



•ENDURANCE TECHNOLOGYSM•

RSX

EXTREME FORCE, HYDRAULIC CLASS ELECTRIC ACTUATOR



LINEAR SOLUTIONS MADE EASY

RSX Extreme Force, Hydraulic Class Electric Actuator

WHAT IS THE RSX?

The RSX is an extreme force electric actuator designed for rugged service, long life and is an ideal choice for replacing hydraulic cylinders. The RSX utilizes roller screws for long lasting consistent performance. Additionally, the RSX uses Tolomatic's popular Your Motor Here program which allows RSX to easily mount most servo motor and gearboxes on the market



TOLOMATIC'S ELECTRIC ROD-STYLE ACTUATORS

	ERD	RSA	RSX	GSA	IMA
Rod-Style Actuator	Rod-Style Actuator	Rod-Style Actuator	Rod-Style Actuator	Guided Rod-Style Actuator	Integrated Motor Rod-Style Actuator
Thrust up to:	7,868 lbf [34,999 N]	13,039 lbf [58,001 N]	30,000 lbf [133,450 N]	950 lbf [4,226 N]	6,875 lbf [30,594 N]
Speed up to:	58 in/sec [1473 mm/sec]	123 in/sec [3,124 mm/sec]	29.9 in/sec [760 mm/sec]	123 in/sec [3,124 mm/sec]	52.5 in/sec [1,334 mm/sec]
Stroke Length up to:	39.4 in [1000 mm]	60 in [1,524 mm]	26 in [660 mm]	36 in [914 mm]	18 in [457 mm]
Screw/Nut Type	Solid, Ball & Roller	Solid, Ball & Roller	Roller	Solid & Ball	Ball & Roller
<i>For complete information see www.tolomatic.com or literature number:</i>					
Literature Number:	2190-4000	3600-4609	2171-4000	3600-4609	2700-4000

(Not all models deliver maximum values listed, i.e.: Maximum thrust may not be available with maximum speed)

RSX Extreme Force, Hydraulic Class Electric Actuator

Applications



**Volumetric pumps
Injection molding**



**Motion
simulators**

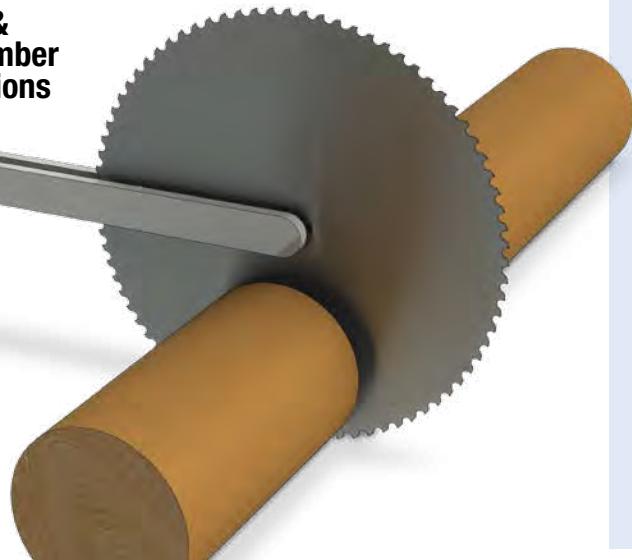


Other Applications:

- Active Security Barrier
- Assembly machinery
- Automatic tool changers
- Automotive
- Clamping
- Converting
- Cycle testing
- Fillers
- Formers
- Hydraulic replacement
- Machine tools
- Open/close doors
- Parts clamping
- Piercing
- Precision grinders
- Product test simulations
- Pressing
- Punching
- Riveting/fastening/joining
- Sawmill equipment
- Stamping
- Tension control
- Test stands
- Tube bending
- Wave generation
- Web guidance
- Welding
- Wire winding
- and many more



**Cut-Off &
Other Timber
Applications**



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RSX ELECTRIC ROD-STYLE ACTUATOR

• ENDURANCE TECHNOLOGY™

Endurance Technology features are designed for maximum durability to provide extended service life.

The RSX is a extreme force electric actuator designed for rugged service, long life and is an ideal choice for replacing hydraulic cylinders.

• SUPERIOR CONSTRUCTION •

- Steel parts are black or clear zinc plated for corrosion resistance
- Aluminum parts are Type III hardcoat black anodized for high surface hardness

• IP65 STANDARD •

- Protection against dust and water spray (static)

• IP67 OPTION •

- Resist water ingress 1m deep for up to 30 min

• HIGH POSITIONAL ACCURACY •

SCREW ACCURACY

Roller Nut ± 0.0004 "/ft. ± 0.0102 mm/300mm

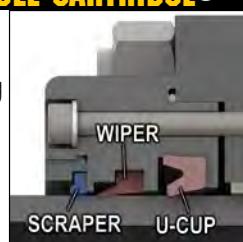
• YOUR MOTOR HERE •

YOU CAN CHOOSE:

- Specify the device to be installed and actuator ships with proper mounting hardware
- Specify and ship your device to Tolomatic for factory installation
- Motor or gearbox supplied and installed by Tolomatic

• FIELD REPLACEABLE CARTRIDGE •

- Scraper, Wiper and U-Cup combine to prevent contaminants from entering the housing for extended life of the actuator
- One piece assembly designed for easy field replacement



• THRUST TUBE •

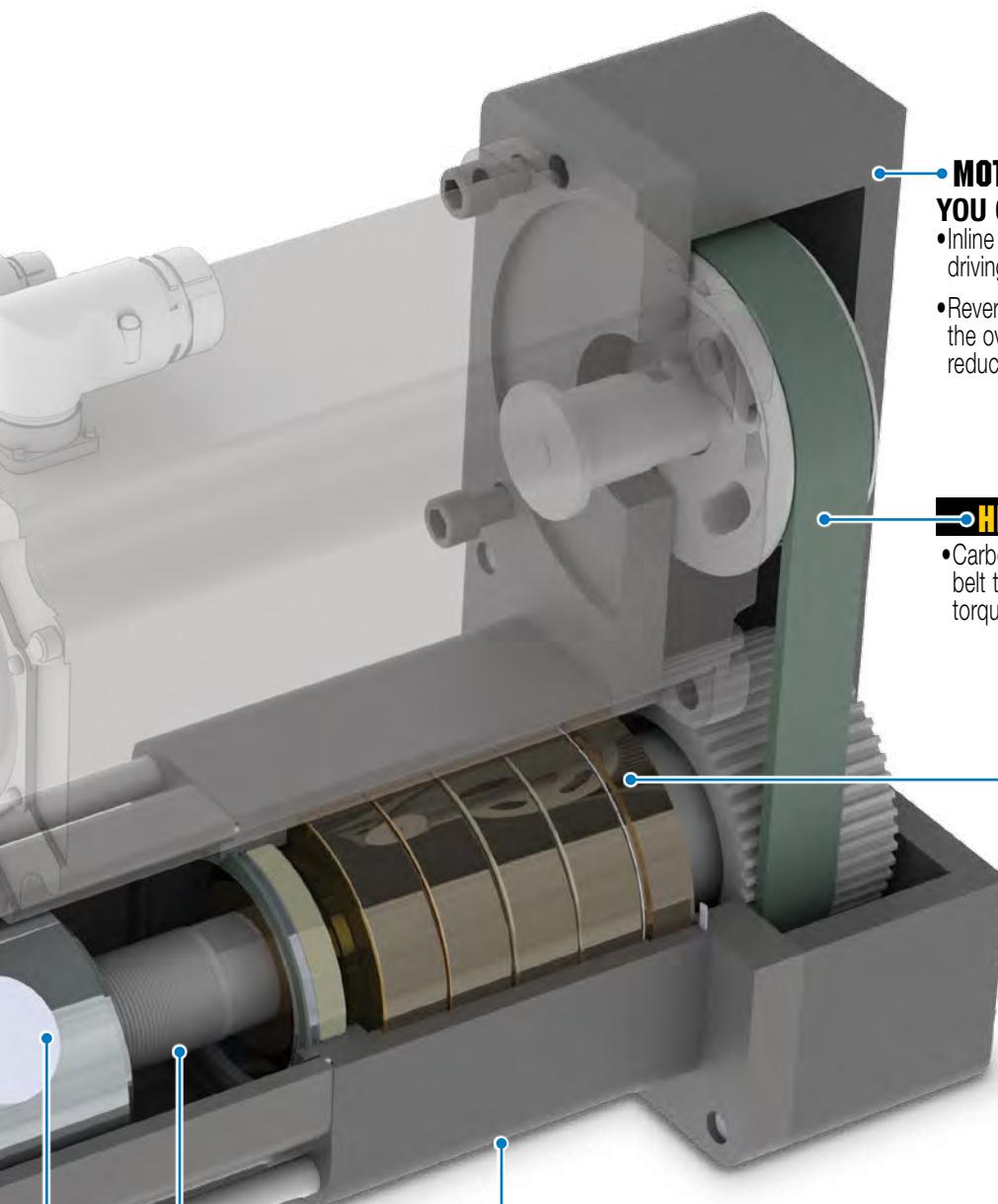
- Steel thrust tube supports extremely high force capabilities
- Salt bath nitride treatment provides excellent corrosion resistance, surface hardness and is very resistant to adherence of potential contaminants

• NOSE BEARING •

- Support the thrust tube and nut assembly through entire stroke length
- Unique nose bearing material allows for smooth operation

• HEAVY DUTY INTERNAL BUMPER •

- Bumpers protect the screw and nut assembly from damage at both ends of stroke



ADVANCED SCREW TECHNOLOGY



- Roller nuts provide the highest thrust and life ratings available

INTERNAL ANTI-ROTATE

- The bearings that convert rotary motion to linear motion also serve as an anti-rotate mechanism throughout the entire stroke

MOTOR ORIENTATION

YOU CAN CHOOSE:

- Inline option directly couples the driving shaft
- Reverse-parallel option minimizes the overall length and offers a belt reduction drive with a 1:1 or 2:1 ratio

HIGH POWER TIMING BELT

- Carbon fiber tensile reinforced synchronous belt to ensure smooth transmission of high torques in a compact design.

ENHANCED HIGH THRUST BEARING

- RSX actuators come with 4 high thrust angular contact ball bearings

BREATHER/PURGE PORTS



- Standard feature on RSX actuators
- As seen in this view, located on both the bottom and the opposite side of the actuator

- Use as **Breather Port**: allows air flow into the interior of the actuator. Prevents additional load on the motor caused by air buildup due to fast cycling of the RSX.
- Use as **Purge Port**: positive pressure with air lines and filters insure contaminants (which could potentially shorten the actuator life) do not enter the interior of the actuator.

MOUNTING OPTIONS

- Front Flange
- Extended Tie Rods
- Trunnion
- Mounting Plates
- Rear Clevis

ROD END OPTIONS

- Rod Clevis
- Threaded Rod (standard)
- Extended Rod

SENSORS

- Tie Rod Clip



Specifications

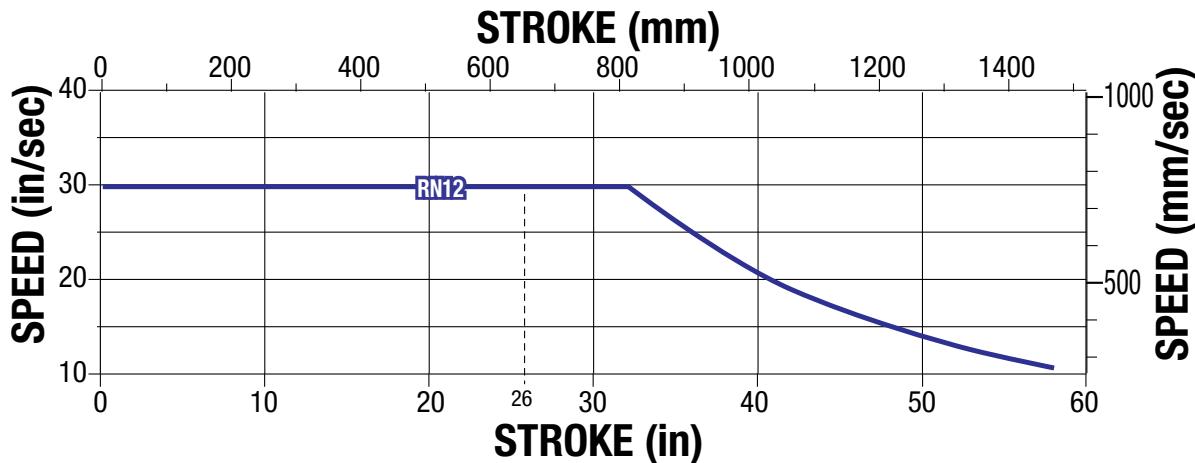
PERFORMANCE

RSX SIZE	*MAX. STROKE		SCREW CODE	SCREW LEAD	LEAD ACCURACY	BACKLASH	MAX. THRUST	MAX. SPEED	DYNAMIC LOAD RATING	DYNAMIC TORQUE TO OVERCOME FRICTION
	LMI	RP								
096	660.4	641.4	RN12	12.00	0.01	0.030	133.45	759	269.3	6.21
	in	in		turns/in	in/ft	in	lbf	in/sec	lbf	lbf-in
	26.00	25.25	RN12	2.12	0.0004	0.0012	30,000	29.9	60,530	55.0

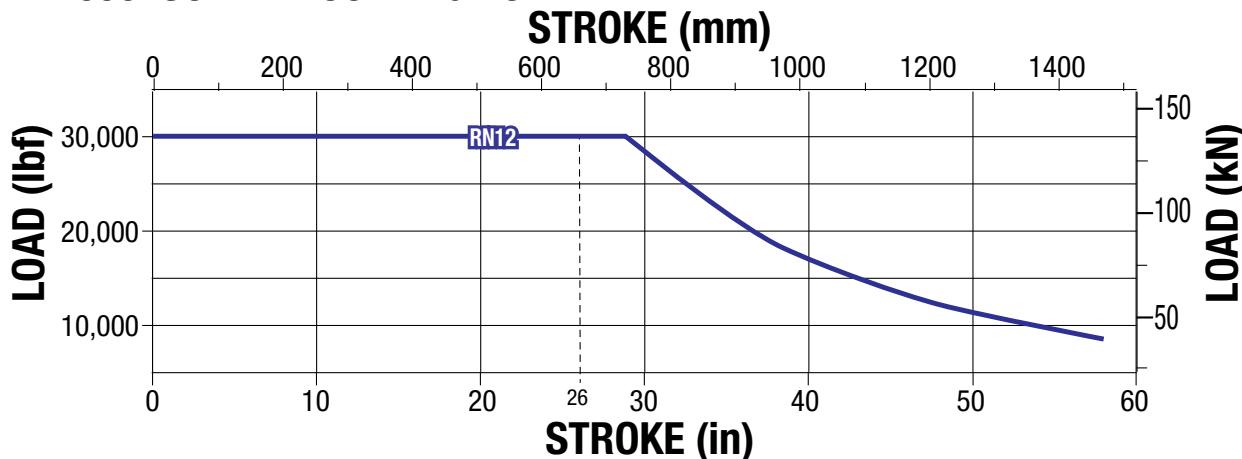
*Consult Tolomatic for longer strokes. Trunnion option reduces max. stroke by 72.4 mm (2.85")

		RSX SIZE	SCREW CODE		LMI	RP1		RP2	
						ST	HT	ST	HT
INERTIA	BASE ACTUATOR	096	RN12	kg·m ² x 10 ⁻⁴	192.902	164.476	238.786	86.861	86.004
		096	RN12	lb-in ²	65.92	56.21	81.60	29.68	29.39
	PER IN	096	RN12	kg·m ² x 10 ⁻⁴			1.039		
	PER 25.4mm	096	RN12	lb-in ²			0.355		
WEIGHT	BASE ACTUATOR	096	RN12	kg	72.03	71.59	73.01	72.08	72.58
		096	RN12	lb	158.8	157.8	161.0	158.9	160.0
	PER 25.4mm	096	RN12	kg			1.05		
	PER IN	096	RN12	lb			2.31		

SIZE: 096: CRITICAL SPEED CAPACITIES



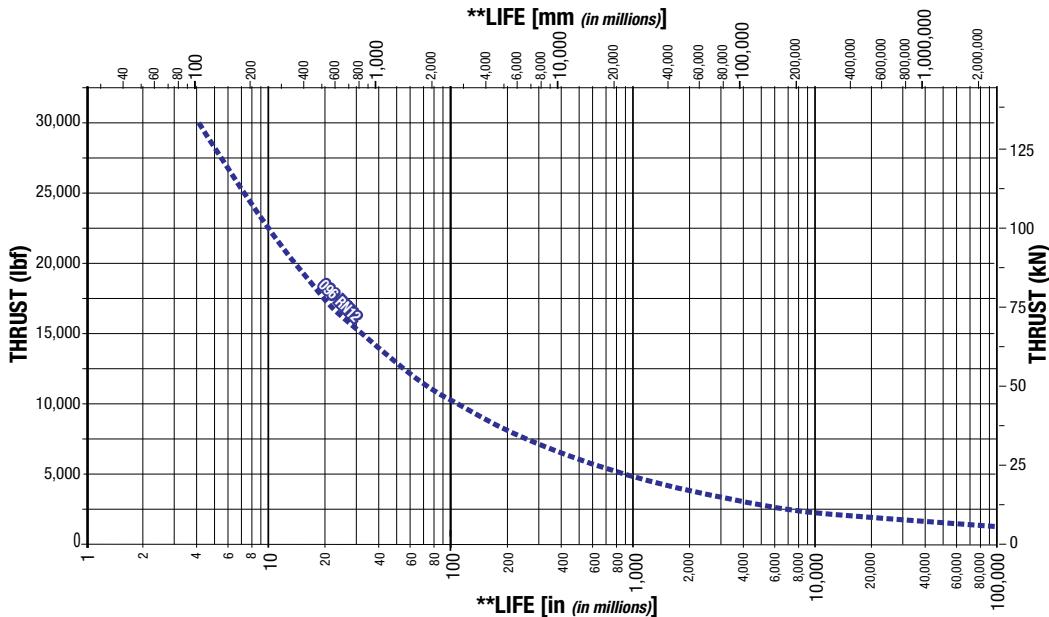
SIZE: 096: SCREW BUCKLING LOAD



RSX Extreme Force, Hydraulic Class Electric Actuator

SIZE: 096: ROLLER SCREW LIFE GRAPH

PERFORMANCE



NOTE: The L_{10} expected life of a roller screw linear actuator is expressed as the linear travel distance that 90% of properly maintained roller screw manufactured are expected to meet or exceed. This is not a guarantee and this graph should be used for estimation purposes only.

The underlying formula that defines this value is:

$$L_{10} = \left(\frac{C}{P_e} \right)^3 \cdot \ell =$$

L_{10} Travel life in millions of units (in or mm), where:

C = Dynamic load rating (lbf) or (N)

P_e = Equivalent load (lbf) or (N)

If load is constant across all movements then:
actual load = equivalent load

ℓ = Screw lead (in/rev) (mm/rev)

Use the "Equivalent Load" calculation below, when the load is not constant throughout the entire stroke. In cases where there is only minor variation in loading, use greatest load for life calculations.

$$P_e = \sqrt[3]{L_1(P_1)^3 + L_2(P_2)^3 + L_3(P_3)^3 + L_n(P_n)^3}$$

Where:

P_e = Equivalent load (lbf) or (N)

P_n = Each increment at different load (lbf) or (N)

L = Total distance traveled per cycle (extend + retract stroke)
[$L = L_1 + L_2 + L_3 + L_n$]

L_n = Each increment of stroke at different load (in) or (mm)

CALCULATING RMS THRUST, RMS VELOCITY AND POWER LIMIT

Roller screw actuators have two different operating regions which must be sized: RMS and peak. Peak operation is the maximum speed and/or maximum thrust the actuator that does not factor in dwells. RMS operation is the root mean square calculation of the entire motion cycle including dwells (time at rest). It is extremely important to include all dwells (time at rest) in the RMS calculation. There are instances where peak and RMS specifications can be exceeded, but must be approved by Tolomatic. RMS Thrust, RMS Velocity and Power Limit are calculated using these equations:

$$T_{RMS} = \sqrt{\frac{\sum (T_i^2 \times t_i)}{\sum (t_i)}}$$

$$V_{RMS} = \sqrt{\frac{\sum (V_i^2 \times t_i)}{\sum (t_i)}}$$

$$P = T_{RMS} \times V_{RMS}$$

(Watts) (N) (m/sec)

Where:
 T_{RMS} = RMS Thrust
 V_{RMS} = RMS Velocity
 T_i = Thrust during interval i
 \sum = sum
 $i = 1$ to n
 V_i = Average velocity during interval i
 t_i = Time interval i
 P = Power limit

RSX096	
RN12	
K_{Co}	0.21

LUBRICATION

RSA roller screw actuators require periodic re-lubrication to maintain optimal performance. Below are formulas to help determine lubrication interval. See parts sheets for formula definitions, complete instructions and examples.

$$\text{STEP 1: } t_{BL} = 4500 \times (V_{RMS})^{-1.57}$$

$$\text{STEP 2: } K_T = K_{Co} \left(\frac{T_{PEAK}}{T_{MAX}} \right) - 0.15$$

$$\text{STEP 3: } t_L = t_{BL} \times K_T$$

Where:
t_{BL} = Basic Lubrication Interval (hours)
V_{RMS} = RMS Velocity (in/sec)
K_T = Thrust Correction Factor
K_{Co} = Screw Static Load Factor
T_{PEAK} = Actuator Peak Thrust Rating
T_{MAX} = Maximum Cycle Thrust
t_L = Lubrication Interval (hours)

Re-lubricate with Tolomatic Grease into the grease zerk located on the rod end.

RSX096	
Quantity	0.32 oz (9.0 g)

! In some applications oil may leak from the grease zerk. In contamination sensitive applications replace grease zerk with plug.

! NOTE: Denominator represents full cycle time including dwells. Do NOT include dwell times in the numerator.

RSX096	
Power Limit	690 W

! Use software at sizeit.tolomatic.com for fast, accurate actuator selection

RSX Extreme Force, Hydraulic Class Electric Actuator

SIZE: 096

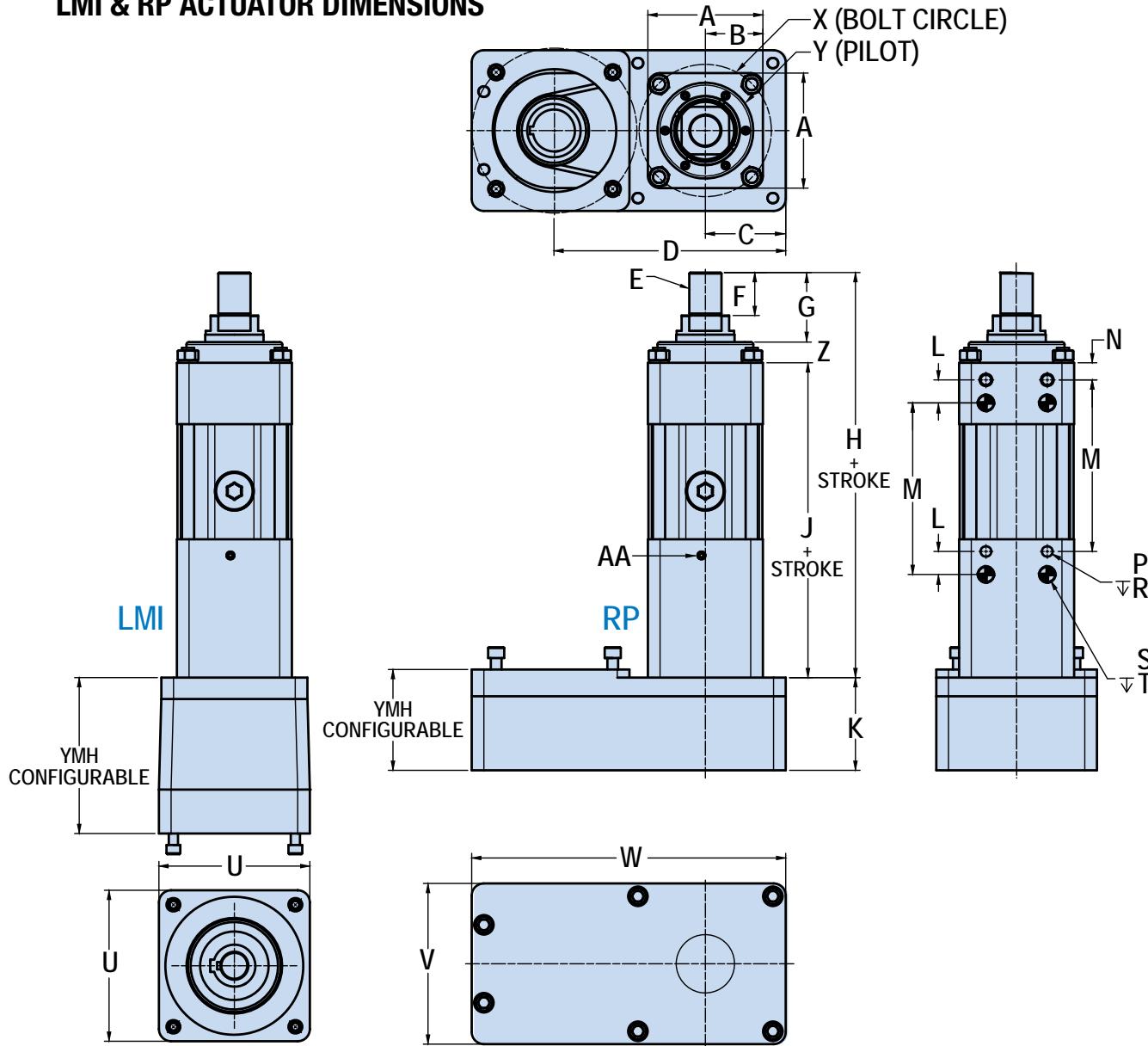
3D CAD available at www.tolomatic.com

Always use configured CAD solid model
to determine critical dimensions



DIMENSIONS

LMI & RP ACTUATOR DIMENSIONS



RSX096	
A	mm 150.0
	in 5.91
B	mm 75.0
	in 2.95
C	mm 104.8
	in 4.13
RP1	
	mm 304.8
D	mm 12.00
RP2	
	mm 302.3
	in 11.90

RSX096	
E	STANDARD
	M42 x 4.5-6g
E	SR1 OPTION
	1 1/8-12 UN-2A
F	THREAD LENGTH
F	mm 56.0
F	in 2.20
G	FULL RETRACT
G	mm 90.7
G	in 3.57
H	mm 562.9
H	in 22.16

RSX096	
J	mm 445.2
J	in 17.53
K	mm 120.9
K	in 4.76
L	mm 30.0
L	in 1.18
M	mm 258.4
M	in 10.17
N	mm 22.3
N	in 0.88
P	M16 x 2.0-6H
P	in -

RSX096	
R	mm $\downarrow 20.0(4)$
R	in $\downarrow .79(4)$
S	mm 20.026
S	mm 20.013
S	in 0.7884
S	in 0.7879
T	mm $\downarrow 15.0(4)$
T	in $\downarrow .59(4)$
U	mm 196.9
U	in 7.75
V	mm 209.6
V	in 8.25
W	mm 409.6
W	in 16.13

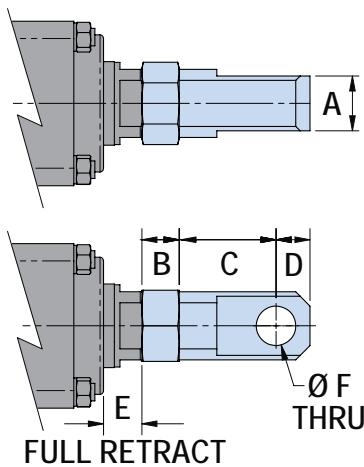
RSX096	
X	mm 171.0
X	in 6.73
Y	mm 125.00
Y	mm (+0.00) (-0.03)
Y	in 4.920
Y	in (+0.000) (-0.001)
Z	mm 27.0
Z	in 1.06
AA	mm RC 1/8
AA	-28 X
AA	38.1 DP
AA	(Plugged)

RSX Extreme Force, Hydraulic Class Electric Actuator

SIZE: 096

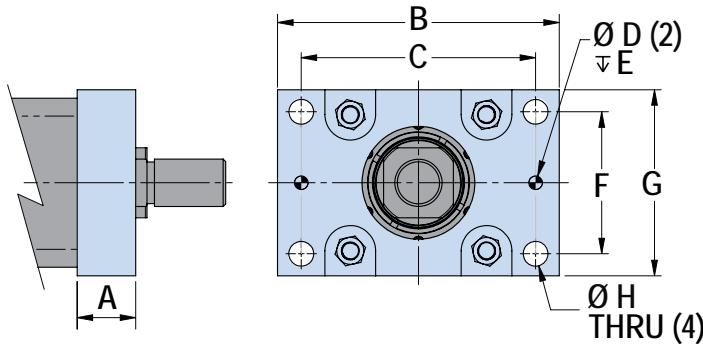
DIMENSIONS

CLEVIS OPTION (CLV)



RSX096	
A	mm 50.00 49.38
	in 1.969 1.944
B	mm 34.0
	in 1.34
C	mm 88.3
	in 3.48
D	mm 31.0
	in 1.22
E	mm 35.0
	in 1.38
F	mm 36.06 36.00
	in 1.420 1.417

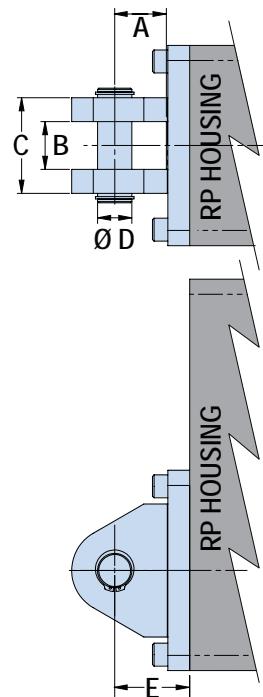
FRONT FLANGE OPTION (FFG)



RSX096	
A	mm 52.0
	in 2.05
B	mm 250.0
	in 9.84
C	mm 208.0
	in 8.19
D	mm 12.025 12.013
	in 0.4734 0.4729

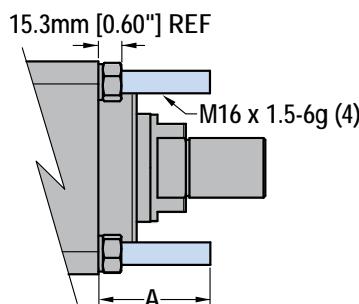
RSX096	
E	mm 12.0
	in 0.42
F	mm 126.0
	in 4.96
G	mm 165.0
	in 6.50
H	mm 22.0
	in 0.87

REAR CLEVIS OPTION (PCD)



RSX096	
A	mm 54.0
	in 2.13
B	mm 50.062 50.000
	in 1.9709 1.9685
C	mm 100.0
	in 3.94
D	mm 35.980 35.940
	in 1.4165 1.4150
E	mm 78.4
	in 3.09

EXTENDED TIE ROD OPTION (XT)



A = Customer Specified Length
MIN mm 50.0
in 1.97
MAX mm 100.0
in 3.94

RSX Extreme Force, Hydraulic Class Electric Actuator

SIZE: 096

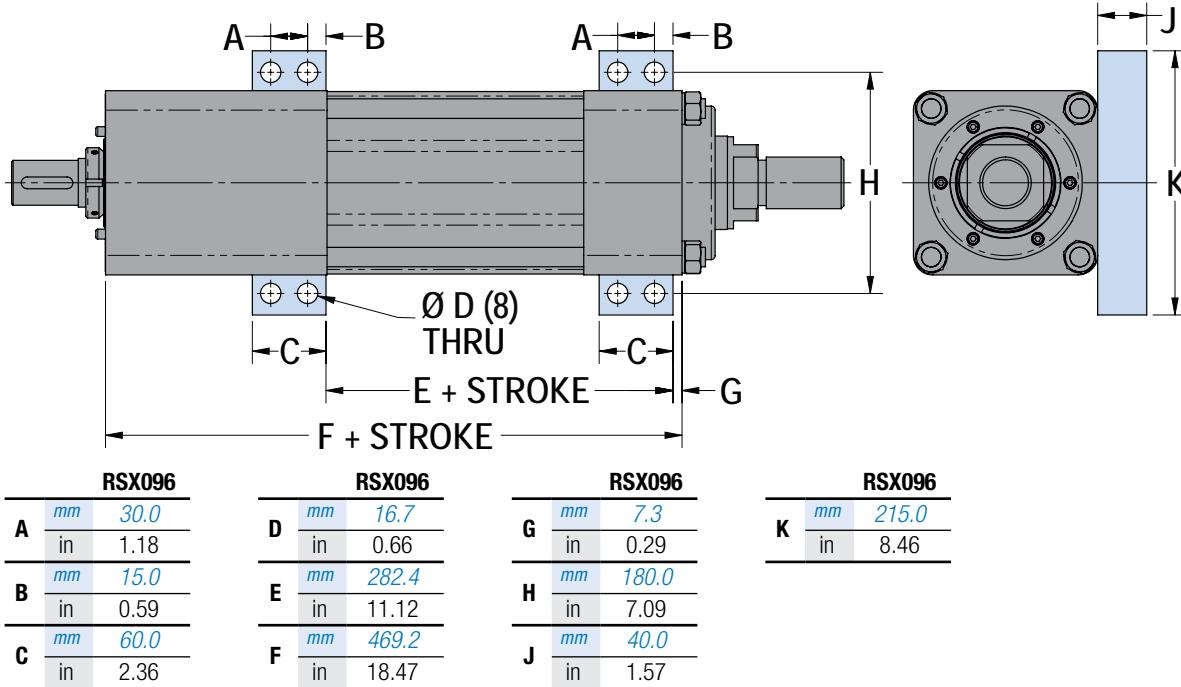
3D CAD available at www.tolomatic.com

Always use configured CAD solid model
to determine critical dimensions

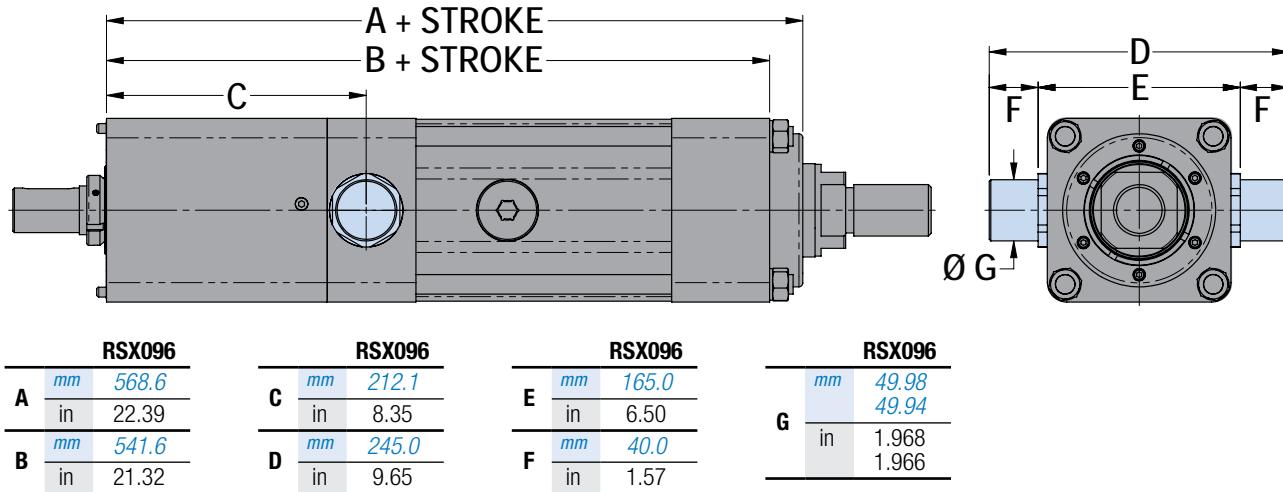


DIMENSIONS

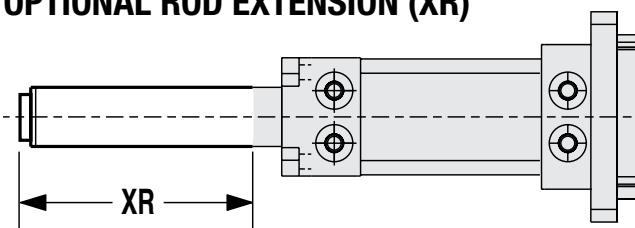
MOUNTING PLATE OPTION (MP2) DIMENSIONS



TRUNNION OPTION (TRR) DIMENSIONS



OPTIONAL ROD EXTENSION (XR)



In **vertical applications only**, the thrust rod length can be extended by specifying the rod extension option. This

does not increase the working stroke, only the length of the thrust rod.

NOTE: the XR dimension in the configurator string (extension + stroke) should not exceed the maximum stroke of the specified actuator. Consult Tolomatic for extensions greater than the maximum stroke length.

MAXIMUM STROKE RSX

SIZE		mm	in
096	LMI	660.4	26.00
096	RP	647.7	25.50

RSX Extreme Force, Hydraulic Class Electric Actuator

SWITCHES



RSX actuators offer a wide range of sensing choices. There are 12 switch choices: reed, solid state PNP (sourcing) or solid state NPN (sinking); in normally open or normally closed; with flying leads or quick-disconnect.

Commonly used for end-of-stroke positioning, these switches allow installation anywhere along the entire actuator length. The internal magnet is a standard feature. Switches can be installed in the field at any time.

Switches are used to send digital signals to PLC (programmable logic controller), TTL, CMOS circuit or other controller device. Switches contain reverse polarity protection. Solid state QD cables are shielded; shield should be terminated at flying lead end.

All switches are CE rated and are RoHS compliant. Switches feature bright red or yellow LED signal indicators; solid state switches also have green LED power indicators.

RoHS
COMPLIANT



	Order Code	Lead	Switching Logic	Power LED	Signal LED	Operating Voltage	*Power Rating (Watts)	Switching Current (mA max.)	Current Consumption	Voltage Drop	Leakage Current	Temp. Range	Shock / Vibration							
REED	R Y	5m	SPST Normally Open	—	Red	5 - 240 AC/DC	**10.0	100mA	—	3.0 V max.	—	14 to 158°F [-10 to 70°C]	50 G / 9 G							
	R K	QD*																		
	N Y	5m	SPST Normally Closed	—	Yellow	5 - 110 AC/DC														
	N K	QD*																		
SOLID STATE	T Y	5m	PNP (Sourcing) Normally Open	Green	Yellow	10 - 30 VDC	**3.0	100mA	20 mA @ 24V	2.0 V max.	0.05 mA max.	14 to 158°F [-10 to 70°C]	50 G / 9 G							
	T K	QD*																		
	K Y	5m	NPN (Sinking) Normally Open	Green	Red															
	K K	QD*																		
	P Y	5m	PNP (Sourcing) Normally Closed	Green	Yellow															
	P K	QD*																		
	H Y	5m	NPN (Sinking) Normally Closed	Green	Red															
	H K	QD*																		

*QD = Quick-disconnect

Enclosure classification IEC 529 IP67 (NEMA 6)

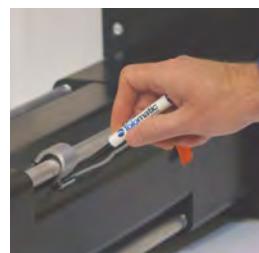
CABLES: Robotic grade, oil resistant polyurethane jacket, PVC insulation

⚠ **WARNING: Do not exceed power rating (Watt = Voltage x Amperage). Permanent damage to sensor will occur.

SWITCH INSTALLATION



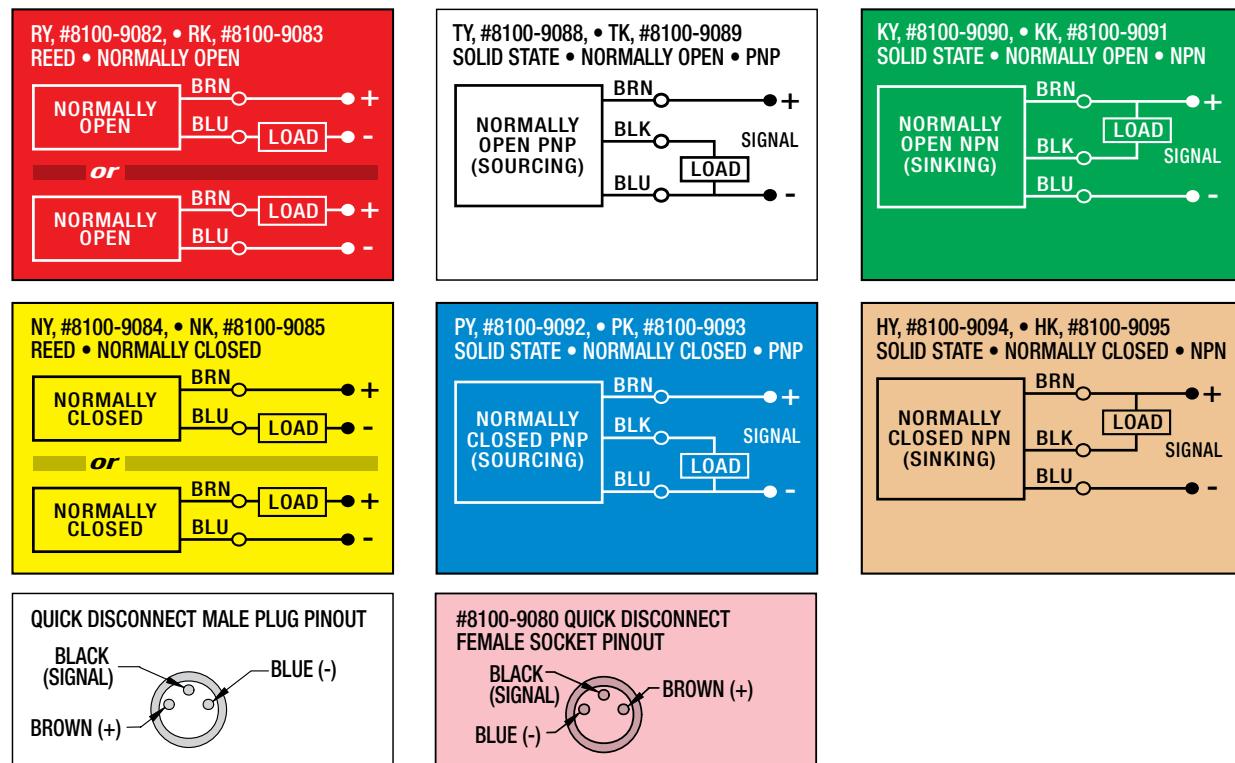
Place switch bracket onto any one of the four tie rods that run the length of the extruded tube. Insert the switch with set screw and the word "Tolomatic" facing up and slide it the mating slot on the bracket. Position the bracket with the switch to the exact location desired, with the bracket tight to the surface of the extrusion, then lock the bracket securely into place by tightening the set screw with the Allen wrench provided. Then tighten the switch into the bracket with a small slotted screwdriver.



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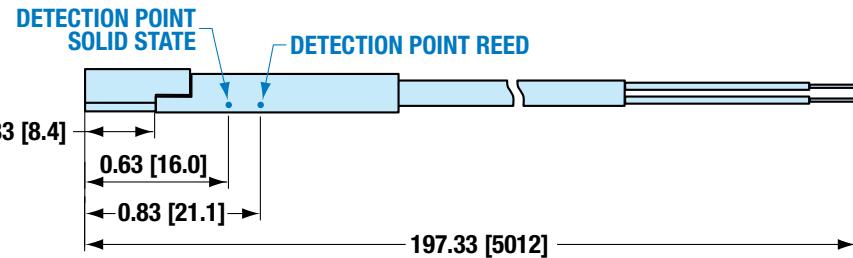
SWITCHES

WIRING DIAGRAMS

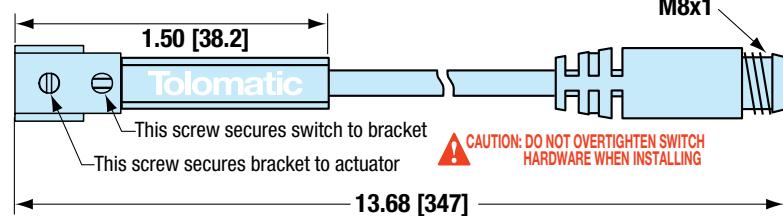


SWITCH DIMENSIONS

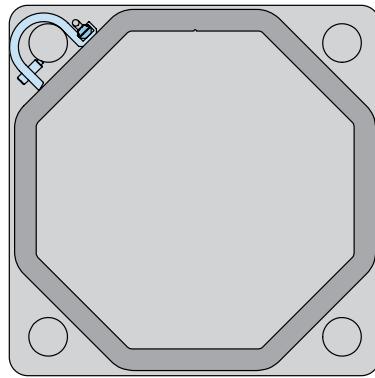
Y - direct connect



K - QD (Quick-disconnect) switch



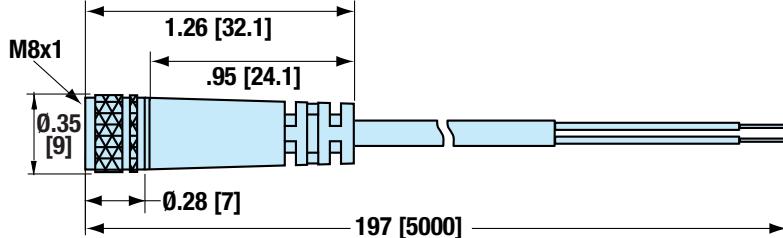
SWITCH MOUNTING



The switch bracket and switch does not extend beyond the profile of the RSX heads.

Switch Bracket Part # 2171-1115

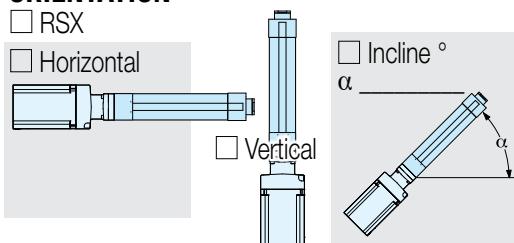
8100-9080 - QD Cable



APPLICATION DATA WORKSHEET

Fill in known data. Not all information is required for all applications

ORIENTATION



Load supported by actuator OR Load supported by other mechanism

MOVE PROFILE

EXTEND

Move Distance _____

inch millimeters
(US Standard) (Metric)

Move Time _____ sec

Max. Speed _____

in/sec mm/sec

Dwell Time After Move _____ sec

RETRACT

Move Distance _____

inch millimeters

Move Time _____ sec

Max. Speed _____

in/sec mm/sec

Dwell Time After Move _____ sec

NO. OF CYCLES

per minute per hour

HOLD POSITION?

Required

Not Required

After Move During Power Loss

NOTE: If load or force changes during cycle use the highest numbers for calculations

EXTEND

LOAD

lb. kg.
(U.S. Standard) (Metric)

RETRACT

LOAD

lb. kg.
(U.S. Standard) (Metric)

FORCE

lb. kg.
(U.S. Standard) (Metric)

FORCE

lb. kg.
(U.S. Standard) (Metric)

STROKE LENGTH _____

inch millimeters
(US Standard) (Metric)

PRECISION

Repeatability _____

inch millimeters

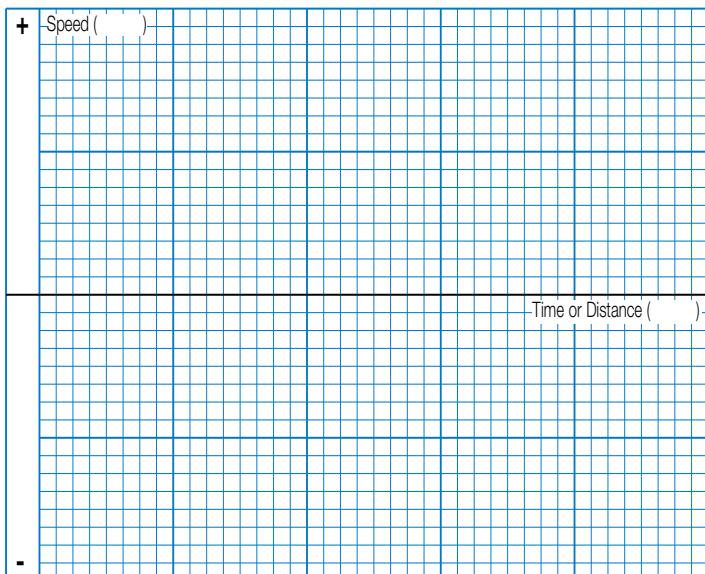
OPERATING ENVIRONMENT

Temperature, Contamination, Water, etc.



Or Call 1-800-328-2174 for
Excellent Customer Service
& Technical Support

MOTION PROFILE



Graph your most demanding cycle, including accel/decel, velocity and dwell times. You may also want to indicate load variations and I/O changes during the cycle. Label axes with proper scale and units.

CONTACT INFORMATION

Name, Phone, Email _____
Co. Name, Etc. _____



USE THE TOLOMATIC SIZING AND SELECTION SOFTWARE AVAILABLE ON-LINE AT
www.tolomatic.com OR... CALL TOLOMATIC AT 1-800-328-2174. We will provide any
assistance needed to determine the proper actuator for the job.

FAX 1-763-478-8080

EMAIL help@tolomatic.com

RSX Extreme Force, Hydraulic Class Electric Actuator

Selection Guidelines

1 ESTABLISH MOTION PROFILE

1 Using the application stroke length, desired cycle time, loads and forces, establish the motion profile details including linear velocity and thrust in each of its segments.

2 SELECT ACTUATOR SIZE AND SCREW TYPE

2 Based on the required velocities and thrust select an actuator size and type and lead of screw drive.

3 VERIFY CRITICAL SPEED OF THE SCREW

3 Verify that the application's peak linear velocity does not exceed the critical speed value for the size and lead of the screw selected.

4 VERIFY AXIAL BUCKLING STRENGTH OF THE SCREW

4 Verify that the peak thrust does not exceed the critical buckling force for the size of the screw selected.

5 COMPARE APPLICATION'S PEAK PARAMETERS TO PEAK CAPACITY (PEAK REGION) OF SELECTED ACTUATOR

When a roller screw is selected, calculate the application's required peak thrust and peak velocity and compare to the graphs. The selection must satisfy the application's peak requirements.

6 COMPARE APPLICATION'S CONTINUOUS OPERATION PARAMETERS TO CONTINUOUS OPERATION CAPACITY (CONTINUOUS DUTY REGION) OF SELECTED ACTUATOR

When a roller screw is selected, calculate the application's continuous operation thrust and velocity and compare to the graph. The selection must satisfy the application's peak requirements.

7 CALCULATE LUBRICATION INTERVAL

7 Calculate the recommended lubrication interval.
See page RSX_7 for complete lubrication information.



The above guidelines are for reference only. Use Tolomatic online sizing software for best results.

8 TEMPERATURE CONSIDERATIONS

8 If the application's ambient temperature lies outside of the allowed range -40° to +70°C (-40° to +158°F), contact the factory. Note that in aggressive applications where roller screw is used, outside temperature of the actuator's body can approach 82°C (180°F), and adequate clearance to avoid overheating of other system components should be allowed.

9 ESTABLISH TOTAL TORQUE REQUIREMENTS

9 Calculate total system inertia, the peak and the RMS torque required from the motor to overcome internal friction, external forces and accelerate/decelerate the load.

10 SELECT A MOTOR AND A CONTROLLER

10 Use the obtained total torque value to select a motor and a reduction device (if required). Verify that the peak torque value is below the motor's peak torque curve, and that the continuous torque value is below the motor's continuous torque curve. Verify the minimum torque margin (15%). Verify the inertia match. Select a controller.

11 SELECT A MOTOR-ACTUATOR CONFIGURATION AND SENSORS IF REQUIRED

Select an inline or a reverse-parallel motor configuration. Select mounting and rod end options. Select position sensors (if required). 12 sensor choices include: reed, solid state PNP or NPN, all in normally open or normally closed, with flying leads or quick-disconnect couplers.

12 SELECT ROD END OPTIONS AND MOUNTING OPTIONS

12 Rod end options include: CLV clevis rod end. Mounting options include: TRN trunnion mount, FFG front flange mount, MP2 mounting plates, PCD clevis mount.

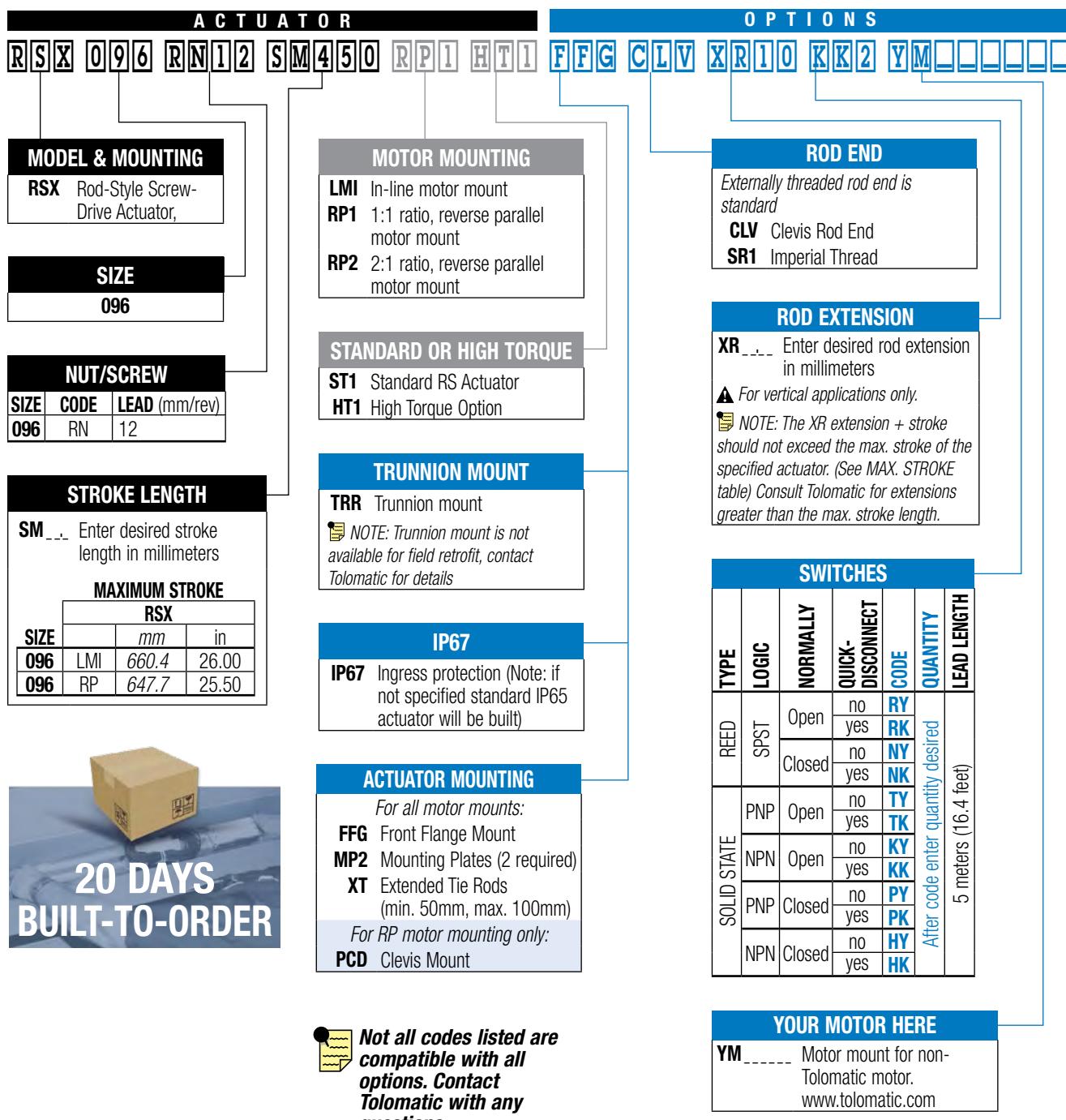


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