POWER JACKS

Section 1.1. Screw Jack Idea and Application Guide

Screw Jack (Mechanical Actuator) Product Summary
Typical Applications and Accessories
Selecting an actuator
Product Codes

Section 1.2.1

Sym-metric (Cubic) Actuators
S-Series

Sym-metric (CUBIC) Actuators
25kN to 200kN capacities with Machine Screw
Translating and Rotating screw
3 gear ratios and 2 screw leads as standard
Anti-backlash & Anti-rotation (keyed) options

Section 1.2.2. and 1.3.1.

Metric Single Face Screw
Jacks (Mechanical Actuators)
E-Series

Metric Single Face Screw Jacks (mechanical actuators)
5kN to 1000kN capacities with Machine Screw or Ball Screw
Translating and Rotating Screw in Upright and Inverted types
2 gear ratios and 1 screw lead as standard
Ball screw units have 2 screw lead options
Anti-backlash and Anti-rotation (keyed) options
6 mounting options including trunnion and double clevis

Section 1.2.3. and 1.3.2

Imperial Single Face Screw
Jacks (Mechanical Actuators)
M-Series

Imperial Single Face Screw Jacks (mechanical actuators)
$^1/_2$ Ton to 100 Ton capacities with Machine Screw or Ball Screw
Translating and Rotating Screw in Upright and Inverted types
2 gear ratios and 1 screw lead as standard
Ball screw units have 2 screw lead options
Anti-backlash and Anti-rotation (keyed) options
5 mounting options including double clevis

1. screw **jacks** (mechanical actuators)

Section 1.2.4. & 1.2.5.

Stainless Steel (E) Metric and
(M) Imperial (Single Face)
Actuators

Metric 10kN to 1000kN capacities with Machine Screw
Imperial 2 Ton to 100 Ton capacities with Machine Screw
Translating and Rotating Screw in Upright and Inverted types
2 gear ratios and 1 screw lead as standard
Anti-backlash and Anti-rotation (keyed) options
5 mounting options including double clevis

Section 1.2.6.

Micro-Miniature Actuators

Metric or Imperial
Up to 450kg capacities with Machine Screw
Balanced or continuous dial types

Section 1.4.

High Duty and
Special Screw Jacks

Roller Screw & Special Actuators
Roller Screw Jacks for high duty applications
Modified screw jacks e.g. material, paint, screw lead, etc..
Special additional features e.g. wear indicator, safety nuts, etc..
New design tailored to exact customer requirements

Section 1.5.

Engineering Guide

Screw Jack (Mechanical Actuator) Engineering Guide
Actuator performance charts
Actuator product operation features
Installation and maintenance tips

Section Index

Picture Index

Cubic Actuators

Metric Actuators

Metric Ball Screw Actuators

Stainless Steel Actuators

EMA Actuators
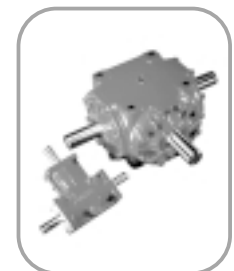
Ball Screw Rolaram Actuator
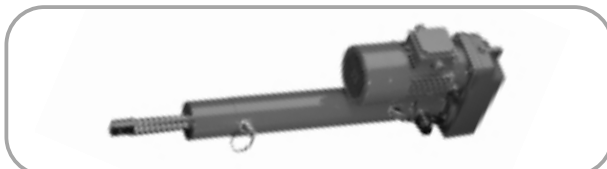
Roller Screw Rolaram Actuator

Special Actuators

Imperial Actuators

Imperial Ball Screw Actuators

Roller Screw and Special Actuators

Spiracon Roller Screw

P-Range Bevel Gearboxes

N-Range Bevel Gearboxes

BA-Range Bevel Gearboxes

Electric Motors

Couplings and Drive Shafts
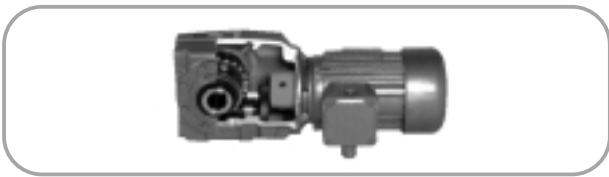
Helical Worm Gearboxes

In-Line Helical Gearboxes

Proximity and Contact Limit Switches

Rotary Limit Switches

Encoders

Position Indicators

Engineers Reference

Company Profile

Power Jacks is the largest and most experienced manufacturer of actuators and mechanical jacks in the UK. With our range of Power Jacks and Duff-Norton actuators you don't just get the product, you also get the knowledge and experience from a company that has, since 1883, manufactured quality industrial lifting, positioning and materials handling equipment.

On our extensive site in Fraserburgh, Aberdeenshire, we have a wide range of engineering facilities including CAD/CAM/CAE technology to aid engineering design and manufacture, an advanced production control system ensuring the optimum product flow through our comprehensive range of conventional and CNC machining facilities, which maximises efficiency and reduces delivery times. This is achieved with our 100+ highly trained employees, giving Power Jacks the capability to produce mechanical engineering of the highest standards.

Quality is a key part of Power Jacks working philosophy and built into the product from initial design conception, through production, to installation and after sales service.

There are over two million of our actuators successfully in operation world-wide. The Power Jacks Group are a global market leader in Linear Actuation Systems.
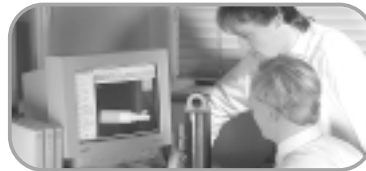
Power Jacks Ltd Extensive Site in Fraserburgh, Aberdeenshire

By specifying a Power Jacks product you are assured of quality, reliability, performance and value. In the United Kingdom there are a team of highly experienced sales engineers to assist customers with their actuation applications whether on site or by direct communications with the Fraserburgh factory. For overseas customers there is an extensive distributor network world-wide.

Power Jacks Standard Product Range Covers:-

Machine Screw Worm Gear Actuators (Screw Jacks)

Ball Screw Actuators (Screw Jacks)

Stainless Steel Actuators (Screw Jacks)

Micro-Miniature Actuators

TracMaster Electro-Mechanical Linear Actuators

EMA Electro-Mechanical Linear Actuators

Rolaram Electro-Mechanical Linear Actuators

Mechanical Jacks

Neeter Drive Bevel Gear Boxes

Reduction Gear Boxes

Power Transmissions

Accessories for Complete Actuator Systems

Actuator Motion Control Systems

Track (Rail) Jacks

Hydraulic Jacks

Hydraulic Cylinders

Hydraulic Pumps and Tools
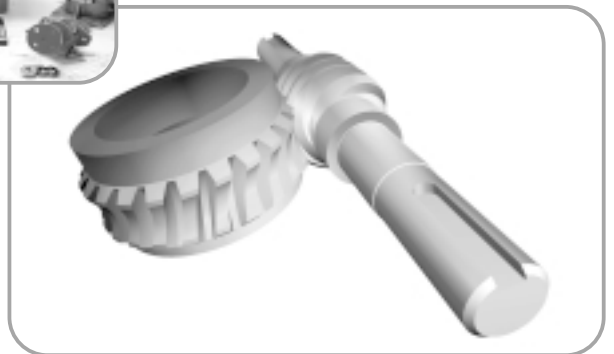
Both Metric and Imperial Products are available.

As well as these standard products Power Jacks has a dedicated engineering team for the design of "Special" products to suit all customer requirements.

These products can be provided as individual parts or single or multiple systems with full engineering consultancy available as part of the service.

For more information contact:

Power Jacks Ltd
South Harbour Road Fraserburgh AB43 9BZ
Tel: +44 (0) 1346 513131
Fax: +44 (0) 1346 516827
email: sales@powerjacks.com
Internet: http://www.powerjacks.com

Company Profile

The Power Jacks Group is an engineering group focused on providing customers with the best solution for precision linear actuation, power transmission, mechanical jacking, hydraulic jacking and engineering service. The engineering history of the group dates from 1883 and the products and service are supplied to customers world-wide.

The Power Jacks Group Brings Together

Representation

screw**jacks**

Contents

1.1. Idea and Application Guide

1.1.1. Screw Jack (Mechanical Actuator) Product Summary

Sym-metric Machine Screw Actuators

Cubic style metric actuator designed and manufactured in the UK. This actuator was designed with a higher thermal efficiency than conventional machine screw actuators, allowing higher duties and working temperatures, and improved mounting arrangements e.g. Upright and inverted positions are now incorporated in one model.

Sym-metric Machine Screw Actuator

Conventional Machine Screw Actuators

Probably the most widely used mechanical actuator for intermittent duty cycles as the actuator incorporates a precision worm gear set in a rugged casting delivering positive, precise actuation. Available in a comprehensive range including metric models, imperial models in standard materials or stainless steel models for special environments.

Conventional Machine Screw Actuators
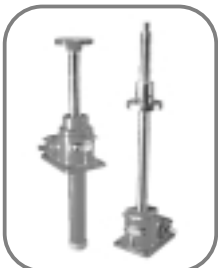
Ball Screw Actuators

The ball screw actuator can run at higher duties and speeds than machine screw actuators through the high efficiency of the ball screw and nut. The ball screw also provides longer life at load and requires less power than a machine screw actuator for a specified thrust. The range is available with the same number of metric and imperial variants as the machine screw range. All metric models have a ball nut safety device as standard. A high duty cycle model for continuous operation is also available.

Ball Screw Actuators

Miniature Actuators

Designed for applications which call for extremely precise very small adjustments. To achieve their high accuracy they are equipped with anti-backlash nuts as standard to minimise vertical backlash between the lifting screw and worm gear nut. These actuators are available with a corrosion resistant finish or in stainless steel for harsh environments.

Miniature Actuators

Special Actuators

Power Jacks design and manufacture special actuators to suit specific customer applications whether this requires modification or addition to a standard product or the design of a completely new actuator.

Special Actuators

Actuators Accessories

Power Jacks have a comprehensive range of actuator accessories including power transmissions and motion control systems. A turn key actuation solution can therefore be provided to the customer whether it be for singular or multiple actuator systems.

Actuator Accessories

1.1.2.　Typical Applications

Power Jacks actuators operating successfully world-wide in a wide variety of industries including paper, food processing, nuclear, steel, transport, aerospace, communications and leisure.

*Adjuster to
Paper Machine*
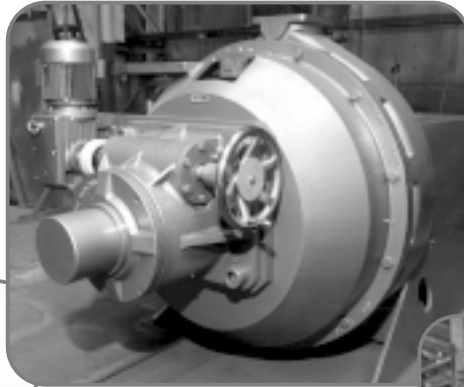
*Quick Hitch for
Excavator Bucket Attachment*
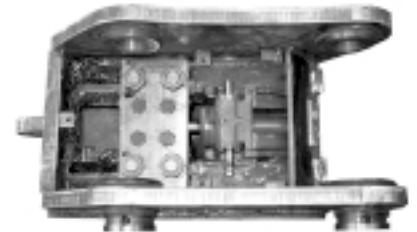
Satellite Dish Positioning

Roll Tensioner
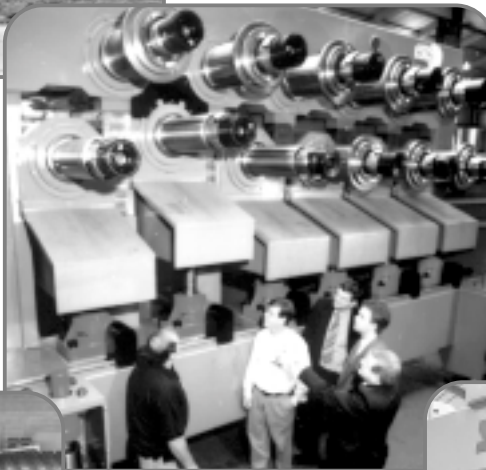
Steel Strip Tension Leveler
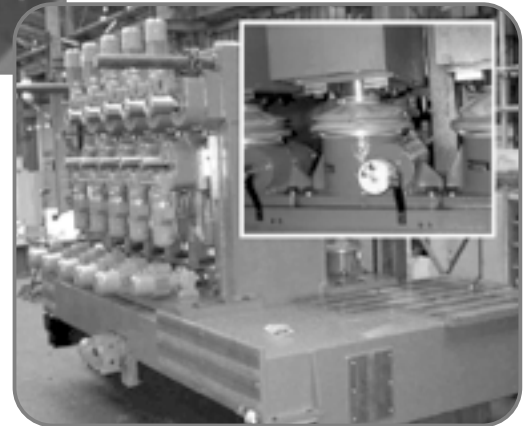
Stadium Access Lift

*12 Head Horizontal
Band Saw*

Particle Accelerator

Plate Leveller

Screw Jack with Coil
Spring Damper Unit

Biscuit
Making Machine

Headbox Adjustment
on Paper Machine

Pre-Feed and Stacking
on Fibre Board Machine

Glass Packaging
Machine

Aircraft Airbridge
Access Leveling

Military Aircraft
Assembly Locating Rig
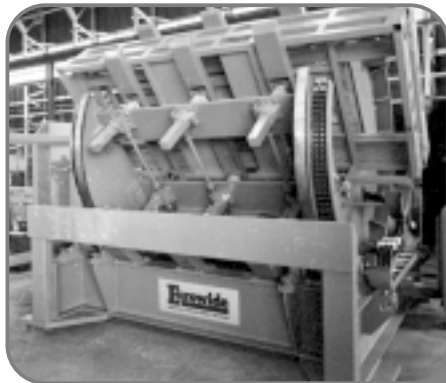
Sheet Metal Bundle
Turnover Machine

Tube End
Deburring Machine
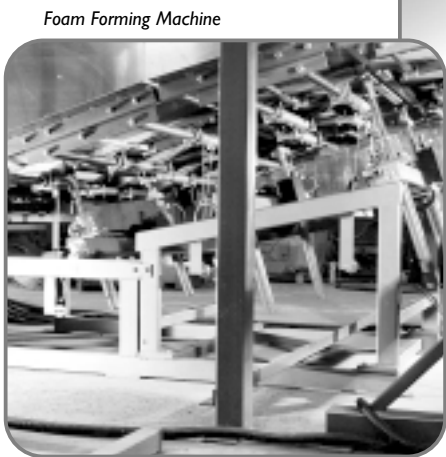
Foam Forming Machine
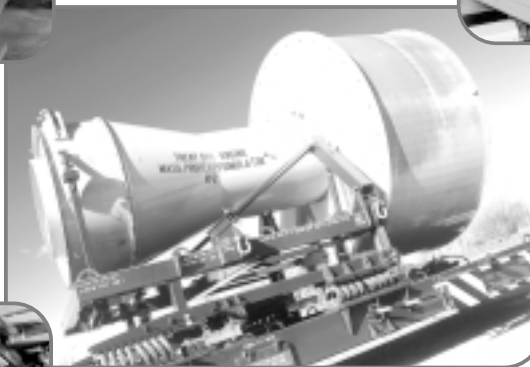
Aero Engine Lift for
Transportation Stand

Railway
Carriage Lift

Raise and Lower Dampers
in Power Station Flues

Hydospace Test Centre
35 Te Pressure Vessel Lid Lift
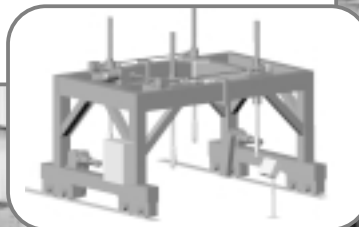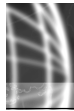
The applications are wide, varied and ever increasing as pneumatic and hydraulic technologies are replaced by what can be a cleaner, quieter and more reliable solution.

Aircraft Access Equipment

Section Rolling Machine

Access Platform Lift for
Aircraft Wing Manufacture

Strip Guide Adjusters
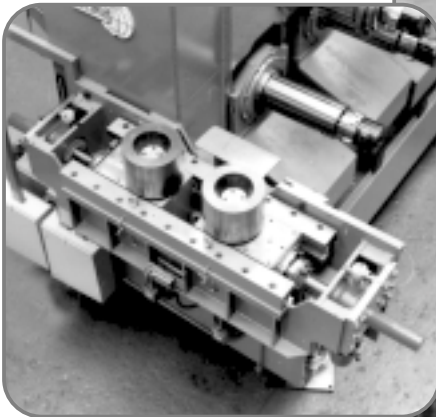
Printing Press

Heavy Duty
Straightening Machine

Medical
Examination Table

Double Pinch
Bending Rolls Machine

Actuators with
Shock Absorbers

1.1.3. Selecting an Actuator

The following selection procedure is applicable for machine screw and ball screw actuators.

1.1.3.1. Five Step Guide to Initial Actuator Selection

Calculate Power and Torque Requirements

Select an actuator from the tables with adequate load carrying capacity and note the actuator static and dynamic efficiency for required input speed.

Step1   Actuator Input Speed

$$N \text{ (rpm)} = \frac{\text{Raise Rate (mm/min)} * \text{Gear Ratio}}{\text{Pitch (mm)} * \text{N° of Starts on Lifting Screw}}$$

Note   Actuator Input Speed should not exceed 1800 rpm.

Step 2 Operating Input Power (kW), P_{in}

$$P_{in} \text{(kW)} = \frac{\text{Load (kN)} * \text{Raise Rate (mm/min)}}{60000 * \eta_{ad}}$$

η_{ad} *= Dynamic Actuator Efficiency*

Step 3 Operating Input Torque

$$T_{ino} \text{(Nm)} = \frac{P_{in} \text{(kW)} * 9550}{N \text{ (rpm)}}$$

Step 4 Actuator Start-Up Torque

$$T_{ins} = \frac{\text{Load (kN)} * \text{Pitch (mm)} * \text{N° of Starts on Lifting Screw}}{2 * \pi * \eta_{as} * \text{Gear Ratio}}$$

η_{as} *= Static Actuator Efficiency*

Step 5 Mechanical Power and Torque Check

Check whether the actuator power and torque required for the application is not greater than the maximum allowable mechanical input power ($P_{mechanical}$) and Start-Up Torque at Full Load (T_s) values specified in the actuator performance tables.

If $P_{mechanical} > P_{in}$ & $T_s > T_{ins}$ then the actuator selected is acceptable for power requirements.

Example Initial Actuator Selection

Application Contraints

- Load on Actuator   = 15 kN in Tension
- Raise Rate required = 100 mm/min

Consider all application constraints then choose an actuator that looks suitable for the application with an actuator load rating equal to or greater than the maximum working load. For this example say a 25 kN Sym-metric Actuator (refer 1.2.1.) with translating screw, 6:1 gear ratio, single start lifting screw (6 mm lead).

Calculate Power and Torque Requirements

Step1   Actuator Input Speed

$$N \text{ (rpm)} = \frac{100 \text{ (mm/min)} * 6 \text{ (Gear Ratio)}}{6 \text{ (mm)} * 1 \text{ (N° of Starts on Lifting Screw)}} \qquad N = \textit{100 rpm}$$

Note Actuator Input Speed should not exceed 1800 rpm.

From the Sym-metric performance tables (refer 1.2.1.1.) dynamic actuator efficiency = 0.275.
(Efficiency value found by interpolating between efficiency values at input speeds higher and lower than desired input speed).

Step 2 Operating Input Power (kW), P_{in}

$$P_{in} \text{ (kW)} = \frac{15 \text{ (kN)} * 100 \text{ (mm/min)}}{60000 * 0.275} \qquad P_{in} = \textit{0.091 kW}$$

Step 3 Operating Input Torque

$$T_{ino} \text{ (Nm)} = \frac{0.091 \text{(kW)} * 9550}{100 \text{ (rpm)}} \qquad T_{ino} = \textit{8.7 Nm}$$

Step 4 Actuator Start-Up Torque

$$T_{ins} = \frac{15 \text{ (kN)} * 6 \text{ (mm)} * 1 \text{ (N° of Starts on Lifting Screws)}}{2 * \pi * 0.208 * 6 \text{ (Gear Ratio)}} \qquad T_{ins} = \textit{11.5 Nm}$$

$$\eta_{as} = \textit{0.208 (refer 1.2.1.1.)}$$

Step 5 Mechanical Power and Torque Check

Find the actuators mechanical power and torque rating from the performance data tables (refer 1.2.1.1.)

$$P_{mechanical} = 1.5 \text{ kW} > P_{in} \text{ and } T_s = 19 \text{ Nm} > T_{ins}$$

Therefore the actuator selected is suitable for application for initial constraints tested, further analysis may be required to ensure the actuator is suitable for all application conditions (refer 1.1.3.1. or consult Power Jacks Ltd.)

1.1.3.2. Actuator Constraints for Detailed Selection

1.1.3.2.1. Lifting Screw Buckling Criteria

For compressive loads on the actuator lifting screw column strength calculations are required to check for buckling. As an actuator selection guide use the following process:

1. Determine the maximum column length (L) for the actuator being considered (refer 1.5.1.1.).

2. Referring to the relevant column buckling chart (refer 1.5.1.1.) determine the permissible compressive load (Wp) corresponding to the column length (L) for the appropriate end constraints. This permissible compressive load is the maximum load (inclusive of shock loads) which may be applied to the actuator for a given column length.

3. Where an application involves human cargo or there is a risk to personnel, it is highly recommended that the permissible compressive load (as calculated above) be factored by 0.7 to enhance working safety. (Equivalent to a column strength safety factor of 5).

$$W_{phc} = W_p * 0.7 \qquad \text{(Permissable compressive load for personnel risk applications)}$$

Note   *1. For Ball Screw Actuators Refer 1.5.1.1.2.*
   2. For detailed analysis of actuators and their systems (not all covered in this guide) consult Power Jacks.
   3. Safety factor of 3.5 for column strength's used for normal industrial cargo.

1.1.3.2.2. Lifting Screw Critical Speed

To calculate the critical speed for rotating screw actuators:

1. Refer to the appropriate critical speed chart in section 1.5.1.2., 1.5.1.3., and 1.5.1.4.

2. Select the correction factor F_{cs} corresponding to the end support conditions for the application.

3. From the critical speed chart select the critical speed corresponding to the unsupported screw length (m) and the actuator load rating (kN).

4. Calculate the limiting critical speed with the formula below.

Limiting Critical Speed = Critical screw speed * F_{cs}

Note   *Critical for speeds drive shafts refer 6.2.1.*

1.1.3.2.3.   Lifting Screw Deflection

The lifting screw of an actuator mounted horizontally will deflect under its own weight to some extent. The amount of deflection tolerable (y_T) should be less than 0.5 mm per metre.

Deflection Factors, F_{sd}
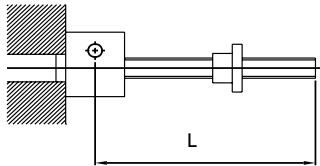
Fixed/Fixed. $F_{sd} = 8$ Fixed/Fixed. $F_{sd} = 186$ Fixed/Fixed. $F_{sd} = 384$
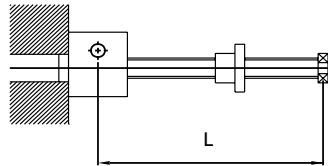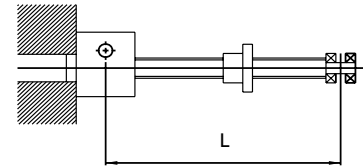
$$\text{Deflection, } y, \text{(mm)} = \frac{6 * 10^{-9} * L^4}{F_{sd} \ (d-p)^2}$$

$$\text{Deflection Tolerable, } y_T, \text{(mm)} = \frac{0.5 * L}{1000}$$

L = Lifting Screw Length (mm)
d = Diameter of Lifting Screw (mm)
p = Pitch of Lifting Screw (mm)

If $y < y_T$ then the lifting screw deflection is acceptable.

Note   *This is only a deflection guide.*
For detailed analysis, including methods to reduce deflections consult Power Jacks Ltd .

1.1.3.2.4.   Actuator Torque

Start up/Static torque values are listed in all performance tables. Whereas dynamic torque values are either calculated using the tabulated dynamic efficiencies or taken direct from torque tables where listed. For detailed actuators analysis consult Power Jacks Ltd.

1.1.3.2.5.   Actuator Side Loads
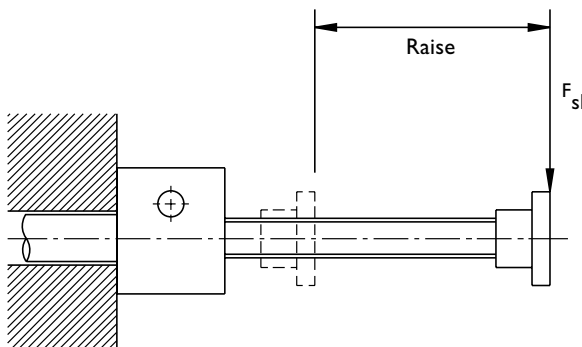
It is recommended that all side loads (F_{sl}) are carried by guides in your arrangement and not by the lifting screw and nut. If there are any side loads on the actuator they must not exceed those tabulated in section 1.5.1.6., and it must be noted that any such loads will adversely affect the life of the lifting screw and nut.

1.1.3.2.6. Radial Forces on Actuator Worm Shaft

For applications where an actuator is belt driven, radial force (F_R) values exerted on the worm shaft must not exceed those tabulated in section 1.5.1.6. Values are tabulated for the Sym-metric and Metric machine screw actuators and Ball Screw actuators. The values are maximum values for the actuators at rated load regardless of worm speed or load direction.
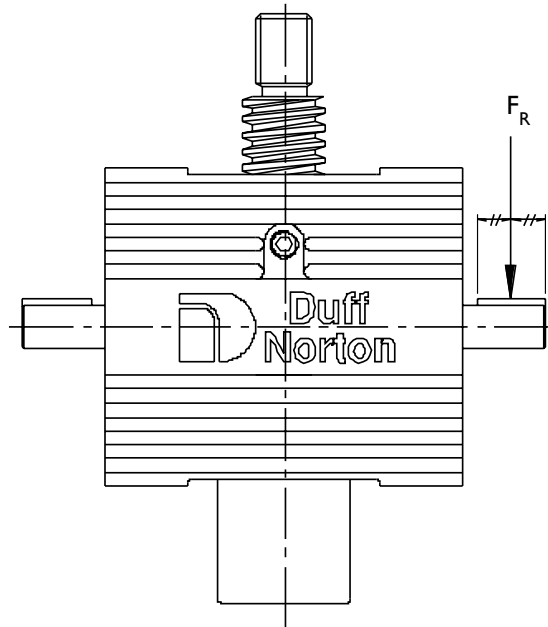
1.1.3.2.7. Actuator Self Lowering and Drift

Most machine screw actuators are self-locking (refer 1.5.2.1.1.8.) either in the gearbox or the lifting screw however to ensure there is no self-lowering and to reduce drift due to the motor slowing a brake motor is recommended (refer 1.5.2.1.4.5.). Standard motor frame size brakes will be suitable for most applications with only slight vibration and thermal fluctuation present. Motor selection as normal. For dynamic braking consult Power Jacks.

Ball screw actuators always require a brake as their high efficiency makes them self-lowering. To calculate the brake torque required for ball screw actuators:

1. Obtain the motor speed (RPM) and inertia value (Mk^2) from the motor manufacturer.
2. Obtain the value for actuator lead and the hold back torque from the actuator performance tables.
3. Select the desired drift after the motor is turned off, note allow as much drift as possible to keep the brake size to a minimum.
4. If a gear reduction unit is used in the drive then the "reducer ratio" is equal to the gear ratio of the reducer.
5. Substitute values in the equation below and solve for the brake torque required by the motor.

$$\text{Motor Brake Torque (Nm)} = \frac{\text{lead (mm)} * \text{RPM}^2 * \text{Mk}^2}{573 * \text{Drift (mm)} * \text{Reducer Ratio}} + \frac{\text{Hold Back Torque (Nm)} * \text{Number of Actuators}}{\text{Reducer Ratio}}$$

Use the closest standard brake size that is greater or equal to the motor brake torque required.

Note　　1.　*For Machine screw actuators the lowering torque 0.5 * Lifting Torque.*
　　　　　2.　*Self lowering can occur in any actuator system not fitted with a brake where high levels of vibration are present in the application.*
　　　　　3.　*Power Jacks recommend the use of a brake on single actuator applications in the vertical position.*

1.1.3.2.8. Multiple Actuator Configurations

Total Input Power for Actuator Systems (kW), P_s:

$$P_s = \frac{\text{Input Power per Actuator (kW) * Number of Actuators}}{\text{Arrangement Efficiency * Gearbox Efficiency}}$$

Number of Actuators in Arrangement	2	3	4	6 → 8
Arrangement Efficiency (%)	95	90	85	80

Gearbox Efficiency = Bevel Gearbox Efficiency * Reduction Gearbox Efficiency

Bevel Gearbox Efficiency = 95% Typical (refer to 4.0.).

Reduction Gearbox Efficiency = Consult unit details, if no reduction gearbox present assume efficiency of 100%

Note   *For actuators connected in-line the worm shaft can transmit up to 3 times the torque for a single actuator at its maximum capacity, except the 1820 Unit which can transmit 1.5 times the torque (refer 1.5.2.2.2.).*

1.1.3.2.9. Typical System Configurations

'H' Configuration   *'U' Configuration*
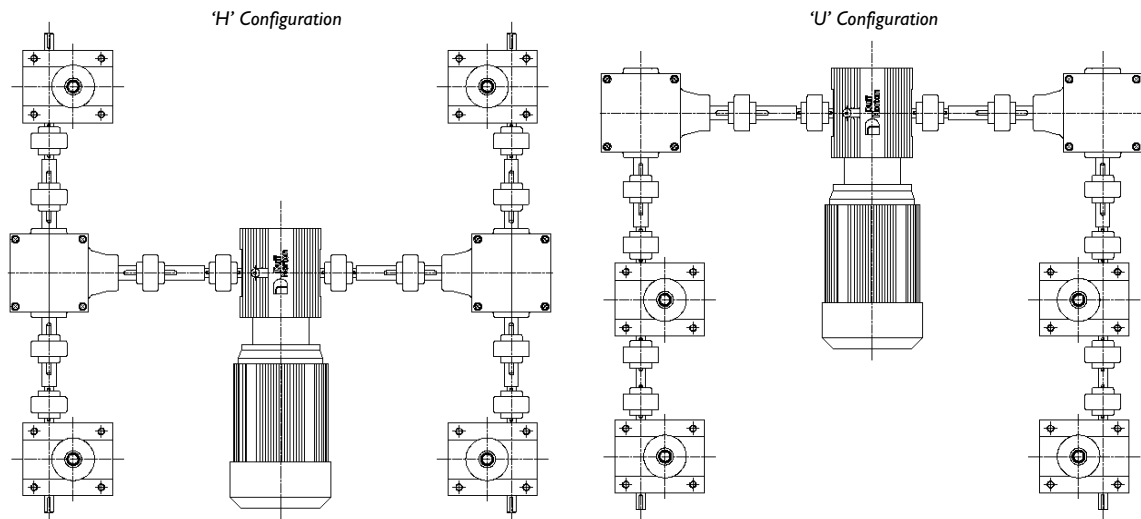
'H' and 'U' configured actuator systems are typical and include actuators, motor, bevel gearboxes, reduction gearboxes, drive shafts, couplings and plummer blocks.

Actuator arrangements can be built in many formats with the use of bevel gear boxes which allow the direction of drive rotation to be selected on assembly. The gear boxes come in 2, 3 and 4 way drive types (refer 4.0).
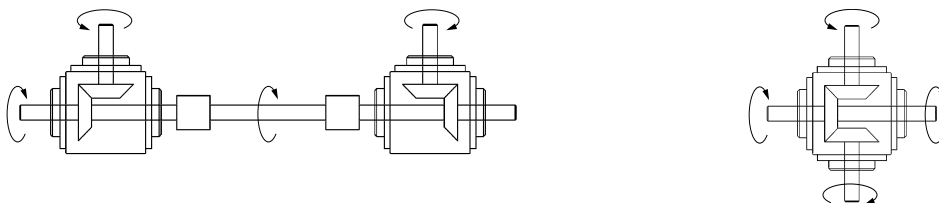
1.1.3.2.10. Other System Configurations
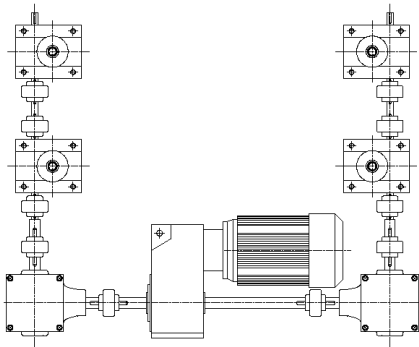
'U' Configuration   *'2H' Configuration*
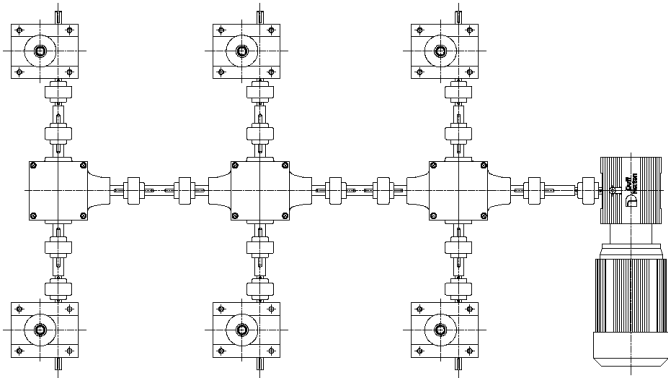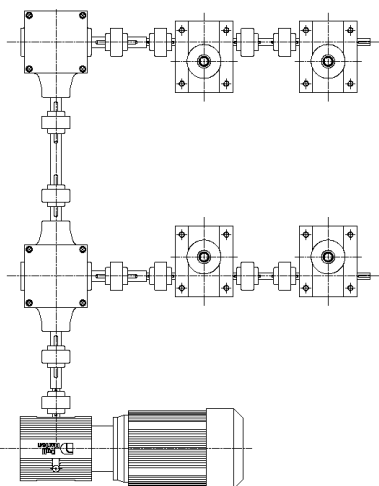
'E' Configuration   *'TF' Configuration*

'T' Configuration

AC Motor with
integral AC Brake
and Encoder

Neeter Drive
Bevel Gearbox

Sym-metric Translating
Screw Actuator
Mechanical linked in two
Jack Actuator System

RLS-51 Limit Switch
Provides extreme end of
travel limits for Actuator System

Spacer Coupling
(Self Supporting)
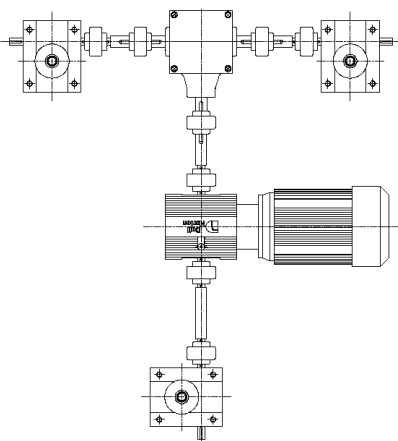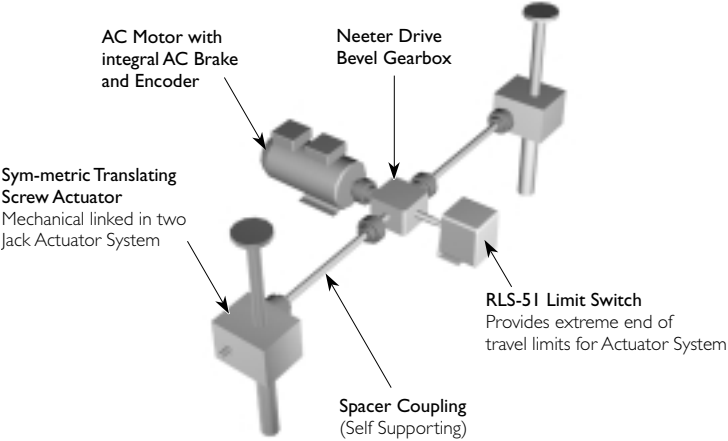
1.1.4. Preview of Actuator Accessories

1.1.4.1. End of Travel Limit Switches

Inductive proximity sensors or electro-mechanical roller plunger switches can be used as end of travel limit switches. These arrangements are typically used as limits to stop the actuator or reverse the drive motor.

Electro-mechanical roller plunger switches triggered by a nut on the lifting screw which depresses the plunger as it passes.

Inductive Proximity sensors trigger when the target nut on the lifting screw passes the sensor. The sensor sends a signal to the control circuit.
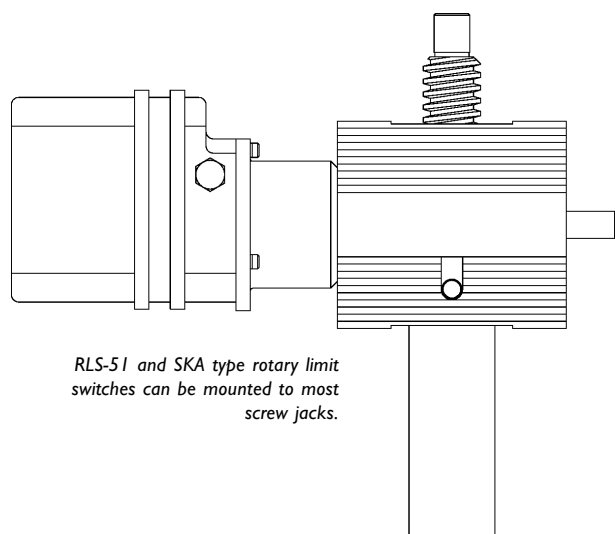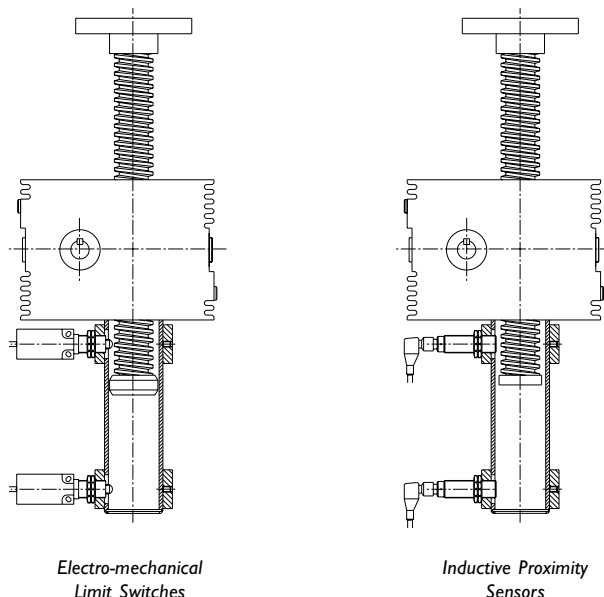
Electro-mechanical Limit Switches

Inductive Proximity Sensors

Rotary limit switches can be used as end of travel limit switches with the option of intermediate switches as well. These units are mounted onto a screw jacks free worm shaft and offer an alternative where bottom pipe mounted limit switches are not possible e.g. rotating screw jacks. Up to 8 limit switches can be accomodated in one unit.

RLS-51 and SKA type rotary limit switches can be mounted to most screw jacks.

1.1.4.2. Screw Jacks with Position Indicators

Position indicators can be provided on screw jacks by means of an encoder. The encoder (incremental or absolute) is mounted on a free worm shaft and feedsback to a digital position indicator or other control system. The position indicator can then be calibrated for the application in user units e.g. millimetres of travel are displayed.

Encoder Anti-Rotation Pin

Protective Cover

Encoder (Hollow Shaft)

1 2 3 4 5

Position Indicator

Drive Shaft Adaptor

Plug-in connector and cable

50 kN Metric Actuator
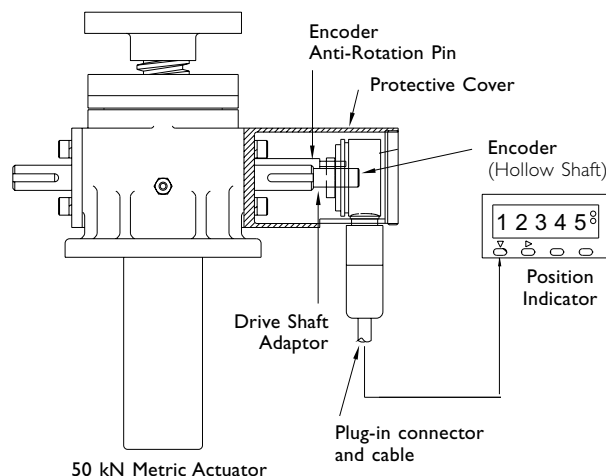
1.1.4.3. Anti-Rotation and Wear Monitoring

Wear Monitor Target Ring

Anti-Rotation Target Discs

Nut

Nut connects to worm gear via dowel pins. This allows the nut to rotate with the gear and follow the lifting screw as the thread in the gear wears. *Note The nut is unloaded.*

Actuator Base

Anti-Rotation Monitor
The inductive proximity sensor generates a series of pulses from the target discs mounted on the circumference of the nut. The nut rotates at the same speed as the worm gear. If the frequency of pulses is lower than a predetermined value or stops then the control system can inform the operator. This can be used to indicate that the system is below speed or a jamming condition has occurred.

Wear Monitor
Inductive Proximity Sensor looks for the target ring on the nut. As the gear set wears the nut and its target ring move closer to the sensor. The sensor triggers when the ring is in front of the sensor. When triggered the control system indicates that the actuator should be inspected and refurbished.

Actuator Bottom Pipe

The above arrangement is for a lifting screw in compression because as the gear wears the nut moves away from the gear and towards the sensor. If an actuator were in tension the target ring for the sensor would be to the right of the sensor, as the nut would move towards the gear.

The anti-rotation and wear monitor devices can be supplied together or as separate devices for Power Jacks machine screw actuators. For installation purposes both devices can be accommodated either below the actuator base (as above) or in the actuator's shell cap. Consult Power Jacks Ltd for details.

1.1.4.4. Motor/Gearbox Adaptors

Screw Jacks can be have motors or motorised reduction gearboxes attached via motor adaptor kits. These mount the motor/gearbox unit onto an actuators free worm shaft.
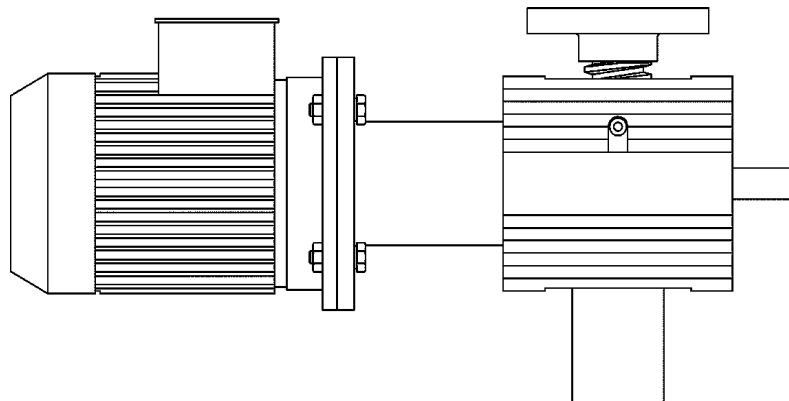
1.1.5. Actuator System Selection Guide

I require a Linear Actuation Solution

Determine operating conditions that
a system must fulfill

↓

Decide how many actuators
are required

↓

Calculate loading conditions on each
actuator for all service conditions

↓

Initially select an actuator type

↓

Check actuator suitability
using procedure in 1.1.3.

Not Suitable → Re-select actuator

Repeat for number of
different actuators or
differently loaded
actuators in system

OK

↓

Plan actuator system layout

Mechanically Linked System
(refer 1.1.3.2.8.)

**Individually
Motorised**

↓

Requires synchronisation and
motion control

↓

Consult Power Jacks Ltd for advice

*Remember at any time during the selection/specification of any linear actuation system consult
Power Jacks Ltd for advice and/or detailed analysis at no extra cost.*

```
                          Itemise power transmission
                              equipment required
```

Typical System

```
                         Calculate power, torque and speed
                          required from main drive unit
                          (motorised reduction gearbox)
                                refer 1.1.3.2.8.
```

```
                          Select a main drive unit from charts
                              (sections 4, 5 and 7)
```

```
  Re-check
  actuator          YES        Is actual speed higher than
  power          ◄──────            initial speed
  ratings
```

NOT OK

NO

OK

```
                          Calculate power, torque and speed required
                           to be transmitted by bevel gearboxes
                                 (refer 1.1.3.2.8.)
```

```
                           Select a bevel gearbox from charts.
                                    (selection 4)
```

```
                          Select suitable flexible couplings for each      Spacer
                           connection between system components           Coupling
                                      (refer 6)
```

Ordinary Coupling

```
                           Select drive shafts for each link based
                            on transmitted speed and torque
                                    (refer 6.2.1.)
```

```
                           Where radial support of drive shafts
                           is required select suitable plummer blocks
                                    (refer 6.2.2.)
```

```
                           To complete the system Power Jacks
                          offers a wide range of motion control
                           equipment to suit most applications
                                      (refer 8)
```

Complete Linear Actuation Solution
Provided by Power Jacks Limited
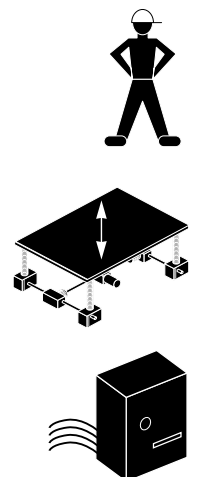
1.1.6.   Worksheet/Application Analysis Form

Power Jacks engineers will be pleased to make recommendations for your specific requirements. Complete this form with as much information as possible and send it to the Application Department.

Mail it to   Power Jacks Ltd., South Harbour Road, Fraserburgh, AB43 9BZ, Scotland UK.
Or fax   +44 (0) 1346 516827
Or email   sales@powerjacks.com

There is no charge for this service.

Use a separate sheet to sketch your application, or send us your design drawings in complete confidence.

Type of Application

How many actuator units needed:		Raise/Unit		mm	
How many bevel gear boxes needed:					
Total working load:		Working load per unit			
Total static load:		Static load per unit			
Side load on lifting screw:		Off centre load on lifting screw:		kN	mm
Operating cycles		per hour	hours per day	days per week	
Life expectancy:		m (metres per cycle × cycles per day × days per year × years of service required)			
Lifting speed desired		mm/min	Drive	Manual	Motor-driven
Load type:	Guided	Unguided	Compression	Tension	Both compression and tension
Ambient conditions:	Vibration	Impact	High temp.	Low temp.	Other
Type of prime mover:	Electric Motor	Air Motor	Hydraulic Motor	Manual	Other
Type of actuator preferred:					
Ultimate use of actuator units:			In-plant		Resale
Quotation desired on the following quantities:			Actuator units		Gear boxes
Name:		Title:			
Company:					
Address:					
Town:		County:		Post Code:	
Country:		Phone:		Fax:	

Note   *A brake is required on ball screw actuator units due to their high efficiency.*

Order Checklist

To ensure you receive the required equipment, please use the following checklist before finalising your order

- Quantity
- Stroke
- Capacity
- Actuator Model
- Type of screw end
  (top plate, threaded end, etc)
- Submit print if special end configuration
  is desired
- Gear ratio
- Whether upright, inverted screw, translating
  screw or rotating screw
- Keyed screw
  (not standard must be specified)
- Bellows Boot

- Anti-backlash feature (machine screw actuator models only)
- Worm extension - right or left-hand or both
  (double extension is standard)
- Limit switch and position (state voltage - available as standard
  with 250 V, 480 V, or 600 V. Also state whether switch is to
  be mounted on right or left extension of worm shaft)
- Encoder
- Visual position indicator
- Control System
- Motor mounted on actuator
- Call out other special requirements in detail, or submit print
  with order
- State cargo carried by actuators i.e. industrial only or
  human cargo

1.1.7. Actuator Product Codes for Ordering

1.1.7.1. S-Series (Sym-metric) Screw Jack Product Code

Character	1	2	3	4	5		6	7	8	9		10	11	12	13		14	15	16	17	18	19	20
Example	S	T	0	2	5	-	1	5	0	0	-	C	1	R	K	-	C	P	C	1	B	3	B

1. SYM-METRIC ACTUATOR
[S]

2. TYPE
[T] - Translating
[R} - Rotating

3-5. RATING (kN)
[025] - 25kN
[050] - 50 kN
[100] - 100 kN
[200] - 200 kN

6-9. RAISE (mm)
0000 - 9999

10. END TYPE
Translating:-
[C] - Clevis End
[E] - Screw Thread
[T] - Top Plate
[A] - Plain

Rotating:-
[P] - Pilot
[N] - No Pilot

11. LIFTING SCREW START
[1] - 1 Start
[2] - 2 Start *

12. GEAR RATIO
[R] - Standard Ratio
[1] - Option 1 Ratio
[2] - Option 2 Ratio
[X] - Special *

13. FEATURES
[0] - None
[K] - Keyed *
[C] - Secondary Guide *
[R] - Anti-Backlash *
[V] - Inverted Screw Anti-Backlash *
[Y] - Keyed Anti-Backlash *
[W] - Inverted Screw Keyed Anti-Backlash *

14. ACTUATOR DESIGNATION
[F] - Factory Designated *
[C] - Customised Feature

15. BOTTOM PIPE
[P] - Bottom Pipe
[F] - No Bottom Pipe

16. LIFTING SCREW THREAD
(Direction of worm rotation to raise load)
[C] - Right Hand (Clockwise)
[A] - Left Hand (Anti-Clockwise) *

17. LIFTING SCREW MATERIAL
[1] - Carbon Steel
[2] - Stainless Steel *

18. SCREW COVER
[0] - None
[B] - Bellows Boot *
[T] - Telescopic *

19. SIDE ADAPTER BOLT HOLES
[0] - None
[1] - Left Hand *
[2] - Right Hand *
[3] - Both *

20. DRIVE SHAFT ENDS
[B] - Standard (Both)
[F] - Left Hand Only
[R] - Right Hand Only

* Cost increase as the product is a variant, this may also effect delivery.

screw**jacks**

1.1.7.2. E-Series Metric Machine Screw Jack Product Code

Example   200 kN inverted keyed translating machine screw actuator with top plate, 300 mm of raise, bellows boots fitted to protect lifting screw and a single ended worm shaft extension on the right-hand side only.

K	ME	1819	300	BR
(a)	(b)	(c)	(d)	(e)
Prefix	Basic Model	Series No.	Travel of Unit (mm)	Suffix

1.1.7.2.1. Prefixes (a)

S   - All Stainless Steel Metric actuator.

K   - Keyed Lifting Screw

1.1.7.2.2. Basic Model (b)

TE   - Threaded end on lifting screw (standard).

ME   - Top Plate on end of lifting screw.

CE   - Clevis End on lifting screw.

PE   - Plain end, with no machining on end of lifting screw.

DE   - Inverted rotating screw actuator.

UE   - Upright rotating screw actuator.

CCE - Actuator unit with double clevis mounting arrangement.

Note   *1.   For Metric actuators with plain ended lifting screws consult Power Jacks.*
         2.   For Metric Stainless Steel actuators with varying materials and/or platings consult Power Jacks.
         3.   For external keyed guides consult Power Jacks.

1.1.7.2.3. Capacity and Series Designations (c)

Upright Translating Metric Actuator Models

Model Number	2625	2501	1802	1805	1810	1820	1830	1850	18100
Rating (kN)	5	10	25	50	100	200	300	500	1000

Inverted Translating Metric Screw Actuator Models

Decrease the upright model number by 1, e.g. 1804, 50 kN inverted Metric actuator.

Rotating Screw Metric Screw Actuator Models

Increase the upright model number by 1, e.g. 1806, 50 kN rotating Metric actuator.

Anti-Backlash Metric Actuator Models

Replace the first digit in the model number with a 4, e.g. 4805, 50 kN anti-backlash Metric Actuator.

1.1.7.2.4. Third Space Numerals (d)

The characters appearing in this space are to indicate raise in millimetres on all standard units, but not on specials. This space on special actuators helps to identify to our Engineering Department the actual actuator model produced. The numerals do not indicate raise or type of modification performed on special orders.

1.1.7.2.5. Suffix (e)

B - Indicates bellows boot required to protect lifting screw.

G - Secondary guide for the lifting screw.

L - Single-end worm shaft extension on left-hand side only.

R - Single-end worm shaft extension on right-hand side only.

1 - Alternate gear ratio required.

X - Supplied without bottom pipe, but with guide bushing.

Note   *1.*   *All suffixes (e) that do not conflict with another may be used in series against one actuator unit.*

1.1.7.3. E-Series Metric Ball Screw Jack Product Code

Example   100 kN inverted translating ball screw actuator with clevis end, 300 mm of raise, bellows boots fitted to protect lifting screw and a single ended worm shaft extension on the left-hand side only.

	CE	2809	300	BL
	↓	↓	↓	↓
(a)	(b)	(c)	(d)	(e)
↓	↓	↓	↓	↓
Prefix	Basic Model	Series No.	Travel of Unit (mm)	Suffix
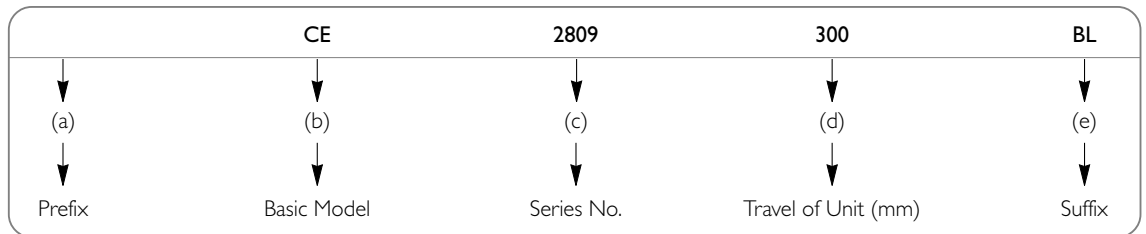
1.1.7.3.1. Prefixes (a)

For Future Use.

1.1.7.3.2. Basic Model (b)

TE - Threaded end on lifting screw (standard).

ME - Top plate on end of lifting screw.

CE - Clevis end on lifting screw.

PE - Plain end, with no machining on end of lifting screw.

DE - Inverted rotating screw actuator.

UE - Upright rotating screw actuator.

CCE - Actuator unit with double clevis mounting arrangement.

Note   *1.*   *Translating ball screw actuators are the standard and require no prefixes.*
          2.   *For Metric actuators with plain ended lifting screws consult Power Jacks Ltd.*
          3.   *Stainless Steel actuators with varying materials and/or platings consult Power Jacks Ltd.*
          4.   *Anti-rotation devices for the lifting screw consult Power Jacks Ltd for standard options.*
          5.   *Pre-loaded ball nuts with zero linear backlash consult Power Jacks Ltd for standard options.*
          6.   *All metric ball screw actuators include an integral safety device as standard.*
          7.   *All rotating screw ball screw actuators include wiper seals on the ball nut as standard.*

1.1.7.3.3. Capacity and Series Designations (c)

Upright Translating Metric Ball Screw Actuator Models

Model Number	28501	2802	2805	2810	2820	2830	2860
Rating (kN)	10	25	50	100	200	300	500

Inverted Translating Ball Screw Actuator Models

Decrease the upright model number by 1, e.g. 2804, 50 kN inverted Metric actuator.

Rotating Ball Screw Actuator Models

Increase the upright model number by 1, e.g. 2806, 50 kN rotating Metric actuator.

Optional Lead Metric Ball Screw Actuator Models

Metric Ball Screw actuators have an increased lead option for the ball screw assembly (typically double the standard option). To specify the optional lead add a "1" to the end of the model number, e.g. 28051, 50 kN upright optional lead Metric Ball Screw actuator.

1.1.7.3.4. Third Space Numerals (d)

The characters appearing in this space is to indicate raise in millimetres on all standard units, but not on specials. This space on special actuators helps to identify to our Engineering Department the actual actuator model produced. The numerals do not indicate raise or type of modification performed on special orders.

1.1.7.3.5. Suffix (e)

    B   -   Indicates bellows boot required to protect lifting screw.

    G   -   Secondary guide for the lifting screw.

    L   -   Single-end worm shaft extension on left-hand side only.

    R   -   Single-end worm shaft extension or right-hand side only.

    1   -   Alternate gear ratio required.

    X   -   Supplied without bottom pipe, but with guide bushing.

    Note   1.   All suffixes (e) that do not conflict with another may be used in series against one actuator unit.

1.1.7.4. Imperial Actuator Product Codes

For imperial actuator product codes for machine screw or ball screw models in carbon or stainless steel please consult Power Jacks Ltd.

1.2. Machine Screw Jacks

1.2.1. S-Series (Sym-metric) Screw Jacks

Advantages

- Increased Performance
- Robust Construction
- Multiple Arrangements

- Metric Cubic Design
- Positive, Mechanical Positioning
- Double Start Lifting Screw (optional)

- Easy Mounting
- Uniform, Lifting Speed
- Anti-Backlash Feature (optional)

Lifting Screw
Threaded end as standard and available with screw on clevis end or top plate.

Oil breather/plug

Shell Cap
Locked in place by set screws.

Guide Bush

Thrust bearings and oil seals
At each end of worm.

Oil Seals
At each end of gear

Taper Roller Bearings
Top and bottom take loads in either direction and accommodate any radial loads.

Worm Gear
Aluminium bronze. Accurately hobbed for greater gear contact.

Oil fill/drain plug

Worm
Available with double or single shaft extension, supplied with key.

Cooling fins
Improves heat dissipation.

Housing
Ductile iron.

Bottom Pipe
Protects lifting screw threads.

Capacities from 25 kN to 200 kN
Worm Gear Ratios from 6:1 to 24:1
Single and Double Start Lifting Screws

The Sym-metric actuator range was designed and manufactured in the UK. The actuators design offers higher performance, through higher thermal efficiency, from a machine screw actuator in a cubic style housing for ready mounting, e.g. upright and inverted positions in one standard unit. The actuator's design includes many new standard features satisfying almost any requirement. Operated manually or by motor units Sym-metric actuator models can be used singly, in tandem or in multiple arrangements (refer 1.1.3.2.9.). Since most capacities have a uniform lifting speed, added economy can be realised in raising unevenly distributed loads by operating the different capacities in unison.

Most Sym-metric actuator models with higher ratios are self-locking and will hold heavy loads in position indefinitely without creep under ideal conditions. They can be used to push, pull, apply pressure and as linear actuators. They are furnished with standard raises in increments of 25 mm. Depending upon size and type of load, models are available with raises up to 6 metres.

More Than 5000 Standard Combinations

Features

- **Increased Performance** - The design uses an oil filled, finned cubic housing designed for improved thermal efficiency, extending the duties and/or lowering working temperatures possible.

- **Flexible Mounting** - The standard actuator can be mounted in either upright or inverted positions and the side faces can be provided with bolt holes for accessory mounting.

- **Precise Positioning** - Can be controlled accurately for positioning within hundredths of a millimetre.

- **Self-Locking** - Will normally hold loads in position without creeping when using the higher ratio units, as long as the actuator unit is not subject to vibration or cyclic temperature variations. If self-locking is critical a brake motor or other restraining device should be considered.

- **Uniform Lifting Speed** - Since many models have the same gear ratios, various capacities can be used in the same application to lift unevenly distributed loads with uniform speed.

- **Quick, Sure Operation** - Designed and built to be positive acting, for accurate response to motive power.

Options

- **Translating or Rotating Screw Models**

- **Three Standard Gear Ratios**

- **Anti-Backlash Option** - Reduces vertical backlash between the screw and the worm gear nut to a practical minimum for smooth, precise operation and minimum wear.

- **Double Start Lifting Screw** - Standard option for increased raise rate.

- **Keyed Option** - Stops a translating screw from rotating when the screw ends are free.

- **Secondary Guide Option** - Increases lifting screw lateral rigidity aiding screw guidance and improved side load resilience.

- **Bellows Boot Option** - Protects the screw from dust, dirt, moisture and corrosive contaminants.

- **Side Bolt Hole Options** - Provided for drive shaft accessories such as standard motor adaptors.

- **Screw End Types** - Include clevis end, threaded end, top plate and plain end.

Translating Screw
(Upright and Inverted)

Rotating Screw
(Upright and Inverted)
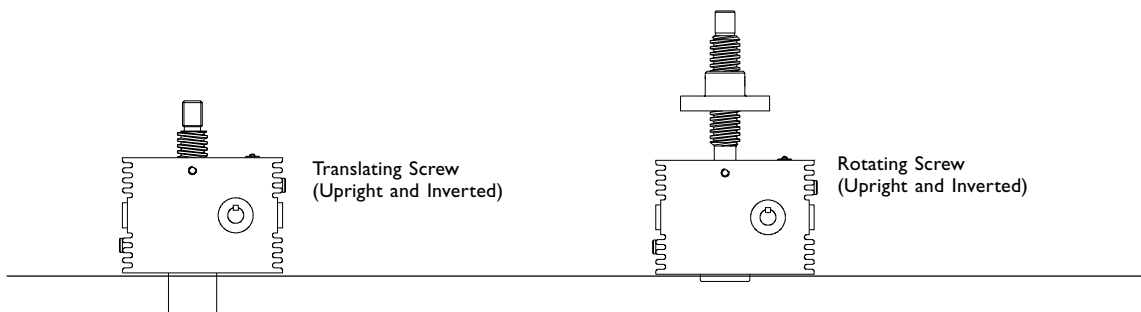
Note   *Clockwise rotation of worm raises load on all models (refer previous page) - counter clockwise available at extra charge.*
Unless a translating lifting screw is keyed, the top should be bolted to the lifting member to prevent the screw from rotating.
Actuators are equipped with sightglass oil plug and breather fittings.
Recommended lubricants are listed in the installation and maintenance instructions (refer 1.5.3.).
Actuators supplied complete with drive shaft keys.
Wherever possible loads should be guided, if not consult Power Jacks Ltd.

Attachments

IEC and Nema C-Face flanges, motors, gear boxes, reducers and couplings available for single actuator drive or multiple actuator arrangements (refer 6, 7 and 8).

Motion control components include Motor Drives, Motion Controllers with operator interfaces, encoders, limit switches, potentiometers and meters with LCD display (refer 8.).

1.2.1.1. Performance of Standard S-Series (Sym-metric) Actuators

Actuator Model			ST025		ST050		ST100		ST200	
Capacity (kN)			25		50		100		200	
Lifting Screw		Diameter	Ø30		Ø40		Ø55		Ø65	
		Pitch	6 mm		9 mm		12 mm		12 mm	
		No. of Starts*	1	2	1	2	1	2	1	2
Worm Gear Ratios		Standard	6:1		6:1		8:1		8:1	
		Option 1	8:1		8:1		6:1		6:1	
		Option 2	24:1		24:1		24:1		24:1	
Turn of worm for raise of lifting screw	1 Turn	Standard	1 mm	2 mm	1.5 mm	3 mm	1.5 mm	3 mm	1.5 mm	3 mm
	4 Turn	Option 1	3 mm	6 mm	4.5 mm	9mm	8 mm	16 mm	8 mm	16 mm
	4 Turn	Option 2	1 mm	2 mm	1.5 mm	3 mm	2 mm	4 mm	2 mm	4 mm
Maximum Input Power per Actuator (kW)		Standard	1.5		3.0		3.75		3.75	
		Option 1	1.5		3		3.75		3.75	
		Option 2	0.375		0.550		1.125		1.125	
Start-Up Torque at full Load (Nm) †		Standard	19	26	54	73	111	151	252	330
		Option 1	15	20	44	59	140	190	317	416
		Option 2	8	11	24	33	57	77	129	168
Weight with base raise of 150mm (kg)			13		25		41		70	
Weight for each additional 25mm raise (kg)			0.21		0.32		0.57		0.86	

*   *Single start lifting screw is standard.*

†   *For loads of 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.*

Sym-metric Actuator Efficiencies

Model	Gear Ratio	Lifting Screw Start	Static Input Speed Zero rpm	Dynamic Input Speed (rpm)			
				50	750	1000	1500
ST025	6:1	1	0.209	0.262	0.299	0.302	0.309
		2	0.314	0.379	0.434	0.438	0.448
	8:1	1	0.194	0.247	0.288	0.293	0.301
		2	0.293	0.358	0.418	0.424	0.436
	24:1	1	0.121	0.164	0.220	0.226	0.239
		2	0.183	0.238	0.320	0.328	0.347
ST050	6:1	1	0.222	0.281	0.324	0.329	0.337
		2	0.325	0.398	0.460	0.466	0.477
	8:1	1	0.206	0.264	0.312	0.318	0.328
		2	0.302	0.374	0.442	0.451	0.465
	24:1	1	0.125	0.171	0.238	0.246	0.263
		2	0.184	0.242	0.337	0.349	0.372
ST100	6:1	1	0.227	0.285	0.324	0.329	0.336
		2	0.336	0.407	0.462	0.469	0.479
	8:1	1	0.214	0.272	0.315	0.320	0.328
		2	0.317	0.389	0.450	0.456	0.468
	24:1	1	0.140	0.188	0.252	0.260	0.274
		2	0.207	0.269	0.359	0.370	0.391
ST200	6:1	1	0.201	0.255	0.289	0.294	0.300
		2	0.307	0.375	0.426	0.432	0.442
	8:1	1	0.190	0.243	0.282	0.286	0.293
		2	0.290	0.358	0.415	0.421	0.431
	24:1	1	0.124	0.168	0.225	0.232	0.245
		2	0.189	0.248	0.331	0.341	0.361

Note   *Values for standard oil lubricated Sym-metric actuators only, ref: BS 721 part 2. with grease lubricated lifting screw.*

1.2.1.2. Standard Sym-metric Translating Screw Actuators
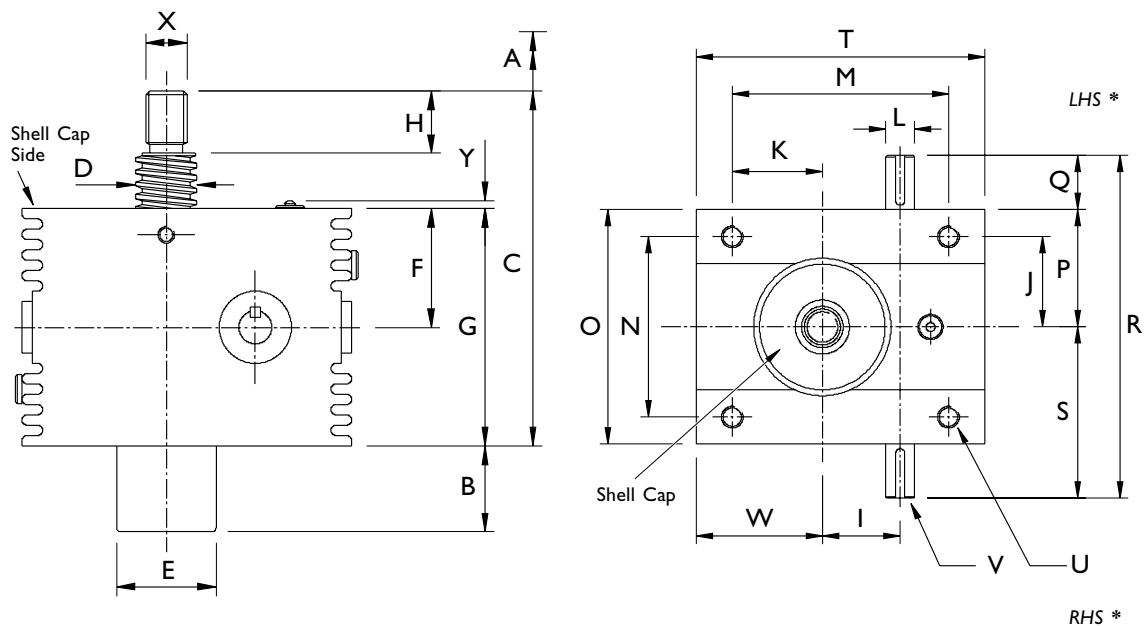
Note   *All dimensions in millimetres.*

*   * When viewed in direction of Shell Cap   LHS = Left Hand Side   RHS = Right Hand Side*

Model	ST025	ST050	ST100	ST200
A		Raise as Required		
B	Raise	Raise	Raise	Raise
C	Min Closed Height 157	Min Closed Height 192	Min Closed Height 224	Min Closed Height 265
D	Ø30	Ø40	Ø55	Ø65
E	Ø50	Ø60	Ø76	Ø95
F	57.5	72.5	85	97.5
G	115	145	170	195
H	30	35	40	55
I	43.26 +0.050 -0.000	55.58 +0.050 -0.000	66.0 +0.060 -0.000	66.0 +0.070 -0.000
J	50	62.5	72.5	82.5
K	50	60	65	72.5
L	Ø16 h8	Ø19 h8	Ø25 h8	Ø28 h8
M	120	155	165	190
N	100	125	145	165
O	130	160	190	220
P	65	80	95	110
Q	30	35	50	50
R	190	230	290	320
S	95	115	145	160
T	160	200	235	275
U	M12 x 1.75 x 16 Deep	M16 x 2 x 24 Deep	M20 x 2.5 x 30 Deep	M24 x 3 x 36 Deep
V	5 x 5 x 25	6 x 6 x 32	8 x 7 x 40	8 x 7 x 40
W	70	83	100	115
X	M20 x 2.5	M24 x 3	M36 x 4	M48 x 5
Y	4 Max	4 Max	4 Max	4 Max

Note   *Dimensions subject to change without notice.*

1.2.1.3. Standard Sym-metric Rotating Screw Actuators
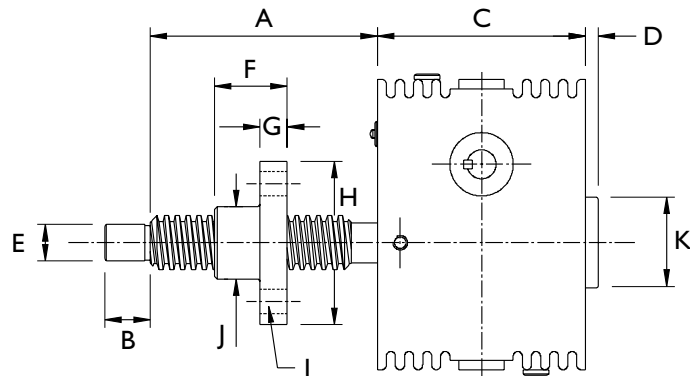
Note   *For other dimensions and performance data refer to translating screw models.*

Model	Rating kN	A	B	C	D	E	F	G	H	I	J	K
SR025	25	Raise + 60	25	115	15	20	40	15	90	4 Holes - 13.5 Dia. on 65 P.C.D.	40	50
SR050	50	Raise + 80	30	145	15	25	65	20	115	4 Holes - 18 Dia. on 85 P.C.D.	55	62
SR100	100	Raise + 100	50	170	31	35	75	25	160	4 Holes - 22 Dia. on 120 P.C.D.	80	76
SR200	200	Raise + 100	65	195	50	45	75	25	185	4 Holes - 26 Dia. on 135 P.C.D.	90	95

1.2.1.4. Standard Translating Screw Ends
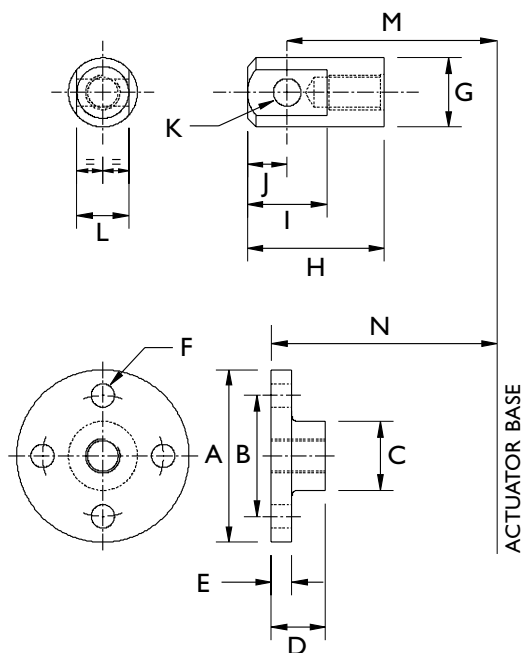
Model	ST025	ST050	ST100	ST200
A	Ø100	Ø120	Ø150	Ø170
B	P.C.D. 70	P.C.D. 85	P.C.D. 110	P.C.D. 120
C	Ø40	Ø50	Ø65	Ø75
D	31.5	36.5	42	58
E	12	16	20	25
F	Ø13.5	Ø18	Ø22	Ø26
G	Ø40	Ø50	Ø65	Ø75
H	79.5	91.5	120	143
I	46	60	66	80
J	23	30	33	40
K	Ø16	Ø20	Ø22	Ø30
L	30	35	40	50
M	182	217	269	310
N	157	192	224	265

Note   *Dimensions subject to change without notice.*

1.2.1.5. Sym-metric Actuators with Anti-Backlash Feature
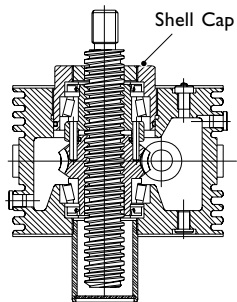
Shell Cap

Sym-metric actuators are available with anti-backlash nuts for applications where a reversal of loading from tension to compression is encountered.

Anti-Backlash Features

• Reduction in the vertical backlash between the screw and the worm gear nut to a practical minimum for smoother, more precise operation and minimum wear.

• Acts as a safety device, providing a dual nut load carrying unit, when the worm gear becomes worn.

• Wear indicator for critical applications.

The anti-backlash feature can be maintained by adjusting the shell cap until the desired amount of backlash is achieved. To avoid binding and excessive wear, do not adjust lifting screw backlash to less than 0.013 mm (refer 1.5.2.1.1.7.).

Optional

Anti-Backlash actuators are available with inverted screws to increase mounting flexibility as access is required to the shell cap to allow backlash adjustment. The bottom pipe (*) for these actuators screw into the shell cap. For keyed actuators the position of the keyed hub (**) remains as shown.
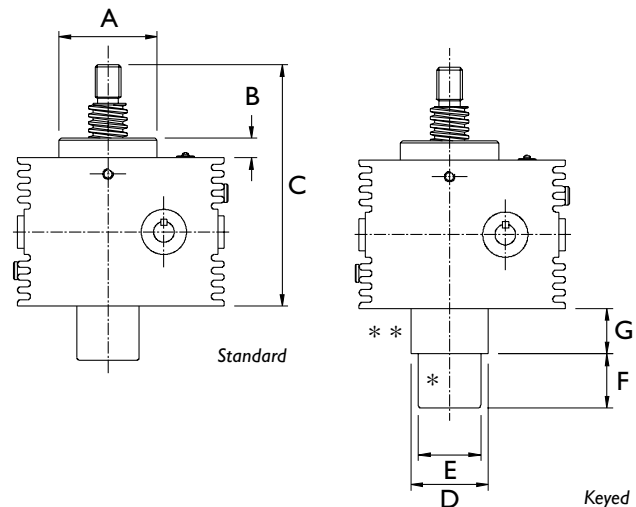
Standard

Keyed

Standard Dimensions (mm)

Model	Standard (R)			Keyed (Y)			
	A	B	C	D	E	F	G
ST025-R (Y)	76	15	172	60	50	Raise	35
ST050-R (Y)	100	25	217	75	60	Raise	42
ST100-R (Y)	127	28	252	90	76	Raise	52
ST200-R (Y)	145	34	299	102	95	Raise	63

Torque and Efficiencies for Standard Anti-Backlash Actuators

Model		ST025-R		ST050-R		ST100-R		ST200-R	
Capacity (kN)		25		50		100		200	
Lifting Screw No, of Starts		Single	Double	Single	Double	Single	Double	Single	Double
Torque at Full Load (Nm)	Standard	21	28	60	82	124	168	279	367
	Option 1	17	23	48	66	155	211	352	461
	Option 2	9	12	26	36	63	86	142	187
Static Actuator Efficiency Rating	Standard	0.188	0.282	0.200	0.293	0.193	0.285	0.171	0.260
	Option 1	0.175	0.263	0.186	0.272	0.205	0.302	0.181	0.276
	Option 2	0.109	0.164	0.113	0.165	0.126	0.186	0.112	0.170
Weight with base raise of 150 mm (kg)		13.4		26.5		43.5		74	

Note
1. Refer 1.1.7.1. for Sym-metric product code structure.
2. For loads from 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.
3. Dimensions are subject to change without notice.

1.2.1.6. Sym-metric Actuators with Key or Secondary Guide

- A Keyed translating screw actuator stops the screw from rotating without the need for end pinning. However the key-way in the screw will cause greater than normal wear on the internal threads of the worm gear.
- Secondary Guiding for the screw for greater lateral rigidity aiding screw guidance and improved side load resilience.
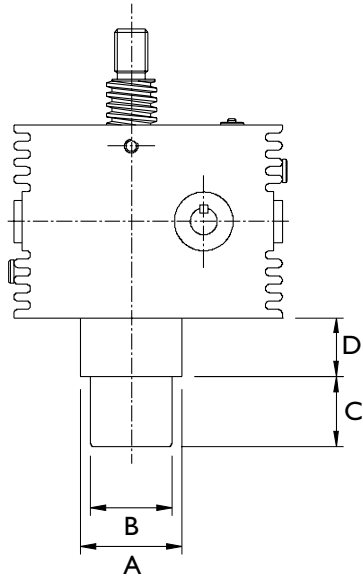
Standard Keyed Dimensions

Model	ST025-K	ST050-K	ST100-K	ST200-K
A	60	75	90	102
B	50	60	76	95
C	Raise	Raise	Raise	Raise
D	35	38	52	63

Standard Secondary Guide Dimensions

Model	ST025-C	ST050-C	ST100-C	ST200-C
A	60	70	90	100
B	50	60	76	95
C	Raise	Raise	Raise	Raise
D	20	20	20	20

Note *Dimensions in mm.*

1.2.1.7. Standard Flange Bolt Configuration for Actuator Sides
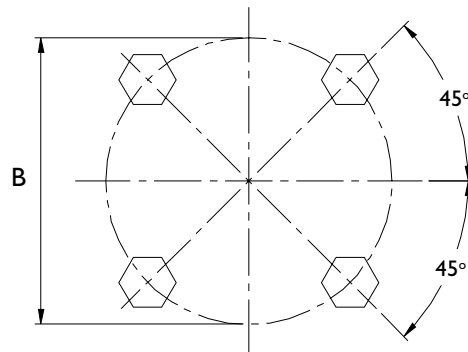
Model	'B' Bolt P.C.D. (mm)	Bolt Information
ST025	46	M6 x 1 mm Pitch, 14 mm Deep
ST050	61	M8 x 1.25 mm Pitch, 22 mm Deep
ST100	70	M8 x 1.25 mm Pitch, 14 mm Deep
ST200	88	M10 x 1.5 mm Pitch, 14 mm Deep

Note *Dimensions are subject to change without notice.*

1.2.1.8. Sym-metric Actuators with Bellow Boots

Example Bellows Boot Actuator

Threaded End *Top Plate* *Clevis End* *Bellows Boots*
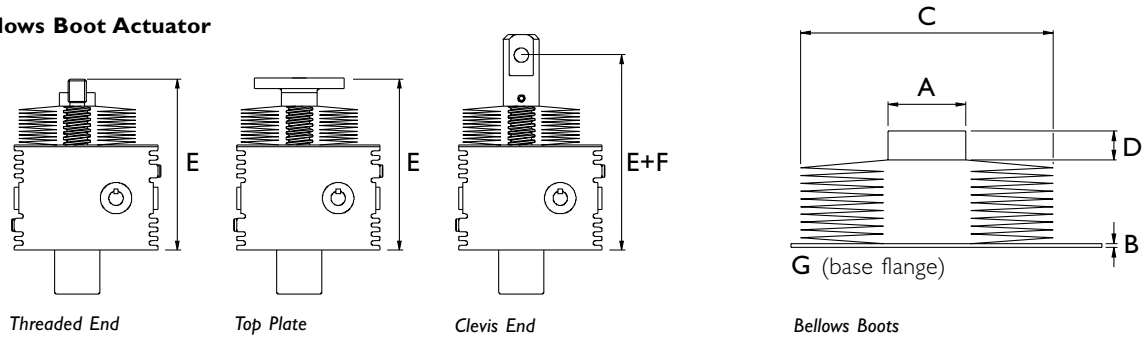
Model		ST025-B	ST050-B	ST100-B	ST200-B
A		Ø40	Ø50	Ø65	Ø75
B		2	2	3	3
C*		Ø130	Ø140	Ø150	Ø170
D		10	10	10	10
E Closed Height	Raise 0 → 300	157	192	224	265
	Raise 300 → 600	171	206	238	279
	Raise 600 → 1050	189	224	256	297
	Raise 1050 →1500	208	244	275	317
	Raise 1500 → 1800	228	258	295	331
	Raise 1800 → 2150	-	-	305	351
	Raise 2150 → 2500	-	-	320	366
Extra Closed Height (E) for Keyed Anti-Backlash Units		+15	+25	+28	+34
F	Extra Closed Height for Clevis End	+25	+25	+45	+45

Note 1. *The bellows boot fixes via an adapter flange (G) to the actuator housing mounting bolt holes.*
2. ** For raises of 1500+ control tapes are fitted (approximately 20 mm external diameter increase). Clipped every third vee.*
3. *Supplied complete with one corrosion resistant jubilee clip suitable for fitting over collar diameter.*

Example Bellows Boot Actuator
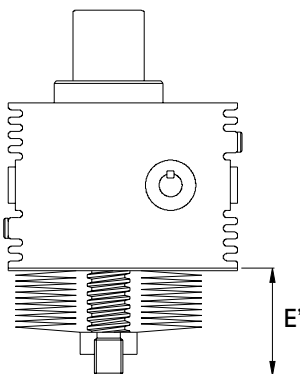
Anti-Backlash Units with Inverted Lifting Screws					
Model		ST025-VB	ST050-VB	ST100-VB	ST200-VB
E' Closed Height	Raise 0 → 300	42	47	54	70
	Raise 300 → 600	56	61	68	84
	Raise 600 → 1050	74	79	86	102
	Raise 1050 → 1500	93	99	105	122
	Raise 1500 → 1800	113	113	125	136
	Raise 1800 → 2150	-	-	135	156
	Raise 2150 → 2500	-	-	150	171
Extra Closed Height (E) for Keyed Anti-Backlash		+23	+33	+35	+44
F	Extra Closed Height for Clevis End	+25	+25	+45	+45

Note *Dimensions are subject to change without notice.*

1.2.1.9.   Motor Adaptors for Sym-metric Screw Jacks

Motor Adaptors		Actuator Rating (kN)			
		25			
Frame Size	Motor Mounting	Std Part	A	B	C (squ)
71	B5	✔	166	14	80
	B14 C105	✗	-	-	-
80	B5	✔	181	14	80
	B14 C120	✔	166	14	80
90	B5	✔	181	14	80
	B14 C140	✔	166	14	80
100	B5	✔	181	14	80
	B14 C160	✔	181	14	80
112	B5	✗	-	-	-
	B14 C190	✗	-	-	-
132	B5	✗	-	-	-
	B14 C200	✗	-	-	-
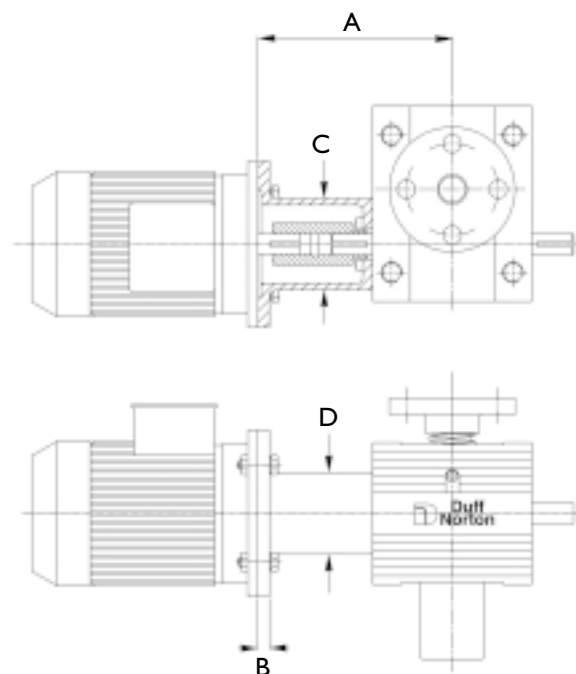
Motor Adaptors		Actuator Rating (kN)				Actuator Rating (kN)					Actuator Rating (kN)				
		50				100					200				
Frame Size	Motor Mounting	Std Part	A	B	C (squ)	Std Part	A	B	C (squ)	D	Std Part	A	B	C (squ)	D
71	B5	✗	-	-	-	✗	-	-	-	-	✗	-	-	-	-
	B14 C105	✗	-	-	-	✗	-	-	-	-	✗	-	-	-	-
80	B5	✔	203	14	100	✗	-	-	-	-	✗	-	-	-	-
	B14 C120	✗	-	-	-	✗	-	-	-	-	✗	-	-	-	-
90	B5	✔	203	14	100	✔	232	14	110	98	✔	247	14	110	98
	B14 C140	✗	-	-	-	✔	232	14	110	98	✔	247	14	110	98
100	B5	✔	225	14	100	✔	232	14	110	98	✔	247	14	110	98
	B14 C160	✔	203	14	100	✔	232	14	110	98	✔	247	14	110	98
112	B5	✔	225	14	100	✔	232	14	110	98	✔	247	14	110	98
	B14 C190	✔	203	14	100	✔	232	14	110	98	✔	247	14	110	98
132	B5	✔	225	14	100	✗	-	-	-	-	✗	-	-	-	-
	B14 C200	✔	225	14	100	✔	252	14	110	98	✔	267	14	110	98

Note   *1.   All dimensions are in millimetres (mm) unless otherwise stated.*
2.   Dimensions are subject to change without notice.
3.   Other IEC frame sizes are available on request
4.   NEMA motor adaptors are available on request.
5.   For motor specifications refer to section 7.

1.2.1.10.　Trunnion Mounts for Sym-metric Actuators

25, 50 & 100 kN Models
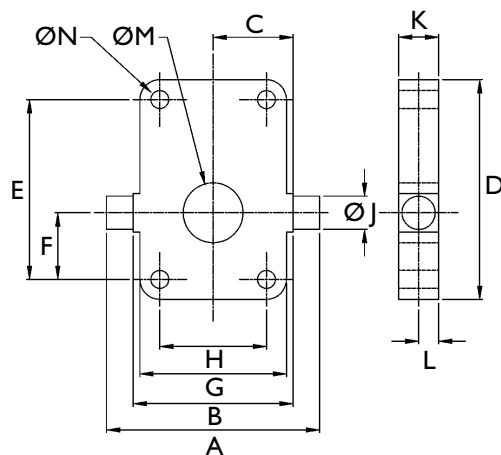
Actuator Rating (kN)	A	B	C	D	E	F	G	H	J (h6)	K	L	M	N	Weight (kG)
25	180	140	70	160	120	50	130	100	25	30	15	72	13	3.7
50	210	170	85	200	155	60	160	125	35	40	20	95	17	9.3
100	270	200	100	235	165	65	190	145	45	50	25	130	21	16.3
200	Available on request													

Trunnion mounts bolt onto actuator base plates.

Note:　1.　*Trunnion mounts for other actuator sizes are available on request.*
　　　　2.　*All dimensions in millimetres (mm) unless otherwise stated.*
　　　　3.　*Dimensions subject to change without notice.*

**Example diagram of
actuator with trunnion mount fitted**
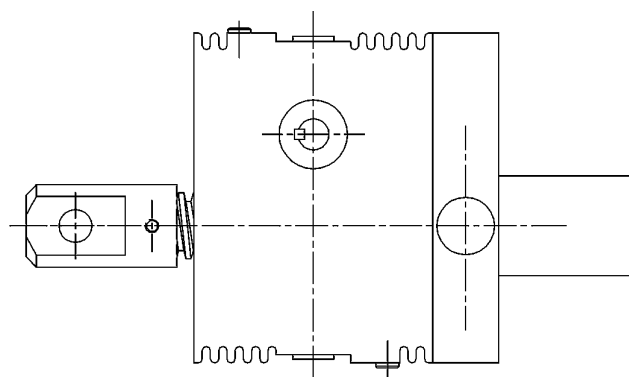
1.2.1.11. RLS-51 Rotary Limit Switch Adaptors for Sym-metric Screw Jacks

Rotary limit switches can be used as end of travel limit switches with the option of intermediate switches as well. These units are mounted onto a screw jacks free worm shaft and offer an alternative where bottom pipe mounted limit switches are not possible e.g. rotating screw jacks. Up to 8 limit switches can be accommodated in one unit.

For full details on the RLS-51 limit switch refer to section 8.1.1.

Sym-metric Actuator Rating (kN)								
	25				50			
Adaptor Mounting	Std Part	A	B	C (squ)	Std Part	A	B	C (squ)
B5	✗	-	-	-	✗	-	-	-
B14	✔	138	10	70	✔	151	10	89

Sym-metric Actuator Rating (kN)								
	100				200			
Adaptor Mounting	Std Part	A	B	C (squ)	Std Part	A	B	C (squ)
B5	✔	172	13	98	✔	201	13	125
B14	✗	-	-	-	✗	-	-	-

The mounting kit includes the flexible coupling and drive adaptor.

Note 1. *All dimensions are in millimetres (mm) unless otherwise stated.*
2. *Dimensions are subject to change without notice.*
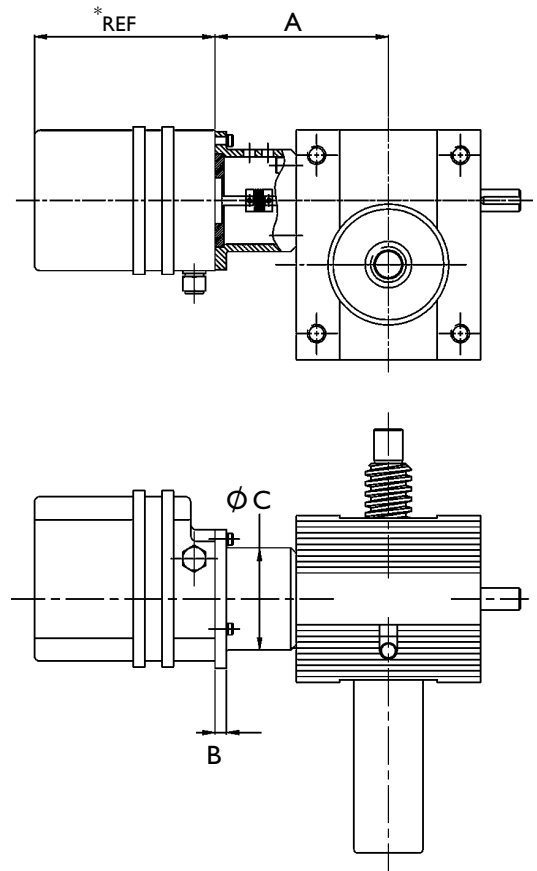
1.2.1.12. SKA Rotary Limit Switch Adaptors for Sym-metric Screw Jacks

The SKA rotary limit switch is a compact 2-position limit switch designed for screw jack and linear actuator applications. For mounting details for Sym-metric actuators please consult Power Jacks Ltd. For full details on the SKA limit switch refer to section 8.1.2.

1.2.1.13. Encoder Adaptors for Sym-metric Screw Jacks

Both incremental and absolute encoders can be mounted on a Sym-metric actuators free worm shaft. The specification for these encoders is given in section 8.3. For mounting details please consult Power Jacks Ltd.

1.2.1.14. Limit Switch Mounted on Sym-metric Actuator Bottom Pipe

1.2.1.14.1. Sym-metric Actuator with End of Travel Proximity Sensors

Sensor Kit

- Inductive Proximity Sensors as standard others available on request.
- No contact, so no wearing parts.
- 2 Wire sensor for either Normally Closed (NC) or Normally Open (NO) switching.
- Sensor has rugged one-piece Metal housing.
- Optical setting aid with 2 LED Colour settings:- Red LED indicates just in sensing range. Yellow LED only indicates within 80% safe sensing range.
- M12 Plug in connection for fast change-ability.
- M12 sockets available straight or angled with 5-m cable (other cable lengths available on request).
- Full 360° visibility for switching with 4 yellow LED's at 90° offset.
- Sensor kit includes - sensor, mounting ring, target ring and modification to actuators bottom pipe.
- For full sensor details refer to section 8.2.1.

Sym-metric Actuator Rating (kN)								
Actuator Rating (kN)	Switch Dia (mm)	A1 (mm)	B (mm)	C (mm)	D (Ø mm)	E (mm) ±5	F (mm)	Switch Adjustment(mm)
25	12	50	Stroke +15	25	50	83	15	±10
50	12	50	Stroke +18	35	60	90	15	±10
100	18	50	Stroke +24	50	76	103	20	±10
200	18	50	Stroke +24	55	95	110	20	±10

Note   1. All dimensions in mm unless otherwise stated.
2. Dimensions subject to change without notice.

1.2.1.14.2. Sym-metric Actuator with End of Travel Electro-Mechanical Switches

The actuators can be fitted with electro-mechanical limit switches in a similar design. For dimensions please consult Power Jacks. For limit switch details refer to section 8.2.2. and 8.2.3.

Example Switches

1.2.2. E-Series Metric Machine Screw Jacks

Advantages

- Positive, Mechanical Positioning
- Multiple Arrangements
- Uniform, Lifting Speed
- Anti-Backlash Feature (optional)

Lifting Screw
Threaded end as standard and available with screw on clevis end or top plate.

Thrust Bearings
and Grease Seals
At each end of worm.
5 & 10 kN models
do not have seals.

Shell Cap
Locked in place by set screws.

Load Bearings
Bearings, top and bottom to take loads in tension or compression.

Worm Gear
Aluminium bronze. Accurately hobbed for greater gear contact.

Worm
Available with double or single shaft extension.

Housing
Aluminium on 5 & 10 kN models, ductile iron on 25 kN through 100 kN models, cast steel on 200 kN through 1000 kN models.

Bottom Pipe
Protects lifting screw threads.

Capacities from 5 kN to 1000 kN
Worm Gear Ratios from 5:1 to 36:1

The Metric machine screw actuator range is produced in many standard models with a wide range of capabilities, there is a standard model for almost any requirement.

Operated manually or by motor units metric actuator models can be used singly, in tandem or in multiple arrangements (refer 1.1.3.2.9.). Since most capacities have a uniform lifting speed, added economy can be realised in raising unevenly distributed loads by operating the different capacities in unison.

Most Metric machine screw actuator models with higher ratios are self-locking and will hold heavy loads in position indefinitely without creep, in ideal conditions. They can be used to push, pull, apply pressure and as linear actuators. They are furnished with standard raises in increments of 25 mm. Depending upon size and type of load, models are available with raises up to 6 metres.

More Than 5000 Standard Combinations

Features

- **Precise Positioning** - Can be controlled accurately for positioning within hundredths of a millimetre.
- **Self-Locking** - Will normally hold loads in position without creeping when using the higher ratio units, as long as the actuator unit is not subject to vibration or cyclic temperature variation. If self-locking is critical a brake motor or other restraining device should be considered.
- **Uniform Lifting Speed** - Since many models have the same gear ratios, various capacities can be used in the same application to lift unevenly distributed loads with uniform speed.
- **Quick, Sure Operation** - Designed and built to be positive acting, for accurate response to motive power.

Options

- **Two Standard Gear Ratios**
- **Anti-Backlash Option** - Reduces vertical backlash between the screw and the worm gear nut to a practical minimum for smooth, precise operation and minimum wear.
- **Keyed Option** - Stops a translating screw from rotating when the screw ends are free.
- **Secondary Guide Option** - Increases lifting screw lateral rigidity aiding screw guidance and improved side load resilience.
- **Bellows Boot Option** - Protects the screw from dust, dirt, moisture and corrosive contaminants.

Upright Screw

Rotating Screw (Upright)
Available in both upright and inverted types

Inverted Screw

Clevis

Threaded

Note   Clockwise rotation of worm raises load on all models (refer to previous page) - counter clockwise available at extra charge.
Unless a translating lifting screw is keyed, the top should be bolted to the lifting member to prevent the screw from rotating.
Actuators are equipped with "Alemite" grease fittings.
Recommended lubricants are listed in the installation and maintenance instructions.
Actuators supplied complete with drive shaft keys.

Attachments

IEC and Nema C-Face flanges, motors, gear boxes, reducers and couplings available for single actuator drive or multiple actuator arrangements (refer 4, 5, 6, 7 and 8).

Motion control components include motor drives, Motion Controllers with operator interfaces, encoders, limit switches, potentiometers and meters with LCD display (refer 8.).

1.2.2.1. Performance of Standard Metric Actuators

Actuator Model		E2625	E2501	E1802	E1805	E1810	E1820	E1830	E1850	E18100
Capacity (kN)		5	10	25	50	100	200	300	500	1000
Lifting Screw *	Diameter	16 mm	20 mm	30 mm	40 mm	55 mm	65 mm	95 mm	120 mm	160 mm
	Pitch	3 mm	5 mm	6 mm	9 mm	12 mm	12 mm	16 mm	16 mm	20 mm
Worm Gear Ratios	Standard	5:1	5:1	6:1	6:1	8:1	8:1	10 $^2/_3$	10 $^2/_3$	12:1
	Optional	20:1	20:1	24:1	24:1	24:1	24:1	32:1	32:1	36:1
Turn of worm for raise of lifting screw	Standard	5 for 3 mm	1 for 1 mm	1 for 1 mm	1 for 1.5 mm	1 for 1.5 mm	1 for 1.5 mm	1 for 1.5 mm	1 for 1.5 mm	3 for 5 mm
	Optional	20 for 3 mm	4 for 1 mm	4 for 1 mm	4 for 1.5 mm	2 for 1 mm	2 for 1 mm	2 for 1 mm	2 for 1 mm	9 for 5 mm
Maximum Input Power per Actuator (kW)	Standard	0.25	0.375	1.5	3	3.75	3.75	6	11.25	18.5
	Optional	0.12	0.19	0.375	0.55	1.125	1.125	1.9	4.5	8.25
Start-Up Torque at full load (Nm) †	Standard	2.5	6.8	19.8	56.0	115.9	263.8	480	904	2025
	Optional	1.1	3.0	8.7	25.5	60.5	137	284	504	1119
Weight with base raise of 150mm (kg)		1.03	2.27	8.17	15.88	24.72	45	86	195	553
Weight for each additional 25mm raise (kg)		0.073	0.13	0.21	0.32	0.57	0.86	1.58	2.49	4.31

* All metric machine screws have a trapezoidal thread form, single start as standard.

† For loads of 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.

Metric Actuator Efficiencies

Standard Gear Ratio

Actuator Model	E2625	E2501	E1802	E1805	E1810	E1820	E1830	E1850	E18100
Gear Ratio	5	5	6	6	8	8	10 $^2/_3$	10 $^2/_3$	12
Actuator Static Efficiency	0.189	0.233	0.201	0.213	0.206	0.181	0.149	0.132	0.131
Actuator Dynamic Efficiency	0.252	0.306	0.264	0.281	0.272	0.242	0.205	0.181	0.178

Optional Gear Ratio

Actuator Model	E2625	E2501	E1802	E1805	E1810	E1820	E1830	E1850	E18100
Gear Ratio	20	20	24	24	24	24	32	32	36
Actuator Static Efficiency	0.107	0.130	0.115	0.117	0.132	0.116	0.084	0.079	0.079
Actuator Dynamic Efficiency	0.160	0.194	0.167	0.172	0.190	0.169	0.128	0.120	0.123

Note   Efficiency values for standard grease lubricated worm gear box and lifting screw.

1.2.2.2. Standard Metric Translating Screw Actuators
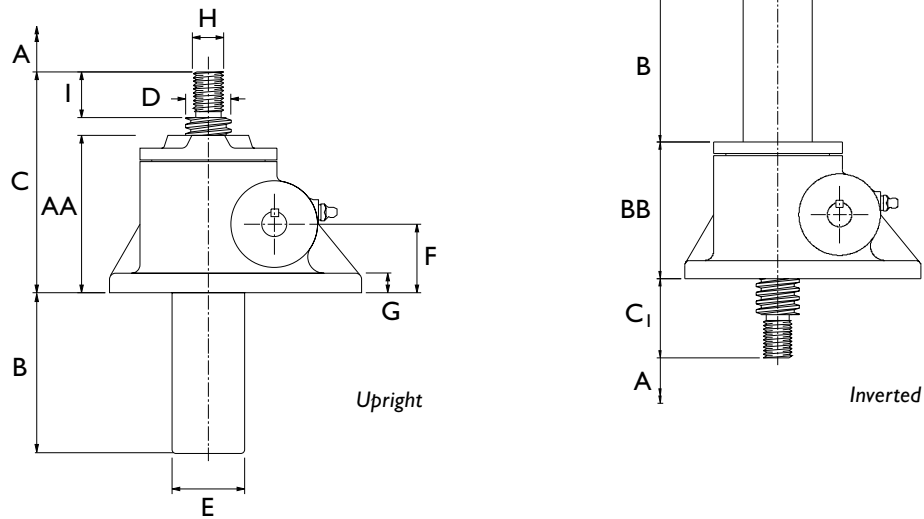
Upright

Inverted

Note   All Dimensions in mm.

Plan View

Models: 2625 & 2501

Models: 1802   1805   1810
          1820   1830   1850

Models: 18100
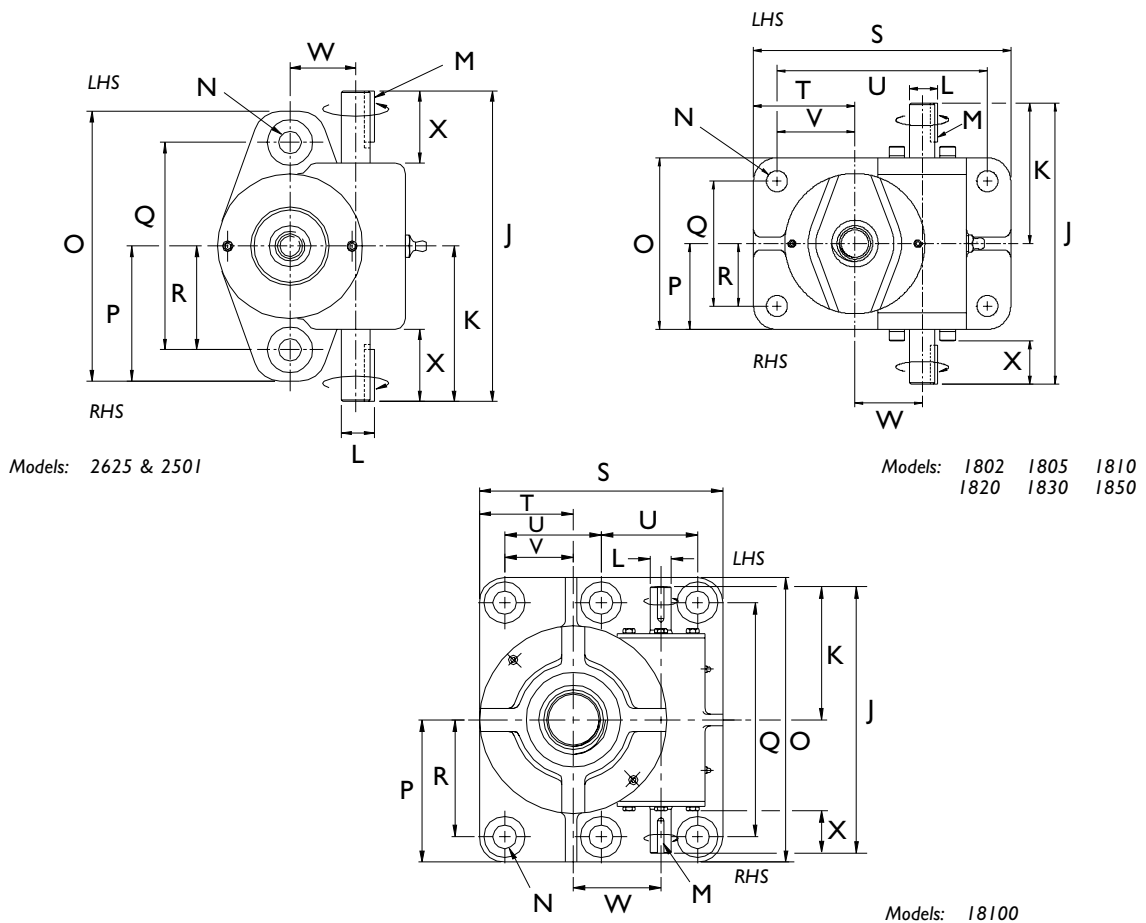
Note   1. Closed Height of threaded end and top plate units is the same for upright or inverted models.
*   2. Dimensions are subject to change without notice.*
*   3. LHS = Left Hand Side*
*   4. RHS = Right Hand Side*

Model	Upright	E2625	E2501	E1802	E1805	E1810	E1820	E1830	E1850	E18100
	Inverted	E2624	E2500	E1801	E1804	E1809	E1819	E1829	E1849	E18099
Capacity (kN)		5	10	25	50	100	200	300	500	1000
A		Raise As Required								
B		A + 9	A + 9 (A+10)	A + 5	A - 5	A + 3	A - 1	A + 15	A + 13	A + 3
C		95	125	145	185	200	265	325	390	560
C1		40	45	55	65	80	95	115	150	260
D		16	20	30	40	55	65	95	120	160
E		26.7	33.4	48.3	60.3	73	89	115	141	194
F		26 ± 0.13	40 ± 0.13	45 ± 0.13	60 ± 0.13	60 ± 0.13	85 ± 0.13	105 ± 0.13	120 ± 0.13	150 ± 0.13
G		10	10	13	14	16	20	30	32	40
H		M10 × 1.5	M12 × 1.75	M20 × 2.5	M24 × 3	M36 × 4	M48 × 5	M72 × 4	M100 × 4	M125 × 4
I		20	24	30	35	40	55	65	90	125
J		120	150	180	230	280	300	380	460	580
K		60	75	90	115	140	150	190	230	290
L		10h8	14h8	16h8	19h8	25h8	28h8	35h8	40h8	45h8
M		3 × 3 × 18	5 × 5 × 25	5 × 5 × 25	6 × 6 × 32	8 × 7 × 40	8 × 7 × 40	10 × 8 × 50	12 × 8 × 56	14 × 9 × 70
N		9	11	13.5	18	22	26	39	51	51
O		110	130	110	150	190	210	260	300	620
P		55	65	55	75	95	105	130	150	310
Q		85	100	80	115	145	150	190	200	510
R		42.5	50	40	57.5	72.5	75	95	100	255
S		-	-	165	205	225	275	365	535	530
T		-	-	65	75	75	105	140	225	205
U		-	-	135	170	180	215	295	435	210
V		-	-	50	57.5	52.5	75	105	175	150
W		23.82 + 0.076 - 0.000	31.75 + 0.076 - 0.000	43.26 + 0.025 - 0.025	55.58 + 0.050 - 0.000	66 + 0.060 - 0.000	66 + 0.070 - 0.000	95.25 + 0.130 - 0.000	135 + 0.070 - 0.000	190.5 + 0.076 - 0.000
X		27	35	27.5	35	44	44	56	66	88
AA		64	90	103.5	138	146.5	195	235	275	405
BB		64	78	95.5	122	130.5	179	235	275	405

1.2.2.3. Standard Translating Screw Ends

Note
1850 & 18100
Models have
6 bolt holes
on the Top Plate

Top Plate

Clevis End

ACTUATOR BASE
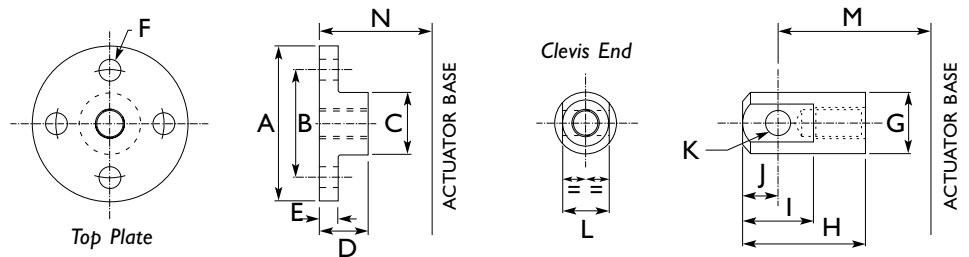
Model		E2625	E2501	E1802	E1805	E1810	E1820	E1830	E1850	E18100
A		Ø65	Ø80	Ø100	Ø120	Ø150	Ø170	Ø240	Ø280	Ø380
B		P.C.D. 45	P.C.D. 55	P.C.D. 70	P.C.D. 85	P.C.D. 110	P.C.D. 120	P.C.D. 170	P.C.D. 215	P.C.D. 290
C		Ø25	Ø30	Ø40	Ø50	Ø65	Ø75	Ø110	Ø150	Ø200
D		21	24	31.5	36.5	42	58	67	92	127
E		8	10	12	16	20	25	30	35	75
F		Ø9	Ø11	Ø13.5	Ø18	Ø22	Ø26	Ø33	Ø33	Ø51
G		Ø25	Ø30	Ø40	Ø50	Ø65	Ø75	Ø110	Ø150	Ø200
H		56	63	79.5	91.5	120	143	167	217	297
I		30	36	46	60	66	80	120	150	210
J		15	18	23	30	33	40	60	75	105
K		Ø10	Ø12	Ø16	Ø20	Ø22	Ø30	Ø45	Ø60	Ø90
L		15	20	30	35	40	50	80	110	140
M	Upright	115	145	170	210	245	310	365	440	625
	Inverted	60	65	80	90	125	140	155	200	325
N	Upright	95	125	145	185	200	265	325	390	560
	Inverted	40	45	55	65	80	95	115	150	260

1.2.2.4.   Standard Metric Rotating Screw Actuator

For other dimensions and performance data refer to metric translating actuators. All dimensions in mm.

Upright Rotating Screw
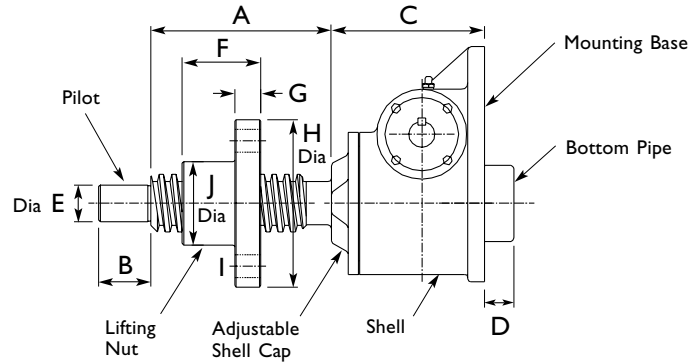
Model Number	Rating (KN)	A	B	C	D	E	F	G	H	I	J
UE-2626	5	Raise + 40	16	64	34	10	25	10	60	4 Holes - 9 Dia. on 42 Dia. P.C.D.	25
UE-2502	10	Raise + 44	16	90	0	12	35	12	80	4 Holes - 11 Dia. on 57 Dia. P.C.D.	35
UE-1803	25	Raise + 60	25	103.5	0	20	40	15	90	4 Holes - 13.5 Dia. on 65 Dia. P.C.D.	40
UE-1806	50	Raise + 80	30	138	0	25	65	20	115	4 Holes - 18 Dia. on 85 Dia. P.C.D.	55
UE-1811	100	Raise + 100	50	146.5	28	35	75	25	160	4 Holes - 22 Dia. on 120 Dia. P.C.D.	80
UE-1821	200	Raise + 100	65	195	24	45	75	25	185	4 Holes - 26 Dia. on 135 Dia. P.C.D.	90
UE-1831	300	Raise + 180	85	235	40	75	140	35	230	6 Holes - 26 Dia. on 175 Dia. P.C.D.	125
UE-1851	500	Raise + 200	100	275	63	90	150	50	280	6 Holes - 33 Dia. on 220 Dia. P.C.D.	160
UE-18101	1000	Raise + 250	125	405	128	125	175	60	380	6 Holes - 45 Dia. on 295 Dia. P.C.D.	210

Inverted Rotating Screw
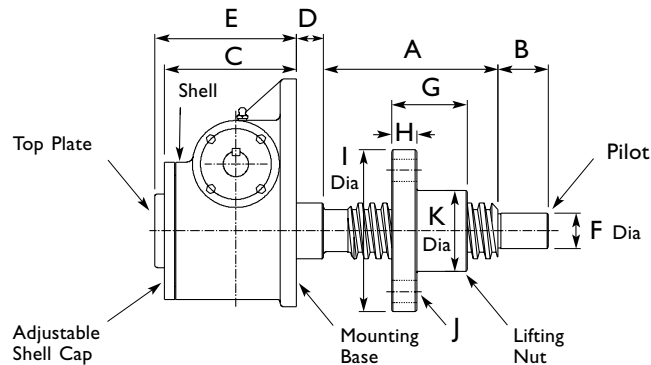
Model Number	Rating (KN)	A	B	C	D	E	F	G	H	I	J	K
DE-2626	5	Raise + 40	16	64	12	64	10	25	10	60	4 Holes - 9 Dia. on 42 Dia. P.C.D.	25
DE-2502	10	Raise + 44	16	90	10	90	12	35	12	80	4 Holes - 11 Dia. on 57 Dia. P.C.D.	35
DE-1803	25	Raise + 60	25	95.5	14	95.5	20	40	15	90	4 Holes - 13.5 Dia. on 65 Dia. P.C.D.	40
DE-1806	50	Raise + 80	30	122	18	122	25	65	20	115	4 Holes - 18 Dia. on 85 Dia. P.C.D.	55
DE-1811	100	Raise + 100	50	130.5	26.5	130.5	35	75	25	160	4 Holes - 22 Dia. on 120 Dia. P.C.D.	80
DE-1821	200	Raise + 100	65	179	25	203	45	75	25	185	4 Holes - 26 Dia. on 135 Dia. P.C.D.	90
DE-1831	300	Raise + 180	85	235	25	275	75	140	35	230	6 Holes - 26 Dia. on 175 Dia. P.C.D.	125
DE-1851	500	Raise + 200	100	275	35	313	90	150	50	280	6 Holes - 33 Dia. on 220 Dia. P.C.D.	160
DE-18101	1000	Raise + 250	125	405	105	458	125	175	60	380	6 Holes - 45 Dia. on 295 Dia. P.C.D.	210

1.2.2.5. Metric Actuators with Anti-Backlash Feature

Metric actuators are available with anti-backlash nuts for applications where a reversal of loading from tension to compression is encountered.

Shell Cap

Anti-Backlash Features

- Reduction in the vertical backlash between the screw and the worm gear nut to a practical minimum for smoother, more precise operation and minimum wear.
- Acts as a safety device, providing a dual nut load carrying unit, when the worm gear becomes worn.
- Wear indicator for critical applications.

The anti-backlash feature can be maintained by adjusting the shell cap until the desired amount of backlash is achieved. To avoid binding and excessive wear, do not adjust lifting screw backlash to less than 0.013 mm (refer 1.5.2.1.1.7.).

Anti-Backlash   *Keyed Anti-Backlash*

Upright   *Inverted*   *Upright*   *Inverted*

Note   Inverted unit closed height same as standard unit

Standard Dimensions (mm)

Anti-Backlash					Keyed - Anti-Backlash					
Model	A	B	C	D	Model	E	F	G	H	I	J
4625	95	20	65	Raise + 34	K4625	36	Raise + 9	25	20	40	14
4501	125	24	86	Raise + 35	K4501	38	Raise + 9	30	24	45	16
4802	145	30	103.5	Raise + 30	K4802	60	Raise + 5	37	30	55	19.5
4805	185	35	138	Raise - 5	K4805	75	Raise - 5	40	35	65	24
4810	200	40	146.5	Raise + 3	K4810	90	Raise + 3	48	40	80	30
4820	265	55	195	Raise + 24	K4820	102	Raise + 24	58	55	110	39
4830	340	65	250	Raise + 38	K4830	138	Raise + 15	73	65	115	43
4850	415	90	295	Raise + 55	K4850	206	Raise + 13	95	90	213	63
48100	585	125	415	Raise + 35	K48100	264	Raise + 3	180	125	405	145

Torque and Efficiencies for Standard Anti-Backlash Actuators

Model		4625	4501	4802	4805	4810	4820	4830	4850	48100
	Upright	4625	4501	4802	4805	4810	4820	4830	4850	48100
	Inverted	4624	4500	4801	4804	4809	4819	4829	4849	48099
Capacity (kN)		5	10	25	50	100	200	300	500	1000
Start-Up Torque at Full Load (Nm)	Standard	2.9	7.8	23.5	62	129	281	535	1003	2248
	Optional	1.3	3.7	9.8	28	67	153	314	568	1245
Actuator Static Efficiency	Standard	0.164	0.203	0.169	0.192	0.185	0.170	0.134	0.119	0.118
	Optional	0.090	0.109	0.102	0.105	0.119	0.104	0.076	0.070	0.071
Weight with Base Raise of 150mm (kg) approx.		1.48	2.72	8.62	16.78	26.12	48.6	90.5	208.6	609.8

Note   1.   For loads from 25% to 100% of actuator capacity, torque requirements are proportional to the load.
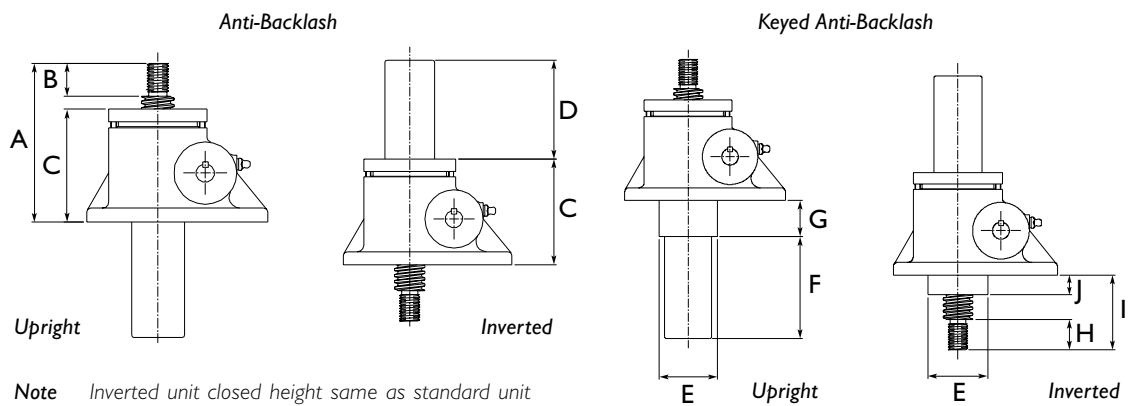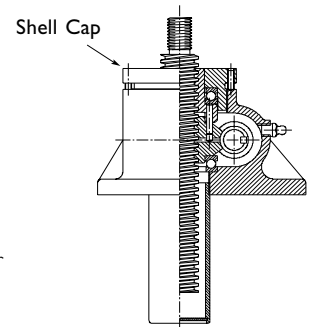*2.   Dimensions are subject to change without notice.*

1.2.2.5.   Metric Actuators with Anti-Backlash Feature

Metric actuators are available with anti-backlash nuts for applications where a reversal of loading from tension to compression is encountered.

Shell Cap

Anti-Backlash Features

- Reduction in the vertical backlash between the screw and the worm gear nut to a practical minimum for smoother, more precise operation and minimum wear.
- Acts as a safety device, providing a dual nut load carrying unit, when the worm gear becomes worn.
- Wear indicator for critical applications.

The anti-backlash feature can be maintained by adjusting the shell cap until the desired amount of backlash is achieved. To avoid binding and excessive wear, do not adjust lifting screw backlash to less than 0.013 mm (refer 1.5.2.1.1.7.).

Anti-Backlash   *Keyed Anti-Backlash*

Upright   *Inverted*   *Upright*   *Inverted*

Note   Inverted unit closed height same as standard unit

Standard Dimensions (mm)

Anti-Backlash					Keyed - Anti-Backlash						
Model	A	B	C	D	Model	E	F	G	H	I	J
E4625	95	20	65	Raise + 34	KE4625	36	Raise + 9	25	20	40	14
E4501	125	24	86	Raise + 35	KE4501	38	Raise + 9	30	24	45	16
E4802	145	30	103.5	Raise + 30	KE4802	60	Raise + 30	37	30	55	19.5
E4805	185	35	138	Raise - 5	KE4805	75	Raise + 20	40	35	65	24
E4810	200	40	146.5	Raise + 3	KE4810	90	Raise + 3	48	40	80	30
E4820	265	55	195	Raise + 24	KE4820	102	Raise + 24	58	55	110	39
E4830	340	65	250	Raise + 38	KE4830	138	Raise + 15	73	65	115	43
E4850	415	90	295	Raise + 55	KE4850	206	Raise + 13	95	90	213	63
E48100	585	125	415	Raise + 35	KE48100	264	Raise + 3	180	125	405	145

Torque and Efficiencies for Standard Anti-Backlash Actuators

Model		E4625	E4501	E4802	E4805	E4810	E4820	E4830	E4850	E48100
	Upright	E4625	E4501	E4802	E4805	E4810	E4820	E4830	E4850	E48100
	Inverted	E4624	E4500	E4801	E4804	E4809	E4819	E4829	E4849	E48099
Capacity (kN)		5	10	25	50	100	200	300	500	1000
Start-Up Torque at Full Load (Nm)	Standard	2.9	7.8	23.5	62	129	281	535	1003	2248
	Optional	1.3	3.7	9.8	28	67	153	314	568	1245
Actuator Static Efficiency	Standard	0.164	0.203	0.169	0.192	0.185	0.170	0.134	0.119	0.118
	Optional	0.090	0.109	0.102	0.105	0.119	0.104	0.076	0.070	0.071
Weight with Base Raise of 150mm (kg) approx.		1.48	2.72	8.62	16.78	26.12	48.6	90.5	208.6	609.8

Note   1.   For loads from 25% to 100% of actuator capacity, torque requirements are proportional to the load.
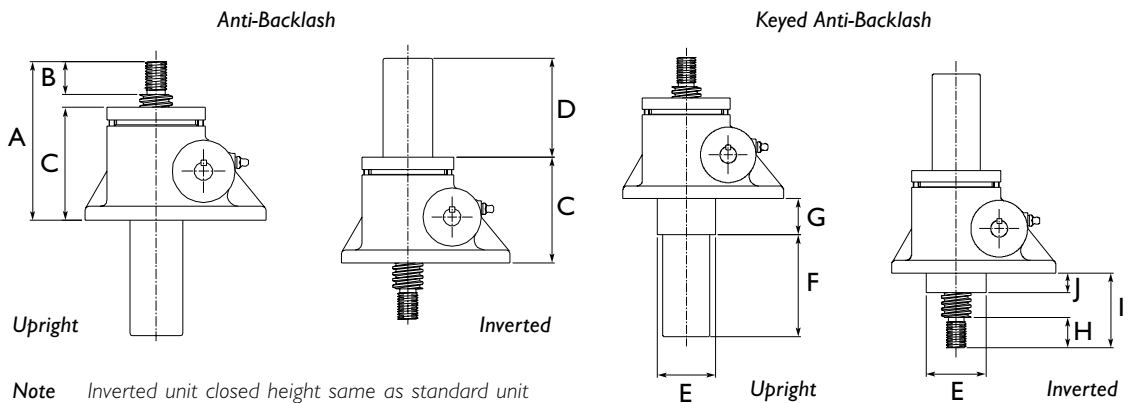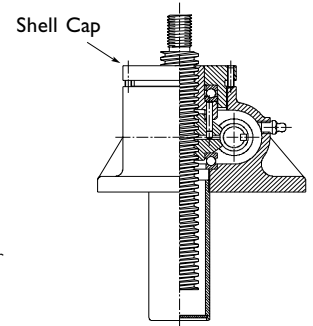*2.   Dimensions are subject to change without notice.*

1.2.2.6.   Keyed Metric Actuators

A Keyed translating screw actuator stops the screw from rotating without the need for end pinning. However the key-way in the screw will cause greater than normal wear on the internal threads of the worm gear.

Upright

(dimensions as non-keyed version refer 1.2.2.2.)
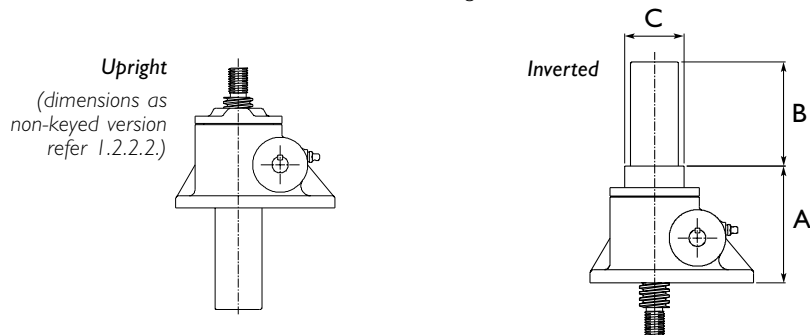
Inverted

Standard Keyed Dimensions for Inverted Models

Model		E2624	E2500	E1801	E1804	E1809	E1819	E1829	E1849	E1899
Inverted	A	79	78	125.5	159	167.5	210	267	**	**
	B	Raise + 9	Raise + 35	Raise + 30	Raise + 20	Raise + 3	Raise - 1	Raise + 15	**	**
	C	35	N/A	60	75	90	102	141.5	**	**

1.2.2.7.   Metric Actuators with Secondary Guide

Secondary Guiding for the screw for greater lateral rigidity aiding screw guidance and improved side load resilience.

Upright

Inverted
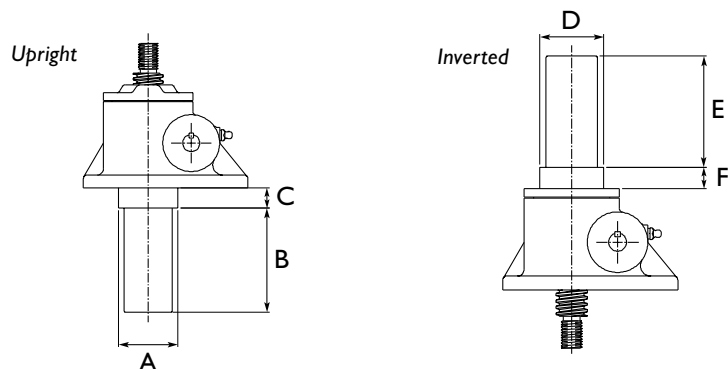
Standard Secondary Guide Dimensions

Model Capacity (kN)		E2625	E2501	E1802	E1805	E1810	E1820	E1830	E1850	E18100
Upright	A	36	38	60	70	90	100	138	155	225
	B	Raise + 34	Raise + 34	Raise + 30	Raise + 20	Raise + 29	Raise + 24	Raise + 40	Raise + 38	Raise + 50
	C	16	20	20	18	20	20	38	38	65
Inverted	D	36	**	60	70	90	100	138	155	**
	E	Raise + 34	Raise + 34	Raise + 30	Raise + 20	Raise + 29	Raise + 24	Raise + 40	Raise + 38	**
	F	16	**	20	18	20	20	38	38	**

** *Consult Power Jacks Ltd*

Note   1.   *All dimensions in mm.*

2.   *Dimensions are subject to change without notice.*

1.2.2.8. Metric Machine Screw Actuators with Bellows Boots

1.2.2.8.1. Bellows Boots for Metric Actuators

Features

- Protects the screw from dust and dirt.
- Guards against moisture and corrosive contaminants.
- Helps maintain the proper lubrication.
- Boots are made of P.V.C. coated nylon with sewn construction. Other materials are available for applications involving high temperatures, highly corrosive atmospheres and other special conditions.

1.2.2.8.1.1. Boot Dimensions
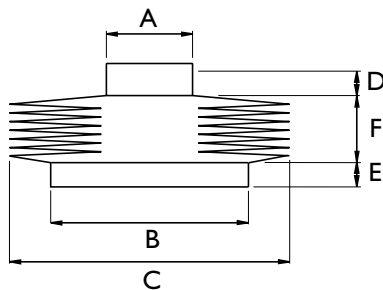
Model	A	B	C	D	E
E2625-B	25	60	100	13	13
E2501-B	30	70	110	15	15
E1802-B	40	90	120	15	23
E1805-B	50	115	140	15	31
E1810-B	65	136	150	15	31
E1820-B	75	165	165	20	20
E1830-B	110	220	191	20	20
E1850-B	150	285	210	20	45
E18100-B	200	220	244	20	20

	Model	E2625-B	E2501-B	E1802-B	E1805-B	E1810-B	E1820-B	E1830-B	E1850-B	E18100-B
F	Raise 0 → 150	10	-	-	-	-	-	-	-	-
	Raise 0 → 300	20	20	20	20	20	20	20	20	20
	Raise 300 → 600	30	35	30	30	30	30	30	30	30
	Raise 600 → 750	-	40	-	-	-	-	-	-	-
	Raise 600 → 900	-	-	-	45	-	-	-	-	-
	Raise 750 → 1000	-	60	-	-	-	-	-	-	-
	Raise 600 → 1050	-	-	50	-	50	50	50	50	50
	Raise 900 → 1050	-	-	-	50	-	-	-	-	-
	Raise 1000 → 1250	-	60 †	-	-	-	-	-	-	-
	Raise 1050 → 1500	-	-	70	70	70	70	70	70	70
	Raise 1500 → 1800	-	-	100 †	95	-	90 †	100 †	-	-
	Raise 1500 → 2000	-	-	-	-	105	-	-	-	-
	Raise 1800 → 2100	-	-	-	110 †	-	110 †	-	-	-
	Raise 2000 → 2500	-	-	-	-	120 †	-	-	-	-
	Raise 2100 → 2500	-	-	-	130 †	-	-	-	-	-
	Raise 2500 → 3000	-	-	-	160 †	-	-	-	-	-

Note 1. **F** = *Bellows boot minimum closed thickness.*
2. **-** = *Not applicable.*
3. **†** = *Control tapes fitted (approximately 20 mm increase to outer diameter).*

1.2.2.8.2. Bellows Boots for Metric Actuators

Closed Heights ★

Threaded End *Top Plate* *Clevis End*
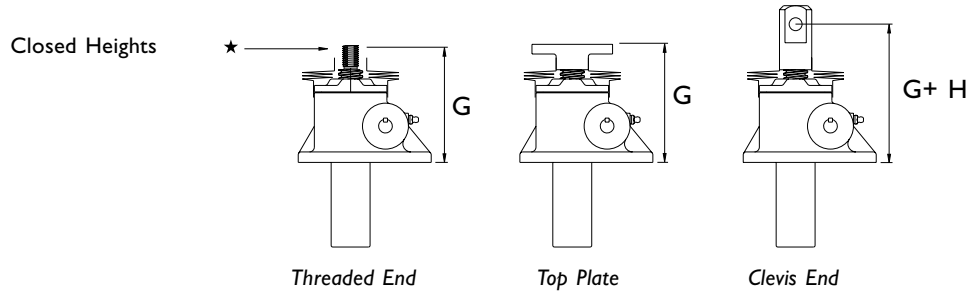
1.2.2.8.2.1. Standard Dimensions for all Upright Metric Actuators including Keyed

	Model	E2625-B	E2501-B	E1802-B	E1805-B	E1810-B	E1820-B	E1830-B	E1850-B	E18100-B
G	Raise 0 →150	100	-	-	-	-	-	-	-	-
	Raise 0 →300	110	140	160	200	215	280	330	390	560
	Raise 300→ 600	120	155	170	210	225	290	340	400	565
	Raise 600 → 750	-	160	-	-	-	-	-	-	-
	Raise 600 → 900	-	-	-	225	-	-	-	-	-
	Raise 750 → 1000	-	180	-	-	-	-	-	-	-
	Raise 600 → 1050	-	-	190	-	245	310	360	420	585
	Raise 900 → 1050	-	-	-	230	-	-	-	-	-
	Raise 1000 →1250	-	180 †	-	-	-	-	-	-	-
	Raise 1050 →1500	-	-	210	250	265	330	380	440	605
	Raise 1500 →1800	-	-	240 †	275	-	350 †	410 †	-	-
	Raise 1500 → 2000	-	-	-	-	300	-	-	-	-
	Raise 1800 → 2100	-	-	-	290 †	-	370 †	-	-	-
	Raise 2000 → 2500	-	-	-	-	315 †	-	-	-	-
	Raise 2100 → 2500	-	-	-	310 †	-	-	-	-	-
	Raise 2500 → 3000	-	-	-	340 †	-	-	-	-	-
H	Extra Closed Height for Clevis	20	20	25	25	45	45	40	50	65

1.2.2.8.2.2. Standard Dimensions for all Upright Metric Anti-Backlash Actuators including Keyed

	Model	E4625-B	E4501-B	E4802-B	E4805-B	E4810-B	E4820-B	E4830-B	E4850-B	E48100-B
G	Raise 0 →150	105	-	-	-	-	-	-	-	-
	Raise 0 →300	115	140	160	200	215	280	345	415	585
	Raise 300→ 600	120	155	170	210	225	290	355	425	585
	Raise 600 → 750	-	160	-	-	-	-	-	-	-
	Raise 600 → 900	-	-	-	225	-	-	-	-	-
	Raise 750 → 1000	-	180	-	-	-	-	-	-	-
	Raise 600 → 1050	-	-	190	-	245	310	375	445	600
	Raise 900 → 1050	-	-	-	230	-	-	-	-	-
	Raise 1000 →1250	-	180 †	-	-	-	-	-	-	-
	Raise 1050 →1500	-	-	210	250	265	330	395	465	620
	Raise 1500 →1800	-	-	240 †	275	-	350 †	425 †	-	-
	Raise 1500 → 2000	-	-	-	-	300	-	-	-	-
	Raise 1800 → 2100	-	-	-	290 †	-	370 †	-	-	-
	Raise 2000 → 2500	-	-	-	-	315 †	-	-	-	-
	Raise 2100 → 2500	-	-	-	310 †	-	-	-	-	-
	Raise 2500 → 3000	-	-	-	340 †	-	-	-	-	-
H	Extra Closed Height for Clevis	20	20	25	25	45	45	40	50	65

1.2.2.8.3. Inverted Metric Actuators with Bellows Boots

Applies to all inverted Metric actuators including Anti-Backlash and Keyed.

Closed Heights

Actuator Mounting Plate, 'M' thick. Alter thickness to suit application.

Boot Mounting Plate, to suit collar size. Typically ØB × (E+5 mm fitting allowance) thick.
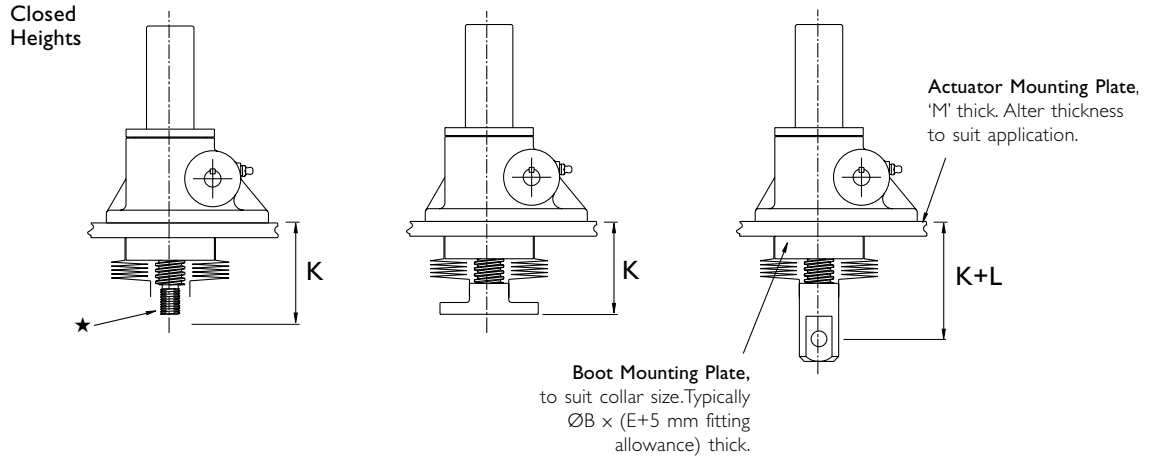
	Model	E2624-B	E2500-B	E1801-B	E1804-B	E1809-B	E1819-B	E1829-B	E1849-B	E18099-B
M	Mounting Plate	10	10	15	15	20	20	30	30	50
K	Raise 0 → 150	70	-	-	-	-	-	-	-	-
	Raise 0 → 300	80	85	105	120	130	135	165	215	260
	Raise 300 → 600	90	100	115	130	140	145	175	225	260
	Raise 600 → 750	-	105	-	-	-	-	-	-	-
	Raise 600 → 900	-	-	-	145	-	-	-	-	-
	Raise 750 → 1000	-	125	-	-	-	-	-	-	-
	Raise 600 → 1050	-	-	135	-	160	165	195	245	280
	Raise 900 → 1050	-	-	-	150	-	-	-	-	-
	Raise 1000 → 1250	-	125 †	-	-	-	-	-	-	-
	Raise 1050 → 1500	-	-	155	170	180	185	215	265	300
	Raise 1500 → 1800	-	-	185 †	195	-	205 †	245 †	-	-
	Raise 1500 → 2000	-	-	-	-	215	-	-	-	-
	Raise 1800 → 2100	-	-	-	210 †	-	225 †	-	-	-
	Raise 2000 → 2500	-	-	-	-	230 †	-	-	-	-
	Raise 2100 → 2500	-	-	-	230 †	-	-	-	-	-
	Raise 2500 → 3000	-	-	-	260 †	-	-	-	-	-
L	Extra Closed Height for Clevis	20	20	25	25	45	45	40	50	65
P	Extra Closed Height for Keyed Anti-Backlash Units	4	6	4.5	9	10	19	13	33	115

1.2.2.8.4. Notes for all Metric Actuators with Bellows Boots

Note
1. Supplied complete with a set of corrosion-resistant 'jubilee' clips (2) suitable for fitting over collar diameters.
2. † Control tapes are fitted (approximately 20 mm increase to outer diameter).
3. For horizontal installation exceeding 450 mm of travel, internal boot guides are recommended.
4. Customers with threaded end actuators must provide a fixing for the unattached collar (★).
5. Bellows boots for Rotating Screw Actuators consult Power Jacks Ltd.
6. For other sizes, raises, and materials please consult Power Jacks Ltd.
7. All dimensions in millimetres unless otherwise stated.
8. Dimensions subject to change without notice.

1.2.2.9. Standard Flange Bolt Configuration for Worm Shafts

Configuration A   B   45° 45°   B   60° 60°   *Configuration B*
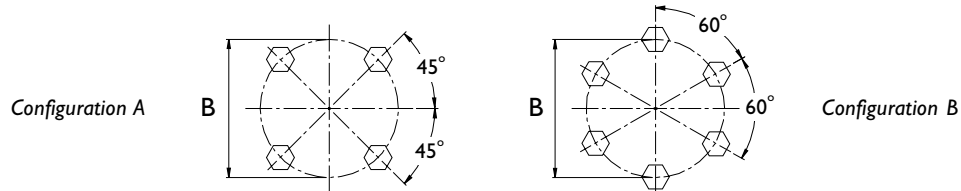
Model	'B' Bolt P.C.D. (mm)	Bolt Information	Configuration
E2625	N/A	N/A	N/A
E2501	N/A	N/A	N/A
E1802	46	M6 X 1 mm Pitch, 14 mm Deep	A
E1805	61	M8 X 1.25 mm Pitch, 22 mm Deep	A
E1810	70	M8 X 1.25 mm Pitch, 14 mm Deep	A
E1820	88	M10 X 1.5 mm Pitch, 14 mm Deep	A
E1830	107	M10 X 1.5 mm Pitch, 19 mm Deep	A
E1850	135	M16 X 2 mm Pitch, 25 mm Deep	A
E18100	160	M16 X 2 mm Pitch, 28 mm Deep	B

1.2.2.10. Metric Double Clevis End Actuators

Note   For other performance and dimension information refer to translating screw models.

Style 1   *Style 2*
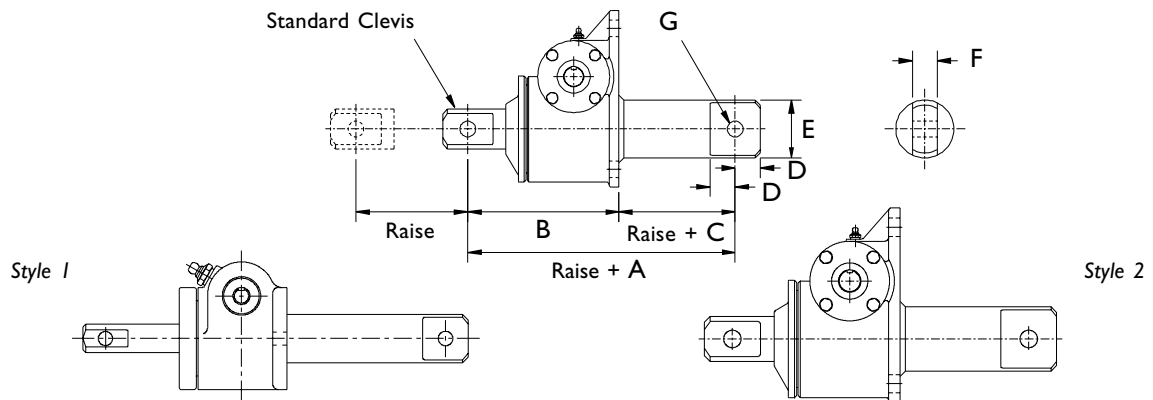
Model	CCE 2625	CCE 2501	CCE 1802	CCE 1805	CCE 1810	CCE 1820	CCE 1830	CCE 1850
Capacity (kN)	5	10	25	50	100	200	300	500
Style	1	1	2	2	2	2	2	2
A	150	180	213	260	352	428	492	570
B	115	145	170	210	247	313	367	440
C	35	35	43	50	105	115	125	130
D	15	20	23	30	33	40	60	75
E	26.7	33.4	48.3	60.3	73	102	141	168
F	15	20	30	35	40	50	80	110
G	10	12	16	20	22	30	45	60
Max Raise at Rated Load (Compression)	220	175	352	420	593	592	1338	1920

Note   1.   All dimensions in millimetres unless otherwise stated.
2.   Dimensions subject to change without notice.

1.2.2.11. Motor Adaptors for Metric Actuators

- Standard adaptors for 25 kN - 300 kN metric machine screw and ball screw actuators.
- Designed for standard IEC frame sizes.
- Allows direct motor coupling on either side of the actuator input shaft.
- Complete with drive coupling and mounting hardware.
- NEMA frame size versions available on request.
- Adaptors for other Metric actuators and mounting arrangements available on request.
- Adaptors for Imperial actuators available on request.

Note   When direct coupling a motor to an actuator, it is necessary to match motor power to actuator load so the motor does not exceed the maximum actuator power.
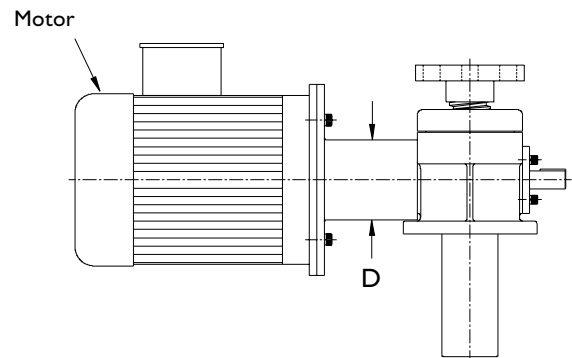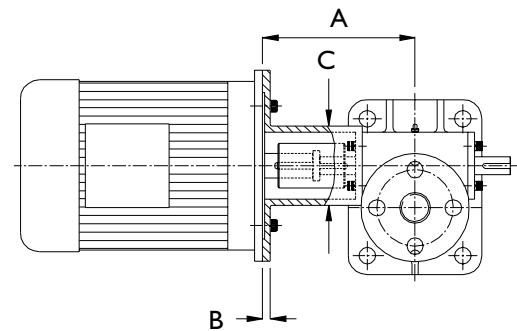
Motor Adaptors		Actuator Rating (kN)																				
		25				50				100					200					300			
Frame Size	Motor Mounting	Std. Part	A	B	C (squ.)	Std Part	A	B	C (squ.)	Std Part	A	B	C	D	Std. Part	A	B	C	D	Std. Part	A	B	C (squ.)
71	B5	✔	145	14	80	✗	-	-	-	✗	-	-	-	-	✗	-	-	-	-	✗	-	-	-
	B14 C105	✗	-	-	-	✗	-	-	-	✗	-	-	-	-	✗	-	-	-	-	✗	-	-	-
80	B5	✔	160	14	80	✔	187	14	100	✗	-	-	-	-	✗	-	-	-	-	✗	-	-	-
	B14 C120	✔	145	14	80	✗	-	-	-	✗	-	-	-	-	✗	-	-	-	-	✗	-	-	-
90	B5	✔	160	14	80	✔	187	14	100	✔	212	14	110	98	✔	212	14	110	98	✔	250	14	120
	B14 C140	✔	145	14	80	✗	-	-	-	✔	212	14	110	98	✔	212	14	110	98	✔	260	14	120
100	B5	✔	160	14	80	✔	207	14	100	✔	212	14	110	98	✔	212	14	110	98	✔	280	14	120
	B14 C160	✔	160	14	80	✔	187	14	100	✔	212	14	110	98	✔	212	14	110	98	✔	260	14	120
112	B5	✗	-	-	-	✔	207	14	100	✔	212	14	110	98	✔	212	14	110	98	✔	280	14	120
	B14 C190	✗	-	-	-	✔	187	14	100	✔	212	14	110	98	✔	212	14	110	98	✔	260	14	120
132	B5	✗	-	-	-	✔	207	14	100	✗	-	-	-	-	✗	-	-	-	-	✔	280	14	120
	B14 C200	✗	-	-	-	✔	207	14	100	✔	232	14	110	98	✔	232	14	110	98	✔	280	14	120

1.2.2.12. Trunnion Mounts for Metric Actuators

5 & 10 kN Models   *25, 50 & 100 kN Models*
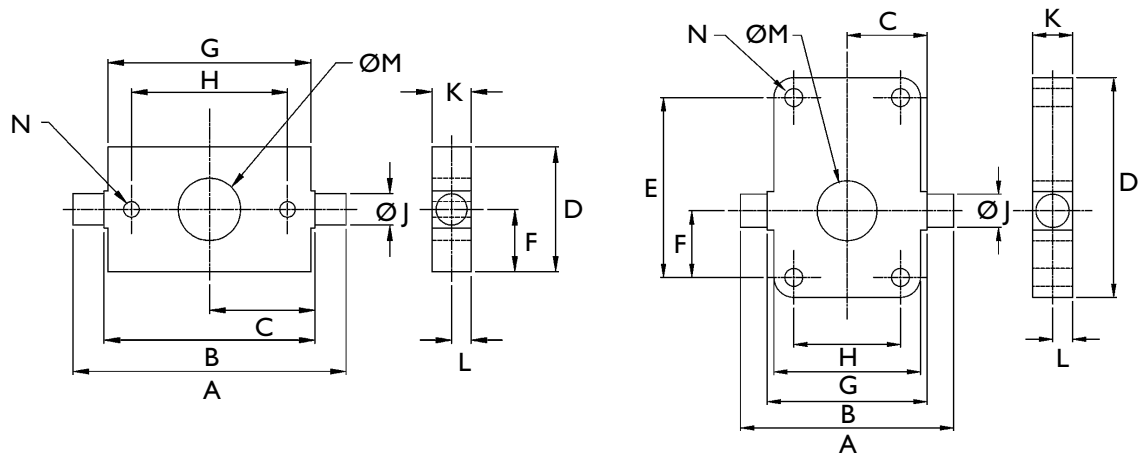
Actuator Rating (kN)	A	B	C	D	E	F	G	H	J (h6)	K	L	M	N	Weight (kG)
5	114	114	57	60	-	30	110	85	15	20	10	50	M8 (2)	1.24
10	175	135	67.5	80	-	40	130	100	20	25	12.5	58	M10 (2)	2.27
25	160	120	60	165	135	50	110	80	25	30	15	72	M12 (4)	3.27
50	200	160	80	205	170	57.5	150	115	35	40	20	95	M16 (4)	8.90
100	270	200	100	225	180	52.5	190	145	45	50	25	130	M20(4)	15.57

Trunnion mounts bolt onto actuator base plates.

Note: 1. *Trunnion mounts for other actuator sizes are available on request.*
2. *All dimensions in millimetres (mm) unless otherwise stated.*
3. *Dimensions subject to change without notice.*

**Example diagram of
actuator with trunnion mount fitted**
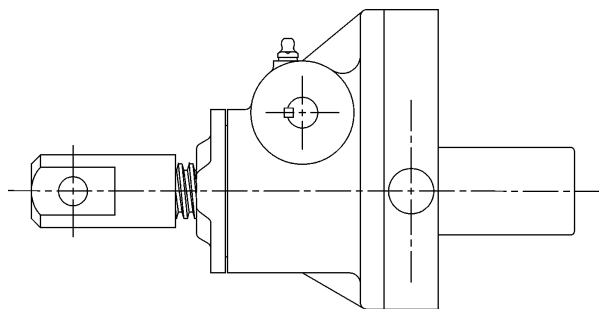
1.2.2.13. RLS-51 Rotary Limit Switch Adaptors for Metric Actuators
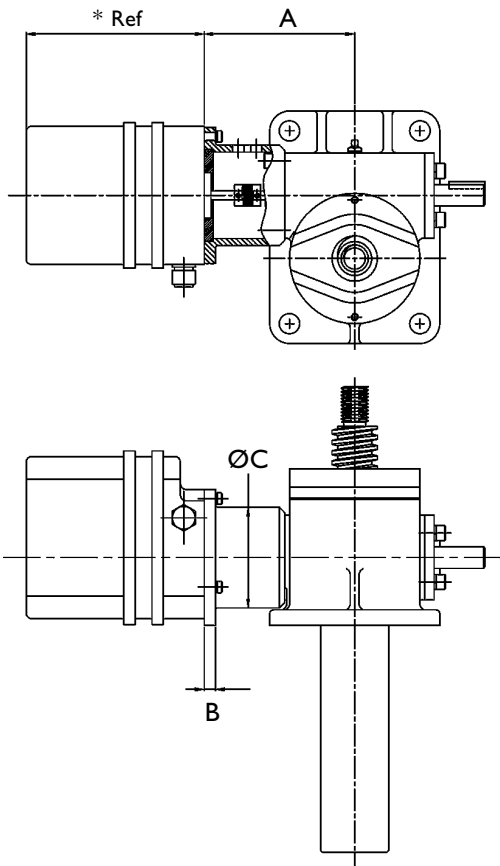
* Ref   A

ØC

B

Rotary limit switches can be used as end of travel limit switches with the option of intermediate switches as well. These units are mounted onto a screw jacks free worm shaft and offer an alternative where bottom pipe mounted limit switches are not possible e.g. rotating screw jacks. Up to 8 limit switches can be accommodated in one unit.

For full details on the RLS-51 limit switch refer to section 8.1.1.

Metric Actuator Rating (kN)							
	25				50		
Adaptor Mounting	Std Part	A	B	C (squ)	Std Part	A	B	C (squ)
B5	✗	-	-	-	✗	-	-	-
B14	✔	117	10	70	✔	133	10	89

Metric Actuator Rating (kN)							
	100				200		
Adaptor Mounting	Std Part	A	B	C (squ)	Std Part	A	B	C (squ)
B5	✔	152	13	98	✔	174	13	125
B14	✗	-	-	-	✗	-	-	-

The mounting kit includes the flexible coupling and drive adaptor.

Note   *1. All dimensions are in millimetres (mm) unless otherwise stated.*
            2. Dimensions are subject to change without notice.

1.2.1.14. SKA Rotary Limit Switch Adaptors for Metric Actuators

The SKA rotary limit switch is a compact 2-position limit switch designed for screw jack and linear actuator applications. For full details on the SKA limit switch refer to section 8.1.2.

1/2" NPT

76 mm

90.5 mm   159 mm

168 mm
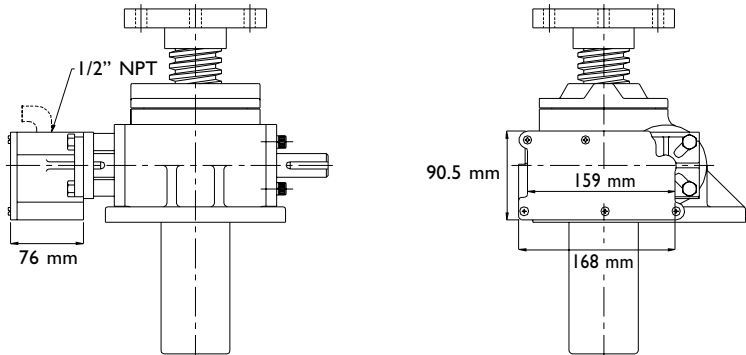
Actuator Mounted

Note   *1. All dimensions are in millimetres (mm) unless otherwise stated.*
          2. Dimensions are subject to change without notice.
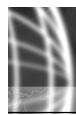
1.2.2.14.1. Mounting and Adjustment Specifications for SKA Rotary Limit Switches
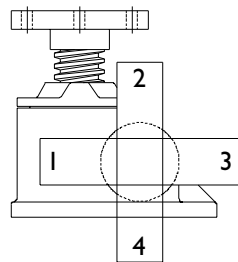
Position Number of Switch
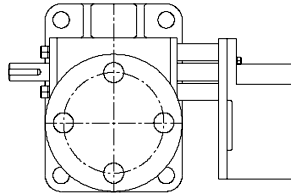
Typical top view showing switch mounted on RH worm extension
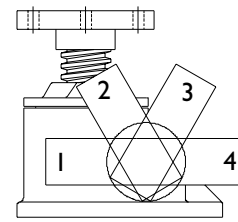
1000 kN metric; 75, 100 & 150 Tons Imperial models only

Actuator	Extended Mount								Closed Mount							
Capacity (kN)	RH				LH				RH				LH			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
25	C	A & B	B & D	C	B & D	A & B	C	C	-	-	-	-	-	-	-	-
50	✔	A	D	C	D	A	✔	C	✔	A & B	D	-	D	A & B	✔	-
100	✔	A	D	C	D	A	✔	C	✔	A & B	D	-	D	A & B	✔	-
200	✔	A	✔	C	✔	A	✔	C	✔	A & B	✔	-	✔	A & B	✔	-
300	✔	✔	✔	C	✔	✔	✔	C	✔	B	✔	-	✔	A & B	✔	-
500	✔	✔	✔	C	✔	✔	✔	C	-	✔	✔	-	✔	B	✔	-
1000	✔	✔	✔	✔	✔	✔	✔	C	-	-	✔	✔	-	-	✔	✔

Note (A) Special Closed Height. (B) Boot Interference Unit. (C) Rotary Limit Switch extends below base of Actuator Unit.
(D) Sealed electric elbow would extend below base of Actuator Unit. (✔) Recommended. (-) Not Recommended
Extended Mount is Standard.

1.2.2.14.2. SKA Limit Switch Field Installation Dimensions
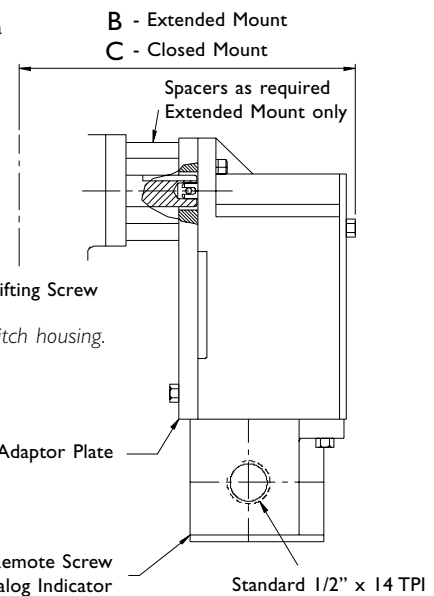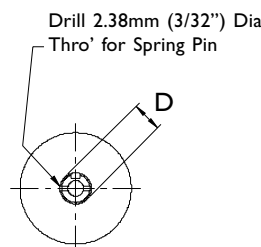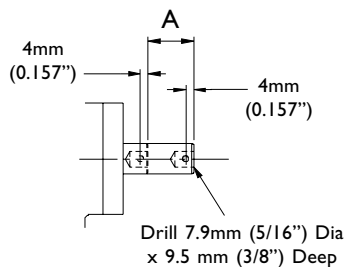
Note: Shim out on limit switch if necessary worm shaft end must not rub switch housing. Dimensions subject to change without notice.

Model (kN)	A Cut-off Closed Mount (mm)	B Extended Mount (mm)	C Closed Mount (mm)	D Worm Shaft Dia. (mm)
25	-	172.5	-	16
50	35	198.5	163.5	19
100	44.2	223.4	179.2	25
200	38.5	233.5	195	28
300	51	273.5	222.5	35
500	61	313	252	40
1000	83.5	373.5	290	45

Note 1. All dimensions are in millimetres (mm) unless otherwise stated.
2. Dimensions are subject to change without notice.

### 1.2.2.15. Encoder Adaptors for Metric Machine Screw Actuators

Both incremental and absolute encoders can be mounted on a Metric actuators free worm shaft. The specification for these encoders is given in section 8.3. For mounting details please consult Power Jacks Ltd.

1.2.2.16. Limit Switches Mounted on Metric Actuator Bottom Pipe

1.2.2.16.1. Metric Actuator with End of Travel Proximity Sensors

Sensor Kit

- Inductive Proximity Sensors as standard other available on request.
- No contact, so no wearing parts.
- 2 Wire sensor for either Normally Closed (NC) or Normally Open (NO) switching.
- Sensor has rugged one-piece Metal housing.
- Optical setting aid with 2 LED Colour settings:- Red LED indicates just in sensing range. Yellow LED only indicates within 80% safe sensing range.
- M12 Plug in connection for fast change-ability.
- M12 sockets available straight or angled with 5-m cable (other cable lengths available on request).
- Full 360° visibility for switching with 4 yellow LED's at 90° offset.
- Sensor kit includes - sensor, mounting ring, target ring and modification to actuators bottom pipe.
- For full sensor details refer to section 8.2.1.

Metric Upright & Inverted Actuators									
Actuator Rating (kN)	Switch Dia (mm)	A1 (mm)	A2 (mm)	B (mm)	C (mm)	D (Ø mm)	E (mm) ±5	F (mm)	Switch Adjustment (mm)
25	12	50	40	Stroke +15	40	48	83	15	±10
50	12	50	40	Stroke +18	40	60	90	15	±10
100	18	50	40	Stroke +24	45	73	103	20	±10
200	18	50	40	Stroke +24	45	89	110	20	±10

Note   1.   All dimensions in mm unless otherwise stated.
2.   Dimensions subject to change without notice.
3.   Other metric actuator sizes are available with bottom pipe limit switches. Consult Power Jacks Ltd for advice.

1.2.2.16.2. Metric Actuator with End of Travel Electro-Mechanical Switches

The actuators can be fitted with electro-mechanical limit switches in a similar design. For dimensions please consult Power Jacks Ltd. For limit switch details refer to section 8.2.2. and 8.2.3.

1.2.2.17. Metric Machine Screw Actuators with Safety Nuts

Power Jacks metric machine screw actuators can be fitted with a safety nut, which provides 2 safety roles:

1. In the event of excessive wear on the nut thread the load will be transferred from the standard nut to the safety nut. This will also provide visual wear indication as the gap between the safety nut decreases to zero as the standard lifting nut wears.

2. In the unlikely event of catostrophic nut thread failure the safety nut will sustain the load. The safety of industrial and human cargo is therefore improved.

There are several configurations for each safety nut device as they only work in one load direction. For this reason when ordering please supply a sketch of your application showing load directions.

1.2.2.18. Translating Metric Actuators with Safety Nuts

Translating Metric Actuators with safety nuts are similar in format to the anti-backlash units. Consult Power Jacks for details.

1.2.2.19. Rotating Metric Actuators with Safety Nuts

Upright Models   Inverted Models
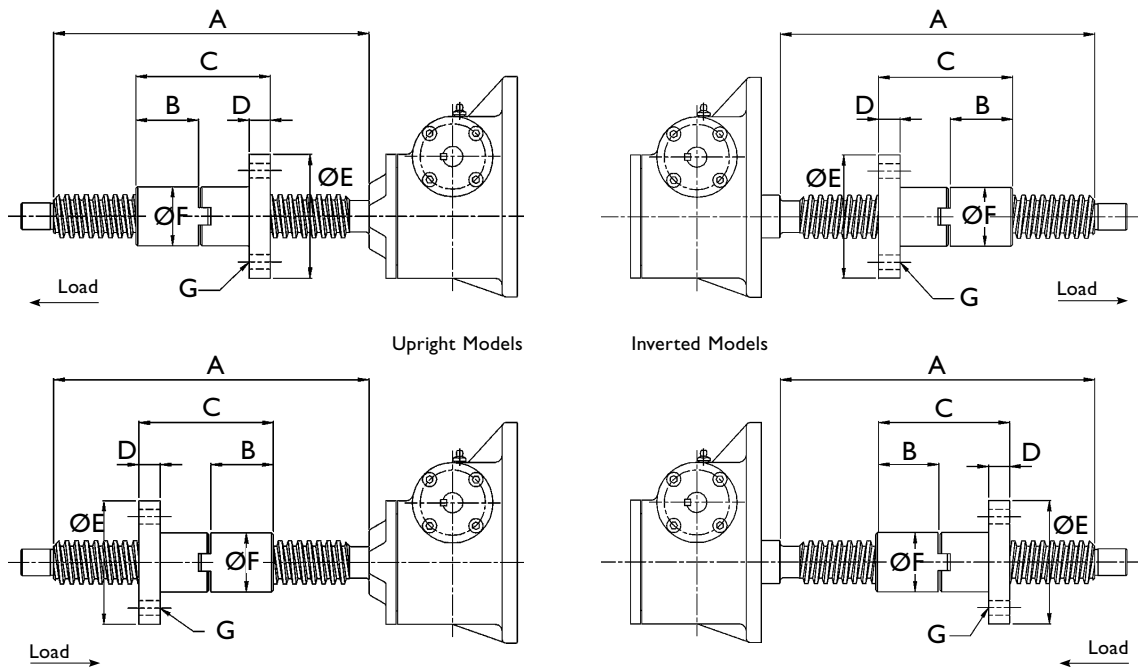
Upright Rotating Screw

Model Number	Rating (KN)	A	B	C	D	E	F	G
UE-1803	25	Raise + 95	33.5	75	15	90	40	4 Holes - 13.5 Dia. on 65 Dia. P.C.D.
UE-1806	50	Raise + 140	58	125	20	115	55	4 Holes - 18 Dia. on 85 Dia. P.C.D.
UE-1811	100	Raise + 170	67	145	25	160	80	4 Holes - 22 Dia. on 120 Dia. P.C.D.
UE-1821	200	Raise + 170	67	145	25	185	90	4 Holes - 26 Dia. on 135 Dia. P.C.D.

Inverted Rotating Screw

Model Number	Rating (KN)	A	B	C	D	E	F	G
DE-1803	25	Raise + 95	33.5	75	15	90	40	4 Holes - 13.5 Dia. on 65 Dia. P.C.D.
DE-1806	50	Raise + 140	58	125	20	115	55	4 Holes - 18 Dia. on 85 Dia. P.C.D.
DE-1811	100	Raise + 170	67	145	25	160	80	4 Holes - 22 Dia. on 120 Dia. P.C.D.
DE-1821	200	Raise + 170	67	145	25	185	90	4 Holes - 26 Dia. on 135 Dia. P.C.D.

Note: *1. All dimensions in millimetres.* *2. Dimensions subject to change without notice.*

1.2.3.   M-Series Imperial Machine Screw Jack Models

Advantages

- Positive, Mechanical Positioning
- Uniform, Lifting Speed
- Multiple Arrangements
- Anti-Backlash Feature (optional)

Lifting Screw
Available with threaded end or clevis end instead of top plate.

Shell Cap
Locked in place by set screws.

Load Bearings
Bearings, top and bottom to take loads in tension or compression.

Worm Gear
Aluminium bronze. Accurately hobbed for greater gear contact.

Worm
Available with double or single shaft extension.

Top Plate
Must be bolted to lifting member to preventy rotation except when screw is keyed.

Thrust Bearings and Grease Seals
At each end of worm. 1/4 & 1/2 ton models do not have seals.

Housing
Aluminium on 1/4 to 1 ton models, ductile iron on 2 ton through 15 ton models, cast steel on 20 ton through 250 ton models.

Bottom Pipe
Protects lifting screw threads.

Capacities from 1/4 Ton to 250 Ton
Worm Gear Ratios from 5:1 to 50:1

The imperial machine screw actuator range is produced in many standard models with a wide range of capabilities, there is a standard model for almost any requirement.

Operated manually or by motor units imperial actuator models can be used singly, in tandem or in multiple arrangements (refer 1.1.5.2.9.). Since most capacities have a uniform lifting speed, added economy can be realised in raising unevenly distributed loads by operating the different capacities in unison.

Most imperial machine screw actuator models with higher ratios are self-locking and will hold heavy loads in position indefinitely without creep, in ideal conditions. However if self-locking is critical, a brake motor or other restraining device should be considered. They can be used to push, pull, apply pressure and as linear actuators. They are furnished with standard raises in increments of 1 inch. Depending upon size and type of load, models are available with raises up to 25 feet.

More Than 200 Standard Combinations

Features

- **Precise Positioning** - Can be controlled accurately for positioning within thousandths of a millimetre.
- **Self-Locking** - Will normally hold loads in position without creeping when using the higher ratio units, as long as the actuator unit is not subject to vibration. If self-locking is critical a brake motor or other restraining device should be considered.
- **Uniform Lifting Speed** - Since many models have the same gear ratios, various capacities can be used in the same application to lift unevenly distributed loads with uniform speed.
- **Quick, Sure Operation** - Designed and built to be positive acting, for accurate response to motive power.

Options

- **Anti-Backlash Option** - Reduces vertical backlash between the screw and the worm gear nut to a practical minimum for smooth, precise operation and minimum wear.
- **Keyed Option** - Stops a translating screw from rotating when the screw ends are free.
- **Bellows Boot Option** - Protects the screw from dust, dirt, moisture and corrosive contaminants.
- **Double Clevis End Option** - Incorporates a special clevis end bottom pipe and a standard clevis end on the lifting screw.

Upright Screw   *Rotating Screw (Upright)*   *Inverted Screw*
                      Available in both upright
                      and inverted types

Clevis

Threaded

Note   Clockwise rotation of worm raises load on all models (refer to previous page) - counter clockwise available at extra charge.
Unless a translating lifting screw is keyed, the top should be bolted to the lifting member to prevent the screw from rotating.
Actuators are equipped with "Alemite" grease fittings.
Recommended lubricants are listed in the installation and maintenance instructions.
Actuators supplied complete with drive shaft keys.

Attachments

Nema C-Face flanges, motors, gear boxes, reducers and couplings available for single actuator drive or multiple actuator arrangements (refer 4, 5, 6, 7 and 8).

Motion control components include motor drives, Motion Controllers with operator interfaces, encoders, limit switches, potentiometers and meters with LCD display (refer 8.).

1.2.3.1. Performance of Standard M-Series Imperial Machine Screw Jacks

Note *For loads from 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.*

Raises, measured in increments of one inch, are available up to 20 feet, depending on lifting screw diameter and available bar stock length.

Model	Upright	2555	2625	2501	1802 & 9002	1805	1810	1815	1820	1825	9035	1850	9075	1899	18150	2250
	Inverted	2554	2624	2500	1801 & 9001	1804	1809	1814	1819	1824	9034	1849	9074	1898	18149	2249
Capacity (Short Tons)		0.25	0.5	1	2	5	10	15	20	25	35	50	75	100	150	250
Lifting Screw	Diameter	0.5	0.625	0.75	1	1.5	2	2.25	2.5	3.375	3.75	4.5	5	6	7	9
	Pitch	0.25	0.125	0.2	0.25	0.375	0.5	0.5	0.5	0.666	0.666	0.666	0.666	0.75	1	1
	Form	Acme	Acme	Acme	Acme	Square	Square	Square	Square	Square	Acme	Square	Square	Square	Square	Square
Worm Gear Ratios	Standard	5:1	5:1	5:1	6:1	6:1	8:1	8:1	8:1	10 2/3:1	10 2/3:1	10 2/3:1	10 2/3:1	12:1	12:1	50:1
	Optional	-	-	20:1	24:1	24:1	24:1	24:1	24:1	32:1	32:1	32:1	32:1	36:1	36:1	-
Turns of Worm for 1" Raise	Standard	20	40	25	24	16	16	16	16	16	16	16	16	16	12	50
	Optional	-	-	100	96	64	48	48	48	48	48	48	48	48	36	-
Max. HP per Actuator	Standard	0.333	0.333	0.5	2	4	5	5	5	8	8	15	15	25	25	35
	Optional	-	-	0.25	0.5	0.75	1.5	1.5	1.5	2.5	2.5	6	6	11	11	-
Start-Up Torque at Full Load (in.lb)	Standard	13	21	55	120	450	950	1430	2050	3360	4000	7500	12000	16000	28100	20000
	Optional	-	-	25	50	185	490	820	1170	1900	2400	4200	6600	8600	15500	-
Actuator Efficiency	Standard	0.330	0.200	0.245	0.232	0.221	0.220	0.202	0.188	0.164	0.158	0.138	0.124	0.130	0.141	0.080
	Optional	-	-	0.140	0.133	0.121	0.140	0.129	0.120	0.092	0.089	0.083	0.075	0.080	0.086	-
Weight with Base Raise of 6" (lb)		2.33	2.33	5	17	35	52	66	93	181	240	410	650	1200	1350	2700
Weight for each Additional 1" Raise (lb)		0.1	0.1	0.27	0.33	0.85	1.4	1.5	2.6	3.5	3.7	5.5	6.5	9	12.6	23

Imperial Actuators with Numeric Control Ratios

1 to 25 Ton Actuators with Decimal Ratio at no extra cost.

Numeric Control Ratios ➤ 100 Turns = 1'' of Travel

Model	Upright	2501	1802 & 9002	1805	1810	1815	1820	1825
	Inverted	2500	1801 & 9001	1804	1809	1814	1819	1824
Capacity (Short Tons)		1	2	5	10	15	20	25
Lifting Screw	Diameter	0.75	1	1.5	2	2.25	2.5	3
	Pitch	0.200	0.250	0.250	0.250	0.250	0.250	0.320
	Form	Acme	Acme	Acme	Acme	Acme	Acme	Acme
Worm Gear Ratios		20:1	25:1	25:1	25:1	25:1	25:1	32:1
Turns of Worm for 1" Raise		100	100	100	100	100	100	100
Start-Up Torque at Full Load (in.lb)		24	48	175	370	640	925	1500
Actuator Efficiency		0.133	0.132	0.091	0.086	0.075	0.069	0.053
Maximum HP per Actuator		0.25	0.5	0.75	1.5	1.5	1.5	2.5

Note: 1. *All other data for these models is the same as main performance table at the top of the page.*
2. *For loads from 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.*

1.2.2.3.   Standard/Imperial Translating Screw Actuators

Style 3

Style 2

Style 5

Style 4

Inverted

Upright

Style 1

Note
1. All dimensions in inches.
2. Dimensions subject to change without notice.
3. LHS = Left Hand Side
4. RHS = Right Hand Side

screw**jacks**

| Model	2555 / 2554	2625 / 2624	2501 / 2500	1802 / 1801	9002 / 9001	1805 / 1804	1810 / 1809	1815 / 1814	1820 / 1819	1825 / 1824	9035 / 9034	1850 / 1849	9075 / 9074	1899 / 1898	18150 / 18149	2250 / 2249
Capacity (Short Tons)	0.25	0.5	1	2	2	5	10	15	20	25	35	50	75	100	150	250
Style	1	1	1	2	3	3	3	3	3	3	3	2	2	4	4	5
A RAISE								AS REQUIRED								
B Upright / Inverted	A+3/4 / A+3/4	A+3/4 / A+3/4	A / A	A-1/8 / A-1/8	A-1/4 / A	A-1/8 / A-1/8	A-1/8 / A-1/8	A-1/8 / A-1/8	A-1/2 / A-1/2	A / A	A / A-1	A-3/8 / A-3/8	A-1/2 / A-1/2	A+1/4 / A+1/4	A-1/2 / A-1/2	A-2 / A+1/2
C Upright / Inverted	4 / 2	4 / 2	4.5 / 1.25	5.25 / 1.75	5.25 / 1.75	7 / 2.5	7.25 / 2.75	8 / 2.75	9.25 / 3	11 / 3	12 / 4	13 / 3.5	16.5 / 5.5	24 / 12	24 / 12	30 / 12
D DIA.	0.5	0.625	0.75	1	1	1.5	2	2.25	2.5	3.375	3.75	4.5	5	6	7	9
E Diameter	7/8	7/8	15/16	1 21/32	1 21/32	2 3/8	2 7/8	2 7/8	3 1/2	4 1/2	4 1/2	5 9/16	6 5/8	7	8	11
F	1	1	1.5	1.75	1.75	2.25	2.25	2.75	3.25	4	4	4.75	5.5	6	6	9
G	5/16	5/16	3/8	1/2	1/2	1/2	1/2	5/8	3/4	1	1 1/4	1 1/4	1 3/8	1 1/2	1 1/2	2 1/2
H DIA.	2 1/4	2 1/4	3 1/2	4 1/4	4 1/4	4 1/2	5 3/4	5 3/4	5 3/4	8 1/2	10 1/2	11 1/4	11 1/4	14	14	24
I	5/16	5/16	3/8	7/16	7/16	5/8	3/4	3/4	3/4	1	1 5/16	1 1/4	1 3/8	2 15/16	2 15/16	3 15/16
J	4 1/2	4 1/2	6	7	7	9	11	11	11	14	14	22	24	23	23	48
K	2 1/4	2 1/4	3	3.5	3.5	4.5	5.5	5.5	5.5	7	7	11	12	11.5	11.5	24
L DIA.	0.375 +0.000 -0.002	0.375 +0.000 -0.002	0.500 +0.000 -0.002	0.500 +0.000 -0.002	0.500 +0.000 -0.002	0.75 +0.000 -0.002	1 +0.000 -0.002	1 +0.000 -0.002	1 +0.000 -0.002	1.375 +0.000 -0.002	1.375 +0.000 -0.002	1.5 +0.000 -0.002	1.75 +0.000 -0.002	1.75 +0.000 -0.002	1.875 +0.000 -0.002	3 +0.000 -0.002
M	1/8 x 1/16 3/4 LNG	1/8 x 1/16 3/4 LNG	1/8 x 1/16 1 LNG	1/8 x 1/16 1 LNG	1/8 x 1/16 1 LNG	3/16 x 3/32 1 1/4 LNG	1/4 x 1/8 1 1/2 LNG	1/4 x 1/8 1 1/2 LNG	1/4 x 1/8 1 1/2 LNG	5/16 x 5/32 2 LNG	0.313 x 0.156 2 LNG	3/8 x 3/16 2 1/4 LNG	3/8 x 3/16 2 1/4 LNG	1/2 x 1/4 3 LNG	1/2 x 1/4 3 LNG	3/4 x 3/8 5 LNG
N DIA.	9/32	9/32	13/32	13/32	13/32	11/16	13/16	13/16	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	1 7/8	1 7/8	2 3/4
O	4	4	5	7	4 1/8	6	7.5	7 3/4	8 1/4	10 1/4	10.25	19 3/4	14	24 1/2	24.5	41
P	2	2	2 1/2	3.5	2 1/16	3	3 3/4	3 7/8	4 1/8	5 1/8	5 1/8	9 7/8	7	12 1/4	12 1/4	20 1/2
Q	3 1/4	3 1/4	4	6	3 1/8	4 1/2	5 3/4	6	6	7 1/2	7 1/2	16	10	20	20	35
R	1 5/8	1 5/8	2	3	1 9/16	2 1/4	2 7/8	3	3	3 3/4	3 3/4	8	5	10	10	17.5
S	-	- -	-	3 1/2	6 1/4	8	8 3/4	9 1/4	11	13 3/4	15 1/2	9 3/4	23	20 3/4	20 3/4	29 1/2
T	-	-	-	1 3/4	2.42	3	2 7/8	3 3/8	4 1/8	5 1/8	6	4 7/8	9.5	8	8	14.75
U	-	-	-	2	5 1/4	6 1/2	7	7 1/2	8 3/4	11	12.5	6	19	8 1/8	8 1/8	20 1/2
V	-	-	-	1	1.93	2.25	2	2.5	3	3.75	4.5	3	7.5	5.75	5.75	11
W	0.938 +0.003 -0.000	0.938 +0.003 -0.000	1.25 +0.003 -0.003	1.703 +0.001 -0.001	1.703 +0.001 -0.001	2.188 +0.002 -0.000	2.598 +0.003 -0.000	2.598 +0.003 -0.000	2.598 +0.003 -0.000	3.75 +0.005 -0.000	3.75 +0.005 -0.000	5.313 +0.003 -0.000	5.313 +0.003 -0.000	7.5 +0.003 -0.000	7.5 +0.003 -0.000	13 +0.005 -0.000
X	1 1/8	1 1/8	1 7/16	1 1/8	1 1/8	1 11/32	1 23/32	1 23/32	1 3/8	2 3/16	2 3/16	4 5/16	4 1/8	3 7/16	4 1/4	10 1/2
Y P.C.D	1.5	1.5	2.5	3	3	3	4.13	4.13	4.13	6	7.75	8.75	10.25	11	11	16
Z DIA.	9/32	9/32	7/16	13/32	13/32	11/16	13/16	13/16	13/16	1 1/16	1 5/8	1 3/8	1.5	1 7/8	1 7/8	2 3/4
No. of Holes	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	6
A-A	2 3/8	2 3/8	3 1/4	4 1/16	4 1/16	5 1/4	5 5/8	6 5/16	7 1/8	8 7/8	8 7/8	10 7/8	13 9/16	17	17	23 1/8
B-B	2 3/8	2 3/8	3 1/4	3 3/4	3 3/4	4 3/4	5	5 1/2	7 1/8	8 7/8	8 7/8	10 7/8	13 9/16	17	17	23 1/8

Note   Dimensions are subject to change without notice.

## 1.2.3.3.   Standard Imperial Rotating Screw Actuators

For other dimensions and performance data refer to translating screw model. All dimensions in inches.

Upright Rotating Screw
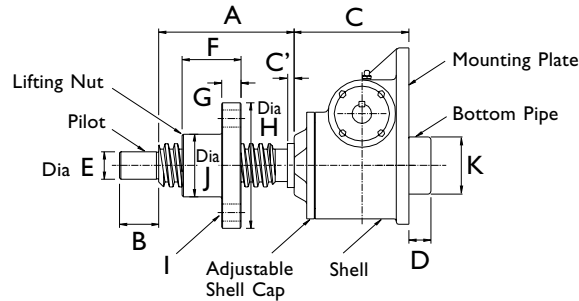
Model UM	Capacity (Short Tons)	Style	A	B	C	C'	D	E	F	G	H	I Holes	I Dia.	I P.C.D.	J	K
2556	0.25	1	Raise + 1.5	5/8	2 3/8	0	0	0.312	7/8	3/8	2.25	4	9/32	1.75	1	0
2626	0.5	1	Raise + 1 7/8	5/8	2 3/8	0	0	0.437	7/8	3/8	2.25	4	9/32	1.75	1	0
2502	1	1	Raise + 1.75	5/8	3 1/4	0	0	0.5	1.5	0.5	3.25	4	13/32	2 3/8	1.5	0
1803	2	2	Raise + 2 3/8	0.75	4 1/16	0	0	0.625	1.5	0.5	3.25	4	13/32	2 3/8	1.5	0
9003	2	3	Raise + 2 3/8	0.75	4 1/16	0	0	0.625	1.5	0.5	3.25	4	13/32	2 3/8	1.5	0
1806	5	3	Raise + 3	1	5 1/4	0	0	1	2.5	0.75	4	4	9/16	3	2	0
1811	10	3	Raise + 4	2	5 5/8	0	1	1.249	3	1	6	4	0.81	4.5	3	2 7/8
1816	15	3	Raise + 4	2	6 5/16	0	1	1.5	3	1	6.5	4	0.81	5	3.5	2 7/8
1821	20	3	Raise + 5	2.5	7 1/8	0	1.75	1.75	3	1	7.5	4	0.94	5.5	3.75	3 1/2
1826	25	3	Raise + 7	3	8 7/8	3 1/8	2	2.5	5.5	1.25	8.5	4	1 1/16	6.5	4.5	4.5
9036	35	3	Raise + 6	3.5	8 7/8	0	2	3	5.5	1.5	9	4	1 1/16	7	5	4.5
1851	50	2	Raise + 7	4	10 7/8	1 1/8	2.5	3.5	6	2	10	6	1 1/16	8	6	5.56
9076	75	2	Raise + 8.5	4.5	13 9/16	1 1/16	2.5	4	7.5	2	12.5	6	1 1/8	10	7	6 5/8
1897	100	4	Raise + 8	5	17	2	5	5	7	2	14	6	1 1/8	11	8	7
18151	150	4	Raise + 9.75	5.5	17	2	3.5	5.5	8.75	2.5	15.5	6	1.5	12.5	9	8

Inverted Rotating Screw
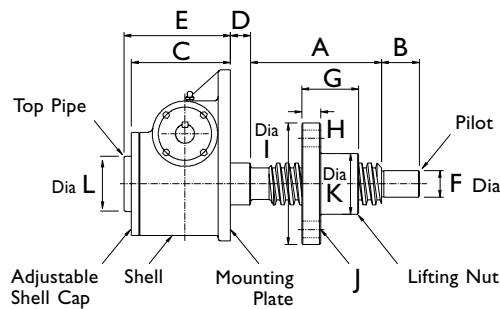
Model DM	Capacity (Short Tons)	Style	A	B	C	D	E	F	G	H	I	J Holes	J Dia.	J P.C.D.	K	L
2556	0.25	1	Raise + 1.5	5/8	2 3/8	3/8	2 3/8	0.312	7/8	3/8	2.25	4	9/32	1.75	1	0
2626	0.5	1	Raise + 1 7/8	5/8	2 3/8	3/8	2 3/8	0.437	7/8	3/8	2.25	4	9/32	1.75	1	0
2502	1	1	Raise + 1.75	5/8	3 1/4	0.25	3 1/4	0.5	1.5	0.5	3.25	4	13/32	2 3/8	1.5	0
1803	2	2	Raise + 2 3/8	0.75	4 1/16	5/8	4 1/16	0.625	1.5	0.5	3.25	4	13/32	2 3/8	1.5	0
9003	2	3	Raise + 2 3/8	0.75	4 1/16	5/8	4 1/16	0.625	1.5	0.5	3.25	4	13/32	2 3/8	1.5	0
1806	5	3	Raise + 3	1	5 1/4	2	5 1/4	1	2.5	0.75	4	4	9/16	3	2	0
1811	10	3	Raise + 4	2	5 5/8	1.13	5 5/8	1.249	3	1	6	4	0.81	4.5	3	0
1816	15	3	Raise + 4	2	6 5/16	0.81	6 1/2	1.5	3	1	6.5	4	0.81	5	3.503	2 7/8
1821	20	3	Raise + 5	2.5	7 1/8	0.63	7 7/8	1.75	3	1	7.5	4	0.94	5.5	3.75	3.5
1826	25	3	Raise + 7	3	8 7/8	1.5	9 7/8	2.5	5.5	1.25	8.5	4	1 1/16	6.5	4.5	4.5
9036	35	3	Raise + 6	3.5	8 7/8	0.88	9 7/8	3	5.5	1.5	9	4	1 1/16	7	5	4.5
1851	50	2	Raise + 7	4	10 7/8	2 5/8	11 1/2	3.5	6	2	10	6	1 1/16	8	6	5.56
9076	75	2	Raise + 8.5	4.5	13 9/16	3 5/8	15 1/16	4	7.5	2	12.5	6	1 1/8	10	7	6 5/8
1897	100	4	Raise + 8	5	17	2	18	5	7	2	14	6	1 1/8	11	8	7
18151	150	4	Raise + 9.75	5.5	17	2	17	5.5	8.75	2.5	15.5	6	1.5	12.5	9	8

Note   *Dimensions subject to change without notice.*

1.2.3.4. Standard Imperial Translating Screw Ends

Model	Upright	2555	2625	2501	1802	9002	1805	1810	1815
	Inverted	2554	2624	2500	1801	9001	1804	1809	1814
Capacity (Short Tons)		0.25	0.5	1	2	2	5	10	15
Threaded End									
A		3/8-24 UNF-2A	3/8-24 UNF-2A	1/2-13 UNC-2A	3/4-10 UNC-2A	3/4-10 UNC-2A	1-8 UNC-2A	1 1/2-6 UNC-2A	1.75-5 UNC-2
B	DIA	0.5	5/8	0.75	1	1	1.5	2	2.25
C		0.75	1	0.75	1 1/8	1 1/8	1 1/8	1 5/8	2
D	Upright	4	4	5 3/8	6	6	8	8.75	9.75
	Inverted	2	2	2	2.5	2.5	3.5	4.25	4.25
E		1/8	1/8	1/8	1/8	0.19	0.19	0.25	0.25
Clevis End									
F		13/64	17/64	21/64	13/32	13/32	21/32	25/32	29/32
G		3/8	0.5	0.5	0.75	0.75	1	1.25	1.5
H		0.5	5/8	0.75	1	1	1.5	2	2.25
I		0.375	0.5	0.375	0.75	0.75	1	1.25	1.25
K	Upright	4	4	5	5.25	5.25	7	7.5	8.5
	Inverted	2	2	1 5/8	1.75	1.75	2.5	3	3

Model	Upright	1820	1825	9035	1850	9075	1899	18150	2250
	Inverted	1819	1824	9034	1849	9074	1898	18149	2249
Capacity (Short Tons)		20	25	35	50	75	100	150	250
Threaded End									
A		2-4.5 UNC-2A	3-4 UNC-2A	3.25-4 UNC-2A	4-4 UNC-2A	4-12 UNC-2A	4 1/2-12 UNC-2A	5-12 UNC-2A	8-12 UNC-2A
B	DIA	2.5	3.375	3.75	4.5	5	6	7	9
C		2.25	3.25	3.75	4.25	4.5	5	5	6
D	Upright	11.5	13.75	15	17.5	20.5	25	25	30
	Inverted	5	5.75	7	8	9.5	12	12	12
E		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Clevis End									
F		1 1/32	1 9/32	1 17/32	1 25/32	2 1/32	2 17/32	2 25/32	3 17/32
G		1.75	2.25	2.5	3.25	3.5	4.25	5.25	7
H		2.5	3.375	3.75	4.5	5	6	7	9
I		1.5	1.75	2	2.5	2.5	3	3	4
K	Upright	10	12	13	15	18	24	24	30
	Inverted	3.5	4	5	5.5	7	9	9	12
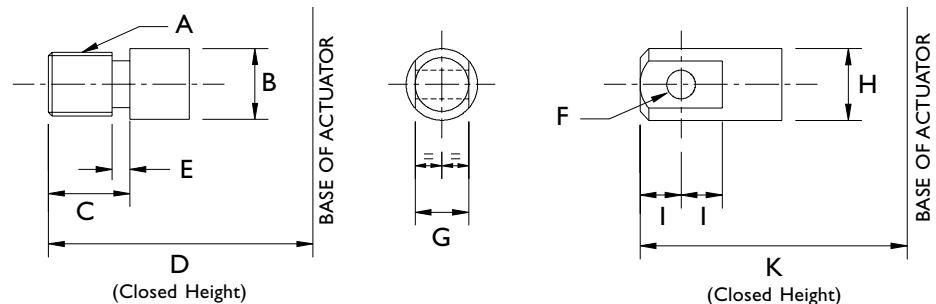
D (Closed Height)
G
K (Closed Height)

Note 1. *All dimensions in inches.*
2. *Dimensions subject to change without notice.*

1.2.3.5. Imperial Double Clevis End Actuators

Note *For other performance and dimension information refer to translating screw models.*

Style 1

Style 2

Style 3
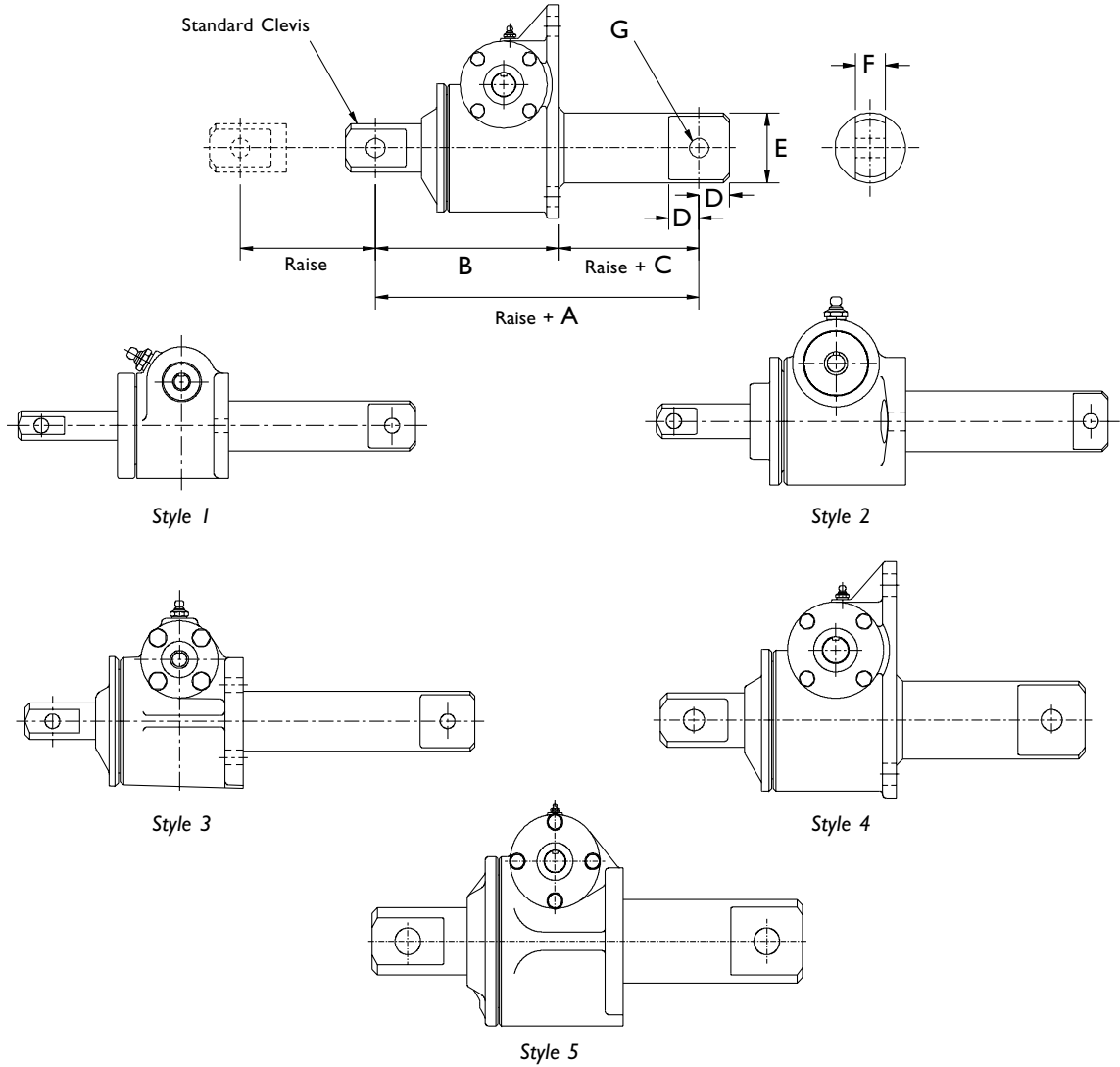
Style 4

Style 5

Model	CCM 2555	CCM 2625	CCM 2501	CCM 1802	CCM 1805	CCM 1810	CCM 1815	CCM 1820	CCM 1825	CCM 9035	CCM 1850
Capacity (Short Tons)	0.25	0.5	1	2	5	10	15	20	25	35	50
Style	1	1	2	3	4	4	4	4	4	4	5
A	5.5	5.5	6.5	6.75	9	10.25	11.25	13.5	16	17	19
B	4	4	5	5.25	7	7.5	8.5	10	12	13	15
C	1.5	1.5	1.5	1.5	2	2.75	2.75	3.5	4	4	4
D	-	-	-	0.75	1	1.25	1.25	1.5	1.75	2	2.5
E	1 1/16	1 1/16	1 5/16	1 21/32	2.38	2.88	2.88	3.5	4.5	4.5	5 9/16
F	3/8	0.5	0.5	0.75	1	1.25	1.5	1.75	2.75	2.5	3.25
G	13/64	17/64	21/64	0.41	0.66	0.78	0.91	1.03	1.28	1.53	1 25/32
Max Allowable Raise (compression) at load (lb)	5.75	9.25	9.75	14.5	22.5	31	37 3/8	39.25	54	73.5	94.5
	500	1000	1500	3000	6500	12000	16000	20000	38000	61000	98000
Max Raise at Rated Load (compression)	5.75	9.25	8.25	12 1/8	17	22 7/8	25 7/8	29.25	47	69	90.5

Note 1. *All dimensions in inches unless otherwise stated.*
2. *Dimensions subject to change without further notice.*

1.2.3.6. Imperial Actuators with Anti-Backlash Feature

Imperial actuators are available with anti-backlash nuts for applications where a reversal of loading from tension to compression is encountered. These are based on the 1800 and 9000 series actuators and are designated 4800 and 9400 series.

Shell Cap

Anti-Backlash Features

- Reduction in the vertical backlash between the screw and the worm gear nut to a practical minimum for smoother, more precise operation and minimum wear.

- Acts as a safety device, providing a dual nut load carrying unit, when the worm gear becomes worn.

- Wear indicator for critical applications.

The anti-backlash feature can be maintained by adjusting the shell cap until the desired amount of backlash is achieved. To avoid binding and excessive wear, do not adjust lifting screw backlash to less than 0.005".

Anti-Backlash   *Keyed Anti-Backlash*

Inverted   *Inverted*

Upright   *Upright*
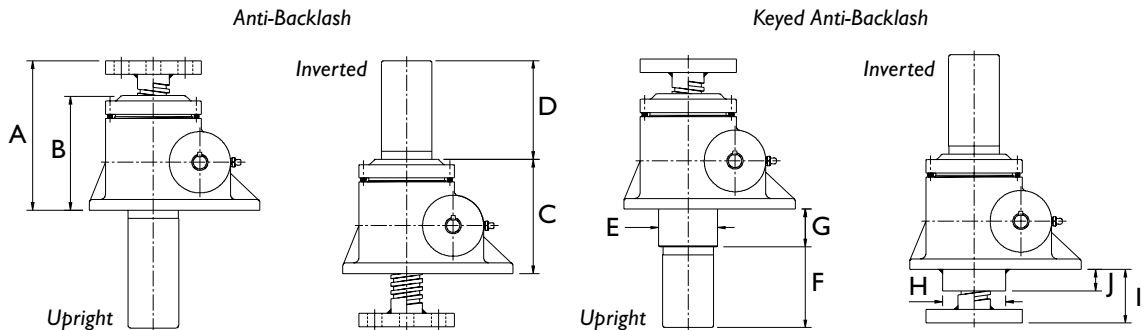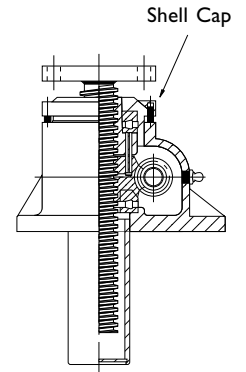
Standard Dimensions (inches)

Anti-Backlash				Keyed Anti-Backlash					
Model	A	B	C	D	Model	E	F	G	H	I	J
4555	4	2.38	2.38	Raise + 0.75	4555-K	1.5	Raise + 0.75	0.75	1.5	2	0.75
4625	4	2.88	2.43	Raise + 0.75	4625-K	1.25	Raise + 0.75	0.81	1.25	2	0.81
4501	5	3.84	3.38	Raise + 1.63	4501-K	1.06	Raise + 1.13	0.75	1.5	2	0.75
4802	5.25	3.88	3.88	Raise + 0.75	4802-K	2.25	Raise - 0.13	1.25	2.25	1.75	0.63
4805	7	5.43	5.43	Raise - 0.25	4805-K	2.75	Raise + 0.38	1.75	2.75	2.5	0.88
4810	7.25	5.75	5.75	Raise	4810-K	3.38	Raise	2	3.38	2.75	1.13
4815	8	6.13	6.13	Raise	4815-K	3.63	Raise	2	3.63	2.75	1.25
4820	9.5	7.75	7.75	Raise + 0.75	4820-K	4.0	Raise + 0.75	1.5	4	3	1.0
4825	12	9.69	9.69	Raise + 1	4825-K	5.5	Raise	2.25	5.5	3	1.25
9435	13	9.44	9.44	Raise + 1.75	9435-K	6.5	Raise + 0.69	2.38	6.5	4	1.25
4850	14	11.75	11.75	Raise + 1.75	4850-K	7.0	Raise + 0.75	3	7.0	5	3.0
9475	18.5	15.25	15.25	Raise + 1	9475-K	7.5	Raise + 1	4	7.5	6.5	4.0
4899	26.5	18.06	18.06	Raise + 0.5	4899-K	8.5	Raise + 1	5	8.5	12	5.0
48150	26.5	18.06	18.06	Raise + 0.5	48150-K	10	Raise + 1	5.56	10	12	5.56

Torque and Efficiencies for Standard Anti-Backlash Actuators

Model	Upright	4555	4625	4501	4802	4805	4810	4815	4820	4825	9435	4850	9475	4899	48150
	Inverted	4554	4624	4500	4801	4804	4809	4814	4819	4824	9434	4849	9474	4898	48149
Capacity, Short Tons		0.25	0.5	1	2	5	10	15	20	25	35	50	75	100	150
Start-Up Torque at Full Load (in.lb)	Std Ratio	15	24	60	135	500	1005	1658	2261	3712	5083	8022	13204	17004	31330
	Option 1	-	-	27	56	228	526	904	1228	1997	3014	4542	7314	9210	17225
Efficiency Rating	Std Ratio	0.277	0.168	0.212	0.196	0.199	0.198	0.180	0.176	0.134	0.137	0.124	0.113	0.117	0.127
	Option 1	-	-	0.117	0.119	0.109	0.126	0.110	0.108	0.083	0.077	0.073	0.068	0.072	0.077
Weight with Base Raise of 6" (lbs)		2.5	2.5	6	18	37	55	70	101	197	250	440	750	1325	1475

Note   For loads from 25% to 100% of actuator capacity, torque requirements are proportional to the load.
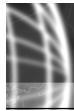
1.2.3.7. Imperial Machine Screw Actuators with Bellows Boots
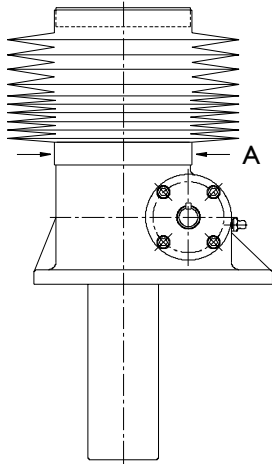
- Protects the screw from dust and dirt.
- Helps maintain the proper lubrication.
- Guards against moisture and corrosive contaminants.
- Boots are made of neoprene-coated nylon with sewn construction. Other materials are available for applications involving high temperatures, highly corrosive atmospheres and other special conditions.

Boot Installation Data

Capacity	500 lb	1000 lb	1 Ton	2 Ton	5 Ton	10 Ton	15 Ton	20 Ton
Shell Cap Diameter "A"	2.25	2.25	2.75	3.5	4.5	5.25	5.625	6

Capacity	25 Ton	35 Ton	50 Ton	75 Ton	100 Ton	150 Ton	250 Ton
Shell Cap Diameter "A"	7.5	7.875	11.25	13.25	10	10	16

Note   *For horizontal installation exceeding 18" of travel, internal boot guides are recommended.*

Upright Imperial Machine Screw Actuators with Bellows Boots
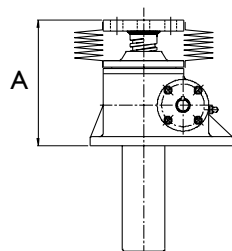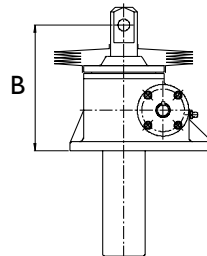
Top Plate   *Clevis End*   *Threaded End*

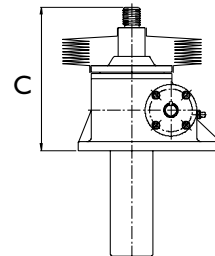| Model No	Boot O.D.	Raise																						
		0-12"			12"-18"			18"-24"			24"-30"			30"-36"			36"-48"			48"-60"			60"-72"		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
2555	4.25	4	4	$4^{1}/_{4}$	$4^{3}/_{4}$	$4^{5}/_{8}$	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2625	4.25	4	4	$4^{1}/_{2}$	$4^{1}/_{4}$	$4^{5}/_{8}$	$4^{1}/_{2}$	$4^{1}/_{4}$	$4^{5}/_{8}$	$4^{1}/_{2}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2501	6.0	$4^{1}/_{2}$	5	$5^{3}/_{8}$	$5^{1}/_{8}$	$5^{5}/_{8}$	6	$5^{1}/_{2}$	$5^{3}/_{4}$	$6^{1}/_{4}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1802	7.75	$5^{1}/_{4}$	$6^{1}/_{2}$	$7^{1}/_{4}$	$5^{3}/_{4}$	$7^{1}/_{2}$	$8^{1}/_{4}$	$5^{3}/_{4}$	$7^{1}/_{2}$	$8^{1}/_{4}$	$5^{3}/_{4}$	$7^{1}/_{2}$	$8^{1}/_{4}$	$6^{1}/_{4}$	$8^{1}/_{2}$	$9^{1}/_{4}$	-	-	-	-	-	-	-	-	-
9002	7.75	$5^{1}/_{4}$	$6^{1}/_{2}$	$7^{1}/_{4}$	$5^{1}/_{4}$	$7^{1}/_{2}$	$8^{1}/_{4}$	$5^{3}/_{4}$	$7^{1}/_{2}$	$8^{1}/_{4}$	$5^{3}/_{4}$	$7^{1}/_{2}$	$8^{1}/_{4}$	$6^{1}/_{4}$	$8^{1}/_{2}$	$9^{1}/_{4}$	-	-	-	-	-	-	-	-	-
1805	7.75	7	7	8	7	$8^{1}/_{2}$	$9^{1}/_{2}$	7	$8^{1}/_{2}$	$9^{1}/_{2}$	8	$8^{1}/_{2}$	$9^{1}/_{2}$	8	10	11	9	10	11	-	-	-	-	-	-
1810	9.0	$7^{1}/_{4}$	$8^{1}/_{2}$	$9^{3}/_{4}$	$7^{1}/_{4}$	$8^{1}/_{2}$	$9^{3}/_{4}$	$7^{1}/_{4}$	$9^{1}/_{2}$	$10^{3}/_{4}$	$8^{1}/_{2}$	$9^{1}/_{2}$	$10^{3}/_{4}$	$8^{1}/_{2}$	$9^{1}/_{2}$	$10^{3}/_{4}$	$9^{1}/_{2}$	$10^{1}/_{2}$	$11^{3}/_{4}$	$10^{1}/_{2}$	$11^{1}/_{2}$	$12^{3}/_{4}$	$11^{1}/_{2}$	$12^{1}/_{2}$	$13^{3}/_{4}$
1815	9.0	8	$8^{1}/_{2}$	$9^{3}/_{4}$	8	10	$11^{1}/_{4}$	8	10	$11^{1}/_{4}$	9	10	$11^{1}/_{4}$	9	10	$11^{1}/_{4}$	11	12	$12^{1}/_{4}$	11	12	$13^{1}/_{4}$	12	13	$14^{1}/_{4}$
1820	9.0	$9^{1}/_{4}$	10	$11^{1}/_{2}$	$9^{1}/_{4}$	11	$12^{1}/_{2}$	$9^{1}/_{4}$	11	$12^{1}/_{2}$	$10^{1}/_{2}$	12	$13^{1}/_{2}$	$10^{1}/_{2}$	12	$13^{1}/_{2}$	$11^{1}/_{2}$	13	$14^{1}/_{2}$	$12^{1}/_{2}$	14	$15^{1}/_{2}$	$13^{1}/_{2}$	15	$16^{1}/_{2}$
1825	10.75	11	12	$13^{3}/_{4}$	11	12	$13^{3}/_{4}$	11	$13^{1}/_{4}$	15	12	$13^{1}/_{4}$	15	12	$14^{1}/_{2}$	$16^{1}/_{4}$	13	$15^{3}/_{4}$	$17^{1}/_{2}$	14	$15^{3}/_{4}$	$17^{1}/_{2}$	15	$16^{3}/_{4}$	$18^{1}/_{2}$
9035	11.0	12	13	15	12	13	-	12	13	15	12	$13^{3}/_{4}$	$15^{3}/_{4}$	12	$13^{3}/_{4}$	$15^{3}/_{4}$	$12^{7}/_{8}$	$14^{3}/_{4}$	$16^{3}/_{4}$	$13^{3}/_{4}$	$15^{1}/_{2}$	$17^{1}/_{2}$	$14^{3}/_{4}$	$16^{1}/_{2}$	$18^{1}/_{2}$
1850	14.5	13	15	$17^{1}/_{2}$	13	16	$18^{1}/_{2}$	13	16	$18^{1}/_{2}$	14	16	$18^{1}/_{2}$	14	17	$19^{1}/_{2}$	15	18	$20^{1}/_{2}$	16	18	$20^{1}/_{2}$	17	19	$21^{1}/_{2}$
9075	16.5	$17^{1}/_{2}$	19	$21^{1}/_{2}$	$17^{1}/_{2}$	19	$21^{1}/_{2}$	$17^{1}/_{2}$	19	$21^{1}/_{2}$	$17^{1}/_{2}$	19	$21^{1}/_{2}$	$17^{1}/_{2}$	19	$21^{1}/_{2}$	$18^{1}/_{2}$	20	$20^{1}/_{2}$	$19^{1}/_{2}$	21	$23^{1}/_{2}$	$20^{1}/_{2}$	22	$24^{1}/_{2}$
1899	11.25	24	24	25	24	24	25	24	24	25	24	24	25	$24^{1}/_{2}$	$24^{1}/_{2}$	$25^{1}/_{2}$	25	$25^{1}/_{2}$	$26^{1}/_{2}$	26	$26^{1}/_{2}$	$27^{1}/_{2}$	27	$27^{1}/_{2}$	$28^{1}/_{2}$
18150	12.25	24	24	25	24	24	25	24	24	25	24	24	25	$24^{1}/_{2}$	$24^{3}/_{8}$	$25^{3}/_{8}$	25	$25^{1}/_{2}$	$26^{1}/_{8}$	26	$26^{7}/_{8}$	$26^{7}/_{8}$	27	$26^{5}/_{8}$	$27^{5}/_{8}$
2250	16.0	30	-	-	30	-	-	30	-	-	$30^{1}/_{2}$	-	-	$30^{1}/_{2}$	-	-	$31^{1}/_{2}$	-	-	$31^{1}/_{2}$	-	-	32	-	-

Note   1. *(-) indicates "not applicable".*
   2. *For lengths of raise not detailed in the above table consult Power Jacks Ltd.*
   3. *Dimensions subject to change without notice.*
   4. *All dimensions in inches.*

Inverted Imperial Machine Screw Actuators with Bellows Boots

1898 - 18149 only

Top Plate   *Clevis End*   *Threaded End*
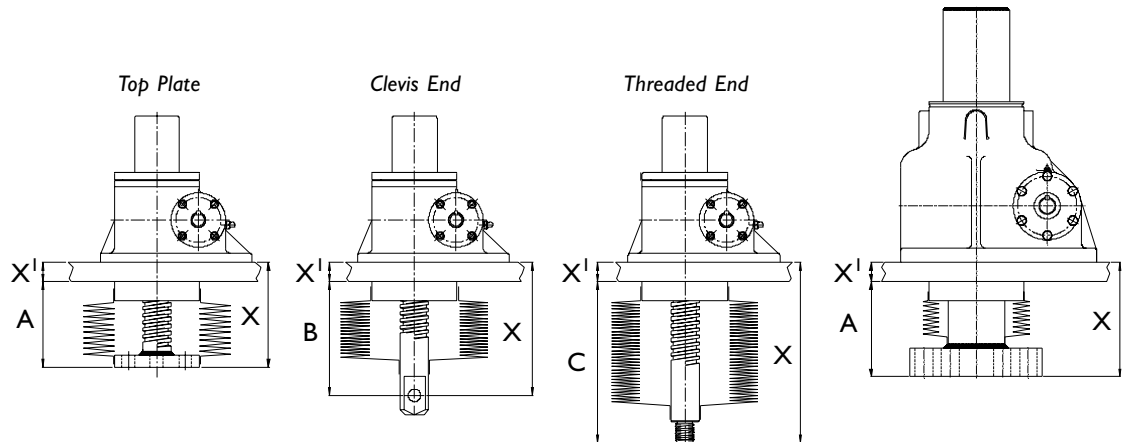

Finding minimum closed dimensions

- Add your structure thickness X^1 to A, B, or C from the appropriate chart to find the minimum closed dimension.
- Other styles and sizes of boots can be supplied.
- In order to use a standard boot, make the mounting plate diameter the same as the shell cap diameter of the appropriate actuator.
- When boots are required for rotating screw actuators, consult Power Jacks Ltd.

Model No	Raise (Inches)											
	1"-6"			7"-12"			13"-18"			19"-24"		
	A	B	C	A	B	C	A	B	C	A	B	C
2554	2	2 3/8	2	2	2 3/8	2	2 1/8	-	-	-	-	-
2624	2	2 5/8	2 1/8	2	2 5/8	2 1/8	2 1/8	3 1/4	2 3/4	-	-	-
2500	2 1/16	3	2 5/8	2 1/16	3	2 5/8	2 11/16	3 5/8	3 1/4	3 1/16	4	3
1801 & 9001	2 3/8	4 3/8	3 5/8	2 3/8	4 3/8	3 5/8	2 7/8	5 3/8	4 5/8	3	5 3/8	4 5/8
1804	3 3/16	4 3/16	3 3/16	3 3/16	4 3/16	3 3/16	3 3/16	5 11/16	4 11/16	3 1/2	5 11/16	4 11/16
1809	3 1/4	5 3/4	4 1/2	3 1/4	5 3/4	4 1/2	3 1/4	5 3/4	4 1/2	3 9/16	7	5 3/4
1814	3 1/4	5 1/4	4	3 1/4	5 1/4	4	3 1/4	6 3/4	5 1/2	3 9/16	6 3/4	5 1/2
1819	3 1/4	5 9/16	4 1/16	3 1/4	5 9/16	4 1/16	3 1/4	6 9/16	5 1/16	3 1/4	6 9/16	5 1/16
1824	3 3/8	6 3/4	5	3 3/8	6 3/4	5	3 3/8	6 3/4	5	3 3/8	7 3/4	6
9034	4 1/2	7 1/2	5 1/2	4 1/2	7 1/2	5 1/2	4 1/2	7 1/2	5 1/2	4 1/2	7 1/2	5 1/2
1849	4 7/8	9 5/16	6 13/16	4 7/8	9 5/16	6 13/16	4 7/8	10 5/16	7 13/16	4 7/8	10 5/16	7 13/16
9074 a,b,c	2 3/8	6 7/8	4 7/8	2 3/4	7 1/4	5 1/4	3	7 1/2	5 1/2	3 3/8	7 7/8	5 7/8
1898	* 7 11/16	* 8 11/16	** 7 11/16	* 7 11/16	* 8 11/16	** 7 11/16	* 7 11/16	* 8 11/16	** 7 11/16	* 7 11/16	* 8 11/16	** 7 11/16
18149	* 7 11/16	* 8 11/16	** 7 11/16	* 7 11/16	* 8 11/16	** 7 11/16	* 7 11/16	* 8 11/16	** 7 11/16	* 7 11/16	* 8 11/16	** 7 11/16

Value of X = **a)** If A+X^1 is less than 5 1/2'', X = 5 1/2''   **b)** If B+ X^1 is less than 9 1/2'', X = 9 1/2''   **c)** If C+ X^1 is less than 7'', X = 7''

*If A+X^1 and B+ X^1 are less than 12'', X = 12''. If greater than 12'', use dimensions shown.

** If C+ X^1 is less than 9'', X = 9''. If greater than 9'', use dimensions shown.

Mounting Plate

12.7 mm (1/2")

Dia as required

To be manufactured by installer
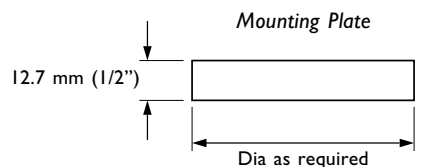
Note   *Same values can be used for 4800 Series Actuator Units.*

Note   *1.   For lengths of raise not detailed in the above table consult Power Jacks Ltd.*
2.   Dimensions subject to change without notice.
4.   All dimensions in inches.

1.2.3.8. Standard Imperial Flange Bolt Configuration

Note   For other performance and dimension information refer to translating screw models.

Configuration A
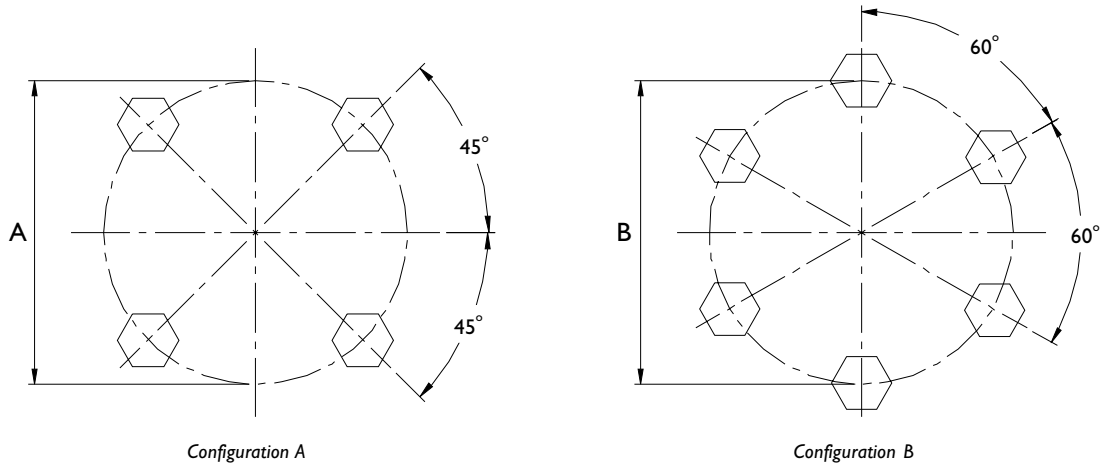
Configuration B

Model	'B' Bolt P.C.D. (inch)	Bolt Information	Configuration
2555	-	No Flange Bolts	-
2625	-	No Flange Bolts	-
2501	-	No Flange Bolts	-
1802 & 9002	$1\,^{11}/16$	$^1/4$ - 20 x $^3/4$" Long	A
1805	$2\,^3/8$	$^5/16$ - 18 x $^3/4$" Long	A
1810	$2\,^3/4$	$^5/16$ - 18 x $^3/4$" Long	A
1815	$2\,^3/4$	$^5/16$ - 18 x 1" Long	A
1820	$3\,^1/2$	$^3/8$ - 16 x 1 $^1/4$" Long	A
1825	$4\,^1/8$	$^3/8$ - 16 x 1 $^1/4$" Long	A
9035	$4\,^1/4$	$^1/2$ - 13 x 1 $^1/4$" Long	A
1850	$5\,^1/4$	$^5/8$ - 11 x 1 $^1/2$" Long	A
9075	$5\,^3/4$	$^5/8$ - 11 x 1 $^1/2$" Long	B
1899	$6\,^1/4$	$^5/8$ - 11 x 1 $^1/2$" Long	B
18150	$6\,^1/4$	$^5/8$ - 11 x 1 $^1/2$" Long	B
2250	$8\,^1/4$	$^3/4$ - 10 x 2" Long	B

Note   1.   All dimensions in inches unless otherwise stated.
2.   Dimensions are subject to change without notice.

1.2.3.9. Motor Adaptors for Imperial Actuators

- Standard adaptors for imperial actuators available on request.
- Designed for standard IEC frame sizes.
- Allows direct motor coupling on either side of the actuator input shaft.
- Complete with drive coupling and mounting hardware.
- NEMA frame size versions available on request.
- Adaptors for other mounting arrangements available on request.

Note   When direct coupling a motor to an actuator, it is necessary to match motor power to actuator load so the motor does not exceed the maximum actuator power.
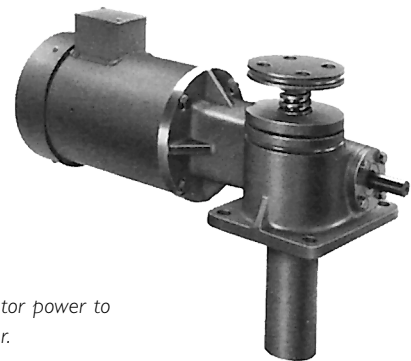
1.2.3.10. RLS-51 Rotary Limit Switch Adaptors for Imperial Actuators
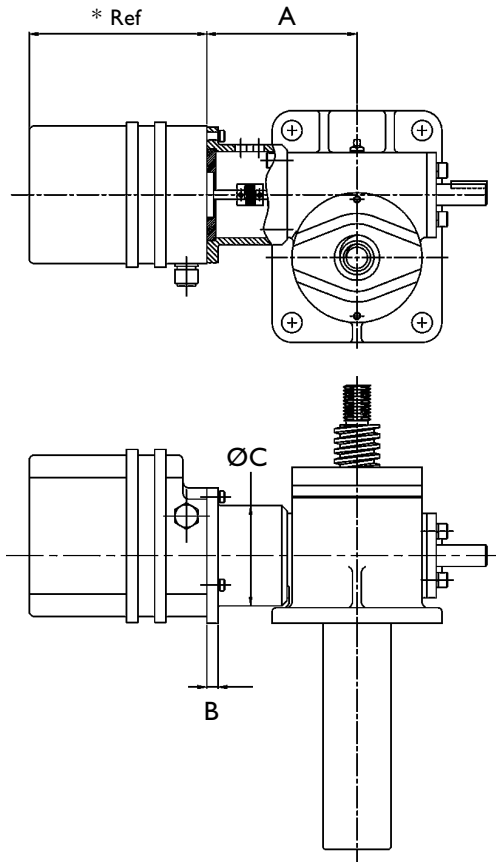
Rotary limit switches can be used as end of travel limit switches with the option of intermediate switches as well. These units are mounted onto a screw jacks free worm shaft and offer an alternative where bottom pipe mounted limit switches are not possible e.g. rotating screw jacks. Up to 8 limit switches can be accommodated in one unit.

For mounting details please consult Power Jacks.

For full details on the RLS-51 limit switch refer to section 8.1.1.

The mounting kit includes the flexible coupling and drive adaptor.

1.2.3.11. SKA Rotary Limit Switch Adaptors for Imperial Actuators

The SKA rotary limit switch is a compact 2-position limit switch designed for screw jack and linear actuator applications. For full details on the SKA limit switch refer to section 8.1.2.
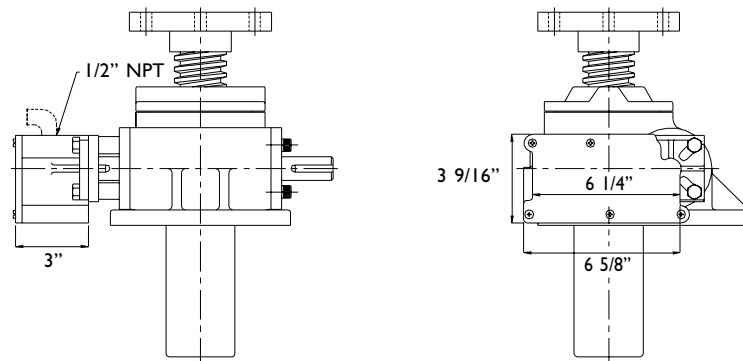
Actuator Mounted

Note 1. *All dimensions are in inches unless otherwise stated.*
2. *Dimensions are subject to change without notice.*

1.2.3.11.1. Mounting and Adjustment Specifications for SKA Rotary Limit Switches
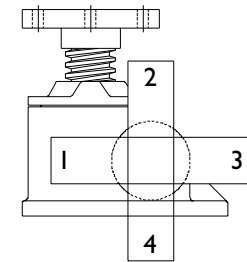
Position Number of Switch
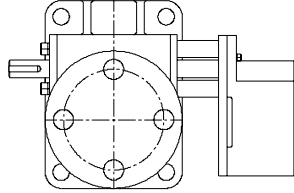
Typical top view showing switch mounted on RH worm extension

75, 100 & 150 Tons Imperial models only

Actuator	Extended Mount								Closed Mount							
Capacity	RH				LH				RH				LH			
(Short Ton)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2 & 3	C	A & B	B & D	-	B & D	A & B	✔	-	-	-	-	-	-	-	-	-
5	✔	A	D	C	D	A	✔	C	✔	A & B	D	-	D	A & B	✔	-
10	✔	A	D	C	D	A	✔	C	✔	A & B	D	-	D	A & B	✔	-
15	✔	A	D	C	D	A	✔	C	-	A & B	D	-	D	A & B	-	-
20	✔	A	✔	C	✔	A	✔	C	✔	A & B	✔	-	✔	A & B	✔	-
25	✔	✔	✔	C	✔	✔	✔	C	✔	B	✔	-	✔	B	✔	-
35	✔	✔	✔	C	✔	✔	✔	C	✔	B	✔	-	✔	B	✔	-
50	✔	✔	✔	C	✔	✔	✔	C	-	✔	✔	-	-	✔	✔	-
75	✔	✔	✔	C	✔	✔	✔	C	-	✔	✔	-	-	✔	✔	-
100	✔	✔	✔	✔	✔	✔	✔	✔	-	✔	✔	✔	-	✔	✔	✔
150	✔	✔	✔	✔	✔	✔	✔	✔	-	✔	✔	✔	-	✔	✔	✔

Note   For 2 & 3 Ton inverted position, extended mount position (2) is the only one practical.
(A) Special Closed Height.   (B) Boot Interference Unit.   (C) Rotary Limit Switch extends below base of Actuator Unit.
(D) Sealed electric elbow would extend below base of Actuator Unit.   (✔) Recommended.   (-) Not Recommended
Extended Mount is Standard.

1.2.3.11.2. SKA Limit Switch Field Installation Dimensions
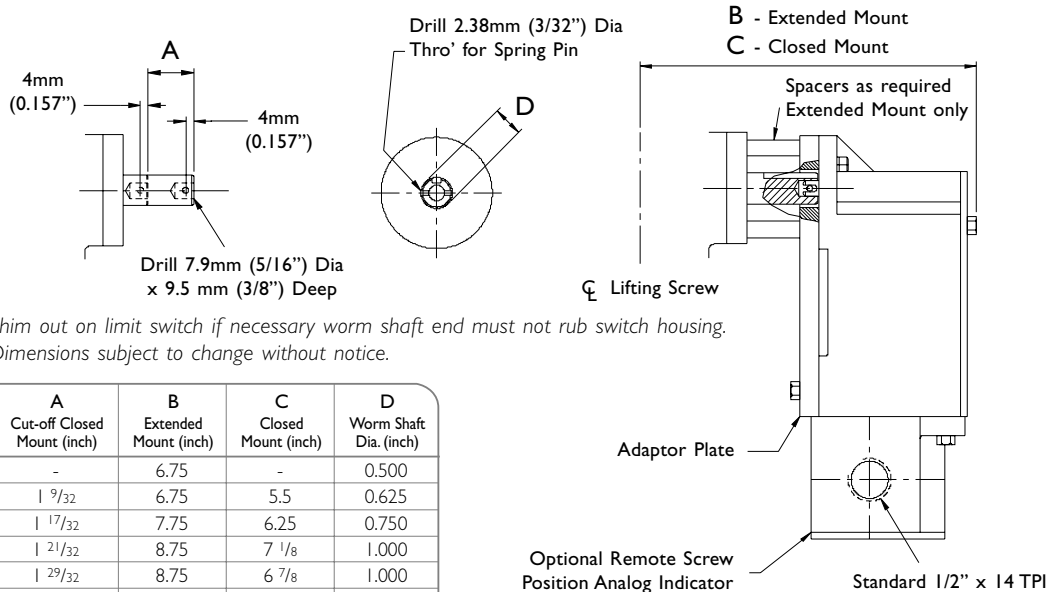
4mm (0.157")

A

4mm (0.157")

Drill 7.9mm (5/16") Dia x 9.5 mm (3/8") Deep

Drill 2.38mm (3/32") Dia Thro' for Spring Pin

D

B - Extended Mount
C - Closed Mount

Spacers as required Extended Mount only

C̶ Lifting Screw

Adaptor Plate

Optional Remote Screw Position Analog Indicator

Standard 1/2" x 14 TPI

Note   Shim out on limit switch if necessary worm shaft end must not rub switch housing.
Dimensions subject to change without notice.

Model (Short Ton)	A Cut-off Closed Mount (inch)	B Extended Mount (inch)	C Closed Mount (inch)	D Worm Shaft Dia. (inch)
2	-	6.75	-	0.500
3	1 $^9/_{32}$	6.75	5.5	0.625
5	1 $^{17}/_{32}$	7.75	6.25	0.750
10	1 $^{21}/_{32}$	8.75	7 $^1/_8$	1.000
15	1 $^{29}/_{32}$	8.75	6 $^7/_8$	1.000
20	1 $^3/_8$	8.75	7 $^{13}/_{32}$	1.000
25	2 $^7/_{32}$	10.25	8 $^1/_{16}$	1.375
35	2 $^7/_{32}$	10.25	8 $^1/_{16}$	1.375
50	4 $^{21}/_{32}$	14.25	9 $^5/_8$	1.500
75	4.5	15.25	10.75	1.750
100	3.75	14.75	11 $^1/_{32}$	1.750
150	3.75	14.75	11 $^1/_{32}$	1.875

Note   1. All dimensions are in inches unless otherwise stated.
2. Dimensions are subject to change without notice.

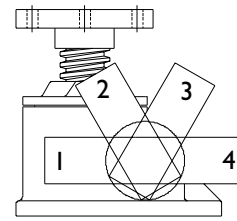**1.2.4.   E-Series Metric Stainless Steel Machine Screw Jacks**

Advantages

- Capacity from 10kN → 300 kN.
- Available in Upright and Inverted models.
- Corrosion resistant.
- Different materials and plating available to suit application environments.
- External dimensions same as for Metric Machine Screw actuators.
- Keyed Anti-backlash models available.
- Anti-backlash models available.
- Uniform, Lifting Speed.

- Translating and Rotating screw models.
- Worm gear ratios from 5:1 → 32:1.
- Stainless steel hardware.
- Available with sealed gear cavity to keep water and other contaminants out.
- Available with keyed lifting screw for translating screw models.
- Secondary Guides available.
- Positive, Mechanical Positioning.
- Multiple Arrangements.

Lifting Screw
BS970 Stainless Steel.
Threaded end as standard
and available with screw on
clevis end or top plate.

Nitrile Rubber Seals
Top and bottom with
Stainless Steel case and
spring protects gear housing
from contamination.

Shell Cap
BS970 Stainless Steel.
Locked in place by
set screws.

Load Bearings
Carbon Steel Bearings, top
and bottom to take loads in
tension or compression.

Bearings and Seals
At each end of worm.
Seals have stainless
steel garter spring.

Worm Gear
Aluminium bronze.
Accurately hobbed for
greater gear contact.

Worm
BS970 Stainless Steel.
Available with double
or single shaft extension.

Housing
BS3100 Stainless Steel.

Bottom Pipe
BS970 Stainless Steel.
Protects lifting screw threads.

For other stainless steel variants and other capacities (5 kN, 500 kN & 1000 kN) consult Power Jacks Ltd.

The stainless steel actuators are ideal for use in harsh or corrosive environments such as food processing or paper making machinery where standard materials may be inadequate.

1.2.4.1. Performance of Standard Metric Stainless Steel Actuators

Actuator Model		S 2501	S 1802	S 1805	S 1810	S 1820	S 1830
Metric Actuator Base Model Rating (kN)		10	25	50	100	200	300
Sustaining Capacity (kN) ¥	Tension	6.6	16.5	33	66	132	200
	Compression	10	25	50	100	200	300
Operating Capacity (kN) ‡		3.3	8.25	16.5	33	66	100
Lifting Screw *	Diameter	20 mm	30 mm	40 mm	55 mm	65 mm	95 mm
	Pitch	5 mm	6 mm	9 mm	12 mm	12 mm	16 mm
Worm Gear Ratios	Standard	5:1	6:1	6:1	8:1	8:1	10 2/3
	Optional	20:1	24:1	24:1	24:1	24:1	32:1
Turn of worm for raise of lifting screw	Standard	1 for 1 mm	1 for 1 mm	1 for 1.5 mm	1 for 1.5 mm	1 for 1.5 mm	1 for 1.5 mm
	Optional	4 for 1 mm	4 for 1 mm	4 for 1.5 mm	2 for 1 mm	2 for 1 mm	2 for 1 mm
Maximum Input Power per Actuator (kW)	Standard	0.375	1.5	3.0	3.75	3.75	6.0
	Optional	0.19	0.375	0.55	1.125	1.125	1.9
Start-Up Torque at full operating capacity (Nm) †	Standard	2.3	6.5	18.5	38.2	87	160
	Optional	1.0	2.9	8.4	19.9	45	95
Weight with base raise of 150mm (kg)		2.27	8.17	15.88	24.72	45	86
Weight for each additional 25mm raise (kg)		0.13	0.21	0.32	0.57	0.86	1.58

¥ Sustaining capacity for tension is less than actuator rating due to the performance of the stainless steel lifting screw. If a tension sustaining capacity is required equal to the actuator rating consult Power Jacks Ltd.

‡ Operational rating is less than sustaining rating due to the performance of stainless steel worm shafts. If a operating capacity is required equal to sustaining capacity consult Power Jacks for worm shaft options such as Chrome or Electroless-Nickel plating.

* All metric stainless steel machine screws have a trapezoidal thread form, single start as standard.

† For loads of 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.

Metric Stainless Steel Actuator Efficiencies

Standard Gear Ratio

Model		S 2501	S 1802	S 1805	S 1810	S 1820	S 1830
Gear Ratio		5	6	6	8	8	10.66
Actuator Static Efficiency	1 Start	0.233	0.201	0.213	0.206	0.181	0.149
Actuator Dynamic Efficiency	1 Start	0.306	0.264	0.281	0.272	0.242	0.205

Optional Gear Ratio

Model		S 2501	S 1802	S 1805	S 1810	S 1820	S 1830
Gear Ratio		20	24	24	24	24	32
Actuator Static Efficiency	1 Start	0.130	0.115	0.117	0.132	0.116	0.084
Actuator Dynamic Efficiency	1 Start	0.194	0.167	0.172	0.190	0.169	0.128

Note Efficiency values for standard grease lubricated worm gear box and lifting screw.
External dimensions same as for Metric Machine Screw Actuators

Upright Screw

Rotating Screw (Upright)
Available in both upright
and inverted types

Inverted Screw

Threaded

Clevis
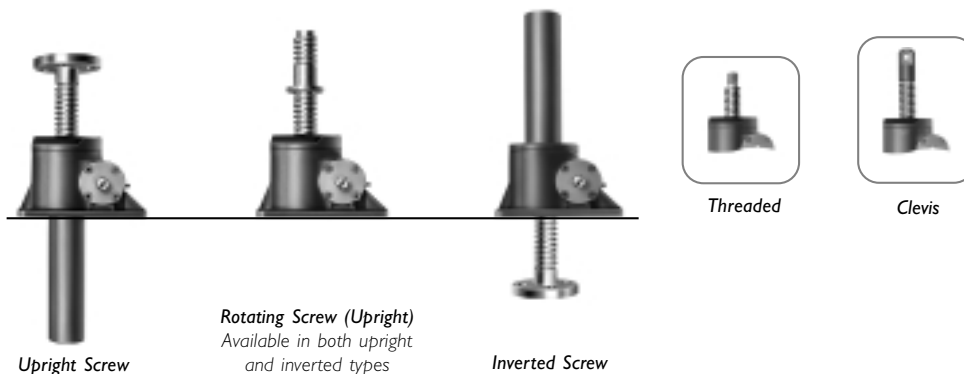
1.2.5. M-Series Imperial Stainless Steel Machine Screw Jacks

Advantages

- Capacity from 2 Tons through to 100 Tons.
- Worm gear ratios from 6:1 to 36:1
- Corrosion resistant.
- Stainless steel hardware.
- Sealed gear cavity keeps water and other contaminants out.
- Anti-Backlash models available.
- Available with keyed lifting screws for translating screw models.
- Available in upright and inverted rotating screw models with travelling nut.
- Can be retrofitted into applications where Duff-Norton non-stainless steel actuators have been previously used.

Optional Features

- Closed heights
- Materials
- Lifting screw ends
- With Stop Nuts
- Worm shaft extensions
- With bellows boots
- Lifting screw thread pitches

Lifting Screw
316 Stainless Steel.
Also available as threaded
end or clevis end.

Shell Cap
316 Stainless Steel.
Locked into place by
set screws.

Guide Bushing
Bronze.

Load Bearings
Carbon Steel Bearings, top
and bottom to take loads in
tension or compression.

Worm Gear
Aluminium Bronze.
Accurately hobbed for
greater gear contact.

Worm
316 Stainless Steel standard.
Available with double
or single shaft extension.
(17-4 Ph available as special)

Top Plate
316 Stainless Steel.
Must be bolted to lifting
member to prevent
rotation except when
keyed.

Nitrile Rubber Seals
Top and bottom with
316 Stainless Steel
case and spring protects
gear housing from
contamination.

**Worm Bearings
and Seals**
Both ends of worm.
316 Stainless Steel case
and spring.

Housing
316 Stainless Steel.

Bottom Pipe
316 Stainless Steel.
Protects lifting screw threads.

1.2.5.1.   Performance of Standard Imperial Stainless Steel Actuators

| Actuator Model | Upright | SM-1802 | SM-1805 | SM-1810 | SM-1815 | SM-1820 | SM-1825 | SM-9035 | SM-1850 | SM-1899 |
	Inverted	SM-1801	SM-1804	SM-1809	SM-1814	SM-1819	SM-1824	SM-9034	SM-1849	SM-1898
Capacity (Short Tons)	Sustaining	2	5	10	15	20	25	35	50	100
	Operating**	0.66	1.66	3.33	5.00	6.66	8.33	11.66	16.66	33.33
Lifting Screw	Diameter	1	1 $^1/_2$	2	2 $^1/_4$	2 $^1/_2$	3$^3/_8$	3 $^3/_4$	4 $^1/_2$	6
	Pitch	0.250	0.375	0.500	0.500	0.500	0.666	0.666	0.666	0.750
	Form	Acme	Square	Square	Square	Square	Square	Acme	Square	Square
Worm Gear Ratios	Std. Ratio	6:1	6:1	8:1	8:1	8:1	10 $^2/_3$:1	10 $^2/_3$:1	10 $^2/_3$:1	12:1
	Optional	24:1	24:1	24:1	24:1	24:1	32:1	32:1	32:1	36:1
Turns of Worm for 1" Raise	Std. Ratio	24	16	16	16	16	16	16	16	16
	Optional	96	64	48	48	48	48	48	48	48
Max. HP per Actuator	Std. Ratio	2	4	5	5	5	8	8	15	25
	Optional	$^1/_2$	$^3/_4$	1 $^1/_2$	1 $^1/_2$	1 $^1/_2$	2 $^1/_2$	2 $^1/_2$	6	11
Start-Up Torque at Operating Load* (In.-lbs)	Std. Ratio	40	150	250	475	685	665	1335	2500	5335
	Optional	17	60	135	275	390	400	800	1400	2865
Efficiency Rating	Std. Ratio	0.232	0.221	0.237	0.202	0.188	0.164	0.156	0.138	0.130
	Optional	0.133	0.121	0.151	0.129	0.120	0.092	0.089	0.083	0.080
Weight with Base Raise of 6" (lbs)		19	37	55	70	96	168	250	420	1260

*   *For Loads 25% to 100% of actuator capacity, torque requirements are approximately proportional to load.*
** *Actuator has been de-rated for 316 Stainless Steel worm. For full load rating use 17-4 PH worm.*

1.2.5.2.   Standard Stainless Steel Actuators Screw End Dimensions
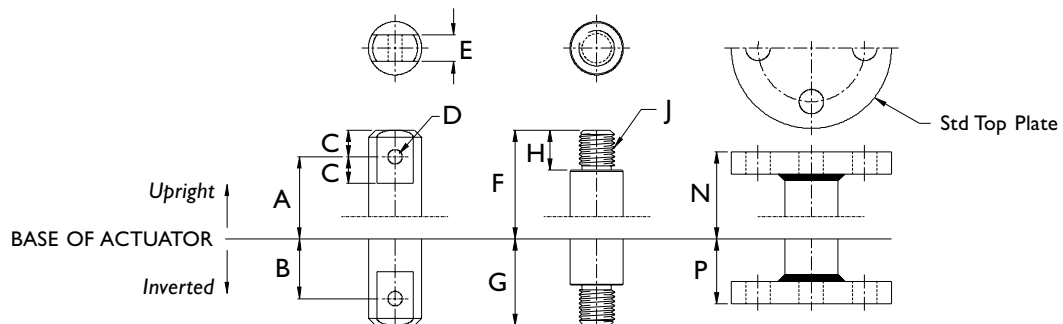
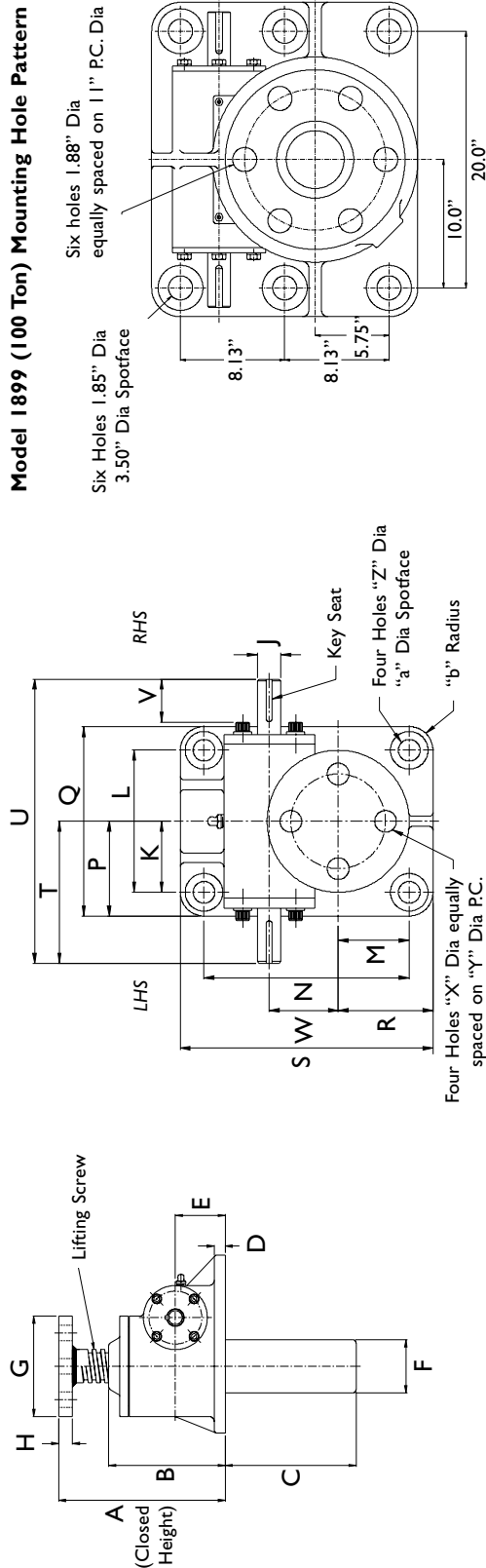| Model No	A*	B*	C	D	E	F	G	H	J	N	P
SM-1802	5 $^1/_4$"	1 $^3/_4$"	$^3/_4$"	$^{13}/_{32}$"	$^3/_4$"	6.0	2 $^1/_2$"	1 $^1/_8$"	$^3/_4$"-10-UNC-2A	5.25	1 3/4"
SM-1805	7"	2 $^1/_2$"	1"	$^{21}/_{32}$"	1"	8.0	3 $^1/_2$"	1 $^1/_8$"	1"-8-UNC-2A	7.5	2 $^1/_2$"
SM-1810	7 $^1/_2$"	3"	1 $^1/_4$"	$^{25}/_{32}$"	1 $^1/_4$"	9.25	4 $^1/_4$"	1 $^5/_8$"	1 $^1/_2$"-6-UNC-2A	7.75	2 $^3/_4$"
SM-1815	8 $^1/_2$"	3"	1 $^1/_4$"	$^{29}/_{32}$"	1 $^1/_2$"	10.25	4 $^1/_4$"	2"	1 $^3/_4$"-5-UNC-2A	8.5	2 $^3/_4$"
SM-1820	10"	3 $^1/_2$"	1 $^1/_2$"	1 $^1/_{32}$"	1 $^3/_4$"	12.5	5"	2$^1/_4$"	2"-4 $^1/_2$-UNC-2A	10.25	3"
SM-1825	12"	4"	1 $^3/_4$"	1 $^9/_{32}$"	2 $^1/_4$"	14.5	5 $^3/_4$"	3 $^1/_4$"	2 $^1/_2$"-4-UNC-2A	11.75	3"
SM-9035	13"	5"	2"	1 $^{17}/_{32}$"	2 $^1/_2$"	15.5	7"	3 $^3/_4$"	3 $^1/_4$"-4-UNC-2A	12.5	4"
SM-1850	15"	5 $^1/_2$"	2 $^1/_2$"	1 $^{21}/_{32}$"	3 $^1/_4$"	18.0	8"	4 $^1/_4$"	4"-4-UNC-2A	13.5	3 $^1/_2$"
SM-1899	24"	9"	3"	2 $^{17}/_{32}$"	4 $^1/_4$"	25.0	12"	5"	4 $^1/_2$"-12-UNC-2A	24.0	12"

Note   1.   ** Closed height dimensions may increase for actuator units supplied with bellows boots. Consult Power Jacks Ltd.*
         2.   *Lifting screw listed above are not keyed. Must be held to prevent rotation.*
         3.   *Keyed lifting screws and keyed anti-backlash models are also available. Consult Power Jacks Ltd.*
         4.   *All dimensions in inches.*
         5.   *Dimensions are subject to change without notice.*

1.2.5.3 Imperial Stainless Steel Actuator Dimensions

Model 1899 (100 Ton) Mounting Hole Pattern

Six holes 1.88" Dia equally spaced on 11" P.C. Dia
Six Holes 1.85" Dia 3.50" Dia Spotface

8.13"
8.13"
5.75"
10.0"
20.0"

RHS
LHS
Key Seat
Four Holes "Z" Dia "a" Dia Spotface
"b" Radius
Four Holes "X" Dia equally spaced on "Y" Dia P.C.

Lifting Screw
A (Closed Height)

Model No	Capacity (Short Tons) Sustaining	Capacity (Short Tons) Operating	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	a	b	Keyseat (b × h × L)
SM-1802	2	0.66	5.50	4.56	Travel	.50	1.750 ±.005	1.66	4.25	.50	.500 +.000/−.002	3.00	6.00	1.00	2.00	3.5	7.00	1.75	3.5	3.5	7.00	1.12	1.702 +.003/−.000	.41	3.00	.41	.75	1.5	.125 × 0.060 × 1.00 LG
SM-1805	5	1.66	7.50	5.88	Travel +3/8	.50	2.250 ±.005	2.38	4.50	.60	.749 +.000/−.002	2.25	4.50	2.25	6.50	3.00	6.00	3.00	8.00	4.50	9.00	1.50	2.188 +.003/−.000	.69	3.00	.69	1.19	.75	.188 × .094 × 1.25 LG
SM-1810	10	3.33	7.75	6.00	Travel +1/4	.50	2.250 ±.005	2.88	5.75	.94	1.000 +.000/−.002	2.88	5.75	2.00	7.00	3.75	7.50	2.88	8.75	5.50	11.00	1.80	2.598 +.003/−.000	.81	4.13	.81	1.31	.88	.250 × .125 × 1.50 LG
SM-1815	15	5.00	8.00	6.31	Travel +1/2	.63	2.750 ±.005	2.88	5.75	.94	1.000 +.000/−.002	3.00	6.00	2.50	7.50	3.88	7.75	3.38	9.25	5.50	11.00	1.80	2.598 +.003/−.000	.81	4.13	.81	1.38	.88	.250 × .125 × 1.50 LG
SM-1820	20	6.66	10.25	8.00	Travel −1/4	.75	3.250 ±.005	3.50	5.75	.94	1.000 +.000/−.002	3.00	6.00	3.00	8.75	4.13	8.25	4.13	11.00	5.50	11.00	1.50	2.598 +.003/−.000	.81	4.13	1.12	1.75	1.13	.250 × .125 × 1.50 LG
SM-1825	25	8.33	11.75	9.75	Travel +1/4	1.00	4.000 ±.005	4.50	8.50	.94	1.375 +.000/−.002	3.75	7.50	3.75	11.00	5.13	10.25	5.13	13.75	7.00	14.00	2.30	3.750 +.003/−.000	1.06	6.00	1.38	2.13	1.38	.313 × .156 × 2.00 LG
SM-9035	35	11.66	12.50	9.56	Travel +1/4	1.25	4.000 ±.005	4.50	10.50	1.31	1.375 +.000/−.002	3.75	7.50	4.50	12.50	5.13	10.25	6.00	15.50	7.00	14.00	2.10	3.750 +.003/−.000	1.62	7.75	1.62	2.63	1.38	.313 × .156 × 2.00 LG
SM-1850	50	16.66	13.50	11.38	Travel	1.25	4.750 ±.005	5.63	11.25	1.25	1.500 +.000/−.002	8.00	16.00	3.00	6.00	9.88	19.75	4.88	9.75	11.00	22.00	4.40	5.313 +.003/−.000	1.38	8.75	1.88	3.25	1.88	.375 × .188 × 2.25 LG
SM-1899	100	33.33	24.00	18.50	Travel +1/2	1.50	6.000 ±.005	7.00	14.00	2.94	1.750 +.000/−.002	*	*	*	*	12.25	24.50	8.00	20.75	11.50	23.00	3.40	7.500 +.003/−.002	*	*	•	*	*	.500 × .250 × 3.00 LG

Note:
1. Dimensions are subject to change without notice.
2. For models SM1802 and SM-1850 style as per section 1.2.3.2.
3. Dimensions in inches.
4. LHS = Left Hand Side
5. RHS = Right Hand Side

1.2.6. Micro Miniature Actuator

Manual operation is accomplished with an easy to use hand knob. The dial indicator is protected by a removable clear plastic cover.

Dial indicators available on request. Indicate preference when ordering:

- **Dial SK-3554-46**
  Balanced dial reading 0 → 50 → 0 inches with 0.001'' graduations with revolution counter.

- **Dial SK-3554-83**
  Continuous dial reading 0 → 100 inches in 0.001'' graduations with revolution counter.

- **Metric Dial**
  Dial readings with 0 → 50 → 0mm or 0 →100mm with 0.01mm graduations with revolution counter.

  (Type of dial must be specified as above when ordering the actuator)

- Actuates up to 450 kg (1,000 lb).

- Allows for extremely fine adjustment.

- Equipped with anti-backlash nuts to minimise vertical backlash between lifting screw and worm gear nut.

- Standard model has anodised aluminium shell cap and housing with stainless steel worm and lifting screws.

- Stainless Steel option has sealed 316 stainless steel shell cap, housing, worm and lifting screw.

Note   The load bearings and worm bearings inside stainless steel actuators are not stainless steel.

Patent Numbers:
3,220,277 and
3,323,777

1.2.6.1. Micro Miniature Actuator Specification

Model	Rated Capacity		Screw Dia.	Turns of Worm for 1/2" Raise	Lifting Torque at Full Load		Worm Gear Ratio	Weight		Shell Cap & Housing
	(kg)	(lb)	(inch)		Nm	in.lb		(kg)	(lb)	
M-3554-30	225	500	0.500	500	1.36	12	20:1	0.91	2	Aluminium
M-3554-27	450	1000	0.625	500	2.03	18	20:1	0.91	2	Aluminium
M-3554-136	450	1000	0.625	500	2.03	18	20:1	1.36	3	Stainless Steel
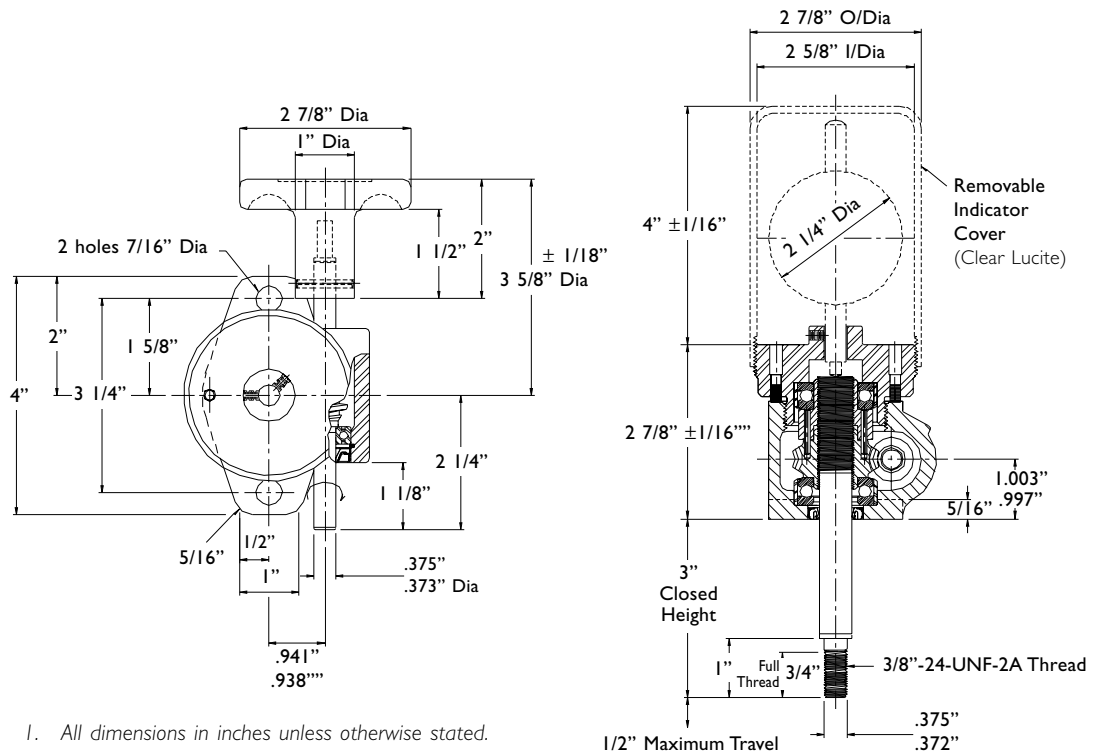
Note   1.   All dimensions in inches unless otherwise stated.
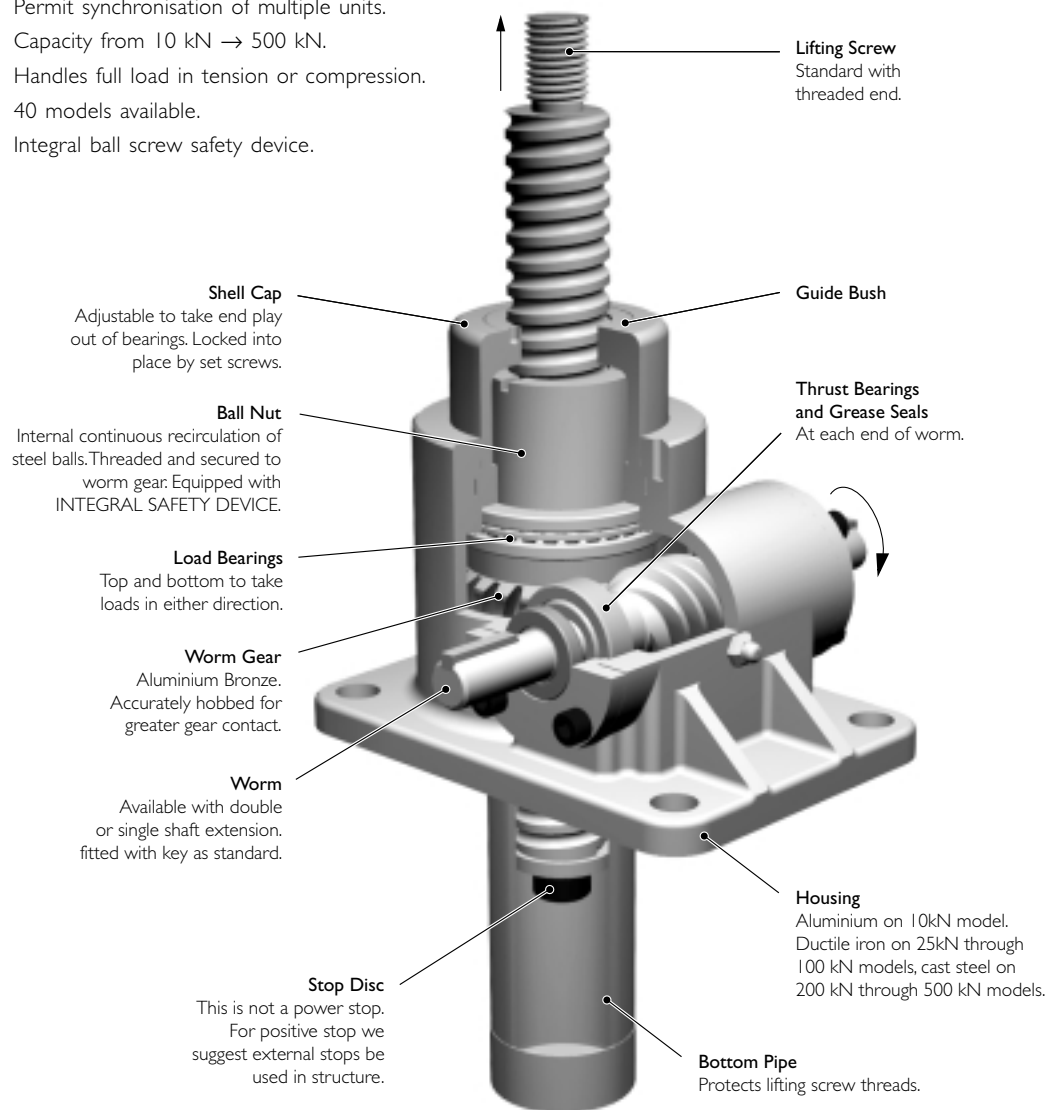*2.   Dimensions are subject to change without notice.*

1.3.   Ball Screw Actuator

1.3.1.   E-Series Metric Ball Screw Jacks

Advantages

- Move Loads and apply force more efficiently than other mechanical actuators.
- Permit faster operation and longer life under load.
- Require less power by providing positive mechanical action.
- Permit synchronisation of multiple units.
- Capacity from 10 kN $\rightarrow$ 500 kN.
- Handles full load in tension or compression.
- 40 models available.
- Integral ball screw safety device.

Lifting Screw
Standard with threaded end.

Guide Bush

Shell Cap
Adjustable to take end play out of bearings. Locked into place by set screws.

Thrust Bearings and Grease Seals
At each end of worm.

Ball Nut
Internal continuous recirculation of steel balls. Threaded and secured to worm gear. Equipped with INTEGRAL SAFETY DEVICE.

Load Bearings
Top and bottom to take loads in either direction.

Worm Gear
Aluminium Bronze. Accurately hobbed for greater gear contact.

Worm
Available with double or single shaft extension. fitted with key as standard.

Housing
Aluminium on 10kN model. Ductile iron on 25kN through 100 kN models, cast steel on 200 kN through 500 kN models.

Stop Disc
This is not a power stop. For positive stop we suggest external stops be used in structure.

Bottom Pipe
Protects lifting screw threads.

The metric ball screw gives you a single-package, positive action linear actuator that can be driven by an electric, air or hydraulic motor. A ball-bearing type heat-treated screw and mating nut with rolling contact reduces friction to a bare minimum in converting torque to thrust. Overall operating efficiency is as high as 70% in some models, depending on the worm gear ratio.

Metric ball screw actuators are available as translating or rotating screws in either upright or inverted configurations. In the translating screw type, the ball nut is fixed to the gear and the lifting screw moves up and down through the nut. In the rotating screw type, the screw is fixed to the gear and the ball nut travels along the screw.

Depending on size and type of load, models are available with raises up to 3 metres. Raises up to 6 metres are available on request. Metric ball screw actuators may be used individually, in tandem or in multiple arrangements. Special models are available and there is no extra charge for single ended worm shafts extensions.
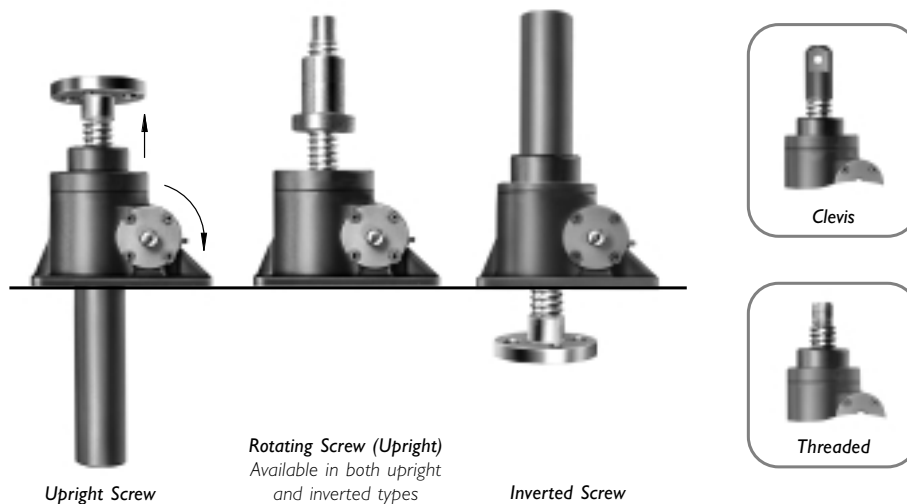
Metric Ball Screw Actuator Models

Features

- **Integral Safety Device** - All Power Jacks Metric ball screw actuator except Model E28501 have an integral safety device as standard. This provides two important safety roles: (a) wear indicator and (b) sustain the load in the unlikely event of catastrophic ball failure. For further details refer to section 1.3.1.1.2.
- **High Speed** - Low friction permits linear motion in some models up to 6 $^m/_{min}$ at 1800 rpm worm shaft speeds, providing maximum power ratings are not exceeded.
- **Precise Positioning** - Can be controlled accurately for positioning within hundredths of a millimetre.
- **Positive Action** - Operates with a high degree of reliability, without the need for costly pumps, hoses or valves.
- **Uniform Lifting Speed** - Highly efficient design means less power is needed to achieve a given thrust; power needs are as much as two-thirds that of machine screw actuators, with savings in motors, couplings, reducers, shafting and controls.
- **Long-Life** - Low friction means longer operating life.
- **Low Power Usage** - Highly efficient design means less power is needed to achieve a given thrust; power needs are as much as two-thirds that of machine screw actuators.
- **Internal Recirculating Balls** - For smooth movement, less turns per circuit and absence of parts liable to wear.

Options

- 2 Standard Gear Ratios.
- **2 Ball Screw Lead Options as Standard** - Other leads are available on request.
- **Pre-Loaded Ball Screw** - These ball screw assemblies give zero linear backlash (available on request).
- **Anti-Rotation Device** - Stops a translating screw from rotating when the screw end is free.
- **Bellows Boot Option** - Protects the screw from dust, dirt, moisture and corrosive contaminants.
- **Secondary Guide Option** - Increases a lifting screw lateral rigidity aiding screw guidance and improved side load resilience.
- **Double Clevis End Option** - Incorporates a special clevis end bottom pipe and a standard clevis end on the lifting screw.

Upright Screw

Rotating Screw (Upright)
Available in both upright and inverted types

Inverted Screw

Clevis

Threaded

Note *Clockwise rotation of worm raises load on all models - counter clockwise available at extra charge.*
Unless a translating screw has an anti-rotation device, the lifting screw end should be bolted to the lifting member to prevent the screw from rotating.
Actuators are equipped with "Alemite" grease fittings.
Recommended lubricants are listed in the installation and maintenance instructions.
Actuators supplied complete with drive shaft keys.

Attachments

IEC and NEMA flange, motors, gearboxes, reducers and couplings available for single actuator drive or multiple actuator arrangements (refer 4, 6, 7 and 8).

Motion control components include electronic motion controllers, motor drives, operator interfaces, encoders, limit switches, potentiometers and meters with LCD display (refer 8).

1.3.1.1. Performance of Standard E-Series Metric Ball Screw Jacks

Actuator Model		E28501	E2802		E2805		E2810		E2820		E2830	E2860
Capacity (kN)		10	25		50		100		200		300	500
Lifting Screw	Diameter	20 mm	25 mm		40 mm		50 mm		63 mm		80 mm	Available on Request
	Pitch	5 mm	5 mm	10mm	10 mm	20mm	10 mm	20mm	10 mm	20mm	20 mm	
Worm Gear Ratios	Standard	5	6:1		6:1		8:1		8:1		10 2/3	
	Optional	20	24:1		24:1		24:1		24:1		32	
Turn of worm for Raise of Lifting Screw	Standard	10 for 10 mm	12 for 10 mm	6 for 10 mm	6 for 10 mm	3 for 10 mm	8 for 10 mm	4 for 10 mm	8 for 10 mm	4 for 10 mm	5.33 for 10 mm	
	Optional	40 for 10 mm	48 for 10 mm	24 for 10 mm	24 for 10 mm	12 for 10 mm	24 for 10 mm	12 for 10 mm	24 for 10 mm	12 for 10 mm	16 for 10 mm	
Maximum Input Power per Actuator (kW)	Standard	0.375	1.5		3		3.75		3.75		6	
	Optional	0.18	0.375		0.55		1.125		1.125		1.9	
Start-Up Torque at full Load (Nm) †	Standard	2.7	5.9	11.1	23.4	44.6	36.4	68.5	75.2	139.4	182	
	Optional	1.2	2.6	4.9	10.7	20.4	19.1	35.8	39.4	72.9	107.3	
Weight with base raise of 150mm (kg)		2.8	8.17		15.88		24.72		45		86	
Weight for each additional 25mm raise (kg)		0.08	0.21		0.32		0.57		0.86		1.58	

†   For loads of 25% to 100% of actuator capacity, torque requirements are approximately proportional to the load.

1.3.1.1.1.   Metric Ball Screw Actuator Efficiencies

Standard Gear Ratio

Actuator Model	E28501	E2802		E2805		E2810		E2820		E2830	E2860
Gear Ratio	5	6		6		8		8		10 2/3	Available on Request
Lifting Screw Lead (mm)	5	5	10	10	20	10	20	10	20	20	
Actuator Static Efficiency	0.603	0.565	0.600	0.567	0.595	0.546	0.581	0.529	0.571	0.492	
Actuator Dynamic Efficiency	0.681	0.662	0.692	0.663	0.687	0.645	0.674	0.631	0.665	0.595	

Optional Gear Ratio

| Actuator Model	E28501	E2802		E2805		E2810		E2820		E2830	E2860
Gear Ratio	20	24		24		24		24		32	Available on Request
Lifting Screw Lead (mm)	5	5	10	10	20	10	20	10	20	20	
Actuator Static Efficiency	0.341	0.320	0.340	0.310	0.325	0.348	0.370	0.337	0.364	0.278	
Actuator Dynamic Efficiency	0.429	0.419	0.438	0.407	0.422	0.450	0.470	0.440	0.465	0.371	

Note   Efficiency values for standard grease lubricated worm gear box and lifting screw.

1.3.1.1.2.   **Ball Nut Design**

Power Jacks ball nut employs the internal ball transfer system for recirculating the balls. This design provides for:

- Robust design.
- Small ball nut body outer diameter.
- Smooth movement.
- Less turns per circuit.
- Absence of parts liable to wear.

For standard units the single liner, single circuit transfer system is used e.g.
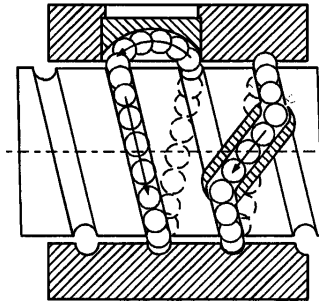
### 1.3.1.1.2.1. **Integral Safety Device**

All Power Jacks metric ball screw actuators have an integral safety device as standard. This provides two important safety roles:

1. In the unlikely event of an excessive wear in the ball screw drive, the safety device will contact the screw shaft, and act as an "ACME" Thread. This will provide early warning of any possible ball screw failure, and is capable of providing drive in the event of any such failure. This can allow a control system to alert an operator to wear of this kind by monitoring the increase in motor current required to drive the system due to the increased friction generated by the device.

2. It allows the ball nut on the actuator to sustain a load in the event of catastrophic ball failure. The safety of industrial and human cargo is therefore improved. Ball screw systems without this device could collapse under load or drop the carried load.

   Note: Model E28501 ball screw actuator does not have safety device as standard if required consult Power Jacks Ltd.

1.3.1.1.2.2. **Sealing**

On metric ball screw actuators solid formed nylon wiper seals on the ball nut prevents ingress of foreign matter and retain lubrication within the nut.
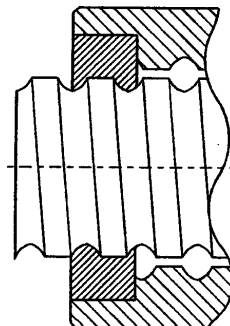
1.3.1.1.2.3. Preloaded for Reduced Axial Backlash

Power Jacks Metric Ball Screw Actuators can be provided with preloaded ball nuts to give reduced axial backlash as a high efficiency alternative to the metric machine screw anti-backlash option. The preloading on the ball nut is obtained by the "Interference Ball" method. By fitting interference balls in the ball nut to obtain a diametral interference fit and using the ogival track form, a four-point contact results e.g.

Four Point Contact
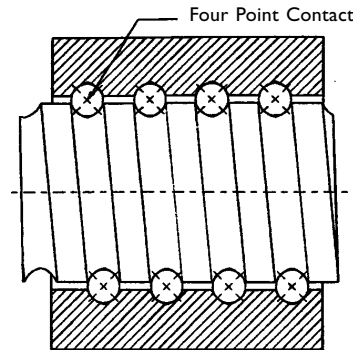
1.3.1.1.3. Ball Screw Life

Theoretical service life can be expressed in either L_{10} 10^6 revolutions or $L_h 10^3$ hours or L_d kilometres. As the life of a ball screw is determined by metal fatigue it is not possible to accurately predict life. However, it is practical to suppose that 90% of a sufficiently large number of equally sized ball screws running under equal working conditions will reach L_{10} or L_h without evidence of material fatigue.

The L_{10} ball screw life is rated using the Dynamic Capacity, which is the maximum constant axial load that can be applied in running conditions for a life of 1.10^6 revolutions of the ball screw. This can be expressed in linear travel (L_d).

$$L_d = L_{10} * P$$

Where L_{10} = Service Life (millions of revolutions)
L_d = Service Life (km)
P = Pitch of Ball Screw (mm)

Linear Travel L_d in km			Working Load (kN)										
Actuator Model	Actuator Rating (kN)	Actuator Pitch (mm)	5	10	25	30	50	75	100	150	200	250	300
E28501	10	5	20.5	2.5	-	-	-	-	-	-	-	-	-
E2802	25	5	381	48	3	-	-	-	-	-	-	-	-
E28021	25	10	1 775	222	14	-	-	-	-	-	-	-	-
E2805	50	10	11 978	1 497	96	55	12	-	-	-	-	-	-
E28051	50	20	17 039	2 130	136	79	17	-	-	-	-	-	-
E2810	100	10	32 287	4 036	258	149	32	10	4	-	-	-	-
E28101	100	20	38 503	4 813	308	178	39	11	5	-	-	-	-
E2820	200	10	162 327	20 291	1 299	752	162	48	20	6	3	-	-
E28201	200	20	320 060	40 008	2 560	1 482	320	95	40	12	5	-	-
E2830	300	30	903 882	112 985	7 231	4 185	904	268	113	33	14	7	4

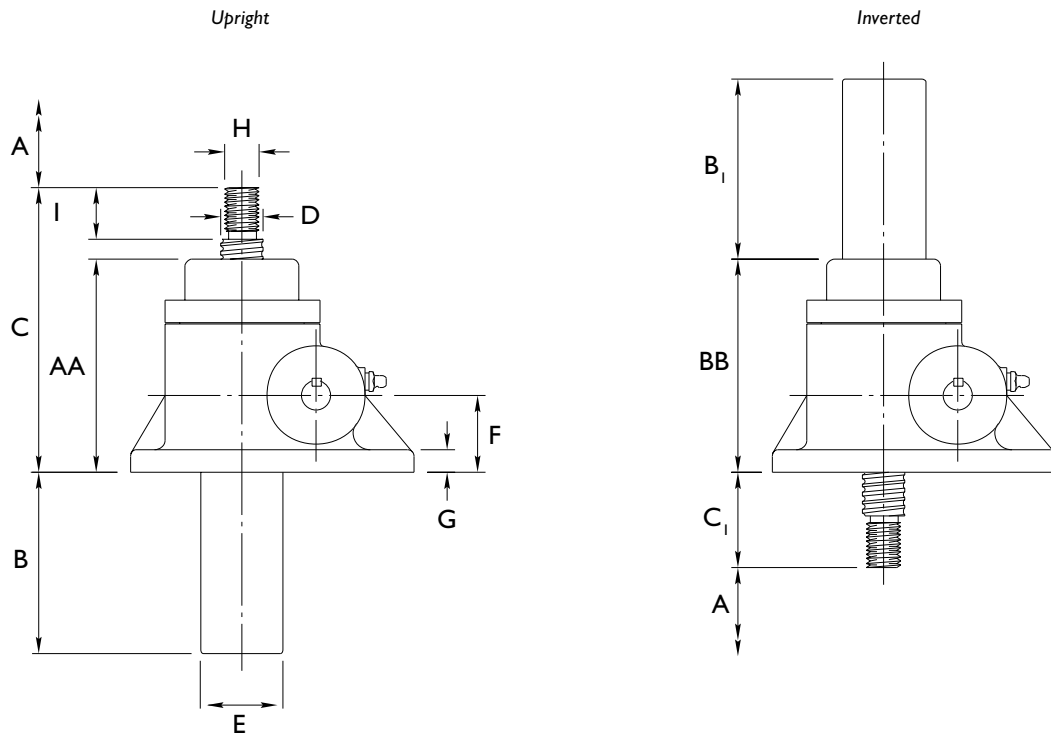Use the following formulae to calculate the service life in terms of hours running:

$$L_h = \frac{L_{10} * Gr}{60 * n_m}$$

Where L_h = Service Life (hours)
L_{10} = Service Life (revolutions)
n_m = Mean Actuator Input Speed (rpm)
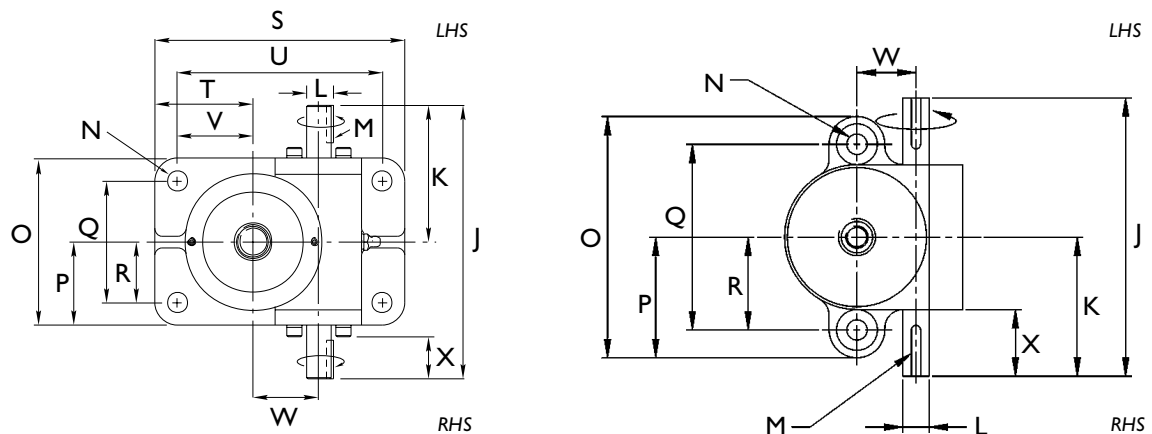Gr = Actuator Gear Ratio

Note: *Ball screw life based on dynamic load calculated according to DIN69051 Part 4.*

screw**jacks**

1.3.1.2. Metric Ball Screw Actuator Dimensions

1.3.1.2.1. Standard Metric Translating Screw Actuators

Upright

Inverted

Plan View

LHS

RHS

LHS

RHS

Models:
2802, 28021, 2805,
28051, 2810, 28101,
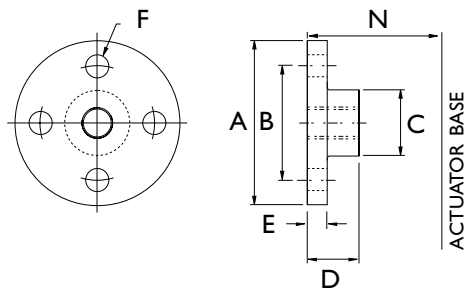*2820, 28201,*
2830, 2860.

Model:
28501

Note   1. All dimensions in mm.
2. Dimensions are subject to change without notice.
3. LHS = Left Hand Side
4. RHS = Right Hand Side

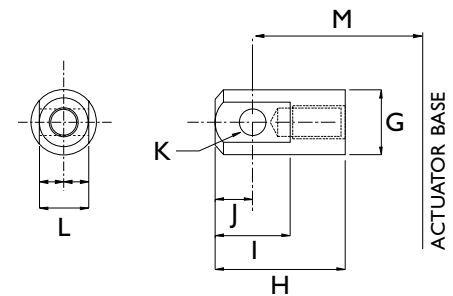| Model	Upright	E28501	E2802	E28021	E2805	E28051	E2810	E28101	E2820	E28201	E2830	E2860
	Inverted	E28500	E2801	E28011	E2804	E28041	E2809	E28091	E2819		E2829	E2859
Capacity (kN)		10	25	25	50	50	100	100	200	200	300	500
A		Raise As Required										
B		A + 35	A + 10	A + 10	A + 10	A + 10	A + 15	A + 15	A + 10	A + 10	A + 30	
B₁		A + 35	A + 25	A + 25	A + 25	A + 25	A + 25	A + 25	A + 25	A + 25	A + 25	
C		150	165	185	215	255	245	275	313	351	445	
C₁		45	55	55	65	65	80	80	95	95	115	
D		20	25	25	40	40	50	50	63	63	80	
E		42	48.3	48.3	60.3	60.3	73	73	89	89	115	
F		40 ± 0.13	45 ± 0.13	45 ± 0.13	60 ± 0.13	60 ± 0.13	60 ± 0.13	60 ± 0.13	85 ± 0.13	85 ± 0.13	105 ± 0.13	
G		9	13	13	14	14	16	16	20	20	30	
H		M12 × 1.75	M20 × 2.5	M20 × 2.5	M24 × 3	M24 × 3	M36 × 4	M36 × 4	M48 × 5	M48 × 5	M72 × 4	
I		24	30	30	35	35	40	40	55	55	65	
J		150	180	180	230	230	280	280	300	300	380	
K		75	90	90	115	115	140	140	150	150	190	
L		Ø14 h8	Ø16 h8	Ø16 h8	Ø19 h8	Ø19 h8	Ø25 h8	Ø25 h8	Ø28 h8	Ø28 h8	Ø35 h8	
M		5 × 5 × 25	5 × 5 × 25	5 × 5 × 25	6 × 6 × 32	6 × 6 × 32	8 × 7 × 40	8 × 7 × 40	8 × 7 × 40	8 × 7 × 40	10 × 8 × 50	
N		11	13.5	13.5	18	18	22	22	26	26	39	
O		130	110	110	150	150	190	190	210	210	260	
P		65	55	55	75	75	95	95	105	105	130	
Q		100	80	80	115	115	145	145	150	150	190	
R		50	40	40	57.5	57.5	72.5	72.5	75	75	95	
S		-	165	165	205	205	225	225	275	275	365	
T		-	65	65	75	75	75	75	105	105	140	
U		-	135	135	170	170	180	180	215	215	295	
V		-	50	50	57.5	57.5	52.5	52.5	75	75	105	
W		31.75 + 0.076 - 0.000	43.26 + 0.025 - 0.025	43.26 + 0.025 - 0.025	55.58 + 0.050 - 0.000	55.58 + 0.050 - 0.000	66 + 0.060 - 0.000	66 + 0.060 - 0.000	66 + 0.070 - 0.000	66 + 0.070 - 0.000	95.25 + 0.130 - 0.000	
X		36	27.5	27.5	35	35	44	44	44	44	56	
AA		114	124	144	169	209	190	220	243	281	360	
BB		114	124	144	169	209	190	220	243	281	360	

(Right-hand E2860 / E2859 column: Available on Request)

1.3.1.2.2. Standard Translating Ball Screw Ends

Top Plate

Clevis End

Model		E28501	E2802	E28021	E2805	E28051	E2810	E28101	E2820	E28201	E2830	E2860
A		Ø80	Ø100	Ø100	Ø120	Ø120	Ø150	Ø150	Ø170	Ø170	Ø240	Ø280
B		P.C.D. 55	P.C.D. 70	P.C.D. 70	P.C.D. 85	P.C.D. 85	P.C.D. 110	P.C.D. 110	P.C.D. 120	P.C.D. 120	P.C.D. 170	P.C.D. 215
C		Ø30	Ø40	Ø40	Ø50	Ø50	Ø65	Ø65	Ø75	Ø75	Ø110	Ø150
D		24	31.5	31.5	36.5	36.5	42	42	58	58	67	92
E		10	12	12	16	16	20	20	25	25	30	35
F		Ø11	Ø13.5	Ø13.5	Ø18	Ø18	Ø22	Ø22	Ø26	Ø26	Ø33	Ø33
G		Ø30	Ø40	Ø40	Ø50	Ø50	Ø65	Ø65	Ø75	Ø75	Ø110	Ø150
H		63	79.5	79.5	91.5	91.5	120	120	143	143	167	217
I		36	46	46	60	60	66	66	80	80	120	150
J		18	23	23	30	30	33	33	40	40	60	75
K		Ø12	Ø16	Ø16	Ø20	Ø20	Ø22	Ø22	Ø30	Ø30	Ø45	Ø60
L		20	30	30	35	35	40	40	50	50	80	110
M	Upright	150	191.5	211.5	241.5	281.5	292	322	361	399	485	Available on request
	Inverted	45	81.5	81.5	91.5	91.5	127	127	143	143	155	
N	Upright	170	166.5	186.5	216.5	256.5	247	277	316	354	445	
	Inverted	65	56.5	56.5	66.5	66.5	82	82	98	98	115	

### 1.3.1.2.3. Standard Rotating Ball Screw Actuators

For other dimensions and performance data refer to translating actuators.

1.3.1.2.3.1. Upright Rotating Ball Screw
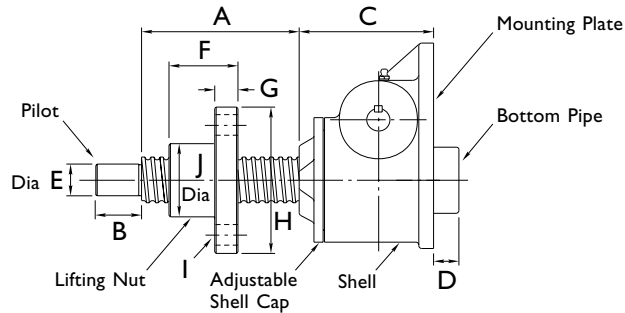
Model No	Rating (KN)	A	B	C	D	E	F	G	H	I	J
UE-28502	10	Raise + 74	16	90	0	12	44	12	55	6 Holes - 7 Dia. on 45 Dia. P.C.D.	32
UE-2803	25	Raise + 80	25	103.5	0	20	62	15	90	4 Holes - 13.5 Dia. on 65 Dia. P.C.D.	40
UE-28031		Raise + 100					82				
UE-2806	50	Raise + 105	30	138	0	25	87	20	120	4 Holes - 18 Dia. on 90 Dia. P.C.D.	60
UE-28061		Raise + 145					124				
UE-2811	100	Raise + 130	50	146.5	28	35	104	25	155	4 Holes - 22 Dia. on 115 Dia. P.C.D.	70
UE-28111		Raise + 160					134				
UE-2821	200	Raise + 150	65	195	24	45	125	35	185	4 Holes - 26 Dia. on 135 Dia. P.C.D.	85
UE-28211		Raise + 190					163				
UE-2831	300	Raise + 240	85	235	40	75	200	48	230	4 Holes - 26 Dia. on 175 Dia. P.C.D.	120
UE-2861	500	Available on Request									

1.3.1.2.3.2. Inverted Rotating Ball Screw Actuator
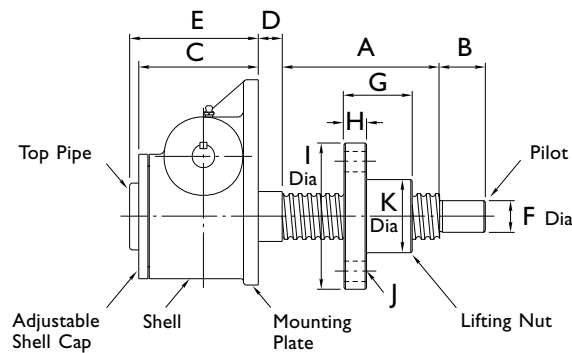
	Model No	Rating (KN)	A	B	C	D	E	F	G	H	I	J	K
DE-28502	10	Raise + 74	16	90	10	90	12	44	12	55	6 Holes - 7 Dia. on 45 Dia. P.C.D.	32
DE-2803	25	Raise + 80	25	95.5	13.5	95.5	20	62	15	90	4 Holes - 13.5 Dia. on 65 Dia. P.C.D.	40
DE-28031		Raise + 100						82				
DE-2806	50	Raise + 105	30	122	18	122	25	87	20	120	4 Holes - 18 Dia. on 90 Dia. P.C.D.	60
DE-28061		Raise + 145						124				
DE-2811	100	Raise + 130	50	130.5	26.5	130.5	35	104	25	155	4 Holes - 22 Dia. on 115 Dia. P.C.D.	70
DE-28111		Raise + 160						134				
DE-2821	200	Raise + 150	65	179	25	203	45	125	35	185	4 Holes - 26 Dia. on 135 Dia. P.C.D.	85
DE-28211		Raise + 190						163				
DE-2831	300	Raise + 240	85	235	25	275	75	200	48	230	4 Holes - 26 Dia. on 175 Dia. P.C.D.	120
DE-2861	500	Available on Request										

1.3.1.3.   Bellows Boots for Metric Actuators

Features

- Protects the screw from dust and dirt.
- Guards against moisture and corrosive contaminants.
- Helps maintain the proper lubrication.
- Boots are made of P.V.C. coated nylon with sewn construction. Other materials are available for applications involving high temperatures, highly corrosive atmospheres and other special conditions.


1.3.1.3.1.   Boot Dimensions
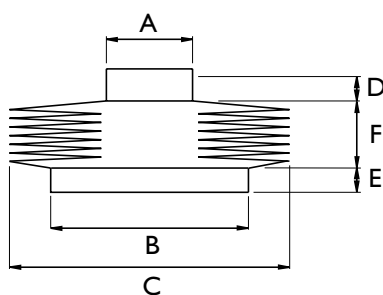
Model	A	B	C	D	E
E28501-B	30	75	114	12	12
E2802-B	40	66	120	15	15
E2805-B	50	85	140	15	15
E2810-B	65	100	150	15	15
E2820-B	75	105	165	20	20
E2830-B	Available on Request				
E2860-B	Available on Request				

Model		E28501-B	E2802-B	E2805-B	E2810-B	E2820-B	E2830-B	E2860-B
F	Raise 0 →300	16	20	20	20	20	Available on Request	Available on Request
	Raise 300 →600	32	30	30	30	30		
	Raise 600 →900	-	-	45	-	-		
	Raise 600 →1050	56	50	-	50	50		
	Raise 900 →1050	-	-	50	-	-		
	Raise 1050 →1500	80	70	70	70	70		
	Raise 1500 →1800	-	100†	95	-	90 †		
	Raise 1500 →2000	-	-	-	105	-		
	Raise 1800 →2100	-	-	110†	-	110†		
	Raise 2000 →2500	-	-	-	120 †	-		
	Raise 2100 →2500	-	-	130†	-	-		
	Raise 2500 →3000	-	-	160†	-	-		

Note   1. **F**   =   *Bellows boot minimum closed thickness.*
2. **-**   =   *Not applicable consult Power Jacks Ltd.*
3. **†**   =   *Control tapes fitted (approximately 20 mm increase to outer diameter).*

1.3.1.3.2.   Upright Metric Ball Screw Actuators with Bellows Boots

Closed Heights

Threaded End   *Top Plate*   *Clevis End*
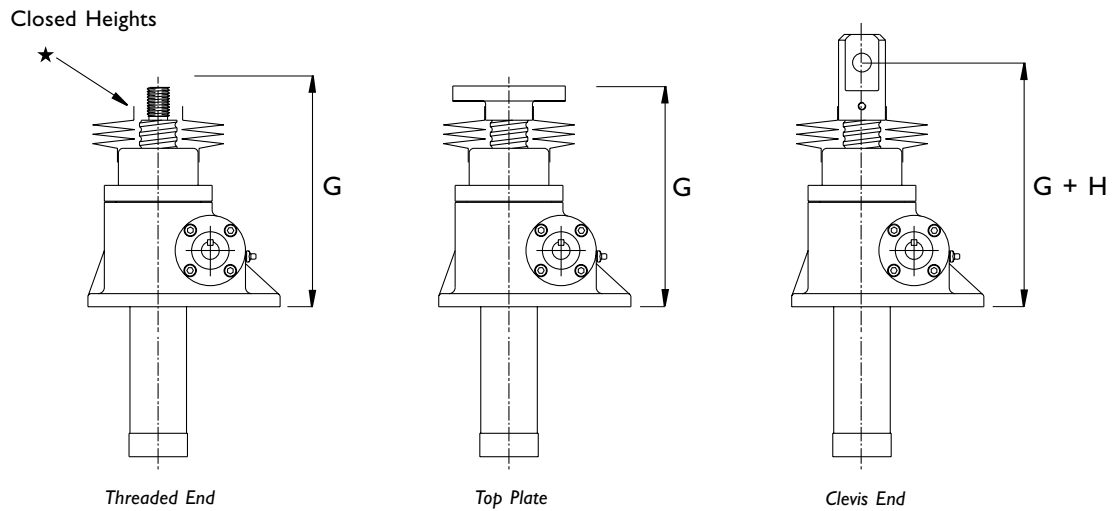
1.3.1.3.2.1. Standard Dimensions for all Upright Metric Ball Screw Actuators

Model		E28501-B	E2802-B	E28021-B	E2805-B	E28051-B	E2810-B	E28101-B	E2820-B	E28201-B	E2830-B & E2860-B
G	Raise 0 →150	-	-	-	-	-	-	-	-	-	
	Raise 0 →300	166	180	200	230	270	255	285	323	361	
	Raise 300 →600	182	190	210	240	280	265	295	333	371	
	Raise 600 →900	-	-	-	255	295	-	-	-	-	Available on Request
	Raise 600 →1050	206	210	230	-	-	285	315	353	391	
	Raise 900 →1050	-	-	-	260	300	-	-	-	-	
	Raise 1050 →1500	230	230	250	280	320	305	335	373	411	
	Raise 1500 →1800	-	260 †	280 †	305	345	-	-	393 †	431†	
	Raise 1500 →2000	-	-	-	-	-	340	370	-	-	
	Raise 1800 →2100	-	-	-	320 †	360 †	-	-	413 †	451†	
	Raise 2000 →2500	-	-	-	-	-	355 †	385 †	-	-	
	Raise 2100 →2500	-	-	-	340 †	380 †	-	-	-	-	
	Raise 2500 →3000	-	-	-	370 †	410 †	-	-	-	-	
H	Extra Closed Height for Clevis	20	25	25	25	25	45	45	45	45	

Note   1.   *Supplied complete with a set of corrosion-resistant 'jubilee' clips (2) suitable for fitting over collar diameters*
         2.   *† Control tapes are fitted (approximately 20 mm increase to outer diameter).*
         3.   *For horizontal installation exceeding 450 mm of travel, internal boot guides are recommended.*
         4.   *Customers with threaded end actuators must provide a fixing for the unattached collar (★).*
         5.   *Bellows boots for Rotating Screw Actuators consult Power Jacks Ltd.*
         6.   *For other sizes, raises, and materials please consult Power Jacks Ltd.*
         7.   *All dimensions in millimetres unless otherwise stated.*

1.3.1.3.3. Inverted Metric Ball Screw Actuators with Bellows Boots

Closed Heights

Actuator Mounting Plate, 'M' thick. Alter thickness to suit application.

Boot Mounting Plate, to suit collar size. Typically ØB × (E+5 mm fitting allowance) thick.

1.3.1.3.3.1. Standard Dimensions for all Inverted Metric Ball Screw Actuators

Model		E28501-B	E2801-B & E28011-B	E2804-B & E28041-B	E2809-B & E28091-B	E2819-B & E28191-B	E2829-B & E2859-B
M	Mounting Plate Thickness	10	15	15	20	20	30
J	Raise 0 → 150	-	-	-	-	-	Available on Request
	Raise 0 → 300	61	100	105	120	140	
	Raise 300 → 600	77	110	115	130	150	
	Raise 600 → 900	-	-	130	-	-	
	Raise 600 → 1050	101	130	-	150	170	
	Raise 900 → 1050	-	-	135	-	-	
	Raise 1050 → 1500	125	150	155	170	190	
	Raise 1500 → 1800	-	180†	170	-	210†	
	Raise 1500 → 2000	-	-	-	195	-	
	Raise 1800 → 2100	-	-	185†	-	230†	
	Raise 2000 → 2500	-	-	-	210†	-	
	Raise 2100 → 2500	-	-	205†	-	-	
	Raise 2500 → 3000	-	-	235†	-	-	
K	Extra Closed Height For Clevis	20	25	25	45	45	

1.3.1.3.4. Notes for all Metric Ball Screw Actuators with Bellows Boots

Note
1. *Supplied complete with a set of corrosion-resistant 'jubilee' clips (2) suitable for fitting over collar diameters.*
2. *† Control tapes are fitted (approximately 20 mm increase to outer diameter).*
3. *For horizontal installation exceeding 450 mm of travel, internal boot guides are recommended.*
4. *Customers with threaded end actuators must provide a fixing for the unattached collar (★).*
5. *Bellows boots for Rotating Screw Actuators consult Power Jacks Ltd.*
6. *For other sizes, and materials please contact Power Jacks Ltd.*
7. *All dimensions in millimetres unless otherwise stated.*
8. *Dimensions subject to change without notice.*

1.3.1.4. Standard Flange Bolt Configuration for Worm Shafts
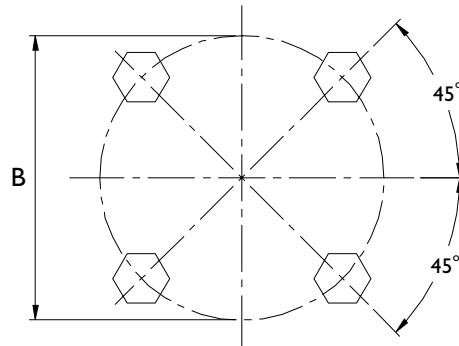
Model	'B' Bolt P.C.D. (mm)	Bolt Information
E28501	-	-
E2802	46	M6 × 1 mm Pitch, 14 mm Deep
E2805	61	M8 × 1.25 mm Pitch, 22 mm Deep
E2810	70	M8 × 1.25 mm Pitch, 14 mm Deep
E2820	88	M10 × 1.5 mm Pitch, 14 mm Deep
E2830	107	M10 × 1.5 mm Pitch, 19 mm Deep

Note   1.   All dimensions in millimetres unless otherwise stated.
2.   Dimensions subject to change without notice.

1.3.1.5. Metric Double Clevis End Ball Screw Actuators
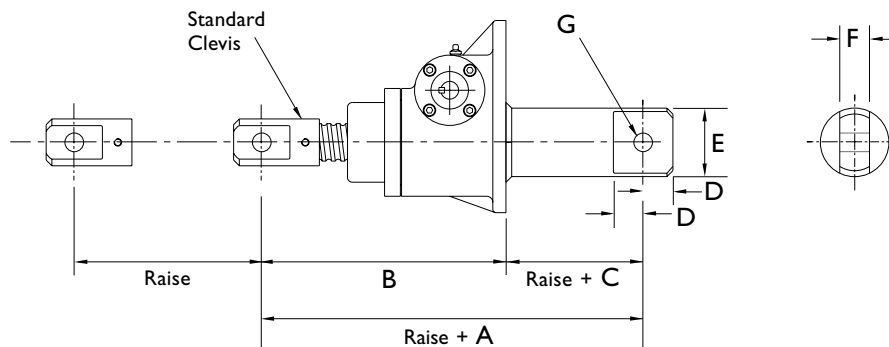
Model	CCE 28501	CCE 2802	CCE 28021	CCE 2805	CCE 28051	CCE 2810	CCE 28101	CCE 2820	CCE 28201	CCE 2830	CCE 2860
Capacity (kN)	10	25	25	50	50	100	100	200	200	300	500
A		250	270	310	350	420	450	500	538		
B		192	212	242	282	292	322	361	399		
C	Available on Request	58	58	68	68	128	128	139	139	Available on Request	Available on Request
D		23	23	30	30	33	33	40	40		
E		48.3	48.3	60.3	60.3	73	73	102	102		
F		30	30	35	35	40	40	50	50		
G		16	16	20	20	22	22	30	30		
Max Raise at Max Rated Load in Compression		280	200	600	560	658	588	769	621		

Note   1.   For other performance and dimension information refer to translating screw models.
2.   All dimensions in millimetres unless otherwise stated.
3.   Dimensions subject to change without notice.

1.3.1.6.   Motor Adaptors for Metric Ball Screw Actuators

Dimensions and details are the same as for Metric Machine Screw Actuators.

Please refer to section 1.2.2.11.
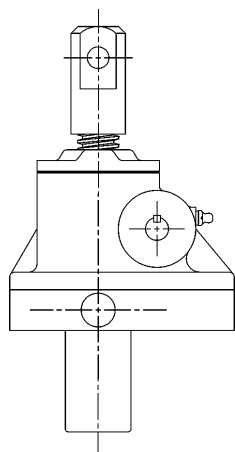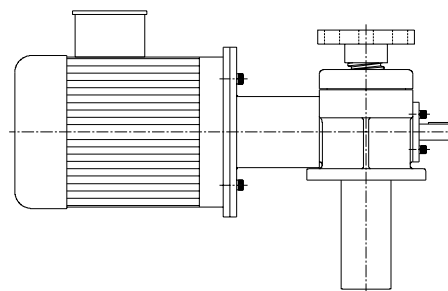
1.3.1.7.   Trunnion Mounts for Metric Ball Screw Actuators

Dimensions and details are the same as for Metric Machine Screw Actuators.

Please refer to section 1.2.2.12.

1.3.1.8.   Rotary Limit Switch Adaptors for Metric Ball Screw Actuators

Dimensions and details are the same as for Metric Machine Screw Actuators.

Please refer to sections 1.2.2.13. and 1.2.2.14.
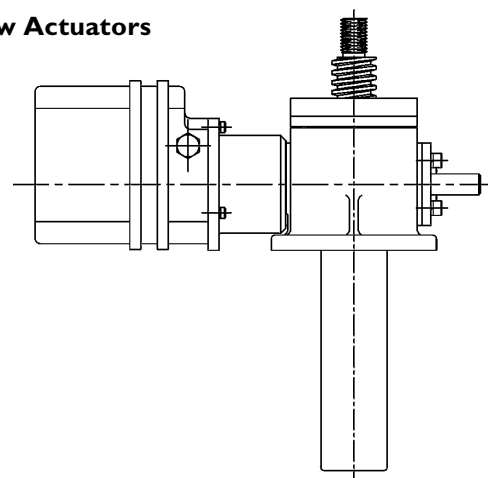
1.3.1.9.   Limit Switches Mounted on Metric Ball Screw Actuator Bottom Pipes

Dimensions and details are the same as for Metric Machine Screw Actuators.

Please refer to section 1.2.2.16.
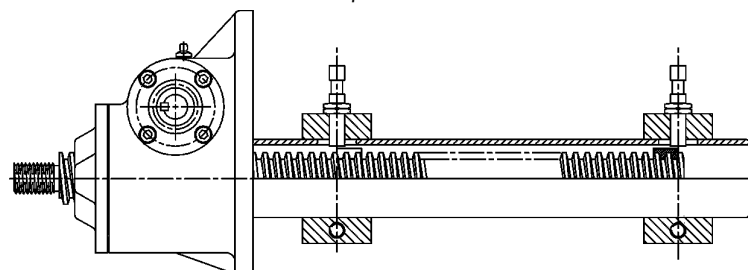
1.3.1.10. Anti-Rotation for Metric Ball Screw Actuators

The anti-rotation device is available for translating ball screw models only. It is used only when the load to be moved (actuated) may rotate, i.e. the screw is unguided and does not prevent rotation.

The anti-rotation device consists of a square steel tube which guides the movement of a square aluminium bronze guide block fitted to the end of the ball screw. The guide block also acts as a stop nut.
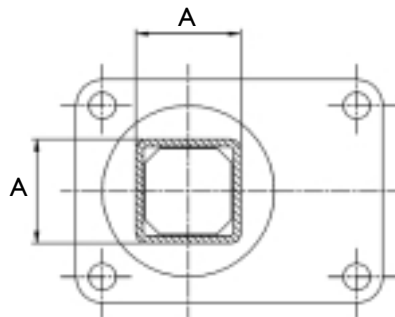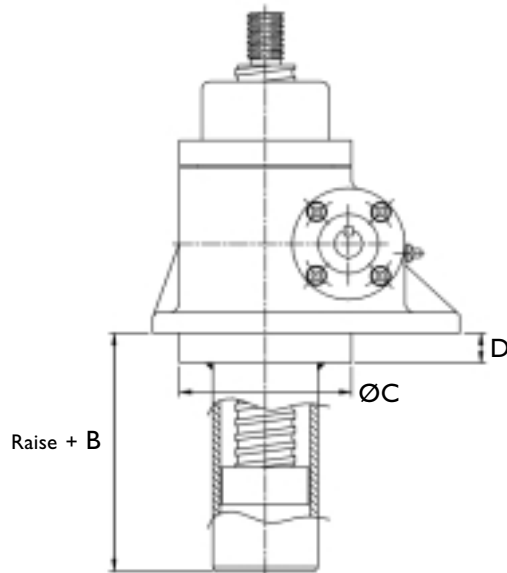
Model	28501	2802	2805	2810	2820	2830	2860
Capacity (kN)	10	25	50	100	200	300	500
A	AOR	50	70	AOR	AOR	AOR	AOR
B	AOR	50	60	AOR	AOR	AOR	AOR
C	AOR	90	115	AOR	AOR	AOR	AOR
D	AOR	16	20	AOR	AOR	AOR	AOR

Note   1.   *AOR = Application On Request, consult Power Jacks Ltd.*
2.   *All dimensions in millimetres unless otherwise stated.*
3.   *Dimensions subject to change without notice.*

1.3.2.   M-Series Imperial Ball Screw Jacks

Advantages

- Move Loads and apply force more efficiently than machine screw actuators.
- Permit faster operation and longer life under load.
- Require less power by providing positive mechanical action.
- Permit synchronisation of multiple units.
- Capacity from 1/2 to 50 tons (4.5 kN to 450 kN).
- Handles full load in tension or compression.
- 40 models available.

Lifting Screw
Standard with threaded end.

Shell Cap
Adjustable to take end play
out of bearings. Locked into
place by set screws.

Ball Nut
Equipped with return tubes
for continuous recirculation
of steel balls. Threaded and
secured to worm gear. Should
be ordered as set.

Worm Gear
Aluminium bronze. Accurately
hobbed for greater gear contact.

Load Bearings
Top and bottom to take loads
in either direction.

**Thrust Bearings
and Grease Seals**
At each end of
worm. 1/2 ton
models do not
have seals.

Worm
Available with double
or single shaft extension. Clockwise
rotation of this end raises load on
all actuator models except 50 ton
ball screw actuator units.

Housing
Aluminium on 1/2 ton models,
ductile iron on 2 ton through
10 ton models, cast steel on
20 ton through 50 ton models.

Bottom Pipe
Protects lifting screw threads.

Stop-Disc
This is not a power stop. For
positive stop we suggest external
stops be used in structure.

The Imperial ball screw gives you a single-package, positive action linear actuator which can be driven by an electric, air or hydraulic motor. A ball-bearing type heat-treated screw and mating nut with rolling contact reduces friction to a bare minimum in converting torque to thrust. Overall operating efficiency is as high as 70% in some models, depending on the worm gear ratio.

Imperial ball screw actuators are available as translating or rotating screws in either upright or inverted configurations. In the translating screw type, the ball nut is fixed to the gear and the lifting screw moves up and down through the nut. In the rotating screw type, the screw is fixed to the gear and the ball nut travels along the screw.

Depending on size and type of load, models are available with raises up to 10 feet (3 metres). Raises up to 20 feet (6 metres) are available on request. Ball screw actuators may be used individually, in tandem or in multiple arrangements. Special models are available and there is no extra charge for single ended worm shafts extensions.
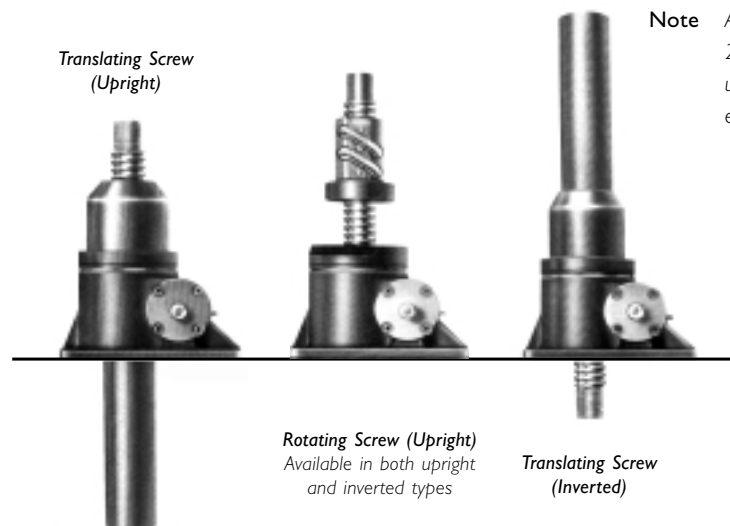
Imperial Ball Screw Actuator Models

Features

- **High Speed** - Low friction permits linear motion in some models up to 300 $^{inches}/_{min}$ (7.62 $^m/_{min}$) at 1800 rpm worm shaft speeds, providing maximum horsepower ratings are not exceeded.
- **Precise Positioning** - Can be controlled accurately for positioning within thousandths of an inch.
- **Positive Action** - Operates with a high degree of reliability, without the need for costly pumps, hoses or valves
- **Long-Life** - Low friction means longer operating life.
- **Low Power Usage** - Highly efficient design means less power is needed to achieve a given thrust; power needs are much as two-thirds that of machine screw actuators.

Options

- **3 Standard Gear Ratios** - Wide selection of gear ratios, increases the amount of raise rates available.
- **2 Ball Screw Lead Options** - On the 2, 5 and 10 ton models there is the option of either the standard or a 1'' (25.4 mm) lead for rapid raise rates.
- **Screw on Ends** - The standard actuator has a threaded end to which clevis or top plates can be screwed. Note these items are shipped loose and must be spot drilled before seating set screws in field installations.
- **Bellows Boot Option** - Protects the screw from dust, dirt, moisture and corrosive contaminants.
- **Double Clevis End Option** - Incorporates a special clevis end bottompipe and standard clevis end on the lifting screw.

Note *A brake is required on 2800 and 9800 actuator units due to their high efficiency.*

Translating Screw (Upright)

Rotating Screw (Upright)
Available in both upright and inverted types

Translating Screw (Inverted)

Note *Translating screw models covered by U.S. Patent No. 3,178,958*
Clockwise rotation of worm raises load on all models (refer previous page) except 50 ton ball screw actuator - counter clockwise available at extra charge.
The lifting screw end should be bolted to the lifting member to prevent the screw from rotating.
Actuators are equipped with "Alemite" grease fittings.
Recommended lubricants are listed in the installation and maintenance instructions.
Actuators supplied complete with drive shaft keys.

Attachments

IEC and Nema C-Face flanges, motors, gear boxes, reducers and couplings available for single actuator drive or multiple actuator arrangements (refer 4, 5,6,7 and 8.).

Motion control components include motor drives, Motion Controllers with operator interfaces, encoders, limit switches, potentiometers and meters with LCD display (refer 8.).

1.3.2.1. Performance of Standard Imperial Ball Screw Actuators

Model		28631	2802 & 9802*	28021 & 98021*	28003	2805	28051	2810	28101	2820	2825	2860
Model	Upright	28631	2802 & 9802*	28021 & 98021*	28003	2805	28051	2810	28101	2820	2825	2860
	Inverted	28630	2801 & 9801*	28011 & 98011*	28002	2804	28041	2809	28091	2819	2824	2859
Capacity (Short Tons)		0.5	2	2	3	5	5	10	10	20	25	50
Lifting Screw (Inches)	Diameter	5/8	1	1	1 11/64	1.5	1.5	1.5	1.5	2.25	3	4
	Lead	0.2	0.25	1	0.413	0.474	1	0.474	1	0.5	0.66	1
Worm Gear Ratios	Standard	5:1	6:1	6:1	6:1	6:1	6:1	8:1	8:1	8:1	10 2/3:1	10 2/3:1
	Option 1	20:1	24:1	24:1	24:1	24:1	24:1	24:1	24:1	24:1	32:1	32:1
	Option 2	-	12:1	12:1	12:1	-	-	-	-	-	-	-
Turns of Worm for 1" Raise	Standard	25	24	6	14.526	12.667	6	16.888	8	16	16.16	10.66
	Option 1	100	96	24	58.104	50.667	24	50.667	24	48	48.48	32
	Option 2	-	48	12	29.052	-	-	-	-	-	-	-
Maximum HP per actuator	Standard	1/3	2	2	2	4	4	5	5	5	8	15
	Option 1	1/6	1/2	1/2	1/2	3/4	3/4	1 1/2	1 1/2	1 1/2	2 1/2	6
	Option2	-	3/4	3/4	3/4	-	-	-	-	-	-	-
Starting Torque at Full Load (in.lb)	Standard	10.5	50	180	110	220	500	350	800	700	925	2700
	Option 1	5	25	80	50	90	206	175	400	325	475	1500
	Option 2	-	30	135	68	-	-	-	-	-	-	-
Running Torque at Full Load (in.lb)	Standard	9.5	45	160	100	180	410	300	700	650	825	2200
	Option 1	4.5	20	70	45	80	183	150	290	300	425	1200
	Option 2	-	25	105	60	-	-	-	-	-	-	-
Efficiency Rating	Standard	0.67	0.59	0.66	0.66	0.70	0.65	0.63	0.57	0.61	0.60	0.68
	Option 1	0.35	0.33	0.38	0.37	0.39	0.36	0.42	0.46	0.44	0.39	0.41
	Option 2	-	0.53	0.51	0.55	-	-	-	-	-	-	-
Weight with Baise Raise of 6" (lbs)		2.75	20	20	21	40	40	50	50	115	235	520
Weight for each additional 1" Raise (lbs)		0.1	0.33	0.33	0.42	0.85	0.85	0.85	0.85	1.5	2.9	5
Hold Back Torque at Rated Load (ft.lb)	Standard	1	2	2	7	8	8	11	11	24	24	92
	Option 1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	33
	Option 2	-	1	1	2	-	-	-	-	-	-	-

* Dimension same as model 2802 and 28021.

Note   *Lifting screws listed above are not keyed. Must be held to prevent rotation. Hold Back Torque is restraining torque at the worm shaft to keep load from running down. Lifting torques are proportional to load, down to 25% of rated load.*

1.3.2.2. Life Expectancy of Imperial Ball Screw and Ball 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 maintenance.
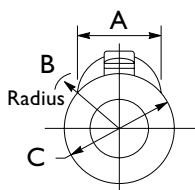
It is possible to estimate the minimum life of the Duff-Norton ball screw and nut only. Because of the many variable operating conditions, we can not accurately predict the life of the worm and gear set in the 2800 and 9800 Series actuators. Consult Power Jacks Ltd for advice.

Life in Thousands of Inches Travelled

Model	28631	2802 & 9802	28021 & 98021	28003	2805	28051	2810	28101	2820	2825	2860
Capacity (Short Tons)	0.5	2	2	3	5	5	10	10	20	25	50
100% Full Load	400	50	125	250	1000	500	100	50	150	700	600
75% Full Load	1200	150	300	650	2500	1000	350	150	350	2000	1500
50% Full Load or Less	3500	500	1000	2200	9000	4000	1000	500	1200	6000	5000

Note   *5 Ton and 10 Ton models use the same screw and nut.*

1.3.2.3. Imperial Ball Nut Return Tube Dimensions

Model	28631	2802 & 9802	28021 & 98021	28003	2805 & 2810	28051 & 28101	2820	2825	2860
Lead	0.200	0.250	1.000	0.413	0.474	1.00	0.500	0.660	1.000
A	0.822	1.104	1.104	1.587	1.981	1.718	2.561	3.349	4.029
B (Radius)	0.797	1.194	1.194	1.386	1.69	1.72	2.272	3.076	3.756
C	1 Sq.	1.5 Sq.	1.5 Sq.	2.125 Dia.	2.625 Dia.	2.625 Dia.	3.75 Dia.	4.751 Dia.	5.88 Dia.

Note: All dimensions in inches.

1.3.2.1. Performance of Standard M-Series Imperial Ball Screw Jacks

Model		28631	2802 & 9802*	28021 & 98021*	28003	2805	28051	2810	28101	2820	2825	2860
	Upright	28631	2802 & 9802*	28021 & 98021*	28003	2805	28051	2810	28101	2820	2825	2860
	Inverted	28630	2801 & 9801*	28011 & 98011*	28002	2804	28041	2809	28091	2819	2824	2859
Capacity (Short Tons)		0.5	2	2	3	5	5	10	10	20	25	50
Lifting Screw (Inches)	Diameter	5/8	1	1	1 11/64	1.5	1.5	1.5	1.5	2.25	3	4
	Lead	0.2	0.25	1	0.413	0.474	1	0.474	1	0.5	0.66	1
Worm Gear Ratios	Standard	5:1	6:1	6:1	6:1	6:1	6:1	8:1	8:1	8:1	10 2/3:1	10 2/3:1
	Option 1	20:1	24:1	24:1	24:1	24:1	24:1	24:1	24:1	24:1	32:1	32:1
	Option 2	-	12:1	12:1	12:1	-	-	-	-	-	-	-
Turns of Worm for 1" Raise	Standard	25	24	6	14.526	12.667	6	16.888	8	16	16.16	10.66
	Option 1	100	96	24	58.104	50.667	24	50.667	24	48	48.48	32
	Option 2	-	48	12	29.052	-	-	-	-	-	-	-
Maximum HP per actuator	Standard	1/3	2	2	2	4	4	5	5	5	8	15
	Option 1	1/6	1/2	1/2	1/2	3/4	3/4	1 1/2	1 1/2	1 1/2	2 1/2	6
	Option2	-	3/4	3/4	3/4	-	-	-	-	-	-	-
Starting Torque at Full Load (in.lb)	Standard	10.5	50	180	110	220	500	350	800	700	925	2700
	Option 1	5	25	80	50	90	206	175	400	325	475	1500
	Option 2	-	30	135	68	-	-	-	-	-	-	-
Running Torque at Full Load (in.lb)	Standard	9.5	45	160	100	180	410	300	700	650	825	2200
	Option 1	4.5	20	70	45	80	183	150	290	300	425	1200
	Option 2	-	25	105	60	-	-	-	-	-	-	-
Efficiency Rating	Standard	0.67	0.59	0.66	0.66	0.70	0.65	0.63	0.57	0.61	0.60	0.68
	Option 1	0.35	0.33	0.38	0.37	0.39	0.36	0.42	0.46	0.44	0.39	0.41
	Option 2	-	0.53	0.51	0.55	-	-	-	-	-	-	-
Weight with Baise Raise of 6" (lbs)		2.75	20	20	21	40	40	50	50	115	235	520
Weight for each additional 1" Raise (lbs)		0.1	0.33	0.33	0.42	0.85	0.85	0.85	0.85	1.5	2.9	5
Hold Back Torque at Rated Load (ft.lb)	Standard	1	2	2	7	8	8	11	11	24	24	92
	Option 1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	33
	Option 2	-	1	1	2	-	-	-	-	-	-	-

* *Dimension same as model 2802 and 28021.*

Note *Lifting screws listed above are not keyed. Must be held to prevent rotation. Hold Back Torque is restraining torque at the worm shaft to keep load from running down. Lifting torques are proportional to load, down to 25% of rated load.*

1.3.2.2. Life Expectancy of Imperial Ball Screw and Ball 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 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 accurately predict the life of the worm and gear set in the 2800 and 9800 Series actuators. Consult Power Jacks Ltd for advice.
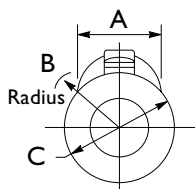
Life in Thousands of Inches Travelled

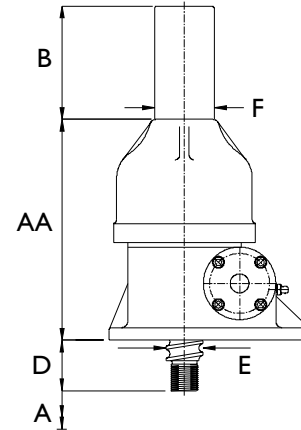| Model	28631	2802 & 9802	28021 & 98021	28003	2805	28051	2810	28101	2820	2825	2860
Capacity (Short Tons)	0.5	2	2	3	5	5	10	10	20	25	50
100% Full Load	400	50	125	250	1000	500	100	50	150	700	600
75% Full Load	1200	150	300	650	2500	1000	350	150	350	2000	1500
50% Full Load or Less	3500	500	1000	2200	9000	4000	1000	500	1200	6000	5000

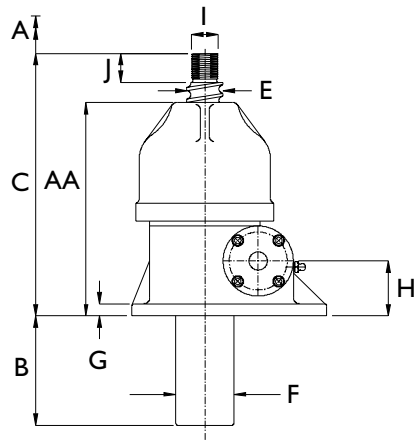*Note* *5 Ton and 10 Ton models use the same screw and nut.*
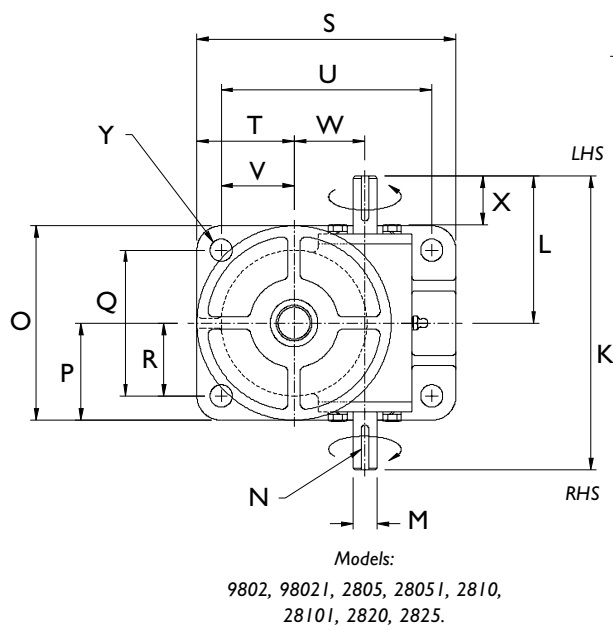
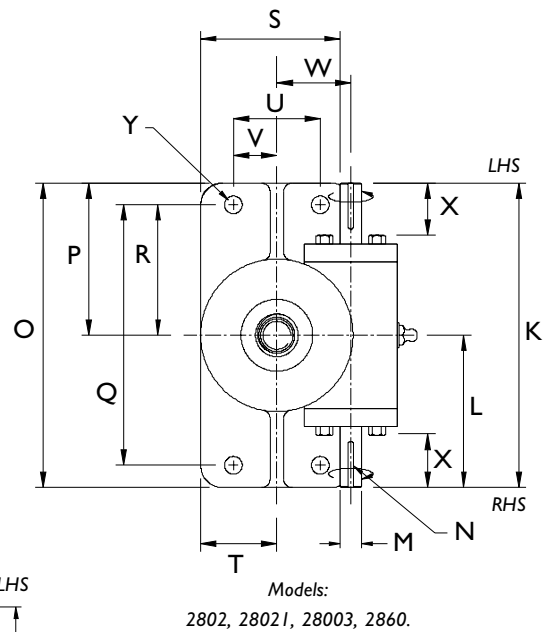### 1.3.2.3. Imperial Ball Nut Return Tube Dimensions

Model	28631	2802 & 9802	28021 & 98021	28003	2805 & 2810	28051 & 28101	2820	2825	2860
Lead	0.200	0.250	1.000	0.413	0.474	1.00	0.500	0.660	1.000
A	0.822	1.104	1.104	1.587	1.981	1.718	2.561	3.349	4.029
B (Radius)	0.797	1.194	1.194	1.386	1.69	1.72	2.272	3.076	3.756
C	1 Sq.	1.5 Sq.	1.5 Sq.	2.125 Dia.	2.625 Dia.	2.625 Dia.	3.75 Dia.	4.751 Dia.	5.88 Dia.

Note: *All dimensions in inches.*

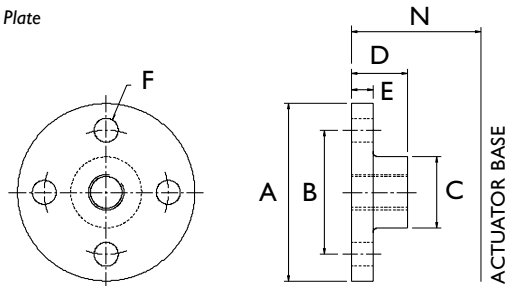## 1.3.2.4.   Standard Imperial Translating Ball Screw Actuators

Plan View

Model:
28631

Models:
2802, 28021, 28003, 2860.

Models:
9802, 98021, 2805, 28051, 2810,
28101, 2820, 2825.
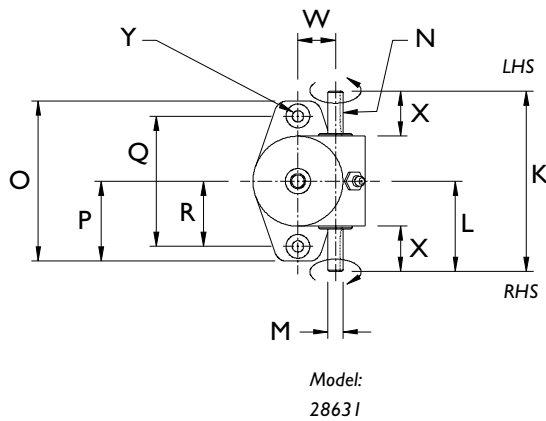
Note   **LHS** = *Left Hand Side*
          RHS = *Right Hand Side*

Model Upright	28631	2802 & 28021	9802 & 98021	28003	2805 & 28051	2810 & 28101	2820	2825	2860
Inverted	28630	2801 & 28011	9801 & 98011	28002	2804 & 28041	2809 & 28091	2819	2824	2859
Capacity (Short Tons)	0.5	2	2	3	5	10	20	25	50
A	Raise As Required								
B	A + 1	A + 0.75	A + 0.75	A + 0.75	A + 2	A + 1	A + 0.75	A + 2	A + 2.75
C	5	7.5	7.5	9.25	10.75	10 3/8	16.5	19.75	25 3/8
D	1	1 3/8	1 3/8	1 3/8	1 3/8	1.5	2.75	3 1/8	3 5/8
E	5/8	1	1	1 11/64	1.5	1.5	2.25	3	4
F	1 1/16	1 21/32	1 21/32	1 21/32	2 3/8	2 7/8	3.5	4.5	5 9/16
G	5/16	0.5	0.5	0.5	0.5	0.5	0.75	1	1.25
H	1 ± 0.003	1.75 ± 0.005	1.75 ± 0.005	1.75 ± 0.005	2.25 ± 0.005	2.25 ± 0.005	3.25 ± 0.005	4 ± 0.005	4.75 ± 0.005
I	3/8-24UNF-2A	3/4-16UNF-2A	3/4-16UNF-2A	3/4-16UNF-2A	1-14UNS-2A	1-14UNS-2A	1.75-12UN-2A	2.25-12UN-2A	3.25-12UN-2A
J	0.75	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	2.25	2.25	2.75
K	4.5	7	7	7	9	11	11	14	22
L	2.25	3.5	3.5	3.5	4.5	5.5	5.5	7	11
M	0.375 / 0.373	0.500 / 0.498	0.500 / 0.498	0.625 / 0.623	0.749 / 0.747	0.999 /0.997	1.000 / 0.998	1.375 / 1.373	1.500 / 1.498
N	1/8 X 1/6 X 3/4	1/8 X 1/16 X 1	1/8 X 1/16 X 1	3/16 X 3/32 X 1	3/16X3/32X1.25	1/4 X 1.8 X 1.5	1/4 X 1/8 X 1.5	5/16 X 5/32 X 2	3/8 X 3/16 X 2.25
O	4	7	4 1/8	7	6	7.5	8.25	10.25	19.75
P	2	3.5	2 1/16	3.5	3	3.75	4 1/8	5 1/8	9 7/8
Q	3.25	6	3 1/8	6	4.5	5.75	6	7.5	16
R	1 5/8	3	1 9/16	3	2.25	2 7/8	3	3.75	8
S	-	3.5	6 1/4	3.5	8	8.75	11	13.75	9.75
T	-	1.75	2 7/16	1.75	3	2 7/8	4 1/8	5 1/8	4 7/8
U	-	2	5 1/4	2	6.5	7	8.75	11	6
V	-	1	1 15/16	1	2.25	2	3	3.75	3
W	0.941 / 0.938	1.705 / 1.702	1.705 / 1.702	1.706 / 1.701	2.190 / 2.188	2.601 / 2.598	2.601 / 2.598	3.755 / 3.750	5.316 / 5.313
X	1 1/8	1 1/8	1 1/8	1 1/8	1.5	1.8	1.5	2 5/16	4 7/16
Y	9/32	13/32	13/32	13/32	11/16	13 / 16	1 1/8	1 3/8	1 7/8
AA	4	5 5/8	5 5/8	7.25	8.75	8 3/8	13	16.75	21 3/8

1.3.2.5. Standard Imperial Translating Ball Screw Ends

Top Plate

Clevis End

Model	28631	2802 & 28021	9802 & 98021	28003	2805 & 28051	2810 & 28101	2820	2825	2860
A	Ø 2.25	Ø 4.25	Ø 4.25	Ø 4.25	Ø 5	Ø 5.75	Ø 7	Ø 8.5	Ø 13
B	PCD 1.5	PCD 3	PCD 3	PCD 3	PCD 3.5	PCD 4.125	PCD 5	PCD 6	PCD 10
C	Ø 0.75	Ø 1.5	Ø 1.5	Ø 1.5	Ø 1.75	Ø 1.75	Ø 2.625	Ø 3.5	Ø 4.5
D	13/16	1 13/16	1 13/16	1 13/16	1.25	1.375	2 5/16	2 5/16	2 13/16
E	5/16	7/16	7/16	7/16	0.625	0.75	1	1	1.375
F	Ø 9/32	Ø 13/32	Ø 13/32	Ø 13/32	Ø 11/16	Ø 13/16	Ø 13/16	Ø 1 1/16	Ø 1.5
G	Ø 0.75	Ø 1.5	Ø 1.5	Ø 1.5	Ø1.75	Ø 2	Ø 2.625	Ø 3.5	Ø 5
H	2.25	3	3	3	4.125	4.125	6.25	8.25	9.125
I	1	1.5	1.5	1.5	2.5	2.5	3	5	5.25
J	0.5	0.75	0.75	0.75	1.25	1.25	1.5	2.5	2.625
K	Ø 5/16	Ø 1/2	Ø 1/2	Ø 1/2	Ø 3/4	Ø 1	Ø 1 1/4	Ø 1 1/2	Ø 2
L	0.5	1	1	1	1.25	1.5	1.75	2.75	3.75
M Upright	6	8 5/8	8 5/8	10 3/8	12 1/2	12 1/8	19	23 1/4	29 1/8
M Inverted	2	2 1/2	2 1/2	2 1/2	3 1/8	3 1/4	5 1/4	6 5/8	7 3/8
N Upright	5	7 1/2	7 1/2	9 5/16	10 3/4	10 3/8	16 1/2	19 3/4	25 7/16
N Inverted	1 1/16	1 7/16	1 7/16	1 7/16	1 7/16	1 9/16	2 13/16	3 3/16	3 11/16

Model Upright	28631	2802 & 28021	9802 & 98021	28003	2805 & 28051	2810 & 28101	2820	2825	2860
Inverted	28630	2801 & 28011	9801 & 98011	28002	2804 & 28041	2809 & 28091	2819	2824	2859
Capacity (Short Tons)	0.5	2	2	3	5	10	20	25	50
A	Raise As Required								
B	A + 1	A + 0.75	A + 0.75	A + 0.75	A + 1	A + 1	A + 0.75	A + 2	A + 2.75
C	5	7.5	7.5	9.25	10.75	10 3/8	16.5	19.75	25 3/8
D	1	1 3/8	1 3/8	1 3/8	1 3/8	1.5	2.75	3 1/8	3 5/8
E	5/8	1	1	1 11/64	1.5	1.5	2.25	3	4
F	1 1/16	1 21/32	1 21/32	1 21/32	2 3/8	2 7/8	3.5	4.5	5 9/16
G	5/16	0.5	0.5	0.5	0.5	0.5	0.75	1	1.25
H	1 ± 0.003	1.75 ± 0.005	1.75 ± 0.005	1.75 ± 0.005	2.25 ± 0.005	2.25 ± 0.005	3.25 ± 0.005	4 ± 0.005	4.75 ± 0.005
I	3/8-24UNF-2A	3/4-16UNF-2A	3/4-16UNF-2A	3/4-16UNF-2A	1-14UNS-2A	1-14UNS-2A	1.75-12UN-2A	2.25-12UN-2A	3.25-12UN-2A
J	0.75	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	2.25	2.25	2.75
K	4.5	7	7	7	9	11	11	14	22
L	2.25	3.5	3.5	3.5	4.5	5.5	5.5	7	11
M	0.375 / 0.373	0.500 / 0.498	0.500 / 0.498	0.625 / 0.623	0.749 / 0.747	0.999 /0.997	1.000 / 0.998	1.375 / 1.373	1.500 / 1.498
N	1/8 X 1/6 X 3/4	1/8 X 1/16 X 1	1/8 X 1/16 X 1	3/16 X 3/32 X 1	3/16X3/32X1.25	1/4 X 1.8 X 1.5	1/4 X 1/8 X 1.5	5/16 X 5/32 X 2	3/8 X 3/16 X 2.25
O	4	7	4 1/8	7	6	7.5	8.25	10.25	19.75
P	2	3.5	2 1/16	3.5	3	3.75	4 1/8	5 1/8	9 7/8
Q	3.25	6	3 1/8	6	4.5	5.75	6	7.5	16
R	1 5/8	3	1 9/16	3	2.25	2 7/8	3	3.75	8
S	-	3.5	6 1/4	3.5	8	8.75	11	13.75	9.75
T	-	1.75	2 7/16	1.75	3	2 7/8	4 1/8	5 1/8	4 7/8
U	-	2	5 1/4	2	6.5	7	8.75	11	6
V	-	1	1 15/16	1	2.25	2	3	3.75	3
W	0.941 / 0.938	1.705 / 1.702	1.705 / 1.702	1.706 / 1.701	2.190 / 2.188	2.601 / 2.598	2.601 / 2.598	3.755 / 3.750	5.316 / 5.313
X	1 1/8	1 1/8	1 1/8	1 1/8	1.5	1.8	1.5	2 5/16	4 7/16
Y	9/32	13/32	13/32	13/32	11/16	13 / 16	1 1/8	1 3/8	1 7/8
AA	4	5 5/8	5 5/8	7.25	8.75	8 3/8	13	16.75	21 3/8

1.3.2.5. Standard Imperial Translating Ball Screw Ends

Top Plate

Clevis End

|	Model	28631	2802 & 28021	9802 & 98021	28003	2805 & 28051	2810 & 28101	2820	2825	2860
	A	Ø 2.25	Ø 4.25	Ø 4.25	Ø 4.25	Ø 5	Ø 5.75	Ø 7	Ø 8.5	Ø 13
	B	PCD 1.5	PCD 3	PCD 3	PCD 3	PCD 3.5	PCD 4.125	PCD 5	PCD 6	PCD 10
	C	Ø 0.75	Ø 1.5	Ø 1.5	Ø 1.5	Ø 1.75	Ø 1.75	Ø 2.625	Ø 3.5	Ø 4.5
	D	13/16	1 13/16	1 13/16	1 13/16	1.25	1.375	2 5/16	2 5/16	2 13/16
	E	5/16	7/16	7/16	7/16	0.625	0.75	1	1	1.375
	F	Ø 9/32	Ø 13/32	Ø 13/32	Ø 13/32	Ø 11/16	Ø 13/16	Ø 13/16	Ø 1 1/16	Ø 1.5
	G	Ø 0.75	Ø1.5	Ø 1.5	Ø 1.5	Ø1.75	Ø 2	Ø 2.625	Ø 3.5	Ø 5
	H	2.25	3	3	3	4.125	4.125	6.25	8.25	9.125
	I	1	1.5	1.5	1.5	2.5	2.5	3	5	5.25
	J	0.5	0.75	0.75	0.75	1.25	1.25	1.5	2.5	2.625
	K	Ø 5/16	Ø 1/2	Ø 1/2	Ø 1/2	Ø 3/4	Ø 1	Ø 1 1/4	Ø 1 1/2	Ø 2
	L	0.5	1	1	1	1.25	1.5	1.75	2.75	3.75
M	Upright	6	8 5/8	8 5/8	10 3/8	12 1/2	12 1/8	19	23 1/4	29 1/8
	Inverted	2	2 1/2	2 1/2	2 1/2	3 1/8	3 1/4	5 1/4	6 5/8	7 3/8
N	Upright	5	7 1/2	7 1/2	9 5/16	10 3/4	10 3/8	16 1/2	19 3/4	25 7/16
	Inverted	1 1/16	1 7/16	1 7/16	1 7/16	1 7/16	1 9/16	2 13/16	3 3/16	3 11/16
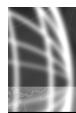
1.3.2.6. Standard Imperial Rotating Ball Screw Actuators

Note *For all other dimensions and performance data refer to translating screw models. All dimensions in inches (1" = 25.4 mm).*

1.3.2.6.1. Upright Rotating Ball Screw Actuator

Lifting Screw - right hand, single thread on all models
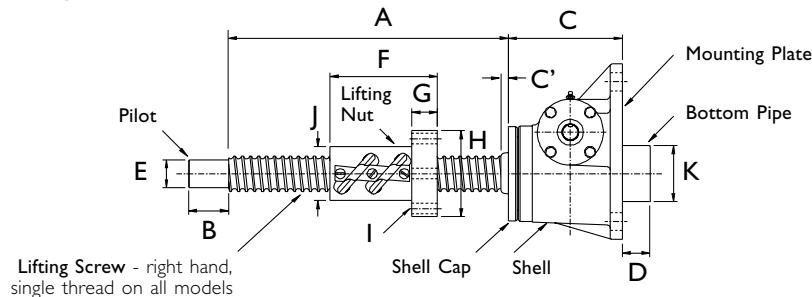
Model		UM 28632	KUM 2803	KUM 28031*	UM 9803	UM 98031*	KUM 28004	KUM 2806	KUM 28061*	UM 2811	UM 28111*	UM 2821	UM 2826	UM 2861*
Capacity (Short Tons)		0.25	2	2	2	2	3	5	5	10	10	20	25	50
A		Raise + 2	Raise + 3 1/16	Raise + 3 11/16	Raise + 3 1/16	Raise + 3 11/16	Raise + 3.75	Raise + 4 5/8	Raise + 4	Raise + 6	Raise + 5	Raise + 8	Raise + 10	Raise + 15
B		0.625	1.125	1.125	1.125	1.125	1.125	1	1	1	1	2.5	2.25	3.25
C		2 3/8	4 1/16	4 1/16	4 1/16	4 1/16	4 1/16	5 1/4	5 1/4	5 5/8	5 5/8	7 1/8	8 7/8	10 7/8
C'		0	0	0	0	0	7/16	0	0	0	0	1	1 5/8	1 1/8
D		0	0	0	0	0	0	0	0	0	0	0	0	0.75
E	Dia.	0.437	0.750	0.750	0.750	0.750	0.750	1.000	1.000	1.000	1.000	1.750	2.250	3.250
		0.435	0.748	0.748	0.748	0.748	0.748	0.998	0.998	0.998	0.998	1.748	2.248	3.248
F		1.75	2 3/8	3 1/32	2 3/8	3 1/32	3.395	4.33	3.65	4.33	3.65	6.706	9.395	12.625
G		0.53125	0.630	0.630	0.630	0.630	0.832	0.895	1.02	0.895	1.02	1.582	2.02	2.02
H	Dia.	2.625	3.25	3.25	3.25	3.25	4.2	4 15/16	4 15/16	4 15/16	4 15/16	5.375	7.375	9.75
	Holes	4	4	4	4	4	4	4	4	4	4	6	8	6
I	Dia.	17/64	17/64	17/64	17/64	17/64	25/64	17/32	17/32	17/32	17/32	21/32	25/32	1 1/32
	P.C.D	2 3/32	2.75	2.75	2.75	2.75	3 7/16	4 1/16	4 1/8	4 1/16	4 1/8	4.375	6.25	8
J	Dia.	1 SQR.	1.5 SQR.	1.5 SQR.	1.5 SQR.	1.5 SQR.	2.125	2.625	2.25 SQR.	2.625	2.25 SQR.	3.375	4.751	5.88
K	Dia.	0	0	0	0	0	0	0	0	0	0	0	0	5.5625

* 1" Lead Screw Models.

1.3.2.6.2. Inverted Rotating Ball Screw Actuator

Lifting Screw - right hand, single thread on all models
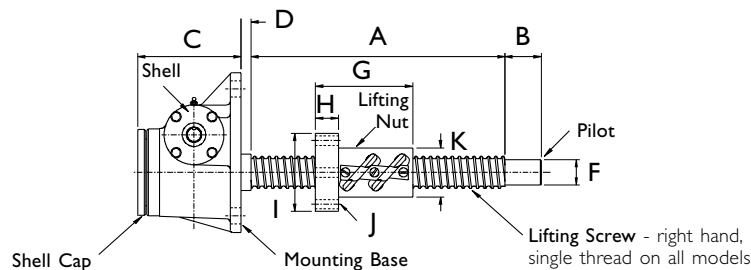
| Model		DM 28632	KDM 2803	KDM 28031*	KDM 9803	KDM 98031*	KDM 28004	KDM 28006	KDM 28061*	KDM 2811	KDM 28111*	KDM 2821	KDM 2826	KDM 2861*
Capacity (Short Tons)		0.25	2	2	2	2	3	5	5	10	10	20	25	50
A		Raise + 2 3/8	Raise + 3	Raise + 3 5/8	Raise + 3 1/6	Raise + 3 5/8	Raise + 3.75	Raise + 4 5/8	Raise + 4	Raise + 6	Raise + 5	Raise + 8	Raise + 10	Raise + 15
B		0.625	1.125	1.125	1.125	1.125	1.125	1	1	1	1	2.5	2.25	3.25
C		2.375	3.75	3.75	3.75	3.75	3.75	5.25	5.25	5	5	7.125	8.875	11
D		0	0.625	0.625	0.625	0.625	1	0.75	0.75	1.125	1.125	1.625	2.5	2.5
F	Dia.	0.437	0.750	0.750	0.750	0.750	0.750	1.000	1.000	1.000	1.000	1.750	2.250	3.250
		0.435	0.748	0.748	0.748	0.748	0.748	0.998	0.998	0.998	0.998	1.748	2.248	3.248
G		1.75	2 3/8	3 1/32	2 3/8	3 1/32	3.395	4.33	3.65	4.33	3.65	6.706	9.395	12.625
H		0.53125	0.630	0.630	0.630	0.630	0.832	0.895	1.02	0.895	1.02	1.582	2.02	2.02
I	Dia.	2.625	3.25	3.25	3.25	3.25	4.2	4 15/16	4 15/16	4 15/16	4 15/16	5.375	7.375	9.75
	Holes	4	4	4	4	4	4	4	4	4	4	6	8	6
J	Dia.	17/64	17/64	17/64	17/64	17/64	25/64	17/32	17/32	17/32	17/32	21/32	25/32	1 1/32
	P.C.D	2 3/32	2.75	2.75	2.75	2.75	3 7/16	4 1/16	4 1/8	4 1/16	4 1/8	4.375	6.25	8
K	Dia.	1 SQR.	1.5 SQR.	1.5 SQR.	1.5 SQR.	1.5 SQR.	2.125	2.625	2.25 SQR.	2.625	2.25 SQR.	3.375	4.751	5.88

Note *Dimensions subject to change without notice.*   ** 1" Lead Screw Models.*

1.3.2.7. Double Clevis End Imperial Ball Screw Actuators

Note   For other performance and dimension information refer to translating ball screw models.

Style 1

Style 2
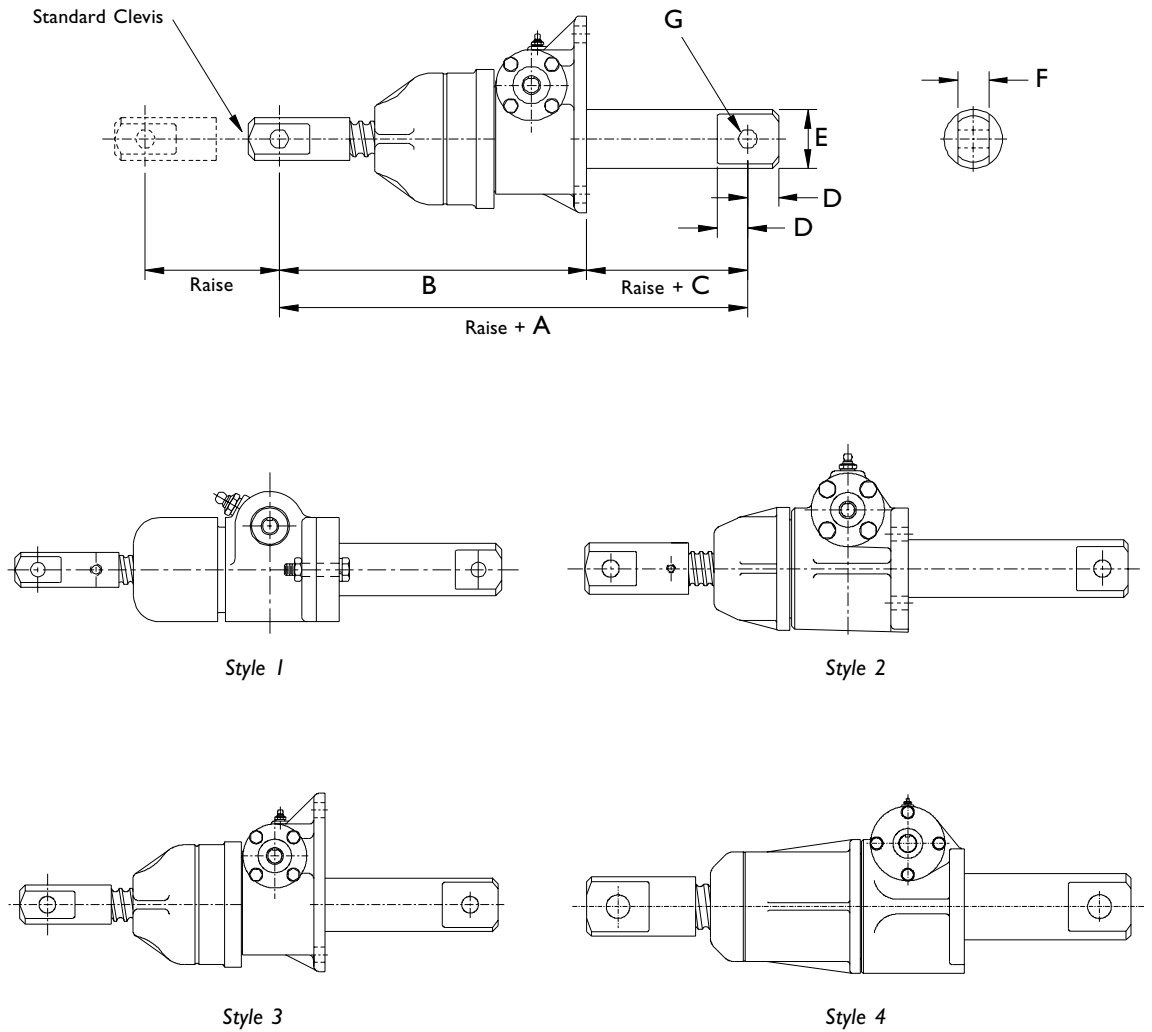
Style 3

Style 4

Model		CCM 28631	CCM 2802 & 28021	CCM 9802 & 98021	CCM 28003	CCM 2805 & 28051	CCM 2810 & 28101	CCM 2820	CCM 2825	CCM 2860
Capacity (Short Tons)		0.5	2	2	3	5	10	20	25	50
Style		1	2	3	2	3	3	3	3	4
A		8.25	11.125	11.125	12.875	16.25	16	23	30.25	37.125
B		6	8.625	8.625	10.375	12.5	12.125	19	23.25	29.125
C		2.25	2.5	2.5	2.5	3.75	3.875	4	7	8
D		0.5	0.75	0.75	0.75	1.25	1.25	1.5	2.5	2.625
E		1.125	1.625	1.625	1.75	2.375	2.875	3.5	4.5	5.5625
F		0.75	1	1	1	1.25	1.5	1.75	2.75	3.75
G	Diag	5/16	0.5	0.5	0.5	0.75	1	1.25	1.5	2
Max. Allowable Raise in	Raise	7.875	15	15	15.5	20.375	20.5	34.5	47	63.5
Compression at Load (lb)	Load	1000	3800	3800	4200	7400	7400	20000	35000	61000
Max Raise At Rated Load (Compression)		7.875	14.5	14.5	11.5	16	9.5	21.5	37	47.5

Note   1.   All dimensions in inches unless otherwise stated (1" = 25.4 mm).
*   2.   Dimensions subject to change without notice.*

1.3.2.8. Imperial Ball Screw Actuators with Bellows Boots

Features

- Protects the screw from dust and dirt.

- Helps maintain the proper lubrication.

- Guards against moisture and corrosive contaminants.

- Boots are made of neoprene-coated nylon with sewn construction. Other materials are available for applications involving high temperatures, highly corrosive atmospheres and other special conditions.

Boot Installation Data

A →
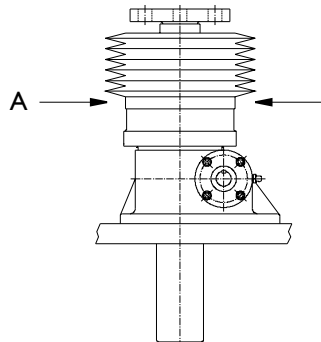
Capacity	1000 lb	2 Ton	3 Ton	5 Ton
Shell Cap Diameter "A"	2.25	3.5	3.5	5.375

Capacity	10 Ton	20 Ton	25 Ton	50 Ton
Shell Cap Diameter "A"	4.5	7	8.875	9.5

Note   *For horizontal installation exceeding 18" of travel, internal boot guides are recommended.*

Upright Imperial Ball Screw Actuators with Bellows Boots

A   B   C
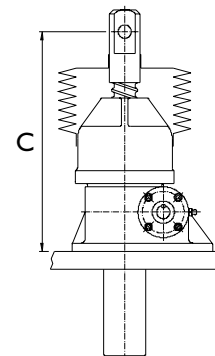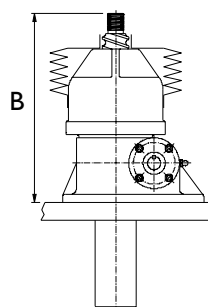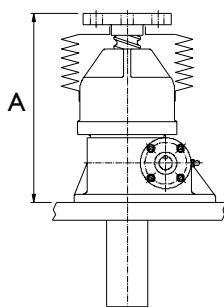
Closed Height "B"		Raise							
Model No.	Boot O.D.	1-12"	18"	24"	30"	36"	48"	60"	72"
28631	4.50	5.000	-	-	-	-	-	-	-
2802	6.63	7.500	7.500	7.500	8.500	-	-	-	-
28021	6.63	7.500	7.500	7.500	8.500	-	-	-	-
9802	6.63	7.500	7.500	7.500	8.500	-	-	-	-
98021	6.63	7.500	7.500	7.500	8.500	-	-	-	-
28003	6.63	9.250	9.250	9.250	10.250	10.250	11.250	-	-
2805	7.50	10.750	10.750	10.750	12.500	12.500	13.750	-	-
28051	7.50	10.750	10.750	10.750	12.500	12.500	13.750	-	-
2810	7.00	10.375	10.375	10.375	11.625	11.625	12.875	-	-
28101	7.00	10.375	10.375	10.375	11.625	11.625	12.875	-	-
2820	9.00	16.500	16.500	16.500	16.500	16.500	18.500	20.500	21.500
2825	11.00	19.750	19.750	19.750	19.750	19.750	21.250	22.750	24.250
2860	12.00	25.375	25.375	25.375	25.375	25.375	26.375	27.375	28.375

Note
1. *(-) indicates "Not Applicable".*
2. *For lengths of raise not detailed in the above table consult Power Jacks Ltd.*
3. *All dimensions in inches (1" = 25.4 mm).*
4. *Dimensions subject to change without notice.*

Inverted Imperial Ball Screw Actuators with Bellows Boots
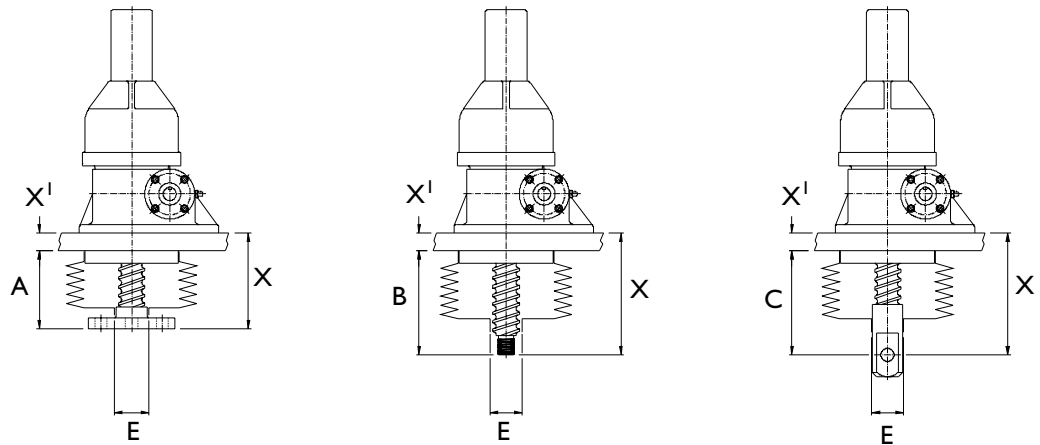
Finding minimum closed dimensions (X)

- Add your structure thickness X^1 to A, B, or C from the appropriate chart to find the minimum closed dimension.
- Other styles and sizes of boots can be supplied.
- In order to use a standard boot, make the mounting plate diameter the same as the shell cap diameter of the appropriate actuator.
- When boots are required for rotating screw actuators, consult Power Jacks Ltd.

Model No.	Raise (inches)												Std. Boot Collar Dia
	1"-6"			7"-12"			13"-18"			19"-24"			
	A	B	C	A	B	C	A	B	C	A	B	C	E
28630	2	2	2 3/4	2 3/8	2 3/8	3 1/4	2 3/4	2 3/4	3 3/4	3 1/4	3 1/4	4 1/4	.75
2801 & 9801	4 3/16	4 5/8	5 1/4	4 3/16	4 5/8	5 1/4	4 3/16	4 5/8	5 1/4	4 3/16	4 5/8	5 1/4	1.5
28002	4 3/16	4 5/8	5 1/4	4 3/16	4 5/8	5 1/4	4 3/16	4 5/8	5 1/4	4 3/16	4 5/8	5 1/4	1.5
9804	4 3/16	5 1/8	6 1/8	4 5/8	5 1/8	6 1/8	4 5/8	5 1/8	6 1/8	4 5/8	5 1/8	6 1/8	1.75
9809	4 3/4	5 1/8	6 1/8	4 3/4	5 1/8	6 1/8	4 3/4	5 1/8	6 1/8	4 3/4	5 1/8	6 1/8	1.5
9819	6 3/4	8	9 3/4	6 3/4	8	9 3/4	6 3/4	8	9 3/4	6 3/4	8	9 3/4	2.615
9824	5 1/2	6 3/4	9 1/2	5 1/2	6 3/4	9 1/2	5 1/2	6 3/4	9 1/2	5 1/2	6 3/4	9 1/2	3.5
2859	7 1/4	7 1/4	10 7/8	7 1/4	7 1/4	10 7/8	7 1/4	7 1/4	10 7/8	7 1/4	7 1/4	10 7/8	4.5

Mounting Plate

12.7 mm (1/2")

Dia as required
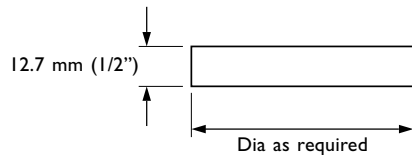
To be manufactured by installer

Note
1. For lengths of raise not detailed in the above table consult Power Jacks Ltd.
2. Dimensions subject to change without notice.
4. All dimensions in inches.

1.3.2.9. Standard Imperial Ball Screw Actuator Flange Bolt Configuration
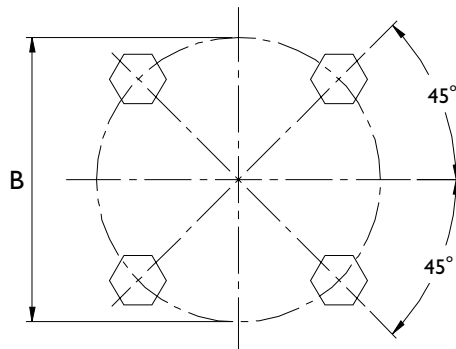
Model	'B' Bolt P.C.D (inch)	Bolt Information
28631	-	No Flange Bolts
2802 & 9802	1 $^{11}/_{16}$	$^{1}/_{4}$ - 20 x $^{3}/_{4}$" Long
28003	1 $^{11}/_{16}$	$^{1}/_{4}$ - 20 x $^{3}/_{4}$" Long
2805	2 $^{3}/_{8}$	$^{5}/_{16}$ - 18 x $^{3}/_{4}$" Long
2810	2 $^{3}/_{4}$	$^{5}/_{16}$ - 18 x $^{3}/_{4}$" Long
2820	3 $^{1}/_{2}$	$^{3}/_{8}$ - 16 x 1 $^{1}/_{4}$" Long
2825	4 $^{1}/_{8}$	$^{3}/_{8}$ - 16 x 1 $^{1}/_{4}$" Long
2860	5 $^{1}/_{4}$	$^{5}/_{8}$ - 11 x 1 $^{1}/_{2}$" Long

Note   1.   *All dimensions in inches (1" = 25.4 mm).*
         2.   *Dimensions subject to change without notice.*

1.3.2.10. Motor Adaptors for Imperial Ball Screw Actuators

Dimensions and details are the same as for imperial machine screw actuators.

Please refer to section 1.2.3.9.
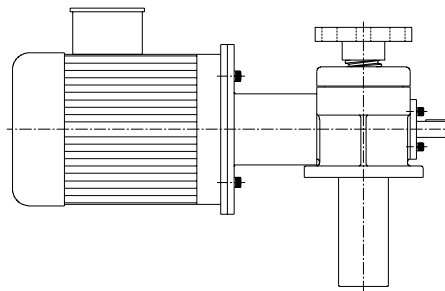
1.3.2.11. Rotary Limit Switch Adaptors for Imperial Ball Screw Actuators

Dimensions and details are the same as for imperial machine screw actuators.

Please refer to section 1.2.3.10. and 1.2.3.11.
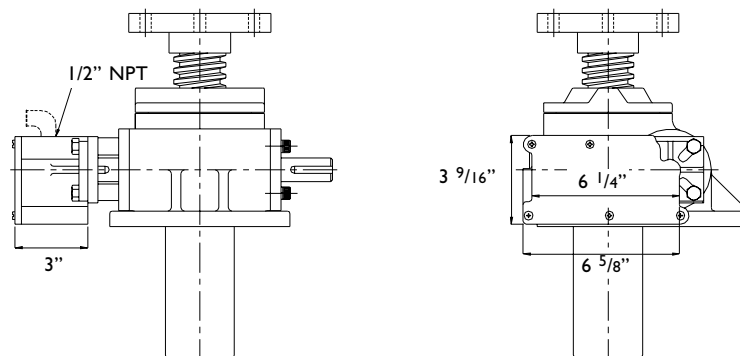
Actuator Mounted

1.4. High Duty Cycle and Special Screw Jacks

1.4.1. High Duty Roller Screw Jacks

An extensive range of axially translating and rotating screw jacks fitted with the patented *Spiracon* roller screw and designed specifically to customers' application requirements. The *Spiracon* roller screw is an extremely high performance screw mechanism exhibiting almost no axial backlash and is designed to meet the following demands:

- High precision and repeatable positioning
- High speed
- High dynamic load capacity
- Continuous duty
- High efficiency
- Long life
- Minimum maintenance requirements

The range covers lifting capacities up to 1200 kN with many design features available to meet the customers' particular requirements.

The units' gearbox is based on the standard range of power Jacks screw jacks, although other gearbox types can be designed for specific applications. The gearboxes are either grease or oil lubricated depending on the application. The roller screw is based around the standard Spiracon planetary roller screw range (refer to section 3.1. for full Spiracon Roller Screw details) with alternative nut housings available to meet the requirements of specific applications.

1.4.2. High Duty Cycle Ball Screw Jacks

Advantages

- Predictable Life
- Continuous Operation
- Oil Lubricated
- High mechanical and thermal efficiency
- 12 Models available
- Capacity 3,500 lb (15,500 kN) to 27,000 lb (120,000 kN)

Ball Screw
Threaded end
is standard.

Shell Cap
Aluminium. Adjustable to take
end play out of bearing.

Load Bearings
Top and bottom to take
full load in either direction.

Worm
Single piece
construction.
Heat treated and
ground.

Pipe Plugs
3 required for fill,
drain and vent.

Housing
Aluminium. Finned
for heat dissipation.

Oil Seals
Top and bottom.
Seals oil in gear case.

Sealed Ball Nut
Sealed to prevent gear case
oil from leaking out around
ball screw.

'O' Ring Seal

Worm Gear
Aluminium
bronze.

Worm Bearings
and Oil Seals
Each end of worm.

Bottom Pipe
Protects lifting screw threads.

The 7500 Series high duty cycle actuators are specifically designed for continuous operation within certain load limitations (consult Power Jacks). The precision worm gear set operates in an oil bath improves thermal efficiency.

In addition, the precision drive arrangement permits the accurate prediction of operating life, in terms of millions of inches of travel. This important feature allows optimum maintenance and replacement scheduling, so as to minimise downtime.

Consult Power Jacks for Life Expectancy graph which is accurate for units installed with good alignment, minimal side loading, and operated in a relatively clean environment.

For further details contact Power Jacks.

1.4.3. Special Screw Jacks (Mechanical Actuators)

1.4.3.1. Special Screw Jack Designs

The special actuators can be broken down into three categories:

1. Modifications to the standard actuators

   This would include non-standard painting or plating of the housing, 2 or 3 start threaded lifting screws, stainless steel lifting screws or worm shafts, increased closed heights, extended worm shafts, opposite threading of lifting screws, etc.

2. Additions to the standard actuators

   Items such as wear indicators, safety nuts, rotation monitoring kits, special lifting screw end fittings, encoder adapter flanges, etc.

3. Completely special actuators

   Where a modification of our existing range is not practical we have the facilities to design and manufacture actuators tailored specifically to your requirements.
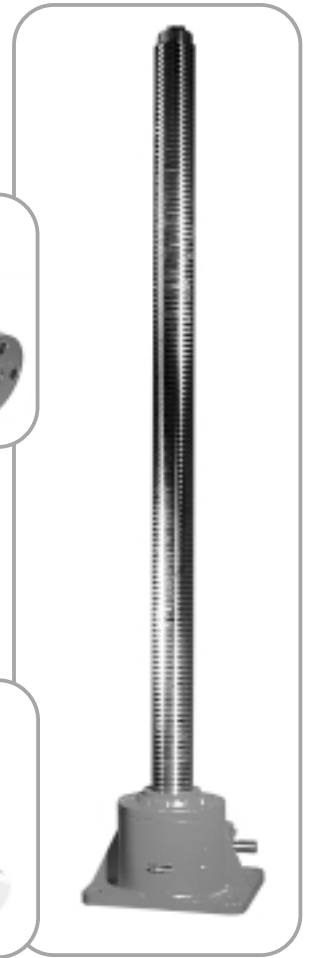
1.4.3.2. Anode Screw Jacks

Power Jacks design and manufacture Anode Screw Jacks and their systems for aluminium smelting anodes. The complete anode jacking system including motors, gearboxes, drive shafts and couplings can be supplied. The screw jacks are a specialheavy duty variant of the standard screw jack, these Anode Screw Jacks incorporate features such as:

- Extended protection pipe (top and bottom)
- High temperature grease
- Hexagonal drive ends (no keys)
- Double bearing arrangement for worm shaft; plain bearings plus thrust roller nearings
- One piece rod end and lifting screw (forged)
- High temperature bright aluminium paint work
- operating temperature $0^{\circ}C \rightarrow +90^{\circ}C$
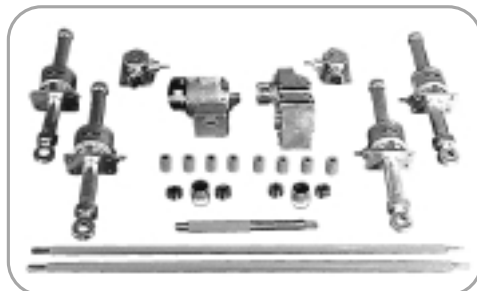
These screw jacks are designed with a large overload capacity to cope with:

1. Side load stresses caused by thermal expansion and contraction of the anode frames.

2. High compressive over loads caused by frozen pots.

1.4.3.2.1. Examples of Special Actuators

Power Jacks
can adapt the standard
actuator to meet your special
requirements.

Special friction pad

Special clevis end

15° Swivel top plate

Keyed screw

Folding handle

Self-aligning ball bushing

Hexworm shaft for hand crank or socket for portable drill

Special wiper seal

Inverted jack with boot replacing top pipe for limited space

Screw end

Clevis plug in base

Air motor restrainer actuator pad bearing surface

Plunger

Flag down position

Ball socket keyed lifting screw

Thrust washers instead of ball bearing, for impact loading

Spherical radius keyed screw

Tapped hole

Guide bushing

Swivel capability

Lifting Nut

Keyed inverted anti-backlash

Special tap-in screw

Key adaptor

Translating tube models

1.5.   Engineering Guide

screw**jacks**

1.5.1.   Actuator Performance

1.5.1.1.   Actuator Column Buckling Charts

Column Length Correction Factors, F_{cb}

Fixed/Free   Pinned/pinned   Fixed/Guided
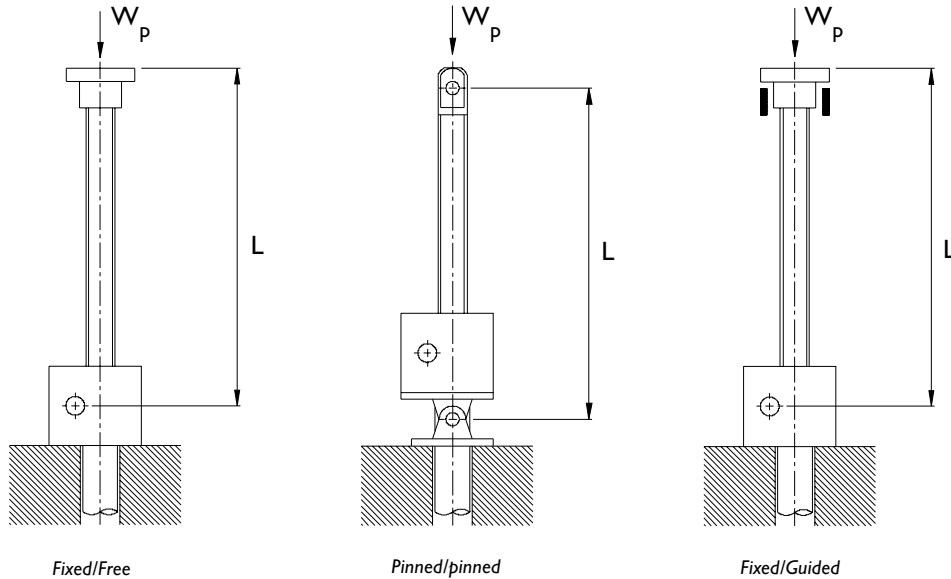
Note   1.   Column end constraints based on A.I.S.C. recommended values.

2.   All actuator column buckling charts show a Euler buckling curve and three scales for the appropriator end condition for the application under analysis.

Important Notes for Sym-metric and Metric Actuators:

1.   All Sym-metric and Metric actuator buckling charts are rated for industrial cargo with a safety factor of 3.5.

2.   For human cargo a safety factor of 5 is recommended. To alter the permissible compressive load (W_P) for human cargo multiply the load selected from the chart by 0.7 e.g. $W_{PHC} = W_P *0.7$.

1.5.1.1.1.   Sym-metric and Metric Machine Screw Actuator Column Buckling Charts
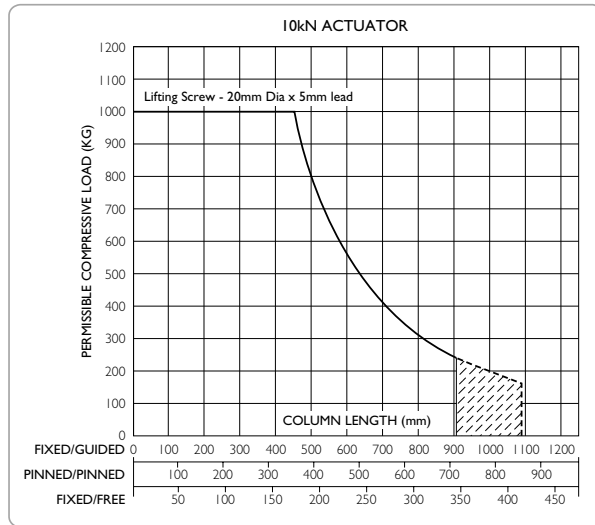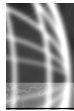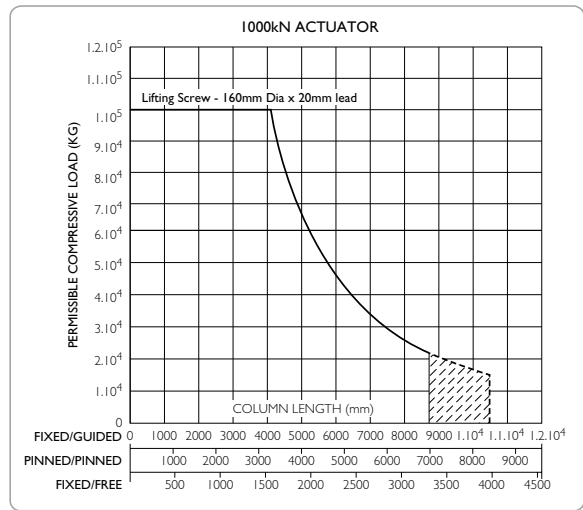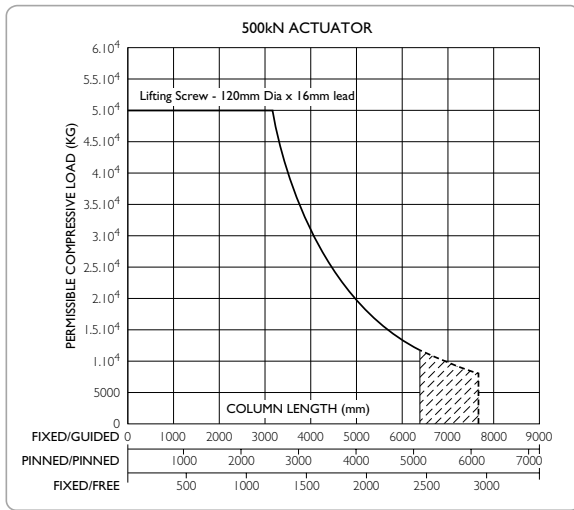
Sym-metric and Metric Machine Screw Actuator Column Buckling Charts (cont)

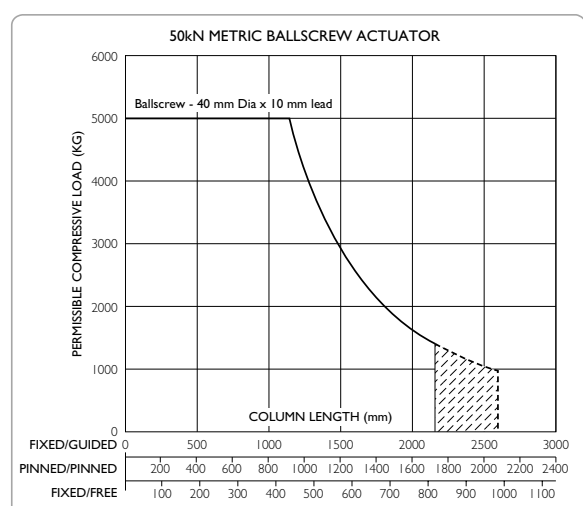### 10kN ACTUATOR
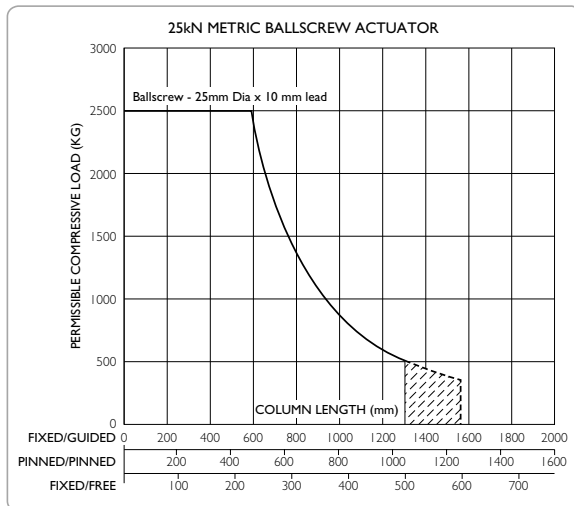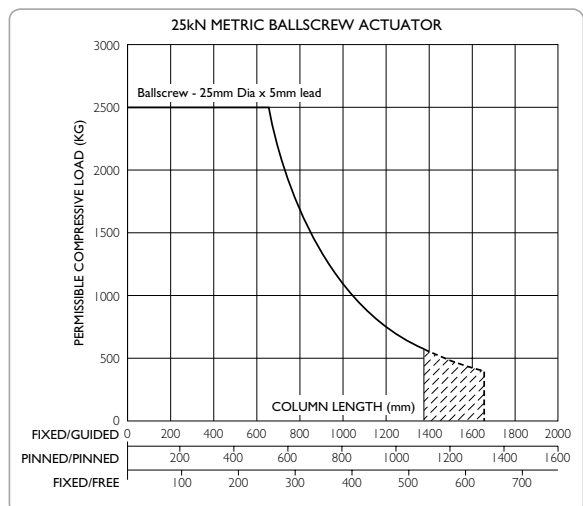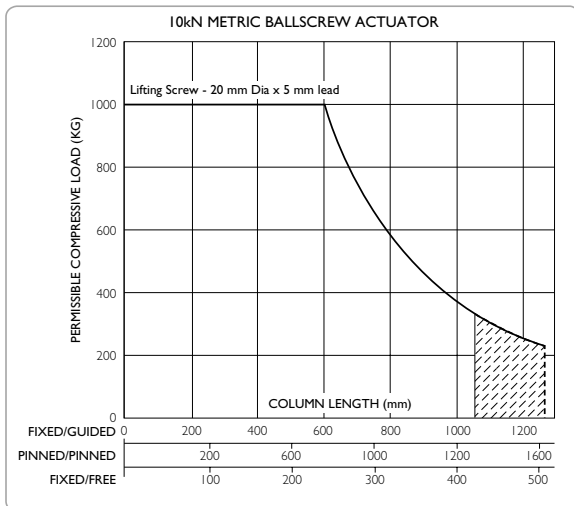
Lifting Screw - 20mm Dia x 5mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
PINNED/PINNED		100	200	300	400	500	600	700	800	900			
FIXED/FREE		50	100	150	200	250	300	350	400	450			

25kN ACTUATOR

Lifting Screw - 30mm Dia x 6mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	200	400	600	800	1000	1200	1400	1600	1800	2000
PINNED/PINNED		200	400	600	800	1000	1200	1400	1600	
FIXED/FREE		100	200	300	400	500	600	700	

50kN ACTUATOR

Lifting Screw - 40mm Dia x 9mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	300	600	900	1200	1500	1800	2100	2400	2700
PINNED/PINNED	200	400	600	800	1000	1200	1400	1600	1800	2000
FIXED/FREE	100	200	300	400	500	600	700	800	900	1000

100kN ACTUATOR

Lifting Screw - 55mm Dia x 12mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	500	1000	1500	2000	2500	3000	3500	4000
PINNED/PINNED		500	1000	1500	2000	2500	3000	
FIXED/FREE		200	400	600	800	1000	1200	1400	

200kN ACTUATOR

Lifting Screw - 65mm Dia x 12mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	500	1000	1500	2000	2500	3000	3500	4000	4500
PINNED/PINNED		500	1000	1500	2000	2500	3000	**3500**
FIXED/FREE		200	400	600	800	1000	1200	1400	1600

300kN ACTUATOR

Lifting Screw - 95mm Dia x 16mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

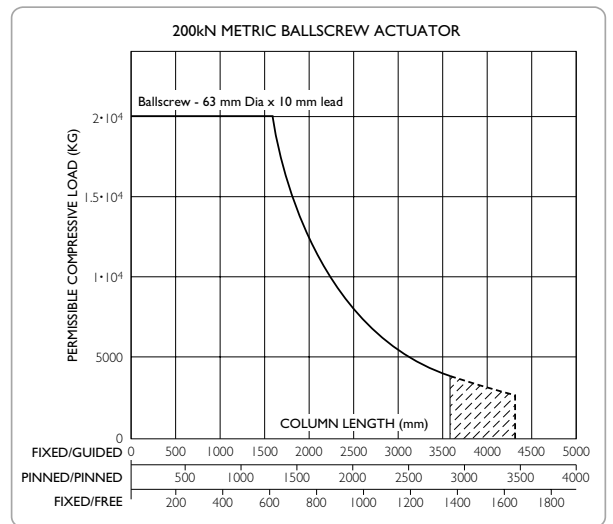| FIXED/GUIDED | 0 | 500 | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 | 6000 | 6500 | 7000 |
| PINNED/PINNED | | 500 | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 |
| FIXED/FREE | | 250 | 500 | 750 | 1000 | 1250 | 1500 | 1750 | 2000 | 2250 | 2500 |

Sym-metric and Metric Machine Screw Actuator Column Buckling Charts (continued)

500kN ACTUATOR

Lifting Screw - 120mm Dia x 16mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
PINNED/PINNED		1000	2000	3000	4000	5000	6000	7000
FIXED/FREE		500	1000	1500	2000	2500	3000

1000kN ACTUATOR

Lifting Screw - 160mm Dia x 20mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	1.10^4	$1.1.10^4$	$1.2.10^4$
PINNED/PINNED		1000	2000	3000	4000	5000	6000	7000	8000	9000
FIXED/FREE		500	1000	1500	2000	2500	3000	3500	4000	4500

1.5.1.1.2. Metric Ball Screw Actuator Column Buckling Charts

10kN METRIC BALLSCREW ACTUATOR

Lifting Screw - 20 mm Dia x 5 mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	200	400	600	800	1000	1200
PINNED/PINNED		200	600	1000	1200	1600
FIXED/FREE		100	200	300	400	500

25kN METRIC BALLSCREW ACTUATOR

Ballscrew - 25mm Dia x 5mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	200	400	600	800	1000	1200	1400	1600	1800	2000
PINNED/PINNED		200	400	600	800	1000	1200	1400	1600
FIXED/FREE		100	200	300	400	500	600	700

25kN METRIC BALLSCREW ACTUATOR

Ballscrew - 25mm Dia x 10 mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	200	400	600	800	1000	1200	1400	1600	1800	2000
PINNED/PINNED		200	400	600	800	1000	1200	1400	1600
FIXED/FREE		100	200	300	400	500	600	700

50kN METRIC BALLSCREW ACTUATOR

Ballscrew - 40 mm Dia x 10 mm lead

PERMISSIBLE COMPRESSIVE LOAD (KG)

COLUMN LENGTH (mm)

FIXED/GUIDED	0	500	1000	1500	2000	2500	3000
PINNED/PINNED		200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
FIXED/FREE		100	200	300	400	500	600	700	800	900	1000	1100

Metric Ball Screw Actuator Column Buckling Charts (continued)

50kN METRIC BALLSCREW ACTUATOR
Ballscrew - 40 mm Dia x 20 mm lead

100kN METRIC BALLSCREW ACTUATOR
Ballscrew - 50 mm Dia x 10 mm lead

100kN METRIC BALLSCREW ACTUATOR
Ballscrew - 50 mm Dia x 20 mm lead

200kN METRIC BALLSCREW ACTUATOR
Ballscrew - 63 mm Dia x 10 mm lead

200kN METRIC BALLSCREW ACTUATOR
Ballscrew - 63 mm Dia x 20 mm lead

300kN METRIC BALLSCREW ACTUATOR
Ballscrew - 80 mm Dia x 20 mm lead

1.5.1.1.3.   Imperial Ball Screw Actuator Column Buckling Charts

Important Notes for Ball Screw Actuators Only:

Actual Load	Actual Load on any actuator should never exceed the catalogue rated load.
Safety Factors	The charts show theoretical Euler buckling curves and suitable safety factors must be chosen by the customer from appropriate A.I.S.C. or other standards, for advice consult Power Jacks.
Maximum Screw Length	Determined by the column slenderness ratio (200) and regardless of load.
End Constraints	Fixed/Guided and Fixed/free are illustrated, for Pinned/Pinned consult Power Jacks.

Selection:

1. Select safety factor form A.I.S.C. or other applicable standards suitable for actuator application.

2. Multiply load by the safety factor to determine failure load.

3. Locate failure 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.
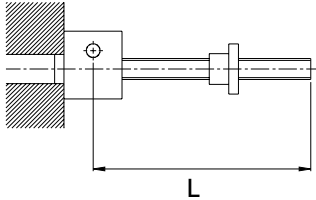
*Imperial Ball Screw Actuator Column Buckling Charts (continued)*

5 TON BALL SCREW ACTUATOR

10 TON BALL SCREW ACTUATOR

20 TON BALL SCREW ACTUATOR

25 TON BALL SCREW ACTUATOR

50 TON BALL SCREW ACTUATOR

screw**jacks**
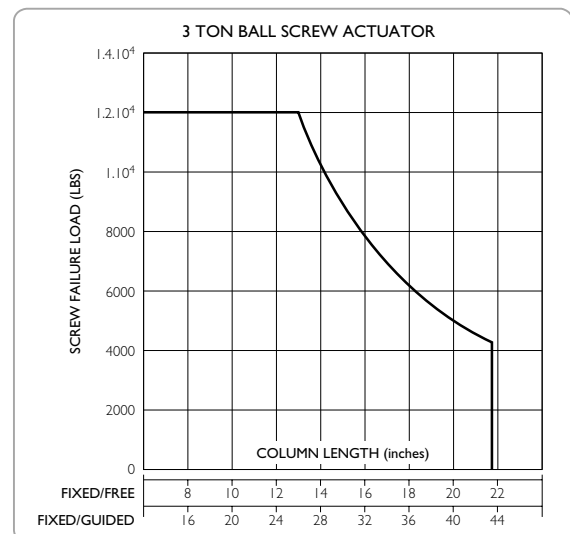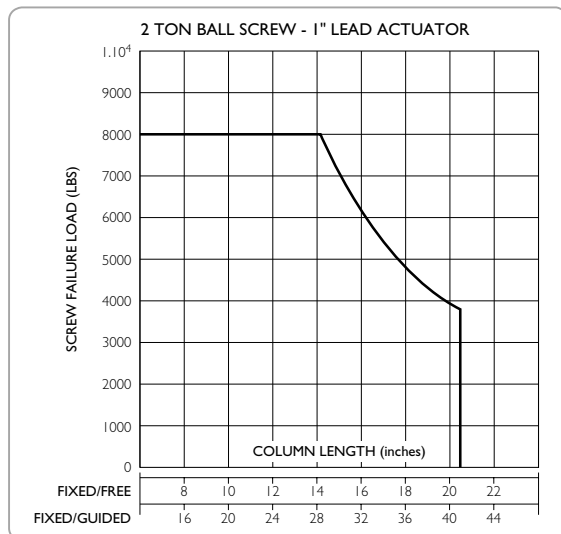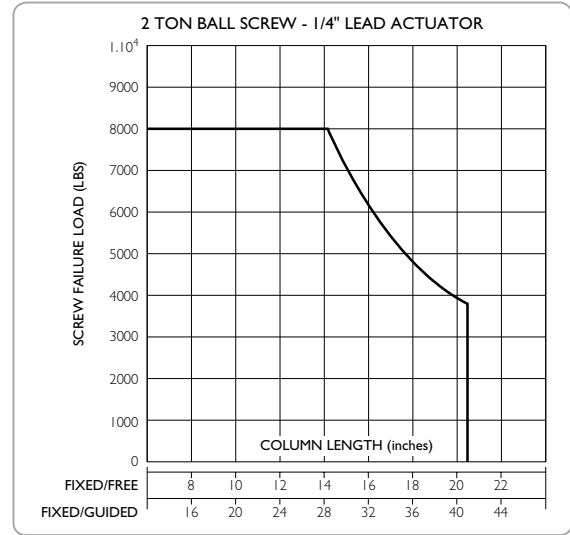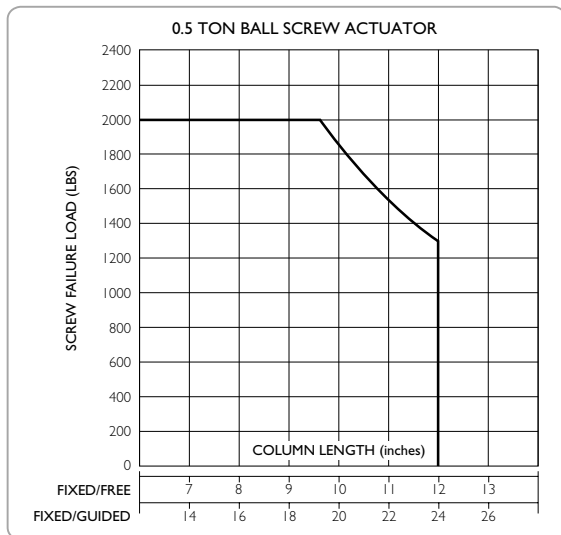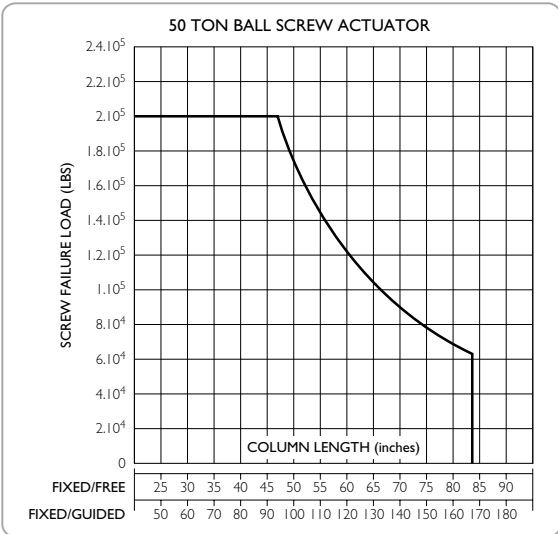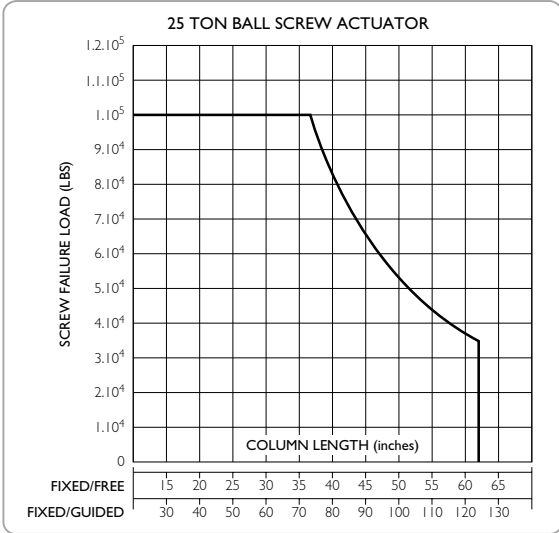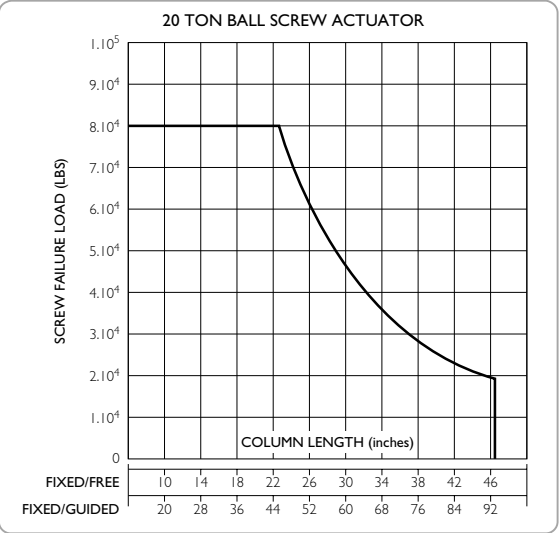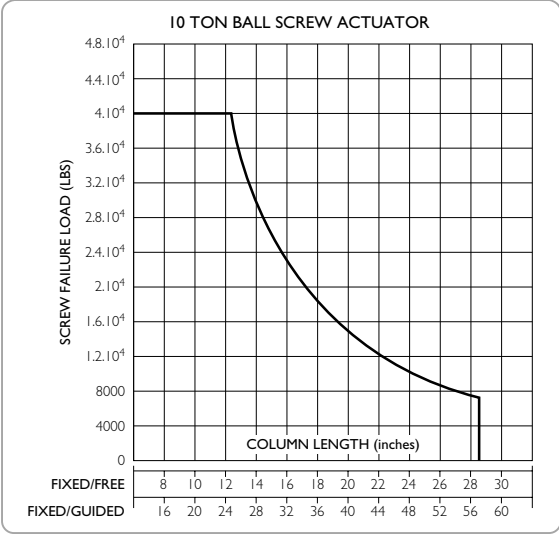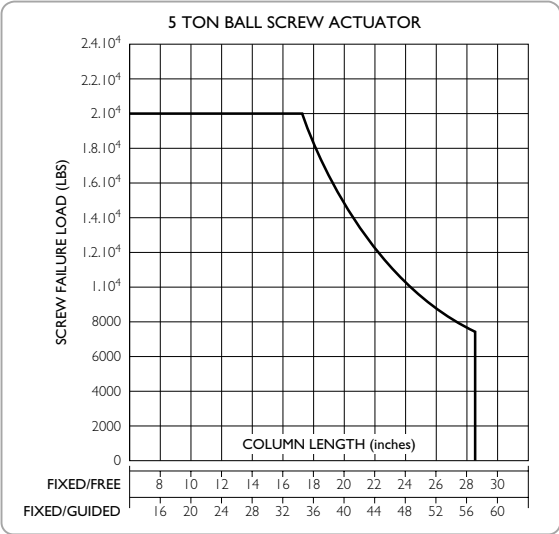
1.5.1.2.   Sym-metric and Metric Machine Screw Critical Screw Speed

Critical Screw Speed Factors, F_{cs}

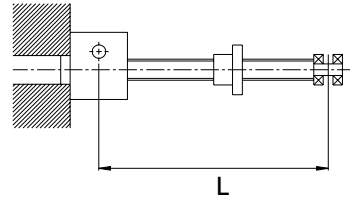*Fixed/Free, F_{cs} = 0.15*
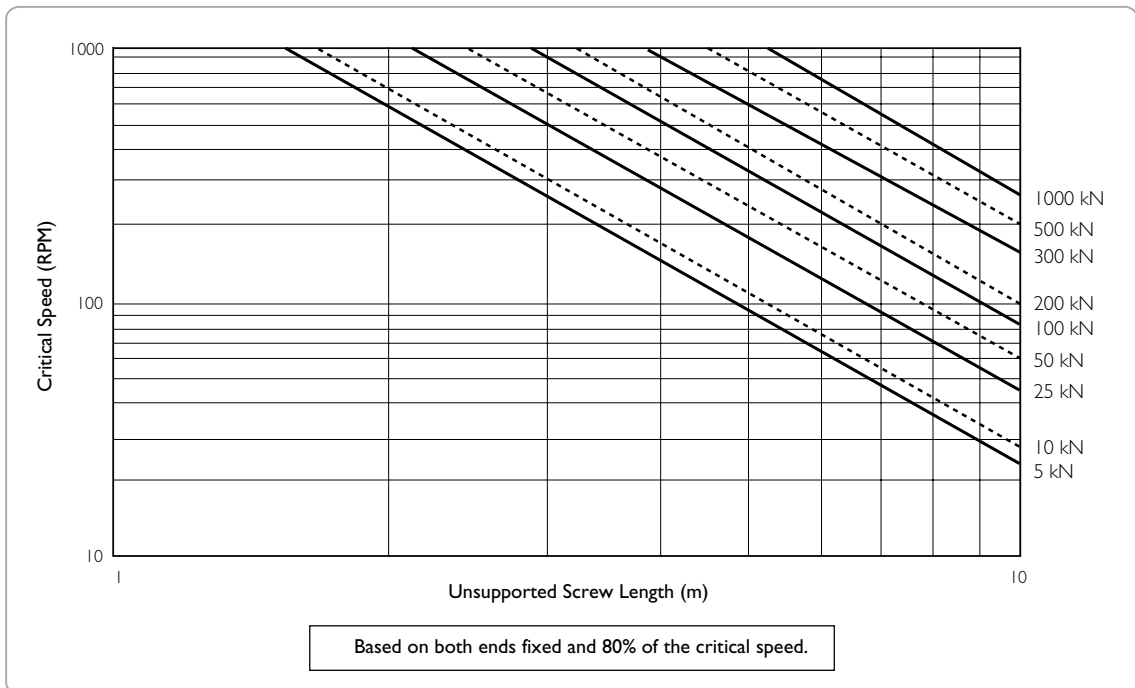
Fixed/Supported, F_{cs} = 0.7

Fixed/Fixed, F_{cs} = 1

L

L

L
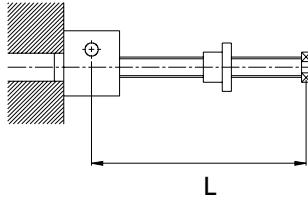
Note   *Both Sym-metric and metric machine screw actuators use metric machine screws.*

**Sym-metric and Metric Machine Screw Critical Screw Speed (Shaft Whirling)**

Critical Speed (RPM)

1000 kN
500 kN
300 kN

200 kN
100 kN
50 kN

25 kN

10 kN
5 kN

Unsupported Screw Length (m)

Based on both ends fixed and **80%** of the critical speed.

1.5.1.3. Metric Ball Screw Critical Screw Speed

Critical Screw Speed Factors, F_{cs} - *refer to 1.5.1.2. for factor values and diagrams*

Metric Ball Screw Critical Screw Speed (Shaft Whirling)

Based on both ends fixed and 80% of the critical speed.
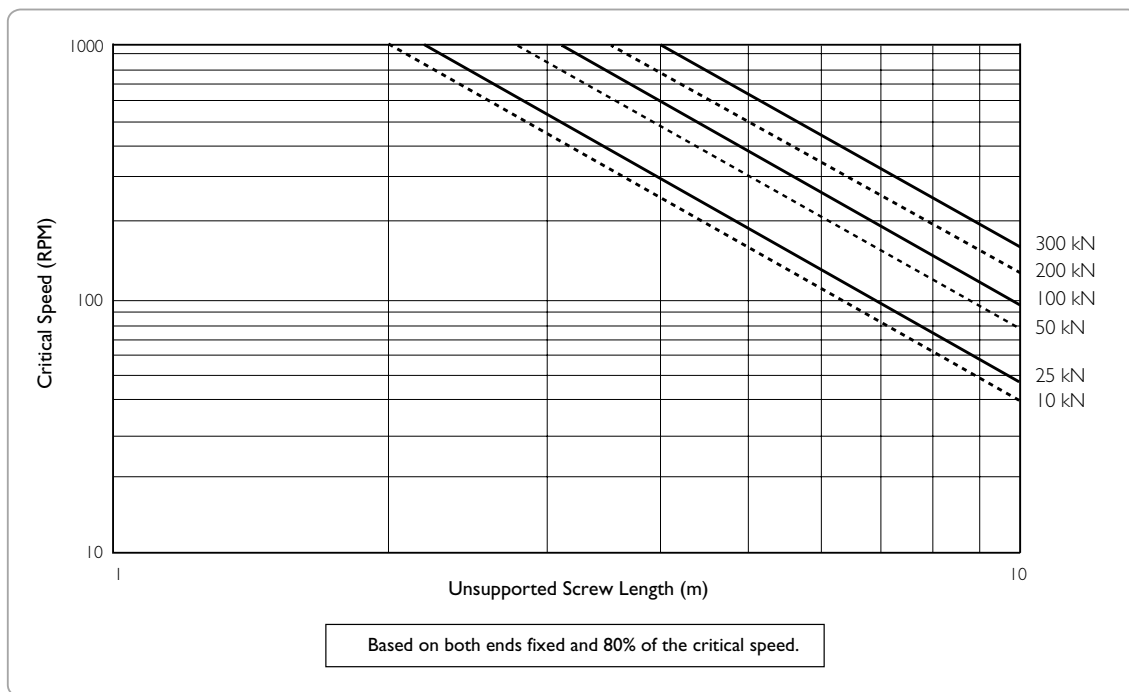
1.5.1.4. Imperial Ball Screw Critical Screw Speed

Critical Screw Speed Factors, F_{cs} - *refer to 1.5.1.2. for factor values and diagrams*

Imperial Ball Screw Critical Screw Speed (Shaft Whirling)

Based on both ends fixed and 80% of the critical speed.
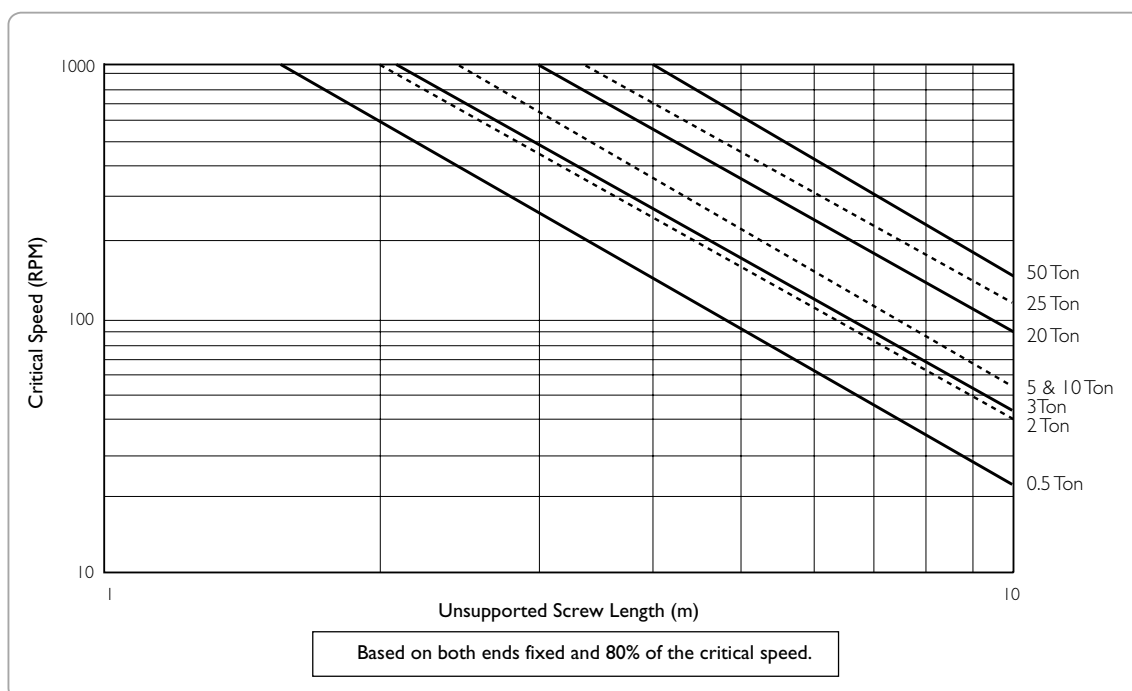
1.5.1.5.   Actuator Key Torque

The key torque is caused by the tendency of the lifting screw to rotate. It is a function of the screw lead, screw efficiency and the load and is not affected by the actuator unit gear ratio.

Note   The values below are given at rated load. For a smaller load reduce the key torque in direct proportion.

Sym-Metric & Metric Actuator Machine Screws			
Rating (kN)	Screw Diam. (m)	Lead (m)	Key Torque (Nm)
5	16	0.003	8
5	16	0.006	11
10	20	0.005	22
10	20	0.010	30
25	30	0.006	76
25	30	0.012	102
50	40	0.009	210
50	40	0.018	290
100	55	0.012	575
100	55	0.024	780
200	65	0.012	1300
200	65	0.024	1705
300	95	0.016	2805
300	95	0.032	3610
500	120	0.016	5645
500	120	0.032	6975
1000	160	0.020	14890
1000	160	0.040	18220

Metric Ball Screw Actuators			
Rating (kN)	Screw Diam. (m)	Lead (m)	Key Torque (Nm)
10	20	0.005	9
10	-	-	-
25	25	0.005	23
25	25	0.01	43
50	40	0.01	88
50	40	0.02	167
100	50	0.01	181
100	50	0.02	340
200	63	0.01	370
200	63	0.02	690
300	80	0.02	1030
300	-	-	-
500	-	-	-
500	-	-	-

-

Imperial Actuator Machine Screws			
Rating (Short Ton)	Screw Diam. (m)	Lead (inch)	Key Torque (lbf *inch)
0.25	0.5	0.250	40
0.5	0.625	0.125	70
1	0.75	0.250	175
2	1	0.250	460
5	1.5	0.375	1750
10	2	0.500	4700
15	2.25	0.500	7580
20	2.5	0.500	10625
25	3	0.666	14000
35	3.75	0.666	26500
50	4.5	0.666	47110
75	5	0.666	73000
100	6	0.750	118200
150	7	1.000	216000
250	9	1.000	423300

Imperial Actuator Ball Screws			
Rating (Short Ton)	Screw Diam. (inch)	Lead (inch)	Key Torque (lbf *inch)
0.5	0.625	0.200	35
2	1	0.250	175
2	1	1.000	700
3	1 11/64	0.413	440
5	1.5	0.474	850
5	1.5	1.000	1800
10	1.5	0.474	1700
10	1.5	1.000	3500
20	2.25	0.500	3500
25	3	0.660	6000
50	4	1.000	17700

1.5.1.6.   Maximum Actuator Side Load Ratings with Full Actuator Rated Load in Tension

Machine Screw Actuators

Sym-metric & Metric Machine Screw Actuator									
Actuator Rating (kN)	5	10	25	50	100	200	300	500	1000
Max. Side Load 300 mm Offset (N)	100	150	540	1130	2900	3350	17500	37800	83400

Imperial Machine Screw Actuator													
Actuator Rating (Short Ton)	0.25	0.5	1	2	5	10	15	20	25	35	50	75	100	150
Max. Side Load 1 ft Offset (lbf)	**	20	28	75	300	600	800	1000	3400	4400	8600	10000	17500	23000

Ball Screw Actuators

Metric Ball Screw Actuator										
Actuator Rating (kN)	10	25	25	50	50	100	100	200	200	300	500
Metric Ball Lead (mm)	5	5	10	10	20	10	20	10	20	20	*
Max. Side Load 300 mm Offset (N)	105	195	195	980	980	1570	1570	2060	2060	4340	*

Imperial Ball Screw Actuator											
Actuator Rating (Short Ton)		0.5	2	2	3	5	5	10	10	20	25	50
Imperial Ball Screw Lead (inch)		0.2	0.25	1	0.413	0.474	1	0.474	1	0.5	0.66	1
Max. Side Load 1ft	(lbf)	15	75	75	125	280	280	135	135	800	1915	4400
Offset	(N)	67	335	335	555	1245	1245	600	600	3560	8520	19570

  *Consult Power Jacks Ltd.
  ** Maximum side load 10 lbs at 400 lb load for 1 foot offset.*

Load

Side Load

Guide System Recommended
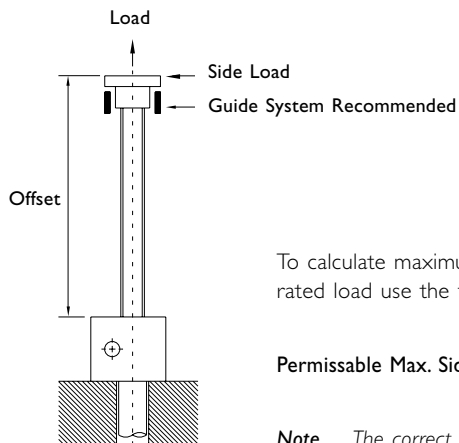
Offset

To calculate maximum side load for different raises for actuators in tension under full rated load use the following formula to modify the above tabulated values.

$$\text{Permissable Max. Side Load for Actual Offset} = \frac{\text{Max Side Load Rating Tabulated} * \text{Stated Offset}}{\text{Actual Offset}}$$

Note   *The correct units must be used.*

Important Notes

1. *These figures are for actuators in tension only.*
2. *The figures given above are permissible side load ratings, however, we recommend that all side loads be carried by guides in your arrangement and not by the screw and nut.*
3. *Life of the lifting screw and nut will be adversely affected the more side load they see.*
4. *These figures are based on acceptable stresses in the lifting screw and not on lifting screw deflection.*
5. *For maximum side load ratings for actuators in compression consult Power Jacks Ltd.*
6. *For precise calculations for your application consult Power Jacks Ltd.*

1.5.1.7. Radial Loads on Actuator Worm Shaft

For applications where an actuator is belt/chain driven, a calculation must be made to determine the radial force (F_R) and compared to the allowable radial load exerted on the worm shaft, that must not exceed those tabulated below. The values below are maximum values for the actuators at rated load regardless of worm speed or load direction and the radial load applied midway along the key of the worm shaft. For all applications the sprocket, gear etc. Should be positioned as close as possible to the actuator housing in order to reduce bearing loads and shaft stresses, and to prolong life.

$$\text{Radial Force, } F_R = \frac{2000 \times T \times K}{D}$$

where F_R = Radial load (N).

T = torque applied to the actuators input shaft (Nm).

K = factor from table below.

D = p.c.d. in mm of gear, sprocket.

Transmission Element	Factor K
Chain sprocket	1
Gears (Spur or helical pinion)	1.25
V-Belt pulley	1.5
Flatbelt pulley	2.0
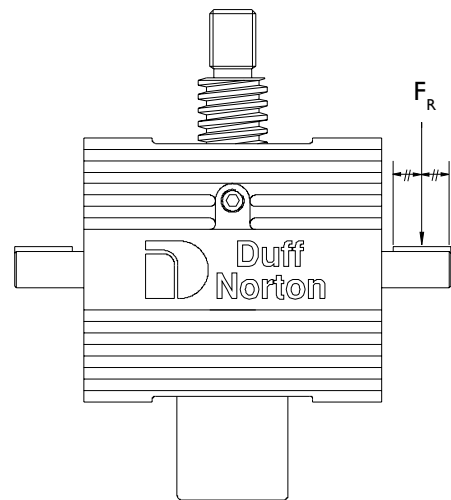
Sym-metric Machine Screw Actuators				
Actuator Rating (kN)	25	50	100	200
Radial Load (N)	440	1100	1200	1600

Metric Machine Screw & Ball Screw Actuators									
Actuator Rating (kN)	5	10	25	50	100	200	300	500	1000
Radial Load (N)	180	325	380	740	1000	1600	2170	2190	2220

Imperial Ball Screw Actuators												
Model Number		28631	2802	28021	28003	2805	28051	2810	28101	2820	2825	2860
Actuator Rating (Short Ton)		0.5	2	2	3	5	5	10	10	20	25	50
Lead (inches)		0.2	0.25	1	0.413	0.474	1	0.474	1	0.5	0.66	1
Radial Load	(lbf)	27	47	42	51	96	90	280	270	270	475	235
	(N)	120	210	185	225	425	400	1245	1200	1200	2110	1045

1.5.1.8. Actuator Accuracy

1.5.1.8.1. Axial Backlash Ratings

1.5.1.8.1.1. Sym-Metric, Metric and Imperial Machine Screw Actuators

Component	Normal Backlash
Lifting Screw and Nut	0.12 mm → 0.2 mm (0.005'' → 0.008'')
Load Bearings	0.00 mm → 0.03 mm (0.000'' → 0.001'')
Total	0.12 mm → 0.23 mm (0.005'' → 0.009'')

Note 1. *The lifting screw backlash will increase during operation due to wear of threads in the nut.*
2. *Axial play can be reduced by altering the load bearings preload to eliminate bearing play or by specifying an actuator with the Anti-Backlash Feature.*
3. *For exact backlash ratings for an individual unit consult Power Jacks.*

1.5.1.8.1.2. Anti-Backlash Option

This unit can be adjusted for screw thread and bearing clearances to a minimum of 0.025 mm (0.001''). Some clearances must be maintained to keep torque requirements within reason and to provide adequate space for a lubrication film to form.

1.5.1.8.1.3. Ball Screw Actuators

Actuator Type	Metric	Imperial
Component	Normal Backlash	Normal Backlash
Ball Track and Ball Nut	0.05 mm → 0.15 mm (0.002'' → 0.006'')	0.05 mm → 0.33 mm (0.002'' → 0.013'')
Load Bearings	0.00 mm → 0.03 mm (0.000'' → 0.001'')	0.05 mm → 0.075 mm (0.002'' → 0.003'')
Total	0.05 mm → 0.18 mm (0.002'' → 0.007'')	0.10 mm → 0.405 mm (0.004'' → 0.017'')

Note 1. *For exact backlash ratings for an individual unit consult Power Jacks.*
2. *Ball nuts can be supplied with zero backlash or with adjustable backlash via a special twin nut assembly (twin nut assembly for rotating screw units only). Consult Power Jacks for details.*
3. *Altering the load bearings preload to eliminate bearing play can reduce axial play.*
4. *There is no Anti-Backlash nut feature for the gear sets of these actuators.*

1.5.1.8.2. Pitch Deviation of Lifting Screw

Lifting Screw		Pitch Deviation
Machine Screw	Metric	0.05 mm → 0.25 mm per 300 mm
	Imperial	0.002'' → 0.010'' per foot
Ball Screw	Metric	0.025 mm → 0.050 mm per 300 mm (DIN Class 5,7)
	Imperial	± 0.009'' per foot (± 0.229 mm per 300 mm)

Note 1. *Pitch deviation is cumulative and* **NOT** *detrimental to the operation of the actuator.*
2. *The Lifting screws are manufactured from material with a straightness tolerance of 0.2 mm per metre.*
3. *Pitch deviation is related to the cutting machines tolerance and the material used.*

1.5.1.8.3. Lateral Movement Ratings

1.5.1.8.3.1. Sym-metric Machine Screw Actuators

Raise (mm)	25 kN	50 kN	100 kN	200 kN
100	0.7	0.9	0.8	0.4
200	1.1	1.4	1.3	0.6
300	1.6	2.0	1.7	0.8
400	2.0	2.5	2.2	1.0
500	2.5	3.0	2.6	1.2
600	2.9	3.5	3.1	1.5
700	3.3	4.1	3.5	1.7
800	3.8	4.6	4.0	1.9
900	4.2	5.1	4.4	2.1
1000	4.7	5.6	4.9	2.3

1.5.1.8.3.2. Metric Machine Screw Actuators

Raise (mm)	5 kN	10 kN	25 kN	50 kN	100 kN	200 kN	300 kN	500 kN	1000 kN
100	0.7	0.6	0.8	1.0	1.0	0.4	0.4	0.7	0.7
200	1.3	1.1	1.4	1.7	1.7	0.7	0.6	1.0	1.0
300	1.9	1.5	1.9	2.3	2.3	0.9	0.8	1.3	1.3
400	2.5	2.0	2.5	2.9	2.9	1.2	1.0	1.7	1.6
500	3.1	2.4	3.1	3.6	3.6	1.4	1.2	2.0	1.9
600	3.7	2.8	3.6	4.2	4.2	1.6	1.4	2.3	2.2
700	4.3	3.3	4.2	4.8	4.8	1.9	1.6	2.6	2.4
800	4.8	3.7	4.8	5.5	5.5	2.1	1.8	2.9	2.7
900	5.4	4.2	5.3	6.1	6.1	2.4	1.9	3.2	3.0
1000	6.0	4.6	5.9	6.7	6.7	2.6	2.1	3.6	3.3

1.5.1.8.3.3. Imperial Machine Screw Actuators (1800 & 9000 Series)

Raise (inch)	2555	2625	2501	1802	9002	1805	1810	1815	1820	1825	9035	1850	9075	1899	18150	2250
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	.130	.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	.225	.090	.135	.135	.170	.135	.150	.125	.200	.110	.275	.120	.120	.120	.160

Notes   1. *Values quoted above are the maximum expected lateral movement for the given raise and actuator model.*
      2. *Does not allow for possible deflection due to side loads.*
      3. *Lateral movements are for information only. For best results we recommend guides where possible.*
      4. *Lateral movements will be reduced if the actuator is fitted with secondary guides (standard option for Sym-metric and Metric actuators).*
      5. *The above movements apply to machine screw actuators only and not ball screw actuators. Permitting lateral movement on the ball screw actuators under load will exert side thrust on the ball screw and ball nut, and will be detrimental to the ball screw and nut life. Ball screw applications should be guided to ensure a minimum of lateral movement.*
      6. *Where lateral movement is critical consult Power Jacks for exact values for the application.*

1.5.2. Actuators Product Operation

1.5.2.1. Actuators

1.5.2.1.1. Actuator Mechanical Performance

1.5.2.1.1.1. Lifting Torque Required

The input 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. Torque values are listed in the individual product specification charts based on capacity loads. For loads from 25% to 100% of actuator model capacity, torque requirements are approximately proportional to the load.

1.5.2.1.1.2. Actuator Operating Input Speed

The input power to these actuators should not exceed the power rating shown in the specifications table. Maximum rpm should not exceed 1800 (sym-metric actuators can go up to 3000 rpm). We cannot accept responsibility for the overheating and rapid wear that may occur should these limits be exceeded. Power 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 power rating of the actuator model is not exceeded.

1.5.2.1.1.3. Actuator Efficiency

Actuator model efficiencies are listed in the individual product specification charts.

1.5.2.1.1.4. Worm Gear Actuator Life

The life expectancy of a machine screw actuator screw, nut and worm gear set varies considerably due to extent of lubrication, abrasive or chemical action, overloading, excessive heat, improper maintenance, etc. For life calculations consult Power Jacks Ltd.

1.5.2.1.1.5. Torque of a Rotating Screw Actuator and a Standard Unit

The input torque, as well as the efficiency and side load ratings, are the same for both translating screw and rotating screw actuators.

1.5.2.1.1.6. Shock Loads on an Actuator

Shock loads should be eliminated or reduced to a minimum, if they cannot be avoided, the actuator model selected should be rated at twice the required static load. For severe shock load applications, using the Sym-metric, Metric and Imperial actuators, the load bearings should be replaced with heat-treated steel thrust rings which is an option available from Power Jacks. Note this will increase the input torque by approximately 100 percent.

1.5.2.1.1.7. Backlash in an Actuator Unit

Machine screw actuators, machine screw actuators with anti-backlash and ball screw actuators must be considered separately, as the normal backlash will vary due to different constructions.

1.5.2.1.1.7.1. Machine Screw Actuators

Machine Screw Actuators have backlash 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 (refer 1.5.1.8.). 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 a unit with the anti-backlash feature should be considered.

1.5.2.1.1.7.2. Anti-Backlash Actuator Feature

When the screw (1) is under a compression load, the bottom of its thread surfaces are supported by the top thread surfaces of the worm gear (2) at point (A). The anti-backlash nut (3), being pinned to the worm gear and floating on these pins and being adjusted downward by the shell cap, forces its bottom thread surfaces against the upper thread surfaces of the lifting screw at point (B). Thus, backlash between worm gear threads is reduced to a regulated minimum (refer 1.5.1.8.).

When wear occurs in the worm gear threads and on the load carrying surfaces of the lifting screw thread, the load carrying thickness of the worm gear thread will be reduced. This wear will create a gap at point (B) and provide backlash equal to the wear on the threads.

Under compression load, the lifting screw will no longer be in contact with the lower thread surface of the anti-backlash nut. Under this condition, backlash will be present when a tension load is applied. The anti-backlash feature can be maintained simply by adjusting the shell cap until the desired amount of backlash is achieved.

To avoid binding and excessive wear do not adjust lifting screw backlash to less than 0.013mm (0.0005″).

This will reduce the calculated separation (C) between the anti-backlash nut and worm gear and will reduce the back lash between the worm gear threads and the lifting screw to the desired minimum value.

When separation (C) has been reduced to zero, wear has taken place. Replace the worm gear (2) at this point. This feature acts as a built in safety device which can be used to provide wear indication for critical applications.
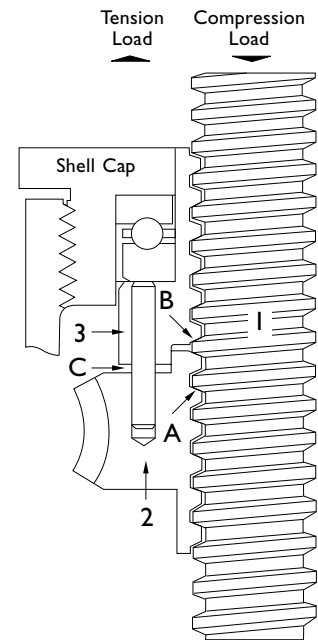
1.5.2.1.1.7.3. Ball Screw Actuators

Ball Screw Actuators do not have an anti-backlash option similar to the machine screw actuators. Instead for zero or reduced axial play ballscrew actuators can be ordered with a pre-loaded ball nut (refer 13.1.1.2.).

1.5.2.1.1.8. Actuator Self-Locking

The following actuator models are considered not to be self-locking; all Metric and Imperial ball screw actuators, the 2555 (1/4 ton), the 2625 (1/2 ton), the 2501 (1-ton), in some cases the 1802 & 9002 (2 ton) units, the 1805 (5 ton) unit, the 1810 (10 ton) unit and the 1815 (15 ton) unit. The 24:1 and 25:1 ratios are self-locking in most cases. All actuators with double start lifting screws are considered not to be self-locking. Units considered not self-locking will require a brake or other holding device (refer 1.1.3.2.7.). If vibration conditions exist, refer to section 1.5.2.1.4.5. For detailed advice and analysis consult Power Jacks.

1.5.2.1.2. Lifting Screw

1.5.2.1.2.1. Lifting Screw Operation

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. Lifting screw key torques (refer 1.5.1.5.) must be checked as excessively heavy unguided loads could break the key.

1.5.2.1.2.2. Keyed Lifting Screw - To Prevent Rotation

Available for all actuators, except for the ball screw. Note the keyway in the screw causes greater than normal wear on the internal threads of the worm gear. The ball screw actuators cannot be keyed, as the keyway would interrupt the ball track, permitting loss of the recirculating balls.

We 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 ensure the load is guided to prevent rotation. A guided load is recommended as a heavy unguided load could cause key failure. Note as a special design option a square anti-rotation tube can be fitted to ball screw actuators to prevent rotation (refer 1.3.1.10.). For further details consult Power Jacks Ltd.

1.5.2.1.2.3.   Keyed Lifting Screw For An Inverted Actuator

For Metric and Imperial actuators the key is mounted in the shell cap, making it necessary to omit the bottom pipe as a standard item. If a dust guard is required, a special adaptor must be attached to permit mounting. Sym-metric actuators can have the key mounted either side of the gear with a bottom pipe available for both options, as standard.

1.5.2.1.2.4.   Lifting Screw Column Strength

The column strength of a screw is determined by the relationship between the length of the screw and its diameter. Column strength nomographs are included in this book (refer 1.5.1.1.).

1.5.2.1.2.5.   Actuator Side Loads

Actuator units are designed primarily to raise and lower loads and any side loads should be avoided. These units will withstand some side loads, depending on diameter of the screw and the extended length of the screw. Where side loads are present, the loads should be guided and the guides, rather than the actuator units, should take the side loads - particularly when long raises are involved. Even a small side load can exert great force on the housings and bearings and increase the operating torque and reduce the life expectancy. "Side Load Rating Charts" are included in this book (refer 1.5.1.6.)

1.5.2.1.2.6.   Maximum Practical Raise or Working Stroke

Generally, standard raises are up to 300mm on 5kN and 500mm on 10 kN on metric screw actuators 12 inches on $^1/_4$ and $^1/_2$ ton models and 18 inch on the 2501 (one ton) imperial actuators. 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 Power Jacks for the following:

        a)   Side loads on extended screw (1.5.1.6.)

        b)   Column strength of screw (1.5.1.1.)

        c)   Thermal rating of screw and nut (1.5.2.1.3.4.)

We suggest guides be used on all applications. The longer the raise, the more important this becomes.

1.5.2.1.3.   Actuator Duty

1.5.2.1.3.1.   Allowable Duty Cycle of a Worm Gear Actuator

Because of the efficiency of conventional metric and imperial worm gear actuators, the duty cycle is intermittent at rated load. At reduced loading, the duty cycle may be increased. The Sym-metric actuators have higher thermal efficiencies due to their design allowing generally 50% higher duty cycles than conventional style actuators. For detailed analysis consult Power Jacks.

1.5.2.1.3.2.   Worm Gear Actuator Suitability for High Temperature Operation

The actuator is normally suitable for operation at ambient temperatures of up to 90°C. Operations above 90°C will require special lubricants. For temperatures above 90°C, the life of even special lubricants is limited. Therefore consult Power Jacks on your application.

For temperatures above 90°C, advise Power Jacks of full particulars of the duration of such temperatures. In some cases, it may be necessary to furnish an unlubricated unit, 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 90°C or less.

Seals for temperatures above 120°C are very expensive. Instead, we should substitute bronze bushings for seals in these cases. If bellows boots are used, special materials will be required for temperatures above 90°C.

1.5.2.1.3.3.   Actuator Suitability for Low Temperature Operation

With the standard lubricant and materials of construction, the actuator is suitable for use at sustained temperatures of -20°C. Below -20°C, low temperature lubricant should be used. Also, at temperatures below -20°C, if there is any possibility of shock loading, special materials may be required due to notch sensitivity of the standard materials at lower temperatures. Power Jacks application engineers must be consulted in these instances for a recommendation.

Actuators with standard material of construction and lubrication may be safely stored at temperatures as low as -55°C.

1.5.2.1.3.4.   Thermal/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. Sym-metric actuators have an oil lubricated cubic gearbox housing specifically designed to dissipate heat more efficiently with increased surface area and mass, allowing increased duty capabilities.

1.5.2.1.3.5.   Continuous Duty Actuators

Recommendation should be obtained from Power Jacks on this type of 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 Sym-metric and 7500 Series, oil-lubricated, high duty cycle actuators, are designed for maximum duty cycles. Special purpose actuators fitted with ball screws may also suit applications, consult Power Jacks.

1.5.2.1.4.   Actuator Applications

1.5.2.1.4.1.   Bellows Boots for an Inverted Screw Actuator

Metric and Imperial inverted screw actuators with bellows boots must incorporate an allowance 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. (refer 1.2.1.8., 1.2.2.8., 1.2.3.7. and 1.3.1.3. and 1.3.2.8.).

Sym-metric actuators allow mounting from two sides instead of one and allow mounting on the same side as the bellows boot with only an access hole required in the structure for the lifting screw and bellows boot.

1.5.2.1.4.2.   Actuator used to Pivot a Load

The actuator can be 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 portion. 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 load conditions. See the double clevis model illustrations on the dimensional drawings (refer 1.2.2.10., 1.2.3.5. 1.3.1.5. and 1.3.2.7.).

1.5.2.1.4.3.   Actuators used within Rigid Structures or Presses

We recommend that the actuator selected has a greater capacity than the rated capacity of the press or of the load capacity of the structure. We also recommend that a torque 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 realising it.

1.5.2.1.4.4.   Actuator Drift after Motor Switch Off

The actuator will drift after the motor drive is switched off 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 interia of the rotor in the motor. Due to different construction, the ball screw actuator unit must be considered separately; refer 1.1.3.2.7. Machine screw actuators require approximately one-half as much torque to lower the load as they do to raise the load.

For machine screw actuators with no load, the amount of drift will depend upon the size and speed of the motor. For example, a 1500 RPM motor directly connected to an actuator unit without a load will give on average 35mm → 60mm drift; a 1000 RPM gear motor will give about 1/2 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.

1.5.2.1.4.5.   Actuator Units where Vibration is Present

The actuators will operate in areas with vibration, however the vibration may cause the lifting screw to creep or inch down under load. For applications involving slight vibration, select the higher of the worm gear ratios. Should considerable vibration be present, use a drive motor equipped with a magnetic brake which will prevent the actuator from self-lowering.

1.5.2.1.4.6.   Stop Discs, Stop Pins or Stop Nuts Used on Actuator Units

To prevent over travel of the lifting screw a stop disc, pins or nut can be fitted to an actuator unit that is hand operated. For motor driven units it is possible for the full capacity of the actuator unit or even a greater force (depending on the power of the motor) to be applied against the stop, thereby jamming so tightly it must be disassembled in order to free it. It is recommended that external stops are fitted where possible, however they must only be used as a last resort (Note - limit switches are one possible solution to constrain actuator movement safely - consult Power Jacks for system advice). Under ideal conditions where a slip clutch or torque limiting device is used, a stop pin or stop nut may be used - but Power Jacks should be consulted. The stop disc used on the bottom of the lifting screw prevents our ball screw from running out of the ball nut during shipping and handling, thereby preventing loss of the recirculating balls.

1.5.2.2.   Actuator Systems

1.5.2.2.1.   Multiple Actuator Arrangements

Perhaps the greatest single advantage of Power Jacks actuators is that they can be linked together mechanically, to lift and lower in unison. Typical arrangements involving the actuator units, bevel gear boxes, motors, reducers, shafting and couplings are shown in section 1.1.3.2.8.

1.5.2.2.2.   Number of Actuators Connected in Series

This will be limited by 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 on the machine screw actuators (this does not include the 1820 unit).

1.5.2.2.3.   Multiple Actuator Arrangement

In addition to the efficiencies of the actuator units and the mitre gearboxes, 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. For efficiency values refer 1.1.3.2.8.

1.5.2.2.4.   Multiple Actuator Unit Arrangement with a Visual Position Indicator for Lifting Screw Position at any Point

A visual position indicator for an actuator system can be provided in several ways, for example:

> 1.   Actuator system with encoder and counter (refer 8.3. and 8.4.)
> 2.   Actuator system with rotary limit switch and position transducer (refer 8.1.2.)

However, it is suggested you consult Power Jacks for recommendations based on your particular application.

1.5.3.   Installation and Maintenance Tips

The following installation and maintenance tips are for the Sym-metric, Metric and Imperial machine screw and ball screw actuator models.

General care should be taken to ensure that equipment is sufficient to handle the load.

1. The structure on which the actuator unit is mounted should have ample strength to carry the maximum load, and be rigid enough to prevent undue deflection or distortion of the actuator unit supporting members.

2. It is essential that the actuator unit be carefully aligned during installation so that the lifting screws are vertically true and the connecting shafts are exactly in line with the worm shafts. After the actuator unit, shafting, and gear boxes are coupled together, it should be possible to turn the main drive shaft by hand. If there are no signs of binding or misalignment, the actuating system is then ready for normal operation.

3. The actuator unit should have a greater raise than is needed in the actuator installation. If it is necessary to operate the actuator at the extreme limits of travel, it should be done with caution.

    CAUTION: Do not allow screw travel below catalogue closed height of the actuator unit or serious damage to internal mechanism may result. Refer to table specifications for closed height of respective units.

4. The input power should not exceed the power rating shown in the specification table. Maximum RPM should not exceed 1800.

5. The lifting screw should not be permitted to accumulate dust and grit on the threads. If possible, lifting screws should be returned to closed position when not in use.

6. The ball screws in the ball screw actuator units should be checked periodically for excessive backlash and spalling of raceways. A periodic check of backlash of the lifting screw thread is recommended to check wear of the worm gear internal threads on the machine screw actuator models. Backlash in excess of 50% of the thread thickness indicates the need to replace the worm gear. (refer 1.5.1.7. and 1.5.2.1.1.7.).

7. Unless otherwise specified, actuator units and gear boxes are shipped packed with grease (refer point 8 for oil lubricated standard products) which should be sufficient for one month of normal operation. For normal operation, the actuator units and gear boxes should be lubricated about once a month, using one of the following extreme pressure greases or their equivalent:

    Shell   Alvania WR2

    BP   Energrease LC2

    Castrol   Spheerol L-EP2

    Mobil   Mobilux EP2

    For severe conditions, the actuator units should be lubricated more frequently, using one of the above greases (daily to weekly depending on conditions). If duty is heavy, an automatic lubrication system is strongly recommended. If ambient temperatures exceed 90°C (194°F) consult Power Jacks.

8. Unless otherwise specified, all Sym-metric Actuators have oil filled gear boxes which should be sufficient for normal operation. Under normal operation, the actuator units should have oil levels checked regularly, using one of the following premium gear oils or their equivalent:

    Sym-metric Actuator

    BP   Energol GR-XP150

    Shell   OMALA Oil 150

    Castrol   Alpha SP150

    Mobil   Gear Oil 629

9. On ball screw actuator model applications, periodically lubricate the exposed ball screw grooves with a cloth dampened with a good grade 10W30 oil for most applications. An instrument grade oil should be used in dirty and heavy duty environments, and bearing grease for environments at extremely high temperatures. Extreme temperature and other environmental conditions should be referred to Power Jacks for recommended lubricating procedures.

    CAUTION: Where ball screws are not protected from airborne dirt, dust, etc., bellows boots should be used. Inspect frequently at regular intervals to be certain a lubricating film is present. Ball screws should never be run dry.

10. Due to the high efficiency of the ball screw actuator design, a brake must be used in conjunction with motor selected to position the actuator unit (refer 1.1.3.2.7. and 1.5.2.1.1.8.)