Part No.: **6441-713C**

SERIES ECP DESIGN 5 CYLINDER INFORMATION MANUAL

TYPE
Electromechanical

SERIES
PA - Protected to IP69K Non-Rotating Rod
PR - Protected to IP69K Rotating Rod

SIZE
32
40
50

OPTIONS
K _ - Extra rod extension in 1mm increments. Length code is K100=100mm, K050=50 mm
T44 - Female rod end, stainless steel applications
TEE - Oversized, threaded, male rod end, stainless steel
Y8 - Stainless steel external construction compatible with caustic washdown. USDA Certified for Product Splash Zone
Y91 - Stainless steel external construction compatible with caustic washdown. USDA Certified for Product Contact Zone

MOTOR MOUNT CODE
Wxxxx - Open Architecture p/n code

E C PA 5 32 x 500 - RB010 - T44 - QF21 - Wxxxx

PRODUCT
Cylinder

DESIGN NO.
5 - Metric

TRAVEL (MAX.)

Size	RB (Ball) mm	RL (Lead) mm
32	750	500
40	750	600
50	750	750

50 mm minimum stroke in 50 mm increments

SCREW CONFIGURATION

	Size	Type	Lead mm
BALL SCREW	32	RB005	5
	32	RB010	10
	40	RB010	10
	40	RB016	16
	50	RB010	10
	50	RB020	20
LEAD SCREW	32	RL003	3
	32	RL006	6
	40	RL004	4
	40	RL008	8
	50	RL004	4
	50	RL008	8

MOTOR CONFIGURATION
QF11 - Foldback with 1:1 ratio
QF21 - Foldback with 2:1 ratio
QL11 - Inline with 1:1 ratio

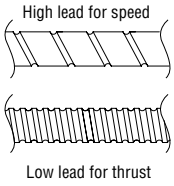
ROD ROTATION

Series ECPA requires no external guidance/coupling for cataloged performance.

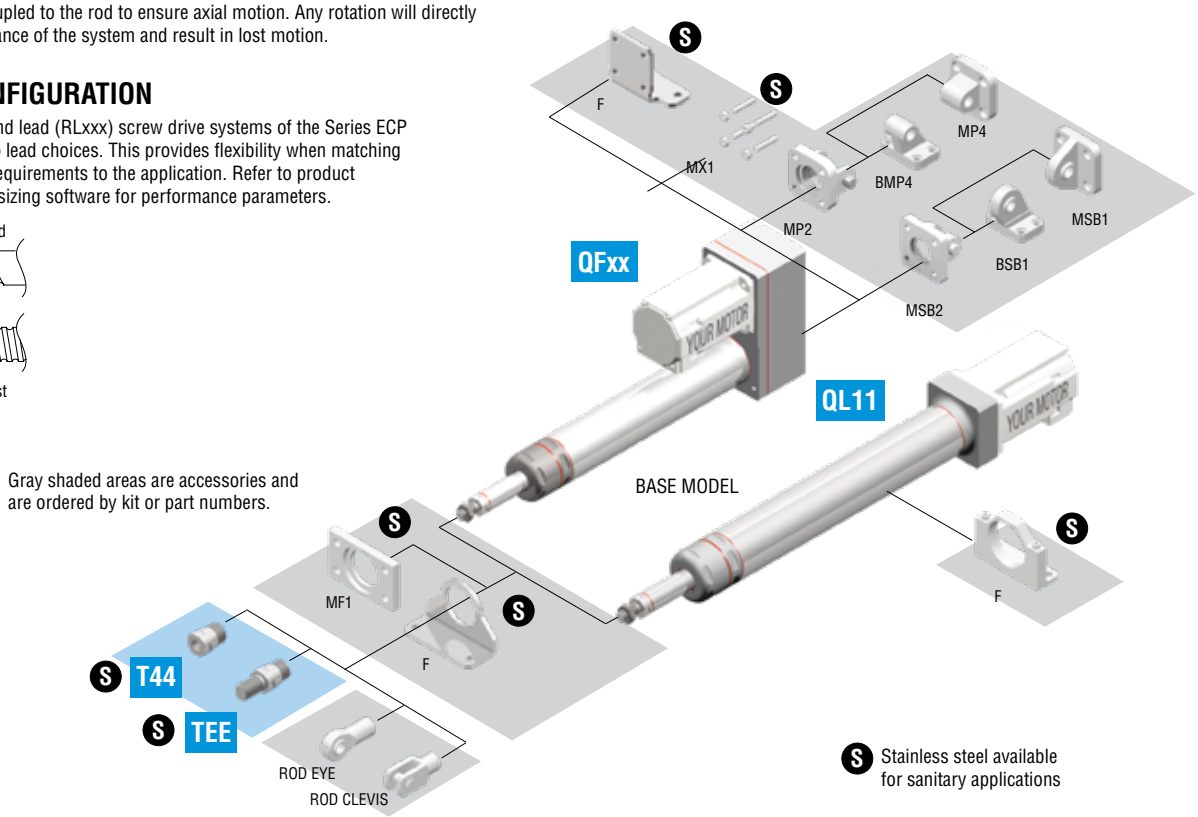
Series ECPR requires external guidance to provide non-rotation to the system. This must be rigidly coupled to the rod to ensure axial motion. Any rotation will directly affect the performance of the system and result in lost motion.

SCREW CONFIGURATION

The ball (RBxxx) and lead (RLxxx) screw drive systems of the Series ECP are available in two lead choices. This provides flexibility when matching velocity and load requirements to the application. Refer to product specifications and sizing software for performance parameters.



MOUNTING OPTIONS & ACCESSORIES



Gray shaded areas are accessories and are ordered by kit or part numbers.

S Stainless steel available for sanitary applications

SERIES ECP DESIGN 5 CYLINDER INFORMATION MANUAL

ENGINEERING DATA: BALL SCREW - RB

SPECIFICATIONS	BALL SCREW SERIES ECPA	BALL SCREW SERIES ECPR[8]
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 in the product catalog	
FULL TRAVEL TOLERANCE[7]	+3.5/-0.0 mm [+0.138/-0.000 in]	
DUTY CYCLE	75%	
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	IP69K	

	SPECIFICATIONS			SIZE					
				32		40		50	
MECHANICS	MAXIMUM TRAVEL		mm [in]	750 [29.53]					
	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_{OT})			Refer to DIMENSIONS pages					
	TOTAL LENGTH ADDER (W_{LT})								
	MOVING @ ZERO STROKE (W_{OM}) BASE & -Y8		kg [lb]	0.33 [0.73]		0.54 [1.19]		1.01 [2.23]	
	MOVING @ ZERO STROKE (W_{OM}) -Y91		kg [lb]	0.36 [0.81]		0.59 [1.31]		1.08 [2.38]	
	MOVING LENGTH ADDER (W_{LM})		kg/mm [lb/in]	0.0007 [0.037]		0.0010 [0.058]		0.0018 [0.102]	
INERTIA	ACTUATOR @ ZERO STROKE (J_O)		$kg\text{-}m^2$ [$lb\text{-}in^2$]	3.00×10^{-6} [0.010]		1.50×10^{-5} [0.051]		4.84×10^{-5} [0.165]	
	LENGTH ADDER (J_L)		$kg\text{-}m^2$/mm [$lb\text{-}in^2$/in]	9.85×10^{-9} [0.0009]		2.90×10^{-8} [0.0025]		7.95×10^{-8} [0.0069]	
	MOVING WEIGHT ADDER (J_M)		$kg\text{-}m^2$/kg	6.21×10^{-7}	2.48×10^{-6}	2.48×10^{-6}	6.36×10^{-6}	2.48×10^{-6}	9.93×10^{-6}
			[$lb\text{-}in^2$/lb]	[9.63×10^{-4}]	[3.85×10^{-3}]	[3.85×10^{-3}]	[9.86×10^{-3}]	[3.85×10^{-3}]	[1.54×10^{-2}]
	MOTOR CONFIGURATION (J_Q)	-QF11	$kg\text{-}m^2$ [$lb\text{-}in^2$]	1.40×10^{-5} [0.048]		4.71×10^{-5} [0.161]		4.65×10^{-5} [0.159]	
		-QF21		2.75×10^{-5} [0.094]		8.28×10^{-5} [0.283]		1.91×10^{-4} [0.654]	
		-QL11		3.14×10^{-6} [0.011]		6.11×10^{-6} [0.021]		4.04×10^{-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 PRODUCT 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 ECPR 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.

WEIGHT AND INERTIAL CALCULATIONS:

TOTAL WEIGHT = W_{OT} + (W_{LT} x TRAVEL) + MOTOR MOUNT WEIGHT [reference Dimension pages in product catalog]
TOTAL MOVING WEIGHT = W_{OM} + (W_{LM} x TRAVEL) + EXTERNAL PAYLOAD

FOR -Qx11: INERTIA $_{Reflected}$ = J_O + (J_L x TRAVEL) + (J_M x TOTAL MOVING WEIGHT) + J_Q
FOR -QF21: INERTIA $_{Reflected}$ = [J_O + (J_L x TRAVEL) + (J_M x TOTAL MOVING WEIGHT)] / 4 + J_Q

Part No.: **6441-713C**

SERIES ECP DESIGN 5 CYLINDER INFORMATION MANUAL

ENGINEERING DATA: LEAD SCREW - RL

SPECIFICATIONS	LEAD SCREW SERIES ECPA	LEAD SCREW SERIES ECPR
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	IP69K	

	SPECIFICATIONS			SIZE 32		SIZE 40		SIZE 50	
MECHANICS	MAXIMUM TRAVEL		mm [in]	500 [19.68]		600 [23.62]		750 [29.53]	
	SCREW DIAMETER		mm	12		16		20	
	SCREW CONFIGURATION			-RL003	-RL006	-RL004	-RL008	-RL004	-RL008
	SCREW LEAD		mm	3	6	4	8	4	8
SPEED[4]	MAXIMUM SPEED		mm/sec [in/sec]	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	
	MAXIMUM ACCELERATION		m/sec² [in/sec²]	0.3 [11.81]	1.0 [39.37]	0.5 [19.69]	1.0 [39.37]	0.5 [19.69]	1.0 [39.37]
THRUST	MAXIMUM THRUST		N [lbf]	800 [180]	400 [90]	1600 [360]	800 [180]	2500 [562]	1250 [281]
TORQUE	PERMISSIBLE DRIVE TORQUE[5]	-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_{OT})			Refer to DIMENSIONS pages					
	TOTAL LENGTH ADDER (W_{LT})								
	MOVING @ ZERO STROKE (W_{OM}) BASE & -Y8		kg [lb]	0.26 [0.57]		0.43 [0.95]		0.82 [1.80]	
	MOVING @ ZERO STROKE (W_{OM}) - Y91		kg [lb]	0.29 [0.64]		0.48 [1.07]		0.89 [1.95]	
	MOVING LENGTH ADDER (W_{LM})		kg/mm [lb/in]	0.0006 [0.034]		0.0010 [0.058]		0.0019 [0.105]	
INERTIA	ACTUATOR @ ZERO STROKE (J_O)		kg-mm² [lb-in²]	3.00×10^{-6} [0.010]		1.50×10^{-5} [0.051]		4.84×10^{-5} [0.165]	
	LENGTH ADDER (J_L)		kg-m²/mm [lb-in²/in]	9.85×10^{-9} [0.0009]		2.90×10^{-8} [0.0025]		7.95×10^{-8} [0.0069]	
	MOVING WEIGHT ADDER (J_M)		kg-m²/kg [lb-in²/lb]	7.6×10^{-8} [1.18×10^{-4}]	1.52×10^{-7} [2.36×10^{-4}]	1.01×10^{-7} [1.57×10^{-4}]	2.03×10^{-7} [3.14×10^{-4}]	1.01×10^{-7} [1.57×10^{-4}]	2.03×10^{-7} [3.14×10^{-4}]
	MOTOR CONFIGURATION (J_Q)	-QF11	kg-m² [lb-in²]	1.40×10^{-5} [0.048]		4.71×10^{-5} [0.161]		4.65×10^{-5} [0.159]	
		-QF21		2.75×10^{-5} [0.094]		8.28×10^{-5} [0.283]		1.91×10^{-4} [0.654]	
		-QL11		3.14×10^{-6} [0.011]		6.11×10^{-6} [0.021]		4.04×10^{-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 PRODUCT CATALOG
5) CORRESPONDS TO MAXIMUM THRUST

WEIGHT AND INERTIAL CALCULATIONS:

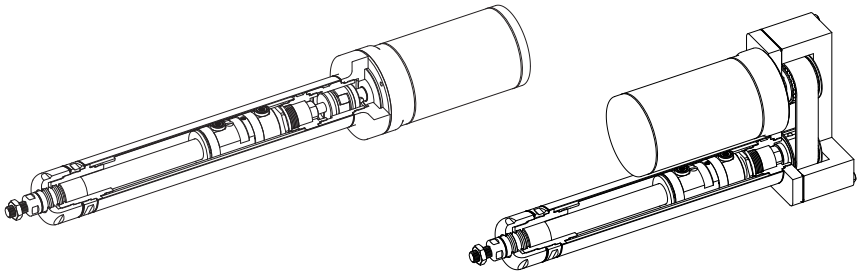
TOTAL WEIGHT = W_{OT} + (W_{LT} x TRAVEL) + MOTOR MOUNT WEIGHT [reference Dimension pages in product catalog]
TOTAL MOVING WEIGHT = W_{OM} + (W_{LM} x TRAVEL) + EXTERNAL PAYLOAD

FOR -Qx11: INERTIA $_{Reflected}$ = J_O + (J_L x TRAVEL) + (J_M x TOTAL MOVING WEIGHT) + J_Q

FOR -QF21: INERTIA $_{Reflected}$ = [J_O + (J_L x TRAVEL) + (J_M x TOTAL MOVING WEIGHT)] / 4 + J_Q

SERIES ECP DESIGN 5 CYLINDER INFORMATION MANUAL

MOUNTING INFORMATION:



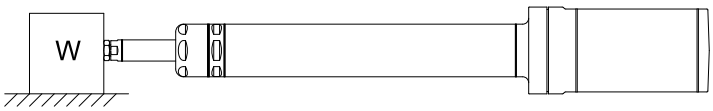
START-UP PROCEDURE

- The cylinder should be securely mounted before powering up the motor. When mounting the unit, apply the recommended fastener torque as specified on pages 7 and 8. Refer to the product catalog for a list of available mounting options.
- The motor (inline or foldback) should be securely mounted to the cylinder and fastened using the recommended fastener torque.
- Adequate space should be provided for the cylinder rod to extend to full travel.

⚠ **Do not transmit torque through the rod and into the actuator. Use the flats on the rod end when tightening or loosening the payload**.

OPERATING CONDITIONS

⚠ **The payload or other external mass that is attached to the cylinder rod should be guided using any external guidance method.**



- -RBxxx (Ball Screw) ONLY - Refer to the side load vs. stroke chart in the product catalog for the maximum permissible side load when using light unguided loads.
- -RLxxx (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 to an ingress protection rating of IP69K and will operate in a wash-down environment (limited by the IP rating of the motor).
- The base model should be used for a non-caustic wash-down application.

  The -Y8 and -Y9x options should be used for a caustic wash-down application.

On ECPR Series Cylinders Only

- The ECPR (Rotating Rod) series cylinder 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 cylinder is not field repairable.**

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

SCREW TYPE	LUBRICANT	ORIENTATION	
		HORIZONTAL	VERTICAL
-RBxxx (Ball Screw)	Chevron FM ALC EP2	100 M in [2500 km]	60 M in [1500 km]
-RLxxx (Lead Screw)	Clarion FM HT EP2	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.

MAINTENANCE: BALL SCREW - RB

RELUBRICATING BALL SCREW ASSEMBLY

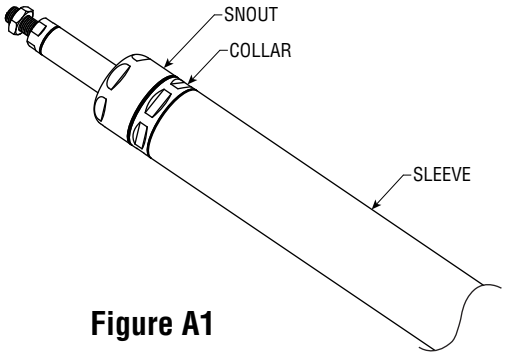


Figure A1

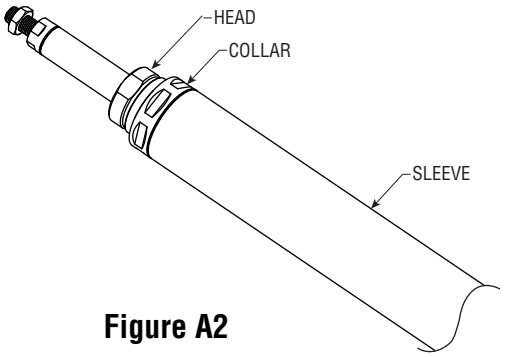


Figure A2

ECPA -RB

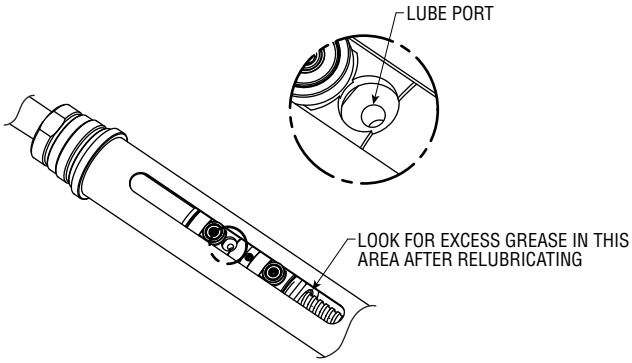


Figure A3

ECPR -RB

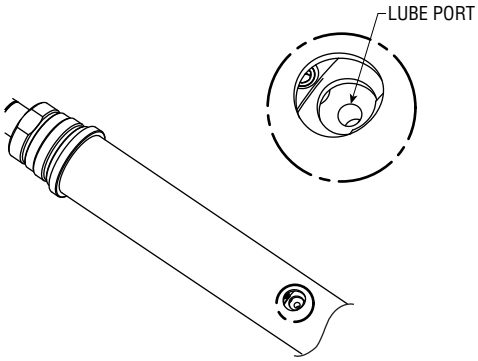


Figure A4

RECOMMENDED GREASE: CHEVRON FM ALC EP2

1. Remove Snout, Collar and Sleeve from cylinder.
    a. While firmly holding the Collar by the flats, remove the Snout (see Figure A1).
    b. While firmly holding the Head by the flats, remove the Collar (see Figure A2).
    c. Remove the Sleeve.
2. For ECPR (Rotating Rod) series cylinders: Fully retract the rod and rotate the rod clockwise until the lube port is accessible (see Figure A4). This step may require disengagement of motor brake or attached load.
3. Insert the tip of a grease gun into the lube port of the ball nut (see Figure A3 and A4) and fill the piston assembly with the recommended grease.
4. Cycle the cylinder at low speeds or by hand while keeping any contaminants from entering the tube, then repeat step 3.
5. Reassemble the Snout, Collar and Sleeve being careful to align the seals. Verify the seals are seated in the grooves before tightening the Snout and Collar. The Snout and Collar should have a removable liquid threadlocker applied to the threads and then tighten both to the same torque as Snout, specified on page 7, chart 1.

MAINTENANCE:
LEAD SCREW - RL

RELUBRICATING LEAD SCREW ASSEMBLY

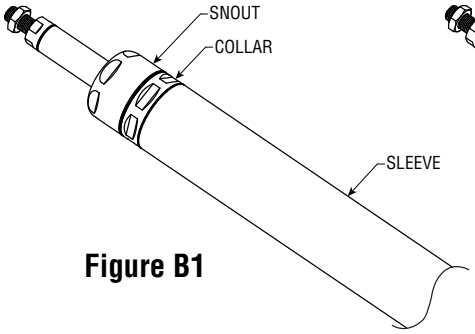


Figure B1

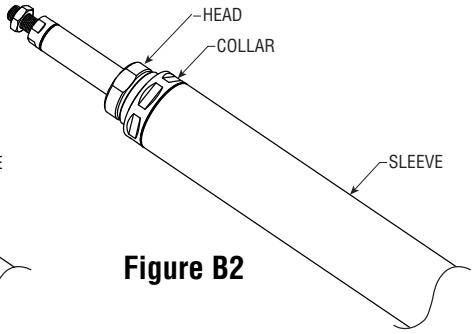


Figure B2

ECPA -RL

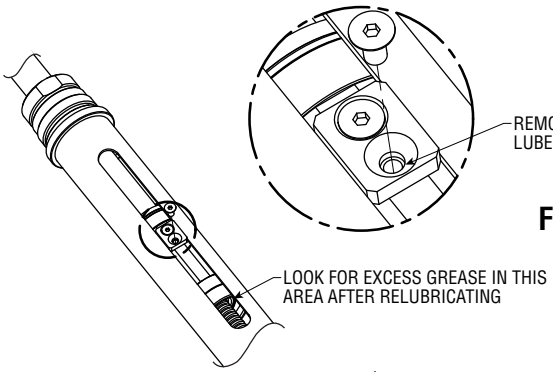


Figure B3

ECPR -RL

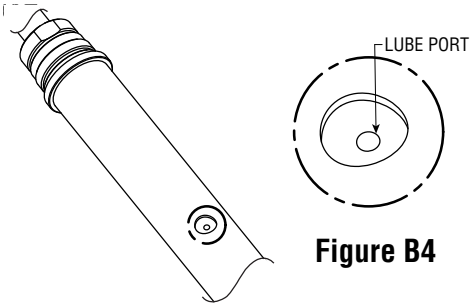


Figure B4

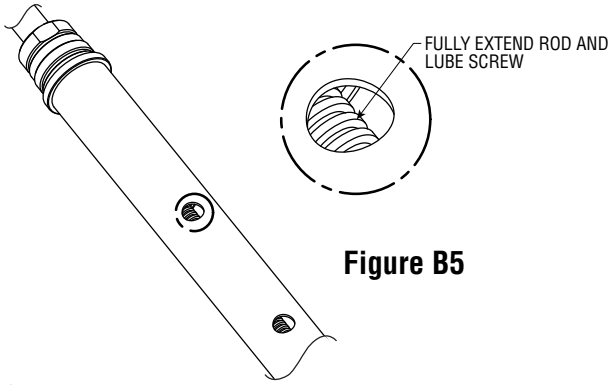


Figure B5

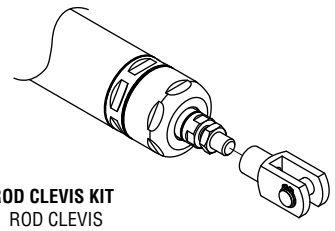
RECOMMENDED GREASE: CLARION FM HT EP2

1. Remove Snout, Collar and Sleeve from cylinder.
    a. While firmly holding the Collar by the flats, remove the Snout (see Figure B1).
    b. While firmly holding the Head by the flats, remove the Collar (see Figure B2).
    c. Remove the Sleeve.
2. For ECPA (Non-Rotating Rod) series cylinders: Fully retract the rod and remove the FHCS in the anti-rotation key (see Figure B3).
   For ECPR (Rotating Rod) series cylinders: Fully retract the rod and rotate the rod clockwise until the lube port is accessible (see Figure B4). This step may require disengagement of motor brake or attached load.
3. Insert the tip of a grease gun into the lube port of the piston (see Figure B3 and B4) and fill the piston assembly with the recommended grease.
4. Cycle the cylinder at low speeds or by hand while keeping any contaminants from entering the tube, the repeat step 3.
5. For lead screw units with 200 mm or more of travel, fully extend the rod and lube the screw through the access hole in the tube (see Figure B5).
6. Reassemble the Snout, Collar and Sleeve being careful to align the seals. Verify the seals are seated in the grooves before tightening the Snout and Collar. The Snout and Collar should have a removable liquid threadlocker applied to the threads and then tight both to the same torque as Snout, specified on page 7, chart 1.

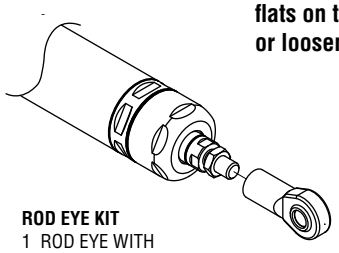
SERIES ECP DESIGN 5 CYLINDER INFORMATION MANUAL

MOUNTING ATTACHMENT:
TIGHTENING TORQUES FOR MOUNTING KITS

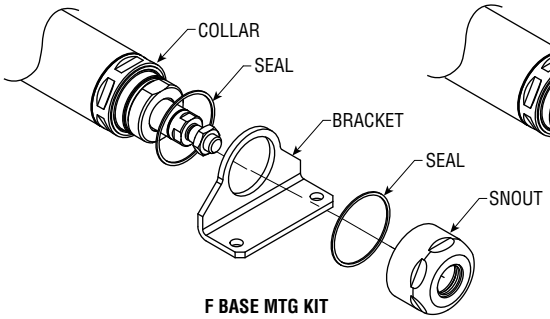
Do not transmit torque through the rod and into the actuator. Use the flats on the rod end when tightening or loosening the mounting.



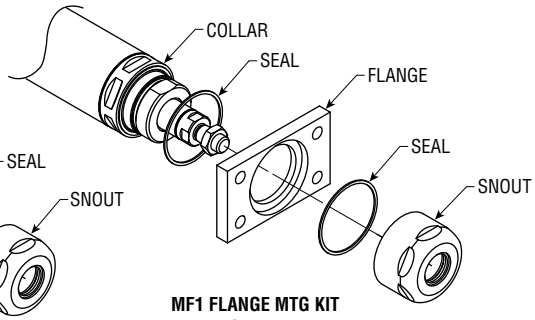
ROD CLEVIS KIT
1 ROD CLEVIS
1 PIVOT PIN
2 RETAINING CLIPS



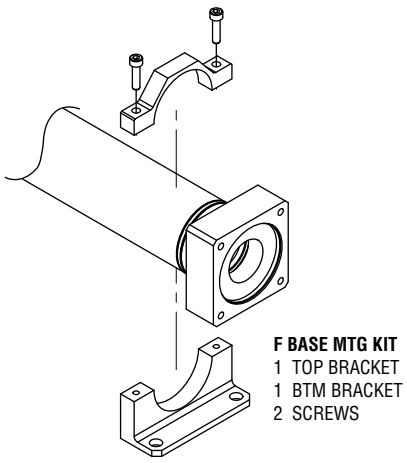
ROD EYE KIT
1 ROD EYE WITH
SPHERICAL BRG



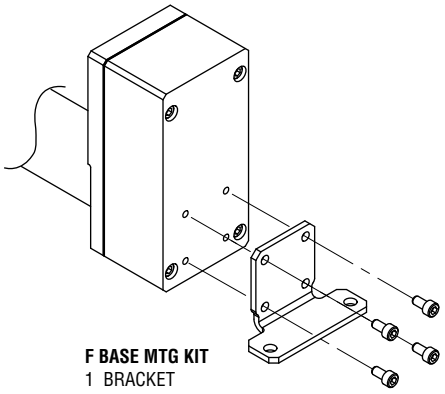
F BASE MTG KIT
1 BRACKET



MF1 FLANGE MTG KIT
1 FLANGE



F BASE MTG KIT
1 TOP BRACKET
1 BTM BRACKET
2 SCREWS



F BASE MTG KIT
1 BRACKET
4 SCREWS

CHART 1 - TORQUE VALUES FOR MOUNTING KITS

PART DESCRIPTION	TORQUE in-lb [Nm]		
	32 mm	40 mm	50 mm
SNOUT FOR F AND MF1 (HEAD END)	60 [7]	70 [8]	85 [9.5]
SCREW (STEEL) FOR F (CAP END - INLINE)	60 [7]	60 [7]	60 [7]
SCREW (STAINLESS) FOR F (CAP END - INLINE)	30 [3.5]	30 [3.5]	30 [3.5]
SCREW (STAINLESS) FOR F (CAP END - FOLDBACK)	50 [5.5]	50 [5.5]	115 [13]

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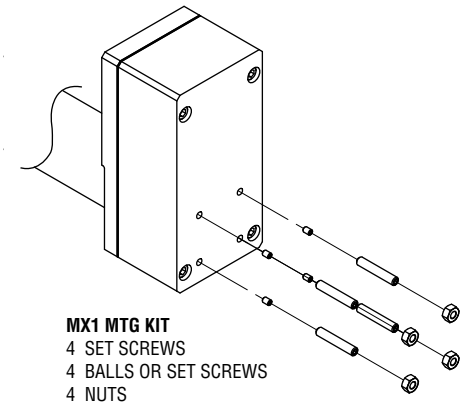
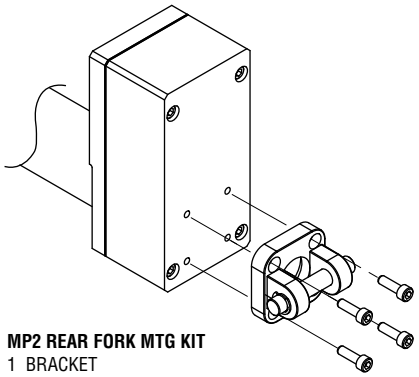
MOUNTING ATTACHMENT:

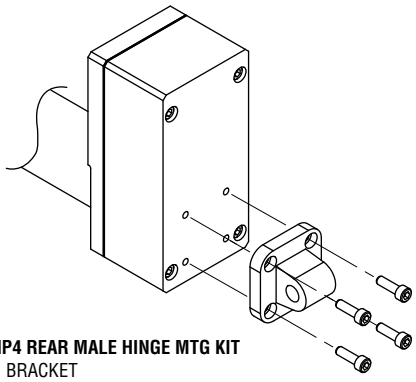
TIGHTENING TORQUES FOR MOUNTING KITS



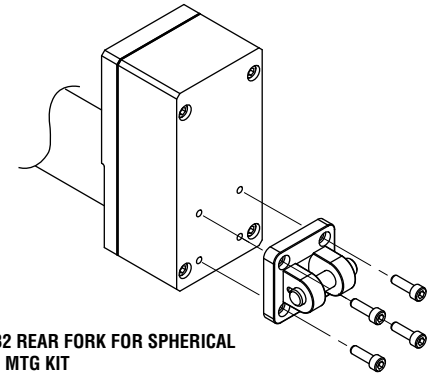
MX1 MTG KIT
4 SET SCREWS
4 BALLS OR SET SCREWS
4 NUTS



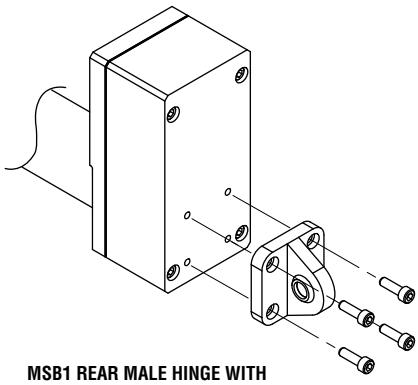
MP2 REAR FORK MTG KIT
1 BRACKET
1 PIVOT PIN
2 RETAINING CLIPS
4 SCREWS



MP4 REAR MALE HINGE MTG KIT
1 BRACKET
4 SCREWS



MSB2 REAR FORK FOR SPHERICAL BRG MTG KIT
1 BRACKET
1 PIVOT PIN
1 RETAINING RING
4 SCREWS



MSB1 REAR MALE HINGE WITH SPHERICAL BRG MTG KIT
1 BRACKET
4 SCREWS

CHART 2 - TORQUE VALUES FOR MOUNTING KITS

PART DESCRIPTION	TORQUE in-lb [Nm]		
	32 mm	40 mm	50 mm
SET SCREW (STEEL) FOR MX1 (CAP END - FOLDBACK)	40 [4.5]	40 [4.5]	90 [10]
SET SCREW (STAINLESS) FOR MX1 (CAP END - FOLDBACK)	20 [2.5]	20 [2.5]	45 [5]
SCREW (STEEL) FOR MP2, MP4, MSB1, MSB2 (CAP END - FOLDBACK)	100 [11]	100 [11]	230 [26]

MOTOR MOUNTS:

QL11 INLINE MOTOR MOUNTING ASSEMBLY INSTRUCTIONS (BASE MODEL SHOWN)

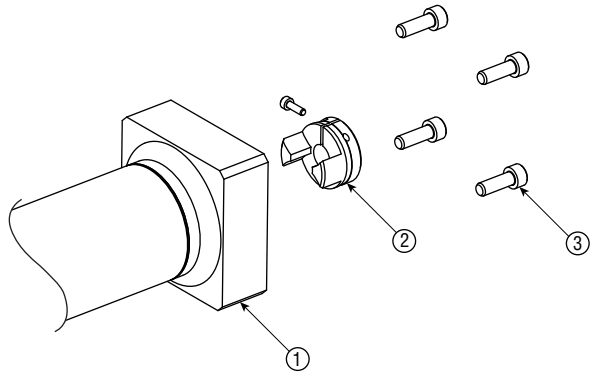


Figure C1

ITEM	PART DESCRIPTION	QTY	TORQUE in-lb [Nm]		
			ECPx532	ECPx540	ECPx550
1	Motor Mounting Plate	1	—	—	—
2	Motor Coupling Hub with Screw	1	18 [2]	18 [2]	80 [9]
3	Motor Screw	4	See torque charts on page 10		

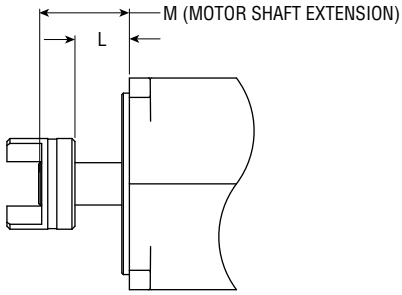


Figure C2

SIZE	DIMENSION L in [mm]
32	M - 0.472 ±0.004 [12.0 ±0.1]
40	M - 0.472 ±0.004 [12.0 ±0.1]
50	M - 1.024 ±0.004 [26.0 ±0.1]

Refer to Figure C1 for Item Numbers

1. Mount the motor coupling hub, Item **2**, onto the motor shaft to Dimension L (see Figure C2).
2. Tighten the motor coupling hub screw to the recommended torque.
3. Position the motor against the motor mounting plate, Item **1**, engaging the motor coupling hub fingers with the mating coupling hub spider (installed at factory).
4. Fasten the motor to the motor mounting plate, Item **1**, using 4 screws, Item **3**. Orientation of screws may be different than shown.
5. Tighten the screws, Item **3**, to the recommended torque.

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MOTOR MOUNTS:

QFx1 FOLDBACK MOTOR MOUNTING ASSEMBLY INSTRUCTIONS (BASE MODEL SHOWN)

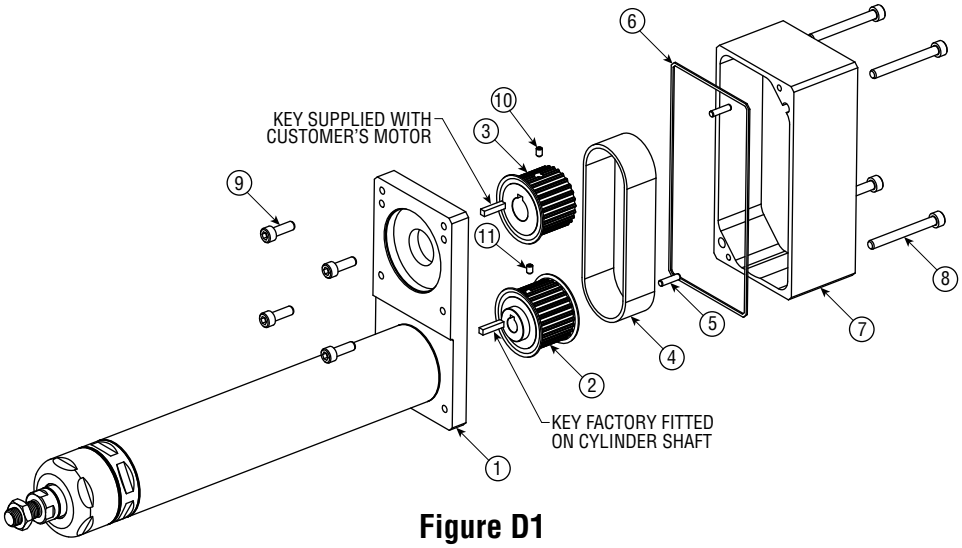

Figure D1

ITEM	PART DESCRIPTION	QTY	TORQUE in-lb [Nm]		
			ECPx532	ECPx540	ECPx550
1	Motor Mounting Plate	1	-	-	-
2	Cylinder Pulley	1	-	-	-
3	Motor Pulley	1	-	-	-
4	Timing Belt	1	-	-	-
5	Dowel Pin	2	-	-	-
6	Seal	1	-	-	-
7	Drive Cover	1	-	-	-
8	Screw	4	60 [7]	100 [11]	100 [11]
9	Motor Screw	4	See torque charts below		
10	Set Screw	1	See torque charts below		
11	Set Screw	1	15 [1.5]	27 [3]	27 [3]

TORQUE CHART - METRIC THREADS

SCREW TYPE & MATERIAL	TORQUE in-lb [Nm]					
	M3	M4	M5	M6	M8	M10
Cap Screw - Steel	22 [2.5]	53 [6]	106 [12]	177 [20]	434 [49]	867 [98]
Cap Screw - Stainless Steel	12 [1.3]	27 [3]	53 [6]	97 [11]	230 [26]	460 [52]
Set Screw - Steel	9 [1]	18 [2]	44 [5]	71 [8]	159 [18]	310 [35]

TORQUE CHART - IMPERIAL THREADS

SCREW TYPE & MATERIAL	TORQUE in-lb [Nm]							
	#4	#5	#6	#8	#10	1/4	5/16	3/8
Cap Screw - Steel	16 [1.8]	20 [2.3]	30 [3.4]	50 [5.6]	64 [7.2]	150 [17]	300 [33.9]	545 [61.6]
Cap Screw - Stainless Steel	9 [1]	12 [1.3]	15 [1.7]	29 [3.3]	40 [4.5]	95 [10.7]	170 [19.2]	300 [33.9]
Set Screw - Steel	5 [0.6]	10 [1.1]	10 [1.1]	20 [2.3]	36 [4.1]	87 [9.8]	165 [18.6]	290 [32.8]

SERIES ECP DESIGN 5 CYLINDER INFORMATION MANUAL

MOTOR MOUNTS:

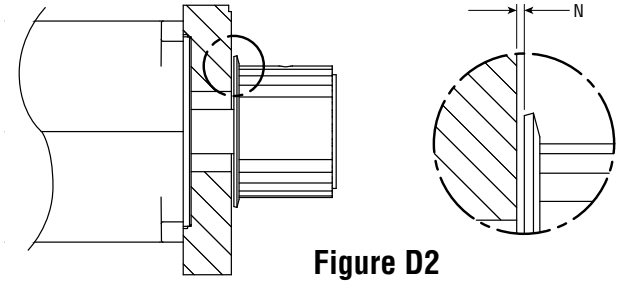

Figure D2

SIZE	DIMENSION N in [mm]
32	0.067 [1.7]
40	0.047 [1.2]
50	0.057 [1.5]

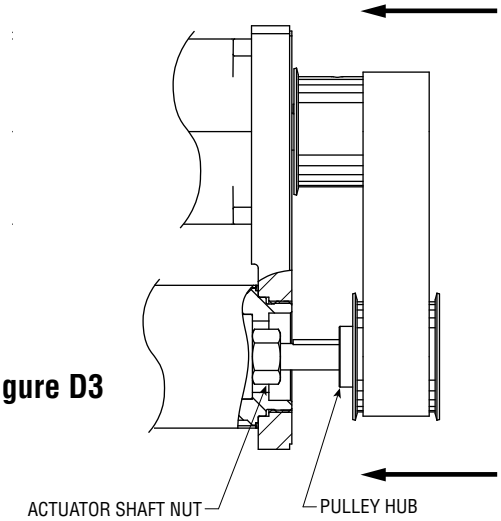

Figure D3

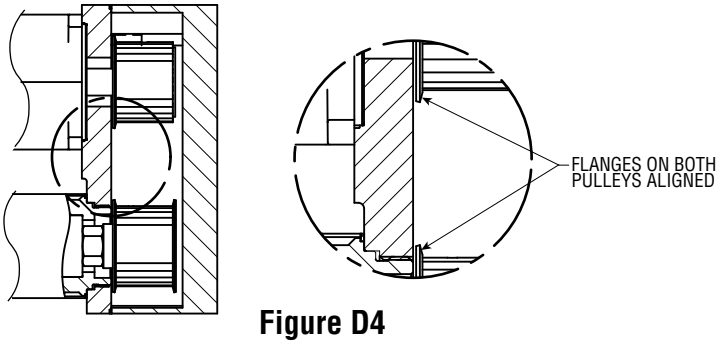

Figure D4

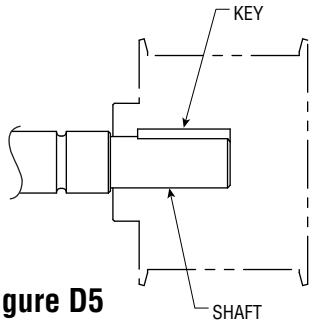

Figure D5

Refer to Figure D1 for Item Numbers

1. Fasten the motor (not shown) to the motor mounting plate, Item **1**, using 4 screws, Item **9**. Orientation of screws may be different than shown.
2. Tighten the screws, Item **9**, to the recommended torque.
3. Mount the pulleys, Item **2** and Item **3**, onto the motor shaft and the actuator shaft.
   a. Slide the motor pulley, Item **3**, onto the motor shaft to Dimension N (see Figure D2). Depending on the motor shaft configuration, either align the keyway with the key or the set screw(s), Item **10**, with the flat(s) on the motor shaft.
   b. Verify that the end of the key is flush with the end of the motor shaft (see Figure D5).
   c. Tighten the set screw(s), Item **10**, to the recommended torque. There may be multiple set screws in the motor pulley.
   d. Rotate the actuator shaft so that the key faces the motor pulley, Item **3**.
   e. Place the timing belt, Item **4**, around the cylinder pulley, Item **2**.
   f. Slide the cylinder pulley, Item **2**, onto the actuator shaft to Dimension N (see Figure D2) while also sliding the timing belt, Item **4**, around the motor pulley, Item **3** (see Figure D3). The hub of the cylinder pulley should make contact with the nut on the actuator shaft.
   g. Verify that the end of the key is flush with the end of the actuator shaft (see Figure D5).
   h. Tighten the set screw, Item **11**, to the recommended torque.
4. Verify that the actuator pulley, Item **2**, and the motor pulley, Item **3**, are aligned (see Figure D4). Adjust pulley location if necessary.
5. Insert the dowel pins, Item **5**, into the holes in the motor mounting plate, Item **1**.
6. Install the seal, Item **6**, into the seal groove in the motor mounting plate, Item **1**.
7. Fasten the drive cover, Item 7, to the motor mounting plate, Item **1**, using 4 screws, Item **8**. Verify that the seal is seated in the groove before tightening the screws.
8. Tighten the screws, Item **8**, to the recommended torque. ⚠ **The drive cover must be installed for the timing belt to track properly.**

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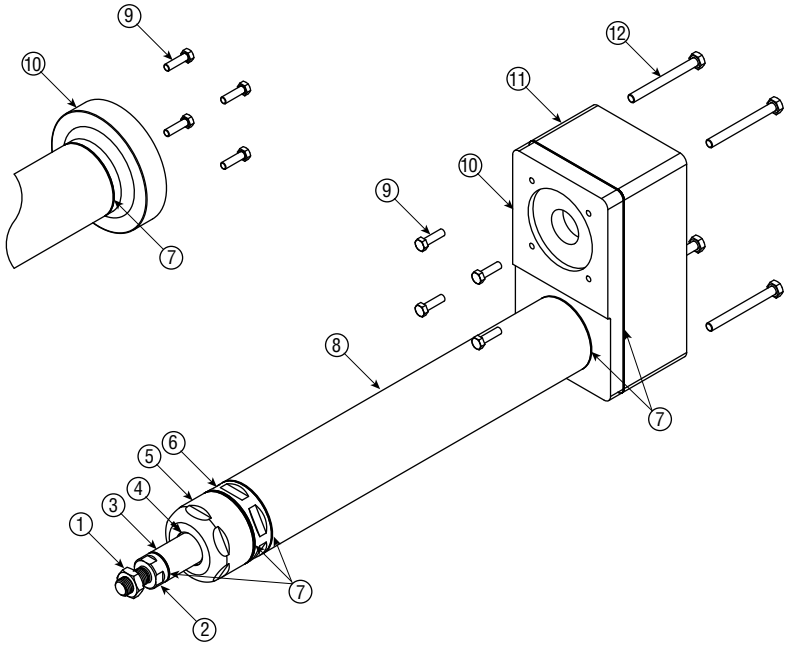
MATERIALS:



ITEM	PART DESCRIPTION	MATERIALS		
		BASE UNIT	-Y8 OPTION	-Y91 OPTION
1	Nut	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel
2	Rod End	303 Stainless Steel Passivated	303 Stainless Steel Passivated	303 Stainless Steel Passivated
3	Rod	304 or 304L Stainless Steel Electroless Nickel Plated	304 or 304L Stainless Steel Electroless Nickel Plated	304 or 304L Stainless Steel Electroless Nickel Plated
4	Rod Wiper	Thermoplastic Polyurethane	Thermoplastic Polyurethane	Thermoplastic Polyurethane
5	Snout	6061-T6 Aluminum Sulfuric Anodized	303 or 304 Stainless Steel Electropolished	303 or 304 Stainless Steel Electropolished
6	Collar	6061-T6 Aluminum Sulfuric Anodized	303 or 304 Stainless Steel Electropolished	303 or 304 Stainless Steel Electropolished
7	Seals	Thermoplastic Polyurethane	Thermoplastic Polyurethane	Thermoplastic Polyurethane
8	Sleeve	304 or 304L Stainless Steel Electropolished	304 or 304L Stainless Steel Electropolished	304 or 304L Stainless Steel Electropolished
9	Motor Screws	Alloy Steel Brite Zinc Plated	304 Stainless Steel	304 Stainless Steel
10	Motor Mount	6061-T6 Aluminum Sulfuric Anodized	303 or 304 Stainless Steel Electropolished	303 or 304 Stainless Steel Electropolished
11	Drive Cover	6061-T6 Aluminum Sulfuric Anodized	303 or 304 Stainless Steel Electropolished	303 or 304 Stainless Steel Electropolished
12	Cover Screws	Alloy Steel Brite Zinc Plated	304 Stainless Steel	304 Stainless Steel