ELECTROMECHANICAL

LINEAR ACTUATOR
DESIGN GUIDE

Duff-Norton®
By Columbus McKinnon

LINEAR ACTUATOR
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Since 1883 Duff-Norton has been at the forefront of motion technology and through continuous improvement and lean manufacturing models has established a reputation for the highest quality in engineering and design.

With an ISO 9001 registration since 1994 all Duff-Norton products, standard or custom designed, have been held to the same rigorous testing and scrutiny to assure maximum performance and quality.

Duff-Norton linear actuator products are specially designed for a variety of industrial and commercial applications. Our actuators are used for opening and closing, tilting and pivoting, lifting and lowering and positioning.

NOTE

Duff-Norton has made every effort to ensure that the information contained in the publication is accurate and reliable. Determining the suitability of our products for specific applications is the user's responsibility.

WARNING

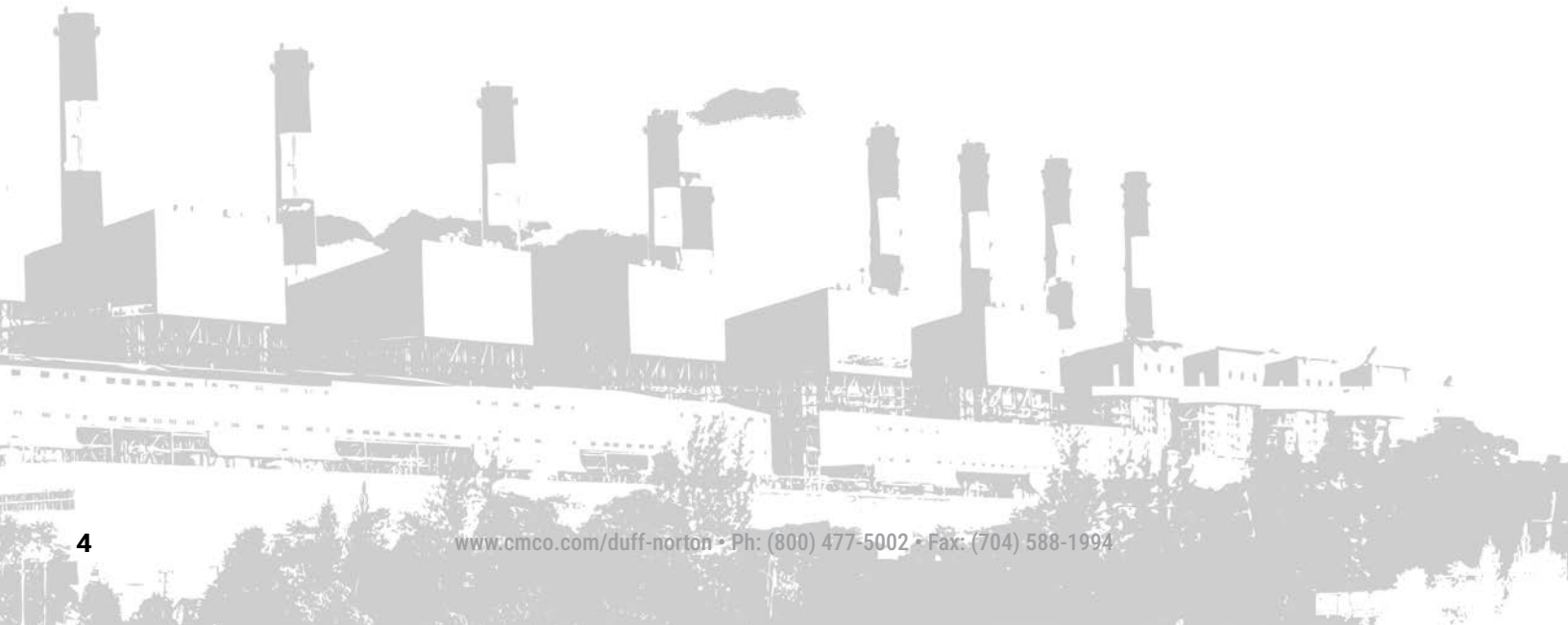
The equipment shown in this catalog is intended for industrial use only and should not be used to lift, support, or otherwise transport people unless you have written statement from Duff-Norton, which authorizes the specific actuator used in your applications as suitable for moving people.

USERS GUIDE
FOR SELECTING A LINEAR ACTUATOR

Define the application's operating parameters:

- Capacity ..... The force required to move and hold the load
- Voltage ..... The AC or DC motor voltage needed to operate the actuator
- Travel ..... The distance or range of motion
- Speed ..... The rate at which the linear actuator moves the load
- Duty Cycle ..... Percentage of time an actuator is in motion relative to total time
- Orientation ..... The relative position or direction in which the force is applied
- Environment ..... The surrounding conditions in which the system will operate

Once you determine the linear actuator specifications, selection of an actuator model can be simplified by using the Quick Reference Table on page 6.



LINEAR ACTUATOR
APPLICATION ANALYSIS FORM

Duff-Norton engineers will be pleased to make recommendations for your specific requirements. Complete this form and send it to Duff-Norton Company. There is no obligation for this service.

Customer: _____

Address: _____

_____

Phone Number: _____ **Fax Number:** _____

Contact: _____ **Email:** _____

1. **How many pounds do you need to move, or how great is the force you need to exert on the load (in pounds or newtons)?** _____

2. **How many inches (mm) do you need to move the load?** _____

3. **What is your available power source?**
   ❑ 115 VAC, 60Hz ❑ 220 VAC, 50Hz ❑ 12 VDC ❑ 24 VDC ❑ 230 3Phase ❑ 460 3Phase ❑ other _____ (Please Specify)

4. **Do you need?** ❑ Clutch ❑ Limit Switch ❑ Both

5. **How fast (inches/min. or mm/min.) do you want the actuator to extent or retract?** _____

6. **How many cycles per hour do you need the actuator to perform?** _____

7. **Do you require position feedback?** ❑ Yes ❑ No

8. **All AC actuators require a capacitor for operation. Do you want Duff-Norton to supply a capacitor? (Note: for 1500 pound and above capacity models, a capacitor is automatically supplied on SPA and LS models)**
   ❑ Yes, please supply capacitor
   ❑ No, I will purchase a capacitor seperately that meets the specifications outlined by Duff-Norton

9. **Do you have any special requirements such as weather resistant treatment, non standard lifting stroke, explosion proof, special end or mounting?** _____
   _____
   _____

10. **How many actuators are required?** _____

11. **Do you require any actuator controls?** ❑ Yes ❑ No

Use a separate sheet to sketch your application, or send us your design drawings in complete confidence.
If you have any questions or are in need of assistance please contact our Application Engineers at 800-477-5002

Please send completed sheet to
Phone: 1(800) 477-5002 • Email: duffnorton@cmworks.com
P.O. Box 7010 • Charlotte, NC 28241-7010
www.cmco.com/duff-norton

⚠ WARNING
Improper use can result in personal injury.
To avoid injury:
- Do not use actuators to lift, support, or transport people or loads over people, without written approval from Duff-Norton.
- Read all product warnings and operating instructions.

Duff-Norton®

Duff-Norton UL REGISTERED FIRM ISO 9001 #A2574

QUICK REFERENCE

FOR SELECTING A LINEAR ACTUATOR

	Series	Page #	Capacity	Voltages	Standard Stroke Lengths	Maximum Speed at Rated Load	Load Limiting Clutch	Limit Switches	Feedback	
	LT	10-11	27 to 225 lb (120 to 1000 N)	12 VDC or 24 VDC	1 to 12 in (25 to 300 mm)	Up to 1.3 in/s (Up to 33 mm/s)	N/A	Fixed	Optional	
	LS	12-15	450 to 675 lb (2000 to 3000 N)	12 VDC or 115 VAC	4, 8, 12, 24 in (101, 203, 304, 608 mm)	Up to 0.26 in/s (6.6 mm/s)	N/A	Adjustable	N/A	
	TMD01	16-17	100 lb (444 N)	12 VDC or 24 VDC	2, 4, 6, 8, 10, 12 in (50, 101, 152, 203, 254, 304 mm)	Up to 1 in/s 25.4 mm/s)	N/A	Optional	Optional	
	TMD02	18-19	250 lb (1112 N)	12 VDC or 24 VDC	2, 4, 6, 8, 10, 12 in (50, 101, 152, 203, 254, 304 mm)	Up to 0.75 in/s (19 mm/s)	N/A	Optional	Optional	
	HMPD w/Clutch	20-21	250 lb (1112 N)	12 VDC or 24 VDC	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 2 in/s (50 mm/s)	Yes	N/A	N/A	
	HMPD w/Limit Switch	22-23	250 lb (1112 N)	12 VDC or 24 VDC	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 2 in/s (50 mm/s)	N/A	Adjustable	Optional	
	HMPB	24-25	250 lb (1112 N)	115 VAC (60 Hz) or 220 VAC (50 Hz)	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 1.4 in/s (35.5 mm/s)	N/A	Adjustable	Optional	
	HSPB	26-27	250 lb (1112 N)	115 VAC (60 Hz) or 220 VAC (50 Hz)	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 1/4 in/s (35.5 mm/s)	Yes	N/A	N/A	
	MPD	28-29	500 lb (2224 N)	12 VDC or 24 VDC	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 0.85 in/s (21.5 mm/s)	Available upon request	Adjustable	Optional	
	HMPB	30-31	500 lb (2224 N)	115 VAC (60 Hz) or 220 VAC (50 Hz)	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 1.33 in/s (33.7 mm/s)	No	Adjustable	Optional	
	SPB	32-33	500 lb (2224 N)	115 VAC (60 Hz) or 220 VAC (50 Hz)	3, 6, 12, 18 in (76, 152, 304, 457 mm)	Up to 1.3 in/s (33.0 mm/s)	Yes	N/A	N/A	
	TAC	34-35	500 lb (2224 N)	12 VDC or 24 VDC	4, 6, 12, 18 in (102, 152, 304, 457 mm)	Up to 0.45 in/s (11.4 mm/s)	Yes	N/A	N/A	
	TAL	38-39	1000 lb (4448 N)	115 VAC (60 Hz) or 220/230 VAC (50 Hz/60 Hz)	4, 8, 12, 18 in (101, 203, 304, 407 mm)	Up to 0.45 in/s (11.4 mm/s)	No	Adjustable	Optional	
	SPD	40-41	1500 lb (6672 N)	12 VDC	3, 6, 12, 18, 24, 30, 36 in (76, 152, 304, 457, 608, 762, 915 mm)	0.43 in/s (10.9 mm/s)	Available upon request	Optional	Optional	
	SPA	42-43	1500 lb (6672 N)	115 VAC (60 Hz) or 220 VAC (50 Hz)	3, 6, 12, 18, 24, 30, 36 in (76, 152, 304, 457, 608, 762, 915 mm)	Up to 0.83 in/s (21.0 mm/s)	N/A	Adjustable	Optional	
	SPA	44-45	2000 lb (8896 N)	115 VAC (60 Hz) or 220 VAC (50 Hz)	3, 6, 12, 18, 24 in (76, 152, 304, 457, 608 mm)	Up to 0.86 in/s (21.8 mm/s)	N/A	Adjustable	Optional	
	CMLA	46-53	500 to 2000 lb (2224 to 8896 N)	115 VAC (60 Hz), 230 VAC (60 Hz) or 230/ 460 VAC/60 Hz/3ph	3.9, 5.9, 11.9, 17.7, 23.6, 29.5 in (100, 150, 300, 450, 600, 750 mm)	Up to 0.8 in/s (203 mm/s)	Yes (not available on 1000 lb quad speed 2.1:1 ratio)	Optional Adjustable	Optional Potentiometer	

	Current Draw at Rated Load	Duty Cycle at Rated Load	Motor Overload Protection	Environment	Temperature Range	Restraining Torque	Translating Tube Material	Options
	Up to 3.5 A (12 VDC) Up to 2.0 A (24 VDC)	20%	N/A	IP66	-13°F to 150°F (-25°C to 65°C)	Keyed	Polished Aluminum	Stainless Steel Translating Tube Third Limit Switch
	10 A (12 VDC) 1.6 A (115 VAC)	17%	AC motor thermal protection	N/A	32°F to 110°F (0°C to 43°C)	N/A	Plated Steel	N/A
	7 A (12 VDC) 5 A (24 VDC)	25%	N/A	IP50	25°F to 120°F (-4°C to 50°C)	Keyed	Stainless Steel	Adjustable Limit Switches Pulse Generator Feedback
	7 A (12 VDC) 5 A (24 VDC)	25%	N/A	IP50	25°F to 120°F (-4°C to 50°C)	Keyed	Stainless Steel	Adjustable Limit Switches Pulse Generator Feedback
	Up to 28 A	Up to 35%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	30 in-lbf (3.4 Nm)	Steel Zinc Chromate Plated	Weather Sealant Bellows Boot
	Up to 28 A	Up to 32%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	30 in-lbf (3.4 Nm)	Steel Zinc Chromate Plated	Potentiometer Weather Resistant Bellows Boot
	Up to 5.0 A	Up to 23%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	30 in-lbf (3.4 Nm)	Steel Zinc Chromate Plated	Potentiometer, Capacitor Weather Resistant Capacitor Enclosure
	Up to 5.1 A	Up to 24%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	30 in-lbf (3.4 Nm)	Steel Zinc Chromate Plated	Capacitor Weather Resistant Capacitor Enclosure
	23 A (12 VDC) or 12 A (24 VDC)	Up to 19%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	60 in-lbf (6.7 Nm)	Steel Zinc Chromate Plated	Potentiometer Weather Resistant Bellows Boot
	Up to 5.5 A	Up to 22%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	60 in-lbf (6.7 Nm)	Steel Zinc Chromate Plated	Potentiometer Weather Resistant Bellows Boot
	Up to 5.5 A	Up to 24%	Yes	IP50 standard IP52 optional	25°F to 120°F (-4°C to 50°C)	60 in-lbf (6.7 Nm)	Steel Zinc Chromate Plated	Weather Resistant Capacitor Capacitor Enclosure
	10 A (12 VDC) or 5 A (24 VDC)	40%	Yes	IP50	25°F to 120°F (-4°C to 50°C)	40 in-lbf (4.5 Nm)	Stainless Steel	Bellows Boot
	4 A (115 VAC) or 2.0/2.5 A (220/230 VAC)	17.5% (115 VAC) or 17%/14% (220/230 VAC)	Yes	IP50	-20°F to 120°F (-28°C to 48°C)	80 in-lbf (9 Nm)	Stainless Steel	Bellows Boot
	27 A	27%	Yes	IP50 standard IP52 optional	-15°F to 120°F (-10°C to 48°C)	215 in-lbf (24.2 Nm)	Steel Zinc Chromate Plated	Potentiometer Bellows Boot Weather Resistant
	Up to 6.5 A (115 VAC) Up to 2 A (220 VAC, 50 Hz)	Up to 25%	Yes	IP66	15°F to 120°F (-9°C to 48°C)	215 in-lbf (24.2 Nm)	Steel Zinc Chromate Plated	Potentiometer Bellows Boot Weather Resistant
	Up to 5.1 A	Up to 25%	Yes	IP66	15°F to 120°F (-9°C to 48°C)	180 in-lbf (20.3 Nm)	Steel Zinc Chromate Plated	Potentiometer Bellows Boot Weather Resistant
	Up to 8.3 A	Up to 16,000 in/hr (406 m/hr)	Yes	IP66	4°F to 150°F (-20°C to 65°C)	Keyed	Hardened Chrome Stainless Steel	Potentiometer Adjustable Limit Switches

LINEAR ACTUATOR APPLICATIONS

Tilt / Pivot

Duff-Norton linear actuators can be used to tilt objects, fixed at one end, up to 180º from their starting positions. The extension and retraction of the actuator causes the object to pivot about its stationary end.

Lift / Lower

Duff-Norton linear actuators can handle any lifting and lowering application up to 2000 lb (910 kg). As the translating tube of the actuator extends and retracts, the object that the actuator is attached to is raised and lowered at a consistent speed.

Position

When an application requires periodic adjustment to the position of an object or objects, Duff-Norton linear actuators provide the solution. The motion of the actuator allows the operator to position an object by simply pushing a button.

Portable Lighting

PROBLEM: Movie and construction crews need portable lighting for work at night. Lighting that is compact for travel and easily erected on location was difficult to find.

SOLUTION: Duff-Norton linear actuators mounted to the skeleton of the lighting system, allows the lights to be drawn flush against the vehicle, then fully extended on location at the flip of a switch. Additional actuators adjust the angle of the lighting fixtures

Drill Press Table

PROBLEM: When work pieces of different sizes require manual machining, it is necessary to adjust the height of the drill press table. Adjusting the height of the table manually is both time consuming and fatiguing.

SOLUTION: A Duff-Norton linear actuator mounted under the table allows the operator to change the height of the table as often as needed using either hand or foot controls.

Engine Assembly Fixture

PROBLEM: Fixture must be highly adjustable to specific positions for different procedures. The movement of the fixture must be smooth and reliable.

SOLUTION: Duff-Norton linear actuators are used to raise and lower the assembly fixture. This saves assembly time, reduces employee fatigue and work related injuries.

Roll / Slide

When it is necessary to roll or slide an object or a mechanical assembly into position, a

Duff-Norton linear actuator is the answer. The movement of the actuator causes the clamping, rolling or sliding of the desired object.

Open / Close

A Duff-Norton linear actuator mounted on a door, gate, or valve allows opening and closing operations on either a timed, or on-demand basis. As the actuator retracts, the gate is opened at a steady rate; the extension of the actuator returns the gate to a closed position.

Tension

Duff-Norton linear actuators offer a perfect solution for applications in which tension on a conveyor or web must be maintained and adjusted. An actuator mounted on a frame or roller extends and retracts to control the tension in the system.

Drum / Barrel Lifter

PROBLEM: Hazardous material sealed in drums must be handled and processed for disposal. It is desirable to minimize human involvement in the process.

SOLUTION: Two Duff-Norton linear actuators are used in each assembly. One operates a set of ratchet clamps that securely grasp the drum. The other actuator lifts the drum for pouring.

Industrial Oven

PROBLEM: Industrial oven doors can be very large and must often be opened and closed on a timed basis to allow for steady flow of material in and out.

SOLUTION: A Duff-Norton linear actuator is connected to the oven door and operated by an electronic control system. The actuator opens and closes the door to allow materials to enter and exit when prompted by the control system.

Conveyor System

PROBLEM: The tension in conveyor belts must frequently be adjusted to allow for crates of different sizes and to take up slack in the system that develops with use.

SOLUTION: A Duff-Norton linear actuator is mounted to a roller at one end of the conveyor system. At the push of a button, the actuator adjusts the position of the roller, controlling the tension in the entire system. Actuators can also be used to reposition conveyor systems.

SERIES LT

27 to 225 lbs (120 to 1000 N)

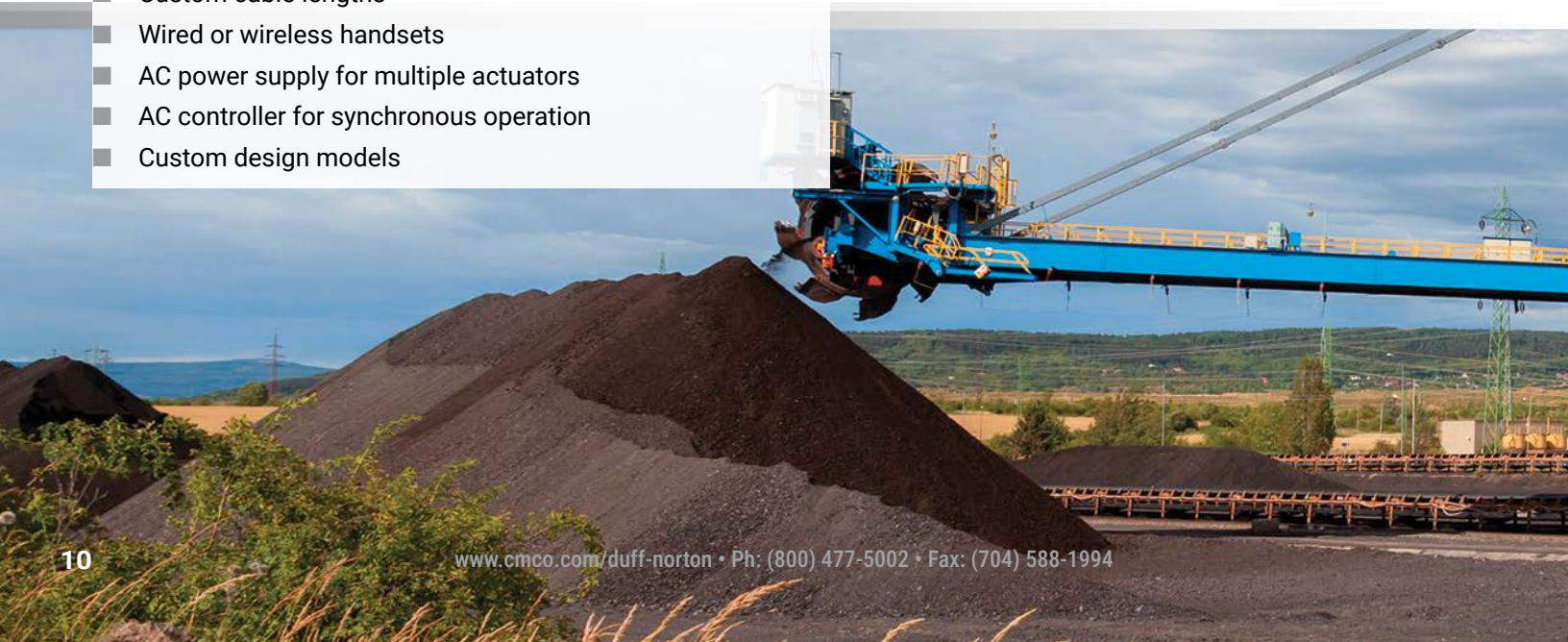
VOLTAGE:	12 or 24 VDC
STROKES:	2 to 11.8 in (50 to 300 mm)
TEMPERATURE RANGE:	-13ºF to 150ºF (-25ºC to 65ºC)
ENVIRONMENT:	IP66 protection

FEATURES & BENEFITS

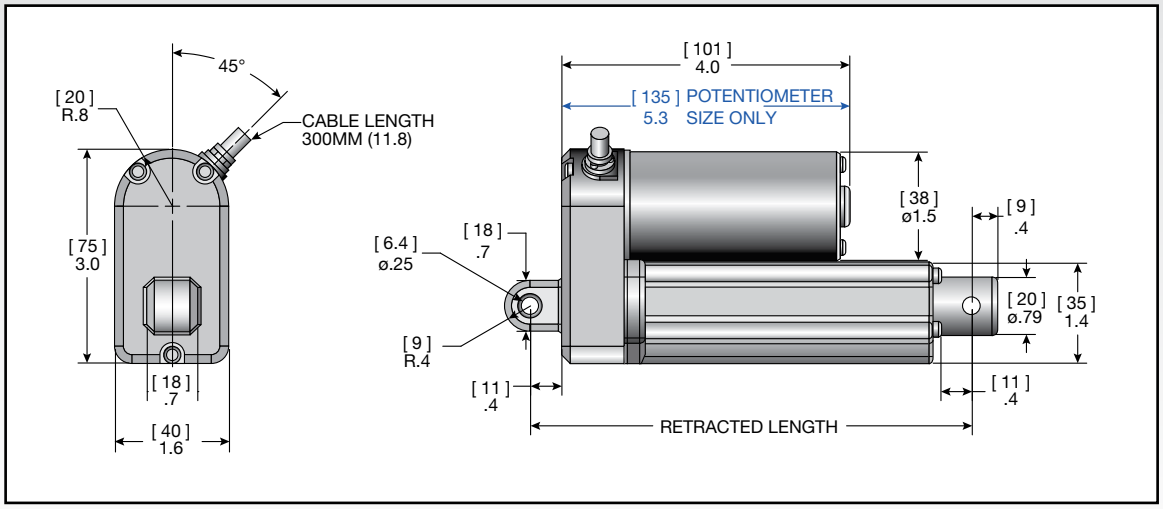
- Limit switches - internal, factory preset
- Zinc die cast housing for strength
- Aluminum outer tube for corrosion resistance
- Keyed translating tube to prevent rotation
- Polished aluminum translating tube for smooth operation
- Warranty - 1 year, parts and labor
- Gear driven

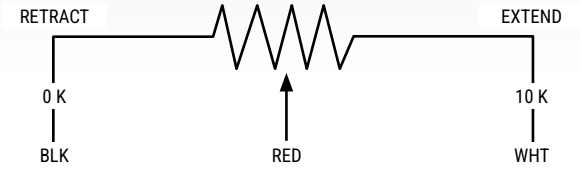
OPTIONS

- Potentiometer, Hall effect, reed or optical feedback
- Signal sending limit switch
- Third limit switch
- Stainless steel translating tube
- Custom cable lengths
- Wired or wireless handsets
- AC power supply for multiple actuators
- AC controller for synchronous operation
- Custom design models



DIMENSIONS





POTENTIOMETER / HALL EFFECT SENSOR DIMENSIONS

Stroke Length	50 mm 1.9 in	100 mm 3.9 in	150 mm 5.9 in	200 mm 7.9 in	250 mm 7.9 in	300 mm 11.8 in
Retracted Length mm (in)	189 (7.4)	239 (9.4)	289 (11.4)	341 (13.4)	391 (15.4)	464 (18.3)
Extended Length mm (in)	239 (9.4)	339 (13.3)	439 (17.3)	541 (21.3)	641 (25.2)	764 (30.0)

Potentiometer Stroke mm (in)	50 (1.97)	100 (3.94)	150 (5.91)	200 (7.87)	250 (9.84)	300 (11.81)
POT Travel (% of 10K)	47%	50%	71%	94%	39%	47%

PRODUCT INFORMATION

Part Number	Rated Load Lbs (N)	Stroke Lengths		Retracted Length		Voltage	Current Draw at Rated Load	Lifting Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load
		in	mm	in	mm	VDC	amp	in/s	mm/s		
LT25-*-50	27 lbs (120 N)	2	50	6.1	155	12 or 24	2.5 (12 VDC) 1.5 (24 VDC)	1.3	33	Yes	20%
LT25-*-100		4	100	8	205						
LT25-*-150		5.9	150	10	255						
LT25-*-200		7.9	200	12	307						
LT25-*-250		9.8	250	14	357						
LT25-*-300		11.8	300	16	407						
LT50-*-50	54 lbs (240 N)	2	50	6.1	155	12 or 24	3.5 (12 VDC) 2.0 (24 VDC)	0.9	23	Yes	20%
LT50-*-100		4	100	8	205						
LT50-*-150		5.9	150	10	255						
LT50-*-200		7.9	200	12	307						
LT50-*-250		9.8	250	14	357						
LT50-*-300		11.8	300	16	407						
LT100-*-50	112 lbs (500 N)	2	50	6.1	155	12 or 24	3.5 (12 VDC) 2.0 (24 VDC)	0.5	12	Yes	20%
LT100-*-100		4	100	8	205						
LT100-*-150		5.9	150	10	255						
LT100-*-200		7.9	200	12	307						
LT100-*-250		9.8	250	14	357						
LT100-*-300		11.8	300	16	407						
LT150-*-50	169 lbs (750 N)	2	50	6.1	155	12 or 24	3.5 (12 VDC) 2.0 (24 VDC)	0.3	8	Yes	20%
LT150-*-100		4	100	8	205						
LT150-*-150		5.9	150	10	255						
LT150-*-200		7.9	200	12	307						
LT150-*-250		9.8	250	14	357						
LT150-*-300		11.8	300	16	407						
LT225-*-50	225 lbs (1000 N)	2	50	6.1	155	12 or 24	3.5 (12 VDC) 2.0 (24 VDC)	0.2	6	Yes	20%
LT225-*-100		4	100	8	205						
LT225-*-150		5.9	150	10	255						
LT225-*-200		7.9	200	12	307						
LT225-*-250		9.8	250	14	357						
LT225-*-300		11.8	300	16	407						

***Voltage: 1=12 VDC and 2=24 VDC**
Contact factory for potentiometer models

SERIES LS

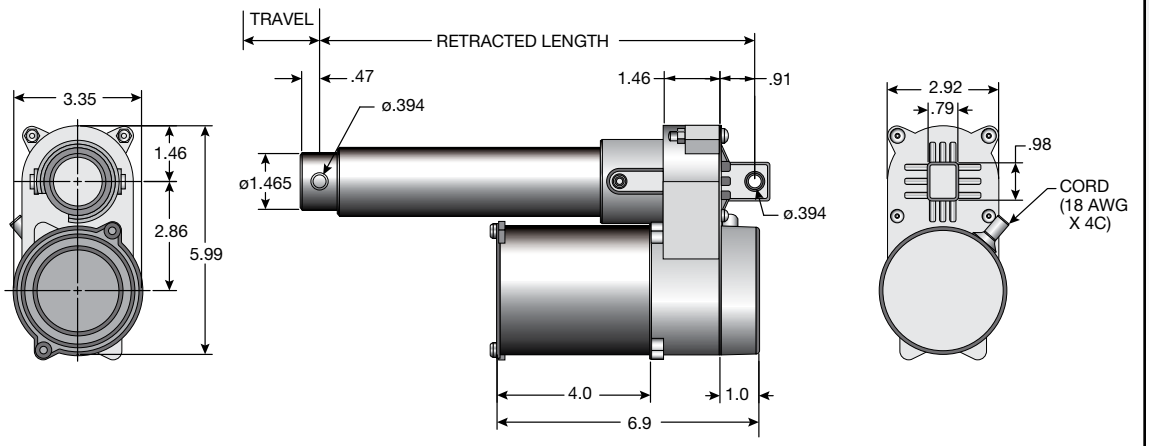
450 to 675 lbs (2000 to 3000 N)

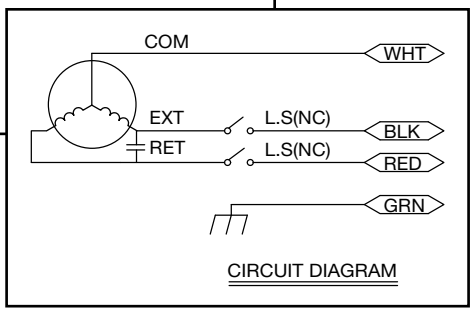
SPEED:	0.15 to 0.26 in/s (3.8 to 6.6 mm/s)
VOLTAGE:	12 VDC or 115 VAC
STROKES:	4, 8, 12, and 24 in (101, 203, 304, and 609 mm)

FEATURES & BENEFITS

- Loading: tension (pull) or compression (push) at rated load
- AC motor thermal protection to prevent over heating
- Internal limit switches - adjustable
- Onboard capacitor for AC models
- Die cast aluminum housing for strength
- Steel translating tube and outer tube
- Self locking acme screw to prevent back driving
- CE compliant and UL recognized
- Custom models available - call for more information

LS 25, 26 & 28



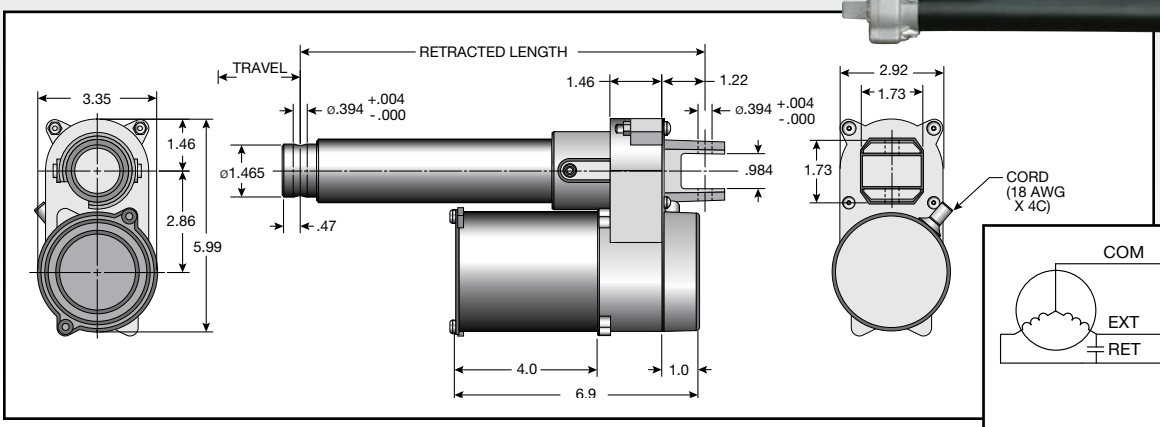


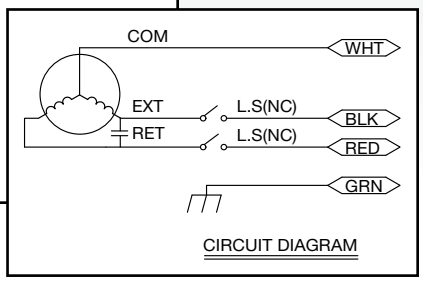
PRODUCT INFORMATION (LS 25, 26 & 28)

Part Number	Rated Load		Stroke		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed		Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s		lbs	kg
LS25-1B5TN-04	450	2000	4	101	11.4	290	115 VAC	1.4	0.26	6.6	17%	9.1	4.1
LS25-1B5TN-08			8	203	15.4	391						9.8	4.4
LS25-1B5TN-12			12	304	19.4	493						10.6	4.8
LS26-1B5TN-04	560	2491	4	101	11.4	290	115 VAC	1.4	0.21	5.3	17%	9.1	4.1
LS26-1B5TN-08			8	203	15.4	391						9.8	4.4
LS26-1B5TN-12			12	304	19.4	493						10.6	4.8
LS28-1B5TN-04	675	3002	4	101	11.4	290	115 VAC	1.4	0.15	3.8	17%	9.1	4.1
LS28-1B5TN-08			8	203	15.4	391						9.8	4.4
LS28-1B5TN-12			12	304	19.4	493						10.6	4.8

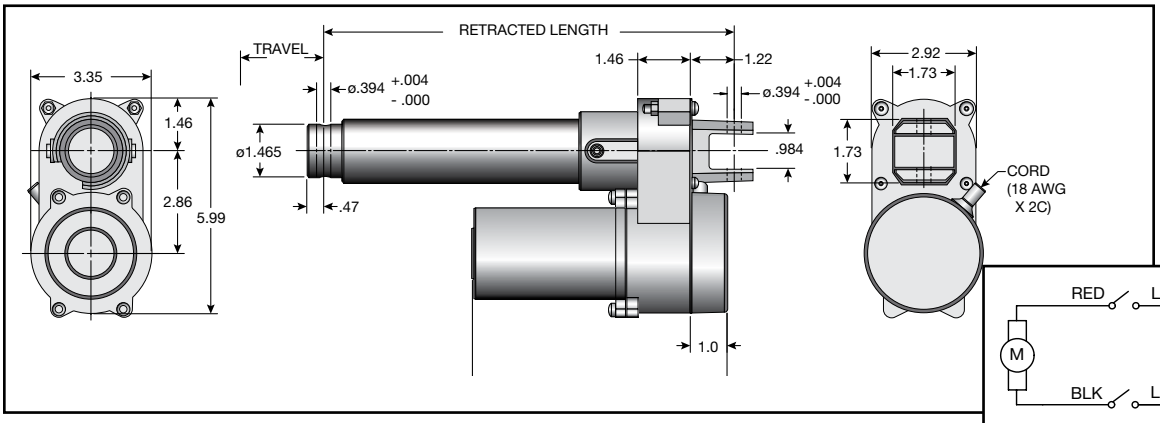
SERIES
LS
450 to 675 lbs (2000 to 3000 N)

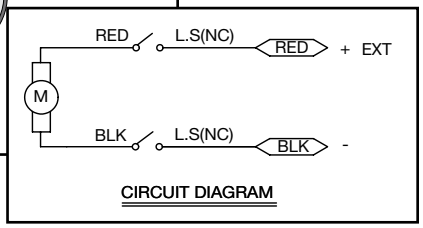
LS 35 AC





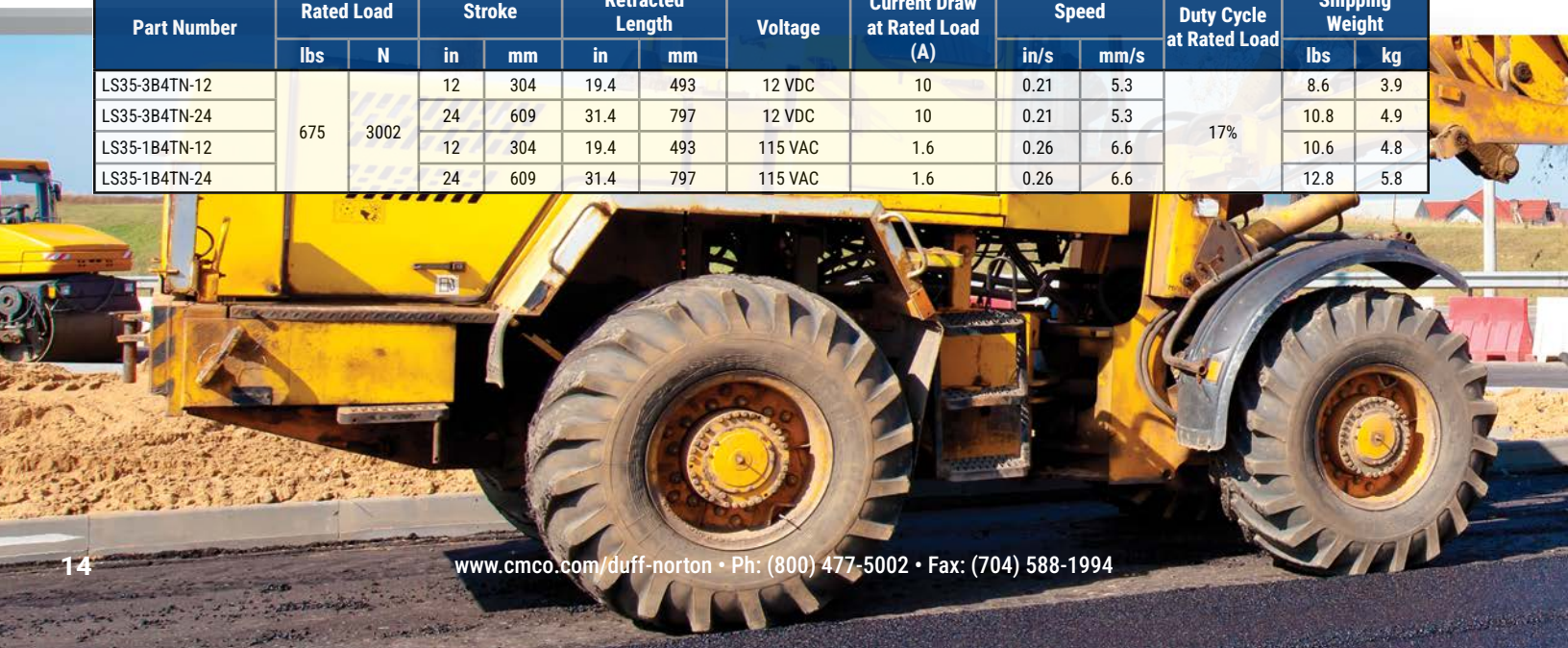
LS 35 DC



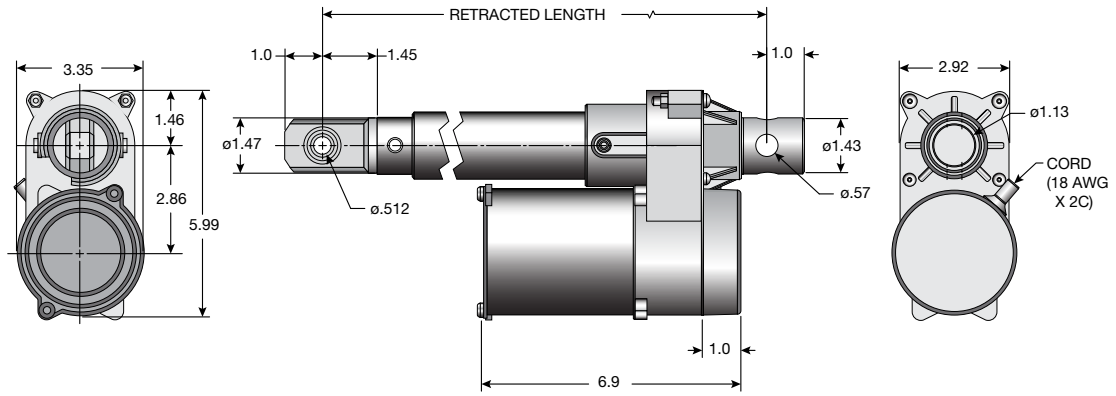


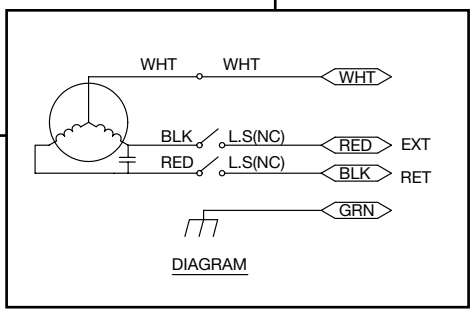
PRODUCT INFORMATION (LS 35)

Part Number	Rated Load		Stroke		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed		Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s		lbs	kg
LS35-3B4TN-12	675	3002	12	304	19.4	493	12 VDC	10	0.21	5.3	17%	8.6	3.9
LS35-3B4TN-24			24	609	31.4	797	12 VDC	10	0.21	5.3		10.8	4.9
LS35-1B4TN-12			12	304	19.4	493	115 VAC	1.6	0.26	6.6		10.6	4.8
LS35-1B4TN-24			24	609	31.4	797	115 VAC	1.6	0.26	6.6		12.8	5.8



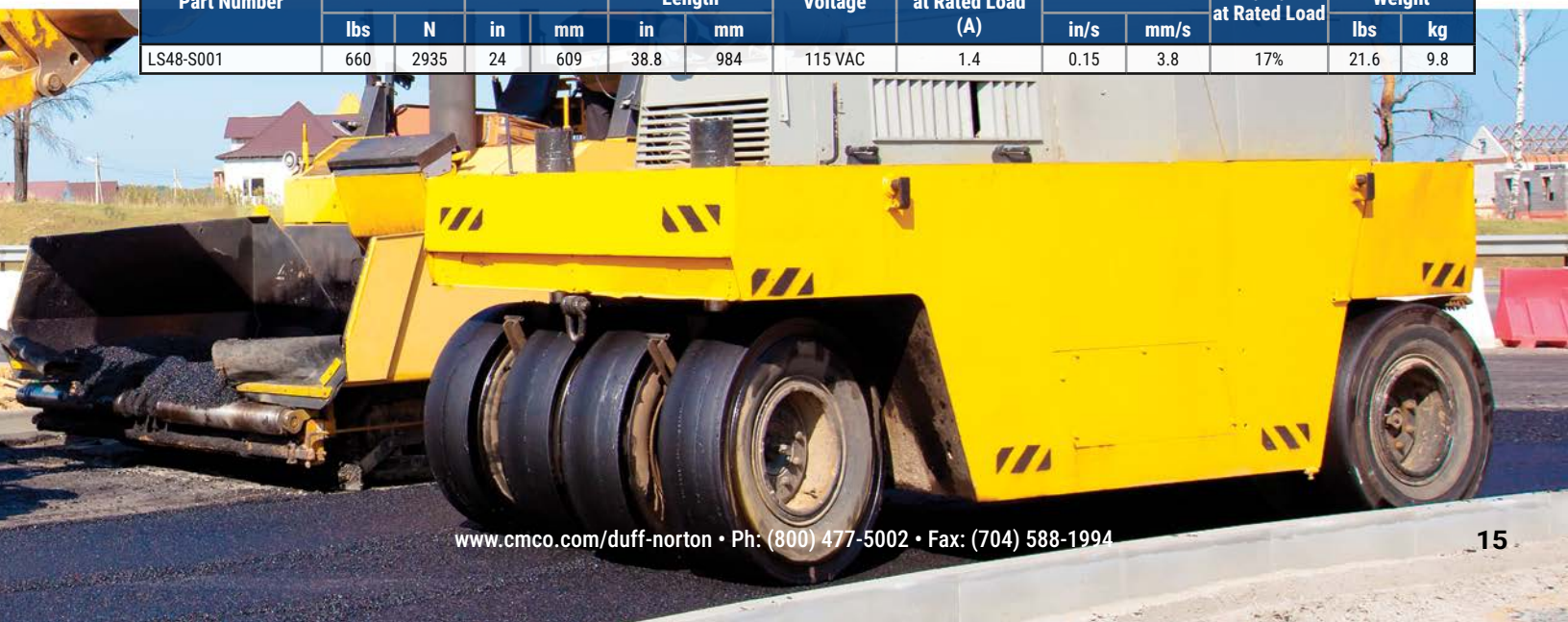
LS 48





PRODUCT INFORMATION (LS 48)

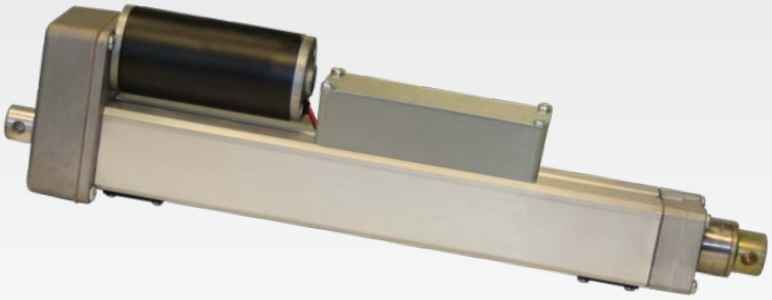
Part Number	Rated Load		Stroke		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed		Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s		lbs	kg
LS48-S001	660	2935	24	609	38.8	984	115 VAC	1.4	0.15	3.8	17%	21.6	9.8



SERIES TMD01

100 lbs (444 N)

VOLTAGE:	12 or 24 VDC
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC)
ENVIRONMENT:	IP50 protection standard

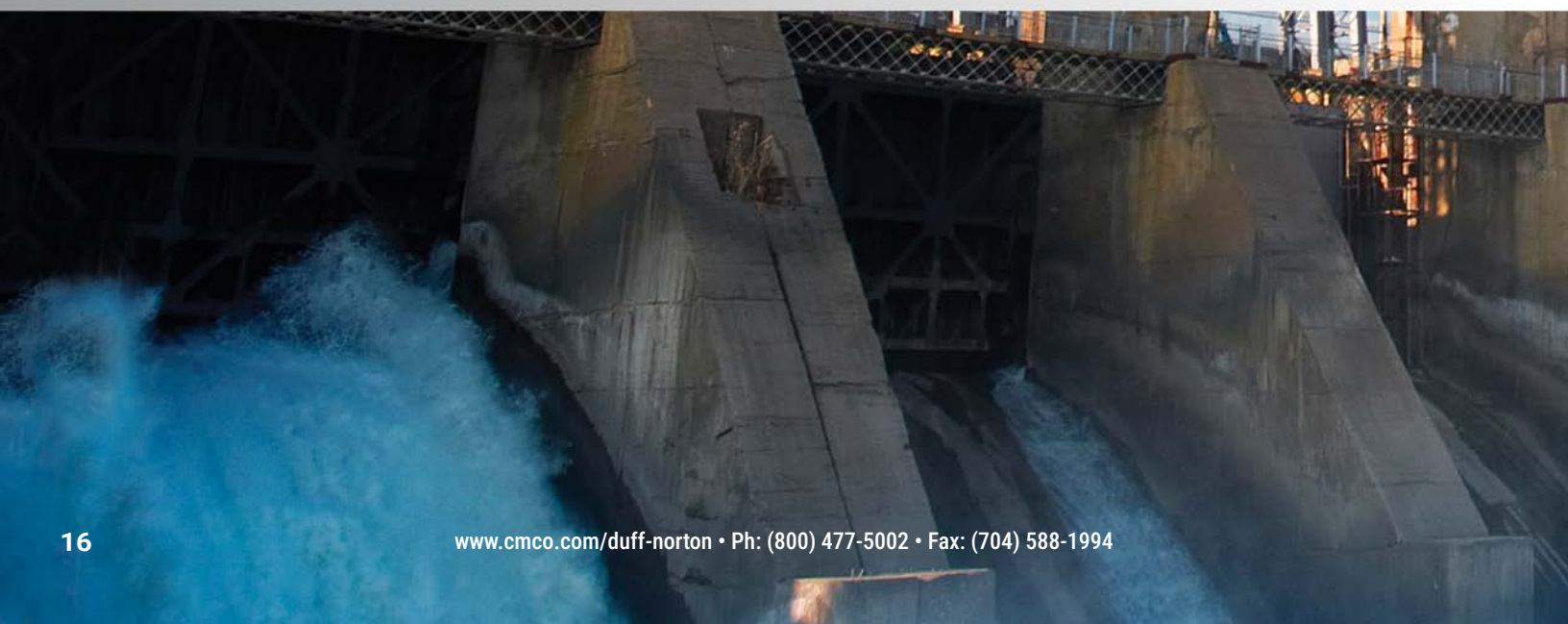


FEATURES & BENEFITS

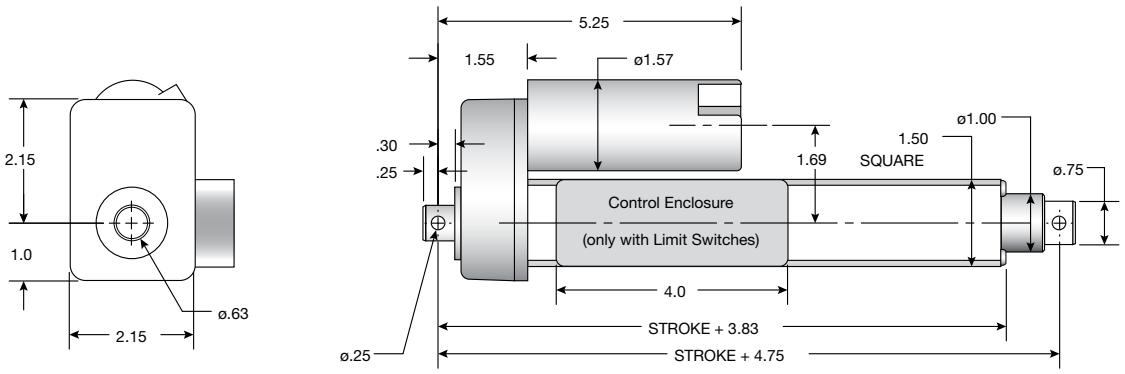
- Compact design
- Timing belt drive for quiet operation
- Aluminum housing and outer tube
- Low current draw
- Double clevis mounting
- Easy to wire terminal strip (limit switch models)
- Keyed translating tube
- Permanent magnet motors - no thermal overload protection

OPTIONS

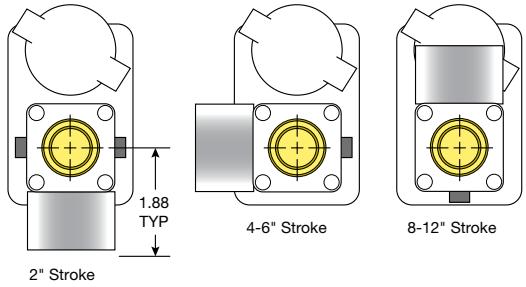
- Adjustable limit switches - includes control enclosure with fuse
- Pulse generator for feedback (Add “PTD” prefix)



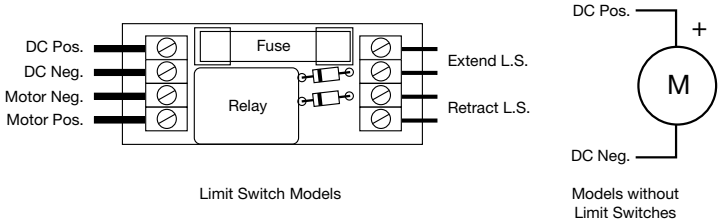
DIMENSIONS



CONTROL ENCLOSURE LOCATIONS



POLARITY AS SHOWN TO EXTEND.



PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
TMD01-1406-2	100	444	2	50	6.75	171	12 VDC	7	0.7	18	No Limit Switches	25%	4	1.8
TMD01-1406-4			4	101	8.75	222							4	1.8
TMD01-1406-6			6	152	10.75	273							5	2.3
TMD01-1406-8			8	203	12.75	323							5	2.3
TMD01-1406-10			10	254	14.75	374							5	2.3
TMD01-1406-12			12	304	16.75	425							5	2.3
TMD01-1906-2	100	444	2	50	6.75	171	12 VDC	7	0.7	18	Adjustable Limit Switches	25%	4	1.8
TMD01-1906-4			4	101	8.75	222							4	1.8
TMD01-1906-6			6	152	10.75	273							5	2.3
TMD01-1906-8			8	203	12.75	323							5	2.3
TMD01-1906-10			10	254	14.75	374							5	2.3
TMD01-1906-12			12	304	16.75	425							5	2.3
TMD01-2406-2	100	444	2	50	6.75	171	24 VDC	5	1	25	No Limit Switches	25%	4	1.8
TMD01-2406-4			4	101	8.75	222							4	1.8
TMD01-2406-6			6	152	10.75	273							5	2.3
TMD01-2406-8			8	203	12.75	323							5	2.3
TMD01-2406-10			10	254	14.75	374							5	2.3
TMD01-2406-12			12	304	16.75	425							5	2.3
TMD01-2906-2	100	444	2	50	6.75	171	24 VDC	5	1	25	Adjustable Limit Switches	25%	4	1.8
TMD01-2906-4			4	101	8.75	222							4	1.8
TMD01-2906-6			6	152	10.75	273							5	2.3
TMD01-2906-8			8	203	12.75	323							5	2.3
TMD01-2906-10			10	254	14.75	374							5	2.3
TMD01-2906-12			12	304	16.75	425							5	2.3

Note: For pulse generator models, use PTD model number prefix instead of TMD

SERIES TMD02

250 lbs (1112 N)

VOLTAGE:	12 or 24 VDC
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC)
ENVIRONMENT:	IP50 protection standard

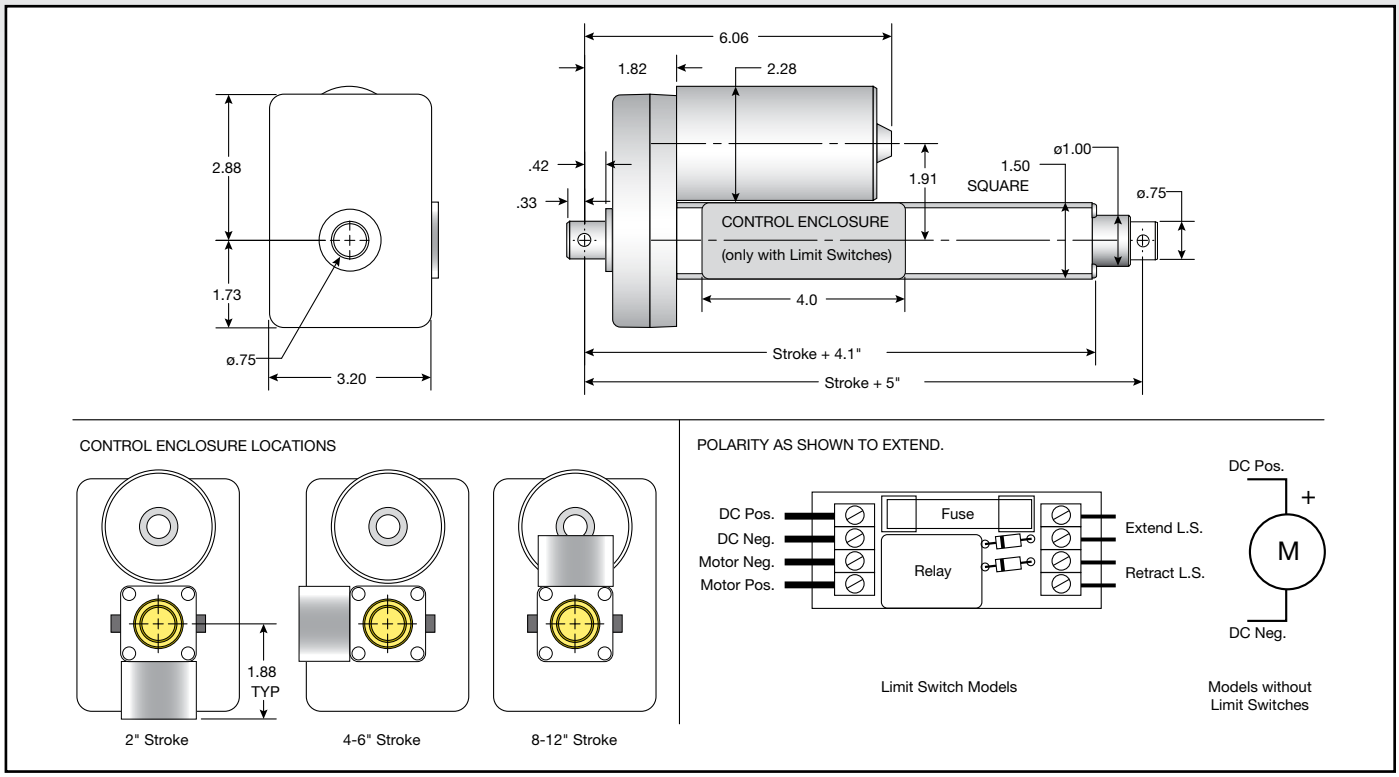
FEATURES & BENEFITS

- Compact design
- Belt drive for quiet operation
- Aluminum housing and outer tube
- Stainless steel translating tube
- Double clevis mounting
- Easy to wire terminal strip (limit switch models)
- Keyed translating tube
- Permanent magnet motors - no thermal overload protection

OPTIONS

- Adjustable limit switches - includes control enclosure with fuse
- Pulse generator for feedback (Add “PTD” prefix)

DIMENSIONS



PRODUCT INFORMATION

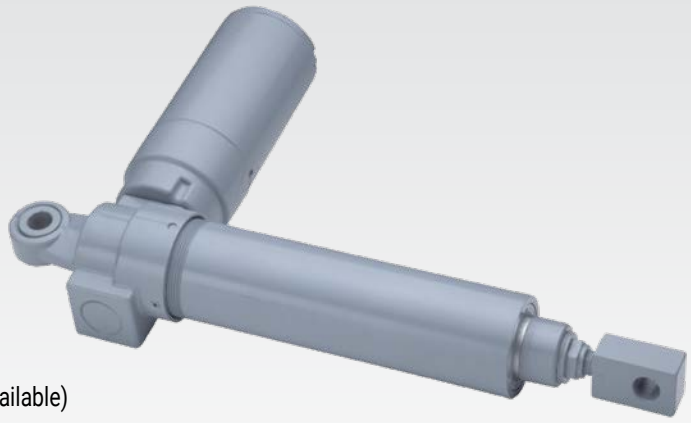
Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
TMD02-1406-2	250	1112	2	50	7	177	12 VDC	7	0.4	10	No Limit Switches	25%	4	1.8
TMD02-1406-4			4	101	9	228							4	1.8
TMD02-1406-6			6	152	11	279							5	2.3
TMD02-1406-8			8	203	13	330							5	2.3
TMD02-1406-10			10	254	15	381							5	2.3
TMD02-1406-12			12	304	17	431							5	2.3
TMD02-1906-2	250	1112	2	50	7	177	12 VDC	7	0.4	10	Independently Adjustable Limit Switches	25%	4	1.8
TMD02-1906-4			4	101	9	228							4	1.8
TMD02-1906-6			6	152	11	279							5	2.3
TMD02-1906-8			8	203	13	330							5	2.3
TMD02-1906-10			10	254	15	381							5	2.3
TMD02-1906-12			12	304	17	431							5	2.3
TMD02-2406-2	250	1112	2	50	7	177	24 VDC	4.5	0.75	19	No Limit Switches	25%	4	1.8
TMD02-2406-4			4	101	9	228							4	1.8
TMD02-2406-6			6	152	11	279							5	2.3
TMD02-2406-8			8	203	13	330							5	2.3
TMD02-2406-10			10	254	15	381							5	2.3
TMD02-2406-12			12	304	17	431							5	2.3
TMD02-2906-2	250	1112	2	50	7	177	24 VDC	4.5	0.75	19	Independently Adjustable Limit Switches	25%	4	1.8
TMD02-2906-4			4	101	9	228							4	1.8
TMD02-2906-6			6	152	11	279							5	2.3
TMD02-2906-8			8	203	13	330							5	2.3
TMD02-2906-10			10	254	15	381							5	2.3
TMD02-2906-12			12	304	17	431							5	2.3

Note: For pulse generator models, use PTD model number prefix instead of TMD

SERIES

HMPD with clutch

250 lbs (1112 N)



TUBE RESTRAINING TORQUE:	30 in-lbf (3.4 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

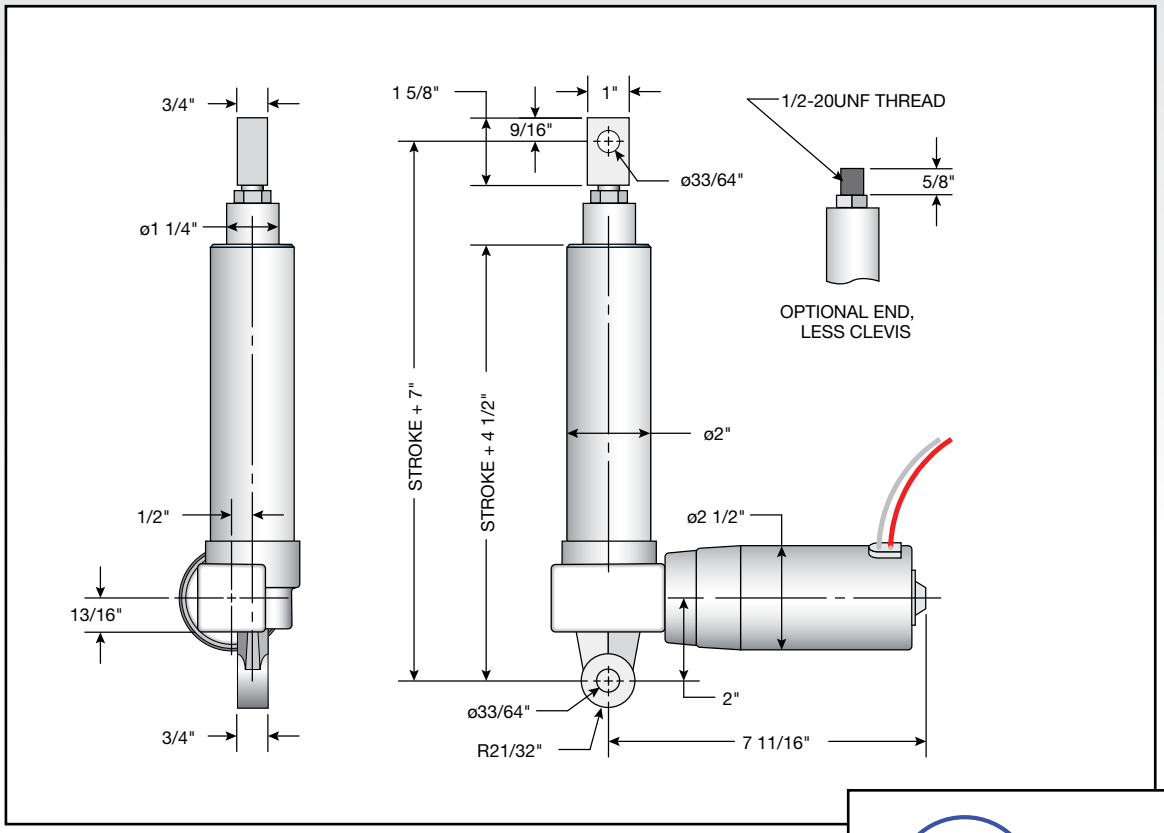
FEATURES & BENEFITS

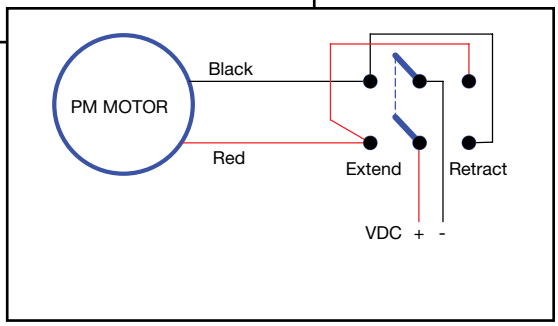
- Heavy duty design for long life in tough applications
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Patented spring brake
- Load limiting friction disc clutch
- Automatic reset thermal overload motor protection

OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Bellows boot
- 90 degree housing clevis mounting
- Threaded end (add “T” prefix)

DIMENSIONS

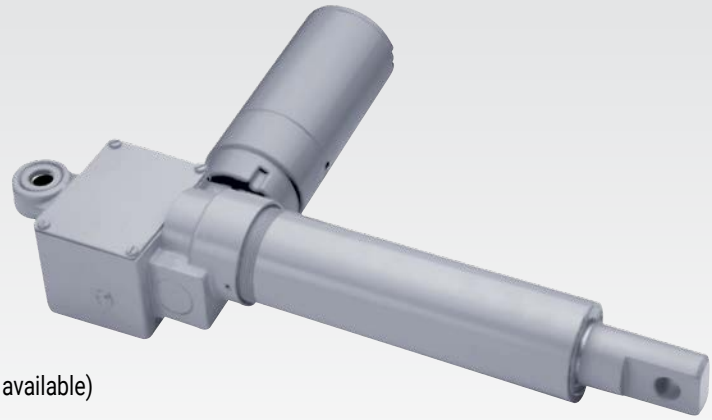




PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s		lbs	kg
MPD3405-3	250	1112	3	76	10	254	12 VDC	14	1	25	21%	8	3.6
MPD3405-6			6	152	13	330						10	4.5
MPD3405-12			12	304	19	483						12	5.4
MPD3405-18			18	457	25	635						15	6.8
MPD3404-3	250	1112	3	76	10	254	12 VDC	5	1	25	32%	8	3.6
MPD3404-6			6	152	13	330						10	4.5
MPD3404-12			12	304	19	483						12	5.4
MPD3404-18			18	457	25	635						15	6.8
HMPD3405-3	250	1112	3	76	10	254	12 VDC	28	2	50	12%	8	3.6
HMPD3405-6			6	152	13	330						10	4.5
HMPD3405-12			12	304	19	483						12	5.4
HMPD3405-18			18	457	25	635						15	6.8

SERIES
HMPD with limit switch
250 lbs (1112 N)



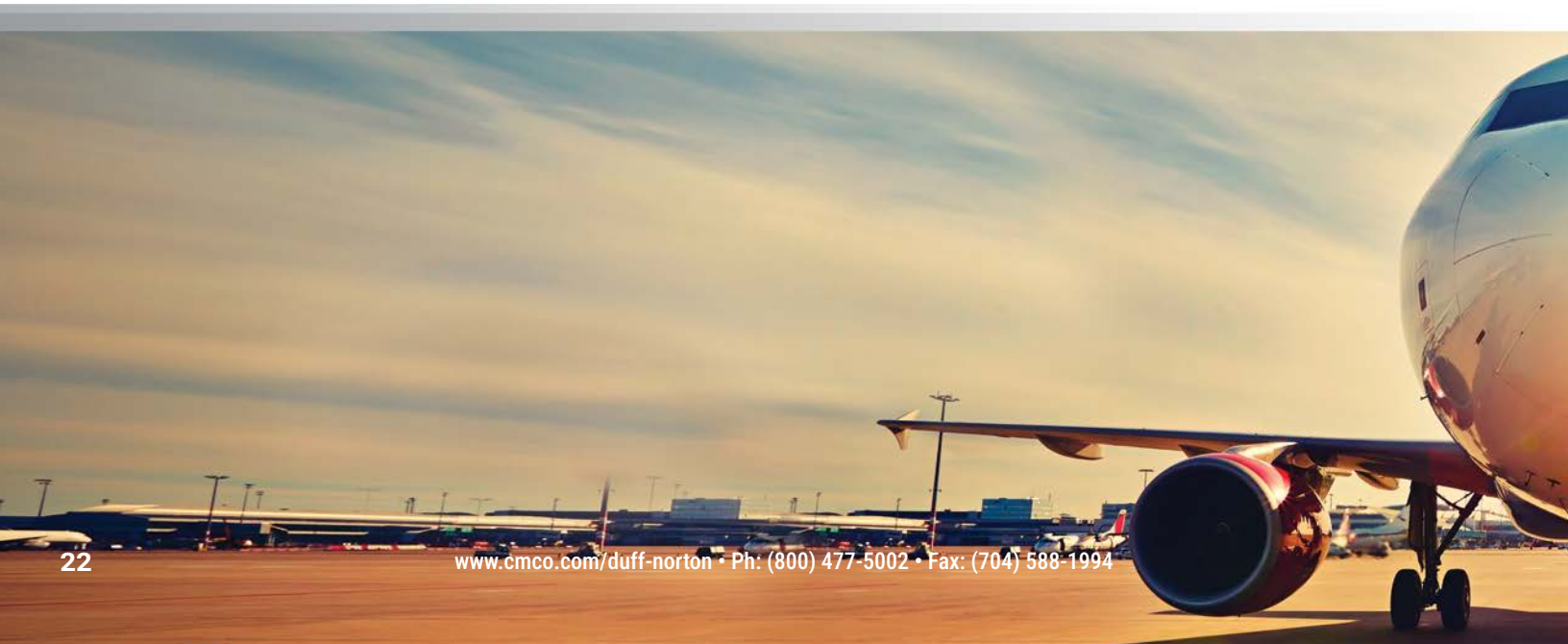
TUBE RESTRAINING TORQUE:	30 in-lbf (3.4 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

FEATURES & BENEFITS

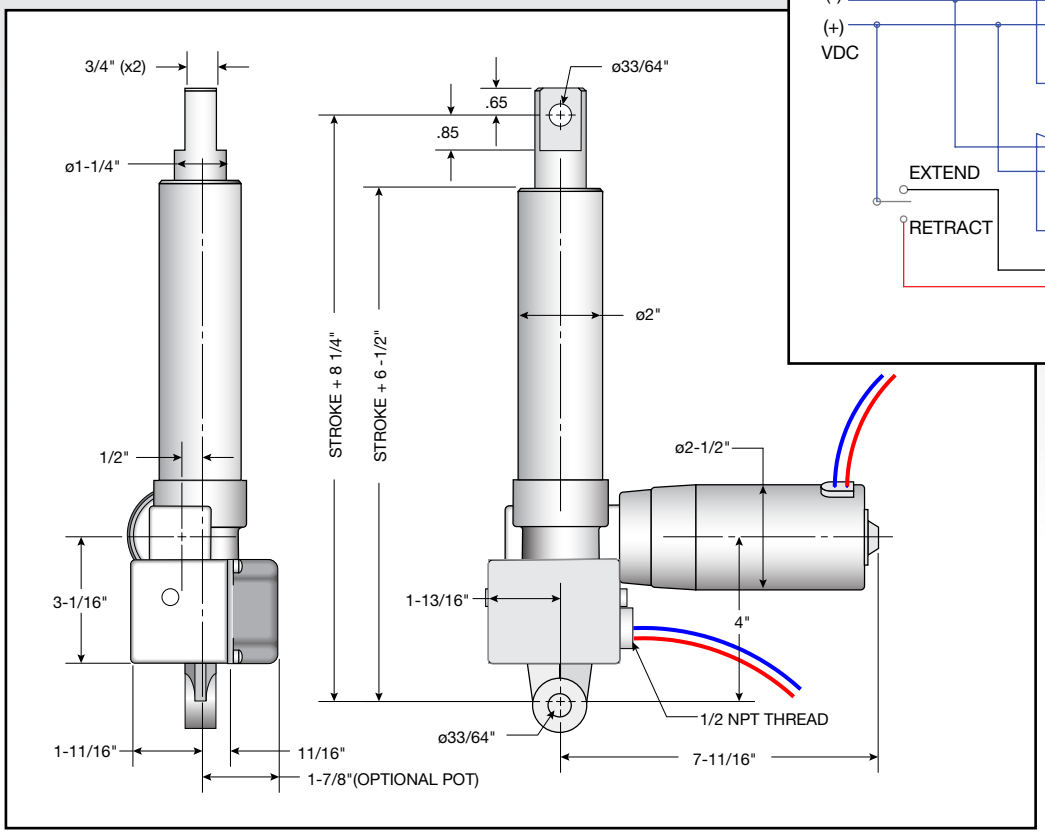
- Heavy duty design for long life in tough applications
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Spring brake
- Internal adjustable limit switches
- Automatic reset thermal overload motor protection

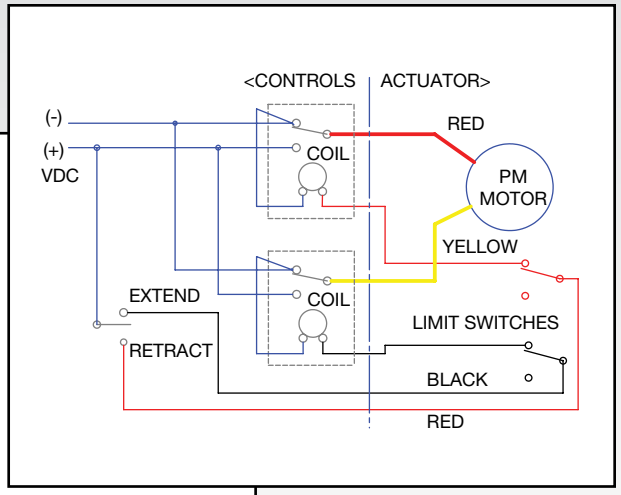
OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Bellows boot
- Potentiometer feedback (add “P” prefix)



DIMENSIONS



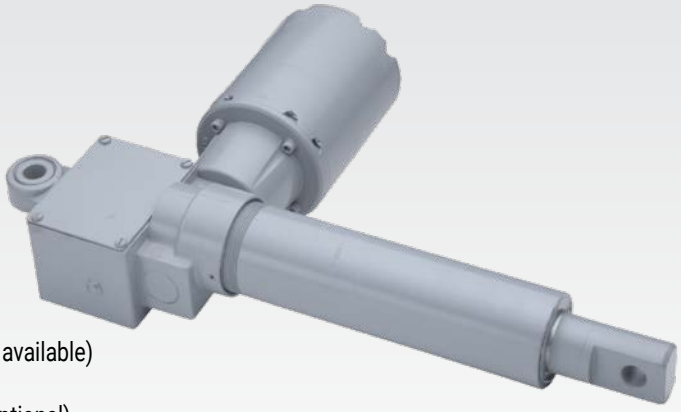


NOTE: (2) relays are required for DC limit switch models

PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
MPD3905-3	250	1112	3	76	11.25	285	12 VDC	14	1	25	Yes	35%	10	4.5
MPD3905-6			6	152	14.25	362							12	5.4
MPD3905-12			12	304	20.25	514							14	6.4
MPD3905-18			18	457	26.25	666							17	7.7
MPD3904-3	250	1112	3	76	11.25	285	24 VDC	6	1.2	30	Yes	26%	10	4.5
MPD3904-6			6	152	14.25	362							12	5.4
MPD3904-12			12	304	20.25	514							14	6.4
MPD3904-18			18	457	26.25	666							17	7.7
HMPD3905-3	250	1112	3	76	11.25	285	12 VDC	28	2	50	Yes	15%	10	4.5
HMPD3905-6			6	152	14.25	362							12	5.4
HMPD3905-12			12	304	20.25	514							14	6.4
HMPD3905-18			18	457	26.25	666							17	7.7

SERIES HMPB
250 lbs (1112 N)



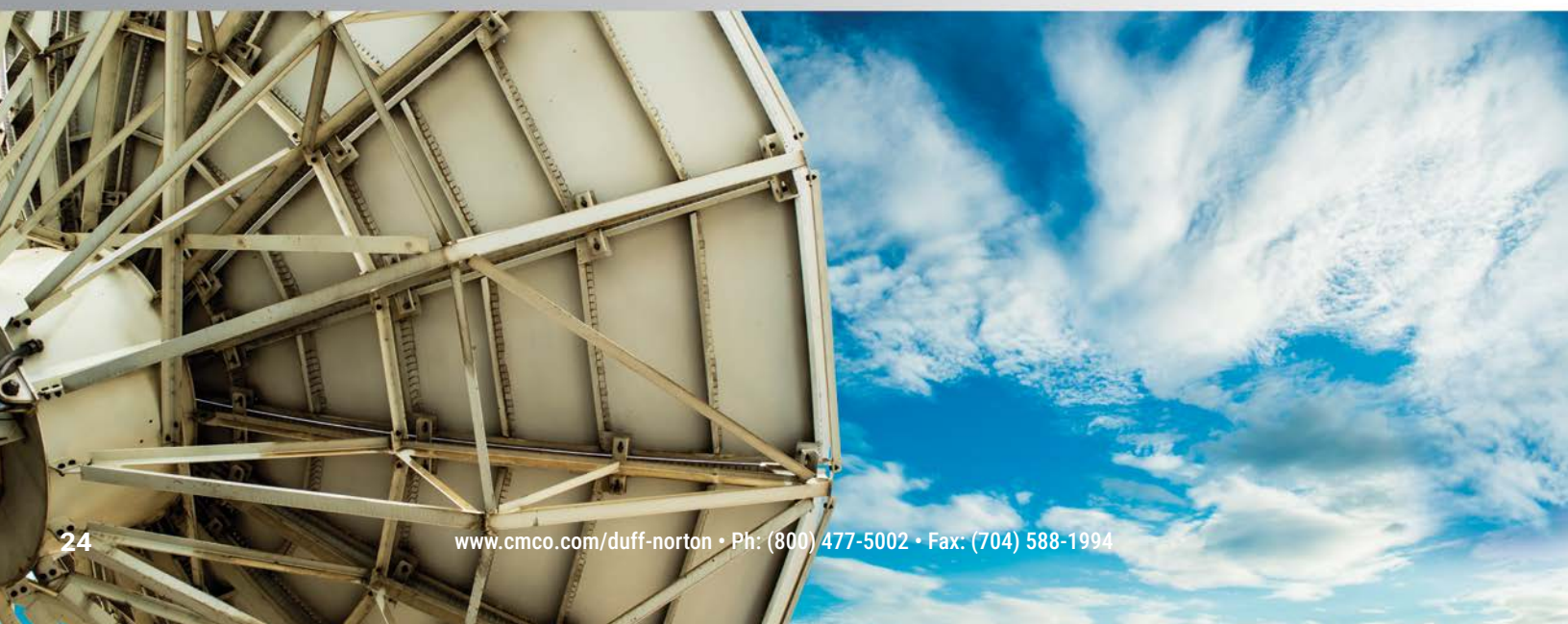
TUBE RESTRAINING TORQUE:	30 in-lbf (3.4 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

FEATURES & BENEFITS

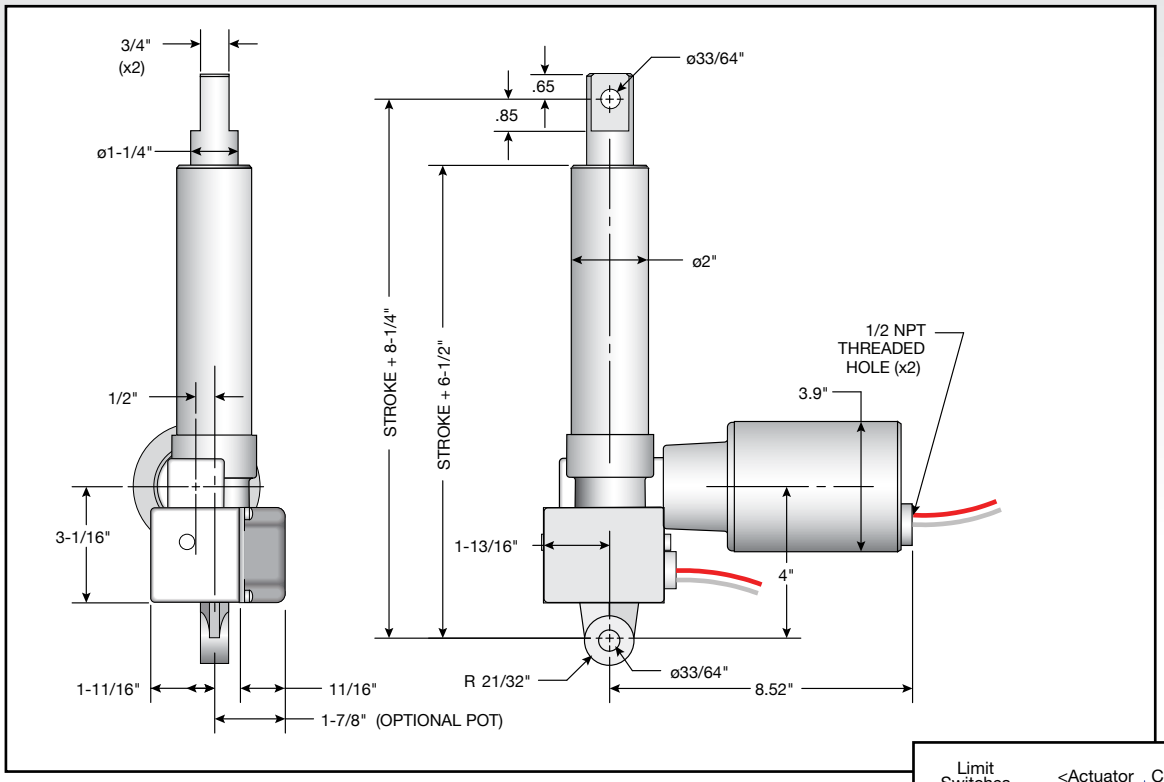
- Heavy duty design for long life in tough applications
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Bi-directional ball type brake
- Internal adjustable limit switches
- Automatic reset thermal overload motor protection

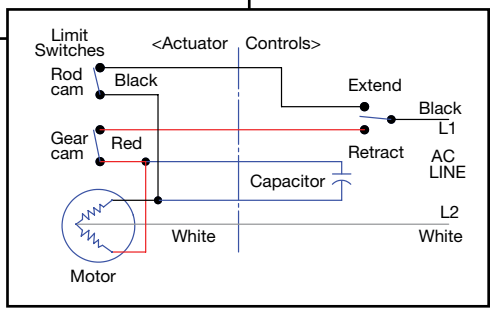
OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Potentiometer (add “P” prefix)
- Capacitor (see table on next page)
- Bellows boot



DIMENSIONS



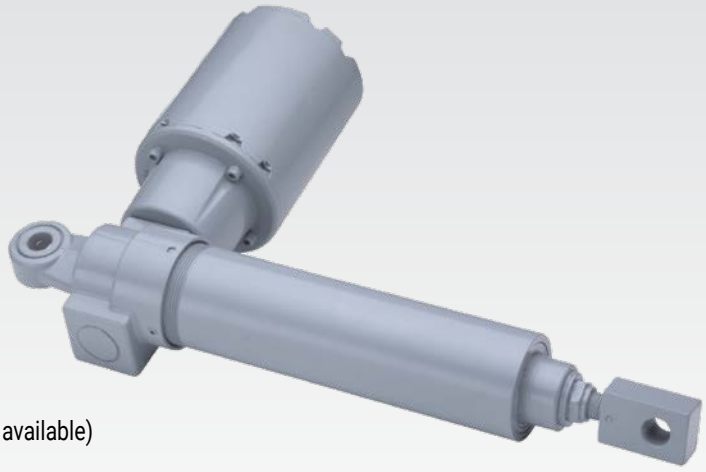


PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Potentio-meter	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
MPB3905-3	250	1112	3	76	11.25	285	115 VAC (60 Hz)	2	0.7	18	No	23%	11	5.0
MPB3905-6			6	152	14.25	362							13	5.9
MPB3905-12			12	304	20.25	514							16	7.3
MPB3905-18			18	457	26.25	666							18	8.2
MPB4905-3	250	1112	3	76	11.25	285	220 VAC (50 Hz)	1	0.6	15	No	21%	11	5.0
MPB4905-6			6	152	14.25	362							13	5.9
MPB4905-12			12	304	20.25	514							16	7.3
MPB4905-18			18	457	26.25	666							18	8.2
HMPB3905-3	250	1112	3	76	11.25	285	115 VAC (60 Hz)	5	1.4	35	No	11%	11	5.0
HMPB3905-6			6	152	14.25	362							13	5.9
HMPB3905-12			12	304	20.25	514							16	7.3
HMPB3905-18			18	457	26.25	666							18	8.2
PHMPB3905-3	250	1112	3	76	11.25	285	115 VAC (60 Hz)	5	1.4	35	Yes	10%	12	5.4
PHMPB3905-6			6	152	14.25	362							14	6.4
PHMPB3905-12			12	304	20.25	514							17	7.7
PHMPB3905-18			18	457	26.25	666							19	8.6

Note: A capacitor is required for all AC volt motors.

SERIES HSPB
250 lbs (1112 N)



TUBE RESTRAINING TORQUE:	30 in-lbf (3.4 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

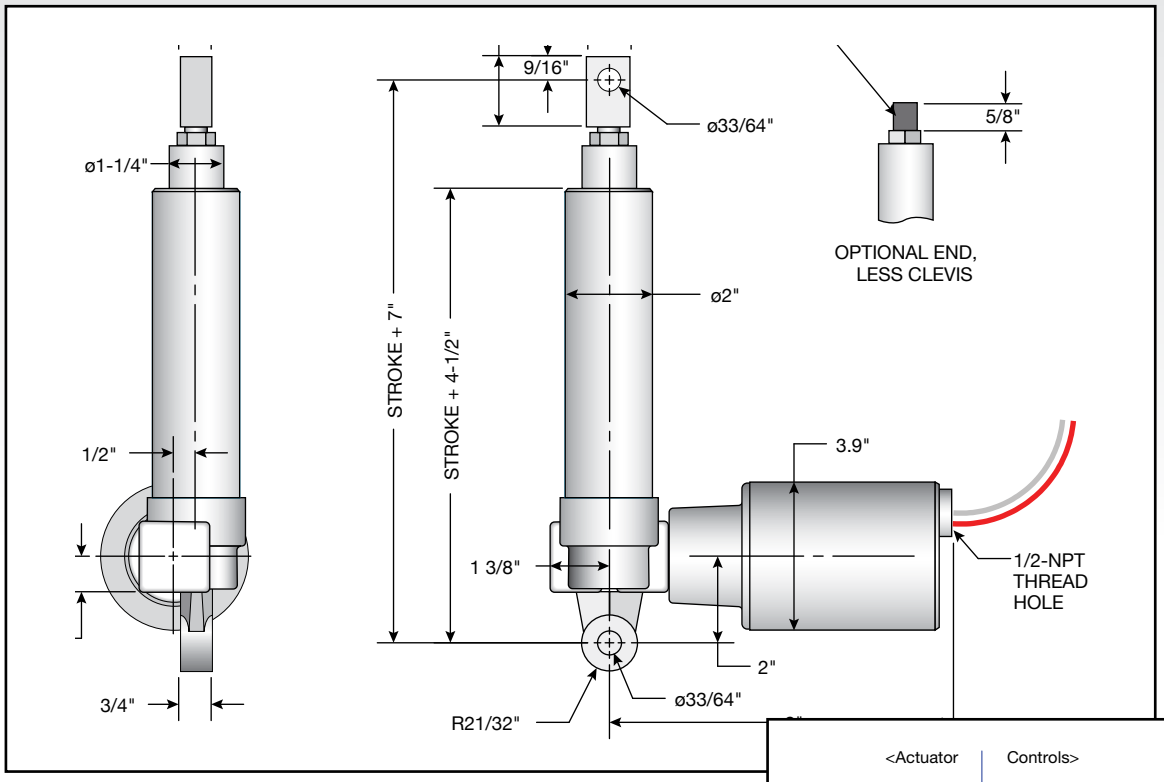
FEATURES & BENEFITS

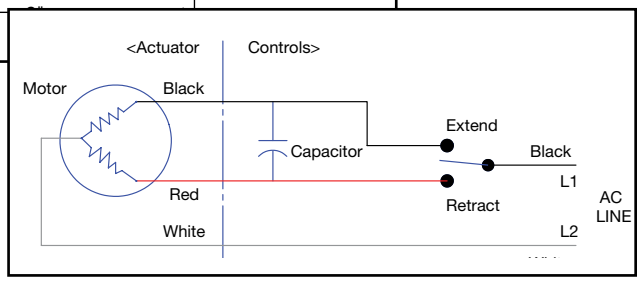
- Heavy duty design for long life in tough applications
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Bidirectional ball type brake
- Load limiting friction disc clutch
- Automatic reset thermal overload motor protection

OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Capacitor (see table on next page)
- Bellows boot
- Threaded end (add “T” prefix)

DIMENSIONS





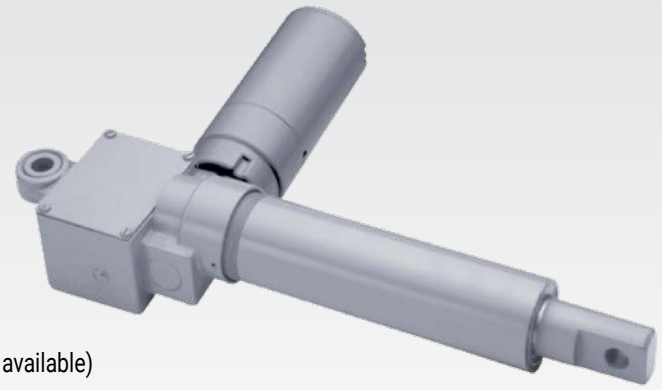
PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s		lbs	kg
SPB3405-3	250	1112	3	76	10	254	115 VAC (60 Hz)	1.9	0.7	18	24%	10	4.5
SPB3405-6			6	152	13	330						12	5.4
SPB3405-12			12	304	19	482						14	6.4
SPB3405-18			18	457	25	635						17	7.7
SPB4405-3	250	1112	3	76	10	254	220 VAC (50 Hz)	1	0.6	15	22%	10	4.5
SPB4405-6			6	152	13	330						12	5.4
SPB4405-12			12	304	19	482						14	6.4
SPB4405-18			18	457	25	635						17	7.7
HSPB3405-3	250	1112	3	76	10	254	115 VAC (60 Hz)	5.1	1.4	36	10%	10	4.5
HSPB3405-6			6	152	13	330						12	5.4
HSPB3405-12			12	304	19	482						14	6.4
HSPB3405-18			18	457	25	635						17	7.7

Note: A capacitor is required for all AC volt motors.

SERIES MPD

500 lbs (2224 N)



TUBE RESTRAINING TORQUE:	60 in-lbf (6.7 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

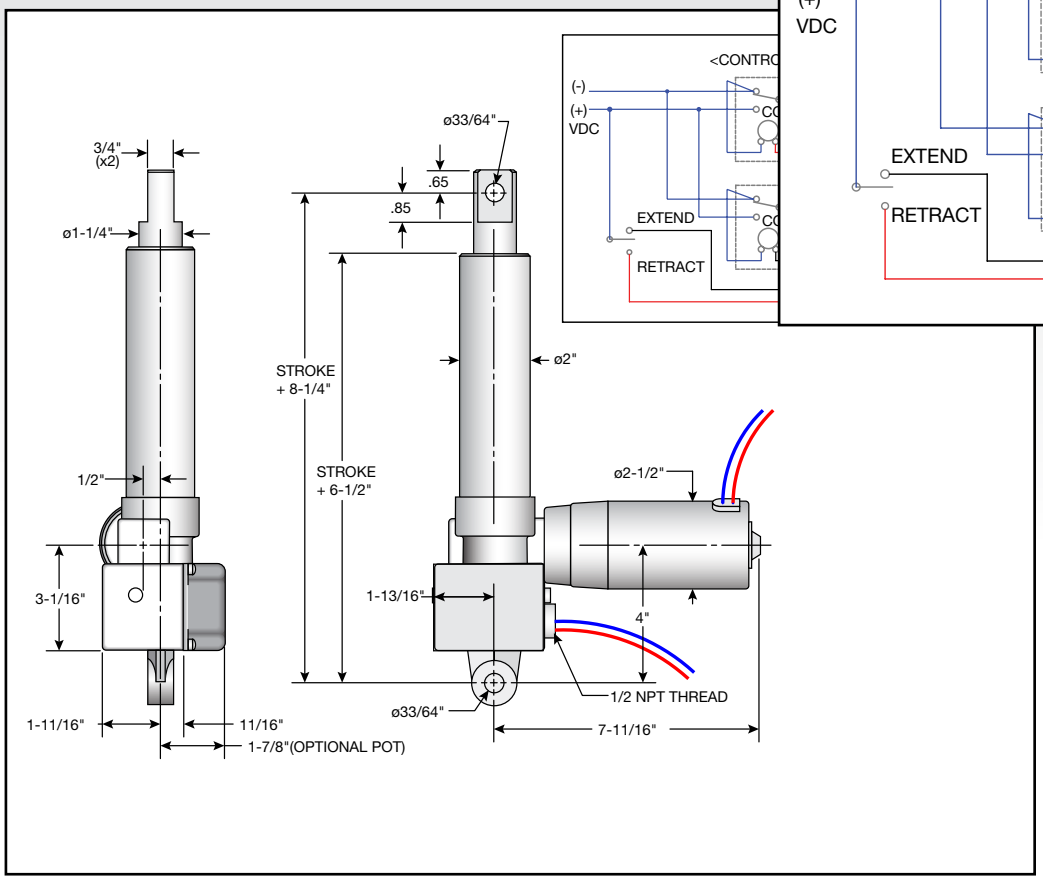
FEATURES & BENEFITS

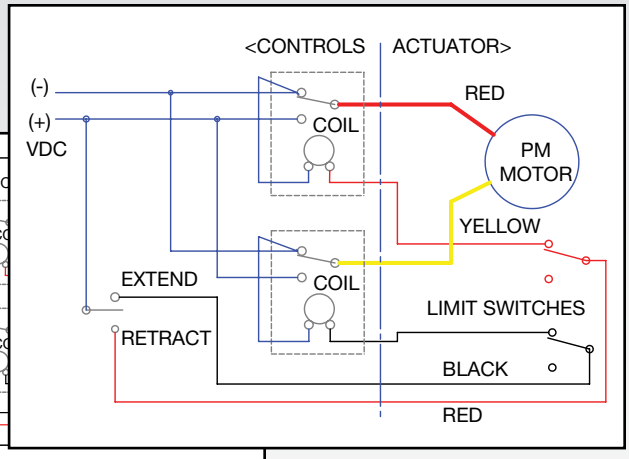
- Heavy duty design for long life in tough applications
- Patented spring brake
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Internal adjustable limit switches
- Automatic reset thermal overload motor protection

OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Potentiometer feedback (add “P” prefix)
- Bellows boot
- Threaded end (add “T” prefix)

DIMENSIONS



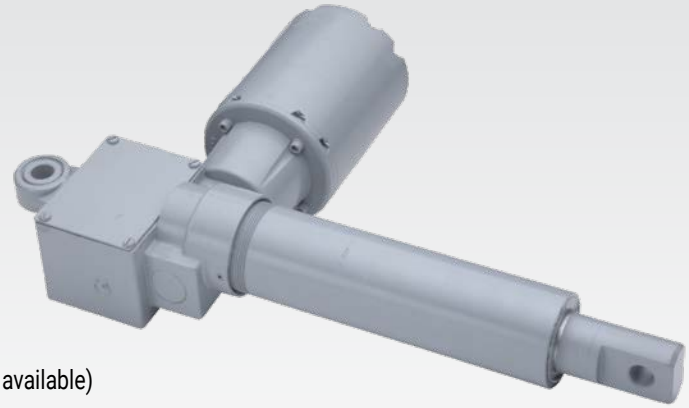


NOTE: (2) relays are required for DC models with limit switch

PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
MPD LINEAR ACTUATOR WITH LIMIT SWITCH														
MPD6905-3	500	2224	3	76	11.25	286	12 VDC	23	0.75	19	Yes	19%	13	5.9
MPD6905-6			6	152.4	14.25	362							15	6.8
MPD6905-12			12	304.8	20.25	514							18	8.2
MPD6905-18			18	457.2	26.25	667							20	9.1
MPD6904-3	500	2224	3	76	11.25	286	24 VDC	12	0.85	22	Yes	17%	13	5.9
MPD6904-6			6	152.4	14.25	362							15	6.8
MPD6904-12			12	304.8	20.25	514							18	8.2
MPD6904-18			18	457.2	26.25	667							20	9.1

SERIES HMPB
500 lbs (2224 N)



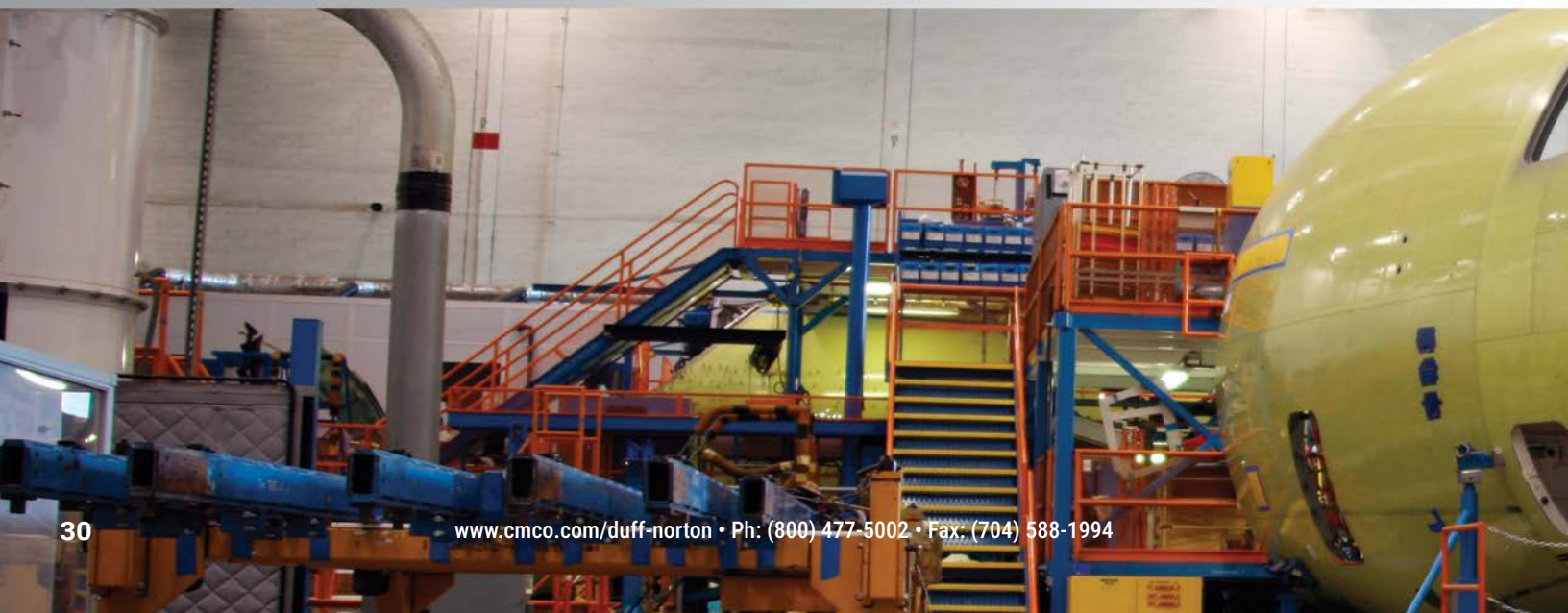
TUBE RESTRAINING TORQUE:	60 in-lbf (6.7 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

FEATURES & BENEFITS

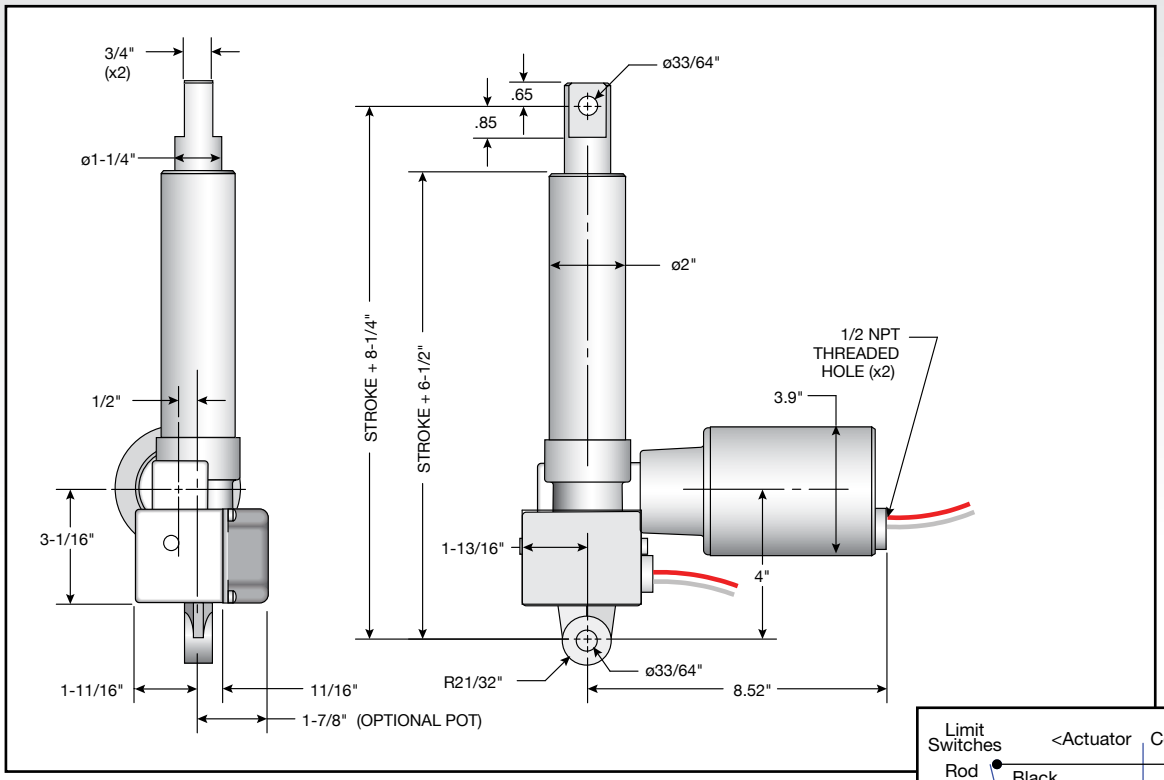
- Heavy duty design for long life in tough applications
- Patented spring brake
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Internal adjustable limit switches
- Automatic reset thermal overload motor protection

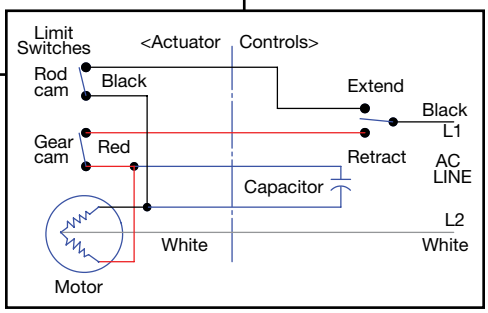
OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Potentiometer (add “P” prefix)
- Capacitor (see table on next page)
- Bellows boot
- Threaded end (add “T” prefix)



DIMENSIONS





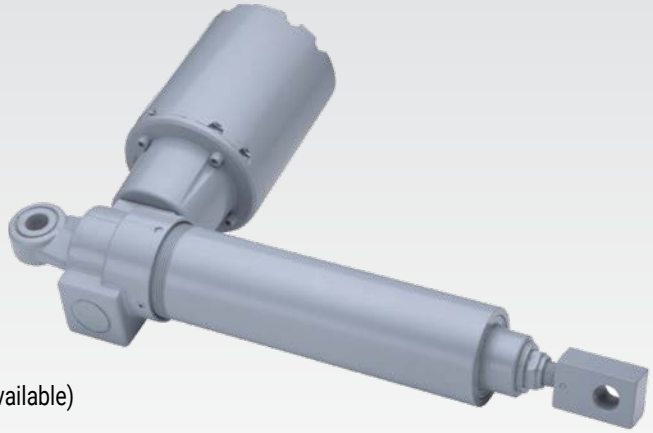
PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Potentio-meter	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s				lbs	kg
MPB6905-3	500	2224	3	76	11.25	286	115 VAC (60 Hz)	2.3	0.6	15	Yes	19%	No	11	5.0
MPB6905-6			6	152.4	14.25	362								13	5.9
MPB6905-12			12	304.8	20.25	514								16	7.3
MPB6905-18			18	457.2	26.25	667								18	8.2
MPB7905-3	500	2224	3	76	11.25	286	220 VAC (50 Hz)	1	0.6	15	Yes	22%	No	12	5.4
MPB7905-6			6	152.4	14.25	362								14	6.4
MPB7905-12			12	304.8	20.25	514								17	7.7
MPB7905-18			18	457.2	26.25	667								19	8.6
HMPB6905-3	500	2224	3	76	11.25	286	115 VAC (60 Hz)	5.5	1.33	34	Yes	11%	No	11	5.0
HMPB6905-6			6	152.4	14.25	362								13	5.9
HMPB6905-12			12	304.8	20.25	514								16	7.3
HMPB6905-18			18	457.2	26.25	667								18	8.2
PHMPB6905-3	500	2224	3	76	11.25	286	115 VAC (60 Hz)	5.5	1.33	34	Yes	11%	Yes	12	5.4
PHMPB6905-6			6	152.4	14.25	362								14	6.4
PHMPB6905-12			12	304.8	20.25	514								17	7.7
PHMPB6905-18			18	457.2	26.25	667								19	8.6

Note: A capacitor is required for all AC volt motors. Recommended part SK6405-7-1 (28-33 MFD) for MPB6905 Series, SK6405-7-10 (10 MFD) for MPB7905 Series and
SK6405-7-3 (64-72 MFD) for HMPB6905 Series

SERIES SPB

500 lbs (2224 N)



TUBE RESTRAINING TORQUE:	60 in-lbf (6.7 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard (IP52 optional)

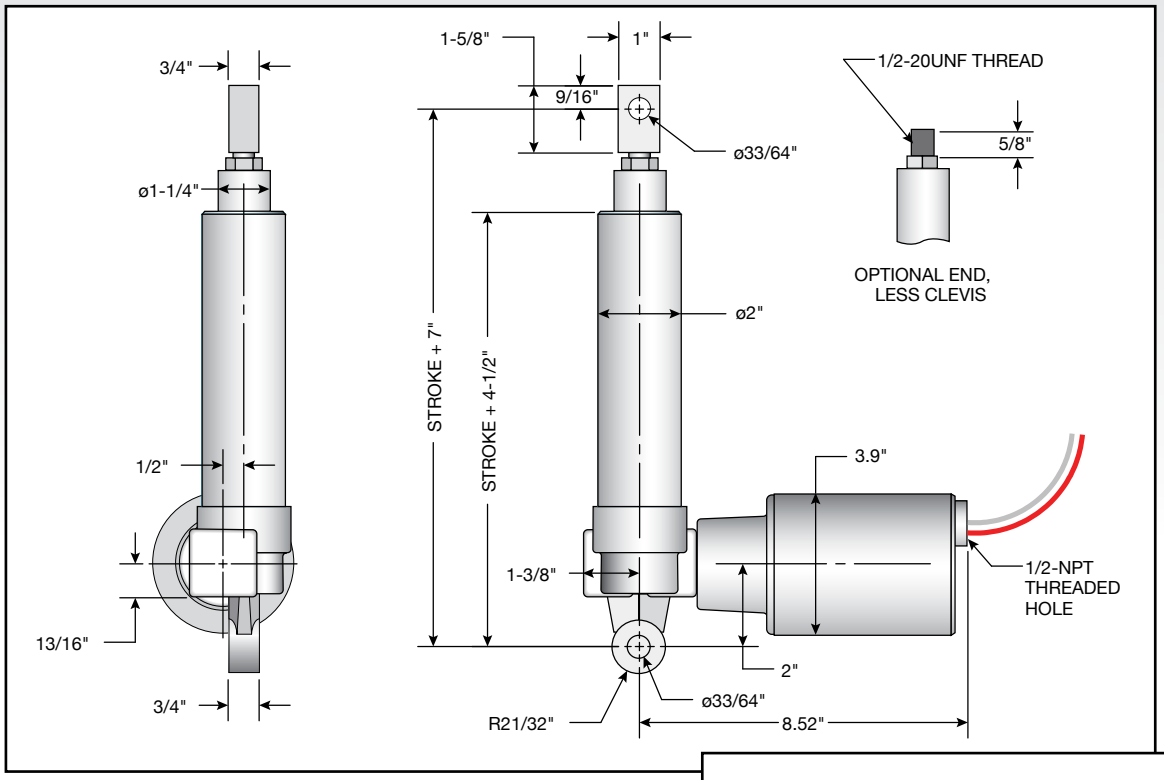
FEATURES & BENEFITS

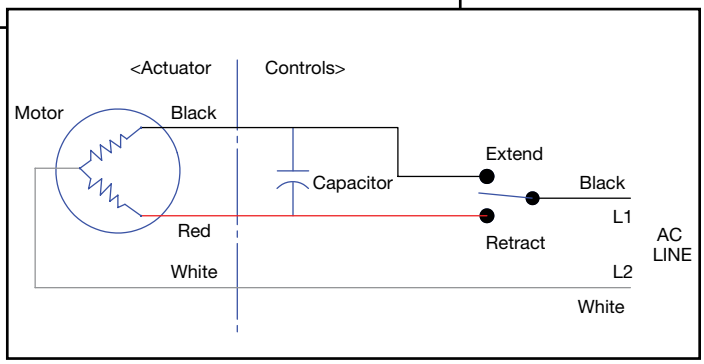
- Heavy duty design for long life in tough applications
- Patented spring brake
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Load limiting friction disc clutch
- Automatic reset thermal overload motor protection

OPTIONS

- Weather resistant sealant – IP52 (add “W” prefix)
- Capacitor (see table on next page
- Bellows boot
- Threaded end (add “T” prefix)

DIMENSIONS



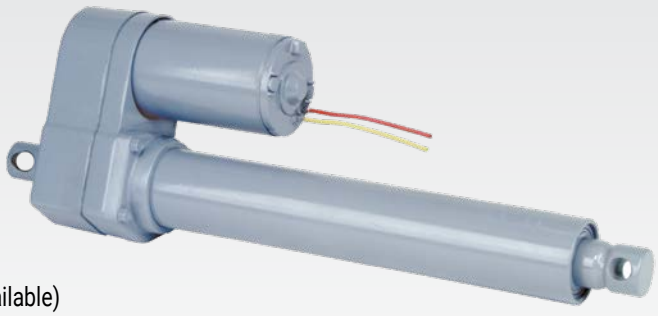


PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Clutch	High Speed Motor	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s				lbs	kg
SPB6405-3	500	2224	3	76	10	254	115 VAC (60 Hz)	2.1	0.58	15	Yes	No	23%	10	4.5
SPB6405-6			6	152.4	13	330								12	5.4
SPB6405-12			12	304.8	19	483								14	6.4
SPB6405-18			18	457.2	25	635								17	7.7
SPB7405-3	500	2224	3	76	10	254	220 VAC (50 Hz)	1	0.51	13	Yes	No	24%	10	4.5
SPB7405-6			6	152.4	13	330								12	5.4
SPB7405-12			12	304.8	19	483								14	6.4
SPB7405-18			18	457.2	25	635								17	7.7
HSPB6405-3	500	2224	3	76	10	254	115 VAC (60 Hz)	5.5	1.3	33	Yes	Yes	11%	10	4.5
HSPB6405-6			6	152.4	13	330								12	5.4
HSPB6405-12			12	304.8	19	483								14	6.4
HSPB6405-18			18	457.2	25	635								17	7.7

Note: A capacitor is required for all AC volt motors

SERIES TAC
500 lbs (2224 N)



TUBE RESTRAINING TORQUE:	40 in-lbf (4.5 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	25ºF to 120ºF (-4ºC to 50ºC) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard

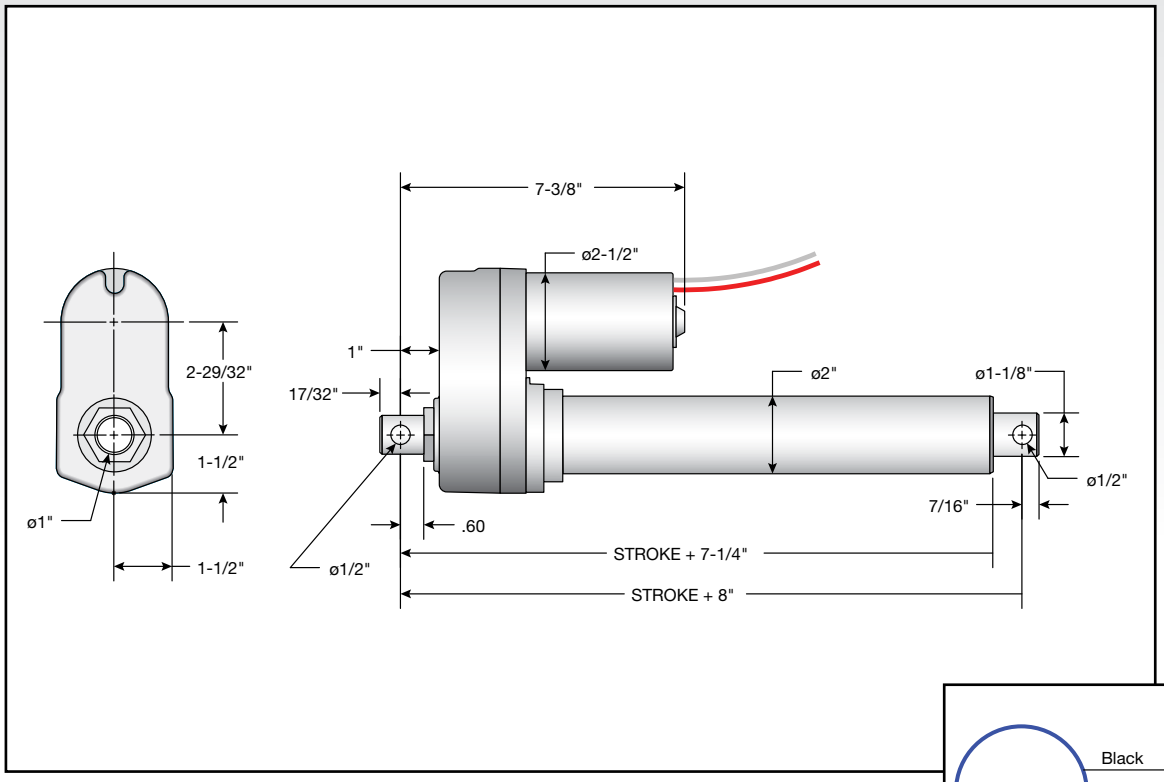
FEATURES & BENEFITS

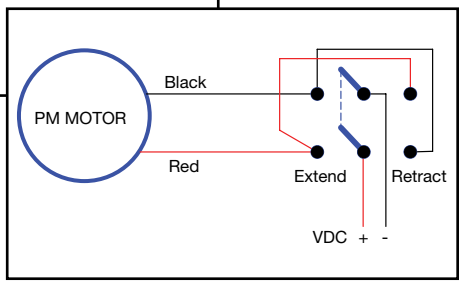
- Heavy duty design for long life in tough applications
- Aluminum housing and outer tube
- Stainless steel translating tube
- Double clevis mounting
- Load limiting ball detent clutch
- Automatic reset thermal overload motor protection

OPTIONS

- Bellows boot

DIMENSIONS





PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Clutch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s				lbs	kg
TAC05-1D20-4	500	2224	4	102	12	305	12 VDC	10	0.45	11	No	Yes	40%	15	6.8
TAC05-1D20-8			8	203	16	406								16	7.3
TAC05-1D20-12			12	305	20	508								17	7.7
TAC05-1D20-18			18	457	26	660								18	8.2
TAC05-2D20-4	500	2224	4	102	12	305	24 VDC	5	0.45	11	No	Yes	40%	15	6.8
TAC05-2D20-8			8	203	16	406								16	7.3
TAC05-2D20-12			12	305	20	508								17	7.7
TAC05-2D20-18			18	457	26	660								18	8.2

SERIES TAL
1000 lbs (2224 N)

TUBE RESTRAINING TORQUE:	80 in-lbf (9 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	-20°F to 120°F (-29°C to 50°C) (Special low temperature grease available)
ENVIRONMENT:	IP50 protection standard

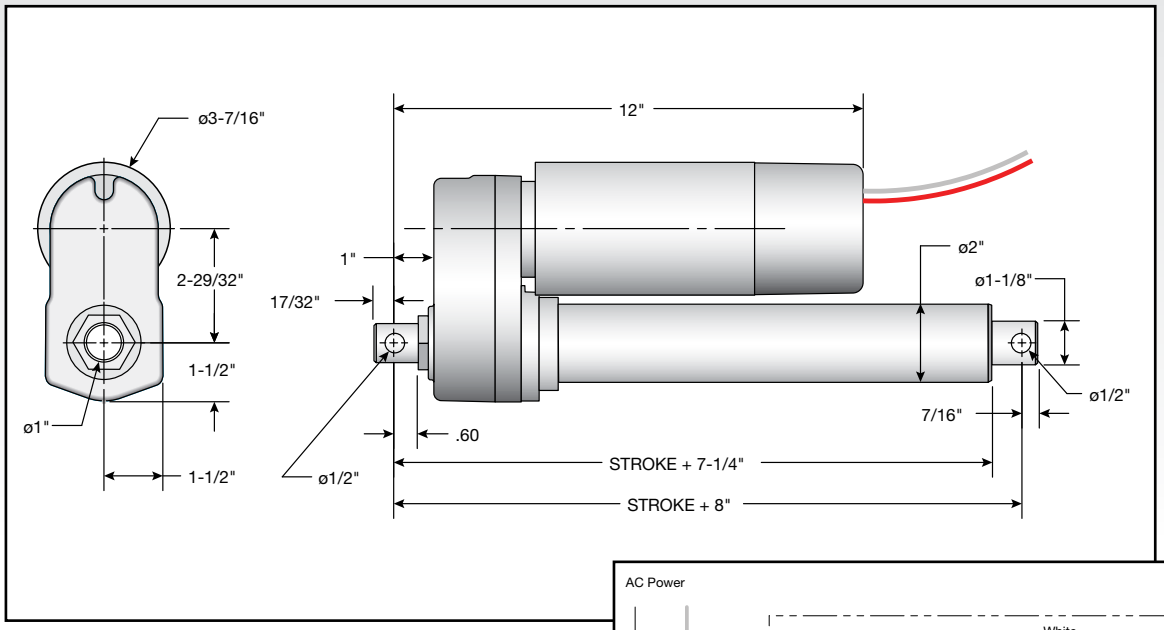
FEATURES & BENEFITS

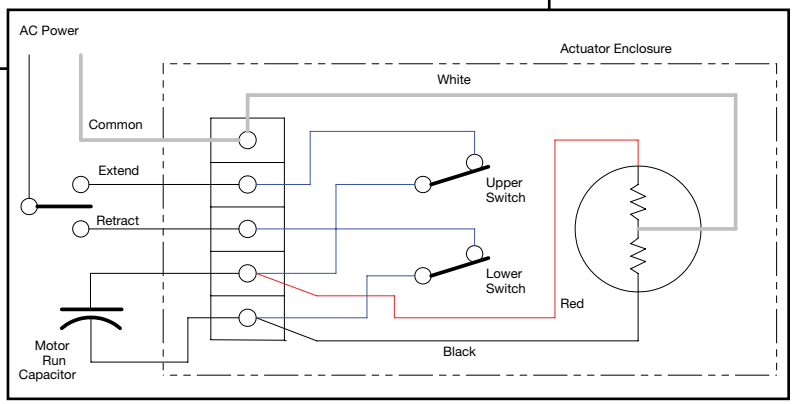
- Heavy duty design for long life in tough applications
- Adjustable limit switches on motor end save space
- Aluminum housing and outer tube
- Stainless steel translating tube
- Double clevis mounting
- Automatic reset thermal overload motor protection

OPTIONS

- Potentiometer feedback (replaces limit switches)
- Capacitor (see table on next page)
- Bellows boot

DIMENSIONS





PRODUCT INFORMATION

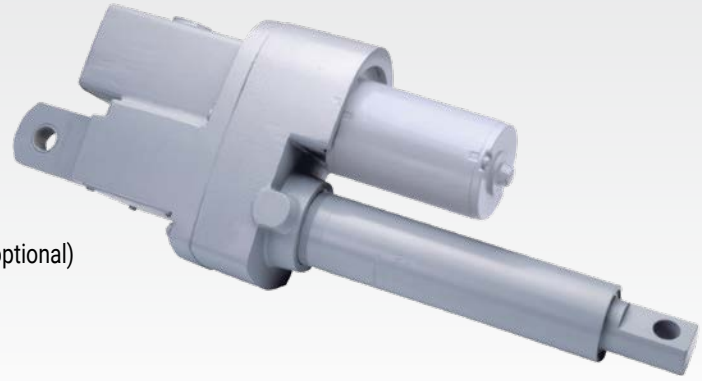
Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
TAL10-1A20-4	1000	4448	4	102	12	305	115 VAC (60 HZ)	4	0.43	10	Yes	17.5%	19	8.6
TAL10-1A20-8			8	203	16	406							21	9.5
TAL10-1A20-12			12	305	20	508							21	9.5
TAL10-1A20-18			18	407	24	610							22	10.0
TAL10-2A20-4	1000	4448	4	102	12	305	220 / 230 VAC (50 / 60 HZ)	2.0 / 2.5	0.45/ 0.37	11/ 9	Yes	17% (14%)	19	8.6
TAL10-2A20-8			8	203	16	406							21	9.5
TAL10-2A20-12			12	305	20	508							21	9.5
TAL10-2A20-18			18	407	24	610							22	10.0

Clutch models are available upon request
Note: A capacitor is required for all AC volt motors. Recommended part SK6405-7-15 (50 MFD) 115 VAC and SK6405-7-14 (15 MFD) 230 VAC

SERIES SPD

1500 lbs (6672 N)

TUBE RESTRAINING TORQUE:	215 in-lbf (24.2 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	15ºF to 120ºF (-10ºC to 50ºC)
ENVIRONMENT:	IP50 protection standard (IP52 optional)



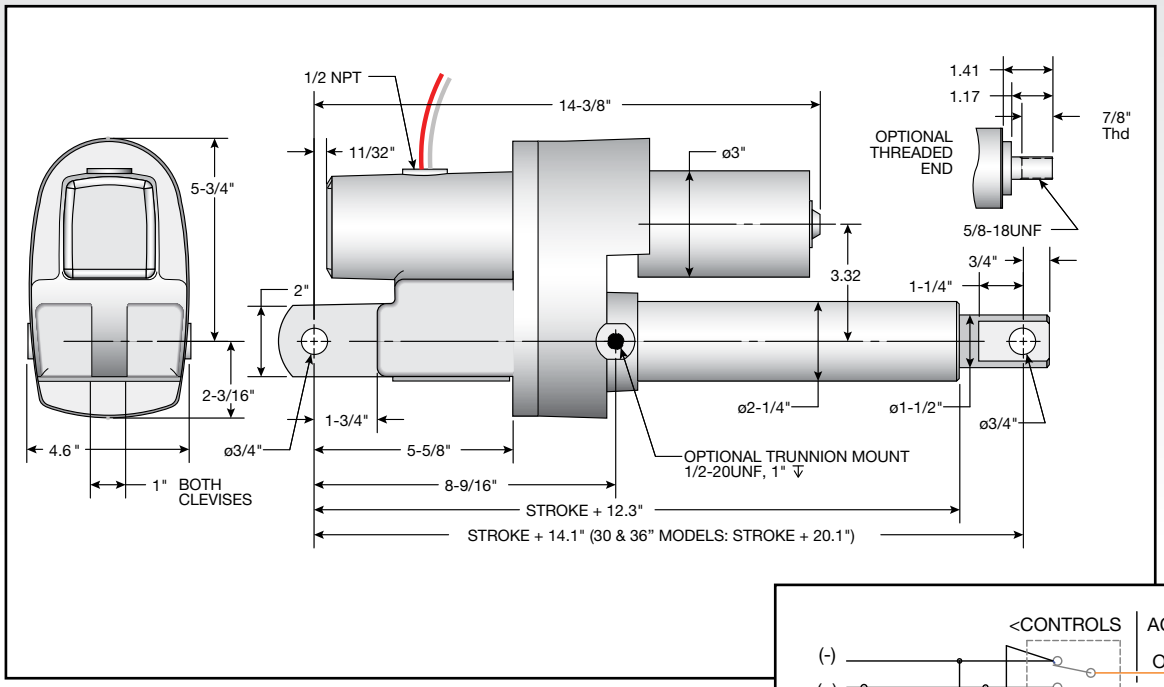
FEATURES & BENEFITS

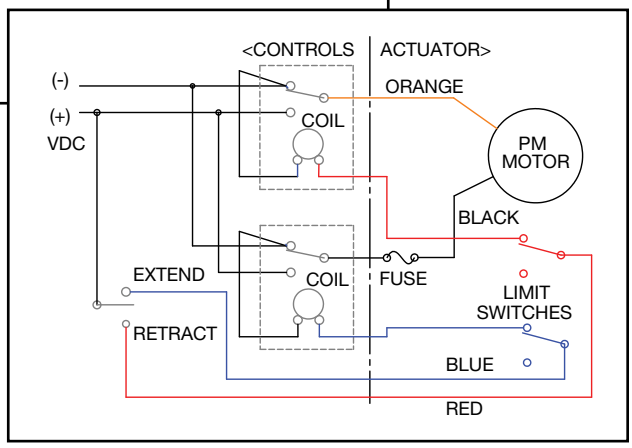
- Heavy duty design for long life in tough applications
- Bi-directional spring brake
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Internal adjustable limit switches (LSPD Series)

OPTIONS

- Potentiometer (add “P” prefix)
- Weather resistant sealant – IP52 (add “W” prefix)
- Bellows boot
- Trunnion mounting (add “R” prefix)
- Threaded end (add “T” prefix)

DIMENSIONS





Note: (2) relays are required for DC limit switch models

PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
LSPD6415-3	1500	6672	3	76	17.1	434	12 VDC	27	0.43	11	Yes	27%	29	13.2
LSPD6415-6			6	152	20.1	511							31	14.1
LSPD6415-12			12	305	26.1	663							33	15.0
LSPD6415-18			18	457	32.1	815							35	15.9
LSPD6415-24			24	610	38.1	968							37	16.8
LSPD6415-30			30	762	50.1	1273							39	17.7
LSPD6415-36			36	915	56.1	1425							39	17.7

Clutch models are available upon request

SERIES SPA

1500 lbs (6672 N)

TUBE RESTRAINING TORQUE:	215 in-lbf (24.2 Nm)
DESIGN:	Acme screw
TEMPERATURE RANGE:	15ºF to 120ºF (-10ºC to 50ºC)
ENVIRONMENT:	IP66 protection standard

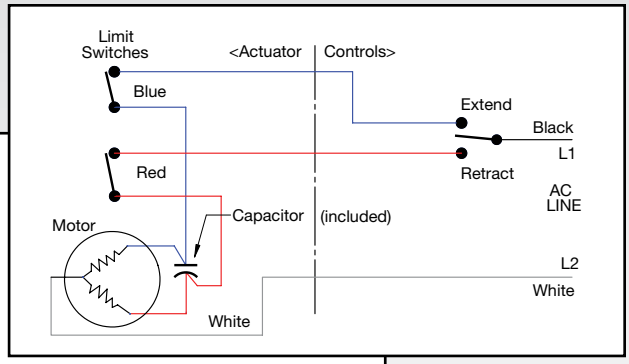
FEATURES & BENEFITS

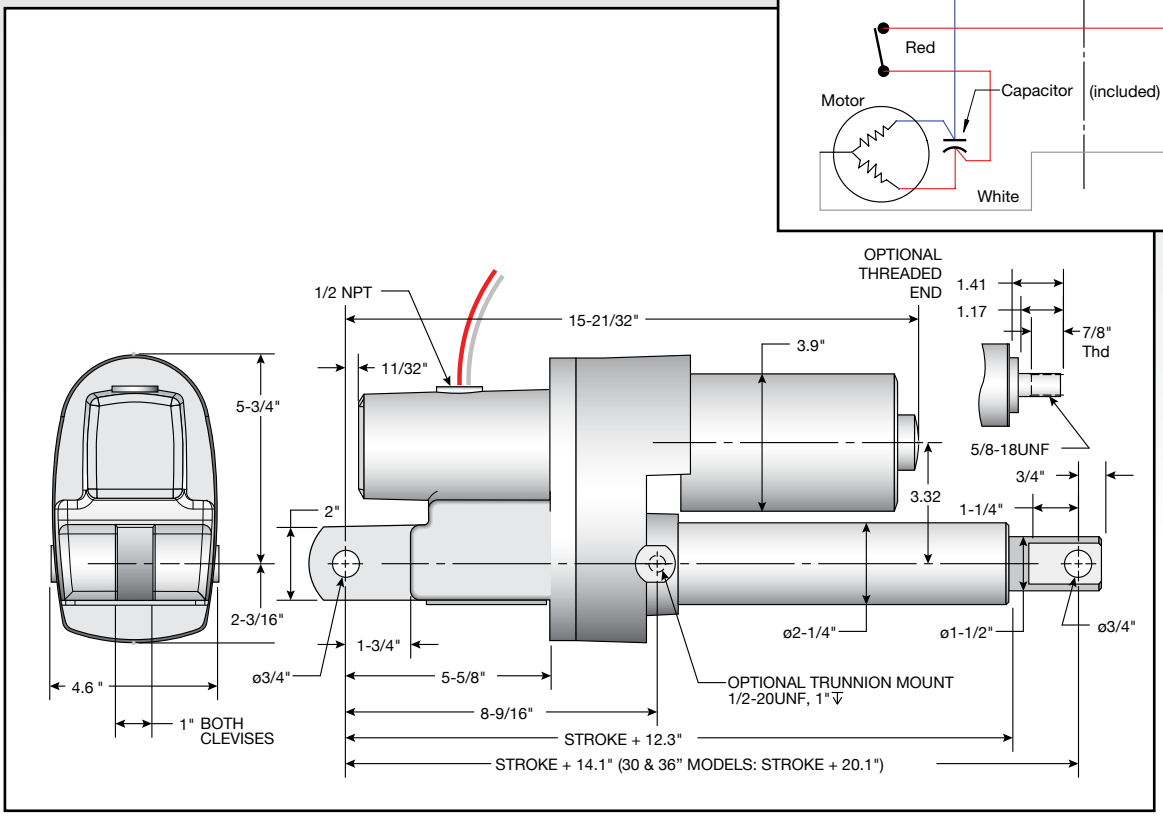
- Heavy duty design for long life in tough applications
- Built in capacitor included
- Bi-directional spring brake
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Internal adjustable limit switches
- Automatic reset thermal overload motor protection

OPTIONS

- Potentiometer (add “P” prefix)
- Bellows boot
- Trunnion mounting (add “R” prefix)
- Threaded end (add “T” prefix)

DIMENSIONS





PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Potentio-meter	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s				lbs	kg
SPA6415-3	1500	6672	3	76	17.1	434.3	115 VAC (60 Hz)	6.5	0.83	21	Yes	No	17%	31	14.1
SPA6415-6			6	152	20.1	510.5								33	15.0
SPA6415-12			12	305	26.1	662.9								35	15.9
SPA6415-18			18	457	32.1	815.3								37	16.8
SPA6415-24			24	610	38.1	967.7								39	17.7
SPA6415-30			30	762	50.1	1273								41	18.6
SPA6415-36			36	915	56.1	1425								41	18.6
PSPA6415-3	1500	6672	3	76	17.1	434.3	115 VAC (60 Hz)	6.5	0.83	21	Yes	Yes	17%	31	14.1
PSPA6415-6			6	152	20.1	510.5								33	15.0
PSPA6415-12			12	305	26.1	662.9								35	15.9
PSPA6415-18			18	457	32.1	815.3								37	16.8
PSPA6415-24			24	610	38.1	967.7								39	17.7
PSPA6415-30*			30	762	50.1	1273					No			41	18.6
PSPA6415-36*			36	915	56.1	1425								41	18.6
SPA7415-3	1500	6672	3	76	17.1	434.3	220 VAC (50 Hz)	2	0.68	17	Yes	No	25%	31	14.1
SPA7415-6			6	152	20.1	510.5								33	15.0
SPA7415-12			12	305	26.1	662.9								35	15.9
SPA7415-18			18	457	32.1	815.3								37	16.8
SPA7415-24			24	610	38.1	967.7								39	17.7
SPA7415-30			30	762	50.1	1273								41	18.6
SPA7415-36			36	915	56.1	1425								41	18.6
PSPA7415-3	1500	6672	3	76	17.1	434.3	220 VAC (50 Hz)	2	0.68	17	Yes	Yes	25%	31	14.1
PSPA7415-6			6	152	20.1	510.5								33	15.0
PSPA7415-12			12	305	26.1	662.9								35	15.9
PSPA7415-18			18	457	32.1	815.3								37	16.8
PSPA7415-24			24	610	38.1	967.7								39	17.7
PSPA7415-30*			30	762	50.1	1273					No			41	18.6
PSPA7415-36*			36	915	56.1	1425								41	18.6

Note: SPA models are supplied complete with capacitor unless otherwise specified
*30" and 36" models only: if potentiometer option is selected, unit will not include limit switches

SERIES SPA

2000 lbs (6672 N)

TUBE RESTRAINING TORQUE:	180 in-lbf (20.3 Nm)
DESIGN:	Ball screw
TEMPERATURE RANGE:	15ºF to 120ºF (-10ºC to 50ºC)
ENVIRONMENT:	IP66 protection standard

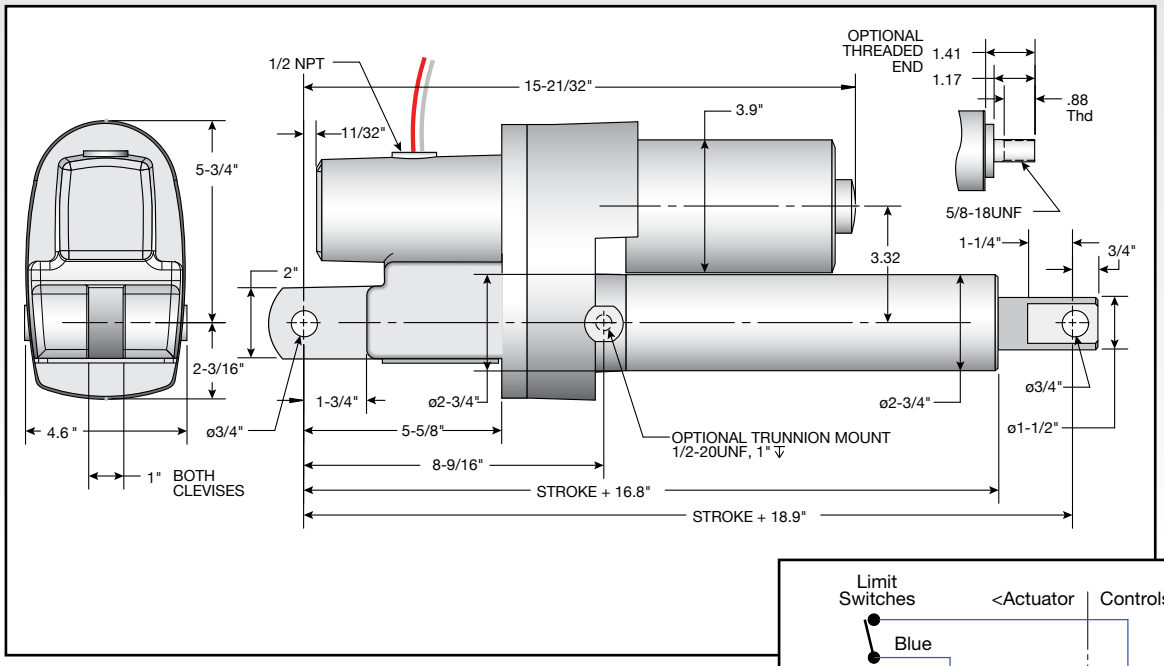
FEATURES & BENEFITS

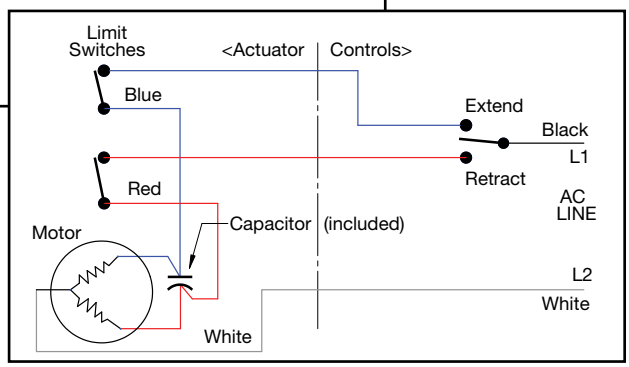
- Heavy duty design for long life in tough applications
- Built in capacitor included
- Automatic set spring brake
- Aluminum housing and outer tube
- Steel translating tube – zinc chromate plated
- Double clevis mounting
- Internal adjustable limit switches

OPTIONS

- Bellows boot
- Trunnion mounting (add “R” prefix)
- Potentiometer feedback
- Threaded end (add “T” prefix)

DIMENSIONS





PRODUCT INFORMATION

Part Number	Rated Load		Stroke Length		Retracted Length		Voltage	Current Draw at Rated Load (A)	Speed at Rated Load		Limit Switch	Duty Cycle at Rated Load	Shipping Weight	
	lbs	N	in	mm	in	mm			in/s	mm/s			lbs	kg
SPA6420-3	2000	8896	3	76	21.9	556	115 VAC (60 Hz)	5.1	0.86	22	Yes	18%	31	14.1
SPA6420-6			6	152	24.9	632							33	15.0
SPA6420-12			12	305	30.9	785							35	15.9
SPA6420-18			18	457	36.9	937							37	16.8
SPA6420-24			24	610	42.9	1090							39	17.7
PSPA6420-3	2000	8896	3	76	21.9	556	115 VAC (60 Hz)	5.1	0.86	22	Yes	18%	31	14.1
PSPA6420-6			6	152	24.9	632							33	15.0
PSPA6420-12			12	305	30.9	785							35	15.9
PSPA6420-18			18	457	36.9	937							37	16.8
PSPA6420-24			24	610	42.9	1090							39	17.7
SPA7420-3	2000	8896	3	76	21.9	556	220 VAC (50 Hz)	2	0.68	17	Yes	25%	31	14.1
SPA7420-6			6	152	24.9	632							33	15.0
SPA7420-12			12	305	30.9	785							35	15.9
SPA7420-18			18	457	36.9	937							37	16.8
SPA7420-24			24	610	42.9	1090							39	17.7

Contact factory for potentiometer models
Note: SPA models are supplied complete with capacitor unless otherwise specified

SERIES
CMLA A
500 lbs (2200 N)

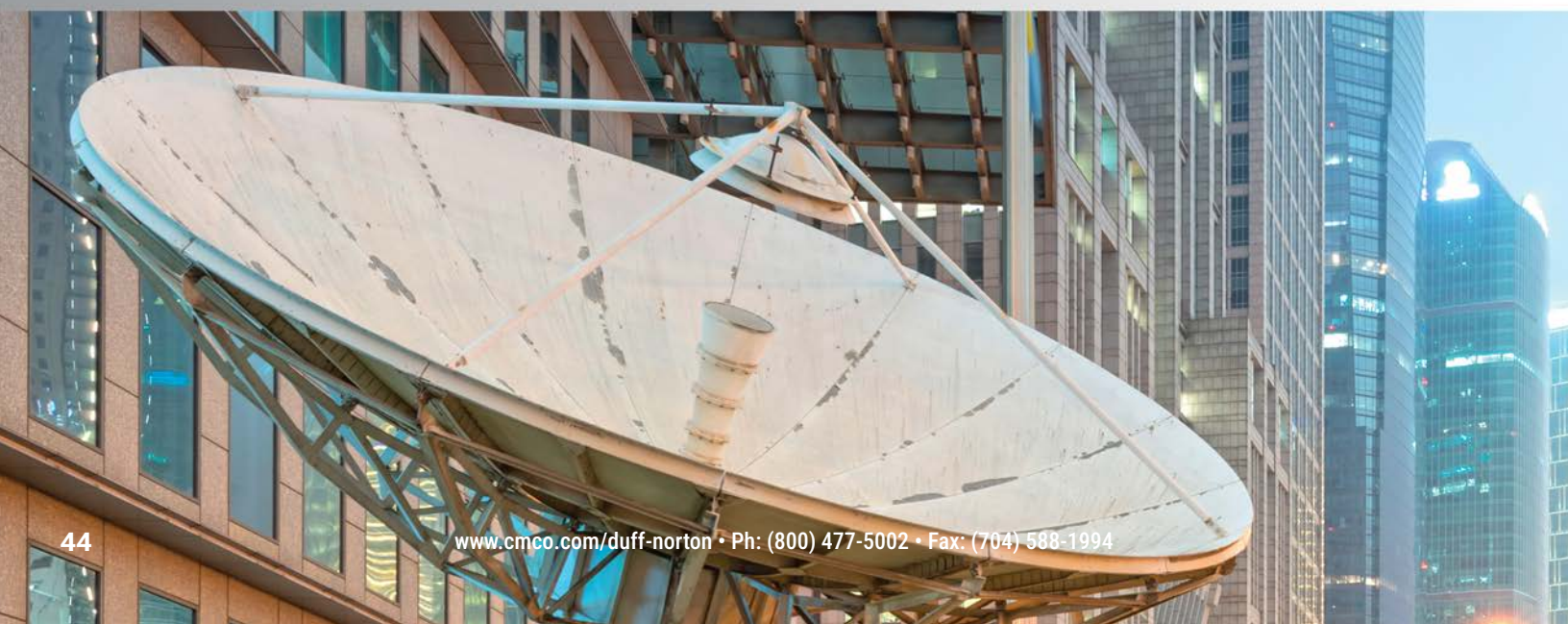
DESIGN:	Ball screw or trapezoidal screw
TEMPERATURE RANGE:	-4°F to 150°F (-20°C to 65°C)
ENVIRONMENT:	IP66 protection standard

FEATURES & BENEFITS

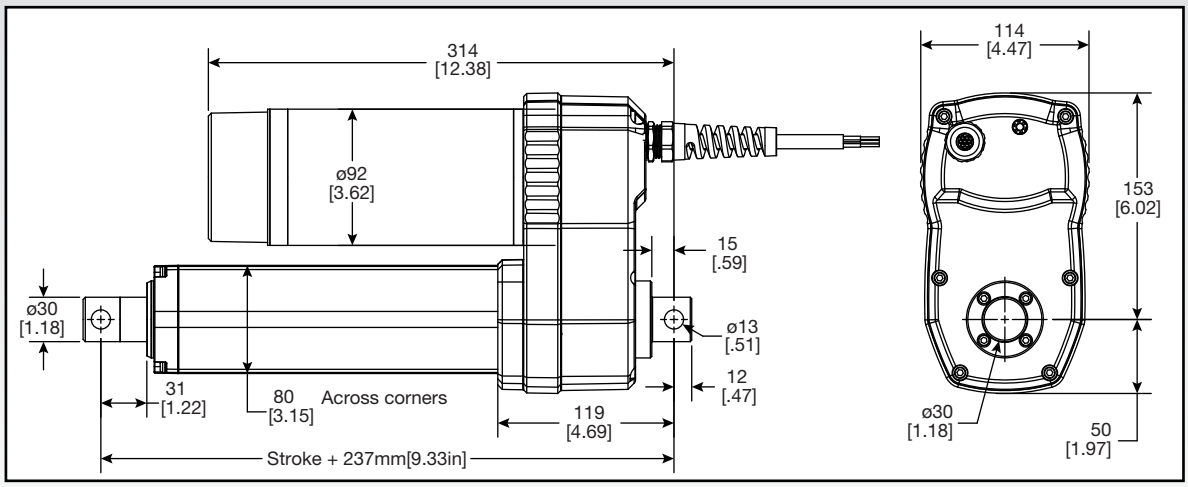
- Tensile and compressive dynamic loads up to 500 lbs (2200 N)
- Lifting speeds up to 38 mm/sec (90 in/min) at rated load
- Standard stroke lengths: 100 mm (3.9 in), 150 mm (5.9 in), 300 mm (11.8 in), 450 mm (17.7 in), 600 mm (23.6 in)
- Safety clutch standard

OPTIONS

- Ball screw or trapezoidal screw
- 115 VAC or 230 VAC motors
- Electric brake - standard on ball screw models
- Potentiometer feedback
- Adjustable limit switches



DIMENSIONS



Wire diagram for PCB option
Note: Wiring to change for models that don't end in PCB. Contact Duff-Norton for more information.

PRODUCT INFORMATION

CMLA A					
Motor Type		AC	AC	AC	AC
Maximum Dynamic Load	N (lbs)	2200 (500)	2200 (500)	2200 (500)	2200 (500)
Maximum Static Load	N (lbs)	3336 (750)	3336 (750)	3336 (750)	3336 (750)
Screw Type		Trapezoid	Trapezoid	Ball	Ball
Gear Ratio		11.5	11.5	6.5	6.5
Motor Power	Volts	115	230	115	230
Amperage	Amps	2.3	1.4	2.4	1.5
Lifting Speed	mm/s (in/s)	18.0 (0.71)	18.0 (0.71)	38.1 (1.5)	38.1 (1.5)
Duty Cycle	m/hr (in/hr)	20.6 (810)	20.6 (810)	30.5 (1200)	30.5 (1200)
Capacitor Rating	mfd	35	10	35	10
Capacitor Model #		SK6405-7-13	SK6405-7-10	SK6405-7-13	SK6405-7-10
Shipping Weight	21 lb (9.5 kg) + 1.3 lb (0.6 kg) per 50 mm of travel				

Note: 1. The correct capacitor mfd should be used for each model or the cylinder will not perform as rated. Capacitor ordered separately.
2. Order Hard Start Kit 192036494 for applications where high starting torque is required (low temperature, high starting load)

ORDERING INFORMATION

Models

A	T	R	1	1	5	C	-				-				-				-	

CMLA 2,200 N: Trapazoid Screw:
11.5:1 Ratio: Standard Clutch

A	K	U	0	6	5	C	-				-				-				-	

CMLA 2,200 N: Ball Screw:
6.5:1 Ratio: Standard Clutch

Motor					
115 VAC/1 PH/60 Hz			1	1	5
230 VAC/1 PH/60 Hz			2	3	0
Brake					B
No Brake					X
Stroke mm (in)					
100 mm (3.9 in)	1	0	0		
150 mm (5.9 in)	1	5	0		
300 mm (11.8 in)	3	0	0		
450 mm (17.7 in)	4	5	0		
600 mm (23.6 in)	6	0	0		
Other Features/Options					
POT - Potentiometer Only - 5K potentiometer signal to customer controls; not valid with brake option; use PCX with brake.	P	O	T		
CBO - Brake Rectifier Only - With internal rectifier for brake.	C	B	O		
PCB - Printed Circuit Board - For internal adjustable limit switches and brake control.	P	C	B		
XXX - No Potentiometer/No Brake - Not valid with brake option; use CBO with brake.	X	X	X		
PCX - Potentiometer Feedback and Brake Rectifier - 5K potentiometer signal to customer controls & internal rectifier for brake.	P	C	X		
Cable Length (Note: PCB option only available with standard 0.76m Cord Length)					
0.76 m (30 in) Standard					(Leave Blank)
1 m (39 in)					1
2 m (79 in)					2
3 m (118 in)					3
5 m (197 in)					5

SERIES
CMLA B
1000 lbs (4500 N)

DESIGN:	Ball screw or trapezoidal screw
TEMPERATURE RANGE:	-4ºF to 150ºF (-20ºC to 65ºC)
ENVIRONMENT:	IP66 protection standard

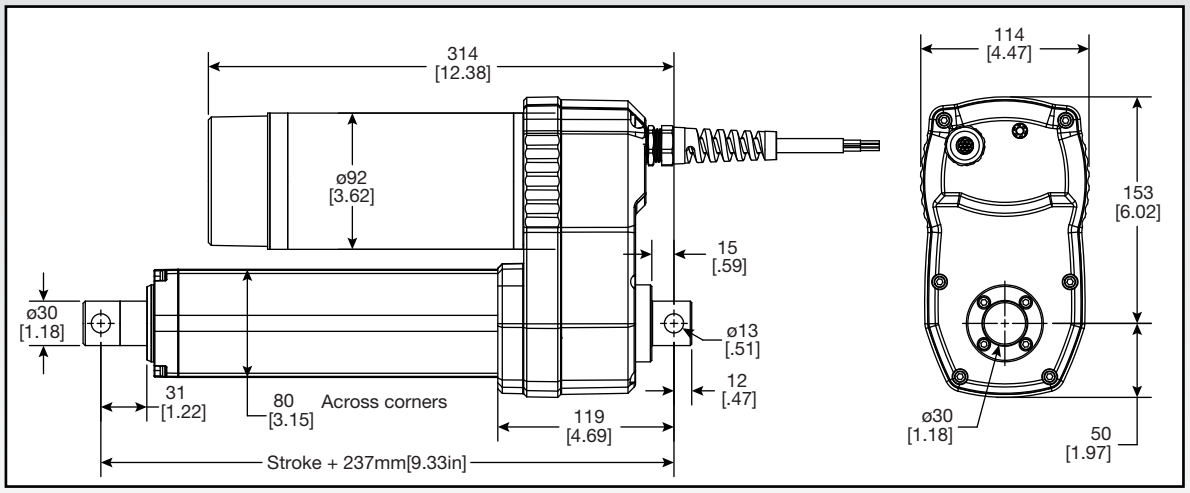
FEATURES & BENEFITS

- Tensile and compressive dynamic loads up to 1000 lbs (4500 N)
- Lifting speeds up to 28 mm/sec (67 in/min) at rated load
- Standard stroke lengths: 100 mm (3.9 in), 150 mm (5.9 in), 300 mm (11.8 in), 450 mm (17.7 in), 600 mm (23.6 in)
- Safety clutch standard (not available on quad speed 2.1:1 ratio)

OPTIONS

- Ball screw or trapezoidal screw
- 115 VAC or 230 VAC motors
- Electric brake - standard on ball screw models
- Potentiometer feedback
- Adjustable limit switches

DIMENSIONS



Wire diagram for PCB option
Note: Wiring to change for models that don't end in PCB. Contact Duff-Norton for more information.

PRODUCT INFORMATION

CMLA B							
Motor Type		AC	AC	AC	AC	AC	AC
Maximum Dynamic Load	N (lbs)	4500 (1000)	4500 (1000)	4500 (1000)	4500 (1000)	1112 (250)§	1112 (250)§
Maximum Static Load	N (lbs)	6672 (1500)	6672 (1500)	6672 (1500)	6672 (1500)	6672 (1500)	6672 (1500)
Screw Type		Trapezoid	Trapezoid	Ball	Ball	Ball	Ball
Gear Ratio		14.2	14.2	8.1	8.1	2.1	2.1
Motor Power	Volts	115	230	115	230	115	230
Amperage	Amps	7	3.4	7	3.4	7	3.4
Lifting Speed	mm/s (in/s)	14.2 (0.56)	14.2 (0.56)	28.5 (1.12)	28.5 (1.12)	109.2 (4.3)	109.2 (4.3)
Duty Cycle	m/hr (in/hr)	9.1 (360)	9.1 (360)	15.2 (600)	15.2 (600)	58.5 (2300)	58.5 (2300)
Capacitor Rating	mfd	50	12.5	50	12.5	50	12.5
Capacitor Model #		SK6405-7-15	192002120	SK6405-7-15	192002120	SK6405-7-15	192002120
Shipping Weight		22 lb (10 kg) + 1.3 lb (0.6 kg) per 50 mm of travel					

§Quad Speed - Lower ratio reduces rated load to 250 lbs. No clutch
Note: 1. The correct capacitor mfd should be used for each model or the cylinder will not perform as rated.
2. Order Hard Start Kit 192036494 for applications where high starting torque is required (low temperature, high starting load)

ORDERING INFORMATION

Models

	B	T	R	1	4	2	C	-					-				-				-	

CMLA 4,500 N: Trapazoid Screw: 14.2:1 Ratio: Standard Clutch

	B	K	U	8	0	7	C	-					-				-				-	

CMLA 4,500 N: Ball Screw: 8.07:1 Ratio: Standard Clutch

§	B	K	U	0	2	1	X	-					-				-				-	

CMLA 1,112 N: Ball Screw: 2.1:1 Ratio: No Clutch

	B	K	U	0	2	1	X	-					-				-				-	

Motor																				
115 VAC/1 PH/60 Hz										1	1	5								
230 VAC/1 PH/60 Hz										2	3	0								
Brake													B							
No Brake													X							
Stroke mm (in)																				
100 mm (3.9 in)														1	0	0				
150 mm (5.9 in)														1	5	0				
300 mm (11.8 in)														3	0	0				
450 mm (17.7 in)														4	5	0				
600 mm (23.6 in)														6	0	0				
Other Features/Options																				
POT - Potentiometer Only - 5K potentiometer signal to customer controls; not valid with brake option; use PCX with brake.																	P	O	T	
CBO - Brake Rectifier Only - With internal rectifier for brake.																	C	B	O	
PCB - Printed Circuit Board - For internal adjustable limit switches and brake control.																	P	C	B	
XXX - No Potentiometer/No Brake - Not valid with brake option; use CBO with brake.																	X	X	X	
PCX - Potentiometer Feedback and Brake Rectifier - 5K potentiometer signal to customer controls & internal rectifier for brake.																	P	C	X	
Cable Length (Note: PCB option only available with standard 0.76m Cord Length)																				
0.76 m (30 in) Standard																				(Leave Blank)
1 m (39 in)																				1
2 m (79 in)																				2
3 m (118 in)																				3
5 m (197 in)																				5

§ Quad Speed - Lower ratio reduces rate load to 250lbs no clutch

SERIES
CMLA C
1500 lbs (6700 N)

DESIGN:	Ball screw or trapezoidal screw
TEMPERATURE RANGE:	-4ºF to 150ºF (-20ºC to 65ºC)
ENVIRONMENT:	IP66 protection standard

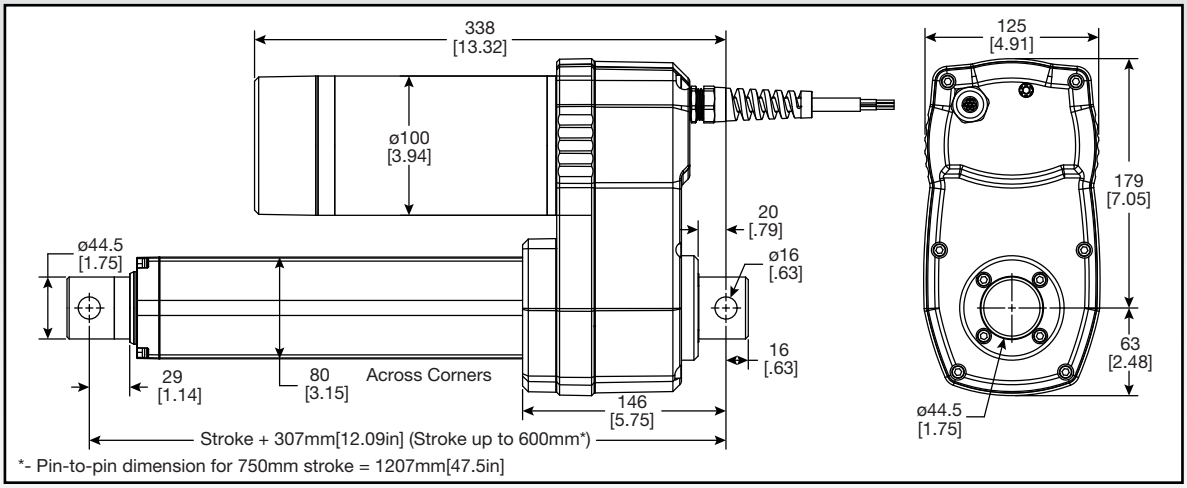
FEATURES & BENEFITS

- Tensile and compressive dynamic loads up to 1500 lbs (6700 N)
- Lifting speeds up to 36 mm/sec (87 in/min) at rated load
- Standard stroke lengths: 100 mm (3.9 in), 150 mm (5.9 in), 300 mm (11.8 in), 450 mm (17.7 in), 600 mm (23.6 in), 750 mm (29.5 in)
- Safety clutch standard

OPTIONS

- Ball screw or trapezoidal screw
- 115 VAC or 230 VAC motors
- Electric brake - standard on ball screw models
- Potentiometer feedback
- Adjustable limit switches

DIMENSIONS



*- Pin-to-pin dimension for 750mm stroke = 1207mm[47.5in]

Wire diagram for PCB option
Note: Wiring to change for models that don't end in PCB. Contact Duff-Norton for more information.

PRODUCT INFORMATION

CMLA C							
Motor Type		AC	AC	AC	AC	AC	AC
Maximum Dynamic Load	N (lbs)	6700 (1500)	6700 (1500)	6700 (1500)	6700 (1500)	3336 (750)§	3336 (750)§
Maximum Static Load	N (lbs)	10,008 (2250)	10,008 (2250)	10,008 (2250)	10,008 (2250)	10,008 (2250)	10,008 (2250)
Screw Type		Trapezoid	Trapezoid	Ball	Ball	Ball	Ball
Gear Ratio		17.2	17.2	14.0	14.0	6.9	6.9
Motor Power	Volts	115	230	115	230	115	230
Amperage	Amps	8	4	8.3	4.4	8.3	4.4
Lifting Speed	mm/s (in/s)	18.8 (0.74)	18.8 (0.74)	36.8 (1.45)	36.8 (1.45)	73.7 (2.9)	73.7 (2.9)
Duty Cycle	m/hr (in/hr)	12.7 (500)	12.7 (500)	22.9 (900)	22.9 (900)	45.8 (1800)	45.8 (1800)
Capacitor Rating	mfd	90	25	90	25	90	25
Capacitor Model #		192002122	192002121	192002122	192002121	192002122	192002121
Shipping Weight		24 lb (10.9 kg) + 1.3 lb (0.6 kg) per 50 mm of travel					

§ Double Speed - Lower ratio reduces rated load to 750 lbs.

Note: 1. The correct capacitor mfd should be used for each model or the cylinder will not perform as rated.
2. Order Hard Start Kit 192036494 for applications where high starting torque is required (low temperature, high starting load)

ORDERING INFORMATION

Models

C T R 1 7 2 C - [ ][ ][ ][ ] - [ ][ ][ ] - [ ][ ][ ] - [ ]
CMLA 6,700 N: Trapazoid Screw: 17.2:1 Ratio: Standard Clutch

C K U 1 4 0 C - [ ][ ][ ][ ] - [ ][ ][ ] - [ ][ ][ ] - [ ]
CMLA 6,700 N: Ball Screw: 13.5:1 Ratio: Standard Clutch

§ C K U 0 6 9 C - [ ][ ][ ][ ] - [ ][ ][ ] - [ ][ ][ ] - [ ]
CMLA 3,336 N: Ball Screw: 6.9:1 Ratio: Standard Clutch

Motor	
115 VAC/1 PH/60 Hz	1 1 5
230 VAC/1 PH/60 Hz	2 3 0
Brake	
Brake	B
No Brake	X
Stroke mm (in)	
100 mm (3.9 in)	1 0 0
150 mm (5.9 in)	1 5 0
300 mm (11.8 in)	3 0 0
450 mm (17.7 in)	4 5 0
600 mm (23.6 in)	6 0 0
750 mm (29.5 in)	7 5 0
Other Features/Options	
POT - Potentiometer Only - 5K potentiometer signal to customer controls; not valid with brake option; use PCX with brake.	P O T
CBO - Brake Rectifier Only - With internal rectifier for brake.	C B O
PCB - Printed Circuit Board - For internal adjustable limit switches and brake control.	P C B
XXX - No Potentiometer/No Brake - Not valid with brake option; use CBO with brake.	X X X
PCX - Potentiometer Feedback and Brake Rectifier - 5K potentiometer signal to customer controls & internal rectifier for brake.	P C X
Cable Length (Note: PCB option only available with standard 0.76m Cord Length)	
0.76 m (30 in) Standard	(Leave Blank)
1 m (39 in)	1
2 m (79 in)	2
3 m (118 in)	3
5 m (197 in)	5

§ Double Speed - Lower ratio reduces rate load to 750lbs

SERIES
CMLA D
2000 lbs (8900 N)

DESIGN:	Ball screw
TEMPERATURE RANGE:	-4ºF to 150ºF (-20ºC to 65ºC)
ENVIRONMENT:	IP66 protection standard

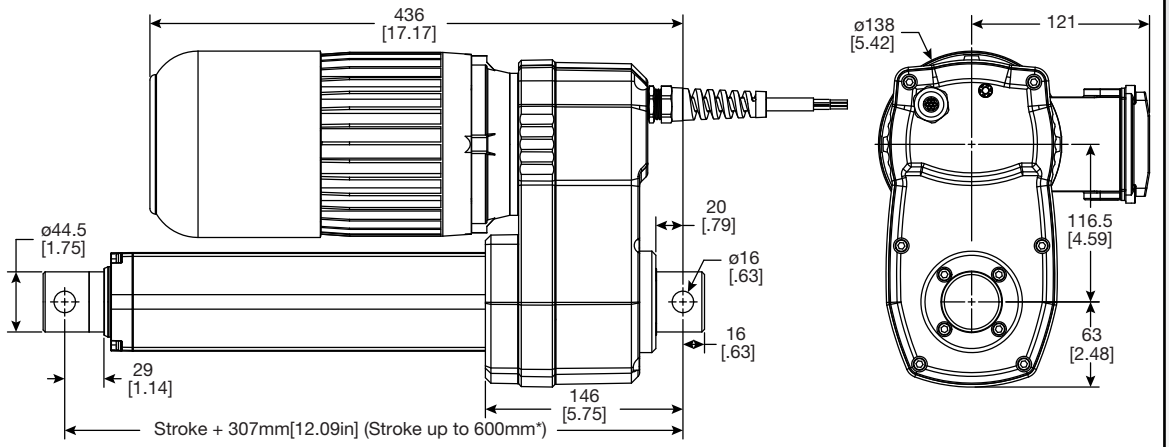
FEATURES & BENEFITS

- Tensile and compressive dynamic loads up to 2000 lbs (8900 N)
- Lifting speeds up to 50 mm/sec (120 in/min) at rated load
- Standard stroke lengths: 100 mm (3.9 in), 150 mm (5.9 in), 300 mm (11.8 in), 450 mm (17.7 in), 600 mm (23.6 in), 750 mm (29.5 in)
- Safety clutch standard
- Standard 230/460 3-phase motor
- 3-phase AC brake standard

OPTIONS

- Potentiometer feedback

DIMENSIONS



Motor wire diagram for PCB option
Note: Wiring to change for models that don't end in PCB. Contact Duff-Norton for more information.

PRODUCT INFORMATION

CMLA D				
Motor Type		AC	AC	AC
Maximum Dynamic Load	N (lbs)	8900 (2000)	4500 (1000)§	2200 (500)†
Maximum Static Load	N (lbs)	13,344 (3000)	13,344 (3000)	13,344 (3000)
Screw Type		Ball	Ball	Ball
Gear Ratio		11.0	5.4	2.7
Motor Power	Volts	230/460	230/460	230/460
Amperage	Amps	3.5/1.7	3.5/1.7	3.5/1.7
Lifting Speed	mm/s (in/s)	50.8 (2.0)	101.3 (3.9)	203.2 (8.0)
Duty Cycle	m/hr (in/hr)	101.6 (4000)	203 (8000)	406 (16,000)
Shipping Weight	39 lb (17.7 kg) + 1.3 lb (0.6 kg) per 50 mm of travel			

§ Double Speed - Lower ratio reduces rated load to 1,000 lbs.
† Quad Speed - Lower ratio reduces rated load to 500 lbs.

ORDERING INFORMATION

Models

DKU110C - 460B - [ ][ ][ ] - [ ][ ][ ] - [ ]
CMLA 8,900 N: Ball Screw: 11.0:1 Ratio: Standard Clutch

§ DKU054C - 460B - [ ][ ][ ] - [ ][ ][ ] - [ ]
CMLA 4,500 N: Ball Screw: 5.4:1 Ratio: Standard Clutch

† DKU027C - 460B - [ ][ ][ ] - [ ][ ][ ] - [ ]
CMLA 3,336 N: Ball Screw: 2.7:1 Ratio: Standard Clutch

Motor												
230/460 VAC/3 PH/60 Hz					4	6	0					
Brake								B				
Stroke mm (in)												
100 mm (3.9 in)									1	0	0	
150 mm (5.9 in)									1	5	0	
300 mm (11.8 in)									3	0	0	
450 mm (17.7 in)									4	5	0	
600 mm (23.6 in)									6	0	0	
750 mm (29.5 in)									7	5	0	
Other Features/Options												
POT - Potentiometer Only - 5K potentiometer signal to customer controls; not valid with brake option											P	O T
XXX - No Potentiometer/No Brake - Not valid with brake option											X	X X
Cable Length (Note: PCB option only available with standard 0.76m Cord Length)												
0.76 m (30 in) Standard												(Leave Blank)
1 m (39 in)												1
2 m (79 in)												2
3 m (118 in)												3
5 m (197 in)												5

§ Double Speed - Lower ratio reduces rate load to 1000lbs
† Quad Speed - Lower ratio reduces rate load to 500lbs

LINEAR ACTUATOR
MODULAR ACTUATORS
100 to 2000 lbs (444 to 8896 N)

FEATURES & BENEFITS

- Integral housing flange engineered for NEMA 56 frame motor. C-face mounting. (NEMA 42 and 48 and IEC71 frame motor C-face mounting options available).
- Rated loads to 2,000 lbs, depending on actuator gear ratio and motor horsepower.
- Lift speeds to 170 inches per minute (varied with load and hp/rpm of motor).
- Standard travel up to 24 inches (consult Duff-Norton engineering for longer travel options).
- Can be tandem-coupled for synchronous operation.
- Optional motors, limit switches and position indicating transducer.
- Clevis attachment accessories available for mounting: eye bracket, clevis bracket and pivot pin.

OPTIONS

- Limit switches
- Transducers

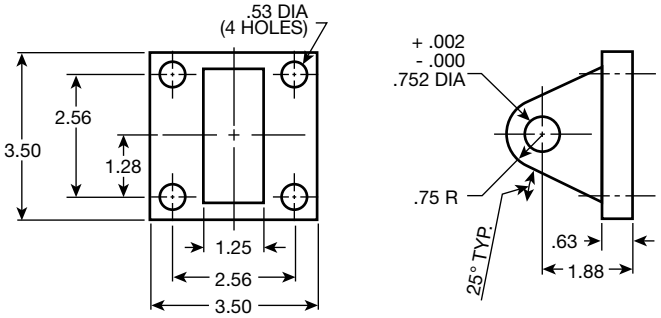
WARNING

These actuators are intended for industrial use only and should not be used to lift, support or otherwise transport people unless you have a written statement from Duff-Norton company which authorizes the specific actuator unit, as used in your application, as suitable for moving people.

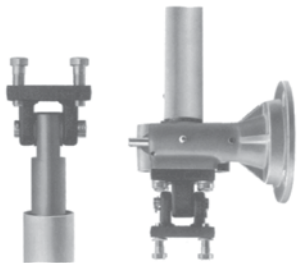
CLEVIS ACCESSORIES

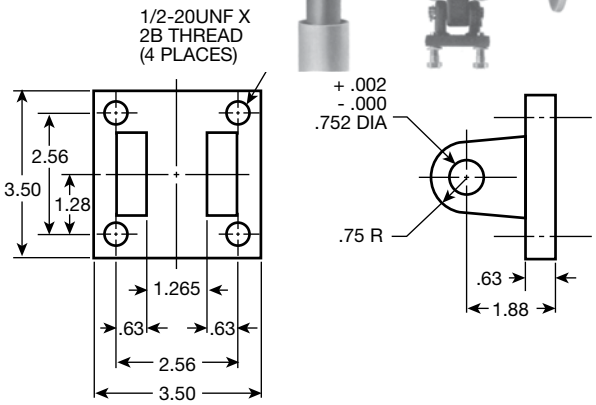
Clevis attachments are available for modular actuators. Attachments are suitable for either housing end or translating tube end. Mounting hardware is not included.

Eye Bracket SK2465-60EB

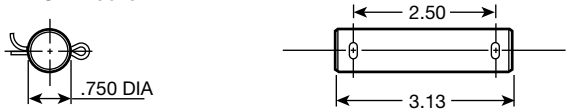


Clevis Bracket SK2465-(





Pivot Pin SK2465-62PP



Pivot Pin Washer H4211C

ORDERING INFORMATION (for special motor flange)

Required Motor Information:

Manufacturer _____

Type _____

AH _____

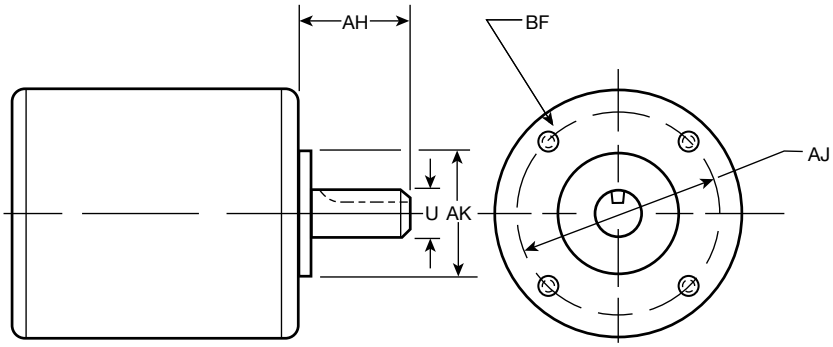
AK _____

AJ _____

U _____

Key Size _____

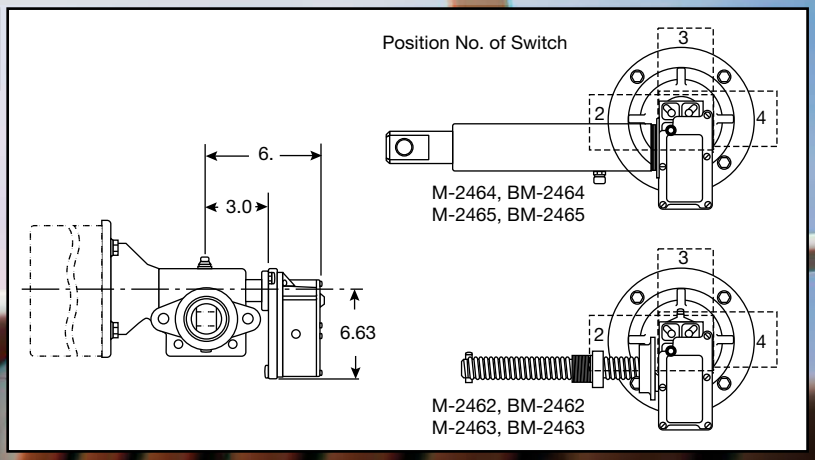
BF _____



LIMIT SWITCH

POSITION	1	2	3	4
M-2462, M-2463, BM-2462, BM-2463	C	A	D	C
M-2464, M-2465, BM-2464, BM-2465	C	X	D	C

(A) Minimum positions of nut may be affected.
(C) Rotary Limit Switch extends below base of actuator unit.
(D) Sealed electric elbow would extend below base of actuator unit.
(X) Recommended
(- -) Not recommended



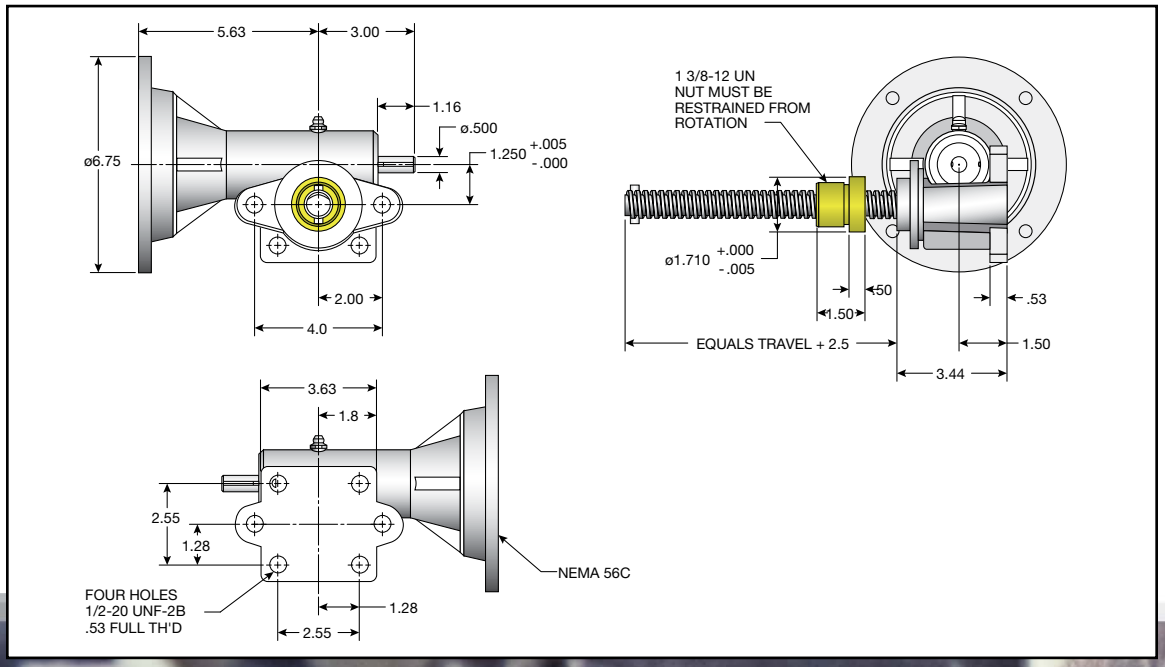
MODULAR ACTUATORS

ROTATING MACHINE SCREW MODELS

FEATURES & BENEFITS

- Integral 56 frame, C-face mounting flange.
- Three-piece flexible coupling for easy motor assembly (included).
- Four threaded holes in base for standard hydraulic cylinder, clevis end accessory attachment. Tapped 1/2 20 UNF-2B.
- Rolled thread lifting screw, with work hardened finish, reduces coefficient of friction between screw and lifting nut. Provides smooth, efficient operation and long service.
- Steel worm and bronze gear set for quiet operation. Available in 5:1 and 20:1 ratios.
- Rugged, lightweight aluminum housing is corrosion resistant.
- Bronze lifting nut for longer life.
- Standard grease fitting on housing for easy lubrication of worm gear.
- Stop-pin at end of lifting screw prevents inadvertent run-off of lifting nut.

DIMENSIONS



PRODUCT INFORMATION

Model Number	"T" Screw Diameter	Turns of Worm 1in Travel		Torque lb/in at 1000 lb Loads		Motor RPM	Rated Loads (lbs)						Lifting Speed in/min	
							1/3 HP Motor		1/2 HP Motor		3/4 HP Motor			
		Ratio		Ratio			Ratio		Ratio		Ratio		Ratio	
		5:1	20:1	5:1	20:1		5:1	20:1	5:1	20:1	5:1	20:1	5:1	20:1
M-2462	0.875 Dia. Acme 0.25 Pitch R.H. Double	10	40	39	18	1725	300	700	500	1000	700	1500	170	43
						1140	450	1000	700	1500	1100	2000	114	28
M-2463	1.0 Dia. Acme 0.25 Pitch R.H. Single	20	80	29	14	1725	400	900	600	1400	900	2000	86	21
						1140	600	1400	900	2000	1400	2000	57	14

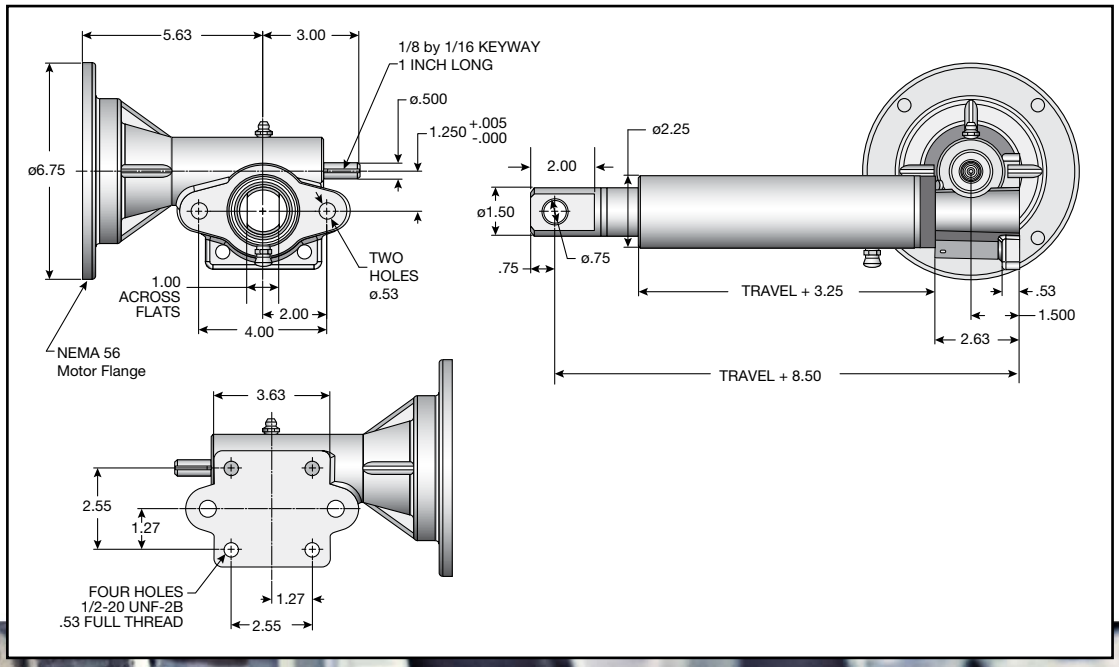
Note: 1. Model M-2462 is self lowering and a motor brake should be used.
2. Model M-2463 may drift 0.75 in (20:1 ratio) to 2.0 in (5:1 ratio) when motor is shut off. If this is undesirable, a motor brake should be employed.
3. When ordering other than 56C-face actuators contact applications engineering at 800-477-5002.

LINEAR ACTUATOR
MODULAR ACTUATORS
TRANSLATING TUBE MACHINE SCREW MODELS

FEATURES & BENEFITS

- Outer aluminum tube is corrosion-resistant and protects translating tube, lifting screw and nut.
- Wiper-scraper seal in end of outer tube keeps dirt out and lubricants in.
- Bronze guide bushing in the outer tube reduces lateral movement of translating tube.
- Translating tube is zinc coated for weather-resistance.
- Single or double lead lifting screw and nut for high efficiency and longer wear.
- Vented in outer tube to prevent pressure build-up in the actuator
- Furnished with standard clevis end on translating tube. Threaded end is available on special order, depending on application, any type of threaded connection may be substituted.

DIMENSIONS



PRODUCT INFORMATION

Model Number	"T" Screw Dia.	Turns of Worm 1" Travel		Torque lb./in. @ 1000 lb. Loads		Motor RPM	Rated Loads (lbs)						Lifting Speed in. / min.	
							1/3 HP Motor		1/2 HP Motor		3/4 HP Motor			
		Ratio		Ratio			Ratio		Ratio		Ratio		Ratio	
		5:1	20:1	5:1	20:1		5:1	20:1	5:1	20:1	5:1	20:1	5:1	20:1
M-2464	0.875 Dia. Acme 0.25 Pitch R.H. Double	10	40	39	18	1725	300	700	500	1000	700	1500	170	43
						1140	450	1000	700	1500	1100	2000	114	28
M-2465	1.0 Dia. Acme 0.25 Pitch R.H. Single	20	80	29	14	1725	400	900	600	1400	900	2000	86	21
						1140	600	1400	900	2000	1400	2000	57	14

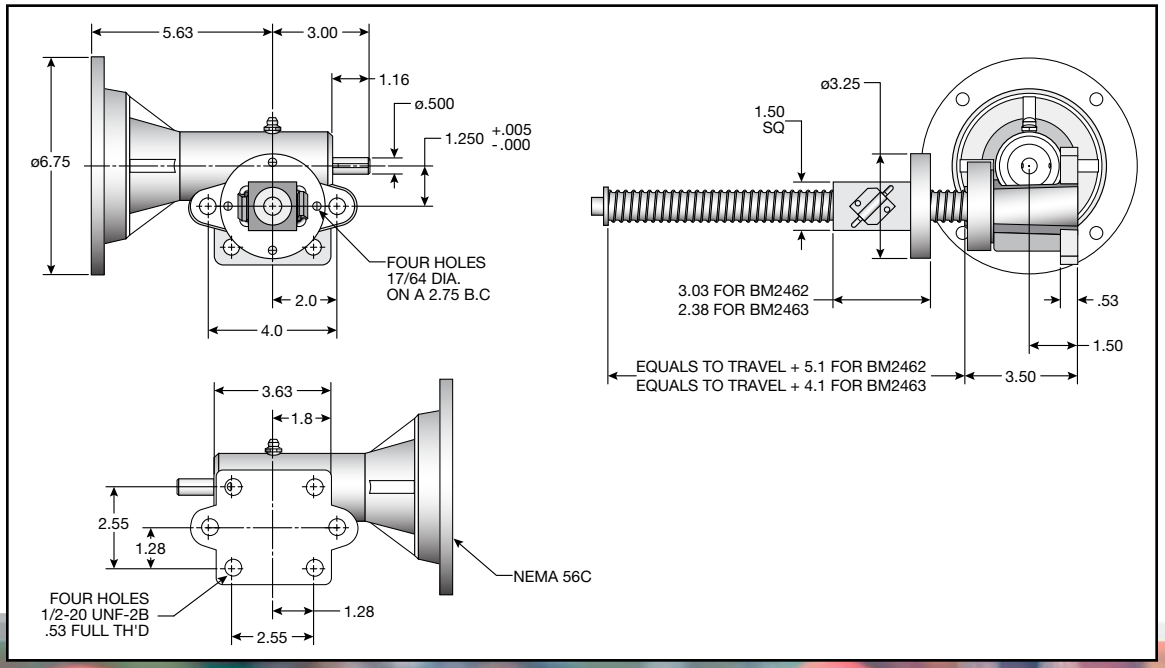
Note: 1. Model M-2464 is self lowering and a motor brake should be used.
2. Model M-2465 may drift 0.75 in. (20:1 ratio) to 2.0 in. (5:1 ratio) when motor is shut off. If this is undesirable, a motor brake should be employed.
3. When ordering other than 56C-face actuators contact applications engineering at 800-477-5002.

LINEAR ACTUATOR
MODULAR ACTUATORS
ROTATING BALL SCREW MODELS

FEATURES & BENEFITS

- Integral 56 frame, C-face mounting flange.
- Three-piece flexible coupling for easy motor assembly (included).
- Four threaded holes in base for standard clevis end accessory attachment. Tapped 1/2-20 UNF-2B.
- Ball-bearing type screw and mating nut with rolling contact reduces friction to a minimum providing capability for higher speed and longer life with less power requirement.
- Steel worm and bronze gear set for quiet operation. Available in 5:1 and 20:1 ratios.
- Rugged, lightweight aluminum housing is corrosion resistant.
- Standard grease fitting on housing for easy lubrication of worm gear.
- Stop-disc at end of lifting screw prevents inadvertent run-off of ball nut.

DIMENSIONS



PRODUCT INFORMATION

Model Number	"T" Screw Diameter	Turns of Worm 1in Travel		Torque lb/in at 1000 lb Loads		Motor RPM	Rated Loads (lbs)								Lifting Speed in/min	
							1/4 HP Motor		1/3 HP Motor		1/2 HP Motor		3/4 HP Motor			
		Ratio		Ratio			Ratio		Ratio		Ratio		Ratio		Ratio	
		5:1	20:1	5:1	20:1		5:1	20:1	5:1	20:1	5:1	20:1	5:1	20:1	5:1	20:1
BM-2462	1.00 Dia. x 1.000 Lead Ball Screw	5	-	5.3	-	1725	100	-	200	-	300	-	500	-	345	-
						1140	200	-	300	-	500	-	700	-	228	-
BM-2463	1.00 Dia. x 0.250 Lead Ball Screw	20	80	1.3	0.6	1725	600	1500	900	2000	1300	-	2000	-	86	21
						1140	1000	-	1300	-	2000	-	-	-	57	14

Note: 1. Model BM-2462 and BM-2463 are self lowering and a motor brake must be used.
2. Due to high travel speed of BM-2462, it is important that a brake with a minimum response time be used. An independently controlled direct acting brake (6ft-lb for 3/4 HP motors and 3ft-lb for smaller motors) is recommended.
3. When ordering other than 56C-face actuators contact applications engineering at 800-477-5002.

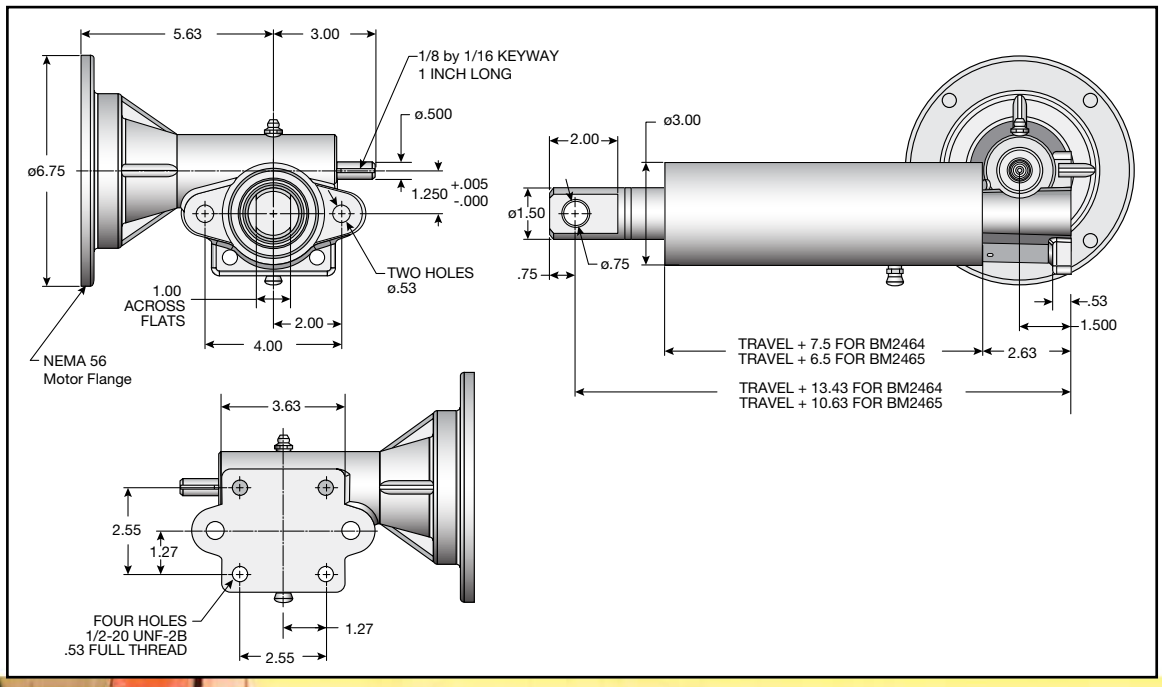
MODULAR ACTUATORS

TRANSLATING TUBE BALL SCREW MODELS

FEATURES & BENEFITS

- Outer aluminum tube is corrosion-resistant and protects translating tube, lifting screw and nut.
- Wiper-scraper seal in end of outer tube keeps dirt out and lubricants in.
- Bronze guide bushing in the outer tube reduces lateral movement of translating tube.
- Translating tube is zinc coated for weather-resistance.
- Single or quadruple lead ball-bearing type lifting screw and nut for higher efficiency and longer life.
- Vented in outer tube to prevent pressure build-up in the actuator
- Furnished with standard clevis end on translating tube. Threaded end is available on special order, depending on application, any type of threaded connection may be substituted.

DIMENSIONS



PRODUCT INFORMATION

Model Number	"T" Screw Diameter	Turns of Worm 1in Travel		Torque lb/in at 1000 lb Loads		Motor RPM	Rated Loads (lbs)								Lifting Speed in/min	
							1/4 HP Motor		1/3 HP Motor		1/2 HP Motor		3/4 HP Motor			
		Ratio		Ratio			Ratio		Ratio		Ratio		Ratio		Ratio	
		5:1	20:1	5:1	20:1		5:1	20:1	5:1	20:1	5:1	20:1	5:1	20:1	5:1	20:1
BM-2464	1.00 Dia. x 1.000 Lead Ball Screw	5	-	5.3	-	1725	100	-	200	-	300	-	500	-	345	-
						1140	200	-	300	-	500	-	700	-	228	-
BM-2465	1.00 Dia. x 0.250 Lead Ball Screw	20	80	1.3	0.6	1725	600	1500	900	2000	1300	-	2000	-	86	21
						1140	1000	-	1300	-	2000	-	-	-	57	14

Note: 1. Model BM-2464 and BM-2465 are self lowering and a motor brake must be used.
2. Due to high travel speed of BM-2464, it is important that a brake with a minimum response time be used. An independently controlled direct acting brake (6ft-lb for 3/4 HP motors and 3ft-lb for smaller motors) is recommended.
3. When ordering other than 56C-face actuators contact applications engineering at 800-477-5002.

FREQUENTLY ASKED QUESTIONS

What are the advantages of using Duff-Norton linear actuators over other linear motion solutions?

Duff-Norton linear actuators offer a packaged solution to your motion requirements. The integration of the actuator and motor simplifies the process of specifying and purchasing components for your motion system. Also, Duff-Norton linear actuators offer many advantages over hydraulic cylinders when low maintenance, installation and operating costs and environmental impact are considerations. Regardless of how simple your requirements or how complex, Duff-Norton Controls are available for all electromechanical actuators and can be customized to suit your application. In addition, Duff-Norton's application engineers can help you determine which actuator best suits your application and environment.

Can two or more Duff-Norton linear actuators be synchronized?

Tandem actuators can be used in certain applications. Small differences in motor speed may cause the actuators to get out of synchronization. Use of clutch models allows alignment when the actuator is fully extended or retracted. Contact Duff-Norton application engineers to discuss your application.

What is the difference between static load and dynamic load?

Dynamic, working, or lifting load is the force that will be applied to the actuator while it is in motion. Static load, also called holding load, is the force that will be applied to the actuator when it is not in motion.

What is duty cycle and how is it calculated?

Duty Cycle relates to the operation of the electric motor powering the actuator. It is the maximum amount of time the motor may run expressed as a percentage of total time. A 25% duty cycle indicates that the motor may be run intermittently for 15 minutes every hour.

Are Duff-Norton limit switches pre-set?

Duff-Norton does not preset limit switches on its linear actuators. Limit switches allow you the flexibility to set the limits of travel on your actuator to fit your particular application. Easy to follow instructions are included in the installation manual, and you may phone the factory if further assistance is required. The customer is responsible for properly setting the limit switch in the unit. If the limit switches are not set, or are improperly set, the unit may be damaged during operation. In addition, limit switches may require resetting if the translating tube of your actuator is rotated manually, as this will change the limit switch setting.

What are side loading and eccentric loading, and why should they be avoided?

Side loading, or radial loading, is a force applied perpendicular to the actuator center line. Eccentric loading is any force whose center of gravity does not act through the longitudinal axis of the actuator. Both side loading and eccentric loading should always be avoided as they can cause binding and shorten the life of the actuator.

What are the "Do's" and "Don'ts" of mounting Duff-Norton electromechanical actuators?

Duff-Norton linear actuators can be used in tension, compression, or combination applications. Eccentric and side loading should be avoided. Please consult the technical data sheets to ensure that all hardware used in conjunction with the actuator can withstand the maximum restraining torque.

What are the most common factors in the failure of a linear actuator?

Improper loading, failure to set limit switches, excessive duty and extreme environments may contribute to premature actuator failure.

Can I adjust the speed of a Duff-Norton linear actuator in the field?

No, typical lifting speeds at various capacities within the operating range of each actuator are graphed on the technical data sheets. Should you have an application which requires lower speed, our application engineers can recommend another model or, if required, one that is customized for your application.

Can Duff-Norton actuators perform complex tasks?

Yes. Complex positioning tasks can be managed through the use of position feedback devices and electronic controls.

What does the clutch do?

The friction disk clutch in Duff-Norton linear actuators is set to slip when the rated load limit of the actuator is exceeded. This is to prevent damage to the actuator due to jamming, or overheating resulting from an excessive load. The load will be held securely should the clutch slip. The clutch also allows end of travel protection, but is not designed to be slipped repeatedly. Select a Duff-Norton actuator with internal limit switches or install external limit switches; if a clutch model will be slipped repeatedly.

Do Duff-Norton linear actuators require maintenance?

Maintenance is minimal but Duff-Norton recommends periodic lubrication to maintain optimal performance. The installation and maintenance guide will give you specific instructions for your model.

Does Duff-Norton make larger linear actuators?

Duff-Norton's linear actuators are rated for capacities up to 2,000 lbs. Duff-Norton also offers a full line of mechanical actuators with capacities up to 250 tons, motorized actuators up to 75 tons. In addition, Duff-Norton also offers customized controls that may be used in conjunction with any actuation system.

How can I determine which Duff-Norton linear actuator is best suited for my application?

Technical information pertaining to each model is contained in individual technical data sheets (see enclosed literature request form.) Should you require any further assistance in selecting the proper actuator for your application, please call your local stocking distributor, or Duff-Norton's application engineering department at (800) 477-5002.

GLOSSARY

Axial Load ..... A load whose center of gravity runs though the axis of the actuator screw

Ball Brake ..... Used on smaller AC motor units, the ball brake is a bi-directional brake that limits drift when the unit is under a full load

Cantilever Mount ..... A pin mount where the pin is not Supported on both sides. Deflection of the pin can cause binding. This type of mount is unacceptable

Current Draw ..... Amount of current (amperes) required by a motor to move a load. It increases as the load increases

Cycle ..... A complete sequence of extension and retraction by the actuator

Double Lead Screw ..... A double lead screw has two separate threads that wrap around the outside diameter of the screw. The advantage of this type of screw is the lifting nut will travel twice the distance with each single turn of the screw

Duty Cycle ..... Percentage of time an actuator is in motion relative to total time. Example: If the total running time for an actuator is 20 seconds in every minute, the duty cycle is 33%

Eccentric Load ..... A load whose center of gravity does not go through the screw axis. Off-center loads cause binding and shorten the actuators life

Extension/Retraction Rate ..... The speed at which an actuator extends and retracts. In DC models the speed can depend on the load

Jog .....To move the actuator in short increments

Limit Switch ..... A device used to limit the extension or retraction of an actuator to a pre-set position

Load ..... Material to be moved by the actuator

Overload Clutch ..... A built-in device that slips when the actuator reaches a predetermined load limit preventing damage to the unit

Peak Load .....The maximum momentary load that an actuator can control

Pivot Mount ..... A clevis mount that allows the actuator to pivot while in operation

Potentiometer ..... A device that provides position feedback information from an actuator

Restraining Torque ..... The amount of torque exerted on the brackets during operation

Screw Pitch ..... The screw pitch is the distance from a point on a screw thread to the equivalent point on an adjacent thread

Side Load ..... A load exerted on the side of the actuator housing or translating tube. Side loading can shorten the life of an actuator. Also called radial load

Spring Brake ..... A bi-directional no-back type brake that is automatically activated by pinion torsion and released when the motor turns

Spur Gear ..... A gear wheel with radial teeth parallel to its axis

Static Load ..... The maximum load an actuator can hold when not operating

Stroke Length ..... The total travel of the translating tube from retracted to fully extended

Tension Load ..... A load that pulls on the actuator along the axis of its screw

Translating Tube ..... The tube that extends in and out of the actuator

Wiper Seal ..... A seal between the actuator housing and the translating tube to keep contaminants out of the actuator. Also called a scraper seal

TERMS OF SALE

All sales by Seller are made pursuant to the following terms. No other or additional terms or conditions are or will be accepted.

ACCEPTANCE OF ORDERS -

All orders, whether placed directly or through an agent, and all subsequent amendments thereto, are subject to a final approval and acceptance by Seller's main office.

LIMITATION OF WARRANTIES, REMEDIES AND DAMAGES –

THE WARRANTY STATED BELOW IS GIVEN IN PLACE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE. NO PROMISE OR AFFIRMATION OF FACT MADE BY ANY AGENT OR REPRESENTATIVE OF SELLER SHALL CONSTITUTE A WARRANTY BY SELLER OR GIVE RISE TO ANY LIABILITY OR OBLIGATION.

Seller warrants that on the date of its delivery to carrier the goods are free from defects in workmanship and materials.

SELLER'S SOLE OBLIGATION IN THE EVENT OF BREACH OF WARRANTY OR CONTRACT OR FOR NEGLIGENCE OR OTHERWISE WITH RESPECT TO GOODS SOLD SHALL BE EXCLUSIVELY LIMITED TO REPAIR OR REPLACEMENT, F.O.B. SELLER'S POINT OF SHIPMENT, OF ANY PARTS WHICH SELLER DETERMINES TO HAVE BEEN DEFECTIVE or if Seller determines that such repair or replacement is not feasible, to a refund of the purchase price upon return of the goods to Seller.

Any action against Seller for breach of warranty, negligence or otherwise must be commenced within one year after such cause of action accrues.

NO CLAIM AGAINST SELLER FOR ANY DEFECT IN THE GOODS SHALL BE VALID OR ENFORCEABLE UNLESS BUYER'S WRITTEN NOTICE THEREOF IS RECEIVED BY SELLER WITHIN ONE YEAR FROM THE DATE OF SHIPMENT.

Seller shall not be liable for any damage, injury or loss arising out of the use of the goods if, prior to such damage, injury or loss, such goods are (1) damaged or misused following Seller's delivery to carrier; (2) not maintained, inspected, or used in compliance with applicable law and Seller's written instructions and recommendations; or (3) installed, repaired, altered or modified without compliance with such law, instructions or recommendations.

UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES AS THOSE TERMS ARE DEFINED IN SECTION 2-715 OF THE UNIFORM COMMERCIAL CODE.

TERMS OF PAYMENT -

Unless otherwise stated herein, payment of each invoice is required within thirty (30) days after date of shipment. Any balance unpaid after the required payment date shall be subject to a service charge of 1% per month from such date.

PRICE ADJUSTMENTS -

Amendments made by the Buyer to orders already placed shall, without formal notice to the Buyer, be subject to extra charges. If the estimated shipping date for the goods is more than sixty (60) days after date of order, the price of the goods are subject to increase by Seller.

TAXES -

Any sales, use, excise, and other taxes applicable to this transaction and the goods and/or services furnished by Seller are not included in the price and shall be paid by Buyer when due. If Seller pays any such taxes, Buyer shall reimburse Seller upon demand.

INDEMNIFICATION AND SAFE OPERATION -

Buyer shall comply with and require its employees to comply with directions set forth in instructions and manuals furnished by Seller and shall use and require its employees to follow such instructions and manuals and to use reasonable care in the use and maintenance of the goods. Buyer shall not remove or permit anyone to remove any warning or instruction signs on the goods. In the event of personal injury or damage to property or business arising from the use of the goods, Buyer shall, within forty-eight (48) hours thereafter, give Seller written notice of such injury or damage. Buyer shall cooperate with Seller in investigating any such injury or damage and in the defense of any claims arising therefrom.

If Buyer fails to comply with this section or if any injury or damage is caused, in whole or in part, by Buyer's failure to comply with applicable federal or state safety requirements, Buyer shall indemnify and hold Seller harmless against any claims, loss or expense for injury or damage arising from the use of the goods.

GOVERNING LAW -

This agreement shall be governed by and construed under the laws of the State of New York.

DELIVERY AND DELAYS -

Unless otherwise specified herein, deliveries shall be F.O.B. Seller's point of shipment and risk of loss shall pass to Buyer upon Seller's delivery to carrier. All shipping dates are approximate and Seller shall not be liable for loss or damage because of delays occasioned by labor disputes, damage to facilities, or failure of suppliers or subcontractors to meet scheduled deliveries or any other cause beyond Seller's reasonable control or making its performance commercially impracticable.

Not withstanding other provisions hereof, if shipment is delayed at Buyer's request, the goods shall be deemed to be stored at Buyer's risk and expense and Seller may thereupon bill Buyer for the full price and storage costs. Buyer shall pay such bill within 30 days after mailing thereof.

BUYER'S INSPECTION UPON RECEIPT OF SHIPMENT -

Buyer shall inspect the goods as soon as received. If any loss or damage is discovered, Buyer must notify both the carrier and Seller at once. Seller will cooperate with Buyer in filing claims with the carrier.

CHANGES AND CANCELLATION -

Seller reserves the right to change or cancel any order whenever circumstances require allocation of production or delivery or Seller deems change or cancellation to be necessary to comply with applicable laws, ordinances, regulations, directives or administrative actions. Seller reserves the right to make changes in materials or design which it determines appropriate for the goods.

SECURITY INTEREST AND REPOSSESSION -

Until full payment has been made therefor, Seller shall have a security interest in goods shipped to Buyer and the goods shall remain personal property. Upon request Buyer shall execute and deliver to Seller security agreements and financing statements further evidencing Seller's security interest. Buyer authorizes Seller to file a financing statement or statements relating to the goods, without Buyer's signature thereon, as Seller may deem appropriate and appoints Seller as Buyer's attorney-in-fact for the limited purpose of executing (without requiring Seller to do so) financing statements in Buyer's name and performing other acts which Seller deems appropriate to perfect and continue its security interest and to protect and preserve the goods.

In the event Buyer defaults in making any payment due Seller, Seller in addition to any other rights or remedies provided by law, shall have the right, with or without legal process, to enter the place where said goods are located and to repossess the goods in accordance with the Uniform Commercial Code.

ASSURANCES -

Shipment by Seller shall at all times be subject to the prior approval of its credit personnel and Seller may, at any time, decline to make shipment except upon receipt of prior payment or upon other terms and conditions or security satisfactory to such personnel.

PATENTS -

Except as to goods manufactured according to design supplied by Buyer, Seller will defend and hold Buyer free and harmless in a suit or proceeding brought against Buyer insofar as it is based on a claim that use of the goods by Buyer constitutes an infringement of any existing U.S. Patents, provided, however, that Buyer gives Seller prompt written notice of such suit or proceeding; permits Seller, through its counsel, to defend and/or settle the same; and gives Seller all necessary information, assistance and authority to enable Seller so to do. If Buyer's use of the goods is held to constitute infringement and further use is enjoined, Seller shall, at its option, either (i) procure for Buyer the right to continue using the goods; or (ii) replace the goods with non-infringing goods; or (iii) modify the goods to non-infringing goods. The foregoing states Seller's entire liability for patent infringement and shall not be construed to render Seller liable for damages based on product output.

MISCELLANEOUS -

This instrument constitutes the entire agreement between Seller and Buyer, superseding all previous understandings and writings regarding this transaction. Any amendment or modification of this Agreement shall be void unless in writing and signed by Seller.

No delay or omission by Seller in exercising any right or remedy hereunder shall be a waiver thereof or of any other right or remedy, and no single or partial exercise thereof shall preclude any other or further exercise thereof or the exercise of any other right or remedy. All rights and remedies of Seller are cumulative.

Sales made pursuant to this Agreement shall be governed by the Uniform Commercial Code as the same may from time to time be construed and in effect in the state wherein Seller has its main office.

ARBITRATION -

All disputes that may arise between the parties regarding the interpretation of the contract and the legal effect of the contract shall, to the exclusion of any court of law, be arbitrated and determined in accordance with the latest Commercial Arbitration Rules of the American Arbitration Association. The arbitration proceeding shall be held in the city in that state where the principal office of the Seller is located. The parties recognize and consent to the above mentioned arbitration association's jurisdiction over each and every one of them.

USTS rev. 2/98

NOTES

MOTION TECHNOLOGY

SCREW JACKS

LINEAR ACTUATORS

ROTARY UNIONS

ACME AND BALL SCREW & NUTS

P.O. Box 7010 • Charlotte, NC 28241-7010
Phone: (800) 477-5002 • (704) 588-4610
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Email: duffnorton@cmworks.com
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