

# SELECTION GUIDE

## USERS GUIDE

### FOR SELECTING A MECHANICAL ACTUATOR

#### 1. Define the application's operating parameters:

- Total load
- Load per actuator (if more than one is required)
- Desired lifting speed
- Travel (distance to move the load)
- Load type (tension, compression, guided, unguided)
- Ambient temperatures (-20° to 120°F, -29° to 50°C)

#### 2. Determine which actuator type best suits the application:

Ball screw or machine screw? There are a wide variety of factors which influence the type of actuator selected. When comparing the two actuator types at the same capacity level, ball screw actuators, being much more efficient, require less motor horsepower to move the same load than do the equivalent machine screw actuators. However, many machine screw actuators are inherently load holding, offer a broader capacity range and a greater selection of special features or materials. Machine screw actuators are often favored in applications subject to constant vibration.



#### Ball Screw Actuators

- Continuous Duty models available.
- Anti-Rotation models available, contact the factory for details.
- Move loads and apply force more efficiently than machine screw actuators.
- Require less power by reducing screw friction.
- Permit faster operation and longer life under load.
- Long predictable ball screw and ball nut life.
- Handles full load in tension or compression.



#### Machine Screw Actuators

- Anti-backlash models available for ¼ to 150 Ton capacities.
- Stainless steel and metric models available for most capacities.
- Precise positioning within thousandths of one inch.
- Self locking - models featuring higher gear ratios are inherently load holding as long as the actuator is not subject to vibration.
- Uniform lifting speeds - since many actuators feature the same gear ratios different capacities can be used in the same application to lift unevenly distributed loads with uniform speeds.

### 3. Calculate actuator performance:

Find an actuator model with Capacity greater than the actuator load. Go to the applicable Actuator Performance Specification table and find Turns of Worm for 1" Raise, Worm Torque at No Load, and Worm Torque at Full Load.

#### A. For loads greater than 25% of actuator capacity, consider torque to be proportional to load:

$$\text{Actuator torque(in-lb)} = \frac{\text{Actuator Load(lbs)} \times \text{Worm Torque at Full Load}}{\text{Actuator Capacity (lbs)}}$$

For loads less than 25% of actuator capacity, add "Worm torque at no load" to the above calculated torque, to account for frictional losses.

#### B. Calculate input RPM. Shaft input should not exceed 1800 rpm.

$$\text{Input RPM} = \text{Desired Lifting Speed(in/min)} \times \text{Turns of Worm for 1" Raise}$$

#### C. Calculate actuator input HP.

$$\text{Actuator Input HP} = \frac{\text{Actuator torque(in-lb)} \times \text{rpm}}{63,000}$$

Compare required Input HP to the Maximum HP per Actuator shown in the Performance Table. If Required HP exceeds Maximum HP, an actuator with greater HP rating must be chosen to obtain the speed and capacity rating desired.

If using a gear reducer, motor horsepower must be multiplied by reducer efficiency to obtain reducer output (actuator input) horsepower.

#### D. Multiple actuator arrangements:

Two or more actuators are often shaft driven from one motor or gear reducer. For multiple actuator arrangements, sum the input HP requirement of all actuators. If using mitre gear boxes, allow for 2% power loss through each 90° turn in the power path.



Upright Translating



Inverted translating



Upright Rotating



Inverted Rotating

### 4. Determine the actuator configuration:

Considering capacity, speed, and duty cycle requirement, select the actuator type and configuration which most closely matches your application's configuration requirements.

# SELECTION GUIDE

## USERS GUIDE - Continued

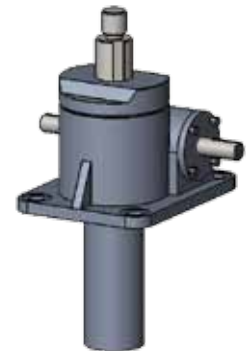
### FOR SELECTING A MECHANICAL ACTUATOR

#### 5. Unattached or unguided load considerations:

If your application involves a load which is unattached or the load is free to rotate, the translating screw actuator must be configured so that the lifting screw will extend when the actuator is in motion. To prevent the translating screw from rotating, machine screw actuators are supplied with a keyed shell and screw, and ball screw actuators are supplied with a square nut on the lifting screw's end, inside a square cover pipe. Both of these configurations ensure the actuator will properly perform for this type of application.



Anti-Rotating Ball Screw



Keyed Machine Screw

#### 6. Verify the actuator selection:

Double check your application's travel requirements, and the actuator's ratio. Verify the actuator's capacity and speed. Also, determine which of the following actuator end fittings best suits your application's requirements.



Top Plate



Clevis End



Threaded End

Please see pages 101-108 for more detailed engineering information such as:

- Flange bolt information
- Lateral movement ratings
- Overhung loads
- Screw column strengths

#### NOTE

Please refer to our "Column Strength Charts" (pages 104-106) if the lifting screw is loaded in compression. It may be necessary to select a larger actuator if the maximum recommended screw length, regardless of load, or maximum load has been exceeded.

#### NOTE

As duty cycles are intermittent, there is an inverse relationship regarding an actuators maximum duty cycle and the load being moved. Please consult our application engineers for assistance in determining the most appropriate actuator.

#### WARNING

- Input RPM should not exceed 1800 RPM.
- Never exceed the actuator's static and dynamic capacity.
- Never exceed the horsepower listed in our actuator specification tables. If the maximum horsepower recommendation is exceeded, reduce the lifting speed, use a larger capacity actuator, choose another actuator ratio, or consider a more efficient actuator type such as a Ball Screw or Continuous Duty Actuator.
- Ball Screw and Continuous Duty Actuators are inherently self-lowering. Should one of these models be the best fit for an application, a brake motor with sufficient torque is required. Please contact our application engineers for assistance.

# SCREW JACK

## APPLICATION ANALYSIS FORM

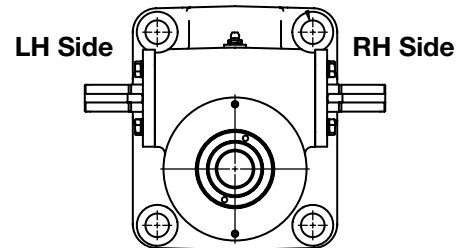
Duff-Norton engineers will be pleased to make recommendations for your specific requirements. Complete this form and mail or fax it to the Duff-Norton Company. There is no obligation for this service. Use a separate sheet to sketch your application, or send us your design drawings in complete confidence.

Name: \_\_\_\_\_ Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Email Address: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_ Ext: \_\_\_\_\_ Fax: \_\_\_\_\_

1. Type of application: \_\_\_\_\_
2. How many actuator units are needed? \_\_\_\_\_
3. Stroke (Raise) / Unit: \_\_\_\_\_ in. \_\_\_\_\_
4. How many mitre gear boxes are needed? \_\_\_\_\_
5. Total working load: \_\_\_\_\_ Working load per unit: \_\_\_\_\_
6. Total static load: \_\_\_\_\_ Static load per unit: \_\_\_\_\_
7. Side thrust on lifting screw:  Yes  No \_\_\_\_\_ lbs.  
 Off-center load on lifting screw:  Yes  No \_\_\_\_\_ in. / lbs.
8. Operating Cycles: \_\_\_\_\_ per hour \_\_\_\_\_ hours per day \_\_\_\_\_ days per week
9. Life expectancy: \_\_\_\_\_ in. \_\_\_\_\_ FORMULA = (Inches Per Cycle x Cycles Per Hour x Hours Per Day x Days Per Years x Years of Service Required)
10. Lifting speed desired: \_\_\_\_\_ in./min.
11. Are controls required for your system:  Yes  No
12. Drive:  Manual  Motor-driven
13. Mounting Position

Limit Switch (pg. 127) RH Side \_\_\_\_\_ (1, 2, 3, 4)  
 LH Side \_\_\_\_\_ (1, 2, 3, 4)

Reducer\* (pg. 116) RH Side \_\_\_\_\_ (1, 2, 3, 4)  
 LH Side \_\_\_\_\_ (1, 2, 3, 4)



\* (On select models this is required to allow for proper lubrication of the gearbox. Choose the option that most closely matches the actual installed position.)

14. Load type:  Guided  Unguided  Compression  Tension  Both compression & tension
15. Conditions:  Vibration  Impact  Wet  Corrosive  Explosion Proof  Other
16. Temp. Range: \_\_\_\_\_
17. Std. actuator model best suited to application: \_\_\_\_\_
18. Ultimate use of actuator units:  In-plant  Resale  Lift people
19. Quotation desired on the following quantities:  Total  Per System



To mail please send completed sheet to:  
 Duff-Norton  
 Application Engineers  
 P.O. Box 7010, Charlotte, NC 28241

To Fax or Email please send to:  
 704-588-1994 • duffnorton@cmworks.com



**WARNING**

Improper use can result in personal injury. To avoid injury:

- Do not use actuators to lift, support, or transport people, without written approval from Duff-Norton.
- Read all product warnings and operating instructions.

# SCREW JACK

## CONTROLS GUIDE

Duff-Norton engineers will be pleased to make recommendations for your specific requirements. Complete this form and mail or fax it to the Duff-Norton Company. There is no obligation for this service. Use a separate sheet to sketch your application, or send us your design drawings in complete confidence.

Name: \_\_\_\_\_ Company: \_\_\_\_\_

Address: \_\_\_\_\_

Email Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Ext: \_\_\_\_\_ Fax: \_\_\_\_\_

### SUPPLY VOLTAGE:

- |                              |                                      |   |                                |  |
|------------------------------|--------------------------------------|---|--------------------------------|--|
| <b>DC</b>                    | <b>AC Single Phase</b>               | <b>AC Three Phase</b>   | <b>Frequency</b>               | <b>Other</b>                           |
| <input type="checkbox"/> 12V | <input type="checkbox"/> 110/115/120 | <input type="checkbox"/> 208 <input type="checkbox"/> 460/480 | <input type="checkbox"/> 60 Hz | <input type="checkbox"/> _____ Hz      |
| <input type="checkbox"/> 24V | <input type="checkbox"/> 220/230/240 | <input type="checkbox"/> 230/240 <input type="checkbox"/> 575 |                                | <input type="checkbox"/> _____ Voltage |

### CONTROLS ENCLOSURE:

- NEMA 1     NEMA 3R     NEMA 4     NEMA 12     Other \_\_\_\_\_

### ENCLOSURE MOUNTING:

- Wall  
 Free Standing  
 Pedestal  
 Console  
 Other \_\_\_\_\_

### CONTROLS ENVIRONMENT:

- Indoor  
 Outdoor  
 Wash Down  
 Hazardous  
 Other \_\_\_\_\_

### CONTROLS CERTIFICATION:

- None  
 UL  
 cUL  
 Other \_\_\_\_\_

### # OF MOTORS:

- 1  
 2  
 3  
 4  
 Other \_\_\_\_\_

### CONTROLS OPERATION:

- |                                     |   |   |  |
|-------------------------------------|---|---|--|
| <b>Jog</b>                          | <b>Positioning</b>  | <b>Synchronous</b>  | <b>Variable Speed</b>                        |
| <input type="checkbox"/> Momentary  | <input type="checkbox"/> Positioning Accuracy                       | <input type="checkbox"/> Synchronous Accuracy                       | <input type="checkbox"/> Speed Pot           |
| <input type="checkbox"/> Maintained | _____ +/- <input type="checkbox"/> inch <input type="checkbox"/> mm | _____ +/- <input type="checkbox"/> inch <input type="checkbox"/> mm | <input type="checkbox"/> Numeric Speed Entry |
|                                     | <input type="checkbox"/> Programmable Positions                     |   | <input type="checkbox"/> Preset Speeds       |
|                                     | _____ Number of Positions   |   | _____ Number of Speeds                       |

### CONTROLS OPTIONS:

- |  |  |
|--|--|
| <input type="checkbox"/> Pushbutton Pendant                          | <input type="checkbox"/> Digital Display                             |
| <input type="checkbox"/> HMI Pendant                                 | <input type="checkbox"/> Touch Screen HMI                            |
| <input type="checkbox"/> Feedback Cable(s)                           | <input type="checkbox"/> Motor Cable(s)                              |
| _____ Length <input type="checkbox"/> ft <input type="checkbox"/> mm | _____ Length <input type="checkbox"/> ft <input type="checkbox"/> mm |
| <input type="checkbox"/> Other _____                                 |  |

### FEEDBACK:

- Incremental  
 Absolute

### CONTROLS FUNCTIONALITY:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### ADDITIONAL INSTRUCTIONS:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Upon completion of this controls guide please Email or Fax to Duff-Norton.**

P.O. Box 7010 • Charlotte NC • Phone: 800-477-5002 • Fax: 704-588-1994 • Email: duffnorton@cmworks.com