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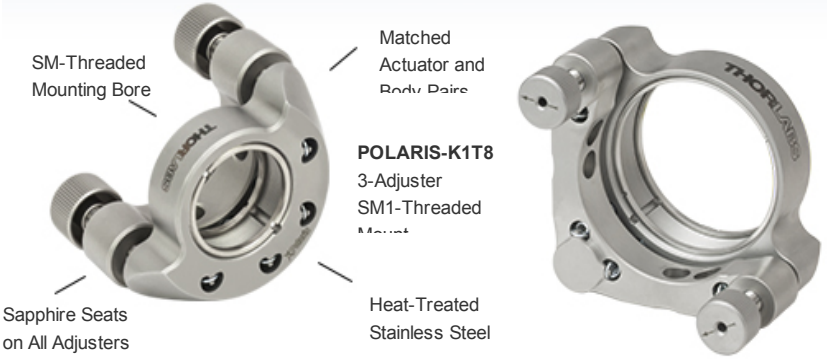
THORLABS

POLARIS-K1T8H - NOV 30, 2016

Item # POLARIS-K1T8H was discontinued on NOV 30, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

POLARIS™ SM-THREADED LOW DRIFT KINEMATIC MIRROR MOUNTS

- **SM-Threaded Mounting Bore**
- **Matched Actuator/Body Pairs Minimize Drift and Backlash**
- **Heat Treating Minimizes Temperature-Dependent Hysteresis**
- **Sapphire Seats Ensure Long-Term Stability**



POLARIS-K2T1
2-Adjuster SM2-threaded Polaris Mount

POLARIS-K05T6
SM05-Threaded Mount With a Fiber Collimator and AD1109F Adapter

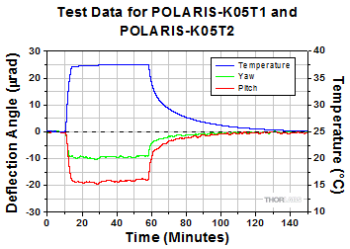
Polaris™
Pointing the Way to Precision Alignment

OVERVIEW

Options

- Ø1/2", Ø1", or Ø2" SM-Threaded Mirror Mounts
- Versions with 2 or 3 Adjusters
- Knob- or Hex-Driven Designs
- For Full Details, Please See the *Specs* Tab
- Custom Mount Configurations are Available by Contacting Tech Support

Quick Links
Ø1/2" SM05-Threaded Polaris Mounts
Ø1" SM1-Threaded Polaris Mounts
Ø2" SM2-Threaded Polaris Mounts
Adjuster Accessories
Lock Nuts



Click to Enlarge

Each Polaris mount undergoes extensive thermal testing to ensure high-quality performance. Please see the Test Data tab for additional test results.

Features

- Fabricated from Heat-Treated Stainless Steel with Matched Coefficients of Thermal Expansion (CTE)
- SM-Threaded Bore for Mounting Optics, Lens Tubes, or Other Components
- Hardened Stainless Steel Ball Contacts with Sapphire Seats for Durability and Smooth Movement
- Matched Actuator/Body Pairs Provide Smooth Kinematic Adjustment
- Extensive Testing Guarantees Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See the *Test Data* Tab for Details)
- Fabricated from Low-Outgassing and Vacuum-Compatible Materials
- Materials are Vacuum Compatible to 10^{-9} Torr at 25 °C with Proper Bake Out
- Ø2 mm Alignment Pin Holes Allow for Precise Mount Placement

Polaris™ SM-Threaded Kinematic Mirror Mounts are the ultimate solution for applications requiring stringent long-term alignment stability. All of the mounts sold here feature an SM05-threaded (0.535"-40), SM1-threaded (1.035"-40), or SM2-threaded (2.035"-40) bore which allows a variety of optical components to be secured in the mount. Fabricated from heat-treated stainless steel, Polaris mounts utilize matched actuator/body pairs and incorporate ball contacts and sapphire seats at all contact points. The integrated tapped steel body design with thermally matched components enables greater stability and durability compared to non-Polaris mounts.

Polaris™

Guaranteed Performance

Our Polaris product line and supporting products bearing its logo are designed to provide the best commercial optomechanical solutions in the photonics industry. If you find another commercially available mount that performs better in your test application,* let us know, and we will accept the return of the Polaris mounts and refund 100% of the purchase price.

*Test applications utilizing up to 100 mounts are eligible for the refund. Please contact us to discuss a larger trial quantity.

These mounts have undergone extensive testing to ensure high-quality performance. Please see the *Test Data* tab for the results of the temperature cycling testing. During the design phases of these Polaris kinematic mirror mounts, extensive modeling and testing were used to determine the materials, components, and dimensional specifications that would result in optimum performance. The Polaris design addresses all of the common causes of beam misalignment, including temperature-induced hysteresis of the mirror position, drift, and backlash. Please refer to the *Design Features* tab for detailed information.

The frame, matched adjuster screws, and retaining ring are all made from stainless steel with a matched coefficient of thermal expansion (CTE) to reduce stress during temperature changes that cause thermal drift. Residual stress, which can cause micro-creep, is minimized by performing a final kiss cutting technique during machining, heat treating, acid etching, and final thermal stress relieving.

The Polaris mirror mounts are equipped with #8 (M4) counterbores for post mounting. We recommend using a stainless steel post, such as our Ø1" Posts for Polaris Mirror Mounts, paired with a Polaris Clamping Arm. We also recommend using a torque driver to accurately install the optic and prevent optical surface distortion. Alternatively, our selection of spanner wrenches can be used to install optics or SM-threaded components. For custom mounting configurations, Ø2 mm alignment pin holes are located on both sides of each counterbore for setting a precise location and mounting angle. Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details). Please see the *Usage Tips* tab for more information and other usage recommendations.

Please note that these mounts are designed for Ø1/2", Ø1", or Ø2" Optics and are not intended for use with smaller metric mirror sizes (Ø12.5 mm, Ø25 mm, or Ø50 mm). To order a mount designed for metric optics, please contact Tech Support.

Cleanroom and Vacuum Compatibility

All Polaris mounts, retaining rings, and lock nuts sold on this page are designed to be compatible with cleanroom and vacuum chamber applications. They are chemically cleaned using the Carpenter AAA passivation method to remove sulfur, iron, and contaminants from the surface. After passivation, they are assembled in a clean environment and double vacuum bagged to eliminate contamination when transported into a cleanroom.

The sapphire contacts are bonded into place using a NASA-approved low outgassing procedure. In addition, DuPont Krytox® LVP High-Vacuum Grease, an ultra-high-vacuum-compatible, low outgassing PTFE grease, is applied to the adjusters. The 8-32 and M4 cap screws included with the Polaris mounts are not rated for pressures below 10^{-5} Torr.

SPECS

Item # Suffix[a]	-K05T6	-K05T1	-K05T2	-K1T8	-K1T8H	-K1T1	-K1T2	-K2T	-K2T3	-K2T1	-K2T2
Optic Sizes	**Ø1/2"**			**Ø1"**				**Ø2"**			
Optic Thickness (Max)	0.25" (6.4 mm)			0.34" (8.6 mm)				0.50" (12.7 mm)			
Number of Adjusters	Three	Two		Three		Two		Three		Two	
Adjuster Drive	5/64" Hex	Low-Profile 5/64" Hex	5/64" Hex	Removable Knobs	5/64" Hex	Removable Knobs	5/64" Hex	Removable Knobs	5/64" Hex	Removable Knobs	5/64" Hex
Adjuster Pitch	130 TPI Matched Actuator/Body Pairs			100 TPI Matched Actuator/Body Pairs							
Measured Point-to-Point Mechanical Resolution per Adjuster	5 µrad (Typical) 2 µrad (Achievable)										
Measured Adjuster Lock Mechanical Resolution per Adjuster	5 µrad (Typical) 2 µrad (Achievable)										
Resolution[b]	~11 mrad/rev			~7.7 mrad/rev				~5 mrad/rev			
Front Plate Translation (Max)	5 mm	N/A		6 mm		N/A		6 mm		N/A	
Mechanical Angular Range (Nominal)	±5°			±4°				±3.4°			
Beam Deviation[c] After Thermal Cycling	<2 µrad										
Recommended Optic Mounting Torque	6 - 20 oz-in for 6 mm Thick Optics			5 - 24 oz-in for 8.6 mm Thick Optics				10 - 24 oz-in for 12.7 mm Thick Optics			
Maximum SM-Threaded Component Mounting Torque[d]	15 lb-in for SM05-Threaded Parts			30 lb-in for SM1-Threaded Parts				45 lb-in for SM2-Threaded Parts			
Maximum Front Plate Payload (Torque / Weight)	1 lb-in (0.11 N·m) / 1 lb (4.4 N)							2.5 lb-in (0.28 N·m) / 1.25 lb (5.6 N)			
Mounting[e]	Two #8 (M4) Counterbores							Four #8 (M4) Counterbores			
Alignment Pin Holes	Two Ø2 mm Holes for DIN 7-m6 Ground Dowel Pin at Each Counterbore										
Vacuum Compatibility[f]	10^{-9} Torr at 25 °C with Proper Bake Out; 10^{-5} Torr at 25°C without Bake Out DuPont Krytox® LVP High-Vacuum Grease Vapor Pressure: 10^{-13} Torr at 20 °C ,10^{-5} Torr at 200 °C EPO-TEK® 353ND (353NDPK) Epoxy Meets Low Outgassing Standards NASA ASTM E595, Telcordia GR-1221										
Operating Temperature Range	-30 to 200 °C										

- All item numbers in the Polaris™ line start with POLARIS.
- When the front plate is parallel to the back plate.
- After 12.5 °C temperature cycle, the beam returns to within 2 µrad of its original position for a Polaris mounted on a Ø1" post. Please see the *Test Data* tab for more details.
- The front plate of the mount should be secured when SM-threaded components are being mounted. See the *Usage Tips* tab for more details.
- The Ø1/2" Mounts come with 8-32 and M4 low-profile cap screws for mounting without obstructing the transmissive beam path. The Ø1" and Ø2" Mounts come with standard 8-32 and M4 cap screws.
- These mounts are vacuum compatible, assembled in a clean environment, chemically cleaned using the Carpenter AAA passivation method to remove sulfur, iron, and contaminants from the surface, and double vacuum bagged. The 8-32 and M4 cap screws included with the Polaris mounts are not rated for pressures below 10^{-5} Torr. Contact techsupport@thorlabs.com for details.

Click to Enlarge
Polaris Mounts are Shipped Inside Two Vacuum Bag Layers

Vacuum Compatible and Low Outgassing

Each vacuum-compatible Polaris™ mount is packaged within two vacuum bag layers after assembly in a clean environment, as seen in the image to the right. These vacuum bags do not contain any desiccant materials and tightly wrap the mount preventing friction against the mount during shipping. This packing method protects the mount from corrosion, gas or liquid contamination, and particulates during transport. The first vacuum bag should be opened in a clean environment while the second vacuum bag should only be opened just prior to installation. When operating at pressures below 10^{-5} Torr, we highly recommend using an appropriate bake out procedure prior to installing the mount in order to minimize contamination caused by outgassing.

TEST DATA

Polaris™ Mirror Mounts Test Data

All of the Polaris Low-Drift Kinematic Mirror Mounts have undergone extensive testing to ensure high-quality performance. After mounting the Polaris to a Ø1" stainless steel post, the mirror and post assembly was secured to a stainless steel optical table in a temperature-controlled environment. A beam from an independently temperature-stabilized laser diode was reflected by the mirror onto a position sensing detector. The mirror was secured between the two retaining rings included with the Polaris mount, not using epoxy.

Positional Repeatability After Thermal Shock

Purpose: This testing was done to determine how reliably the mount returns the mirror, without hysteresis, to its initial position. These measurements show that the alignment of the optical system is unaffected by the temperature shock.

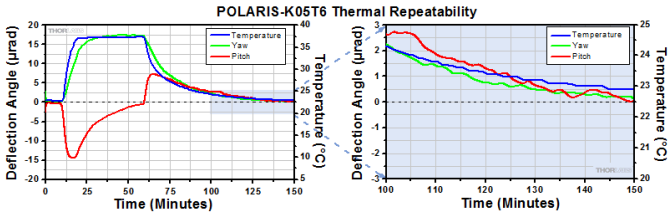
Procedure: The temperature of each mirror mount tested was raised to 37 °C and maintained for a given soak time. Then the temperature of the mirror mount was returned to the starting temperature. The results of these tests are shown below.

Results: As can be seen in the plots below, when the Polaris mounts were returned to their initial temperature, the angular position (both pitch and yaw) of the mirrors returned to within 2 µrad of its initial position. The performance of the Polaris was tested further by subjecting the mount to repeated temperature change cycles. After each cycle, the mirror's position reliably returned to within 2 µrad of its initial position.

For Comparison: To get a 1 µrad change in the mount's position, the 100 TPI adjuster on the Ø1" Polaris mounts needs to be rotated by only 0.05° (1/7200 of a turn). A highly skilled operator might be able to make an adjustment as small as 0.3° (1/1200 of a turn), which corresponds to 6 µrad.

Conclusions: The Polaris Mirror Mounts are high-quality, ultra-stable mounts that will reliably return a mirror to its original position after cycling through a temperature change. As a result, the Polaris mounts are ideal for use in applications that require long-term alignment stability.

Ø1/2" Mounts



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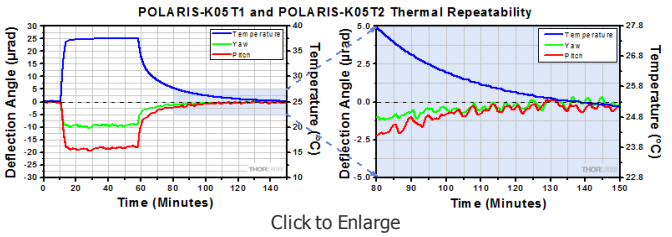

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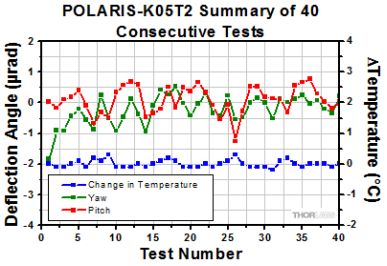
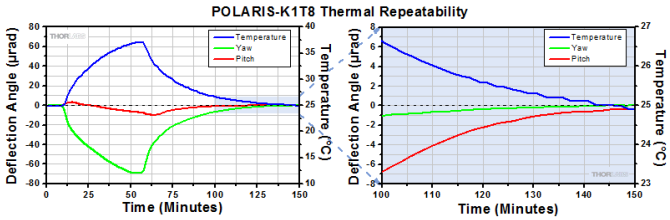


Click to Enlarge

The plot above shows the final angular position of the POLARIS-K05T2 for 40 consecutive thermal shock tests. The change in temperature is the difference between the starting temperature and the temperature at the end of the test and includes factors such as the variation in room temperature.

Ø1" Mounts



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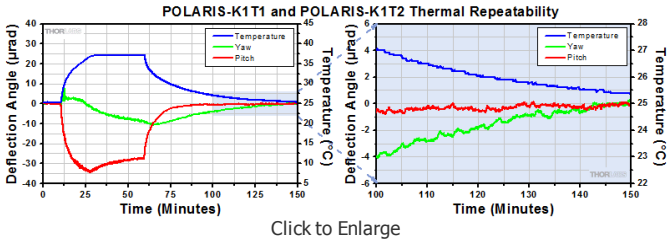

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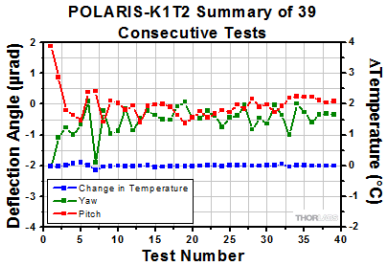
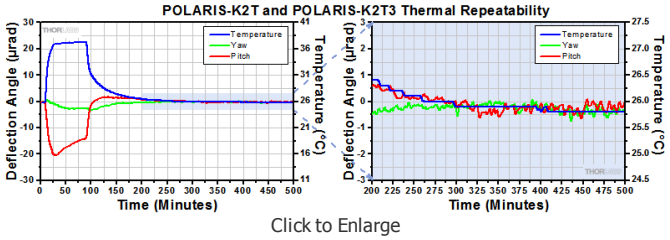


Click to Enlarge

The plot above shows the final angular position of the POLARIS-K1T2 for 39 consecutive thermal shock tests. The change in temperature is the difference between the starting temperature and the temperature at the end of the test and includes factors such as the variation in room temperature.

Ø2" Mounts



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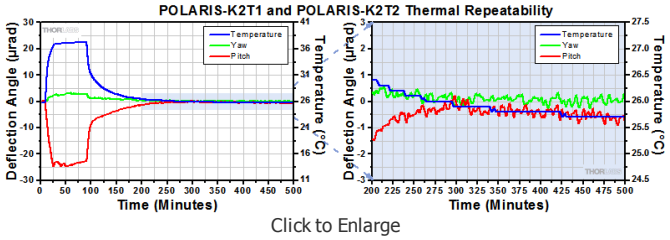

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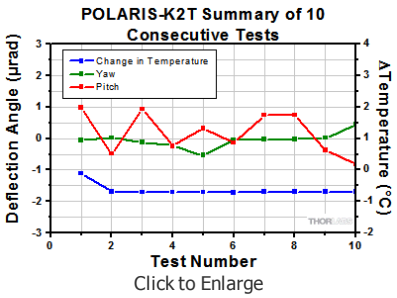

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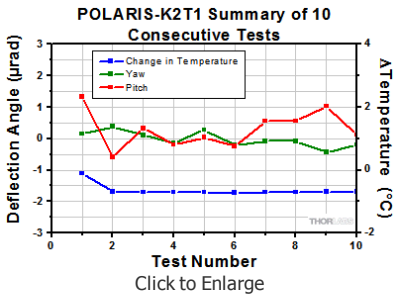


Click to Enlarge

The plots above show the final angular position of POLARIS-K2T and POLARIS-K2T1 mounts for 10 consecutive thermal shock tests. The change in temperature is th difference between the starting temperature and the temperature at the end of the test and includes factors such as the variation in room temperature.

DESIGN FEATURES

Several common factors typically lead to beam misalignment in an optical setup. These include temperature-induced hysteresis of the mirror's position, crosstalk, drift, and backlash. Polaris™ mirror mounts are designed specifically to minimize these misalignment factors and thus provide extremely stable performance. Hours of extensive research, multiple design efforts using sophisticated design tools such as finite element analysis software, and months of rigorous testing went into choosing the best components to provide an ideal solution for experiments requiring ultra-stable performance from a kinematic mirror mount.

Thermal Hysteresis

The temperature in most labs is not constant due to factors such as air conditioning, the number of people in the room, and the operating states of equipment. Thus, it is necessary that all mounts used in an alignment-sensitive optical setup be designed to minimize any thermally induced alignment effects. Thermal effects can be minimized by choosing materials with a low coefficient of thermal expansion (CTE), like stainless steel. However, even mounts made from a material with a low CTE do not typically return the mirror to its initial position when the initial temperature is restored. All the critical components of the Polaris mirror mounts are heat treated prior to assembly since this process removes internal stresses that can cause a temperature-dependent hysteresis. As a result, the alignment of the optical system will be restored when the temperature of the mirror mount is returned to the initial temperature.

The method by which the mirror is secured in the mount is another important design factor for the Polaris; these Polaris mounts offer excellent performance without the use of adhesives. Instead, they have SM05-, SM1-, or SM2-threaded bores and two stainless steel retaining rings that hold the optic in place. The holding force provided by the stainless steel retaining rings is sufficient to keep the mirror locked into place regardless of the ambient temperature. This bore also allows other SM05-, SM1-, or SM2-threaded components to be secured in the mounts.

Crosstalk

Crosstalk is minimized by carefully controlling the dimensional tolerances of the front and back plates of the mount so that the pitch and yaw actuators are orthogonal. In addition, sapphire seats are used at all three contact points. Standard metal-to-metal actuator contact points will wear down over time. The polished sapphire seats of the Polaris mounts, in conjunction with the hardened stainless steel actuator tips, maintain the integrity of the contact surfaces over time.

Drift and Backlash

In order to minimize the positional drift of the mirror mount and backlash, it is necessary to limit the amount of play in the adjuster as well as the amount of lubricant used. When an adjustment is made to the actuator, the lubricant will be squeezed out of some spaces and built up in others. This non-equilibrium distribution of lubricant will slowly relax back into an equilibrium state. However, in doing so, this may cause the position of the front plate of the mount to move. The Polaris™ mounts use adjusters matched to the body that exceed all industry standards so very little adjuster lubricant is needed. These adjusters have a smooth feel that allows the user to make small, repeatable adjustments.

USAGE TIPS

Through thermal changes and vibrations, the Polaris™ kinematic mirror mounts are designed to provide years of use. Below are some usage tips to ensure that the mount provides optimal performance.

Click for Details
Spanner Bits and the TD24 Torque Driver Can Be Used to Mount Optics in SM-Threaded Polaris Mirror Mounts

Match Materials
Due to its relatively low coefficient of thermal expansion, stainless steel was chosen as the material from which to fabricate the front and back plates of the Polaris mounts. When mounting, we recommend using components fabricated from the same material, such as our Ø1" Posts for Polaris Mirror Mounts and Polaris Clamping Arm.

Use a Wide Post
The Polaris' performance is optimized for use with our Ø1" Posts and our POLARIS-CA1 clamping arm. These posts are made of stainless steel and provide two lines of contact with the mount, which help confine the bottom of the mount during variations in the surrounding temperature, thereby minimizing potential alignment issues.

Optic Mounting
Since an optic is prone to movement within its mounting bore, all optics should be mounted with the Polaris out of the setup to ensure accurate mounting that will minimize misalignment effects. As shown to the right, we recommend using a TD24 torque wrench with either an SPB05, SPB1, or SPB2 Spanner Bit for SM05-, SM1-, or SM2-threaded Polaris mounts, respectively. See the *Specs* tab for recommended torques. Over torquing the optic retaining rings can result in dramatic surface distortions.

Click to Enlarge
POLARIS-K1T8 with POLARIS-LN1 Lock Nuts on a Ø1" Pedestal Post, Mounting a Large Beam Fiber Collimator using the AD15F SM1-Threaded Adapter

Mounting SM-Threaded Components
Since the front plate of the Polaris mount can move independently from the back plate, it is important to secure the front plate while mounting SM-threaded components. This ensures that the front plate will not rotate with respect to the back plate and crack the sapphire seats at the contact point between the two plates.

Front Plate's Position
Polaris mounts are designed to allow adjustments of up to 10° for the Ø1/2" mounts, 8° for the Ø1" mounts, and 6.8° for the Ø2" mounts. To achieve the best performance, it is recommended that the front plate be kept as parallel as possible to the back plate. This ensures the highest stability of the adjustments.

Mount as Close to the Table's Surface as Possible
To minimize the impact of vibrations and temperature changes, it is recommended that your setup has as low of a profile as possible. Using short posts will reduce the Y-axis translation caused by temperature variations and will minimize any movements caused by vibrations. Mount the Polaris directly onto a flat surface such as a breadboard using a 8-32 to 1/4"-20 thread adapter (AE8E25E) or M4 x 0.7 to M6 x 1.0 adapter (AE4M6M). Using this mounting method, the instability introduced by a post will be eliminated.

Lock nut installation demonstrated with the POLARIS-LN1 lock nut on one of our low-distortion Polaris mounts. To install a lock nut without cross threading, gently place the lock nut against the end of the adjuster. "Unscrew" the nut until the threads of the nut and the adjuster align; then thread the nut onto the adjuster.

Polish and Clean the Points of Contact
We highly recommend that the points of contact between the mount and the post, as well as the post and the table, are clean and free of scratches or defects. For best results, we recommend using a polishing stone to clean the table's surface and a polishing pad (LFG1P) for the top and bottom of the post as well as the bottom of the mount.

Not Recommended
We do not recommend taking the adjusters out of the body, as it can contaminate the threading. This can reduce the fine adjustment performance significantly. Also, do not pull the front plate away as it might stretch the springs beyond their operating range or crack the sapphire seats.

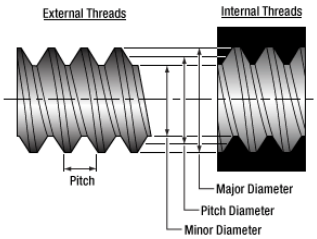
Adjuster Lock Nuts
The Ø1" and Ø2" Polaris mounts below are compatible with the POLARIS-LN1 lock nuts for long-term stability or applications that are exposed to shock and vibration. Lock nuts are pre-installed onto the adjuster for compatible Ø1/2" Polaris mounts. Lock nuts only need to be lightly tightened to a torque of approximately 4 to 8 oz-in (0.03 to 0.06 N·m). The beam can be held on target with the adjuster thumbscrew or hex key while lightly tightening the lock nut by hand or with a thin-head wrench or cone wrench. The POLARIS-LN1 lock nuts have a 13 mm hex and the lock nuts on the Ø1/2" Polaris mounts have a 6 mm hex.

To avoid cross threading the POLARIS-LN1 during installation, place it against the adjuster and "unscrew" the lock nut until you feel a slight drop, then thread the lock nut onto the adjuster (see the animation to the right). Each lock nut is pre-greased with the same ultra-high-vacuum-compatible, low-outgassing PTFE grease as the Polaris mounts and has been tested for adjuster fit.

THREADING SPECS

Thorlabs' Threading Specifications

Thorlabs' lens tubes utilize a series of non-standard threadings. Threading specifications are given below for our SM threadings utilized in our lens tube and cage system components so that you can machine mating components to suit your application. We also offer products with C-Mount and RMS threadings, and the specifications for these threadings are also given below. Please note that other manufacturers may have different tolerances for these threads. For other thread specifications that are not listed here, please contact Tech Support.



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SM05 Threading: Ø1/2" Lens Tubes, 16 mm Cage Systems			
External Thread, 0.535"-40.0, UNS-2A		**Internal Thread, 0.535"-40.0, UNS-2B**	
Max Major Diameter	0.5340"	**Min Major Diameter**	0.5350"
Min Major Diameter	0.5289"	**Min Pitch Diameter**	0.5188"
Max Pitch Diameter	0.5178"	**Max Pitch Diameter**	0.5230"
Min Pitch Diameter	0.5146"	**Min Minor Diameter (and 83.3% of thread)**	0.508"
Max Minor Diameter	0.5069"	**Max Minor Diameter (and 64.9% of thread)**	0.514"

RMS Threading: Objective, Scan, and Tube Lenses			
External Thread, 0.800"-36.0, UNS-2A		**Internal Thread, 0.800"-36.0, UNS-2B**	
Max Major Diameter	0.7989"	**Min Major Diameter**	0.8000"
Min Major Diameter	0.7934"	**Min Pitch Diameter**	0.7820"
Max Pitch Diameter	0.7809"	**Max Pitch Diameter**	0.7866"
Min Pitch Diameter	0.7774"	**Min Minor Diameter (and 83.3% of thread)**	0.770"
Max Minor Diameter	0.7688"	**Max Minor Diameter (and 64.9% of thread)**	0.777"

C-Mount Threading: Machine Vision Lenses, CCD/CMOS Cameras			
External Thread, 1.000"-32.0, UN-2A		**Internal Thread, 1.000"-32.0, UN-2B**	
Max Major Diameter	0.9989"	**Min Major Diameter**	1.0000"
Min Major Diameter	0.9929"	**Min Pitch Diameter**	0.9797"
Max Pitch Diameter	0.9786"	**Max Pitch Diameter**	0.9846"
Min Pitch Diameter	0.9748"	**Min Minor Diameter (and 83.3% of thread)**	0.966"
Max Minor Diameter	0.9651"	**Max Minor Diameter (and 64.9% of thread)**	0.974"

SM1 Threading: Ø1" Lens Tubes, 30 mm Cage Systems			
External Thread, 1.035"-40.0, UNS-2A		**Internal Thread, 1.035"-40.0, UNS-2B**	
Max Major Diameter	1.0339"	**Min Major Diameter**	1.0350"
Min Major Diameter	1.0288"	**Min Pitch Diameter**	1.0188"
Max Pitch Diameter	1.0177"	**Max Pitch Diameter**	1.0234"
Min Pitch Diameter	1.0142"	**Min Minor Diameter (and 83.3% of thread)**	1.008"
Max Minor Diameter	1.0068"	**Max Minor Diameter (and 64.9% of thread)**	1.014"

SM30 Threading: Ø30 mm Lens Tubes			
External Thread, M30.5x0.5		**Internal Thread, M30.5x0.5**	
Max Major Diameter	30.480 mm	**Min Major Diameter**	30.500 mm
Min Major Diameter	30.371 mm	**Min Pitch Diameter**	30.175 mm
Max Pitch Diameter	30.155 mm	**Max Pitch Diameter**	30.302 mm
Min Pitch Diameter	30.059 mm	**Min Minor Diameter (and 83.3% of thread)**	29.959 mm
Max Minor Diameter	29.938 mm	**Max Minor Diameter (and 64.9% of thread)**	30.094 mm

SM2 Threading: Ø2" Lens Tubes, 60 mm Cage Systems

External Thread, 2.035"-40.0, UNS-2A		Internal Thread, 2.035"-40.0, UNS-2B	
Max Major Diameter	2.0338"	**Min Major Diameter**	2.0350"
Min Major Diameter	2.0287"	**Min Pitch Diameter**	2.0188"
Max Pitch Diameter	2.0176"	**Max Pitch Diameter**	2.0239"
Min Pitch Diameter	2.0137"	**Min Minor Diameter (and 83.3% of thread)**	2.008"
Max Minor Diameter	2.0067"	**Max Minor Diameter (and 64.9% of thread)**	2.014"

SM3 Threading: Ø3" Lens Tubes			
External Thread, 3.035"-40.0, UNS-2A		**Internal Thread, 3.035"-40.0, UNS-2B**	
Max Major Diameter	3.0337"	**Min Major Diameter**	3.0350"
Min Major Diameter	3.0286"	**Min Pitch Diameter**	3.0188"
Max Pitch Diameter	3.0175"	**Max Pitch Diameter**	3.0242"
Min Pitch Diameter	3.0133"	**Min Minor Diameter (and 83.3% of thread)**	3.008"
Max Minor Diameter	3.0066"	**Max Minor Diameter (and 64.9% of thread)**	3.014"

POLARIS FAMILY

Thorlabs offers several different general varieties of Polaris mounts, including kinematic low drift, SM threaded, low optic distortion, piezo actuated, and glue-in optic mounts, as well as a fixed monolithic mirror mount and fixed optic mounts. The tables below compare the features of all of our Polaris mirror mounts. We also offer a line of accessories that have been specifically designed for use with our Polaris mounts; these are listed in the table to the right.

Accessories for Polaris Mounts
Ø1" Posts for Polaris Mirror Mounts
Polaris Clamping Arm
Polaris 45° Adapter

Polaris Mounts for Ø1/2" Optics More [+]

Polaris Mounts for Ø19 mm (3/4") Optics More [+]

Polaris Mounts for Ø1" Optics More [+]

Polaris Mounts for Ø2" Optics More [+]

Polaris Kinematic Platform Mount More [+]

Ø1/2" Polaris SM05-Threaded Kinematic Mirror Mount, 3 Adjusters

- 3-Adjuster Hex-Driven Design with 130 TPI Matched Actuator/Body Pairs
- Designed for use with Ø1/2" Optics[a] up to 0.25" (6.4 mm) Thick or SM05-Threaded (0.535"-40) Components
- ±5° Mechanical Angular Range with ~11 mrad/rev Resolution
- Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See *Test Data* Tab)
- 1" Wide Compact Footprint

Click to Enlarge
Fixed Fiber Collimator Mounted in the POLARIS-K05T6 using the AD1109F Thread Adapter

The POLARIS-K05T6 Kinematic Mirror Mount contains an SM05-threaded (0.535"-40) bore for mounting Ø1/2" optics up to 0.25" (6.4 mm) thick or other components, as shown to the right. Kinematic adjustment is provided by three 130 TPI adjusters that are compatible with 5/64" hex keys; they may be adjusted with our HKTS-5/64 Hex Key Thumbscrew (sold below) or any other 5/64" (2 mm) hex wrench. The three-adjuster design provides tip and tilt plus Z-axis (optical axis) adjustment. Two-adjuster versions are also available below.

Two stainless steel retaining rings (included) are used to hold the mounted optic. Additional retaining rings (POLARIS-SM05RR) can also be purchased separately. This mirror mount comes with three adjuster lock nuts that can be tightened by holding the adjuster with a 5/64" (2 mm) hex key while lightly tightening the lock nut by hand or with a 6 mm open-ended wrench. Lock nuts only need to be lightly tightened to a torque of approximately 4 to 8 oz-in (0.03 to 0.06 N·m).

Post mounting is provided by two #8 (M4) counterbores. Due to the shallow design of the counterbores, low-profile 8-32 and M4 cap screws are included for mounting without obstructing the transmissive beam path. The 8-32 cap screw accepts a 5/64" (2 mm) hex wrench, while the M4 cap screw accepts a 2.5 mm hex wrench. For custom mounting configurations, Ø2 mm alignment pin holes are located on both sides of each counterbore for setting a precise location and mounting angle. Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details).

a. Please note that these mounts are designed for Ø1/2" Optics and are not intended for use with the Ø12.5 mm metric mirror size. To order a mount designed for metric optics, please contact
Tech Support.

Part Number	Description	Price	Availability
POLARIS-K05T6	**Customer Inspired!Polaris™ SM05-Threaded Ø1/2" Mirror Mount, 3 Hex Adjusters with Lock Nuts, 2 Retaining Rings Included**	**$160.00**	**Today**
POLARIS-SM05RR	**Stainless Steel SM05 (0.535"-40) Threaded Retaining Ring**	**$7.00**	**Today**

Ø1/2" Polaris SM05-Threaded Kinematic Mirror Mounts, 2 Adjusters

Click to Enlarge

- 2-Adjuster Hex-Driven Design with 130 TPI Matched Actuator/Body Pairs
- Designed for use with Ø1/2" Optics[a] up to 0.25" (6.4 mm) Thick or SM05-Threaded (0.535"-40) Components
- Low-Profile or Standard-Profile Adjusters
- ±5° Mechanical Angular Range with ~11 mrad/rev Resolution
- Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See *Test Data* Tab)
- 1" Wide Compact Footprint


Click to Enlarge


Click to Enlarge

POLARIS-K05T1 (Left) with Low-Profile Adjusters and POLARIS-K05T2 (Right) with Standard-Profile Adjusters and Lock Nuts

These 2-adjuster Ø1/2" Polaris Kinematic Mirror Mounts are similar to the standard 3-adjuster version sold above but feature a hardened steel ball in place of the third adjuster. The 2-adjuster design improves mount stability by limiting the available degrees of freedom for movement. An SM05-threaded (0.535"-40) bore allows for mounting Ø1/2" optics up to 0.25" (6.4 mm) thick or other SM05-threaded components.

The POLARIS-K05T2 mount has standard-profile hex adjusters and includes two adjuster lock nuts. For fitting into tight spaces, the POLARIS-K05T1 mount is equipped with low-profile hex adjusters that are 0.15" (3.8 mm) shorter than the adjusters on the POLARIS-K05T2; due to the shorter adjusters, the POLARIS-K05T1 does not include lock nuts. The hex actuators are compatible with 5/64" (2 mm) hex keys and may be adjusted with our HKTS-5/64 Hex Key Thumbscrew (sold below) or any other 5/64" (2 mm) hex wrench.

Two stainless steel retaining rings (included) are used to hold the mounted optic. Additional retaining rings (POLARIS-SM05RR) can also be purchased separately. The POLARIS-K05T2 comes with two adjuster lock nuts that can be tightened by holding the adjuster with a 5/64" (2 mm) hex key while lightly tightening the lock nut by hand or with a 6 mm open-ended wrench. Lock nuts only need to be lightly tightened to a torque of approximately 4 to 8 oz-in (0.03 to 0.06 N·m).

Post mounting is provided by two #8 (M4) counterbores. Due to the shallow design of the counterbores, low-profile 8-32 and M4 cap screws are included for mounting without obstructing the transmissive beam path. The 8-32 cap screw accepts a 5/64" (2 mm) hex wrench, while the M4 cap screw accepts a 2.5 mm hex wrench. For custom mounting configurations, Ø2 mm alignment pin holes are located on both sides of each counterbore for setting a precise location and mounting angle. Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details).

a. Please note that these mounts are designed for Ø1/2" Optics and are not intended for use with the Ø12.5 mm metric mirror size. To order a mount designed for metric optics, please contact
Tech Support.

Part Number	Description	Price	Availability
POLARIS-K05T1	**Polaris™ SM05-Threaded Ø1/2" Mirror Mount, 2 Low-Profile Hex Adjusters, 2 Retaining Rings Included**	**$125.00**	**Today**
POLARIS-K05T2	**Polaris™ SM05-Threaded Ø1/2" Mirror Mount, 2 Hex Adjusters with Lock Nuts, 2 Retaining Rings Included**	**$150.00**	**Today**
POLARIS-SM05RR	**Stainless Steel SM05 (0.535"-40) Threaded Retaining Ring**	**$7.00**	**Today**

Ø1" Polaris SM1-Threaded Kinematic Mirror Mounts, 3 Adjusters

Click to Enlarge
POLARIS-K1T8H
Hex-Driven Mount

- 3-Adjuster Knob- or Hex-Driven Design with 100 TPI Matched Actuator/Body Pairs
- Designed for use with Ø1" Optics[a] up to 0.34" (8.6 mm) Thick or SM1-Threaded (1.035"-40) Components
- ±4° Mechanical Angular Range with ~7.7 mrad/rev Resolution
- Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See *Test Data* Tab)
- Adjusters can be Locked Using POLARIS-LN1 Lock Nuts (Sold Separately)


Click to Enlarge
The POLARIS-K1T8 has Two Ø2 mm Dowel Pin Holes by Each #8 (M4) Counterbore for Alignment


Click to Enlarge
POLARIS-K1T8 with POLARIS-LN1 Lock Nuts Mounting a Large Beam Fiber Collimator using the AD15F Thread Adapter

The POLARIS-K1T8 and POLARIS-K1T8H Kinematic Mirror Mounts feature an SM1-threaded (1.035"-40) bore for mounting Ø1" optics up to 8.6 mm (0.34") thick or other products (see the photo to the far right). The three-adjuster design provides tip and tilt plus Z-axis (optical axis) adjustment. Two-adjuster versions are also available below.

The POLARIS-K1T8 includes three removable Ø0.60" (Ø15.2 mm) adjuster knobs, while the POLARIS-K1T8H is a hex-driven model. The adjusters on both mounts can be driven by a 5/64" (2 mm) hex key or the HKTS-5/64 hex key thumbscrew (sold below), and can be locked using our POLARIS-LN1 Lock Nuts (also sold below).

Two stainless steel retaining rings (included) are used to hold the mounted optic. Additional retaining rings (POLARIS-SM1RR) can also be purchased separately. Post mounting is provided by two #8 (M4) counterbores which can be used with the included 8-32 and M4 cap screws. For custom mounting configurations, Ø2 mm alignment pin holes are located on both sides of each counterbore for setting a precise location and mounting angle (see photo above, to the left). Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details).

a. Please note that these mounts are designed for Ø1" Optics and are not intended for use with the Ø25 mm metric mirror size. To order a mount designed for metric optics, please contact Tech Support.

Part Number	Description	Price	Availability
POLARIS-K1T8	**Customer Inspired!Polaris™ SM1-Threaded Ø1" Mirror Mount, 3 Adjusters, 2 Retaining Rings Included**	**$242.00**	**3-5 Days**
POLARIS-K1T8H	**Polaris™ SM1-Threaded Ø1" Mirror Mount, 3 Hex Adjusters, 2 Retaining Rings Included**	**$225.00**	**Today**
POLARIS-SM1RR	**Customer Inspired!Stainless Steel SM1 (1.035"-40) Threaded Retaining Ring**	**$10.99**	**Today**
POLARIS-LN1	**1/4"-100 Lock Nut, 13 mm Hex, Stainless Steel**	**$8.00**	**Today**

Ø1" Polaris SM1-Threaded Kinematic Mirror Mounts, 2 Adjusters

- 2-Adjuster Knob- or Hex-Driven Design with 100 TPI Matched Actuator/Body Pairs
- Designed for use with Ø1" Optics[a] up to 0.34" (8.6 mm) Thick or SM1-Threaded (1.035"-40) Components
- ±4° Mechanical Angular Range with ~7.7 mrad/rev Resolution
- Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See *Test Data* Tab)
- Adjusters can be Locked using POLARIS-LN1 Lock Nuts (Sold Separately)

Click to Enlarge
POLARIS-K1T2 2-Adjuster Hex-Driven Mount

These 2-adjuster Ø1" Polaris Kinematic Mirror Mounts are similar to the standard 3-adjuster versions sold above but feature a hardened steel ball in place of the third adjuster. The 2-adjuster design improves mount stability by limiting the available degrees of freedom for movement. An SM1-threaded (1.035"-40) bore allows for mounting Ø1" optics up to 8.6 mm (0.34") thick or other SM1-threaded components.

The POLARIS-K1T1 includes two removable Ø0.60" (Ø15.2 mm) adjuster knobs, while the POLARIS-K1T2 is a hex-driven model. The adjusters on both mounts can be driven by a 5/64" (2 mm) hex key or the HKTS-5/64 hex key thumbscrew (sold below), and can be locked using our POLARIS-LN1 Lock Nuts (also sold below).

Two stainless steel retaining rings (included) are used to hold the mounted optic. Additional retaining rings (POLARIS-SM1RR) can also be purchased separately. Post mounting is provided by two #8 (M4) counterbores which can be used with the included 8-32 and M4 cap screws. For custom mounting configurations, Ø2 mm alignment pin holes are located on both sides of each counterbore for setting a precise location and mounting angle (see photo above, to the right). Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details).

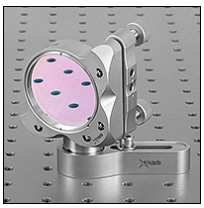
a. Please note that these mounts are designed for Ø1" Optics and are not intended for use with the Ø25 mm metric mirror size. To order a mount designed for metric optics, please contact
Tech Support.

Part Number	Description	Price	Availability
POLARIS-K1T1	**Polaris™ SM1-Threaded Ø1" Mirror Mount, 2 Adjusters, 2 Retaining Rings Included**	**$205.00**	**Lead Time**
POLARIS-K1T2	**Polaris™ SM1-Threaded Ø1" Mirror Mount, 2 Hex Adjusters, 2 Retaining Rings Included**	**$190.00**	**Lead Time**
POLARIS-SM1RR	**Customer Inspired!Stainless Steel SM1 (1.035"-40) Threaded Retaining Ring**	**$10.99**	**Today**
POLARIS-LN1	**1/4"-100 Lock Nut, 13 mm Hex, Stainless Steel**	**$8.00**	**Today**

Ø2" Polaris SM2-Threaded Kinematic Mirror Mounts, 3 Adjusters

Click to Enlarge
POLARIS-K2T3
Hex-Driven Mount

- 3-Adjuster Knob- or Hex-Driven Design with 100 TPI Matched Actuator/Body Pairs
- Designed for use with Ø2" Optics[a] up to 0.50" (12.7 mm) Thick or SM2-Threaded (2.035"-40) Components
- ±3.4° Mechanical Angular Range with ~5 mrad/rev Resolution
- Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See *Test Data* Tab)
- Adjusters can be Locked Using POLARIS-LN1 Lock Nuts (Sold Separately)
- Mounts with Stiffer Springs for Increased Stability[b] are Available by Contacting Tech Support


Click to Enlarge
POLARIS-K2T Holding a BB2-E03 Broadband Dielectric Mirror and Mounted on a Ø1" Pillar Post Secured by a POLARIS-CA1 Clamping Arm

The POLARIS-K2T and POLARIS-K2T3 Kinematic Mirror Mounts feature an SM2-threaded (2.035"-40) bore for mounting Ø2" optics up to 12.7 mm (0.50") thick or other products (see the photo to the right). The three-adjuster design provides tip and tilt plus Z-axis (optical axis) adjustment. Two-adjuster versions are also available below.

The POLARIS-K2T includes three removable Ø0.60" (Ø15.2 mm) adjuster knobs, while the POLARIS-K2T3 is a hex-driven model. The adjusters on both mounts can be driven by a 5/64" (2 mm) hex key or the HKTS-5/64 hex key thumbscrew (sold below), and can be locked using our POLARIS-LN1 Lock Nuts (also sold below).

Two stainless steel retaining rings (included) are used to hold the mounted optic. Additional retaining rings (POLARIS-SM2RR) can also be purchased separately. Post mounting is provided by four #8 (M4) counterbores which can be used with the included 8-32 and M4 cap screws. For custom mounting configurations, Ø2 mm alignment pin holes are located on each mounting face for setting a precise location and mounting angle. Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details).

a. Please note that these mounts are designed for Ø2" Optics and are not intended for use with the Ø50 mm metric mirror size. To order a mount designed for metric optics, please contact Tech Support.
b. Stiffer springs increase the torque required for angular adjustments.

Part Number	Description	Price	Availability
POLARIS-K2T	**Polaris™ SM2-Threaded Ø2" Mirror Mount, 3 Adjusters, 2 Retaining Rings Included**	**$285.00**	**3-5 Days**
POLARIS-K2T3	**Polaris™ SM2-Threaded Ø2" Mirror Mount, 3 Hex Adjusters, 2 Retaining Rings Included**	**$270.00**	**Today**
POLARIS-SM2RR	**Stainless Steel SM2 (2.035"-40) Threaded Retaining Ring**	**$10.00**	**Today**
POLARIS-LN1	**1/4"-100 Lock Nut, 13 mm Hex, Stainless Steel**	**$8.00**	**Today**

Ø2" Polaris SM2-Threaded Kinematic Mirror Mounts, 2 Adjusters

- 2-Adjuster Knob- or Hex-Driven Design with 100 TPI Matched Actuator/Body Pairs
- Designed for use with Ø2" Optics[a] up to 0.50" (12.7 mm) Thick or SM2-Threaded (2.035"-40) Components
- ±3.4° Mechanical Angular Range with ~5 mrad/rev Resolution
- Less than 2 µrad Deviation after 12.5 °C Temperature Cycling (See *Test Data* Tab)
- Adjusters can be Locked using POLARIS-LN1 Lock Nuts (Sold Separately)
- Mounts with Stiffer Springs for Increased Stability[b] are Available by Contacting Tech Support

Click to Enlarge
POLARIS-K2T2 2-Adjuster Hex-Driven Mount

These 2-adjuster Ø2" Polaris Kinematic Mirror Mounts are similar to the standard 3-adjuster versions sold above but feature a hardened steel ball in place of the third adjuster. The 2-adjuster design improves mount stability by limiting the available degrees of freedom for movement. An SM2-threaded (2.035"-40) bore allows for mounting Ø2" optics up to 12.7 mm (0.50") thick or other SM2-threaded components.

The POLARIS-K2T1 includes two removable Ø0.60" (Ø15.2 mm) adjuster knobs, while the POLARIS-K2T2 is a hex-driven model. The adjusters on both mounts can be driven by a 5/64" (2 mm) hex key or the HKTS-5/64 hex key thumbscrew (sold below), and can be locked using our POLARIS-LN1 Lock Nuts (also sold below).

Two stainless steel retaining rings (included) are used to hold the mounted optic. Additional retaining rings (POLARIS-SM2RR) can also be purchased separately. Post mounting is provided by four #8 (M4) counterbores which can be used with the included 8-32 and M4 cap screws. For custom mounting configurations, Ø2 mm alignment pin holes are located on each mounting face for setting a precise location and mounting angle. Standard DIN 7-m6 ground dowel pins are recommended (see the *Documents* tab for details).

a. Please note that these mounts are designed for Ø2" Optics and are not intended for use with the Ø50 mm metric mirror size. To order a mount designed for metric optics, please contact
Tech Support.
b. Stiffer springs increase the torque required for angular adjustments.

Part Number	Description	Price	Availability
POLARIS-K2T1	**Polaris™ SM2-Threaded Ø2" Mirror Mount, 2 Adjusters, 2 Retaining Rings Included**	**$270.00**	**Today**
POLARIS-K2T2	**Polaris™ SM2-Threaded Ø2" Mirror Mount, 2 Hex Adjusters, 2 Retaining Rings Included**	**$260.00**	**Today**
POLARIS-SM2RR	**Stainless Steel SM2 (2.035"-40) Threaded Retaining Ring**	**$10.00**	**Today**
POLARIS-LN1	**1/4"-100 Lock Nut, 13 mm Hex, Stainless Steel**	**$8.00**	**Today**

1/4"-100 Large Adjustment Knob

- Ø0.925" Knob for Additional Angular Resolution
- Clearance Hole Allows Access to Hex Socket of the Adjuster

This removable adjustment knob is compatible with many of our 1/4"-100 adjusters, including those used in the Ø1" and Ø2" Polaris Kinematic Mounts and our Polaris Kinematic Platform Mount. The larger Ø0.925" size provides additional angular resolution over the standard Polaris knobs.

Please note that this knob is not compatible with the POLARIS-K1C4, POLARIS-K1G4, POLARIS-K1S5, and POLARIS-K1S4 mounts with side hole adjusters.

Click to Enlarge
The F25USK2 Knob is Compatible with our Polaris Mounts

Part Number	Description	Price	Availability
F25USK2	**Ø0.925" 1/4"-100 Removable Adjuster Knob**	**$8.20**	**Today**

5/64" Hex Key Adjusters

- For Convenient Adjustment of 5/64" and 2 mm Hex-Driven Actuators
- Red Anodized Adjustment Knob with Engraved Hex Size
- Replaceable Hex Tip
- Sold in Packages of 4

These 5/64" Hex Key Adjuster Thumbscrews allow for quick adjustment of many 5/64" and 2 mm hex-driven actuators (or standard actuators with the knobs removed). These temporary knobs can be left in the screw's hex socket between adjustments for convenience (see photo to the right). An 8-32 setscrew (5/64" hex) secures the replaceable hex bit, which can be reversed if the tip is stripped. Contact Tech Support to order replacement hex key bits.

We offer hex key thumbscrews in sizes from 0.050" to 3/16" and 2 mm to 5 mm.


Click for Details
POLARIS-K1-2AH with HKTS-5/64 Adjuster

Part Number	Description	Price	Availability
HKTS-5/64	**Customer Inspired! 5/64" (2 mm) Hex Key Thumbscrew (4 Pack)**	**$22.50**	**Today**

Adjuster Lock Nuts for Polaris Mounts

- Lock Nuts for Long-Term Adjuster Stability
- Compatible with Select Polaris Mounts

These lock nuts are designed for use with any Polaris kinematic mount that does not contain low-profile adjusters. Designed for long-term adjuster stability or applications that are exposed to shock and vibration, these lock nuts are pre-greased with the same ultra-high-vacuum-compatible, low-outgassing PTFE grease as the Polaris mounts and have been tested for adjuster fit.


Click to Enlarge
POLARIS-LN05 Lock Nuts on a POLARIS-K19S4 Mount

To install a lock nut without cross threading, gently place the lock nut against the end of the adjuster. "Unscrew" the nut until the threads of the nut and the adjuster align before threading the nut onto the adjuster. This animation shows the installation of a POLARIS-LN1 lock nut on a POLARIS-K1F1 low distortion mount.

To secure the lock nut on an adjuster, lightly tighten to a torque of approximately 4 to 8 oz-in (0.03 to 0.06 N·m). The beam can be held on target with the adjuster thumbscrew or hex key while lightly tightening the lock nut by hand or with a thin-head wrench or cone wrench; POLARIS-LN05 lock nuts require a 6 mm hex tool for tightening, while POLARIS-LN1 lock nuts require a 13 mm hex tool. To avoid cross threading the lock nut, place it against the adjuster and "unscrew" the lock nut until you feel a slight drop; then thread the lock nut onto the adjuster.

Part Number	Description	Price	Availability
POLARIS-LN05	**3/16"-130 Lock Nut, 6 mm Hex, Stainless Steel**	**$12.00**	**Today**
POLARIS-LN1	**1/4"-100 Lock Nut, 13 mm Hex, Stainless Steel**	**$8.00**	**Today**

Visit the *Polaris™ SM-Threaded Low Drift Kinematic Mirror Mounts* page for pricing and availability information:
https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=6634