

LCRM2 - May 14, 2024

Item # LCRM2 was discontinued on May 14, 2024. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

60 MM CAGE ROTATION MOUNTS

- ▶ 360° of Continuous Rotation
- ▶ SM1 (1.035"-40)- or SM2 (2.035"-40)-Threaded Rotation Carriage
- ▶ Engraved Graduations at 1° Increments



LCRM2
Rotation Mount with
SM2-Threaded Bore,
360° Continuous



LCP16R1
Rotation Mount with SM1-
Threaded Bore, ±8° Fine
Rotation Adjustment



LCP16R2
Rotation Mount with SM2-
Threaded Bore, ±8° Fine
Rotation Adjustment



LCP16RP2
SM2-Threaded
Rotation Ring



LCP16RP1
SM1-Threaded
Rotation Ring



Application Idea
LCRM2 Mount Rotating 30 mm Cage
Assembly Within 60 mm Cage System

OVERVIEW

Features

- Mount Ø1" (25.4 mm) Optics, Ø2" (Ø50.8 mm) Optics, SM1-Threaded Components, or SM2-Threaded Components
- LCP16R Series Rotation Mounts Include Removable Rotation Rings
 - Additional Rotation Rings Available Separately
- Compatible with 60 mm Cage System

Alternative Size Options

- | |
|----------------------------|
| 16 mm Cage Rotation Mount |
| 30 mm Cage Rotation Mounts |
| 60 mm Cage Rotation Mounts |

Thorlabs offers rotation mounts for integrating optics and mechanical assemblies with 60 mm cage systems. The LCRM2(/M) Rotation Mount is designed to provide 360° of continuous rotation for Ø2" (50.8 mm) optics. Alternatively, other optomechanical components can be mounted in the SM2-threaded (2.035"-40) rotation carriage to integrate other optic sizes and shapes with a 60 mm cage system, as shown in the photo above (see the *Application* tab for details).

The LCP16R series rotation mounts provide 360° of coarse and ±8° of fine rotation for optics or components mounted in a 60 mm cage system. Each mount includes a removable rotation ring with an SM1- (1.035"-40) or SM2- (2.035"-40) threaded bore. The rotation rings are also available separately, allowing the user to switch the internal bore of an LCP16R mount from SM1- to SM2-threaded, or vice versa.

APPLICATION

LCRM2 - Creating a Rotating 30 mm Cage Assembly Within a 60 mm Cage System

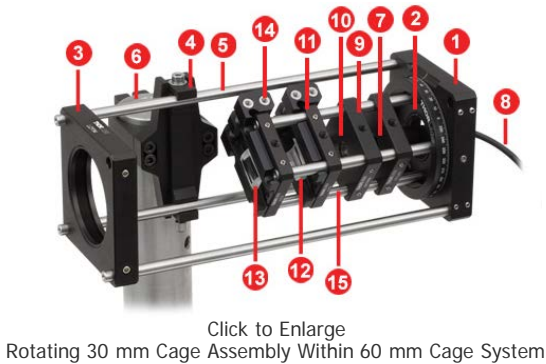
Thorlabs' versatile cage system can be used to create complex optical systems with elements that are aligned along a common optical axis. The cage system is available in three different sizes (16 mm, 30 mm, and 60 mm rod spacings), with a wide selection of accessories available as well as cage size adapters that allow

for interoperability of different cage sizes. Smaller cage assemblies may be mounted within larger ones where clearances allow, as in the Application Idea above.

Design & Construction

In the Application Idea above, a 30 mm cage assembly is mounted on a CP38T SM2-Threaded Round Cage Plate, which is threaded into an LCRM2 60 mm Cage Rotation Mount (available below). The 30 mm cage assembly consists of a TO-can laser diode and collimation optics. Rotating the laser diode in conjunction with its collimation optics allows the polarization axis of the TO can laser diode to be rotated while maintaining a collimated, approximately Gaussian beam.

The Ø9 mm TO can laser diode is mounted in an LDH9-P2 30 mm Cage Collimation Mount and SR9 ESD Protection/Strain Relief Cable. The collimated elliptical output of the laser diode is corrected for using cylindrical lenses mounted in CYCP Cylindrical Lens Mounts. ER1.5 Cage Assembly Rods must be substituted for the ER2 rods that are included with each CYCP mount. This provides the necessary clearance for the 30 mm cage assembly to rotate unobstructed within the 60 mm cage assembly.



Click to Enlarge
Rotating 30 mm Cage Assembly Within 60 mm Cage System

60 mm Cage System Components				
#	Product Description		Item #	Item Qty.
1	60 mm Cage Rotation Mount for Ø2" Optics		LCRM2	1
2	SM2-Threaded Round 30 mm Cage Plate		CP38T	1
3	60 mm Threaded Cage Plate		LCP34	1
4	60 mm Cage Clamp for Ø1.5" Posts		CH1560	1
5	Cage Assembly Rod, 8" Long, 4 Pack		ER8-P4	1
6	Ø1.5" Mounting Post		-	1
30 mm Cage Assembly Components				
#	Product Description		Item #	Item Qty.
7	Ø5.6 mm, Ø9 mm, or TO3 TO Can Laser Diode		-	1
8	ESD Protection and Strain Relief Cable		-	1
9	30 mm Cage Plate Laser Diode Collimation Mount ^a	For Ø5.6 mm TO Can LD	LDH56-P2	1
		For Ø9 mm TO Can LD	LDH9-P2	
		For TO3 Laser Diode	LDH3-P1	
10	Mounted M9 x 0.5 mm Aspheric Lens		-	1
11	30 mm Cage Mount for Cylindrical Lenses		CYCP	2
12	Plano-Concave Cylindrical Lens		-	1
13	Plano-Convex Cylindrical Lens		-	1
14	Cage Assembly Rod, 1.5" Long, 4 Pack		ER1.5-P4	1
15	Cage Assembly Rod, 4" Long, 4 Pack		ER4-P4	1

a. Choose the passive laser diode (LD) mount compatible with the laser diode package (Mounting options for Ø5.6 mm or Ø9 mm TO can as well as TO3 laser diodes are available).

Cage System Overview

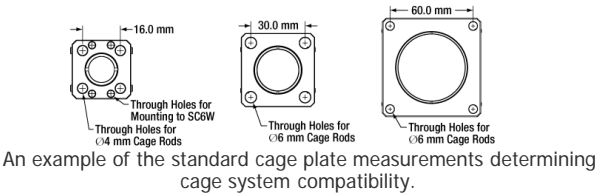
The Cage Assembly System provides a convenient way to construct large optomechanical systems with an established line of precision-machined building blocks designed for high flexibility and accurate alignment.

16 mm, 30 mm, and 60 mm Cage System Standards

Thorlabs offers three standards defined by the center-to-center spacing of the cage assembly rods (see image below). The 16 mm cage, 30 mm cage, and 60 mm cage standards are designed to accommodate Ø1/2", Ø1", and Ø2" optics, respectively. Specialized cage plates that allow smaller optics to be directly inserted into our larger cage systems are also available.

Standard Threads

The flexibility of our Cage Assembly System stems from well-defined mounting and thread standards designed to directly interface with a wide range of specialized products. The three most prevalent thread standards are our SM05 Series (0.535"-40 thread), SM1 Series (1.035"-40 thread), and SM2 Series (2.035"-40 thread), all of which were defined to house the industry's most common optic sizes. Essential building blocks, such as our popular lens tubes, directly interface to these standards.



Standard Cage System Measurements			
Cage System	16 mm	30 mm	60 mm
Thread Series	SM05	SM1	SM2
Rod to Rod Spacing	16 mm (0.63")	30 mm (1.18")	60 mm (2.36")
Total Length	25 mm (0.98")	41 mm (1.60")	71.1 mm (2.80")

Cage Components		
Cage Rods	16 mm	These rods are used to connect cage plates, optic mounts, and other components in the cage system. The SR Series Cage Rods are compatible with our 16 mm cage systems, while the 30 mm and 60 mm cage systems use ER Series Cage Rods.
	30 mm	
	60 mm	
Cage Plates	16 mm	These serve as the basic building blocks for a cage system. They may have SM-threaded central bores, smooth bores sized for industry standard optics or to accommodate the outer profile of our SM Series Lens Tubes, or specialized bores for other components such as our FiberPorts.
	30 mm	
	60 mm	
Optic Mounts	16 mm	Thorlabs offers fixed, kinematic, rotation, and translation mounts specifically designed for our Cage Systems.
	30 mm	
	60 mm	
Cage Cubes	16 mm	These cubes are useful for housing larger optical components, such as prisms or mirrors, or optics that need to sit at an angle to the beam path, such as beamsplitters. Our cage cubes are available empty or with pre-mounted optics.
	30 mm	
	60 mm	
Replacement Setscrews		Replacement setscrews are offered for our 16 mm (SS4B013, SS4B025, and SS4B038) and 30 mm (SS4MS5 and SS4MS4) cage systems products.
Post and Breadboard Mounts and Adapters		Mounting options for cage systems can be found on our Cage System Construction pages. Cage Systems can be mounted either parallel or perpendicular to the table surface.
Size Adapters		Cage System Size Adapters can be used to integrate components from different cage system and threading standards.
Specialized Components		Thorlabs also produces specialized cage components, such as Filter Wheels, a HeNe Laser Mount, and a FiberPort Cage Plate Adapter, allowing a wide range of our products to be integrated into cage-mounted optical systems. Explore our Cage Systems Visual Navigation Guide to see the full range of Thorlabs' cage components.

Rotation Mount and Stage Selection Guide

Thorlabs offers a wide variety of manual and motorized rotation mounts and stages. Rotation mounts are designed with an inner bore to mount a Ø1/2", Ø1", or Ø2" optic, while rotation stages are designed with mounting taps to attach a variety of components or systems. Motorized options are powered by a DC Servo motor, 2 phase stepper motor, piezo inertia motor, or an Elliptec™ resonant piezo motor. Each offers 360° of continuous rotation.







Manual Rotation Mounts

Rotation Mounts for Ø1/2" Optics							
Item #	MRM05(/M)	RSP05(/M)	CRM05	PRM05(/M) ^a	SRM05	KS05RS	CT104
Click Photo to Enlarge							
Features	Mini Series	Standard	External SM1 (1.035"-40) Threads	Micrometer	16 mm Cage-Compatible	±4° Kinematic Tip/Tilt Adjustment Plus Rotation	Compatible with 30 mm Cage Translation Stages and 1/4" Translation Stages ^b
Additional Details							

- a. This mount is available in the PRM05GL5 bundle, which includes the PRM05 rotation mount with the SM05PM5 polarizing prism mount.
- b. The CT104 is complatible with the 1/4" translation stages using our MS103(/M) adapter plate.
- c. The CT104 is compatible with the CT1A(/M) cage translation stage, which is designed for use with 30 mm cage systems.

Rotation Mounts for Ø1" Optics								
Item #	RSP1(/M)	LRM1	RSP1D(/M)	DLM1(/M)	CLR1(/M)	RSP1X15(/M)	RSP1X225(/M)	PRM1(/M) ^a
Click Photo to Enlarge								
Features	Standard	External SM1 (1.035"-40) Threads	Adjustable Zero	Two Independently Rotating Carriages	Rotates Optic Within Fixed Lens Tube System	Continuous 360° Rotation or 15° Increments	Continuous 360° Rotation or 22.5° Increments	Micrometer
Additional Details								







- a. This mount is available in the PRM1GL10 bundle, which includes the PRM1 rotation mount with the SM1PM10 polarizing prism mount.







Rotation Mounts for Ø1" Optics						
Item #	LM1-A & LM1-B(/M)	CRM1T(/M)	CRM1LT(/M)	CRM1PT(/M)	KS1RS	K6XS
Click Photo to Enlarge						
Features	Optic Carriage Rotates Within Mounting Ring	30 mm Cage-Compatible ^a	30 mm Cage-Compatible for Thick Optics ^a	30 mm Cage-Compatible with Micrometer ^a	±4° Kinematic Tip/Tilt Adjustment Plus Rotation	Six-Axis Kinematic Mount ^a
Additional Details						

- a. This mount also features four 4-40 (M3) holes on the rotation dial for use with the K6A1(/M) prism platform.

Rotation Mounts for Ø2" Optics							
Item #	RSP2(/M)	RSP2D(/M)	PRM2(/M)	LM2-A & LM2-B(/M)	LCRM2(/M)	KS2RS	K6X2
Click Photo to Enlarge							
Features	Standard	Adjustable Zero	Micrometer	Optic Carriage Rotates Within Mounting Ring	60 mm Cage-Compatible	±4° Kinematic Tip/Tilt Adjustment Plus Rotation	Six-Axis Kinematic Mount
Additional Details							

Manual Rotation Stages

Manual Rotation Stages						
Item #	RP005(/M)	PR005(/M)	MSRP01 (/M)	RP01 (/M)	RP03(/M)	QRP02 (/M)
Click Photo to Enlarge						
Features	Standard					Two Hard Stops
Additional Details						

Manual Rotation Stages						
Item #	XRNR1(/M)	XRR1(/M)	PR01(/M)	CR1(/M)	XYR1(/M)	OCT-XYR1(/M)
Click Photo to Enlarge						
Features	Fine Rotation Adjuster and 2" Wide Dovetail Quick Connect	Fine Rotation Adjuster and 3" Wide Dovetail Quick Connect	Fine Rotation Adjuster and SM1-Threaded Central Aperture	Fine Pitch Worm Gear	Rotation and 1/2" Linear XY Translation	
Additional Details						



- a. The stage profile is higher when it is mounted using the screw slots rather than stacked on another stage or accessory with mating dovetails.
- b. The OCT-XYR1(/M) stage includes the XYR1A solid sample plate. This plate can be detached from the stage to reveal the same mounting features present on the XYR1(/M) stage.

Motorized Rotation Mounts and Stages

Motorized Rotation Mounts and Stages with Central Clear Apertures					
Item #	DDR25(/M)	PDR1C(/M)	PDR1(/M)	PDR1V(/M)	PDXR1(/M)
Click Photo to Enlarge					
Features	Compatible with SM05 Lens Tubes, 16 mm Cage System, & 30 mm Cage System	Compatible with 16 mm Cage System	Compatible with SM05 Lens Tubes & 30 mm Cage System	Vacuum-Compatible; Also Compatible with SM05 Lens Tubes & 30 mm Cage System	Compatible with SM05 Lens Tubes & 30 mm Cage System
Additional Details					

Motorized Rotation Mounts and Stages with Central Clear Apertures					
Item #	K10CR1(/M)	PRM1Z8(/M) ^a	DDR100(/M)	ELL14	HDR50(/M)
Click Photo to Enlarge					
Features	Compatible with SM1 Lens Tubes & 30 mm Cage System		Compatible with SM1 Lens Tubes, 16 mm Cage System, 30 mm Cage System	Compatible with SM1 Lens Tubes, Open Frame Design for OEM Applications	Compatible with SM2 Lens Tubes
Additional Details					

a. This stage is available in the KPRMTE(/M), which includes the PRMTZ8(/M) Motorized Rotation Stage with the KDC101 K-Cube DC Servo Motor Controller.

Motorized Rotation Mounts and Stages with Tapped Platforms		
Item #	PRMTZ8(/M) ^a	ELL18(/M) ^b
Click Photo to Enlarge		
Features	Tapped Mounting Platform for Mounting Prisms or Other Optics	Tapped Mounting Platform, Open Frame Design for OEM Applications
Additional Details		

- a. This stage is available in the KPRM1E(/M), which includes the PRMT1Z8(/M) Motorized Rotation Stage with the KDC101 K-Cube DC Servo Motor Controller.
- b. This stage is available in the ELL18K(/M), which includes an interface board, mounting brackets, and connectors for PC control.



- ▶ Mounts Ø2" (Ø50.8 mm) Optics or SM2-Threaded Components
- ▶ Ø48 mm Clear Aperture
- ▶ 360° of Continuous Rotation
- ▶ 1° Engraved Graduations on Dial, Labeled Every 10°
- ▶ Setscrew Locking Mechanism
- ▶ SM2-Compatible Rotation Carriage
- ▶ 8-32 (M4 x 0.7) Hole for Post Mounting



Click to Enlarge
Ø2" Polymer Zero-Order Wave Plate Mounted in the LCRM2

The LCRM2(/M) Rotation Mount is designed to mount Ø2" (50.8 mm) optics up to 0.51" (13 mm) thick in an SM2-threaded (2.035"-40) rotation carriage. The optic is secured using the included SM2RR retaining ring (the SPW604 spanner wrench is ideal for tightening this retaining ring). For thicker optics, any of our SM2 series of lens tubes can be threaded into the carriage. The smooth rotation mechanism allows for precise positioning of the rotation carriage. The mount is compatible with the 60 mm cage system and can be mounted on a Ø1/2" optical post using the 8-32 (M4) tapped mounting hole on the bottom side of the rotation mount.

The LCRM2(/M) mount is also compatible with the CP38T SM2-Threaded Round Cage Plate which allows 30 mm cage assemblies to be used inside a 60 mm cage system. This is illustrated in the Application Idea above. For more details, please see the *Application* tab.

Part Number	Description	Price	Availability
LCRM2/M	Customer Inspired! 60 mm Cage Rotation Mount for Ø2" Optics, M4 x 0.7 Tap	\$155.62	Today
LCRM2	Customer Inspired! 60 mm Cage Rotation Mount for Ø2" Optics, 8-32 Tap	\$155.62	Lead Time

60 mm Cage Rotation Mount with SM1-Threaded Bore, ±8° Fine Rotation Adjustment



Click to Enlarge
The recessed area in the back of the mount provides clearance for the camera's input aperture.

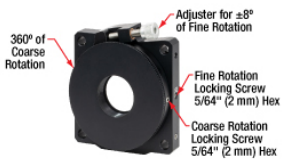
- ▶ Mount Ø1" (Ø25.4 mm) Optics or SM1-Threaded Components
- ▶ Ø0.95" (Ø24.1 mm) Clear Aperture
- ▶ ±8° of Fine Rotation; 360° of Manual Coarse Rotation
- ▶ 1° Engraved Graduations, Labeled Every 2° up to ±8°
- ▶ Setscrew Locking Mechanism
- ▶ Suitable for Cantilevered Loads up to 0.5 ft-lbs (0.68 N·m) Torque
- ▶ Includes LCP16RP1 Removable Rotation Ring
 - ▶ Additional SM1- and SM2-Threaded Rotation Rings Available Below
- ▶ One 8-32 (M4 x 0.7) Hole for Post Mounting

Thorlabs' LCP16R1(/M) 60 mm Cage System Rotation Mount with SM1 Threads provides ±8° of fine and 360° of coarse rotation angle adjustment for SM1-threaded components integrated with a 60 mm cage system. A nylon-tipped setscrew secures the included LCP16RP1 rotation ring; this setscrew can be loosened using a 5/64" (2 mm) hex key to allow for 360° of manual rotation (see the image to the right). Once this screw

is tightened, fine rotation adjustment is achieved via a 3/16"-100 threaded adjuster. A fine adjustment scale engraved on the top of the mount has graduations every 1° with a range of ±8°.

This mount features four through holes for ER cage rods that are compatible with Thorlabs' 60 mm cage system or cameras that use this hole pattern, such as our scientific CCD cameras. The removable rotation ring on the front of the mount has 0.40" (10.1 mm) deep internal SM1 (1.035"-40) threads, allowing Ø1" (Ø25.4 mm) optics, Ø1" lens tubes, or other externally SM1-threaded components to be integrated with the rotation mount. Internally C-mount threaded components, such as Thorlabs' USB C-Mount CCD, Quantalux® sCMOS, or Kiralux™ CMOS cameras, can be attached to the rotation ring using an SM1A39 adapter; alternatively, the SM1T2 coupler can be used to connect internally SM1-threaded components, such as Zelux® CMOS cameras or a selection of our microscope port adapters. Note that the back of the SM1-threaded bore has a retaining lip, so SM1-threaded components can only be mated to the front side.

Users can switch out the included SM1-threaded LCP16RP1 rotation ring with the SM2-threaded LCP16RP2 rotation ring, sold below, to integrate SM2-threaded components into the LCP16R1(/M) mount.



Click to Enlarge
This mount offers 360° of coarse rotation via the rotation ring and ±8° of fine rotation via the threaded adjuster. The coarse and fine rotation are independent of each other and both positions can be locked using the respective 5/64" (2 mm) hex locking screws.



Click to Enlarge
The LCP16R1(/M) rotation mount includes the LCP16RP1 rotation ring.



Click to Enlarge
The LCP16R1 rotation mount in a 60 mm cage system with the CS2100M-USB Quantalux® camera and the LCP4S cage plate adapter.

Part Number	Description	Price	Availability
LCP16R1/M	60 mm Cage System Rotation Mount with SM1-Threaded Bore, M4 x 0.7 Tap	\$411.67	Today
LCP16R1	60 mm Cage System Rotation Mount with SM1-Threaded Bore, 8-32 Tap	\$411.67	Today



Click to Enlarge
Back View. The LCP16R2 rotation mount is 60 mm cage compatible.

- ▶ Mount Ø2" (Ø50.8 mm) Optics or SM2-Threaded Components
- ▶ Ø1.90" (Ø48.3 mm) Clear Aperture
- ▶ ±8° of Fine Rotation; 360° of Manual Coarse Rotation
- ▶ 1° Engraved Graduations, Labeled Every 2° up to ±8°
- ▶ Setscrew Locking Mechanism
- ▶ Suitable for Cantilevered Loads up to 0.5 ft-lbs (0.68 N·m) Torque
- ▶ Includes LCP16RP2 Removable Rotation Ring
 - ▶ Additional SM1- and SM2-Threaded Rotation Rings Available Below
- ▶ One 8-32 (M4 x 0.7) Hole for Post Mounting

Thorlabs' LCP16R2(/M) 60 mm Cage System Rotation Mount with SM2 Threads provides ±8° of fine and 360° of coarse rotation angle adjustment for SM2-threaded components integrated with a 60 mm cage system. A nylon-tipped setscrew secures the included LCP16RP2 rotation ring; this setscrew can be loosened using a 5/64" (2 mm) hex key to allow for 360° of manual rotation (see the image to the right). Once this screw is

tightened, fine rotation adjustment is achieved via a 3/16"-100 threaded adjuster. A fine adjustment scale engraved on the top of the mount has graduations every 1° with a range of ±8°.

This mount features four through holes for ER cage rods that are compatible with Thorlabs' 60 mm cage system or cameras that use this hole pattern, such as our scientific CCD cameras. The removable rotation ring on the front of the mount has 0.40" (10.1 mm) deep internal SM2 (2.035"-40) threads, allowing Ø2" (Ø50.8 mm)



Click to Enlarge
This mount offers 360° of coarse rotation via the rotation ring and ±8° of fine rotation via the threaded adjuster. The coarse and fine rotation are independent of each other and both positions can be locked using the respective 5/64" (2 mm) hex locking screws.



Click to Enlarge
The LCP16R2(/M) rotation mount includes the LCP16RP2 rotation ring.



Click to Enlarge
The LCP16R2 rotation mount in a 60 mm cage system with two LCP34 cage plates.

optics, Ø2" lens tubes, or other externally SM2-threaded components to be integrated with the rotation mount. Internally C-mount threaded components, such as Thorlabs' USB C-Mount CCD, Quantalux[®] sCMOS, or Kiralux[™] CMOS cameras, can be attached to the rotation ring using an SM2A55 adapter.

Users can switch out the included SM2-threaded LCP16RP2 rotation ring with the SM1-threaded LCP16RP1 rotation ring, sold below, to integrate SM1-threaded components into the LCP16R2(/M) mount.

Part Number	Description	Price	Availability
LCP16R2/M	60 mm Cage System Rotation Mount with SM2-Threaded Bore, M4 x 0.7 Tap	\$411.67	Lead Time
LCP16R2	60 mm Cage System Rotation Mount with SM2-Threaded Bore, 8-32 Tap	\$411.67	Today



- ▶ Compatible with LCP16R Series Rotation Mounts
- ▶ Integrate SM1- or SM2-Threaded Components with Mount

Thorlabs' LCP16RP1 and LCP16RP2 rotation rings are sold separately to allow users the option to switch the internal bore of an LCP16R mount from SM1-threaded to SM2-threaded, or vice versa. The LCP16R1(/M) mount (sold above) includes the LCP16RP1 rotation ring; likewise, the LCP16R2(/M) (sold above) mount includes the LCP16RP2. To switch the rotation ring in a mount, loosen the side-located 5/64" (2 mm) hex setscrew on an LCP16R mount to release the inserted rotation ring; replace it with the desired rotation ring and secure the setscrew.

Part Number	Description	Price	Availability
LCP16RP1	Rotation Ring for LCP16R Series Rotation Mounts, SM1-Threaded Bore	\$82.33	Today
LCP16RP2	Rotation Ring for LCP16R Series Rotation Mounts, SM2-Threaded Bore	\$82.33	Tod