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MX45S Linear Positioners

Miniature Single- and Multi-Axis Systems



ENGINEERING YOUR SUCCESS.

MX45S Linear Positioning Stages

Single- and multi-axis, ultra-miniature, high-performance positioners

The MX45S is a 45 mm wide miniature screw driven positioner based on the award winning MX80 family. Like its predecessor, the MX45S is designed for OEM applications requiring reliable linear positioning in space restricted applications.



Designed with anti-cage creep crossed roller bearings, the MX45S allows users to position up to 7 Kg of normal load on the stage's three standard travel lengths (5 mm, 15 mm & 25 mm).

The MX45S can be supplied with a high efficiency leadscrew or a high precision ground ballscrew, both of which are capable of producing 40 N of thrust and reaching a linear velocity of 16 mm/s.

The leadscrew drive employs a PTFE-coated screw with a preloaded nut to deliver extremely smooth and quite linear motion. A choice of two leads allows the user to match the desired mix of velocity and resolution in order to best match the application's requirements.

The ballscrew drive is available in a 1 mm lead offering the user 3 μ m bi-directional repeatability and 24/7 operation (100% duty cycle).

Design Features

- Ultra compact profile (25 mm high X 45 mm wide x 65, 75 or 90 mm long)
- 5, 15 and 25 mm travels
- Ballscrew or leadscrew drive options
- Cross roller bearing (zero cage creep option)
- Up to 40 N axial thrust
- 30 mm/s max velocity
- Stepper motor driven
- Optional digital limit/home sensor pack
- Optional rotary or linear encoders
- Multi-axis platforms
- Ideal for normal or cleanroom environments

Parker is an industry leading supplier who can provide complete technical and engineered solutions to OEMs for any linear positioning requirement. Parker's innovative engineering, breadth of product, worldwide distribution, and outstanding customer service set the standard for the industrial motion market in all these areas:

- **Application analysis**
- **Engineering assistance**
- **Systems design**
- **Assemblies, kits and subsystems**
- **Extended warranty options**
- **ISO certified**
- **Global support and services**

MX45S Functionality

Motor Mount

NEMA 8 stepper motor mounts directly to stage housing

Dowel Pin Holes

Ensure precise repeatable mounting

Home/Limit Sensor Pack

This optional field installable feature consists of three NPN or PNP switches, each of which is fully adjustable over the entire range of travel

Optical Linear Encoders

Optional field installed feature is available in three standard resolutions (1.0 μm , 0.1 μm and sine output)

Cross Roller Bearings

provide high stiffness and extremely smooth linear translation. A rack and pinion anti-cage creep design within the bearing races prevents cage creep even at 5 g acceleration, or with cantilevered loads

Ballscrew or Leadscrew Drive

The 1.0 mm lead ballscrew driven stage offers high performance 24/7 operation with a thrust load capacity of 40 N (9 lb.) and velocity to 30 mm/s. The leadscrew driven stages are available with 0.5 or 1.0 mm leads. The PTFE coated leadscrew provides extremely smooth linear translation at velocities of 20 mm/s

MX45S Specifications

Performance

		MX45S Leadscrew Drive			MX45S Ballscrew Drive		
Travel	mm	5	15	25	5	15	25
Normal Load Capacity	kg (lb)	5.0 (11.0)	5.0 (11.0)	7.0 (15.4)	5.0 (11.0)	5.0 (11.0)	7.0 (15.4)
Thrust Load Capacity	N (lb)	40 (9)			40 (9)		
Maximum Velocity ¹							
0.5 mm lead	mm/sec	10			—		
1.0 mm lead		20			30		
Acceleration/Deceleration	g	2			2		
Running Torque	mNm (oz-in)	11.0 (1.5)			11.0 (1.5)		
Duty Cycle	%	50			100		
Straightness & Flatness ²	µm	3	5	8	3	5	8
Positional Accuracy ³							
With 2000 Count Rotary Encoder	µm	10	18	30	8	12	15
With 1 or 0.1 µm linear Encoder		6	10	12	6	10	12
Bi-directional Repeatability ^{3,4}							
With 2000 Count Rotary Encoder	µm	±8			±3		
With 1 µm Linear Encoder		±4			±2		
With 0.1 µm Linear Encoder		±2			±1		
Input Inertia (without motor)							
0.5 mm lead	10 ⁸ Kg-m ²	2.37	2.76	3.14	—	—	—
1 mm lead		2.58	2.96	3.35	1.41	1.6	1.79
Maximum Screw Speed	rps	20			30		
Screw Efficiency							
0.5 mm lead	%	30			—		
1 mm lead		47			90		
Screw Diameter	mm	4.7			4.0		
Bearing Coefficient of Friction		0.003			0.003		
Unit Mass							
Stage Only		177	200	238	182	205	243
Carriage Only		70	82	100	73	84	104
Additional Mass of Motors & Options							
NEMA 8 Stepper ⁵	g	95			95		
Linear Encoder Option ⁶		16			16		
Limit option Sensor Board ⁶		5			5		
Limit Option Tripper Assembly ⁶		12	13	15	12	13	15

Notes:

¹ See speed/force curve on page 5 for performance with Parker motor.

² Measured at the carriage center, 35 mm above the mounting surface @ 20° C with no load. Unit bolted to granite surface, flat within 1 µm/300 mm.

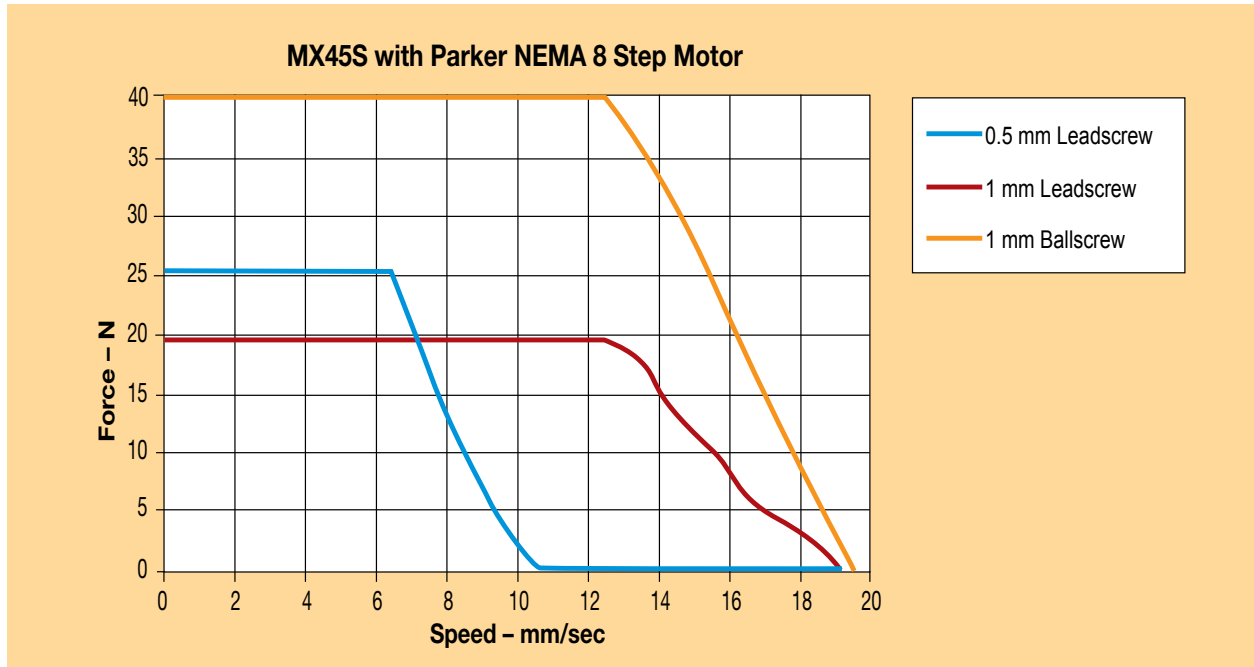
³ Total accuracy and bi-directional repeatability over full travel (peak to peak) (with 0.5 or 1 mm leadscrew)

⁴ Repeatability valid with NEMA 8 stepper motor and encoder noted.

⁵ Includes rotary encoder (part of base)

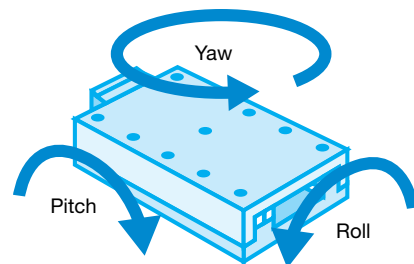
⁶ Part of base

Speed-Force Performance



Performance Loading with 2540 km Life Rating

Normal Load Capacity		
5 mm travel		5.0 (11.0)
15 mm travel	kg (lb)	5.0 (11.0)
25 mm travel		7.0 (15.4)
Pitch & Yaw Moment Loading		
25 mm Lever Arm		1.0 (2.2)
50 mm Lever Arm	kg (lb)	0.6 (1.3)
75 mm Lever Arm		0.5 (1.1)
100 mm Lever Arm		0.4 (0.9)
Roll Moment Loading		
25 mm Lever Arm		2.0 (4.4)
50 mm Lever Arm	kg (lb)	1.2 (2.7)
75 mm Lever Arm		0.9 (2.0)
100 mm Lever Arm		0.7 (1.5)



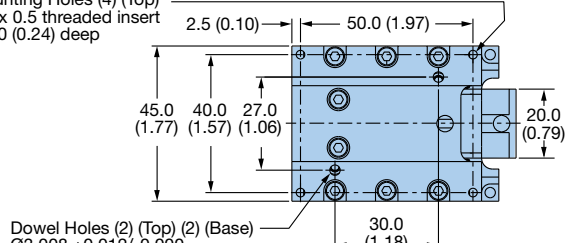
MX45S Specifications

MX45S Dimensions — mm (in)



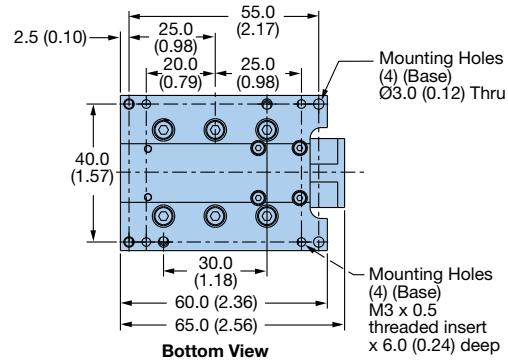
T01 — 5 mm Travel

Mounting Holes (4) (Top)
M3 x 0.5 threaded insert
x 6.0 (0.24) deep



Dowel Holes (2) (Top) (2) (Base)
Ø3.008 +0.012/-0.000
(0.1184 +0.0004/-0.0000)

Top View



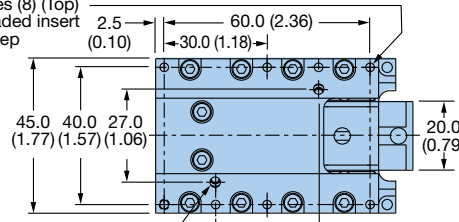
Mounting Holes (4) (Base)
Ø3.0 (0.12) Thru

Mounting Holes (4) (Base)
M3 x 0.5 threaded insert
x 6.0 (0.24) deep

Bottom View

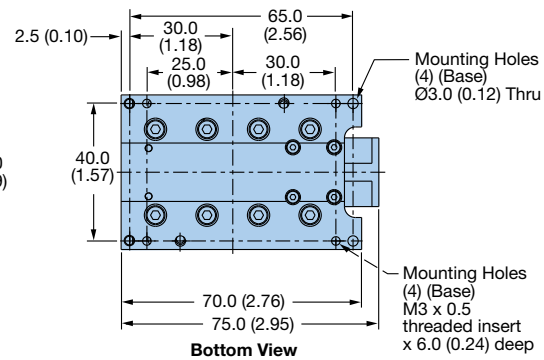
T02 — 15 mm Travel

Mounting Holes (8) (Top)
M3 x 0.5 threaded insert
x 6.0 (0.24) deep



Dowel Holes (2) (Top) (2) (Base)
Ø3.008 +0.012/-0.000
(0.1184 +0.0004/-0.0000)

Top View



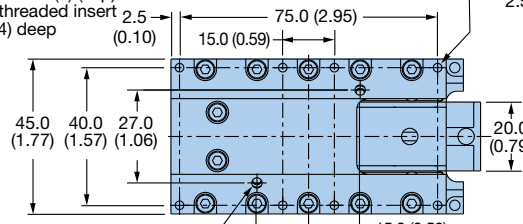
Mounting Holes (4) (Base)
Ø3.0 (0.12) Thru

Mounting Holes (4) (Base)
M3 x 0.5 threaded insert
x 6.0 (0.24) deep

Bottom View

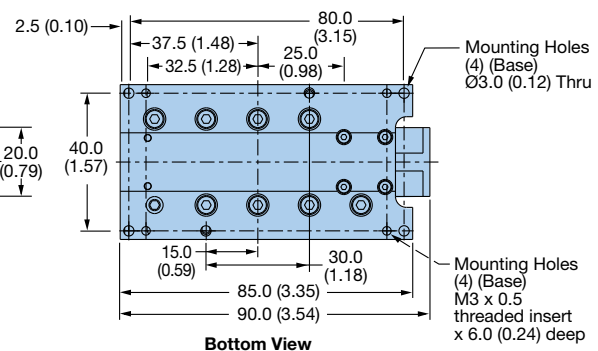
T03 — 25 mm Travel

Mounting Holes (8) (Top)
M3 x 0.5 threaded insert
x 6.0 (0.24) deep



Dowel Holes (2) (Top) (2) (Base)
Ø3.008 +0.012/-0.000
(0.1184 +0.0004/-0.0000)

Top View

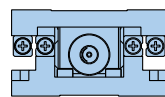


Mounting Holes (4) (Base)
Ø3.0 (0.12) Thru

Mounting Holes (4) (Base)
M3 x 0.5 threaded insert
x 6.0 (0.24) deep

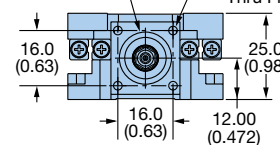
Bottom View

Common Dimensions for T01, T02, T03



Bearing End View

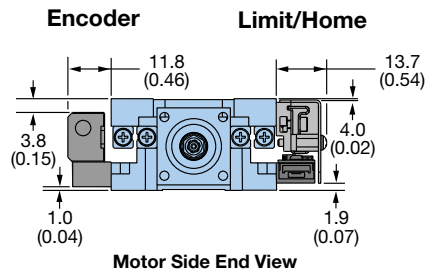
Motor Pilot
Ø15.12 +0.06/-0.00
(0.595 +0.002/-0.000)
x 1.80 +0.20/-0.00 deep
(0.071 +0.007/-0.000)



Motor Side End View

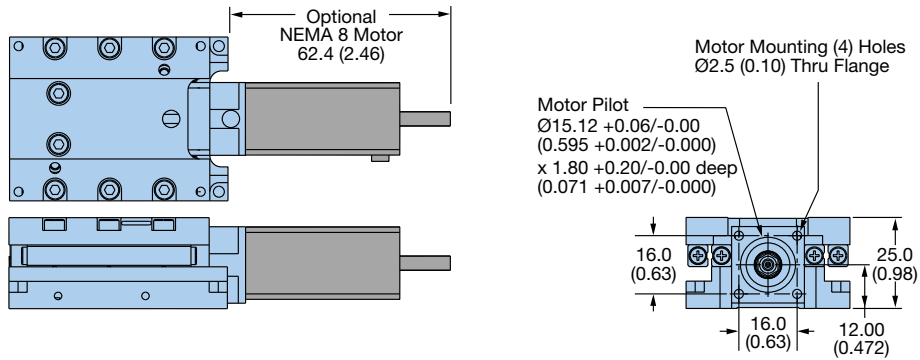
MX45S Option Dimensions — mm (in)

Encoder and Limit/Home (T01, T02, T03)

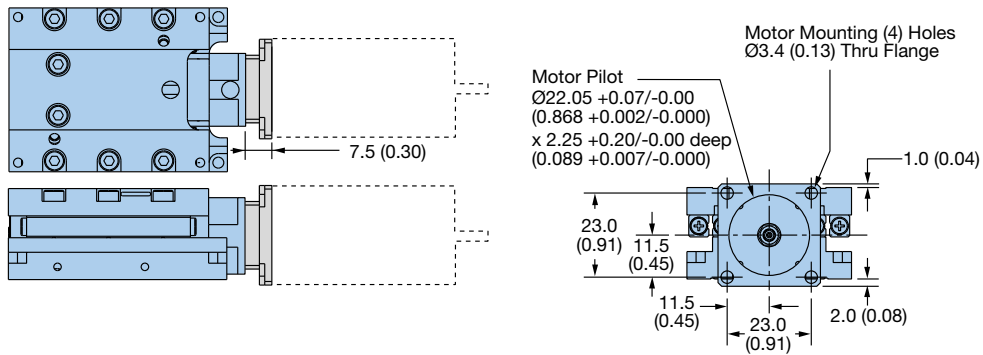


Motor Mounting (T01, T02, T03)

NEMA 8 Motor Mount



NEMA 11 Motor Mount



MX45S Options and Accessories

Encoder Options



Rotary Encoder

When using stepper motors, positional feedback is readily available with the optional rotary encoder. 400- and 500-line rotary encoders provide position verification and position maintenance. Each encoder comes standard with a 1 meter high-flex cable.

Rotary Encoder Connections

Function	Wire Color
Ground	White
A+	Green
A-	Yellow
+5 VDC	Brown
B+	Blue
B-	Red
Not used	Pink
Not used	Gray



Linear Encoder

A non-contact linear optical encoder provides quadrature output and offers resolutions of 1.0 um, 0.1 um and sine output. On the MX45S, the encoder is mounted externally to the stage body, an addition which can be added later if application requirements change. Each encoder comes standard with a 1 meter high-flex cable.

Rotary Encoder Cable (6-pin differential)

Part Number	Description
006-2398-1.0	1 m high-flex with flying leads
006-2398-1.0	1 m high-flex with flying leads

Linear Encoder Digital Outputs

Function	Interface	
	Signal	Pin
Power	5 V	7.8
	0 V	2.9
Incremental	A+	14
	A-	6
	B+	13
	B-	5
Reference Mark	Z+	12
	Z-	4
Limits	P	11
	Q	10
Set-Up	X	1
Alarm	E-	3
Shield	Inner	—
	Outer	Case

Linear Encoder Analog Outputs

Function	Signal	Readhead Interface	
		Color	Pin
Power	5 V	Brown	4, 5
	0 V	White	12, 13
Incremental	Cosine	V ₁₊	Red 9
		V ₁₋	Blue 1
	Sine	V ₂₊	Yellow 10
		V ₂₋	Green 2
Reference Mark	V ₀₊	Violet 3	
	V ₀₋	Gray 11	
Limits	V _p	Pink 7	
	V _q	Black 8	
Set-Up	V _x	Clear 6	
Remote CAL	CAL	Orange 14	
Shield	Inner	Green/Yellow	—
	Outer	Outer Screen	Case

Stepper Motor



The MX45S is available with a standard 1.8 degree NEMA 8 stepper motor capable of providing 4 oz-in of holding torque. Each motor comes standard with a 1 m high-flex cable.

Motor Cable Connections

Function	Color
A +	Red
A -	Black
B +	White
B -	Green

Home/Limit Options



The MX45S features an innovative, compact, fully adjustable and field-installed home/limit sensor pack. The output format is either NPN or PNP and is available as either N.O. or N.C. The sensor pack is powered with +5 to +24 VDC and is capable of sinking or sourcing up to 50 mA per switch.

Limit/Home Cable Connections

Pin Number	Function	Color
1	+ V	Red
2	Ground	Black
3	+ Limit	Orange
4	Home	Green
5	- Limit	Blue

ion Microstepping Drive



The ion Series stepper drive is an OEM-friendly miniature motion drive capable of up to 2 Amps in a 1" x 1" x 3.3" square package.

- Adjustable run current via potentiometer
- Auto standby adjustable current to reduce heat generation and power consumption
- Stepper resolution to 3200 steps per rev
- RoHS compliant
- DIN rail mountable
- Accepts single or differential step and direction inputs

Visit our website at www.parkermotion.com for complete details on these MX45S system compatible products.

E-DC Microstepping Drive



The DC-input E-DC is a high-performing, low-cost packaged microstepping drive.

- Anti-resonance circuitry suppresses mid-range instability
- Recommended motor inductance range of 0.5 mH to 80 mH
- Selectable resolution up to 50,800 steps/rev
- Auto standby reduces motor current (and heating)
- Current waveforms to optimize smoothness
- Optically isolated step and direction inputs
- Short-circuit and over-temperature protection

ViX Microstepping Drive/Controller



The ViX Series is a digital, compact and high-power DC-input microstepping drive/controller.

- Wizard-based configuration
- Anti-resonance circuitry suppresses mid-range instability
- Recommended motor inductance range of 0.5 mH to 20 mH
- 24 to 80 VDC bus input voltage
- Integer-selectable resolution from 200 to 51,200 steps/rev
- Five digital inputs and three digital outputs
- One analog input
- Controller version provides basic control functionality
- RS232 or RS485 fieldbus

Complete your system by integrating one or more of Parker's other miniature linear products.

- MX80 Series 80 mm wide, available in 5 different drive trains
- LX80L Series linear motor stage for travels up to 750 mm
- LCR Series miniature belt and screw driven actuators

For complete information, go to: www.parkermotion.com



MX45S Linear Positioning Stages

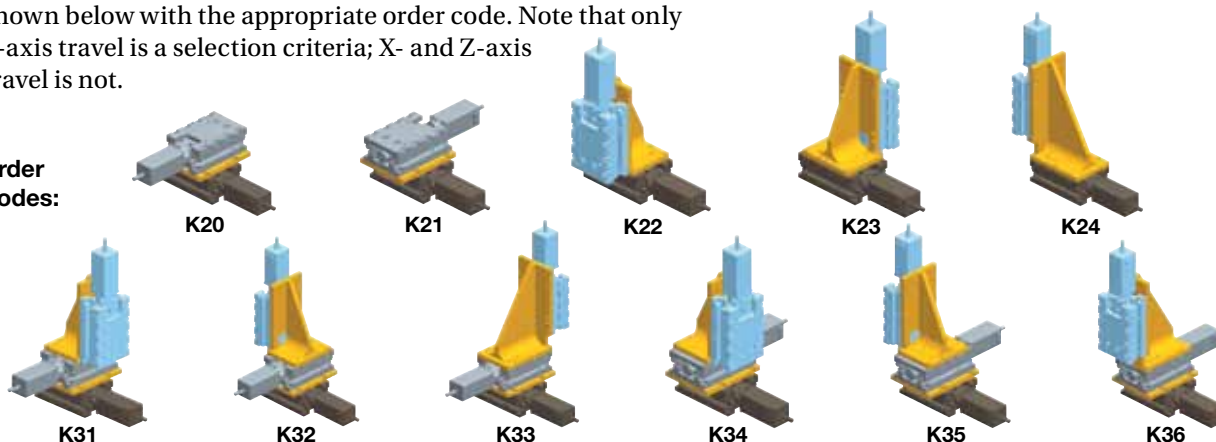
Multi-Axis Bracket Kit Options

MX45S to MX45S Mounting Bracket Kits

To build multi-axis MX45S systems, mounting bracket kits are available to build the two and three-axis configurations shown below with the appropriate order code. Note that only Y-axis travel is a selection criteria; X- and Z-axis travel is not.

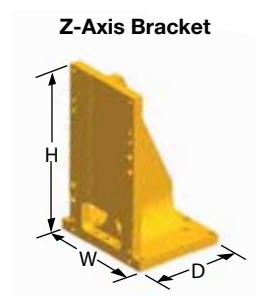
Consult factory or visit our website for complete bracket dimensions.

Order Codes:



Bracket Kit	Part Number		
	T01*	T02*	T03*
K20	002-2956-200	002-2956-201	002-2956-202
K21	002-2956-200	002-2956-201	002-2956-202
K22	—	002-2956-220	—
K23	—	002-2956-220	—
K24	—	002-2956-240	—
K31	002-2956-310	002-2956-311	002-2956-312
K32	002-2956-310	002-2956-311	002-2956-312
K33	002-2956-330	002-2956-331	002-2956-332
K34	002-2956-310	002-2956-311	002-2956-312
K35	002-2956-310	002-2956-311	002-2956-312
K36	002-2956-330	002-2956-331	002-2956-332

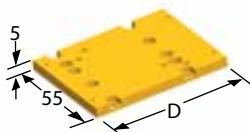
*T01, T02 and T03 designates Y axis travel only



Z-Axis Bracket – H x W x D (mm)

Bracket Kit	T01, T02, T03
K22, K23	85 x 45 x 55
K24, K33, K36	104 x 45 x 55
K31, K32, K34, K35	85 x 55 x 45

X-Y Axis Transition Plate Bracket



X-Y Axis Bracket – Dimension “D” (mm)

Bracket Kit	T01	T02	T03
K20, K21, K31, K32, K33, K34, K35, K36	60	70	85

MX45S to MX80 Mounting Brackets

MX45S positioners can also be used as a Y- or Z-axis in conjunction with MX80 positioners.

Kit	Configuration	Part Number	H x W x D (mm)
X-Y	MX45ST01 to MX80	002-2958-01	5 x 80 x 80
	MX45ST02 to MX80	002-2958-02	5 x 80 x 80
	MX45ST03 to MX80	002-2958-03	5 x 80 x 92.5
X-Z	MX45S (all) to MX80	002-2958-04	87.5 x 80 x 80

Ordering Information

Fill in an order code from each of the numbered fields to create a complete model order code. Note that for multi-axis systems, an order code is required for each axis in the system.

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
Order Example:	MX45S	T01	S	K	D1	N00	E000	L0	K00	S

- ① **Series**
MX45S
- ② **Travel**
T01 5 mm
T02 15 mm
T03 25 mm
- ③ **Grade**
S Standard (specify leadscrew option, item 5)
P Precision (specify ballscrew option, item 5)
- ④ **Bearing Type***
K Anti-Creep System (ACS) Cross Roller
* Consult factory for other bearing options
- ⑤ **Drive Type**
D1 0.5 mm Leadscrew ⁽¹⁾
D2 1 mm Leadscrew ⁽¹⁾
D3 1 mm Ballscrew ⁽²⁾
⁽¹⁾ With standard grade only ⁽²⁾ With precision grade only
- ⑥ **Motor Options (see page 9 for drive and drive/controller accessories)**
N00 No motor, no motor mount, no coupler
N08 No motor, NEMA 8 motor mount & coupler
N11 No motor, NEMA 11 motor mount & coupler ⁽¹⁾
M10 NEMA 8 stepper motor ⁽²⁾
M11 NEMA 8 stepper motor ⁽³⁾
⁽¹⁾ Not available with T03 travel option
⁽²⁾ With 1 meter cable, flying leads
⁽³⁾ With 1 meter cable with ion drive connector

- ⑦ **Encoder Options (see page 8)***
E000 No Encoder
ER10 Rotary Encoder, 400-Line⁽¹⁾ (flying leads)
ER11 Rotary Encoder, 400-Line⁽¹⁾ (ViX connector)
ER12 Rotary Encoder, 400-Line⁽¹⁾ (ACR connector)
ER13 Rotary Encoder, 400-Line⁽¹⁾ (6K connector)
ER20 Rotary Encoder, 500-Line⁽¹⁾ (flying leads)
ER21 Rotary Encoder, 500-Line⁽¹⁾ (ViX connector)
ER22 Rotary Encoder, 500-Line⁽¹⁾ (ACR connector)
ER23 Rotary Encoder, 500-Line⁽¹⁾ (6K connector)
EL20 Linear Encoder ⁽²⁾ (1 µm resolution)
EL40 Linear Encoder ⁽²⁾ (0.1 µm resolution)
EL70 Linear Encoder ⁽²⁾ (sine output)
* Consult factory for other encoder options
⁽¹⁾ Encoder equipped with 1 meter high-flex cable
⁽²⁾ Encoder equipped with 1 meter high-flex cable, 15-pin D-sub connector; Z-channel in center position

- ⑧ **Home/Limit Switch Options (see page 8)***
L0 None
L2 N.O. Home/N.C. Limits, NPN, 1 meter cable to flying leads
L3 N.O. Home/N.C. Limits, PNP, 1 meter cable to flying leads
*NC = Normally Closed; NO = Normally Open. Home switch not available with T01; use one of the limits as home for T01.

- ⑨ **Multi-axis Kit Options (see page 10)**
K00 No kit (single-axis)
K20
K21
K22
K23 Refer to system kit configuration illustrations on page 10
K24
K31
K32 Note: all appropriate mounting bracket hardware is included with the kit number
K33
K34
K35
K36

- ⑩ **Axis Designator**
S None (single-axis)
X X-axis for multi-axis system
Y Y-axis for multi-axis system
Z Z-axis for multi-axis system

EM Sales Offices

Australia

Parker Hannifin (Australia) Pty Ltd.
9 Carrington Road
Castle Hill NSW 2154
Australia
Tel: +61 (0) 2 9634-7777
Fax: +61 (0) 2 9634 3749

Brazil

Parker Hannifin Ind. Com Ltda.
Av. Lucas Nogueira Garcez 2181
Esperança
12325-900 Jacareí, SP
Tel: 12 3954 5100
Fax: 12 3954 5262
Email: automation.brazil@parker.com

Canada

Parker Hannifin (Canada) Inc.
160 Chisholm Dr
Milton, Ontario L9T 3G9
Tel: 905-693-3000
Fax: 905-876-1958
Email: miltoncustservice@parker.com

China

Parker Hannifin Motion & Control
(Shanghai) Co., Ltd
280 Yunqiao Rd. Jin Qiao Export
Processing Zone
Shanghai 201206, China
Tel: (86-21) 50312525
Fax: (86-21) 64459717

France

Parker SSD Parvex
8 avenue du Lac
B.P. 249
F-21007 Dijon Cedex
Tel: +33 (0) 3 80 42 41 40
Fax: +33 (0) 3 80 42 41 23

Germany

Electromechanical Europe
Parker Hannifin GmbH & Co KG
Robert-Bosch-Strasse 22
D-77656 Offenburg
Germany
Tel: +49 (0) 781 509 0
Fax: +49 (0) 781 509 98176

India

Parker Hannifin India Pvt. Ltd
Automation Group-SSD Drives Div.
133 & 151 Developed Plots Estate
Perungudi, Chennai 600 096
Tel: 044-4391-0799
Fax: 044-4391-0700

Italy

Parker Hannifin SpA
Via Gounod 1
20092 Cinsello Balsamo
Milano, Italy
Tel: +39 02 361081
Fax: +39 02 36108400

Korea

Parker Hannifin Korea
9th Floor KAMCO Yangjae Tower
949-3 Dogok 1-dong Gangnam-gu
Seoul 135-860, Korea
Tel: 82-2-559-0454
Fax: 82-2-556-8187

Mexico

Parker Hannifin de Mexico
Eje uno Norte No.100
Parque Industrial Toluca 2000
Toluca, CP 50100 México
Tel: 52-722-275-4200
Fax: 52-722-279-0316

Singapore

Parker Hannifin Singapore Pte Ltd
11, Fourth Chin Bee Road
Singapore 619702
Tel: (65) 6887 6300
Fax: (65) 6265 5125/6261 4929

Taiwan

Parker Hannifin Taiwan Co., Ltd
No. 40, Wuchiuan 3rd Road
Wuku Industrial Park
Taipei County, Taiwan 248
ROC
Tel: 886 2 2298 8987
Fax: 886 2 2298 8982

Thailand

Parker Hannifin (Thailand) Co., Ltd.
1023, 3rd Floor, TPS Building,
Pattanakarn Road,
Suanluang, Bangkok 10250
Thailand
Tel: (66) 02717 8140
Fax: (66) 02717 8148

UK

Parker Hannifin Ltd.
Tachbrook Park Drive
Tachbrook Park
Warwick CV34 6TU
Tel: +44 (0) 1926 317970
Fax: +44 (0) 1926 317980

USA

Parker Hannifin Electromechanical
Automation Division Main Office/
Compumotor/CTC
5500 Business Park Drive
Rohnert Park, CA 94928 USA
Tel: 707-584-7558
800-358-9070
Fax: 707-584-8015
Email: emn_support@parker.com

Parker Hannifin Electromechanical
Automation Division/Daedal
1140 Sandy Hill Road
Irwin, PA 15642
Tel: 724-861-8200
800-245-6903
Fax: 724-861-3330
Email: ddllcat@parker.com



MX45S Series:
Made in the USA

