

# NM3D-25VP Advanced Nano-Manipulator System



The NM3D-25VP is a newly developed state-of-the-art 3-axis motorized manipulator system designed specifically for stem cell use. The system combines extremely high resolution, with long-term stability and long travel range.



## Ease of Operation Saves Hours of Time in the Lab

The NM3D-25VP is simple to use, the micropipette is clamped into the universal holder mounted on the side of the NM3D-25VP. The clamp accommodates a range of pipette-holder sizes (3 mm to 15 mm) and can also rotate in a vertical plane (90°). The NM3D-25VP is itself mounted on a rotary base plate, which enables complete 360° rotation in the horizontal plane.

### Compatible with all popular inverted microscopes

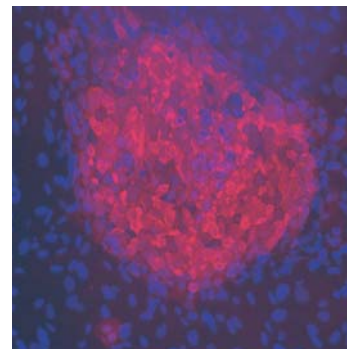
The system is designed to be mounted directly onto the stage of most popular inverted microscopes using a single bracket and standard screws. Brackets can also be supplied to suit other microscope makes.

### 3-D multi-function Joystick with software programmable controls

Control over the XYZ movement is achieved using the joystick. The direction and speed of movement is precisely proportional to the degree of displacement of the joystick handle. If the joystick is deflected fully the manipulator will move at maximum speed, which is ideal for rapidly approaching a cell. If the joystick is deflected gently, the manipulator will move slowly in few nanometer increments, making it ideal for the final and precise approach to the cell membrane/target site. The joystick can control each manipulator axis independently, or all three axes simultaneously.

## Key Features

- 3-D movement from a single joystick control
- Superior nanometer resolution
- Fully programmable vertical positioning
- PiezoThrust™ function for smooth membrane penetration
- Variable speed of movement
- Negligible lost motion/backlash/drift
- Can be mounted onto any brand of inverted microscope
- Digital Signal Processor based
- Low voltage design
- Compact size & economical
- Optional rechargeable battery pack for complete portability



## Automated Rapid 'Home' and 'Work' vertical positioning with sub-micron accuracy

Control over the Z-axis can also be achieved using the joystick button. This will cause the manipulator to move rapidly within a few seconds to any user-defined 'Home' or 'Work' position. This feature is ideal in busy labs where multiple routine procedures are conducted throughout the day; allowing the micropipette to be raised from the Work position to the Home position for micropipette changing and then returned back to the Work position with sub-micron positioning accuracy.

### Advanced Piezoelectric Digital Signal Processing DSP Design

The NM3D-25VP nanomanipulator works by converting the rotary motion of an advanced piezoelectric motor (fitted onto each axis of the manipulator) into linear motion. The design is based on a new technology currently utilized in DTI's range of popular nanopositioning devices for use in high precision laser/optical applications. A combination of high torque, variable speed and high resolution facilitates a smooth transition, without degradation in intrinsic performance. The X and Y-axis both have 10 mm travel, 0.4 nm resolution, and a variable velocity range of 0.5 nm/sec to 500 mm/sec. The Z-axis differs in that it combines extended travel (25 mm) with very fast speed and high precision, to facilitate rapid changing of micropipettes. It has a resolution of 4 nm and a variable velocity range from 5 nm/sec to 5 mm/sec.

An integral part of the NM3D-25VP system is the controller, which is embedded into the joystick. The internal architecture of controller is based entirely on DSP technology, therefore enabling a wide dynamic range, the highest resolution and accuracy, and error-free operation.

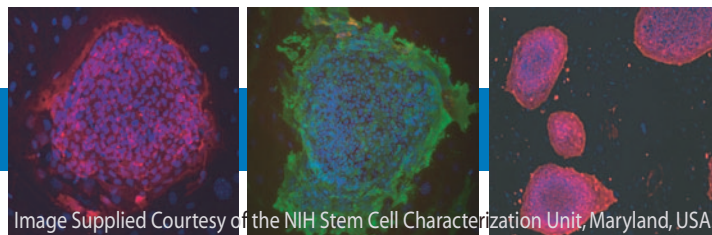


Image Supplied Courtesy of the NIH Stem Cell Characterization Unit, Maryland, USA.

### Variable PiezoThrust™ Allows rapid penetration of membrane

The NM3D-25VP incorporates a proprietary PiezoThrust™ function, which is activated using the joystick button when the micropipette is positioned very close to the cell membrane. During a PiezoThrust the micropipette rapidly accelerates (e.g. 5 m/sec<sup>2</sup>) towards the cell, which it penetrates. The high acceleration enables the microelectrode to puncture the cell without damaging the surrounding membrane. The depth of penetration during a PiezoThrust can be set using the software (e.g. 0.5 µm to 5 µm).

### Ready to Use

The NM3D-25VP is supplied ready to use, pre-programmed with default settings. Windows® based configuration software included enables the user to re-program the joystick controller settings via a USB port, providing complete user control of the NM3D-25VP's response characteristics. Once programmed, the NM3D-25VP operates as a standalone device. No host computer is required.

Additional benefits of the NM3D-25VP design include, ultra-low electrical noise (similar system are used in delicate electrophysiological studies, such as 'patch-clamp') and low supply voltage (12 V DC). The NM3D-25VP is ideal for the most sensitive applications. The complete system is extremely compact and portable and can operate from an optional Li-Ion rechargeable 12 V DC battery pack.

## Technical data

Travel Range	10 mm	25 mm
Design Resolution	0.4 nm	4 nm
Min. Linear Increment	1 nm	10 nm
Long-term Drift	<2 nm per hour @20°C	<2 nm per hour @20°C
Unidirectional Repeatability	< 0.4 nm	4 nm
Bi-directional Repeatability	< 0.5 µm	5 µm
Backlash	< 0.5 µm	5 µm
Hysteresis	< 0.5 µm	5 µm
Velocity Range	0.5 nm/sec to 500 µm/sec	5 nm/sec to 5 mm/sec
Reaction Time – demand to max velocity	< 0.3 msec	< 0.3 msec
Response Time	10 µsec	10 µsec
PiezoThrust (Acceleration)/(Depth)	(0.5 m/sec <sup>2</sup> to 5 m/sec <sup>2</sup> )/(0.5 µm to 5 µm)	-
Max Load – Capacity	3 kg	6 kg
Supply Voltage	12 V DC	12 V DC
Nominal Power Consumption	1 W	1 W
Maximum Power Consumption (per axis)	6 W	6 W
Dimensions NM3D-25VP (mm)	198 (h) x 123 (w) x 115 (d)	198 (h) x 123 (w) x 115 (d)
Dimensions Joystick Controller (mm)	40 (h) X 120 (w) x 200 (d)	40 (h) X 120 (w) x 200 (d)
Weight NM3D-25VP/Joystick controller	2.1kg/0.5 kg	2.1kg/0.5 kg



### Ordering Information

Part Number: NM3D-25VP  
Description: NM3D-25VP nano-manipulator System (system also includes: joystick controller, microscope table bracket, power adapter)

For further information inquiries please contact:



**Discovery Technology International, LLLP**

Sarasota, FL USA

<http://www.DTI-NanoTech.com>

[info@DTI-NanoTech.com](mailto:info@DTI-NanoTech.com)

**Toll-Free: 877-SALE DTI**

Fax: 941-921-5111