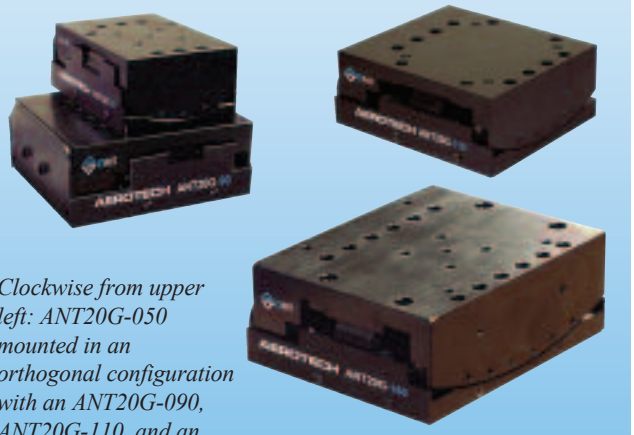
ANT20G Series

Single-Axis Direct-Drive Nanopositioning Goniometers

nano Motion Technology

- Noncontact, non-cogging, frictionless direct-drive for zero backlash or hysteresis
- High speed (150°/s)
- High resolution (0.1 arc second)
- Excellent in-position stability
- Large angular range; 20° of travel
- Orthogonal mounting of two cradles provides rotation about the same point
- No maintenance
- Compact design



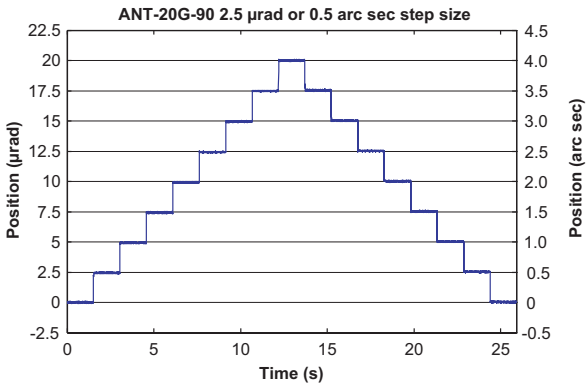
Clockwise from upper left: ANT20G-050 mounted in an orthogonal configuration with an ANT20G-090, ANT20G-110, and an ANT20G-160.

U.S. Patent No. 6,442,851

Aerotech's ANT20G goniometers represent a significant breakthrough in the high-accuracy angular alignment of components. This unique design utilizes Aerotech's best-in-class direct-drive noncontact motor technology. When used with Aerotech's controllers, the ANT20G series provides an industry-leading positioning speed of 150 degrees per second.

High-precision bearings, direct on-axis encoder feedback, and noncontact and noncogging direct-drive technology assure the highest level of performance and make excellent repeatability and in-position stability a reality. The goniometer cradles can be mounted orthogonally to provide pitch and roll about the same point in space. Combining this with a rotary stage under the orthogonal assembly adds a third rotation axis (pitch, roll, yaw) through the same point.

The critical elements of the ANT20G goniometers, as with all other ANT series nanopositioners, were selected to operate in a 24/7 manufacturing environment. Unlike worm- or piezo-driven goniometers, the ANT20G series will not require periodic adjustment or maintenance. This will assure many years of trouble-free operation. The ANT20G cradles are available in four sizes.



ANT20G-090 step plot. Best-in-class resolution and exceptional in-position stability for large angular travel stages.

ANT20G Series SPECIFICATIONS

Mechanical Specifications		ANT20G-050	ANT20G-090
Rotation Angle		20°	20°
Accuracy[1]		±90 µrad (±18 arc sec)	±50 µrad (±10 arc sec)
Resolution (Minimum Incremental Motion)		0.25 µrad (0.05 arc sec)	0.25 µrad (0.05 arc sec)
Repeatability (Bi-Directional)[1]		±18 µrad (±4 arc-sec)	±10 µrad (±2 arc-sec)
Repeatability (Uni-Directional)		±5 µrad (±1 arc-sec)	±5 µrad (±1 arc-sec)
Tilt Error Motion		±90 µrad (±18 arc sec)	±50 µrad (±10 arc sec)
Maximum Speed		150 degrees per second	
Maximum Acceleration		1200 rad/s^2	500 rad/s^2
Settling Time		See graph for typical performance	
In-Position Stability[2]		±0.4 µrad (±0.08 arc sec)	±0.2 µrad (±0.04 arc sec)
Nominal Radius of Rotation		50 mm	90 mm
Height from Tabletop to Rotation Point		19.1 mm	57.5 mm
Maximum Torque (Continuous)		0.40 N-m	0.85 N-m
Load Capacity	Axial	1.5 kg	2.0 kg
	Moment	60 kg-mm	80 kg-mm
Stage Mass		0.55 kg (1.2 lb)	1.1 kg (2.4 lb)
Material		Aluminum	
MTBF (Mean Time Between Failure)		30,000 Hours	

Notes:
1. Certified with each stage.
2. In-Position Jitter listing is 3 sigma value.
• Specifications are per axis, measured at the rotation point. Performance of multi-axis systems is payload and workpoint dependent. Consult factory for multi-axis or non-standard applications.

Mechanical Specifications		ANT20G-110	ANT20G-160
Rotation Angle		20°	20°
Accuracy[1]		±40 µrad (±8 arc sec)	±30 µrad (±6 arc sec)
Resolution (Minimum Incremental Motion)		0.25 µrad (0.05 arc sec)	0.25 µrad (0.05 arc sec)
Repeatability (Bi-Directional)[1]		±10 µrad (±2 arc-sec)	±10 µrad (±2 arc-sec)
Repeatability (Uni-Directional)		±5 µrad (±1 arc-sec)	±5 µrad (±1 arc-sec)
Tilt Error Motion		±40 µrad (±8 arc sec)	±30 µrad (±6 arc sec)
Maximum Speed		150 degrees per second	
Maximum Acceleration		375 rad/s^2	250 rad/s^2
Settling Time		See graph for typical performance	
In-Position Stability[2]		±0.2 µrad (±0.04 arc sec)	±0.15 µrad (±0.03 arc sec)
Nominal Radius of Rotation		110 mm	160 mm
Height from Tabletop to Rotation Point		76.2 mm	120.4 mm
Maximum Torque (Continuous)		1.00 N-m	2.40 N-m
Load Capacity	Axial	2.0 kg	3.5 kg
	Moment	80 kg-mm	140 kg-mm
Stage Mass		1.2 kg (2.6 lb)	1.6 kg (3.5 lb)
Material		Aluminum	
MTBF (Mean Time Between Failure)		30,000 Hours	

Notes:
1. Certified with each stage.
2. In-Position Jitter listing is 3 sigma value.
• Specifications are per axis, measured at the rotation point. Performance of multi-axis systems is payload and workpoint dependent. Consult factory for multi-axis or non-standard applications.

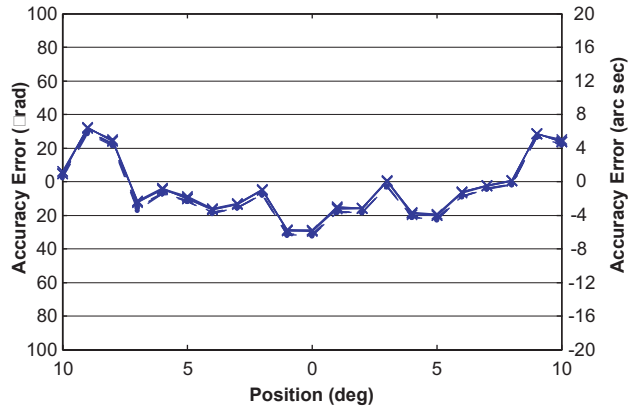
Note: To ensure the achievement and repeatability of specifications over an extended period of time, environmental temperature must be controlled to within 0.25ºC/24 hours. If this is not possible, alternate products are available. Please consult Aerotech Application Engineering for more information.

ANT-20G Series SPECIFICATIONS

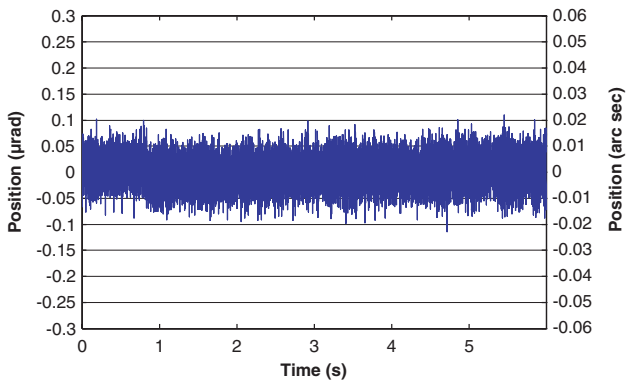
Electrical Specifications	ANT20G
Drive System	Slotless, Brushless, Direct-Drive
Feedback	Noncontact Encoder
Maximum Bus Voltage	±40 VDC
Limit Switches	5 V, Normally Closed
Home Switch	Near Center

Recommended Controller		ANT20G
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

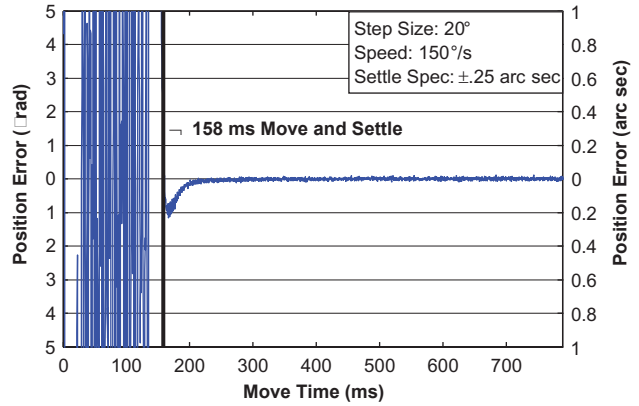
Notes:
1. Linear amplifiers are required to achieve the listed specifications. Other options are available.



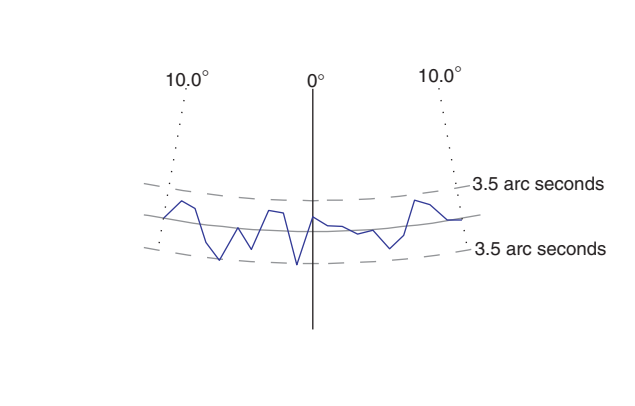
ANT20G-090 accuracy, five runs, bi-directional, uncalibrated, shows the high level of system accuracy.



ANT20G-090 in-position stability. Excellent in-position stability is another feature of the ANT Series goniometers.



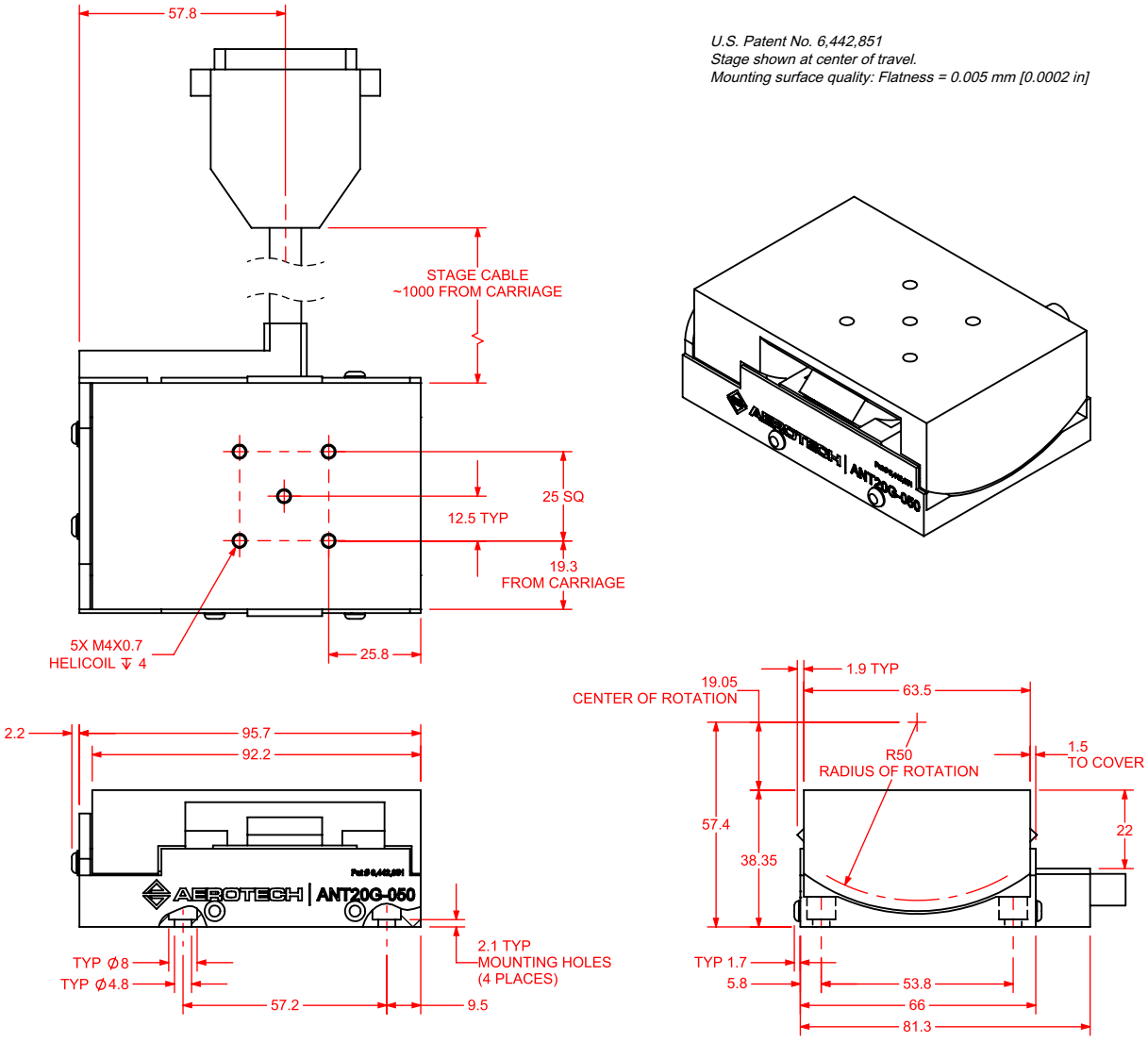
ANT20G-090 step and settle performance. Outstanding settling time enhances throughput of most applications.



ANT20G-090 tilt error motion performance.

ANT20G Series DIMENSIONS

ANT20G-050

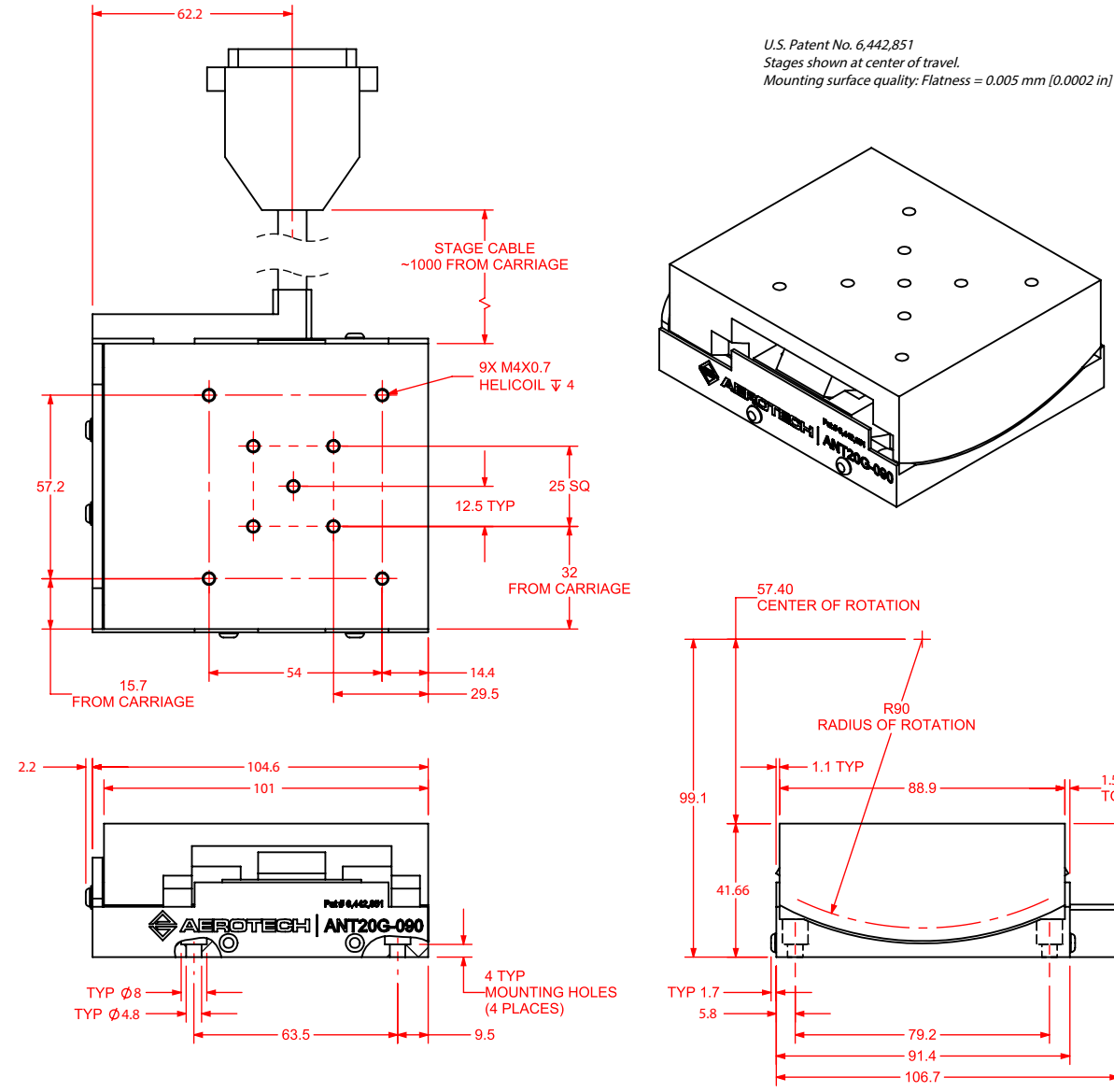


U.S. Patent No. 6,442,851
Stage shown at center of travel.
Mounting surface quality: Flatness = 0.005 mm [0.0002 in]

DIMENSIONS: MILLIMETERS

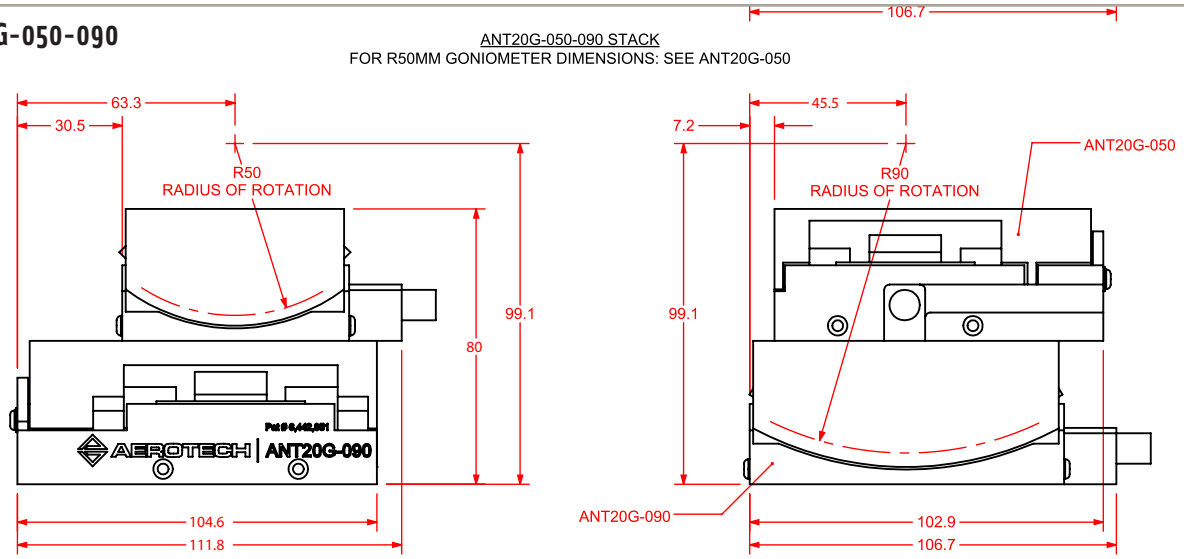
ANT20G Series DIMENSIONS

ANT20G-090



ANT20G Series DIMENSIONS

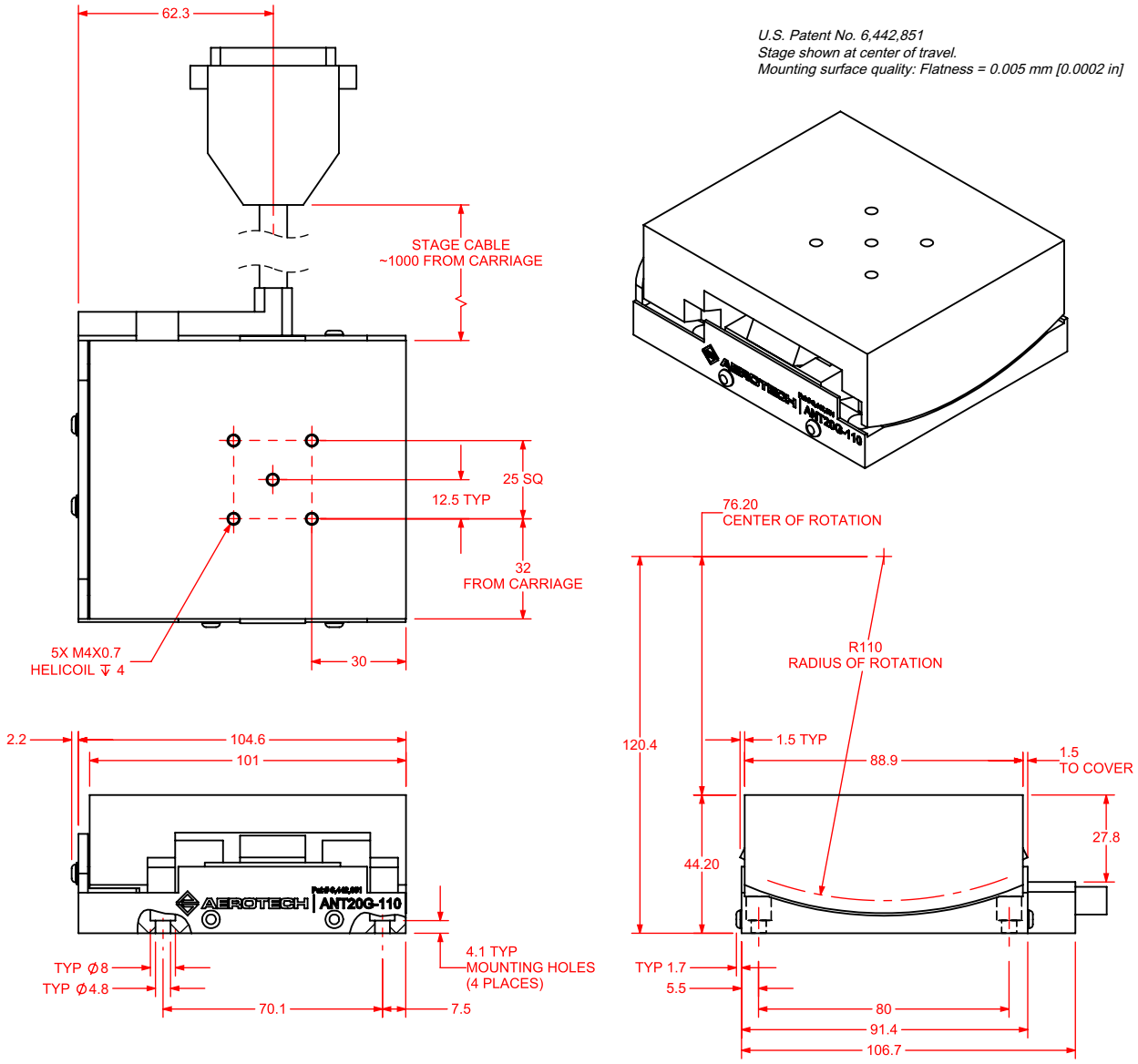
ANT20G-050-090



DIMENSIONS: MILLIMETERS

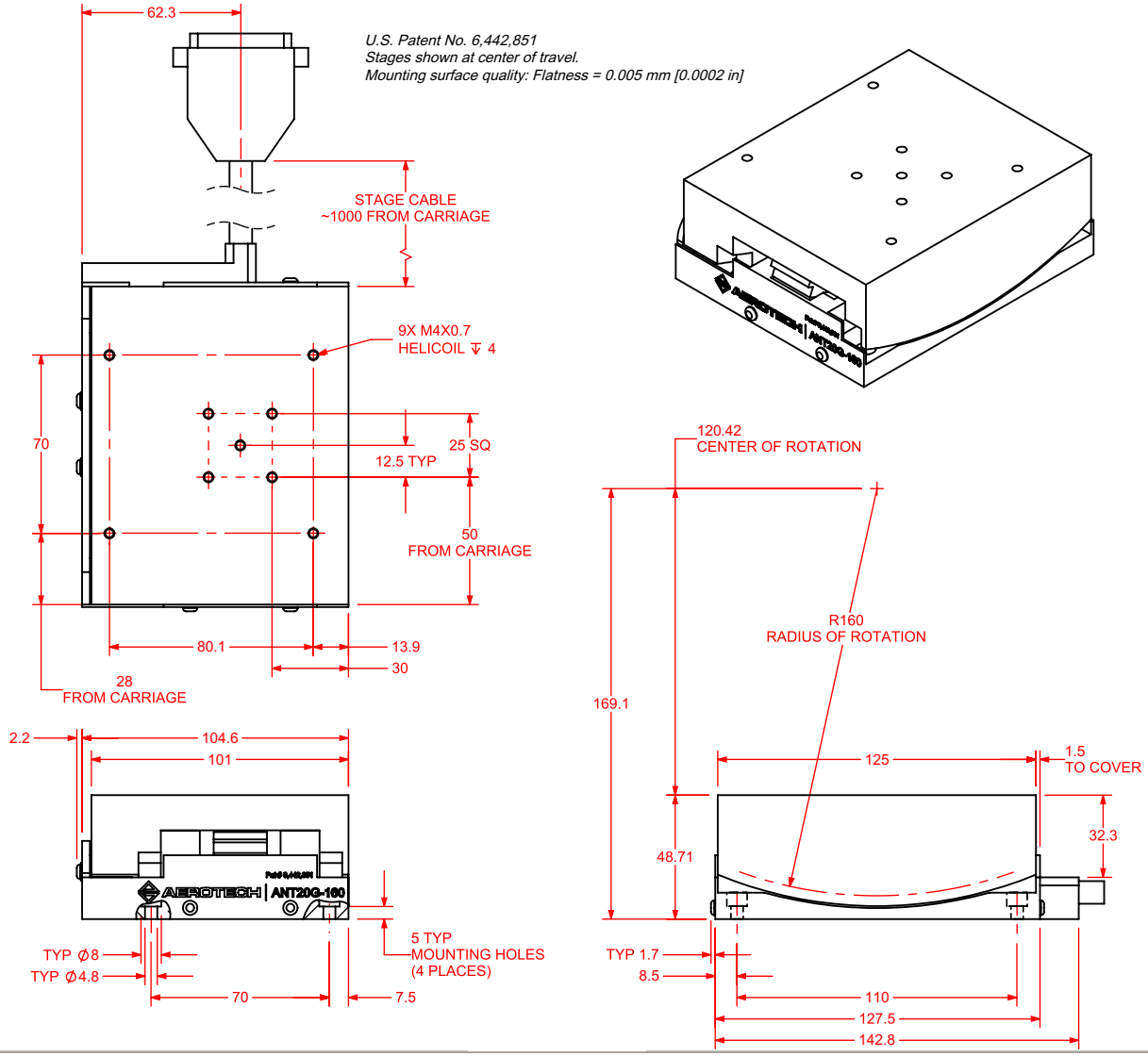
U.S. Patent No. 6,442,851
All stages shown at center of travel. Mounting surface quality: Flatness = 5 µm [0.0002 in.]

ANT20G-110



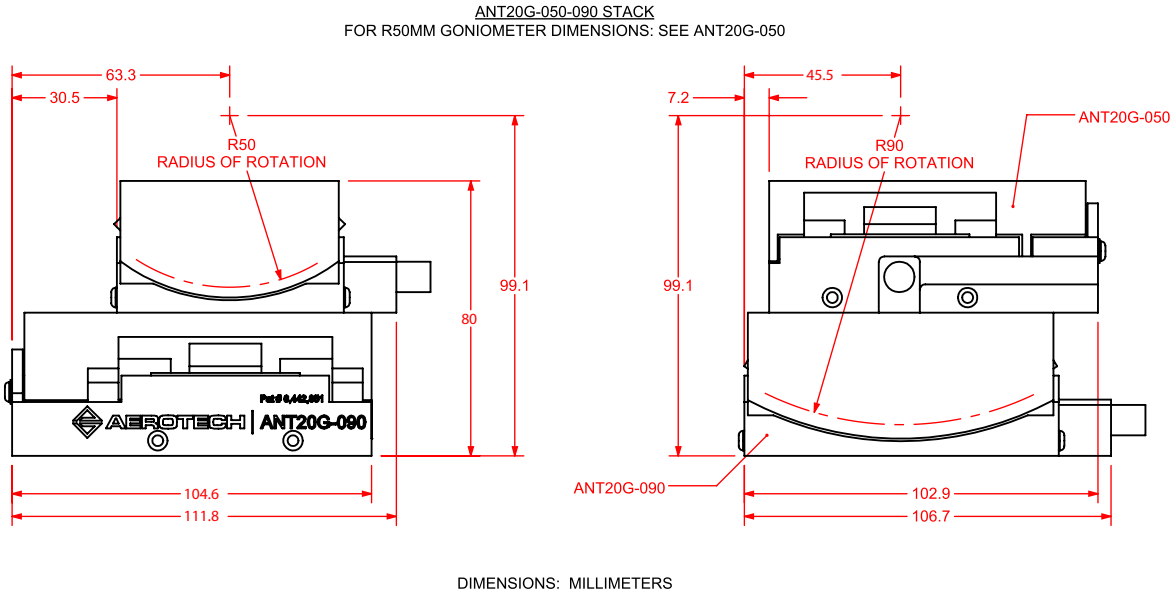
DIMENSIONS: MILLIMETERS

ANT20G-160


62.3
U.S. Patent No. 6,442,851
Stages shown at center of travel.
Mounting surface quality: Flatness = 0.005 mm [0.0002 in]
STAGE CABLE
~1000 FROM CARRIAGE
9X M4X0.7
HELICOIL ↧ 4
70
25 SQ
12.5 TYP
50
FROM CARRIAGE
80.1
13.9
30
28
FROM CARRIAGE
120.42
CENTER OF ROTATION
R160
RADIUS OF ROTATION
169.1
2.2
104.6
101
125
1.5
TO COVER
32.3
48.71
AEROTECH | ANT20G-160
TYP Ø8
TYP Ø4.8
5 TYP
MOUNTING HOLES
(4 PLACES)
70
7.5
TYP 1.7
8.5
110
127.5
142.8

ANT20G Series DIMENSIONS

ANT20G-110-160



U.S. Patent No. 6,442,851
All stages shown at center of travel. Mounting surface quality: Flatness = 5 µm [0.0002 in.]

ANT20G Series ORDERING INFORMATION

Radius of Rotation (Required)

-050	50 mm radius of rotation
-090	90 mm radius of rotation
-110	110 mm radius of rotation
-160	160 mm radius of rotation

Metrology (Required)

-PL1	Base performance
-PL2	High-accuracy performance, PLUS

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.

Accessories (to be ordered as separate line item)

ALIGN-PA10	XY assembly; 10 arc sec orthogonality
ALIGN-PA5	XY assembly; 5 arc sec orthogonality