

What is a Micromanipulator - 2

Web News issue No.57 discussed how the first micromanipulator evolved to different hydraulic systems respectively intended for different types of experiments. This issue focuses on the differences of the hydraulic systems and why they diverged.

Oil Hydraulic and Water Hydraulic

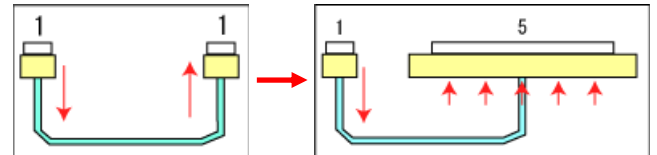
Narishige's oil hydraulic micromanipulators use less evaporable fluid oil, which can transmit pressure more effectively than water to provide a good response. On the other hand, water has an advantageous property that it tends not to create as much drift occurrence as oil. Also, water hydraulic systems allow for replenishment of water for maintenance by the user. For details of the advantages and disadvantages of oil and water hydraulic, please refer back to Narishige Web News No.049.

According to their material characteristics, the oil hydraulic system is basically used for microinjection experiments and the water hydraulic system is basically used for electrophysiology experiments.

1:1 Cartridge and 1:5 Cartridge

There are two types of hydraulic cartridges used with Narishige micromanipulators and they are the 1:1 cartridge and the 1:5 cartridge. The 1:1 cartridge cylinder size of the control unit is identical to that of a drive unit. On the other hand, the 1:5 cartridge cylinder size for a drive unit is five times bigger than that of a control unit. The cartridges function according to Pascal's principle whereby, with the 1:5 cartridge, movement of a control unit is reduced to 1/5 with the quintuple cylinder of the drive unit. This means that the 1:5 cartridge has an advantage that it can be less affected by drift occurrence than the 1:1 cartridge. However, on the other hand, since the 1:5 cartridge reduces movement to one-fifth, it requires a number of rotations of the control knob to move a distance. Movement speed is slow.

Narishige micromanipulators generally employ the 1:1 cartridge. For electrophysiology purposes the 1:5 cartridge is employed to reduce drift occurrence.

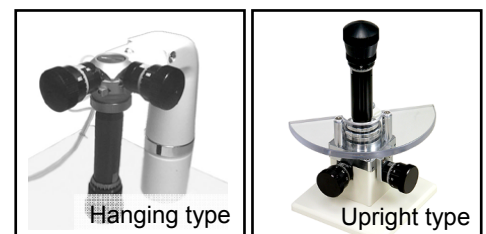


Joystick Controller and Vernier Type Controller

The joystick controller allows X-Y plane movement with a single joystick operation. After a pipette is in focus, a joystick controller allows micromanipulation of the pipette in an intuitive way whereby the user can reproduce intended movement quickly. With this characteristic, the joystick controller is commonly used for microinjection experiments.

Narishige micromanipulators consist of two types of joystick controllers and they are upright joystick and hanging joystick.

The upright joystick control unit offers a comparatively easy to operate X-axis knob. The hanging joystick control unit minimizes strain of the user's hand during operation.



The vernier type control unit is advantageous for creating three dimensional linear movements. The large control knobs allow secure movement to an intended location.

The joystick can create drift due to its own mechanism and can be accidentally moved by careless contact. The vernier type control unit can reduce such mishaps.



Fine Micromanipulator, Coarse Manipulator, Manual and Motorized

All hydraulic micromanipulators are designed to be used under the high magnification of optical microscopes. However, the movement range of hydraulic micromanipulators does not extend enough to bring a pipette into optical axis. To compliment and facilitate it, coarse manipulators are used. Coarse manipulators are intended to be used to bring a pipette briefly into view, however not after hand vibration becomes an issue. Therefore, mechanical types were conventionally used. Subsequently, hydraulic micromanipulators with a remote control unit created a demand for a coarse manipulator with remote control. This led to the development of a motorized coarse manipulator. These electrical features brought about remotely controlled fast movement of the coarse manipulator.

Motorized manipulators will be discussed in the next Web News.

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