Mirror Holders Application Note

Mirror holders are divided into six categories by function.

Classification of Mirror Holder Functions

Part Number	Mounting Center	Rotational Mechanism	Fine Adjustment Center	Optics Fixation	Control Direction	Control
MHG	Offset	None	Offset	Lateral side set screw	Back	Screw
MMHN	Offset	None	Offset	Mirror case	Back	Screw
MHAN/MHA	Mirror center	Mirror center	Mirror center	Retaining ring	Front/Back	Screw/Micro
BHAN	Mirror center	Mirror center	Mirror center	Retaining ring	Front/Back	Screw/Micro
BSHL	Offset	None	Mirror center	Retaining ring	Vertical	Screw

(1) Center of Mounting

Mirror holders fitted with a post (such as MHAN) are designed so that the reflective surface of the mirror is along the center of the post.
MMHN-25RO and MMH-50M6 are excluded. By having the reflective optical axis and center post coaxial, the position of the laser beam irradiated on mirrors will not change even when the mounting direction of the holder is changed. In such cases where the center of mounting has offset, attention is required to the positional relationship between the laser beam and the mirror holder. Mirror holders that do not come standard with posts must be aligned when mounted to a post. The holder will come with an offset to position the mirror and laser beam correctly. (The following figure on the right shows this.)
To install a mirror holder that has an offset at the center of mounting, roughly position the angle of the mirror before fixing the holder.
Find the position of the mirror where the laser beam irradiates at the center of the mirror at the specified incidence angle, and fix the mirror holder at that position. The mounting screws for the baseplate may not match the hole position of the breadboard. If such a case arises, use a magnetic baseplate or a different baseplate designed for offset positions.
Special plates for mounting posts (MHG-BPRO) are available for the MHG holders to match the center of the post to the center of the reflective surface of the mirror.

Image of MHAN Holder Installation

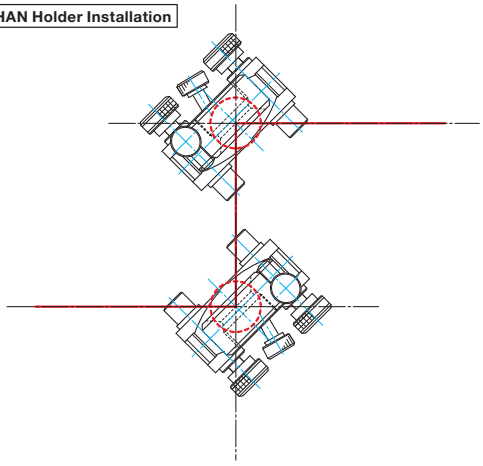
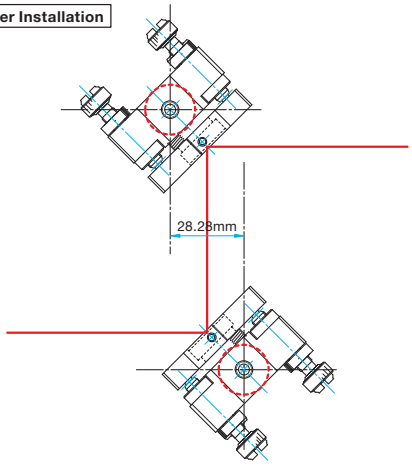


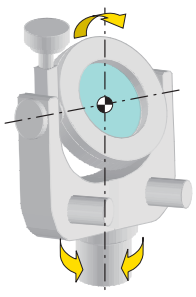
Image of MHG Holder Installation



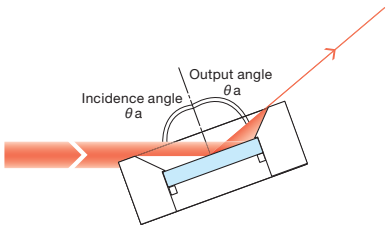
(2) Rotational Mechanism

With their two-axis gimbal structure, the MHAN and BHAN holders can be positioned to face any laser beam source in any direction.
The rotational center of the gimbal mechanism is at the center of the of the reflective surface; therefore, a laser beam irradiated at the center of the mirror will stay at the center of the mirror regardless of mirror direction. There are no constraints on mirror rotation, thus the reflected beam can be directed at angles vertically, diagonally, or horizontally.
The reflected beam may become partially blocked by the mirror holder frame depending on the beam diameter or angle of incidence.

Image of Gimbal Type Mirror Holder



Schematic of Beam Loss due to Mirror Frame

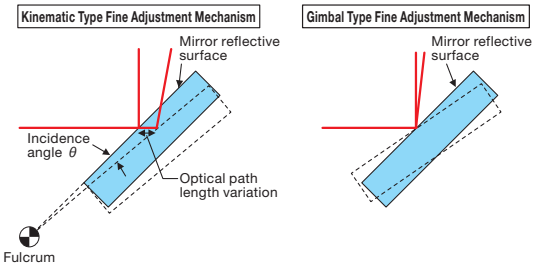


(3) Fine Adjustment Center

Mirror holders are capable of fine angle adjustments using one of two mechanisms.
The first type of fine adjustment mechanism is the gimbal type which allows for rotation of the reflective surface of the mirror.
The second type, kinematic type, allows for rotating around the outside of reflective surface.
The only differences in stability between the two adjustment mechanisms arise when dealing with interferometers and laser resonators.
Optical path length variations caused by angle adjustment are shown in the table to the right for kinematic mirror holders.
Using the gimbal fine adjustment is advantageous for small optical path length variations.
Conversely, the kinematic adjustment has issues with small optical path variations. The physical and temperature stability of the kinematic adjustment make them excellent for laser resonators applications.

Variation in optical path length by angle adjustment of kinematic mirror holder

Part Number	Adjustment Range [°]	Max Optical Path Length Deviation (Incidence angle 0 degree) [mm]	Optical Path Length Variation when Turned by 0.5° (mm)	
			Incidence Angle 0°	Incidence Angle 45°
MHG-12.7	±3	0.5	0.17	0.12
MHG-30	±3	1.0	0.33	0.24
MHG-50	±2	1.0	0.51	0.36
MHG-80	±2	1.5	0.77	0.55
MHG-100	±2	2.1	1.03	0.73



(4) Mounting Method of Optics

Mirrors with high surface accuracy are used in optical experiments with interferometers or laser concentration.
Beam deviation may not be seen due to the thickness or hardness of the material, but a slight bump to the holder can cause deviations in the shape of the beam. The deviation can be observed in the more precise optical experiments. It is imperative to choose the correct mounting method for mirrors, and to mount the mirrors securely.

●Retaining Ring Mount

With retaining rings, the mirror is pressed against a resin ring secured by an aluminum threaded ring.
The position of the reflective surface of the mirror does not change because it is pressed against the face of the mirror frame. Optics will rarely fall out of their holders due to vibration or impact with these mounting method. The retaining rings must not be over tightened or the mirrors will be in stress.

●Lateral Side Screw Mount

The mirror is held on its edge with two points and one resin set screw as shown in the figure to the right. Changes in thickness of the mirrors shifts the position of the reflective surface because the mirror is mounted by its edges and not by its face. The mirror can be tilted relative to the frame with this mounting method.
Stressed is induced with the torque of the set screw, and can be changed after lens installation. The mirror can fall out of the holder in situations with high vibrations or potential impact.

Image of Retaining Ring Fixation

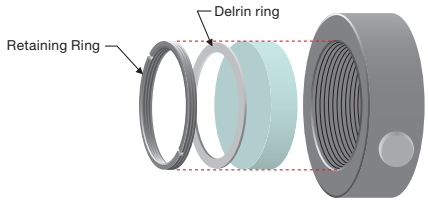
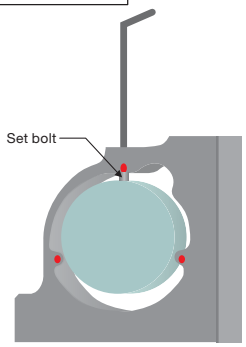


Image of Lateral Side Screw Fixation



(5) Control Directions

When holders are used in complex crowded optical systems or narrow spaces, operating the mechanisms becomes difficult. Mirror holders with vertical or horizontal adjustment control directions can be used to make adjustments easier.

(6) Types of Adjustment Mechanisms

There are two types of adjustment mechanisms for holders. The graduated micrometer has a long knurled rotating knob that allows for frequent and easy manipulations. The other type of adjustment is a 0.25 mm pitched screw. These screws are shorter than micrometers allow for fine adjustments in confined spaces.