Planar$_{DL}$ Series

Two Axis, Mechanical Bearing, Direct-Drive Linear Stage

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

Excellent geometric performance (straightness to ±0.4 µm; flatness to ±1 µm)

Anti-creep, precision crossed-roller bearings

Large selection – nine models in travel and accuracy

Aerotech's PlanarDL – 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 ±400 nm and orthogonality down to 1 arc second.

Planar_DL SPECIFICATIONS

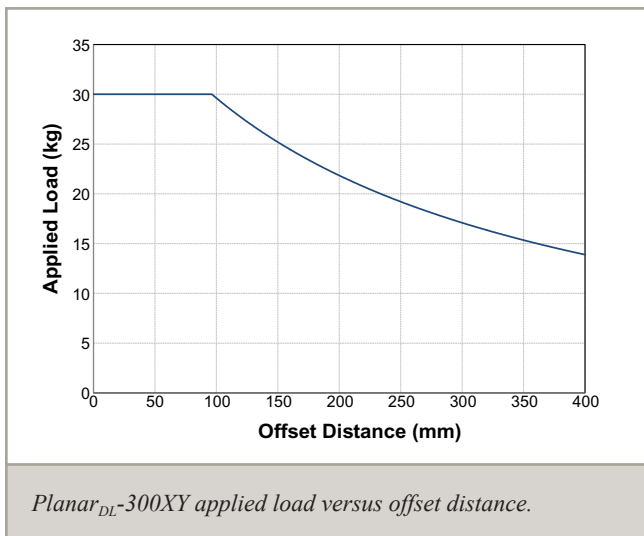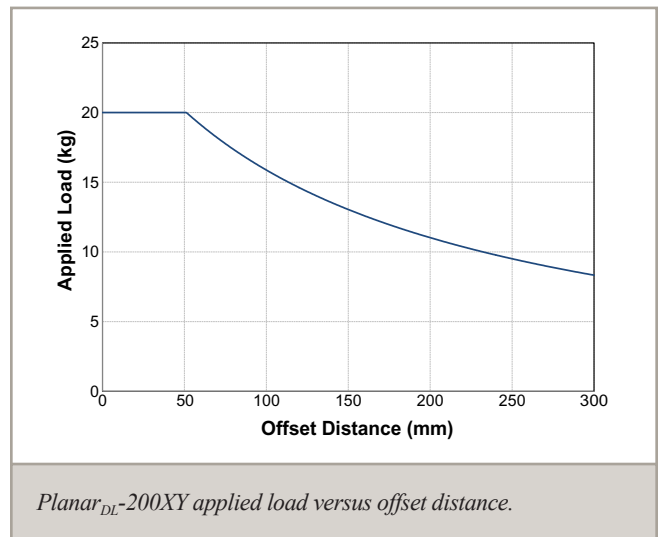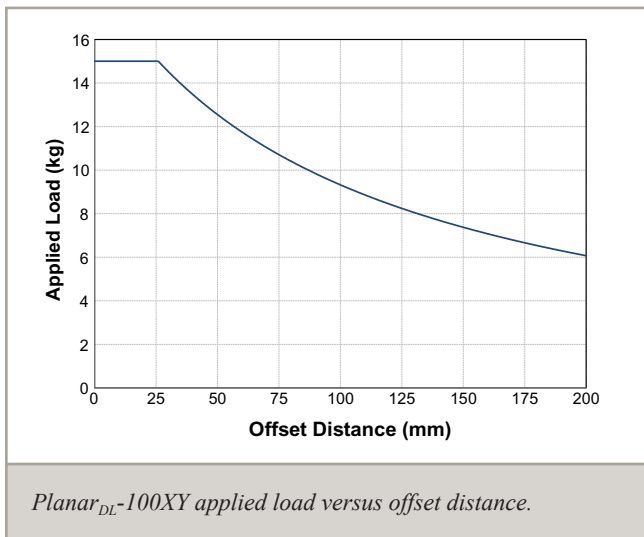| Mechanical Specifications		Planar_DL-100XY			Planar_DL-200XY			Planar_DL-300XY		
		-PL1	-PL3[1]	-PL4[1]	-PL1	-PL3[1]	-PL4[1]	-PL1	-PL3[1]	-PL4[1]
Travel		100 mm x 100 mm			200 mm x 200 mm			300 mm x 300 mm		
Accuracy		±3 µm	±0.4 µm	±0.4 µm	±4 µm		±0.5 µm	±5 µm	±0.75 µm	±0.75 µm
Bidirectional Repeatability[2]		±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 (Continous)		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 (-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)		
	Lower Axis	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)		
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 -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.
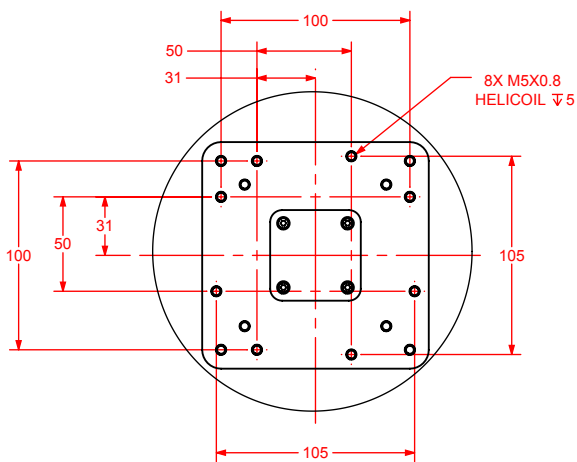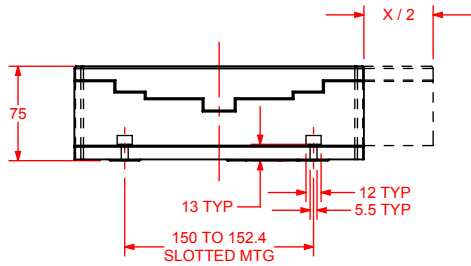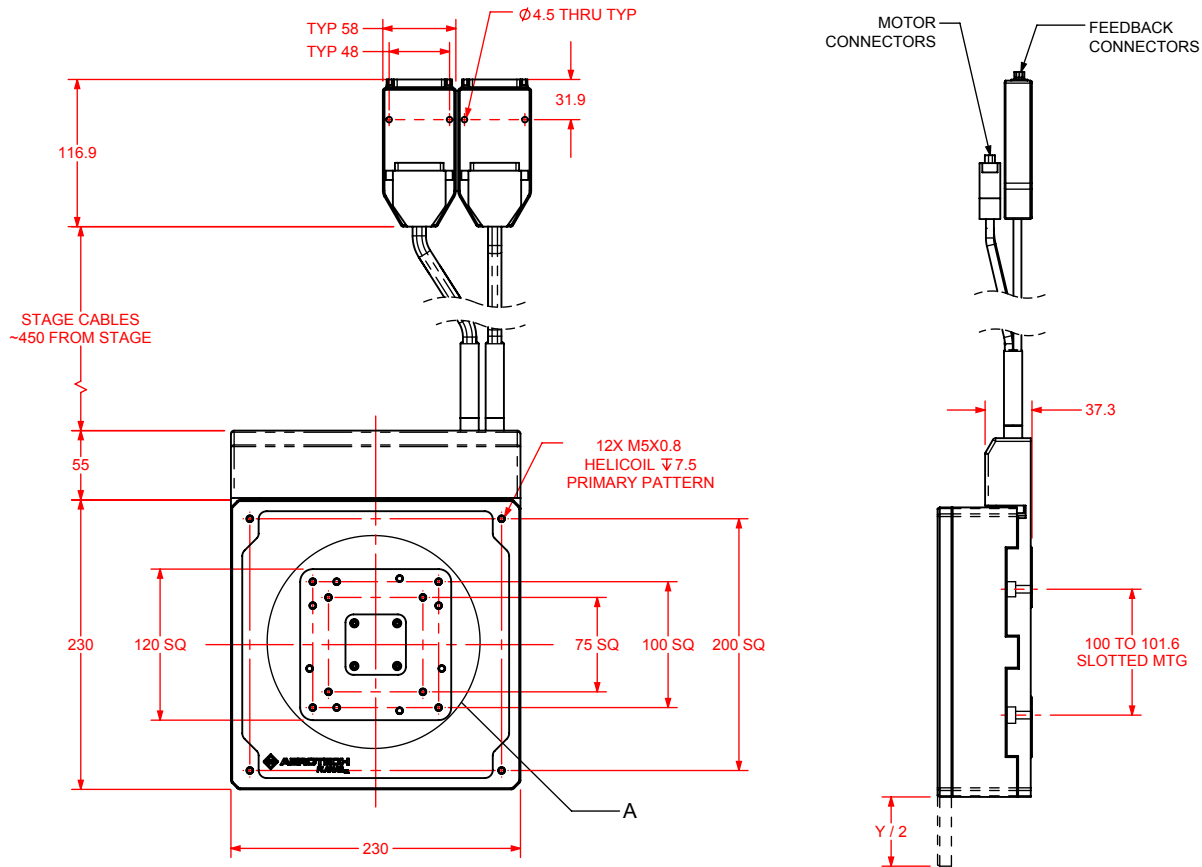

Planar_DL-200XY with -CMS2 option.

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	340 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 applied load versus offset distance.

Planar_{DL}-200XY applied load versus offset distance.

Planar_{DL}-300XY applied load versus offset distance.

Planar_DL-100XY DIMENSIONS

TYP 58
TYP 48
Ø4.5 THRU TYP
31.9
116.9

MOTOR CONNECTORS
FEEDBACK CONNECTORS

STAGE CABLES ~450 FROM STAGE

55

12X M5X0.8 HELICOIL ▽7.5 PRIMARY PATTERN

230
120 SQ
75 SQ
100 SQ
200 SQ

A

230

37.3

100 TO 101.6 SLOTTED MTG

Y / 2

X / 2

75

13 TYP
12 TYP
5.5 TYP

150 TO 152.4 SLOTTED MTG

100
50
31

8X M5X0.8 HELICOIL ▽5

100
50
31
105
105

DETAIL A
AUXILIARY PATTERN
SCALE 1:4
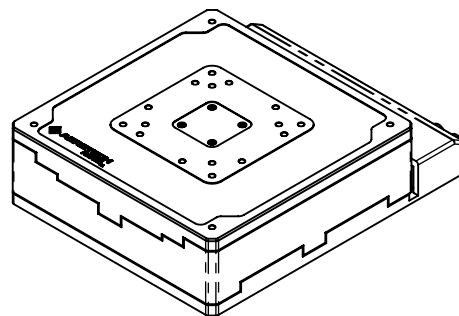
MODEL	XY NOMINAL TRAVEL	XY ELEC LIMIT TRAVEL	XY MECH LIMIT TRAVEL
PlanarDL-100XY	100	106	110

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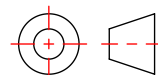
Planar_{DL}-100XY-CMS1/2 DIMENSIONS

-CMS1

SEE STANDARD DRAWING
FOR MOUNTING HOLES

6MM OD TUBING
AIR INLET

X/2

306

230

125

125

21

125

230

21

6MM OD TUBING
AIR OUTLET

6MM OD TUBING
AIR OUTLET

6MM OD TUBING
AIR INLET

-CMS2

SEE STANDARD DRAWING
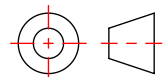FOR MOUNTING HOLES

CMS CABLES
~450 FROM STAGE
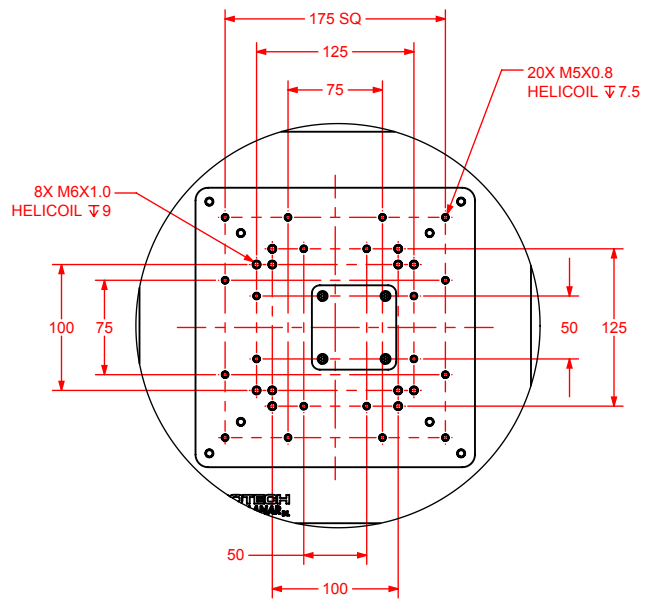
285

230

214

230

154

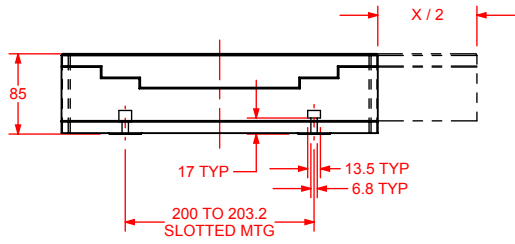384

15 CABLE LOOP
ALLOWANCE

40 STANDARD
CABLE CONNECTOR
2X 25 PIN D-SUB

75
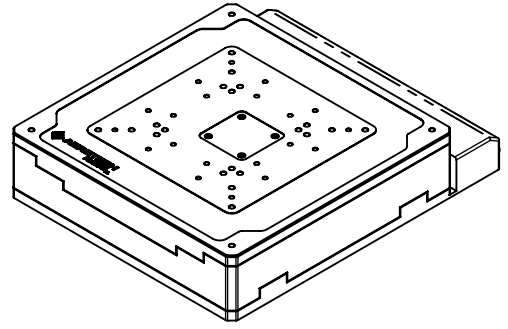
74
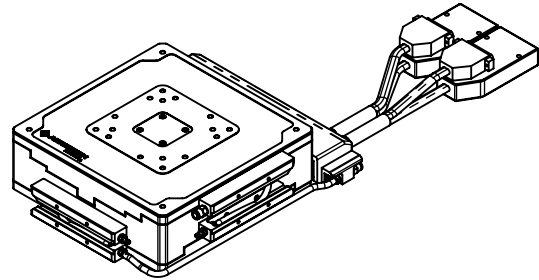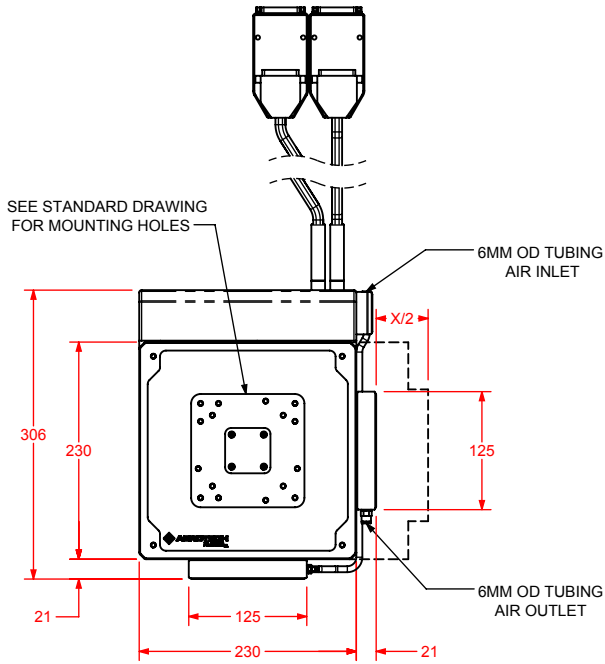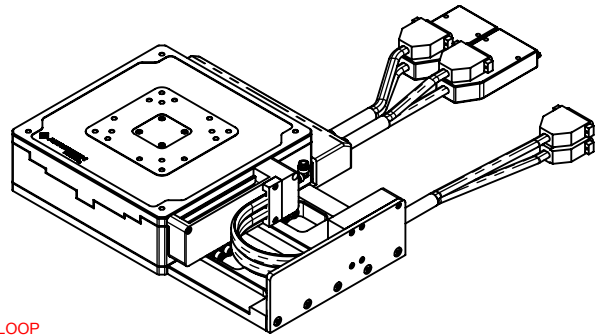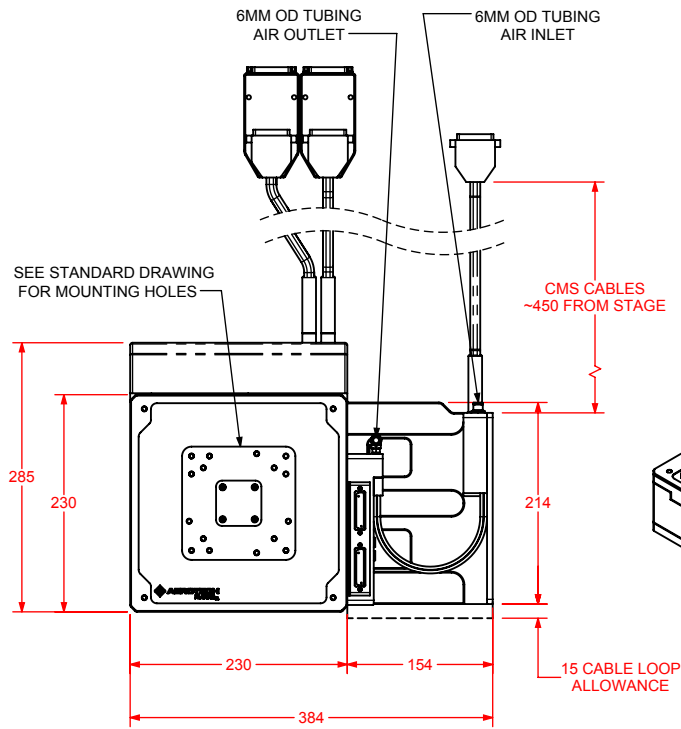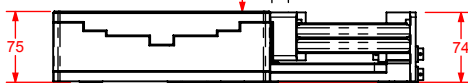
DIMENSIONS: MILLIMETERS

Planar$_{DL}$-200XY DIMENSIONS

MOTOR CONNECTORS — FEEDBACK CONNECTORS

STAGE CABLES ~450 FROM STAGE

67

16X M6X1.0 HELICOIL ⬇9 PRIMARY PATTERN

47.7

300 SQ

200 SQ

335

222 SQ

100 SQ

200 TO 203.2 SLOTTED MTG

150 SQ

A

335

Y / 2

X / 2

85

17 TYP

13.5 TYP

6.8 TYP

200 TO 203.2 SLOTTED MTG

175 SQ

125

75

20X M5X0.8 HELICOIL ⬇7.5

8X M6X1.0 HELICOIL ⬇9

100

75

50

125

50

100
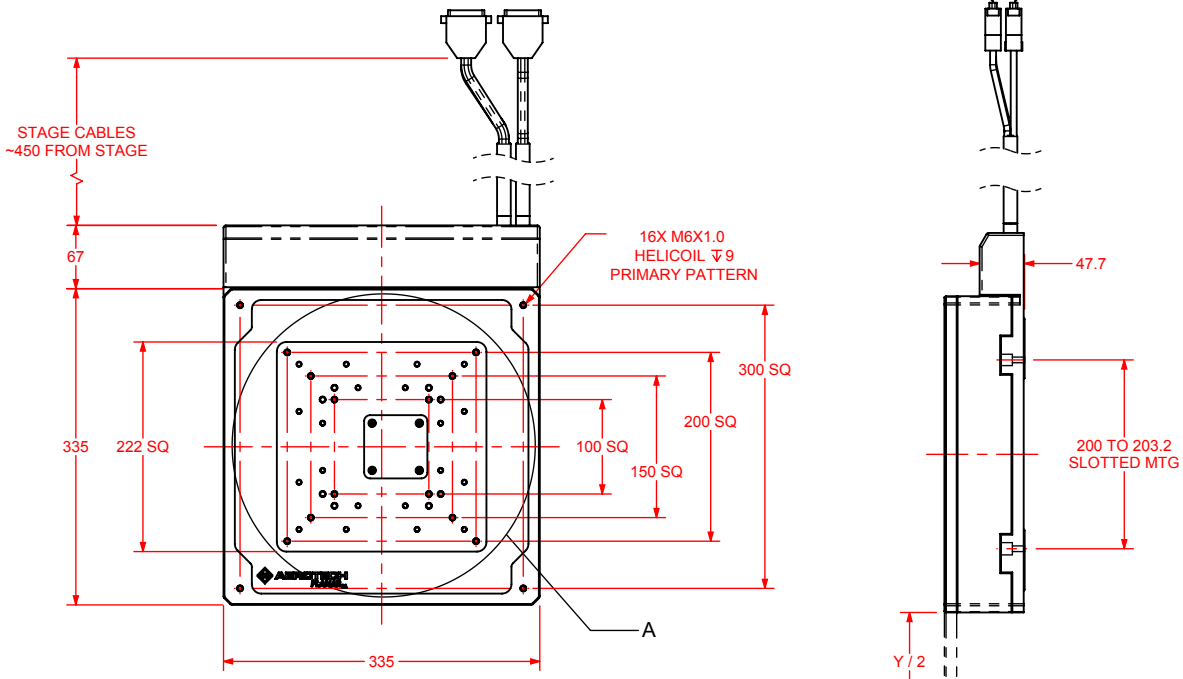
DETAIL A
AUXILIARY PATTERNS
SCALE 1:6

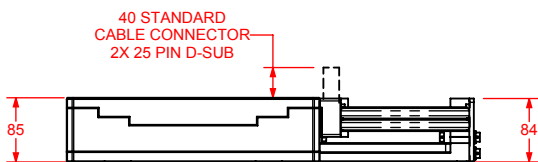| MODEL	XY NOMINAL TRAVEL	XY ELEC LIMIT TRAVEL	XY MECH LIMIT TRAVEL
PlanarDL-200XY	200	206	210

DIMENSIONS: MILLIMETERS

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

-CMS1

SEE STANDARD DRAWING
FOR MOUNTING HOLES

6MM OD TUBING
AIR INLET

X/2

423

335

200

21

200

335

21

6MM OD TUBING
AIR OUTLET

-CMS2

6MM OD TUBING
AIR OUTLET

6MM OD TUBING
AIR INLET

SEE STANDARD DRAWING
FOR MOUNTING HOLES

CMS CABLES
~450 FROM STAGE

402

335

310

335

204

539

35 CABLE LOOP
ALLOWANCE

40 STANDARD
CABLE CONNECTOR
2X 25 PIN D-SUB

85

84
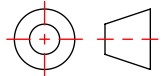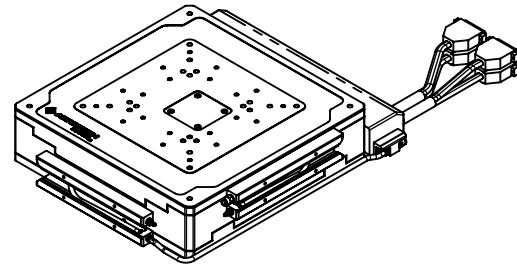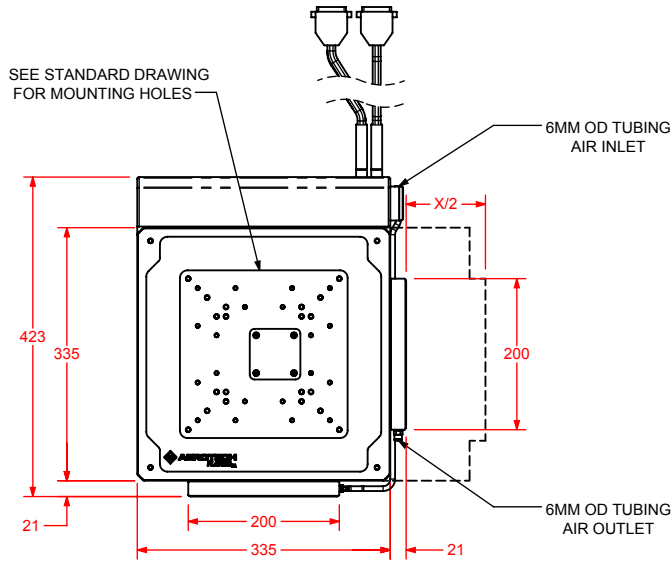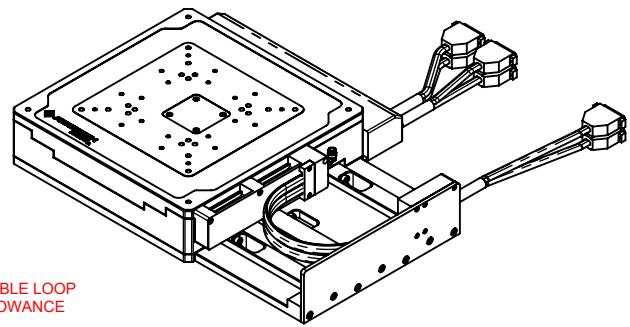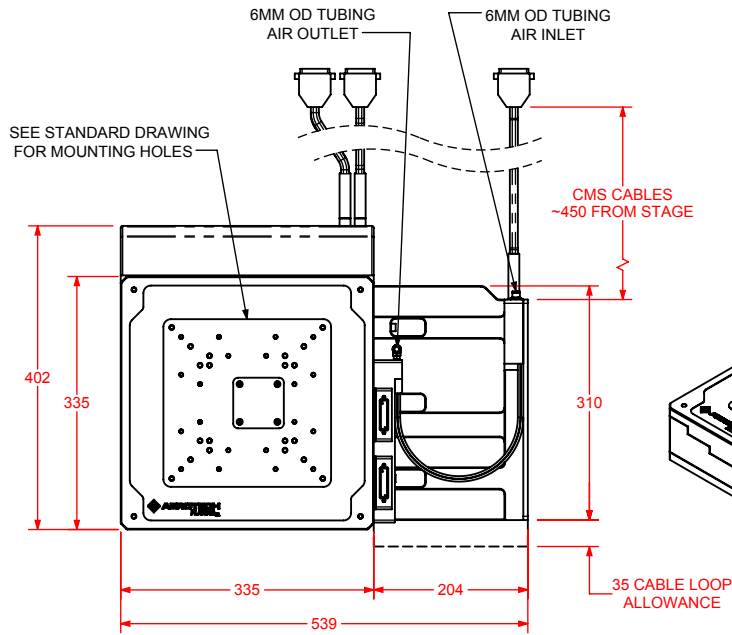
DIMENSIONS: MILLIMETERS
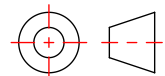
Planar_DL-300XY DIMENSIONS

MOTOR CONNECTORS
FEEDBACK CONNECTORS

STAGE CABLES
~450 FROM STAGE

67

470

290 SQ

250 SQ   425 SQ

470

8X M8X1.25
HELICOIL ⍌ 12
PRIMARY PATTERN

A

59

250 TO 254
SLOTTED MTG

Y / 2

115

X / 2

21.4 TYP

200 TO 203.2
SLOTTED MTG

17 TYP

9 TYP

425 TO 431.8
SLOTTED MTG

175 SQ

80

75

16X M6X1.0
HELICOIL ⍌ 9

12X M5X0.8
HELICOIL ⍌ 7.5

80   75

150 SQ

100 SQ
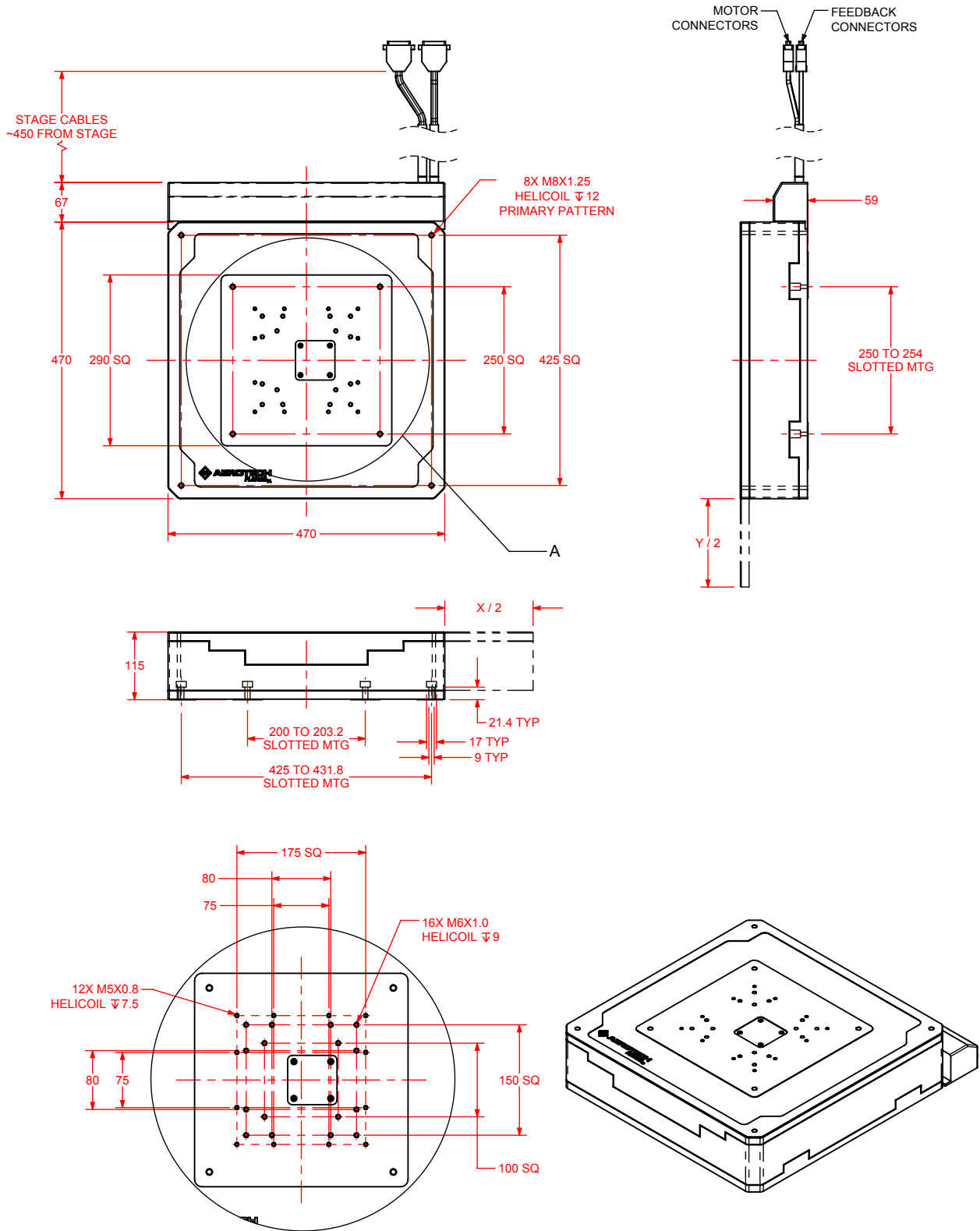
DETAIL A
AUXILIARY PATTERNS
SCALE 1:8

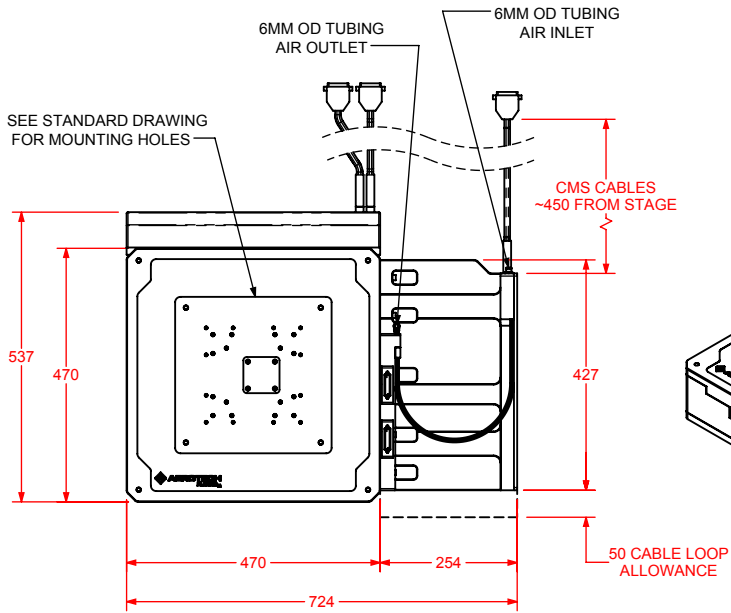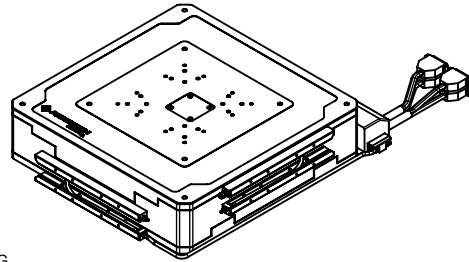| MODEL	XY NOMINAL TRAVEL	XY ELEC LIMIT TRAVEL	XY MECH LIMIT TRAVEL
PlanarDL-300XY	300	306	310

DIMENSIONS: MILLIMETERS
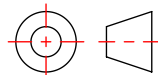
Planar$_{DL}$-300XY-CMS1/2 DIMENSIONS

SEE STANDARD DRAWING
FOR MOUNTING HOLES

6MM OD TUBING
AIR INLET

-CMS1

X/2

558

470

275

275

470

21

21

6MM OD TUBING
AIR OUTLET

6MM OD TUBING
AIR OUTLET

6MM OD TUBING
AIR INLET

-CMS2

SEE STANDARD DRAWING
FOR MOUNTING HOLES

CMS CABLES
~450 FROM STAGE

537

470

427

470

254

50 CABLE LOOP
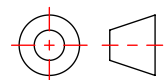ALLOWANCE

724

40 STANDARD
CABLE CONNECTOR
2X 25 PIN D-SUB

115

114
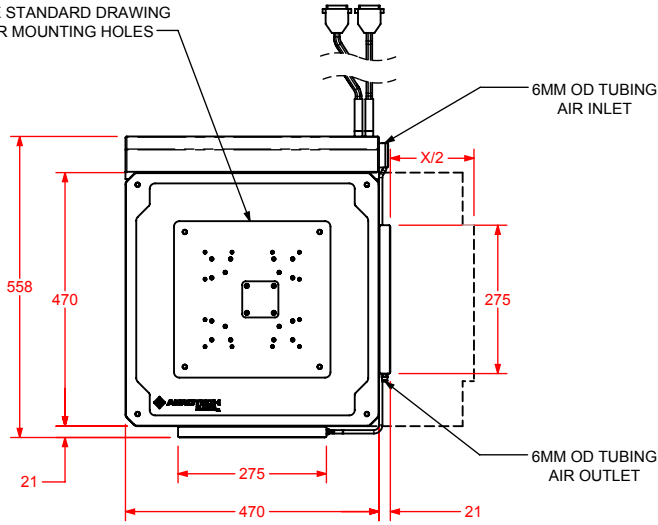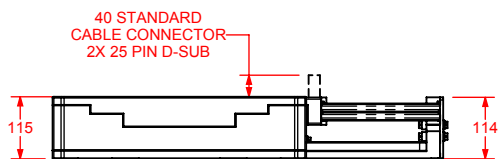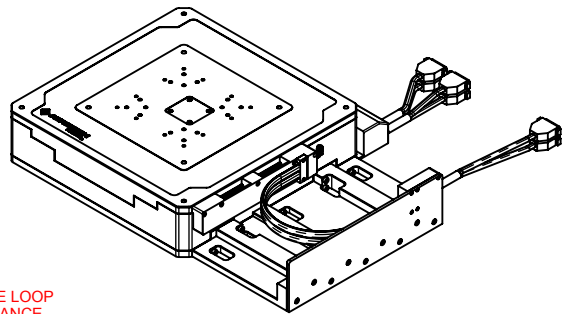
DIMENSIONS: MILLIMETERS

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 µm TTL on upper axis, 1 Vpp on lower axis
-E3	Incremental encoders, 1 Vpp on upper axis, 0.1 µm TTL on lower axis
-E4	Incremental encoders, 0.1 µm 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 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.