INFORMATION SHEET: SERIES ESU-RT DESIGN 5 LINEAR ACTUATOR

ORDERING DATA

PRODUCT
Slide

SIZE
5
6
8

DRIVE MODE: BELT (RT)

Size		Lead mm
5	RT160	160
6	RT192	192
8	RT256	256

RT000 = Passive Unit (without drive)
Must be ordered with QL00 option.

MOTOR CONFIGURATION
QL11 - Inline with 1:1 ratio (Standard)
QLT1 - Inline Plain Shaft
QLD1 - Inline Dual Shaft 1:1 Ratio
QLTD - Inline Dual Plain Shaft 1:1 Ratio
QL00 - No Shaft (Passive Configuration), Must be ordered with RT000 option.

MOTOR MOUNT CODE
Wxxxx - Open Architecture
W0000 - Blank Motor Mount
Blank - Slide Only (No motor mount)

END/MID SUPPORTS
Head Support Qty
KS**0**xx or KS**1**xx
Qty Support (Max 1)
Mid Support Qty
KSx**0**x to KSx**9**x
Qty Support (Max 9)
See Options page for recommended spacing
Cap Support Qty
KSxx**0** or KSxx**1**
Qty Support
(Max 1, Motor End)

ESU S 5 5 x 300 - RTxxx - QL11 - H71 - Wxxxx - KSxxx - SCNK2

TYPE
S - Single Saddle
D - Dual In-Line Saddle

DESIGN NO.
5 - Metric

TRAVEL (MAX.)

ESUS Size	mm	ESUD Size	mm
5	5500	5	5350
6	5500	6	5250
8	5500	8	5100

50 mm minimum travel in 50 mm increments

DRIVE SHAFT ORIENTATION
Blank - Right Hand (Standard)
H71 - Left Hand

SWITCH BUNDLE (OPTIONAL)
S C N K 2

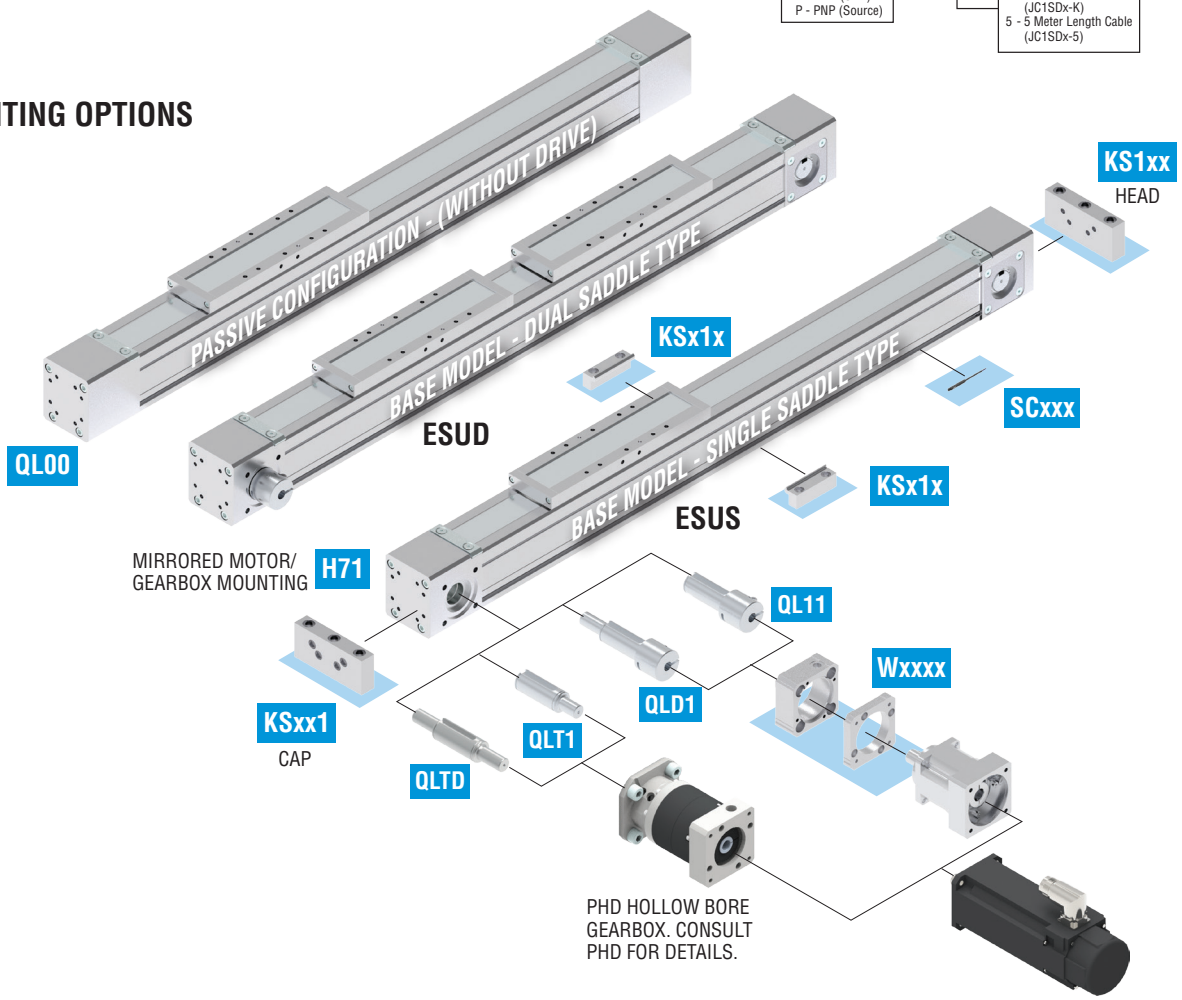
SWITCH SERIES
C - JC1SDx-x Series Single Position

QUANTITY
1 to 9
(JC1SDx-x)

SWITCH CIRCUITRY
N - NPN (Sink)
P - PNP (Source)

CABLE TYPE
K - Quick Connect only (JC1SDx-K)
5 - 5 Meter Length Cable (JC1SDx-5)

MOUNTING OPTIONS



ENGINEERING DATA: SERIES ESU LINEAR ACTUATOR - RT VERSION

SPECIFICATIONS	TIMING BELT SERIES ESU-RT
REPEATABILITY	±0.05 mm [±0.002 in]
TRAVEL TOLERANCE	+2.5/-0.0 mm [+0.100/-0.000 in]
DUTY CYCLE	100%
OPERATING TEMPERATURE	4 - 65°C [40 - 150°F]
LUBRICATION INTERVAL	Factory lubricated for life
ENCAPSULATION CLASS	IP54

SPECIFICATIONS				SIZE 5	SIZE 6	SIZE 8
MECHANICS	DRIVE MECHANISM			Timing Belt		
	GUIDE			Recirculating Ball- Linear Motion Guide & Rail System		
	ESUS MAX. TRAVEL[1]		mm [in]	5500 [216.53]		
	ESUD MAX. TRAVEL[1]		mm [in]	5350 [210.62]	5250 [206.69]	5100 [200.78]
	BELT			HTD8		
	PITCH (LINEAR TRAVEL PER REVOLUTION)		mm [in]	160 [6.3]	192 [7.56]	256 [10.08]
	PULLEY DIAMETER		mm [in]	50.93 [2.005]	61.12 [2.406]	81.5 [3.208]
SPEED	MAXIMUM SPEED		mm/s [in/sec]	5000 [197]		
	MAXIMUM ACCELERATION		m/s^2 [ft/s^2]	50 [164.05]		
THRUST	MAXIMUM THRUST[2]		N [lbf]	1450 [326]	2610 [586]	5440 [1222]
TORQUE	MAX. PERMISSABLE DRIVE TORQUE[3]		Nm [in-lb]	32 [283]	71 [628]	208 [1842]
	NO-LOAD TORQUE		Nm [in-lb]	1.5 [13.3]	2.4 [22]	3.6 [32]
WEIGHT	TOTAL @ ZERO STROKE (W_{OT})	STANDARD	kg [lb]	6.38 [14.08]	13.69 [30.21]	25.66 [56.74]
		DUAL SADDLE	kg [lb]	9.46 [20.87]	20.43 [45.09]	37.47 [82.92]
	TOTAL TRAVEL ADDER (W_{LT})		kg/mm [lb/in]	6.5×10^{-3} [0.366]	1.04×10^{-2} [0.582]	1.54×10^{-2} [0.881]
	MOVING @ ZERO TRAVEL (W_{OM})	STANDARD	kg [lb]	1.81 [3.99]	4.35 [9.59]	7.48 [16.52]
		DUAL SADDLE	kg [lb]	3.03 [6.69]	7.29 [16.09]	12.16 [26.87]
	MOVING TRAVEL ADDER (W_{LM})		kg/mm [lb/in]	3.0×10^{-4} [1.57×10^{-2}]	4.0×10^{-4} [2.35×10^{-2}]	7.0×10^{-4} [3.92×10^{-2}]
INERTIA	ACTUATOR @ ZERO STROKE (J_O)	STANDARD	$kg\text{-}m^2$ [$lb\text{-}in^2$]	1.17×10^{-3} [4.00]	4.06×10^{-3} [13.90]	1.24×10^{-2} [42.50]
		DUAL SADDLE	$kg\text{-}m^2$ [$lb\text{-}in^2$]	1.97×10^{-3} [6.70]	6.81×10^{-3} [23.30]	2.02×10^{-2} [69.10]
	TRAVEL ADDER (J_L)		$kg\text{-}m^2/mm$ [$lb\text{-}in^2/in$]	1.82×10^{-7} [1.58×10^{-2}]	3.92×10^{-7} [3.40×10^{-2}]	1.16×10^{-6} [1.01×10^{-1}]
	EXTERNAL PAYLOAD ADDER (J_M)		$kg\text{-}m^2/kg$ [$lb\text{-}in^2/lb$]	6.84×10^{-4} [1.01]	9.34×10^{-4} [1.45]	1.66×10^{-3} [2.57]

NOTES:
1) STRONGLY RECOMMENDED: ORDERED TRAVEL = WORKING TRAVEL + SAFETY TRAVEL ON BOTH ENDS
2) REFER TO SPEED VS. THRUST CHART
3) REFER TO SPEED VS. TORQUE CHART

WEIGHT AND INERTIAL CALCULATIONS:

TOTAL WEIGHT = W_{OT} + (W_{LT} x TRAVEL) + MOTOR MOUNT WEIGHT
TOTAL MOVING WEIGHT = W_{OM} + (W_{LM} x TRAVEL) + EXTERNAL PAYLOAD

INERTIA $_{Reflected}$ = J_O + (J_L x TRAVEL) + (J_M x TOTAL MOVING WEIGHT)

DYNAMIC LOADS AND MOMENTS

f_C = Equivalent Load Factor

			5	6	8
Load (Max)	Fz	N [lb]	4903 [1103]	7648 [1720]	11410 [2567]
	Fy	N [lb]	3923 [883]	6120 [1377]	9129 [2054]
Bending Moments (Max)	Mx	Nm [in-lb]	43 [381]	94 [832]	166 [1469]
	My	Nm [in-lb]	380 [3363]	715 [6328]	1466 [12975]
	Mz	Nm [in-lb]	380 [3363]	715 [6328]	1466 [12975]

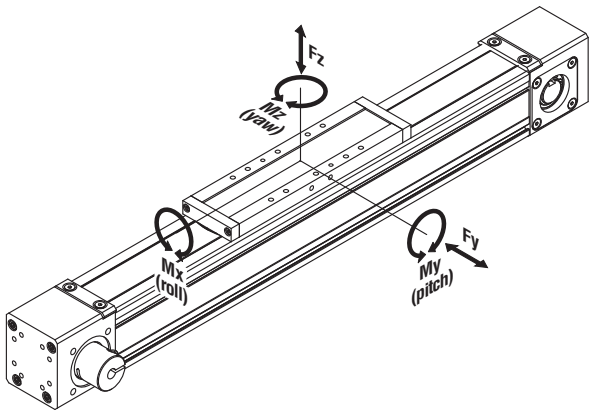
$$f_C = \frac{Fz}{Fz\ max} + \frac{Fy}{Fy\ max} + \frac{Mx}{Mx\ max} + \frac{My}{My\ max} + \frac{Mz}{Mz\ max} \leq 1$$

NOTE: Max Loads and Moments correspond to 5000 km of actuator life when applied individually to single saddle slide.

Mx, My and Mz are total Moments (Static + Dynamic)

To make the selection process quick and simple, refer to PHD's sizing software.

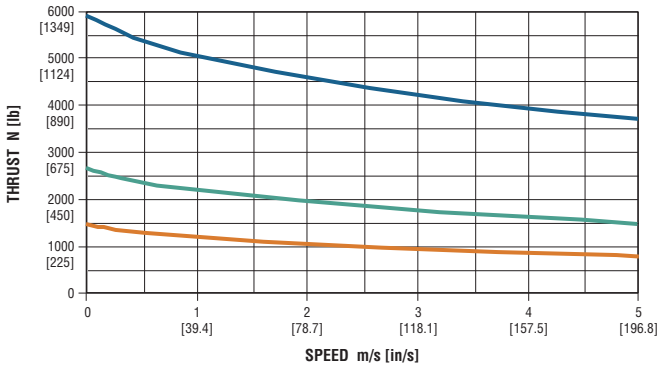
The max dynamic loads Fz and Fy and the moment Mx of a dual saddle Series ESU are doubled. The max dynamic moment of My and Mz depends on the distance between the saddles; the distance calculation follows the note 4 and 5 on pages 68 and 69 of the product catalog respectively.



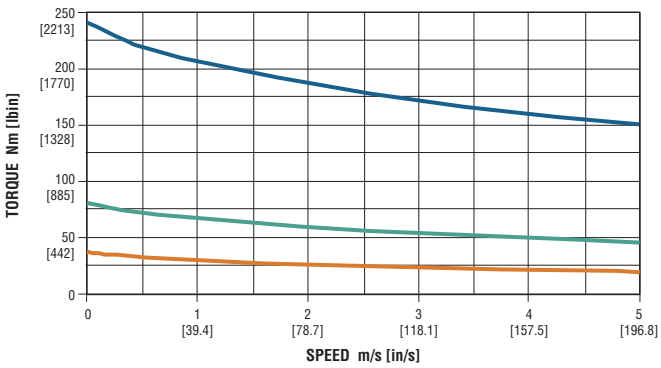
ENGINEERING DATA: SERIES ESU LINEAR ACTUATOR - RT VERSION

This section contains information on the capabilities of the Series ESU -RT version. It is not intended to be a comprehensive selection guide. To make the selection process simple and quick, refer to PHD's sizing software. You may request application assistance from your distributor or PHD's Inside Sales Department.

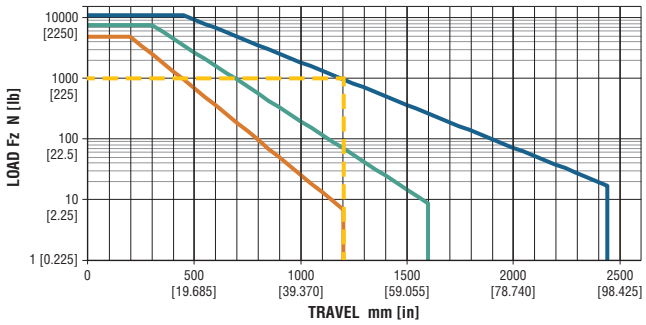
SPEED VS. THRUST



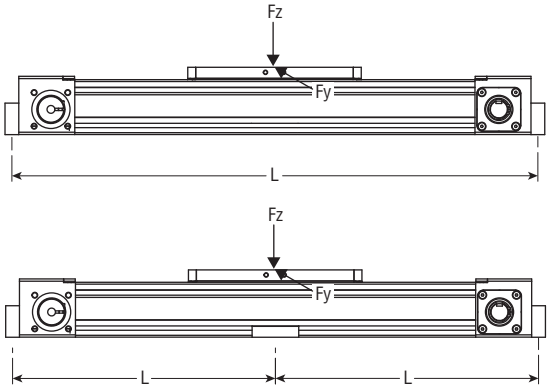
SPEED VS. TORQUE



Load Fz/Fy vs. Maximum Unsupported Length



Mid-Support Calculation illustrated by dashed yellow line in graph above.



MID-SUPPORT CALCULATION

Example (Application Requirements)

Actuator – ESUS size 8
Load Fz – 1000 N [225 lb]
Travel – 3000 mm

Use Load Fz/Fy vs Maximum Unsupported Length graph

1) Find **Maximum Unsupported Length** from the above graph [1000 N = 1200 mm]
2) Calculate **Total Actuator Length** (refer to Dimensions page 68 of the product catalog)
   Total Travel + Dimension A = Total Actuator Length

   3000 + 628.1 = **3628.1 mm**
3) Determine **number of required mid-supports**
   (Total Actuator Length / Maximum Unsupported Length) - 1 = Required mid-supports
   (3628.1 mm / 1200 mm) - 1 = **2 mid-supports** (round up to next whole number)

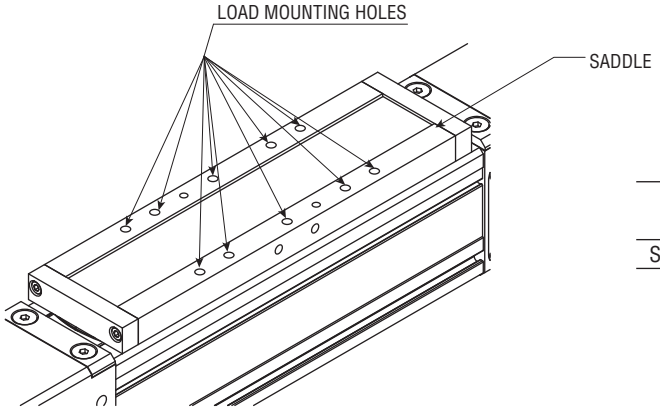
MOUNTING INFORMATION: SERIES ESU LINEAR ACTUATOR - RT VERSION

START-UP PROCEDURE

1) The ESU Linear Actuator should be securely mounted before powering up the electric motor. When mounting the unit on your machine, apply the recommended fastener tightening torques as specified on page 5. For a list of available mounting options, refer to the End/Mid Supports options page in the product catalog.
2) Care should be taken to provide adequate space around the saddle and the attached load/tooling.
3) Make sure that the electric motor and the motor mount kit are securely mounted to the linear actuator and fastened with recommended tightening torques.
4) Due to possible shifting of the outer seal band during handling, be sure to verify that the sealing band is centered, and no gaps exist between the band and slide. For adjustment, loosen the band clamps, adjust the band, and retighten the band clamps. Failure to ensure proper fit may lead to band damage.

OPERATING CONDITIONS

1) It is strongly recommended that the Load/Tooling be fastened to the saddle using all ten threaded mounting holes as shown below. If the tooling is very long, a dual saddle should be used to prevent excessive overhang and corresponding bending moments.



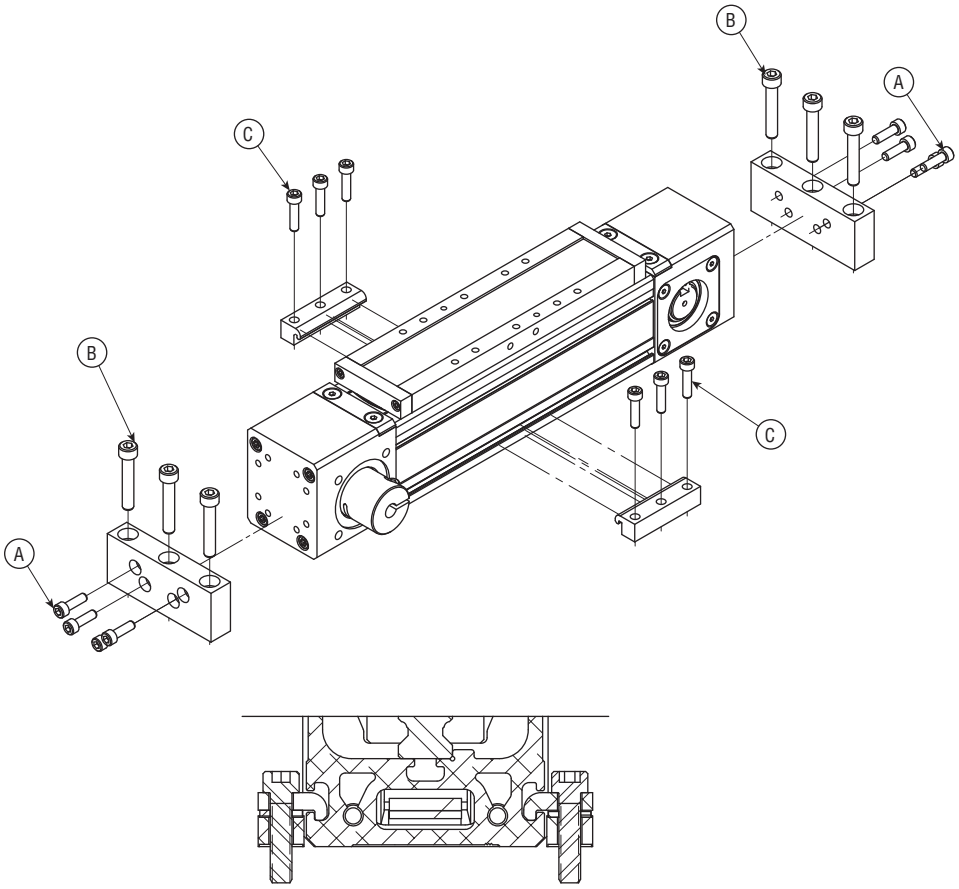
PART DESCRIPTION	TORQUE in-lb [Nm]		
	5	6	8
SHCS for saddle to load	100 [11]	100 [11]	230 [26]

2) The mechanical stop for the saddle, on both ends of the linear actuator, should **not** be used as the end of travel! Always add safe travel of about 25 to 50 mm on both ends to avoid accidental end of travel impact.
3) Use the “Load vs. Max Unsupported Length” chart on page 3 to calculate the need for mid supports. This is very important for proper functioning of the linear actuator.
4) The maximum input torque and speed should not exceed the values specified in the engineering data on page 2.
5) Use ESU sizing software to select the right linear actuator for your application. This will ensure that max moments and loads are not exceeded.
6) The linear actuator is designed for use in a clean industrial environment. The design prevents any solid particles from entering the cylinder. Some indirect splashing of fluids is permitted. Consult factory for more details.

MAINTENANCE

1) Under normal operating conditions, all the components of the ESU Linear Actuator are designed to last at least for 5000 km of life.
2) The linear guides and rail are factory lubricated for life.
3) If the stainless steel sealing band shows signs of excessive wear, it may require to be re-lubricated after 5000 km of life (see instructions on page 6). If required, replace the steel band.
4) Check the belt tension after 2500 km of life and re-tension the belt as per instructions on page 7.

TIGHTENING TORQUES FOR KSxxx END/MID SUPPORTS



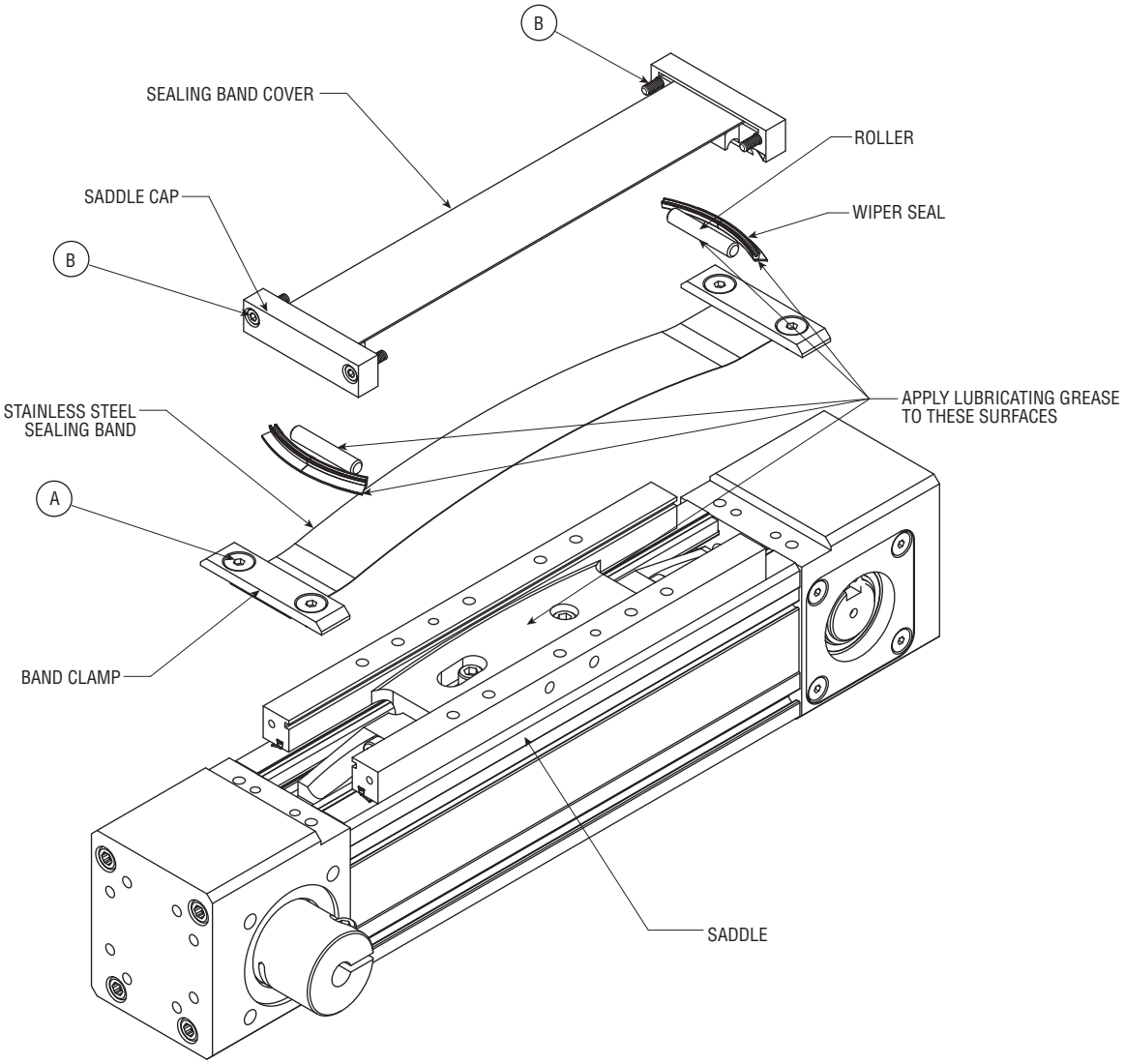
PART DESCRIPTION	FASTENER	TORQUE in-lb [Nm]		
		5	6	8
SHCS for KS1x1 End Supports	A (4 per side)	100 [11]	230 [26]	400 [45]
	B (3 per side)	230 [26]	400 [45]	400 [45]
SHCS for KSx1x Mid Supports	C (3 or 4 per side)	100 [11]	100 [11]	230 [26]

NOTE: PHD does not recommend only the use of mid supports for linear actuator mounting. Utilize end supports when applicable.

SUPPORT REPLACEMENT KITS

SUPPORT KITS	SIZE		
	5	6	8
Head or Cap	90036-01	90036-02	90036-03
Mid	90037-01	90037-02	90037-03

RELUBRICATING SADDLE/SEALING BAND



RECOMMENDED GREASE: NYE RHEOLUBE 368 AX-1

1) Remove the four FHCS screws **A** and take off the band clamps.
2) Remove the four SHCS screws **B** to take off the saddle caps on both ends.
3) Pull the sealing band cover from the saddle and take off the sealing band.
4) Lubricate the convex surface of the saddle with recommended grease.
5) Also lubricate the wiper seals and plastic rollers in the saddle caps.
6) Reinstall one end of the sealing band using the band clamp and screws **A**, with a torque of 60 in-lb [6.7 Nm].
7) Place the sealing band over the saddle onto the other end of the linear actuator. Install the saddle caps and the sealing band cover on the saddle. Tighten the four screws **B** to 40 [4.5], 80 [9], and 130 [15] in-lb [Nm] respectively for ESU sizes 5, 6, and 8.
8) Reinstall the other end of the sealing band using screws **A** with a torque of 60 in-lb [6.7 Nm].

TIMING BELT RE-TENSIONING

Figure 1

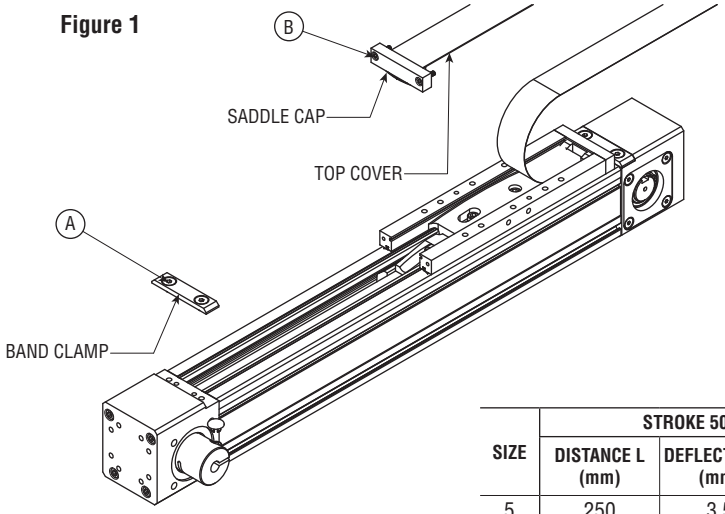
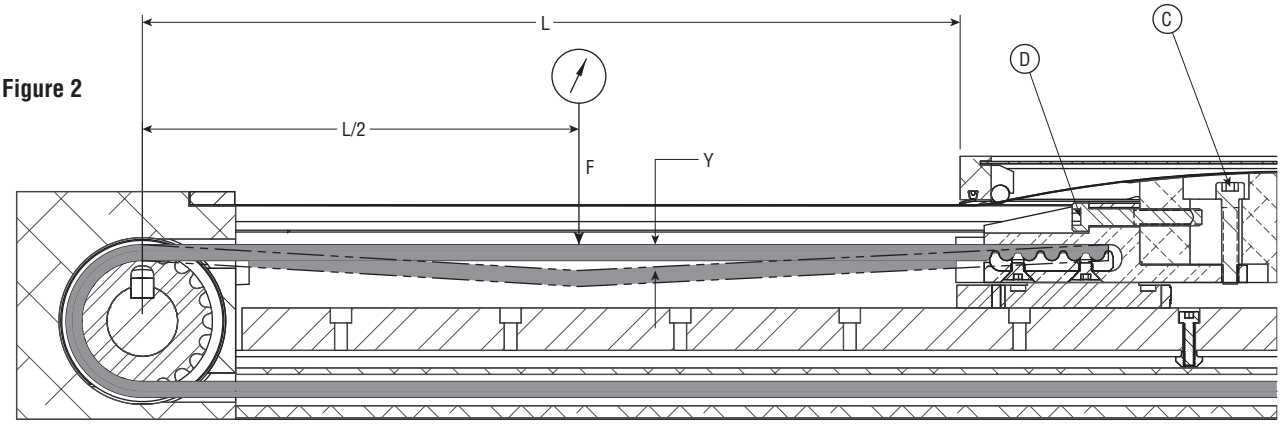


TABLE 1

SIZE	STROKE 50 TO 499 mm			STROKE 500 mm TO MAX		
	DISTANCE L (mm)	DEFLECTION Y (mm)	APPLIED FORCE lb [N]	DISTANCE L (mm)	DEFLECTION Y (mm)	APPLIED FORCE lb [N]
5	250	3.5	9 [40]	500	7	9 [40]
6	250	3.5	16 [70]	500	7	16 [70]
8	250	3.5	30 [130]	500	7	30 [130]

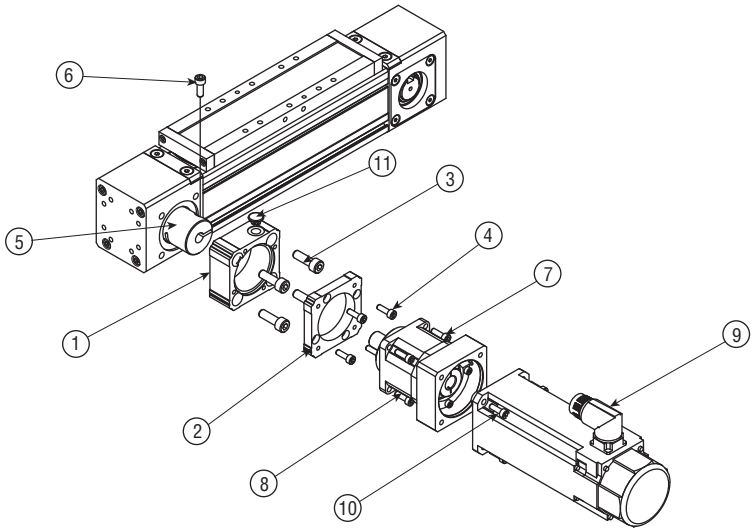
Figure 2

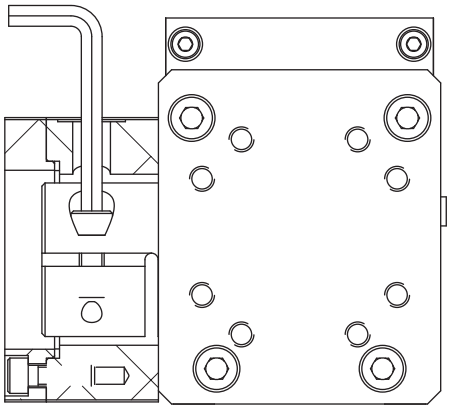


1) Move the saddle to 500 mm [19.6 in] from the motor end as shown above. If the total travel is less than 500 mm, move the saddle to 250 mm [9.8 in] from the motor end.
2) Remove the band clamp screws **A**, along with the saddle cap screws **B** as shown in Figure 1. Fold the sealing band over (as shown) to access the belt tensioning system.
3) On the belt, locate the distance **L**/2 (halfway between saddle and motor end, see Figure 1).
4) Using a force gauge, measure the push force **F** required to deflect the belt by distance **Y** on the belt as shown in Figure 2 at the distance **L**/2.
5) If the applied force to move the belt distance **Y** is less than the force **F** in Table 1, belt tensioning is required.
6) To tension the belt, loosen screw **C**. Next, tighten screw(s) **D** to increase the belt tension as shown in Figure 2 until Force **F** equals the Applied Force value in Table 1 for the respective size.
7) Next, tighten the SHCS **C** to [130 in-lb] 15 Nm on ESU sizes 5 and 6. Size 8 does not have screw **C**.
8) Replace the saddle caps and sealing band cover, tighten the screws **B** to 40 [4.5], 80 [9], and 130 [15] in-lb [Nm] respectively for ESU sizes 5, 6, and 8.
9) Replace the sealing band using the screws **A** with a torque of 60 in-lb [6.7 Nm].

MOTOR MOUNTS: SERIES ESU LINEAR ACTUATOR - RT VERSION

QL11: INLINE MOTOR MOUNT OPTION





KEY	DESCRIPTION	QTY	TORQUE in-lb [Nm]		
			5	6	8
1	COUPLING HOUSING	1	-	-	-
2	GEAR REDUCER/MOTOR MOUNTING PLATE	1	-	-	-
3	BRITE ZINC PLATE (SHCS, LHCS) METRIC FASTENERS	4	250 [28]	250 [28]	400 [45]
4	BRITE ZINC PLATE (SHCS) METRIC FASTENERS	4	80 [9]	130 [15]	250 [28]
5	SHAFT COUPLING (INTEGRAL WITH DRIVE SHAFT)	1	-	-	-
6	BRITE ZINC PLATE (SHCS) METRIC FASTENERS	1	140 [16]	140 [16]	345 [39]
7	BRITE ZINC PLATE (SHCS) METRIC FASTENERS	4	see note below		
8	GEAR REDUCER (IF NEEDED)	2	-	-	-
9	ELECTRIC MOTOR		-	-	-
10	BRITE ZINC PLATE (SHCS) METRIC FASTENERS	4	see note below		
11	HOLE PLUG	1	-	-	-

NOTE: THE TORQUE FOR THESE SCREWS WILL DEPEND ON THE SCREW SIZES ON YOUR MOTOR/GEAR REDUCER.

1) Using the four screws **3**, fasten the housing **1** to the linear actuator and tighten to the recommended torque.
2) Mount the mounting plate **2** to the housing **1** using the four fasteners **4** and tighten to the recommended torque.
3) **Important:** Rotate the linear actuator 90 degrees, such that the shaft coupling **5** is facing upwards. This will ensure that the gear reducer/motor shaft is allowed to self-align with coupling **5**.
4) Insert the gear reducer/motor carefully through the gear reducer/motor mounting plate **2** to allow the shaft to be inserted in the coupling **5**. You may have to apply some force to fully insert the shaft in the coupling.
5) With the flange on the gear reducer/motor in contact with the mounting plate **2**, use the mounting screws **7** to fasten the motor to the mounting plate **2**.
6) To tighten coupling screw **6**, align the head of this screw with the hole in the coupling housing as shown in the view above by moving the saddle to the left or right, which rotates the coupling. Tighten the screw **6** to the recommended torque.
7) Plug the hole on the coupling housing using the plastic plug **11**.
8) Repeat steps 4 to 7 for the motor, if this is a gear reducer and motor combination.