JOYCE®

EDRIVE® ACTUATORS
A JOYCE/DAYTON BRAND

SERVICE GUIDE

Eliminator Series

SD9-22-110

Contents

Engineering Assistance
Joyce/Dayton Corp
3300 S. Dixie Dr.
Kettering, OH 45439
sales@joycedayton.com

Repair Service
Request RMA from:
sales@joycedayton.com
Please include serial number with request.

Phone: 937.294.6261
Website: www.joycedayton.com/edrive

For warranty information please refer to www.joycedayton.com/edrive

Important Information for Users

Installation and Operation
EDrive Linear Actuators must be installed and operated in such a way that all applicable safety requirements are met. As an installer, it is your responsibility to identify and comply with all relevant safety standards. Severe personal injury as well as equipment damage may result from any failure to heed this warning. Read and understand this entire service guide before installation and operation of this equipment.

The installation and maintenance of this actuator should only be performed by personnel who have been appropriately trained. Such persons should be familiar with the potential hazards associated with electrical and mechanical equipment. The individual or group having overall responsibility for this equipment must ensure that operators are adequately trained.

Under no circumstances will Joyce/Dayton be liable for any incidental, consequential, or special damages resulting from use or misuse of this equipment or this service guide.

Safety Warning
Motion equipment is capable of rapid movement and very high forces. Unexpected motion may occur at any time. KEEP CLEAR of any machinery until the on-site supervisor has determined that all sources of electrical or mechanical potential energy have been disabled or otherwise “locked out”. Avoid contact or physical proximity to the actuator while it is in operation.

This product is sold, as a component, to be installed in a complete system using good engineering practices.

Joyce/Dayton continually strives to improve its products, therefore we reserve the right to modify equipment and service guides without prior notice.

Product Description

EDrive Linear Actuators are based on a high efficiency anti-friction screw, supported in bearings, and rotated by a motor. The nut is attached to the piston rod. By constraining the piston from rotating, the rotary movement of the motor is converted into linear motion of the piston rod. The motor may be directly coupled or include a gear belt drive or a third-party gear reducer.

Mechanical and performance specifications can be found on our web site, or by contacting Joyce/Dayton at sales@joycedayton.com or 937.294.6261.
All inquiries should include the actuator serial number, this is a number with a “P” prefix that is inscribed on the actuator.

Specifications

Please refer to the Joyce/Dayton website for detailed product specifications including size, measurements, weight, and inertia values.

Safety Considerations

In any situation where safeguards and control systems do not prevent accidental contact between personnel and the actuator, the machine builder/installer must provide suitable warnings.

Installation Considerations

In mounting any actuator, the following issues need to be considered:

- Avoid distortion of the actuator body.
- Proper alignment of the actuator must be relative to the load travel.
- Prevent side loading of the piston rod.
- Limit linear acceleration and deceleration. It should not exceed 386 in/sec².
- The load, velocity, and motor input torque should not exceed catalog specifications.

As with any ball bearing device, special care must be taken to avoid impact. Any impact will jeopardize actuator life. Before energizing the motor install over- travel limit switches and connect them to control circuitry. This is a necessary step to reduce the possibility of damage through accidental extension or retraction beyond the limits of the actuator.

Motor Pulley should be in line with the ball screw pulley within 1/32 inch. Fasten pulley to motor shaft with the supplied set screw or taper lock bushing.

Gear Belt should be properly tensioned. Gear belt drives should not be tightened to the same extent as other belt drives (i.e. V-belt, Poly-V, Flat belt, etc.). If the gear belt tension is too great, it imposes excessive and unnecessary loading on the bearings. When the gear belt is too loose, the belt may jump teeth (particularly on high torque applications).

Coupling (inline only) Determine the correct position to equally engage both the motor shaft and the ball screw shaft into the coupling. Fasten the coupling to the motor shaft and install the motor into the coupling housing. Use the access hole in the housing to tighten the clamping bolt on the ball screw side of the coupling. Caution: Avoid excess axial loading on the ball screw shaft.

End Effectors Caution should be exercised when attaching any device to the end of the piston rod. Use the wrench flats on the piston end to prevent rotation while attaching the end effector. Any substantial torque applied to the piston rod may damage the internal anti-rotation system.

Roller Screw Pulley In the event this pulley is removed or replaced – DO NOT use the fully retracted or fully extended rod position to counteract the applied wrench

torque.

Air Purge and Vent

This actuator is a sealed chamber. As the piston is extended, the internal volume increases, creating a partial vacuum. Similarly, when the piston retracts, a positive pressure develops. When the linear motions are rapid, there may be a tendency during extension to draw airborne contaminants through the end seal; and similarly, during retraction, to expel air through the seal. These conditions may compromise the seal integrity and subsequently lead to contamination of the roller screw system. We encourage the application of 2-3 psi of clean air to the actuator chamber to compensate for these air flows. If this air purge is not used, we suggest use of a filtered vent or plumbing pipe/hose to a source of clean air.

Lubrication

The standard lubrication is Mobilgrease FM22. As an option, the actuatorcan be supplied with a food grade grease, Mobil FM101.

1. Units have been pre-lubricated at assembly. Re-greasing is recommended at these intervals: Re-grease 40 grams after the first 100,000 revolutions; Re-grease 80 grams every 500-1,000 hours of actuator movement under load.
2. Caution – DO NOT mix different types of lubricant.
3. To re-grease actuators with *switch track covers*, move the piston to its re-grease position (approximately 1 inch from its fully retracted position). Clean, then remove either switch mounting cover. Using a grease gun, apply grease. Be careful not to allow any debris into the cylinder chamber. Replace the mounting plate.
4. To re-grease actuators with *solid side covers*, move the piston to its re-grease position (approximately 1 inch from its fully retracted position). Clean, then remove either re-grease plug on the side cover Using a grease gun, apply grease. Be careful not to allow any debris into the cylinder chamber. Replace the re-grease plug.

Note: Eliminator SD9 products use standard type grease fittings.

Maintenance

1. Ball bearings are greased for life and require no maintenance.
2. Piston seals require periodic (6 months approx.) inspection.
3. Gear belts require periodic (6 months approx.) inspection for possible wear and proper tension.

The successful operation and longevity of this actuator is based on superior components, precise manufacturing, and extreme cleanliness. Unless your maintenance personnel are thoroughly familiar with this type of construction, any attempt to perform “field” repairs may aggravate rather than resolve your problem. Emergency repairs and rebuilds are always given the highest priority by Joyce/Dayton.

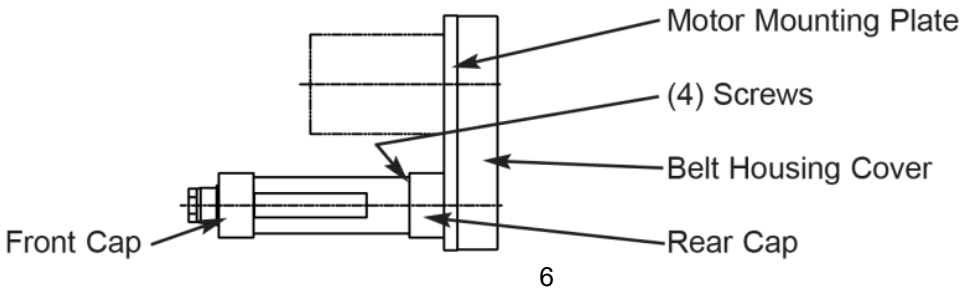
If you have any questions regarding performance or possible explanations for symptoms – we encourage early contact with Joyce/Dayton (sales@joycedayton.com) to help define the problem and determine the most appropriate resolution. For answers to common questions, you can check the FAQ page of our website, www.joycedayton.com/edrive.

When you call, it is most helpful if you have the actuator serial number available. This is the number with a "P" prefix that is inscribed directly on the actuator.

Gear Belt Installation/Tensioning *(see diagram)*

Remove the belt housing cover. Loosen the (4) screws in the rear cap but DO NOT remove them. This will allow you to slide the motor mounting plate toward the actuator body. If both pulleys have flanges, it may be necessary to unbolt the motor to remove or install the gear belt. Install the gear belt. Then re-assemble with the correct tension and alignment.

Gear belt drives do not need to be tightened to the same extent as other belt drives (i.e. V-belt, Poly-V, Flat belt, etc.) if the gear belt tension is too great, it imposes excessive and unnecessary loading on the bearings. For standard models, the chart below shows the correct deflection and force values for proper belt tensioning. For non-standard models please refer to Appendix A.



SD Eliminator Series	SD/SDL 948		SD/SDL 966		SD/SDL 999	
Reduction Ratio	1:1	2:1	1:1	2:1	1:1	2:1
Belt Deflection	0.19 inch	0.18 inch	0.19 inch	0.18 inch	0.19 inch	0.18 inch
Deflection Force	78-85 lbs.	74-80 lbs.	111-120 lbs.	105-114 lbs.	165-179 lbs.	157-170 lbs.
Gear Belt Number	14MGT-1400-37	14MGT-1260-37	14MGT-1400-68	14MGT-1260-68	14MGT-1400-90	14MGT-1260-90
Number of teeth (driver)	56	30	56	30	56	30
Number of teeth (driven)	56	60	56	60	56	60

Start Up and End Stop Guidelines

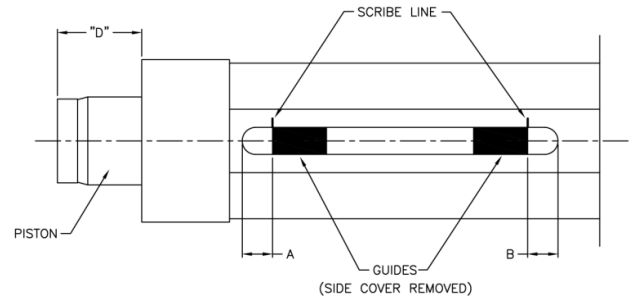
1. The EDrive actuator must be aligned within 0.003" (0.076mm) of the true centerline through the entire side. Improper alignment may result in offset or side loading which could damage the actuator.

2. Over extension or over retraction will cause internal damage to the actuator. The actuator should never be retracted further than the “D” dimension shown below or extended beyond “D” plus the nominal stroke. If the “D” dimension is not easily measured remove either switch track cover and confirm the bronze anti-rotation guides have not traveled past the limit lines scribed on the actuator cylinder. (Starting after serial number P- 32662) Note: For all SD and SDL actuators, “D” equals 2”.

3. The actuator must be re-greased every 500 to 1,000 hours of travel under load with Mobil Temp SHC32. Only greases certified compatible with Mobil Temp SHC32 should be used to prevent chemical reactions which could shorten the actuators life.

4. **Caution:** Impact with a hard stop will damage the ball screw and its support bearings.

   To view the soft stop scribe line, remove either side cover. Bring the guide to the correct position and set as “end of travel”. See diagram and note on the following page.

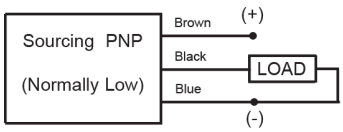


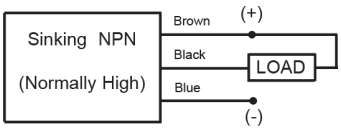
Model	SD/SDL
A	0.88 inches
B	1.13 inches
D	2.00 inches

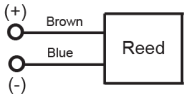
Note: “A” and “B” soft stop distances include approximately 0.06” clearance from minimum positions. This means that approximately 0.12” of total stroke is lost to the soft stops.

Limit Switch Wiring

Supplied Hall Effect or Reed type switches are for “home” sensing and over travel protection only. They should not be used as position switches.







	Configuration	State	Voltage (VDC Typ.)	Current (mA Max.)	Type	Part Number	H					
							1	2	3	4	5	6
A	Hall Effect, Sourcing	N.O.	5-24	500	PNP	MLE-K06			1	2	2	1
A	Hall Effect, Sourcing	N.C.	5-24	500	PNP	MLE-Q06						
B	Hall Effect, Sinking	N.O.	5-24	500	NPN	MLE-G06						
B	Hall Effect, Sinking	N.C.	5-24	500	NPN	MLE-J06	1	2			1	2

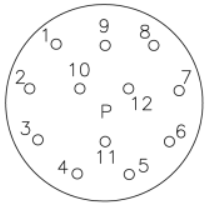
	Configuration	State	Contact Rating (VA)	Switching Voltage (Max.) V(AC/DC)	Switching Current (Max.) (mA)	Carry Current (Max)	Part Number
C	Reed	N.O.	10	100	500	1 A	MLE-D06
C	Reed	N.C.	3	30	200	500 mA	MLE-T06

- Cable - PVC Jacket; 24 AWG 105 strand
- Brown (+), Blue (-), Black (load)
- Switch response: 0.01 mS
- Operating temperature: -10 to 60° C
- Shock resistance: 50 g Hall; 30 g Reed
- Vibration resistance: 30 g
- Magnetic field required: 40 gauss minimum, no upper limit

Load Cell Specifications

Rated Output, Typical	2 mV/V
Combined Error	0.25% F.S.
Non-Repeatability	0.05% F.S.
Zero Balance	1% R.O.
Temperature range, Compensated	50° - 120° F
Temperature Effect, Output	0.0008% of load / degree F
Temperature Effects, Zero Balance	0.2% / R.O. / degree F
Bridge Impedance, Typical	700 ohms
Excitation Voltage, Typical	10 VDC or VAC rms
Excitation Voltage, Maximum	15 VDC or VAC rms
Insulation Resistance	>5,000 megohms @50 VDC
Overload, Safe	150% over capacity
Overload, ultimate	200% over capacity
Deflection at Rated Capacity, Approx.	0.0015 inch
Construction	Tool Steel

Cable Pin Configuration	Receptacle Type		Load Cell Cable	
1	Green	+ Excitation	Gray	+ Excitation
2	Black	- Excitation	Gray stripe	- Excitation
3	White	+ Signal	Orange	+ Output
4	Red	- Signal	Orange stripe	- Output



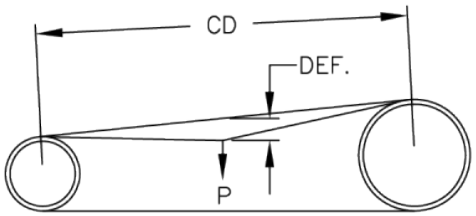
View of Receptacle

Gear Belt Installation/Tensioning *(continued)*

Method of Tensioning Trapezoidal Gearbelt Drives

Gearbelt drives do not need to be extremely tight such as other belt drives. (V–Belt, Poly–V, Flat Belt, etc.) If belt tension is too great, it imposes excessive, and unnecessary loading on bearings. When belt is too loose (particularly on High Torque Applications), belts may "jump" teeth. In order to tension a drive properly, the following may be followed:

FORMULA:



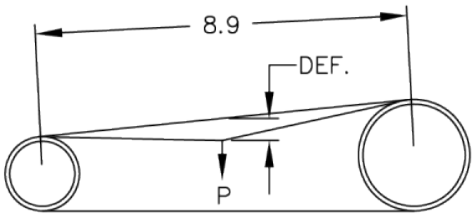
$$Ts = T + \frac{CD \times K}{L_B}$$

$$P = \frac{Ts}{16}$$

$$DEF. = \frac{CD}{64}$$

CD = Center Distance
L_B = Belt Length
Ts = Static Tension
P = Deflecting Force
DEF. = Amount of Deflection in inches
T = Tension in lbs. (from table below)
K = Constant (from table below)

EXAMPLE:



$$Ts = 70 + \left(\frac{8.9 \times 46}{24}\right)$$

$$P = \frac{87.058}{16}$$

$$DEF. = \frac{8.9}{64}$$

(i.e., belt #240H100 is 24" long, 1" wide, "H" belt.)

Ts = 87.058
P = 5.4 lbs.
DEF. = 0.140

CD = Center Distance
L_B = Belt Length
Ts = Static Tension
P = Deflecting Force
DEF. = Amount of Deflection in inches
T = Tension in lbs. (from table below)
K = Constant (from table below)

BELT SECT.	FACTORS	BELT WIDTH 1/2	3/4	1	1–1/2	2
3/8"P. (L)	T	11.5	19.5	27.5		
	K	9.9	17.0	24.0		
1/2"P. (H)	T		49.5	70	109	150
	K		32	46	71	95
7/8"P. (XH)	T					204
	K					190

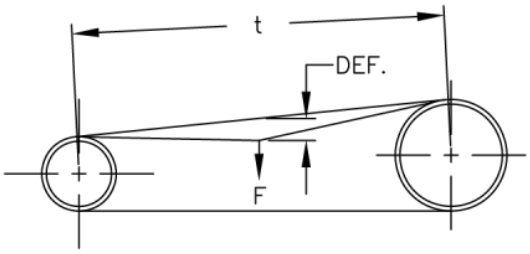
A Belt Tension checker can be used to check both, "P" and "DEF." as obtained above.

Gear Belt Installation/Tensioning *(continued)*

Method of Tensioning HPT Gearbelt Drives

Place belt on sprockets and adjust takeup so that belt teeth mesh securely with sprocket grooves. Measure belt span "t". Then tighten belt so that it deflects 1/64" for each inch of belt span when a force is applied as specified in the table below. Deflection 1/64" per inch of span. (Measure or calculate the span length "t" as shown in sketch below.)

FORMULA:

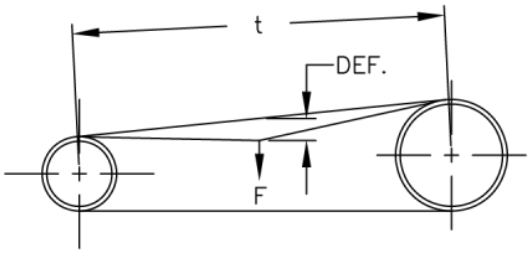


$$t = \sqrt{C^2 - \left(\frac{D-d}{2}\right)^2}$$

$$DEF. = \frac{1}{64}(t)$$

t = Span Length
C = Center Distance
D = Pitch Dia. (Large Pulley)
d = Pitch Dia. (Small Pulley)
F = Deflecting Force (see Table)
DEF. = Amount of Deflection in inches

EXAMPLE:



i.e.
D = B568M30SDS (5.61)
d = B288M30H (2.81)
C = B7208M30 (7.43)

$$t = \sqrt{7.43^2 - \left(\frac{5.61-2.81}{2}\right)^2}$$

$$t = 7.30$$

$$DEF. = \frac{1}{64}(7.30)$$

$$DEF. = .114$$

Belt Pitch	Belt Width	Force
8 mm	20 mm	4 lbs.
	30 mm	6 lbs.
	50 mm	11 lbs.
	85 mm	19 lbs.
14 mm	40 mm	11 lbs.
	55 mm	16 lbs.
	85 mm	26 lbs.
	115 mm	37 lbs.
	170 mm	58 lbs.

Note:

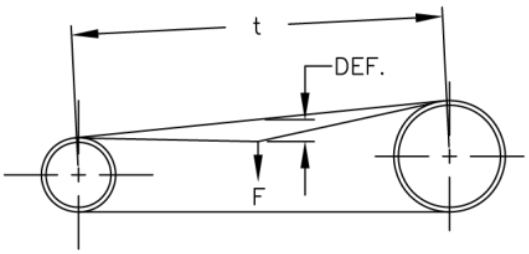
For belts wider than two inches, it is suggested that a strip of keystock or something similiar, be placed across the belt between the tension tester and the belt to prevent belt distortion.

Gear Belt Installation/Tensioning *(continued)*

Method of Tensioning HTD Gearbelt Drives

Place belt on sprockets and adjust takeup so that belt teeth mesh securely with sprocket grooves. Measure belt span "t". Then tighten belt so that it deflects 1/64" for each inch of belt span when a force is applied as specified in the table below.
Deflection 1/64" per inch of span. (Measure or calculate the span length "t" as shown in sketch below.)

FORMULA:

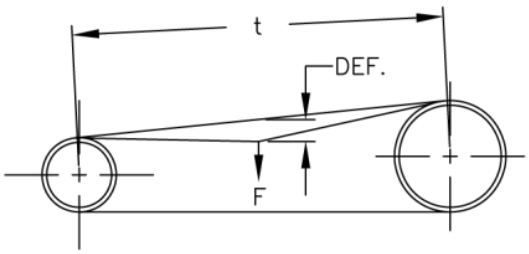


$$t = \sqrt{C^2 - \left(\frac{D-d}{2}\right)^2}$$

$$DEF. = \frac{1}{64}(t)$$

t = Span Length
C = Center Distance
D = Pitch Dia. (Large Pulley)
d = Pitch Dia. (Small Pulley)
F = Deflecting Force (see Table)
DEF. = Amount of Deflection in inches

EXAMPLE:



i.e.
D = P80–8M–85 (8.02)
d = P40–8M–85 (4.02)
C = 880–8M–85 (7.61)

$$t = \sqrt{7.61^2 - \left(\frac{8.02-4.02}{2}\right)^2}$$

$$t = 7.34$$

$$DEF. = \frac{1}{64}(7.34)$$

$$DEF. = .115$$

Belt Pitch	Belt Width	Force
5 mm	9 mm 15 mm 25 mm	9 to 18 oz. 1 to 2 lbs. 1–1/2 to 3 lbs.
8 mm	20 mm 30 mm 50 mm 85 mm	3 to 4 lbs. 5 to 6–1/2 lbs. 9 to 12 lbs. 16 to 20 lbs.

Note:

For belts wider than two inches, it is suggested that a 3/4 or 1 inch strip of metal be placed across the belt between the tension tester and the belt to prevent belt distortion.