User Information Guide

MANUAL NO. 102-6195-01
REV E
EFFECTIVE : 11/16/22
SUPERCEDES : 6/1/20

mSR080

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.

Since Parker Hannifin Corporation, Electromechanical Automation-Parker constantly strives to improve all of its products, we reserve the right to change this product manual and equipment mentioned therein at any time without notice.

For assistance contact:
Parker Hannifin Corporation
Electro Mechanical Division
1140 Sandy Hill Road
Irwin , PA 15642

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800-245-6903
E-mail : emn_applications@parker.com
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MSR Series Product Manual
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REVISON NOTES

REV - INITIAL RELEASE 5/15/15.

REV 1 PG 8 - CHANGE TRANSPORT TEMPERATURE TO 0 TO +40 (WAS -20 TO +60)

REV 2 Updated mounting information P 14

REV C - p14 - Base Dowel Pin corrected to Slip Fit

REV D - updated compliance information

REV E– Updated Specification Conditions (Environmental Specifications) Page 8.

Introduction

The mSR is a series of linear positioners 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 motor. 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 system.

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 (≤ 8 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 "*R*eturn *M*aterial *A*uthorization" *(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 positioneris 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 effecting 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 effect 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. Impacts loads generated by hammering or riveting may result in flat spots on bearing surfaces or misalignment of drive components, drastically effecting 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.

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 [1]	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.

[1] Minimum to maximum continuous operating temperature range (with NO guarantee of any specification except motion)

Mounting Surface Requirements

Proper mounting of the mSR is essential to optimize product performance. All specifications are based on the following conditions:

- The positioner must be bolted down to a flat surface which supports the entire length of the base using all mounting holes provided
- 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).
- 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.

Specifications

Specifications		Units	25	35	50	100	150
Travel		mm					
Size (WxH)		mm	80 x 25	80 x 25	80 x 25	80 x 25	80 x 25
Normal Load		kg	4	4	8	8	8
Continuous Thrust		N	4	4	8	8	8
Peak Thrust (Max)		N	12	12	24	24	24
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[1]	Standard grade	µm	±6	±6	±8	±10	±15
	Precision grade		±3	±3	±4	±5	±10
Carriage Mass		kg	0.2365	0.2365	0.3065	0.4115	0.519
Stage Mass		kg	0.525	0.5815	0.7395	1.0665	1.403

1 Precision grade version stage mounted to granite surface, 0.01 micron optical encoder

Continuous Power	
Motor	**Power (Watts)**
CS Motor	38.4
CD motor	76.8

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mSR080 Specifications (Travel & Encoder Dependent)

Specification	Units	Travel (mm) 25	35	50	100	150
Magnetic Encoder -1 Micron Resolution						
Max. Speed	**mm/s**	1100	1500	2000	2000	2000
Bi-directional Repeatability	**µm**	±5.0				
Positional Accuracy	**µm**	40	40	60	80	80
Optical Encoder- 1 Micron Resolution						
Max. Speed	**mm/s**	1100	1500	2000	2000	2000
Bi-directional Repeatability	**µm**	±2.0				
Positional Accuracy	**µm**	9	9	9	11	13
Positional Accuracy (Slope Corrected)	**µm**	5	6	6	6	7
Optical Encoder- 0.1 Micron Resolution						
Max. Speed	**mm/s**	300	300	300	300	300
Bi-directional Repeatability	**µm**	±0.3				
Positional Accuracy	**µm**	8	8	8	10	12
Positional Accuracy (Slope Corrected)	**µm**	4	5	5	5	6
Optical Encoder- 0.01 Micron Resolution						
Max. Speed	**mm/s**	30	30	30	30	30
Bi-directional Repeatability	**µm**	±0.1				
Positional Accuracy	**µm**	8	8	8	10	12
Positional Accuracy (Slope Corrected)	**µm**	4	5	5	5	6

Part Number Nomenclature
mSR 080

Part Number Example:

MSR	080	L	050	P	CD	E3	H1	L1	CM01	X0

① Series

MSR	Series

② Size

80	80 mm wide profile

③ Drive Train

L	Linear Motor Drive

④ Stroke Length (mm)

025	25 mm
035	35 mm
050	50 mm
100	100 mm
150	150 mm

⑤ Grade

P	Precision
S	Standard

⑥ Motor

CS	Ironcore,single (25 and 35 mm travels only)
CD	Ironcore, double (50, 100 and 150 travels only

⑦ Encoder

E1	1µ optical incremental *
E2	0.1µ optical incremental *
E3	0.01µ optical incremental *
SC	Sine/ Cosine*
M1	1µ magnetic incremental **

*Available on precision grade only

**Available on standard grade only

⑧ Home Sensor

H1	Home Sensor[1]

[1]Home sensor with M1 option

[1]Index mark with E1/E2/E3 or SC options

⑨ Limit Sensor

L1	End-of-travel limit sensors

⑩ Cable Options

CM01	No cable management 1 meter
CM03	No cable management 3 meter

⑪ Other Options

X0	No counter balance
X1	Magnetic counter balance* (50 grams)
X2	Magnetic counter balance* (200 grams)
X3	Magnetic counter balance* (300 grams)
X4	Magnetic counter balance* (360 grams)
X5	Magnetic counter balance* (440 grams)
X6	Magnetic counter balance* (650 grams)

*Available on 25 mm stroke only

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Electrical Specifications

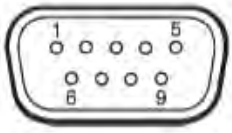
Motor Specifications	Units	4 Pole (CS Option)	8 Pole (CD Option)
Magnetic Pitch	mm	13	13
Continuous Force[1]	N	4	8
Peak Force	N	12	24
Continuous Current[1]	A(rms)	0.8	1.6
Peak Current[2,3]	A(rms)	2.4	4.8
Voltage Constant[2,3]	Volts/m/s	4.5	4.5
Force Constant[2]	N/A(rms)	5.51	5.51
Resistance[2]	Ohms	8.8	4.3
Inductance[4]	mH	2.4	1.6
Max Bus Voltage	VDC	48	48
Thermal Resistance	C/Watt	6.84	3.4
Winding Thermal Time Constant	Minutes	0.5	0.5
Motor Thermal Time Constant	Minutes	0.8	0.8

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

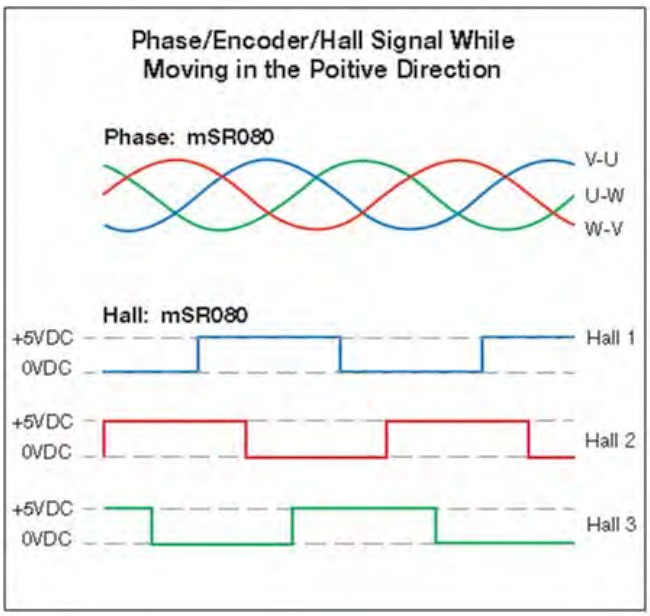
2 Measured line to line

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



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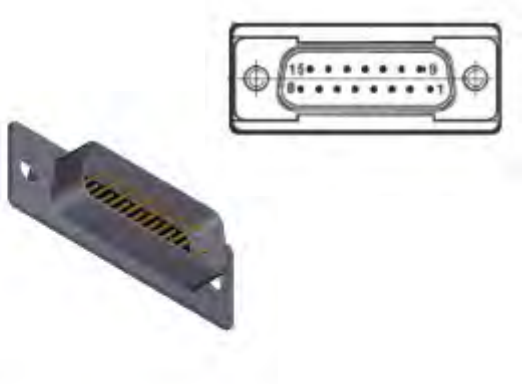
Optical Encoder

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



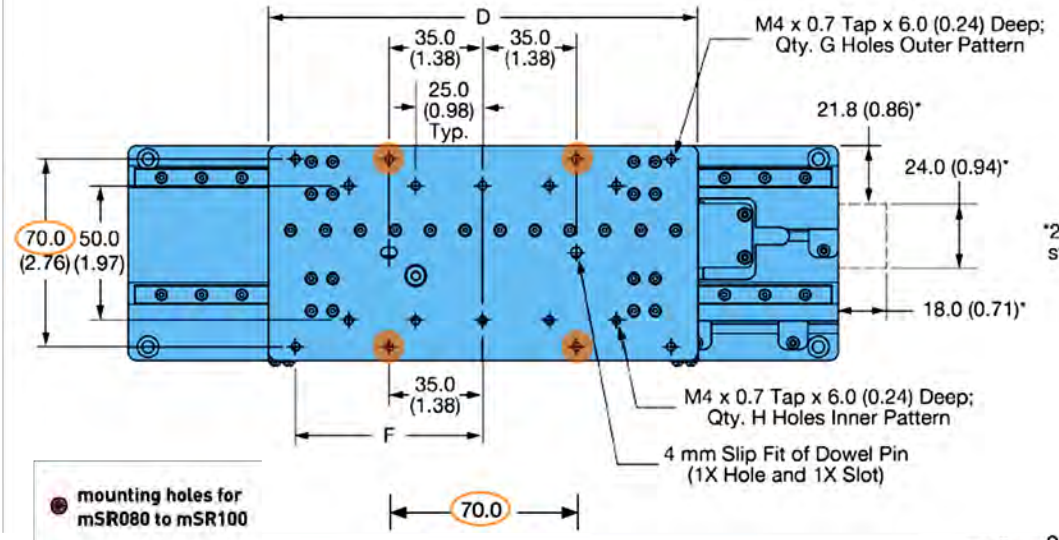
Sine Cosine Encoder

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

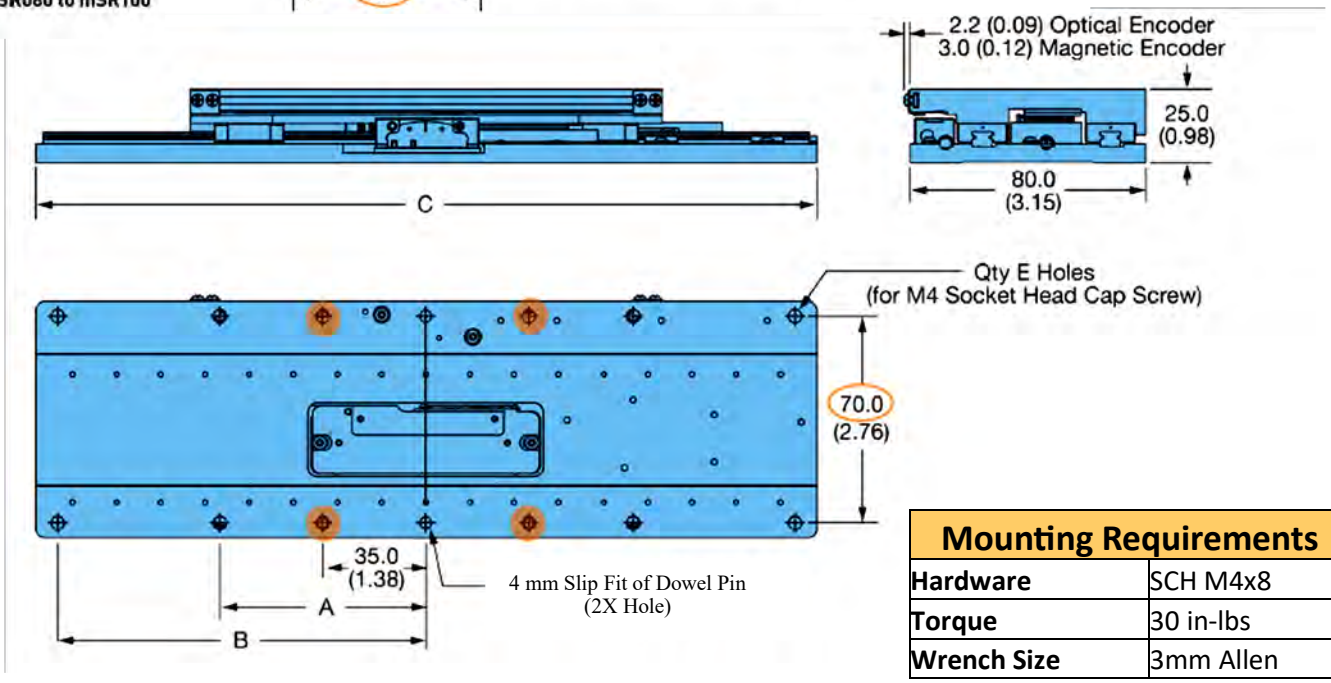
Function	Signal	Pin #
Power	5 Volts DC	8
	Ground	9
Incremental Signals	A+	14
	A-	6
	B+	13
	B-	5
Reference Mark	Z+	12
	Z-	4
Limits	Positive Limit	11
	Negative Limit	10
Home	NPN	2
Error Output	NPN	3

Dimensional Drawings- mSR080 - mm



The mSR part numbers mount directly to one another. The 4 bolts go through the center of the Y axis base to the carriage of the X axis. See the mSR100 for more

Configuration	Bolt size
mSR80—mSR80	M4 x 0.7 x 8
mSR80—mSR100	M4 x 0.7 x 8



Mounting Requirements	
Hardware	SCH M4x8
Torque	30 in-lbs
Wrench Size	3mm Allen

Dimensions - mm (in)

Travel	A	B	C	D	E	F	G	H
(mm)					(QTY)		(QTY)	(QTY)
25	-	-	110 (4.33)	80	4	-	4	6
35	-	-	120 (4.72)	80	4	-	4	6
50	70 (2.76)	-	165 (6.50)	110 (4.33)	8	-	8	6
100	70 (2.76)	125 (4.92)	265 (10.43)	160 (6.30)	12	70 (2.76)	8	10
150	100 (3.94)	175 (6.89)	365 (14.37)	210 (8.27)	12	100 (3.94)	8	14

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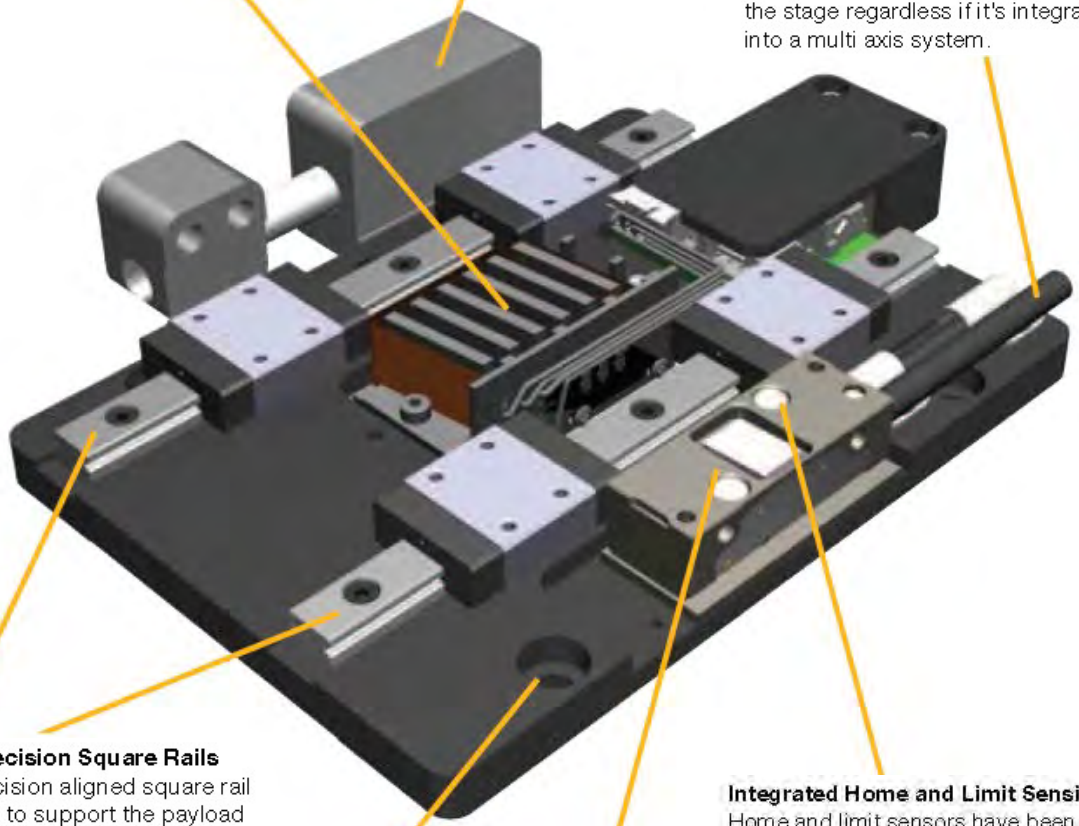
Assembly Diagram - mSR080

Center Driven Ironcore Linear Motor
The mSR 80 offers both a 4 and 8 pole ironcore linear motor based upon the application thrust requirements. Each of these motors have been optimized operate on 48 Volts DC.

An Optional Magnetic Counterbalance
The mSR 80 with 25 mm stroke has an optional magnetic counterbalance that can be used for Z axis applications. The magnetic counter balance is a more robust solution when compared to spring or pneumatic driven alternatives.

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.



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 80 encoder read head, and signals are passed through the same cable, minimizing the amount of cables requiring cable management.

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.

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

Five Different Linear Encoder Technologies
The mSR 80 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.

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Setting the Optical Encoder Limits

The mSR080 with the optical encoder option comes equipped with adjustable end of travel limit sensors. The sensors are activated by two magnetic targets on the side of the stage as shown in image #1 below. The factory setting location of these 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, simple loosen both screws on the targets ~1/4 turn using a Philips screw driver, slide the target to the desired position, push the target upward toward the carriage top to seat the target on the bottom side of the carriage (see image #1) 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 1

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Setting the Magnetic Encoder Limits

The mSR080 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 on the side of the stage as shown in image #2 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, simple loosen both screws on the targets ~1/4 turn using a Philips screw driver, slide the target to the desired position, push the target upward toward the carriage top to seat the target on the bottom side of the carriage (see image #2) 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.

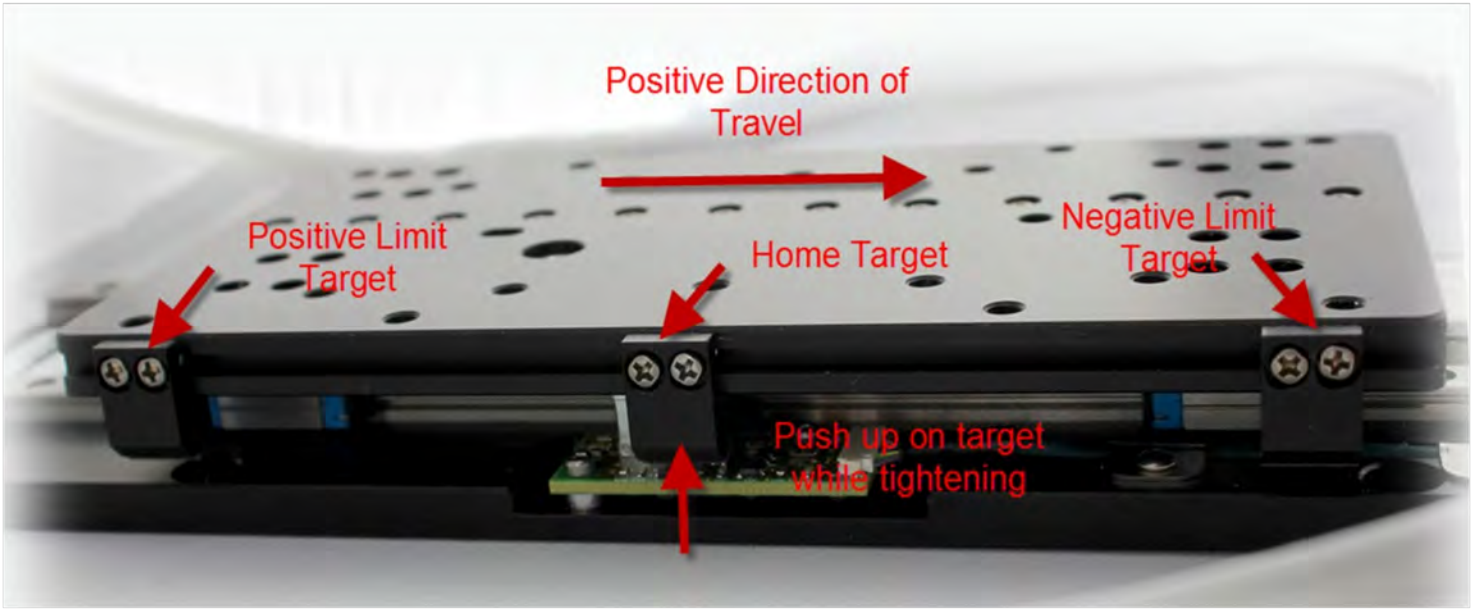

Image 2

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Part and Serial Number Location

The mSR 80 part number and serial number can be located at the negative end of travel, between the square rail bearings.

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.

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Maintenance and Life Expectancy

Maintenance:

The mSR080 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 which 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 mSR080 is limited by the linear bearings, 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.

Spare Parts

Description	Part #
Limit Kit,MSR080 Optical	002-3545-01
Limit Kit,MSR080 Magnetic	002-3546-01
Z bracket, 25-50mm	002-2238-01
Z bracket, 100-150mm	002-2240-01

Compliance Documents

Parker Hannifin Corporation
Electromechanical Automation Div.
1140 Sandy Hill Road
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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
Diburyl phthalate (DBP)	< 1000 ppm
Diisobutyl phthalate (DIBP)	< 1000 ppm

mSr Series

Date: June 26, 2020

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

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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 Mounich**
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

ENGINEERING **YOUR** SUCCESS

Notes

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