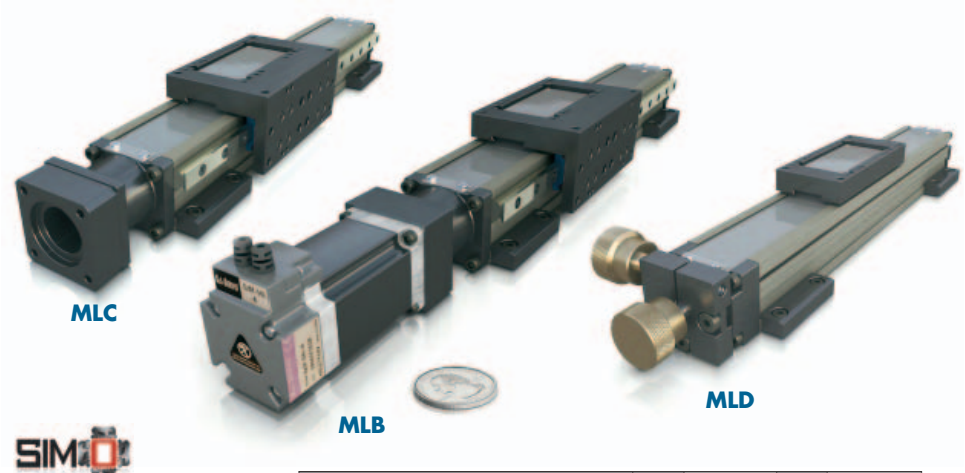
ML Series

MINIATURE SCREW-DRIVEN LINEAR ACTUATOR

NEW **Compact and easy to install, a low cost linear solution perfectly suited for the medical industry, life science and small scale automation applications.**

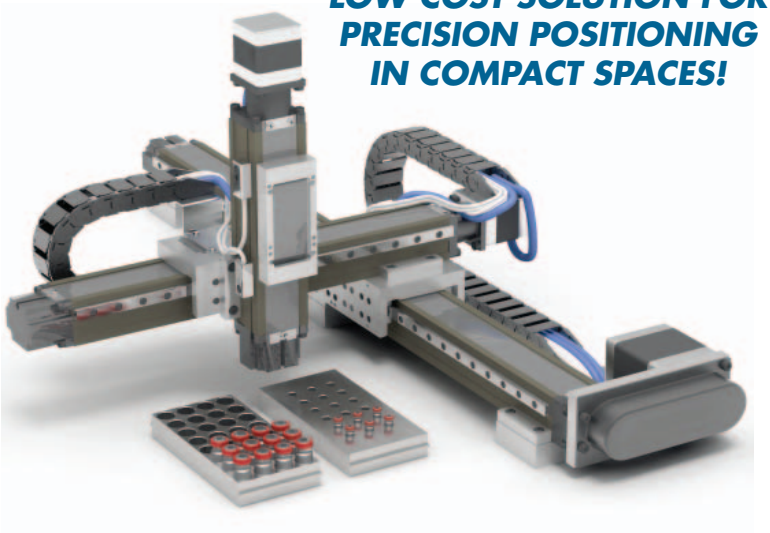


FEATURES & BENEFITS

- Small, Compact Profile - 28 x 32mm
- Patent Pending SIMO™ process for machine tool performance at extruded prices
- Lead Screw Driven - High accuracy and precise repeatability
- Many Multi-Axis Configurations - Easy assembly
- Long Travel Lengths - up to 650 mm

ML PRODUCT SERIES

- **MLB** (Integrated Motors) - pre-mounted Omron® servo motors, Fastech® or PBC® brand stepper motors.
- **MLC** (Motor Mount Only) - designed motor mounts and couplings for easy mounting and extended life.
- **MLD** (Hand driven)- adjustable hand operated knob and optional brake for precision control.
- **MLE** - Designed to provide, uniform ultra smooth velocity and reduce velocity ripple. Perfect for precision scanning and printing applicaitons. (not shown)



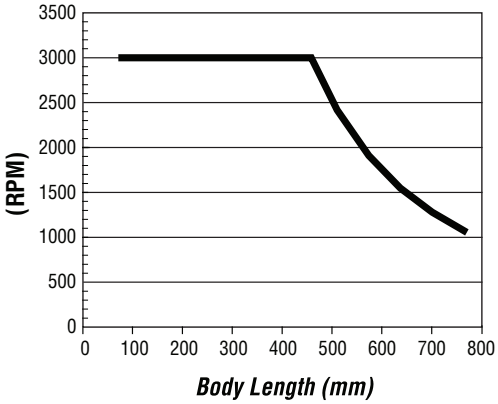
LOW COST SOLUTION FOR PRECISION POSITIONING IN COMPACT SPACES!

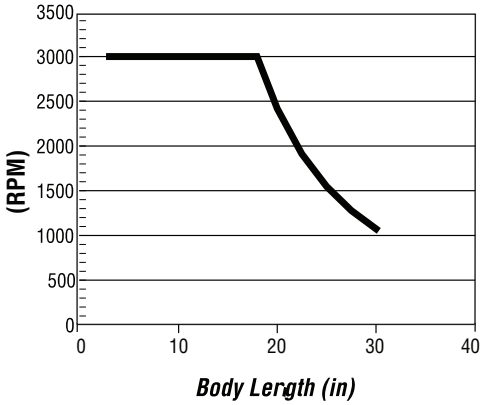
Size		mm	28 x 32	in	1.10 x 1.26
Max. Load - Lite Preload - *anti-backlash* - Normal Preload - *anti-backlash* - Standard	**Fx**	N	44 89 267	lbf	10 20 60
	Fy		107		24
	Fz		178		40
Max. Moments	**Mx**	Nm	1.4	lbf-in	12.4
	My		1.4		12.4
	Mz		1.4		12.4
Bending Moment of Inertia (second moment of area)	**Iy**	cm^4	2.4	in^4	0.058
	Iz		4.4		0.106
Base Weight without Motor		Kg	0.06	lbf	0.13
Add for 100 mm of stroke			0.15		0.34
Total Carriage Mass			0.020		0.044
Total Carriage Mass & Top Plate			0.059		0.130
Coefficient of Friction			0.19		
Max. Speed		m/s	1.9	in/s	75
Max. Stroke Length		mm	650	in	25.6
Min. Stroke Length			5		0.2
Nominal Screw Diameter			10.0		0.375
Max RPM			3000		
No Load Torque Nut - Lite Preload - *anti-backlash* - Normal Preload *anti-backlash* - Standard		Nm	0.0565 0.106 0.007	lbf-in	0.50 0.94 0.062
Linear Guide - Single Linear Guide - Dual Linear Guides		Nm	.017 .034	lbf-in	0.15 0.30
Seal Strip - with Seal Strip - without Seal Strip		Nm	.028 0	lbf-in	0.25 0
Screw Lead Accuracy*		mm/mm	.0006	in/in	.0006
Bi-directional Repeatability - Anti-Backlash Nut - Standard Nut		+/- mm	0.02 076 -.254	+/- in	0.0008 .003 -.010

*Higher accuracies are available to .0001 mm/mm (in/in). Contact manufacturer for details.
Specifications are subject to change without notice.

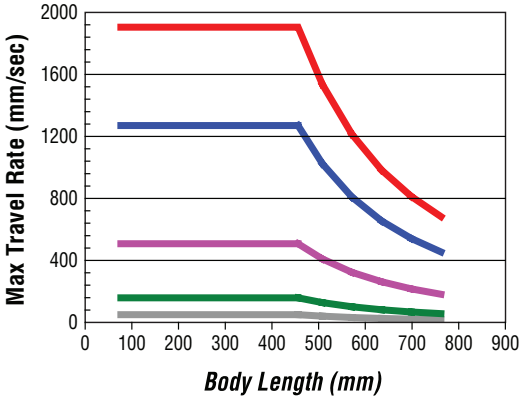
LOAD RANGE

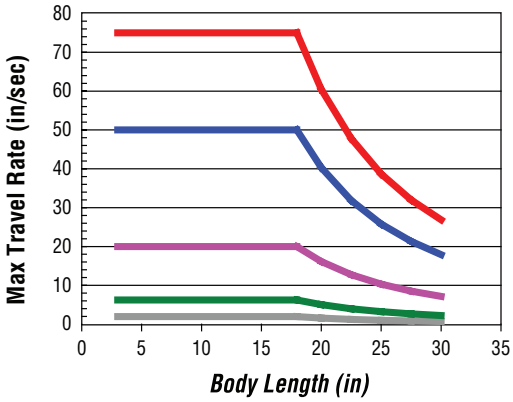
80% CRITICAL SPEED

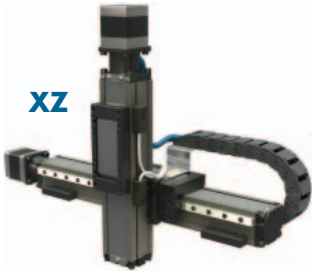


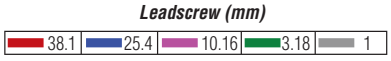


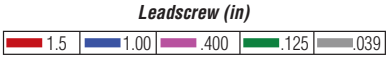
TRAVEL RATES











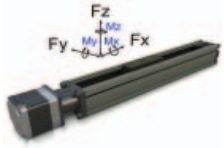
LINEAR GUIDE SUPPORTS			(1) SINGLE		(2) DUAL			(1) SINGLE		(2) DUAL	
			# of runner blocks on each guide					# of runner blocks on each guide			
			1	2	1	2		1	2	1	2
Max. Load Anti-Backlash - Lite Preload	**Fx**	N	44	44	44	44	lbf	10	10	10	10
- Normal Preload			89	89	89	89		20	20	20	20
Standard Nut			267	267	267	267		60	60	60	60
	Fy		180	250	445	890		40	56	100	200
	Fz		267	356	445	890		60	80	100	200
Max. Moments	**Mx**	Nm	1.8	3.6	8.6	18	lbf-in	16	32	76	160
	My		1.8	5	3.6	10		16	44	32	88
	Mz		1.8	5	3.6	10		16	44	32	88
Bending Moment of Inertia (Second moment of area)	**Iy**	cm^4	2.4	2.4	2.4	2.4	in^4	0.058	0.058	0.058	0.058
	Iz		4.4	4.4	4.4	4.4		0.106	0.106	0.106	0.106
Base Weight without Motor		Kg	0.127	0.136	0.195	0.205	lbf	0.28	0.30	0.43	0.45
Add for 100mm of Stroke			0.18	0.18	0.21	0.21		0.40	0.40	0.46	0.46
Total Carriage Mass		Kg	.109	.117	.159	.175	lbm	.240	.257	.350	.385
Coefficent of Friction			0.19		0.01			0.19		0.01	

NOTE:

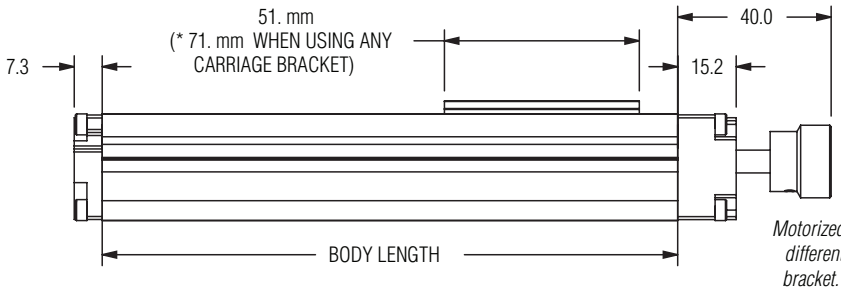
1. Moment arms for calculating moments should be measured from the center of the extrusion.
2. Limit switches must be used in order to prevent the carriage from contacting the actuator end blocks, resulting in damage.
3. Servo drive system - Recommended over-travel of 20 mm
4. Stepper motors or manual hand cranks system - add 5 mm of over-travel.

For combined loads. loading cannot exceed the following formula.

$$\frac{Fy_A}{Fy}+\frac{Fz_A}{Fz}+\frac{Mx_A}{Mx}+\frac{My_A}{My}+\frac{Mz_A}{Mz}<=1$$

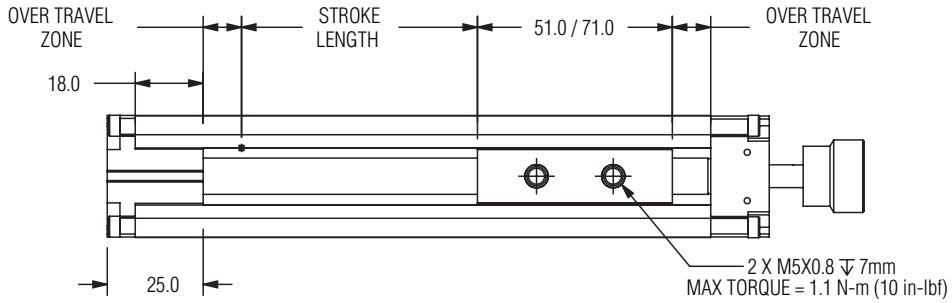


DIMENSIONAL INFORMATION



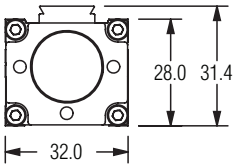
Motorized units use a different drive end bracket. See motor section for more details.

NOTE: BODY LENGTH = STROKE + *CARRIAGE LENGTH + (2 X OVER TRAVEL) + 18mm

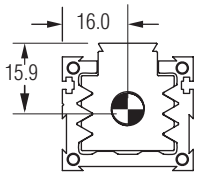


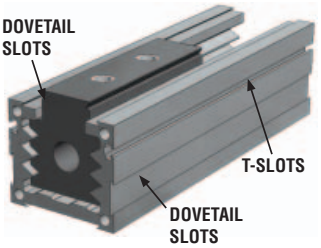
RECOMMENDED OVER TRAVEL- per side
Knob or Hand Crank = 5mm
Stepper Motor = 10mm
Servo Motor = 20mm

CARRIAGE WITH DOVETAIL

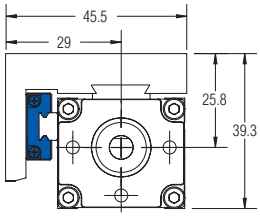


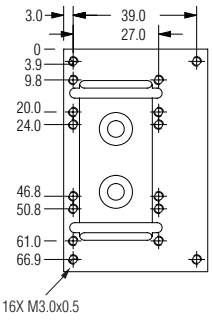
CENTER OF GRAVITY FOR MOMENT CALCULATIONS

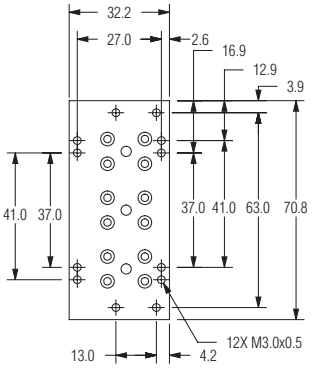




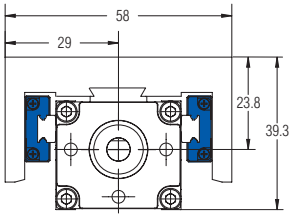
SINGLE LINEAR GUIDE SUPPORTS

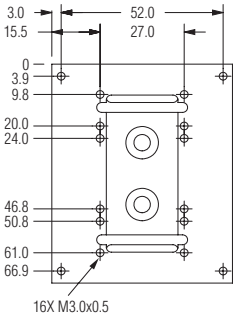


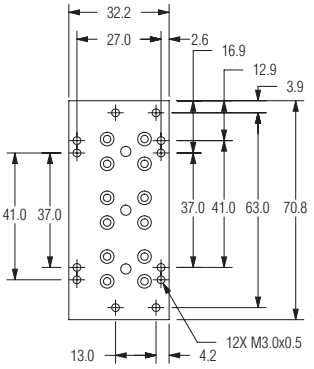




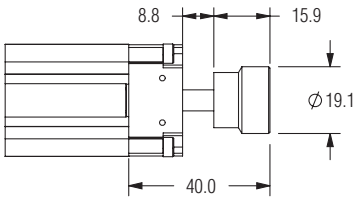
DUAL LINEAR GUIDE SUPPORTS

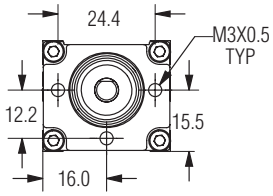




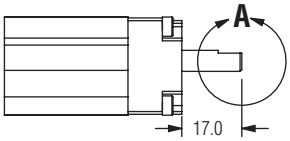


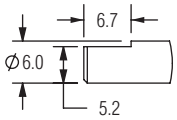
KNOB





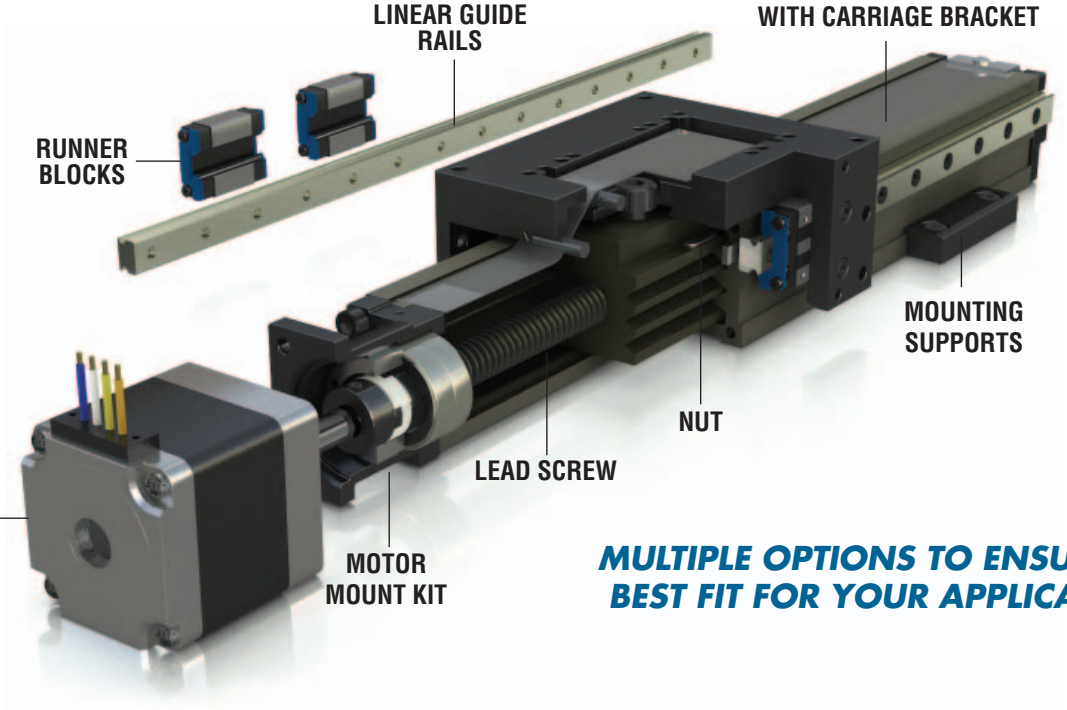
SHAFT ONLY.





DETAIL A

ORDERING OPTIONS & ACCESSORIES

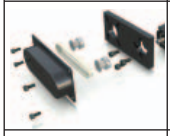


MULTIPLE OPTIONS TO ENSURE THE BEST FIT FOR YOUR APPLICATION!

ORDERING OPTIONS

	**Linear Guide Supports** - Provides increased load and moment capacities. Available in single or dual rails with runner blocks.
	**Lead Screws** - 1mm (0.039"), 3 mm (0.125"), 10 mm (0.4"), 25mm (1"), 38mm (1.5") *Contact manufacturer for other available sizes.*
	**Nut Type** Standard or optional anti-blash nut for applications requiring high bi-directional accuracy and repeatability.
	**Seal Strip** Prevent debris from entering or exiting the actuator.
	**Stepper Motors** - PBC brand motors are designed to reduce length in the ML actuator. Standard NEMA and metric sizes available in single, double or triple stack. Fastech® motors offer state-of-the-art monitoring and drive advancements into their EZi-step motor for precision, speed and power. Available in open or closed loop designs. **Servo motors -** Omron high-precision positioning with improved response and vibration control. Available in 40 & 60 mm.

ACCESSORIES

	**Mounting Supports** Dovetail clamps and riser plates for stable positioning and surface mounting.
	**Motor Coupling** Extends life of the motor and provides shortest overall length.
	**Position Sensor** Attaches to housing to precisely signal when the carriage has reached limit or home positions.
	**Replacement Parts** Fast replacement parts at a moments notice. Side motor brackets, covers and pulley belt system
	**Upgrade System Parts** Carriage Bracket Kit, Linear Guide Support Kit, Seal Strip Kit
	**Cable Carrier** Extruded one-piece or snap together side bands for various cable carrier cavities and application requirements.

QUESTIONS? 1(888) 777-1465
TO ORDER CALL: 1(800) 962-8979

6402 E. Rockton Road, Roscoe, IL 61073 USA • 1-888-777-1765 • www.pbclinear.com

ML SERIES - TO ORDER CALL 1-888-777-1465

See ML catalog for full product details & accessories

MLB Series

- Includes motor, coupling and motor assembly
- Full stock of open and closed loop stepper motors and servo motors
- Available in NEMA 11,14,17,23
- Precision machined body
- High acceleration, speed and rigidity
- Pre-engineered and assembled for easy installation

MLC Series

- Includes motor mount with coupling
- Includes motor spacer (if required)
- Precision machined body
- Small, compact design
- Smooth and quiet operation
- High acceleration, speed and rigidity

MLD Series

- Perfect for hand-operated precision control
- Manual brake optional
- Textured knob for both positioning and braking
- Precision machined body
- Small, compact design
- Great repeatability

MLB SERIES INTEGRATED MOTOR

MLB028D –	X	XX	X	X	X	– ####

Series
Motor or Lead Screw Driven 28 x 32 mm

Linear Guide Supports*
- **0** No External Rail
- **1** (1) Rail, (1) Runner Block - XY-2 Brkt (R)
- **2** (1) Rail, (2) Runner Blocks - XY-2 Brkt (R)
- **3** (2) Rail, (1) Runner Block - XY-3 Brkt
- **4** (2) Rail, (2) Runner Blocks - XY-3 Brkt
- **5** (1) Rail, (1) Runner Block - XY-2 Brkt (L)
- **6** (1) Rail, (2) Runner Blocks - XY-2 Brkt (L)
- **7** No Seal Strip - XY-1 Brkt

*(L) = Left (R) = Right

Lead
- **AH** 1mm
- **AG** 2mm
- **AX** 5mm
- **AJ** 10mm
- **BD** 12mm
- **AF** 16mm
- **AW** 25mm
- **AS** 1.5 in

Nut Type
- **2 Standard Nut**
- **4** Anti-backlash (light preload)
- **6** Anti-backlash (normal preload)

Seal Strip
- **0 None**
- **1** With Seal Strip & XY Bracket

of Carriages
- **1 1 Carriage**
- **2** 2 Carriages
- **3** 3 Carriages
- **4** 4 Carriages

NOTE: Contact manufacturer before ordering multiple carriages.

Body Length
(mm)

See page 11 for body length calculation table

EX: 90mm = 0090
250mm = 0250

X	X	X	X	XX	0

Motor Location
- **S** Straight
- **L** Left
- **R** Right
- **B** Bottom
- **T** Top

Motor Make
- **1** PBC Linear™ Open loop stepper motor
- **3** FASTech® EZI-Step BT with integral drive. Open loop stepper motor
- **4** FASTech® EZI-Servo Closed loop stepper motor
- **5** Omron® A/C, brushless servo motor

Motor Frame Size
- **B** NEMA 11 (28mm)
- **C** NEMA 14 (35mm)
- **F** NEMA 17 (42mm)
- **G** NEMA 23 (56mm)
- **E** Metric 40mm

Motor Power
- **A** 1/2 Stack
- **B** Single Stack
- **C** Double Stack*
- **D** Triple Stack

* not available with NEMA 14

- **F** 50W
- **G** 100W

Motor Features
- **00** Hybrid wiring (8 wires), flying leads, no encoders [hybrid wiring can be bi-polar or uni-polar]
- **00** Bi-polar wiring, flying leads, no encoder
- **01** 2,000 resolution (pulse/rev) encoder (std)
- **03** 16,000 resolution (pulse/rev) encoder
- **02** 10,000 resolution (pulse/rev) encoder (std)
- **04** 20,000 resolution (pulse/rev) encoder
- **05** 32,000 resolution (pulse/rev) encoder
- **01** 120V input, INC encoder, NO brake
- **02** 120V input, INC encoder, with brake
- **03** 120V input, ABS encoder, NO brake
- **04** 120V input, ABS encoder, with brake
- **05** 240V input, INC encoder, NO brake
- **06** 240V input, INC encoder, with brake
- **07** 240V input, ABS encoder, NO brake
- **08** 240V input, ABS encoder, with brake

Configuration
- **0** Standard

FINAL PART #

MLB028D -	X	XX	X	X	X	- XXXX -	X	X	X	X	XX	0

NOTE: Not all combinations are possible. Contact manufacturer for available combinations. Body lengths are available in 1mm increments up to 701mm. Standard lengths are multiples of 10mm. When possible round up to nearest multiple of 10mm. Longer lead times apply to non-standard lengths. NEMA 11 stepper motors typically do not have enough torque to drive the anti-backlash nuts. Customers are responsible for doing torque calculations to ensure the motor is properly sized. Specifications are subject to change without notice.

MLC SERIES
MOTOR MOUNT

MLC028D –	X	XX	X	X	X

Series	Linear Guide Supports*	Leads	Nut Type	Seal Strip	# of Carriages
ML Series with motor mount 28 x 32mm	**0** No External Rail **1** (1) Rail, (1) Runner Block - XY-2 Brkt (R) **2** (1) Rail, (2) Runner Blocks - XY-2 Brkt (R) **3** (2) Rail, (1) Runner Block - XY-3 Brkt **4** (2) Rail, (2) Runner Blocks - XY-3 Brkt **5** (1) Rail, (1) Runner Block - XY-2 Brkt (L) **6** (1) Rail, (2) Runner Blocks - XY-2 Brkt (L) **7** No Seal Strip - XY-1 Brkt	**AH** 1mm **AG** 2mm **AX** 5mm **AJ** 10mm **BD** 12mm **AF** 16mm **AW** 25mm **AS** 1.5in	**2 Standard Nut** **4** Anti-backlash (light preload) **6** Anti-backlash (normal preload)	**0 None** **1** With Seal Strip & XY Bracket	**1 1 Carriage** **2** 2 Carriages **3** 3 Carriages **4** 4 Carriages NOTE: Contact manufacturer before ordering multiple carriages.

*(L) = Left (R) = Right

#### –	X	X	X	X	X	0

Body Length	Motor Location	Motor Frame Size	Shaft OD	Coupling Material	Spacer Config	Config.
mm See page 11 for body length calculation table EX: 90mm = 0090 250mm = 0250	**S** Straight (in-line) **L** Left **R** Right **B** Bottom **T** Top	**A** NEMA 8 (20mm) **B** NEMA 11 (28mm) **C** NEMA 14 (35mm) **E** Metric 40 **F** NEMA 17 (42mm) **G** NEMA 23 (56/58mm)	**A** 3mm **B** 0.125 in **C** 4mm **D** 0.1875 in **E** 5mm **F** 6mm **G** 0.25 in **H** 0.3125 in **J** 8mm	**1** Acetal	**A** Standard **B** **C** **D** Contact PBC application engineer to specify spacer before ordering	**0** Standard

At time of order, customer must declare their pilot diameter, shaft length and mounting hole pattern of the matching motor so that the proper spacer can be included.

FINAL PART #	MLC028D	-	X	XX	X	X	X	-	XXXX	-	X	X	X	X	X	0

NOTE: Not all combinations are possible. Contact manufacturer for available combinations. Body lengths are available in 1mm increments up to 701mm. Standard lengths are multiples of 10mm. When possible round up to nearest multiple of 10mm. NEMA 11 stepper motors typically do not have enough torque to drive the anti-backlash nuts. Customers are responsible for doing torque calculations to ensure the motor is properly sized. Specifications are subject to change without notice.

MLD SERIES
HAND DRIVEN

MLD028D –	X	XX	X	X	X

Series	Linear Guide Supports	Leads	Nut Type	Seal Strip	# of Carriages
ML Series with knob/drive lead screw driven 28 x 32 mm	**0** No External Rail **1** (1) Rail, (1) Runner Block - XY-2 Brkt (R) **2** (1) Rail, (2) Runner Blocks - XY-2 Brkt (R) **3** (2) Rail, (1) Runner Block - XY-3 Brkt **4** (2) Rail, (2) Runner Blocks - XY-3 Brkt **5** (1) Rail, (1) Runner Block - XY-2 Brkt (L) **6** (1) Rail, (2) Runner Blocks - XY-2 Brkt (L) **7** No Seal Strip - XY-1 Brkt	**AH** 1mm **AG** 2mm **AX** 5mm **AJ** 10mm **BD** 12mm **AF** 16mm **AW** 25mm **AS** 1.5 in	**2 Standard Nut** **4** Anti-backlash (light preload) **6** Anti-backlash (normal preload)	**0 None** **1** With Seal Strip & XY Bracket	**1 1 Carriage** **2** 2 Carriages **3** 3 Carriages **4** 4 Carriages NOTE: Contact manufacturer before ordering multiple carriages.

*(L) = Left (R) = Right

#### –	X	X	0

Body Length	(Drive) Knob	Brake	Configuration
mm See page 11 for body length calculation table EX: 90mm = 0090 250mm = 0250	**0** No - shaft only **1** Yes - with knob	**0** No **1** Yes (at drive end)	**0** Standard

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FINAL PART #	MLD028D	-	X	XX	X	X	X	-	XXXX	-	X	X	0