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Rev. 4

Parker

MX80S Series Product Manual

Effective: July 1, 2006
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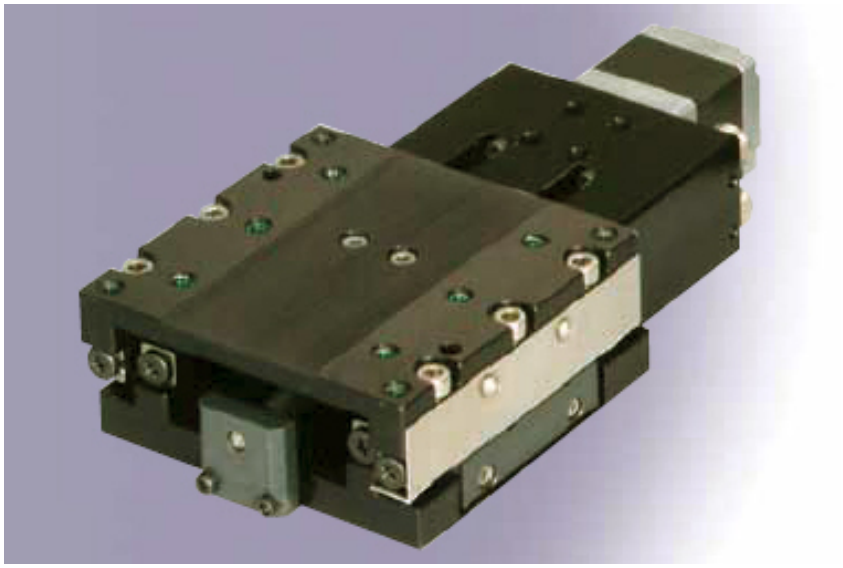
Electromechanical Positioning Systems



Automation

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.

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MX80S Series Product Manual

Table of Contents

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Revision Notes

Revision 1
Original Document

Revision 2
Page 29, Corrected and updated stepper motor lead to ViX wiring
Page 22 & 30, Added servo motor connection information

Revision 3
Page 24, 25, & 26, Changed Limits/Home from optical sensors to magnetic sensors

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Chapter 1 - Introduction

Product Description

MX80S Positioner

The MX80S miniature positioner is the screw driven member of Daedal's MX80 family. Like its counterparts, the MX80L linear motor driven stage and MX80M manual stage, the MX80S is designed for OEM applications requiring reliable linear positioning in space restricted applications. It is the complimentary product that bridges the product spectrum between the high dynamic linear motor performance of the MX80L, and the manual precision of the MX80M. The MX80S can be supplied with a high efficiency leadscrew drive capable of reaching 200mm per second velocity, or a precision ground ballscrew drive offering axial thrust to 123N. The leadscrew drive employs a teflon® coated leadscrew with a preloaded nut to produce extremely smooth linear translation. A choice of three leads provides improved opportunity for matching desired velocity / resolution requirements. The 2.0mm lead ballscrew stage offers high performance 24/7 operation with a thrust load capacity of 123N (28lb.) and velocity to 100 mm/second at 100% duty cycle.

Unpacking

Unpacking

Carefully remove the positioner from the shipping container 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. Please observe the following guidelines for handling and mounting of your new positioner.

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

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.

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 void the product warranty.

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.

Warnings and Precautions

Hot Surfaces

DO NOT touch rotary motor coils located on the MX80S 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.

Pinch Points

Unit may have a pinch point because the top extends over the base of the table. Proper care should be exercised.

Vertical Operation

Depending upon your load and screw selection the carriage and load my 'backdrive' in power loss situations potentially causing product damage or personal injury.

General Safety

Sometimes positioners move without warning, keep all personnel away from dynamic travel range of positioner.

Strain Relieve Electrical Components

All electrical components (such as motor, 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.

Specification Conditions

Specifications Are Temperature Dependent

Catalog specifications are obtained and measured at 20 Degrees C. Specifications at any other temperature may deviate from catalog specifications. Minimum to maximum continuous operating temperature range (with NO guarantee of any specification except motion) of a standard unit before failure is 5 - 40 degrees C.

Specifications Are Mounting Surface Dependent

Catalog specifications are obtained and measured when the positioner is fully supported, bolted down, and is mounted to a work surface that has a maximum flatness error of:

0.001mm/300mm (0.00004”/ft)

Table will operate with work surface of 0.100mm/300mm flatness or worse, but performance specifications will be significantly effected.

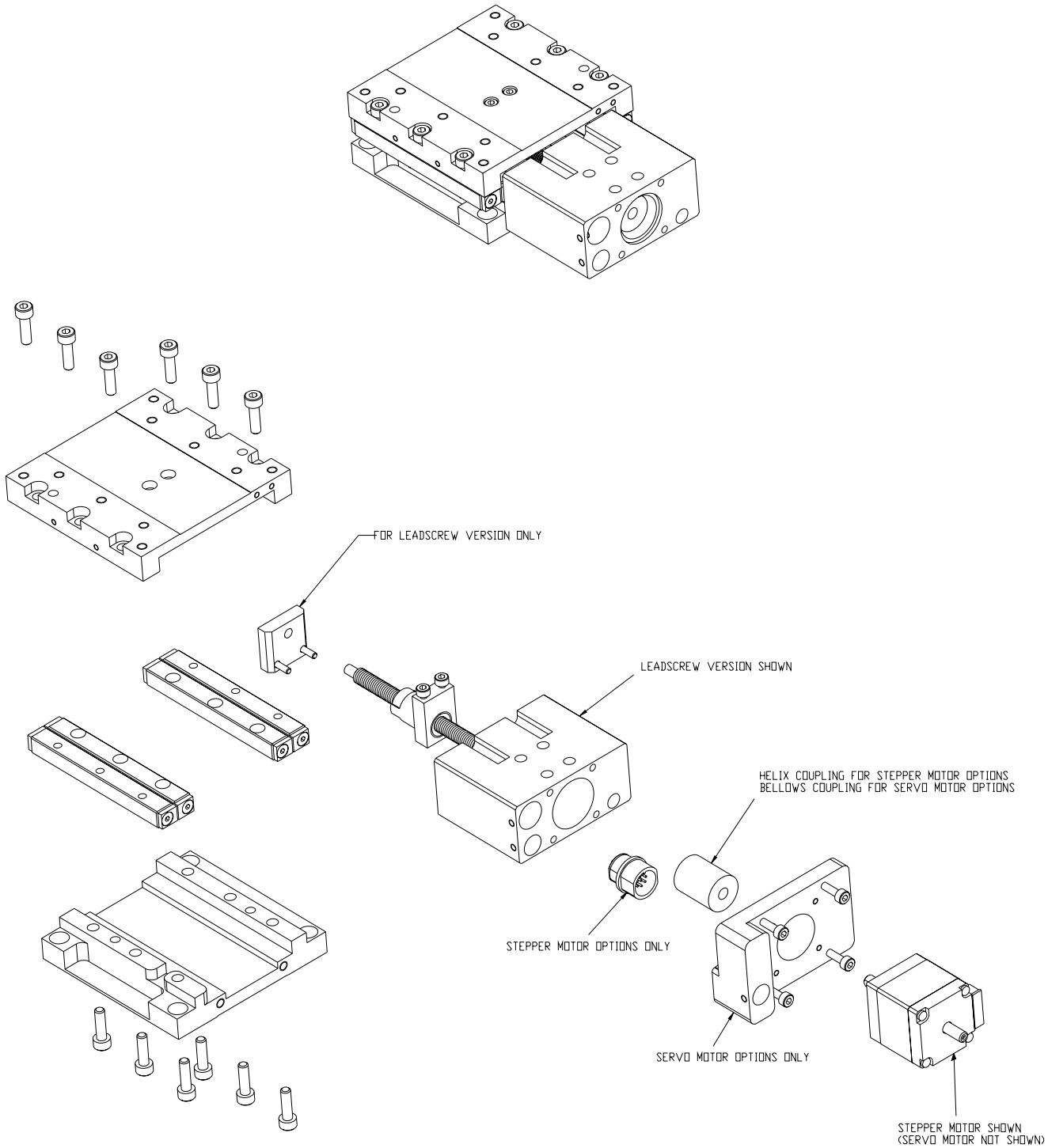
Specifications Are Point of Measurement Dependent

Catalog specifications and specifications in this manual are measured from the center of the carriage, 38 mm above the carriage surface. All measurements taken at any other location may deviate from these values.

Specifications Are Load Mounting Dependent

Catalog specifications are obtained and measured when the customer load is fixed to the carriage mounting surface(s) and has a flatness of equal to or less than 0.0025mm (0.0001”). The table will operate with customer load surface greater than 0.0025mm (0.0001”) flatness, but performance specifications will be significantly effected.

Assembly Diagram



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Chapter 2 – MX80S Series Table Specifications

MX80S Miniature Screw Driven Stage

Model Number Code:

MX80S | T02 | M | S | K | - | D1 | M1 | H3L3 | CM12 | E1 | Z1 | R1 | A11 | X1 | S1

Model MX80S

Travel
- 25 mm T01
- 50 mm T02
- 100 mm T03
- 150 mm* T04

(* Stepper Only)

Mounting (metric) ..... M

Grade
- Standard ..... S
- Precision ..... P

Bearing Type
- Standard Cross Roller ..... J
- ACS Cross Roller ..... K

Drive Type
- 1 mm Lead Screw ....(std. grade only)..... D1
- 2 mm Lead screw .... (std. grade only)..... D2
- 10 mm Lead screw ...(std. grade only)..... D3
- 2 mm Ballscrew .....(prec.grade only)..... D6

Motor
- No Motor, Flange or Coupling M0
- NEMA 16 Flange - No Motor or Coupling M1
- 1 Stack NEMA 11 Stepper M11
- 2 Stack NEMA 11 Stepper M12
- 3 Stack NEMA 11 Stepper M13
- 1 Stack NEMA 16 Servo M21

Home/Limit Switch*

None H1L1

	H2L2	H2L3	H3L2	H3L3
Home	NC	NC	NO	NO
Limits	NC	NO	NC	NO

* NC= Normally Closed; NO= Normally Open

Cable Options (Hi Flex)
- None CM01
- Limits (only) - w/ flying leads - 1 meter CM02
- Limits (only) - w/ flying leads - 3 meter CM03
- Limits (only) - w/ ViX connector - 1 meter CM04
- Limits (only) - w/ ViX connector - 3 meter CM05
- Stepper Motor & Limits w/ViX connector - 1meter CM06
- Stepper Motor & Limits w/ViX connector - 3 meter CM07
- Stepper Motor - no Limits w/ViX connector - 1meter CM08
- Stepper Motor - no Limits w/ViX connector - 3 meter CM09
- CM10 Stepper Motor (E drive) & Limits - 1 meter
- CM11 Stepper Motor (E drive) & Limits - 3 meter
- CM12 Stepper Motor (E drive) no Limits - 1 meter
- CM13 Stepper Motor (E drive) no Limits - 3 meter
- CM15 Servo Motor, Encoder & Limits w/ ViX connector - 3 meter
- CM17 Servo Motor, Encoder, no Limits w/ ViX connector - 3 meter

Axis Designator
- S1 None (single axis)
- S2 X axis base unit (cables @12 o'clock)
- S3 Y-axis 60 arc sec.(cables @ 3 o'clock)
- S4 Y-axis 60 arc sec.(cables @ 9 o'clock)
- S5 Y-axis 15 arc sec.(cables @ 3 o'clock)
- S6 Y-axis 15 arc sec.(cables @ 9 o'clock)
- X1 Required Designator

Digital Drive Options
- A1 No drive
- A10 ViX250-AE servo (torque mode)
- A11 ViX250-AE servo (velocity mode)
- A12 ViX250-AE servo step/direction mode
- A15 ViX250-IE servo drive/controller
- A30 E-AC Stepper Drive
- A31 E-DC Stepper Drive
- A35 ViX250-IM stepper drive/controller

Environmental Options
- R1 Standard finish - black anodized
- R2 Clean room prep.
- R10 Low ESD finish
- R20 Low ESD finish and clean room prep.

Z-Channel Location
- Z1 No Z-Channel
- Z3 Center Position

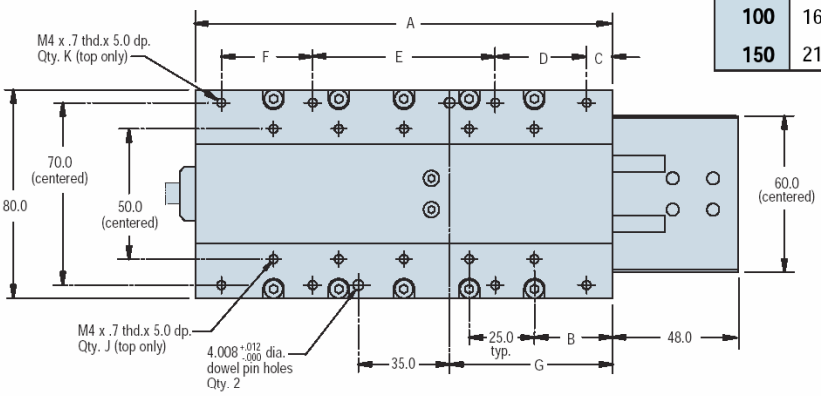
Encoder Option
- E1 No encoder
- E2 1.0 µm resolution (optical)
- E3 0.5 µm resolution (optical)
- E4 0.1 µm resolution (optical)
- E5 5.0 µm resolution (optical)
- E12 1.0 µm resolution(magnetic)
- E15 5.0 µm resolution(magnetic)

MX80S Miniature Screw Driven Stage

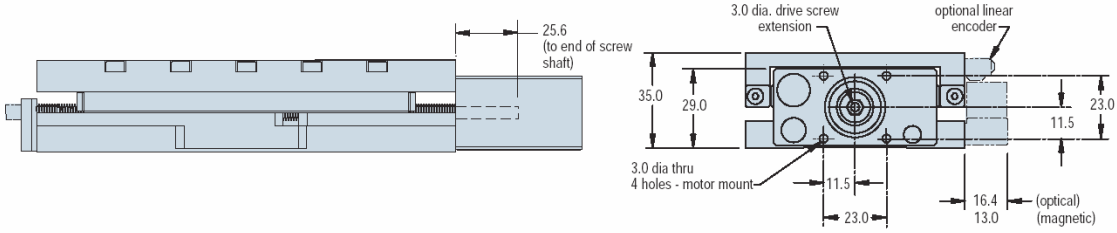
Dimensions

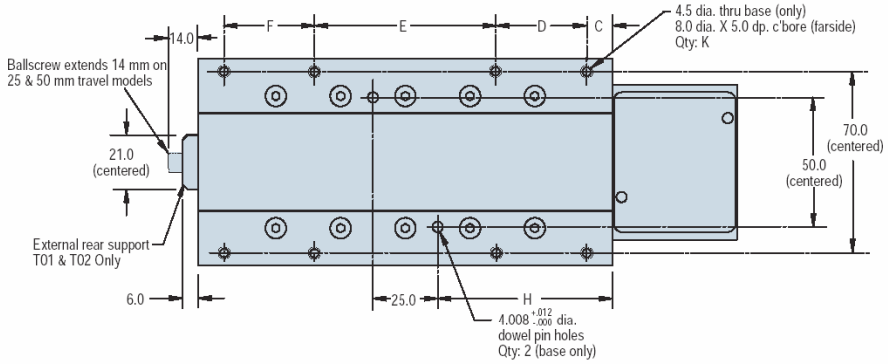
(millimeters)

Travel	Dimensions (mm)									
	A	B	C	D	E	F	G	H	J	K
25	80	15	5	70	n/a	n/a	22.5	27.5	6	4
50	80	15	5	70	n/a	n/a	22.5	27.5	6	4
100	160	30	10	35	70	35	62.5	67.5	10	8
150	210	30	5	65	70	65	87.5	92.5	14	8

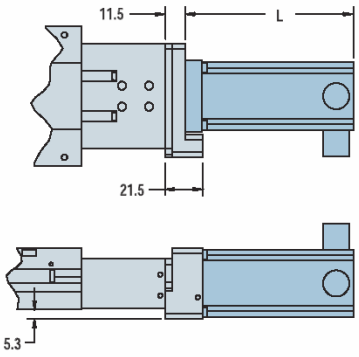


CAD files ... Download from phdaedal.com

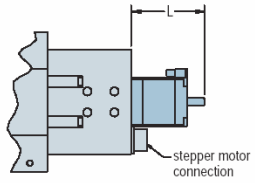




Motor	L
Stepper 1 Stack NEMA 11	42.0
Stepper 2 Stack NEMA 11	50.0
Stepper 3 Stack NEMA 11	61.5
Servo 1 Stack NEMA 16	118.4



Mounting - Servo Motor



Mounting - Stepper Motor

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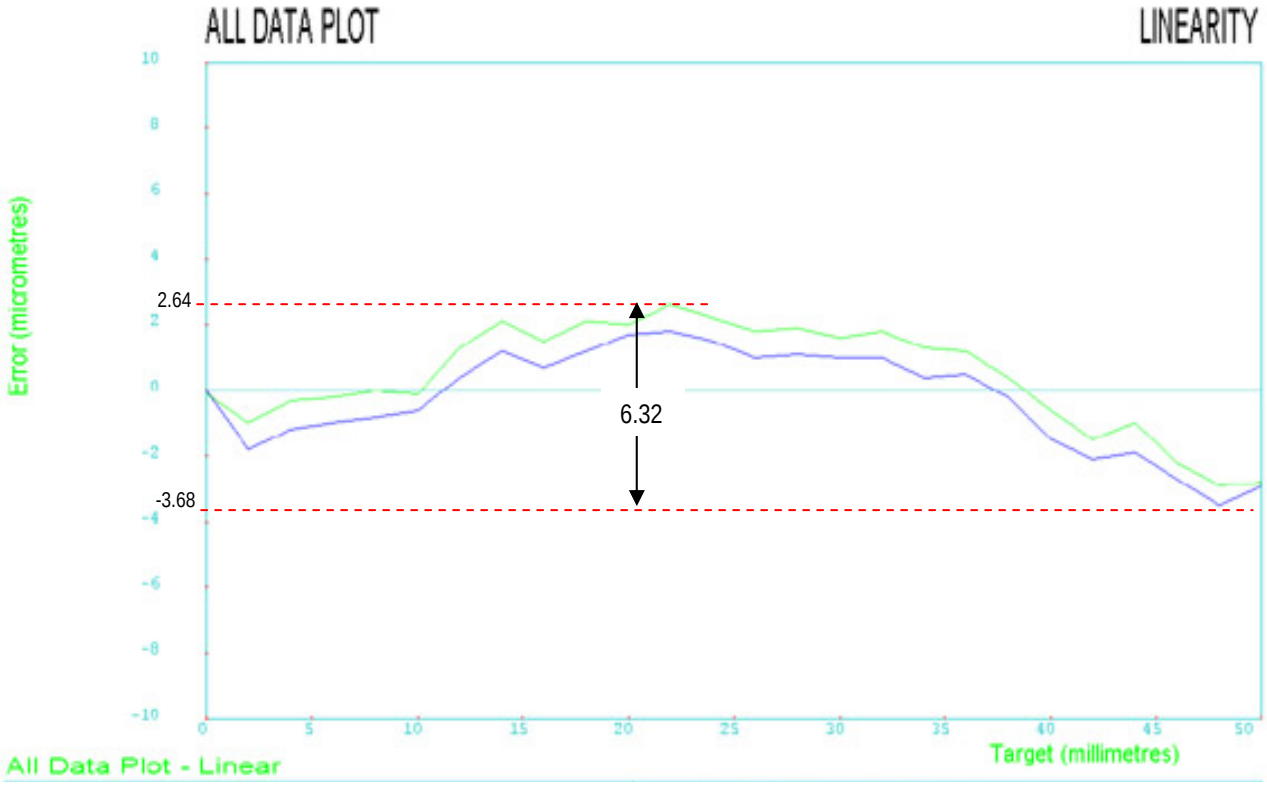
General Table Specifications

Specifications		Travel (Model) 25mm	50mm	100mm	150mm
Normal Load Capacity		8kg	8kg	8kg	8kg
Thrust Load Capacity					
Leadscrew Drive		44N (10 lb)	44N (10 lb)	44N (10 lb)	44N (10 lb)
Ballscrew Drive		123N (28 lb)	123N (28 lb)	123N (28 lb)	123N (28 lb)
Straightness & Flatness(1)(2)		8 microns	12 microns	16 microns	20 microns
Bi-directional Repeatability(1)(2)					
1.0 mm lead	Leadscrew	±5.0 microns			
2.0 mm lead	Leadscrew	±5.0 microns			
10.0 mm lead	Leadscrew	±10.0 microns			
2.0 mm lead	Ballscrew(3)	±1.5 microns			
Positional Accuracy (1)(2)					
1.0 mm lead	Leadscrew	30 microns	45 microns	75 microns	100 microns
2.0 mm lead	Leadscrew	30 microns	45 microns	75 microns	100 microns
10.0 mm lead	Leadscrew	35 microns	50 microns	80 microns	105 microns
2.0 mm lead	Ballscrew	10 microns	15 microns	18 microns	20 microns
Breakaway Torque					
Leadscrew Drive		0.021Nm			
Ballscrew Drive		0.050Nm			
Running Torque (max.)					
1.0 mm lead	Leadscrew	0.028Nm	0.028Nm	0.035Nm	0.035Nm
2.0 mm lead	Leadscrew	0.028Nm	0.028Nm	0.035Nm	0.035Nm
10.0 mm lead	Leadscrew	0.021Nm	0.021Nm	0.021Nm	0.028Nm
2.0 mm lead	Ballscrew	0.085Nm	0.085Nm	0.085Nm	0.085Nm
Inertia* (10^{-7}kg-m^2)					
1.0 mm lead	Leadscrew	1.47	1.47	2.42	3.06
2.0 mm lead	Leadscrew	1.62	1.62	2.68	3.42
10.0 mm lead	Leadscrew	6.34	6.34	11.30	14.90
2.0 mm lead	Ballscrew	4.19	4.19	6.08	7.68
* without motor & coupling					
Screw Speed (max.)					
Leadscrew		20 rps			
Ballscrew		50 rps			
Maximum Velocity					
1.0 mm lead	Leadscrew	20 mm/sec			
2.0 mm lead	Leadscrew	40 mm/sec			
10.0 mm lead	Leadscrew	200 mm/sec			
2.0 mm lead	Ballscrew	100 mm/sec			
Leadscrew Efficiency					
1.0 mm lead	Leadscrew	40%			
2.0 mm lead	Leadscrew	59%			
10.0 mm lead	Leadscrew	78%			
2.0 mm lead	Ballscrew	90%			
Screw Dia.	Leadscrew	6.35 mm			
	Ballscrew	8.00 mm			
Brg. Coefficient of Friction		0.003			
Duty Cycle	Leadscrew	50%			
	Ballscrew	100%			
Carriage Mass	Leadscrew	194g	194g	353g	471g
	Ballscrew	291g	291g	464g	595g
Unit Mass	Leadscrew	597g	597g	1003g	1268g
(table only)	Ballscrew	694g	694g	1114g	1392g
Unit Mass	Leadscrew	748g	748g	1154g	1419g
(w/2 stack stepper)	Ballscrew	845g	845g	1265g	1513g

(1) Measured at the carriage center, 35mm off mounting surface @ 20 C with no load. Unit bolted to granite surface, flat to within 1micron/300mm.
(2) Total accuracy and bi-directional repeatability over full travel (peak to peak).
(3) Repeatability valid with M21 servo motor .

Test Methodology



Published accuracy and repeatability specifications are subject to the testing methodology. Parker's methodology provides specifications over the entire table travel regardless of start or finish position. The accuracy and repeatability specifications are based on the peak to peak error measured by a laser interferometer and prism located at 38mm above the center of the table. This type of measurement sums the X, Y, Z, roll, pitch, and yaw errors. Temperature deviations from test condition may cause deviations in straightness, flatness, accuracy, and repeatability from catalog specifications. Tests are performed with the table mounted to a granite table, unloaded at 20^{o} C.

In this example, the accuracy ranges from -3.68 microns to 2.64 microns. This table would have its accuracy specified as 6.32 micron since the worst case would be starting at one extreme and traveling to the other.

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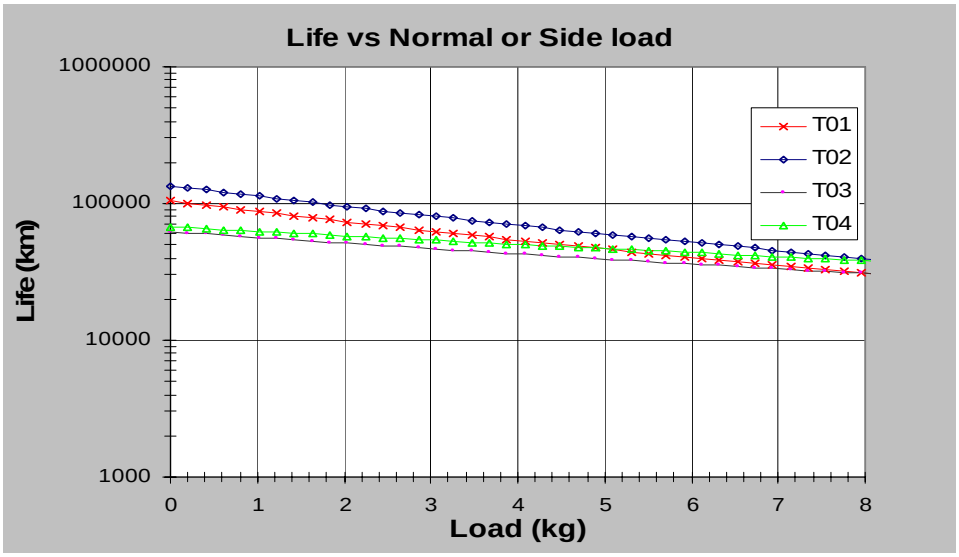
MX80S Series Technical Data

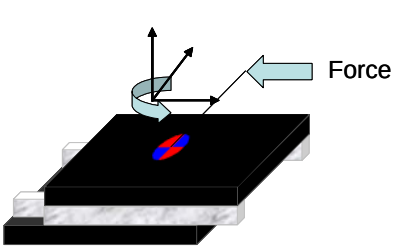
The useful life of a linear table at full catalog specifications is dependent on the forces acting upon it. These forces include both static components resulting from payload weight, and dynamic components due to acceleration/deceleration of the load. In multi-axes applications, the primary positioner at the bottom of the stack usually establishes the load limits for the combined axes. When determining load/life, it is critical to include the weight of all positioning elements that contribute to the load supported by the primary axis. The life/load charts are used to establish the table life relative to the applied loads.

Load-Life All Travels

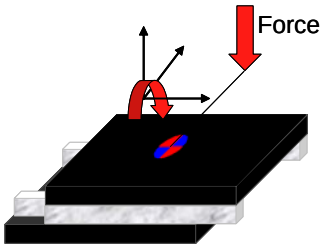


Moment Load – Life Curves

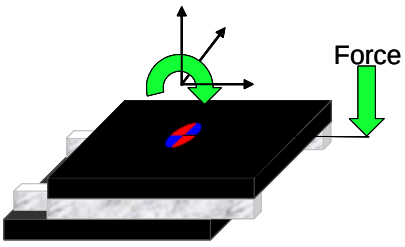
The effect of moment loading on the bearing life is dependent upon load and lever arm. The lever arm in this case is measured from the center of the surface of the table to the point where the load is applied. For dynamic loading, use the distance from the center of the table to the center of mass of the load. The Life-Load charts show curves for various lever arm lengths (units in [mm]). Note Pitch moments and Yaw moments use the same curves.



Yaw Moment Loading



Roll Moment Loading



Pitch Moment Loading

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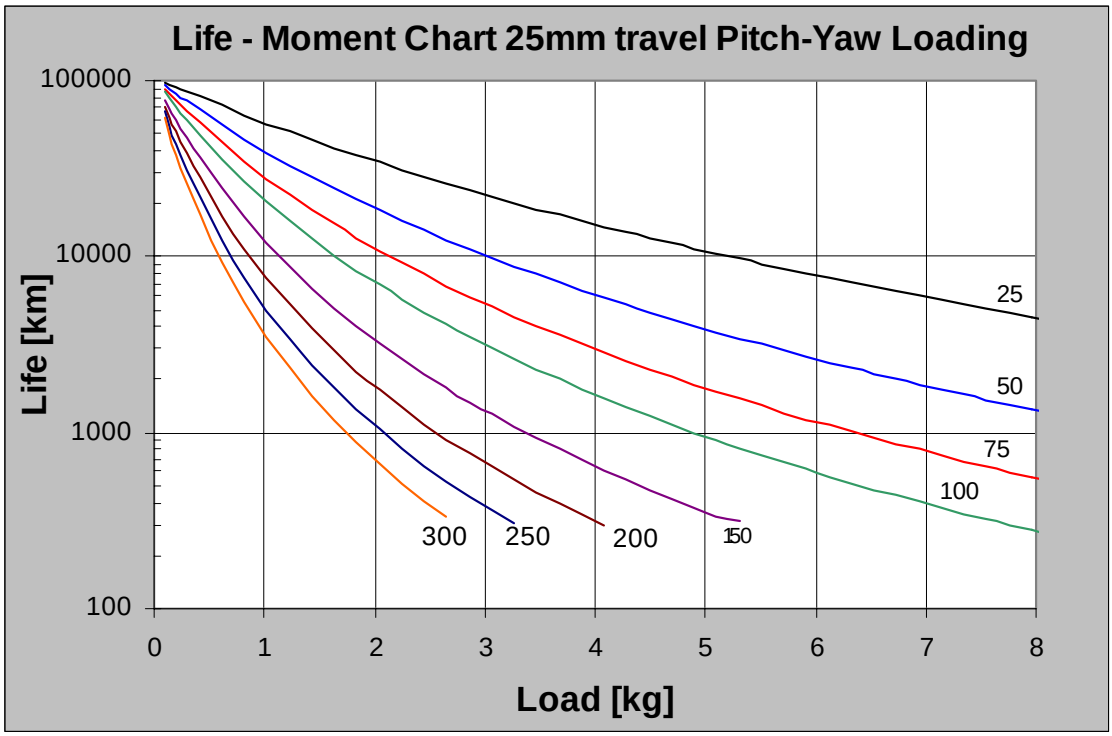
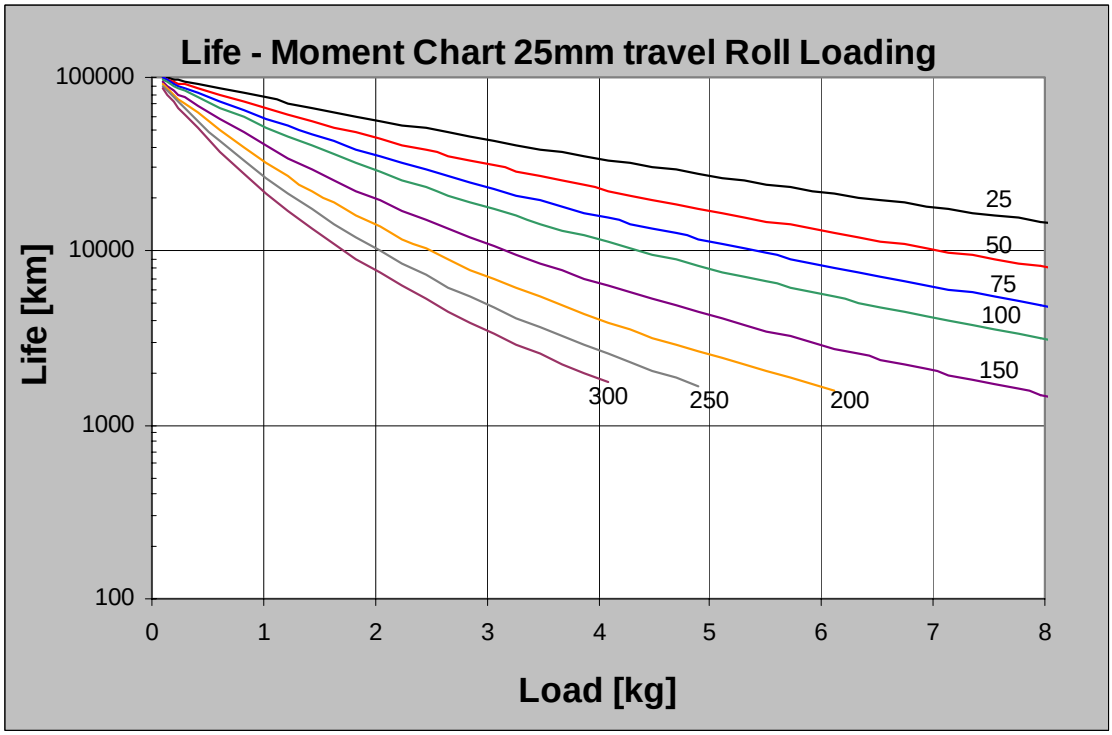
Moment Deflection – Load Charts





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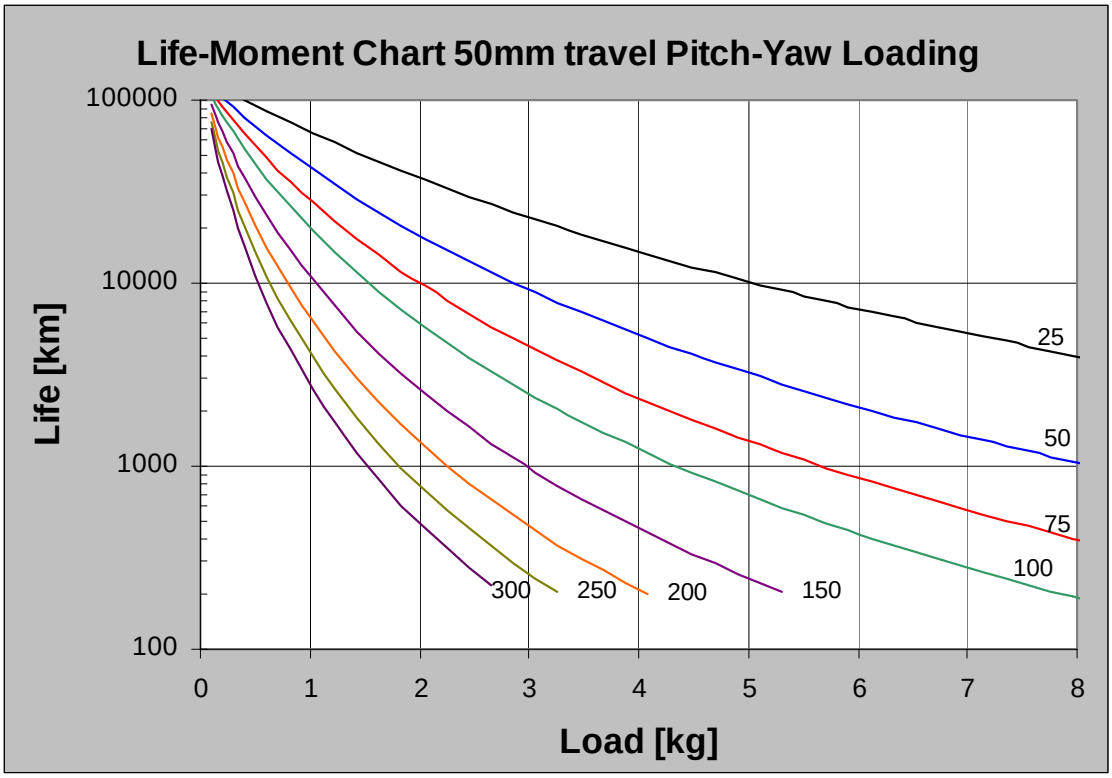

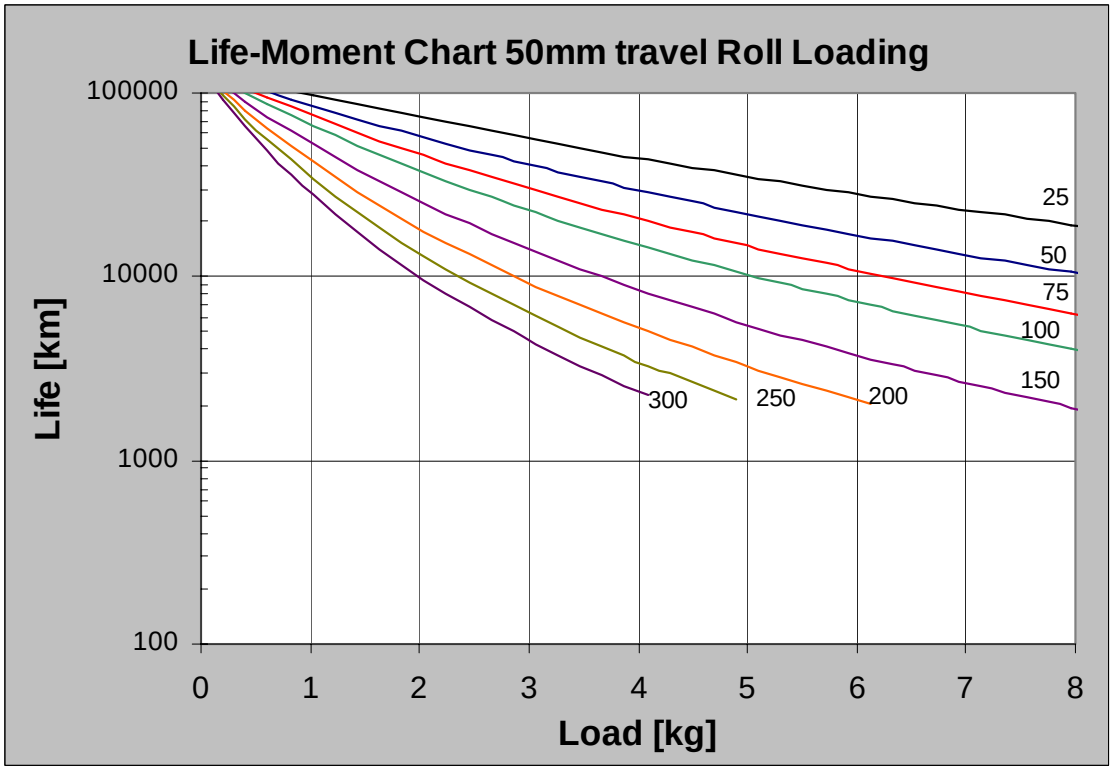

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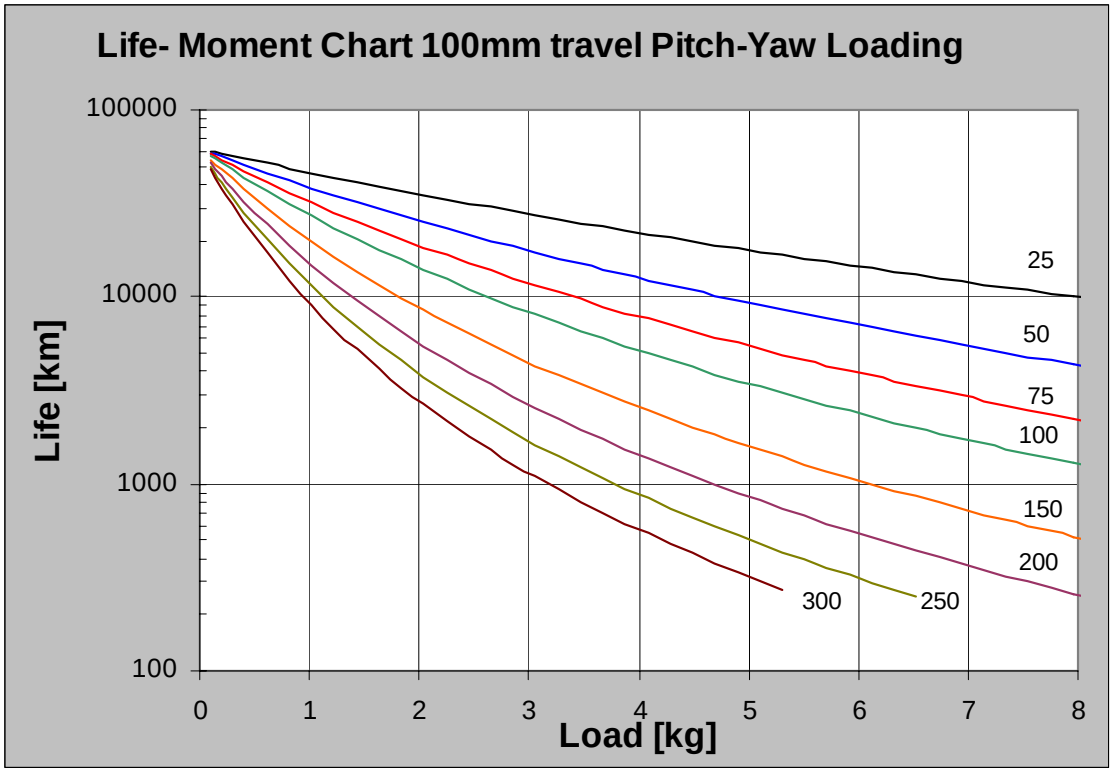

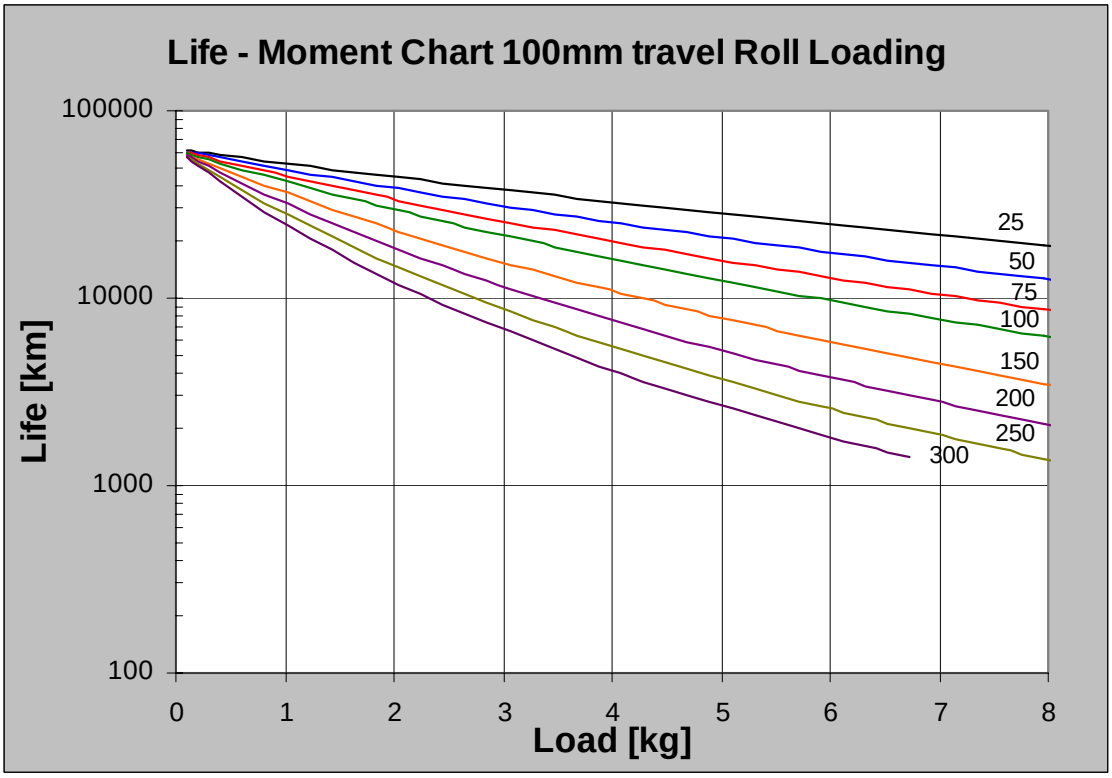

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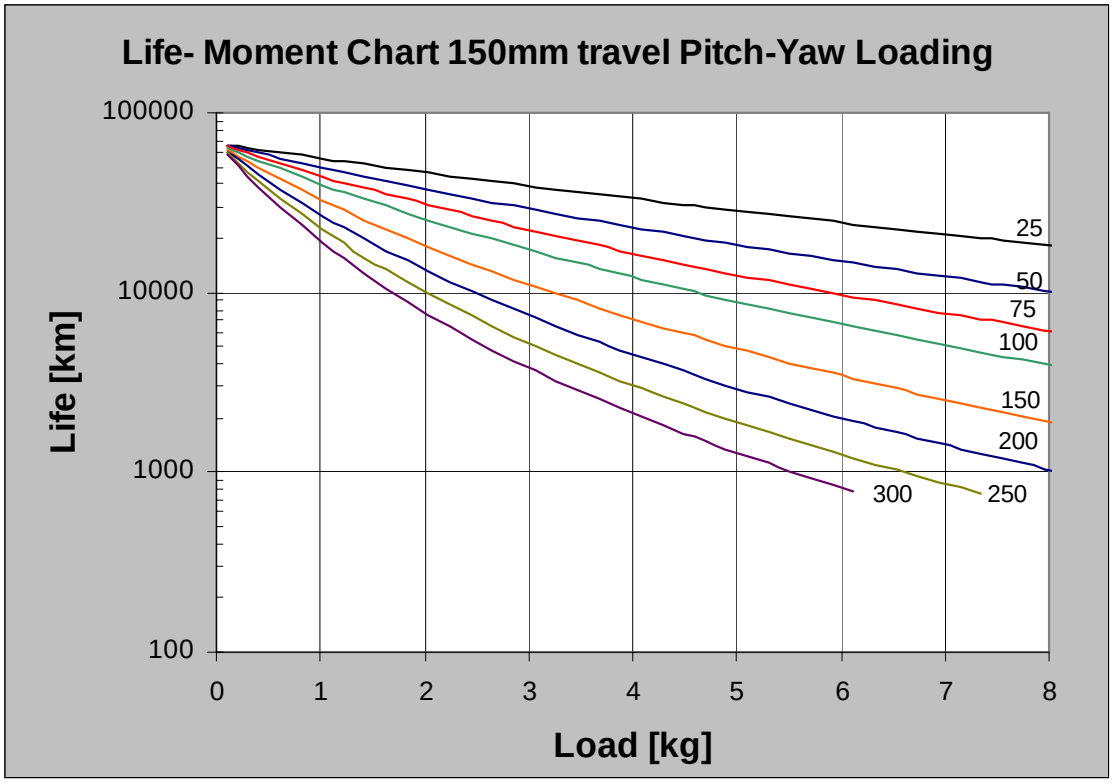

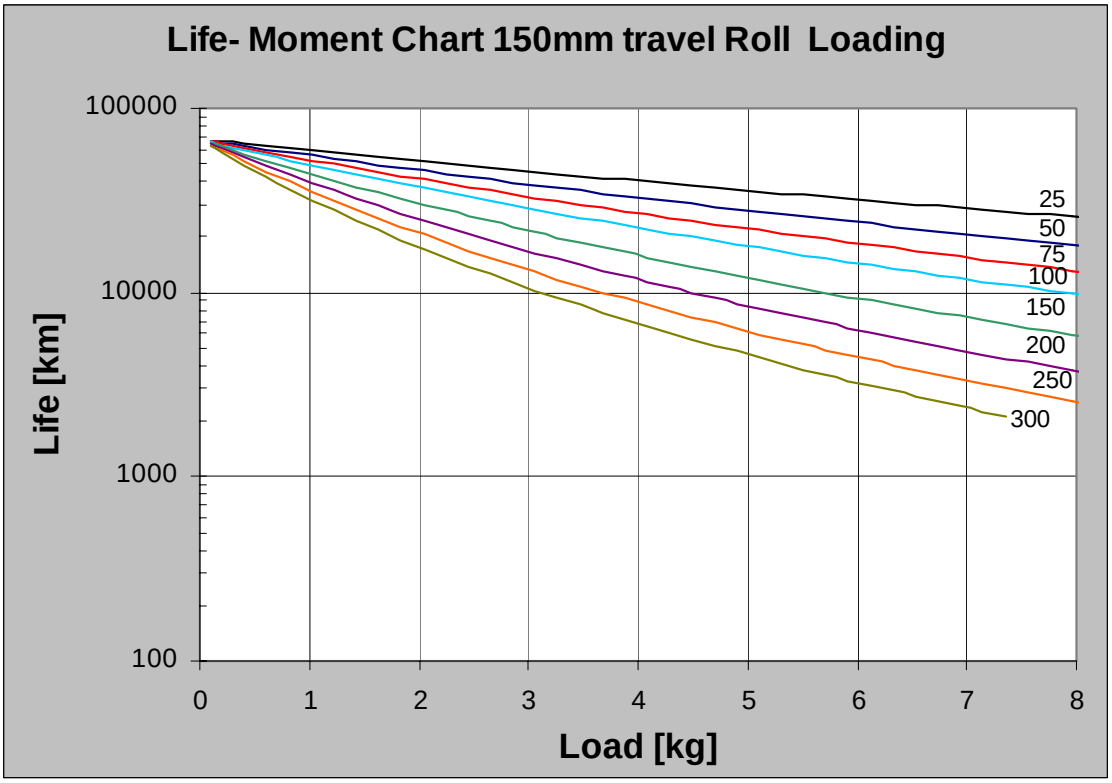

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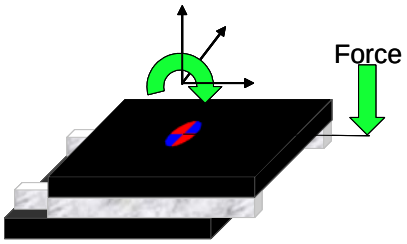
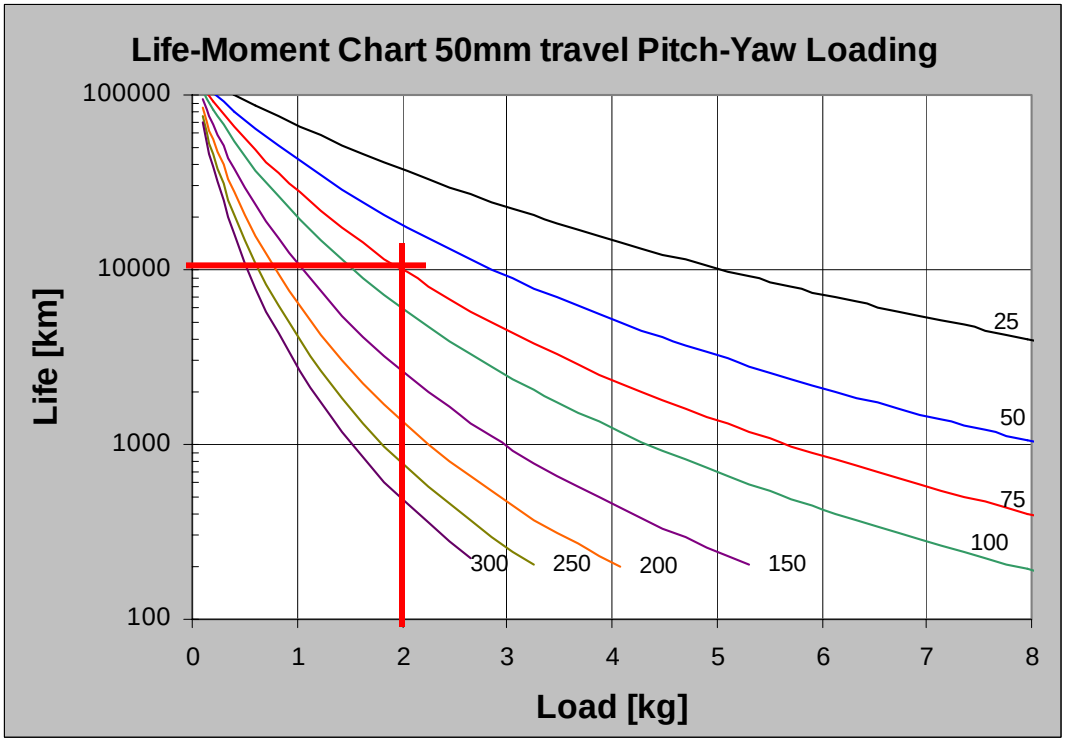
Linear Motion Guide Bearing Life/Load Computation

To predict the travel life of the MX80S cross roller bearings under a moment load use the curve with the corresponding lever arm and given load. Factor in dynamic as well as static loads. For compound loading (multiple moments) use an “effective lever arm of 2x actual lever arm.



Example:
Given a MX80S-T02 with a 2 kg load mounted 35 mm off of the end of the carriage in line with the travel path. The lever arm is 35 mm + 40 mm (center of table to edge) = 75 mm This loading produces a pitch moment. Therefore, using the Pitch curve for the 50mm travel draw a vertical line up from the x-axis at the 2 kg load point until it intersects the 75 curve. The point of intersect is the predicted bearing life of



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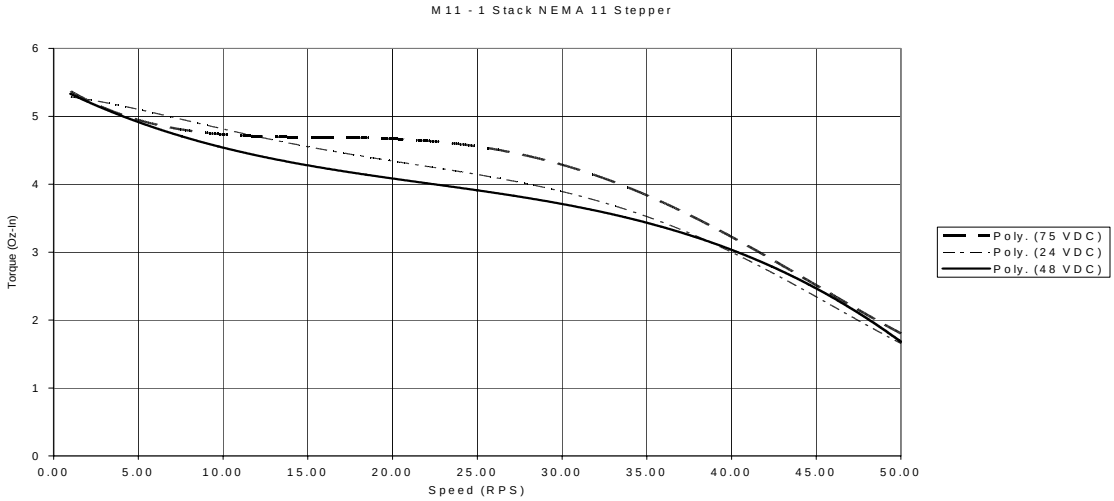
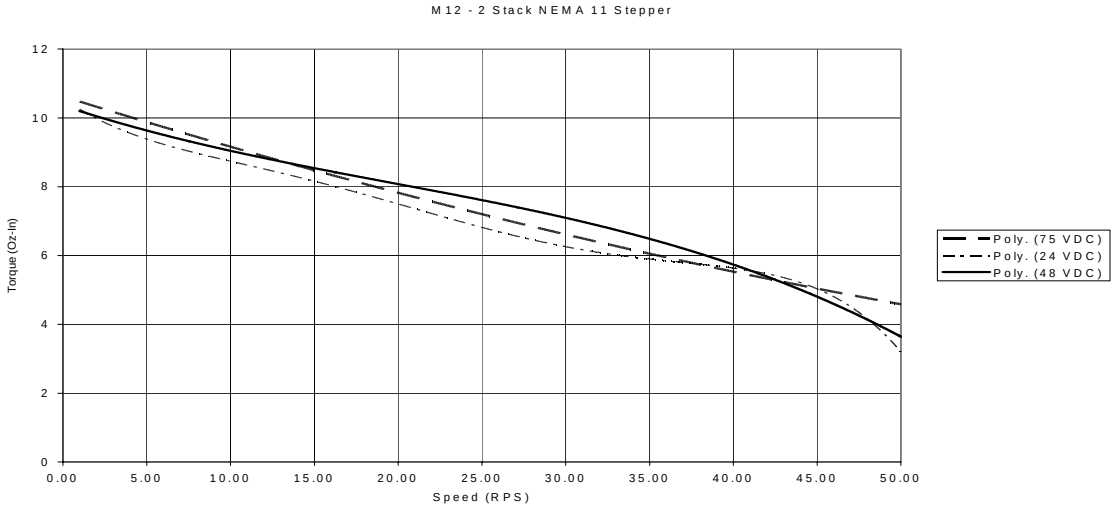
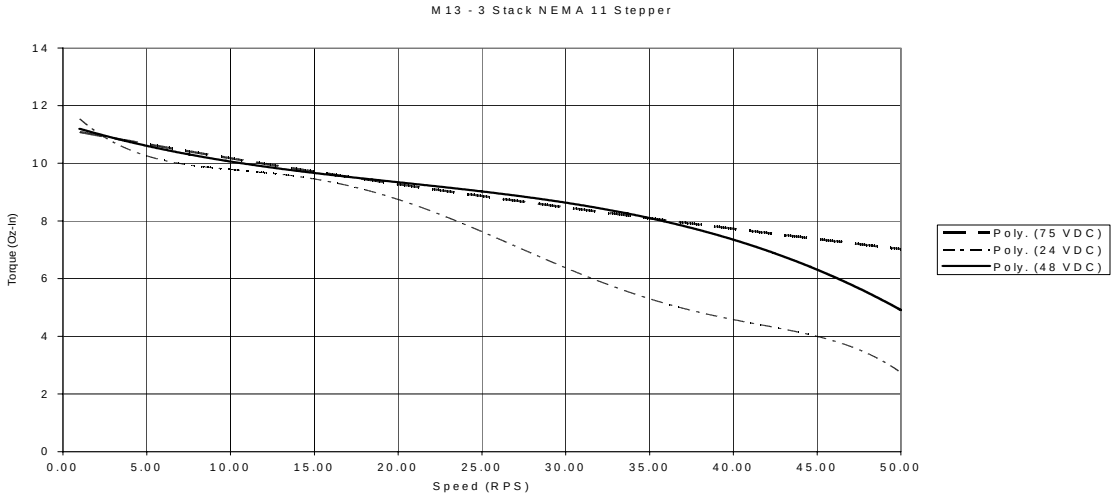
Stepper Motor Torque/Speed







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Cleanroom Preparation

There is no cleanroom 'rating' for motion control products, just individual compatibility with class of cleanrooms. The compatibility is also dependant on measurement location. A point directly below a component may have a different particle count than at a side location. In an effort to clarify the class of cleanroom that our products can be used in with out affecting the overall rating of the cleanroom, Parker provides a Cleanroom Class Compatibility chart for product intended for use in such environments. MX80S tables with cleanroom preparation were tested in Parker's vertical laminar flow work station which utilizes ULPA filters to produce an environment having a cleanliness of class 10 prior to testing. Tables were tested in a variety of orientations with sampling both below the table and at the carriage mounting surface with a particle counter capable of measuring 0.3 μm diameter and larger particles. Based on results from testing following the 209E Federal Standard, the following chart shows the expected cleanroom compatibility of the MX80S with Class 10 cleanroom prep. Consult factory for details on test methodology and results.

* Compatibility is defined as not affecting the cleanroom class rating with the addition of this product for classes shown. The Class 1 rating in the table refers to class 1 levels of 0.3μ and larger particles detected in Parker's Class 10 chamber. For complete class 1 compatibility, the particle count for the 0.1 and 0.2μm particles would also need to be taken into consideration.

Standard Cleanroom Preparation

Stringent cleaning and handling measures
Cleanroom rated lubricant
Reduce force specification by 25% due to additional viscosity of cleanroom lubrication

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Encoder Specifications

Description	Specification
Input Power	5 VDC +/-5% 70 to 220 mA depending on encoder resolution
Output (Incremental)	Square wave differential line driver (EIA RS422) 2 channels A and B in quadrature (90°) phase shift.
Reference (Z Channel)	Synchronized pulse, duration equal to one resolution bit. Repeatability of position is unidirectional moving toward positive direction and is equal to table repeatability specifications. There is no Z Channel for the E12 and E15 (magnetic) encoder options.
Maximum Speed	5.0 micron resolution = 2.0 meters/sec (limited by table) 1.0 micron resolution = 2.0 meters/sec (limited by table) 0.5 micron resolution = 1.5 meters/sec 0.1 micron resolution = 0.3 meters/sec

Limit and Home Sensor Specifications

Description	Specification
Input Power	+5 to 12 VDC 60 mA **If using 24VDC power supply, a 560 Ohm 0.50 Watt resister must be placed in series with the 24 VDC positive leg of the power supply.
Output	Output form is selectable with product: - Normally Closed Current Sinking Limits - Normally Open Current Sinking Home NPN open collector +5 to +24 VDC All types Sink maximum of 50 mA
Repeatability	Home Sensor: +/- 5 µm (unidirectional) plus repeatability of the positioner

ViX Drive Specifications

Refer to Specifications provided in ViX Manual, available at www.Compumotor.com.

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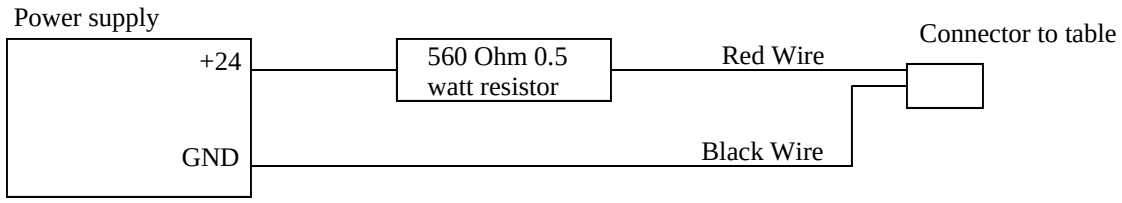
Cabling and Wiring Diagrams

Connector Pin Out and Extension Cable Wire Color Codes for the 5, 1, 0.5 and 0.1 micron resolution encoders

006-1742-length LIMIT CABLE—FLYING LEAD CM02, CM03, CM10, CM11		
PIN	FUNCTION	WIRE COLOR
A	+5 to +12V DC (1)	RED
B	- End of travel	BLUE
C	+ End of travel	ORANGE
D	Home	GREEN
E	Ground	BLACK
Shield	Shield	GREEN w/ YEL-LOW STRIPE

006-1869-length LIMIT CABLE—ViX CONNECTOR CM04, CM05, CM06, CM07, CM15, CM17		
PIN	FUNCTION	WIRE COLOR
11	+24 VDC with inline 560 ohm resistor built into connector	RED
7	- End of travel	BLUE
6	+ End of travel	ORANGE
8	Home	GREEN
1	Ground	BLACK

(1) for powering limits from a 24 VDC power source a 560 ohm 0.5 watt resistor must be placed inline with the positive lead of the power supply (see below)



006-1867-length STEP MOTOR CABLE—FLYING LEAD CM06, CM07, CM08, CM09, CM10, CM11, CM12, CM13		
PIN	FUNCTION	WIRE COLOR
A	A+	RED
B	A-	BLACK
C	B+	WHITE
D	B-	BLUE / RED
E	Ground	GREEN w/ YEL-LOW STRIPE

006-1868-length SERVO MOTOR CABLE—PS CONNECTORS CM15 & CM17		
PIN	FUNCTION	WIRE COLOR
J	PHASE A	RED
K	PHASE B	WHITE
L	PHASE C	BLACK
M	Ground	GREEN

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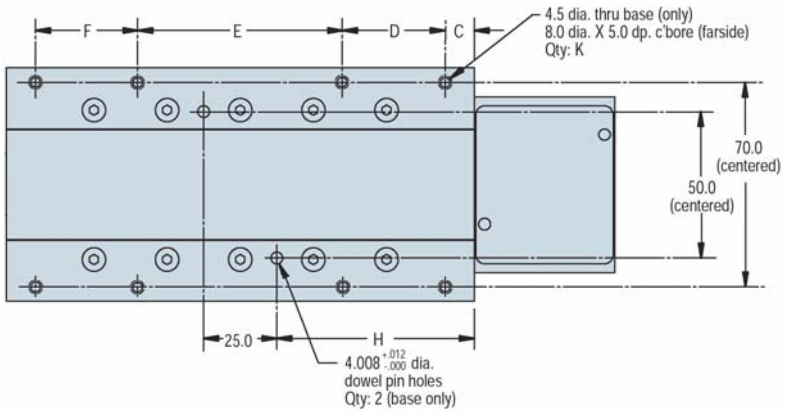
Chapter 3 - How to Use the MX80S

Mounting Orientations

The MX80S can be mounted horizontal, inverted, or side. For all mounting orientations, the cables should be secured as to not interfere with the movement of the carriage and bearings.

Mounting Surface Requirements

- The positioner must be mounted to a flat, stable surface, with a flatness error less than or equal to 0.025mm/300mm for operation or specifications will be greatly varied from published specification. 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.
- Catalog specifications may deviate for positioners mounted to surfaces that do not meet the above conditions.
- If the intended mounting surface cannot meet these specifications a separate rigid mounting plate meeting these specifications should be used to mount to the main structure.
- If mounting conditions require that the table base is overhung, table specifications will not be met over that portion of the table. Additionally, in X-Y Systems the overhung portion of the Y-axis may not met specifications due to the additional error caused by deflection and non-support of the base. Contact Parker for guidelines on specifications of overhang applications.



Travel	Dimensions (mm) C	D	E	F	H	K
25	5	70	n/a	n/a	27.5	4
50	5	70	n/a	n/a	27.5	4
100	10	35	70	35	67.5	8
150	5	65	70	65	92.5	8

Load Mounting Requirements

Dowel holes are included in the carriage of the MX80S for repeatable mounting of loads/fixturing. When bolting payload to carriage take precaution in using bolts M4 with 7mm of engagement as to not damage the table.

Use appropriate length bolt.

The MX80S compact design requires proper sized bolts to be used when mounting payloads to the carriage. Excessive length bolts can damage bearings or pin the table in position.

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Limit and Home Sensor Operation

The MX80S utilizes an innovative method for setting limit and home positions. The magnetic sensors embedded in the base of the MX80S change state based on the limit "flag". This space saving, compact design consists of three (3) parts; magnetic sensors, limit flag and limit flag bracket. The limit and home magnetic sensors are mounted to a PCB in a fixed position to the base of the unit. The flag bracket is mounted to the left side of the carriage with respect to the cables. The Limit Flag is a pattern of thin magnets which triggers the sensors. This pattern defines whether the switch functions as normally open or normally closed. A limit is normally closed when the switch operates from non-magnet to magnet surfaces. The home switch is normally open when the switch operates from non-magnet to magnet surfaces. To change from normally open to normally closed operation of the sensor the patterns are reversed.

Example of Limit and Home Flag magnets corresponding to possible MX80S Limit Home configurations:

Config	Home	End of Travel	Limit Flag Magnet Configuration
H2 L2	Normally Closed	Normally Closed	
H2 L3	Normally Closed	Normally Open	
H3 L2	Normally Open	Normally Closed	
H3 L3	Normally Open	Normally Open	

H1L1 Option Upgrades

- Limits and Homes can not be added to the MX80S table in the field due to the integrated design which encloses the sensor on a printed circuit board in the base. If the magnetic sensor limit and home are desired the unit must be returned to the factory on an RMA.
- To change Limit/Home operation from Normally Open to Normally Closed or from Normally Closed to Normally Open a new limit flag bracket must be purchased, contact factory for proper configuration and part number.
- To adjust the operating position of the limits, limit/home adjustment magnets can be adhered on top of the existing limit flag. These adjustment magnets are included with the unit.

  To change the activation position of the sensors:

  Determine desired position
  Cut magnet to proper length
  Follow Adjusting Limit Flag Procedure to add to the adjustment

Determining Desired Position

The limit sensors are set at the factory for maximum travel. These factory settings only allow for 3mm (0.12") before the carriage contacts the end stop. In slow speed applications this may be adequate, however as the top speed of the application increases the required deceleration distance increases. To determine the safe Deceleration Distance the Maximum Speed and the Maximum Obtainable Deceleration Rate must be known or calculated. The maximum speed should be known from your application requirements. Velocity limits should be set in your program or in your amplifier to cause a fault if the speed exceeds this value. The maximum deceleration is a factor of load and available peak force of the table. Using F = ma, calculate maximum acceleration and then required deceleration distance. See the following example for calculating maximum deceleration for an application with a payload = 0.25 kg on an MX80-T01 with a maximum speed of 100 mm/s.

Total mass = 0.46 kg (Payload mass = 250 grams + Carriage mass = 213 grams)
Application Speed = 100mm/sec w/10mm leadscrew
Available peak force for 3 stack stepper at .1 m/sec = 10 oz-in (See Chapter 2, *Force / Speed Curve*)
F=(Torque x 0.393 / Lead (inches)) x efficiency = (10 x 0.393/ (10/25.4)) x .78 = 7.78 lbs = 34.65 N
Maximum Obtainable Deceleration Rate
Thus: F = ma à a = F/m à a = 34.65N / 0.46kg à **75.3 m/sec^2 Maximum permitted is 20 m/sec^2**

Now, calculate the **Deceleration Distance** for linear deceleration:
First… find the *Deceleration time*:
Ta = Max Velocity / Deceleration Rate
Ta = .10 m/sec / 20.0 m/sec^2 à 0.0050 seconds
Second… find the **Deceleration Distance**:
Distance = ((Max Velocity) * (Ta)) / 2
Distance = ((100 mm/sec) * (0.005)) / 2 à **0.25 mm**

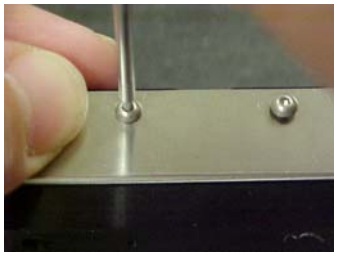
This means that both the positive and negative limit switch targets must be moved inward by 0.25 mm. The limit deceleration rate should be set to 20.0 meters/sec^2. Using the supplied limit flag sheet cut two 0.25 mm long strips from the appropriate white or black (depending on configuration) marked Limit/Home Adjustment overlay decal and follow the procedure for changing the limits.

Adjusting the Limit Flag Procedure

The following procedure is to be used for adjusting the activation position of the end of travel limits on the MX80S:

Step 1: Remove power from the unit and allow time for stage base and carriage to reach room temperature.

Step 2: Remove the limit flag bracket from the MX80S by removing the button head cap screws (BHCS) that secure the bracket to the side of the carriage.

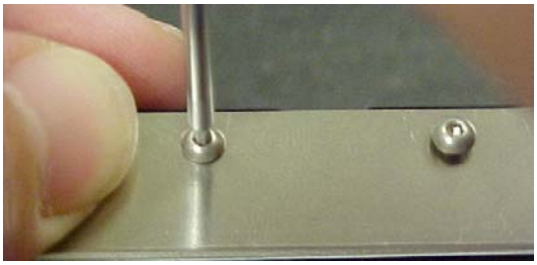


Step 3: Gently slide the bracket from out from under the carriage.

Step 4a: *To adjust limits to increase travel*: With a razor, cut and remove the desired amount of protective sticker and magnet which equals the amount of desired travel increase.

Step 4b: *To adjust limits to reduce travel*: With a razor, cut the clear protective sticker at the end of the magnet that is to be adjusted. Flatten out protective sticker at the cut, this allows a flat surface to adhere additional magnet. Place additional self adhesive magnet (supplied with positioner) at the end of the existing magnet which equals the amount of desired travel reduction. Confirm that there is no gap between the original magnet and the additional magnet just applied. If there is a gap, remove the additional magnet, discard it, and apply a new magnet.

Step 5: Gently slide bracket under carriage. Push up on bracket, insert 0.5mm to 1.0mm shims between bracket and base, insert and tighten BHCS.



Setting Home Sensor

The MX80S is equipped with a “home” position reference sensor when purchased with Home configuration option [H2] or [H3]. The home sensor is located on the same PCB as the limit sensors and the target is located between the limit targets.

Z Channel Position Reference

The Z channel is an output on the encoder. Many servo controllers support this input. The Z channel on the MX80S is at mid travel. The Z channel is a unidirectional device. This means that the final homing direction must occur in one direction. The MX80S is set that the final home direction is to be toward the positive end of the table (See Chapter 2, *Dimensional Drawing*, for positive direction definition). The repeatability of the Z channel is equal to the repeatability of the table. Thus the repeatability of the “Z” channel equals:

Encoder Resolution	Z Channel Repeatability
5 micron	+/- 10 micron
1 micron	+/- 2 micron
0.5 micron	+/- 1 micron
0.1 micron	+/- 1 micron

FOR UNITS EQUIPPED WITH LINEAR ENCODER OPTIONS ONLY:
NOTE: Limit sensors is typically used in conjunction with the encoder 'Z' marker. If another home location is desired, the home target can be adjusted by removing the limit flag decal and applying adjustment overlay decals in the desired location.
NOTE: Home repeatability is also very dependent on controller input speed and homing algorithms. The above repeatability does not include possible controller tolerance. Additionally, to achieve the highest repeatability the final homing speed must be slow. Slower final speed usually results in higher repeatability.
NOTE: The Z-channel output is only one resolution count wide. Thus the on-time may be very brief. Due to this some controllers may have difficulty reading the signal. If you are experiencing the positioner not finding the Z-channel during homing, try reducing final homing speed; also refer to your controller manual

Grounding / Shielding

All cables are shielded. These shields are to be grounded to a good earth ground. Failure to ground shields properly may cause electrical noise problems. These noise problems may result in positioning errors and possible run away conditions.
The motor cable has an area of the shield exposed to allow a grounding path from shield to drive ground. MX80S purchased with ViX drives as part of the configurable part number come equipped with p-clips designed for the small OD of the motor cable to allow the cable shield to be grounded to the ViX ground.

Cabling

The MX80S is provided with high flex cabling which is strain relieved at the connection point on the positioner. The Encoder cable is terminated with flying leads. The motor cable is terminated with flying leads which are stripped and tinned and ready for installation into the screw terminals on the ViX drive. For wire color codes and pin outs see tables in electrical section of manual.

The limit/home cable is provided with either a 15 pin D-sub connector, which is compatible with the ViX drive, or flying leads. For wire color codes and pin outs see tables in electrical section of manual.

Recommended bend radius for these cables is 50mm. This radius will provide a minimum of 10 million cycles of the cable. Smaller bend radius will reduce cable life while larger bend radius will increase life.

If the positioner is mounted in a multi-axis configuration special care should be taken in routing and strain relieving the cables so as to prevent flexing of the cable at the connection to the table and where mounted stationary to the structure. Provide sufficient service loop that the cable bends a minimum of 25mm from these end points. It is also recommended to avoid twisting the cable. The cable should be secured in a position which will orient it in a direction that creates a single plane of operation for the cable.

Cable Management

For multi-axis configurations special attention needs to be taken into account for the moving cables on the non-base axis.

TIP: For Multi-axis Configurations.
Consider using the top axis for the highest frequency move in the application. The top axis will have the least amount of weight to move and will reduce the cycles on the cables.

Chapter 4 - Performance

Acceleration Limits

Acceleration of linear servo driven tables is typically limited by four *(4)* factors:

- **Linear Bearings**
  The linear bearings used in the MX80S have a continuous acceleration limit of 2 g's. This means that the bearings are designed to take repetitive accelerations of 2 g's and maintain the rated bearing life.

- **Reduced Bearing Life**
  Bearing loading due to high acceleration may reduce bearing life to an unacceptable application limit. This is not usually a limiting factor unless loading is significantly cantilevered causing high moment loads during accelerations. (Chapter 2, *MX80S Series Technical Data* to determine bearing load life for your application).

- **Available Motor Force**
  This is the primary factor that reduces acceleration. This is simply the amount of motor force available to produce acceleration. The larger the inertial and or frictional load the lower the accelerations limit.

- **Settling Time**

  In many applications reducing cycle time is a primary concern. To this end, the "settling" time (the amount of time needed after a move is completed for table and load oscillating to come within acceptable limits) become very important. In many cases where very small incrementing moves are executed, the settling time is greater than the actual move time. In these cases accelerations may need to be reduced thus reducing the settling time.

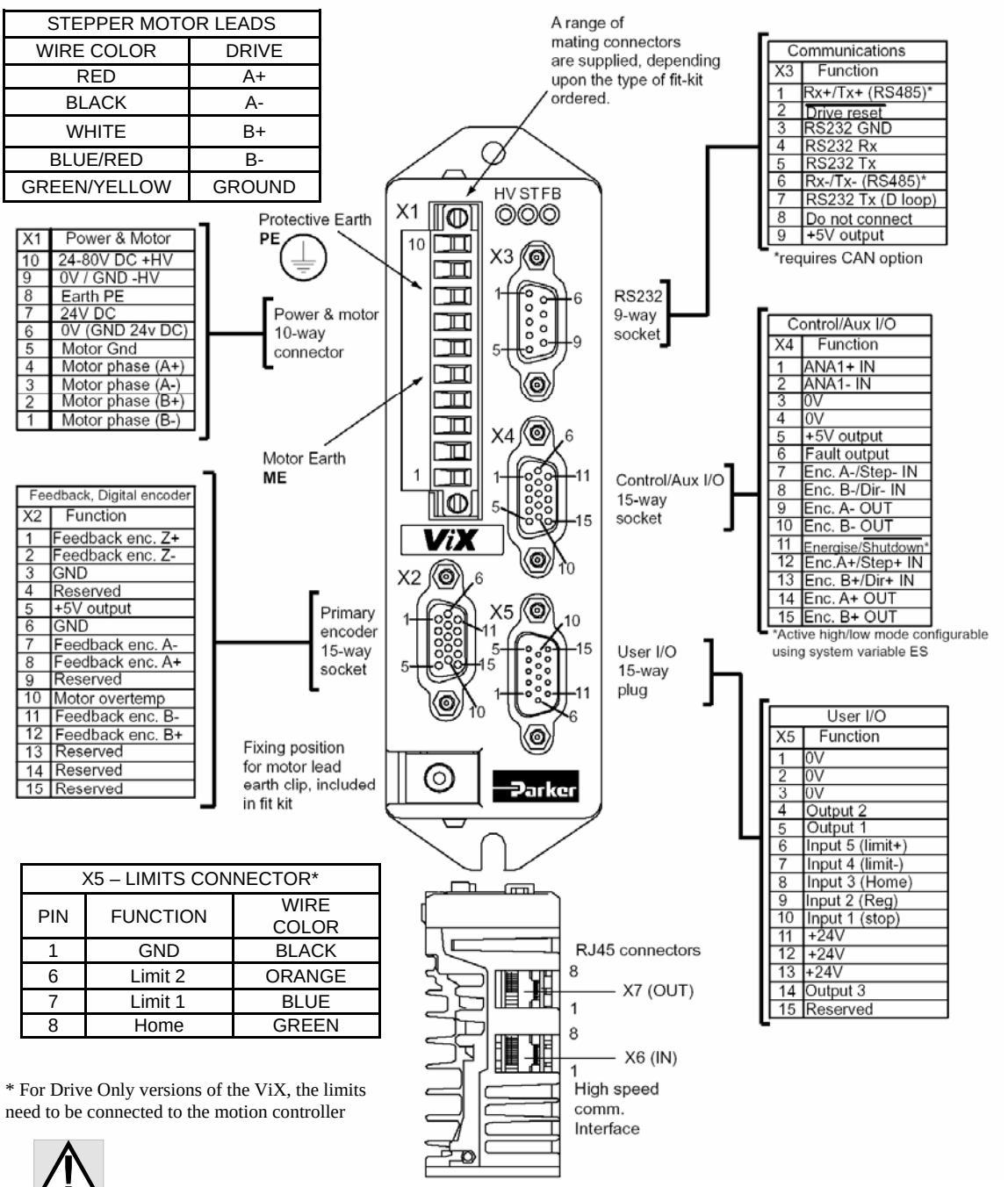
Speed Limits

Acceleration of the MX80S table is limited by the maximum screw speed:

Screw Lead	Maximum Velocity
1mm Leadscrew	20 mm/second
2mm Leadscrew	40 mm/second
10mm Leadscrew	200 mm/second
2mm Ballscrew	100 mm/second

Chapter 5 - Connecting to the ViX Amplifier— Stepper

The MX80S is designed to be plug and run compatible with the Parker ViX drive. The cables on the MX80S are labeled to match the labels on the ViX for ease of use and quick installation. When purchased as part of the part number, the ViX will have the motor parameters already downloaded.



STEPPER MOTOR LEADS	
WIRE COLOR	DRIVE
RED	A+
BLACK	A-
WHITE	B+
BLUE/RED	B-
GREEN/YELLOW	GROUND

X1	Power & Motor
10	24-80V DC +HV
9	0V / GND -HV
8	Earth PE
7	24V DC
6	0V (GND 24v DC)
5	Motor Gnd
4	Motor phase (A+)
3	Motor phase (A-)
2	Motor phase (B+)
1	Motor phase (B-)

Feedback, Digital encoder	
X2	Function
1	Feedback enc. Z+
2	Feedback enc. Z-
3	GND
4	Reserved
5	+5V output
6	GND
7	Feedback enc. A-
8	Feedback enc. A+
9	Reserved
10	Motor overtemp
11	Feedback enc. B-
12	Feedback enc. B+
13	Reserved
14	Reserved
15	Reserved

Communications	
X3	Function
1	Rx+/Tx+ (RS485)*
2	Drive reset
3	RS232 GND
4	RS232 Rx
5	RS232 Tx
6	Rx-/Tx- (RS485)*
7	RS232 Tx (D loop)
8	Do not connect
9	+5V output

Control/Aux I/O	
X4	Function
1	ANA1+ IN
2	ANA1- IN
3	0V
4	0V
5	+5V output
6	Fault output
7	Enc. A-/Step- IN
8	Enc. B-/Dir- IN
9	Enc. A- OUT
10	Enc. B- OUT
11	Energise/Shutdown*
12	Enc.A+/Step+ IN
13	Enc. B+/Dir+ IN
14	Enc. A+ OUT
15	Enc. B+ OUT

User I/O	
X5	Function
1	0V
2	0V
3	0V
4	Output 2
5	Output 1
6	Input 5 (limit+)
7	Input 4 (limit-)
8	Input 3 (Home)
9	Input 2 (Reg)
10	Input 1 (stop)
11	+24V
12	+24V
13	+24V
14	Output 3
15	Reserved

X5 – LIMITS CONNECTOR*		
PIN	FUNCTION	WIRE COLOR
1	GND	BLACK
6	Limit 2	ORANGE
7	Limit 1	BLUE
8	Home	GREEN

* For Drive Only versions of the ViX, the limits need to be connected to the motion controller

Limits use Inputs

The ViX drive has 5 digital inputs. When using with MX80S, the EOT Limits and Home use 3 of the 5 inputs. A VM15-PF screw terminal breakout board may be purchased to allow access to the remaining 2 inputs and all of the outputs.

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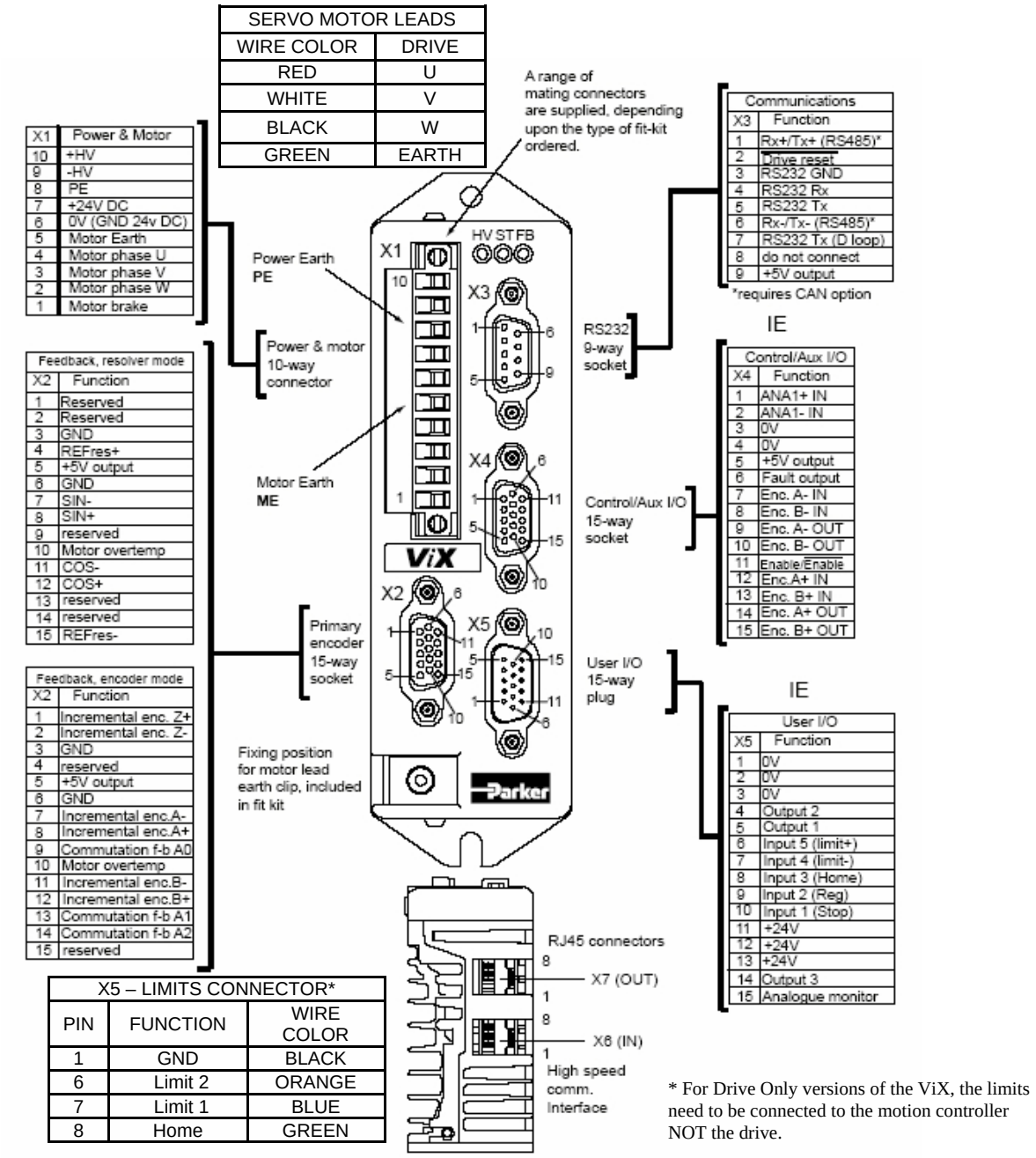
Chapter 6 - Connecting to the ViX Amplifier—Servo

The MX80S is designed to be plug and run compatible with the Parker ViX drive. The cables on the MX80S are labeled to match the labels on the ViX for ease of use and quick installation. When purchased as part of the part number, the ViX will have the motor parameters already downloaded.



X5 – LIMITS CONNECTOR*		
PIN	FUNCTION	WIRE COLOR
1	GND	BLACK
6	Limit 2	ORANGE
7	Limit 1	BLUE
8	Home	GREEN

* For Drive Only versions of the ViX, the limits need to be connected to the motion controller NOT the drive.

Limits use Inputs

The ViX drive has 5 digital inputs. When using with MX80S, the EOT Limits and Home use 3 of the 5 inputs. A VM15-PF screw terminal breakout board may be purchased to allow access to the remaining 2 inputs and all of the outputs.

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Chapter 7 - Maintenance and Lubrication

Cross Roller Bearing and Screw Lubrication

Materials Required: Replacement bearing and screw lubrication (See below for lubrication type and ordering information), clean cloth, small brush

Lubrication Type

For positioners with cleanroom preparation **R1**, class 1000 compatible (standard): Use
Mobil Vactra Oil No.2 on crossed roller bearings (**J** & **K**)
Kyodo Yushi Multemp PS2 Grease on drive ballscrew (**D6**)
Drive Leadscrews (**D1**, **D2**, & **D6**) do not require lubrication

For positioners with cleanroom preparation **R2**, class 10 compatible: Use
Castrol Braycote 803 Grease on crossed roller bearings (**J** & **K**) & on drive ballscrew (**D6**)
Drive Leadscrews (**D1**, **D2**, & **D6**) do not require lubrication

Lubricant Grease Appearance

R1 - Translucent-white, smooth and buttery.

R2 - Creamy-white, smooth and buttery

Maintenance Frequency

For both **'R1'** and **'R2'** Preparations: Cross roller bearings and drive screws are lubricated at our facility prior to shipment. For lubrication inspection and supply intervals following shipment, apply grease/oil every 1000 hours of usage. The time period may change depending on frequency of use and environment. Inspect for contamination, chips, etc, and replenish according to inspection results.

Lubricant Application

For both **'R1'** and **'R2'** Preparations: Wipe the rails or screw down the entire length with a clean cloth. Apply lubrication on the rails or screw, using a small brush.

Notes:

Do not use/mix petroleum base grease with synthetic base grease at any time. For lubrication under special conditions consult factory.

Shorter lubrication interval may be required in environments with high amounts of dust and other contamination.

Appendix A - Internal Protection

Parker has conducted testing to determine the *degree* to which the positioner is protected by using a British standard called an **Ingress Protection Rating (IP Rating)**. The MX80S has an IP 10 protection rating.

Definition

Reference: British standard EN 60529 : 1992

This standard describes a system of classifying degrees of protection provided by enclosures of electrical equipment. Standardized test methods and the establishment of a two digit numeric rating verify the extent of protection provided against access to hazardous parts, against ingress of solid foreign objects, and against the ingress of water.

First Number – The first number indicates protection of persons against access to dangerous parts and protection of internal equipment against the ingress of solid foreign objects.

1 - Protection against access to hazardous parts with the back of a hand, and protected against solid foreign objects of 50 mm diameter and larger.

Second Number – The second number indicates protection of internal equipment against harmful ingress of water.

0 - No special protection provided.

Note: Number Indicators above represent only a partial list of IP Rating specifications.

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