PPS-50 Series

Precision Positioning Stage
Reference Manual
(Piezo and Linear Motor Versions)

micronix USA
PRECISION MOTION SOLUTIONS

PPS-50

Piezo/Linear Motor
Precision Positioning Stage
Reference Manual

Rev 2.0

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1. Introduction

1.1 Product Description

The PPS-50 Precision Translation Stage is available in both piezo motor and linear motor configurations, addressing a wide range of nano-positioning requirements.

The piezo motor version utilizes Micronix's patented multi-phase piezo motor technology and may be configured with either a high-resolution incremental encoder or an absolute encoder, providing precise positioning performance. A high-force option is also available for applications requiring increased thrust and load capacity.

The linear motor version is designed for high-speed nano-positioning applications and is equipped with a high-resolution absolute encoder. Resolution specifications can be found in the table below.

Both PPS-50 configurations feature anti-creep crossed roller bearings for high stiffness, smooth motion, and long-term stability. The PPS-50 can be integrated with Micronix rotary, goniometer, and linear stages to create a wide range of multi-axis positioning systems.

Piezo Motor

Product Specifications	**Open Loop**	**Digital Encoder**	**Absolute Encoder**
Travel	26 -100 mm		
Max Speed	2 mm/s (MMC-100) 10 mm/s (MMC-110) 5 mm/s (NanoDrive)		
Encoder Resolution	N/A	1 nm	25 nm
Bi-directional Repeatability	N/A	50 nm	200 nm
Max Load	2 kg		
Environment	Atmospheric, HV, UHV, Non-Magnetic		

Linear Motor

Product Specifications	**Absolute Encoder**
Travel	26 -100 mm
Max Speed	300 mm/s
Encoder Resolution	25 nm
Bi-directional Repeatability	± 200 nm
Max Load	2 kg
Continuous Force	2 N*
Peak Force	5 N*
Environment	Atmospheric, HV

***CAUTION:** Force specifications assume mounting to a thermally conductive surface. Take care to dissipate heat near these operating points.

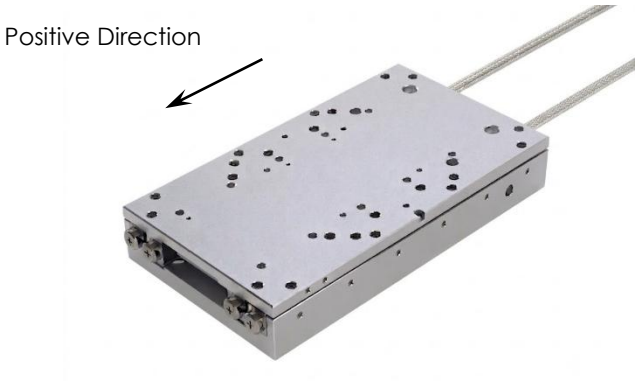


Figure 1-A. PPS-50 Linear / Piezo Motor

1.2 Recommended Controllers

The following controllers are available from MICRONIX USA:

Controller	Piezo Motor	Piezo High Force	Linear Motor	Analog Encoder	Digital Encoder	Absolute Encoder
MMC-100	✓			✓	✓	
MMC-110	✓	✓		✓	✓	✓
NanoDrive	✓		✓		✓	✓
MMX-120	✓	✓		✓	✓	✓
MMX-320			✓	✓	✓	✓

Note: Piezo High Force configuration with the MMC-110 is not available on the shortest travel option.

CAUTION: Ensure the controller is compatible with the stage's motor and feedback signals and that connector types match before connecting. Improper connections or incompatibility may cause damage to the stage or controller.

1.3 Technical Data and Ordering Information

Detailed specifications and ordering information can be found on the PPS-50 piezo motor and PPS-50 linear motor product page on the MICRONIX USA website.

2. Preparing to Install the PPS-50 Stage

2.1 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 surface. The stage's performance and structural integrity are impacted by the mounting flatness.

The stage specification is tested at a temperature of 20°C ± 5°C unless otherwise specified. Ensure the following conditions are met before operating the stage:

- Mounting surface is clean and free of debris, burrs or dings.
- Recommended mounting surface flatness is less than 25 µm for optimal performance.
- Indoor atmosphere is free of corrosive gases, excessive dust, and condensation.
- Operating temperature range of 5-40°C (extended temperature range available upon request).
- Relative humidity between 20-80%.
- The stage is located away from water, heat, and electrical noise.

2.2 Product Handling

- The PPS-50 is a precision mechanical device and should be handled with care. Do not drop or mishandle the stage.
- Do not touch the scale or ceramic track, as this will contaminate and jeopardize the performance of the stage.
- Use proper cable management to ensure a clean and safe operating environment.
- Properly connect the stage to the controller before powering on the controller. Failure to do so can result in damage to the stage.
- Allow for easy access to the stage in case of servicing.

NOTE: Piezo stages use friction-based motion with ceramic components that are sensitive to oils. Wear powder-free nitrile gloves when handling the stage to avoid contamination.

NOTE: It is possible to gently move the carriage manually without damaging the stage.

WARNING: Powerful magnets are installed in linear motor configurations. Keep magnetic hardware away when installing the stage.

WARNING: Keep hands clear of all moving parts while the stage is in motion to avoid personal injury.

2.3 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:

- PPS-50 Stage
- Reference Manual
- Any additional components specified in the order, such as a controller

3. Installing the PPS-50 Stage

Additional brackets and screws may be required for custom applications, see Section 5 for stacking configuration examples.

NOTE: Mounting the PPS-50 requires M3 low profile socket head cap screws or screws with a maximum head height of 2 mm. Use non-magnetic materials for linear motor versions.

NOTE: It is possible to gently move the carriage manually without damaging the stage.

NOTE: Stages assembled in factory do not require disassembly for base mounting.

3.1 PPS-50 Installation

3.1.1 *General Mounting*

A recommended general mounting pattern sample can be found in Section 3.2.

1. Align the stage to the mounting surface using at least two M1.5 x 4 mm dowel pins.
2. Move the carriage to access the mounting holes. Secure the stage to the mounting surface using four M3 low profile socket head cap screws at 0.5 Nm recommended torque.

CAUTION: Do not handle the stage with bare hands to avoid contaminating the scale located under the bearing rail or under the moving carriage.

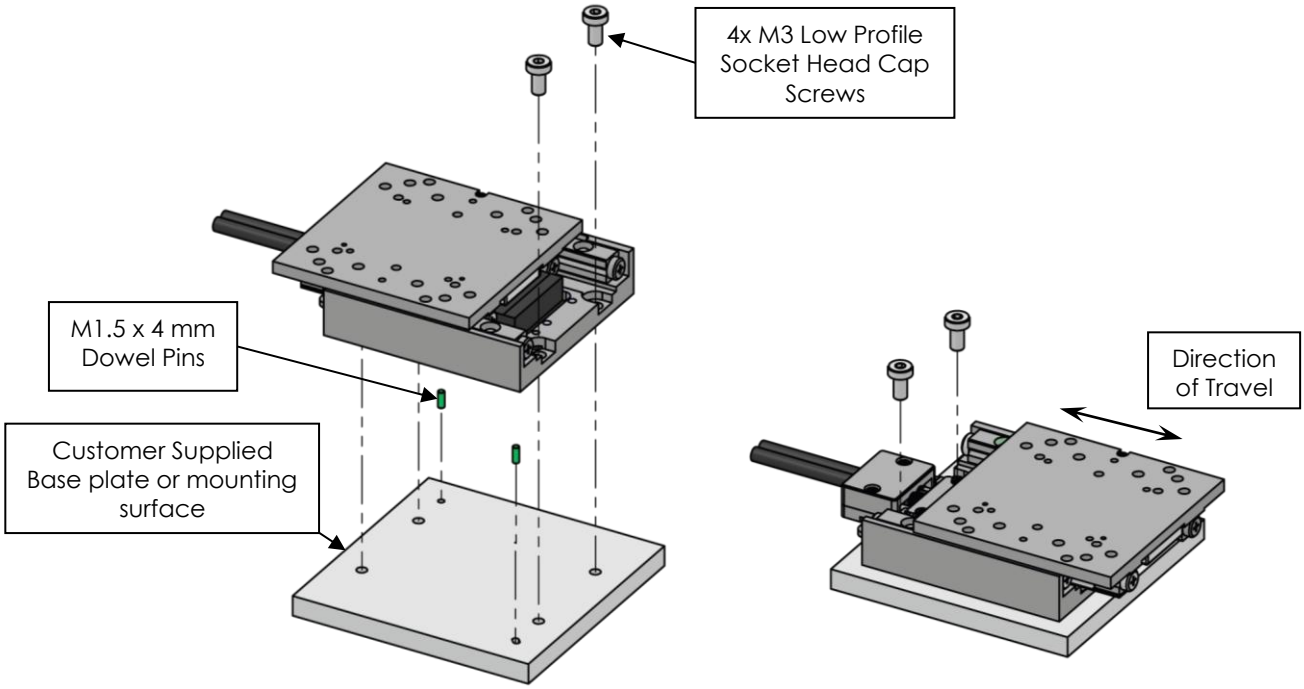


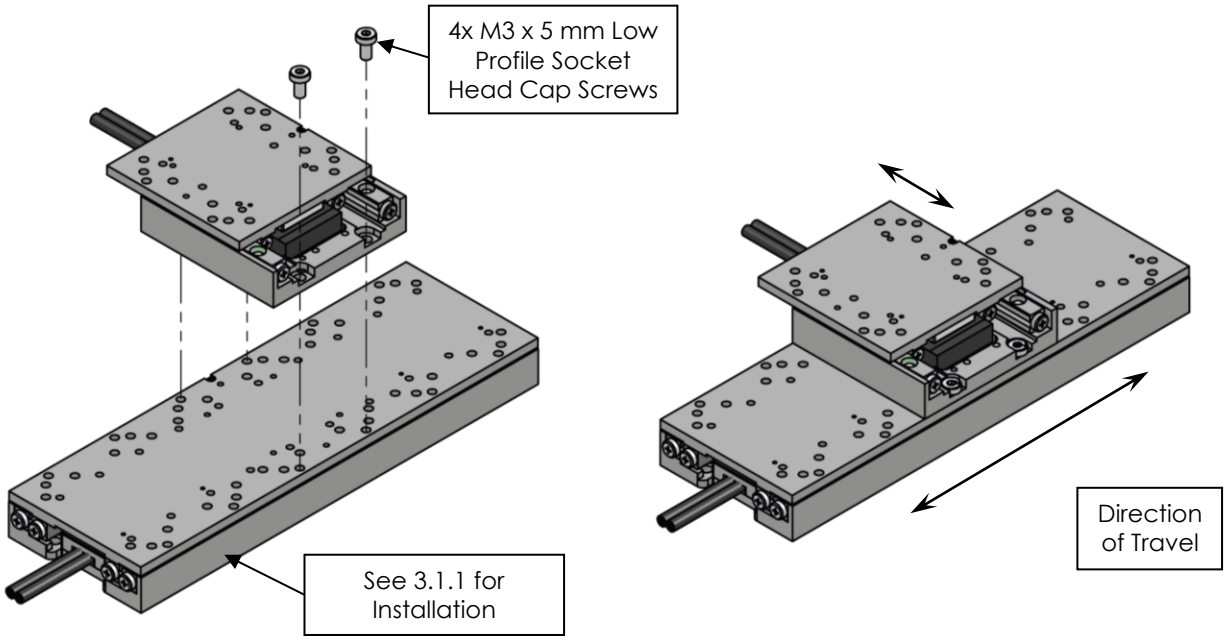
Figure 3-A. PPS-50 General Mounting Installation

3.1.2 *X-Y Mounting*

The 26 mm travel versions may be mounted directly to the carriage of any bottom-axis stage without an adapter bracket. When using longer-travel top-axis stages in an X-Y configuration, adapter bracket P/N 431687 is required.

3.1.2.1 X-Y Mounting, 26 mm Travel Configurations

1. Install the bottom stage to the mounting surface as shown in Section 3.1.1.
2. Align and secure the top stage to the bottom stage using four M3 x 5 mm low profile socket head cap screws at 0.5 Nm recommended torque.

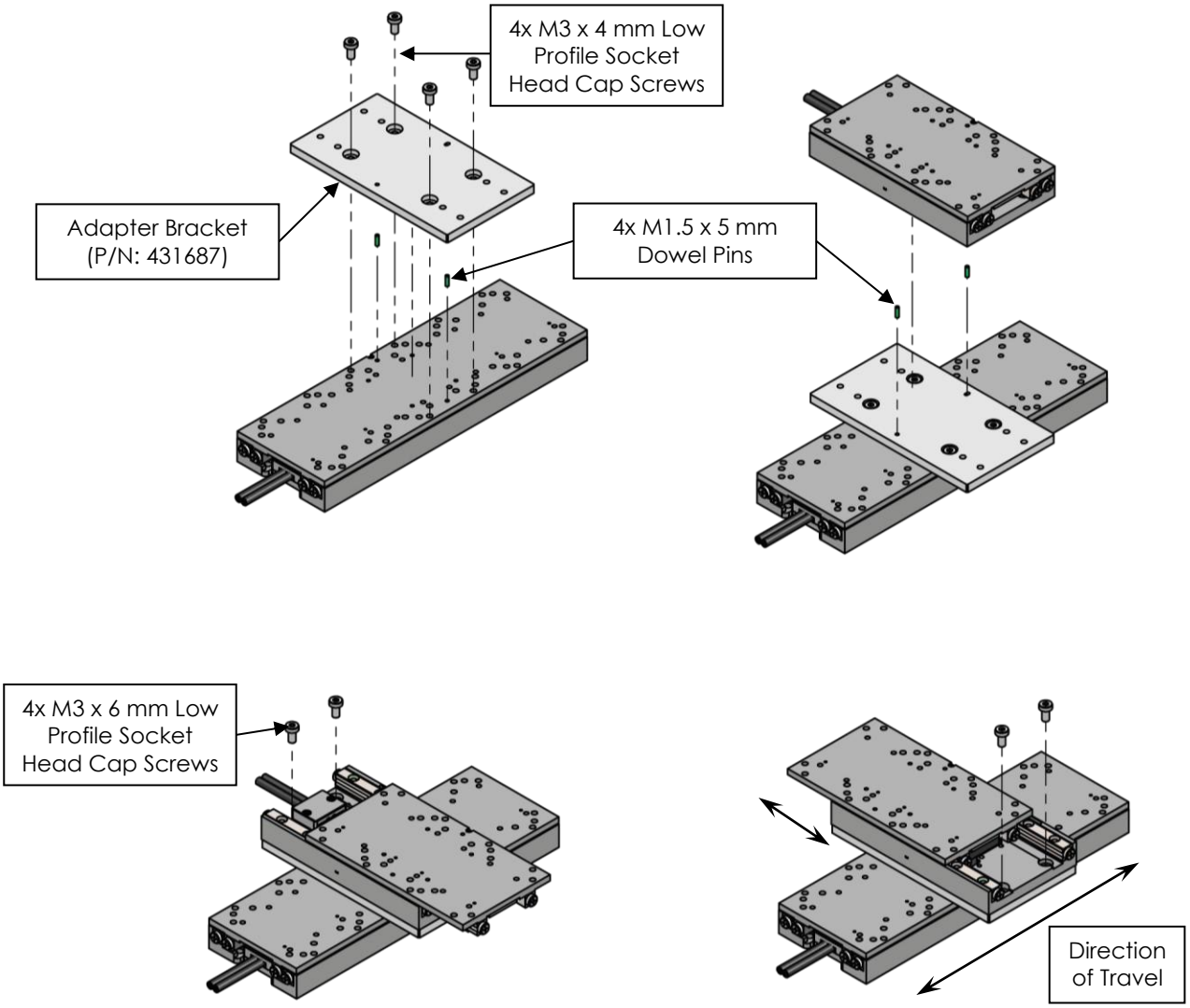


CAUTION: Do not use screws longer than specified to avoid internal damage. Screws can go a maximum of 2.5 mm into the carriage without damage.

Figure 3-B. PPS-50 XY Mounting Installation, 26mm Configuration

3.1.2.2 X-Y Mounting, 50mm, 75mm, 150mm Travel Configurations

1. Install the bottom stage to the mounting surface as shown in Section 3.1.1.
2. Align the adapter bracket (PN: 431687) to the carriage using two M1.5 x 5 mm dowel pins and secure using four M3 x 4 mm low profile socket head cap screws at 0.5 Nm recommended torque.
3. Align the stage onto the adapter bracket using two M1.5 x 5 mm dowel pins. Move the carriage to access the mounting holes and secure the using four M3 x 6 mm low profile socket head cap screws at 0.5 Nm recommended torque.

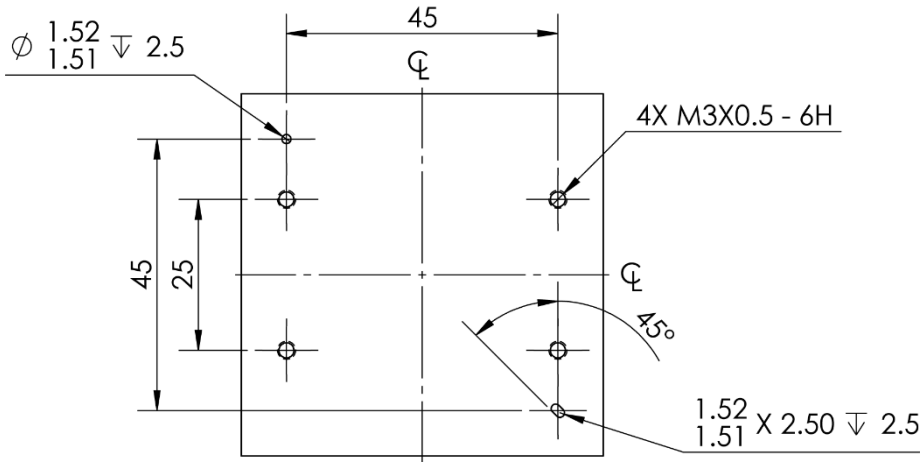


CAUTION: Do not use screws longer than specified to avoid internal damage.

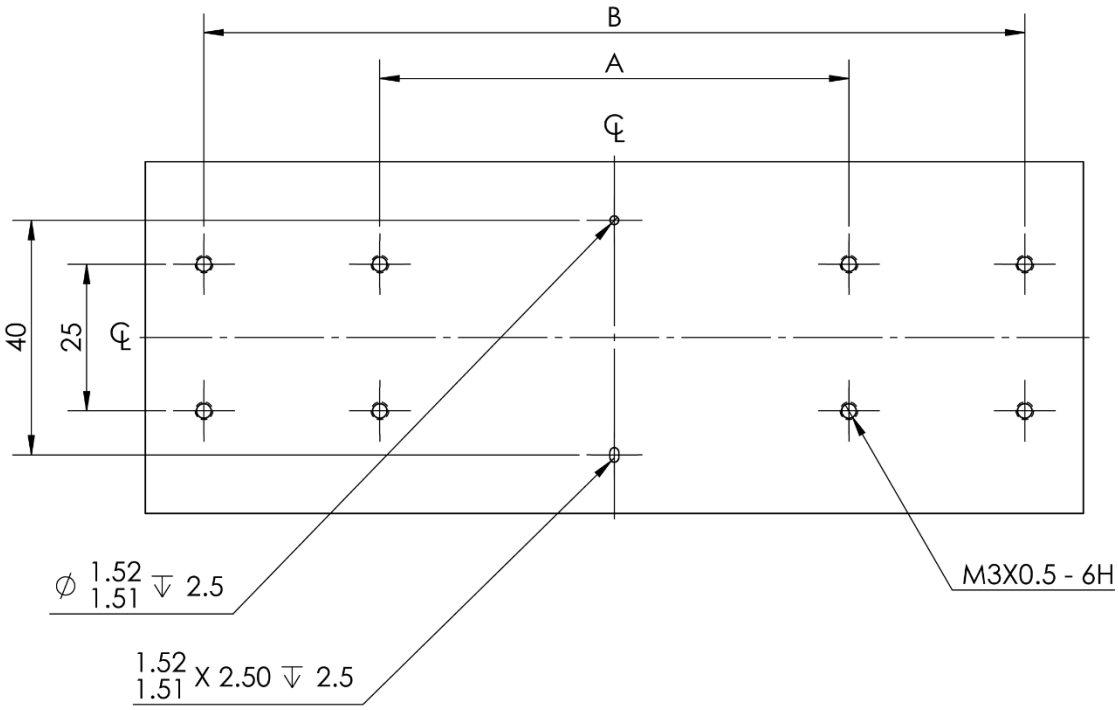
Figure 3-C. PPS-50 XY Mounting Installation, Longer Configurations

3.2 Recommended General Mounting Pattern

3.2.1 *26 mm Travel Configuration*



3.2.2 *50 mm, 75 mm, and 150 mm Travel Configurations*



TRAVEL	A	B
50	N/A	80
75	60	110
100	80	140

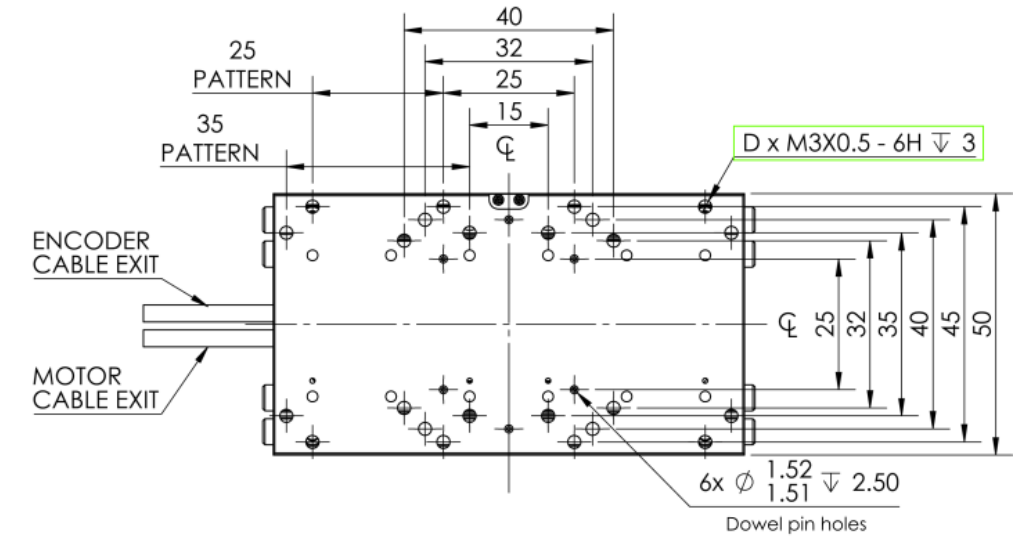
3.3 Mounting to the PPS-50

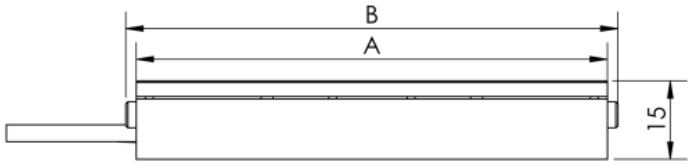
The payload mounts to the PPS-50 via the carriage on the top of the stage. The recommended specifications for mounting to the PPS-50 are found below:

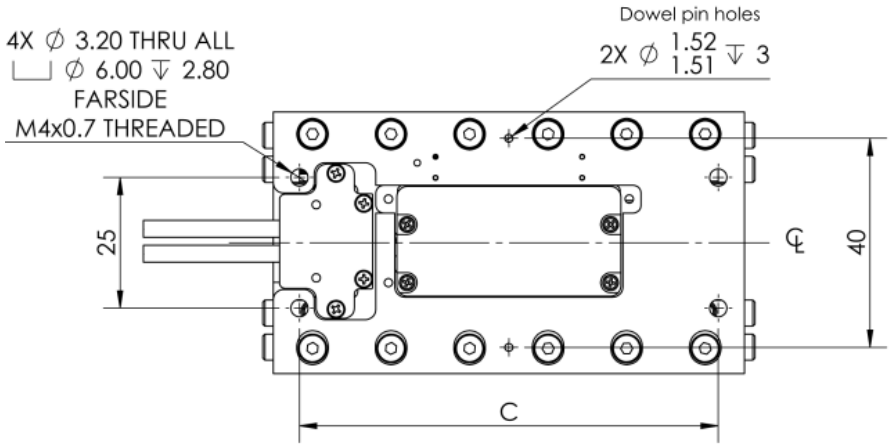
- Use M3X0.5 - 6H with a max depth of 3 mm according to the diagram in Section 4.1. Longer screws may damage the stage.
- For best performance, torque all 4 screws to 0.16 Nm.
- For best performance, the payload mating surface should have a flatness of 25 µm or better for 26 mm and 50 mm travel configurations and a flatness of 50 µm or better for 75 mm and 100 mm travel configurations.

4. Dimensions

4.1 PPS-50 Piezo/Linear Motor Standard Dimensions



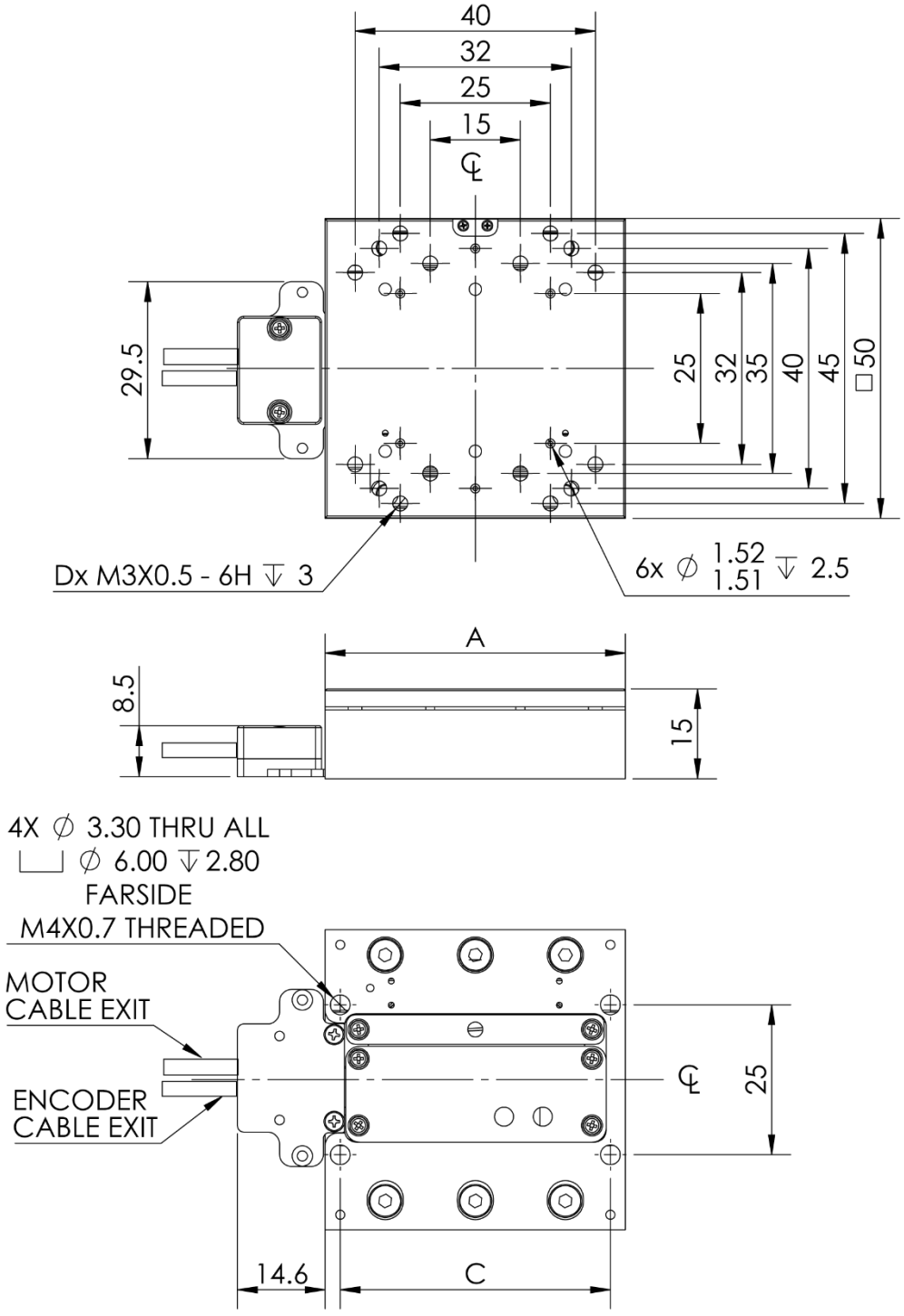




Boxed callout = mounting pattern

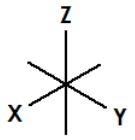
TRAVEL	A	B	C	D
26	50	50	45	16
50	90	94	80	24
75	120	124	60	24
100	150	154	80	48

4.2 PPS-50 Piezo/Linear Motor, 26mm Travel Stage Dimensions



5. Stacking Configurations

- Additional configurations are available upon request
- Images are positioned according to:



Note: Stacking compatibility applies for all motor configurations.

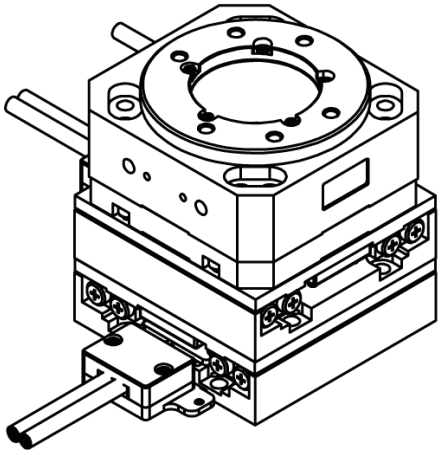
5.1 Configuration Examples

The PPS-50 short version can be mounted directly onto a range of MICRONIX stages, enabling flexible multi-axis configurations. Below are examples of stages that support direct mounting without the need for an adapter bracket.

If an adapter is required, contact MICRONIX USA for assistance.

5.1.1 *PPS-50 X-Y + PR-50, Translation and Rotation*

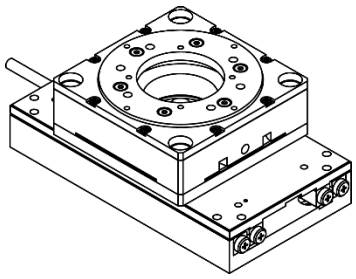
PR-50 and PR-50SM can mount directly on PPS-50 for 360° with up to 100mm travel.



PPS-50 & PR-50

5.1.2 *PPS-50 + PR-50CR, Translation and Rotation*

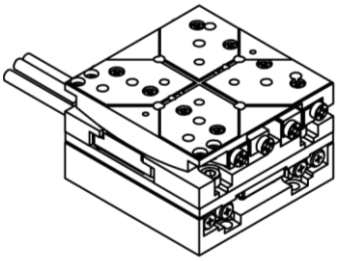
PR-50CR can mount using adapter plate 431244 on PPS-50 for 360° with up to 100mm travel.



PPS-50 & PR-50CR

5.1.3 *PPS-50 + PG-50, Translation and Tilt*

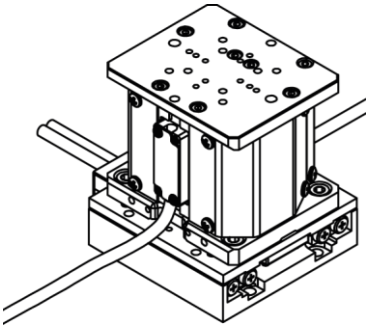
The PG-50 can mount directly on PPS-50 for angular ±5° with up to 100mm travel.



PPS-50 & PG-50

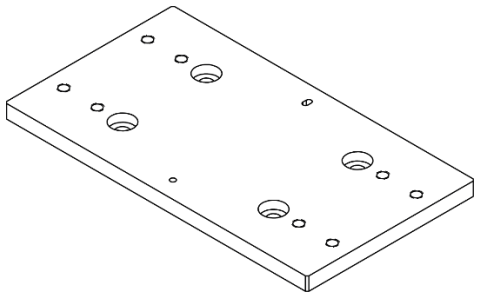
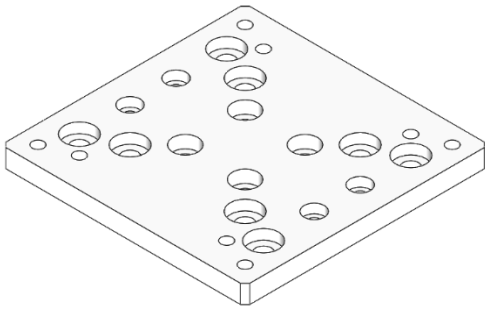
5.1.4 *PPS-50 + ES-50, Translation with Elevation*

The ES-50 and ES-50SM can mount directly on PPS-50 for lift of 10mm and up to 100mm travel.



PPS-50 & ES-50

5.2 Accessories

431687 XY-Bracket Adapter Plate	432144 PR-50CR Adapter Plate
	
Used to adapt 90mm, 120mm, and 150mm length versions of the PPS-50 to an XY configuration. For longer XY-Bracket Adapter Plates, contact MICRONIX USA.	Used to adapt the PR-50CR rotary stage to linear/elevation stages for θ-X mounting configurations.

6. Connecting the PPS-50 Stage (DSUB9 Connections)

This section provides information for connecting the DSUB9 connectors. For controller information, refer to the appropriate controller manual.

6.1 Atmospheric Environments

6.1.1 *Open Loop, Atmospheric Wiring Diagram (piezo motor only)*

See Appendix Section A.2.1.1 for piezo motor pinout information.

Cable Descriptions:
A. Motor Cable (Male D-sub 9 Pin, 1.5m PVC Black Cable)

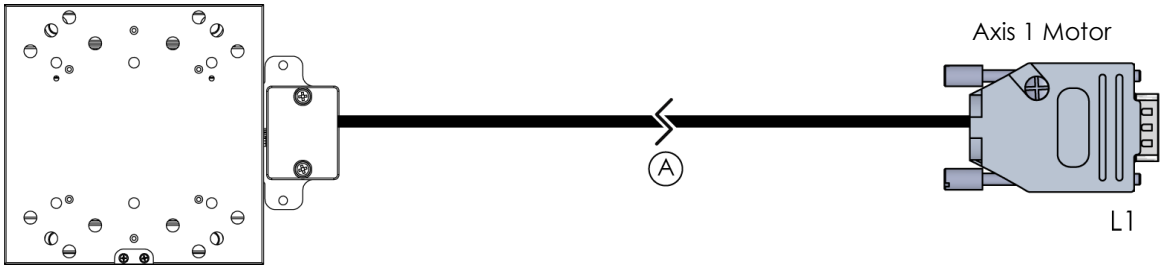
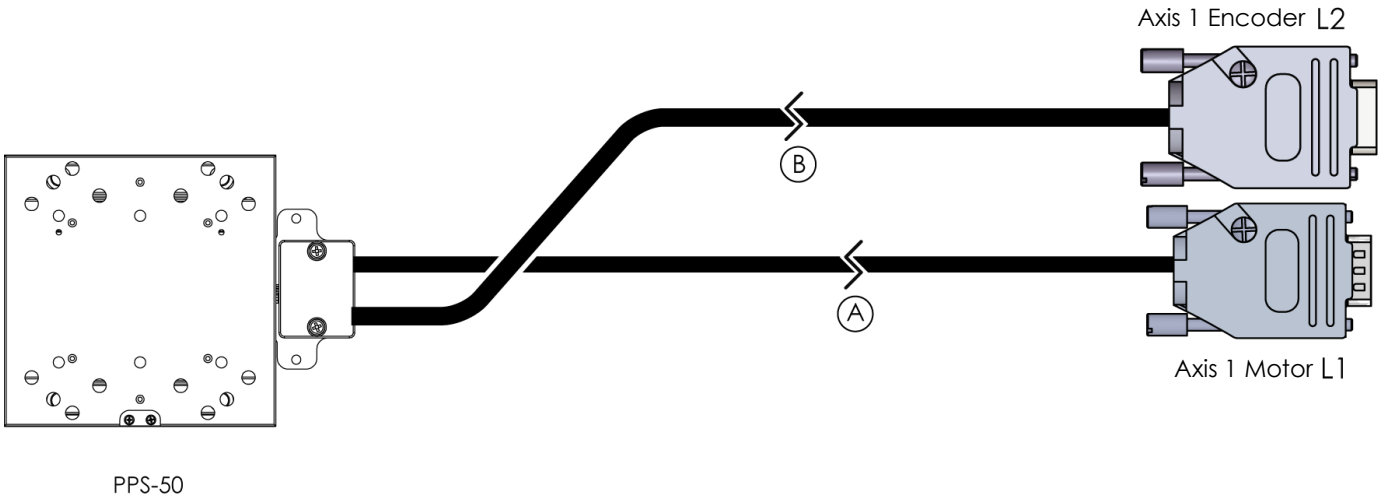


Figure 6-A. PPS-50, Open Loop, Atmospheric Wiring Diagram

6.1.2 *Closed Loop, Atmospheric Wiring Diagram*

For piezo motors, see Appendix Section A.2.1.2 and A.2.1.3 for digital pinouts and absolute pinouts, respectively. See A.2.2 for all linear motor pinouts.

Cable Descriptions:
A. Motor Cable (Male D-sub 9 Pin, 1.5m PVC Black Cable)
B. Encoder Cable (Female D-sub 9 Pin, 1.5m PVC Black Cable)



**For digital encoders, the interpolator is internal to connector*

Figure 6-B. PPS-50, Closed Loop, Atmospheric Wiring Diagram

6.2 Vacuum Environments (MMC-Controller)

6.2.1 Handling and Preparation

When handling stages configured for vacuum use, take the necessary precautions, such as wearing powder-free nitrile gloves, clean room garments, etc. to avoid any contaminants. Maximum bake-out temperature is 100°C. As standard, the stage is supplied with non-vacuum-compatible connectors. MICRONIX USA optionally offers this stage supplied with vacuum-rated connectors installed, see chart below.

Connector Description	Connector Material	Contacts	Backshell
High Vacuum Glass- filled Diallyl Phthalate D-Subminiature	DAP	T2 Female Crimps, Gold Pins (Accuglass P/N: 111652)	Nickel-plated Zinc Backshell Strain Relief
Ultra-High Vacuum D-Subminiature	PEEK	T1 Female Crimps, Gold Pins (Accuglass P/N: 100180)	PEEK UHV Strain Relief

Environment	Open Loop	Closed Loop
High Vacuum (10^{-6} mbar)	9 Pin Female DAP	15 Pin Female DAP
Ultra-High Vacuum (10^{-9} mbar)	9 Pin Female PEEK	15 Pin Female PEEK

Connecting the PPS-50 in a vacuum chamber requires the use of a feedthrough connector at the vacuum chamber wall. For final application, the customer is responsible for providing their own feedthrough connection.

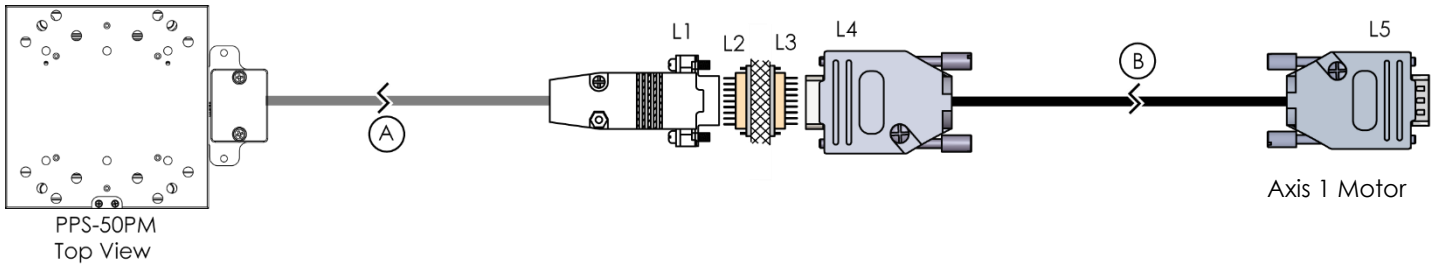
The vacuum compatible PPS-50 will be supplied with wiring for a straight through feedthrough, not a cross over gender changer. MICRONIX USA supplies test connectors that simulate the vacuum feedthrough, to allow for functionality testing prior to installation in a vacuum chamber. See Appendix A.4 for feedthrough pins.

Note: Linear motor versions are not available for ultra-high vacuum environments.

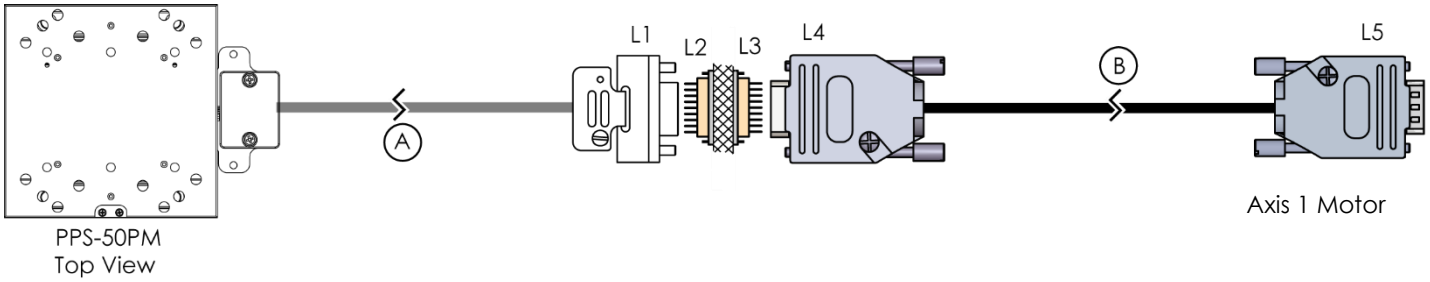
6.2.2 *Open Loop, Vacuum Wiring Diagram*

See Appendix Section A.2.1.4 for piezo motor pinout information.

Cable Descriptions:
A. Vacuum Motor Cable (Female D-sub 9 Pin PEEK or DAP, 1.5m Silver Braided Cable)
B. Atmospheric Motor Breakout Cable (Female D-sub 9 Pin to Male D-sub 9 Pin, 1.5m PVC Black Cable)



HV Connector



UHV Connector

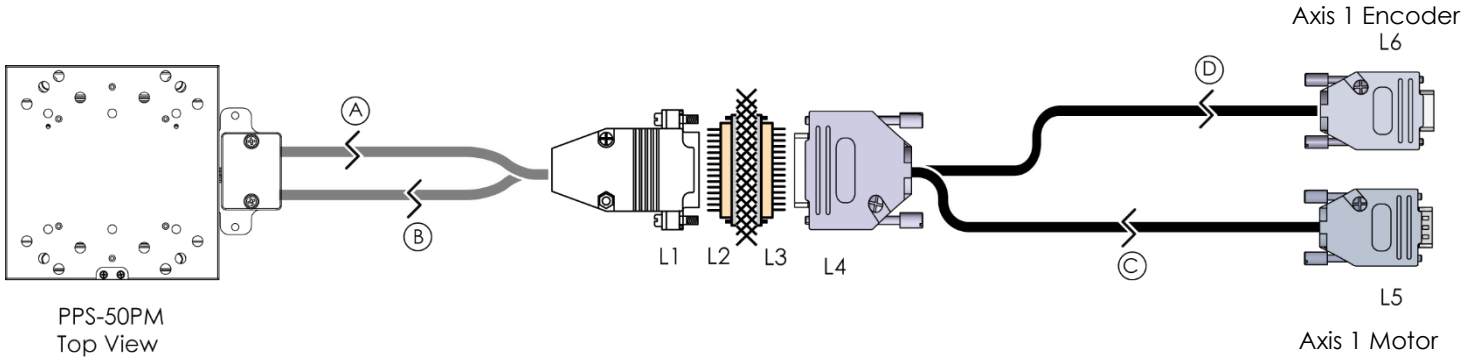
Figure 6-C. PPS-50, Open Loop, Vacuum Wiring Diagram

6.2.3 *Closed Loop, Vacuum Wiring Diagram*

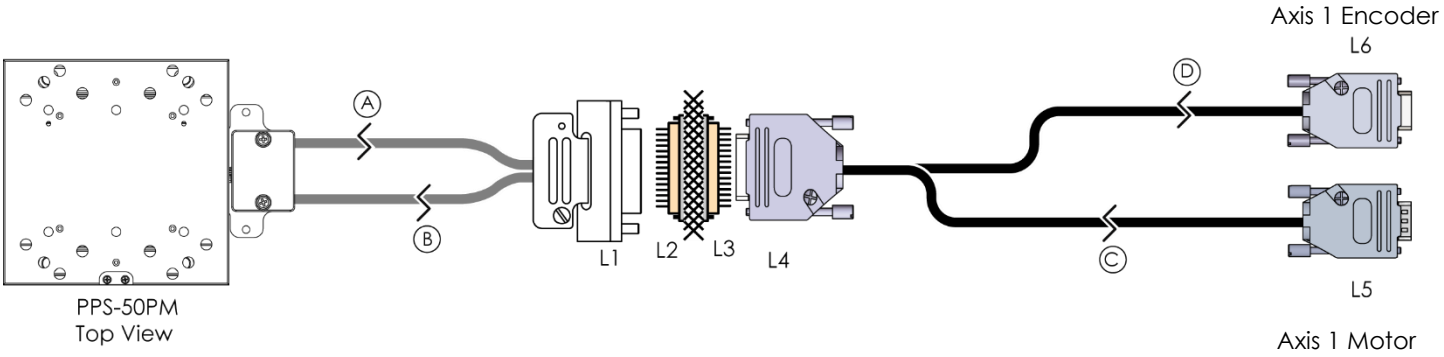
For piezo motors, see Appendix Section A.2.1.5 and A.2.1.6 digital pinouts and absolute pinouts, respectively. See Section A.2.2.2 for linear motor absolute pinouts.

Cable Descriptions:

A. Vacuum Motor Cable (Female D-sub 15 Pin PEEK Connector, 1.5m Silver Braided Cable)
B. Vacuum Encoder Cable (Female D-sub 15 Pin PEEK Connector, 1.5m Silver Braided Cable)
C. Atmospheric Motor Breakout Cable (Female D-sub 15 Pin to Male D-sub 9 Pin, 1.5m PVC Black Cable)
D. Atmospheric Encoder Breakout Cable (Female D-sub 15 Pin to Female D-sub 9 Pin, 1.5m PVC Black Cable)



HV Connector



UHV Connector

**For digital encoders, the interpolator is internal to connector*

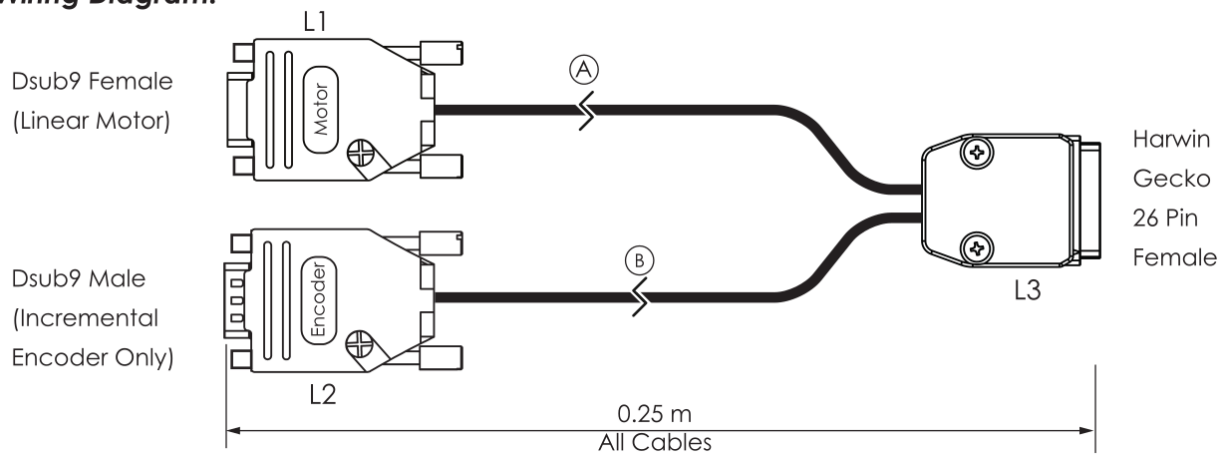
**UHV linear motor configuration not available*

Figure 6-D. PPS-50, Closed Loop, Vacuum Wiring Diagram

6.3 Connecting to the NanoDrive

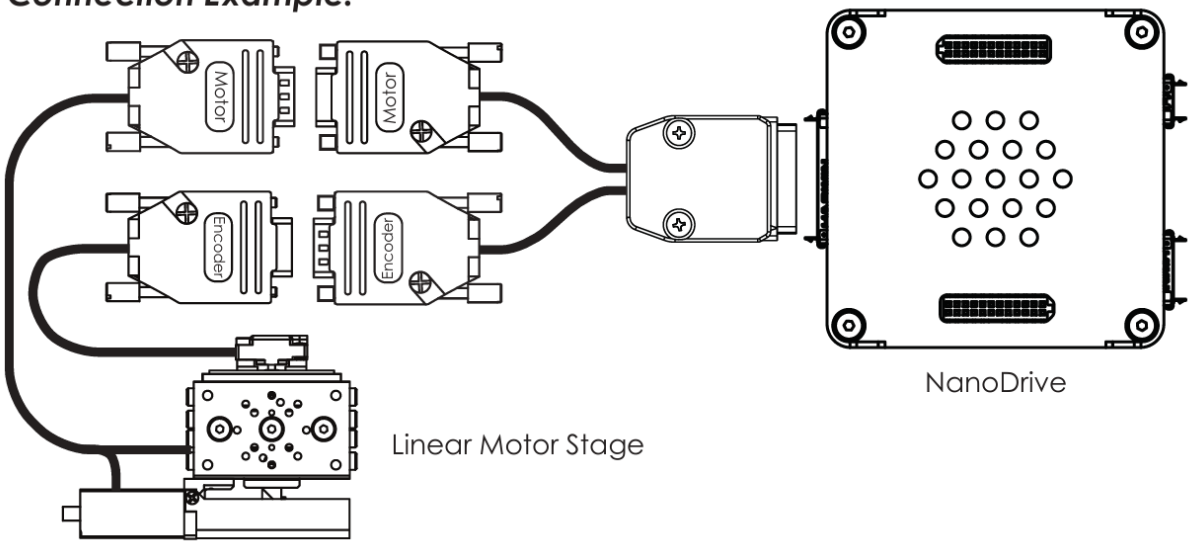
If using a Micronix NanoDrive, Micronix will provide an adapter cable with the appropriate connectors (see following section for cable dimensions); contact Micronix for additional lengths or connector options. See Appendix Section A.2.2.3 and Section A.2.2.4 for pinout specifications.

Wiring Diagram:



NanoDrive Adapter Cable

Connection Example:



Connection Between Linear Motor Stage and NanoDrive. For reference only.

7. Supplementary Information

7.1 Maintenance

The PPS-50 series of modular linear stages utilizes a maintenance free design. Do not modify the stage or perform any maintenance unless specifically instructed to do so by MICRONIX USA personnel. If the stage is not performing up to the original specifications, please contact MICRONIX USA.

7.2 Units and Conversions

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

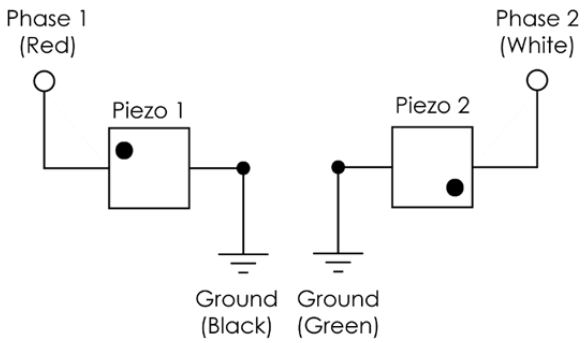
Metric Unit	English Unit
1 millimeter	0.0394 inches
1 micron	0.0000394 inches
1 Newton	0.2248 lbs
1 Newton-meter	8.85 in-lbs

Appendix

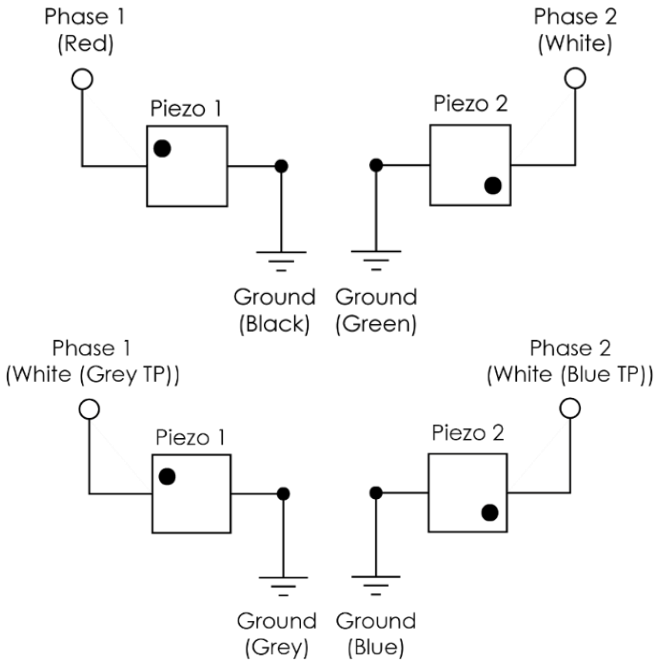
A.1 Motor Specifications

A.1.1 *Piezo Motor*

A.1.1.1 2 Phase Piezo Motor Wiring Diagram



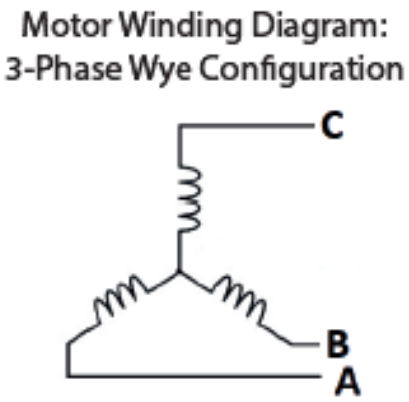
A.1.1.2 4 Phase (High Force) Piezo Motor Wiring Diagrams



A.1.1.3 Piezo Operating and Electrical Specifications

Voltage	60V maximum
Capacitance	150nf ±15%

A.1.2 BLDC Motor Operating and Electrical Specifications



Linear Motor Type	Brushless DC (Ironless)
Winding Type	Wye
Continuous Force	2 N
Continuous Current	1.72 A_{rms}
Peak Force	5 N
Peak Current	4.31 A_{rms}
Force Constant (K_f)	1.16 N / A_{rms}
Back EMF (K_e)	1.0 V-sec/m
Resistance (Line-to-Line) 25°C	2.8 Ohms
Inductance (Line-to-Line)	0.25 mH
Magnetic Pitch (N-N)	12.49mm

CAUTION: Continuous current specification assumes mounting to a thermally conductive surface. Take care to dissipate heat when running continuously.

A.2 Wiring Pinouts

A.2.1 Piezo Motor

A.2.1.1 Piezo Motor, Atmospheric, Open Loop Pinout

See Figure 6-A.

Pinout for PPS-50-1X000/-5X000 — Cable A D-sub 9M

	Description	Color	L1
Motor	Motor 1, Phase 1	Red	1
	Motor 1, Phase 2	White (Green TP)	2
	Motor 2*, Phase 1	White (Grey TP)	3
	Motor 2*, Phase 2	White (Blue TP)	4
	Motor 1, Ground	Black/Green	5
	Motor 2*, Ground	Grey/Blue	5
	Shield	-	Casing

* Greyed out rows are for High Force Piezo option

A.2.1.2 Piezo Motor, Atmospheric, Closed Loop, Digital Pinout

See Figure 6-B.

Pinout for PPS-50-1X300/-5X300 — Cable A D-sub 9M

	Description	Color	L1
Motor	Motor 1, Phase 1	Red	1
	Motor 1, Phase 2	White (Green TP)	2
	Motor 2*, Phase 1	White (Grey TP)	3
	Motor 2*, Phase 2	White (Blue TP)	4
	Motor 1, Ground	Black/Green	5
	Motor 2*, Ground	Grey/Blue	5
	Shield	-	Casing

*Greyed out rows are for High Force Piezo option

Cable B D-sub 9F

	Description	Color	L2
Encoder	A +	Brown	1
	B +	Blue	2
	Index+	Violet	3
	GND	Grey	4
	+5V	White (Grey TP)	5
	A -	White (Brown TP)	6
	B -	White (Blue TP)	7
	Index-	White (Violet TP)	8
	Shield	-	Casing

A.2.1.3 Piezo Motor, Atmospheric, Closed Loop, Absolute Pinout

See Figure 6-B.

Pinout for PPS-50-1X500/-5X500 — Cable A D-sub 9M

	Description	Color	L1
Motor	Motor 1, Phase 1	Red	1
	Motor 1, Phase 2	White (Green TP)	2
	Motor 2*, Phase 1	White (Grey TP)	3
	Motor 2*, Phase 2	White (Blue TP)	4
	Motor 1, Ground	Black/Green	5
	Motor 2*, Ground	Grey/Blue	5
	Shield	-	Casing

*Greyed out rows are for High Force Piezo option

Cable B D-sub 9F

	Description	Color	L2
Encoder	SLO+ /DATA+	Blue	1
	MA+ / CLK+	Brown	2
	SLI+	Violet	3
	GND	Grey	4
	+5V	White (Grey TP)	5
	SLO- / DATA-	White (Blue TP)	6
	MA- / CLK-	White (Brown TP)	7
	SLI-	White (Violet TP)	8
	Shield	-	Casing

*SLI+/SLI- signals available upon request

A.2.1.4 Piezo Motor, Vacuum, Open Loop Pinout

See Figure 6-C.

	Pinout for PPS-50-1X006/9 or -5X006/9		Cable A D-sub 9F	Feedthrough D-sub 9M			Cable B D-sub 9F	Cable B D-sub 9M
	Description	**Color**	**L1**	**L2**	**L3**	**Color**	**L4**	**L5**
Motor	Motor 1, Phase 1	Red	5	5	1	Red	1	1
	Motor 1, Phase 2	White (Green TP)	4	4	2	White (Green TP)	2	2
	Motor 2*, Phase 1	White (Grey TP)	3	3	3	White (Grey TP)	3	3
	Motor 2*, Phase 2	White (Blue TP)	2	2	4	White (Blue TP)	4	4
	Motor 1, Ground	Black/Green	1	1	5	Black/Green	5	5
	Motor 2*, Ground	Grey/Blue	1	1	5	Grey/Blue	5	5
	Shield	-	6	6	9	-	9	Casing

* Greyed out rows are for High Force Piezo option

A.2.1.5 Piezo Motor, Vacuum, Closed Loop, Digital Pinout

See Figure 6-D.

	Pinout for PPS-50-1X306/9 or -5X306/9		Cable A&B D-sub 15F	Feedthrough D-sub 15M			D-sub 15F	Cable C D-sub 9M	Cable D D-sub 9F
	Description	**Color**	**L1**	**L2**	**L3**	**Color**	**L4**	**L5**	**L6**
MOTOR A & C	Motor 1, Phase 1	Red	1	1	8	Red	8	1	-
	Motor 1, Phase 2	White (Green TP)	2	2	7	White (Green TP)	7	2	-
	Motor 2*, Phase 1	Black/Green	9	9	15	Black/Green	15	5	-
	Motor 2*, Phase 2	White (Grey TP)	3	3	6	White (Grey TP)	6	3	-
	Motor 1, Ground	White (Blue TP)	11	11	13	White (Blue TP)	13	4	-
	Motor 2*, Ground	Grey/Blue	9	9	15	Grey/Blue	15	5	-
	Shield	-	10	10	14	-	14	Casing	-
Encoder B & D	Encoder GND	White	8	8	1	Grey	1	-	4
	A+	Red	7	7	2	Brown	2	-	1
	+5V	Brown	6	6	3	White (Grey TP)	3	-	5
	A-	Blue	5	5	4	White (Brown TP)	4	-	6
	B+	Yellow	4	4	5	Blue	5	-	2
	B-	Green	12	12	12	White (Blue TP)	12	-	7
	Index-	Grey	13	13	11	White (Violet TP)	11	-	8
	Index+	Violet	14	14	10	Violet	10	-	3
	Encoder Shield	-	15	15	9	-	9	-	Casing

* Greyed out rows are for High Force Piezo option

A.2.1.6 Piezo Motor, Vacuum, Closed Loop, Absolute Pinout

See Figure 6-D.

	Pinout for PPS-50-1X506/9 or -5X506/9		Cable A&B D-sub 15F	Feedthrough D-sub 15M			D-sub 15F	Cable C D-sub 9M	Cable D D-sub 9F
	Description	**Color**	**L1**	**L2**	**L3**	**Color**	**L4**	**L5**	**L6**
MOTOR A & C	Motor 1, Phase 1	Red	1	1	8	Red	8	1	-
	Motor 1, Phase 2	White (Green TP)	2	2	7	White (Green TP)	7	2	-
	Motor 2*, Phase 1	Black/Green	9	9	15	Black/Green	15	5	-
	Motor 2*, Phase 2	White (Grey TP)	3	3	6	White (Grey TP)	6	3	-
	Motor 1, Ground	White (Blue TP)	11	11	13	White (Blue TP)	13	4	-
	Motor 2*, Ground	Grey/Blue	9	9	15	Grey/Blue	15	5	-
	Shield	-	10	10	14	-	14	Casing	-
Encoder B & D	GND	Grey	8	8	1	Grey	1	-	4
	SLO+ / DATA+	Blue	7	7	2	Blue	2	-	1
	+5V	White (Grey TP)	6	6	3	White (Grey TP)	3	-	5
	SLO- / DATA-	White (Blue TP)	5	5	4	White (Blue TP)	4	-	6
	MA+ / CLK+	Brown	4	4	5	Brown	5	-	2
	MA- / CLK-	White (Brown TP)	12	12	12	White (Brown TP)	12	-	7
	SLI-	White (Violet TP)	13	13	11	White (Violet TP)	11	-	8
	SLI+	Violet	14	14	10	Violet	10	-	3
	Shield	-	15	15	9	-	9	-	Casing

*SLI+/SLI- signals available upon request

* Greyed out rows are for High Force Piezo option

A.2.2 Linear Motor

A.2.2.1 Linear Motor, Atmospheric, Closed Loop

See Figure 6-B.

Pinout for PPS-50-3X510

Motor

Description	Color	Cable A D-sub 9M L1
Motor Phase A	Black	1
Motor Phase B	Red	2
Motor Phase C	White	3
Limit Switch+	Violet	6
Limit Switch-	White (Violet TP)	7
Limit +5V	White (Grey TP)	8
Limit GND	Grey	9
Motor Shield	-	Casing

Encoder

Description	Color	Cable B D-sub 9F L2
SLO+ /DATA+	Blue	1
MA+ / CLK+	Brown	2
SLI+	Violet	3
GND	Grey	4
+5V	White (Grey TP)	5
SLO- / DATA-	White (Blue TP)	6
MA- / CLK-	White (Brown TP)	7
SLI-	White (Violet TP)	8
Shield	-	Casing

*SLI+/SLI- signals available upon request

A.2.2.2 Linear Motor, Vacuum, Closed Loop

See Figure 6-D.

Pinout for PPS-50-3X506

	Description	Color	Cable A&B D-sub 15F L1	Feedthrough D-sub 15M L2	Feedthrough D-sub 15M L3	Color	D-sub 15F L4	Cable C D-sub 9M L5	Cable D D-sub 9F L6
MOTOR A & C	Motor Phase A	Black	1	1	8	Brown (White TP)	8	1	-
	Motor Phase B	Red	2	2	7	Violet (White TP)	7	2	-
	Motor Phase C	White	9	9	15	Green (White TP)	15	3	-
	Limit Switch+	Violet	3	3	6	White (Grey TP)	6	6	-
	Limit Switch-	White (Violet TP)	11	11	13	White (Blue TP)	13	7	-
	Limit +5V	White (Grey TP)	6	6	3	White (Grey TP)	3	8	-
	Limit GND	Grey	8	8	1	Grey	1	9	-
	Motor Shield	-	10	10	14	-	14	Casing	
Encoder B & D	GND	Grey	8	8	1	Grey	1	-	4
	SLO+ / DATA+	Blue	7	7	2	Blue	2	-	1
	+5V	White (Grey TP)	6	6	3	White (Grey TP)	3	-	5
	SLO- / DATA-	White (Blue TP)	5	5	4	White (Blue TP)	4	-	6
	MA+ / CLK+	Brown	4	4	5	Brown	5	-	2
	MA- / CLK-	White (Brown TP)	12	12	12	White (Brown TP)	12	-	7
	SLI-	White (Violet TP)	13	13	11	White (Violet TP)	11	-	8
	SLI+	Violet	14	14	10	Violet	10	-	3
	Shield	-	15	15	9	-	9	-	Casing

*SLI+/SLI- signals available upon request

A.2.2.3 Linear Motor, Gecko Connection, Absolute Encoder

			Female Dsub9	Male Dsub9	26 Female H.Gecko
	Description	**Color**	**L1**	**L2**	**L3**
MOTOR Cable A	Motor A+ / U	Brown	1	-	13
		White (Brown TP)	1	-	12
	Motor B+ / W	Blue	3	-	26
		White (Blue TP)	3	-	25
	Motor A- / V	Violet	2	-	11
		White (Violet TP)	2	-	10
	Motor B-	White (Grey TP)	4	-	24
	Motor Ground	Grey	5	-	23
	Limit Switch +	Green	6	-	9
	Limit Switch -	White (Green TP)	7	-	22
	Limit +5V	Red	8	-	7
	Limit GND	Black	9	-	20
	Motor Shield	-	Casing	-	23
Absolute Encoder Cable B	SLO+/Data+	Blue	-	1	3
	SLO-/Data-	White (Blue TP)	-	6	16
	CLK+/MA+	Brown	-	2	2
	CLK-/MA-	White (Brown TP)	-	7	15
	SLI+	Violet	-	3	1
	SLI-	White (Violet TP)	-	8	14
	GND	Black	-	4	20
	+5VDC	Red	-	5	7
	Encoder Shield	-	-	Casing	23

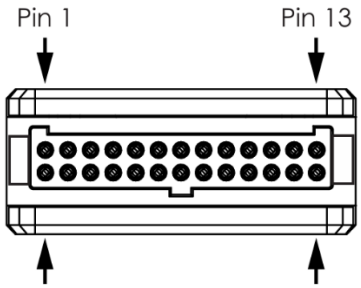
*SLI+/SLI- signals available upon request

A.2.2.4 Linear Motor, Gecko Connection, Incremental Encoder

			Female Dsub9	Male Dsub9	26 Female H.Gecko
	Description	**Color**	**L1**	**L2**	**L3**
MOTOR Cable A	Motor A+ / U	Brown	1	-	13
		White (Brown TP)	1	-	12
	Motor B+ / W	Blue	3	-	26
		White (Blue TP)	3	-	25
	Motor A- / V	Violet	2	-	11
		White (Violet TP)	2	-	10
	Motor B-	White (Grey TP)	4	-	24
	Motor Ground	Grey	5	-	23
	Limit Switch+	Green	6	-	9
	Limit Switch-	White (Green TP)	7	-	22
	Limit +5V	Red	8	-	7
	Limit GND	Black	9	-	20
	Motor Shield	-	Casing	-	23
Incremental Encoder Cable B	A+	Brown	-	1	6
	A-	White (Brown TP)	-	6	19
	B+	Blue	-	2	5
	B-	White (Blue TP)	-	7	18
	Index+	Violet	-	3	4
	Index-	White (Violet TP)	-	8	17
	GND	Black	-	4	20
	+5VDC	Red	-	5	7
	Encoder Shield	-	-	Casing	20

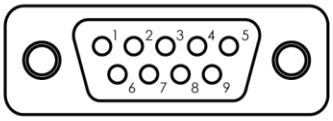
A.3 Connector Pinouts

A.3.1 Gecko Connector Pinout

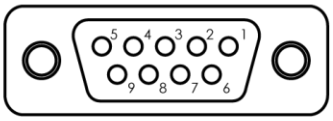


Harwin Gecko - 26 Pin
Female Front View

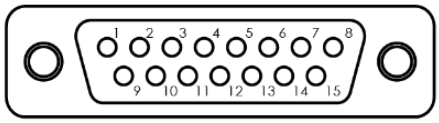
A.3.2 D-sub Connector Pinout



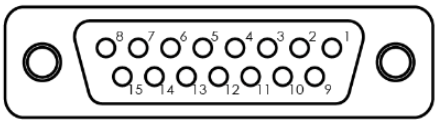
Male Dsub9 Connector (Dsub9M) - Front View



Female Dsub9 Connector (Dsub9F) - Front View



Male Dsub15 Connector (Dsub-15M) - Front View

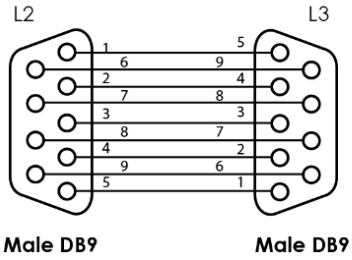


Female Dsub15 Connector (Dsub-15F) - Front View

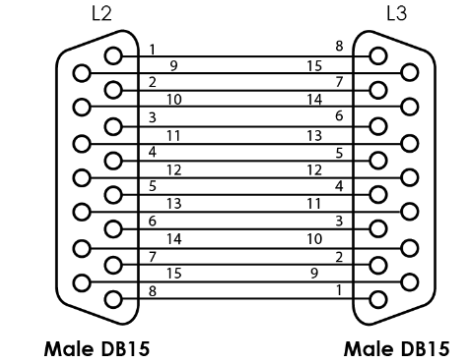
A.4 Vacuum Feedthrough Pinout

Recommended feedthrough pinout based on off the shelf feedthroughs.

Straight Through 9-Pin Feed-through



Straight Through 15-Pin Feed-through



A.5 Using the Digital Encoder

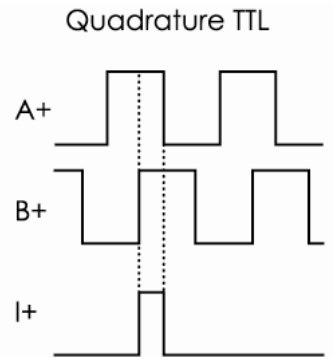
A.5.1 Encoder Overview

The PPS-50 with Digital Encoder must be paired with an appropriate controller. The PPS-50 with a digital encoder will be supplied with a 9-pin connector that incorporates these encoder signals.

A.5.2 Operating and Electrical Specifications

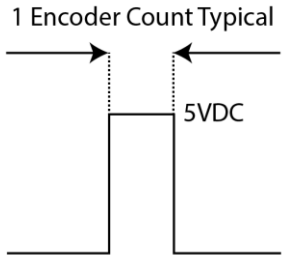
Power Supply	5VDC ±10% @ < 35mA (No outputs terminated) @ < 85mA (A, B, I, and both limits terminated); 50mA at the sensor

A.5.4.1 Output Signals



***Note:** The index pulse may be aligned with A- or B- at some interpolation values.

A.5.4.2 Index Window



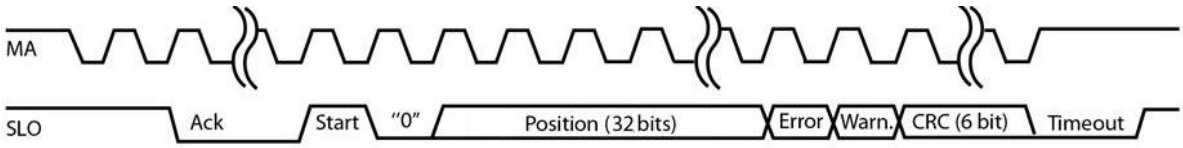
A.5.5 Resolution

A resolution of 1 nm is achievable with a Micronix controller. The digital encoder module interpolates to a higher resolution as specified in the order. All closed loop stages are supplied with 20µm scales.

A.6 Using an Absolute Encoder

A.6.1 Encoder Overview

The Micronix absolute encoder operates using standard BiSS C-mode (continuous) interface, transmitting 32-bits of position data on each request. The controller will clock position acquisitions via the MA signal. The SLO signal will transmit position data from the encoder.



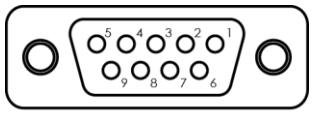
A.6.2 Operating and Electrical Specifications

Power Supply	5VDC ±10% (< 30mA for sensor)

A.6.7.1 Absolute Encoder Pinout

Pin	Description
1	SLO+ / DATA+
2	MA+ / CLK+
3	SLI+
4	Ground
5	+5V
6	SLO- / DATA-
7	MA- / CLK-
8	SLI-
9	Not In Use

*SLI+/SLI- signals available upon request



Dsub9F - Front View
9 Pin Female Connector

A.6.7.2 Absolute Encoder Setup

Absolute Encoder BiSS-C	
Absolute Resolution	32 Bits
Encoder BiSS Frequency	5 MHz
Encoder BiSS CRC Polynomial	0
Position Integer Type	Unsigned
Number of Status Bits	0
Error Bits Mask	0
CRC Error Suppression	None
Data Alignment	Left Justified

A.6.8 Resolution

Absolute encoder with a Micronix controller has an achievable resolution of 25nm.

A.7 Limit Switches

A.7.1 Magnetic Limit Switches (Hall Effect)

Hall Effect transistor switches are activated in the presence of a magnetic field. These switches feature a highly repeatable operation, remote sensing non-contact operation, broad temperature range (-40 to +150°C), and exceptionally long life.

The hall effect limit switches are factory calibrated to ensure advertised travel length and cannot be adjusted by the customer.

A.7.1.1 Switch Specifications

Supply Voltage	3 – 12 VDC
Supply Current	< 5 mA
Output Configuration	Open Collector
Max Sink Current	20 mA
Contact Rating	100 mA @ 30V
Contact Type	Open Collector (NPN)

A.7.1.2 Switch Schematic