

# AMG Series

## Motorized Position and Rate Gimbals

Continuous 360° rotation of azimuth and elevation including built-in slip ring

High accuracy angular position and rate capability

Direct-drive brushless servomotors result in zero backlash

Cog-free design for outstanding velocity stability

Accommodate loads up to 600 mm diameter

Low maintenance and high reliability provide the lowest cost of ownership



Aerotech's AMG position and rate gimbal mounts provide ultra-precise angular position, rate, and acceleration for development and production testing of a wide range of systems. The AMG series is ideal for directing optics, lasers, antennas, and sensors at high speed to very precise pointing angles. Typical applications include missile seeker test and calibration, LIDAR, electro-optical sensor and FLIR testing, airborne targets tracking, optical testing of space-based sensors in a vacuum, and angular testing of inertial sensors such as gyros, MEMS, accelerometers, and inertial reference units. The AMG gimbal design incorporates recent Aerotech rotary stage design improvements to provide high performance at an affordable price. The finest quality motors, bearings, and encoders are integrated into precision-machined housings to ensure peak performance. The AMG position and rate gimbals provide precise angular motion with the high performance customers expect from Aerotech products.

### Accurate 360° Positioning and Rate Generation

Direct-drive brushless torque motors, with rare-earth magnets and high-accuracy angular transducers, are coupled directly to precision shafts for accurate and smooth 360° continuous motion. The absence of gear trains and other drive mechanisms eliminates position error contributions due to mechanical hysteresis and backlash.

Directly-coupled high-resolution position transducers ensure highly accurate and repeatable positioning.

A wide-range of performance feedback grades is available. Typical line gimbal resolution ranges from 1.0 to 0.13  $\mu$ rad with Aerotech controls. The built-in azimuth slip ring provides for continuous rotation with no cable wrap up.

### Direct-Drive Motors for Outstanding Control

To maximize positioning and velocity performance, AMG gimbal mounts utilize Aerotech's high torque S-series brushless, slotless servomotors. These motors have all of the advantages of a brushless direct-drive motor — no brushes to wear, no gear trains to maintain, and high acceleration and high speeds. Since it is a slotless, ironless design, there is zero cogging, meaning that there is absolutely no torque ripple. This results in smoother motion throughout travel and more precise positioning. These motors are available in different winding configurations to work with high or low voltage power supplies.

### Superior Mechanical Design Features

Large diameter, matched-set ABEC-7 bearings maximize performance with respect to wobble, moment stiffness, and rotating friction. The large diameter bearing permits large payload capacity without compromising performance.

## AMG Series DESCRIPTION

Casting gimbal yokes provide high stiffness to maintain gimbal accuracy under dynamic conditions. Travel limits, hardstops, and brakes are available as standard options.

sensors or other odd shaped payloads. We understand customer payloads vary and our engineers have a variety of solutions to implement offset CG payloads.

### Mirror and Alternate Payload Accommodation

A variety of mirror cell diameters are available for standard optic applications. We also provide for custom payload attachment solutions to accommodate various device interfaces. Each gimbal mirror cell can be modified or replaced with different shaped cells to accommodate

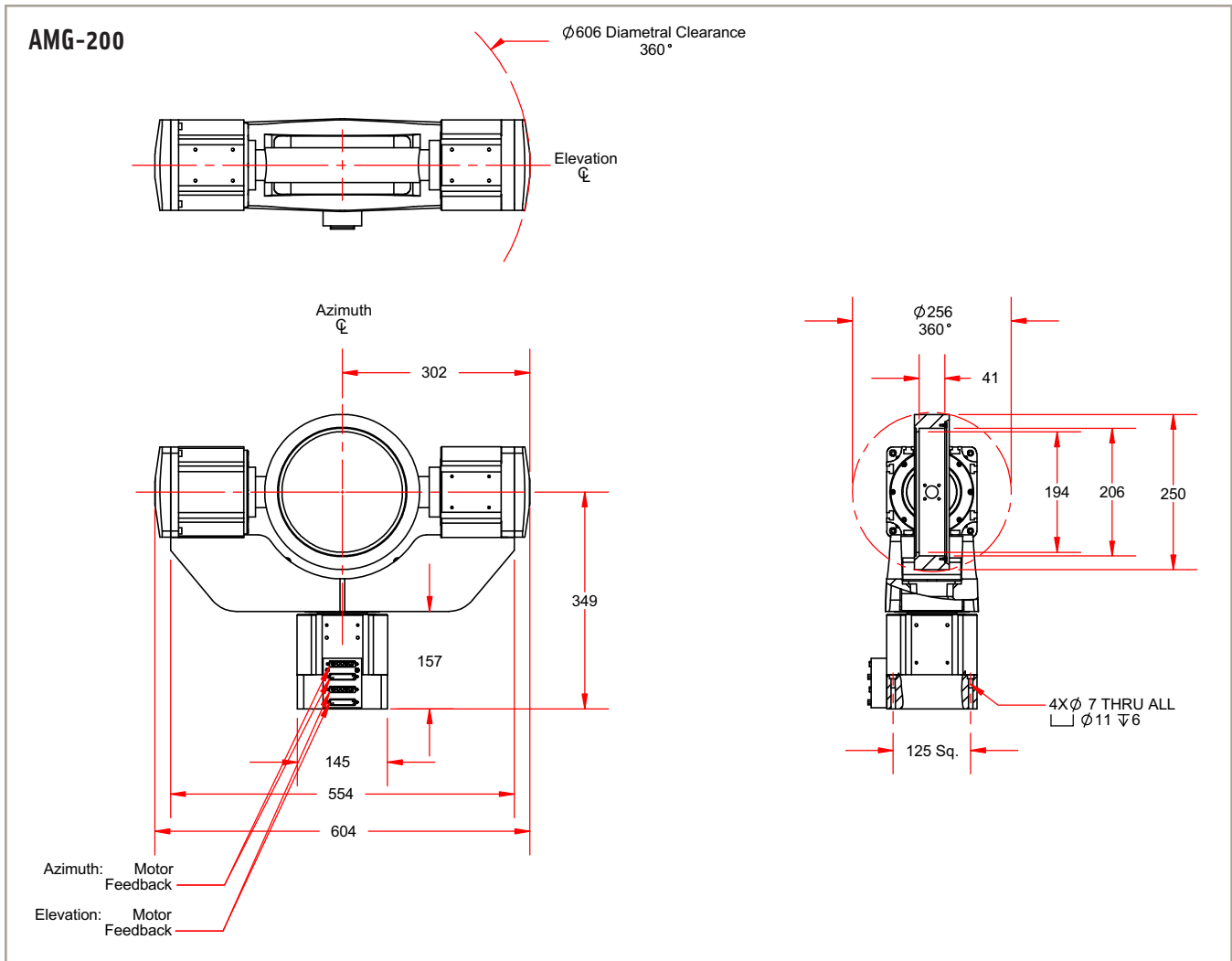
## AMG Series SPECIFICATIONS

Basic Model	AMG-200	AMG-300	AMG-400	AMG-500	AMG-600
Travel	360° continuous, AZ/EL				
Clear Aperture Diameter <sup>(1)</sup>	194 mm	292 mm	394 mm	489 mm	591 mm
Mechanical Drive System	Direct-Drive Brushless Servomotor				
Accuracy	±24 to ±144 μrad <sup>(2)</sup> (±5 to ±30 arc sec)				
Repeatability	±2.4 μrad (±0.5 arc sec)				
Maximum Rotary Speed <sup>(3)</sup>	100 rpm	100 rpm	100 rpm	50 rpm	50 rpm
AZ Resolution <sup>(4)</sup>	0.27 μrad	0.2 μrad	0.2 μrad	0.13 μrad	0.13 μrad
EL Resolution <sup>(4)</sup>	0.27 μrad	0.27 μrad	0.27 μrad	0.2 μrad	0.2 μrad
Maximum Load Capability	20 kg	40 kg	40 kg	70 kg	70 kg
Axis Wobble	48 μrad (10 arc sec)				
Orthogonality	24 μrad (5 arc sec)				
Standard Finish	Black Anodize with Hard-Coated Cell				
Max Component Diameter <sup>(5)</sup>	206 mm	306 mm	407 mm	509 mm	610 mm
Nominal Component Thickness	41 mm	54 mm	64 mm	95 mm	102 mm
Mass (Without Mirror)	29 kg	47 kg	54 kg	116 kg	137 kg
Inertia AZ <sup>(6)</sup>	0.521 kg•m <sup>2</sup>	1.198 kg•m <sup>2</sup>	2.246 kg•m <sup>2</sup>	8.289 kg•m <sup>2</sup>	12.362 kg•m <sup>2</sup>
Inertia EL <sup>(6)</sup>	0.016 kg•m <sup>2</sup>	0.103 kg•m <sup>2</sup>	0.265 kg•m <sup>2</sup>	0.950 kg•m <sup>2</sup>	2.310 kg•m <sup>2</sup>
AZ Motor Type	S-130-39-A	S-180-69-A	S-180-69-A	S-240-63-A	S-240-63-A
EL Motor Type	S-130-39-A	S-130-39-A	S-130-39-A	S-180-69-A	S-180-69-A
AZ Aperture When Slip Ring Is Removed (AZ Travel Must Be Limited)	50 mm	75 mm	75 mm	100 mm	100 mm
Aperture With Slip Ring	12.7 mm	12.7 mm	12.7 mm	38.1 mm	38.1 mm

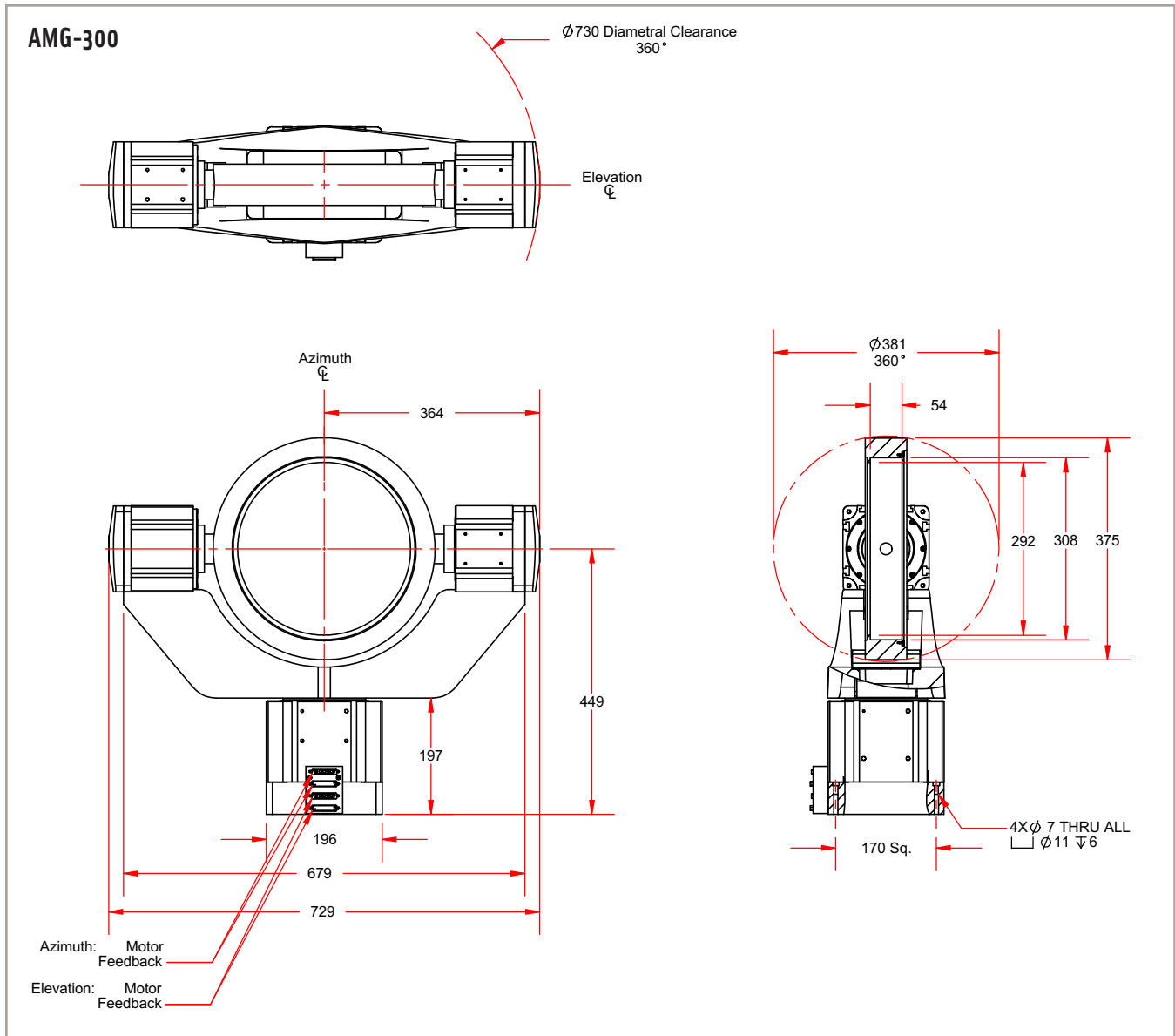
Notes:

1. Special cell adapters and slip ring assemblies available by special order.
2. ±24 μrad calibrated; ±144 μrad uncalibrated.
3. Maximum speed based on stage capability; maximum application velocity may be limited by system data rate and system resolution.
4. With x500 multiplication on AS encoder. Higher resolutions available.
5. Tolerance equals +0/-0.25.
6. Unloaded inertia.

# AMG Series DIMENSIONS

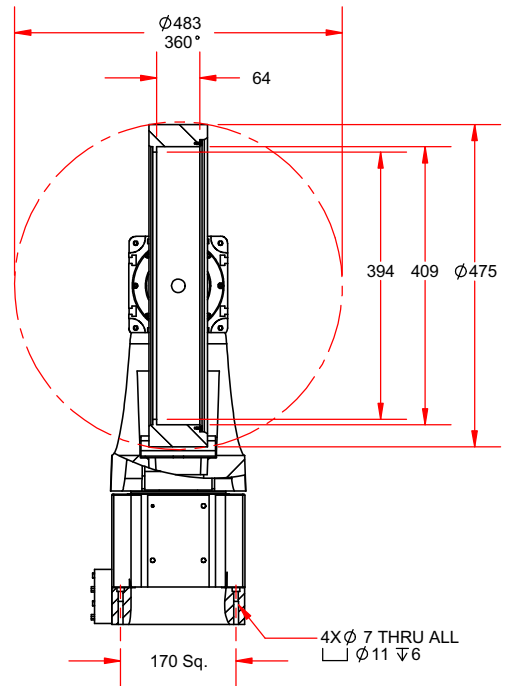
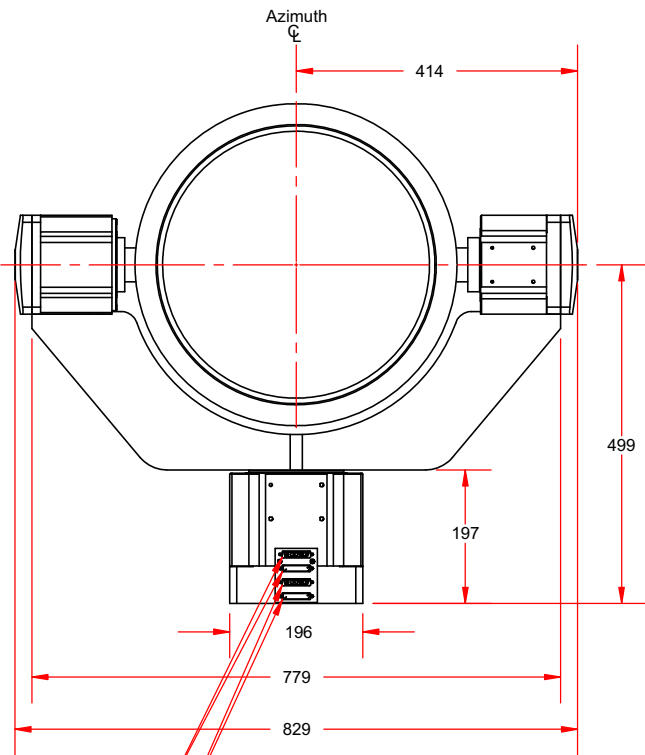
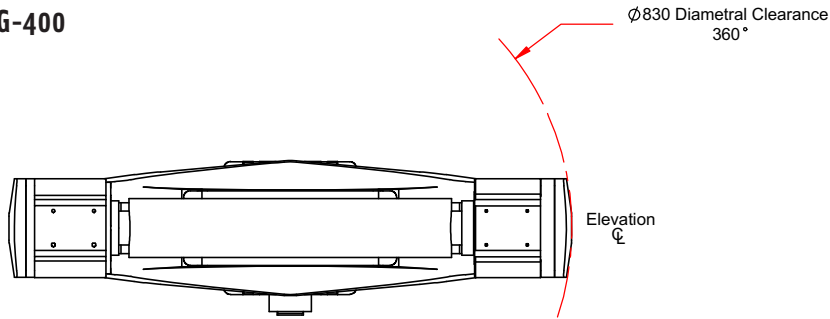


# AMG Series DIMENSIONS



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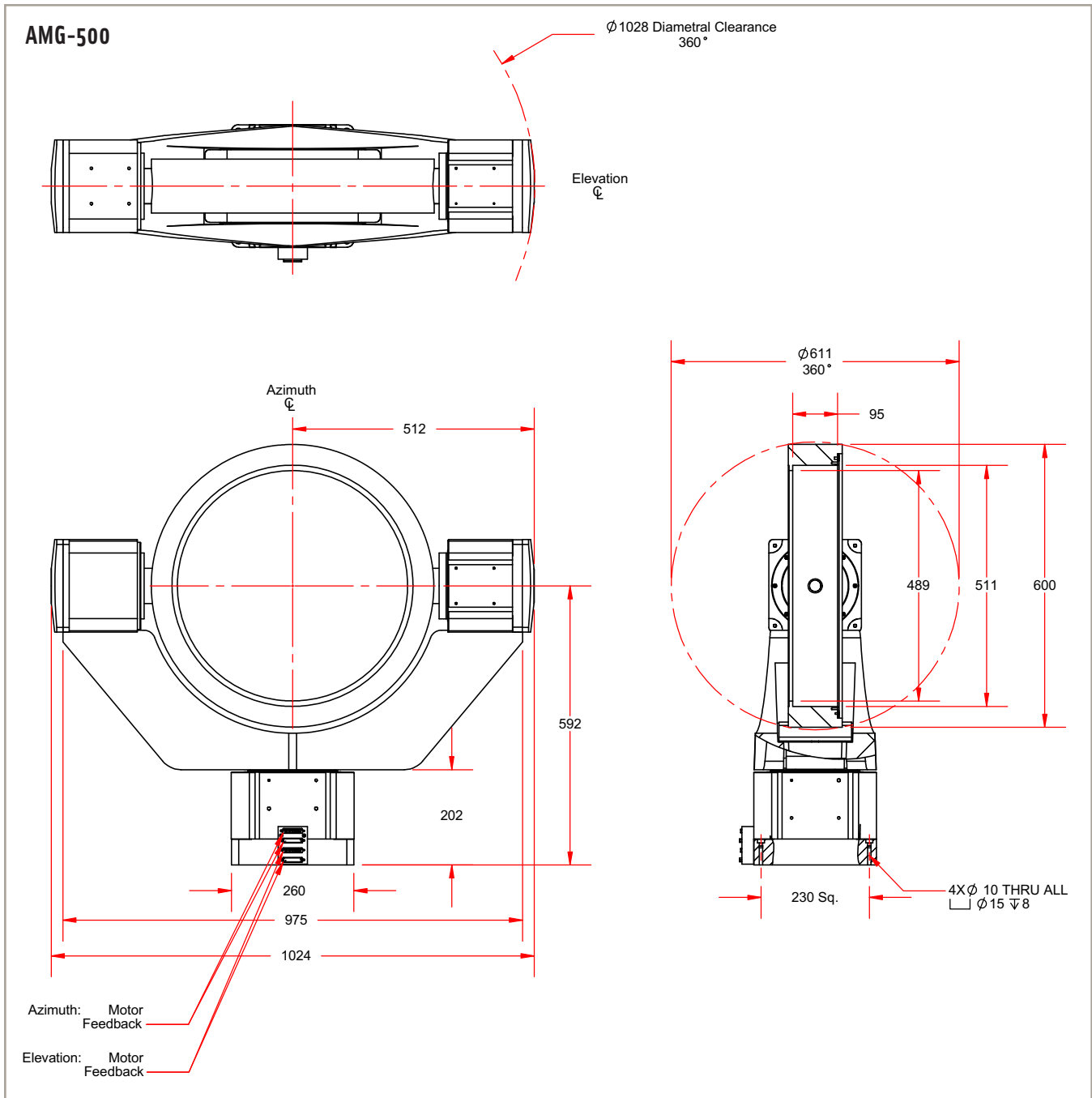
**AMG-400**



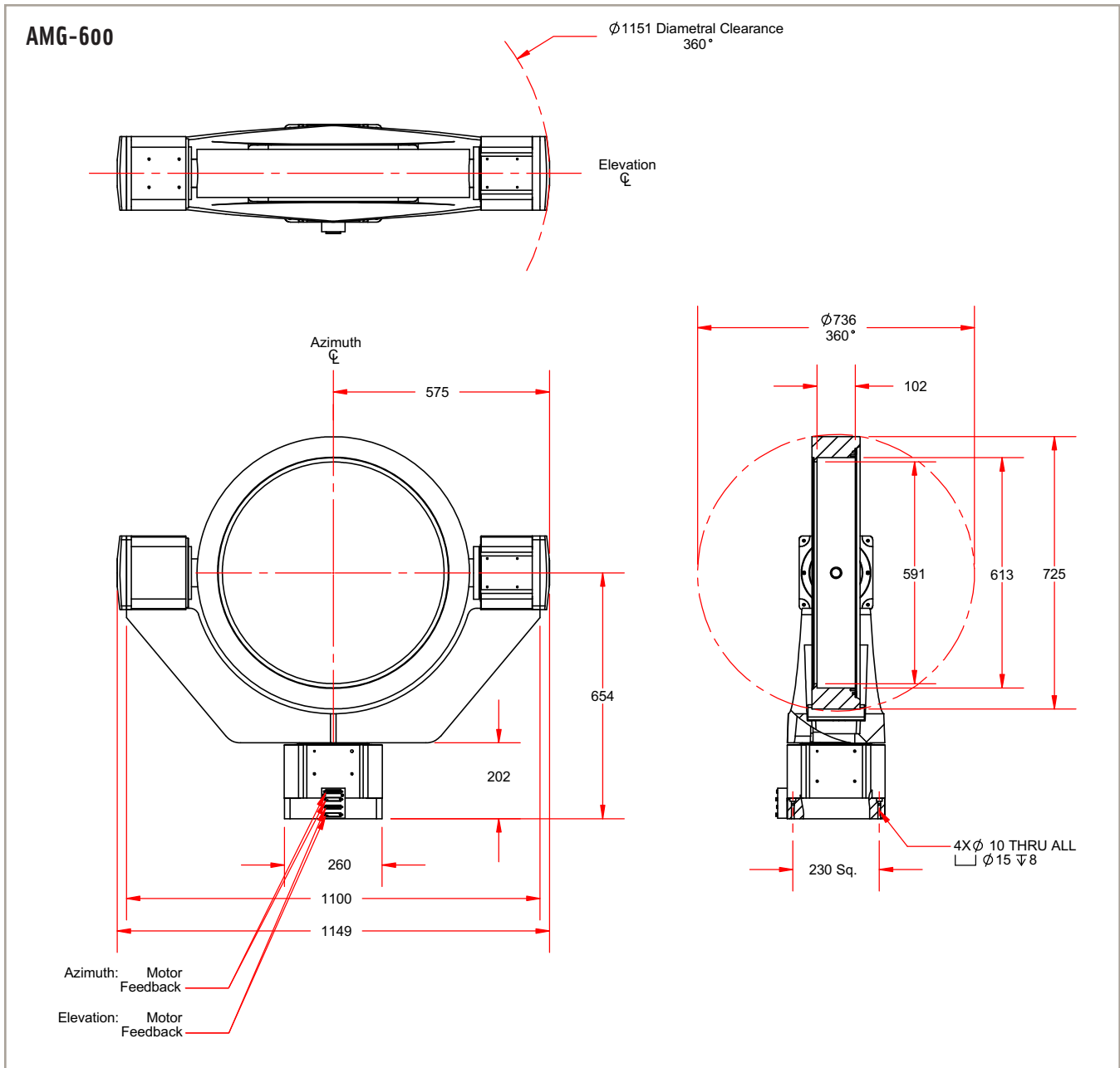
Azimuth: Motor  
Feedback

Elevation: Motor  
Feedback

# AMG Series DIMENSIONS



# AMG Series DIMENSIONS



## AMG Series ORDERING INFORMATION

### Ordering Example

AMG	-200	-AS	(Opt.)/
Model	Cell Size	Position Transducer	Stage & Assembly Options
AMG	-200	AS	-VAC3
	-300	X5	-VAC6
	-400	X50	
	-500		
	-600		

### AMG Direct-Drive Motorized Gimbal

AMG-200	High accuracy, direct-drive gimbal with zero motion cogging and zero backlash; 206 mm mirror cell ID with mirror face forward of the rotation intersection of AZ/EL; fundamental encoder resolution: both AZ and EL 11840 lines/rev; continuous 360 degree rotation in both axes; includes AZ slip ring for the EL axis power and signals
AMG-300	High accuracy, direct-drive gimbal with zero motion cogging and zero backlash; 306 mm mirror cell ID with mirror face forward of the rotation intersection of AZ/EL; fundamental encoder resolution: AZ 15744 lines/rev, EL 11840 lines/rev; continuous 360 degree rotation in both axes; includes AZ slip ring for the EL axis power and signals
AMG-400	High accuracy, direct-drive gimbal with zero motion cogging and zero backlash; 407 mm mirror cell ID with mirror face forward of the rotation intersection of AZ/EL; fundamental encoder resolution: AZ 15744 lines/rev, EL 11840 lines/rev; continuous 360 degree rotation in both axes; includes AZ slip ring for the EL axis power and signals
AMG-500	High accuracy, direct-drive gimbal with zero motion cogging and zero backlash; 509 mm mirror cell ID with mirror face forward of the rotation intersection of AZ/EL; fundamental encoder resolution: AZ 23600 lines/rev, EL 15744 lines/rev; continuous 360 degree rotation in both axes; includes AZ slip ring for the EL axis power and signals
AMG-600	High accuracy, direct-drive gimbal with zero motion cogging and zero backlash; 610 mm mirror cell ID with mirror face forward of the rotation intersection of AZ/EL; fundamental encoder resolution: AZ 23600 lines/rev, EL 15744 lines/rev; continuous 360 degree rotation in both axes; includes AZ slip ring for the EL axis power and signals

### Position Transducer (AZ = azimuth; EL = elevation)

AMG-200	
-AS	Standard feedback device; 1 Vpp sine wave output encoder with 0.27 $\mu$ rad resolution in both AZ and EL when used with 2000 times external multiplication
-X5	TTL output encoder with internal 5x multiplier provides 27 $\mu$ rad resolution in both AZ and EL
-X50	TTL output encoder with internal 50x multiplier provides 2.7 $\mu$ rad resolution in both AZ and EL
AMG-300/400	
-AS	Standard feedback device; 1 Vpp sine wave output encoder with 0.2 $\mu$ rad resolution in AZ and 0.27 $\mu$ rad resolution in EL when used with 2000 times external multiplication
-X5	TTL output encoder with internal 5x multiplier provides 20 $\mu$ rad resolution in AZ and 27 $\mu$ rad resolution in EL
-X50	TTL output encoder with internal 50x multiplier provides 2 $\mu$ rad resolution in AZ and 2.7 $\mu$ rad resolution in EL
AMG-500/600	
-AS	Standard feedback device; 1 Vpp sine wave output encoder with 0.13 $\mu$ rad resolution in AZ and 0.2 $\mu$ rad resolution in EL when used with 2000 times external multiplication
-X5	TTL output encoder with internal 5x multiplier provides 13 $\mu$ rad resolution in AZ and 20 $\mu$ rad resolution in EL
-X50	TTL output encoder with internal 50x multiplier provides 1.3 $\mu$ rad resolution in AZ and 2.0 $\mu$ rad resolution in EL

### Stage Construction Options

/VAC3	Vacuum preparation of stage to 10 <sup>-3</sup> torr
/VAC6	Vacuum preparation of stage to 10 <sup>-6</sup> torr

## AMG Series ORDERING INFORMATION

### Contact Factory for Custom Options Available

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Optional mirror face aligned to rotation axes — the mirror cell may be offset so the mirror face is at the AZ/EL intersection as a special order system; additional counterbalance weight may be needed for this configuration; please consult factory for details

External cable CMS; larger clear aperture available through AZ; limited AZ travel

Limit switches and hard stops available

Slip ring for customer signals and power