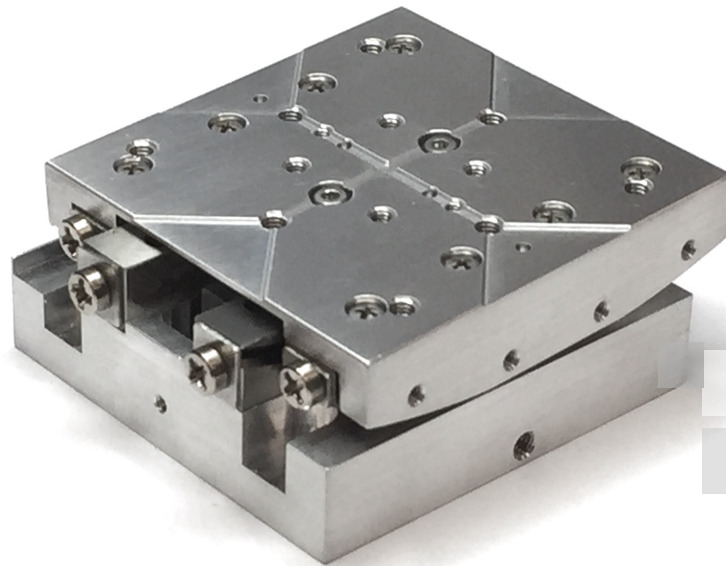


# PG-50

Series



## Precision Gonio Stage Reference Manual (Open and Closed Loop Versions)

***PG-50***  
***Gonio Stage***  
***Piezo Motor***  
***Reference Manual***  
Rev 2.05

**MICRONIX USA, LLC**  
**Tel: 949-480-0538**  
**Fax: 949-480-0538**  
**Email: [info@micronixusa.com](mailto:info@micronixusa.com)**  
**<http://micronixusa.com>**

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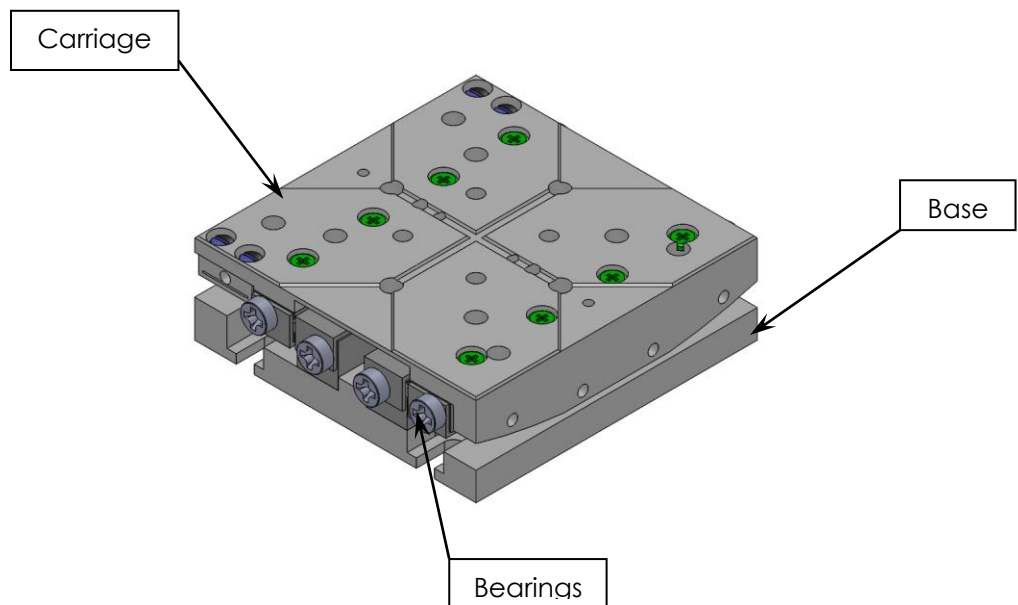
## 1. Introduction

### 1.1 Product Description

The PG-50 is a compact gonio stage designed for limited-space applications. High stiffness motion is achieved through pre-loaded crossed-roller bearings and a precision worm drive. These stages may be mounted orthogonally to achieve pitch and roll adjustment. Vacuum ( $10^{-9}$  mbar) compatible versions are available.

**Features:**

- Smooth, continuous  $\pm 5^\circ$  motion
- Load capacity up to 1 kg
- Steel crossed-roller bearings
- Low profile, 16 mm height
- Vacuum versions available



PG-50  
(Shown in center position)

## 1.2 Recommended Controller

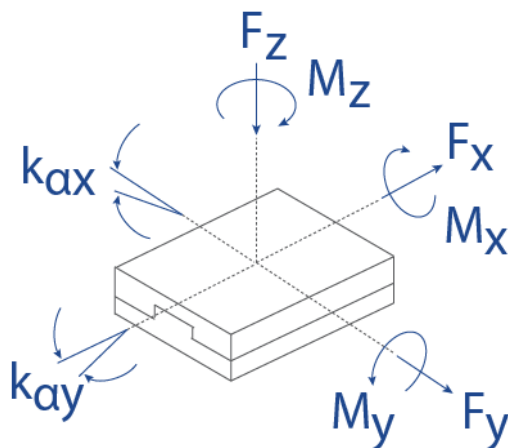
The following controller is available from MICRONIX USA:

- MMC-100
- MMC-110

## 1.3 Technical Data

Motor	PM-004R
Speed Max. (°/sec)	3
Resolution Typical ( $\mu^\circ$ )	1 (open loop), 50 (Analog), 10 (with encoder)
Bi-directional Repeatability ( $\mu^\circ$ )	$\pm 200$ (with encoder)
Uni-directional Repeatability ( $\mu^\circ$ )	200 (with encoder)

## 1.4 Load Characteristics



Load Characteristics	$F_{x(N)}$	$F_{y(N)}$	$F_{z(N)}$	$M_{x(Nm)}$	$M_{y(Nm)}$	$M_{z(Nm)}$	$k_{ax} [\mu rad/Nm]$	$k_{ay} [\mu rad/Nm]$
PM-004R	5	5	10	0.75	0.3	4	80	80

## 2. Model Configurations

### 2.1 PG-50 Order Numbers

Order No.	PG-50-	1	1			
Piezo Motor, PM-004R.....	1					
± 5° .....	1					
Open Loop.....	0					
Analog (1 V <sub>pp</sub> ) .....	2					
Digital (RS-422).....	3					
None.....	0					
Magnetic .....	1					
Atmospheric.....	0					
High Vacuum, 10 <sup>-6</sup> mbar.....	6					
Ultra High Vacuum, 10 <sup>-9</sup> mbar.....	9					

Contact MICRONIX USA for custom versions and stacking configurations.

### **3. Preparing to Install the PG-50**

#### **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. 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 gasses, 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 the 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:**

- PG-50 Gonio Stage
- Reference Manual
- Any other previously agreed upon components such as a controller

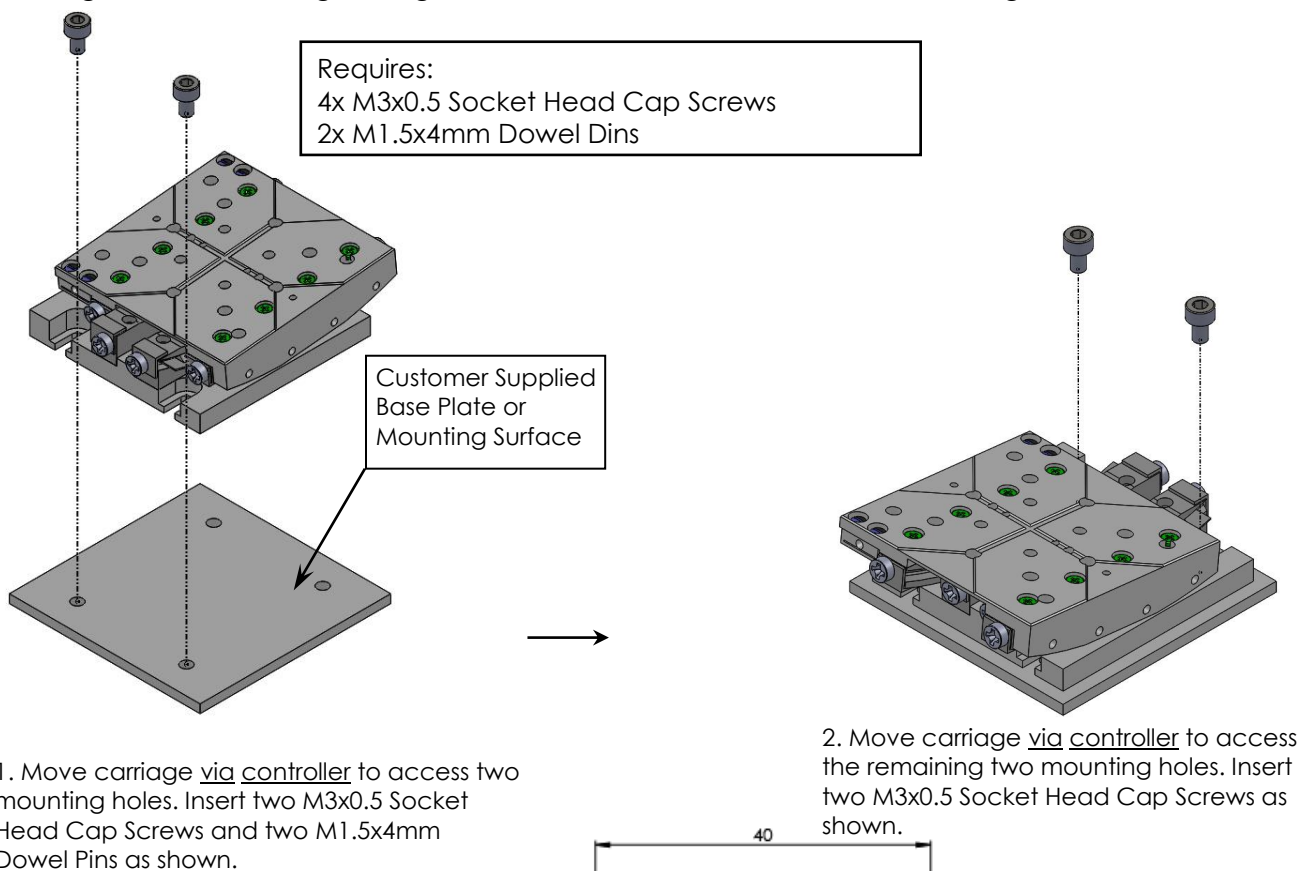
### 4. Installing the PG-50

All mounting patterns require M3 screws for mounting and M1.5 x 4mm dowel pins for precision alignment. Additional brackets and screws may be needed for custom applications.

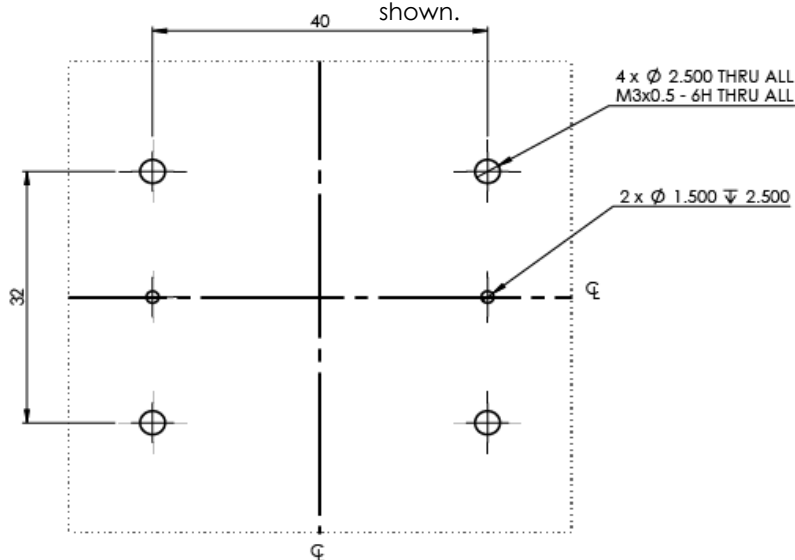
#### 4.1 PG-50 Installation

##### 4.1.1 General Mounting

For general mounting configurations, mount the base to the mounting surface.



Top View  
Stage Mounting Pattern





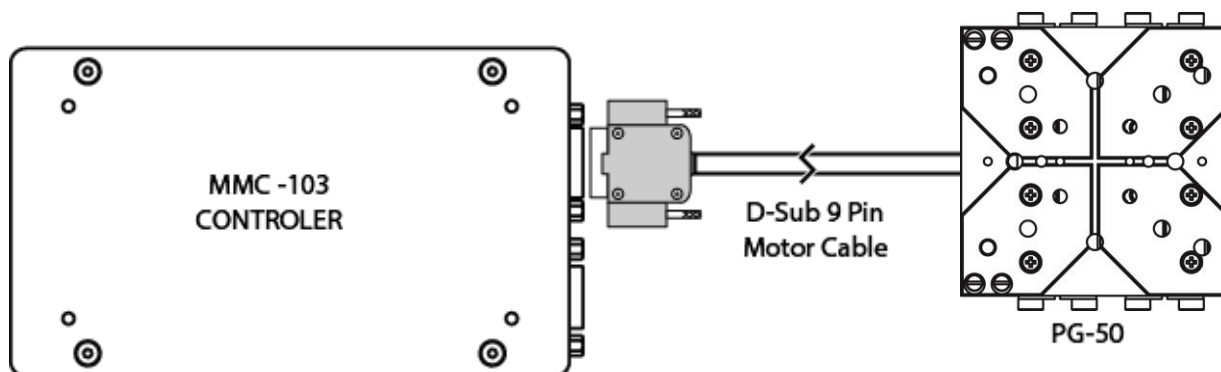
## 5. Connecting the PG-50

### 5.1 Atmospheric Environments

For controller information refer to the appropriate MMC controller manual.

#### 5.1.1 Open Loop Installation & Wiring Diagram

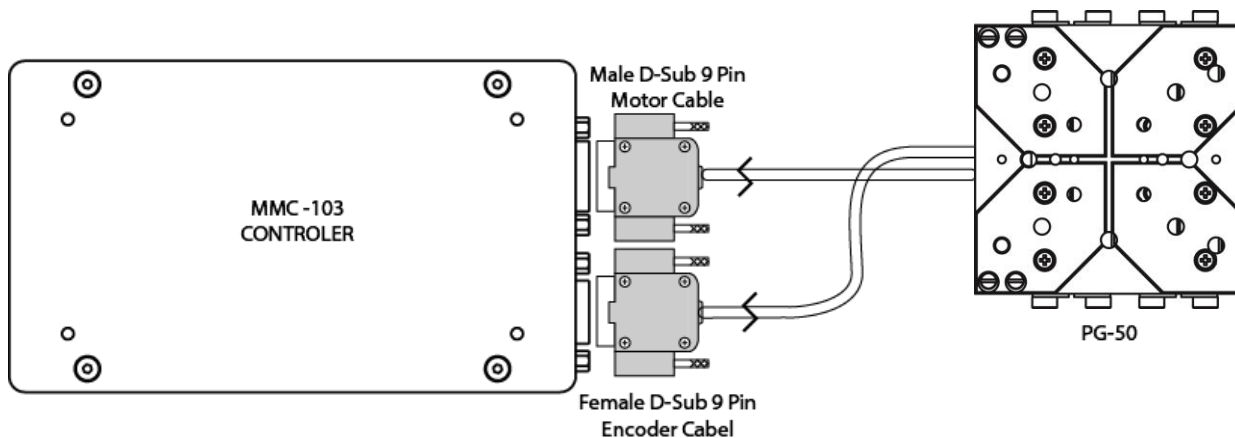
Connecting the PG-50 in an open loop configuration only requires that the D-sub 9 Pin Motor Cable be connected to a compatible controller. No other cables or components are needed.



#### 5.1.2 Closed Loop/Encoder Installation & Wiring Diagram

Using the PG-50 stage with an encoder requires a closed loop compatible controller that recognizes encoder feedback.

##### 5.1.2.1 Wiring Diagram for Atmospheric System with Analog Encoder



## 5.2 Vacuum Environments

### 5.2.1 Handling and Preparation

When preparing the stage for vacuum environments, take the necessary precautions (wearing latex gloves, clean room clothing, etc.) when handling the stage to avoid any contaminants. Maximum Bake-out temperature 100° C. MICRONIX USA supplies the stage with vacuum compatible connectors: 9-pin female PEEK connector for open loop, 15-Pin female PEEK connector for closed loop.

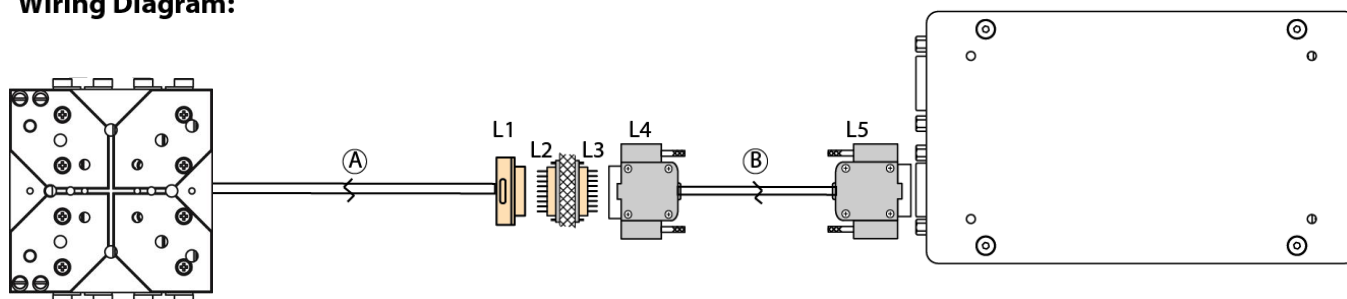
### 5.2.2 Open loop Installation & Wiring Diagram

Connecting an open loop PG-50 in a vacuum chamber requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible PG-50 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. PG-50, Vacuum Motor Cable (Female Dsub 9 Pin, 1.5m)
- B. Atmospheric Motor Cabel (Female to Male Dsub 9 Pin, 1.5m)

#### Wiring Diagram:



### 5.2.3 Closed Loop/Encoder Installation & Wiring Diagram

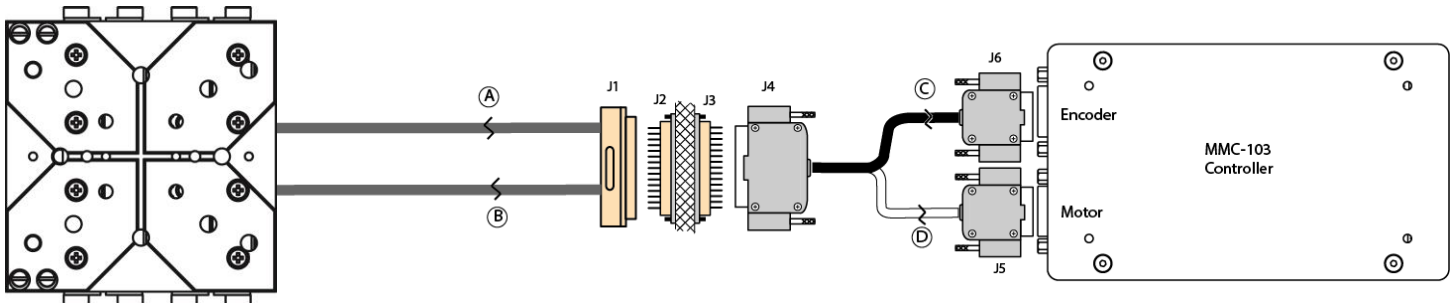
Closed loop installation of the PG-50 stage in vacuum environments requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible PG-50 will be supplied with wiring for a straight through feed through not a cross over gender changer. MICRONIX USA supplies test connectors 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.

### 5.2.3.1 Wiring Diagram for System with Analog Encoder

#### Standard Cable Description:

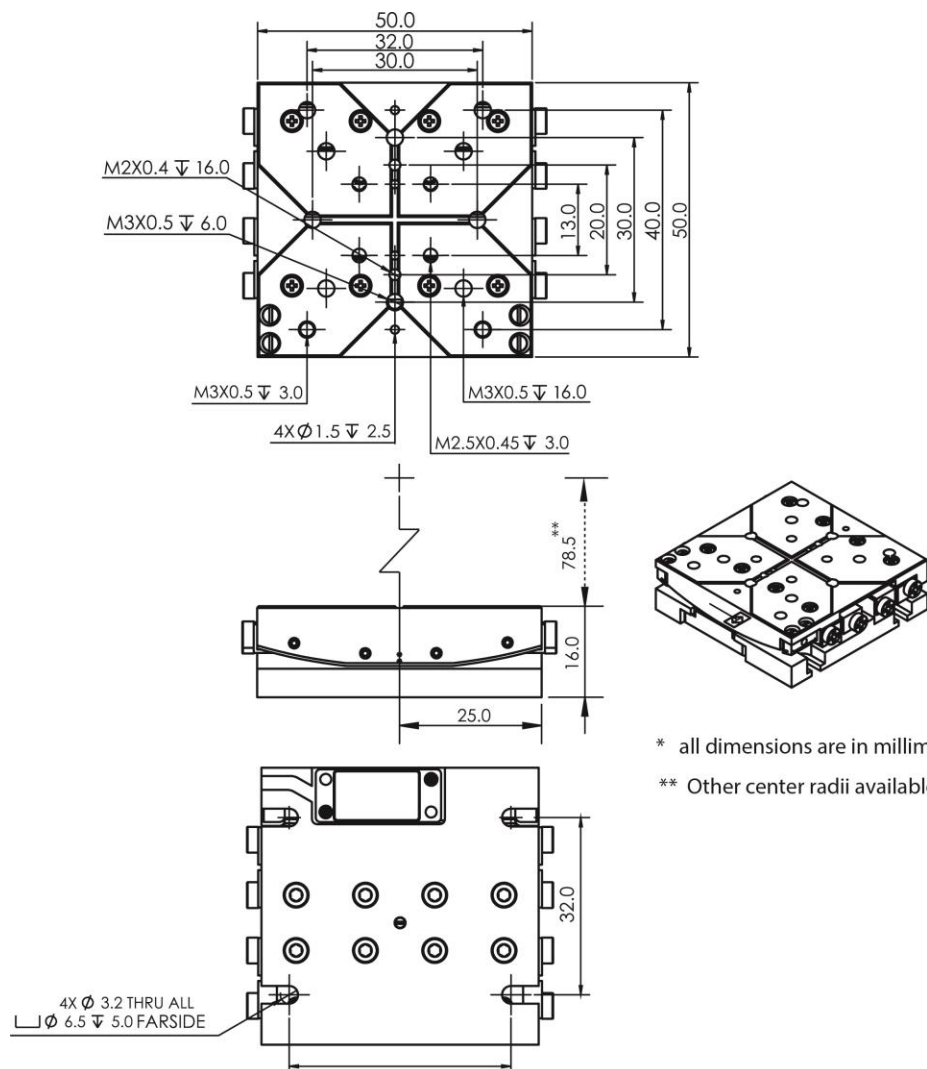
- A. PG-50, Motor Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
- B. PG-50, Encoder Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
- C. Encoder Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m)
- D. Motor Cable (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m)

#### Wiring Diagram:



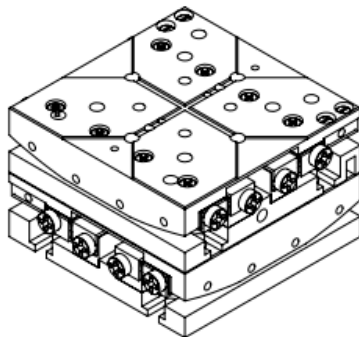
## 6. Technical Specifications

### 6.1 Dimensions

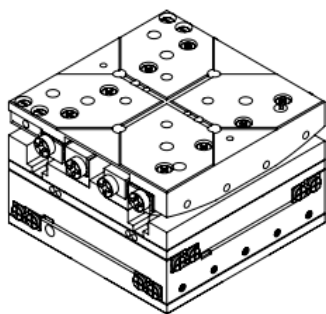


## 7. Stacking Configurations

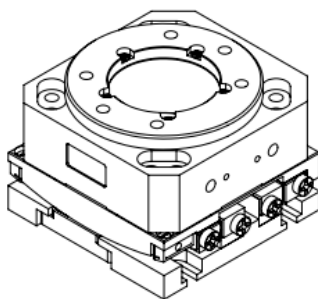
### 7.1 Possible Configuration



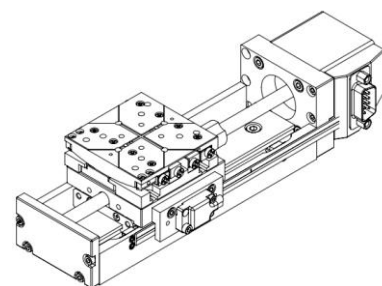
X-Y MOUNTING



PPX-50 & PG-50



PG-50 & PR-50



VT-50 & PG-50

Other Combinations available on request

## 8. Supplementary Information

### 8.1 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

### 8.2 Maintenance

- The PG-50 series of gonio 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 PG-50 gonio 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 Section 3.1 *Installation Preparation* requirements and use proper cable management to ensure a clean and safe operating environment.

### 8.3 Units and Conventions

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

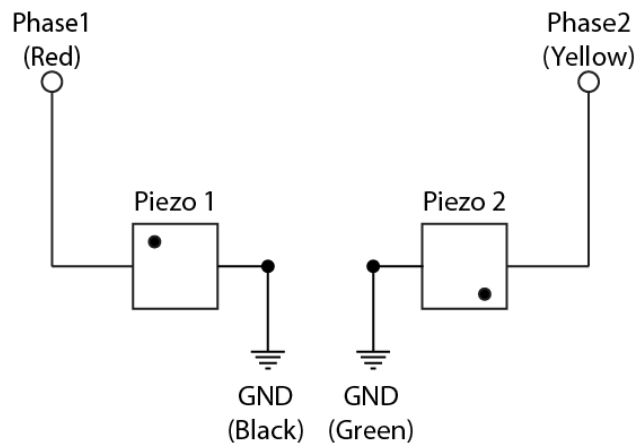
Metric Unit	English Unit
1 millimeter	0.0394 inches
1 micron	0.0000394 inches
1 Newton	0.2249 lbs
1 Newton-meter	8.85 in-lbs

## Appendix

### A.1 DB-9 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	+5V	N/C
7	+5V	N/C
8	Not in Use	N/C
9	Not in Use	N/C

### A.2 Phase Piezo Motor Wiring Diagram

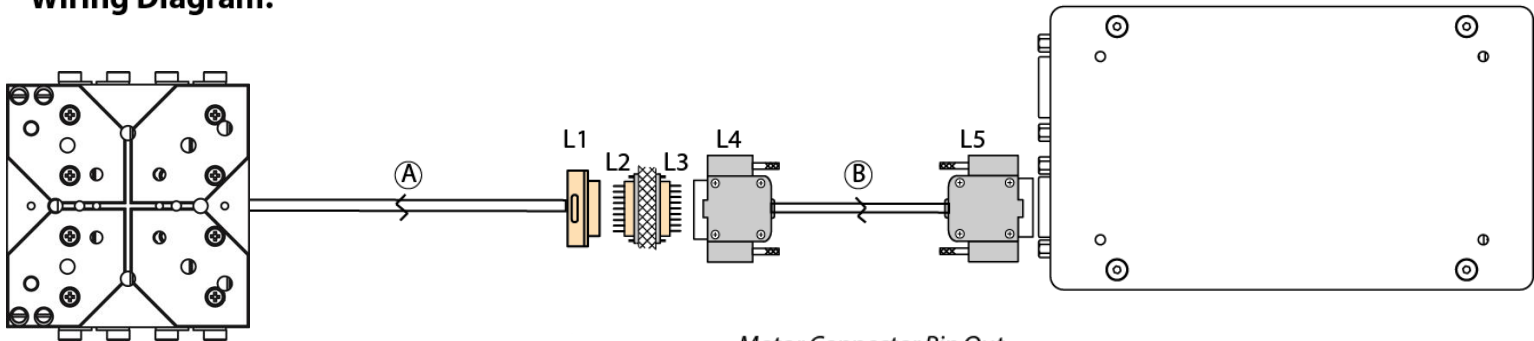


## A.4 Open Loop Vacuum Wiring Diagram

### Standard Cable Description:

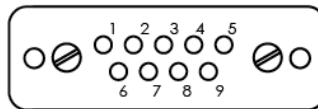
- A. PG-50, Vacuum Motor Cable (Female Dsub 9 Pin, 1.5m)
- B. Atmospheric Motor Cable (Female to Male Dsub 9 Pin, 1.5m)

### Wiring Diagram:

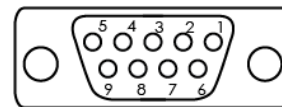


Motor Connector Pin Out

Description:	L1	L2	L3	L4	L5
Phase 1	5	5	1	1	1
Phase 2	4	4	2	2	2
Ground	1	1	5	5	5
Shield	6	6	9	9	9

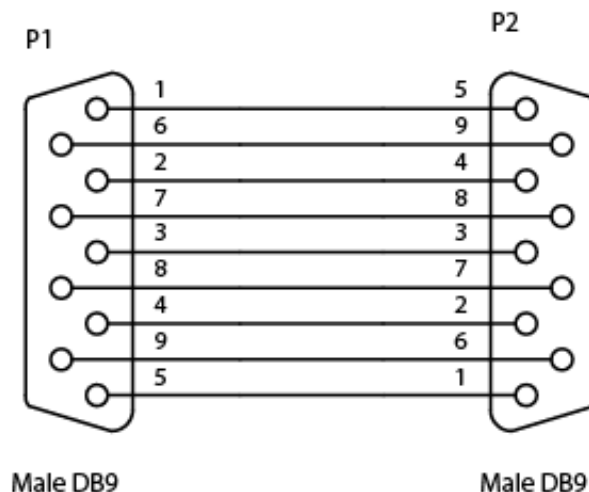


Female Dsub9 Connector - Rear View



Male Dsub9 Connector - Rear View

### A.4.1 Straight Through 9-Pin Feed Through



## A.5 Using an Analog Encoder

### A.5.1 Analog Encoder Overview

A PPS-20 with Analog encoder will need to be paired with an appropriate controller. The MMC-100 has an Analog option. The PPS-20 with an analog encoder will be supplied with a 15-pin connector that incorporates both motor and encoder signals.

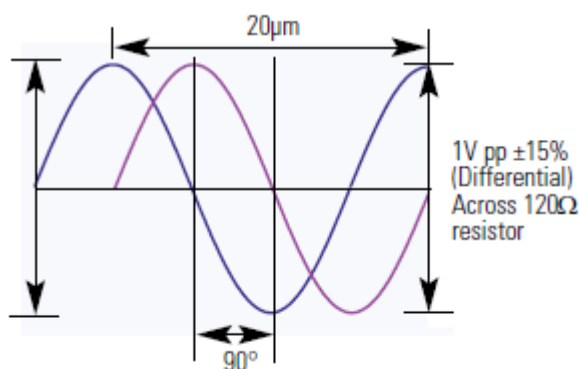
### A.5.2 Encoder Pin-Out

Pin	Color	Description
1	Brown	A+/Cos+
2	Red	B+/Sin+
3	Orange	Index +
4	Yellow	Ground
5	Green	+5V
6	Blue	A-/Cos-
7	Purple	B-/Sin-
8	Grey	Index -
9	Black	Not In Use

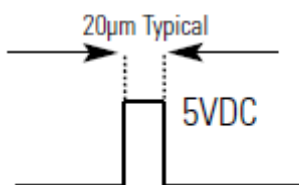
### A.5.3 Operating and Electrical Specifications

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

### A.5.4 Analog Output (Pins 1,2,6, and 7)



### A.5.5 Index Window (Pins 3)





### A.5.6 Resolution

Interpolation done in controller to a higher resolution as specified in the order. With an analog encoder the MMC-100 has an achievable Resolution down to  $44\mu^\circ$ .

### A.5.7 Closed Loop Vacuum Wiring Diagram

### A.5.8 Straight Through 15-Pin Feed Through

#### Standard Cable Descriptions:

- A. PG-50 Motor Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
- B. PG-50 Encoder Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
- C. Atmospheric Encoder Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m)
- D. Atmospheric Motor Cable (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m)

#### Wiring Diagram:

