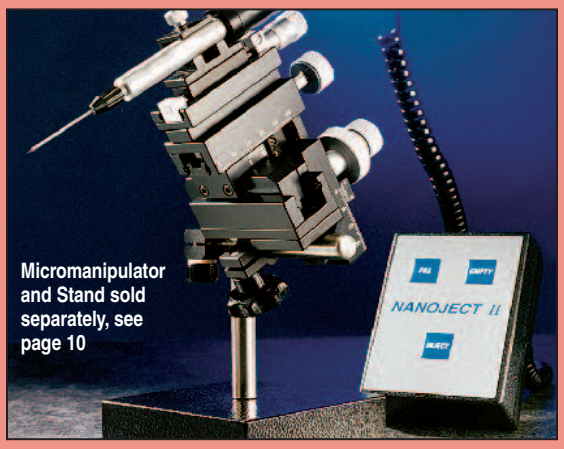
injectors

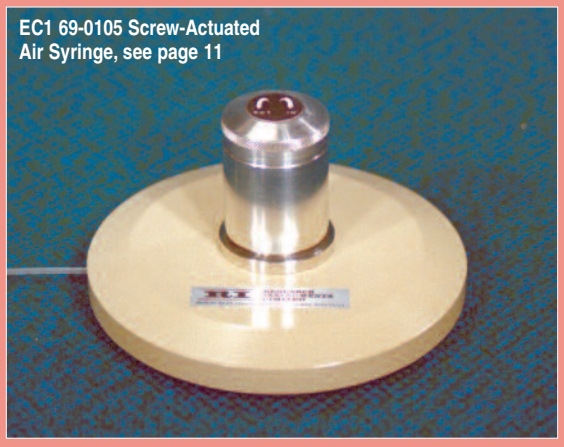
EC1 65-0001 PLI-100
Pico-Injector, see pages 4 to 5

EC1 69-0153 8-Channel
Pressure Injection
System, see page 8



Micromanipulator
and Stand sold
separately, see
page 10

EC1 69-0105 Screw-Actuated
Air Syringe, see page 11



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Introduction to Microinjection

The use of Glass Needle (Fine Glass Microcapillary Pipette) based techniques for intracellular/extracellular microinjection and perfusion has become a popular procedure in numerous areas of experimental biology research (e.g. In vitro fertilization, transgenics, etc.). These techniques can best be described as micro surgical procedures that are conducted on a single cell using either a single or multiple barrel glass micropipette a precision positioning device (micromanipulator) and a microinjector or microperfusor. The micropipettes used in these procedures are formed using a Pipette Puller. The capillary glass tubing is heated to its softening point and 'pulled' to create the proper size tip diameter and taper for the desired application. The small tip diameters (as low as 0.2 µm) of these micropipettes combined with the high precision of the Micromanipulator and Microinjection/Perfusion Apparatus, allows for precise and accurate delivery. This precision allows for accurate and repeatable injections down to the sub-picoliter liter range into or around various types and sizes of cells with accuracy to 0.1 micron. The process of extruding substances through these micropipettes is accomplished through the use of either direct hydrostatic pressure (Pressure Injection) or by moving charged ions that are the result of an applied electric field (Iontophoresis) without the use of hydraulic flow.

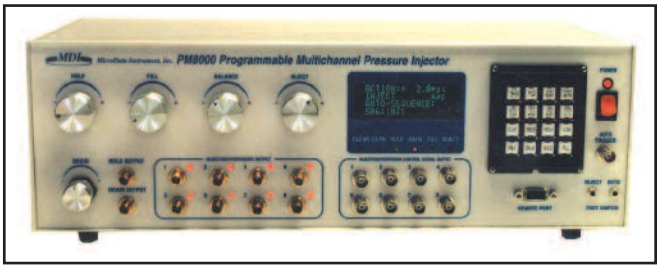
Applications of microinjection range from assisted (In vitro) cell fertilization techniques to the transport of molecular and cellular elements. These substances are typically injected into the cell to manipulate and/or monitor the fundamental biochemistry of a specific living cell. Substance that can be injected include, cellular organelles, kinases, histochemical markers (such as horseradish peroxidase or lucifer yellow), proteins, metabolites, microbeads, ions, antibodies, genes, molecular biology mRNA and DNA, etc. The precise delivery (microperfusion) of small volumes (picoliter to milliliter) of various agents and drugs to a cell or group of cells for applications such as pharmacological drug testing can also be accomplished using these techniques.

In order for the researcher to conduct any of the above experiments and get meaningful results, the tools (equipment) used in these experiments must provide not only the specific functionality, but they also need to be of the highest quality and provide the necessary reliability, accuracy and repeatability to insure proper results. Harvard Apparatus, Inc. manufactures and sells the complete range of product that are needed to successfully microinject and/or microperfuse.

Warner and Harvard Apparatus Clark Capillary Glass

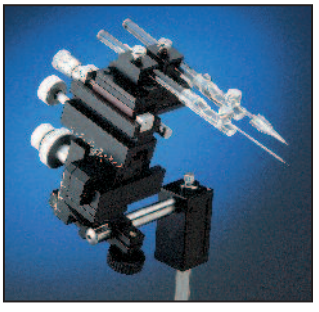
Harvard Apparatus/Medical Systems Picoliter Injectors

Harvard/Apparatus Medical Systems NeuroPhore, visit www.harvardapparatus.com for more information.



Pressure Injection Systems

Pipette Pullers



Micromanipulators

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PLS-1

Pico Injection/Micromanipulator System

The PLS-1 Pico Injection/Micromanipulator System combines our popular PLI-100 pico injector, a motorized micromanipulator, and magnetic base in a single package.

The PLI-100 Pico-Injector delivers a wide range of volumes through micropipettes by applying a regulated pressure for a set period of time. The system features 5 pressures: inject, balance, clear, fill, and hold. The injector comes complete with input and output hoses, foot switch and pipette holder.

For precise and convenient movement of the electrode our three axes motorized micromanipulator and push button controller are included. This micromanipulator features hands free spatial resolution of 0.5 µm which enables positioning in the sub-micro range. Flexible motor coupling ensures no vibration of probe during movement.

The MB/B magnetic base provides a convenient position device for the micromanipulator.

Order #	Model	Product
EC1 64-1608	PLS-1	Pico-Injector Micromanipulator System
EC1 65-0002	PLI-100 Plus	Pico Injector
EC1 60-0571		Right-handed motorized micromanipulator
EC1 60-0577		Push button controller
EC1 64-0060		MB/B Magnetic base

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PLI-100

Medical Systems Pico-Injector

EC1 65-0001 PLI-100 Pico-Injector

- 5 pressures: inject, balance, clear, fill and hold
- Reliable
- Femtoliter to microliter injections
- Reproducible performance
- Easy to use
- Popular applications:
  - Injection of mouse, frog, zebrafish and other oocytes
  - Extracellular brain injections
  - Injection of DNA, mRNA, microbeads, neurotransmitters, kinases and other proteins
- Most Published Injector

The PLI-100 Pico-Injector reliably delivers a wide range of volumes through micropipettes by applying a regulated pressure for a digitally set period of time. Compressed gas allows the user to deliver desired volumes from femtoliters to microliters while simultaneously holding a cell. Whether you need to do large injections into capillaries or very small injections into mammalian nuclei, the PLI-100 is well suited for your experiment.

The PLI-100 has become a favorite of prestigious national microinjection workshops like Cold Spring Harbor Laboratories and other researchers worldwide. Other companies have tried to design similar systems, but the PLI-100 remains unparalleled in terms of ease of use, durability, precision, and cost.

Researchers Say:

"The PLI-100 is very robust, in constant use in our lab."

"Most importantly, the PLI-100 valves prevent cytosol and yolk backflow into my pipette after oocyte injection."

"It's very easy to control."

"The PLI-100 is heavily used on a daily basis, and works great."

"I like the fact that I can use the PLI-100 with TTL pulses."

"It works great in conjunction with my imaging system."

"The balance pressure is a good option."

"My injection pipettes rarely clog."

Easy to Use

Inject with the touch of a button or a tap of the foot switch — it's as easy as that!

Reproducible

Pressure to the pipette is controlled precisely through a multi-turn regulator, and is reported digitally for easy repeat. Injection time is digitally controlled in 10 msec steps between 0.01 to 0.99 seconds (and in 1 second steps between 1 to 99 seconds). Pipette tip diameter, and hence delivered volume, are easy determinations once the timing and pressure are known.

Versatile

Deliver volumes from femtoliters to microliters with the same instrument, resulting in a wide range of applications.

Pressure Capabilities

The PLI-100 features two negative and three positive pressure pneumatic capabilities.

The negative, or vacuum functions allow the user to:

1. **Fill micropipettes from their tips, reducing wastage of valuable injectables.**
2. **Provide a means to secure and manipulate a cell using a holding pipette.**

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PLI-100

Medical Systems Pico-Injector (continued)

The positive pressures allow the user to:

1. **Eject precise amounts of fluids.**
2. **Create a balance pressure which prevents backflow into the micropipette following an injection.**
3. **Clear a micropipette of material in it.**

Unique Features

The PLI-100's important 'Balance', 'Hold' and 'Clear' functions are not found on other microinjection units.

Balance

In addition to the ejection pressure, the Pico-Injector offers a secondary balance pressure. This secondary balance maintains a positive pressure on the injection pipette before and after injections. This eliminates dilution caused by capillary action and aids in the prevention of clogging. Wasteful continuous injection, which often occurs when no separate balance pressure is offered by an injection device, is avoided.

Fill/Hold

There are two built-in vacuum generators to fill a micropipette from the tip and to hold suspended cells. Filling the pipette from the tip is easier than back filling. Suspended cells can be held with a second (holding) pipette. The holding vacuum's range accommodates most cell types.

Clear

A high-pressure pulse can be used for clearing a pipette, should it happen to clog. This is particularly useful when working with pipettes sized for smaller volumes.

Electrical Connectors

BNC type connectors are available at the front panel to ease integrating the Pico-Injector with other equipment. Synchronization of injections to other stimulations or recordings is therefore possible.

Selection Guidelines

The PLI-100 is available in three packages: Plus, Basic and Deluxe. The basic unit is supplied with an input hose, output hose, holding hose, power cord and instruction manual. The plus unit also includes a foot switch, pipette holder and input hose adapter. The deluxe unit includes all the previously mentioned accessories plus an additional foot switch and one pipette holder.

Accessories

Available accessories for the PLI-100 Injection Systems are located on page 7.

Specifications

Input Gas Pressure	70 to 105 p.s.i. (480 to 720 kPa)
Injection Pressure	0.2 to 60 p.s.i. (413 kPa), regulated, multi-turn control
Balance Pressure	0.1 to 3.5 p.s.i. (68.9 kPa), regulated, multi-turn control, other ranges available upon request
Fill Vacuum	Internally produced, -12.0 p.s.i. (-82 kPa), unregulated
Holding Vacuum	Internally produced, 0 to 3 in H_2O (0 to 0.75 kPa or 0 to 0.1 p.s.i.), regulated
Clearing Pressure	Input gas pressure, unregulated
Injection Timer Pulse Width	0.01 to 0.99 sec in 10 msec steps; 1 to 99 sec in 1 sec steps
Injection Count Display	Digital, 0 through 9999
Duration Mode	Internally timed or externally gated
Time Trigger	Front panel, foot switch, or external TTL pulse (BNC)
Pressure Units	p.s.i./kPa; switch selectable
Pressure Monitor	BNC connector, 10 mV/p.s.i.
Pressure Readout	Inject, balance, clear, output port
Line Voltage	100/110/220/240 VAC
Power Usage	220 W
Meter Accuracy	0.1% full scale
Foot Switches	Inject, fill, hold, and gated; provided in plus and deluxe pkgs.
Weight	6.8 kg (15 lb)
Dimensions, H x W x D	11 x 38 x 25.5 cm (5 x 15 x 10 in)
Accessories Supplied	Input, output and holding hoses

Order #	Model	Product
EC1 65-0001	PLI-100	PLI-100 Basic Pico Injector with Injection, Balance, Clear, Filling and Holding Pressures; Comes with Input Hose, Output Hose, Holding Hose, Power Cord and Instruction Manual
EC1 65-0002	PLI-100 Plus	PLI-100 Plus Pico Injector with Injection, Balance, Clear, Filling and Holding Pressures; Comes with Input Hose, Output Hose, Holding Hose, Power Cord, Instruction Manual, Foot Switch (65-0029), Pipette Holder (65-0013) and Input Hose Adapter
EC1 65-0003	PLI-100 Deluxe	PLI-100 Deluxe Pico-Injector with Injection, Balance, Clear, Filling and Holding Pressures, Comes with Input Hose, Output Hose, Holding Hose, Power Cord, Instruction Manual, Two Foot Switches, Two Pipette Holders and Input Hose Adapter

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PLI-90

Medical Systems Pico-Injector


EC1 65-0004 PLI-90 Pico-Injector

- 3 pressures — inject, balance, and clearing
- Eliminates backflow into pipette after injection
- Reproducibly delivers femtoliters to microliters
- Easy to use
- Economical
- Precise

The PLI-90 Pico-Injector, like the reliable PLI-100 Pico-Injector, controls the precise and reproducible regulation of injection pressure and time.

Simplicity

Because the PLI-90 features only the injection, balance, and clearing pressures, it is a lower cost alternative to the PLI-100. This simplicity makes it even easier to use than the PLI-100.

Selection Guidelines

The PLI-90 is ideal for the user who does not require vacuum for filling pipette barrels or if using a holding pipette for holding cells is not essential to your application.

The PLI-90 is available in two packages: Basic and Plus. The basic model includes an input and output hose, handle, power cord and instruction manual. The plus model is supplied with all of the same parts as the basic model but also includes a Footswitch, Pipette Holder, and Input Hose Adapter.

Specifications

Input Gas Pressure	70 to 105 p.s.i. (480 to 720 kPa)
Injection Pressure	0.2 to 60 p.s.i. (413 kPa), regulated, multi-turn control
Balance Pressure	0.1 to 3.5 p.s.i. (68.9 kPa), regulated, multi-turn control, other ranges available upon request
Clearing Pressure	Input gas pressure, unregulated
Injection Time	0.01 to 0.99 sec in 10 msec steps; 1 to 99 sec in 1 sec steps
Pressure Display	Digital, three and a half digits
Duration Mode	Internally timed or externally triggered
Trigger Mode	Foot or panel switch
Pressure Readout	Inject, balance, clear, output port
Line Voltage	100/110/220/240 VAC
Power Usage	220 W
Foot Switch(es)	Optional inject and gating
Accessories Supplied	Input hose, output hose and power cord
Weight	6.8 kg (15 lb)
Dimensions, H x W x D	11 x 38 x 25.5 x cm (5 x 15 x 10 in)

Order #	Model	Product
EC1 65-0004	PLI-90 BASIC	Pico-Injector with Injection, Balance and Clear Pressures; Includes Input Hose (PLI-IHN) and Output Hose (PLI-OHN), Handle, Power Cord and Inustruction Manual. Applications: Basic setups that do not need suction.
EC1 65-0005	PLI-90 PLUS	Pico-Injector Basic Model and Acces-sories (Shown Above), Plus One Each PLI-FS Foot Switch, PLI-PH1 Pipette Holder and PLI-IHA Input Hose Adapter

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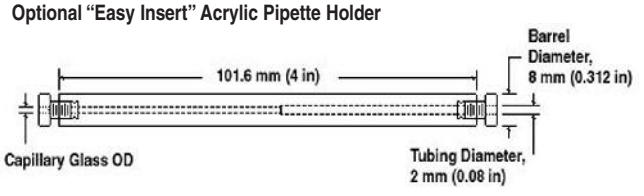
PLI-100 and PLI-90

PLI-100 and PLI-90 Accessories

Order #	Model	Product
Accessories		
EC1 65-0029	PLI-FS	Footswitch for Inject, Hold, Fill or Gate (Order more than one if frequent use of footswitch is needed for more than one of these functions.)
EC1 65-0030	PLI-RM	Frame to Mount PLI-90 or PLI-100 in 19-in. Wide Instrument Rack
Hosing		
EC1 65-0006	PLI-IHA	Input Hose Adapter (¼ in Male EC1T Pipe Thread) Gas Bottle Regulator Fitting; Connects with PLI-IHO/N
EC1 65-0007	PLI-IHO	Gas Input Hose (Tygon Tubing), 9 ft x 0.250 in (6.35 mm) x 0.125 in (3.18 mm) x 0.062 in (1.57 mm) (L x OD x ID x Wall Thickness); Connects to PLI-IHA and PLI 90/100 Gas Input, Brass Screw Fitting Type - Old
EC1 65-0008	PLI-IHN	Gas Input Hose (Tygon Tubing) 9 ft L x 0.250 in (6.35 mm) OD x 0.125 in (3.18 mm) ID x 0.062 in (1.57 mm) Wall Thickness; Connects to PLI-IHA and PLI 90/100 Gas Input, Quick Connect/Disconnect Type - New
EC1 65-0009	PLI-OHO	Output Hose (Tygon Tubing) 9 ft L x 0.071 in (1.80 mm) OD x 0.039 in (1 mm) ID x 0.016 in (0.41 mm) Wall Thickness; Connects to MSC Pipette Holders, Brass Screw Fitting Type - Old
EC1 65-0010	PLI-OHN	Output Hose (Tygon Tubing) 9 ft L x 0.071 in (1.80 mm) OD x 0.039 in (1 mm) ID x 0.016 in (0.41 mm) Wall Thickness; Connects to MSC Pipette Holders and PLI 90/100 Gas Output, Quick Connect/Disconnect Type - New
EC1 65-0011	PLI-HHO	Holding Hose with Cell Release Bulb; 9 ft L x 0.071 in (1.80 mm) OD x 0.039 in (1 mm) ID x 0.016 in (0.41 mm) Wall Thickness; Connects to MSC Pipette Holders and PLI-100 Hold Output, Brass Screw Fitting Type - Old
EC1 65-0012	PLI-HHN	Holding Hose with Cell Release Bulb; 9 ft L x 0.071 in (1.80 mm) OD x 0.039 in (1 mm) ID x 0.016 in (0.41 mm) Wall Thickness. Connects to MSC Pipette Holders and PLI-100 Hold Output, Quick Connect/Disconnect Type - New

Order #	Model	Product
Pipette Holder/Adapter/Parts		
EC1 65-0013	PLI-PH1	Stainless Steel Pipette Holder, 130 mm L for 1 to 1.5 mm OD Glass Pipettes
EC1 65-0014	PLI-PH1A	Stainless Steel Pipette Holder, 80 mm L for 1 to 1.5 mm OD Glass Pipettes
EC1 65-0017	PLI-SRG	Silicone Rubber Gasket Replacement for use with PLI-PH1 and PLI-PH1A, 10.2 cm (12 in)
EC1 65-0015	PLI-SRG1.5	Silicone Rubber Gasket Replacement for use with 1.5 mm Glass Pipettes
EC1 65-0018	PLI-SSB	Stainless Steel Bushing Replacement for use with PLI-PH1 and PLI-PH1A Pipette Holders
EC1 65-0019	PLI-PC	Stainless Steel Pipette Cap Replacement for use with PLI-PH1 and PLI-PH1A Pipette Holders
EC1 65-0020	PLI-HN	Stainless Steel Hose Nut Replacement for use with PLI-PH1 and PLI-PH1A Pipette Holders
EC1 65-0021	PLI-PH-KIT	Pipette Holder Hardware Replacement Kit for use with PLI-PH1 and PLI-PH1A Pipette Holders, Includes 1 each PLI-SSB, PLI-PC, PLI-HN and PLI-SRG
EC1 65-0022	PLI-PHA	Stainless Steel Pipette Holder (PLI-PH series) Adapter for Eppendorf ECET FEMTOTIP

Optional "Easy Insert" Acrylic Pipette Holder



Order #	Model	Product
EC1 64-1626	AO16 1.0	Acrylic Pipette Holder for 1.0 mm Pipettes
EC1 64-1627	AO16 1.2	Acrylic Pipette Holder for 1.2 mm Pipettes
EC1 64-1628	PLI-PPH	Acrylic Pipette Holder for 1.5 mm Pipettes
EC1 64-1629	AO16 1.2	Acrylic Pipette Holder for 2 mm Pipettes

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PM-8 and PM-4

8- and 4-Channel Pressure Injection Systems

EC1 69-0153 8-Channel Pressure Injection System

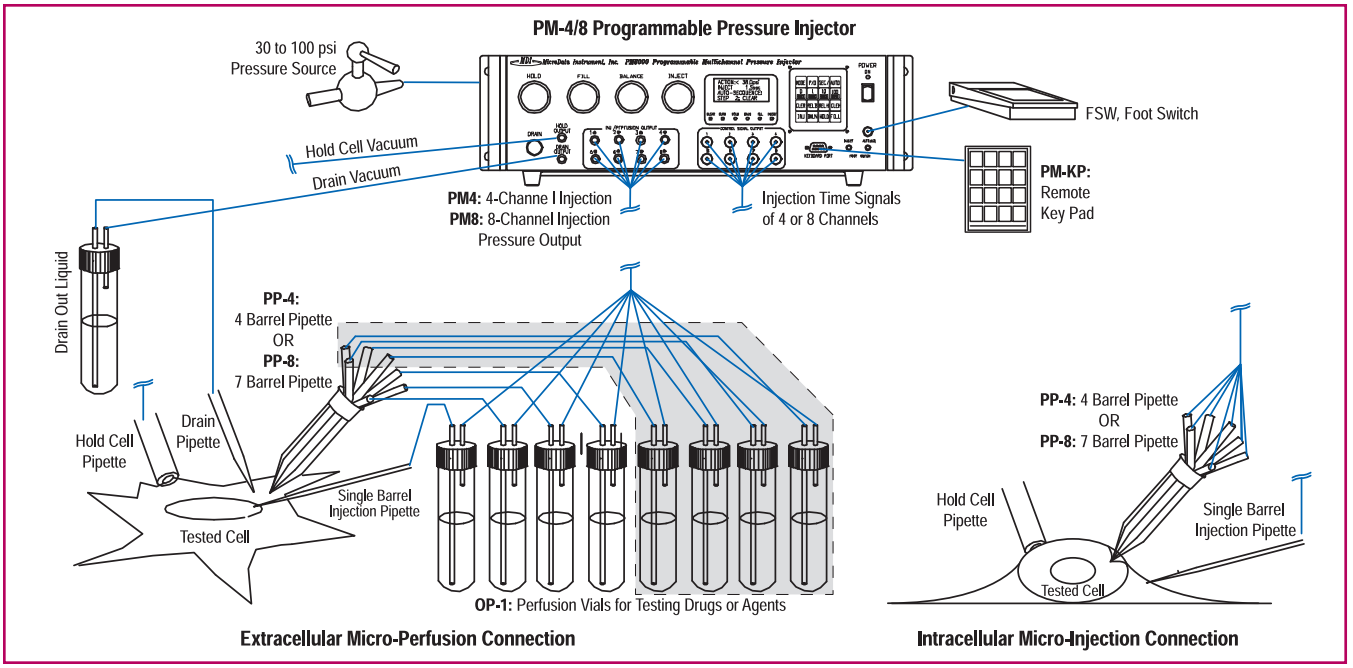
- Multiple function system for micro-injection and perfusion
- Up to 8 injection/perfusion outputs, one hold cell output, and one synchronized drain out channel
- Programmable timers, counters, and step sequences which can be stored for reuse
- Manual control or automatic sequential step cycle operation
- Front panel display for pressures and programming information

The PM-4 and PM-8 programmable 4 and 8-Channel Pressure Injector Systems are designed for one to eight channel intracellular injection and extracellular perfusion. These microinjection and perfusion engines are especially designed for pharmacological drug testing, molecular biological DNA, RNA transferring, intracytoplasmic sperm injection and cell electrophysiological applications.

Combining an advanced micro-controller with precision pneumatic components, these systems can simultaneously control up to eight injection micropipettes or eight perfusion vials, one cell holding pipette, and one drain pipette. The four (PM-4) or eight (PM-8) injection/perfusion output ports can be controlled separately or combined together to perform actions such as injection, capillary action balancing, suction or clear up. The cell holding output port can produce an adjusted gentle suction to hold a cell, eject a pressure to push a cell, or completely clear the holding pipette. Another drain output port can simultaneously produce an adjusted suction to drain and clear out liquid before the next channel micro-perfusion. The PM-4/8 can deliver different quantity agents and drugs from picoliters to continuous perfusion. All output pressures and vacuums can be regulated and can be displayed real-time on the front panel display. Previous pressure readings can also be recovered on the display for setting comparison.

Besides programmable timers and counters, there are 16 programmable and savable injection/perfusion sequences with 32 programmable steps in each sequence. Each sequence can be repeated continuously or triggered manually. The interval time between steps can be programmed for automatic sequential cycle or manual trigger. There are two foot switch connectors for sequential step trigger and injection trigger. A digital remote port can be connected to an optional remote key pad or be controlled by a computer. With exceptional versatility and extremely precise control, either the PM-4 or 8 is an ideal multi-channel injection/perfusion engine.

Connection Diagram for Extracellular Micro-Perfusion and Intracellular Micro-Injection Systems



Extracellular Micro-Perfusion Connection

Intracellular Micro-Injection Connection

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PM-8 and PM-4

8- and 4-Channel Pressure Injection Systems (continued)

EC1 69-0152 4-Channel Pressure Injection System

Below are the components supplied with each of the **Pressure Injection Systems**.

Pressure Injection System		PM-4	PM-8
Order #	**Product**	**Qty.**	**Qty.**
EC1 69-0154	IP1 Input Tubing with Connector	1	1
EC1 69-0156	OP2 Output Tubing with Connector Only	6	10
EC1 69-0157	FSW Foot Switch	1	1
EC1 69-0164	PP-4 Pulled 4-Barrel Pipette	1	-
EC1 69-0166	HOLD4 Holder for 4-Barrel Pipette	1	-
EC1 69-0163	PP-7 Pulled 7-Barrel Pipette	-	1
EC1 69-0167	HOLD7 Holder for 7-Barrel Pipette	-	1
-	Power Cord	1	1
-	User's Manual	1	1

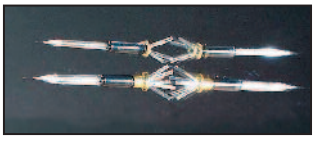
Specifications

Output Channels	Four (PM-4) or eight (PM-8) injection / perfusion outputs, one synchronized drain out and one cell hold channel
Input Gas Pressure	30 to 100 p.s.i.
Clearing Pressure	Same as input pressure
Clear Hold Pressure	0 to 3 p.s.i. (regulated)
Injection Pressure	0.05 to 60 p.s.i. (regulated)
Balance Pressure	0.05 to 10 p.s.i. (regulated)
Fill Vacuum	0 to 24 in Hg (regulated)
Hold Vacuum	0 to 30 in of water (regulated)
Drain Vacuum	0 to 30 in of water (regulated)
Repeatability	±0.02 p.s.i.
Display Accuracy	±0.05 p.s.i. for pressure, ±0.2 in for vacuum (< 2 in H_2O)
Timer Setting Range	10 msec to 327.67 sec (10 msec resolution for whole range)
Counter Setting Range	1 to 255
Savable Sequences	16 sequences
Programmable Steps	32 steps for each sequence
Remote Control Ports	DB9 connector for remote key pad, foot switch jack and BNC for negative TTL trigger, jack connector for injection foot switch
Signal Output Ports	Eight BNCs for injection signal on output port 1 to 4
Power Consumption	100, 120 or 220 VAC, 35 W

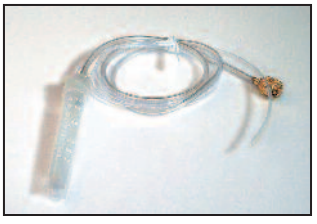
Order #	Model	Product
EC1 69-0152	PM-4	4-Channel Pressure Injection System
EC1 69-0153	PM-8	8-Channel Pressure Injection System
Options and Accessories		
EC1 69-0154	IP-1	Input Tubing with Connector
EC1 69-0155	OP-1	Output Tubing with Connector and 4.5 ml Vial
EC1 69-0156	OP-2	Output Tubing with Connector only
EC1 69-0157	FSW	Footswitch
EC1 69-0158	PM-KP	Remote Key Pad
EC1 69-0160	RK-2	Rack Mounting Kit with Handles for PM 4/8
EC1 69-0163	PP-7	Pulled Seven Barrel Pipette (each)
EC1 69-0164	PP-4	Pulled Four Barrel Pipette (each)
EC1 69-0165	HOLD-1	Holder for Single-Barrel Pipette
EC1 69-0166	HOLD-4	Holder for Four-Barrel Pipette
EC1 69-0167	HOLD-7	Holder for Seven-Barrel Pipette

EC1 69-0156 Output Tubing with Connector for use with:
EC1 69-0152
EC1 69-0153
EC1 69-0150
EC1 69-0151

EC1 69-0154 Input Tubing with Connector for use with:
EC1 69-0152
EC1 69-0153
EC1 69-0150
EC1 69-0151



EC1 69-0164 and **EC1 69-0163** Pulled Pipettes for use with:
EC1 69-0152
EC1 69-0153



EC1 69-0155 Output Tubing with Connector and 4.5 ml Vial for use with:
EC1 69-0152
EC1 69-0153
EC1 69-0150
EC1 69-0151

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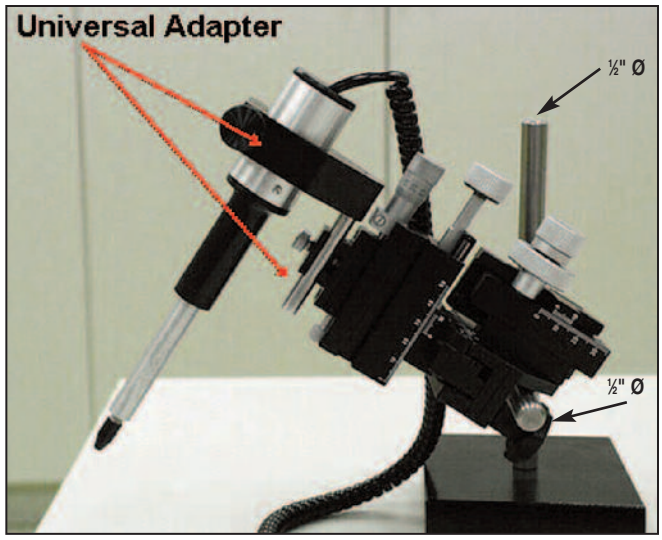
Nanoject II

Auto Nanoliter Injector



Needs Micromanipulator to attach to Support Stand

- Lower volume (2.3 nl) capability
- Positive displacement technology
- 2.3 to 69.0 nl range of volumes
- Minimal vibration
- New improved high torque motor
- Membrane key pad
- Improved micropipette holder
- Two speed injection/fill rates
- Auto 'Home' capability

The Nanoject II is the latest development in the Nanoject family of microinjectors. One unique features of the Nanoject II is the use of a high torque motor to provide smooth operation resulting in substantially reduced tip movement. A new collect configuration holds the micropipette more securely thereby reducing air infiltration and oil leakage. The two-speed fill/inject mode allows the user to fill and inject at half speed, facilitating the use of smaller micropipettes. The handling of more viscous samples is also improved. All of the above factors enhance the precise delivery of sample.

Volumes for the Nanoject II range from 2.3 nl to 69 nl. The smaller tips and smaller injection volumes of the Nanoject II allow users to perform injections into other specimens/applications that previously could not be performed.

Positive displacement technology and the use of precision micropipettes, eliminate the need for tedious calibration when the viscosity of the sample changes. Contaminants in the sample do not hinder or change the injection volume as with some other injectors. An optional universal mounting adapter provides easy mounting of the Nanoject II to a variety of micromanipulators and stereotaxic frames.

Specifications

Operation	Automatic
Glass Properties	Softening point 780°C
Glass Dimensions	1.14 x 0.053 mm (0.045 x 0.021 in) (OD x ID)
Injection Speed:	Fast: 46 nl/sec; Slow: 23 nl/sec
Fill Speed:	Fast: 46 nl/sec; Slow: 23 nl/sec
Empty Speed	92 nl/sec
Volume Range	2.3 nl to 69.0 nl
Change Volume	Dip switches #1 to #4
Change Inject Speed	Dip switch #5
Weight	99.2 g (3.5 oz)

Order #	Product
EC1 69-0130	Nanoject II Nanoliter Injector, 115 V, 60 Hz, US Plug
EC1 69-0131	Nanoject II Nanoliter Injector, 230 V, 50 Hz, European Plug
EC1 69-0132	Nanoject II Nanoliter Injector, 230 V, 50 Hz, UK Plug
Replacement Parts	
EC1 69-0133	Replacement Glass, 88.9 x 1.14 x 0.053 mm (3.5 x 0.045 x 0.021 in) (L x OD x ID), Vial of 100
EC1 69-0134	Replacement Glass, 177.8 x 1.14 x 0.053 mm (7 x 0.045 x 0.021 in) (L x OD x ID), Vial of 100
EC1 69-0135	Flared Glass, 90 mm (3.5 in), Vial of 100
EC1 69-0136	Standard O-Ring
EC1 69-0137	Special Flared O-Ring
EC1 69-0138	Replacement Wire Plunger
EC1 69-0139	Needle, 30 ga x 51 mm (2 in)
Accessories (Must be ordered separately)	
EC1 69-0140	Footswitch
EC1 69-0141	Support Base
EC1 69-0142	Universal Mounting Adapter, see above photo
EC1 3-000-034	International Wall Adapter
EC1 3-000-033	US Wall Adapter

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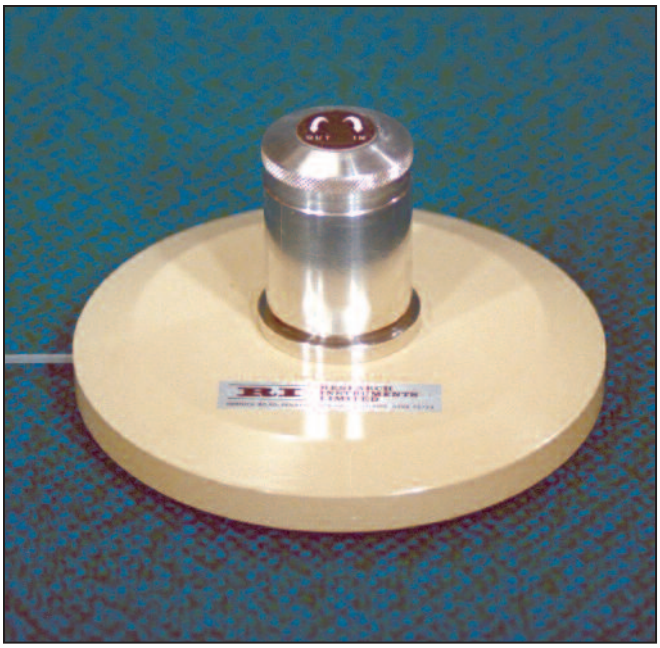
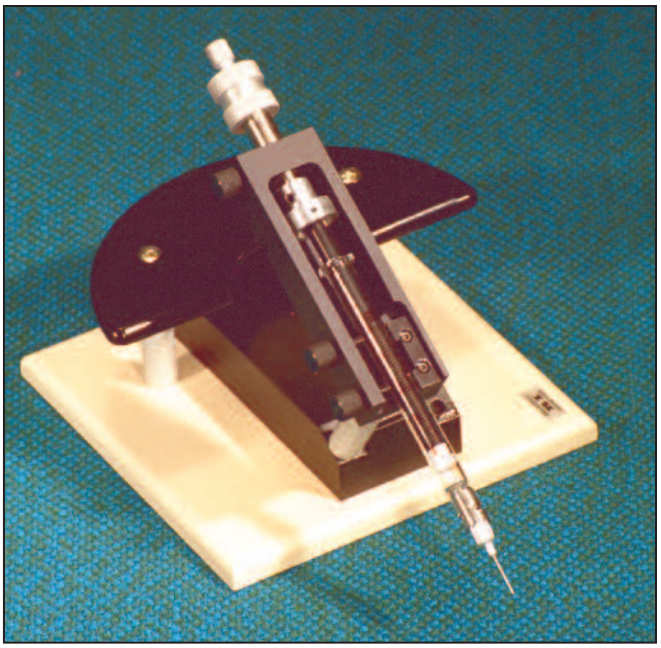
Screw-Actuated Syringes





- For air-assisted microinjection and microaspiration
- Uncomplicated and easy to use
- Accurate
- Sensitive control
- High suction/pressure

Screw-Actuated Air Syringes

These air-assisted microinjection/microaspiration syringes provide the user with sensitive control and an extremely low dead-air volume. The capacity of the syringe is 10 ml. When required, the syringes can be used to generate high pressure or suction.

The Screw-Actuated Syringe is a small compact unit incorporated into a heavy circular base. Its convenient dimensions enable it to be ergonomically positioned next to the control lever of a micromanipulator to facilitate single-handed operation of both instruments.

The syringe is connected by hard polyethylene tubing to a micropipette, which in turn, may be fitted to a micromanipulator or positioning device. Suction/injection is obtained by turning the metal colored actuator screw-control on the top of the syringe. The syringe provides a solution to the problem of capillary action when working with small micropipettes. A small balance (equilibrating) pressure can be maintained to offset the effects of capillary action. A conveniently situated release-button on-top of the screw-control is provided to achieve equilibration.

Order #	Product
EC1 69-0105	Screw-Actuated Air Syringe

- Ideal for oil-filled injection/aspiration
- Easy to use
- Hamilton syringe incorporated
- Accurate
- Sensitive control
- Low dead-air volume
- High suction/pressure
- Easy to exchange or replace the syringe

Screw-Actuated Micrometer Driven Hamilton Syringe

This screw actuated syringe is a micrometer-actuated syringe mechanism mounted on a small base. This syringe is for oil/air-assisted micro-injections and micro-aspirations. Its compact dimensions enable it to be ergonomically positioned next to the control lever of a micromanipulator to facilitate single-handed operation of both instruments.

Suction/injection is achieved by using the rotary-actuator with a fine micrometer-thread, which has a 15 mm movement range. A 1 ml gastight Hamilton glass syringe with a Luer-taper is incorporated. A Luer-taper hypodermic needle is mounted on the taper of the Hamilton syringe. The syringe is connected by hard polyethylene tubing to a micropipette, which in turn, may be fitted to a micromanipulator or similar instrument. The 1 ml Hamilton syringe can be easily exchanged for any other Hamilton 1700 syringe series including the 1000, 500, 200, 100 and 50 µl sizes, visit www.harvardapparatus.com for complete details.

Order #	Product
EC1 69-0107	Screw-Actuated Micrometer Driven Hamilton Syringe