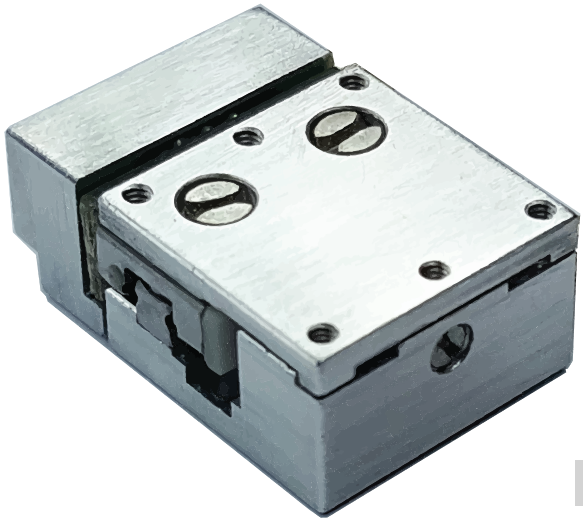
PP-12 Series



Piezo Positioner Stage

Reference Manual

(Open and Closed Loop Versions)

micronix USA
PRECISION MOTION SOLUTIONS

PP-12

Piezo Positioner Stage

Reference Manual

Rev 1.4

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Contents

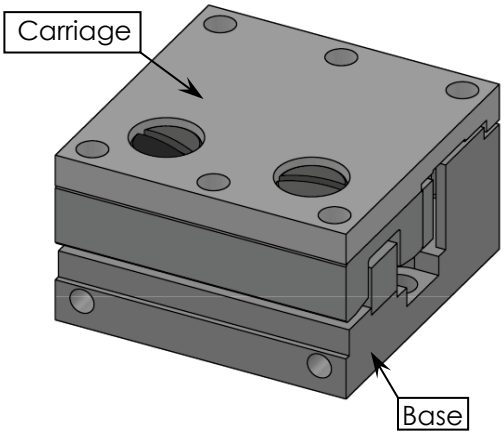
1. Introduction

1.1 Product Description

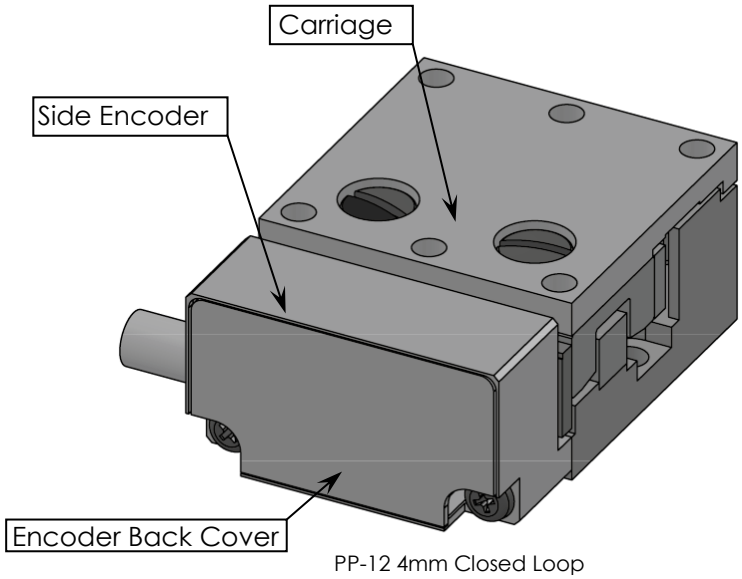
The PP-12 is an ultra-compact linear piezo stage. Low profile and high load capacity are achieved through the use of a multiple-phase piezo motor combined with a steel ball slide, which allows for smooth travel up to 4mm. The PP-12 can be directly X-Y mounted without the use of adapter plates. Vacuum versions are available. The PP-12 is compatible with the MMC-100 and MMC-110 controllers.

Features:

- Travel ranges of 4mm
- Load capacity up to 0.25kg
- Closed loop resolution of 20 nm



PP-12 20mm Open Loop
(Shown in center position)



PP-12 4mm Closed Loop
with Digital encoder
(Shown in center position)

1.2 Recommended Controllers

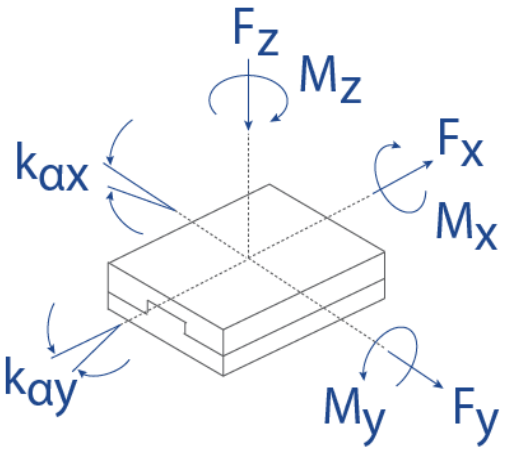
The following controllers are available from MICRONIX USA for piezo stages:

- MMC-100
- MMC-110

1.3 Technical Data

Motor	PM-002
Speed Max. (mm/sec)	1 (MMC-100), 3(MMC-110)
Resolution Typical (nm)	<1 (open loop), 20 (digital encoder)
Bi-directional Repeatability (nm)	N/A (open loop), ±200 (analog encoder)
Uni-directional Repeatability (nm)	N/A (open loop), 200 (analog encoder)

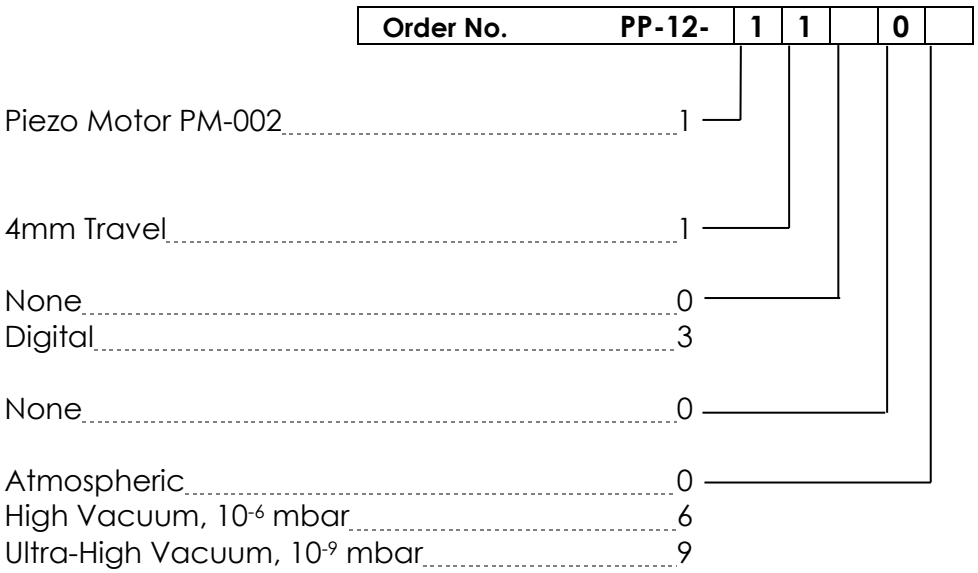
1.4 Load Characteristics



Load Characteristics	Fx(N)	Fy(N)	Fz(N)	Mx(Nm)	My(Nm)	Mz(Nm)	kax(µrad/Nm)	kay(µrad/Nm)
PM-002	1	1	1.5	0.1	0.1	0.1	-	-

2. Model Configurations

2.1 PP-12 Order Numbers



Contact MICRONIX USA for custom applications and stacking configurations.

3. Preparing to Install the PP-12

3.1 Installation Preparation

When mounting the stage, it is important to consider the flatness of the mounting surface, as the stage will conform to the shape of that mounting surface. A surface that is not flat can adversely affect the performance and structural integrity of the stage.

The stage is calibrated and guaranteed to be within specification at 20°C ±5°C unless otherwise specified. Be sure to use the stage under the following conditions:

- Mount to a clean and flat surface which is free of debris, burrs or dings
- An indoor atmosphere free of corrosive gases, excessive dust, and condensation
- Temperature range of 0-40°C
- Relative humidity between 20-80%
- Locate away from water, heat, and electrical noise

3.2 Package Contents

If product is damaged or there are missing components, contact MICRONIX USA immediately. Do not discard product packaging in case of return shipment.

Package Should Contain:

- PP-12 Linear Stage
- Reference Manual
- Any other previously agreed upon components such as a controller

4. Installing the PP-12

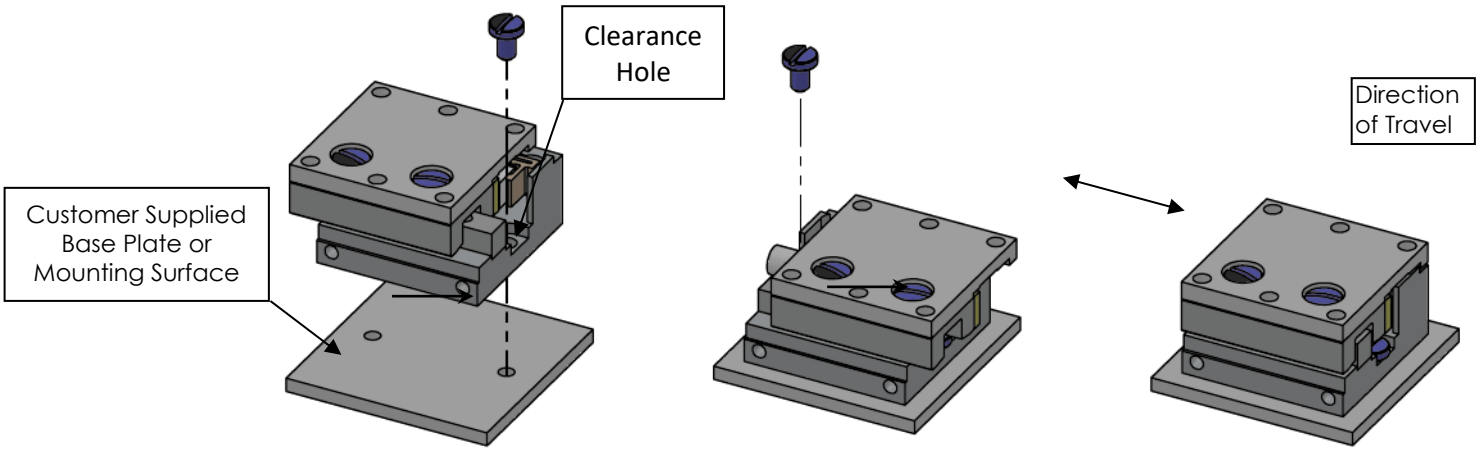
All mounting patterns require M1.2 screws for mounting. Additional brackets and screws may be needed for custom applications.

4.1 PP-12 Installation

4.1.1 *General Mounting*

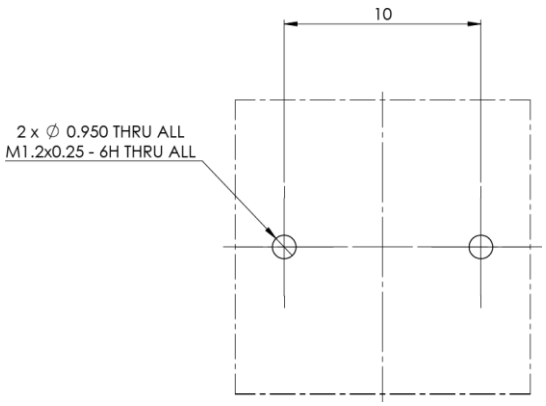
For general mounting configurations, mount the base to the mounting surface. Align carriage with clearance holes to access base mounting pattern. (Please note, it is possible to move the carriage manually without damaging the stage)

Requires:
2x M1.2 x 3mm Slotted Cheese Head Machine Screw



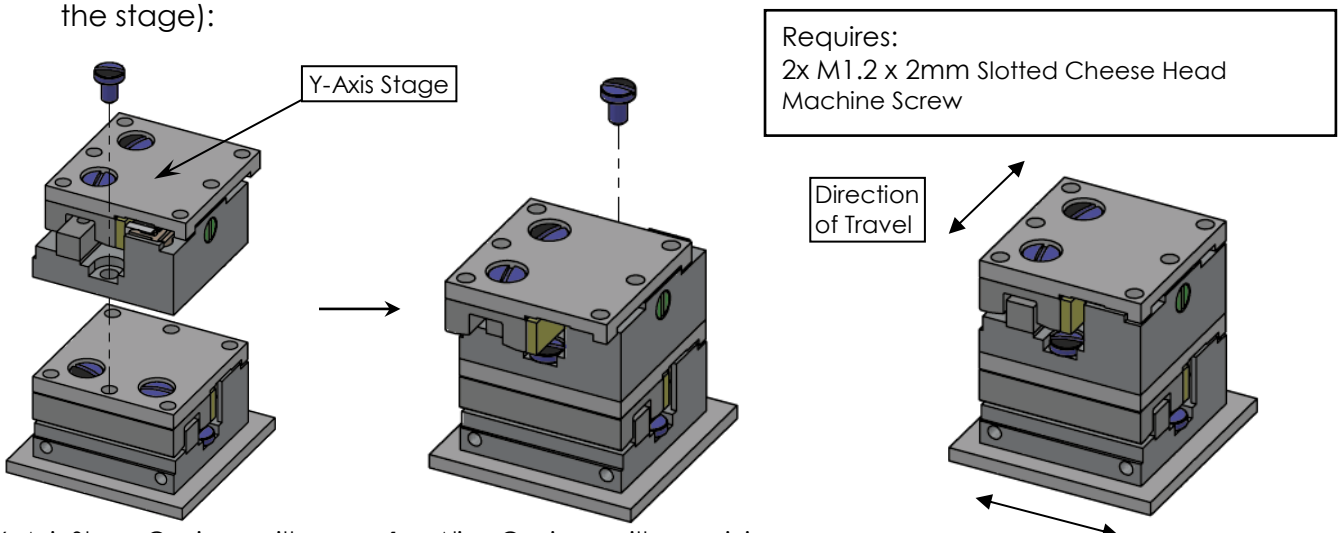
2. Align carriage with clearance hole and install M1.2 Slotted Cheese Head Machine Screw

1. Align carriage with second clearance hole and install second M1.2 Slotted Cheese Head Machine Screw



4.1.2 *X-Y Mounting*

For X-Y mounting, follow the instructions for mounting the X-axis stage, outlined in section 4.1.1 *General Mounting,* then proceed to mount the Y-axis stage, as shown below (Please note, it is possible to move the carriage manually without damaging the stage):



2. Align Y- Axis Stage Carriage with Clearance Hole. Install M1.2 Slotted Cheese Head Machine Screw
1. Align Carriage with remaining clearance hole and install second M1.2 Slotted Cheese Head Machine Screw

Note: Stages assembled in XY configuration from the factory do not require disassembly for base mounting

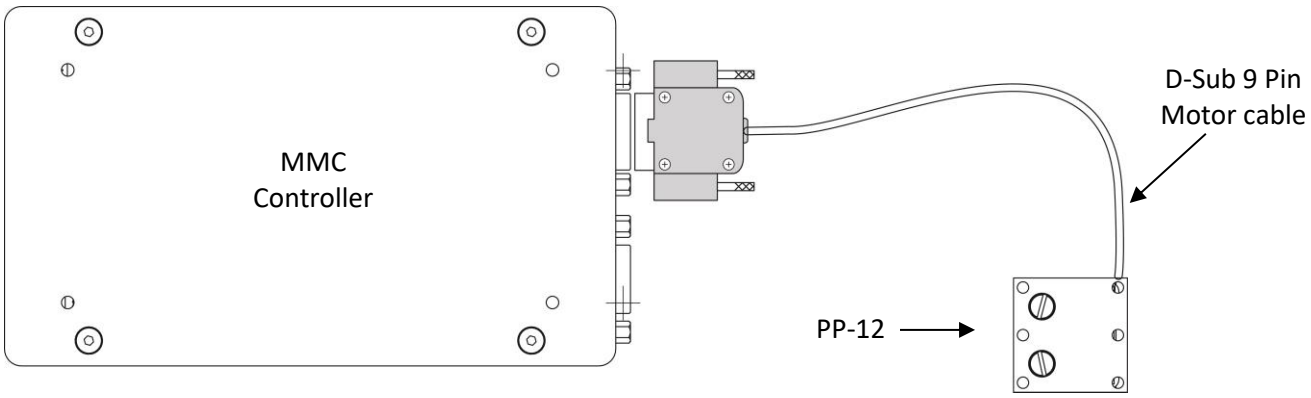
5. Connecting the PP-12

5.1 Atmospheric Environments

For controller information refer to the appropriate MMC controller manual.

5.1.1 *Open Loop Installation & Wiring Diagram*

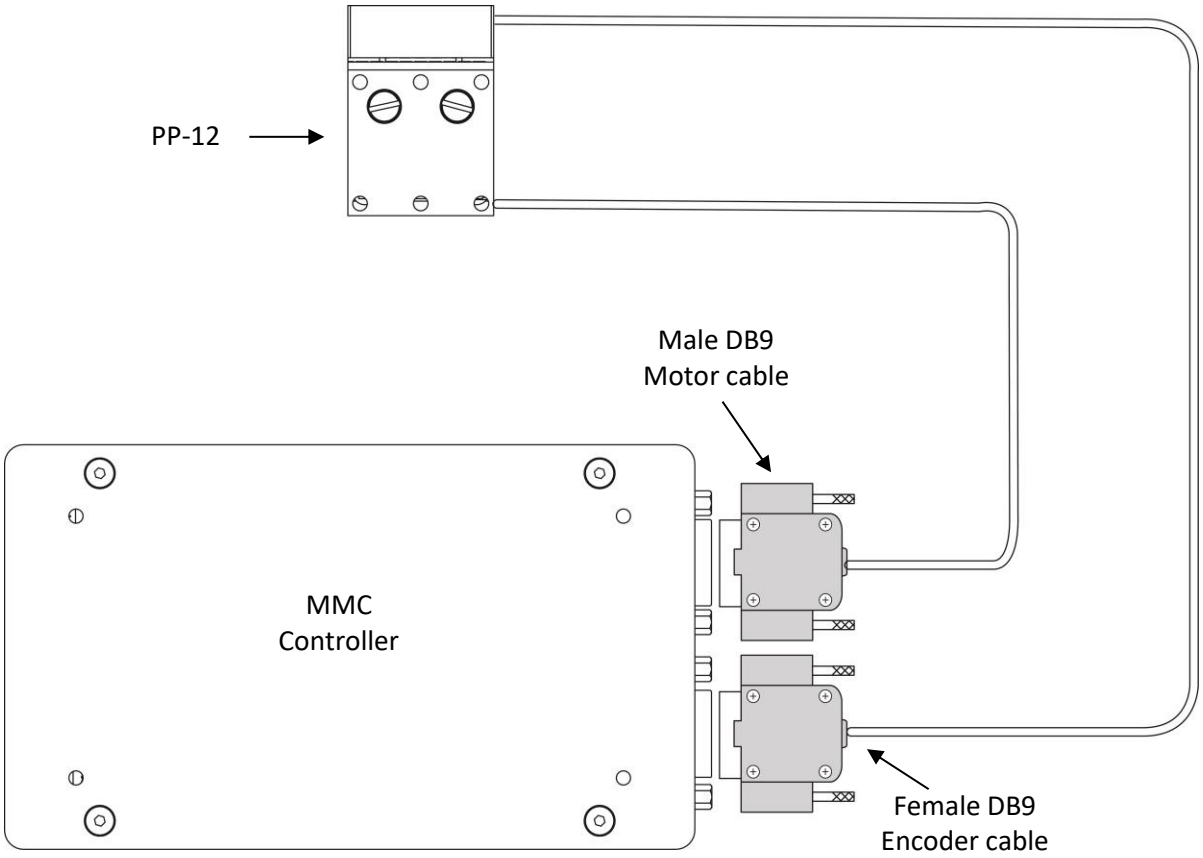
Connecting the PP-12 in an open loop configuration only requires that the D-sub 9 Pin male Motor Cable be connected to a compatible controller. No other cables or components are needed.



Closed Loop/Encoder Installation & Wiring Diagram

Using the PP-12 stage with an encoder requires a closed loop compatible controller (MMC-100 or MMC-110) that recognizes encoder feedback. Connect the stage as shown below.

5.1.1.1 Digital Encoder Wiring Diagram



5.2 Vacuum Environments

5.2.1 Handling and Preparation

When preparing the stage for vacuum environments, take the necessary precautions (such as wearing gloves, clean room clothing, etc.) when handling the stage as to avoid any contaminants. Maximum Bake-out temperature is 100°C. MICRONIX USA supplies the stage with vacuum compatible connectors: 9-pin female PEEK connectors for open loop and15-pin female PEEK connector for closed loop with digital encoder.

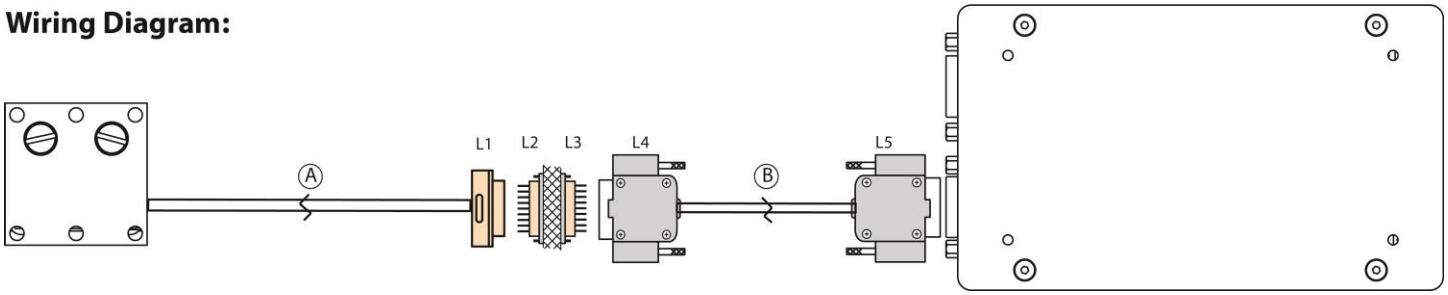
5.2.2 Open loop Installation & Wiring Diagram

Connecting an open loop PP-12 in a vacuum chamber requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible PP-12 will be supplied with wiring for a straight through feed through not a cross over gender changer. MICRONIX USA supplies test connectors that simulate the vacuum feed through to allow functionality test prior to installation in a vacuum chamber. For details regarding the pin-out and feed through specifications see the Appendix A.3.

Standard Cable Description:

A. PP-12, Vacuum Motor Cable (Female Dsub 9 Pin. 1.5m)
B. Atmosperic Motor Cable (Female to Male Dsub 9 Pin, 1.5m)

Wiring Diagram:



5.2.3 Closed Loop/Encoder Installation & Wiring Diagram

Closed loop installation of the PP-12 stage in vacuum environments requires an intermediate feed through connector at the vacuum chamber wall that can accommodate both the motor cable, and the encoder cable.

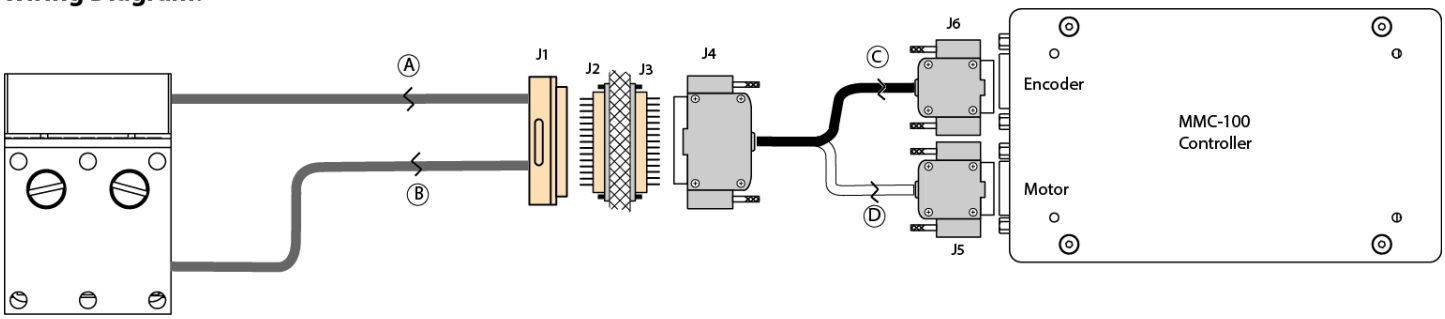
The vacuum compatible PP-12 will be supplied with wiring for a straight through feed through not a cross over gender changer. MICRONIX USA supplies test connectors that simulate the vacuum feed through to allow functionality test prior to installation in a vacuum chamber. For details regarding the pin-out and feed through specifications see the Appendix A.4.5, A.4.6.

5.2.3.1 Digital Encoder Wiring Diagram

Standard Cable Description:

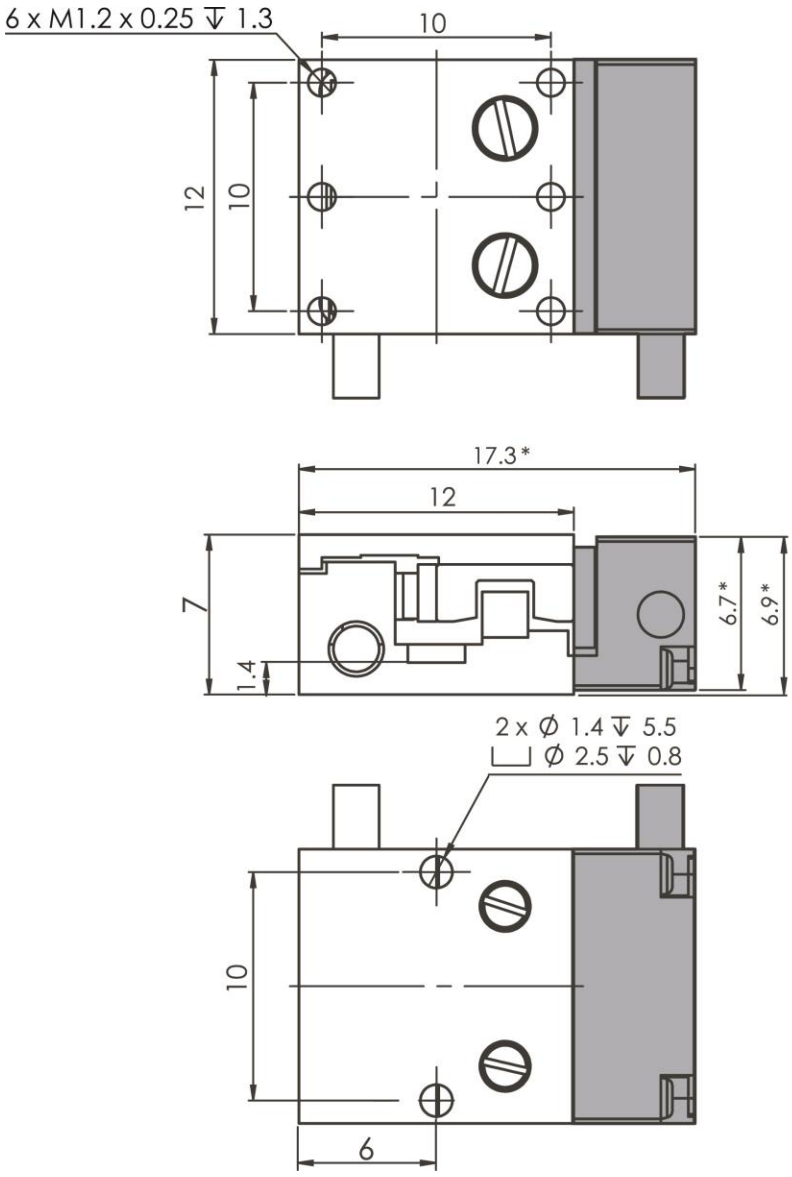
A. PP-12, Motor Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
B. PP-12, Encoder Cable - Vacuum Side(Female Dsub 15 Pin, 1.5m)
C. Encoder Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m)
D. Motor Cable (Female Dsub 15 Pin to Male Dsub 9 Pin,1.5m)

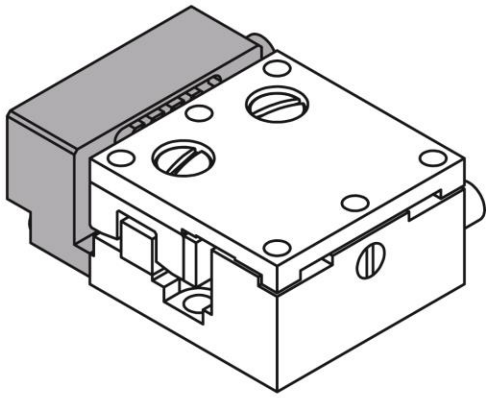
Wiring Diagram:



6. Dimensions

6.1 PP-12 with Digital Encoder

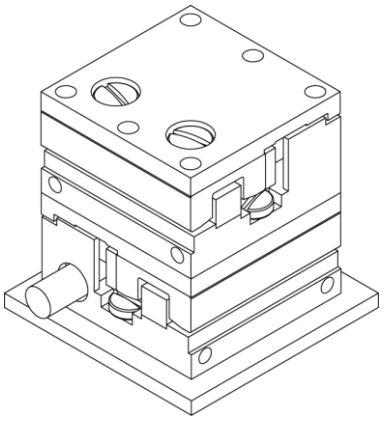




* all dimensions are in millimeters
* grey parts for closed loop version only

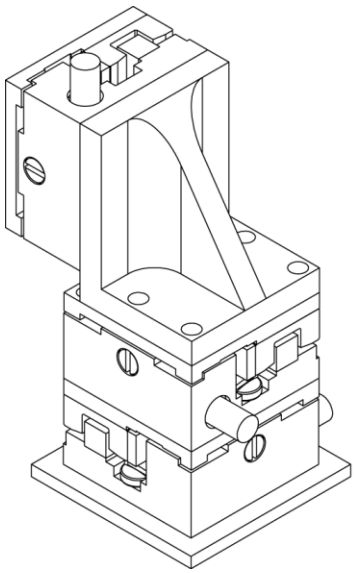
7. Stacking Configurations

7.1 Configurations Examples (Additional Configurations available upon request)

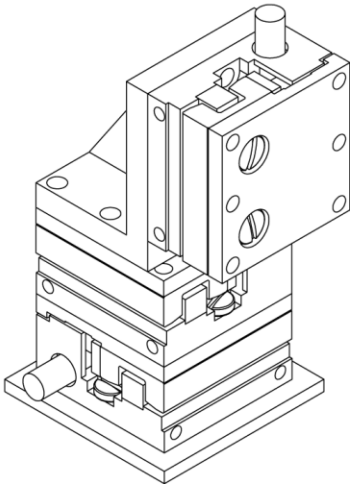


X-Y

Using Z-Adapter (P/N: 430635)



X-Y-Z



X-Y-Z

8. Supplementary Information

8.1 Maintenance

- The PP-12 series of linear piezo stages utilizes a maintenance free design. Do not modify the stage or perform any maintenance unless specifically instructed to do so by MICRONIX USA personal. If the stage is not performing up to the original specifications, please contact MICRONIX USA.
- The PP-12 linear piezo stage is a precision mechanical device and should be handled with care. Do not drop or mishandle the stage.
- Do not touch the bearings, as this will contaminate the lubrication and jeopardize the longevity of the stage.
- Follow the *Installation Preparation* requirements and use proper cable management to ensure a clean and safe operating environment.

8.2 Units and Conventions

All measurements in this document are in the metric system of units.

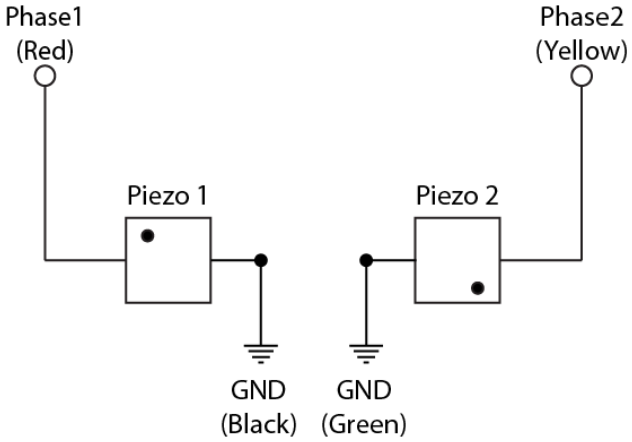
Metric Unit	English Unit
1 millimeter	0.0394 inches
1 micron	0.0000394 inches
1 Newton	0.2248 lbs.
1 Newton-meter	8.85 in-lbs.

A. Appendix

A.1 DB-9 Standard Male Motor Connector

Pin	Description	Color
1	Phase 1	Red
2	Phase 2	Yellow
3	N/C	N/C
4	Not in Use	N/C
5	Ground	Black& Green
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	Ground	N/C

A.2 2 Phase Piezo Motor Wiring Diagram

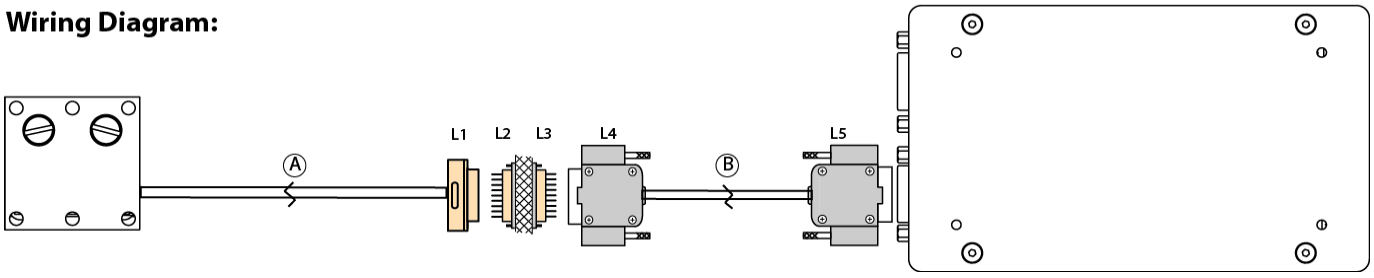


A.3 Open Loop Vacuum Wiring Diagram

Standard Cable Description:

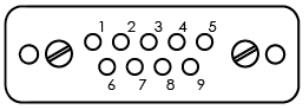
A. PP-12, Vacuum Motor Cable (Female Dsub 9 Pin. 1.5m)
B. Atmosperic Motor Cabel (Female to Male Dsub 9 Pin, 1.5m)

Wiring Diagram:

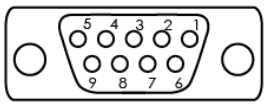


Motor Connector Pinout

Description:	L1	L2	L3	L4	L5
Phase1	5	5	1	1	1
Phase2	4	4	2	2	2
GND	1	1	5	5	5
Shield	6	6	9	9	9

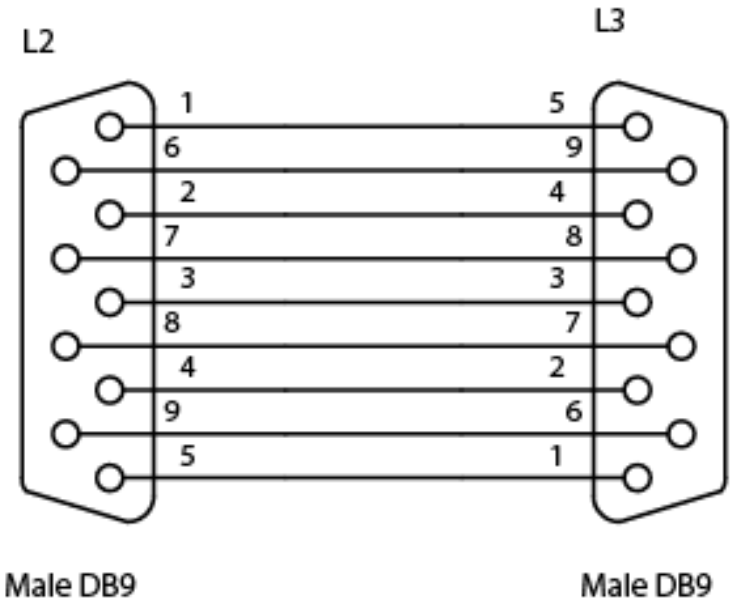


Female Dsub9 Connector - Rear View



Male Dsub9 Connector - Rear View

A.3.1 *Straight Through 9-Pin Feed Through*



A.4 Using an Digital Encoder

A.4.1 *Digital Encoder Overview*

A PP-12 with digital encoder will need to be paired with an appropriate controller. The MMC-100 has a digital option. The PP-12 with a digital encoder will be supplied with a 15-pin connector that incorporates both motor and encoder signals.

A.4.2 Encoder Pin-out

Pin	Color	Description
1	Brown	A+
2	Yellow	B+
3	Violet	Index +
4	Black	Ground
5	Red	+5V
6	Orange	A-
7	Green	B-
8	Blue	Index -
9	Not in Use	Not in Use

A.4.3 Operating and Electrical Specifications

Power Supply	5VDC ±5% @ 330mA (60mA for sensor)
Operating Temperature	0 to 70°C
Humidity	10 - 90% RH non-condensing

A.4.4 *Resolution*

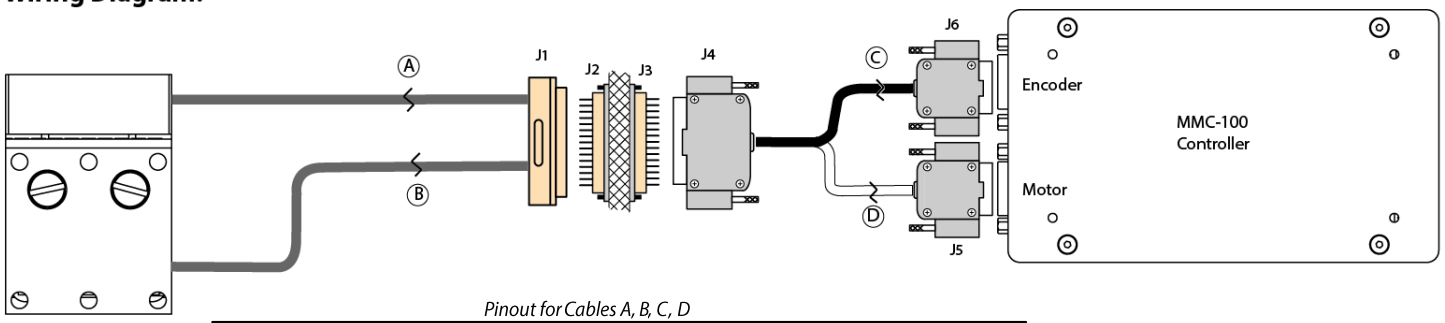
All closed loop stages are supplied with 1.2µm scales. The interpolation is done in the digital encoder to head a higher resolution as specified in the order. With a digital encoder the MMC-100 has an achievable resolution of 20nm.

A.4.5 *Digital Encoder Wiring Diagram*

Standard Cable Description:

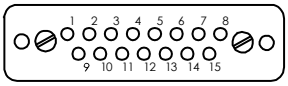
A. PP-12, Encoder Cable - Vacuum Side(Female Dsub 15 Pin, Peek Connector, 1.5m,Silver Braided Coper Cable)
B. PP-12, Motor Cable - Vacuum Side (Female Dsub 15 Pin, Peek Connector, 1.5m,Silver Braided Coper Cable)
C. Encoder Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m, White Teflon Cable)
D. Motor Cable (Female Dsub 15 Pin to Male Dsub 9 Pin,1.5m, White Teflon Cable)

Wiring Diagram:



Pinout for Cables A, B, C, D

	Description:	Color	J1	J2	J3	Color	J4	J5	J6
B & D	Phase 1	Red	1	1	8	Red	8	1	
	Phase 2	Yellow	2	2	7	White (Green TP)	7	2	
	Ground	Black/Green	9	9	15	Black/Green	15	5	
	Shield	-	10	10	14	-	14	Casing	
A & C	GND	Black	8	8	1	Black	1		4
	Cos+	Brown	7	7	2	Brown	2		1
	+5V	Red	6	6	3	Red	3		5
	Cos-	Orange	5	5	4	White (Brown TP)	4		6
	Sin+	Yellow	4	4	5	Yellow	5		2
	Sin-	Green	12	12	12	White (Yellow TP)	12		7
	Index-	Blue	13	13	11	Violet (White TP)	11		8
	Index+	Violet	14	14	10	Violet	10		3
	Shield	-	15	15	9	-	9		Casing



Female PEEK Dsub15 Connector - Rear View

A.4.6 *Straight Through 15-Pin Feed Through*