

# LINEAR STAGES **PLANAR<sub>DL</sub> SERIES**



*Aerotech's Planar<sub>DL</sub> – Superior Planar Performance*

Aerotech's Planar<sub>DL</sub>-series stages offer excellent geometric and dynamic performance in a compact, low-profile package. A variety of travel and performance options make this stage ideal for applications ranging from surface profilometry to LED wafer scribing.

## **Superior Stage Design**

The Planar<sub>DL</sub> XY design allows for industry-leading planar geometric performance in applications where straightness and flatness of motion are critical. High-precision anti-creep crossed-roller bearings, precision-machined surfaces and Aerotech linear motors driving through the axes' center-of-stiffness result in a positioning stage with exceptional geometric tolerances.

The Planar<sub>DL</sub> structural elements are optimized for high-dynamics and high-stiffness for the most demanding dynamic applications. Capable of achieving 1 m/s velocities and 1.5 g accelerations, the Planar<sub>DL</sub> enables high-throughput, high-accuracy processing resulting in superior process yield and a low total cost of ownership. Unlike competitive products using recirculating bearings, the anti-creep crossed-roller bearings used in this design permit smooth motion making this an ideal stage solution for challenging scanning applications.

## **Noncontact Direct-Drive Technology**

Only noncontact, direct-drive technology offers high-speed and accurate positioning coupled with maintenance-free operation and long service life. At the heart of the Planar<sub>DL</sub> is Aerotech's proprietary direct-drive technology. This drive technology allows

for unmatched performance compared to other competitive screw-based and linear motor designs.

The Planar<sub>DL</sub>-200XY and -300XY stages are both available with one or two motors per axis, allowing optimization of each individual axis for the specific application and process. Regardless of the number of motors selected, the resulting drive force acts through the centers of friction and stiffness resulting in superior geometric performance and accuracy.

## **Integrated Cable Management**

The cable management system on the Planar<sub>DL</sub> is integrated into the stage and optimized for long life and performance. Additional standard options are available for extra servo axes or air/vacuum lines for vacuum chucks or other process pneumatics.

## **Extreme Positioning Performance**

The Planar<sub>DL</sub> is available in three positioning performance options. Relying upon decades of experience in system-level design including not only positioning mechanics, but also software and electronics, Aerotech has developed advanced technologies to push the envelope of precision. High-performance -PLUS and -ULTRA options are available to enable accuracies and straightness values down to  $\pm 400$  nm and orthogonality down to 1 arc second.

## — PRODUCT HIGHLIGHTS —

Integrated, low-profile, XY, linear-motor stage

Excellent geometric performance (straightness to  $\pm 0.4$   $\mu\text{m}$ ; flatness to  $\pm 1$   $\mu\text{m}$ )

Anti-creep, precision crossed-roller bearings

Large selection – nine models in travel and accuracy

## Planar<sub>DL</sub> Series Specifications

Mechanical Specifications	Planar <sub>DL</sub> -100XY			Planar <sub>DL</sub> -200XY			Planar <sub>DL</sub> -300XY			
	-PL1	-PL3 <sup>(1)</sup>	-PL4 <sup>(1)</sup>	-PL1	-PL3 <sup>(1)</sup>	-PL4 <sup>(1)</sup>	-PL1	-PL3 <sup>(1)</sup>	-PL4 <sup>(1)</sup>	
<b>Travel</b>	100 mm x 100 mm			200 mm x 200 mm			300 mm x 300 mm			
<b>Accuracy</b>	±3 µm	±0.4 µm	±0.4 µm	±4 µm		±0.5 µm	±5 µm	±0.75 µm	±0.75 µm	
<b>Bidirectional Repeatability<sup>(2)</sup></b>	±0.1 µm									
<b>Resolution (Minimum Incremental Motion)</b>	3 nm									
<b>Straightness</b>	±1 µm		±0.4 µm	±1.5 µm		±0.5 µm	±2 µm		±0.75 µm	
<b>Flatness</b>	±1 µm			±1.5 µm			±2 µm			
<b>Pitch</b>	12 arc sec			15 arc sec			18 arc sec			
<b>Roll</b>	12 arc sec			15 arc sec			18 arc sec			
<b>Yaw</b>	6 arc sec			8 arc sec			10 arc sec			
<b>Orthogonality</b>	20 arc sec	5 arc sec	1 arc sec	20 arc sec	5 arc sec	1 arc sec	20 arc sec	5 arc sec	1 arc sec	
<b>Maximum Speed</b>	500 mm/s			750 mm/s			1000 mm/s			
<b>Maximum Acceleration (No Load; Upper Axis)</b>	1.5 g			1.0 g (x1 Motor) 1.5 g (x2 Motors)			1.0 g (x1 Motor) 1.5 g (x2 Motors)			
<b>Maximum Force (Continuous)</b>	26 N			31 N (x1 Motor) 62 N (x2 Motors)			78 N (x1 Motor) 156 N (x2 Motors)			
<b>Load Capacity<sup>(3)</sup></b>	<b>Horizontal</b>	15 kg			20 kg			30 kg		
<b>Moving Mass</b>	<b>Upper Axis</b>	2.9 kg			6.3 kg (-M1 or -M3 Motor) 7.4 kg (-M2 or -M4 Motor)			16.3 kg (-M1 or -M3 Motor) 19.1 kg (-M2 or -M4 Motor)		
	<b>Lower Axis</b>	8.4 kg			16.8 kg (-M1 Motor) 17.8 kg (-M2 or -M3 Motor) 19.0 kg (-M4 Motors)			45.0 kg (-M1 Motor) 48.1 kg (-M2 or -M3 Motor) 50.9 kg (-M4 Motors)		
<b>Stage Mass<sup>(4)</sup></b>	11 kg			23-25 kg			53-63 kg			
<b>Material</b>	Black Anodized Aluminum									
<b>MTBF (Mean Time Between Failure)</b>	30,000 Hours									

**Notes:**

1. The -PL3 and -PL4 options require the use of an Aerotech controller.
2. Repeatability specification assumes a feedback resolution of 20 nm or less.
3. On-axis loading for orientation listed.
4. Stage mass is a function of motor configuration.
5. Specifications for -PL1 and -PL3 options are per axis measured 25 mm above the tabletop. Specifications for -PL4 are XY measured 25 mm above the tabletop.

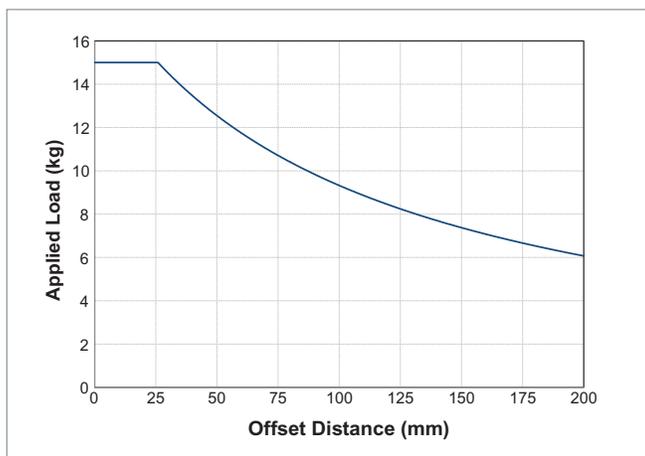


Planar<sub>DL</sub>-200XY with -CMS2 option.

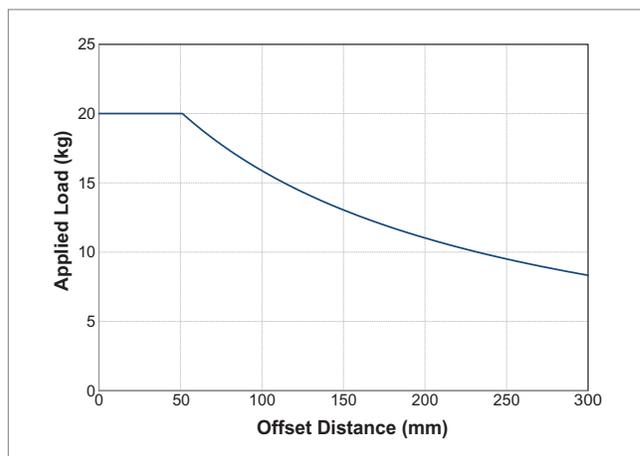
## Planar<sub>DL</sub> Series Specifications

Electrical Specifications	Planar <sub>DL</sub> -100XY	Planar <sub>DL</sub> -200XY	Planar <sub>DL</sub> -300XY
Drive System	Brushless Linear Servomotor		
Feedback	Noncontact Linear Encoder		
Maximum Bus Voltage	340 VDC		
Limit Switches	5 V, Normally Closed		
Home Switch	Near Center of XY Travel		

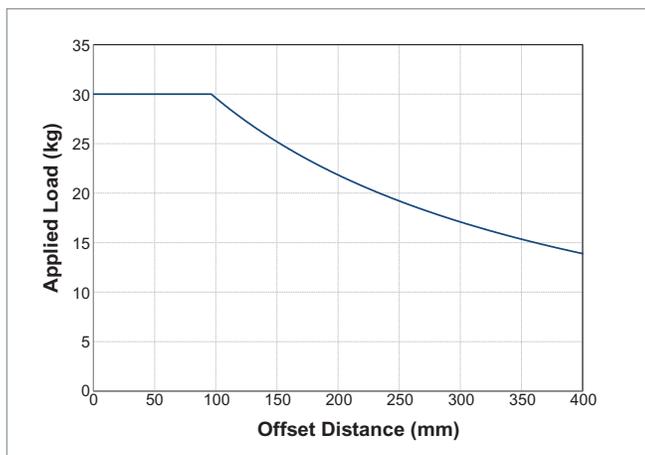
Recommended Controller	Planar <sub>DL</sub> -100XY	Planar <sub>DL</sub> -200XY	Planar <sub>DL</sub> -300XY
Multi-Axis	A3200	Ndrive CP, Ndrive HLe/HPe, Npaq	
	Ensemble	Ensemble CP, Ensemble HLe/HPe	
Single Axis	Soloist	Soloist CP, Soloist HLe/HPe	



Planar<sub>DL</sub>-100XY applied load versus offset distance.

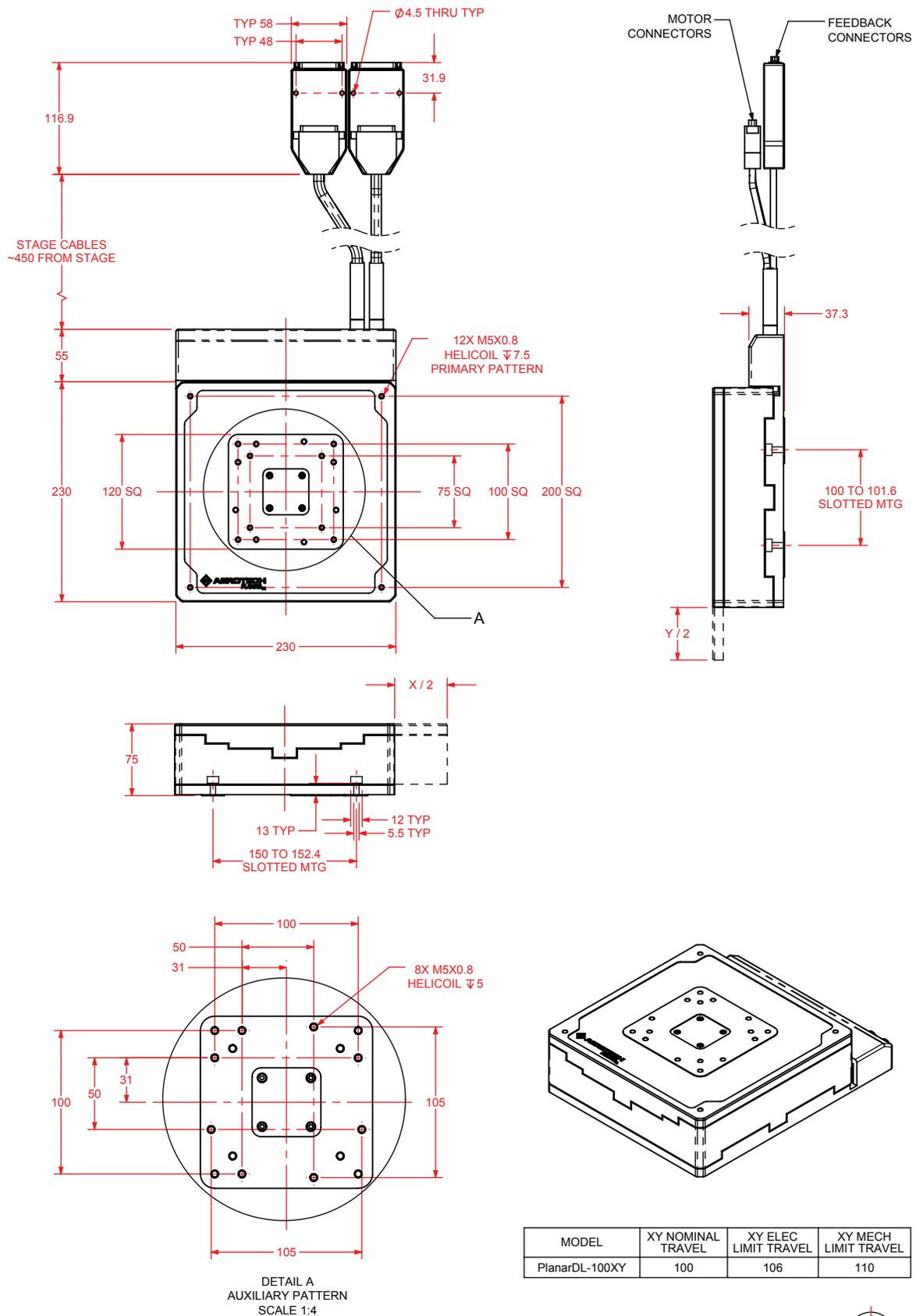


Planar<sub>DL</sub>-200XY applied load versus offset distance.



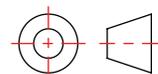
Planar<sub>DL</sub>-300XY applied load versus offset distance.

# Planar<sub>DL</sub>-100XY Dimensions

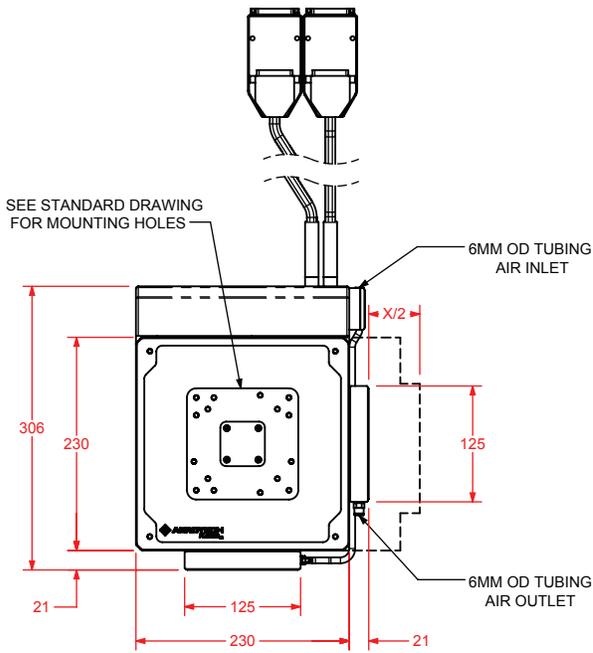


MODEL	XY NOMINAL TRAVEL	XY ELEC LIMIT TRAVEL	XY MECH LIMIT TRAVEL
PlanarDL-100XY	100	106	110

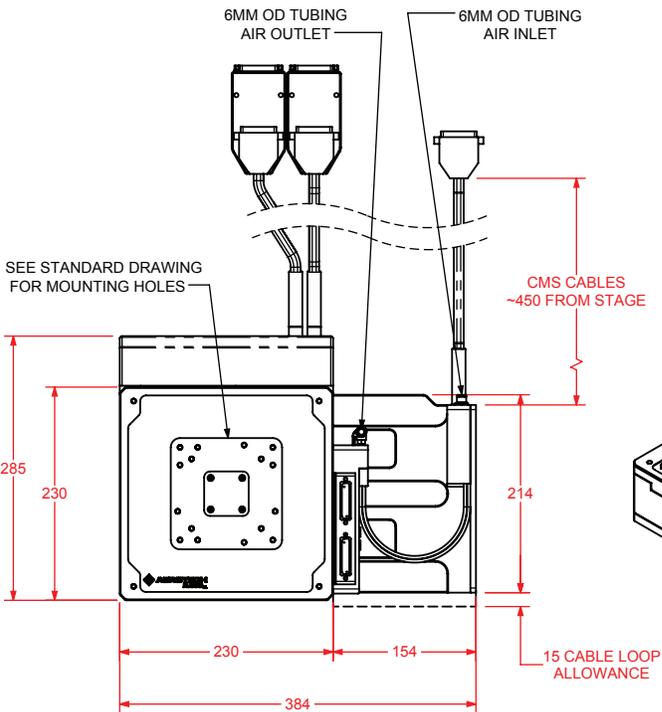
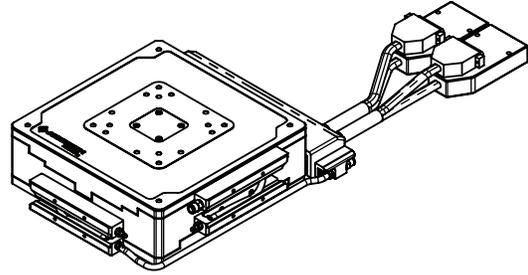
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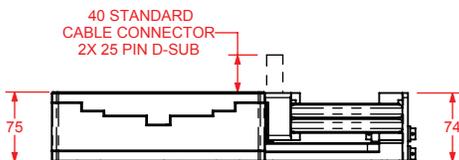
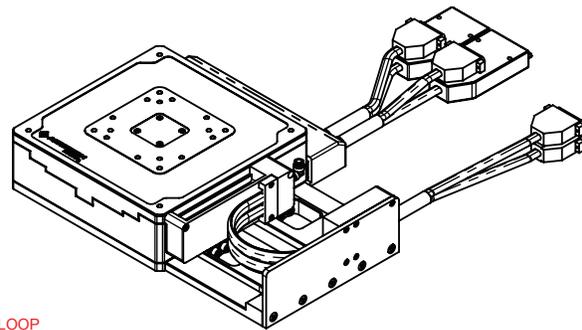
Planar<sub>DL</sub>-100XY-CMS1/2 Dimensions



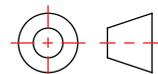
-CMS1



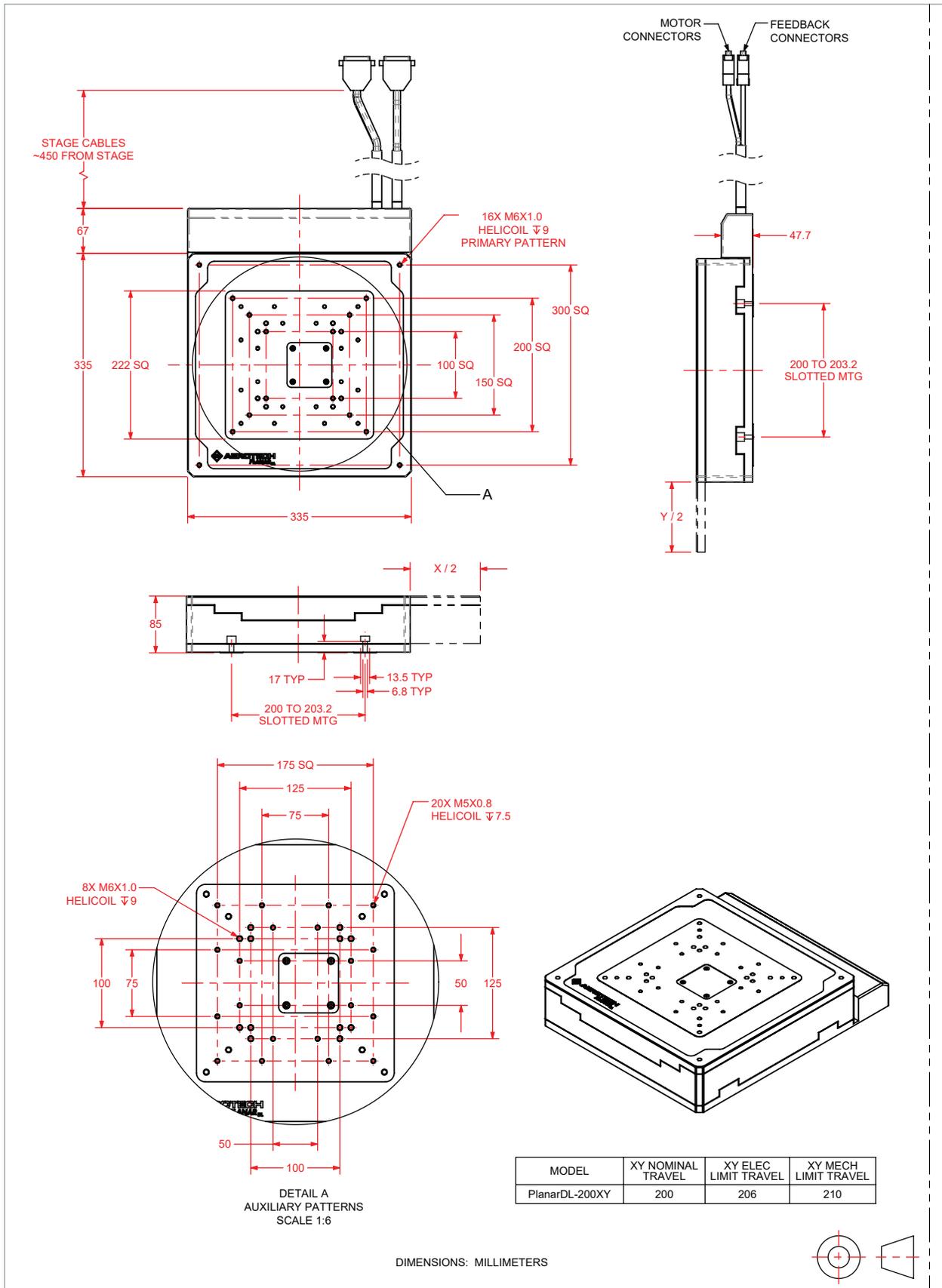
-CMS2



DIMENSIONS: MILLIMETERS

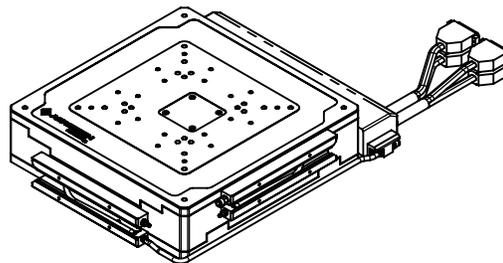
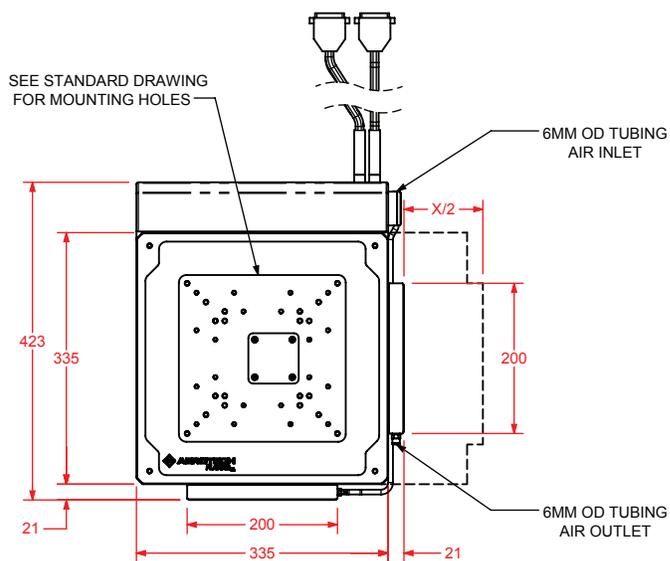


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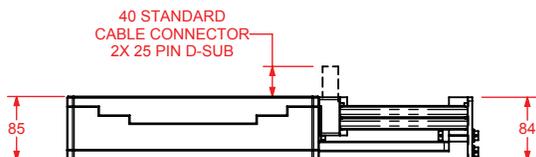
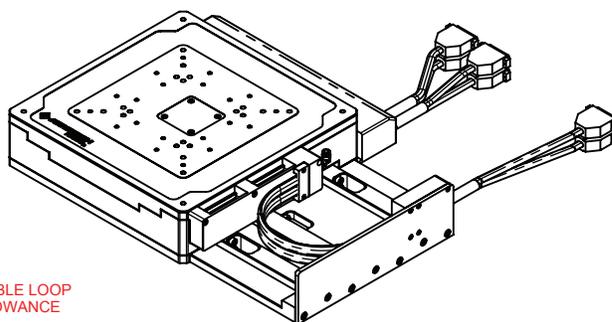
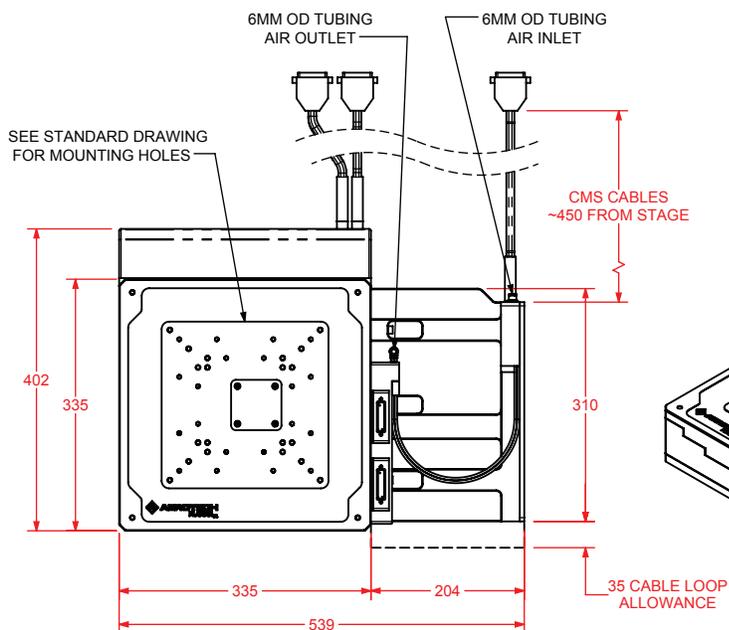


# Planar<sub>DL</sub>-200XY-CMS1/2 Dimensions

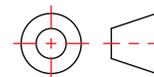
## -CMS1



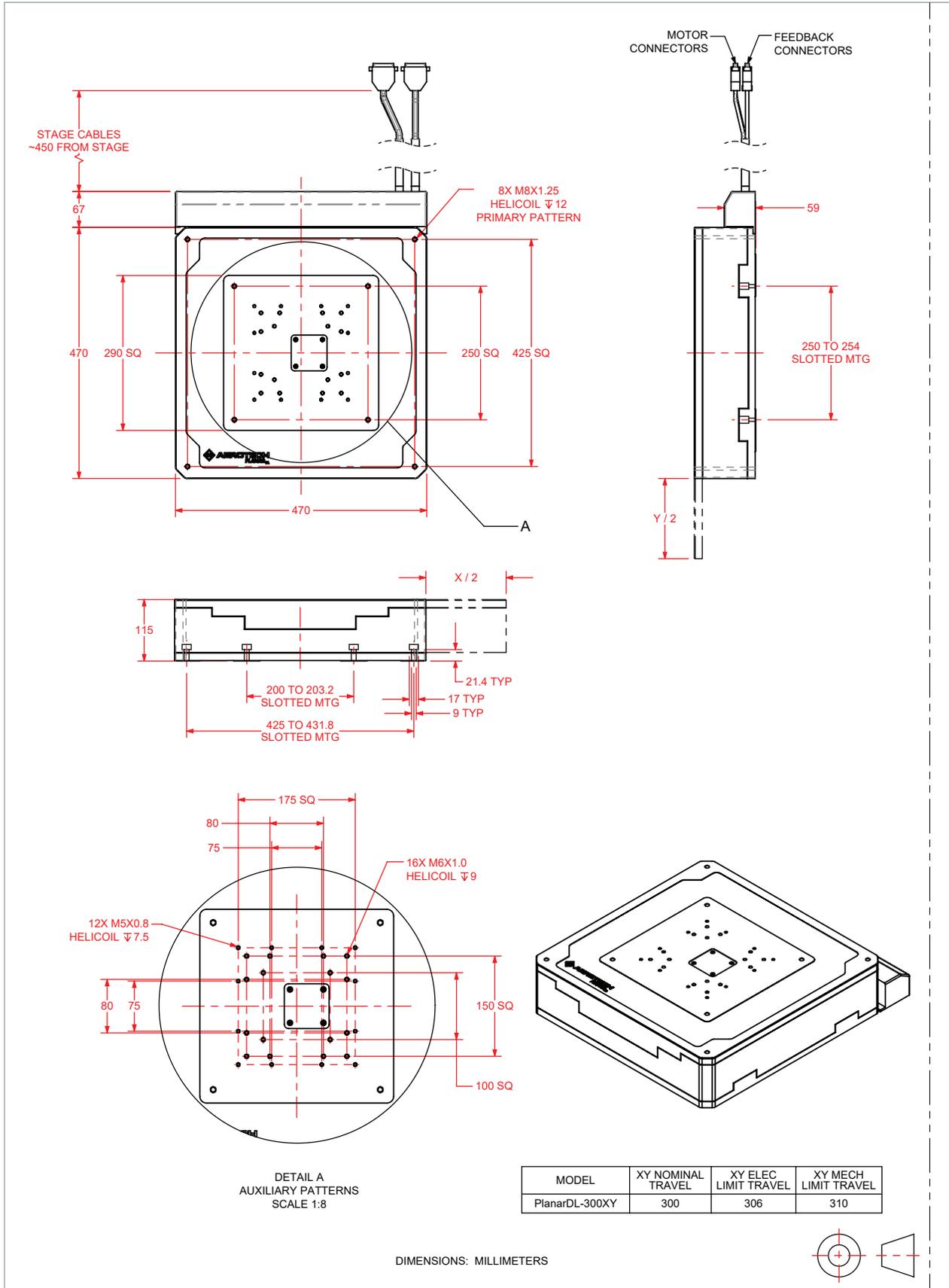
## -CMS2



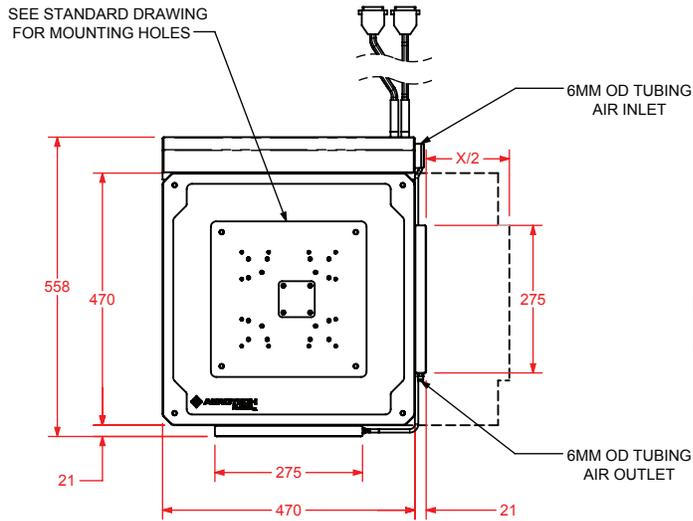
DIMENSIONS: MILLIMETERS



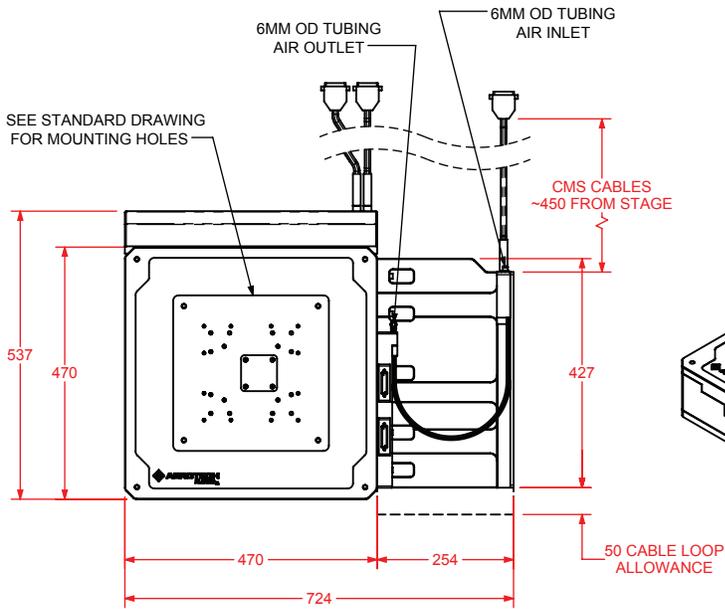
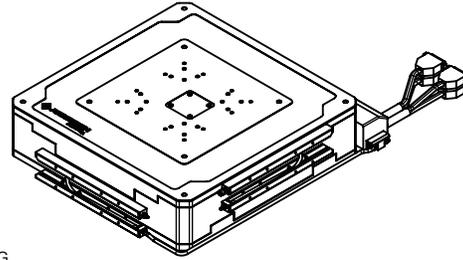
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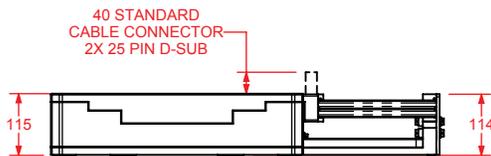
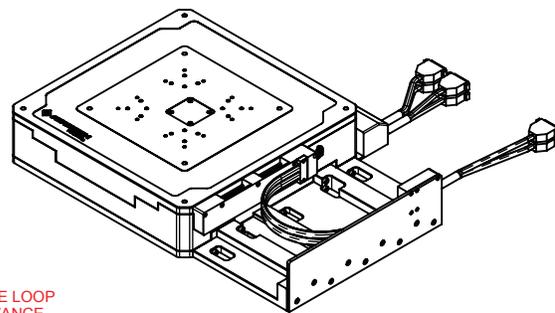
Planar<sub>DL</sub>-300XY-CMS1/2 Dimensions



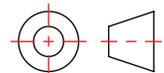
**-CMS1**



**-CMS2**



DIMENSIONS: MILLIMETERS



## Planar<sub>DL</sub> Series **Ordering Information**

### Planar<sub>DL</sub> Two Axis Mechanical-Bearing Direct-Drive Linear Stage

Planar <sub>DL</sub> -100XY	Two axis mechanical-bearing direct-drive linear stage, 100 x 100 mm travel
Planar <sub>DL</sub> -200XY	Two axis mechanical-bearing direct-drive linear stage, 200 x 200 mm travel
Planar <sub>DL</sub> -300XY	Two axis mechanical-bearing direct-drive linear stage, 300 x 300 mm travel

### Motor (Required) - Not Applicable for Planar<sub>DL</sub>-100XY

-M1	1 motor on upper axis; 1 motor on lower axis
-M2	2 motors on upper axis; 1 motor on lower axis
-M3	1 motor on upper axis; 2 motors on lower axis
-M4	2 motors on upper axis; 2 motors on lower axis

### Feedback (Required)

-E1	Incremental encoders, 1 Vpp on upper and lower axes
-E2	Incremental encoders, 0.1 μm Digital RS422 on upper axis, 1 Vpp on lower axis
-E3	Incremental encoders, 1 Vpp on upper axis, 0.1 μm Digital RS422 on lower axis
-E4	Incremental encoders, 0.1 μm Digital RS422 on upper and lower axes

### Cable Management (Optional)

-CMS1	Cable management for air/vacuum line
-CMS2	Cable management for air/vacuum line and 3rd axis motor/feedback

### Performance Grade (Required)

-PL1	Base performance
-PL3	High-accuracy performance, PLUS
-PL4	Ultra-high accuracy 2D performance, ULTRA

Note: -PL3 and -PL4 performance grades require Aerotech controller.

### 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	Integration - Test as system 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.
-TAC	Integration - Test as components 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.