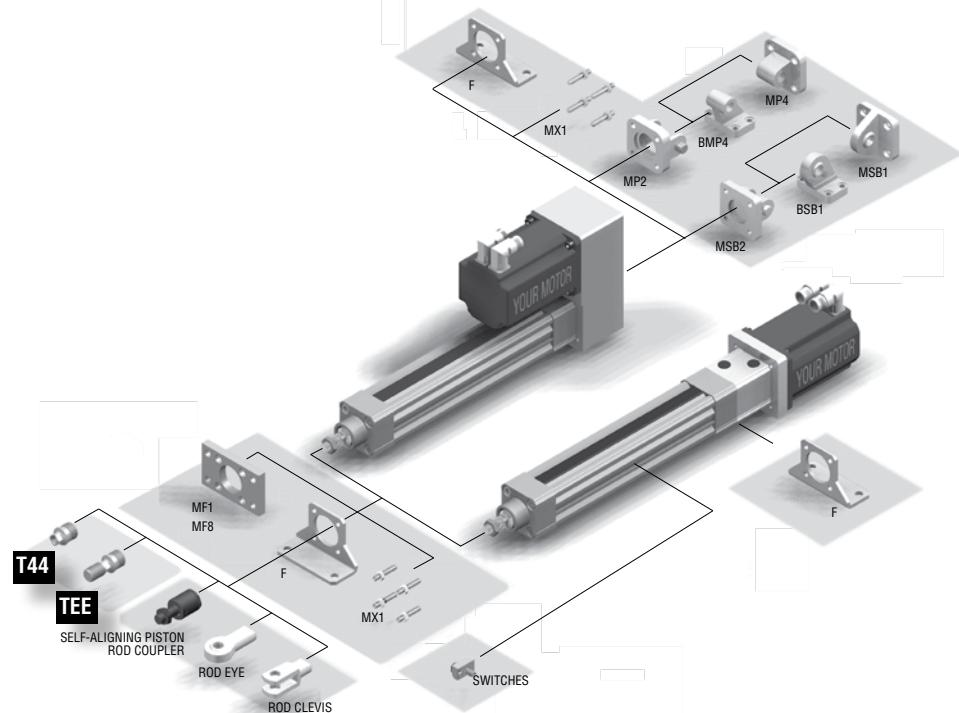
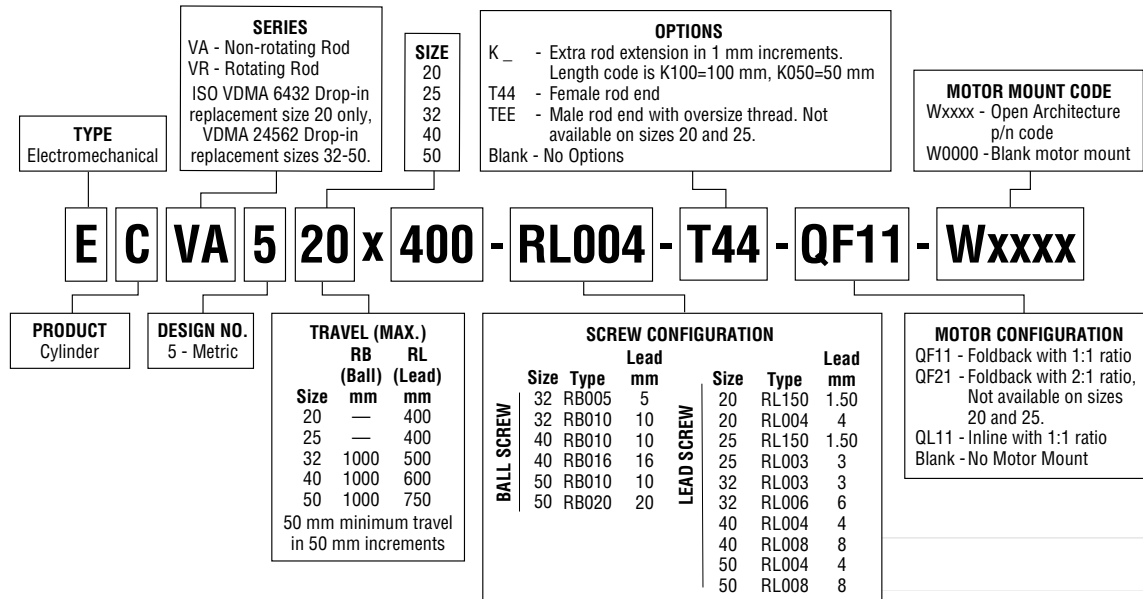


IMPORTANT INFORMATION DO NOT DISCARD!

Use this information sheet to assist with cylinder installation and setup.
File with maintenance or machine documentation.



**ENGINEERING DATA: SERIES ECV RB ELECTRIC CYLINDERS-BALL SCREW**

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SPECIFICATIONS	BALL SCREW SERIES ECVA	BALL SCREW SERIES ECVR®
PISTON ROD	Non-Rotating	Rotating
REPEATABILITY ¹	±0.01 mm [±0.0004 in]	
MAXIMUM BACKLASH ²	0.025 mm [0.001 in]	
RATED LIFE	Refer to Life vs. Thrust Chart (page 8)	
FULL TRAVEL TOLERANCE ⁷	+3.5/-0.0 mm [+0.138/-0.000 in]	
DUTY CYCLE	100%	
OPERATING TEMPERATURE	4 - 65°C [40 - 150°F]	
LUBRICATION INTERVAL ³	Horizontal: 2500 km [100 million in], Vertical: 1500 km [60 million in]	
ENCAPSULATION CLASS	IP50	

SPECIFICATIONS				SIZE													
				32		40		50									
MECHANICS	MAXIMUM TRAVEL			mm [in]					1000 [39.37]								
	DRIVE MECHANISM								Ball Screw								
	SCREW DIAMETER			mm		12			16		20						
	SCREW CONFIGURATION					-RB005		-RB010		-RB010		-RB016		-RB010		-RB020	
	SCREW LEAD			mm		5		10		10		16		10		20	
SPEED ⁴	MAXIMUM SPEED			mm/sec [in/sec]		500 [19.6]		1000 [39.3]		1000 [39.3]		1600 [63.0]		1000 [39.3]		2000 [78.7]	
	MAXIMUM RPM			rev/min							6000						
	MAXIMUM ACCELERATION		-QL11	m/sec ² [in/sec ²]							19.6 [772]						
			-QFx1	m/sec ² [in/sec ²]							9.8 [386]						
THRUST ⁴	MAXIMUM THRUST			N [lbf]		1360 [306]		680 [153]		2430 [546]		1520 [342]		4410 [991]		2510 [564]	
TORQUE	PERMISSIBLE DRIVE TORQUE ⁶		-QL11	Nm [in-lb]		1.2 [10.62]				4.3 [38.06]				7.8 [69.03]			
			-QFx1	Nm [in-lb]		0.84 [7.43]				3 [26.55]				5.46 [48.32]			
	NO-LOAD TORQUE			Nm [in-lb]		0.10 [0.89]				0.25 [2.21]				0.40 [3.54]			
WEIGHT	TOTAL @ ZERO STROKE (W _{0T})			kg [lb]		1.16 [2.55]				1.49 [3.29]				2.36 [5.20]			
	TOTAL LENGTH ADDER (W _{LT})			kg/mm [lb/in]		0.0034 [0.19]				0.0046 [0.26]				0.0071 [0.40]			
	MOVING @ ZERO STROKE (W _{0M})			kg [lb]		0.30 [0.66]				0.52 [1.14]				0.98 [2.15]			
	MOVING LENGTH ADDER (W _{LM})			kg/mm [lb/in]		0.0010 [0.058]				0.0010 [0.058]				0.0020 [0.111]			
INERTIA	ACTUATOR @ ZERO STROKE (J ₀)			kg-m ² [lb-in ²]		3.00 x 10 ⁻⁶ [0.010]				1.50 x 10 ⁻⁵ [0.051]				4.84 x 10 ⁻⁵ [0.165]			
	LENGTH ADDER (J _L)			kg-m ² /mm [lb-in ² /in]		9.85 x 10 ⁻⁹ [0.0009]				2.90 x 10 ⁻⁸ [0.0025]				7.95 x 10 ⁻⁸ [0.0069]			
	MOVING WEIGHT ADDER (J _M)			kg-m ² /kg [lb-in ² /lb]		6.21 x 10 ⁻⁷ [9.63 x 10 ⁻⁴]		2.48 x 10 ⁻⁶ [3.85 x 10 ⁻³]		2.48 x 10 ⁻⁶ [3.85 x 10 ⁻³]		6.36 x 10 ⁻⁶ [9.86 x 10 ⁻³]		2.48 x 10 ⁻⁶ [3.85 x 10 ⁻³]		9.93 x 10 ⁻⁶ [1.54 x 10 ⁻²]	
	MOTOR CONFIGURATION (J ₀)		-QF11	kg-m ² [lb-in ²]		1.40 x 10 ⁻⁵ [0.048]				4.71 x 10 ⁻⁵ [0.161]				4.65 x 10 ⁻⁵ [0.159]			
			-QF21			2.75 x 10 ⁻⁵ [0.094]				8.28 x 10 ⁻⁵ [0.283]				1.91 x 10 ⁻⁴ [0.654]			
			-QL11			3.14 x 10 ⁻⁶ [0.011]				6.11 x 10 ⁻⁶ [0.021]				4.04 x 10 ⁻⁵ [0.138]			

NOTES:

- 1) UNIDIRECTIONAL
- 2) AXIAL FREE PLAY WHEN DRIVE SHAFT LOCKED
- 3) REFER TO OPERATING INSTRUCTIONS FOR RE-LUBRICATION DETAILS
- 4) REFER TO PERFORMANCE CHARTS IN CATALOG
- 5) 2500 km [100 MILLION INCHES] LIFE
- 6) CORRESPONDS TO MAXIMUM THRUST
- 7) FOR HOMING AND INCREASED APPLICATION FLEXIBILITY, INCLUDE EXTRA TRAVEL WHEN NECESSARY.
- 8) SERIES VR REPEATABILITY AND BACKLASH A FUNCTION OF COUPLING RIGIDITY TO EXTERNAL NON-ROTATING LOAD
- 9) ALL DIMENSIONS ARE FOR REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED. REFER TO ONLINE SIZING SOFTWARE FOR ACTUAL VALUES.

**ENGINEERING DATA: SERIES ECV RL ELECTRIC CYLINDERS-LEAD SCREW**

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SPECIFICATIONS	LEAD SCREW SERIES ECV A	LEAD SCREW SERIES ECV R
PISTON ROD	Non-Rotating	Rotating
REPEATABILITY ¹	±0.5 mm [±0.020 in]	
MAXIMUM BACKLASH ²	0.03 - 0.20 mm [0.001 - 0.008 in]	
RATED LIFE	Refer to Online Sizing	
FULL TRAVEL TOLERANCE	+3.5/-0.0 mm [+0.138/-0.000 in]	
MAXIMUM DUTY CYCLE	35%	
OPERATING TEMPERATURE	4 - 65°C [40 - 150°F]	
LUBRICATION INTERVAL ³	Horizontal: 500 km [20 million in], Vertical: 250 km [10 million in]	
ENCAPSULATION CLASS	IP50	

SPECIFICATIONS			SIZE									
			20		25		32		40		50	
MECHANICS	MAXIMUM TRAVEL	mm [in]	400 [15.75]		400 [15.75]		500 [19.68]		600 [23.62]		750 [29.53]	
	SCREW DIAMETER	mm	8		10		12		16		20	
SPEED ¹	SCREW CONFIGURATION		-RL150	-RL004	-RL150	-RL003	-RL003	-RL006	-RL004	-RL008	-RL004	-RL008
	SCREW LEAD	mm	1.5		4		1.5		3		3	
THRUST	MAXIMUM SPEED	mm/sec [in/sec]	30 [1.2]	80 [3.15]	30 [1.20]	60 [2.40]	60 [2.40]	120 [4.80]	80 [3.15]	160 [6.3]	80 [3.15]	160 [6.3]
	MAXIMUM RPM	rev/min	1200		1200		1200		1200		1200	
TORQUE	MAXIMUM ACCELERATION	mm/sec ² [in/sec ²]	0.3 [11.81]	1.0 [39.37]	0.3 [11.81]	1.0 [39.37]	0.3 [11.81]	1.0 [39.37]	0.5 [19.69]	1.0 [39.37]	0.5 [19.69]	1.0 [39.37]
	MAXIMUM THRUST	N [lbf]	300 [67.5]	150 [33.7]	500 [112]	250 [56]	800 [180]	400 [90]	1600 [360]	800 [180]	2500 [562]	1250 [281]
WEIGHT	PERMISSIBLE DRIVE TORQUE ⁵	-QL11 Nm [in-lb]	0.5 [4.42]		0.7 [6.20]		1.2 [10.62]		4.3 [38.06]		7.8 [69.03]	
		-QFx1 Nm [in-lb]					0.84 [7.43]		3 [26.55]		5.46 [48.32]	
INERTIA	NO-LOAD TORQUE	Nm [in-lb]	0.09 [0.80]		0.12 [1.00]		0.10 [0.89]		0.25 [2.21]		0.40 [3.54]	
	TOTAL @ ZERO STROKE (W _{0T})	kg [lb]	0.57 [1.26]		0.77 [1.70]		1.08 [2.39]		1.38 [3.05]		2.16 [4.77]	
	TOTAL LENGTH ADDER (W _{L1})	kg/mm [lb/in]	0.0015 [0.08]		0.002 [0.11]		0.0034 [0.19]		0.0046 [0.26]		0.0071 [0.40]	
	MOVING @ ZERO STROKE (W _{0M})	kg [lb]	0.08 [0.18]		0.14 [0.30]		0.23 [0.50]		0.41 [0.90]		0.78 [1.72]	
	MOVING LENGTH ADDER (W _{Lm})	kg/mm [lb/in]	0.0004 [0.021]		0.0006 [0.034]		0.0010 [0.058]		0.001 [0.058]		0.002 [0.114]	
	ACTUATOR @ ZERO STROKE (J ₀)	kg-m ² [lb-in ²]	1.66 x 10 ⁻⁶ [0.006]		2.09 x 10 ⁻⁶ [0.007]		3.00 x 10 ⁻⁶ [0.010]		1.50 x 10 ⁻⁵ [0.051]		4.84 x 10 ⁻⁵ [0.165]	
	LENGTH ADDER (J _L)	kg-m ² /mm [lb-in ² /in]	1.59 x 10 ⁻⁹ [0.00014]		4.94 x 10 ⁻⁹ [0.00043]		9.85 x 10 ⁻⁹ [0.0009]		2.90 x 10 ⁻⁸ [0.0025]		7.95 x 10 ⁻⁸ [0.0069]	
	MOVING WEIGHT ADDER (J _M)	kg-m ² /kg [lb-in ² /lb]	3.8 x 10 ⁻⁸	1.01 x 10 ⁻⁷	3.8 x 10 ⁻⁸	7.6 x 10 ⁻⁸	7.6 x 10 ⁻⁸	1.52 x 10 ⁻⁷	1.01 x 10 ⁻⁷	2.03 x 10 ⁻⁷	1.01 x 10 ⁻⁷	2.03 x 10 ⁻⁷
MOTOR CONFIGURATION (J ₀)		-QF11	2.69 x 10 ⁻⁵ [0.092]		2.69 x 10 ⁻⁵ [0.092]		1.40 x 10 ⁻⁵ [0.048]		4.71 x 10 ⁻⁵ [0.161]		4.65 x 10 ⁻⁵ [0.159]	
		-QF21	—		—		2.75 x 10 ⁻⁵ [0.094]		8.28 x 10 ⁻⁵ [0.283]		1.91 x 10 ⁻⁴ [0.654]	
		-QL11	1.89 x 10 ⁻⁶ [0.006]		1.89 x 10 ⁻⁶ [0.006]		3.14 x 10 ⁻⁶ [0.011]		6.11 x 10 ⁻⁶ [0.021]		4.04 x 10 ⁻⁵ [0.138]	

NOTES::

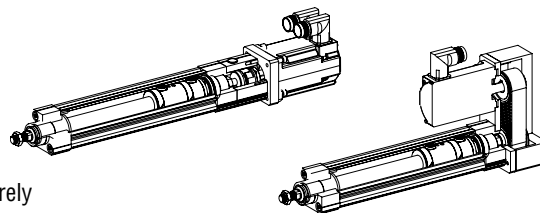
- 1) UNIDIRECTIONAL
- 2) VALUES CORRESPOND TO INITIAL (AS SUPPLIED NEW) CONDITION. BACKLASH MAY INCREASE OVER TIME
- 3) REFER TO OPERATING INSTRUCTIONS FOR RE-LUBRICATION DETAILS
- 4) REFER TO PERFORMANCE CHARTS IN CATALOG
- 5) CORRESPONDS TO MAXIMUM THRUST

MOUNTING INFORMATION: SERIES ECV ELECTRIC CYLINDERS

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START-UP PROCEDURE

- The ECV should be securely mounted before powering up the motor. When mounting the unit, apply the recommended fastener torque as specified on page 7. For a list of available mounting options refer to the product catalog.
- Care should be taken to provide adequate space for the cylinder rod to extend.
- Make sure that the motor and the motor mount kit (inline or fold-back) are securely mounted to the cylinder and fastened with the recommended torques.



- When tightening or loosening the payload to the ECV threaded joint, use the flats on the rod end to prevent torque transmission into the rod.

OPERATING CONDITIONS



- The payload or external mass attached to the cylinder rod should be guided. Depending on the application, you may guide this load by using either PHD's cantilever type ESK/ESL or saddle type ESG Slides, or any other external guidance methods.



- -RB (Ball Screw) ONLY - When using light unguided loads, refer to the side load vs. stroke chart in the catalog for the maximum permissible loads. -RL (Lead Screw) - NO side load permitted.
- **The maximum input torque and speed should not exceed the values specified in the engineering data on pages 2 and 3.**
- The cylinder is designed for use in a clean industrial environment.
- Do not use the cylinder in a wash-down environment. Consult PHD if your application requires wash-down.

Only on Series ECVA Cylinders:

- When attaching the load to the rod it is highly recommended to use a self-aligning rod coupler to prevent internal friction caused by misalignment. These couplers provide greater reliability by reducing component wear and simplifying alignment problems.

Only on Series ECVR Cylinders:

- The ECVR requires the external payload to provide non-rotation to the system. This payload must be rigidly coupled to the rod to ensure axial motion. Any rotation will directly affect the performance of the system and result in lost motion.

MAINTENANCE



- The ECV cylinder is not field repairable.

Re-lubricate nut and screw using recommended grease at the following intervals

Screw Type	Lubricant	Orientation	
		Horizontal	Vertical
-RBxxx (Ball Screw)	Castrol Longtime PD2 (NLGI Class 2)	100 M in [2500 km]	60 M in [1500 km]
-RLxxx (Lead Screw)	NYE Rheolube 368 AX-1	20 M in [500 km]	10 M in [250 km]

- After each lubrication interval, inspect shaft couplings, timing belt and screw assembly for excessive backlash. Replace coupling spider or timing belt as necessary.

MOUNTING: SERIES ECVx-RB

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RELUBRICATING BALL SCREW ASSEMBLY

ECVA-RB

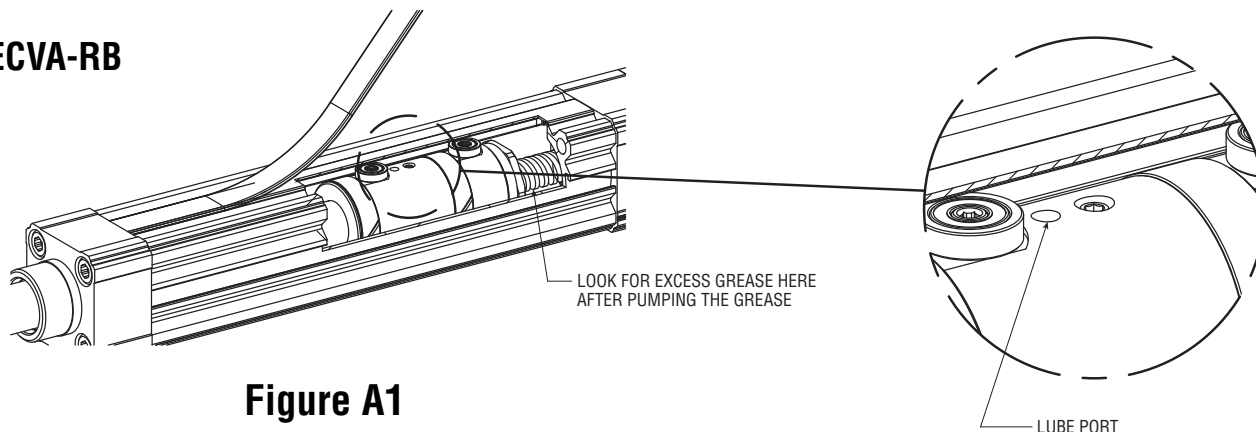


Figure A1

ECVR-RB

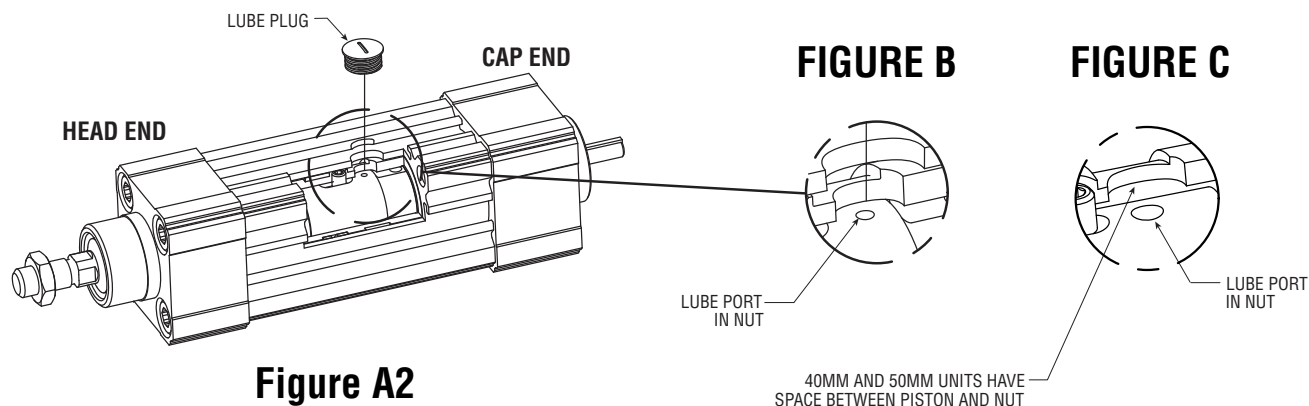


Figure A2

RECOMMENDED GREASE: CASTROL LONGTIME PD 2 (NLGI CLASS2)

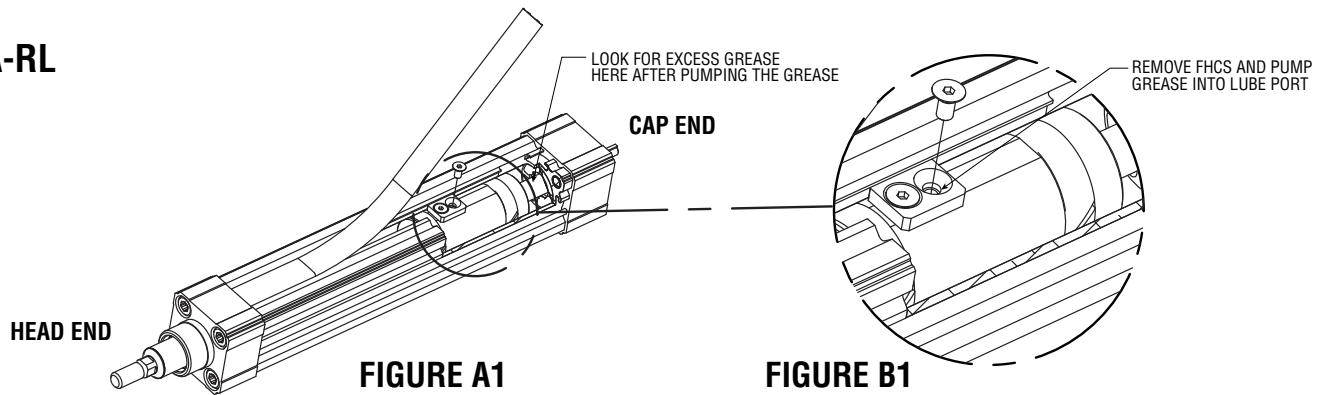
1. Remove the SLOT COVER or LUBE PLUG from the cylinder (Figure A1).
 - ROTATING (ECVR) UNITS: Fully retract the cylinder and rotate rod clockwise until the LUBE PORT in the piston is accessible. This step may require disengagement of the motor brake or attached load.
2. Using grease gun, pump the recommended grease into the LUBE PORT in the BALL NUT (Figure B). Be sure to lubricate the indicated LUBE PORT in the BALL NUT, not extraneous geometry in piston (Figure C).
3. Pump the grease until it fully fills the piston assembly.
4. Cycle the cylinder at low speeds or by hand keeping any contaminant from entering the tube, then repeat step 3.
5. Reinstall the SLOT COVER or LUBE PLUG.

MAINTENANCE: SERIES ECVx-RL ELECTRIC CYLINDERS

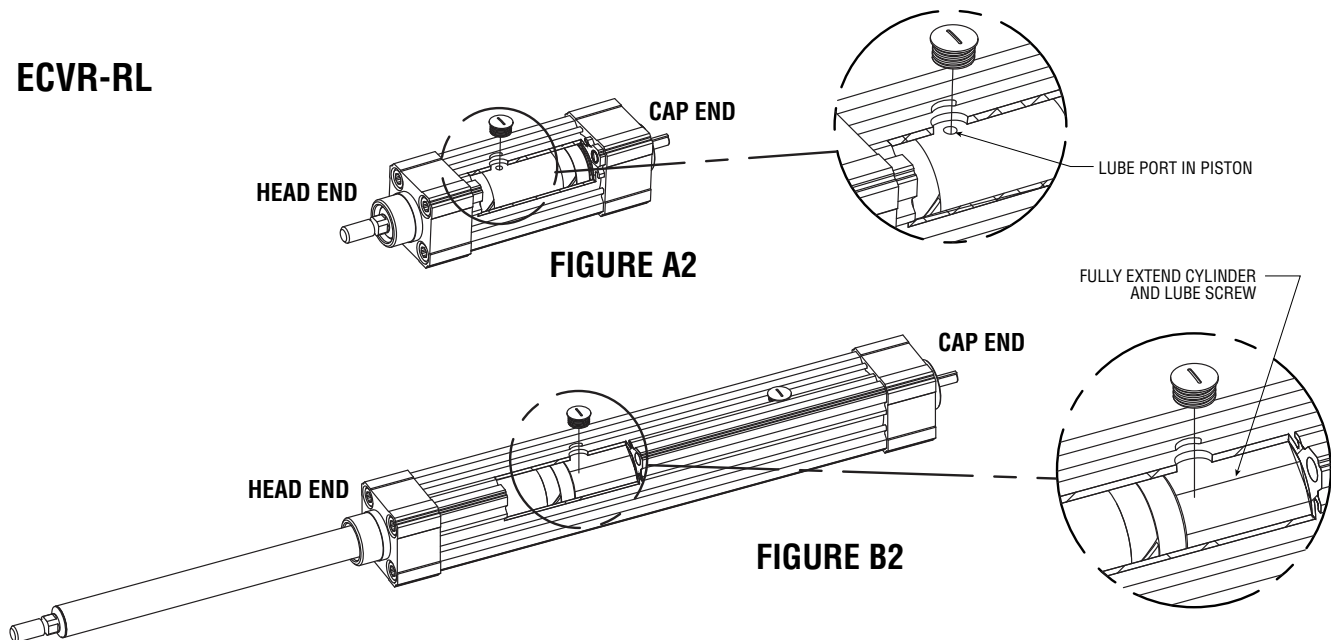
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RELUBRICATING LEAD SCREW ASSEMBLY

ECVA-RL



ECVR-RL



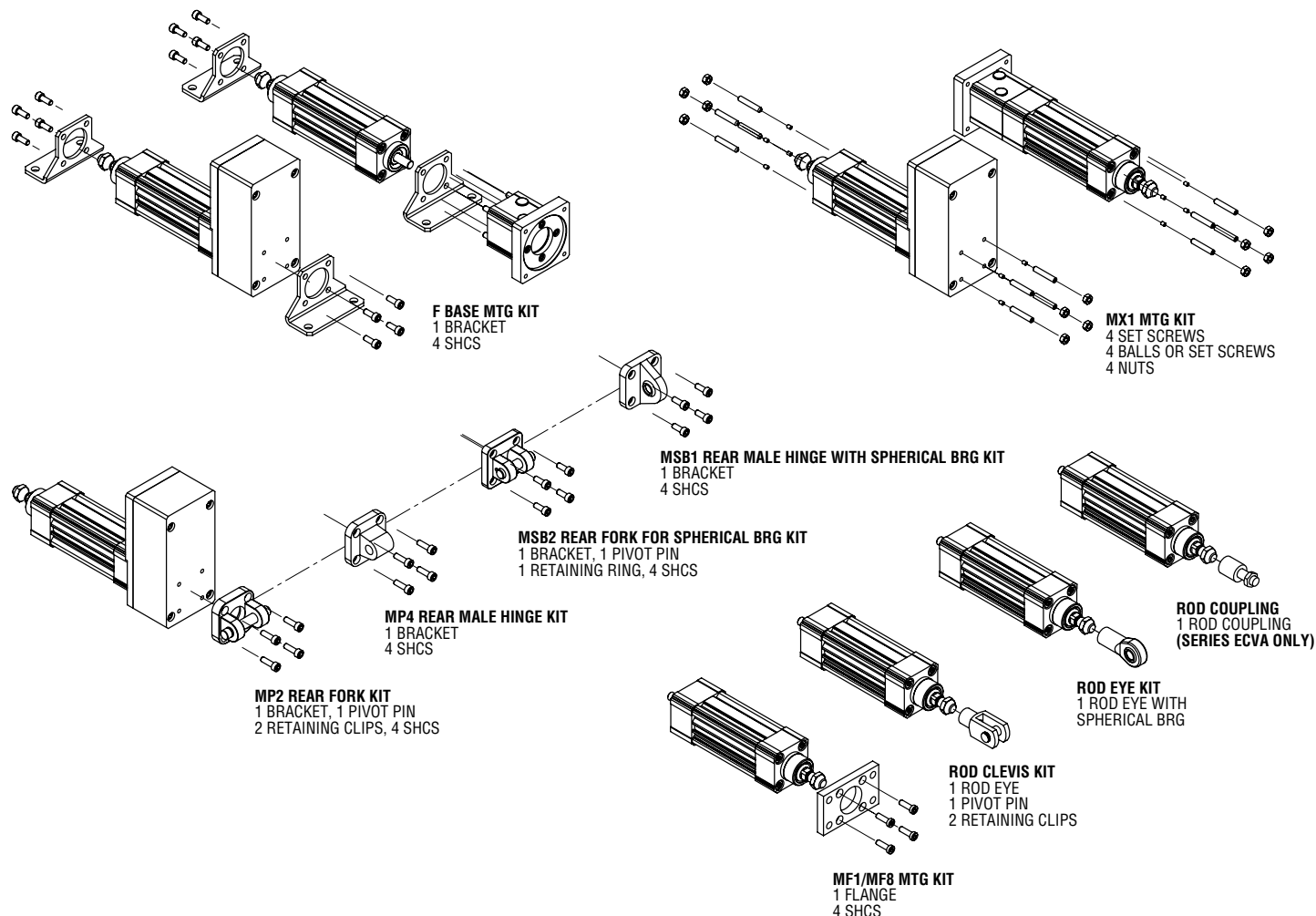
RECOMMENDED GREASE: NYE RHEOLUBE 368 AX-1

1. Remove the SLOT COVER or the LUBE PLUG from the cylinder (Figure A1).
 - NON-ROTATING (ECVA) UNITS: Fully retract the cylinder and remove the CAP END FHCS in the anti-rotation key. (Figure A1)
2. ROTATING (ECVR) UNITS: Fully retract the cylinder and rotate the rod clockwise until the LUBE PORT in piston is accessible. (Figure A2) This step may require disengagement of the motor brake or attached load.
3. Using grease gun, pump the recommended grease into LUBE PORT in the PISTON (Figure A2). Be sure to lubricate the indicated LUBE PORT in the PISTON.
4. Pump the grease until it fully fills the piston assembly.
5. For Lead Screw units with 200mm of travel or more, fully extend the cylinder and lube the screw as shown in (Figure B2).
6. Cycle the cylinder at low speeds or by hand, keeping any contaminant from entering the tube, then repeat step 3.
7. Reinstall the SLOT COVER or LUBE PLUG.

MOUNTING INSTRUCTIONS & MAINTENANCE: SERIES ECV

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TIGHTENING TORQUES FOR MOUNTING KITS



TORQUES FOR KITS

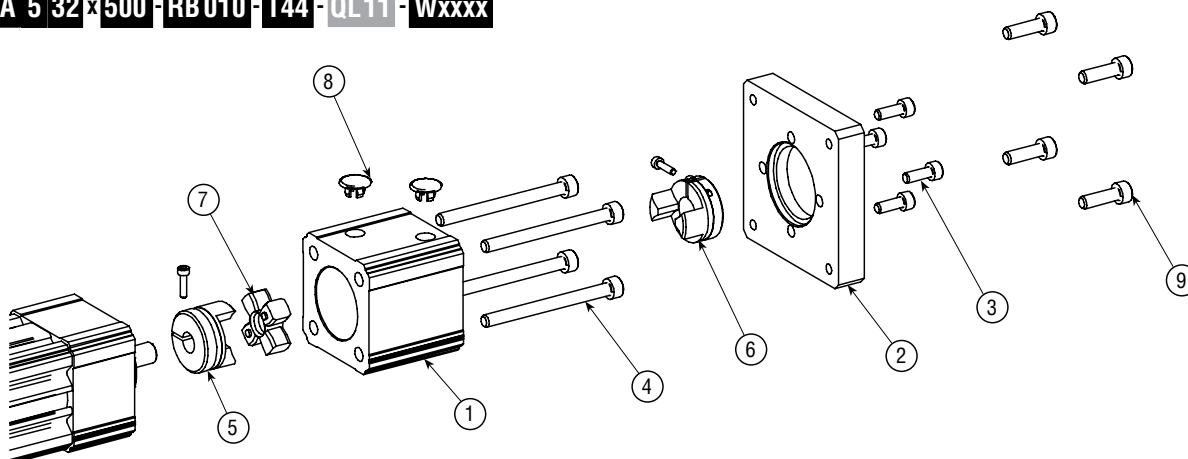
PART DESCRIPTION	TORQUE in-lb [Nm]				
	20 mm	25 mm	32 mm	40 mm	50 mm
SHCS FOR F, MPS, MP4, MSB1, MSB2	40 [4.5]	40 [4.5]	100 [11]	100 [11]	230 [26]
LHCS FOR MF1/MF8	40 [4.5]	40 [4.5]	100 [11]	100 [11]	230 [26]
SET SCREW FOR MX1	40 [4.5]	40 [4.5]	40 [4.5]	40 [4.5]	90 [10]

MOTOR MOUNTS: SERIES ECV ELECTRIC CYLINDERS

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QL11 INLINE MOTOR MOUNTING WITH 1:1 DRIVE RATIO

E C VA 5 32 x 500 - RB010 - T44 - QL11 - Wxxxx



	DESCRIPTION	QTY	TORQUE in-lb [Nm]									
			ECV20		ECV25		ECV32		ECV40		ECV50	
1	Coupling Housing	1	-	-	-	-	-	-	-	-	-	-
2	Motor Mounting Plate	1	-	-	-	-	-	-	-	-	-	-
3	Brite Zinc Plate Metric Fasteners	4	26	[2.9]	26	[2.9]	50	[5.5]	50	[5.5]	50	[5.5]
4	Brite Zinc Plate Metric Fasteners	4	26	[2.9]	26	[2.9]	100	[11]	100	[11]	230	[26]
5	Coupling Hub	1	6	[0.72]	6	[0.72]	18	[2]	18	[2]	80	[9]
6	Coupling Hub	1	6	[0.72]	6	[0.72]	18	[2]	18	[2]	80	[9]
7	Coupling Spider	1	-	-	-	-	-	-	-	-	-	-
8	Hole Plug	2	-	-	-	-	-	-	-	-	-	-
9	Motor Screw	4	See note below									

NOTE: The torque on these screws will depend on the screw sizes on your motor.

ASSEMBLY INSTRUCTIONS

(Please use Loctite 248 or equivalent on all fasteners)

1. Mount the coupling hub half **5** on the ECV cylinder shaft. Dimensions in Figures D & E are factory suggestions and may not work in every combination. Ensure maximum coupling engagement on each shaft while retaining full spider engagement. Avoid axial loading either shaft.

Figure D	L	Standard Assembly		
		ECV Size	Dimension L in [mm]	
		20	0.118	[3]
		25	0.118	[3]
		32	0.197	[5]
		40	0.295	[7.5]
		50	0.178	[4.5]

Figure E	M	Assembly with "F" Type Mount		
		ECV Size	Dimension M in [mm]	
		20	0.197	[5]
		25	0.197	[5]
		32	0.276	[7]
		40	0.374	[9.5]
		50	0.256	[6.5]

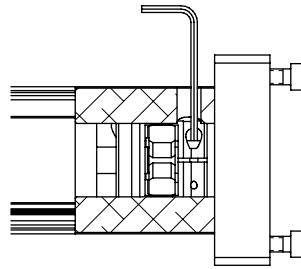
(continued on next page)

MOTOR MOUNTS: SERIES ECV ELECTRIC CYLINDERS

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2. Mount the spider **7** to the coupling hub **5**.
3. Mount the other coupling hub **6** on the spider **7**. Loosen the cap screw on coupling hub **6**.
4. Using the four cap screws **4**, fasten the housing **1** to the cylinder. If an "F" type foot mounting bracket option is being used, mount the bracket between the cylinder and the housing **1** as shown in Figure E. Align the cap screw on coupling hub **6** with the hole in the housing **1**.
5. Mount the motor mounting plate **2** to the housing using the four fasteners **3**, and tighten to the recommended torque.
6. Insert the motor carefully through the motor mounting plate **2** such that the motor shaft enters the hole in the coupling hub **6**. You may have to apply some force to fully insert the motor shaft in the coupling hub.
7. With the motor flush to the motor mounting plate, use the mounting screws **9** to fasten the motor to the mounting plate **2**.
8. To tighten the cap screw on coupling hub **6**, align the head of the cap screw with the hole in the housing **1** as shown in Figure F. If you have lost alignment, realign by either pushing or pulling the cylinder rod or by rotating the motor shaft. Tighten to the recommended torque.
9. Plug the two holes on the coupling housing using the plastic plugs **8**.

Figure F



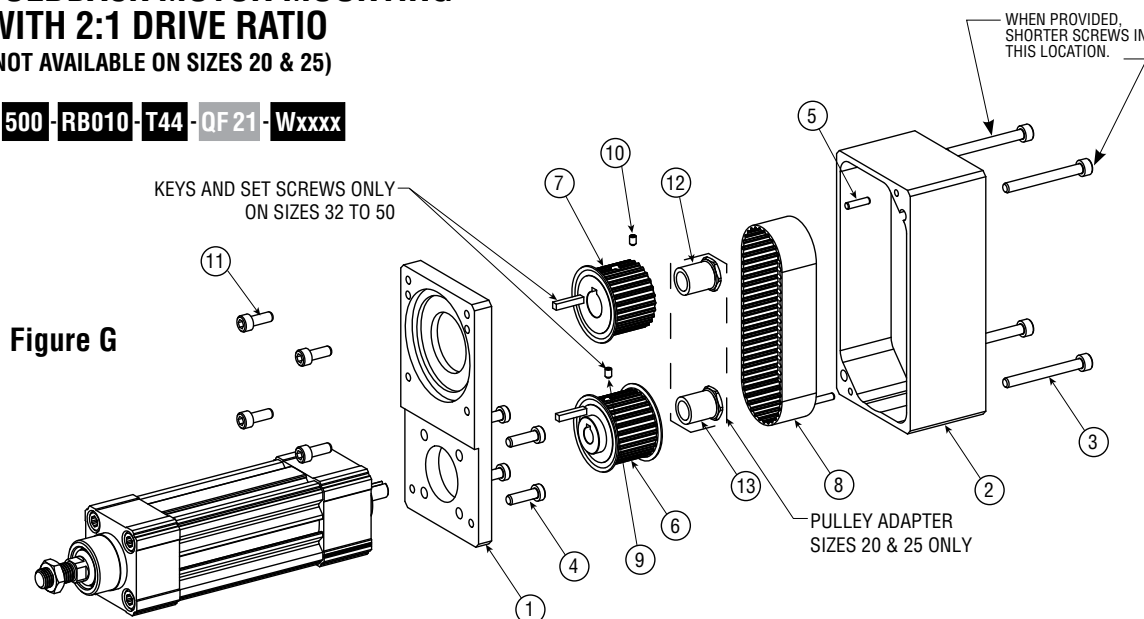
MOTOR MOUNTS: SERIES ECV ELECTRIC CYLINDERS

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QF11 FOLDBACK MOTOR MOUNTING WITH 1:1 DRIVE RATIO

QF21 FOLDBACK MOTOR MOUNTING
WITH 2:1 DRIVE RATIO
 (NOT AVAILABLE ON SIZES 20 & 25)

E C VA 5 32 x 500 - RB010 - T44 - QF 21 - Wxxxx



	DESCRIPTION	QTY	TORQUE in-lb [Nm]									
			ECV20		ECV25		ECV32		ECV40		ECV50	
1	Motor Mounting Plate	1	-	-	-	-	-	-	-	-	-	-
2	Drive Cover	1	-	-	-	-	-	-	-	-	-	-
3	Brite Zinc Metric Fasteners	4	60	[7]	60	[7]	60	[7]	100	[11]	100	[11]
4	Brite Zinc DIN 7984 Metric Fastener	4	100	[11]	100	[11]	100	[11]	100	[11]	230	[26]
5	Metric Dowel Pin	2	-	-	-	-	-	-	-	-	-	-
6	Cylinder Pulley	1	-	-	-	-	-	-	-	-	-	-
7	Motor Pulley	1	-	-	-	-	-	-	-	-	-	-
8	Timing Belt	1	-	-	-	-	-	-	-	-	-	-
9	Metric Socket Set Screw	1	-	-	-	-	15	[1.5]	27	[3]	27	[3]
10	Metric Socket Set Screw	1	-	-	-	-	See note 1 below					
11	Motor Screw	4	-	-	-	-						
12	Motor Pulley Adapter	1	See note 4				-					
13	Cylinder Pulley Adapter	1	44	[5]	44	[5]	-					

NOTE:

- 1) The torque on these screws will depend on the screw sizes on your motor.
- 2) The key shown with the cylinder side pulley will be factory fitted on the cylinder shaft.
- 3) The key shown with the motor side pulley to be used from the customer's motor.
- 4) The torque on this adapter will depend on the shaft size of the motor.
 - Ø 5 mm shaft = 44 [5]
 - Ø 6 mm to Ø 6.35mm shaft = 70 [8]
 - Ø 8 mm shaft = 130 [15]

(continued on next page)

MOTOR MOUNTS: SERIES ECV ELECTRIC CYLINDERS

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ASSEMBLY INSTRUCTIONS

Use Loctite 248 or equivalent on all fasteners (excluding Pulley Adapters).

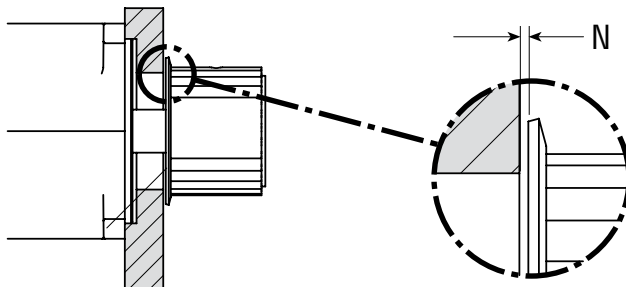
Torque to recommended values.

1. Attach Motor Mounting Plate **1** to actuator and secure with supplied Fasteners **4**.
2. Mount motor [not shown] to Motor plate using supplied Fasteners **11**.
3. Attach Pulleys **6** and **7** to motor and actuator shafts.

SIZES 20 & 25

- a. Insert Motor Pulley Adapter **12** into Pulley **7** and slide over motor shaft.
- b. Maintain clearance between Pulley **7** and Motor Mounting Plate **1** as shown in Figure H.
- c. Torque Motor Pulley Adapter **12** to recommended value. Ensure pulley is protected while torquing.
- d. Place Timing Belt **8** around Pulley **6**.
- e. Insert Cylinder Pulley Adapter **13** into Pulley **6**.
- f. Slide Cylinder Pulley Adapter **13** on actuator shaft while also sliding Timing Belt **8** around Pulley **7** as shown in Figure I. Maintain clearance between Pulley **6** and Motor Mounting Plate **1** as shown Figure H.
- g. Torque Cylinder Pulley Adapter **13** to recommended value.

Figure H



ECV Size	Dimension N in [mm]	
20	0.041	[1.0]
25	0.053	[1.3]
32	0.067	[1.7]
40	0.047	[1.2]
50	0.057	[1.5]

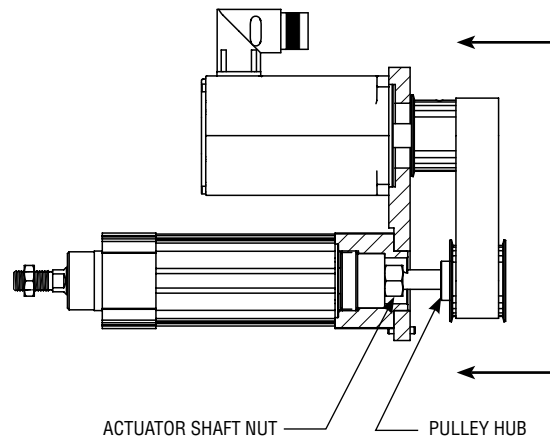


Figure I

MOTOR MOUNTS: SERIES ECV ELECTRIC CYLINDERS

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ASSEMBLY INSTRUCTIONS

SIZES 32 - 50

- a. Slide Motor Pulley **7** over motor shaft while insuring proper placement of key in keyway or Set Screw(s) **10** over flat(s) on motor shaft.
 - b. Maintain clearance between Motor Pulley **7** and Motor Mounting Plate **1** as shown in Figure H.
 - c. Torque Set Screw(s) **10** to recommended value. There may be multiple Set Screws **10** in Motor Pulley **7**.
 - d. Rotate the actuator shaft so the key faces Motor Pulley **7**.
 - e. Place Timing Belt **8** around Cylinder Pulley **6**.
 - f. Slide Cylinder Pulley **6** over actuator shaft while also sliding Timing Belt **8** around Motor Pulley **7** as shown in Figure I. Ensure proper placement of key in keyway.
 - g. Maintain clearance between Cylinder Pulley **6** and Motor Mounting Plate **1** as shown Figure H. The hub on Motor Pulley **7** should contact the nut on the actuator shaft.
 - h. Torque Set Screw **9** to recommended value.
4. Verify Pulleys **6** and **7** alignment as shown in Figure J. Adjust if necessary.
 5. Begin to thread Fasteners **11** to tighten down motor, prior to fully tightening fasteners push motor away from the actuator with approximately 40 lbs of force and torque down Fasteners **11**. This process is crucial for proper belt tension, the pilot diameter of Motor Mounting Plate **1** is elongated to allow for pre-tensioning of belt.
 6. Assemble Dowel Pins **5** in Motor Mounting Plate **1**.
 7. Place Drive Cover **2** on Motor Mounting Plate **1** and secure with Fasteners **3**.

NOTE: Drive Cover **2** must be in place for Timing Belt **8** to track properly.

Figure J

