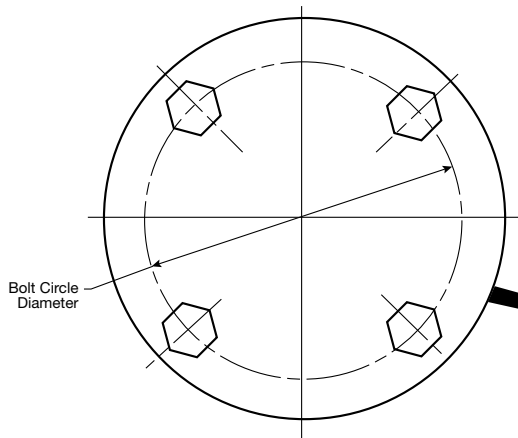


SCREW JACK

ENGINEERING GUIDE

FLANGE BOLT INFORMATION



Worm Flange



Refer to respective catalog dimensional drawings for orientation on flange bolts in relation to the horizontal \varnothing for 4-hole pattern and 30° to horizontal \varnothing for 6-hole pattern.

Flange Bolt Information		
Actuator Rating	B.C. Diameter	Bolt Information
1/4 Ton	N/A	No Flange Bolts
1/2 Ton	N/A	No Flange Bolts
1 Ton	N/A	No Flange Bolts
2 Ton	1-11/16 inch	Four 1/4-20 x 3/4 inch Lg. Equally Spaced at 90 Degrees
3 Ton BS	1-11/16 inch	Four 1/4-20 x 3/4 inch Lg. Equally Spaced at 90 Degrees
3 Ton MS	2-3/32 inch	Four 1/4-20 x 3/4 inch Lg. Equally Spaced at 90 Degrees
5 Ton	2-3/8 inch	Four 5/16-18 x 3/4 inch Lg. Equally Spaced at 90 Degrees
10 Ton	3 inch	Four 5/16-18 x 3/4 inch Lg. Equally Spaced at 90 Degrees
15 Ton	2-3/8 inch	Four 5/16-18 x 1 inch Lg. Equally Spaced at 90 Degrees
20 Ton	3-1/2 inch	Four 3/8-16 x 1 inch Lg. Equally Spaced at 90 Degrees
25 Ton	4-1/8 inch	Four 3/8-16 x 1-1/4 inch Lg. Equally Spaced at 90 Degrees
35 Ton	4-1/4 inch	Four 1/2-13 x 1-1/4 inch Lg. Equally Spaced at 90 Degrees
50 Ton	5-1/4 inch	Four 5/8-11 x 1-1/2 inch Lg. Equally Spaced at 90 Degrees
75 Ton	5-3/4 inch	Six 5/8-11 x 1-1/2 inch Lg. Equally Spaced at 60 Degrees
100 Ton	6-1/4 inch	Six 5/8-11 x 1-1/2 inch Lg. Equally Spaced at 60 Degrees
150 Ton	6-1/4 inch	Six 5/8-11 x 1-1/2 inch Lg. Equally Spaced at 60 Degrees
250 Ton	8-1/4 inch	Six 3/4-10 x 2 inch Lg. Equally Spaced at 60 Degrees

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OVERHUNG LOAD CAPACITY OF ACTUATOR WORM SHAFT (LBS)



Actuator	Overhung Load
1/4 Ton MS	50
1/2 Ton MS	45
1/2 Ton BS	45
1 Ton MS & BS	55
2 Ton MS & BS	30
3 Ton MS	60
3 Ton BS	120
5 Ton MS & BS	105
10 Ton MS & BS	305
15 Ton MS	390
20 Ton MS & BS	325
25 Ton MS & BS	735
35 Ton MS	665
50 Ton MS & BS	350
75 Ton MS	630
100 Ton MS	650
150 Ton MS	350
250 Ton MS	1310

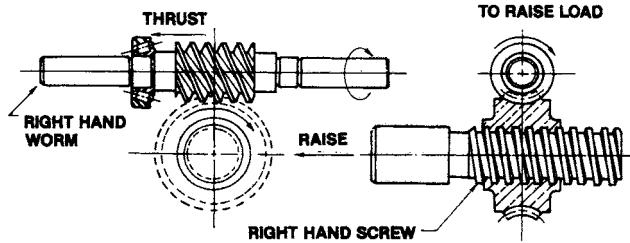
NOTE

- These ratings are based on use of roller chain and sprocket. For other conditions, divide ratings by following factors (must include bolt tension or gear separating forces):
 - 1.25 for overhung gear
 - 1.50 for overhung "V" belt
 - 2.50 for overhung flat belt
- Ratings are based on standard actuator model worm shaft extensions and are calculated on the basis of concentrated load applied at a point 1/2 the keyway length measured from extreme end of worm shaft.
- Above ratings apply to actuators carrying any load up to their rated capacity.

SCREW JACK ENGINEERING GUIDE LATERAL MOVEMENT RATINGS

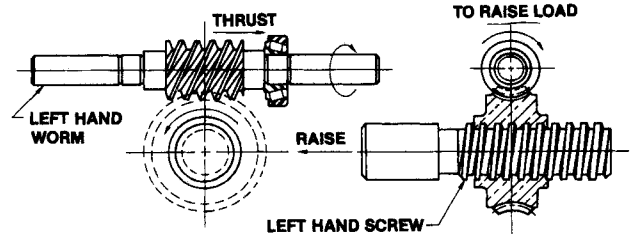
Worm Rotation Chart

Clockwise Rotation of Worm Raises Load



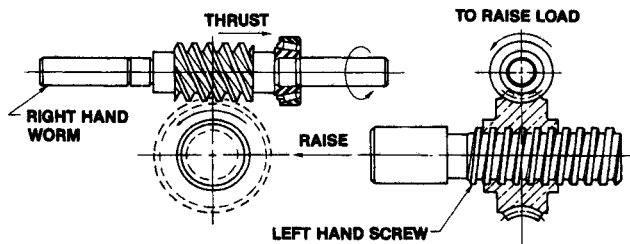
- Standard for All
- Except 50 and 75 ton MS, 50 ton BS

Clockwise Rotation of Worm Raises Load



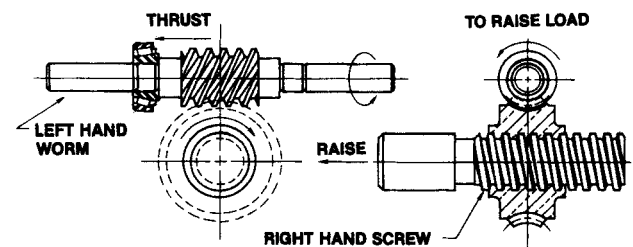
- Standard for 1850, 9050 & 9075
- Except 50 and 75 ton MS, 50 ton BS
- Special for all Other Actuators
- Unit at Extra Cost

Counter-Clockwise Rotation of Worm Raises Load



- Special for all Actuator Units

Counter-Clockwise Rotation of Worm Raises Load



- Standard for 50 ton BS
- Special for all Other Actuators
- Units at Extra Cost

Machine Screw Actuators Loads and Raises

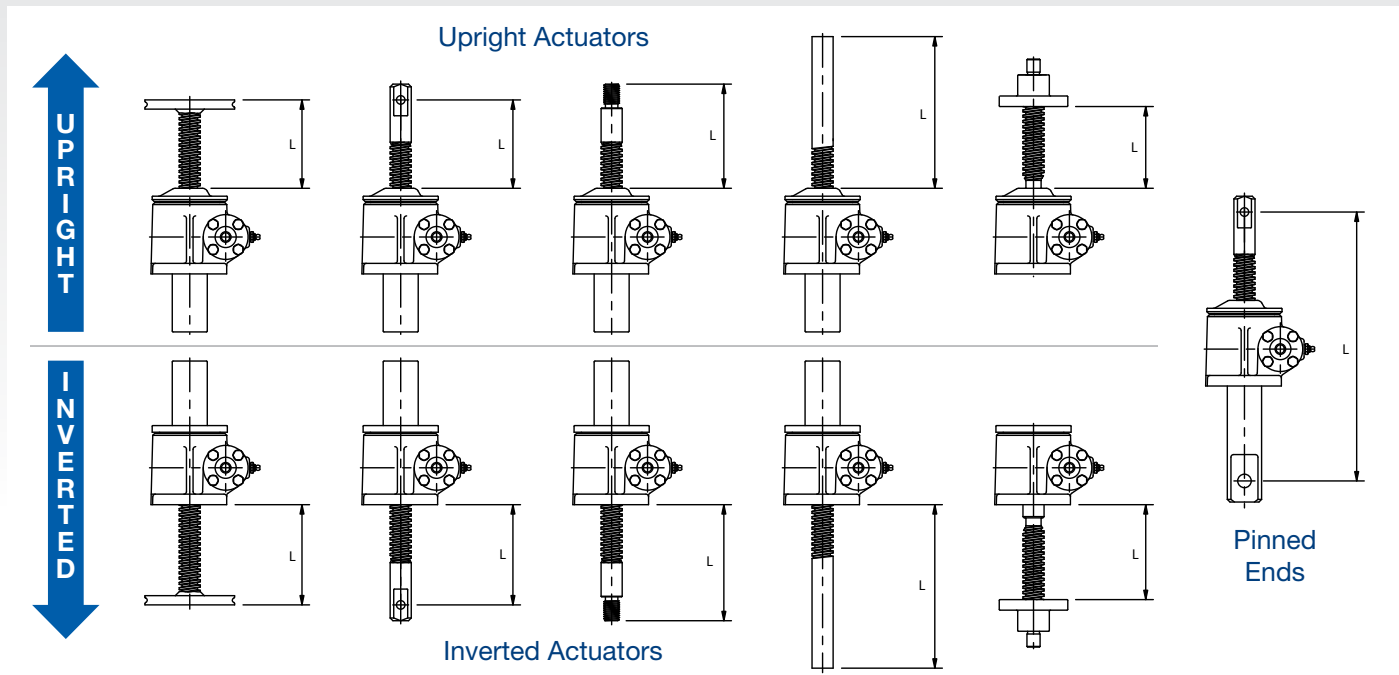
Raise (in)	1/4 Ton	1/2 Ton	1 Ton	2 Ton	3 Ton	5 Ton	10 Ton	15 Ton	20 Ton	25 Ton	35 Ton	50 Ton	75 Ton	100 Ton	150 Ton	250 Ton
3	.040	.050	.020	.020	.020	.030	.025	.030	.025	.035	.040	.060	.050	.050	.050	.090
6	.085	.075	.030	.035	.035	.050	.040	.045	.040	.060	.050	.090	.060	.060	.060	.100
9	.090	.105	.040	.055	.055	.070	.055	.065	.050	.085	.060	.120	.070	.070	.070	.110
12	.115	.135	.050	.070	.070	.090	.070	.080	.070	.105	.070	.150	.080	.080	.080	.120
15	.140	.165	.060	.090	.090	.110	.085	.100	.080	.130	.080	.180	.090	.090	.090	.130
18	.165	.195	.070	.100	.100	.1030	.100	.120	.095	.155	.090	.215	.100	.100	.100	.140
21	.190	.225	.080	.120	.120	.150	.115	.133	.105	.175	.100	.245	.110	.110	.110	.150
24	.215	.255	.090	.135	.130	.170	.135	.150	.125	.200	.110	.275	.120	.120	.120	.160

NOTE

1. Does not allow for possible deflection due to side thrust.
2. Lateral movements are for information only. For best results, we suggest guides where possible.
3. The above movements apply to machine screw actuator models only and not to the ball screw series. Permitting lateral movement on the ball screw under load will exert side thrust on the ball screw and ball nut, and will be detrimental to ball screw and ball screw nut life. Ball screw applications should be guided to ensure a minimum of lateral movement.

SCREW JACK ENGINEERING GUIDE

LOAD SCREW COLUMN STRENGTH SPECIFICATIONS



Screw Length - Screw lengths for strength curves are defined as shown.

NOTE

Screw length can be converted to actuator raise or actuator raise can be converted to screw length by use of appropriate dimensional diagrams in the design guide for standard actuator models or special dimensions and dimensional diagrams for special actuator models.

CAUTION

Actual loads on any actuator should never exceed catalog load rating for that actuator.

Safety Factor - The loads on the vertical axis for the strength curves are theoretical buckling loads as predicted by the Euler column formula in sloping portions and twice rated actuator loads in the horizontal portions. See AISC or other applicable codes for selecting appropriate safety factors.

Capacity	Machine Screw		Max. Pin-to-Pin Length Pinned Ends
	Max. Permissible Screw Length Regardless of Load (in)		
	Fixed Free	Fixed Guided	
5 kN	279	762	609
10 kN	304	838	660
25 kN	431	1143	914
50 kN	609	1625	1295
100 kN	838	2159	1727
150 kN	965	2540	2032
200 kN	1117	2946	2362
300 kN	2006	5257	4216
500 kN	2489	6502	5207

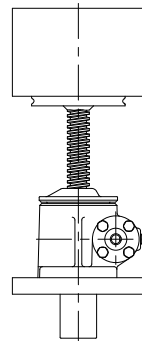
Capacity	Ball Screw		Max. Pin-to-Pin Length Pinned Ends
	Max. Permissible Screw Length Regardless of Load (in)		
	Fixed Free	Fixed Guided	
1/2 Ton BS	11	30	24
1 Ton BS	15	41	33
2 Ton BS	20	51	41
3 Ton BS	21	54	44
5 Ton BS	27	71	57
10 Ton BS	27	71	57
20 Ton BS	44	116	93
25 Ton BS	59	155	124
50 Ton BS	80	211	169

Capacity	Continuous Duty		Max. Pin-to-Pin Length Pinned Ends
	Max. Permissible Screw Length Regardless of Load (in)		
	Fixed Free	Fixed Guided	
7511 CD	21	54	44
7515 CD	27	71	57
7522 CD	44	116	93

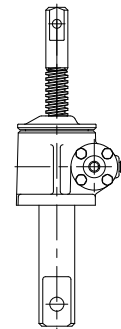
SCREW JACK ENGINEERING GUIDE

LOAD SCREW COLUMN STRENGTH SPECIFICATIONS

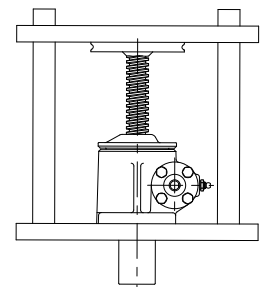
End Fixity Conditions - The horizontal axis of the strength curves has three screw length scales. The top scale is for the housing end of the screw fixed and the load end of the screw free from guiding. The middle scale is for trunnion or pin mounted actuators. The bottom scale is for the housing end of the screw fixed and the load end of the screw guided. Duff-Norton recommends that load end of actuator screws be guided so that forced misalignment does not occur.



One end fixed,
one end free



Pinned Ends



One end fixed,
one end guided

Maximum Permissible Screw Length - The strength curves terminate at a screw length where the screw slenderness ratio is 200. Maximum length versus actuator model is tabulated in the right portion of this page. Screw lengths longer than shown are not recommended regardless of load.

Steps to Follow - To select an actuator suitable for a specific load at a specific screw length with specific end fixity conditions.

1. Select safety factor from AISC or other applicable codes suitable for actuator application.
2. Multiply load by safety factor to determine failure load.
3. Locate failure load on vertical axis.
4. Locate screw length on appropriate horizontal axis.
5. Project horizontally right from failure load and vertically up from screw length to where projections intersect.
6. Any actuator with its curve above the intersection is suitable for the application provided that the actuator's load rating and its maximum permissible screw length are not exceeded.

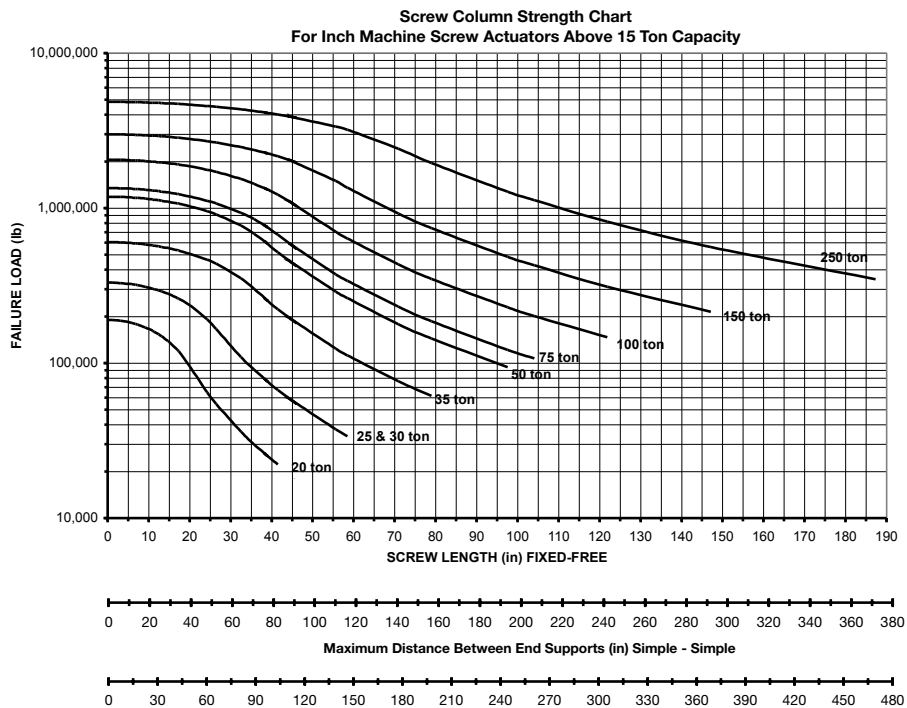
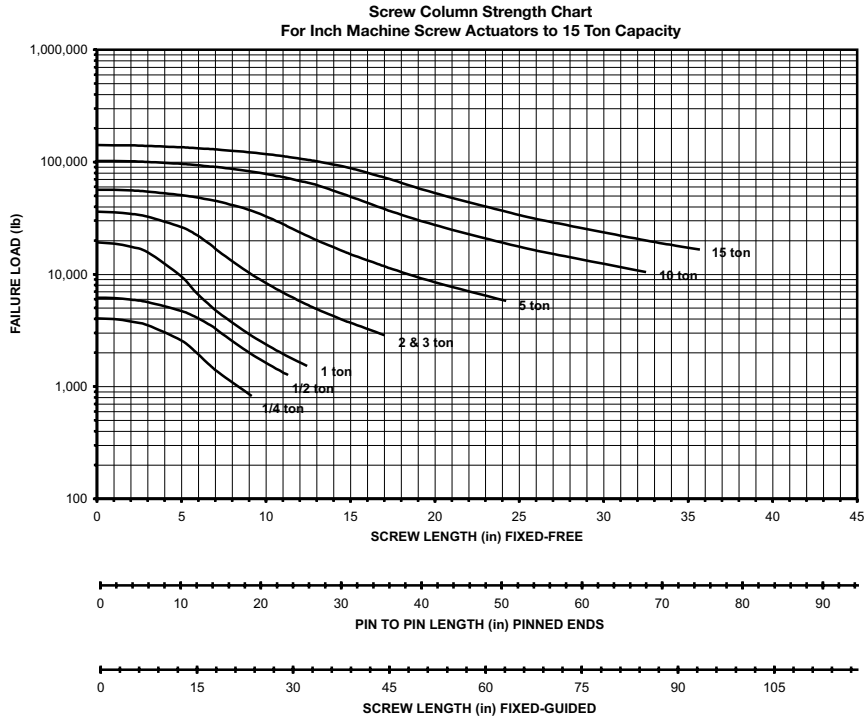
Example - Select a standard upright clevis end machine screw actuator for a 14,000 lb. unguided load and a 25 inch raise. For first approximation assume screw length equal raise.

1. Select safety factor. For example 1.92 from AISC specifications.
2. Multiply 14,000 lb. load by 1.92 safety factor to obtain 26,880 lb. failure load.
3. Locate 26,880 lb. load on vertical axis.
4. Locate 25 inch screw length on upper horizontal axis scale.
5. Project horizontally right from 26,880 lb. load and vertically up from 25 inch screw length.
6. Select 9015 actuator since its strength curve is above the intersection, the 14,000 lb. load is less than the 30,000 lb. rated load and the 25 inch screw length is less than the 41 inch maximum permissible screw length.
 - 6a. Recheck actuator selection using true screw length.
 - 6b. Convert 25 inch actuator raise to true screw length.

8.50 inch	"A" dimension for clevis type screw end from screw end dimension diagram.
- 6.31 inch	Mounting face to top of shell cap from 9015 dimensional diagram.
2.19 inch	Screw length at no raise.
+ 25.00 inch	Raise.
27.19 inch	True screw length at 25 inch raise.
- 6c. Use failure load of 26,880 lb. and true screw length of 27.19 inches and re-enter chart to verify that 9015 is a safe selection.

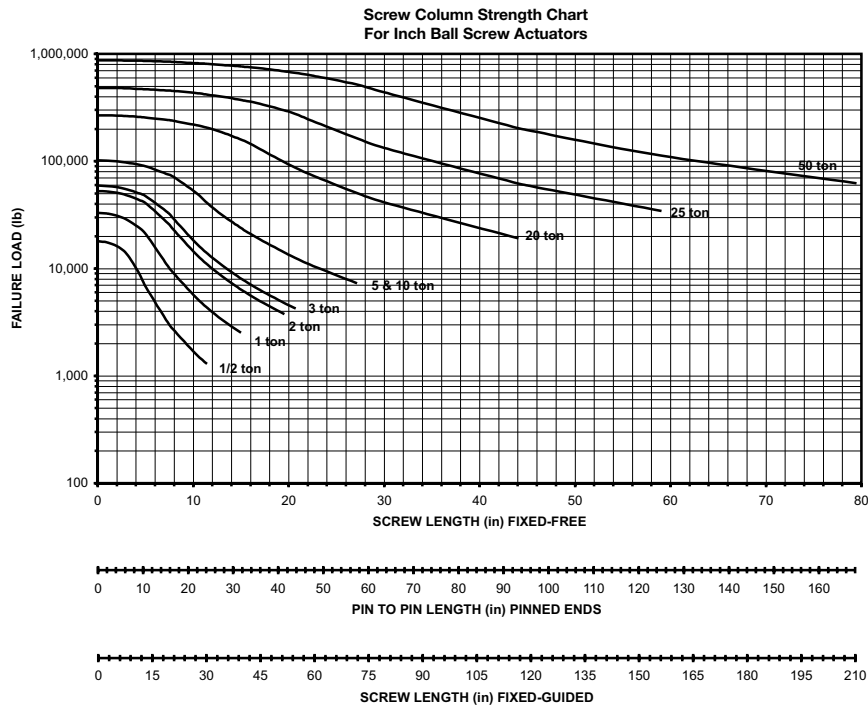
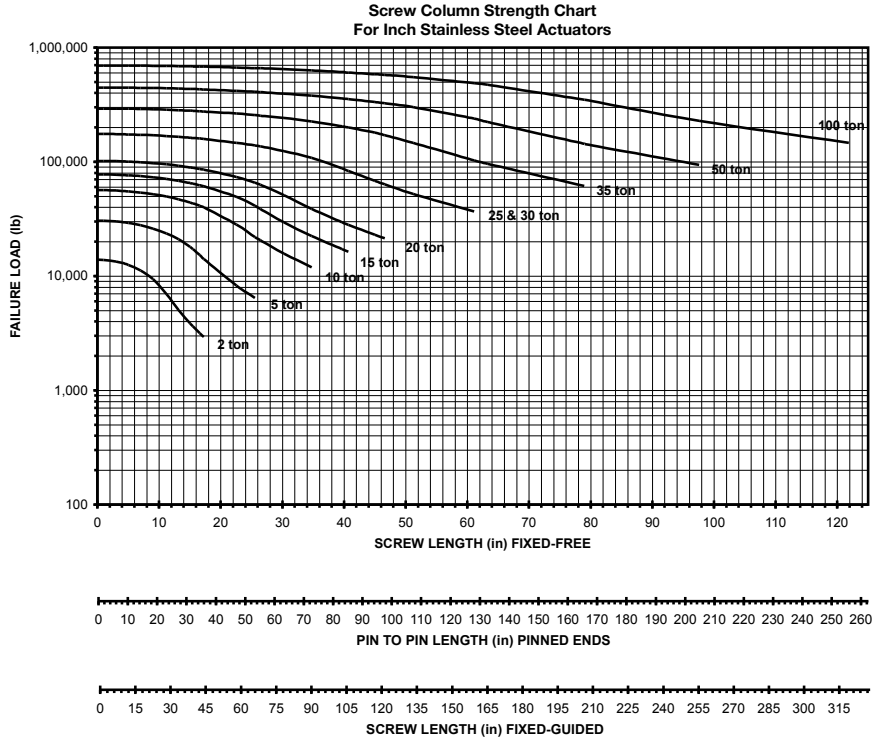
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SCREW COLUMN STRENGTH CHART



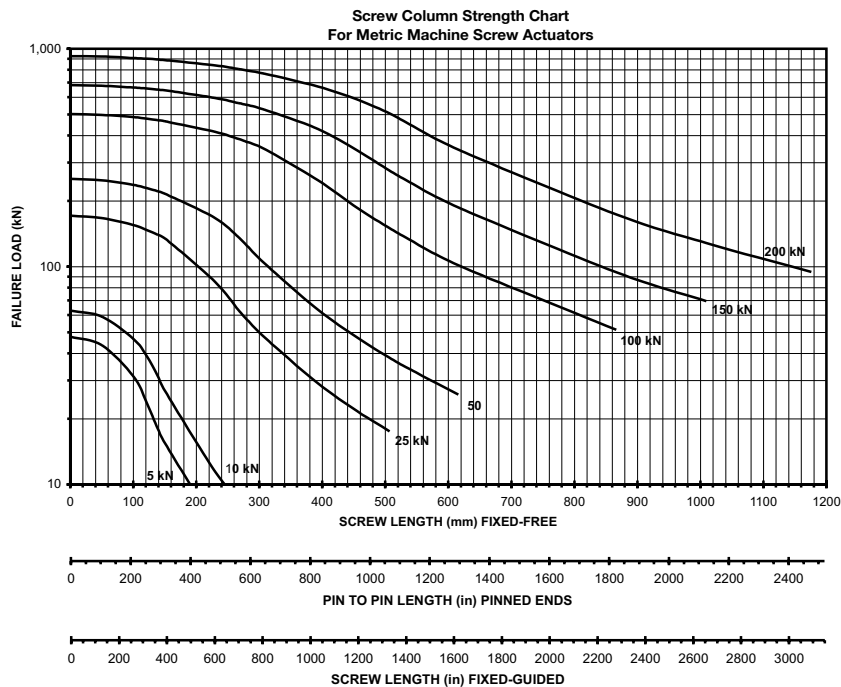
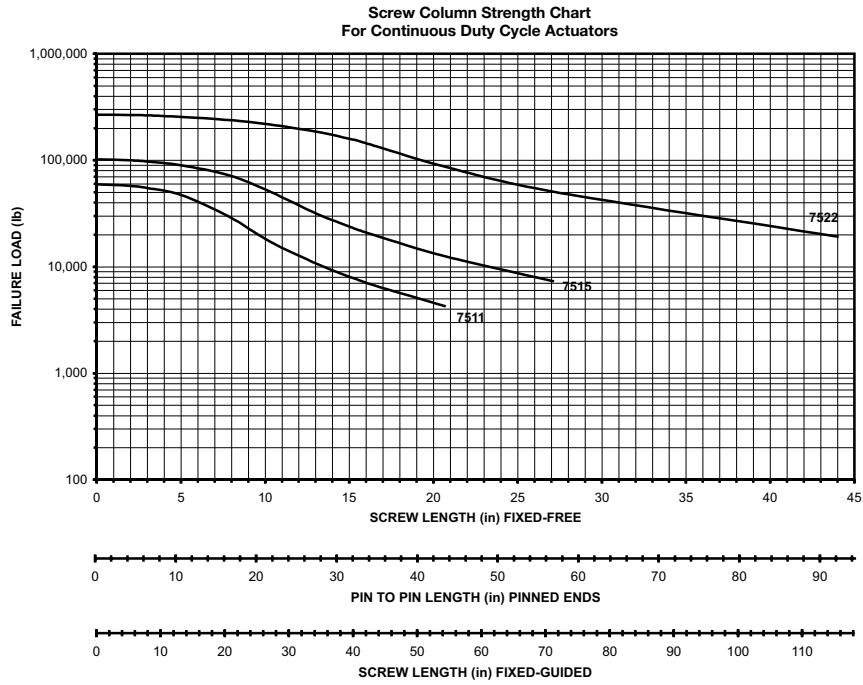
SCREW JACK ENGINEERING GUIDE

SCREW COLUMN STRENGTH CHART



SCREW JACK ENGINEERING GUIDE

SCREW COLUMN STRENGTH CHART



SCREW JACK ENGINEERING GUIDE BALL SCREW AND NUT LIFE RATING

Predicting screw and nut life lets you forecast necessary replacement, saving time and money. It also permits selection of the most economical screw size.

Use caution when installing the ball screw. The life expectancy listed below may be greatly reduced if ball screws are subjected to misalignment, shock loads, side thrust, environmental contamination or lack of lubrication and maintenance.

It is possible to estimate the minimum life of the Duff-Norton ball screw and nut only. Because of the many variable operating conditions, we can not predict the life of the worm and gear set in the ball screw actuators.

Ball Screw Actuator Life Expectancy (total inches of travel)			
Capacity (Tons)	100% of Full Load	75% of Full Load	50% of Full Load
1/2	470,000	1,100,000	3,700,000
1	110,000	250,000	860,000
2	65,000	150,000	520,000
2 - High Lead	150,000	360,000	1,200,000
3	210,000	650,000	2,200,000
5	1,000,000	2,400,000	8,100,000
5 - High Lead	440,000	1,000,000	3,500,000
10	130,000	300,000	1,000,000
10 - High Lead	50,000	130,000	430,000
20	150,000	360,000	1,200,000
25	700,000	1,600,000	5,600,000
50	630,000	1,500,000	5,000,000

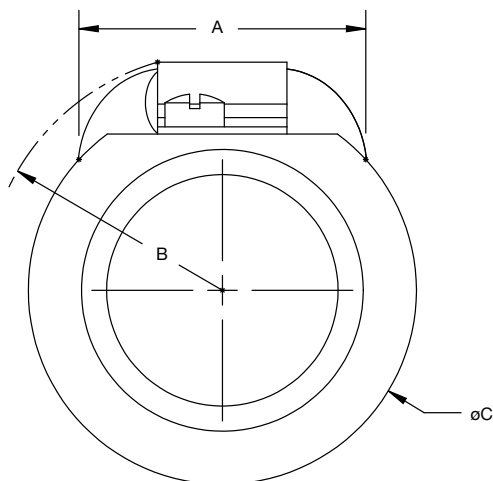
Note: 5 ton and 10 ton models use the same screw and nut.

Continuous Duty Actuator Life Expectancy (total inches of travel)					
Model Number	Maximum Capacity				
	1	0.75	0.5	0.25	0.1
7511	1.10	2.70	9.50	60.00	150.00
7515	.44	1.00	3.70	34.00	110.00
7522	.64	1.50	5.50	50.00	130.00
	Maximum Allowable Duty Cycle at 1750 RPM Input				
	33%	67%	100%	100%	100%

NOTE

Note: Duty Cycles are based on a 100°F temperature rise not to exceed 200°F using Duff-Norton's standard oil.

*Life expectancies listed are L10 values - values where 10% of screw can, statistically, be expected to fail.



Ball Nut Dimensions			
Capacity (Tons)	A	B Radius	C
1/2	.822	.797	1.000 Sq.
1	.812	.875	1.250 Sq.
2	1.104	1.194	1.500 Sq.
2 - High Lead	1.104	1.194	1.500 Sq.
3	1.587	1.386	2.125 Dia.
5	1.981	1.690	2.625 Dia.
5 - High Lead	1.718	1.720	2.625 Dia.
10	1.981	1.690	2.625 Dia.
10 - High Lead	1.718	1.720	2.625 Dia.
20	2.561	2.272	3.375 Dia.
25	3.349	3.076	4.751 Dia.
50	4.029	3.756	5.990 Dia.