Ø25 mm Polaris® Low-Distortion Mirror Mount

POLARIS-K25F4/M

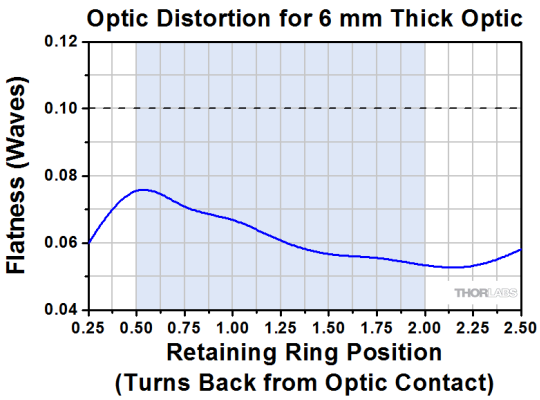
Specifications

POLARIS-K25F4/M		
Optic Size Accommodated	Ø25 mm	
Optic Thickness	4 mm (0.15") Min	8.0 mm (0.32") Max[a]
		9.7 mm (0.38") Max[b]
Adjusters	2 x 100 TPI	
Measured Point-to-Point Mechanical Resolution per Adjuster	5 µrad (Typical) 2 µrad (Achievable)	
Measured Adjuster Lock Mechanical Resolution per Adjuster[c]	5 µrad (Typical) 2 µrad (Achievable)	
Adjustment per Revolution[d]	~7.7 mrad/rev	
Mechanical Angular Range (Nominal)	±4°	
Beam Deviation[e]	<1 µrad	
Vacuum Compatibility[f]	10^{-9} Torr at 25 °C with Proper Bake Out; 10^{-5} Torr at 25°C without Bake Out Grease Vapor Pressure: 10^{-13} Torr @ 20 °C, 10^{-5} Torr @ 200 °C Epoxy Meets Low Outgassing Standards NASA ASTM E595 and Telcordia GR-1221	
Cleaning[f]	Passivized per ASTM-967	
Operating Temperature Range	-30 to 200 °C	
Mounting	Two #8 (M4) Counterbores at 90°	

a. When mounted using the included optic retention spring and the included POLARIS-SM1RRS40 retaining ring.
b. When mounted using only the POLARIS-SM1RR retaining ring (available separately).
c. When the POLARIS-LN1 lock nuts are used (the POLARIS-K25F4/M and POLARIS-LN1 are designed to work together).
d. When the front plate is parallel to the back plate.
e. 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 and a 2" beam height.
f. All POLARIS-K25F4/M mounts are vacuum compatible, assembled in a clean environment, and double vacuum bagged. Contact techsupport@thorlabs.com for details.

Optic Installation

Ensure that there is no grease, dirt, or dust in the optic bore or on the optic itself. Remove any particulates with clean compressed air, which can be purchased from our website, and/or clean with ethanol. The optic, indexed retention spring, and retaining ring are installed through the back of the mount. Place the optic in the mount and insert the spring in after, making sure that the index tab is in the key way and touching the retaining ring. Failing to do so will cause increased optic distortion. Gently turn the retaining ring using the SPW606 or SPW602 Spanner Wrench until the optic makes contact with the three fingers on the face plate. Continue to tighten until the spring is fully compressed into the pocket of the retaining ring. At this point, the retaining ring will make slight contact with the back of the optic. Loosen the retaining ring between one half to two turns to allow the spring pressure alone to hold the optic in place. This will result in an additional distortion of a few hundredths of a wave for a 6 mm thick optic compared to the unmounted optic.



The shaded region in the graph above represents the suggested range of backward turns of the retaining ring in order to have both secure mounting and minimal optic distortion. The optic will not be secured in the mount with more than two turns back, and the retaining ring will remain in contact with the optic with less than half a turn back. The number of turns back use to secure the optic will vary based on the application. The dashed line indicates 0.10λ flatness for reference.

Alternatively, a torque driver can be used to secure the optic. While the results when using a torque driver can be similar to that of loosening the retaining ring, it can be easy to over- or underestimate the amount of torque needed. This can result in securing the optic in the mount too loosely or too tightly, either of which will have a negative effect on the mount's performance. The retaining ring will contact the optic above 30 oz-in.

Usage Tips

When mounting this, or any other high-performance optomechanical device, it is important to follow a few principles:

1) **Match Materials:** Due to its relatively low coefficient of thermal expansion, stainless steel was chosen as the material from which to fabricate the Polaris mount. When mounting the POLARIS-K25F4/M, we recommend using components fabricated from the same material.

2) **Use a Wide Post:** The Polaris' performance is optimized for use with a Ø1" stainless steel post. These posts provide two planes of contact with the mount, which help confine the bottom of the mount during variations in the surrounding temperature, thereby minimizing potential alignment issues.

3) **Mount an Optic only when the Mount is out of a Setup:** Since an optic is prone to movement within its mounting bore, all optics should be mounted while the Polaris out of the setup to ensure accurate mounting that will minimize misalignment effects.

4) **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. For even better performance, the POLARIS-K25F4/M can be mounted directly onto a flat surface such as a breadboard using a 1/4"-20 to 8-32 (Item # AE8E25E) or M6 to M4 (Item # AE4M6M) thread adapter. Before mounting, ensure that the mounting surface is highly flat, polished, and free of debris and scratches. When securing the mount to a post or breadboard, we recommend applying 14 – 16 lb-in (1.6 – 1.8 N-m) of torque using our TD75 torque wrench.

5) **Adjuster Lock Nuts:** The POLARIS-K25F4/M is designed to work with the POLARIS-LN1 adjuster lock nuts to prevent drift as the mount sits for a period of time. We recommend 4 to 8 oz-in of torque to secure the lock nuts.

6) **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 polishing the table's surface with a polishing stone and then polishing the bottom and top of the post as well as the bottom of the mount using a polishing pad (Item # LFG1P). For best results, we recommend resting the post and mount on a flat surface.

7) **Front Plate's Position:** During alignment, deflection will be minimized if the mount's front plate is kept parallel to the back plate. This ensures even thermal expansion of all the adjustment screws, causing the mounted mirror to translate in the Z direction as opposed to rotating during temperature changes.

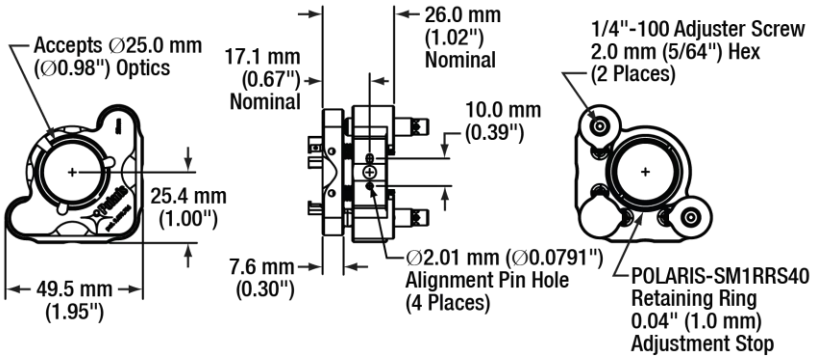
8) **Try to Minimize Deflection Caused by the Hand while Adjusting:** When making adjustments, we recommend applying as little force as possible. There is no detectable play on the POLARIS-K25F4/M screws by feel; however, you still want to apply pure torque on the adjusters instead of torque and a directional force. This will ensure the shortest settling time and greatly reduce the chance of alignment change after adjustment.

9) **Allow the System to Settle:** Whenever a new system is built, the forces from the mounting hardware will create new stresses that will settle in over time, causing micro creep in the system. If possible, allow 24 hours for settling.

Not Recommended:

- Do not take the adjusters out of the mount as this can cause the threading to become contaminated, greatly reducing the mount's fine adjustment performance.
- Do not over-tighten the adjuster lock nuts, as this can damage the fine adjuster threads.
- Do not pull the front plate away as it could stretch the springs beyond their limit; if the plates snap together the sapphire seats may crack.
- Do not over tighten the retaining ring that secures the indexed wave spring and holds the optic in place; only slight force is required.
- Do not adjust the spring-loaded ball contact located in one of the mounting fingers.

Drawings



The mount includes two Ø2 mm alignment pin features for setting a precise mounting location and angle. A standard DIN 7-m6 Ground Dowel Pin (Ø2 mm +0.002 mm to 0.008 mm x 5 mm) is recommended. The recommended tolerance for the location of the mating dowel pin holes and threaded mounting holes is ±0.003".