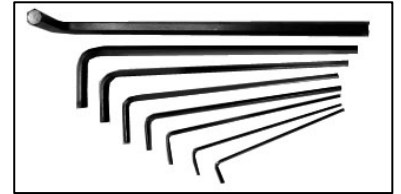


## Key Points for Installation:1 - Hexagonal Wrench

Our manipulators often incorporate hexagonal wrenches for installation or adjustment.

A hexagonal wrench is used to turn and fasten a cap screw (often referred to as a fixing screw in the instruction manuals) which has a hexagonal recess on the screw head. Unlike cross and straight slot screw drivers, the wrench contacts a wide area of the screw head. It secures the turns with strong force preventing the recess of the screw head from slipping and damaging. In other words, cap screws are to be fastened tightly.



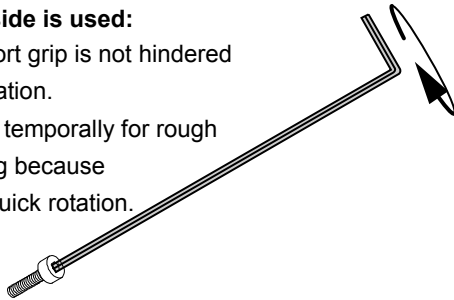
With this concept in mind, it is important to use an appropriately sized wrench in order to fasten screws properly. When the diameter of a wrench is bigger than the diameter of the recess, it simply does not fit in the recess and it is useless. When the wrench size is smaller than the diameter of the recess and it happens to be caught on the edge of the recess, the wrench should not be used. It can damage the recess or the end of the wrench. The size of a hexagonal wrench is the width across the flats. Hexagonal wrenches are available in millimeter and inch sizes. Narishige uses millimeter size wrenches.

### How to Use a Hexagonal Wrench

L-shaped, JIS standard hexagonal wrenches are incorporated in our products. When the long side is used, the grip is less likely hindered during rotation and can be quickly rotated. When the short side is used, it provides a strong force due to the principle of leverage. To fasten the screw tightly, use the short side.

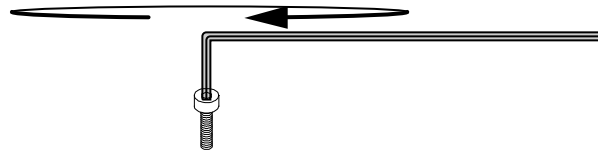
#### The long side is used:

- As the short grip is not hindered during rotation.
- To tighten temporarily for rough positioning because it allows quick rotation.



#### The short side is used:

- To fasten with strong force (Principle of leverage.)
- To fasten tightly at the end.



It is important that the tip of the wrench is inserted up to the bottom of the recess of the screw head. It follows that when the wrench engages with the recess exactly, the rotation axis becomes stable. As the contact area is at maximum, make sure that the torque does not go in the wrong direction, damaging the edges. Twisted and wrenches with damaged tips can cause tension which is dangerous. These types of wrenches should not be used.

### Why It Is Important To Have Your Own Wrenches

It is important that you use familiar tools in order to facilitate installation and adjustment. All types of hexagonal wrenches are available in stores. Tools you are familiar with can help greatly.

#### Hexagonal Wrench of Screwdriver Type

This type of wrench looks like a screwdriver but has the hexagonal tip. It is easier to rotate this type of wrench than to rotate the L-shape wrench with the long side. The grip should be big to some extent, however, not too big, since it can hinder operation.

#### Hexagonal Wrench with Ballpoint

This type of wrench has a ball-shaped tip and is easy to put in the hexagonal recess. It allows rotation even when it is put onto the recess at a slight angle. The ballpoint can be found with some L-shaped wrench sets, but always on the long side.

Despite the convenience, this type of wrench is not suitable for providing strong force. Therefore, we encourage you to fasten a screw using an L-shaped wrench with the short side on.

#### TIPS: Why Hexagonal Shape ?

When the working space is wide enough, the number of edges is not important. However, working space is sometimes limited during installation due to microscope and other equipment. Triangle shape requires 120 degrees and square shape requires 90 degrees to get to the next side. Hexagonal shape requires only 60 degrees which is more practical. (Octagon shape is rather close to circle and it can slip in the recess and is difficult to find in stores.)

If you have any questions or need further information, please contact us.

Narishige Group Website

URL: <http://narishige-group.com>