

MP-21

Series



Linear Actuator Reference Manual

MP-21

Linear Actuator

Reference Manual

Rev 3.07

MICRONIX USA, LLC
Tel: 949-480-0538
Fax: 949-480-0538
Email: info@micronixusa.com
<http://micronixusa.com>

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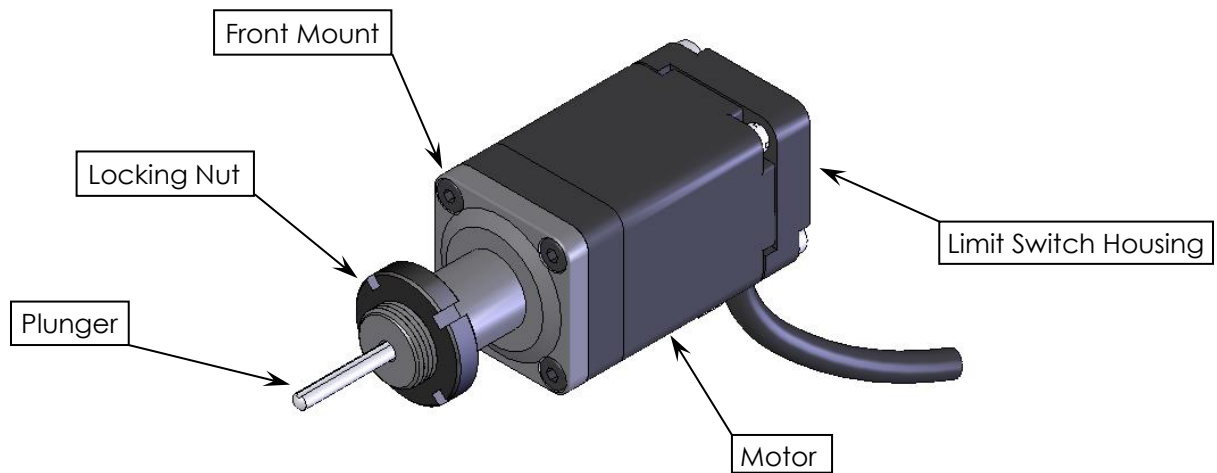
1. Introduction

1.1 Product Description

The MP-21 Linear actuator is designed for applications with very limited space conditions, due to its compact size and travel range of up to 25 mm. Typical applications include actuation of manual drive stages and mirror mounts. Precise positioning is achieved through use of a stepper motor and limit switch. Aluminum construction provides for a rigid housing while reducing weight. The MP-21 is ideally suited for motorization of micro-meter replacement on manual stages or mirror mounts. Versions capable of operation in vacuum (10^{-6} mbar) are available.

Features:

- Travel range of 12 and 25 mm
- Maximum speed 5 mm/sec
- Integrated mechanical limit switch
- Maximum force of 20 N



1.2 Recommended Controllers

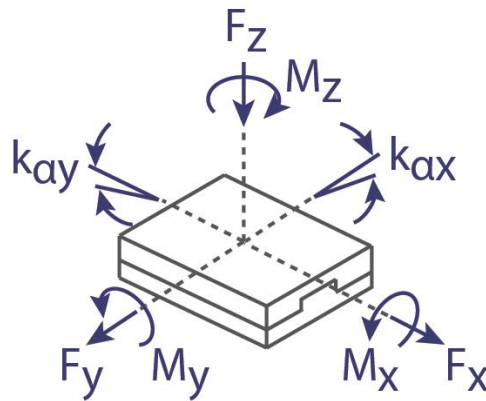
The following controllers are available from MICRONIX USA:

- MMC-200

1.3 Technical Data

Motor	SM-001
Pitch (mm)	0.5
Speed Max. (mm/sec)	5
Resolution Calculated (μm)	2.5 (Full Step)
Resolution Typical (μm)	0.1
Bi-directional Repeatability (μm)	± 0.5
Uni-directional Repeatability (μm)	0.4

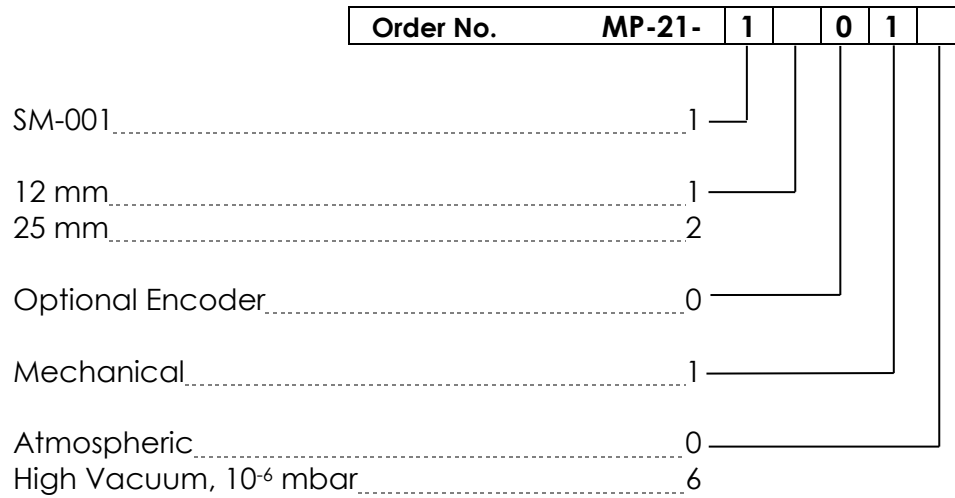
1.4 Load Characteristics



Load Characteristics	$F_{X(N)}$	$F_{Y(N)}$	$F_{Z(N)}$	$M_{X(Nm)}$	$M_{Y(Nm)}$	$M_{Z(Nm)}$	k_{ax} [$\mu\text{rad/Nm}$]	k_{ay} [$\mu\text{rad/Nm}$]
SM-001	20	0	0	-	-	-	-	-

2. Model Configurations

2.1 MP-21 Order Numbers



Contact MICRONIX USA for custom versions and stacking configurations.

3. Preparing to Install the MP-21

3.1 **Installation Preparation**

The actuator is calibrated and guaranteed to be within specification at 20°C ±5°C. Be sure to use the actuator 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:

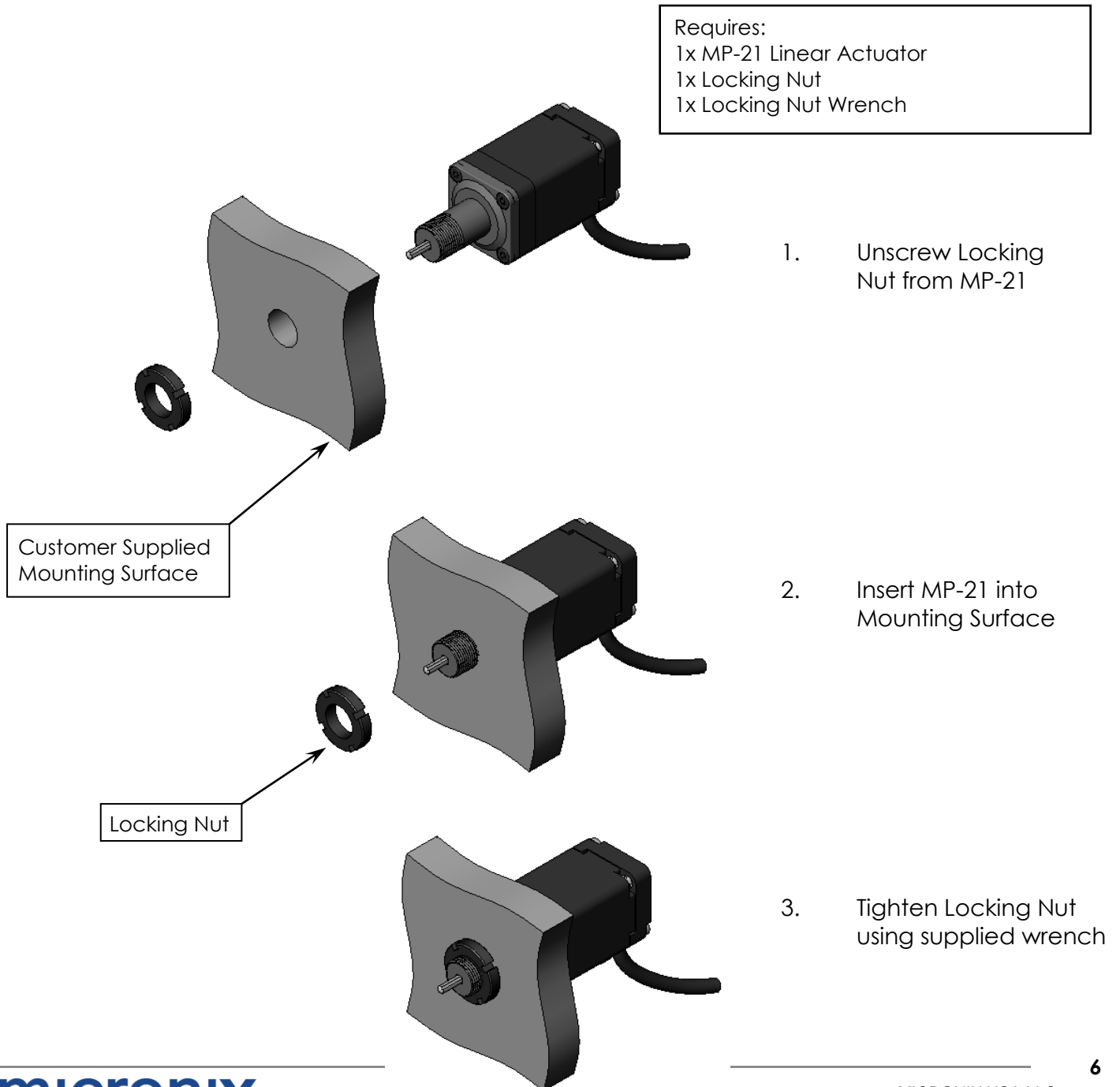
- MP-21 Linear Actuator
- Locking Nut & Wrench
- Reference Manual
- Any other previously agreed upon components such as a controller and cable

4. Installing the MP-21

4.1 MP-21 12 mm & 25 mm Installation

The MP-21 can be installed to motorize manual drives, mirror mounts or other applications. While installing, hold the MP-21 by the front mount to avoid applying torque to the housing. The MP-21 is designed for axial loading; do not apply radial loads to the plunger. When preparing the stage for vacuum environments, take the necessary precautions (such as wearing gloves, clean room and clothing, etc.) when handling the stage as to avoid any contaminants.

Requires:
 1x MP-21 Linear Actuator
 1x Locking Nut
 1x Locking Nut Wrench

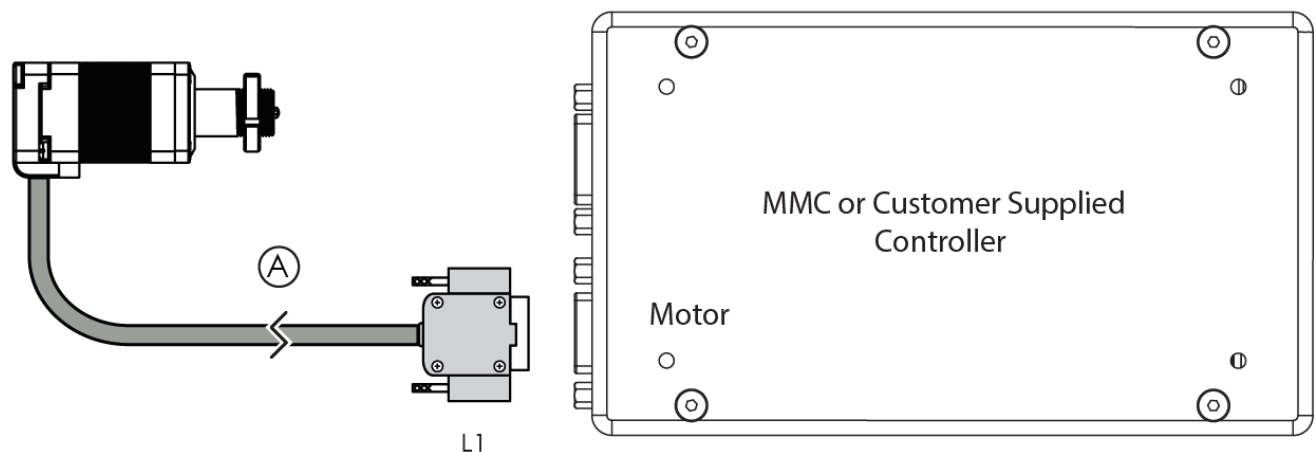


5. Connecting the MP-21 Linear Actuator

5.1 Atmospheric Environments

For controller information refer to the appropriate MMC controller manual.

Connecting the MP-21 Linear Actuator in only requires that the D-sub 9 Pin male Motor Cable be connected to a compatible controller. No other cables or components are required.



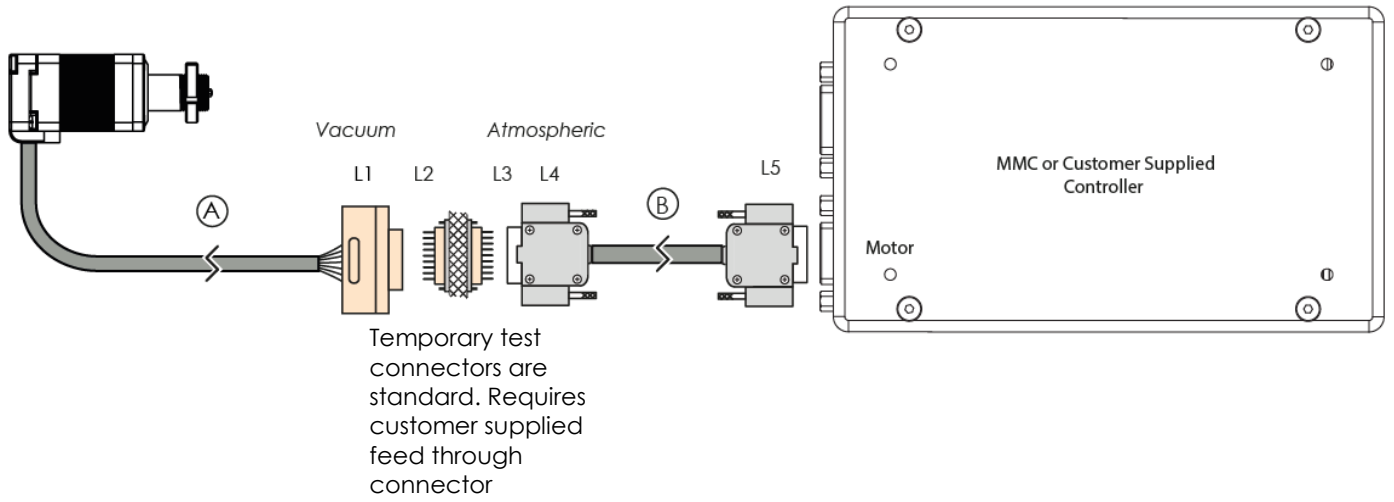
5.2 Vacuum Environments

5.2.1 Handling and Preparation

When preparing the actuator for vacuum environments, take the necessary precautions (such as wearing gloves, clean room, clothing, etc.) when handling the precision mechanical device as to avoid any contaminants. Maximum Bake-out temperature is 100°C. MICRONIX USA can supply the actuator with a vacuum compatible 9-pin female PEEK connector.

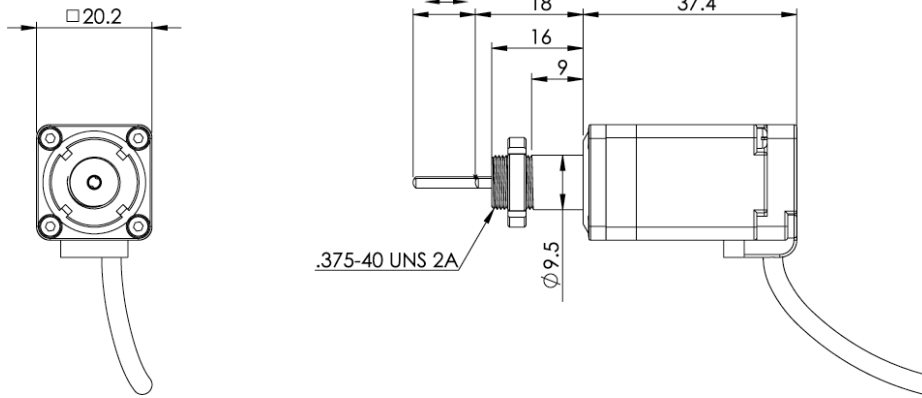
5.2.2 Installation & Wiring Diagram

Connecting the MP-21 in a vacuum chamber requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible MP-21 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 for functionality testing prior to installation in a vacuum chamber. For details regarding the pin-out and feed through specifications see the Appendix section A.3.



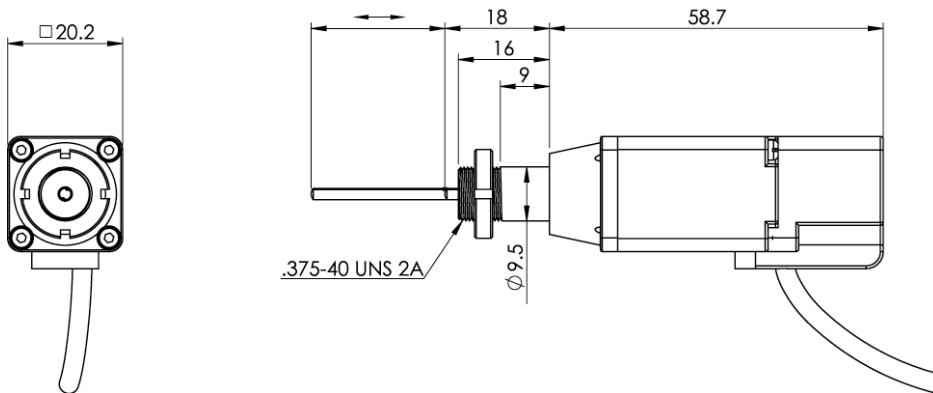
6. Dimensions

6.1 MP-21 12 mm



Weight: 0.14 Kg

6.2 MP-21 25 mm



Weight: 0.17 Kg

7. Supplementary Information

7.1 Maintenance

- The MP-21 linear actuator is a precision mechanical device and should be handled with care. Do not drop or mishandle the actuator.
- Keep hands clear of all moving parts while the actuator is in motion to avoid personal injury.
- Follow the *Safe Operating Environment* requirements and use proper cable management to ensure a clean and safe operating environment.
- The MP-21 is designed to support axial loads only, do not apply radial loads.
- Allow for easy access to the stage in case of servicing.

7.2 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 Stepper Motor

A.1.1 Motor Pinout & Cable

Pin	Function	Wire Color
		Atmospheric
1	Motor A+	Orange
2	Motor A-	White
3	Motor B+	Yellow
4	Motor B-	Black
5	Limit Switch GND	Green
6	Limit Switch +	Blue
7	Limit Switch -	Green(Jumper)
8	Limit Switch +5V	Red
9	Not Used	Not Used

Pin	Function	Wire Color
		Vacuum Test Connector
1	Motor A+	Green
2	Motor A-	Green White
3	Motor B+	Red White
4	Motor B-	Red
5	Limit Switch GND	Brown
6	Limit Switch +	White
7	Limit Switch-	Brown (Jumper)
8	Limit Switch +5V	Violet
9	Not Used	Not Used

A.1.2 Stepper Motor Specifications

Motor Type	2 Phase Bipolar
Phase Current	0.24 A max.
Step Angle	1.8 °
Steps	200
Coil-Resistance	20.4 Ohms
Coil-Inductance	5 mH
Pitch	0.5 mm/rev
Resolution/Full step	2.5 μm

A.2 Limit Switches

The mechanical limit switch is normally closed (when not activated) and should be connected to a compatible controller that recognizes these settings. There is no positive mechanical limit switch; therefore, a software limit should be set up in the motion controller. Failure to properly set up the limit switches in the controller will result in physical damage to the MP-21 Linear Actuator.

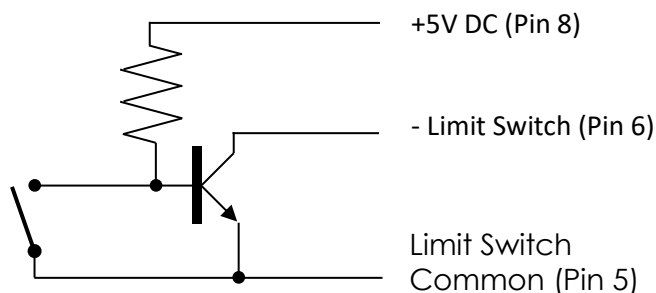
Travel Length (mm)	Software Limit Switch Position (mm)
12	12 or less
25	25 or less

The mechanical limit switch is factory calibrated and cannot be adjusted by the customer. For custom travel lengths, please contact MICRONIX USA.

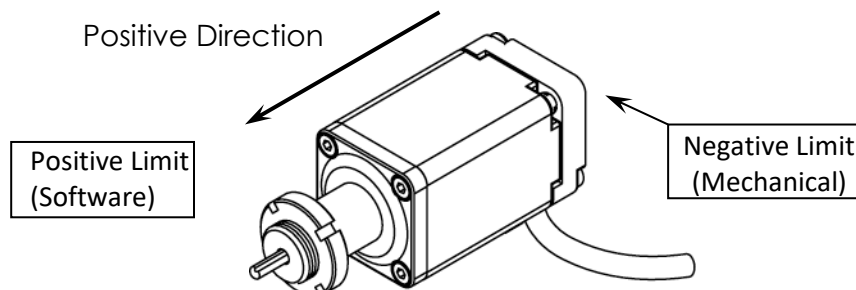
A.2.1 Electrical Specification

Contact Rating	50 mA @ 30 V
Contact Type	Open collector (NPN)
Operating Temperature	-25 to +70 °C

A.2.2 Limit Switch Schematic



A.2.3 Direction of Motion

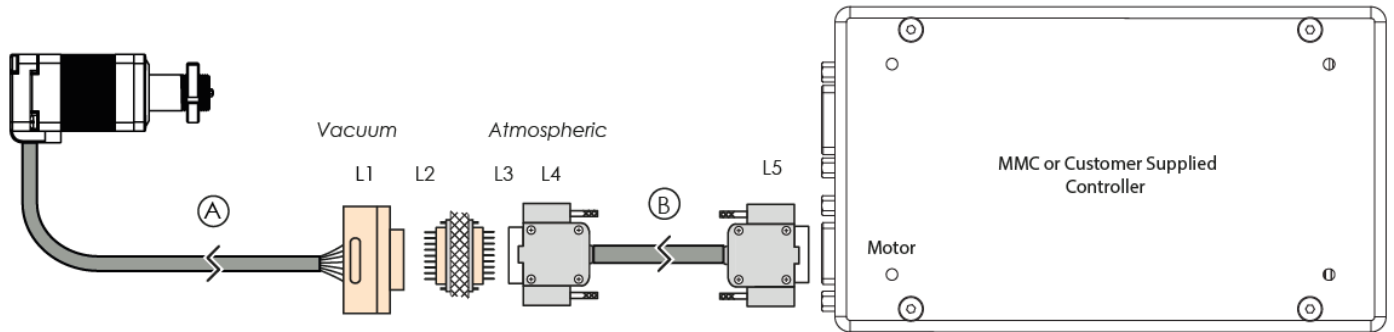


A.3 Vacuum Wiring Diagram

Standard Cable Descriptions:

- A. MP-21 Motor Cable - Vacuum Side (Female Dsub 9 Pin Peek Connector, 1.5m)
- B. Atmospheric Motor Connector (Female Dsub 9 Pin to Male Dsub 9 Pin, 1.5m)

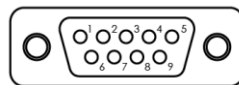
Wiring Diagram:



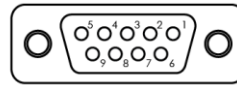
Connector Pinout

Description	Color	L1	L2	L3	L4	L5
Motor Phase A+	Green	5	5	1	1 (Green)	1
Motor Phase A-	Green White	4	4	2	2 (White - Green TP)	2
Motor Phase B+	Red White	3	3	3	3 (Black)	3
Motor Phase B-	Red	2	2	4	4 (Red)	4
Limit Ground	Brown	1	1	5	5 (Brown)	5
Limit Switch +	White	9	9	6	6 (White - Brown TP)	6
Limit Switch -	Brown (Jumper)	8	8	7	7 (Brown - Jumper)	7
+5V DC	Violet	7	7	8	8 (Blue)	8
Shield	-	6	6	9	9 (Shield)	Casing

-Motor



Female Dsub9 Connector - Rear View



Male Dsub9 Connector - Rear View

A.3.1 Straight Through 9-Pin Feed Through

