

# ANT95-XY Series

## Two-Axis XY Direct-Drive Nanopositioning Stages

Integrated low-profile XY linear motor stage

Nanometer-level performance in a large travel format

High resolution (1 nm), repeatability (75 nm), and accuracy (250 nm)

In-position stability of <1 nm

Anti-creep crossed-roller bearings

High dynamic performance with direct-drive technology

ULTRA accuracy grade option

## nano Motion Technology



### Introduction

Aerotech's ANT series stages are the world's first nanometer-level positioning systems with greater than 25 mm travel. The ANT95-XY crossed-roller-bearing, linear motor, dual-axis stage continues the evolution of the ANT series of stages. The integrated, sleek design provides an extremely low profile of only 60 mm. The stage comes with proprietary direct-drive motor technology, non-contact linear encoders, limits, integrated cable management system, and three accuracy grades.

### Ultra-Precise Stage Design

The ANT95-XY design allows critical elements such as orthogonality, straightness, and flatness to be optimized, resulting in a stage with exceptional geometric tolerances. Aerotech's direct-drive technology has no hysteresis or backlash, enabling accurate and repeatable nanometer-scale motion in both the X and Y dimensions. Both travel options (25 mm x 25 mm and 50 mm x 50 mm) come with the 60 mm profile height. The integrated cable management system is designed for long life and to minimize drag forces.

### Noncontact Direct-Drive

Only non-contact direct-drive technology offers the robust, accurate, and high-speed positioning necessary for mass production of precision devices. ANT95-XY stages utilize advanced direct-drive technology pioneered by Aerotech to achieve the highest level of positioning performance. This direct-drive technology is high-performance, non-cogging, non-contact, high-speed, high-resolution, and high-accuracy. This unique drive and bearing combination, packaged in an

extremely small-profile and footprint, offers tangible advantages in many applications such as high-precision positioning, disk-drive fabrication, fiber alignment, optical delay element actuation, sensor testing, and scanning processes that demand smooth and precise motion.

### Multi-Axis Configurations

The ANT95-XY can be combined with other Aerotech ANT series products (vertical lift stages, direct-drive rotaries, and goniometers) to create unique, high performance, multi-axis systems.

### ULTRA Accuracy Grade Option

In order to achieve the highest possible system accuracy from our multi-axis nanopositioning systems, Aerotech has developed an advanced, dynamic trajectory calibration system. To take advantage of this sophisticated calibration system, the mechanical system has to be completely assembled, functionally tested, and calibrated in our best-in-class metrology labs. Nanometer-level system accuracy can only be achieved under stringent environmental conditions, calibrating with the best test equipment, using the highest-precision mechanical elements, and utilizing the ULTRA software capabilities of Aerotech's industry-leading controls. By implementing ULTRA dynamic trajectory calibration with the ANT95-XY, we are able to produce guaranteed 2-dimensional accuracies of  $\pm 250$  nm or better.

The plots provided in the specifications illustrate performance differences between a standard ANT95-XY and the -ULTRA version. Straightness, orthogonality, and accuracy errors caused by stage yawing are virtually eliminated.

## ANT95-XY Series SPECIFICATIONS

Mechanical Specifications	ANT95-25XY			ANT95-50XY			
	-	- PLUS <sup>(1,2)</sup>	- ULTRA <sup>(1,2)</sup>	-	- PLUS <sup>(1,2)</sup>	- ULTRA <sup>(1,2)</sup>	
Travel	25 mm			50 mm			
Accuracy <sup>(2,3)</sup>	±2.5 µm	±250 nm	±250 nm	±2.5 µm	±250 nm	±250 nm	
Resolution (Minimum Incremental Motion)	1 nm						
Repeatability (Bidirectional) <sup>(3)</sup>	±100 nm	±75 nm	±75 nm	±100 nm	±75 nm	±75 nm	
Repeatability (Unidirectional)	±25 nm	±25 nm	±25 nm	±25 nm	±25 nm	±25 nm	
Straightness <sup>(3)</sup>	±1.0 µm	±1.0 µm	±250 nm	±1.0 µm	±1.0 µm	±250 nm	
Flatness <sup>(3)</sup>	±1.0 µm	±1.0 µm	±1.0 µm	±1.0 µm	±1.0 µm	±1.0 µm	
Pitch	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	
Roll	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	49 urad (10 arc sec)	
Yaw	24 urad (5 arc sec)	24 urad (5 arc sec)	24 urad (5 arc sec)	24 urad (5 arc sec)	24 urad (5 arc sec)	24 urad (5 arc sec)	
Orthogonality	49 urad (10 arc sec)	15 urad (3 arc sec)	4.8 urad (1 arc sec)	49 urad (10 arc sec)	15 urad (3 arc sec)	4.8 urad (1 arc sec)	
Maximum Speed <sup>(4)</sup>	500 mm/s (Upper Axis)						
Maximum Acceleration <sup>(4)</sup>	4.5 g - 45 m/s <sup>2</sup> (No Load) (Upper Axis)			2.75 g - 27 m/s <sup>2</sup> (No Load) (Upper Axis)			
Speed Stability <sup>(5)</sup>	See graph for typical performance						
Settling Time	See graph for typical performance						
In-Position Stability <sup>(5)</sup>	<1 nm						
Maximum Force (Continuous)	23 N						
Load Capacity <sup>(6)</sup>	Horizontal	12.0 kg					
	Upper	1.5 kg			2.1 kg		
	Lower	4.2 kg			5.7 kg		
Stage Mass	5.5 kg			7.4 kg			
Material	Aluminum Body/Black Hardcoat Finish						
MTBF (Mean Time Between Failure)	30,000 Hours						

Notes:

- In-Position Jitter listing is 3 sigma value.
- Axis orientation for on-axis loading is listed.
- PLUS and -ULTRA requires the use of an Aerotech controller.
- 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.
- Certified with each stage.
- Requires the selection of an appropriate amplifier with sufficient voltage and current.

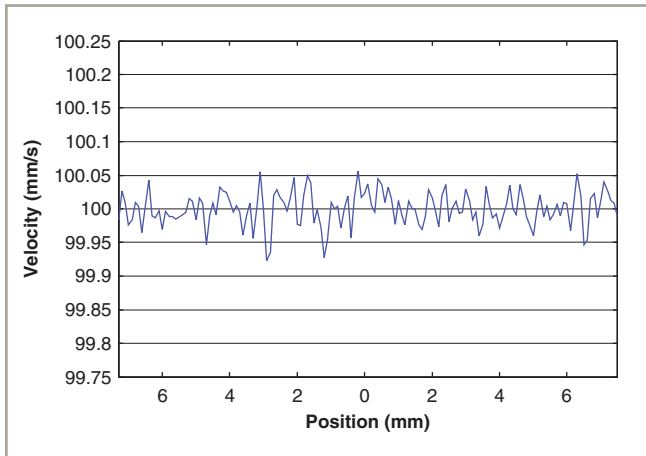
Electrical Specifications	
Drive System	Brushless Linear Servomotor
Feedback	Noncontact Linear Encoder
Maximum Bus Voltage	±40 VDC
Limit Switches	5 V, Normally Closed
Home Switch	Near Center

Recommended Controller		
Multi-Axis	A3200	Npaq MXR Npaq MR-MXH Ndrive ML-MXH
	Ensemble	Epaq MXH Epaq MR-MXH Ensemble ML-MXH
Single Axis	Soloist	Soloist ML-MXH

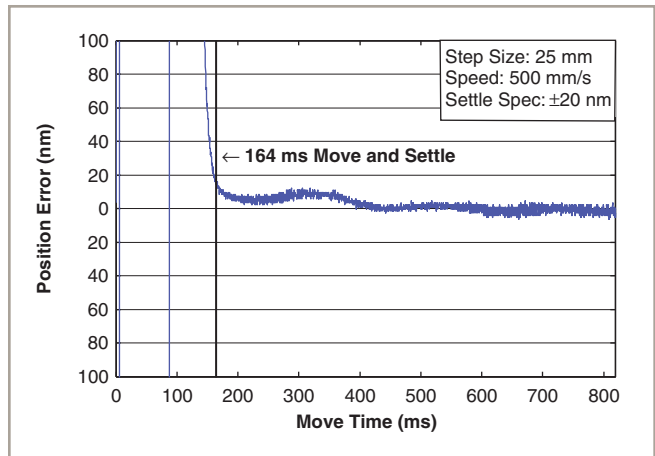
Note: Linear amplifiers are required to achieve the listed specifications. Other options are available.

Note: To ensure the achievement and repeatability of specifications over an extended period of time, environmental temperature must be controlled to within 0.25°C/24 hours. If this is not possible, alternate products are available. Please consult Aerotech Application Engineering for more information.

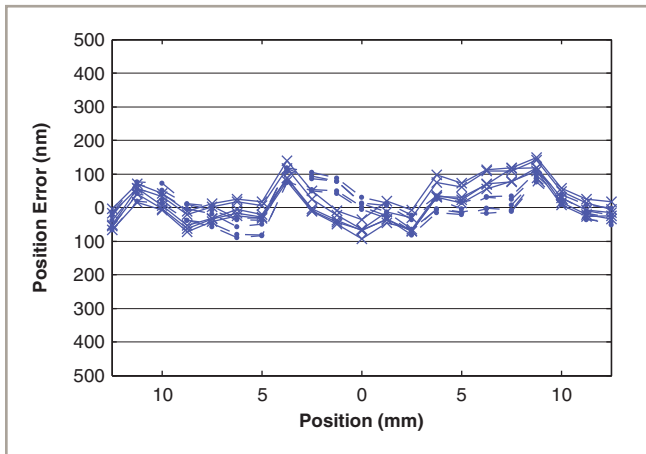
# ANT95-XY Series PERFORMANCE



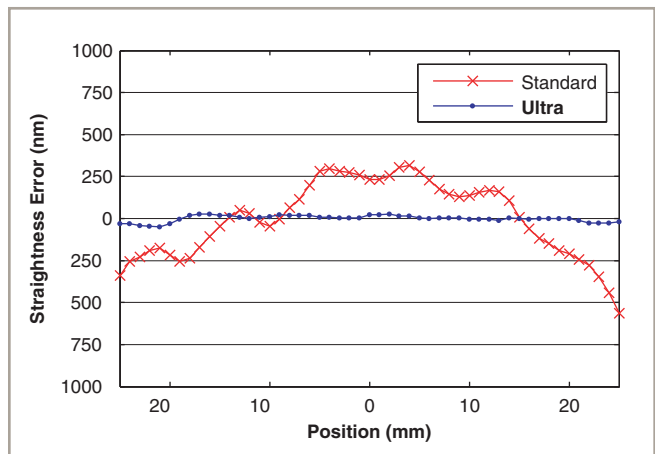
ANT95-25-XY-PLUS velocity performance at 100 mm/s and 1 kg payload for the X (lower) axis. This outstanding speed stability enhances most scanning or laser machining applications.



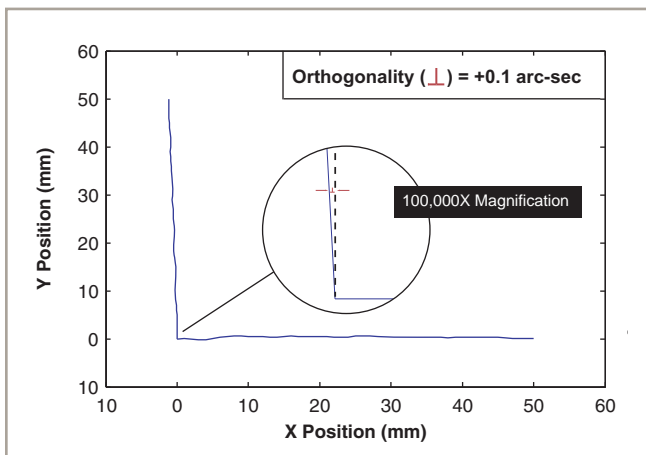
ANT95-25-XY-PLUS step and settle performance at full travel and 1 kg payload for the X (lower) axis. Industry-best settling times significantly improve throughput for most applications.



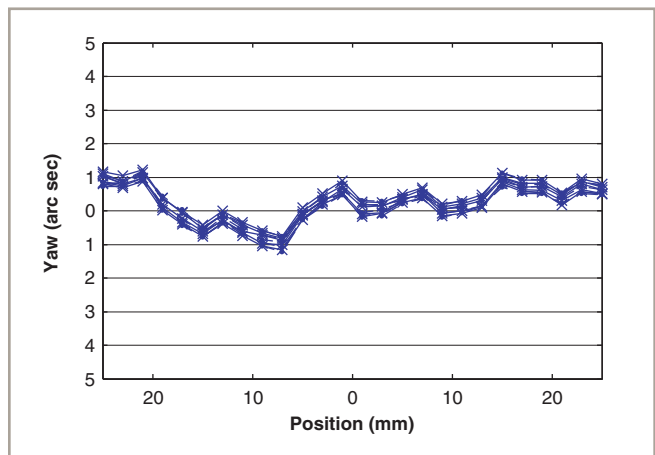
ANT95-25-XY-PLUS accuracy and repeatability, five runs, bi-directional for the X (lower) axis. The total accuracy of 240 nm over 25 mm travel is significantly better than other offerings and half of its stated specification.



ANT95-25-XY straightness error comparison between the BASE and ULTRA models shows a dramatic improvement in this specification.

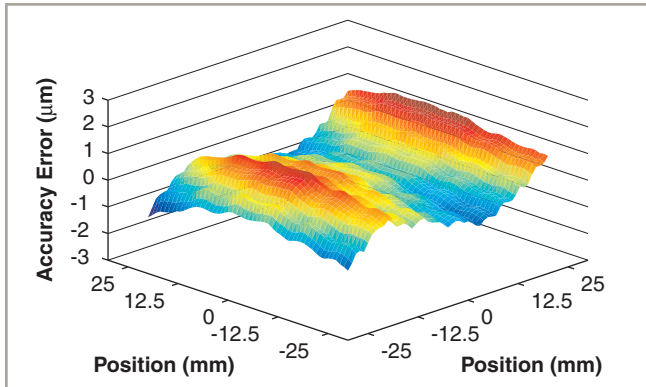


ANT95-50-XY-ULTRA orthogonality. The inset is magnified 100,000X for clarity. The ULTRA model orthogonality is a twenty-fold improvement over the BASE model orthogonality.

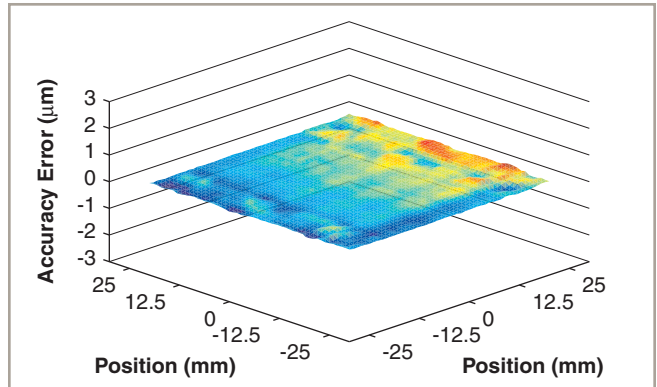


ANT95-50-XY-PLUS Y (upper) axis yaw, five runs, bi-directional. Highly repeatable, lowest angular error over full travel.

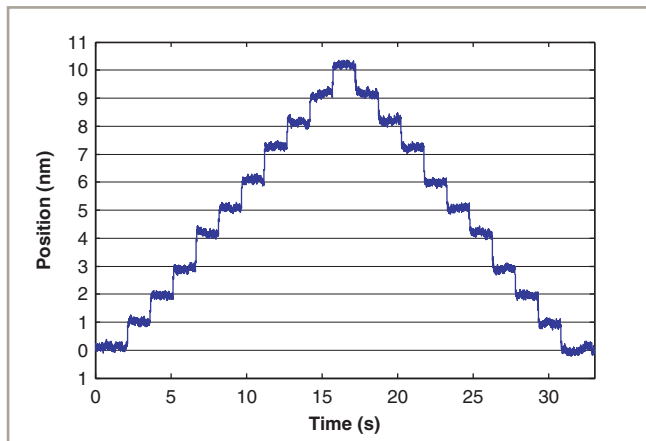
## ANT95-XY Series PERFORMANCE



ANT95-50-XY 2D accuracy plot showing planar accuracy error including straightness, orthogonality, and stage yawing.



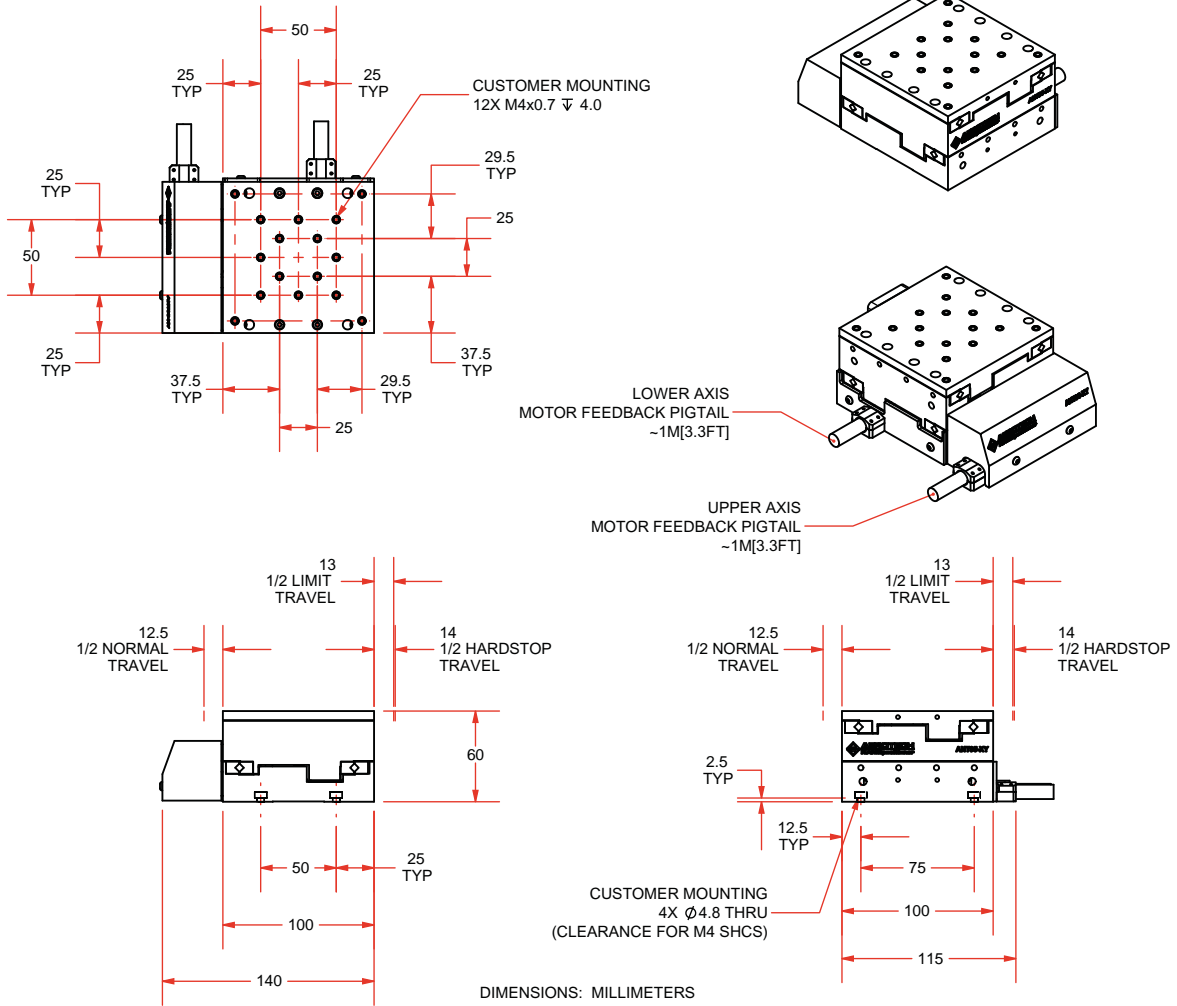
ANT95-50-XY-ULTRA – exceptional 2D system accuracy with Aerotech’s ULTRA version.



ANT95-25-XY-PLUS lower axis 1 nm step plot. Best-in-class resolution and exceptional in-position stability for large travel stages.

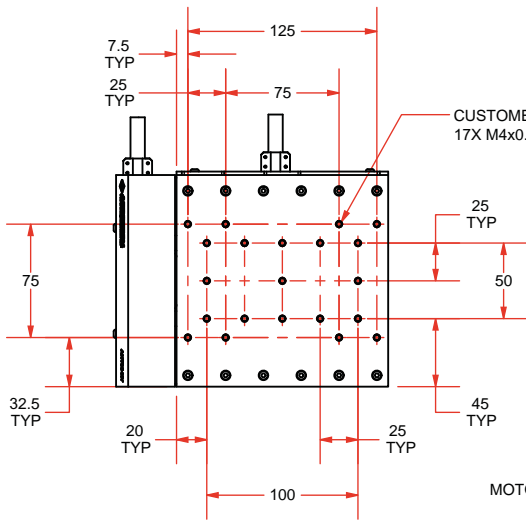
# ANT95-25-XY/ANT95-25-XY-PLUS DIMENSIONS

## ANT95-25-XY/ANT95-25-XY-PLUS

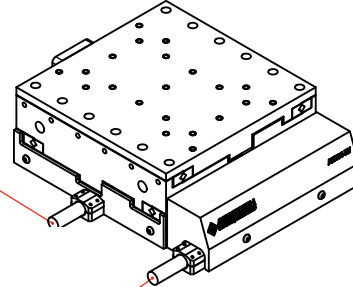
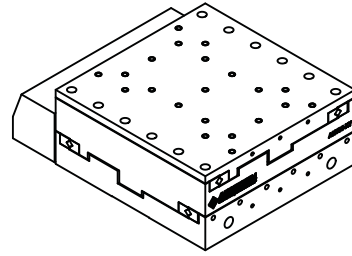


# ANT95-50-XY/ANT95-50-XY-PLUS DIMENSIONS

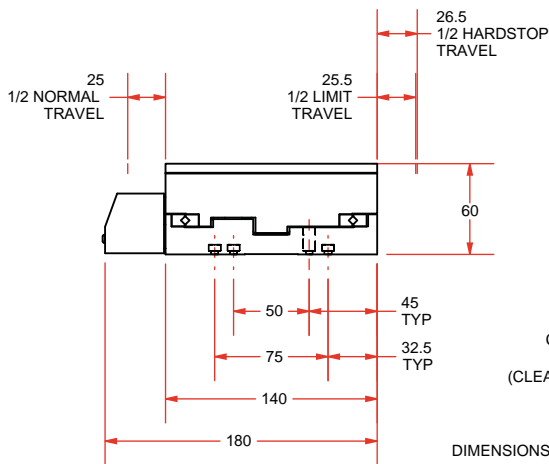
## ANT95-50-XY/ANT95-50-XY-PLUS



CUSTOMER MOUNTING  
17X M4x0.7  $\nabla$  4.0



LOWER AXIS  
MOTOR FEEDBACK PIGTAIL  
~1M[3.3FT]



MOTOR FEEDBACK PIGTAIL  
~1M[3.3FT]

25  
1/2 NORMAL TRAVEL

25.5  
1/2 LIMIT TRAVEL

26.5  
1/2 HARDSTOP TRAVEL

2.5 TYP

20 TYP

CUSTOMER MOUNTING  
8X  $\varnothing$ 4.8 THRU  
(CLEARANCE FOR M4 SHCS)

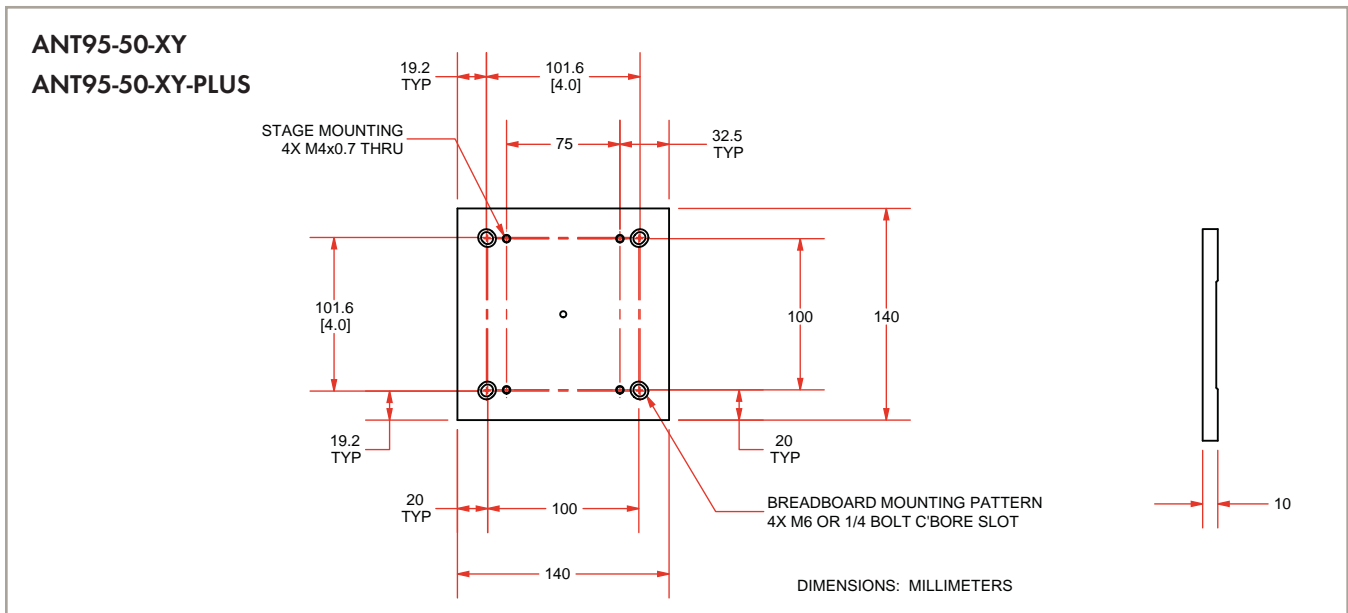
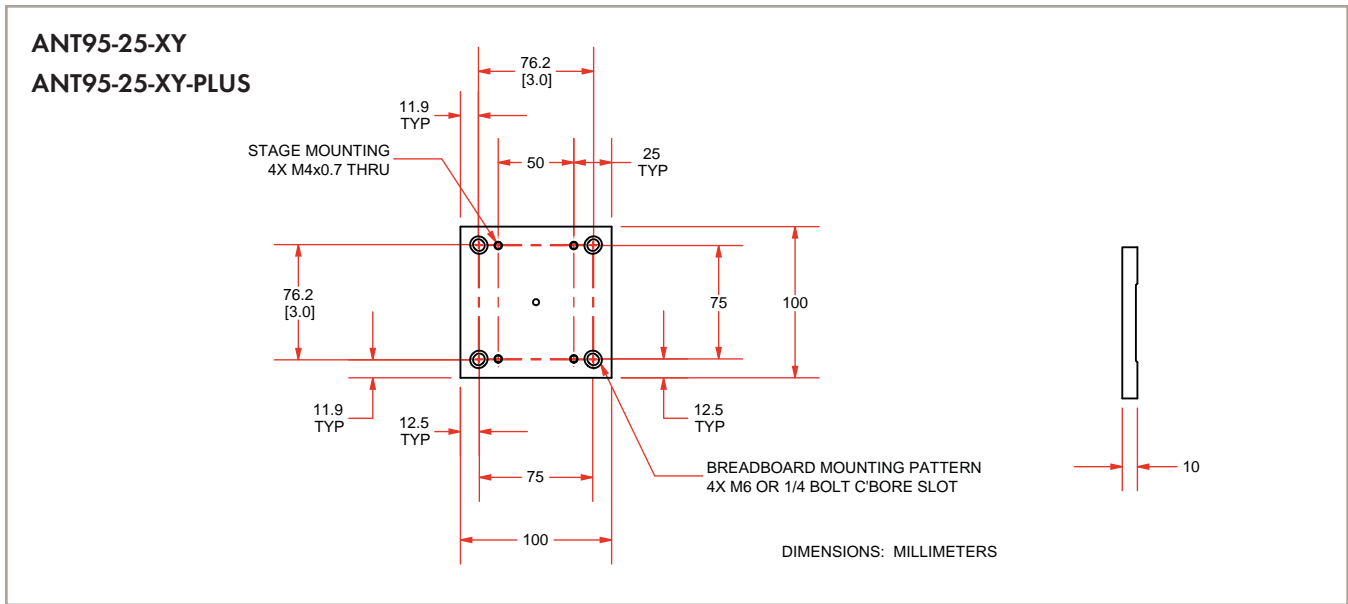
100

140

155

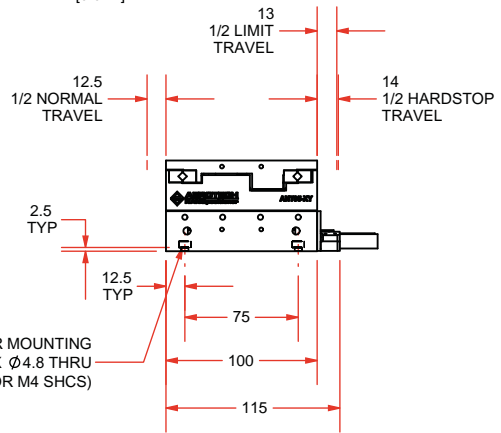
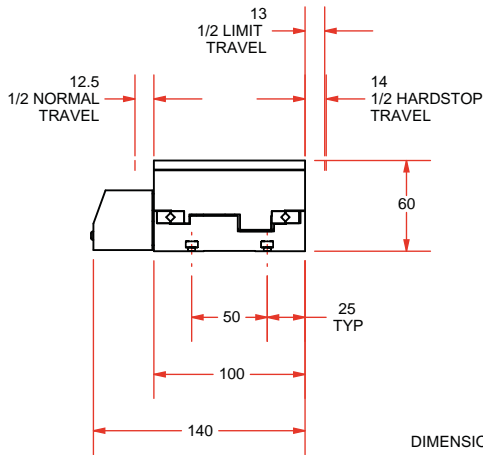
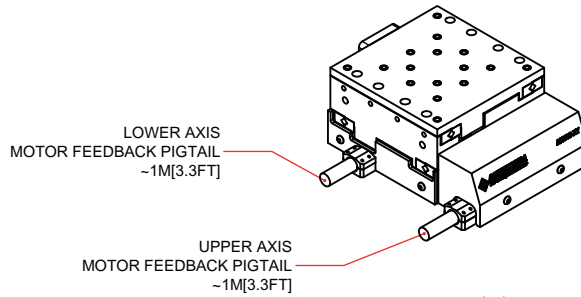
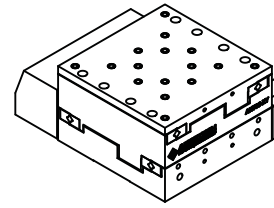
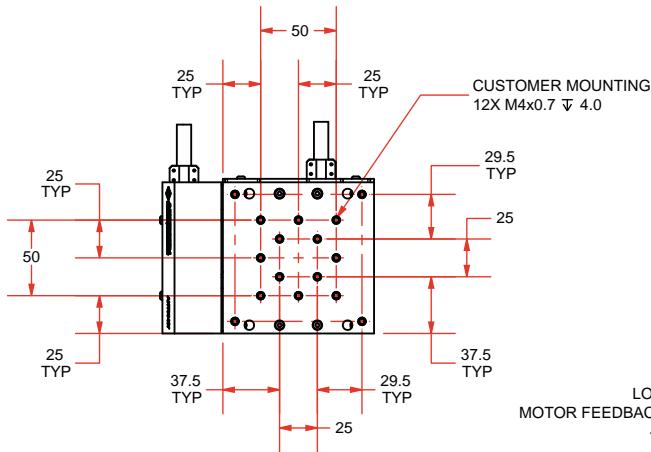
DIMENSIONS: MILLIMETERS

ANT95-25-XY/ANT95-50-XY and ANT95-25-XY-PLUS/ANT95-50-XY-PLUS Mounting Plate DIMENSIONS



ANT95-25-XY-ULTRA DIMENSIONS

ANT95-25-XY-ULTRA

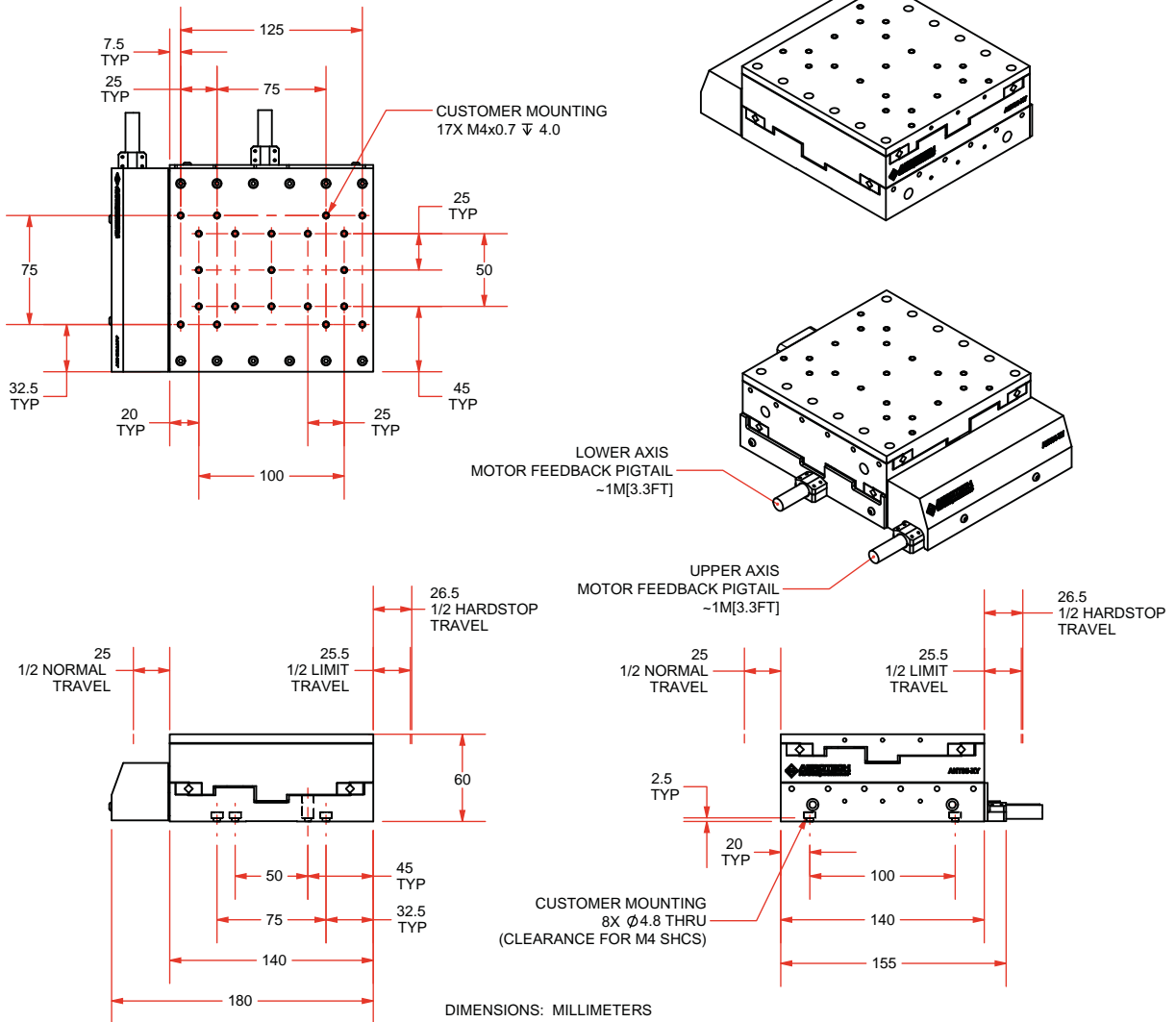


DIMENSIONS: MILLIMETERS

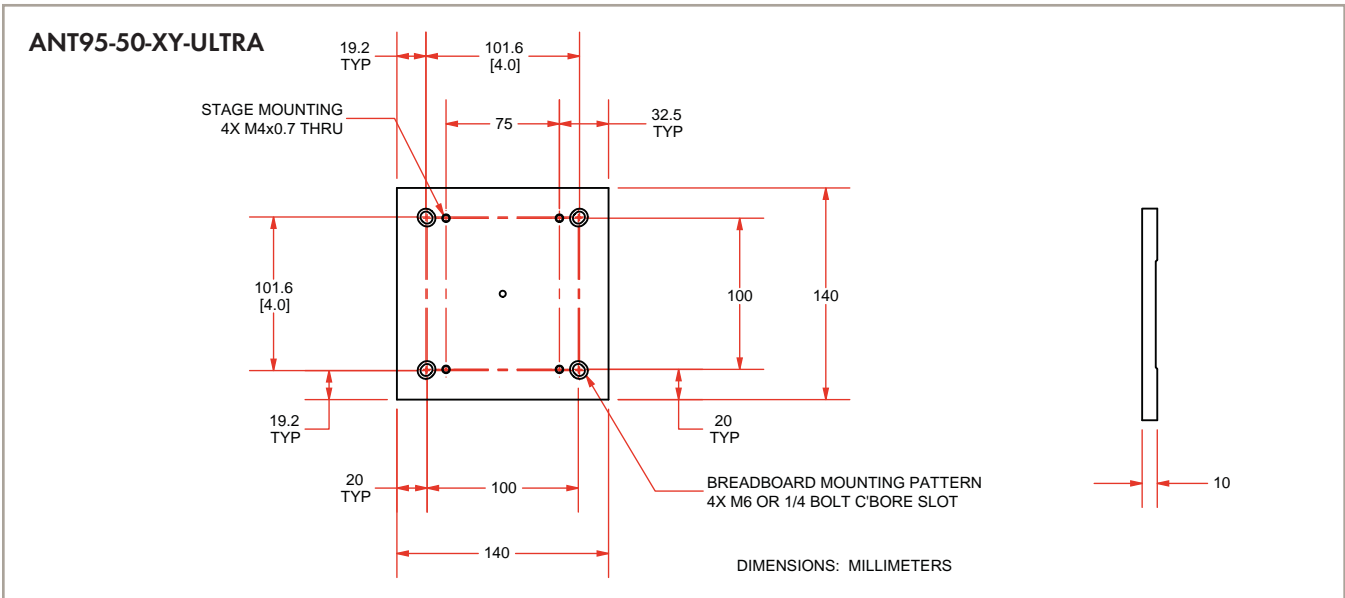
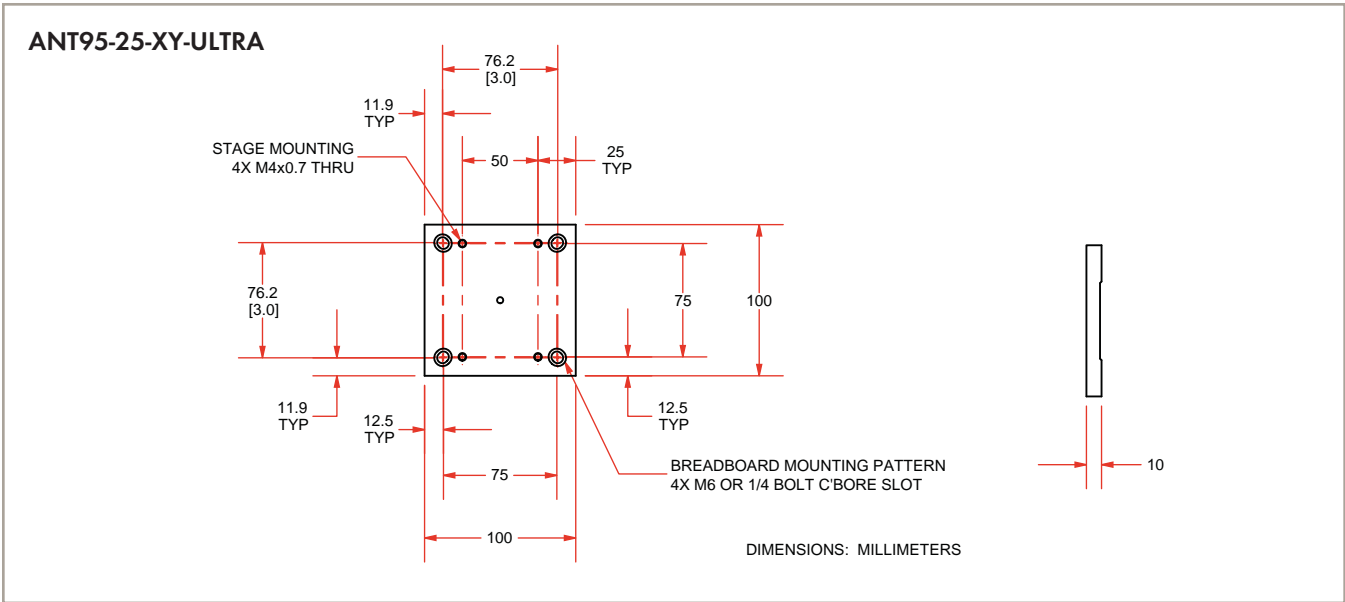


# ANT95-50-XY-ULTRA DIMENSIONS

## ANT95-50-XY-ULTRA



# ANT95-25-XY-ULTRA/ANT95-50-XY-ULTRA Mounting Plate DIMENSIONS



## ANT95-XY Series ORDERING INFORMATION

### ANT95-XY Series Linear Stage

ANT95-XY/ANT95-XY-PLUS	Aerotech nanotranslation crossed-roller linear positioner
ANT95-XY-ULTRA	Aerotech nanotranslation crossed-roller linear positioner with 2D calibration

### Linear Stage Travel

ANT95-25-XY	25 mm (1 in) XY travel stage with proprietary direct-drive motor technology, 1 Vp-p sinusoidal output linear encoder, and limits
ANT95-25-XY-PLUS	25 mm (1 in) XY travel stage with proprietary direct-drive motor technology, 1 Vp-p sinusoidal output linear encoder, and limits (High Accuracy Version)
ANT95-50-XY	50 mm (2 in) XY travel stage with proprietary direct-drive motor technology, 1 Vp-p sinusoidal output linear encoder, and limits
ANT95-50-XY-PLUS	50 mm (2 in) XY travel stage with proprietary direct-drive motor technology, 1 Vp-p sinusoidal output linear encoder, and limits (High Accuracy Version)
ANT95-25-XY-ULTRA	25 mm (1 in) XY travel stage with proprietary direct-drive motor technology, 1 Vp-p sinusoidal output linear encoder and limits
ANT95-50-XY-ULTRA	50 mm (2 in) XY travel stage with proprietary direct-drive motor technology, 1 Vp-p sinusoidal output linear encoder and limits

### Options

-MP	Breadboard mounting plate
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