



High Performance Rodless Actuator

The R4 is our most powerful rodless actuator and can carry the heaviest carriage loads. With its internal linear motion guide bearing, and built-in flexible seal, the R4 Series is designed for operation in an industrial environment.

Two basic drive mechanisms can be used: Belt-drive offers the most rapid moves, and leadscrew offers the highest thrust capacity and repeatability.

There are three motor types available to meet a variety of application requirements:

R4-H - 160 Volt DC

- High torque brushed DC servo motor.
- Precise closed loop operation.
- Thrust monitored.

R4-S - Step Motor

- High load and duty cycle.
- In-position holding.
- Economical open loop operation (encoder optional).
- Repeatable positioning to 0.0005 inches [0.013 mm].

R4-B - Brushless Servo Motor

- Very high acceleration and power.
- High duty cycle.
- Precise closed loop operation.

		R4-H Series		R4-S Series		R4-B Series	
Load (Thrust) Capacity	lbs [N]	1,200 [5,300] screw drive, 300 [1,300] belt drive					
Max. No Load Speed	in/s [m/s]	40 [1,000] screw drive, 120 [3,000] belt drive					
Max. Carriage Load	lbs [kg]	300 [135]					
Repeatability	in [mm]	±0.001 [±0.025]		± 0.0005 [±0.013]		± 0.001 [±0.025]	
Peak Power	W	1,000		600		1,900	
Continuous Power	W	500		600		1,050	
Motor Type		160 volt DC Servo Stepper		1.8° Hybrid		Brushless Servo	
Compatible Controls Offered (Model)		H4301	B8001	NextStep S6002 S6961 S6962 SmartStep		B8001 B8961 B8962	
Typical System Cost*		\$4,100 – 6,700		\$4,000 – 5,800		\$5,300 – 7,200	

*System cost based on single quantity price, 30 inch stroke actuator with control.





Common Specifications

Travel Lengths Construction Materials

Bearing Housing	6063 T-6 aluminum, hardcoat anodized
Guide Housing	6063 T-6 aluminum, hardcoat anodized
Carriage Assembly	6061 T-6 aluminum, hardcoat anodized
Internal Rail Bearings	Recirculating ball on precision ground rail
Leadscrew or Belt	
Support Bearings	Angular contact, high thrust ball bearings
Ball Screw; drive nut	1.0" diameter hardened alloy steel screw; alloy steel, heat treated ballnut
Belt Drive	1.5" wide L pitch urethane with steel reinforcement cords
Flexible Seal	Stainless steel band with elastomeric seal

Weight (Approximate, without options)

	Screw-driven Actuators	Belt-driven Actuators
	- □ □ 1B, - □ □ 4B	- □ □ T
R4-H4	$36 + 0.85 \times (\text{inches stroke}) \text{ lbs}$	$36 + 0.64 \times (\text{inches stroke}) \text{ lbs}$
R4-S33	$32 + 0.85 \times (\text{inches stroke}) \text{ lbs}$	$32 + 0.64 \times (\text{inches stroke}) \text{ lbs}$
R4-S42	$40 + 0.85 \times (\text{inches stroke}) \text{ lbs}$	$40 + 0.64 \times (\text{inches stroke}) \text{ lbs}$
R4-B32	$30 + 0.85 \times (\text{inches stroke}) \text{ lbs}$	$30 + 0.64 \times (\text{inches stroke}) \text{ lbs}$
R4-B41	$36 + 0.85 \times (\text{inches stroke}) \text{ lbs}$	$36 + 0.64 \times (\text{inches stroke}) \text{ lbs}$

Environmental Operation

Temperature Range	-20° to 140°F [-28° to 60°C]
Moisture/Contaminants	IP 44 rated: Splash-proof, protected against ingress of solid particles greater than 0.040" [1 mm] diameter.

R4 Series Actuator Inertia

Equations

$$\text{Rotary Inertia (reflected to the motor)} = A + B^* (\text{stroke, in}) + C^* (\text{load, lb}) + D$$

$$\text{Linear Inertia (reflected to the carriage)} = [A + B^* (\text{stroke, in}) + D]/C + (\text{load, lb})$$

Belt Driven				A	B	C	Motor	D
Models	Motors	Ratio	Belt	(lb-in-s ²)	(lb-in-s ² /in)	(lb-in-s ² /lb)		(lb-in-s ²)
R4...-20T	H4, S42, B42	2:1	1.5 wide	6.06 E-03	1.06 E-05	9.02 E-04	H4	1.25 E-02
R4...-30T	S33, B32	3:1		2.32 E-03	4.71 E-06	4.01 E-04	S33	1.66 E-03
R4...-50T	All	5:1		1.07 E-03	1.62 E-06	1.38 E-04	S42	7.13 E-03
R4...-100T	All	10:1		4.40 E-04	4.21 E-07	3.60 E-05	B32	1.00 E-03
							B41	2.60 E-03

Screw Driven				A	B	C	
Models	Motors	Ratio	Screw	(lb-in-s ²)	(lb-in-s ² /in)	(lb-in-s ² /lb)	
R4...-101B	All	1:1	1x1	2.17 E-03	7.12 E-05	6.56 E-05	
R4...-151B	All	1.5:1		1.04 E-03	3.17 E-05	2.92 E-05	
R4...-201B	All	2:1		6.63 E-04	1.78 E-05	1.64 E-05	
R4...-501B	All	5:1		4.32 E-04	2.72 E-06	2.51 E-06	
R4...-1001B	All	10:1		2.75 E-04	7.12 E-07	6.48 E-07	
R4...-104B	All	1:1	1x0.25	1.80 E-03	7.12 E-05	4.10 E-06	
R4...-154B	All	1.5:1		8.99 E-04	3.17 E-05	1.83 E-06	
R4...-204B	All	2:1		5.84 E-04	1.78 E-05	1.02 E-06	
R4...-504B	All	5:1		4.20 E-04	2.72 E-06	1.62 E-07	
R4...-1004B	All	10:1		2.72 E-04	7.12 E-07	4.86 E-08	

Metric Conversions:
 1 mm = 0.03937 in
 1 kg = 2.205 lb
 1 lb-in-s² = 1129 kg-cm² = 1.152 kg-cm-s²



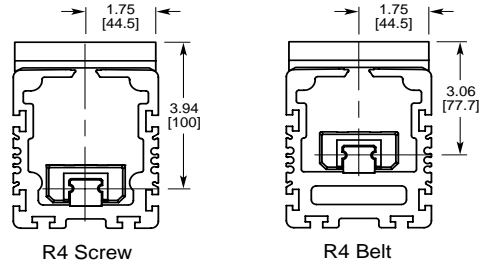
General Specifications

Carriage Straightness & Flatness

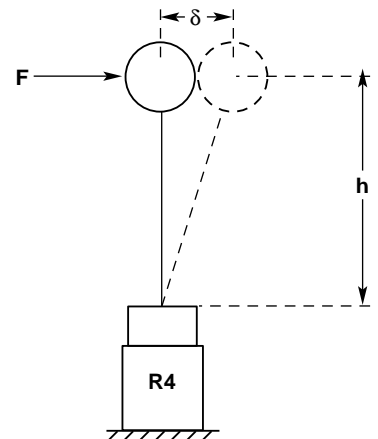
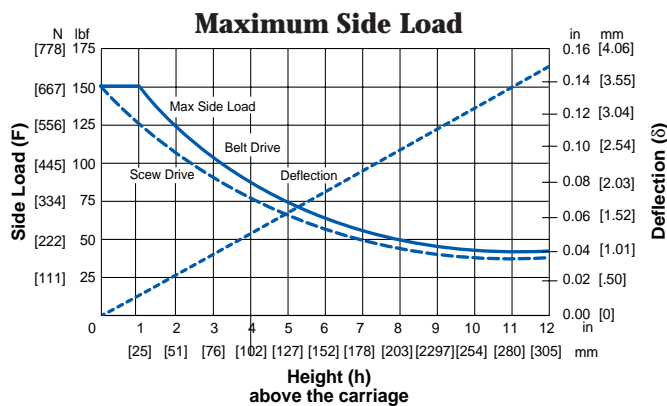
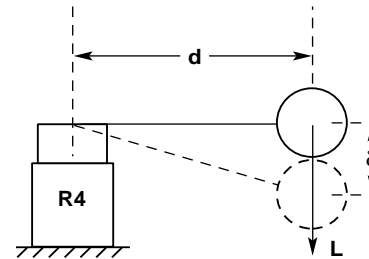
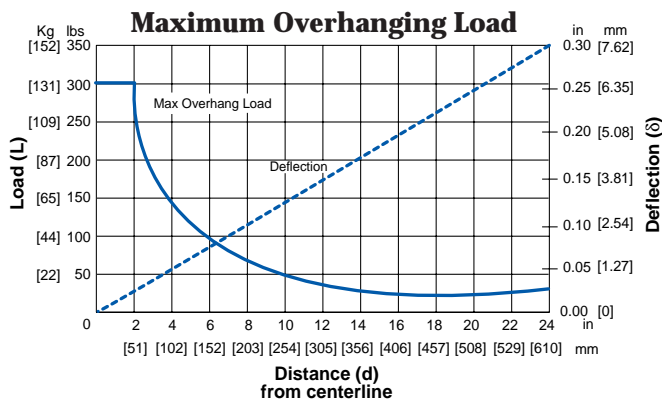
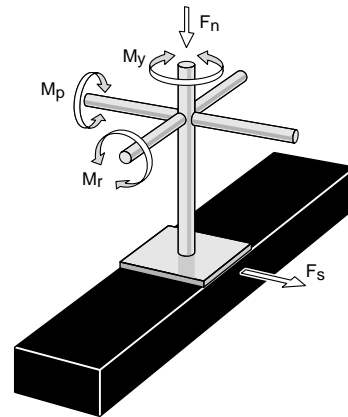
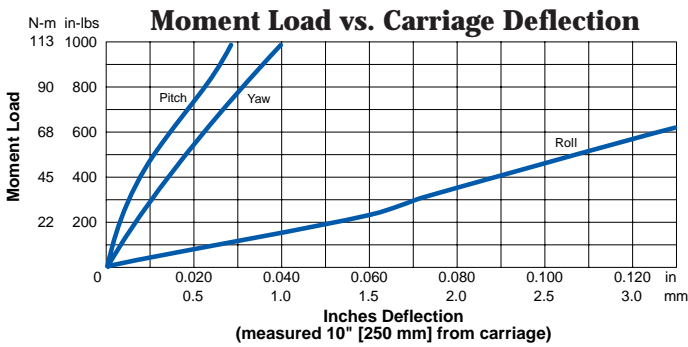
± 0.005 in/ft [0.125 mm/300 mm], not to exceed
 ± 0.035 in [0.9 mm]

Load Limits

Normal (F_n) ± 300 lbs [± 1330 N]
 Side (F_s) ± 150 lbs [667 N]
 Pitch (M_p) 1,000 in-lbs* [113 N-m]
 Roll (M_r) 600 in-lbs* [68 N-m]
 Yaw (M_y) 1,000 in-lbs [113 N-m]



* Be sure to add distance from carriage to bearing centerline to moment arm for pitch and roll calculations.

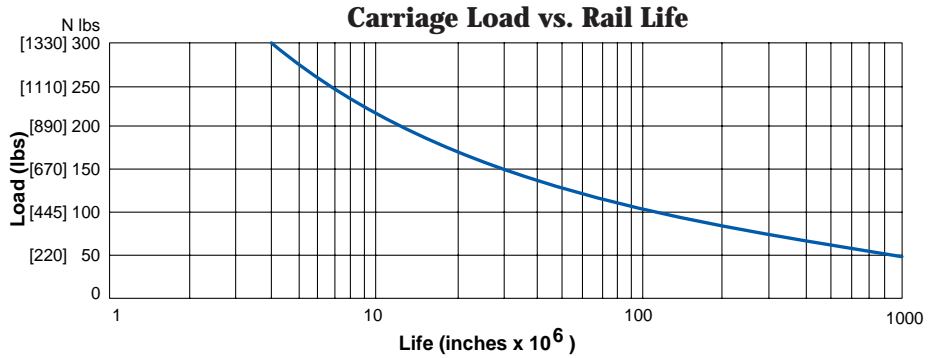




Life

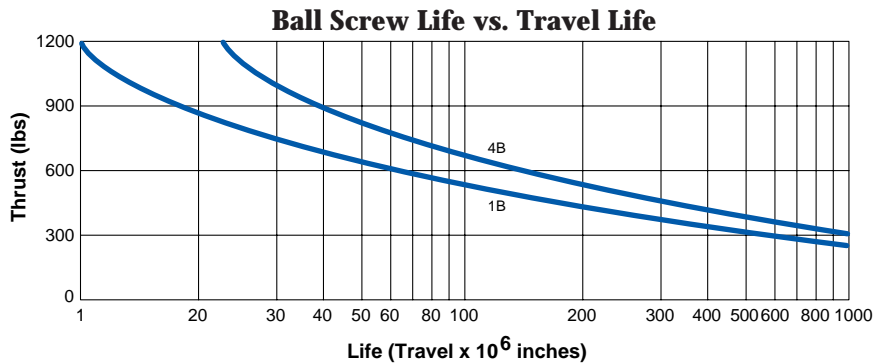
Belt Drive

As belt-driven actuators are generally used horizontally with light thrust loads, life is usually a function of the load weight. Actual life will be determined by carriage loading, speed, acceleration, and duty cycle and operating environment. The curve to the right shows predicted life of the actuator under ideal conditions. Derate as required by your application.



Ball Screw

Ballscrew life is rated in inches of travel at a given load. The values in the chart to the right indicate the travel life where 90% of all units in a sample will continue to work, while 10% have failed. This is similar to the B10 rating of a roller bearing mechanism. Be sure to consider acceleration loads as well as thrust, gravitational and friction loads.

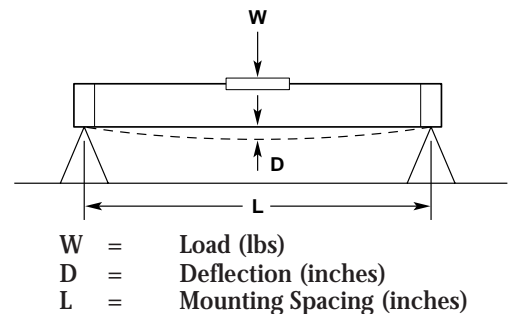


Maintenance

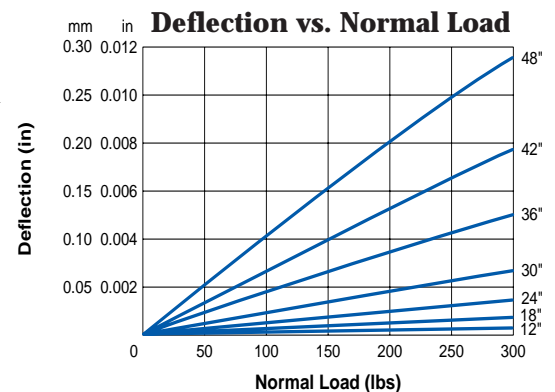
The R4 carriage seal and internal bearing design prevents lubricant contamination and nearly eliminates the need for routine maintenance. Replacement parts are available from the factory – see the Rodless Actuator Manual for details.

Actuator Deflection, Mounting Configurations

Actuator deflection will affect the flatness or straightness of the actuator when the system is supported at spaced mounting points.



The chart to the right provides a quick reference for deflection vs. normal load.



The equations to the right provide deflection as a function of the various loads applied to the carriage. Deflection should not exceed 0.015 in [0.38 mm]. Mounting spacing should not exceed 48 in [1200 mm].

Orientation

- Normal
- Side
- Pitch
- Roll
- Yaw

Deflection Equation

- $WL^3/2.8 \times 10^9$, inches
- $WL^3/1.3 \times 10^9$, inches
- 3×10^{-6} radians/in-lb
- 2×10^{-5} radians/in-lb
- 4×10^{-6} radians/in-lb

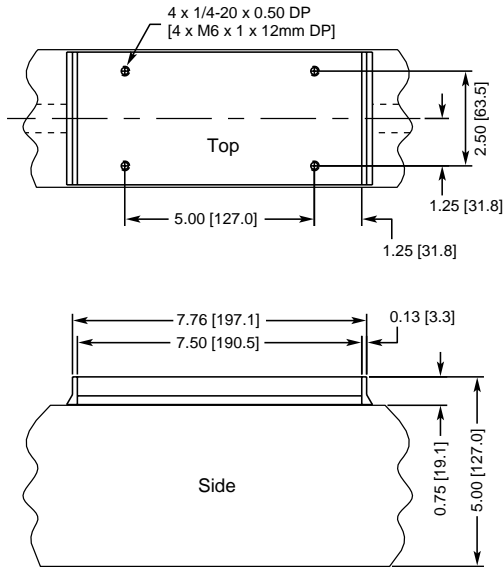
Maximum Allowed

- 0.010" [0.25 mm]
- 0.010" [0.25 mm]
- 0.003 radians @ 1,000 in-lbs
- 0.013 radians @ 600 in-lbs
- 0.004 radians @ 1,000 in-lbs

Carriage Dimensions

Dimensions

- S Single Carriage Option



- D Dual Carriage Option *Screw Driven Actuators Only*

Increase carriage capacity by supporting the load at two separate locations. The second carriage is attached to the internal rail bearing, but is not driven by the leadscrew.

- Available actuator travel will be reduced by the length of one carriage plus the distance between them when mounted to load.



Motor Specifications

H4 Series

Inductance
Terminal Resistance
Hipot Breakdown
Voltage
Current
Continuous
Peak
Torque Constant
Voltage Constant
No Load Speed
Connections

Permanent magnet 2-pole, 160 volt DC motor;
replaceable brushes

12 mH
1.5 Ohms $\pm 20\%$
500 VAC
160 VDC max

User Cabling

Quick Disconnect: 3 contact receptacle, including case ground, in anodized aluminum shell, includes 12 ft cable with molded plug
16 AWG (less than 50 ft [15m]), 14 AWG (50-100 ft [15-30m]), 10 AWG (100-200 ft [30-60m])

Anticipated Life of Brushes Temperature

5 million cycles; 5,000 hours
180°F [82°C] Maximum allowable motor case temperature. Actual motor case temperature is ambient, duty cycle, speed and load dependent. Refer to speed vs. thrust performance curves for system duty ratings.

