Frequently Asked Questions

1.What is the lifting torque required?
The lifting torque for a single actuator depends on the load, the worm gear ratio, type of screw (machine cut or ball screw) and the pitch of the lifting screw. Torques are listed in the specification chart (pages 17, 39, 45, 50, 53, 74, 80 and 88) based on capacity loads. For loads from 25% to 100% of actuator model capacity, torque requirements are approximately proportional to the load.

2. Can the actuator be operated in multiple units?
Perhaps the greatest single advantage of Duff-Norton actuators is that they can be tied together mechanically, to lift and lower in unison. Typical arrangements involving the actuator units, mitre gear boxes, motors, reducers, shafting and couplings are shown on page 130.

3. How many actuators can be connected in series?
This will be limited by the input torque requirements on the first worm shaft in the line. The torque on the worm shaft of the first actuator unit should not exceed 300% of its rated full load torque based for most Machine Screw models.
Torque can be reduced by using a double end gear motor at the center of the arrangement or a higher capacity actuator model can be used as the first unit in the line, provided the turns for 1" raise are the same as the lower capacity units.
If this is not possible, the actuators may be individually motorized and synchronized using electronic controls designed by the customer.

4. Can the Duff-Norton actuator operate at high speeds?
The input horsepower to these actuators should not exceed the hp rating shown in the specifications table. Maximum RPM should not exceed 1800. We cannot accept responsibility for the overheating and rapid wear that may occur should these limits be exceeded Horsepower increases in direct proportion to the speed, and the motor size will be out of proportion to the actuator model design rating should the speed become excessively high. When selecting the maximum permissible speed for an actuating arrangement, always check to see that the hp rating of the actuator model is not exceeded

5. Can Duff-Norton mitre gear boxes operate at high speeds?
The gear boxes can be run at the same speeds as the actuator models. Do not exceed torque ratings.

6. What is the efficiency of the actuator?
Actuator model efficiencies are listed in the specification charts on pages 17, 39, 45, 50, 53, 74, 80 and 88. Where both starting and running torques are listed, use the running torque for hp calculations when using induction electric motors.

7. What is the efficiency of the mitre gear boxes?
We use 98% efficiency.

8. What is the efficiency of an actuator multiple-unit arrangement?
In addition to the efficiencies of the actuator units and the mitre gear boxes, the efficiency of the actuator multiple-unit arrangement must be taken into consideration. The arrangement efficiency allows for misalignment due to slight deformation of the structure under load, for the losses in couplings and bearings, and for a normal amount of misalignment in positioning the actuators and gear boxes. We use the following efficiencies (all standard units):
Two Actuator Arrangement - 95%
Three Actuator Arrangement - 90%
Four Actuator Arrangement - 85%
Six or Eight Actuator Arrangement - 80%

Frequently Asked Questions

9. Can the actuator be used for continuous operation?

Recommendation should be obtained from the Duff-Norton Company on this type application and a completed application analysis form submitted. In general, semi- continuous operation can be permitted where load is light as compared to actuator model rated capacity. Units so used should be lubricated frequently and protected against dust and dirt. The Duff -Norton 7500 Series, oil-lubricated, Continuous Duty cycle actuator is designed for maximum duty cycles.

10. What is the maximum practical raise or working stroke?

Generally, standard raises are up to 12 inches on 1/4- and 1/2-ton models and 18 inches on the 1 ton. Maximum raises available for the larger diameter screws are limited only by the available length of bar stock from suppliers. Practical length will be affected by whether the screw is to be subjected to compression or tension loads. Depending on diameter, the length can be limited due to deformation of material in the machining process or column strength of the screw when subjected to compression loads. Long raise applications should be checked with Duff-Norton for the following:
a) Side thrust on extended screw (see question 11)
b/b) Column strength of screw (see question 12)
c) Thermal rating of screw and nut (see question 13)
We suggest guides be used on all applications. The longer the raise, the more important this becomes.

11. Will the actuator withstand a side thrust?

Actuator units are designed primarily to raise and lower loads and any side thrust should be avoided. These units will withstand some side thrust, depending on diameter of the screw and the extended length of the screw. Where side thrusts are present, the loads should be guided and the guides, rather than the actuator units, should take the side thrust - particularly when long raises are involved. Even a small side thrust can exert great force on the housings and bearings and increase the operating torque.

12. How is the column strength of a lifting screw determined?

The column strength of a screw is determined by the relationship between the length of the screw and its diameter. A column strength nomograph is included in this book on page 98.

13. What is the cause of thermal or heat build-up in an actuator unit?

The duty cycle, the length of the screw, the magnitude of the load, and the efficiency of the actuator unit all have a direct influence on the amount of heat generated within the actuator model. Since most of the power input is used to overcome friction, a large amount of heat is generated in the worm gear set in both ball screw and machine screw actuator models, and in the lifting screw of machine screw actuator units. Long lifts can cause serious overheating.

14. What is the allowable duty cycle of a worm gear actuator?

Because of the low efficiency of worm gear actuators, the duty cycle is low at rated load. At reduced loading, the duty cycle may be increased. Consult Duff-Norton for more complete information.

15. What is the life of the worm gear actuator?

The life of a machine screw actuator screw, nut and worm gear set varies considerably due to extent of lubrication, abrasive or chemical action, overloading, eccentric loading, excessive heat, improper maintenance, etc.

16. Can the actuator be used to pivot a load?

Yes, although the Duff-Norton SuperCylinder is recommended for these applications due to stroke limitations with the conventional double clevis configuration. Double clevis actuators are furnished with a clevis at both ends. The bottom clevis is welded to the bottom end of an extra strong pipe which is threaded into the base of the actuator and welded This bottom pipe still performs its primary function of encasing the lifting screw in its retracted position. The design of the structure in which this type unit is to be used must be so constructed that the actuator unit can pivot at both ends. Use only direct compression or tension loads, thereby eliminating side thrust conditions. See the double clevis model illustrations on the dimensional drawings.

17. Can the actuator unit be used within rigid structures or presses?

We recommend that the actuator selected have a greater capacity than the rated capacity of the press or of the load capacity of the structure. We also recommend that a torque limiting clutch or similar device be used to prevent overloading of the actuator unit. Unless these precautions are taken, it is possible to overload the actuator unit without realizing it, because it is difficult to determine just what load is being imposed on the actuator unit.

18. Can the lifting screw be keyed to prevent rotation?

Yes, except for the ball screw (where we use a square nut on the end of the screw and a square tube to prevent screw rotation); however, the keyway in the screw causes greater than normal wear on the internal threads of the worm gear. The ball screw cannot be keyed, as the keyway would interrupt the ball track, permitting loss of the recirculating balls. We also recommend the following methods for preventing rotation. For multiple actuator model applications, bolt the lifting screw top plates to the member being lifted. For single actuator unit applications, bolt the lifting screw top plate to the load. And the load should be guided to prevent rotation.

19. Why is it ever necessary to use a keyed lifting screw?

When an actuator unit is operated, the rotation of the worm shaft causes the worm gear to rotate. The worm gear is threaded to accommodate the lifting screw thread; as the worm gear turns, the friction forces on the screw thread act to turn the screw also. The greater the load on the actuator unit, the greater the tendency of the screw to turn. It is obvious that if the screw turns with the nut (worm gear), it will not raise the load. In those cases where a single unit is used, and where the load cannot be restrained from turning, it is necessary to key the lifting screw. The lifting screw turning movement or key torque is shown on pages 17, 39, 45, 50, 53, 74, 80 and 88.

20. Can an actuator model with an inverted lifting screw be keyed?

Yes, but the key is mounted in the shell cap, making it necessary to omit the dust guard as a standard item. If a dust guard is required, a special adaptor must be attached to permit mounting.

21. Can bellows boots be supplied for an actuator model with inverted screw?

Yes, but allowance must be made in the length of the lifting screw for both the closed height of the boot and structure thickness. Since we can make no provision for attaching a boot on the underside of your structure, we suggest that a circular plate similar to the lifting screw top plate be welded or bolted to the bottom of your structure supporting the actuator unit, thereby making it possible to use a standard bellows boot. (See pages 143-144.)

22. Can stop discs, stop pins or stop nuts be used on the actuator unit?

Stop disc, pins or nuts can be recommended on the actuator unit that is hand operated. For motor driven units, the full capacity of the actuator unit or even a greater force (depending on the power of the motor) can be applied against the stop, thereby jamming so tightly it must be disassembled in order to free it. It is suggested that external stops be used where possible. Under ideal conditions where a slip clutch or torque limiting device is used, a stop pin or stop nut may be used - but the Duff-Norton Company should be consulted. The stop disc used on the bottom of the lifting screw in our ball screw units are not power stops. These are used to ensure that the lifting screw will not run out of the ball nut during shipping and handling, thereby permitting loss of the recirculating balls.

23. Will the actuator withstand shock loads?

Shock loads should be eliminated or reduced as much as possible, but if they cannot be avoided, the actuator model selected should be rated at twice the required static load. For severe shock load applications, using Machine Screw models, the load bearings should be replaced with heat-treated steel thrust rings which will increase the lifting torque approximately 100 percent. These rings are available as a special from Duff-Norton.

24. Is the actuator self - locking?

Only Machine Screw and Anti-backlash models with 24:1 and 25:1 ratios are self-locking in most cases. Other Machine Screw and Anti-backlash models with 12:1 lower ratios are not self-locking. All Ball Screw models are not self-locking. Units considered not self-locking will require a brake or other control device. If vibration conditions exist, see question 25.

25. Can the actuator unit be used where vibration is present?

Yes, but vibration can cause the lifting screw to creep or inch down under load. For applications involving slight vibration, select the higher of the worm gear

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ratios. Should considerable vibration be present, use a drive motor equipped with a magnetic brake which will prevent the actuator model from self-lowering.

26. Will the actuator unit drift after the motor is switched off?

Yes, unless a brake of sufficient capacity is used to prevent it. The amount of drift will depend upon the load on the actuator unit and the inertia of the rotor in the motor. Most Machine Screw models require approximately one-half as much torque to lower the load as it does to raise the load.

For the machine screw actuator unit with no load, the amount of drift will depend upon the size and speed of the motor. For example, a 1750 RPM motor directly connected to an actuator unit (without a load) will give on the average 2"- 3" drift; a 500 RPM gear motor will give about 1/9 as much drift. Note that the drift varies as the square of the velocity (RPM). The drift of the actuator unit screw can be controlled by using a magnetic brake on the motor.

27. Is the torque of a rotating screw actuator unit the same as a standard unit?

The lifting torque, as well as the efficiency and side thrust ratings, are the same for a rotating screw unit. It is understood, however, that the same pitch and screw diameter are used in each actuator unit, as well as the same worm gear ratio. This comment also applies to the inverted actuator unit and those with threaded or clevis-style ends.

28. Is the worm gear actuator unit suitable for high temperature operation?

The actuator is normally suitable for operation at ambient temperatures of up to 200°F using standard greases and seals. Operation above 200°F will require special lubricants. For temperatures above 300°F the life of even special lubricants is limited in direct proportion to increase in temperature and duration of exposure to such temperatures. At 400°F and above, the oil in the grease will vaporize and grease will carbonize and solidify. Applications of this type should be avoided. For temperatures above 250°F advise Duff-Norton of full particulars of the duration of such temperatures. In some cases, it may be necessary to furnish unlubricated units, then the customer will supply the lubricant of his own choice. We suggest that a lubricant manufacturer be consulted for type of grease and lubrication schedule. As a general rule, the actuator unit should be shielded to keep ambient temperatures to 200°F or less.

Seals for temperatures above 250°F are very expensive. Instead, we would substitute bronze bushings for seals in these cases. If bellows boots are used, special materials will be required for temperatures above 200°F

28a. Is the actuator unit suitable for low temperature operation?

With the standard lubricant and materials of construction, the actuator is suitable for use at sustained temperatures of 0°F. Below 0°F, low temperature lubricant should be used. Also, at temperatures below 0°F, if there is any possibility of shock loading, special materials may be required due to notch sensitivity of the standard materials at lower temperatures. Duff-Norton factory application engineers must be consulted in these instances for a recommendation.

Actuators with standard materials of construction and lubrication may be safely stored at temperatures as low as -65°F.

29. How much backlash is there in the actuator unit?

The Machine Screw, Anti-backlash and Ball Screw models must be considered separately, as the normal backlash will vary due to different constructions.

For the Machine Screw models there is a normal backlash of .005" to .008" in the lifting screw thread, plus .002" to .003" backlash in the load bearings. Therefore, the total backlash is .007" to .011". This backlash is due not only to normal manufacturing tolerances, but to the fact that we must have some clearances to prevent binding and galling when the actuator unit is under load.

Usually, the backlash is not a problem unless the load on the actuator unit changes between compression and tension. If a problem does exist, then an Anti-backlash model should be considered.

Anti-backlash models: This unit can be adjusted for screw thread and bearing clearances to a minimum of .0005". Some clearances must be maintained to keep torque requirements within reason. As the inside thread of the worm gear and the anti-backlash nut wears, adjustment can be maintained by tightening down on the shell cap. Setscrews located in the top of the shell cap are to be respotted each time an adjustment is made.

The additional nut used in the anti-backlash actuator unit is a built-in wear indicator. The clearance

between the two nuts is designed to be 50 percent of the thread thickness. When all this adjustment is used, it indicates the point where the worm gear and the anti-backlash nut set is to be replaced. See the illustration of this feature on page 40.
Ball Screw models will have a normal backlash of .002" to .013" between the ball nut and the ball track; .002" to .003" backlash in the load bearings. Total backlash will be .004" to .016". As Machine Screw models, this backlash will not be detrimental unless the load changes between compression and tension, or tension and compression.

30. How does the "Anti-Backlash" feature operate?

The worm gear and the anti-backlash nut are pinned together with guide pins. The threads in the anti-backlash nut work in opposition to the worm gear on the threads of the lifting screw.
Adjustment is made by threading in the shell cap of the actuator unit, which forces the anti-backlash nut threads into closer contact, reducing clearance and thus reducing backlash. (See page 46)

31. What lead error is present in the lifting screw threads?

Machine Screw and Anti-backlash model lift screws may have lead error up to .0008 per inch. It is cumulative and not detrimental to the operation of the actuator model.
Ball Screw models use heat treated rolled ball track with a lead error up to .003 per inch.

32. How do you compute the raise per minute with a given worm shaft speed?

When the worm shaft speed is known, the distance the load can be raised per minute can be determined with this formula:

$$\text{Raise per minute} = \frac{\text{RPM of Worm Shaft}}{\text{Turns of worm for 1" raise}}$$

or Travel per Worm Turn (mm) x RPM of Worm Shaft
(Worm turns for 1" raise are shown in actuator specifications on pages 17, 39, 45, 50, 53, 74, 80 and 88.

33. How do you calculate the RPM of worm shaft necessary to achieve a given rate of raise?

If the application calls for a certain raise per minute, the worm shaft speed which will give the rate of raise can be calculated as follows (or see tables on pages 106 thru 110).

$$\text{Worm shaft RPM} = \frac{\text{Desired Rate of Raise (in/min)}}{\text{Worm Turns for 1" Raise}}$$

For metric actuators:

$$\text{RPM} = \frac{\text{Desired Rate of Raise (mm/min)}}{\text{Travel per worm Turn (mm)}}$$

34. How is the Duff - Norton rotary limit switch mounted on an actuator unit?

It is suggested that the actuator unit be purchased with the limit switch factory mounted. The rotary limit switch can be field mounted by following the instructions found in this book under "Rotary Limit Switch." In most cases, the switch is mounted to the worm using the worm flange retainer bolts. This switch cannot be directly mounted on 1/4 to 1-ton actuator models.

35. How is the maximum raise determined when using the limit switch?

Maximum raise is determined by the ratio of the switch used and the turns for one inch raise of the actuator unit. The limit switch ratios available are 10:1, 20:1 and 40:1. Refer to the charts on pages 120-121 or on the inside cover of the limit switch, and use the following formula.
Max. Raise of Actuator Unit (inches) = Max. Input Revolutions of Limit Switch Turns of Actuator Unit Worm for 1" Raise

36. How is the rotary limit switch adjusted for position stop?

The Duff-Norton rotary limit switch is infinitesimally adjustable by moving the adjustable nuts of the worm driven screw.

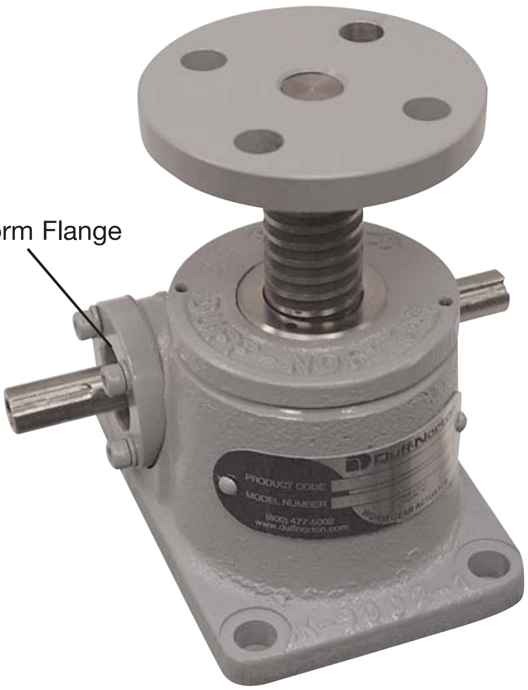
37. Can a multiple actuator unit arrangement be set up to visually indicate position of the lifting screw at any given point?

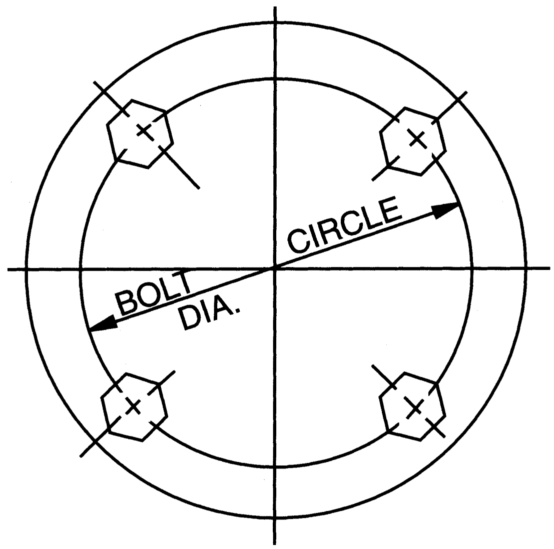
Yes, in several ways. However, it is suggested you consult the Duff-Norton Company for recommendations based on your particular application.

For additional assistance, contact our Customer Service at (800) 477-5002

Flange Bolt Information

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





Flange Bolt Information

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

Overhung Load Capacity of Actuator Worm Shafts (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

Notes:

1. 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
2. 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.
3. Above ratings apply to actuators carrying any load up to their rated capacity.

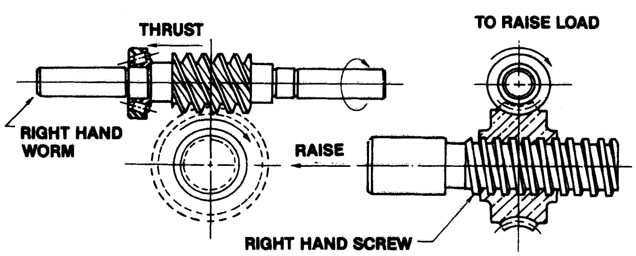
Lateral Movement Ratings

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

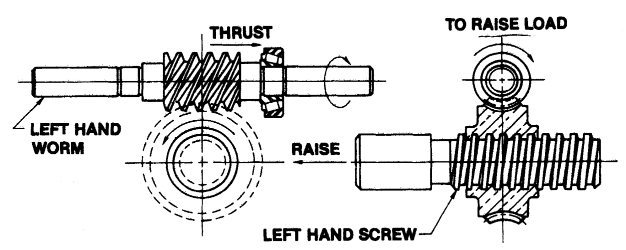
Notes:
1. Does not allow for possible deflection due to side thrust.
2. Lateral movements are for information only. For best results, we suggest guides where possible.
3. The above movements apply to machine screw actuator models only and not to the ball screw series. Permitting lateral movement on the 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.

Worm Rotation Chart



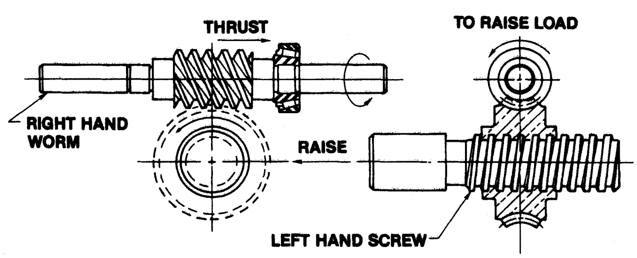
Standard for All
Except 50 and 75 ton MS, 50 ton BS

Clockwise Rotation of Worm Raises Load



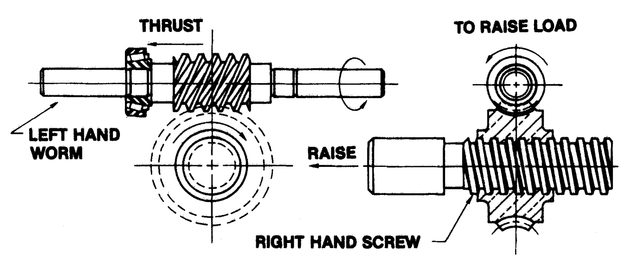
Standard For 1850, 9050 & 9075 Except 50 and 75 ton MS, 50 ton BS
Special For all Other Actuator Units at Extra Cost

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 Actuator Units at Extra Cost

Counter-Clockwise Rotation of Worm Raises Load

Load Screw Column Strength Specifications

Machine Screw

Capacity	Max. Permissible Screw Length Regardless of Load (in.) Fixed Free	Fixed Guided	Max. Pin-to-Pin Length Pinned Ends
1/4 Ton MS	9	24	19
1/2 Ton MS	11	30	24
1 Ton MS	12	33	26
2 Ton MS	17	45	36
3 Ton MS	17	45	36
5 Ton MS	24	64	51
10 Ton MS	33	85	68
15 Ton MS	38	100	80
20 Ton MS	44	116	93
25 Ton MS	58	154	123
35 Ton MS	79	207	166
50 Ton MS	98	256	205
75 Ton MS	104	273	219
100 Ton MS	122	320	256
150 Ton MS	147	386	309
250 Ton MS	187	492	393

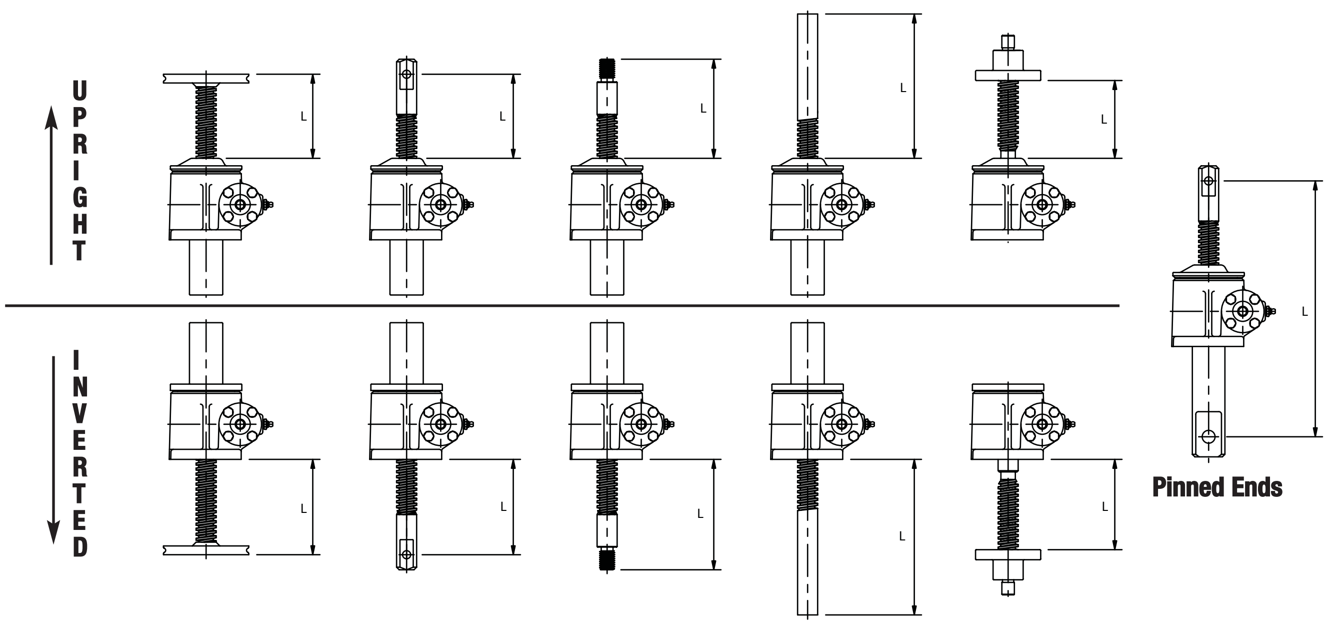
Ball Screw

Capacity	Max. Permissible Screw Length Regardless of Load (in.) Fixed Free	Fixed Guided	Max. Pin-to-Pin Length Pinned Ends
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

Continuous Duty

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

Upright Actuators



Pinned Ends

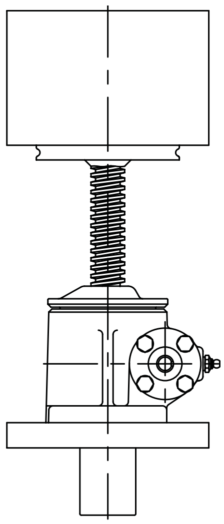
Inverted Actuators

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

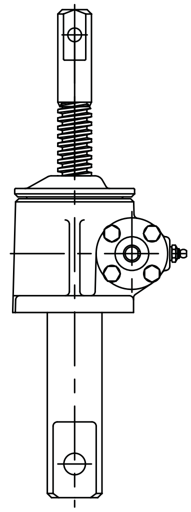
Note: Screw length can be converted to actuator raise or actuator raise can be converted to screw length by use of appropriate dimensional diagrams in the design guide for standard actuator models or special dimensions and dimensional diagrams for special actuator models.
Caution: Actual loads on any 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.

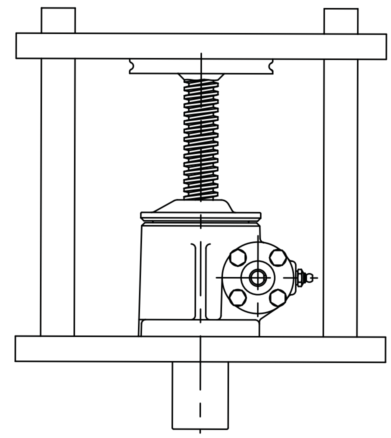
Load Screw Column Strength Specifications



One end fixed, one end free



Pinned Ends



One end fixed, one end guided

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.

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 in. raise. For first approximation assume screw length equal raise.

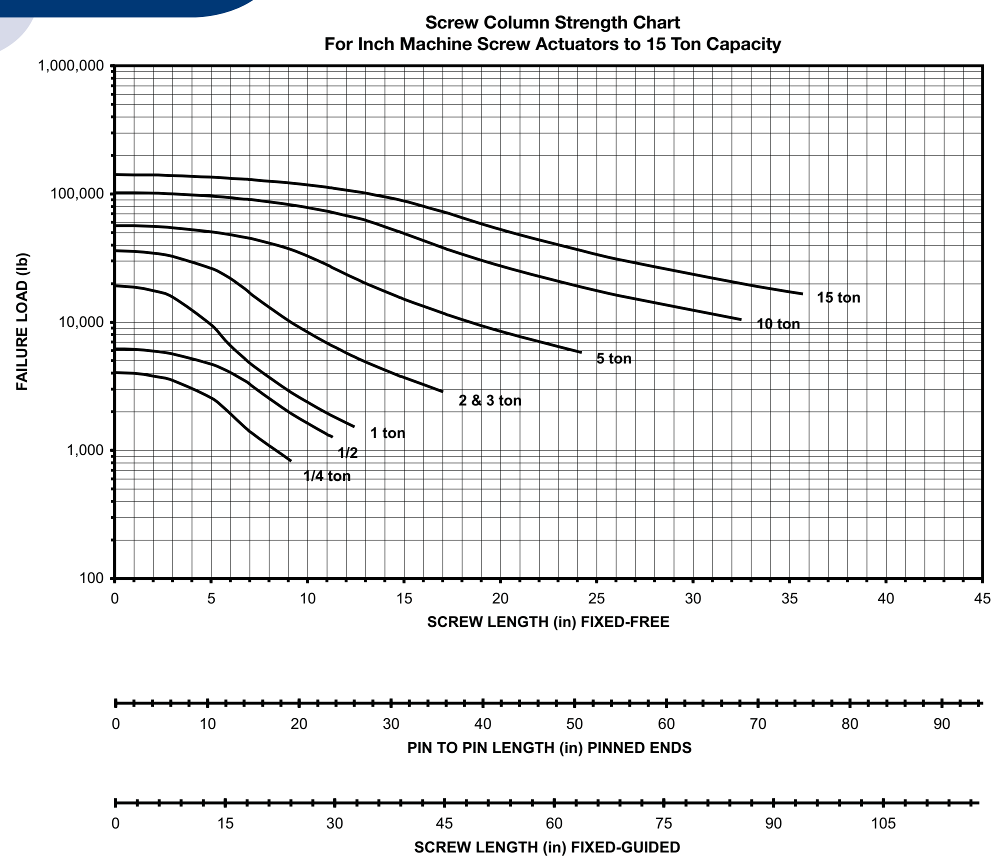
1. Select safety factor. For example 1.92 from AISC specifications.
2. Multiply 14,000 lb. load by 1.92 safety factor to obtain 26,880 lb. failure load.
3. Locate 26,880 lb. load on vertical axis.
4. Locate 25 in. screw length on upper horizontal axis scale.
5. Project horizontally right from 26,880 lb. load and vertically up from 25 in. 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 in. screw length is less than the 41 in. maximum permissible screw length.

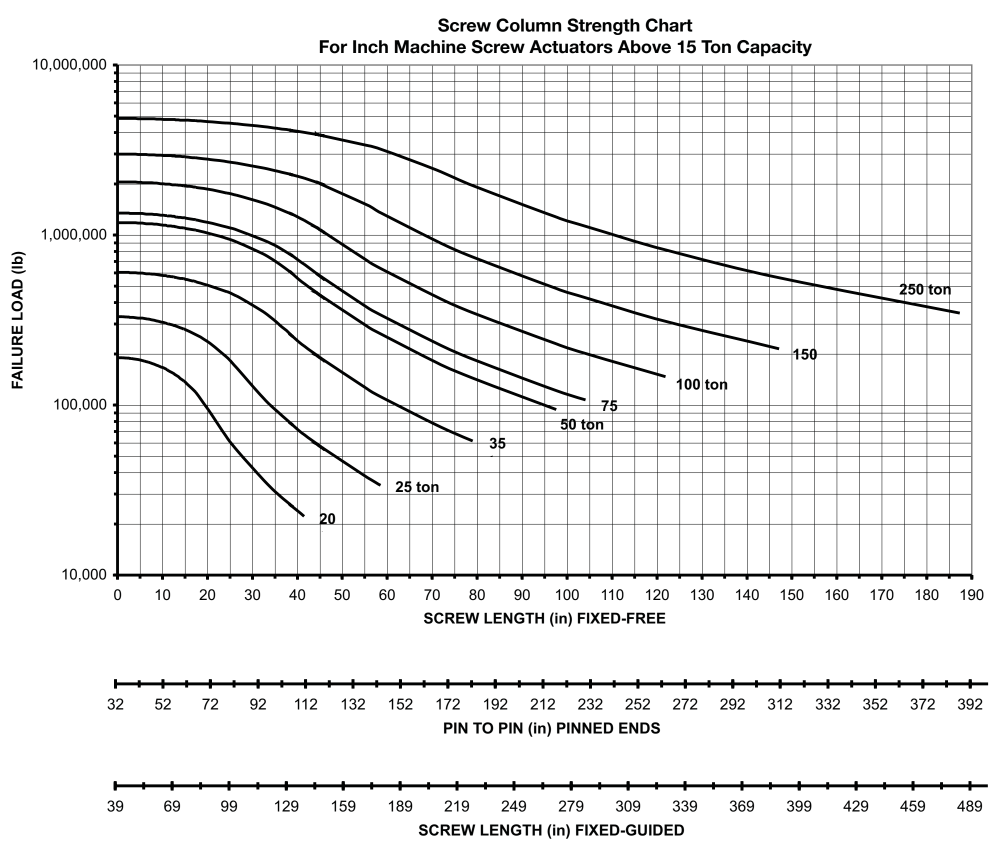
Recheck actuator selection using true screw length.
Convert 25 in. actuator raise to true screw length.

8.50 in.	"A" dimension for clevis type screw end from screw end dimension diagram.
-6.31 in.	Mounting face to top of shell cap from 9015 dimensional diagram.
2.19 in.	Screw length at no raise.
+ 25.00 in.	Raise.
27.19 in.	True screw length at 25 in. raise.

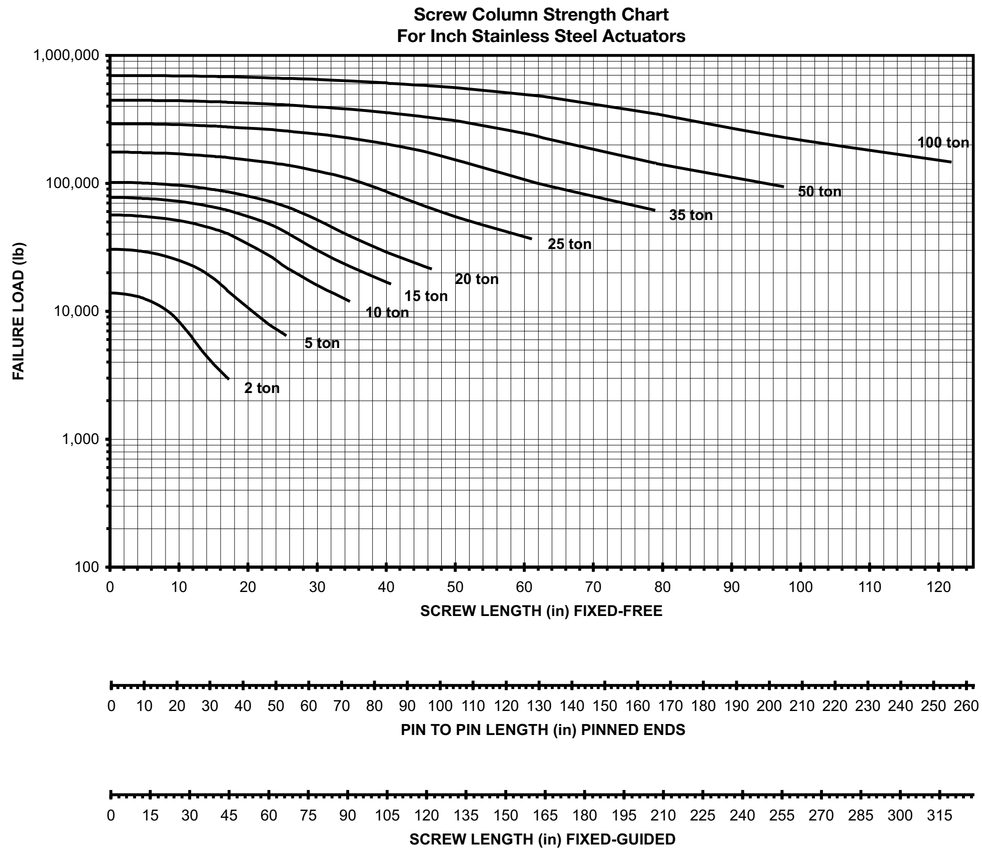
Use failure load of 26,880 lb. and true screw length of 27.19 in. and re-enter chart to verify that 9015 is a safe selection.

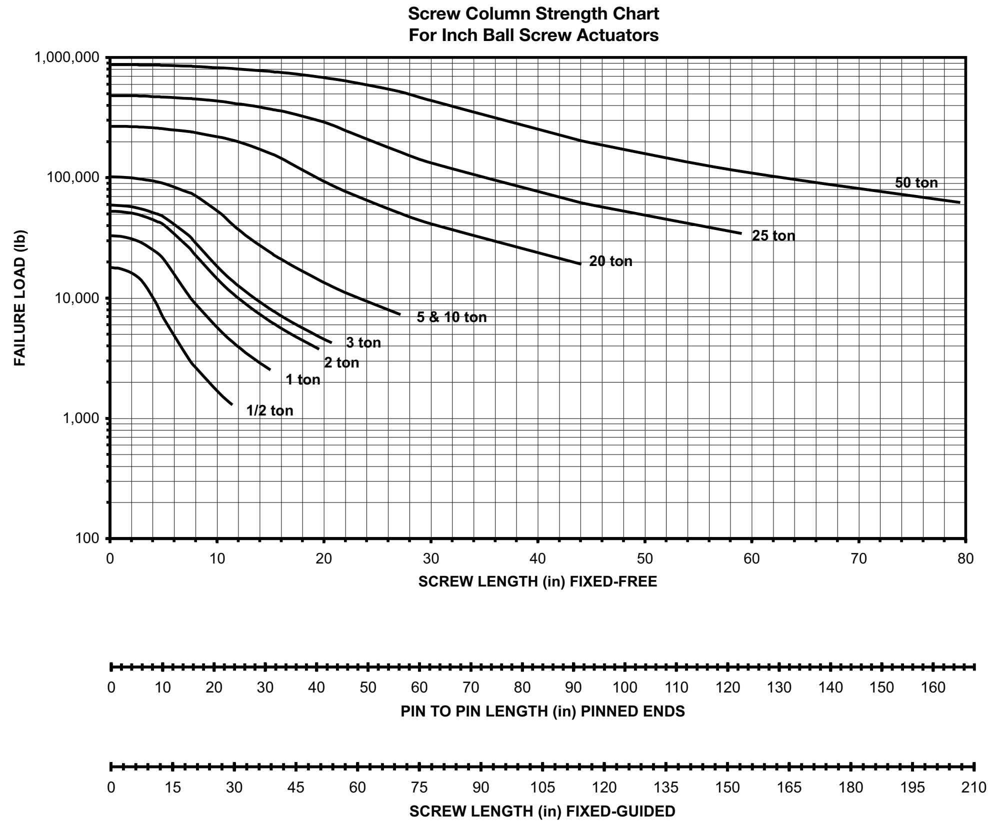
Screw Column Strength Chart





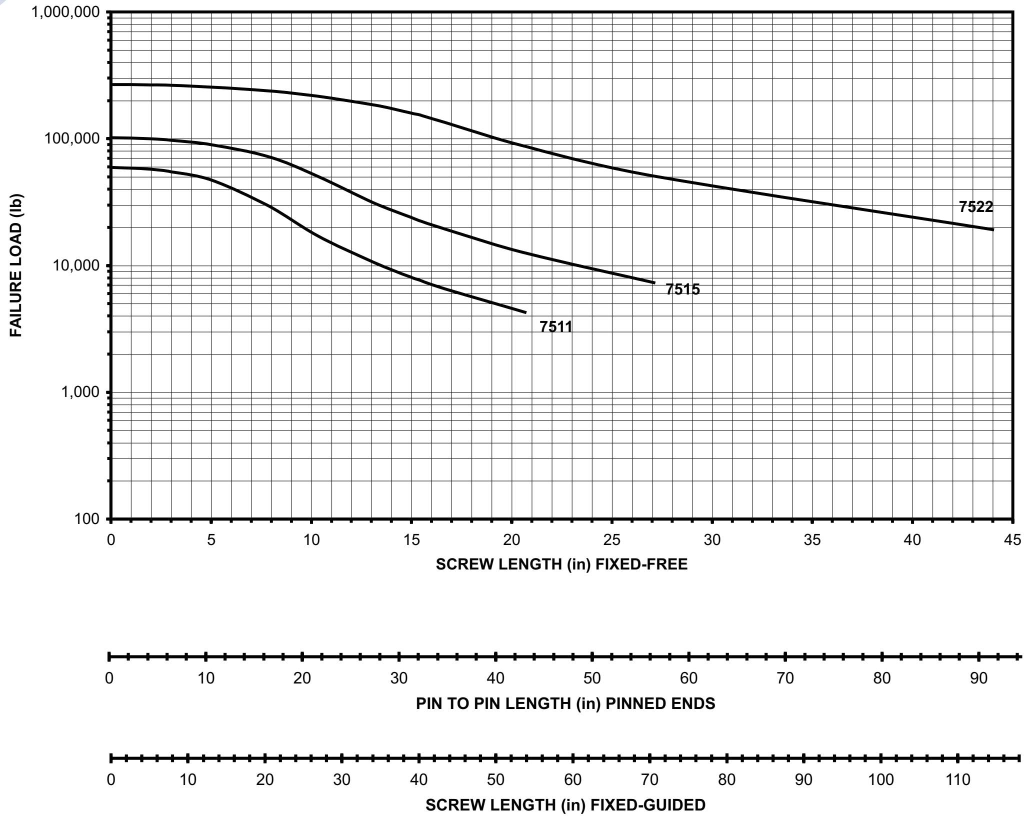
Screw Column Strength Chart



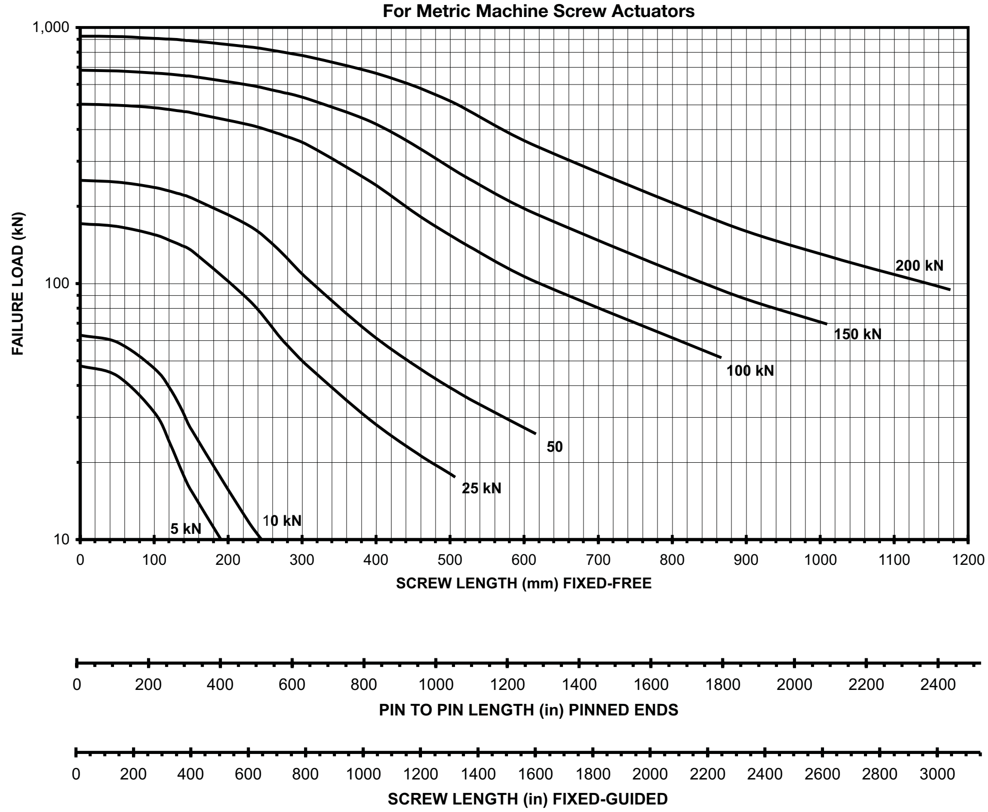


Screw Column Strength Chart

Screw Column Strength Chart
For Continuous Duty Cycle Actuators



Screw Column Strength Chart
For Metric Machine Screw Actuators



Predict the Life of the Ball Screw and Nut

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.

* 5 ton and 10 ton models use the same screw and nut.

Ball Screw Actuator Life Expectancy *(total in. 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

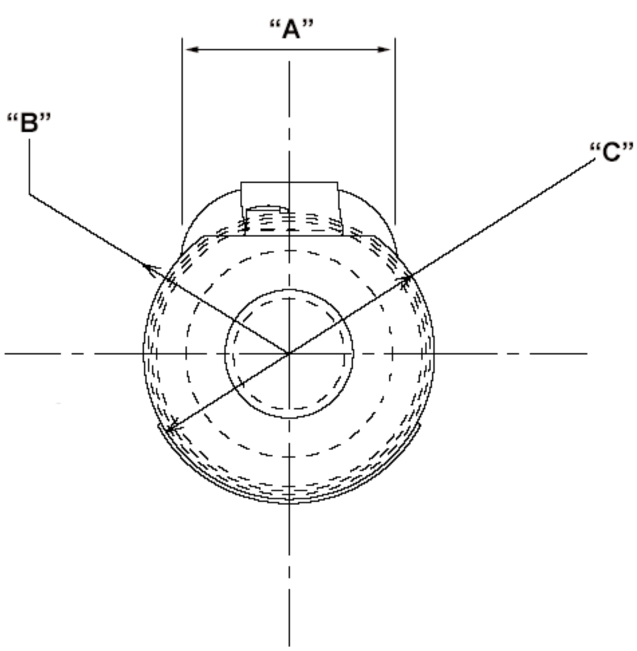
Continuous Duty Actuator Life Expectancy *(total in. of travel)*

Model No.	100% Max. Cap.	75% Max. Cap.	50% Max. Cap.	25% Max. Cap.	10% Max. Cap.
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
Max. Allow. Duty Cycle @ 1750 RPM Input	33%	67%	100%	100%	100%

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

*Life expectancies listed are L_{10} 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 Sq.
1	.812	.875	1.250
2	1.104	1.194	1.5 Sq.
2 - High Lead	1.104	1.194	1.5 Sq.
3	1.587	1.386	2.125 Dia.
5	1.981	1.69	2.625 Dia.
5 - High Lead	1.718	1.72	2.625 Dia.
10	1.981	1.69	2.625 Dia.
10 High Lead	1.718	1.72	2.625 Dia.
20	2.561	2.272	3.375 Dia.
20 High Lead	1.958	2.300	3.375 Dia.
25	3.349	3.076	4.751 Dia.
50	4.029	3.756	5.99 Dia.