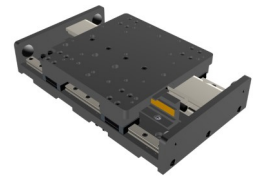


# User Information Guide

MANUAL NO. 102-6307-01  
REV G  
EFFECTIVE : 11/16/22  
SUPERCEDES : 4/11/22



mSR100



# Important User Information

### **WARNING**

**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

This document and other information from Parker Hannifin Corporation, its subsidiaries, and authorized distributors provide product and/or systems options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these product systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuming that all performance, safety, and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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## **User Information Guide**

# **MSR Series Product Manual**

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### **REVISION NOTES**

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REV - INITIAL RELEASE 4/30/15

REV A CHANGED TRANSPORT TEMPERATURE ON PG 8 TO 0 TO +40 (WAS -20 TO +60)

REV B ADDED MOUNTING HOLE INFORMATION PAGE 15

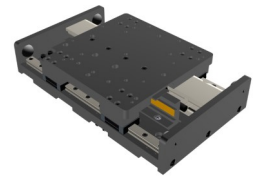
REV C - p15 - Base Dowel Pin corrected to Slip Fit

REV D- UPDATE VALUES ON PGS 10-11

REV E - UPDATED ROHS 3 and CE CERTIFICATES

REV F - REVISED MSR100 E2 (0.1 OPTICAL) REPEATABILITY SPEC FROM 0.3 TO 0.4 UM

REV G- Updated Specification Conditions (Environment Specifications) Page 8.



# Introduction

The mSR is a linear positioner that fits a miniature foot print but delivers large value for customers looking to move a relatively light payload with high precision. All key components are integral to the unit - residing within the body of the stage to provide a clean looking, reliable, unobstructed package. At the heart of the mSR is an innovative, non-contact linear servo motors. This direct drive motor has been optimized for force, speed, and acceleration, to deliver outstanding performance and response. A variety of high precision non-contact linear encoders provides sub-micron resolution and repeatability. Selectable resolutions range from 10 nanometers to 1 micron. Precision linear 'square rails' provide extremely smooth - precise linear translation. Travel limit and home sensors are conveniently designed into the unit for easy adjustment over the entire travel of the stage. Each stage has been fitted with hi-flex cabling to address cable flexing concerns associated with multi-axis systems.

The mSR is intended to be integrated as a component into a machine with separate power electronics, and motion controller. As such the mSR is an incomplete machine, requiring proper power electronics to be added, as well as necessary machine guarding. The mSR is only rated for use in relatively clean environments moving relatively light payloads ( $\leq 12$  kg).

## General Information

Thank you for your interest in the products and systems offered by Parker Hannifin Electromechanical Automation Division. Our products and systems are recognized around the world for their functionality, performance, and reliability. Our products can be combined to form single or multi-axis systems with a full support of custom applications.

The intent of this guide is to provide general information for our MSR product line., including safety, basic maintenance and features. Not all of this information may be applicable to your product.

If you have any questions or challenges please call our factory support team at 800-245-6903.

It is the responsibility of the end user to ensure that equipment is installed and operated in accordance with both local and federal safety codes and guidelines.

The user must ensure that the attachment of work pieces/tools or other devices on the moving

## Return Information

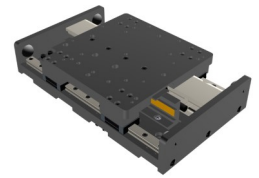
### Returns

All returns must reference a "Return Material Authorization" (RMA) number. Please call your local authorized distributor or Parker Customer Service Department at 800-245-6903 to obtain a "RMA" number.

## Repair Information

### Out-of-Warranty Repair

Our Customer Service Department repairs Out-of-Warranty products. All returns must reference a "RMA" number. Please call your local authorized distributor or Parker Customer Service Department at 800-245-6903 to obtain a "RMA" number. You will be notified of any cost prior to making the repair.



# Unpacking and General Installation

Carefully remove the positioner from the packaging materials and inspect the unit for any evidence of shipping damage. Report any damage immediately to your local authorized distributor. Please save the shipping container for damage inspection or future transportation.

Incorrect handling of the positioner may adversely affect the performance of the unit in its application. Standard handling and lifting practices should be employed, product may be heavy.

### **Please observe the following guidelines for handling and mounting of your new positioner.**

Proper mounting of the positioner is required to reduce risk of injury and provide optimal performance.

Positioners should be mounted to a flat, stable surface by using thru-holes, counter bored holes, or tapped holes on the base of the unit.

Unless otherwise specified, the standard installation of the linear drive is horizontal.

DO NOT allow the positioner to drop onto any surface. Dropping the positioner can generate impact loads that may result in flat spots on bearing surfaces or misalignment of drive components, drastically affecting the performance of the product.

DO NOT drill holes into the positioner. Drilling holes into the positioner can generate particles and machining forces that may affect the operation of the positioner. Parker will drill holes if necessary; contact your local authorized distributor.

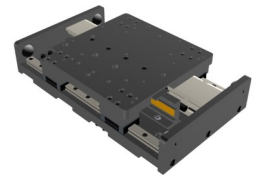
DO NOT subject the unit to impact loads such as hammering, riveting, etc. Impact loads generated by hammering or riveting may result in flat spots on bearing surfaces or misalignment of drive components, drastically affecting the performance of the product.

DO NOT lift the positioner by cables or cable management system. Lifting positioner by cables or cable management system may effect electrical connections and/or cable management assembly. The unit should be lifted by the base structure only.

DO NOT expose positioner to mist, spray or submersion in liquids.

DO NOT disassemble positioner. Unauthorized adjustments may alter the positioner's specifications and will void the product warranty.

DO NOT transport a long axis without proper support as excessive deflection may occur.



# Warnings and Precautions



### **Hot Surfaces**

DO NOT touch motor coils located in the positioner after high duty operation. Motor temperature may approach 60°C. The unit itself may become warm or hot to the touch.



### **Electrical Shock**

DO NOT take apart or touch any internal components of the positioner while unit is plugged into an electrical outlet. SHUT OFF power before replacing components to avoid electrical shock.



### **High Magnetic Field**

Unit may be HAZARDOUS to people with Pace Makers or any other 'magnetically-sensitive' medical devices. Unit may have an effect on 'magnetically-sensitive' applications.



### **Ferrous Materials**

The positioner will NOT keep out small ferrous materials in applications with air born metallic particles. The customer must take additional precautions in these applications to prevent intrusion of these ferrous particles.



### **Vertical Operation**

Depending upon your load and counter balance selection the carriage and load may drop when mounted vertically in power loss situations potentially causing product damage or personal injury.



### **General Safety**

Because linear motors can accelerate up to 3 g's and operate at high speeds, and sometimes positioners move without warning, keep all personnel away from dynamic travel range of positioner. Product does have pinch areas where moving elements relative to each other come together.



### **Moving Cables**

If the cables are to be moving, the use of high flex cabling is recommended to ensure long life .



### **Strain Relieve Electrical Components**

All electrical components (such as motor, halls, encoders and limit/home switches) must be strain relieved. Failure to strain relieve electrical wires or cables may result in component failure and/or possible personal injury.



### **Pinch Points**

Unit may have a pinch point because the top extends over the base of the table as well as moving elements relative to stationary elements. Proper care should be exercised.



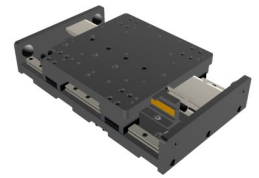
## User Information Guide

# Specification Conditions

| Environmental Specifications                              |                                                                                                                                                    |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage and Transport Temperature Range                   | -10 to +60 Degree C.                                                                                                                               |
| Storage and Transport Humidity Range                      | 10 - 95% Non Condensing                                                                                                                            |
| Operation Temperature to Achieve Specifications           | 20 Degrees C +/- 1 degree C                                                                                                                        |
| Operation Temperature range for basic motion <sup>1</sup> | 5 to 40 Degrees C.                                                                                                                                 |
| Operational Humidity Range                                | 10 - 95% Non Condensing                                                                                                                            |
| Cleanliness                                               | Operating area is to be clean and free of particulation. Normal room dust is acceptable but heavy particulation can cause malfunctions and damage. |

<sup>1</sup> Minimum to maximum continuous operating temperature range (with NO guarantee of any specification except motion)

| Mounting Surface Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Proper mounting of the mSR is essential to optimize product performance. All specifications are based on the following conditions:</p> <ul style="list-style-type: none"> <li>• The positioner must be bolted down to a flat surface which supports the entire length of the base using all mounting holes provided</li> <li>• At a minimum for basic motion the positioner must be mounted to a flat, stable surface, with a flatness error less than or equal to 0.025mm/300mm, (specifications will be greatly varied from published specification with this flatness).</li> <li>• To meet catalog specifications the surface must have a flatness error less than or equal to 0.003mm/300mm for Standard grade and 0.001mm/300mm for Precision grade.</li> </ul> |



# Specifications

## Specifications

|                                      |                 | Units    | 25       |      | 50       |      | 100      |      | 150      |      | 200      |      | 250      |      |
|--------------------------------------|-----------------|----------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| Travel                               |                 | mm       | LS       | LD   | LS       | LD   | LS       | LD   | LS       | LD   | LS       | LD   | LS       | LD   |
| Size (WxH)                           |                 | mm       | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      |
| Normal Load                          |                 | kg       | 12       |      | 12       |      | 12       |      | 12       |      | 12       |      | 12       |      |
| Continuous Thrust                    |                 | N        | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 |
| Peak Thrust (Max)                    |                 | N        | 33       | 50   | 33       | 50   | 33       | 50   | 33       | 50   | 33       | 50   | 33       | 50   |
| Duty Cycle                           |                 | %        | 100      |      | 100      |      | 100      |      | 100      |      | 100      |      | 100      |      |
| Acceleration (Max– no load)          |                 | G        | 3        |      | 3        |      | 3        |      | 3        |      | 3        |      | 3        |      |
| Rated Bus Voltage                    |                 | Volts DC | 48       |      | 48       |      | 48       |      | 48       |      | 48       |      | 48       |      |
| Straightness & Flatness <sup>1</sup> | Standard grade  | µm       | ±5       |      | ±5       |      | ±8       |      | ±8       |      | ±8       |      | ±10      |      |
|                                      | Precision grade |          | ±3       |      | ±3       |      | ±4       |      | ±4       |      | ±5       |      | ±5       |      |
| Carriage Mass                        |                 | kg       | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 |
| Stage Mass                           |                 | kg       | 1.06     | 1.57 | 1.21     | 1.57 | 1.45     | 1.80 | 1.68     | 2.03 | 1.91     | 2.35 | 2.23     | 2.59 |

|                                      |                 | Units    | 300      |      | 350      |      | 400      |      | 450      |      | 500      |      |
|--------------------------------------|-----------------|----------|----------|------|----------|------|----------|------|----------|------|----------|------|
| Travel                               |                 | mm       | LS       | LD   | LS       | LD   | LS       | LD   | LS       | LD   | LS       | LD   |
| Size (WxH)                           |                 | mm       | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      | 100 x 35 |      |
| Normal Load                          |                 | kg       | 12       |      | 12       |      | 12       |      | 12       |      | 12       |      |
| Continuous Thrust                    |                 | N        | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 | 11       | 16.7 |
| Peak Thrust (Max)                    |                 | N        | 33       | 50   | 33       | 50   | 33       | 50   | 33       | 50   | 33       | 50   |
| Duty Cycle                           |                 | %        | 100      |      | 100      |      | 100      |      | 100      |      | 100      |      |
| Acceleration (Max– no load)          |                 | G        | 3        |      | 3        |      | 3        |      | 3        |      | 3        |      |
| Rated Bus Voltage                    |                 | Volts DC | 48       |      | 48       |      | 48       |      | 48       |      | 48       |      |
| Straightness & Flatness <sup>1</sup> | Standard grade  | µm       | ±10      |      | ±12      |      | ±16      |      | ±20      |      | ±20      |      |
|                                      | Precision grade |          | ±5       |      | ±6       |      | ±8       |      | ±10      |      | ±12      |      |
| Carriage Mass                        |                 | kg       | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 | 0.34     | 0.46 |
| Stage Mass                           |                 | kg       | 2.47     | 2.82 | 2.70     | 3.05 | 2.93     | 3.37 | 3.25     | 3.60 | 3.48     | 3.84 |

<sup>1</sup> Precision grade version stage mounted to granite surface, 0.01 micron optical encoder

| Continuous Power |               |
|------------------|---------------|
| Motor            | Power (Watts) |
| LS Motor         | 57.6          |
| LD motor         | 104.6         |



## User Information Guide

### mSR100 Specifications (Travel & Encoder Dependent)

| Specification | Units | Travel (mm) |      |      |      |      |      |      |      |      |      |      |  |
|---------------|-------|-------------|------|------|------|------|------|------|------|------|------|------|--|
|               |       | 25          | 50   | 50   | 100  | 100  | 150  | 150  | 200  | 200  | 250  | 250  |  |
|               |       | (LS)        | (LS) | (LD) | (LS) | (LD) | (LS) | (LD) | (LS) | (LD) | (LS) | (LD) |  |

#### Magnetic Encoder -1 Micron Resolution

|                              |      |      |      |      |      |      |      |      |      |      |      |      |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Max. Speed                   | mm/s | 1100 | 1500 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Bi-directional Repeatability | μm   | ±5.0 |      |      |      |      |      |      |      |      |      |      |
| Positional Accuracy          | μm   | 40   | 40   | 60   | 80   | 100  | 100  | 100  | 100  | 100  | 100  | 100  |

#### Optical Encoder- 1 Micron Resolution

|                                       |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Max. Speed                            | mm/s | 1100 | 1500 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Bi-directional Repeatability          | μm   | ±2.0 |      |      |      |      |      |      |      |      |      |      |
| Positional Accuracy                   | μm   | 10   | 10   | 10   | 10   | 10   | 10   | 10   | 12   | 12   | 14   | 14   |
| Positional Accuracy (Slope Corrected) | μm   | 6    | 6    | 6    | 6    | 6    | 7    | 7    | 7    | 7    | 8    | 8    |

#### Optical Encoder- 0.1 Micron Resolution

|                                       |      |      |     |     |     |     |     |     |     |     |     |     |
|---------------------------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max. Speed                            | mm/s | 300  | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Bi-directional Repeatability          | μm   | ±0.4 |     |     |     |     |     |     |     |     |     |     |
| Positional Accuracy                   | μm   | 9    | 9   | 9   | 9   | 9   | 9   | 9   | 11  | 11  | 13  | 13  |
| Positional Accuracy (Slope Corrected) | μm   | 5    | 5   | 5   | 5   | 5   | 6   | 6   | 6   | 6   | 7   | 7   |

#### Optical Encoder- 0.01 Micron Resolution

|                                       |      |      |    |    |    |    |    |    |    |    |    |    |
|---------------------------------------|------|------|----|----|----|----|----|----|----|----|----|----|
| Max. Speed                            | mm/s | 30   | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Bi-directional Repeatability          | μm   | ±0.2 |    |    |    |    |    |    |    |    |    |    |
| Positional Accuracy                   | μm   | 8    | 8  | 8  | 8  | 8  | 8  | 8  | 10 | 10 | 12 | 12 |
| Positional Accuracy (Slope Corrected) | μm   | 4    | 4  | 4  | 4  | 4  | 5  | 5  | 5  | 5  | 6  | 6  |

#### BiSS-C Absolute Encoder - 0.05 Micron Resolution

|                                       |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Max. Speed                            | mm/s | 1100 | 1500 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Bi-directional Repeatability          | μm   | ±0.4 |      |      |      |      |      |      |      |      |      |      |
| Positional Accuracy                   | μm   | 9    | 9    | 9    | 9    | 9    | 9    | 9    | 11   | 11   | 13   | 13   |
| Positional Accuracy (Slope Corrected) | μm   | 5    | 5    | 5    | 5    | 5    | 6    | 6    | 6    | 6    | 7    | 7    |



## User Information Guide

| Specification | Units | Travel (mm) |             |             |             |             |             |             |             |             |             |
|---------------|-------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|               |       | 300<br>(LS) | 300<br>(LD) | 350<br>(LS) | 350<br>(LD) | 400<br>(LS) | 400<br>(LD) | 450<br>(LS) | 450<br>(LD) | 500<br>(LS) | 500<br>(LD) |

### Magnetic Encoder -1 Micron Resolution

|                              |      |      |      |      |      |      |      |      |      |      |      |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Max. Speed                   | mm/s | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Bi-directional Repeatability | μm   | ±5.0 |      |      |      |      |      |      |      |      |      |
| Positional Accuracy          | μm   | 60   | 60   | 60   | 60   | 60   | 60   | 60   | 60   | 60   | 60   |

### Optical Encoder- 1 Micron Resolution

|                                       |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Max. Speed                            | mm/s | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Bi-directional Repeatability          | μm   | ±2.0 |      |      |      |      |      |      |      |      |      |
| Positional Accuracy                   | μm   | 16   | 16   | 18   | 18   | 20   | 20   | 22   | 22   | 24   | 24   |
| Positional Accuracy (Slope Corrected) | μm   | 8    | 8    | 9    | 9    | 9    | 9    | 10   | 10   | 10   | 10   |

### Optical Encoder- 0.1 Micron Resolution

|                                       |      |      |     |     |     |     |     |     |     |     |     |
|---------------------------------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max. Speed                            | mm/s | 300  | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Bi-directional Repeatability          | μm   | ±0.4 |     |     |     |     |     |     |     |     |     |
| Positional Accuracy                   | μm   | 15   | 15  | 17  | 17  | 19  | 19  | 21  | 21  | 23  | 23  |
| Positional Accuracy (Slope Corrected) | μm   | 7    | 7   | 8   | 8   | 8   | 8   | 9   | 9   | 9   | 9   |

### Optical Encoder- 0.01 Micron Resolution

|                                       |      |      |    |    |    |    |    |    |    |    |    |
|---------------------------------------|------|------|----|----|----|----|----|----|----|----|----|
| Max. Speed                            | mm/s | 30   | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Bi-directional Repeatability          | μm   | ±0.2 |    |    |    |    |    |    |    |    |    |
| Positional Accuracy                   | μm   | 14   | 14 | 16 | 16 | 18 | 18 | 20 | 20 | 22 | 22 |
| Positional Accuracy (Slope Corrected) | μm   | 6    | 6  | 7  | 7  | 7  | 7  | 8  | 8  | 8  | 8  |

### BiSS-C Absolute Encoder - 0.05 Micron Resolution

|                                       |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| Max. Speed                            | mm/s | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| Bi-directional Repeatability          | μm   | ±0.4 |      |      |      |      |      |      |      |      |      |
| Positional Accuracy                   | μm   | 15   | 15   | 17   | 17   | 19   | 19   | 21   | 21   | 23   | 23   |
| Positional Accuracy (Slope Corrected) | μm   | 7    | 7    | 8    | 8    | 8    | 8    | 9    | 9    | 9    | 9    |



## User Information Guide

# Part Number Nomenclature mSR 100

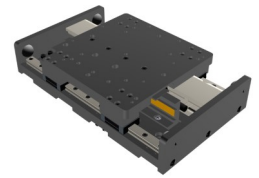
Part  
Number  
Example:

|     |     |   |     |   |    |    |    |    |      |    |
|-----|-----|---|-----|---|----|----|----|----|------|----|
| MSR | 100 | L | 050 | P | LS | E3 | H1 | L1 | CM03 | X0 |
|-----|-----|---|-----|---|----|----|----|----|------|----|

|                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>① Series</b><br><b>MSR</b> Series                                                                                                                                                                                                                             | <b>⑤ Grade</b><br><b>P</b> Precision (Optical, Sine/ Cosine, and Biss-C Absolute only)<br><b>S</b> Standard (Magnetic Encoder only)                                                                                                 | <b>⑧ Home Sensor</b><br><b>H0</b> No home sensor (BiSS-C Absolute only)<br><b>H1</b> Home Sensor <sup>1</sup><br><sup>1</sup> Home sensor with M1 option<br><sup>1</sup> Index mark with E1/E2/E3 or SC options |
| <b>② Size</b><br><b>100</b> 100 mm wide profile                                                                                                                                                                                                                  |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                 |
| <b>③ Drive Train</b><br><b>L</b> Linear Motor Drive                                                                                                                                                                                                              | <b>⑥ Motor</b><br><b>LS</b> Ironless, single<br><b>LD</b> Ironless, double (50 to 500 mm stroke only)                                                                                                                               | <b>⑨ Limit Sensor</b><br><b>L0</b> No limit sensor (BiSS-C Absolute only)<br><b>L1</b> End-of-travel limit sensors                                                                                              |
| <b>④ Stroke Length (mm)</b><br><b>025</b> 25 mm<br><b>050</b> 50 mm<br><b>100</b> 100 mm<br><b>150</b> 150 mm<br><b>200</b> 200 mm<br><b>250</b> 250 mm<br><b>300</b> 300 mm<br><b>350</b> 350 mm<br><b>400</b> 400 mm<br><b>450</b> 450 mm<br><b>500</b> 500 mm | <b>⑦ Encoder</b><br><b>E1</b> 1μ optical incremental<br><b>E2</b> 0.1μ optical incremental<br><b>E3</b> 0.01μ optical incremental<br><b>SC</b> Sine/ Cosine<br><b>M1</b> 1μ magnetic incremental<br><b>R1</b> 0.05μ BiSS-C Absolute | <b>⑩ Cable Options</b><br><b>CM03</b> No cable management 3 meter<br><b>CM13</b> Single cable carrier, 3 meter<br><b>CM23</b> Double cable carrier, 3 meter                                                     |
|                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                     | <b>⑪ Other Options</b><br><b>X0</b> No options                                                                                                                                                                  |

## User Information Guide

# Electrical Specifications



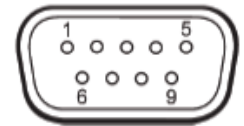
| Motor Specifications            | Units     | 3 Pole      | 5 Pole      |
|---------------------------------|-----------|-------------|-------------|
|                                 |           | (LS Option) | (LD Option) |
| Magnetic Pitch                  | mm        | 40          | 40          |
| Continuous Force <sup>1</sup>   | N         | 11          | 16.7        |
| Peak Force                      | N         | 33          | 50          |
| Continuous Current <sup>1</sup> | A(rms)    | 1.2         | 2.18        |
| Peak Current <sup>2,3</sup>     | A(rms)    | 3.5         | 6.5         |
| Voltage Constant <sup>2,3</sup> | Volts/m/s | 7.7         | 6.3         |
| Force Constant <sup>2</sup>     | N/A(rms)  | 9.4         | 7.65        |
| Resistance <sup>2</sup>         | Ohms      | 6.3         | 2.82        |
| Inductance <sup>4</sup>         | mH        | 1           | 0.5         |
| Max Bus Voltage                 | VDC       | 48          | 48          |
| Thermal Resistance              | C/Watt    | 5.5         | 3.56        |
| Winding Thermal Time Constant   | Minutes   | 1.3         | 0.8         |
| Motor Thermal Time Constant     | Minutes   | 15          | 10          |

1 @ 25° C ambient, and winding temperature at 125° C

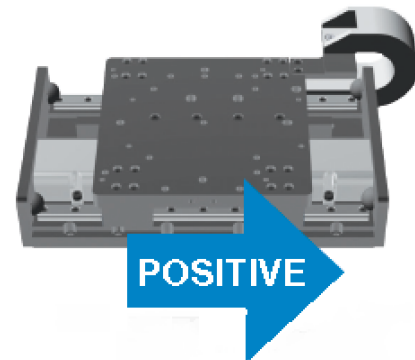
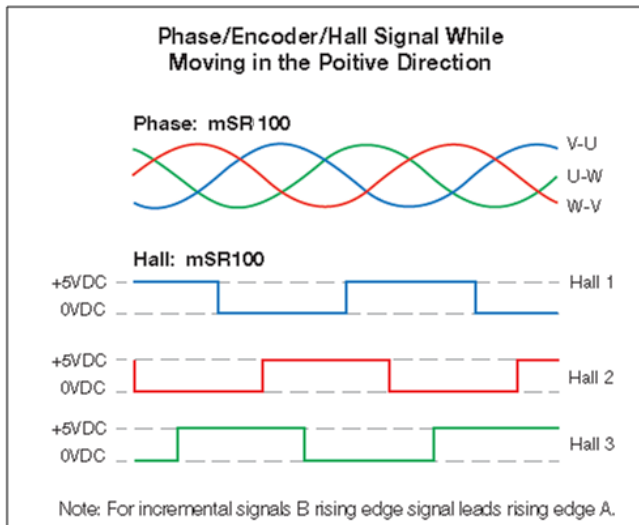
2 Measured line to line

3 Value is measured peak of sine

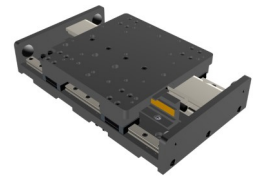
4 ±30% Line-to-Line, induction bridge measurement @ 1 KHz



| Function                | Color        | Pin # |
|-------------------------|--------------|-------|
| Motor Phase U           | Red          | 1     |
| Motor Phase V           | Brown        | 2     |
| Motor Phase W           | Orange       | 3     |
| PE Ground               | Green/Yellow | 4     |
| Hall Power (+5Volts DC) | Black        | 5     |
| Hall Ground             | White        | 6     |
| Hall 1                  | Yellow       | 7     |
| Hall 2                  | Blue         | 8     |
| Hall 3                  | Green        | 9     |

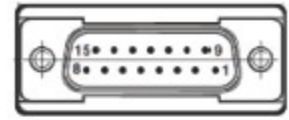
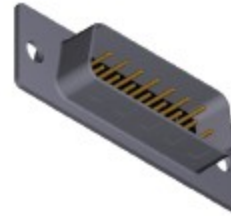


## User Information Guide



### Optical Encoder

| Function            | Signal                 | Pin # |
|---------------------|------------------------|-------|
| Power               | 5 Volts DC             | 8     |
|                     | Ground                 | 2,9   |
| Incremental Signals | A+                     | 14    |
|                     | A-                     | 6     |
|                     | B+                     | 13    |
|                     | B-                     | 5     |
| Reference Mark      | Z+                     | 12    |
|                     | Z-                     | 4     |
| Limits              | Positive Limit         | 11    |
|                     | Negative Limit         | 10    |
| Setup               | (Used in installation) | 1     |
| Error Output        | NPN                    | 3     |



### Sine Cosine Encoder

| Function            | Signal                 | Pin #  |
|---------------------|------------------------|--------|
| Power               | 5 Volts DC             | 4, 5   |
|                     | 0 Volts DC             | 12, 13 |
| Incremental Signals | Cosine +               | 9      |
|                     | Cosine -               | 1      |
|                     | Sine +                 | 10     |
|                     | Sine -                 | 2      |
| Reference Mark      | Z+                     | 3      |
|                     | Z-                     | 11     |
| Limits              | Positive Limit         | 7      |
|                     | Negative Limit         | 8      |
| Setup               | (Used in installation) | 6      |
| Error Output        | NPN                    | 14     |

### Magnetic Encoder

| Function            | Signal         | Pin # |
|---------------------|----------------|-------|
| Power               | 5 Volts DC     | 8     |
|                     | Ground         | 9     |
| Incremental Signals | A+             | 14    |
|                     | A-             | 6     |
|                     | B+             | 13    |
|                     | B-             | 5     |
| Reference Mark      | Z+             | 12    |
|                     | Z-             | 4     |
| Limits              | Positive Limit | 11    |
|                     | Negative Limit | 10    |
| Home                | NPN            | 2     |
| Error Output        | NPN            | 3     |

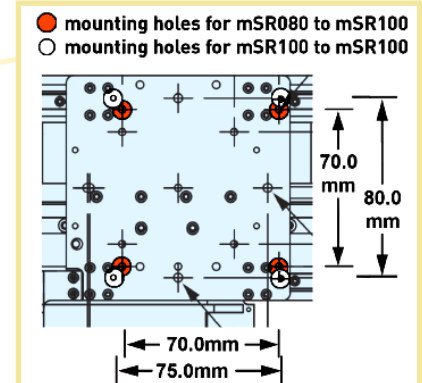
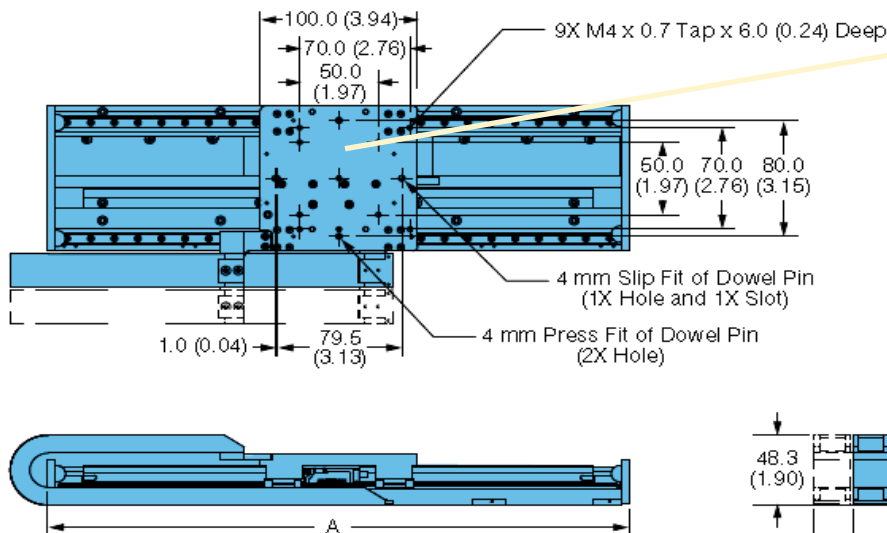
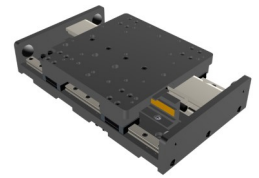
### BISS-C Absolute Encoder

| Function              | Signal     | Color        |
|-----------------------|------------|--------------|
| Power                 | 5 Volts DC | Brown        |
|                       | Ground     | Green        |
|                       |            | White        |
| Serial Communications | MA+        | Violet       |
|                       | MA-        | Yellow       |
|                       | SLO+       | Grey         |
|                       | SLO-       | Pink         |
| Shield                | Inner      | Inner Shield |
|                       | Outer      | Case         |

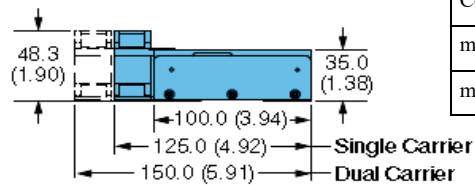
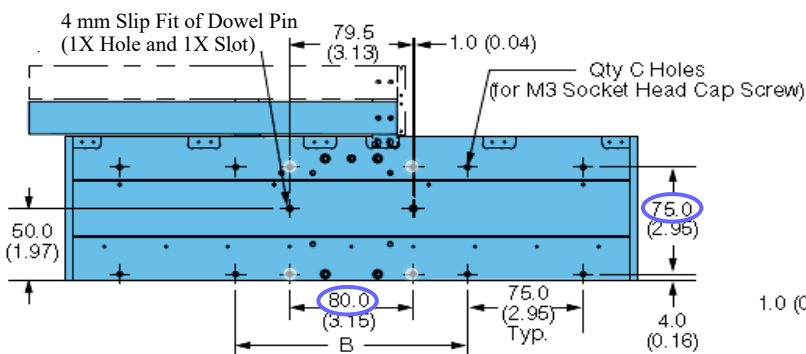


## User Information Guide

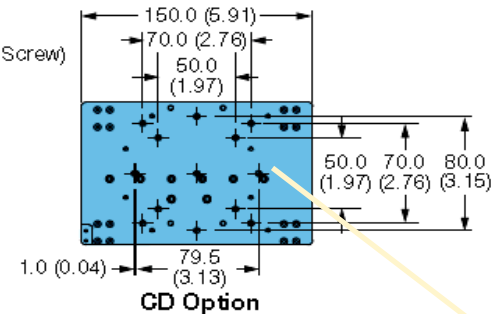
# Dimensional Drawings - mSR100 - mm (in)



| Configuration | Bolt size     |
|---------------|---------------|
| mSR80—mSR100  | M4 x 0.7 x 8  |
| mSR100—mSR100 | M3 x 0.5 x 10 |

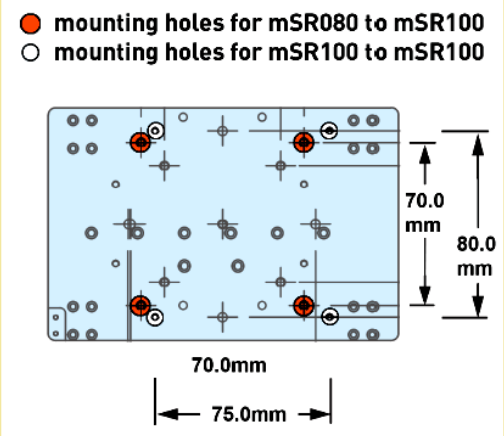


The mSR part numbers mount directly to one another. The 4 bolts go through the center of the Y axis base to the



### Dimensions - mm (in)

| Travel (mm) |           | A           | B          | C (QTY) |
|-------------|-----------|-------------|------------|---------|
| LS Option   | LD Option |             |            |         |
| 25          | -         | 145 (5.71)  | 100 (3.94) | 8       |
| 50          | -         | 170 (6.69)  | 125 (4.92) | 8       |
| 100         | 50        | 220 (8.66)  | 150 (5.91) | 8       |
| 150         | 100       | 270 (10.63) | 200 (7.87) | 8       |
| 200         | 150       | 320 (12.60) | 125 (4.92) | 12      |
| 250         | 200       | 370 (14.57) | 150 (5.91) | 12      |
| 300         | 250       | 420 (16.54) | 200 (7.87) | 12      |
| 350         | 300       | 470 (18.50) | 125 (4.92) | 16      |
| 400         | 350       | 520 (20.47) | 150 (5.91) | 16      |
| 450         | 400       | 570 (22.44) | 200 (7.87) | 16      |
| 500         | 450       | 620 (24.41) | 125 (4.92) | 20      |
| -           | 500       | 670 (26.38) | 150 (5.91) | 20      |

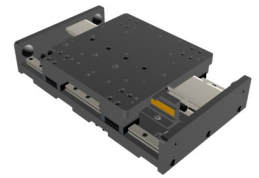


### Mounting Requirements

|             |             |
|-------------|-------------|
| Hardware    | SCH M3x10   |
| Torque      | 12 in-lbs   |
| Wrench Size | 2.5mm Allen |



# Assembly Diagram - mSR100



### Center Driven Ironless Linear Motor

The mSR 100 offers both a 3 and 5 pole ironless linear motor (mL18) based upon the application thrust requirements. Each of these motors have been optimized operate on 48 Volts DC.

### Dual Precision Square Rails

Two precision aligned square rail bearings to support the payload and provide superior straightness and flatness.

### Integrated Home and Limit Sensing

Home and limit sensors have been integrated into the mSR 100 encoder read head, and signals are passed through the same cable, minimizing the amount of cables requiring cable management.

### Six Different Linear Encoder Technologies

The mSR 100 provides maximum versatility with three different optical encoder resolutions (1, 0.1, and 0.01 micron), an analog Sine/Cosine option as well as an economical 1 micron magnetic option. The mSR 100 also offers a BiSS-C, 0.05 micron absolute encoder option for application that require constant positional feedback.

### Tapped Holes and Dowel Pinning

The mSR has tapped holes in both the top and base for ease of mounting, and dowel pins to ensure repeatable mounting when configuring XY systems made with mSR's.

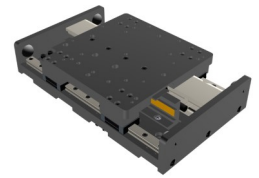
### High Flex Cabling

The mSR uses high flex cabling as standard to ensure maximum life of the stage regardless if it's integrated into a multi axis system.

### CE and RoHS Compliance

The mSR conforms to both CE and RoHS directives as standard.





# Setting the Optical Encoder Limits

The mSR100 with the optical encoder option comes equipped with adjustable end of travel limit sensors. The sensors are activated by magnetic targets located in a slot on the encoder scale bracket as shown in Image #3 below. The factory setting location of the limit sensor targets provide the full nominal travel of the stage with approximately 2mm of over travel before the stage encounters the hard stop.

To adjust travel, simply loosen the screw on the target  $\sim 1/4$  turn using a 1.3mm hex wrench, slide the target to the desired position, and tighten the screws.

NOTE: The active length of the target is approximately 9mm. If the target is moved greater than 9 mm from the stage hard stop, the stage can move beyond the active area of the target and shut off on the other side of the target. This can lead to having the stage behind a limit sensor. Caution in setup and programming should be taken to avoid this potential issue.

Limit sensor hysteresis: Limit sensor can have up to 1.5 mm of hysteresis which means after activation the stage must move more than 1.5 mm away from the activation point to release the limit sensor from being active.

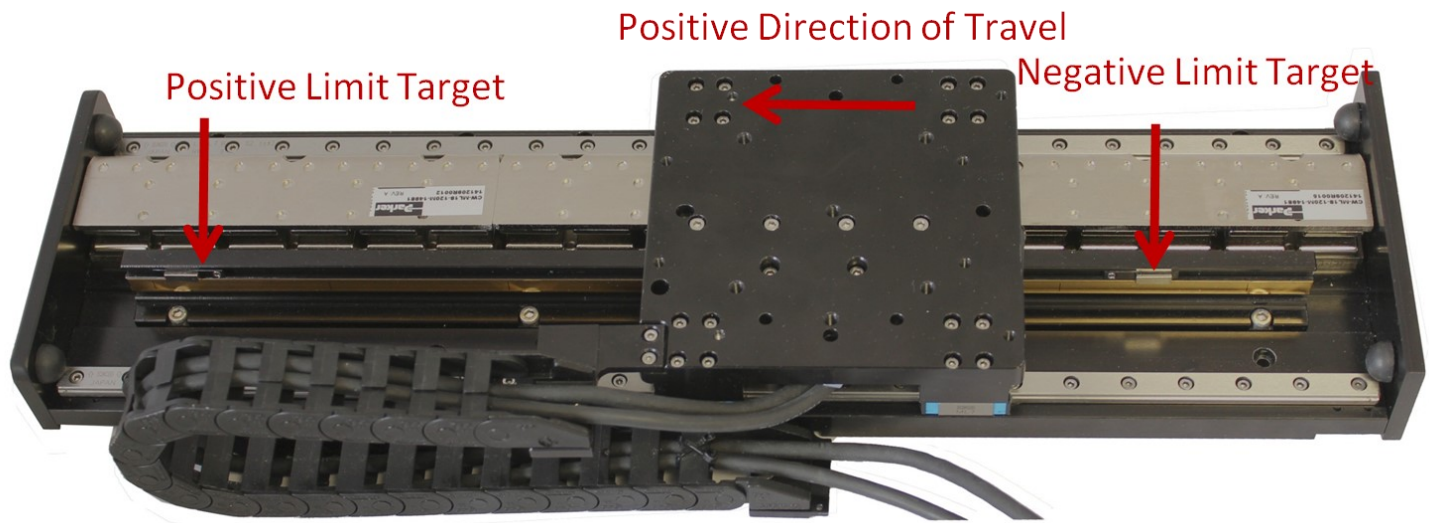
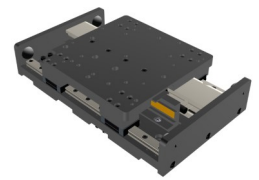


Image 3



# Setting the Magnetic Encoder Limits

The mSR100 with the magnetic encoder option comes equipped with adjustable end of travel limit sensors and a home sensor. The sensors are activated by magnetic targets located in a slot on the encoder scale bracket as shown in image #4 below. The factory setting location of the limit sensor targets provide the full nominal travel of the stage with approximately 2mm of over travel before the stage encounters the hard stop. The home sensor is set such that during a positive direction move the home sensor trips approximately in the center of the travel of the stage.

To adjust travel, simply loosen the screw on the target  $\sim 1/4$  turn using a 1.3mm hex wrench, slide the target to the desired position, and tighten the screws.

NOTE: The active length of the target is approximately 9mm, if the target is moved greater than 9 mm from the stage hard stop, the stage can move beyond the active area of the target and shut off on the other side of the target. This can lead to having the stage behind a limit sensor. Caution in setup and programming should be taken to avoid this potential issue.

Limit sensor hysteresis: Limit sensor can have up to 2 mm of hysteresis which means after activation the stage must move more than 2 mm away from the activation point to release the limit sensor from being active.

Home sensor hysteresis: Home sensor can have up to 0.6 mm of hysteresis which means after activation the stage must move more than 0.6 mm away from the activation point to release the home sensor from being active.

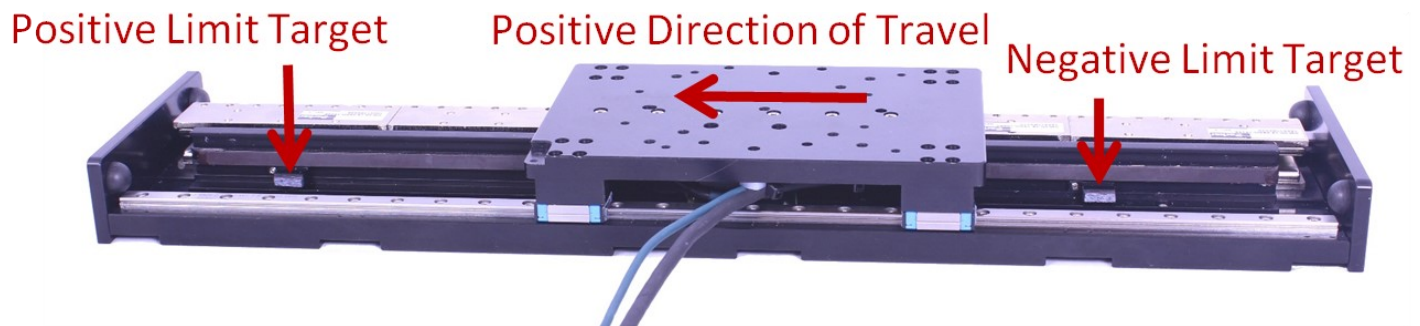
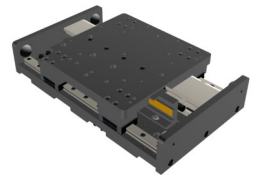
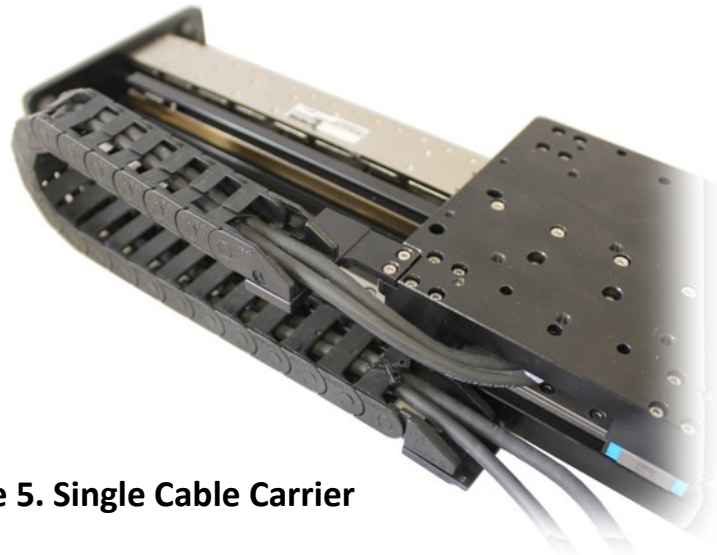


Image 4

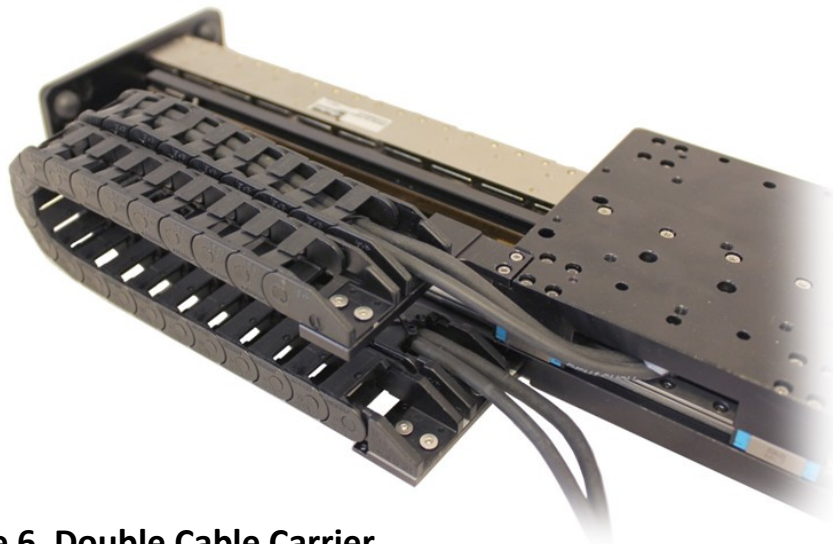


# Cable Carrier

The mSR100 can be fitted with cable carriers to transport the stage cables or user cables. These cable carriers can be purchased as an option assembled to the stage at the time of order, or can be purchased as an accessory. Cable carriers are available in a single or dual version, (see image 5 and 6 below). If purchased as an accessory, mount the cable carriers as shown in accordance to the images below using the 4 flathead screws provided



**Image 5. Single Cable Carrier**

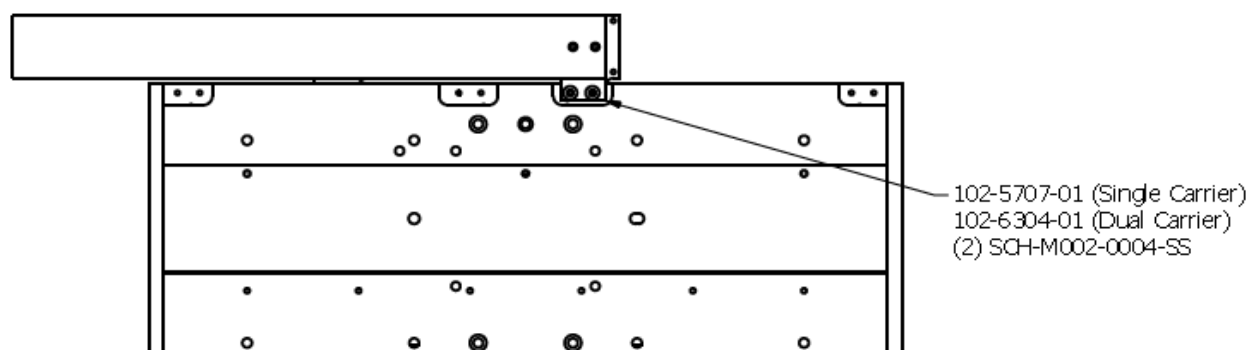
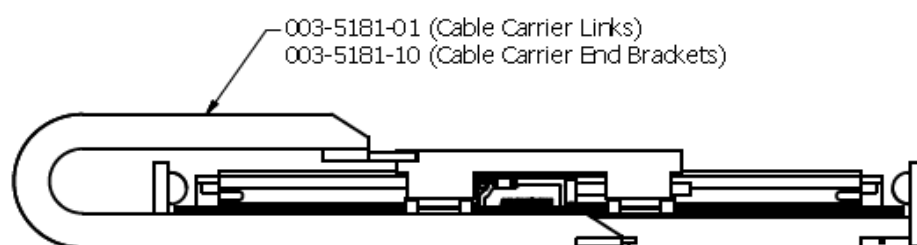
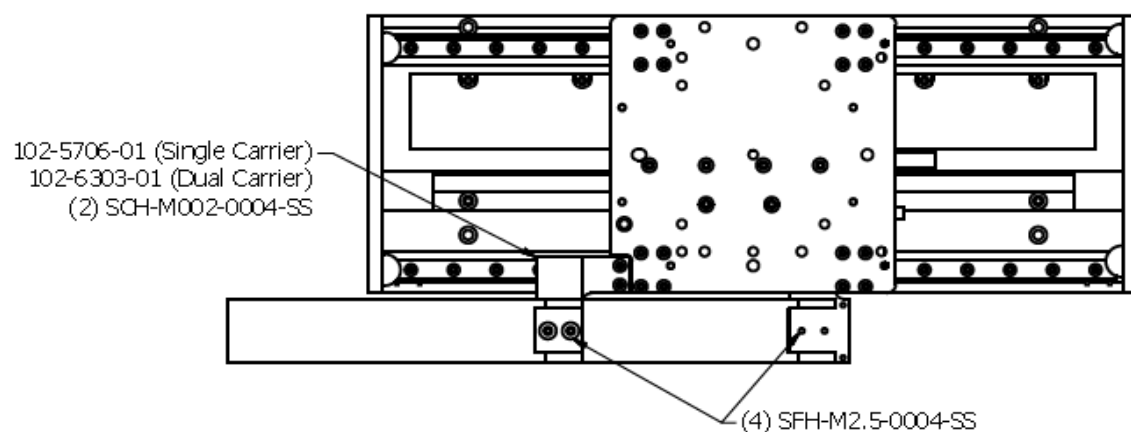


**Image 6. Double Cable Carrier**



## User Information Guide

# Cable Carrier Mounting



\* If mounting a longer unit as a Y axis, additional cable carrier supports are recommended.

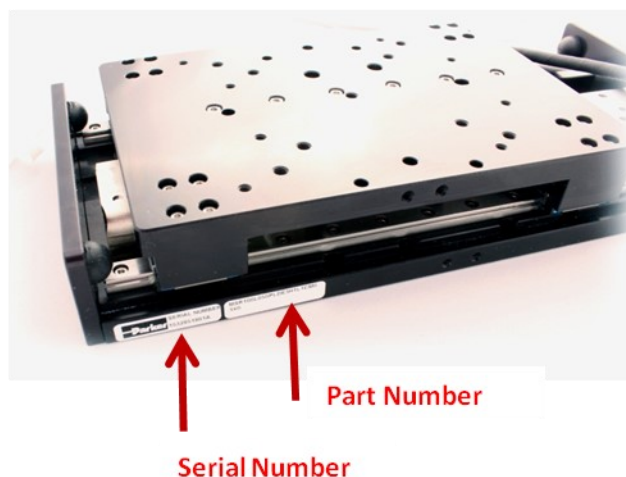
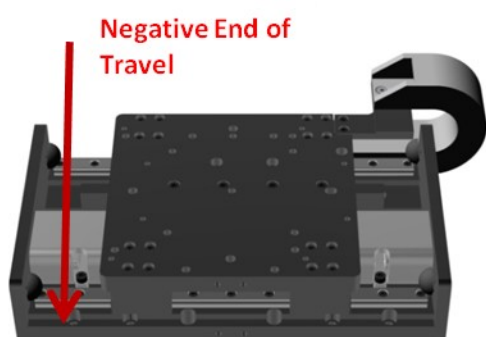
| Recommended # of Additional Supports |                   |
|--------------------------------------|-------------------|
| Base Length                          | # of Bracket Kits |
| Up to 260 mm                         | 1                 |
| 261 - 510 mm                         | 2                 |
| 511 - 660 mm                         | 3                 |



## User Information Guide

# Part and Serial Number Location

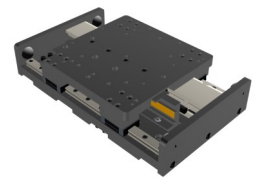
The mSR 100 part number and serial number can be located at the negative end of travel, on the base of the positioner, opposite the cables.



## Caution and Warning Label

The mSR Caution and Warning label is located on the motor phase an hall cable (9 pin D-Sub), as pictured below.





## Maintenance and Life Expectancy

### Maintenance:

The mSR100 is designed to be a maintenance free device. The drive train is a non-contact linear motor and does not need maintenance of any kind. The linear bearings are designed with internal lubricators that provide lubrication of the bearings for the life of the stage. Beside normal cleaning of surfaces (if needed) no other maintenance is required.

### Life:

The operational life of the mSR100 is limited by two primary factors, the linear bearings and the bending life of the cables. If the rated load of the stage is not exceeded, the typical bearing life is on the order of 2,540 km in a clean environment. Contamination or solvents on the bearings can result in lower life performance. The cable flex life in a cable carrier with a bend radius of 25mm is 10 million cycles. Cable flex life increases with larger bend radius.

## Spare Parts

| Description                               | Part #      |
|-------------------------------------------|-------------|
| Limit Kit,MSR100 Optical                  | 002-3547-01 |
| Limit Kit,MSR100 Magnetic                 | 002-3548-01 |
| Z bracket, 25-50mm                        | 002-2238-01 |
| Z bracket, 100-150mm                      | 002-2240-01 |
| Cable carrier bracket kit, Single Carrier | 002-3752-01 |
| Cable carrier bracket kit, Dual Carrier   | 002-3752-02 |



## User Information Guide

# Compliance Documents



**Parker Hannifin Corporation**  
Electromechanical Automation Div.  
1140 Sandy Hill Road  
Irwin, PA 15642  
1-800-245-6903

### RoHS Compliance Statement

We hereby certify that the following product line(s) produced by Parker Hannifin Corporation complies with the requirements of the EU Directive 2015/863 on the restriction of the use of certain hazardous substances in the electrical and electronic equipment (RoHS 3) and other national and international legislation similarly restricting the use of materials.

| RoHS 3 Restricted Substances and Limits |            |
|-----------------------------------------|------------|
| Lead (Pb)                               | < 1000 ppm |
| Mercury (Hg)                            | < 1000 ppm |
| Cadmium (Cd)                            | < 100 ppm  |
| Hexavalent chromium (Cr VI)             | < 1000 ppm |
| Polybrominated biphenyls (PBB)          | < 1000 ppm |
| Polybrominated diphenyl ethers (PBDE)   | < 1000 ppm |
| Bis(2-Ethylhexyl) phthalate (DEHP)      | < 1000 ppm |
| Benzyl butyl phthalate (BBP)            | < 1000 ppm |
| Dibutyl phthalate (DBP)                 | < 1000 ppm |
| Diisobutyl phthalate (DIBP)             | < 1000 ppm |

m5r Series

Date: June 26, 2020

Certified by: James Monnich  
Engineering Manager  
jmonnich@parker.com



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## User Information Guide



**Parker Hannifin Corporation**  
Electromechanical Automation Div.  
1140 Sandy Hill Road  
Irwin, PA 15642  
1-800-245-6903

### DECLARATION OF INCORPORATION

ACCORDING TO EC DIRECTIVE 2006/42/EC (ANNEX II, PART 1, SECTION B) FOR PARTLY COMPLETED MACHINERIES

DECLARATION NO.

MANUFACTURER  
AUTHORIZED PERSON

**PARKER HANNIFIN DAEDAL**  
James Monnich

ADDRESS

**Electromechanical Automation Div.**  
**1140 Sandy Hill Road**  
**Irwin, PA 15642**

PRODUCT

mSR Series Positioners

MODEL/TYPE

mSR080, mSR100

SERIAL NO.

From:

YEAR OF MANUFACTURE

From: 2015

The above mentioned Manufacturer/Authorized person declare that the product is complying with the following essential requirements of the machinery directive 2006/42/EC.

Annex 1, Article 1.1.1, 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.4.1, 1.5.4, 1.5.8, 1.6.1

|                |                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------|
| EN ISO 12100   | Safety of Machinery— basic concepts.                                                                  |
| EN 60034-1     | Rotating electrical machines— Part 1: Rating and performance                                          |
| EN 60034-5     | Rotating electrical machines - Part 5: Degrees of protection provide by the integral design (IP code) |
| EN 60034-18    | Rotating electrical machines - Part 18-1: Functional evaluation of insulation systems                 |
| EN/IEC 60204-1 | Safety of machinery - Electrical equipment of machines - Part 1: general requirements                 |
| EN 60085       | Electrical Insulation— Thermal evaluation and designation                                             |
| EN 349         | Safety of Machinery— Minimum gaps to avoid crushing of parts of the human body                        |
| 2015/863/EU    | Restriction of the use of certain hazardous substances                                                |

These products must be installed and operated with reference to the instructions in the Product Manual. All instruction, warnings and safety information of the Product Manual must be adhered to.

The partly completed machinery must not be put into service until the final machinery, into which it is to be incorporated, has been declared in conformity with the provisions of directive 2006/42/EC on machinery.

The machinery related special technical documentation according annex VII B has been created

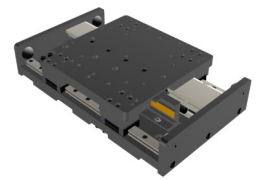
The manufacturer commits to transmit, in response to a reasoned request by the market surveillance authorities, relevant documents on the partly completed machinery electronically by our documentation department. The intellectual rights of the manufacturer of the incomplete machine are not affected.

James Monnich, Engineering Manager  
June 26, 2020



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## User Information Guide

## Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



## User Information Guide

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