

Planar_{DL} Series

Two Axis, Mechanical Bearing, Direct-Drive Linear Stage

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



Aerotech's Planar_{DL} – Superior Planar Performance

Aerotech's Planar_{DL}-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_{DL} 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_{DL} 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_{DL} 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_{DL}

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_{DL}-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_{DL} 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_{DL} 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 $\pm 400 \text{ nm}$ and orthogonality down to 1 arc second.

Planar_{DL} SPECIFICATIONS

| Mechanical Specifications | Planar _{DL} -100XY | | | Planar _{DL} -200XY | | | Planar _{DL} -300XY | | | |
|--|-----------------------------|----------------------|-----------------------|---------------------------------------|---|-----------------------|---------------------------------------|---|-----------------------|--|
| | - | -PLUS ⁽¹⁾ | -ULTRA ⁽⁴⁾ | - | -PLUS ⁽¹⁾ | -ULTRA ⁽⁴⁾ | - | -PLUS ⁽¹⁾ | -ULTRA ⁽⁴⁾ | |
| Travel | 100 mm x 100 mm | | | 200 mm x 200 mm | | | 300 mm x 300 mm | | | |
| Accuracy | ±3 µm | ±0.4 µm | ±0.4 µm | ±4 µm | ±0.5 µm | ±0.5 µm | ±5 µm | ±0.75 µm | ±0.75 µm | |
| Bidirectional Repeatability ⁽²⁾ | ±0.1 µm | | | | | | | | | |
| Resolution (Minimum Incremental Motion) | 3 nm | | | | | | | | | |
| Straightness | ±1 µm | | ±0.4 µm | ±1.5 µm | | ±0.5 µm | ±2 µm | | ±0.75 µm | |
| Flatness | ±1 µm | | | ±1.5 µm | | | ±2 µm | | | |
| Pitch | 12 arc sec | | | 15 arc sec | | | 18 arc sec | | | |
| Roll | 12 arc sec | | | 15 arc sec | | | 18 arc sec | | | |
| Yaw | 6 arc sec | | | 8 arc sec | | | 10 arc sec | | | |
| Orthogonality | 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 | |
| Maximum Speed | 500 mm/s | | | 750 mm/s | | | 1000 mm/s | | | |
| Maximum Acceleration (No Load; Upper Axis) | 1.5 g | | | 1.0 g (X1 Motor) 1.5 g (X2 Motors) | | | 1.0 g (X1 Motor) 1.5 g (X2 Motors) | | | |
| Maximum Force (Continuous) | 26 N | | | 31 N (X1 Motor) 62 N (X2 Motors) | | | 78 N (X1 Motor) 156 N (X2 Motors) | | | |
| Load Capacity ⁽³⁾ | Horizontal | 15 kg | | | 20 kg | | | 30 kg | | |
| Moving Mass | Upper Axis | 2.9 kg | | | 6.3 kg (-UX1 Motor) 7.4 kg (-UX2 Motor) | | | 16.3 kg (-UX1 Motor) 19.1 kg (-UX2 Motor) | | |
| | Lower Axis | 8.4 kg | | | 16.8 kg (-LX1-UX1 Motor) 17.8 kg (-LX1-UX2 or -LX2-UX1 Motor) 19.0 kg (-LX2-UX2 Motors) | | | 45.0 kg (-LX1-UX1 Motor) 48.1 kg (-LX1-UX2 or -LX2-UX1 Motor) 50.9 kg (-LX2-UX2 Motors) | | |
| Stage Mass ⁽⁴⁾ | 11 kg | | | 23-25 kg | | | 53-63 kg | | | |
| Material | Black Anodized Aluminum | | | | | | | | | |
| MTBF (Mean Time Between Failure) | 30,000 Hours | | | | | | | | | |

Notes:

1. The -PLUS and -ULTRA 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 a function of motor configuration.
5. Specifications for Base and -PLUS options are per axis measured 25 mm above the tabletop. Specifications for -ULTRA are XY measured 25 mm above the tabletop.

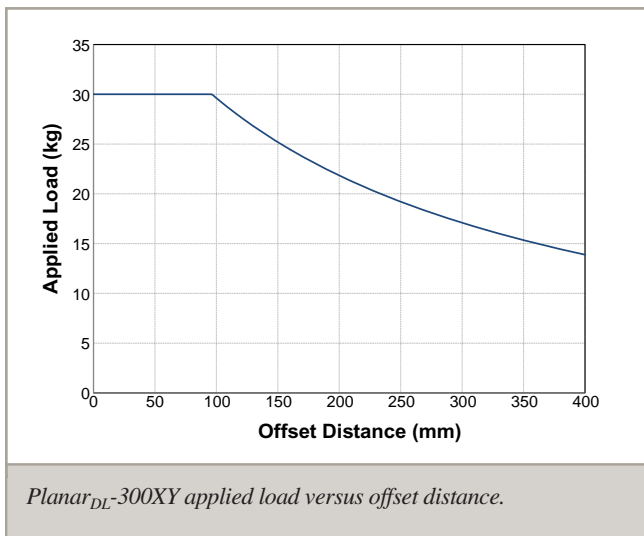
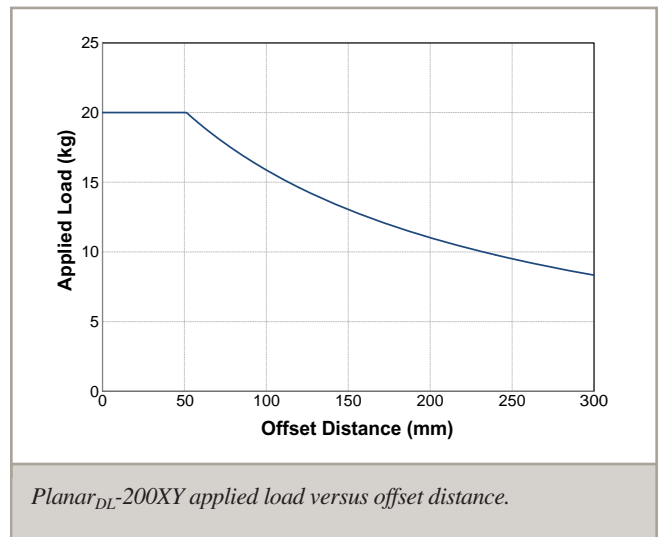
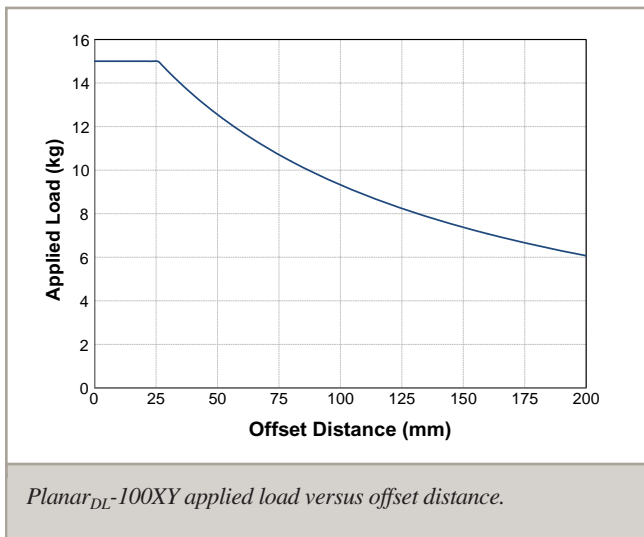


Planar_{DL}-200XY with -CMS2 option.

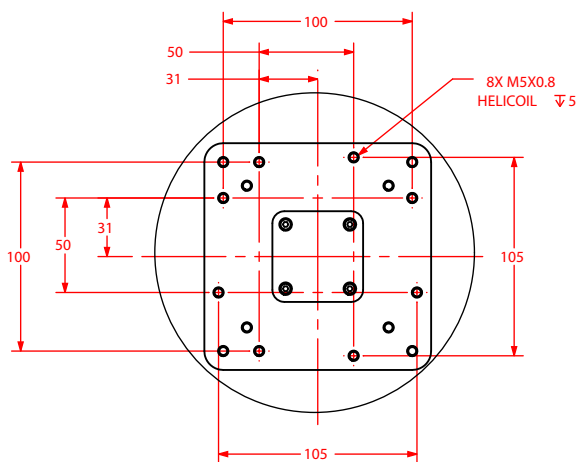
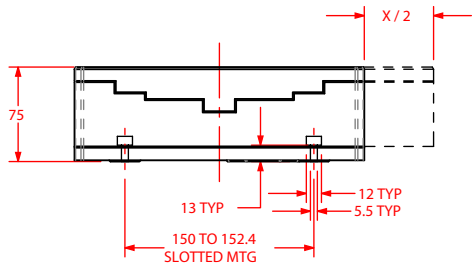
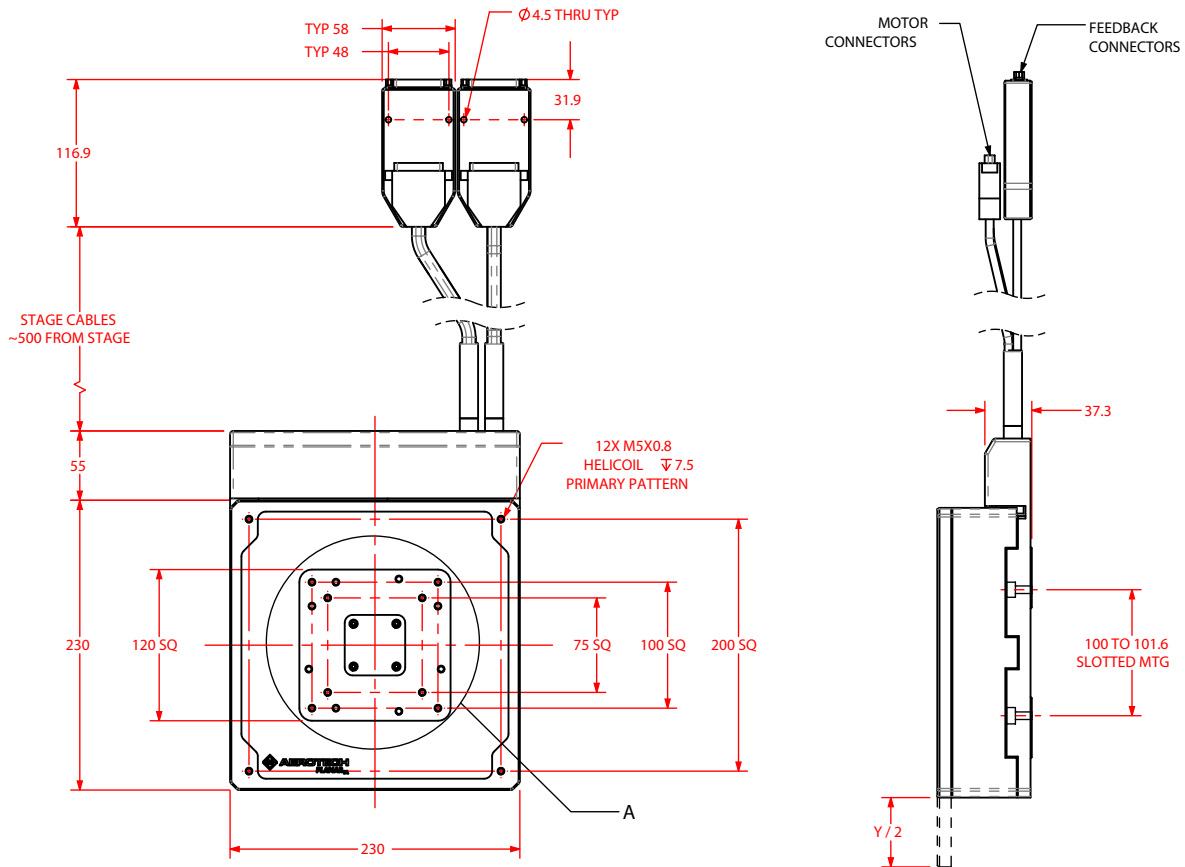
Planar_{DL} SPECIFICATIONS

| Electrical Specifications | Planar _{DL} -100XY | Planar _{DL} -200XY | Planar _{DL} -300XY |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|
| Drive System | Brushless Linear Servomotor | | |
| Feedback | Noncontact Linear Encoder | | |
| Maximum Bus Voltage | 320 VDC | | |
| Limit Switches | 5 V, Normally Closed | | |
| Home Switch | Near Center of XY Travel | | |

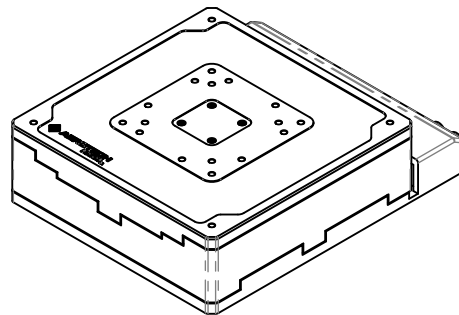
| Recommended Controller | Planar _{DL} -100XY | Planar _{DL} -200XY | Planar _{DL} -300XY |
|------------------------|-----------------------------|---------------------------------|-----------------------------|
| Multi-Axis | A3200 | Ndrive CP, Ndrive HLe/HPe, Npaq | |
| | Ensemble | Ensemble CP, Ensemble HLe/HPe | |
| Single Axis | Soloist | Soloist CP, Soloist HLe/HPe | |



Planar_{DL}-100XY-CMS0 DIMENSIONS

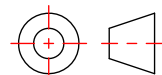


DETAIL A
AUXILIARY PATTERN
SCALE 1:4



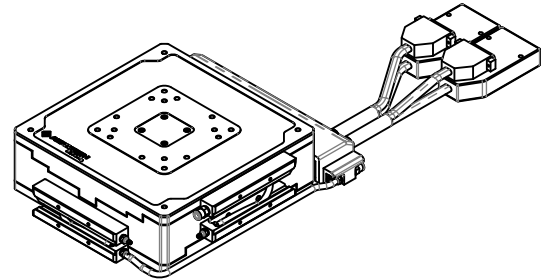
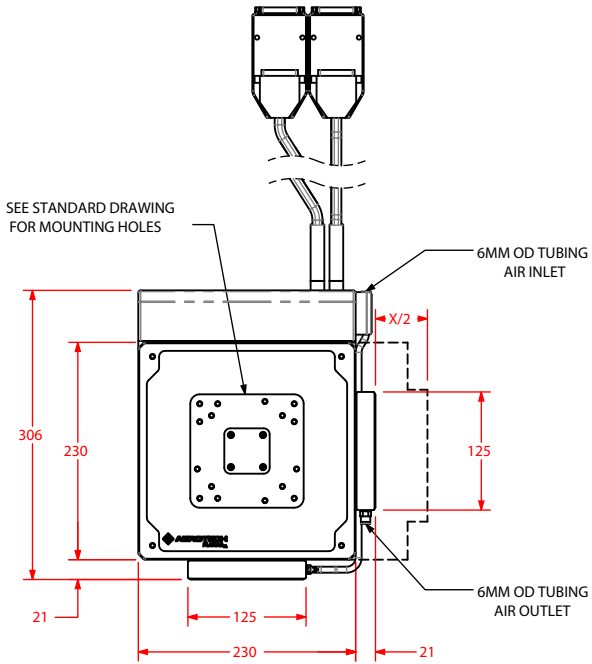
| MODEL | XY NOMINAL TRAVEL | XY ELEC LIMIT TRAVEL | XY MECH LIMIT TRAVEL |
|----------------|-------------------|----------------------|----------------------|
| PlanarDL-100XY | 100 | 106 | 110 |

DIMENSIONS: MILLIMETERS

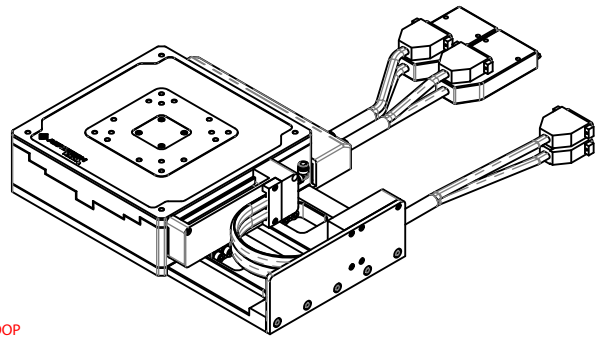
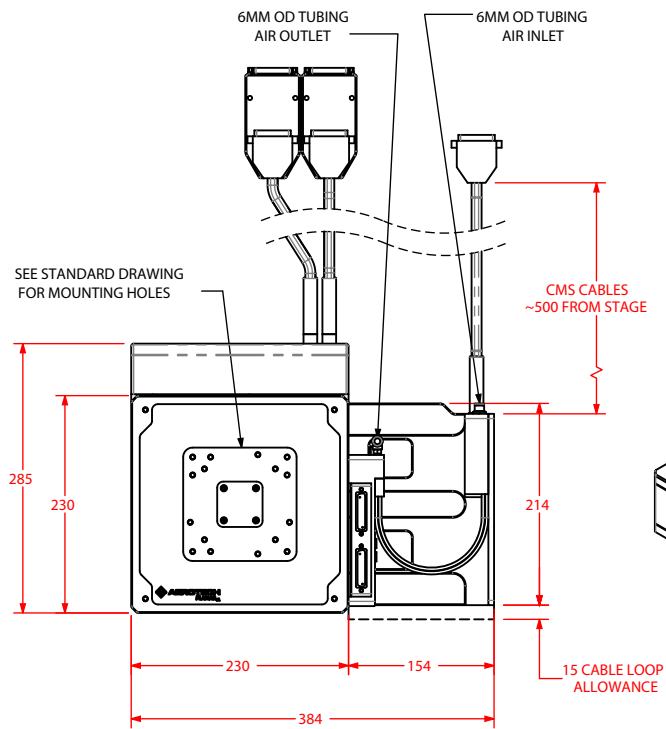


Planar_{DL}-100XY-CMS1/2 DIMENSIONS

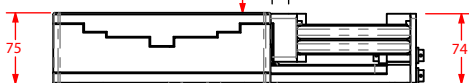
-CMS1



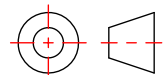
-CMS2



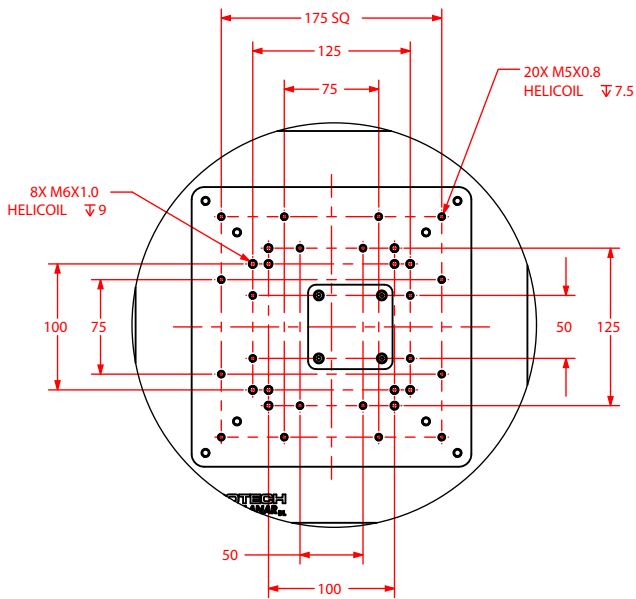
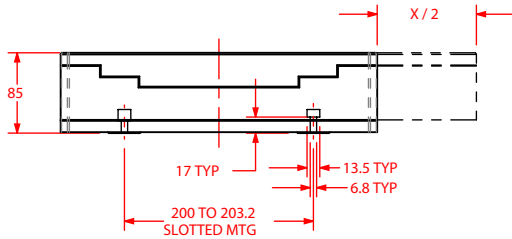
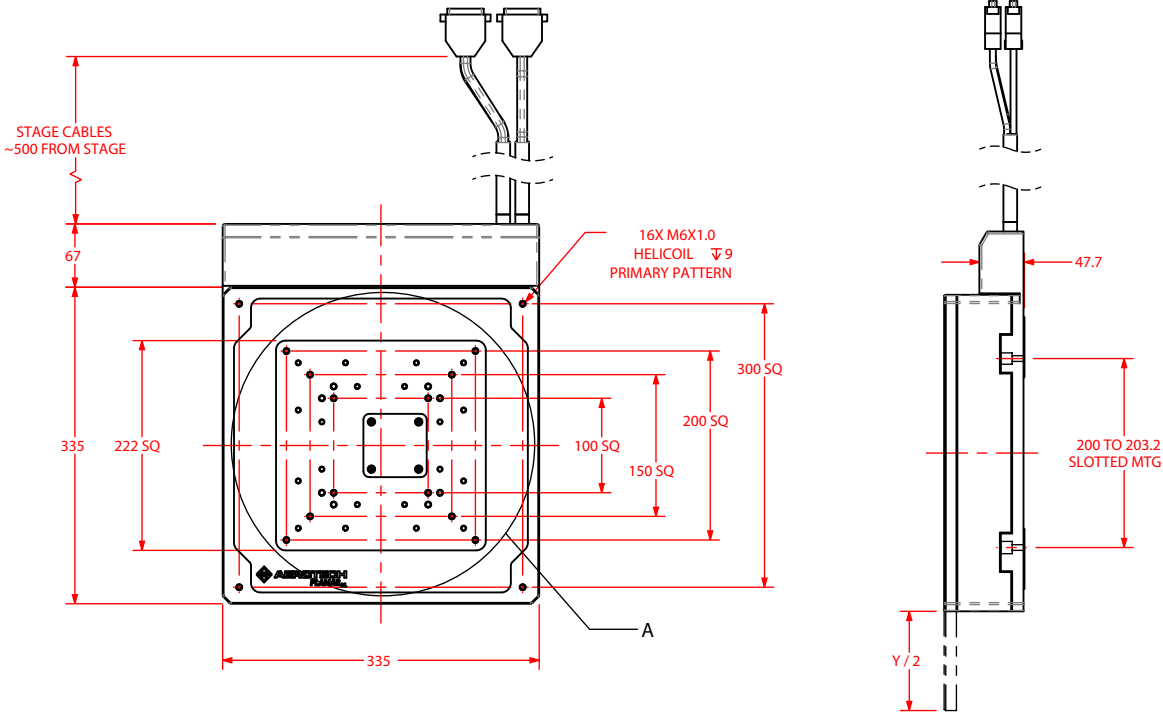
40 STANDARD CABLE CONNECTOR 2X 25 PIN D-SUB



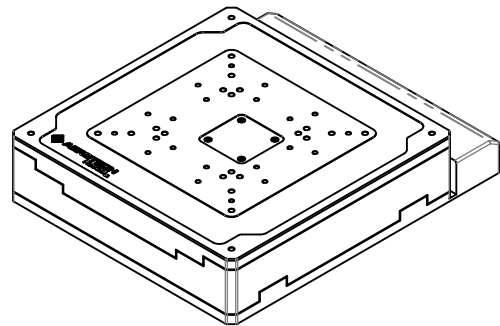
DIMENSIONS: MILLIMETERS



Planar_{DL}-200XY-CMSO DIMENSIONS

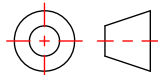


DETAIL A
AUXILIARY PATTERNS
SCALE 1:6

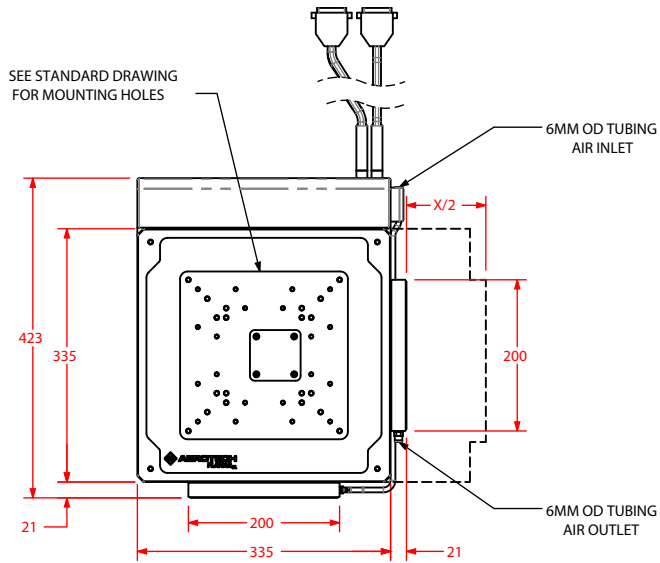


| MODEL | XY NOMINAL TRAVEL | XY ELEC LIMIT TRAVEL | XY MECH LIMIT TRAVEL |
|----------------|-------------------|----------------------|----------------------|
| PlanarDL-200XY | 200 | 206 | 210 |

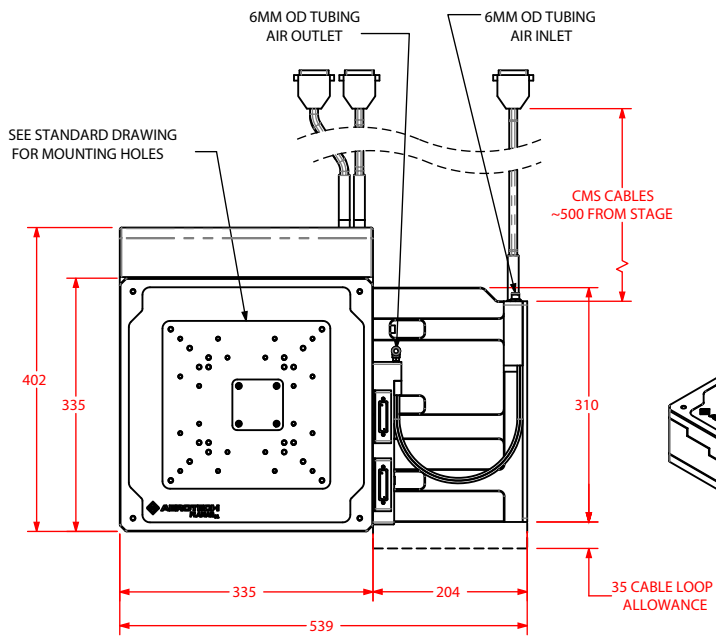
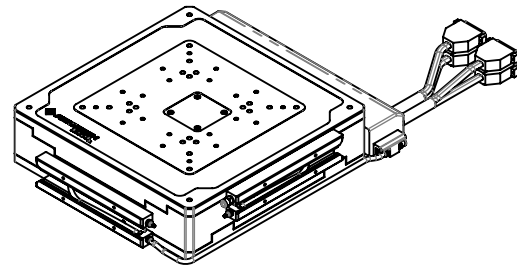
DIMENSIONS: MILLIMETERS



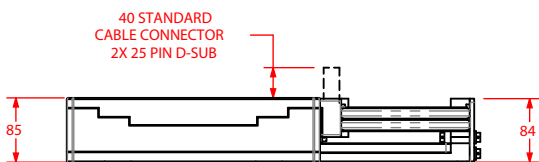
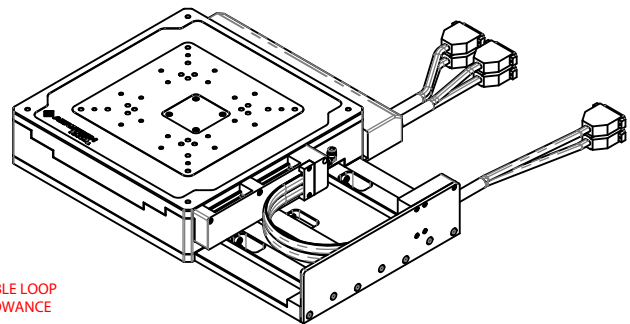
Planar_{DL}-200XY-CMS1/2 DIMENSIONS



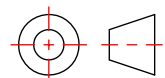
-CMS1



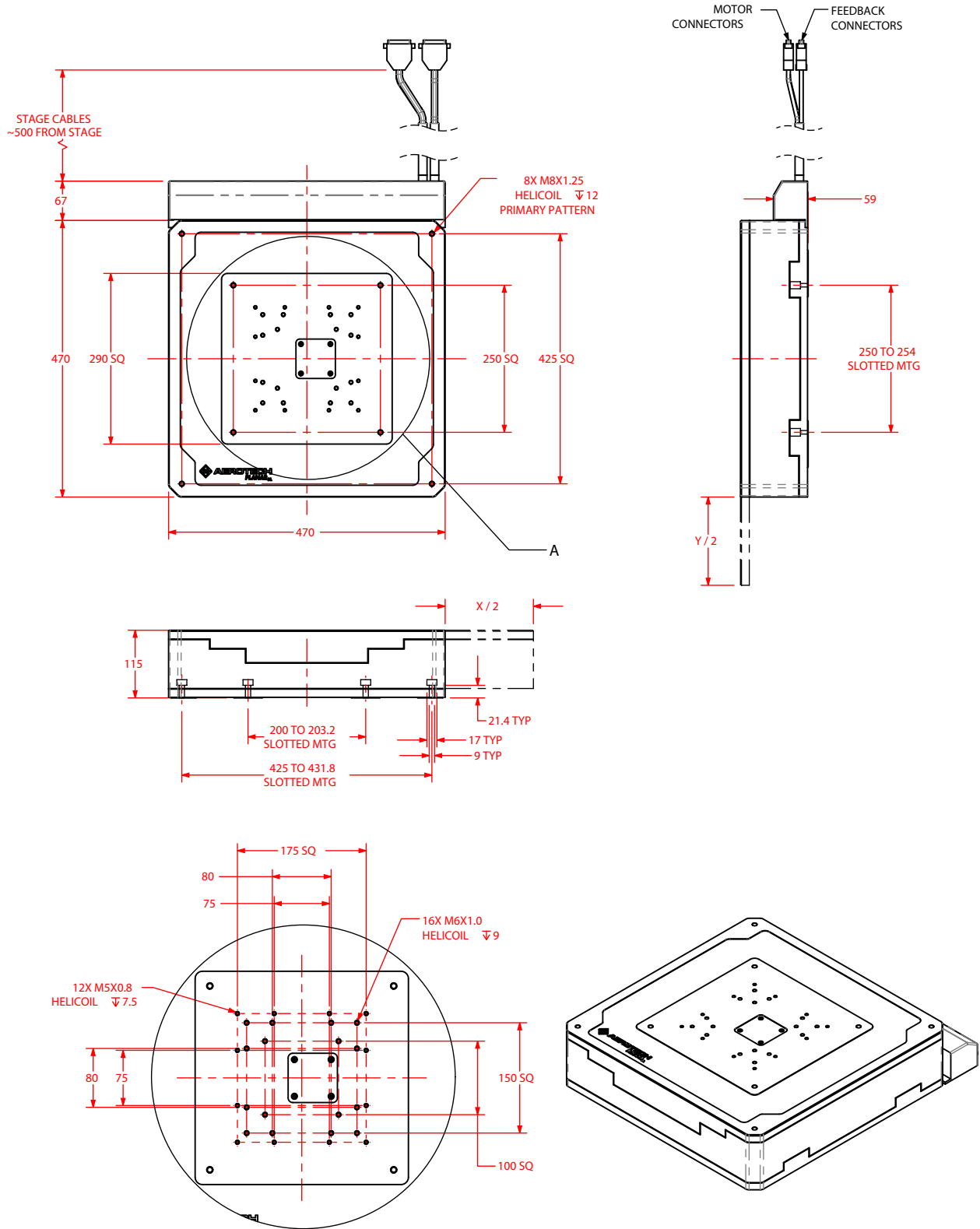
-CMS2



DIMENSIONS: MILLIMETERS



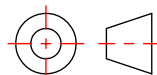
Planar_{DL}-300XY-CMSO DIMENSIONS



DETAIL A
AUXILIARY PATTERNS
SCALE 1:8

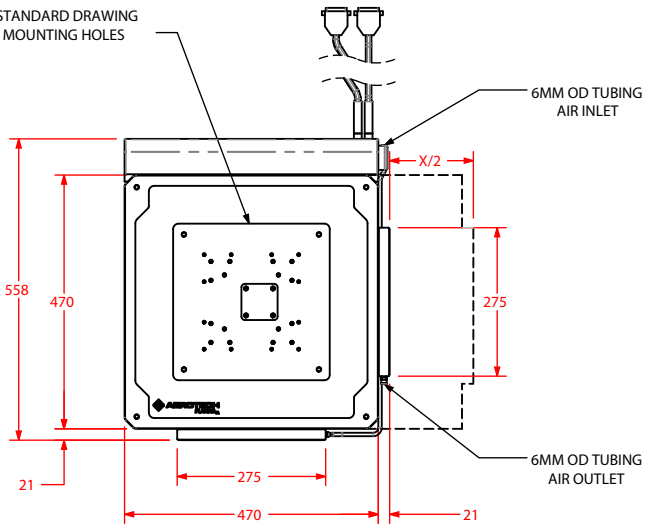
| MODEL | XY NOMINAL TRAVEL | XY ELEC LIMIT TRAVEL | XY MECH LIMIT TRAVEL |
|----------------|-------------------|----------------------|----------------------|
| PlanarDL-300XY | 300 | 306 | 310 |

DIMENSIONS: MILLIMETERS

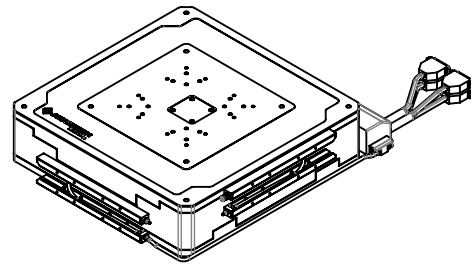


Planar_{DL}-300XY-CMS1/2 DIMENSIONS

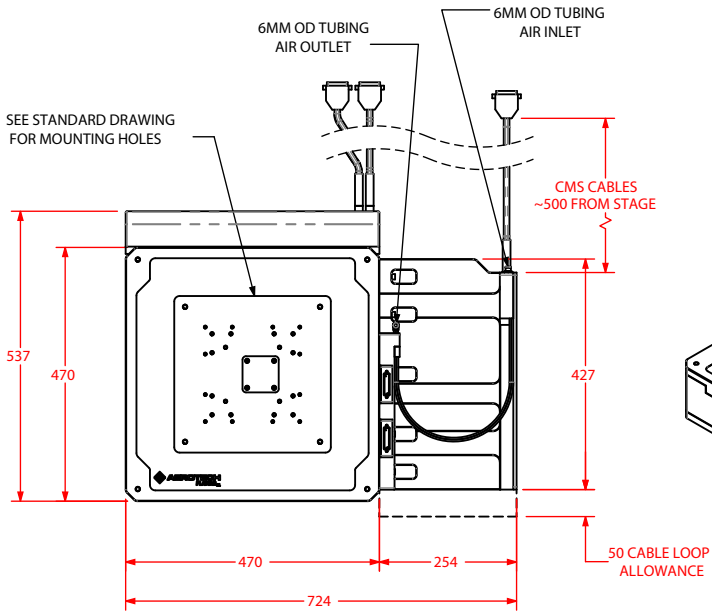
SEE STANDARD DRAWING FOR MOUNTING HOLES



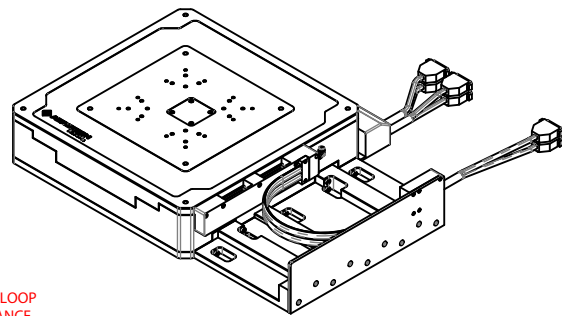
-CMS1



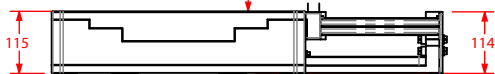
SEE STANDARD DRAWING FOR MOUNTING HOLES



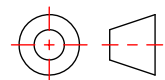
-CMS2



40 STANDARD
CABLE CONNECTOR
2X 25 PIN D-SUB



DIMENSIONS: MILLIMETERS



Planar_{DL} ORDERING INFORMATION

Planar_{DL} Two Axis Mechanical-Bearing Direct-Drive Linear Stage

| | |
|-----------------------------|--|
| Planar _{DL} -100XY | Two axis mechanical-bearing direct-drive linear stage, 100 x 100 mm travel |
| Planar _{DL} -200XY | Two axis mechanical-bearing direct-drive linear stage, 200 x 200 mm travel |
| Planar _{DL} -300XY | Two axis mechanical-bearing direct-drive linear stage, 300 x 300 mm travel |

Motor (Required) - Not Applicable for Planar_{DL}-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 μ m TTL on upper axis, 1 Vpp on lower axis |
| -E3 | Incremental encoders, 1 Vpp on upper axis, 0.1 μ m TTL on lower axis |
| -E4 | Incremental encoders, 0.1 μ m TTL 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. 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. |