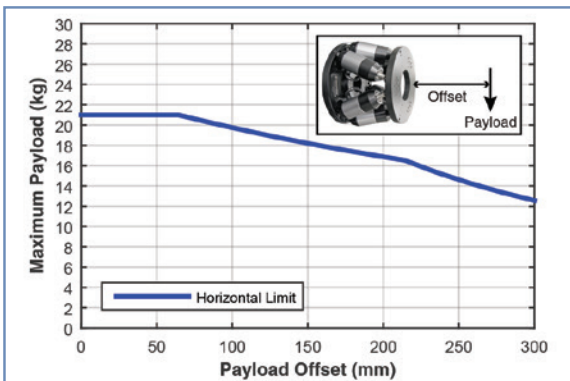
HEX300-230HL three-dimensional accuracy error measured when commanded to move in the XY plane at a Z position of 0 mm. The measurement was taken with three interferometers (X, Y, and Z directions) targeting a three-sided optic. The results show the outstanding three-dimensional accuracy capability of the HEX300-230HL.



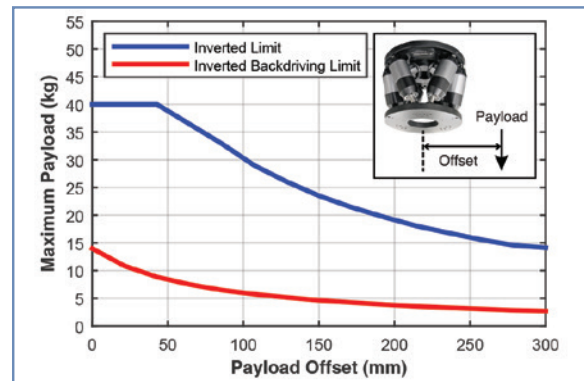
Minimum incremental step plot of the X-axis of the HEX300-230HL. All axes of the HEX300-230HL have industry-leading resolutions enabling higher-resolution processes.



HEX300-230HL vertical load capacity.

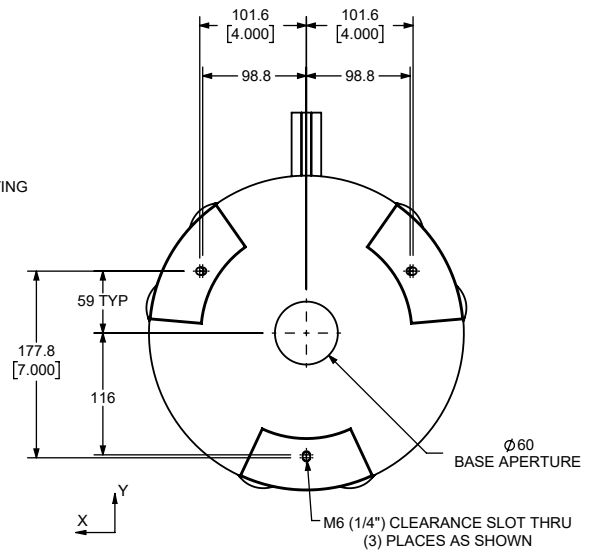
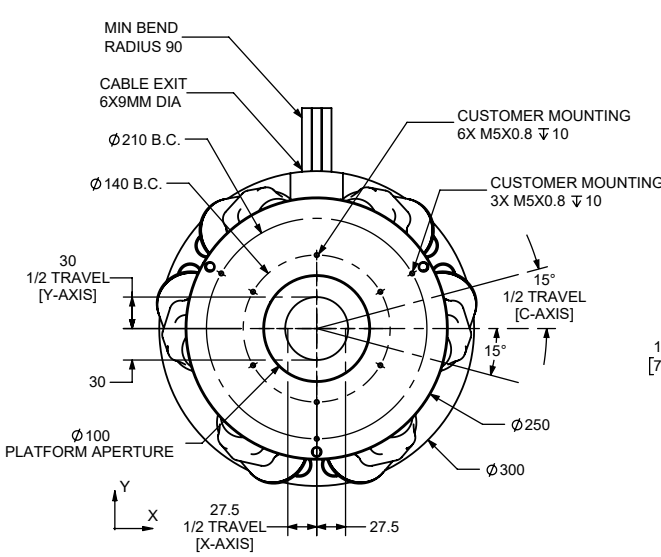
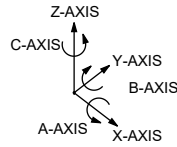
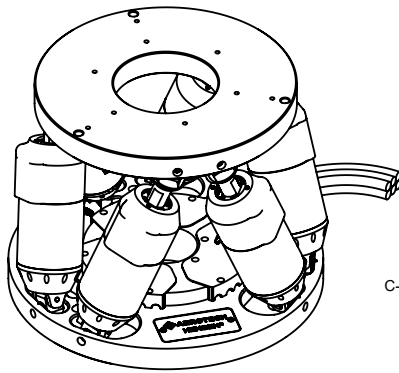


HEX300-230HL horizontal load capacity.



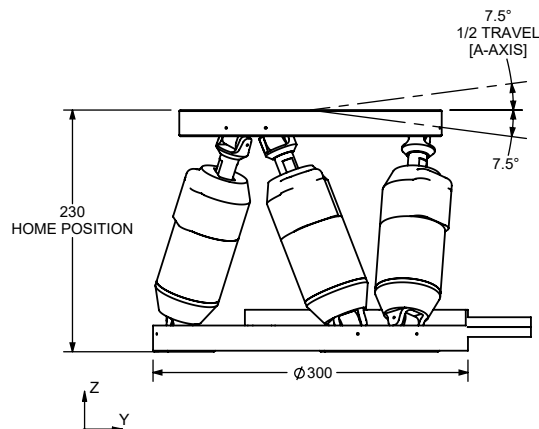
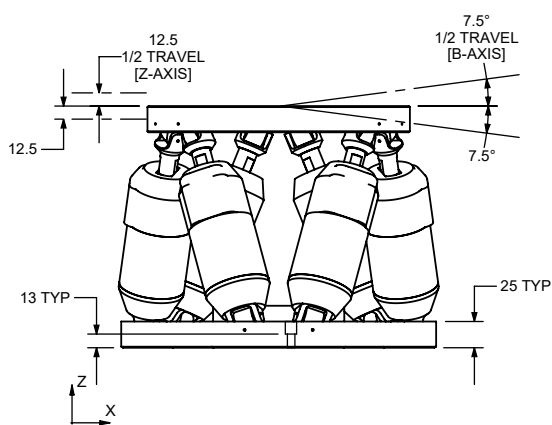
HEX300-230HL inverted load capacity.

# HEX300-230HL DIMENSIONS

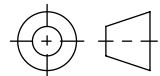


BOTTOM VIEW

NOTE: ALL TRAVELS SPECIFIED AS SINGLE-AXIS MOVES FROM HOME POSITION



DIMENSIONS: MILLIMETERS [INCHES]



## HEX300-230HL ORDERING INFORMATION

### Feedback (Required)

-E1	Incremental encoders
-E2	Absolute encoders

### Performance Grade (Required)

-PL3	Base performance
-PL4	Ultra high-accuracy performance, ULTRA

### 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 that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.</p>