High-Precision Rotary Stages

APR

Superior Performance, Easy Integration

Our APR stages are the highest performing and most versatile direct-drive, mechanical-bearing stages available. With nine models offering a variety of options for load capacity, torque and dimensional requirements, the APR stage family provides convenient design and integration flexibility. APR stages achieve exceptionally high repeatability, geometric performance and dynamics through a combination of ultra-precise components, cogless direct-drive motors, high-resolution encoder feedback and superior craftsmanship.

Key Applications

APR stages are ideal for advanced applications that demand excellent positioning performance, highly dynamic motion with outstanding tracking accuracy, large payloads and more, including:

- Single-axis & multi-axis electro-optic sensor testing
- Inertial navigation device qualification
- Missile seeker testing & antenna testing
- Optical calibration systems
- Metrology systems
- Azimuth/Elevation & Azimuth/Roll pointing & tracking systems

KEY FEATURES:

- Provides **ULTRA-PRECISE ROTARY MOTION** with accuracy to 1.5 arc sec & repeatability to 0.5 arc sec, plus **OUTSTANDING GEOMETRIC PERFORMANCE**
- Achieves extremely **SMOOTH MOTION** with brushless, cogless **DIRECT-DRIVE MOTORS**
- Attains **HIGH SPEEDS** up to 1500 rpm, with **EXCELLENT BANDWIDTH** for aggressive motion profiles
- Offers **SUBSTANTIAL LOAD CAPACITY** to 250 kg & supports loads in multiple orientations
- Provides **PAYLOAD SECURITY & MINIMIZES COLLISION RISK** with available holding brake & limited travel options
- Configurable with high-resolution **INCREMENTAL OR ABSOLUTE ENCODERS**

APR SERIES SPECIFICATIONS

Specifications			APR100DR-095	APR100DR-145
Travel			Continuous (Optional 270° Max Limited)	
Accuracy	-E1, -E2, -E3, -E4 Feedback Options	Uncalibrated	45 arc sec	
		Calibrated	4 arc sec	
	-E5, -E6 Feedback Options	Uncalibrated	4 arc sec	
		Calibrated	2 arc sec	
Resolution (Minimum Incremental Motion)			0.1 arc sec	
Repeatability (Bi-Directional)[1]			1.5 arc sec	
Repeatability (Uni-Directional)			0.75 arc sec	
Total Tilt Error Motion[2]			2 arc sec	
Total Axial Error Motion[2]			1.5 µm	
Total Radial Error Motion[2]			1.5 µm	
Maximum Speed[3]			1500 rpm	
Aperture			15 mm	
Maximum Torque (Continuous)			0.48 N·m	1.6 N·m
Load Capacity	Axial		30 kg	
	Radial		25 kg	
Rotor Inertia (Unloaded)			0.0006 kg-m^2	0.0009 kg-m^2
Stage Mass[4]			3.2 kg	5.6 kg
Material			Aluminum; Hardcoat/Anodize Finish	
MTBF (Mean Time Between Failure)			20,000 hours	

1. Certified with each stage.
2. All error motion specifications are measured at 60 rpm.
3. Maximum speed listed is stage and motor dependent (assuming a 340 V bus). Actual speed may be lower due to motor back emf or encoder bandwidth (see Encoder Bandwidth table). Consult an Aerotech Applications Engineer for more details.
4. Mass listed is for the standard stage option (no brake and no tabletop). Consult Aerotech if brake and tabletop masses are desired.

APR SERIES SPECIFICATIONS

Specifications			APR150DR-115	APR150DR-135	APR150DR-180
Travel			Continuous (Optional 270° Max Limited)		
Accuracy	-E1, -E2, -E3, -E4 Feedback Options	Uncalibrated	45 arc sec		
		Calibrated	4 arc sec		
	-E5, -E6 Feedback Options	Uncalibrated	N/A	4 arc sec	
		Calibrated	N/A	2 arc sec	
Resolution (Minimum Incremental Motion)			.08 arc sec		
Repeatability (Bi-Directional)[1]			1.5 arc sec		
Repeatability (Uni-Directional)			0.75 arc sec		
Total Tilt Error Motion[2]			2 arc sec		
Total Axial Error Motion[2]			1.5 µm		
Total Radial Error Motion[2]			1.5 µm		
Maximum Speed[3]			600 rpm		
Aperture			50mm		
Maximum Torque (Continuous)			2.85 N·m	5.06 N·m	9.29 N·m
Load Capacity	Axial		45 kg		
	Radial		32 kg		
Rotor Inertia (Unloaded)			0.0047 kg-m^2	0.006 kg-m^2	0.0086 kg-m^2
Stage Mass[4]			6.5 kg	8.5 kg	12.3 kg
Material			Aluminum; Hardcoat/Anodize Finish		
MTBF (Mean Time Between Failure)			20,000 hours		

1. Certified with each stage.
2. All error motion specifications are measured at 60 rpm.
3. Maximum speed listed is stage and motor dependent (assuming a 340 V bus). Actual speed may be lower due to motor back emf or encoder bandwidth (see Encoder Bandwidth table). Consult an Aerotech Applications Engineer for more details.
4. Mass listed is for the standard stage option (no brake and no tabletop). Consult Aerotech if brake and tabletop masses are desired.

APR SERIES SPECIFICATIONS

Specifications			APR200DR-155	APR200DR-185	APR260DR-160	APR260DR-180
Travel			Continuous (Optional 270° Max Limited)			
Accuracy	**-E1, -E2, -E3, -E4 Feedback Options**	**Uncalibrated**	33 arc sec		25 arc sec	
		Calibrated	3 arc sec		2 arc sec	
	-E5, -E6 Feedback Options	**Uncalibrated**	3 arc sec		2 arc sec	
		Calibrated	1.75 arc sec		1.5 arc sec	
Resolution (Minimum Incremental Motion)			0.06 arc sec		0.04 arc sec	
Repeatability (Bi-Directional)[1]			1 arc sec		0.75 arc sec	
Repeatability (Uni-Directional)			0.5 arc sec			
Total Tilt Error Motion[2]			2 arc sec			
Total Axial Error Motion[2]			1.5 µm			
Total Radial Error Motion[2]			1.5 µm			
Maximum Speed[3]			600 rpm		375 rpm	
Aperture			75 mm		100 mm	
Maximum Torque (Continuous)			11.12 N·m	15.93 N·m	19.71 N·m	29.09 N·m
Load Capacity	**Axial**		205 kg		250 kg	
	Radial		100 kg		135 kg	
Rotor Inertia (Unloaded)			0.026 kg-m^2	0.032 kg-m^2	0.1 kg-m^2	0.12 kg-m^2
Stage Mass[4]			17.8 kg	22 kg	29.8 kg	35.4 kg
Material			Aluminum; Hardcoat/Anodize Finish			
MTBF (Mean Time Between Failure)			20,000 hours			

1. Certified with each stage.
2. All error motion specifications are measured at 60 rpm.
3. Maximum speed listed is stage and motor dependent (assuming a 340 V bus). Actual speed may be lower due to motor back emf or encoder bandwidth (see Encoder Bandwidth table). Consult an Aerotech Applications Engineer for more details.
4. Mass listed is for the standard stage option (no brake and no tabletop). Consult Aerotech if brake and tabletop masses are desired.

APR SERIES SPECIFICATIONS

Model	Max Speed (rpm) Per Encoder Bandwidth			
	-E1	-E4	-E2, -E5	-E3, -E6
APR100DR	Motor Limited	Motor Limited	147	18
APR150DR	Motor Limited	Motor Limited	118	11
APR200DR	Motor Limited	Motor Limited	82	8
APR260DR	375	375	59	5

Model	APR100DR-095	APR100DR-145
Drive System	Slotless, brushless, direct-drive rotary motor	
Fundamental Resolution (Lines/Rev)	11840	
-E1 Resolution[1]	0.028/0.007 arc sec	
-E2 Resolution	0.109 arc sec	
-E3 Resolution	0.014 arc sec	
-E4 Resolution	0.000301 arc sec	
-E5 Resolution	0.109 arc sec	
-E6 Resolution	0.014 arc sec	
Maximum Bus Voltage	340 VDC	
Limit Switches	Optional – specified at time of order; 5 VDC, Normally Closed	
Home Switch	5 VDC, Normally Closed	

Model	APR150DR-115	APR150DR-135	APR150DR-180
Drive System	Slotless, brushless, direct-drive rotary motor		
Fundamental Resolution (Lines/Rev)	16384		
-E1 Resolution[1]	0.02/0.005 arc sec		
-E2 Resolution	0.079 arc sec		
-E3 Resolution	0.0079 arc sec		
-E4 Resolution	0.000301 arc sec		
-E5 Resolution	0.079 arc sec		
-E6 Resolution	0.0079 arc sec		
Maximum Bus Voltage	340 VDC		
Limit Switches	Optional – specified at time of order; 5 VDC, Normally Closed		
Home Switch	5 VDC, Normally Closed		

Model	APR200DR-155	APR200DR-185	APR260DR-160	APR260DR-180
Drive System	Slotless, brushless, direct-drive rotary motor			
Fundamental Resolution (Lines/Rev)	23600		32768	
-E1 Resolution[1]	0.014/0.0034 arc sec		0.010/0.0025 arc sec	
-E2 Resolution	0.055 arc sec		0.04 arc sec	
-E3 Resolution	0.0055 arc sec		0.004 arc sec	
-E4 Resolution	0.000301 arc sec			
-E5 Resolution	0.055 arc sec		0.04 arc sec	
-E6 Resolution	0.0055 arc sec		0.004 arc sec	
Maximum Bus Voltage	340 VDC			
Limit Switches	Optional – specified at time of order; 5 VDC, Normally Closed			
Home Switch	5 VDC, Normally Closed			

1. -E1 shows 4000MXU/16000MXH total multiplication (inlcuding quadrature).
2. -E5, -E6 not available with APR150DR-115.

APR High-Precision Mechanical Bearing Rotary Stage

APR100DR-095	APR100DR-095 high-precision mechanical bearing rotary stage
APR100DR-145	APR100DR-145 high-precision mechanical bearing rotary stage
APR150DR-115	APR150DR-115 high-precision mechanical bearing rotary stage
APR150DR-135	APR150DR-135 high-precision mechanical bearing rotary stage
APR150DR-180	APR150DR-180 high-precision mechanical bearing rotary stage
APR200DR-155	APR200DR-155 high-precision mechanical bearing rotary stage
APR200DR-185	APR200DR-185 high-precision mechanical bearing rotary stage
APR260DR-160	APR260DR-160 high-precision mechanical bearing rotary stage
APR260DR-180	APR260DR-180 high-precision mechanical bearing rotary stage

Feedback (Required)

-E1	Incremental encoder, 1 Vpp
-E2	Incremental encoder, Digital RS422, x1000 interpolation
-E3	Incremental encoder, Digital RS422, x10000 interpolation (APR150DR, APR200DR, APR260DR); x8000 interpolation (APR100DR)
-E4	Absolute encoder
-E5	High-accuracy incremental encoder, Digital RS422, x1000 interpolation
-E6	High-accuracy incremental encoder, Digital RS422, x10000 interpolation (APR150DR, APR200DR, APR260DR); x8000 interpolation (APR100DR)

Note: -E5 and -E6 options are not available with APR150DR-115.

Motor (Required)

-M1	Low current, -A winding

Tabletop (Optional)

-TT1	Metric graduated tabletop
-TT2	English graduated tabletop

Note: -TT2 option not available with APR100DR models.

Travel (Required)

	Continuous travel
-TR010	Limited travel, +/- 5 degrees
-TR020	Limited travel, +/- 10 degrees
-TR040	Limited travel, +/- 20 degrees
-TR060	Limited travel, +/- 30 degrees
-TR080	Limited travel, +/- 40 degrees
-TR100	Limited travel, +/- 50 degrees
-TR120	Limited travel, +/- 60 degrees
-TR140	Limited travel, +/- 70 degrees
-TR160	Limited travel, +/- 80 degrees
-TR180	Limited travel, +/- 90 degrees

Ordering options continued on next page

-TR200 Limited travel, +/- 100 degrees

-TR220 Limited travel, +/- 110 degrees

-TR240 Limited travel, +/- 120 degrees

-TR270 Limited travel, +/- 135 degrees

Note: -TRxxx options contain an extra 1.5 degrees between the nominal travel and the electrical limit on each side. (Ex: -TR270 contains +/- 135 degrees of nominal travel, with +/-136.5 degrees of travel between electrical limits.)

Note: -TR010 option is not available with APR100DR.

Hardstops (Optional)

-HS Mechanical hard stops

Note: -HS option requires the selection of a Tabletop option (-TTx) and a Limited Travel option (-TRxxx).

Brake (Optional)

-BK Holding brake

Note: -BK option not available with APR260DR models.

Metrology (Required)

-PL3 Metrology, uncalibrated with performance plots

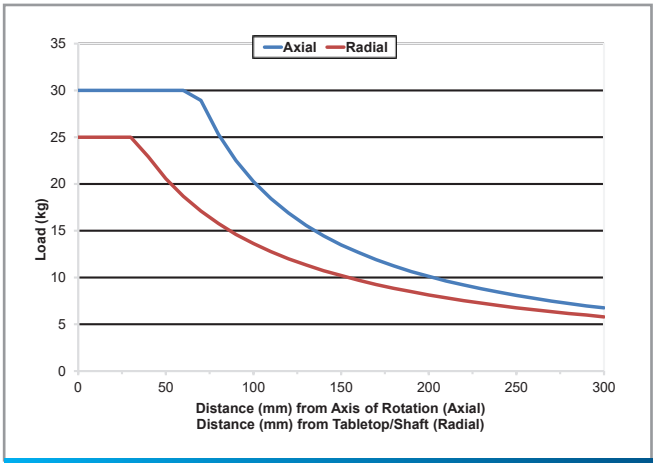
-PL4 Metrology, calibrated (HALAR) with performance plots

Integration (Required)

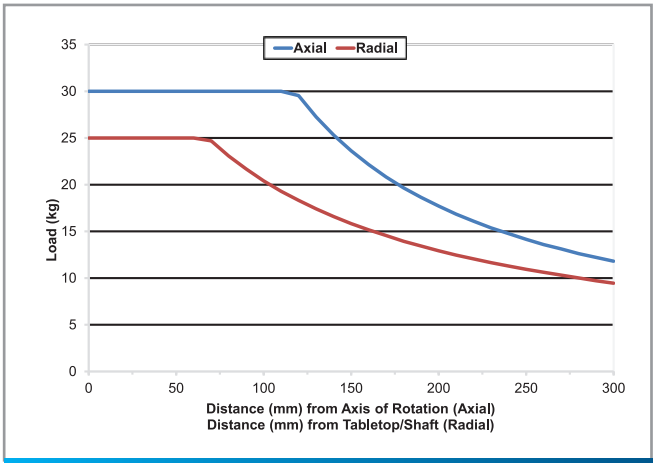
Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire 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.

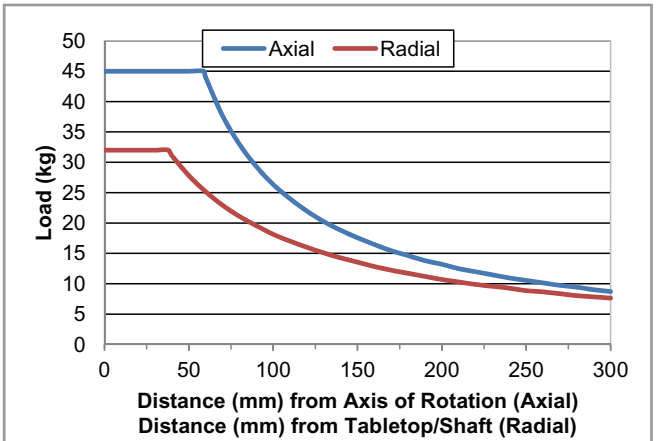
-TAC **Integration - Test as components**
Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.



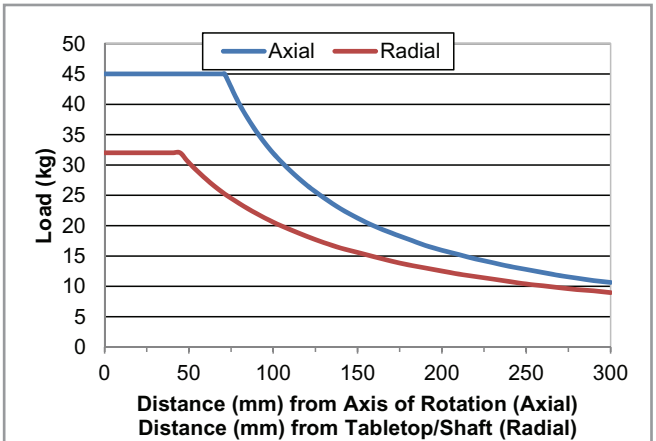
Axial and Radial Cantilevered Load Capability (APR100DR-095)



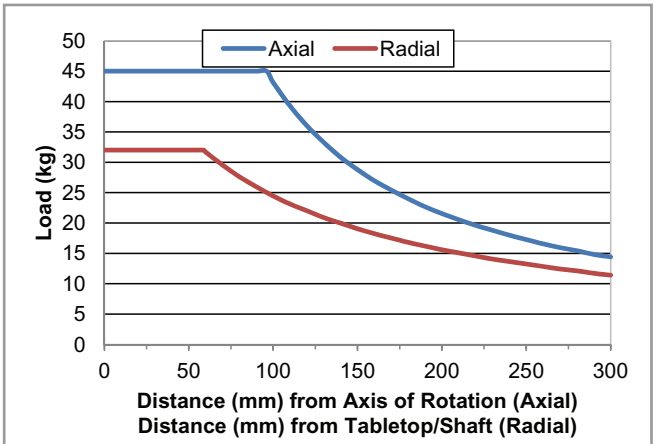
Axial and Radial Cantilevered Load Capability (APR100DR-145)



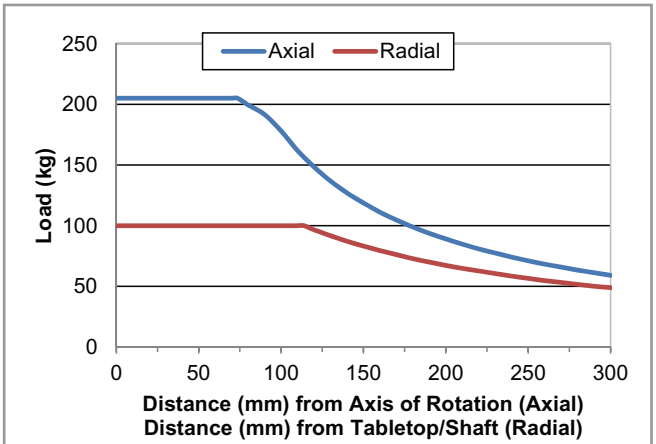
Axial and Radial Cantilevered Load Capability (APR150DR-115)



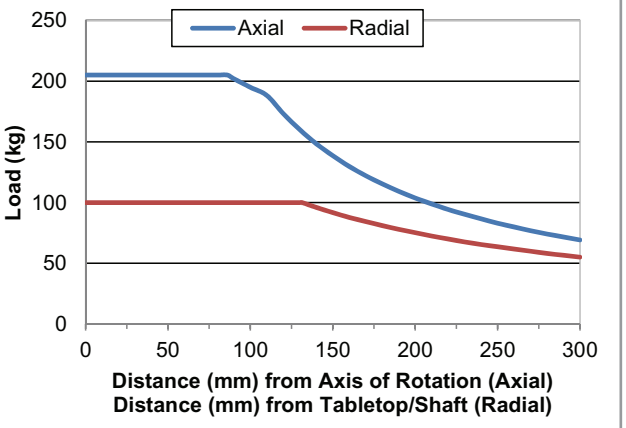
Axial and Radial Cantilevered Load Capability (APR150DR-135)



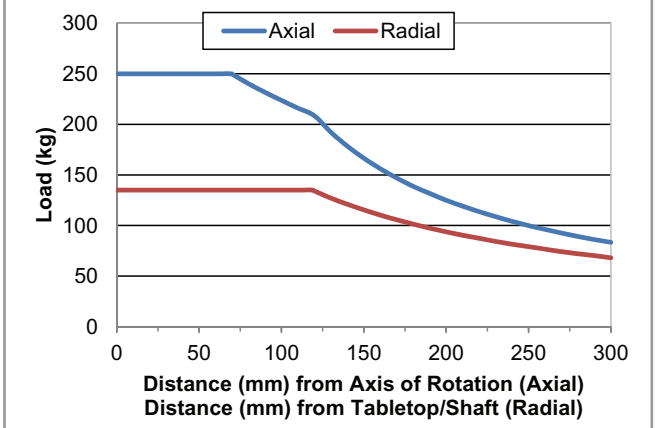
Axial and Radial Cantilevered Load Capability (APR150DR-180)



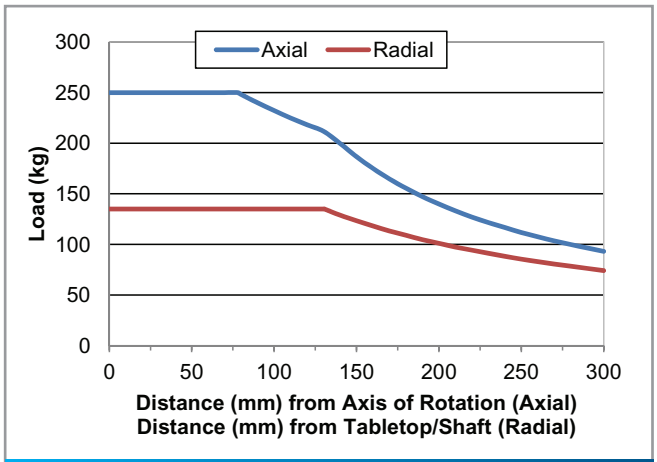
Axial and Radial Cantilevered Load Capability (APR200DR-155)



Axial and Radial Cantilevered Load Capability (APR200DR-185)



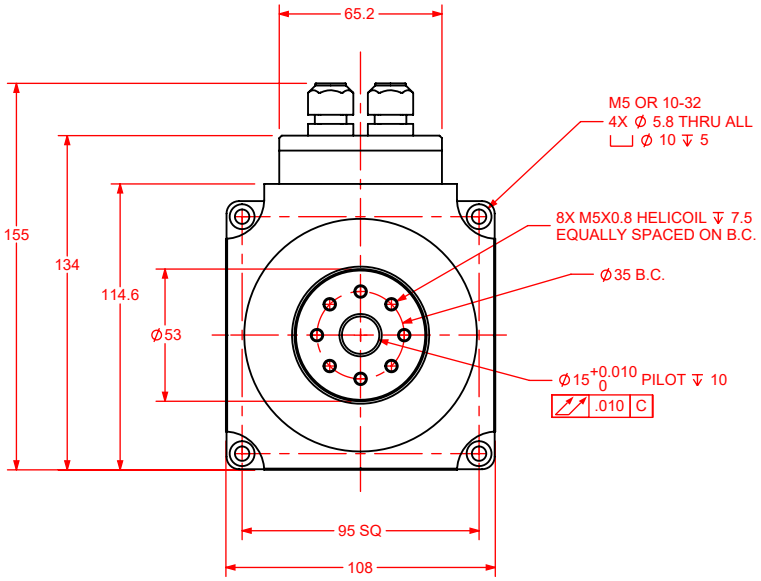
Axial and Radial Cantilevered Load Capability (APR260DR-160)

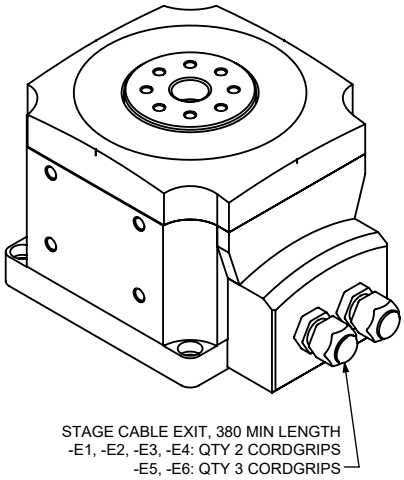


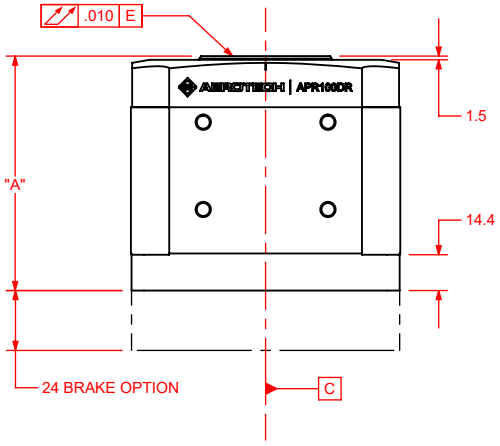
Axial and Radial Cantilevered Load Capability (APR260DR-180)

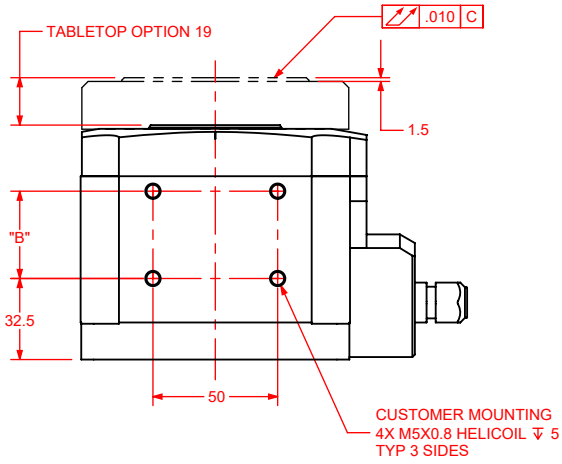
APR SERIES DIMENSIONS

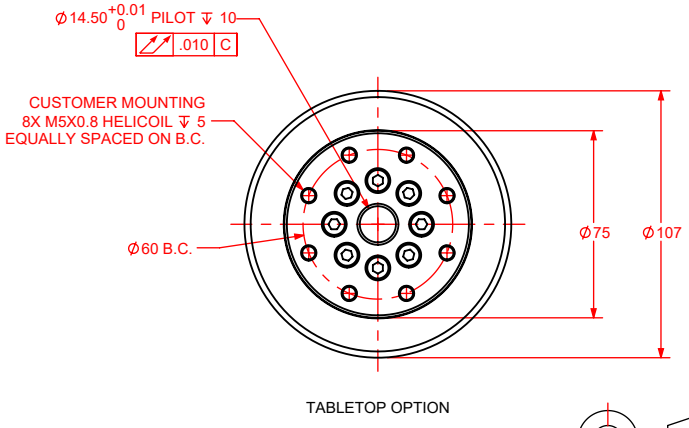
APR100







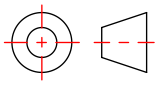




TABLETOP OPTION

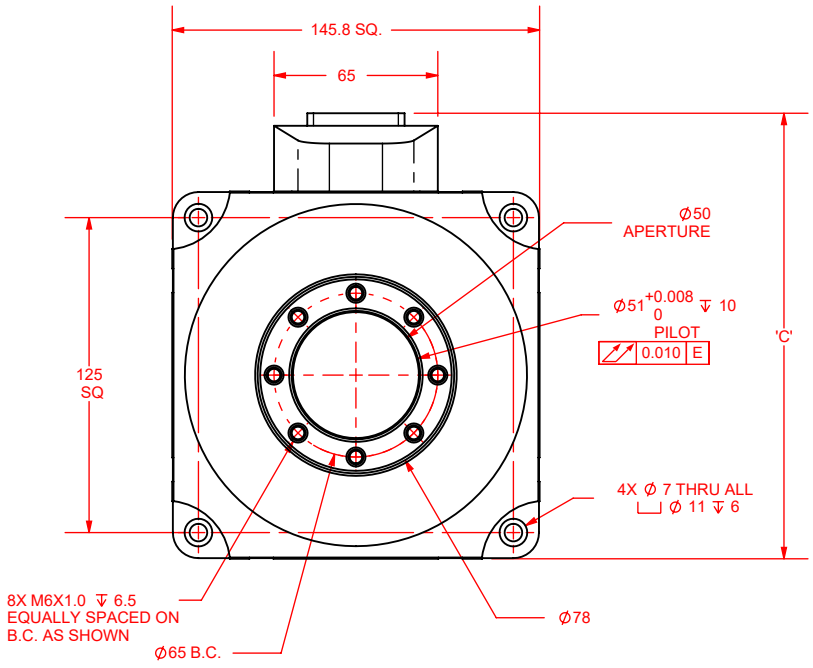
APR100DR Dimensions		
Stage Size	"A"	"B"
-095	94	35
-145	144	85

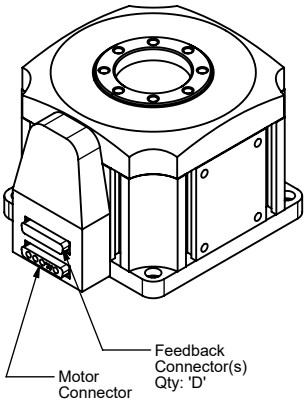
DIMENSIONS: MILLIMETERS



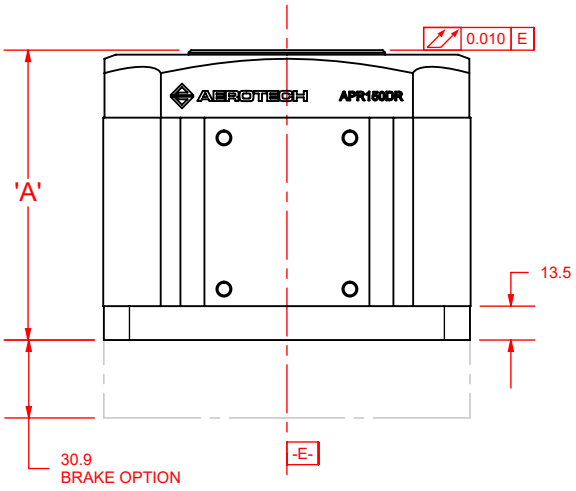
APR SERIES DIMENSIONS

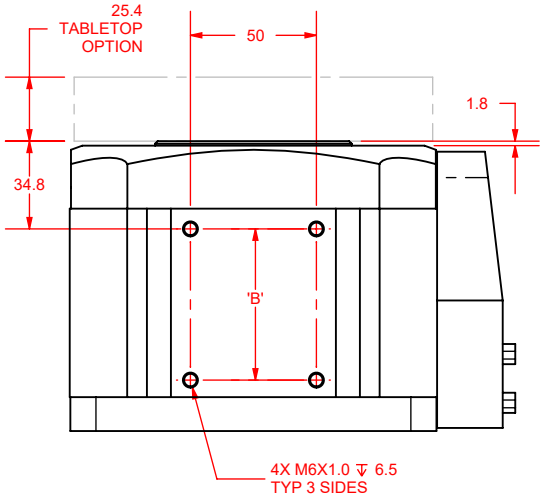
APR150





ISOMETRIC VIEW
Not to Scale

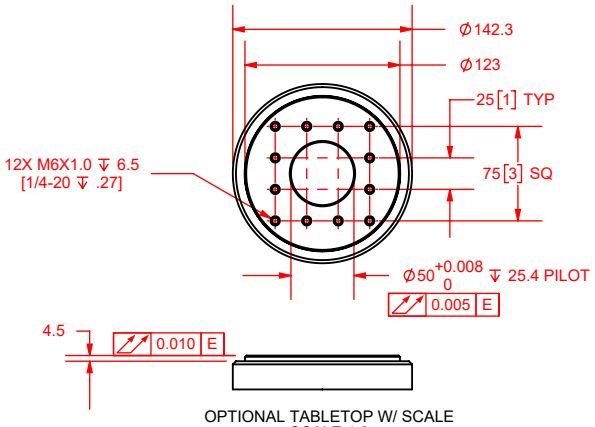




APR150DR DIMENSIONS		
Stage Height	'A'	'B'
-115	115.1	60
-135	136.1	80
-180	178.1	120

APR150DR DIMENSIONS		
Feedback	'C'	'D'
-E1, -E2, -E3, -E4	177	1
-E5, -E6	193	2

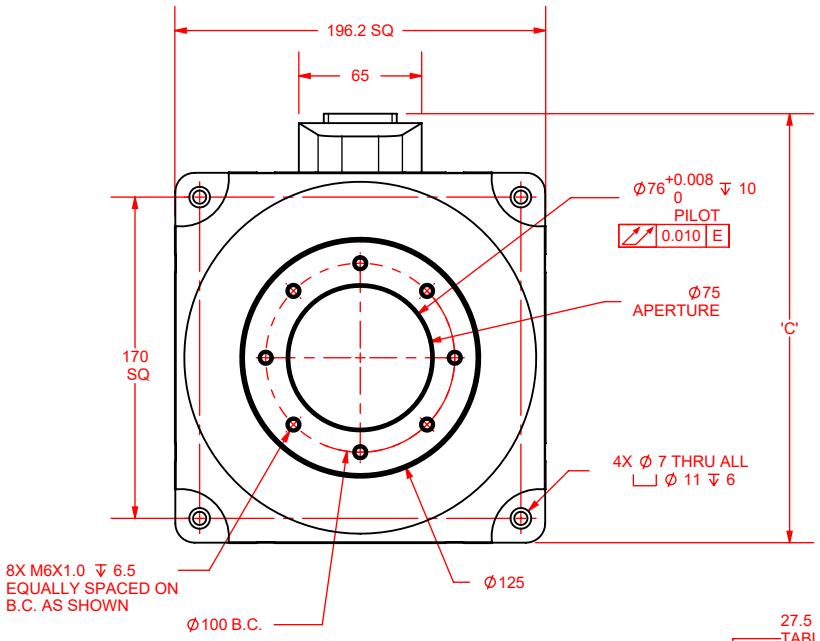
DIMENSIONS: MILLIMETERS

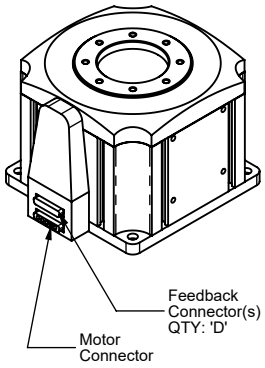


OPTIONAL TABLETOP W/ SCALE
SCALE 1:6

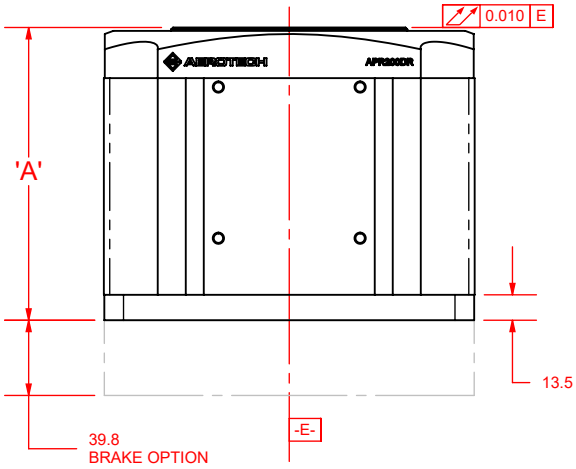
APR SERIES DIMENSIONS

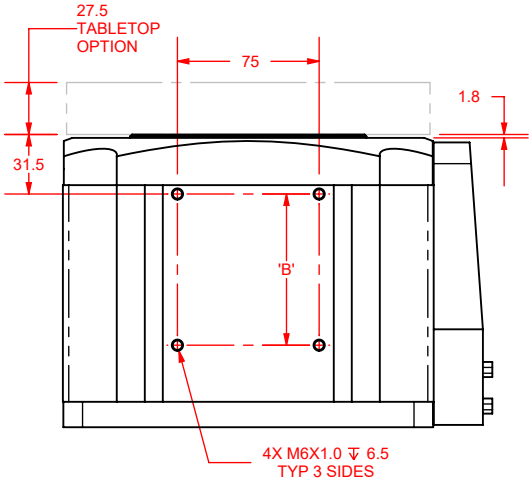
APR200





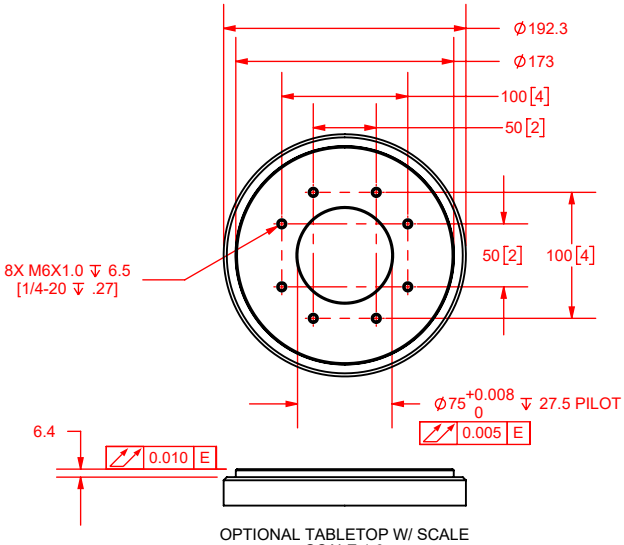
ISOMETRIC VIEW
Not to Scale





APR200DR DIMENSIONS		
Stage Size	'A'	'B'
-155	154.9	80
-185	179.9	100

APR200DR DIMENSIONS		
Feedback	'C'	'D'
-E1, -E2, -E3, -E4	227	1
-E5, -E6	244	2

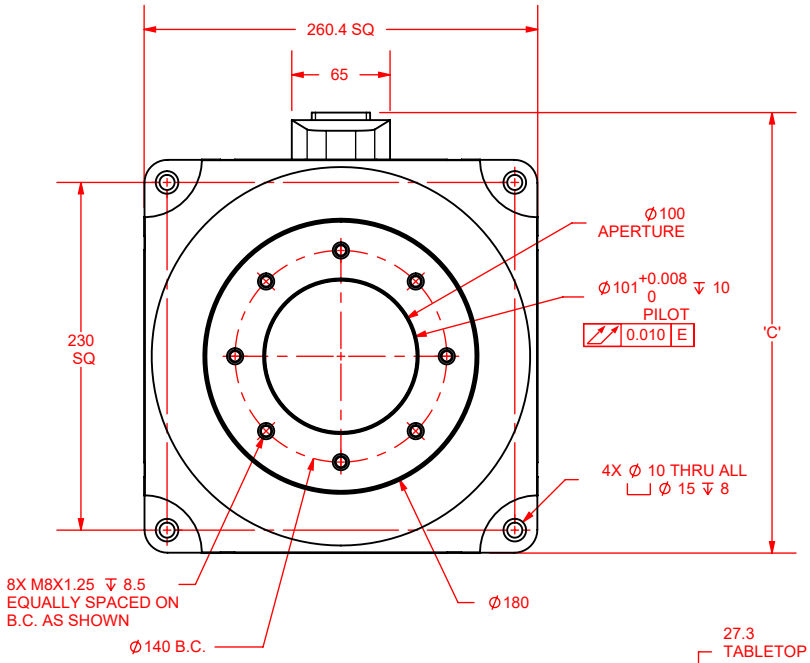


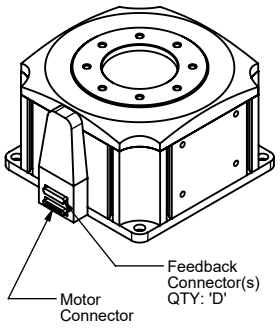
OPTIONAL TABLETOP W/ SCALE
SCALE 1:6

DIMENSIONS: MILLIMETERS

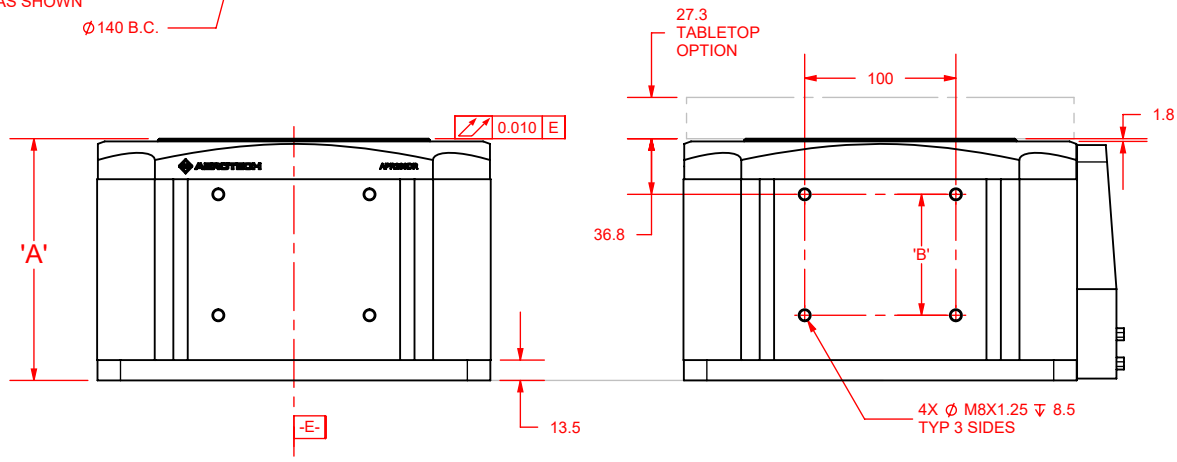
APR SERIES DIMENSIONS

APR260



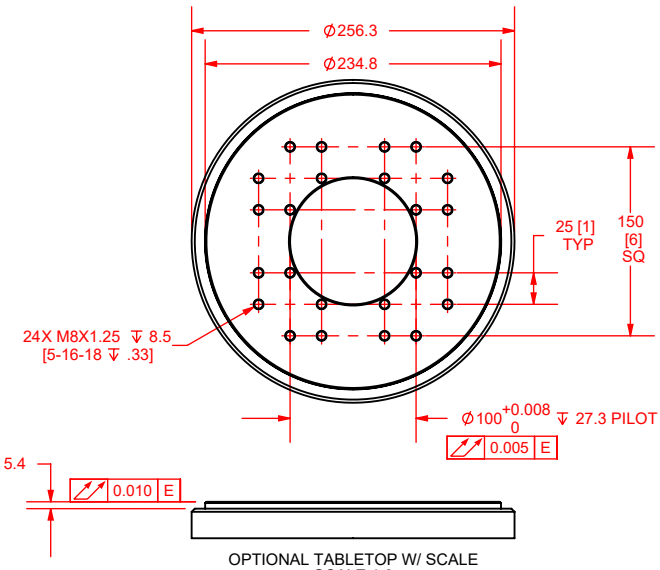


ISOMETRIC VIEW
Not to Scale



APR260DR DIMENSIONS		
Stage Size	'A'	'B'
-160	159.9	80
-180	180.9	100

APR260DR DIMENSIONS		
Feedback	'C'	'D'
-E1, -E2, -E3, -E4	291	1
-E5, -E6	308	2



OPTIONAL TABLETOP W/ SCALE
SCALE 1:6

DIMENSIONS: MILLIMETERS