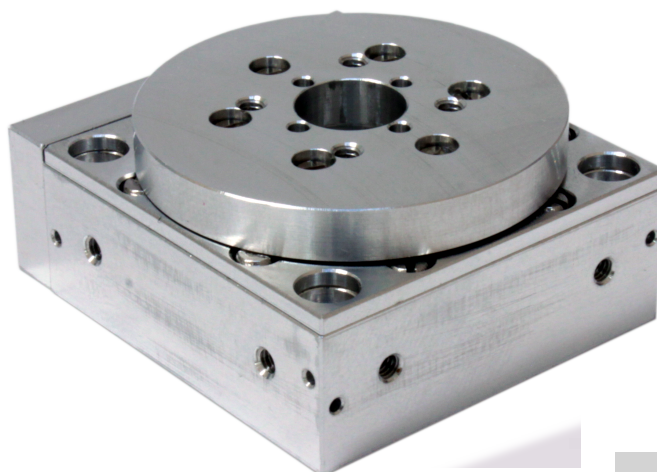


# PR-32

Series



## Piezo Rotation Stage Reference Manual (Open and Closed Loop Versions)

# **PR-32**

## **Piezo Rotation Stage**

### **Reference Manual**

Rev 3.06

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

## Contents

<b>1. Introduction</b> .....	<b>3</b>
1.1 Product Description .....	3
1.2 Recommended Controllers .....	4
1.3 Technical Data .....	4
1.4 Load Characteristics .....	4
<b>2. Model Configurations</b> .....	<b>5</b>
2.1 PR-32 Order Numbers .....	5
<b>3. Preparing to Install the PR-32</b> .....	<b>6</b>
3.1 Installation Preparation .....	6
3.2 Package Contents .....	6
<b>4. Installing the PR-32</b> .....	<b>6</b>
4.1 PR-32 Installation .....	7
4.1.1 General Mounting .....	7
<b>5. Connecting the PR-32</b> .....	<b>8</b>
5.1 Atmospheric Environments .....	8
5.1.1 Open Loop Installation & Wiring Diagram .....	8
5.1.2 Closed Loop/Encoder Installation & Wiring Diagram .....	8
5.1.3 Wiring Diagram for Atmospheric System with Analog Encoder .....	8
5.2 Vacuum Environments .....	9
5.2.1 Handling and Preparation .....	9
5.2.2 Open loop Installation & Wiring Diagram .....	9
5.2.3 Closed Loop/Encoder Installation & Wiring Diagram .....	9
<b>6. Technical Specifications</b> .....	<b>10</b>
6.1 Dimensions .....	10
<b>7. Stacking Configurations</b> .....	<b>11</b>
7.1 Configuration Examples (Additional configurations available upon request) .....	11
<b>8. Supplementary Information</b> .....	<b>11</b>
8.1 Units and Conventions .....	11
8.2 Maintenance .....	11
<b>A. Appendix</b> .....	<b>12</b>
A.1 Electrical Connections .....	12
A.1.1 DB-9 Male Motor Connector .....	12
A.1.2 Encoder Pinout .....	12
A.2 Phase Piezo Motor Wiring Diagram .....	12
A.3 Open Loop Vacuum Wiring Diagram .....	13
A.3.1 Straight Through 9-Pin Feed Through .....	13

A.4	Using an Analog Encoder .....	14
A.4.1	Analog Encoder Overview .....	14
A.4.2	Operating and Electrical Specifications.....	14
A.4.3	Analog Output (Pins 1,2,6, and 7).....	14
A.4.4	Index Window (Pins 3).....	14
A.4.5	Resolution .....	15
A.4.6	Analog Encoder Wiring Diagram.....	15
A.4.7	Straight Through 15-Pin Feed Through.....	15

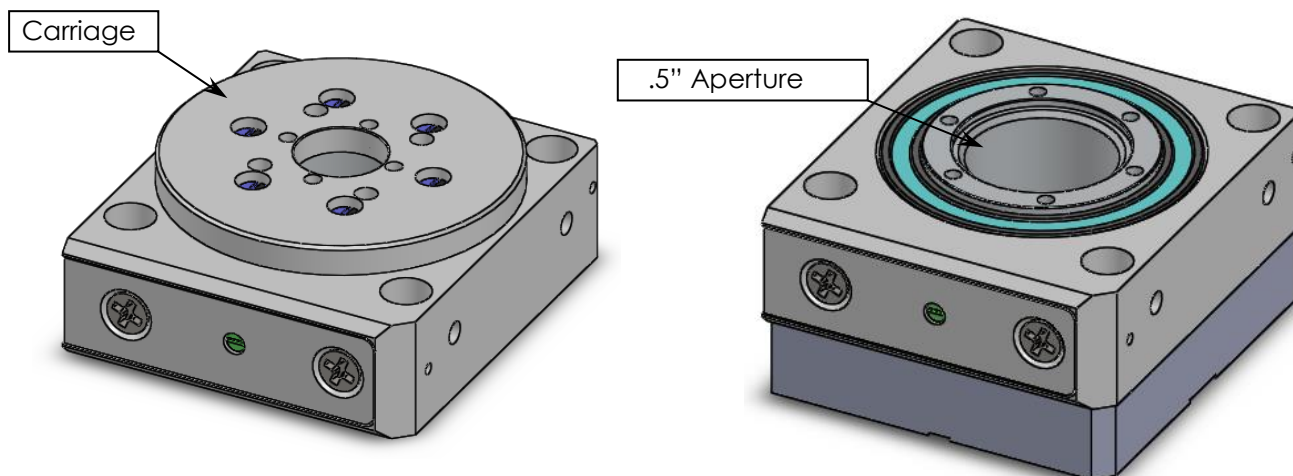
## 1. Introduction

### 1.1 Product Description

The PR-32 is a compact rotation stage with unlimited travel. The use of two mutually pre-loaded steel ball bearings guarantees smooth motion and high stability. It utilizes our patent-pending multi-phase piezo motor resulting in high speed ( $> 30$  °/s) and high blocking torque. The PR-32 can be combined with the linear PPX-32 or with the PPS-series stages. Vacuum and Ultra High Vacuum ( $10^{-9}$  mbar) compatible versions are available.

**Features:**

- 360° continuous
- Load capacity up to 1 kg
- 10  $\mu$ °encoder resolution
- .5" Clear aperture (open loop)



## 1.2 Recommended Controllers

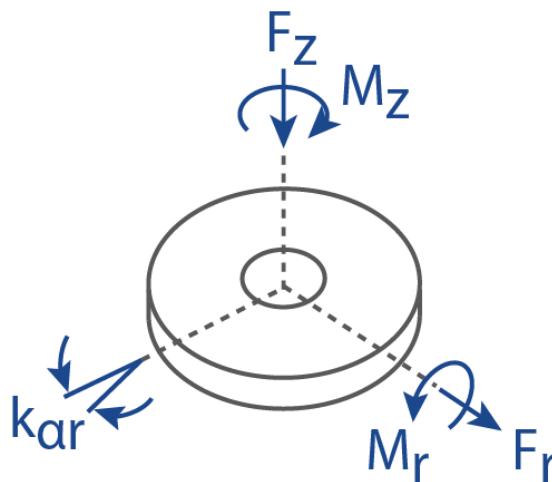
The following controllers are available from MICRONIX USA:

- MMC-100
- MMC-110

## 1.3 Technical Data

Motor	PM-002R
Speed Max. (°/sec)	6 (MMC-100), 30 (MMC-110)
Resolution Typical ( $\mu^\circ$ )	3.6 (open loop), 50 (Analog Encoder), 10 (Digital Encoder)
Bi-directional Repeatability ( $\mu^\circ$ )	N/A (open loop), $\pm 200$ (Analog Encoder), 200 (Digital Encoder)
Uni-directional Repeatability ( $\mu^\circ$ )	N/A (open loop), 200 (Analog Encoder), 200 (Digital Encoder)

## 1.4 Load Characteristics



Load Characteristics	$F_r(N)$	$F_z(N)$	$M_r(Nm)$	$M_z(Nm)$	$K_{ar}(\mu rad/Nm)$
PM-002R	10	10	0.5	0.025	-

## 2. Model Configurations

### 2.1 PR-32 Order Numbers

Order No.	PR-32-	1	1			
Piezo Motor, PM-002R.....	1					
360° Continuous.....	1					
None.....	0					
Analog (1Vpp).....	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 PR-32

#### 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  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . 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

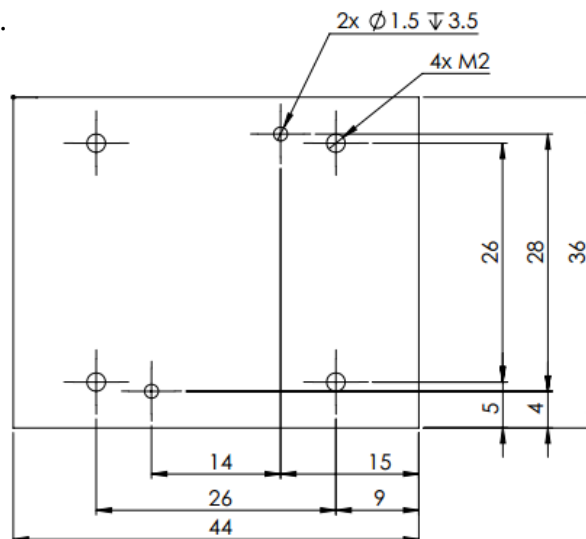
If the product is damaged or there are missing components, contact MICRONIX USA immediately. Do not discard product packaging in case of return shipment.

##### Package Should Contain:

- PR-32 Rotary Stage
- Reference Manual
- Any other previously agreed upon components such as a controller

### 4. Installing the PR-32

All mounting patterns require M2 screws for mounting and M1.5 x 5mm dowel pins for precision alignment. Additional brackets and screws may be needed for custom applications.



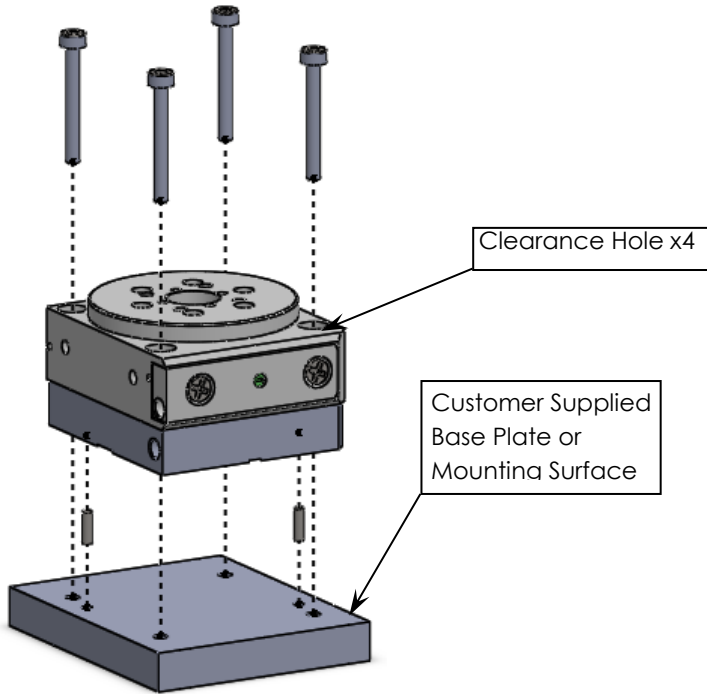
Top View  
Stage Mounting Pattern



### 4.1 PR-32 Installation

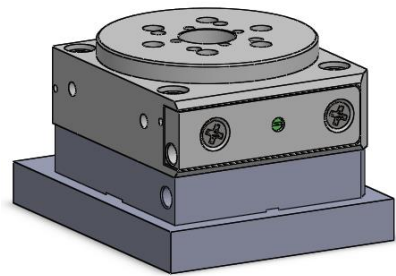
#### 4.1.1 General Mounting

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

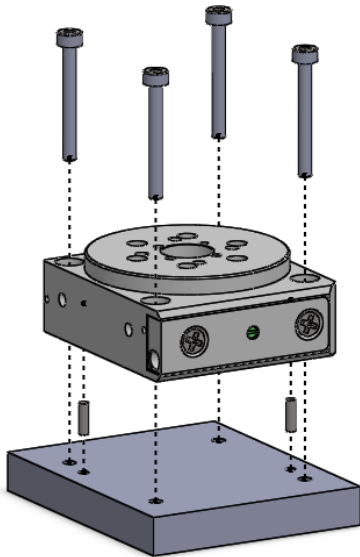


1. Install Dowel Pins and M2 Socket Head Cap Screws

Closed Loop System Requires:  
2x M1.5 x 5mm Dowel Pins  
4x M2 x 25mm Cheese Head Cap Screws

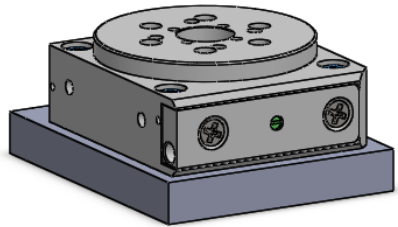


2. Tighten 4x Mounting Screws



1. Install Dowel Pins and M2 Socket Head Cap Screw

Open Loop System Requires:  
2x M1.5 x 5mm Dowel Pins  
4x M2 x 12mm Cheese Head Cap Screws



2. Tighten 4x Mounting Screws

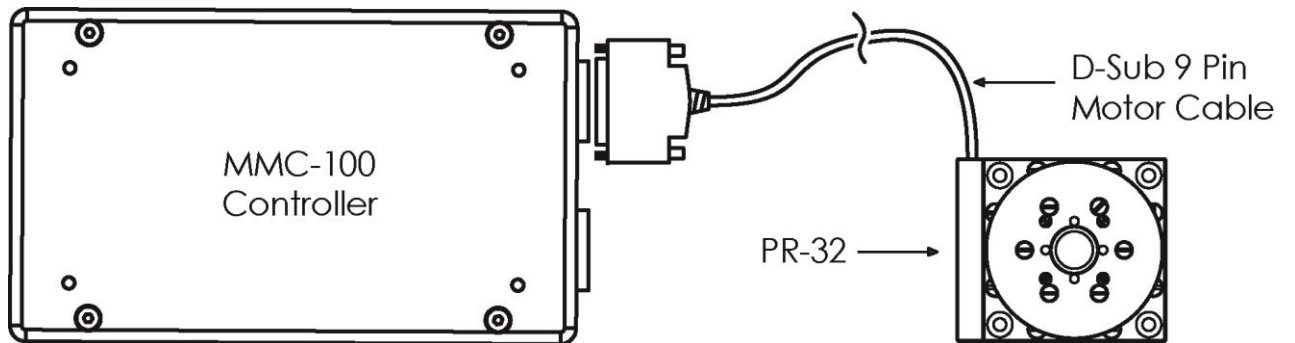
## 5. Connecting the PR-32

### 5.1 Atmospheric Environments

For controller information refer to the appropriate MMC controller manual.

#### 5.1.1 Open Loop Installation & Wiring Diagram

Connecting the PR-32 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.

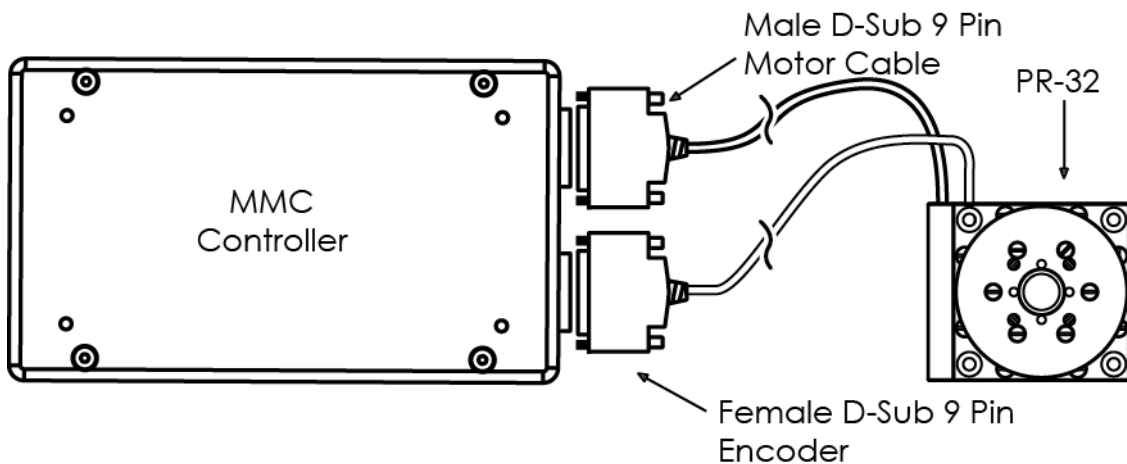


(example)

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

Using the PR-32 stage with an encoder requires a closed loop compatible controller that recognizes encoder feedback.

#### 5.1.3 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.

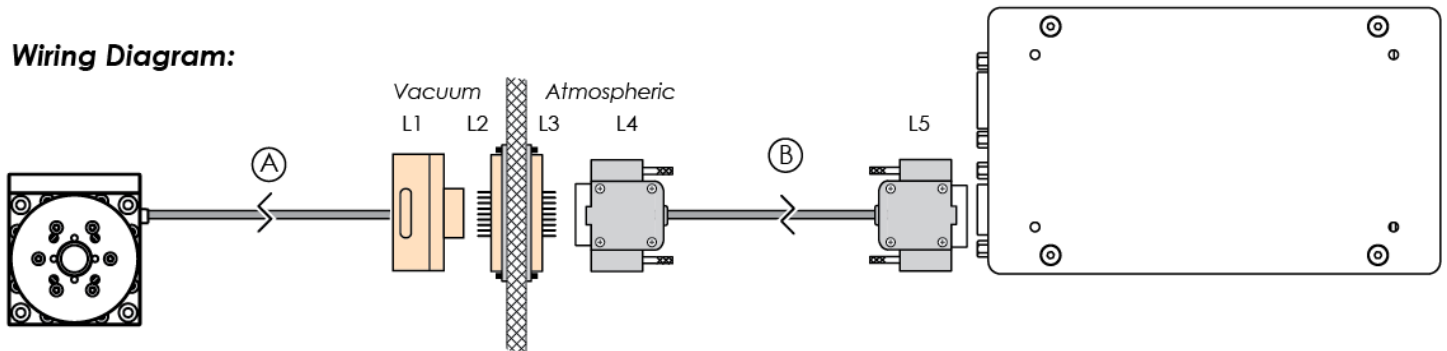
### 5.2.2 Open loop Installation & Wiring Diagram

Connecting an open loop PR-32 in a vacuum chamber requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible PR-32 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 Descriptions:

- A. PR-32, Vacuum Motor Cable (Female Dsub 9 Pin, 1.5m)
- B. Atmospheric Motor Cable (Female to Male Dsub 9 Pin, 1.5m)

#### Wiring Diagram:



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

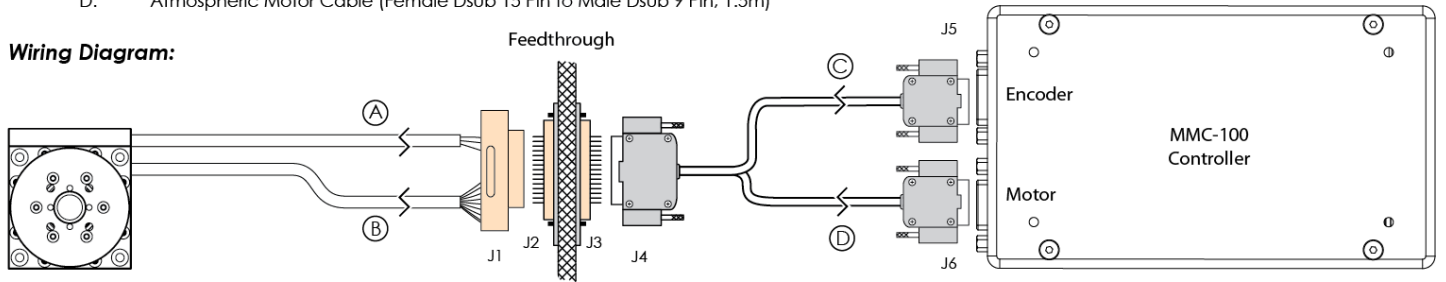
Closed loop installation of the PR-32 stage in vacuum environments requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible PR-32 will be supplied with wiring for a straight through feed through not a cross over gender changer. MICRONIX USA supplies test connectors 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 Descriptions:

- A. PR-32 Motor Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
- B. PR-32 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)

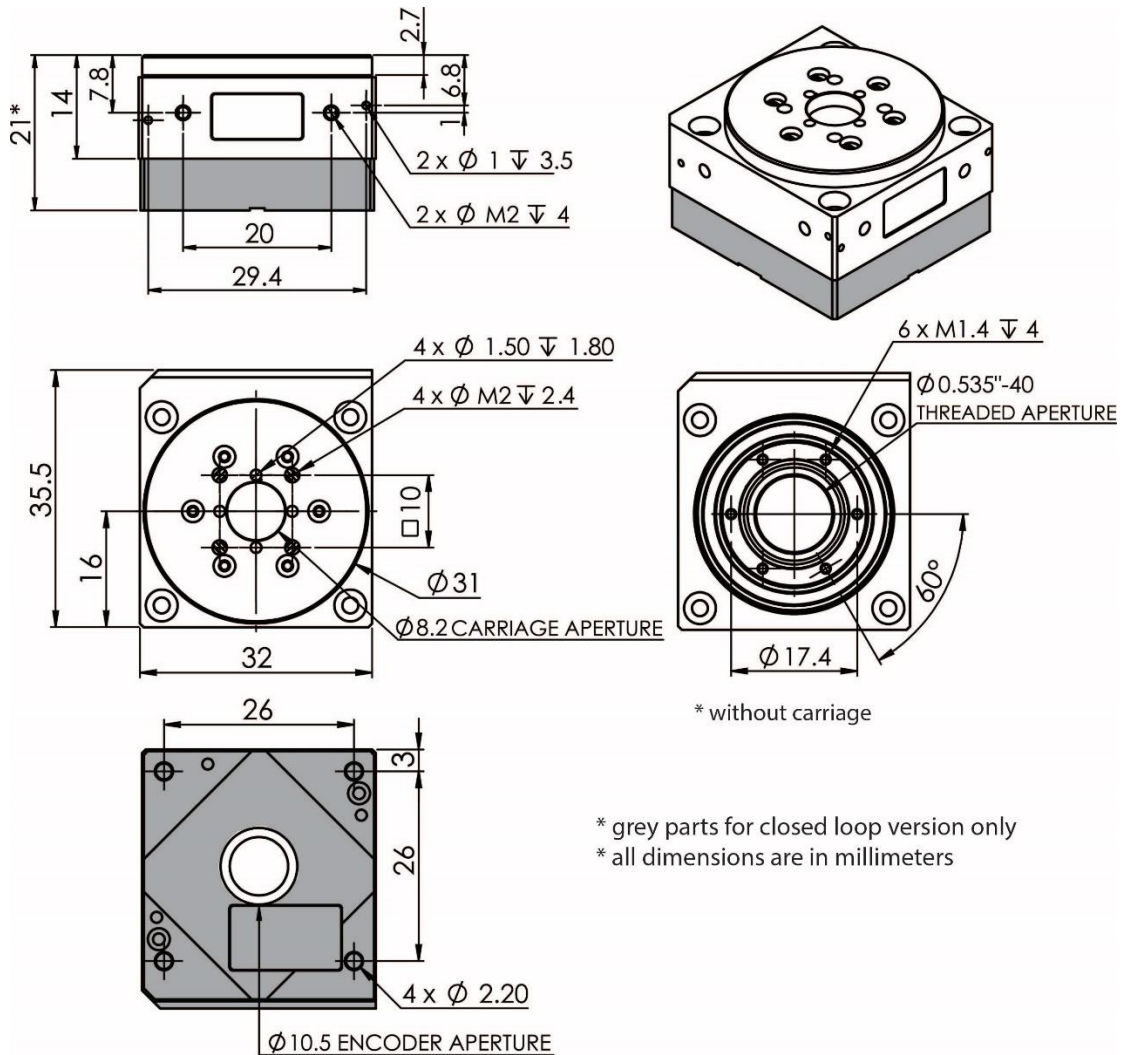
Wiring Diagram:



PR-32 Rotary Stage

6. Technical Specifications

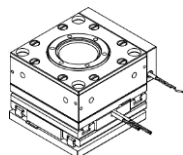
6.1 Dimensions



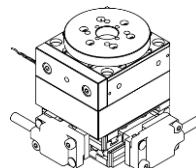
\* grey parts for closed loop version only  
 \* all dimensions are in millimeters

## Stacking Configurations

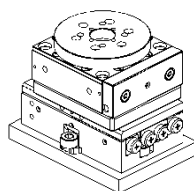
### 7.1 Configuration Examples *(Additional configurations available upon request)*



PPX-32CR &amp; PR-32



Using Adapter Plate (P/N: 430517)



PPS-28 &amp; PR-32

## 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 PR-32 series of rotary 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 PR-32 rotary 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.

## A. Appendix

### A.1 Electrical Connections

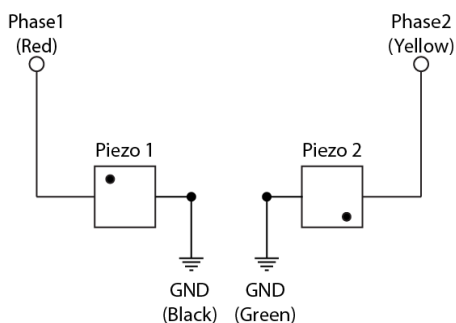
#### A.1.1 DB-9 Male Motor Connector

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.1.2 Encoder Pinout

Pin	Function	Analog
1	A+/Cos+	Brown
2	B+/Sin+	Yellow
3	Index+	Violet
4	GND	Black & Inside shield
5	+5V	Red
6	A-/Cos-	Orange
7	B-/Sin-	Green
8	Index-	Blue
9	N/A	N/A
Shield	GND	Outside Shield

### A.2 Phase Piezo Motor Wiring Diagram

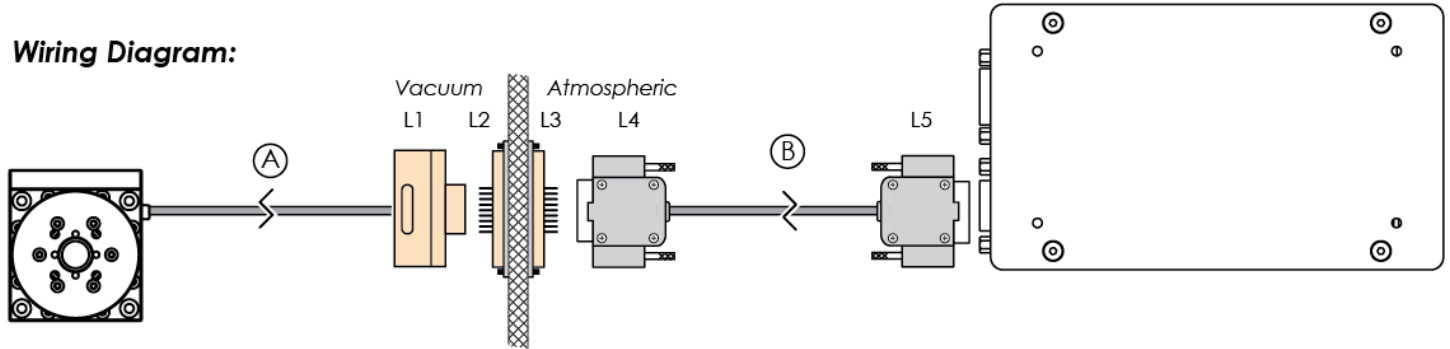


### A.3 Open Loop Vacuum Wiring Diagram

**Standard Cable Descriptions:**

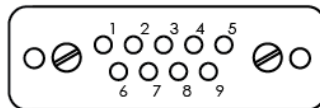
- A. PR-32, Vacuum Motor Cable (Female Dsub 9 Pin, 1.5m)
- B. Atmospheric Motor Cable (Female to Male Dsub 9 Pin, 1.5m)

**Wiring Diagram:**

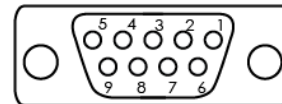


Motor Connector Pinout

Description:	L1	L2	L3	L4	L5
Phase1	8	8	1	1	1
Phase2	7	7	2	2	2
GND	4	4	5	5	5
Shield	3	3	6	6	9

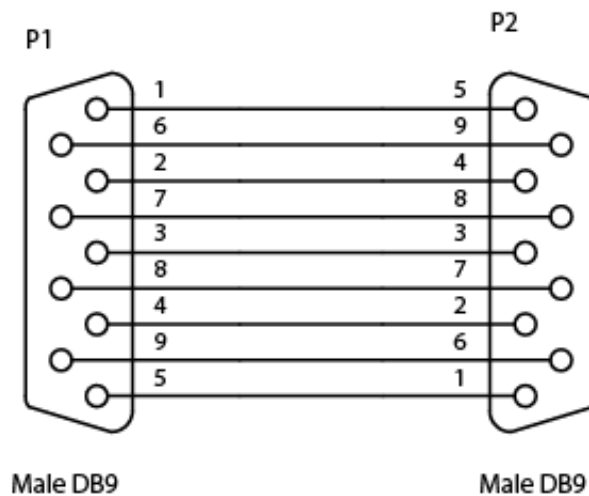


Female Dsub9 Connector - Rear View



Male Dsub9 Connector - Rear View

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



## A.4 Using an Analog Encoder

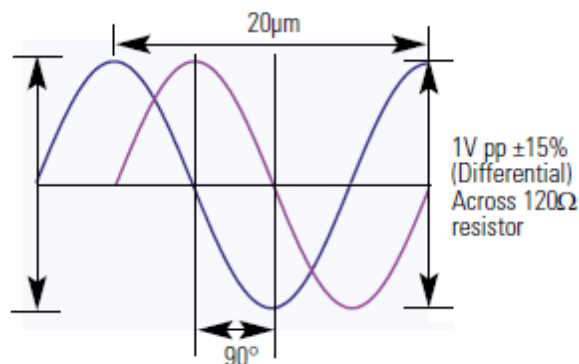
### A.4.1 Analog Encoder Overview

A PR-32 with Analog encoder will need to be paired with an appropriate controller. The MMC-100 has an Analog option. The PR-32 with an analog encoder will be supplied with a 15-pin connector that incorporates both motor and encoder signals.

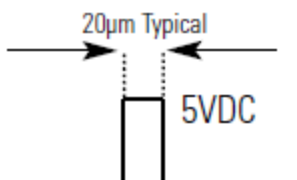
### A.4.2 Operating and Electrical Specifications

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

### A.4.3 Analog Output (Pins 1,2,6, and 7)



### A.4.4 Index Window (Pins 3)





**A.4.5 Resolution**

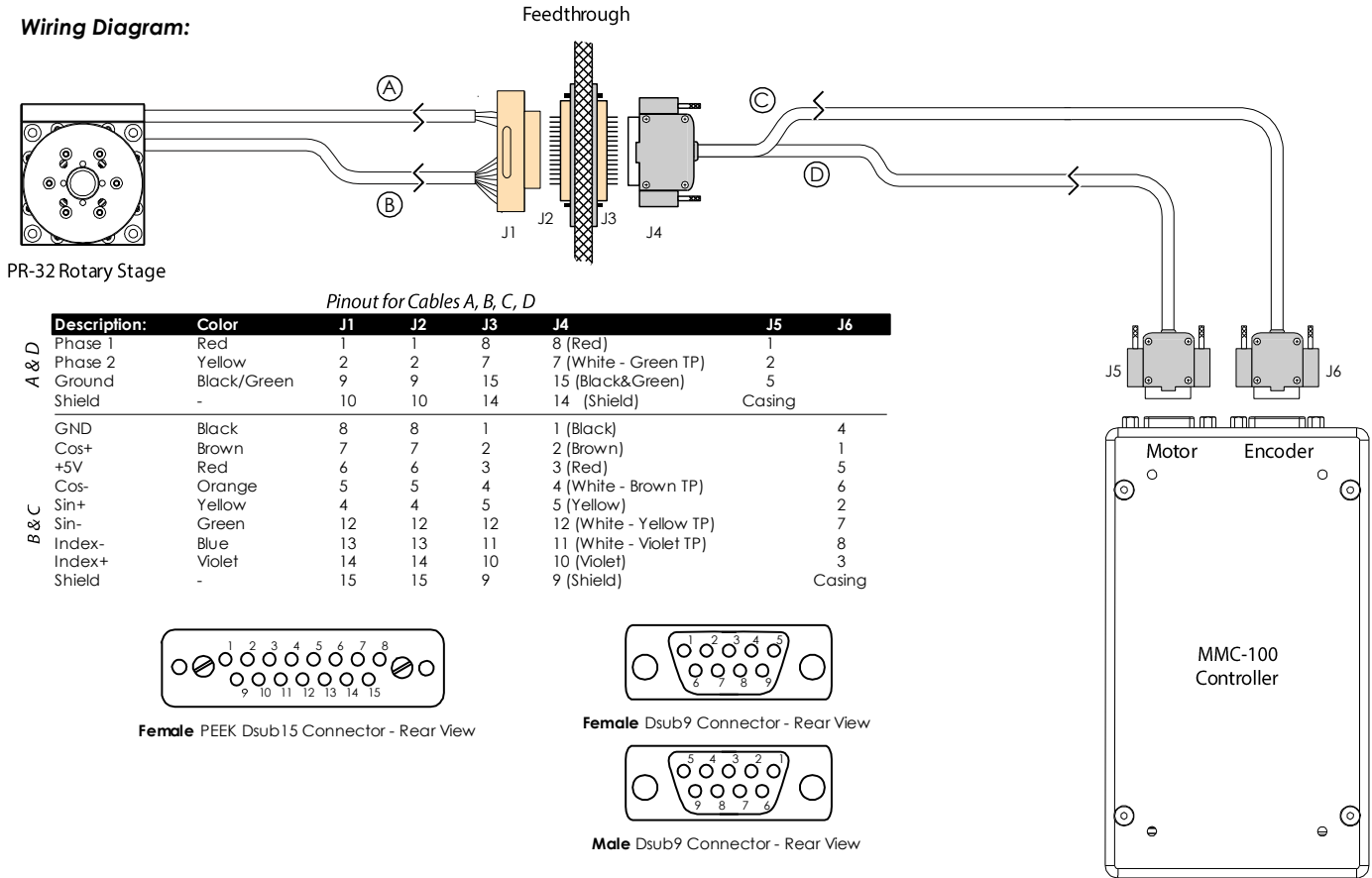
Interpolation done in controller to a higher resolution as specified in the order. With an analog encoder the MMC-110 has an achievable Resolution down to 10 $\mu$ °.

**A.4.6 Analog Encoder Wiring Diagram**

**Standard Cable Descriptions:**

- A. PR-32 Motor Cable - Vacuum Side (Female Dsub 15 Pin, 1.5m)
- B. PR-32 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:**



**A.4.7 Straight Through 15-Pin Feed Through**

