



**Cell Manipulation Systems**  
Serving macroscale ambitions in microscopic world!

# Introduction

From agriculture to medicine, we can observe different branches of life science advance and attract more considerations in modern life on a daily basis. Recent progress in biotechnology demands even more sophistication for devices used by researchers and scientists engaged in this field of science.

Micromanipulators are precision devices that transform hand movements into precise, microscopic mechanical displacements. Hence, micromanipulators are essential for cell manipulation such as Intracytoplasmic sperm injection (ICSI), one of the most effective treatments used in assisted reproductive technologies (ART).

Tarfand Technical Solutions, is the most pioneered company in cell manipulation technologies in the West Asia region. With more than ten years of expertise in developing precise motion control systems, our team of innovative engineers has developed a new product line best suited for every cell manipulation application.

While introducing the product range in this catalog, we reassert our commitment to make cell manipulation as easy as possible, and to supply high-performance, high-reliability instruments, and top-tier after sales service. we hope it helps to advance fundamental research in every biological and medical field.

If you already use other micromanipulator brands, we strongly suggest you to request our product presentation and demo to make a comparison. We are also available to support you with a customized solution for your specific cell manipulation requirements.



## Assisted Reproductive Technology (ART)

The most common application of this system is in ICSI and other related methods. In this technique, sperm is injected into the cytoplasm of the oocyte.

This method is very effective in treating cases where sperm does not have the ability to move and mate with the oocyte.

Tarfund's microinjection workstation is a medical device specifically designed and optimized for ICSI. But there are much more applications. Other applications of this product include the following:

- Selection of individual cells (e.g., biopsies, single cell picking)
- Generation of transgenic animals (e.g., zebra fish)
- Stem cell research
- Nuclear transfer
- Positioning and selection of micro particles
- Microdissection of chromosomes, etc.



# Microinjection Workstation

## Includes of:

Title	Descriptions
2x Prolific® G1	one for moving the holding capillary and another for collecting and transferring the spermatozoa
1x Prolifusion® Oil	microinjector for transferring the sperm
1x Prolifusion® Air	microinjector for holding the oocyte
2x MNH-200	capillary holder for each microinjector
1x Microscope Adapter	for inverted microscope
1x Inverted microscope	equipped with Modulation Contrast or DIC, equipped with 10x, 20x and 40x objectives
1x AVT-100	Anti-vibration table



The Prolific® G1 was designed and manufactured for the purpose of intracytoplasmic sperm injection (ICSI) within the context of human reproductive medicine. Therefore the Prolific® G1 is a medical product in accordance with the guidelines and regulations of National Medical Device Directorate (IMED) of the Health Medical Education Ministry of IR. Iran.



## Fast but gentle at the same time!

We have developed our electrical micromanipulator **Prolific® G1** specifically for high demanding cell manipulation applications. It is designed to meet strict requirements of the in vitro fertilization (IVF) centers.

Our competent team of engineers has enjoyed the advantage of consulting with some of the most prominent embryologists and IVF experts prior and during the development phase of this product.

We understand the two main concerns of ICSI specialists. While your precious cells should not be stressed or experience any traumatic shock, there is a continuous struggle to cope with the heavy workload of your clinic.

Considering this, built-in functions embedded in the control interface will help you speed up the sample handling process. Furthermore, improved joint mechanism and angle head design allow rapid capillary set-up and replacement.



## Manipulator Module

With years of expertise in designing and implementing linear and rotary positioning stages, Tarfand has integrated its most reliable and precise linear actuators into a 3-axis electrical micromanipulation unit. **Prolific® G1** manipulator module is engineered exceptionally to ensure its extraordinary performance, impressive compactness and perfect accessibility.

Each manipulator module will secure the position of a glass capillary or micropipette. The unit's ergonomic design has made it a user-friendly device and minimizes the risk of unintentional capillary breakage. Mounting new capillary or adjusting capillary angle is single-handedly done by just turning two well-positioned knobs.

### Key features:

- Simple installation and maintenance
- Reliable, smooth and precise performance
- Simple capillary holder mounting
- Swivel joint allows easy capillary exchange
- Easily adjustable capillary angle (0° up to 90°)
- Adaptability with all available microscope models of major brands

Title	Unit	Descriptions
Motor Type		5-Phase Stepping
Maximum travel	mm	20
Dimensions	mm	36 × 50 × 140
Step size (theoretical)	nm	20
Max. Speed	mm/s	7
Weight	Kg	0.5



## Control Module

**Prolific® G1** has the privilege of utilizing a robust and well-engineered control module. Control module is equipped with our highly durable joystick. HJS100 is a 3-axis finger joystick based on contactless Hall effect technology.

Its dual function combines the traditional proportional kinetics at central zone with spring-back dynamic kinetics at outer boundary zone. Our joystick also has a thumb button for clutching action in the proportional zone.

### Key features:

- Innovative and ergonomic shape allows lengthy operations with less fatigue
- User-friendly menu
- Highly-durable dual-function joystick with clutch operation
- Avoiding unintentional capillary breakage by Z-Lock function
- More gentle penetration by Y-off function
- More automation using four independent position memory functions and Home function

Title	Unit	Descriptions
Joystick type		Dual function 3-axis joystick with clutch operation
Control type		Speed control: Dynamic zone / Positon control: Proportional zone
Motion mode		Coarse, Fine, X-fine
Weight	kg	2.0
Dimensions	mm	76 × 240 × 350



Tarfang's manual oil microinjector, *Prolifusion® Oil*, is our unique solution for all injection applications requiring precision and sensitivity.

*Prolifusion® Oil* features an excellent sealing system which enables friction-free motion and minimizes oil leakage.

## Key features:

- Easy oil filling and dispensing
- Fine and coarse dials to balance between resolution and sensitivity
- Sub-microliter precision
- Biologically compatible materials
- Durable transparent oil chamber eases bubble elimination
- Stiction free piston-cylinder system

Title	Unit	Descriptions
Micro injector		Prolifusion® Oil
Working media		Oil
Mechanism		Cylinder and piston system Coarse and fine dials
Volume change per revolution (coarse)	μL	10
Volume change per revolution (fine)	μL	1
Cylinder volume	mL	10
Minimum adjustable volume	nL	100
Maximum pressure	bar	15





Tarfand's manual pneumatic microinjector, *Prolifusion® Air*, is our unique solution for holding suspension cells (e.g., oocytes and embryos) in place. For it is entirely oil-free, it features excellent operational and maintenance characteristics.

*Prolifusion® Air* features superb sealing system that enables stiction-free motion.

## Key features:

- Easy to use, no leakage, no filling!
- Large ergonomic dial provides operational comfort
- Piston position scale for better adjusting performance characteristics
- Stiction free piston-cylinder system
- Biologically compatible materials

Title	Unit	Descriptions
Micro injector		Prolifusion® Air
Working media		Air
Mechanism		Cylinder and piston system
Volume change per revolution	μL	600
Cylinder volume	mL	10
Minimum adjustable volume	nL	100
Maximum pressure	bar	3



## Anti-vibration table

Extreme environmental vibrations can harm your microinjection performance and degrade your results.

Our AVT-100 passive anti-vibration table can protect your cell manipulation quality effectively and economically. Also, it pleasantly accommodates your entire microinjection workstation.

Key features:

- Easy to set up with two separate parts
- Easy to use and maintenance-free
- Large float surface compatible with prevalent microscopes
- Adjustable leveling feet
- Polished stainless steel surface



## Capillary Holder

MNH-200 proper function has an essential role in microinjection set-ups. Excellent torsional strength saves this miniature part from unintentional breakage. Transparency makes it easy to eliminate undesirable air bubbles.

The tandem use of two O-rings enables a reliable and no-leakage grip while simplifying the entire process of capillary exchange.

Key features:

- Excellent durability
- Tight grip with no leakage
- Customizable grip head for various capillaries
- Transparent grip head



## Microscope Adapters

There is no need to worry about microscope choice and compatibility. Tell us about your microscope instrument model and we will provide you with adapters that meet your requirement.



## **TARFAND technical solutions**

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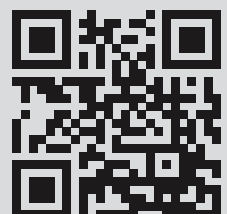
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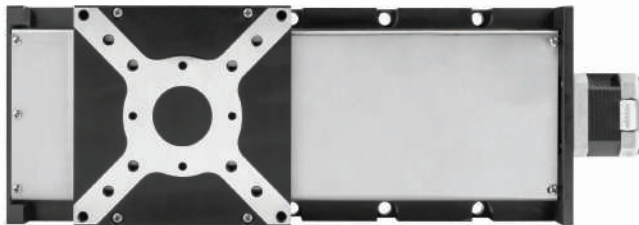
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## Motorized Linear Stage



Tarfand Precision Motorized Linear Stages are designed to facilitate high precision position control via computer. User can easily command the stage via custom LabVIEW, MATLAB and C++ Programs. Driver, software and sample programs are included in the product package.

Motion and positioning	Unit	MMXH050/ 100/ 150	MMXP050/ 100/ 150	» Travel range from 50 to 150 mm
Active axes		X	X	» Microstep driver
Travel Range	mm	50/ 100/ 150	50/ 100/ 150	» Integrated limit switch and home sensor
Resolution*	µm	0.625	0.250	» Modular X,Y,Z configurations available
Unidirectional Repeatability	µm	5	2	» Rigid structure, high load capacity

\* Drive mode: 1/8 microstep

## Compact 3-Axis Manual Positioner



This product is a compact 3-axis flexure-based micro-positioner ideal for fiber alignment applications. The parallel flexure design ensures minimum cross-talk and minimizes friction and stickiness.

Motion and positioning	Unit	MUXYZ	MUXYZ-D	» 4mm travel range
Active axes		X, Y, Z	X, Y, Z	» Compact flexure design
Type of Actuator		Micro Screw	Differential	» Tapped and grooved top plate for easy integration
Travel per axis, Coarse	mm	4	4	» Ideal for alignment applications
Travel per revolution, Coarse	µm/rev	400	400	» Smooth, friction-free motion
Travel per axis, Fine	µm	-	300	
Travel per revolution, Fine	µm/rev	-	25	



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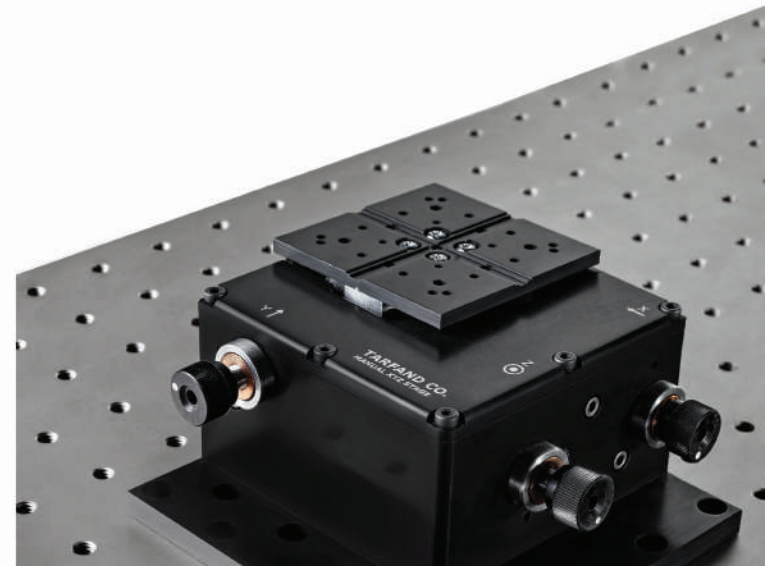
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## Precision Positioning

Optomechanics  
Nano - Micro Positioning

## Kinematic Precision Mount



## High Performance Piezo Controller

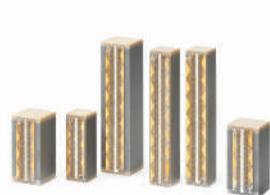


The HPD driver is a wide bandwidth, low noise linear amplifier specified for driving piezoelectric actuators. The output voltage range can be unipolar, bipolar or asymmetric from -30~150V and can be achieved in the bridged configuration. The HPD can drive any load impedance including unlimited capacitive loads such as stack actuators and standard piezoelectric actuators in one, two and three channel versions.

- » Remotely controllable using USB command line
- » External signal control option
- » Closed-Loop operation using strain gauge sensor
- » High resolution position control
- » Compatible with tarfand piezo actuators
- » Programmable in matlab, labVIEW and C++ environments

Electrical Parameter	Unit	HPD150(SG)
Voltage Range	V	-30 ~ 150
No. of Channels		1, 2 or 3
Output Current	mA	300
Analog Input (SMA)	V	-1.5 ~ 7.5
Gain	V/V	20
Voltage Monitor (SMA)	V/V	1/20
Slew Rate	V/us	20

## Piezo Stack Actuators



Order Code	Range +/-10%	Length	Cross Section	Cap. +/-20%	Mass	Stacking Force	Stiffness	Res. Freq.
TA020005	5.6um	5mm	3x3mm	140pF	0.53g	130N	80N/cm	300kHz
TA020010	16um	10mm	3x3mm	300pF	1.1g	130N	136N/cm	150kHz
TA020018	25um	18mm	3x3mm	500pF	2.0g	130N	180N/cm	83kHz
TA050010	16um	10mm	5x5mm	850pF	2.0g	600N	108N/cm	100kHz
TA050020	31um	20mm	5x5mm	1.8uF	6.0g	600N	42N/cm	78kHz
TA050036	56um	36mm	5x5mm	4.3uF	7.1g	600N	36N/cm	43kHz
TA070018	38um	18mm	7x7mm	4.1uF	7.0g	1800N	120N/cm	83kHz
TA070042	70um	42mm	7x7mm	10uF	15g	1800N	53N/cm	36kHz

The TA stack actuators are high-performance piezoelectric stack actuators with a UV cured epoxy coating for improved mechanical and humidity protection. The TA actuators are compatible with Tarfand amplifiers and driver modules. Applications include: Nanopositioning, Microscopy, Precision Machining, Vibration Control, Hydraulic Pumps, Valves, and Optics.

## Tip-Tilt Platform



Piezo steering mirrors are based on stiff piezo actuators driving a single-axis or multi-axis platform. These high-resolution systems can provide response times as low as 10's of microseconds and on the upper end provide tilt angles up to 10 mrad range. Multi-axis steering mirrors are based on parallel kinematic designs with 2 actuators, 3 actuators (tripod design) or 4 actuators (push-pull drive). Open-loop and closed-loop designs with different feedback sensors are available.

- » Travel range up to 12 mrad
- » High stability push-pull drive configuration
- » Ideal for precision beam steering applications
- » Smooth, backlash-free motion
- » Fast response and micro-radian resolution
- » Vacuum compatible version available

Motion and positioning	Unit	NTT402	NTT402SG	NTT410	NTT410SG
Active axes		$\theta_x, \theta_y$	$\theta_x, \theta_y$	$\theta_x, \theta_y$	$\theta_x, \theta_y$
Integrated sensor		-	SGS*	-	SGS*
Open-loop travel	µm	2	2	12	12
30 to +150 V					
Closed-loop travel	mrad ±20%	-	1.5	-	9
0 to +150 V					
Resolution	µrad	0.5	0.5	3.0	3.0
Linearity error	% F.S.	-	0.2	-	0.5
Repeatability	% F.S.	-	0.1	-	0.2

\* Strain Gauge Sensor

## Nano Focus Actuator (Z Stage)



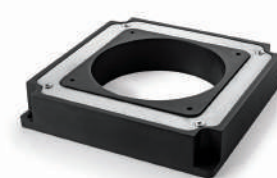
These piezo lens positioners and scanners (Z-nanopositioning) mechanisms are often used to move microscope objectives with extreme resolution and speed, typically one order of magnitude higher than conventional motor driven positioners.

- » Travel range up to 200 µm
- » Compatible with typical microscope objectives
- » Quick-Lock objective gripper
- » Smooth, backlash-free motion
- » Ideal for ultra-fine focusing applications
- » Vacuum compatible version available

Motion and positioning	Unit	NF080	NF140	NF080SG	NF140SG
Active axes		Z	Z	Z	Z
Integrated sensor		-	-	SGS*	SGS*
Open-loop travel, -30 to +150 V	µm	80	140	80	140
Resolution	nm	2	4	30	30
Linearity error	%	-	-	0.5	0.5
Repeatability	nm	-	-	±50	±50

\* Strain Gauge Sensor

## Single Axis Nano Positioning Stage



Tarfand Nano-Positioning Stages are designed to offer maximum guiding accuracy and minimum off-axis motion. The combination of multilayer piezo stacks and flexure mechanism creates an extremely smooth motion without any friction or stickiness.

- » Linear piezo motion up to 200 µm
- » Low profile for easy integration
- » Excellent guidance accuracy
- » High dynamics, high resolution
- » Closed-Loop operation using strain gauge sensor
- » High performance multilayer stack actuators

Motion and positioning	Unit	NX100	NX200	NX100SG	NX200SG
Active axes *		X	X	X	X
Integrated sensor		-	-	SGS**	SGS**
Open-loop travel, -30 to +150 V	µm	300	200	100	200
Resolution	nm	2	4	10	20
Linearity error	%	-	-	0.2	0.2
Repeatability	nm	-	-	±25	±25

\* Optional 2mm manual actuator can be added on request.  
\*\* Strain Gauge Sensor

## XY Nano Positioning Stage



NXY piezo actuated flexure based mechanisms offer high resolution motion for precise nanopositioning and scanning applications.

- » Low profile for easy integration
- » Closed-Loop operation using strain gauge sensor
- » Ideal for nanopositioning, surface analysis and scanning microscopy
- » Smooth, friction-free motion

Motion and positioning	Unit	NXY050	NXY100	NXY050SG	NXY100SG
Active axes		X, Y	X, Y	X, Y	X, Y
Integrated sensor		-	-	SGS*	SGS*
Open-loop travel, -30 to +150 V	µm	50 x 50	100 x 100	50 x 50	100 x 100
Resolution	nm	1	2	0	10
Linearity error	%	-	-	0.2	0.2
Repeatability	nm	-	-	±50	±50

\* Strain Gauge Sensor