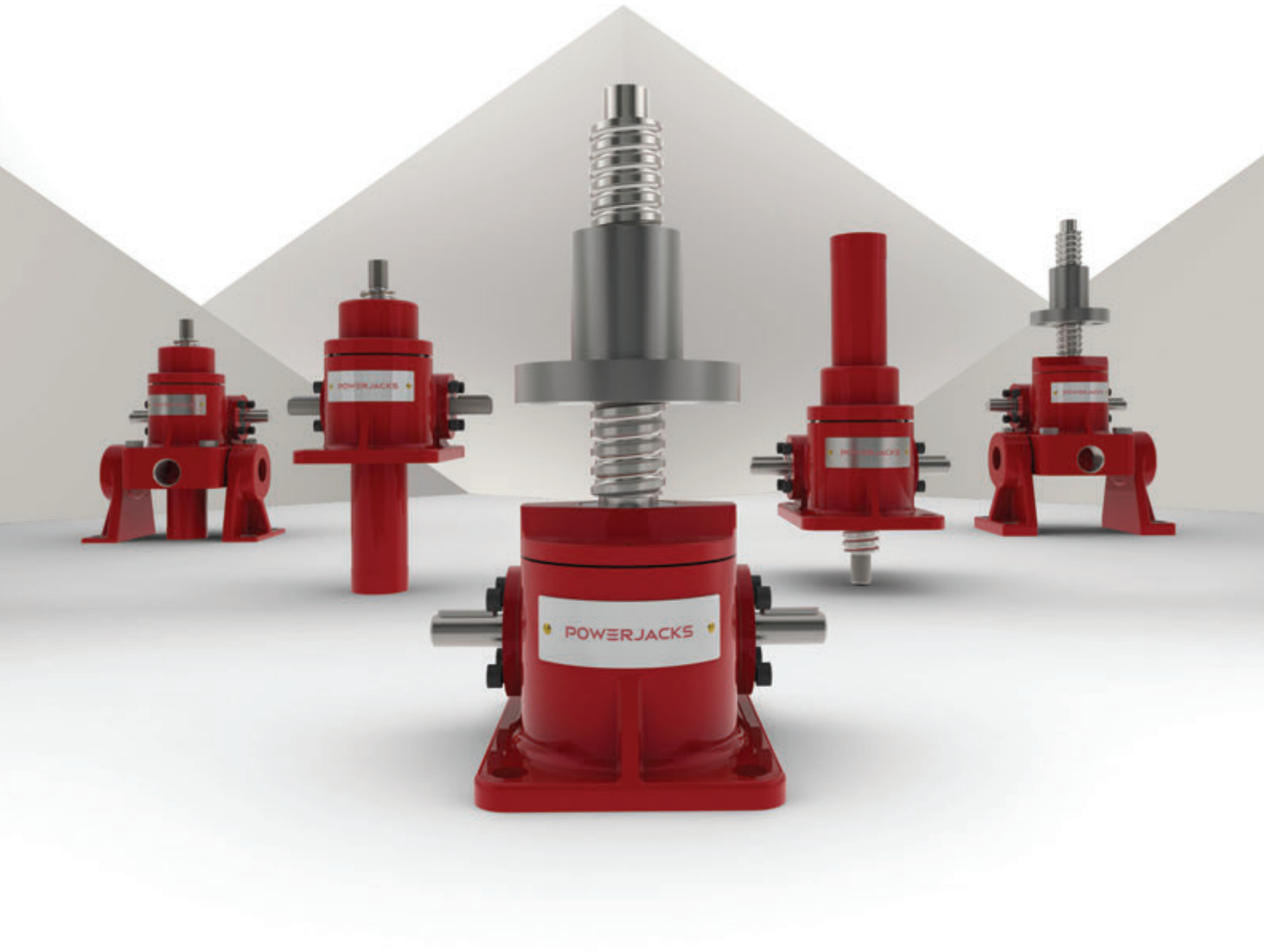
POWERJACKS

PRECISION ACTUATION



E-SERIES BALL SCREW JACKS

POWERJACKS

Best engineered solution for precision linear actuation, power transmission & jacking systems.

Capability

OUR EXPERTISE HAS BEEN BUILT ON A HISTORY OF MORE THAN 100 YEARS OF ENGINEERING, CRAFTSMANSHIP, VISIONARY DESIGN, QUALITY MANUFACTURE AND CUSTOMER CARE.

Power Jacks is a manufacturing/engineering company specialising in the design and manufacture of actuation, lifting and positioning solutions for applications in Industrial Automation, Energy, Defence, Medical, Transport, and the Civil Engineering sectors.

Headquartered near Aberdeen in the UK, the company is the UK's largest screw jack manufacturing facility, that uses the latest engineering technologies to deliver quality products (BS EN ISO 9001) that offer reliability, performance and economy.

Power Jacks deliver this high quality service in a safe (OHSAS 18001) and environmentally friendly (ISO 14001) working environment thanks to the highly trained, flexible and motivated teams that work throughout the business driving the company to higher levels of performance.

We know our customers demand our engineering expertise to help find a solution for their applications. We take pride in designing and delivering the best solution using standard or special designs that help improve your business.

Our Vision is to become the partner of choice for our products globally
Our Mission is to provide high quality lifting & positioning solutions.

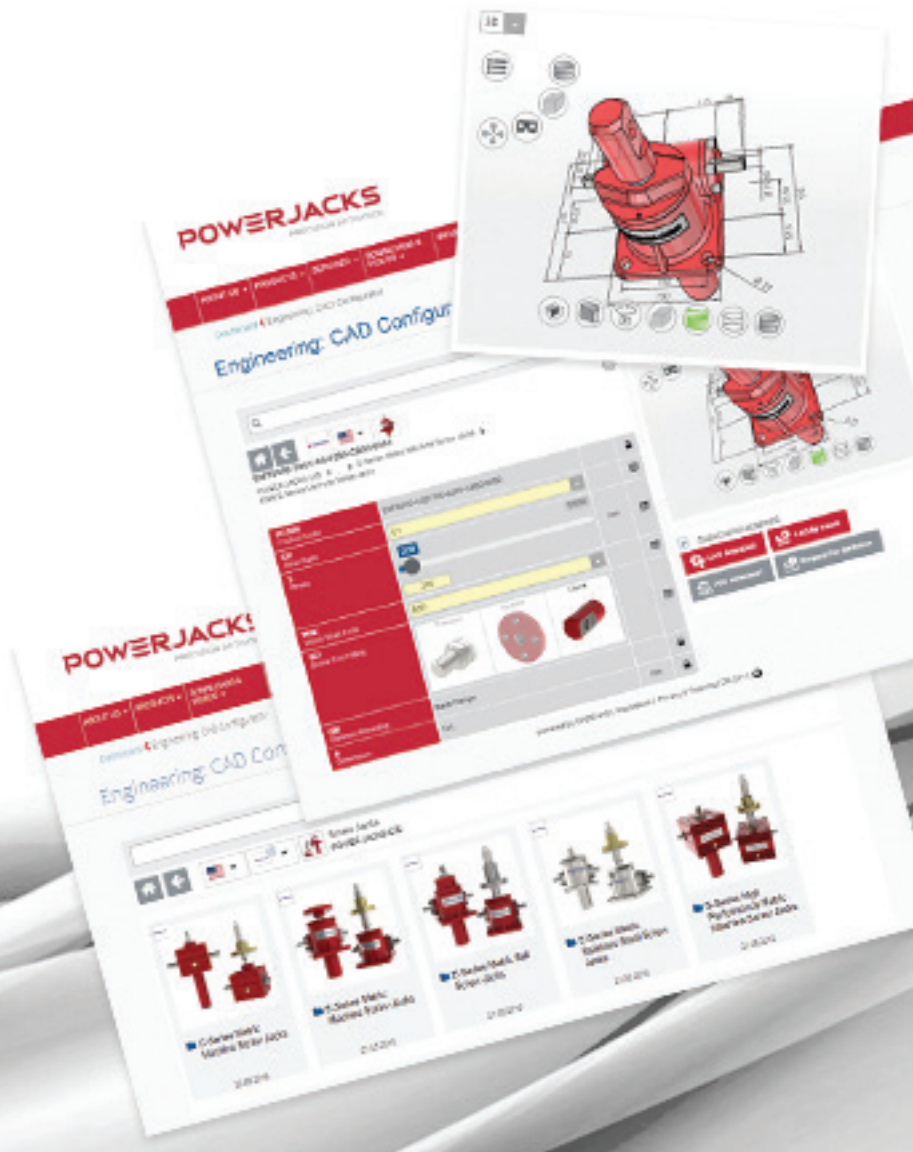
Global Reach

Power Jacks has local representation in 26 countries and supplies its products to more than 80 countries worldwide.

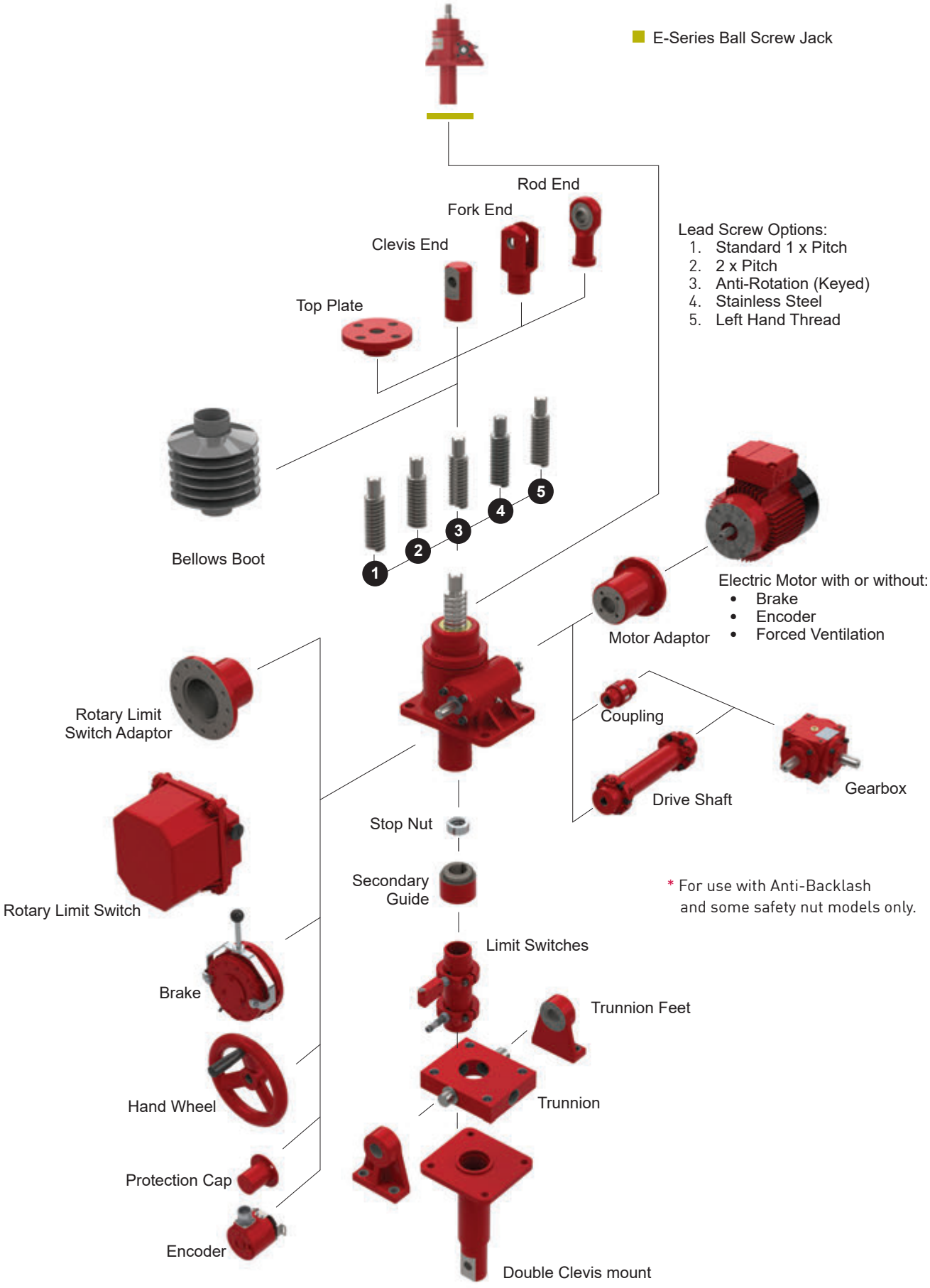
A global reach with a local service as we work closely with our customers to ensure the best solution for all their Electro-Mechanical solution applications.

Headquarters & Factory
Local Power Jacks Sales Offices
Local Representative

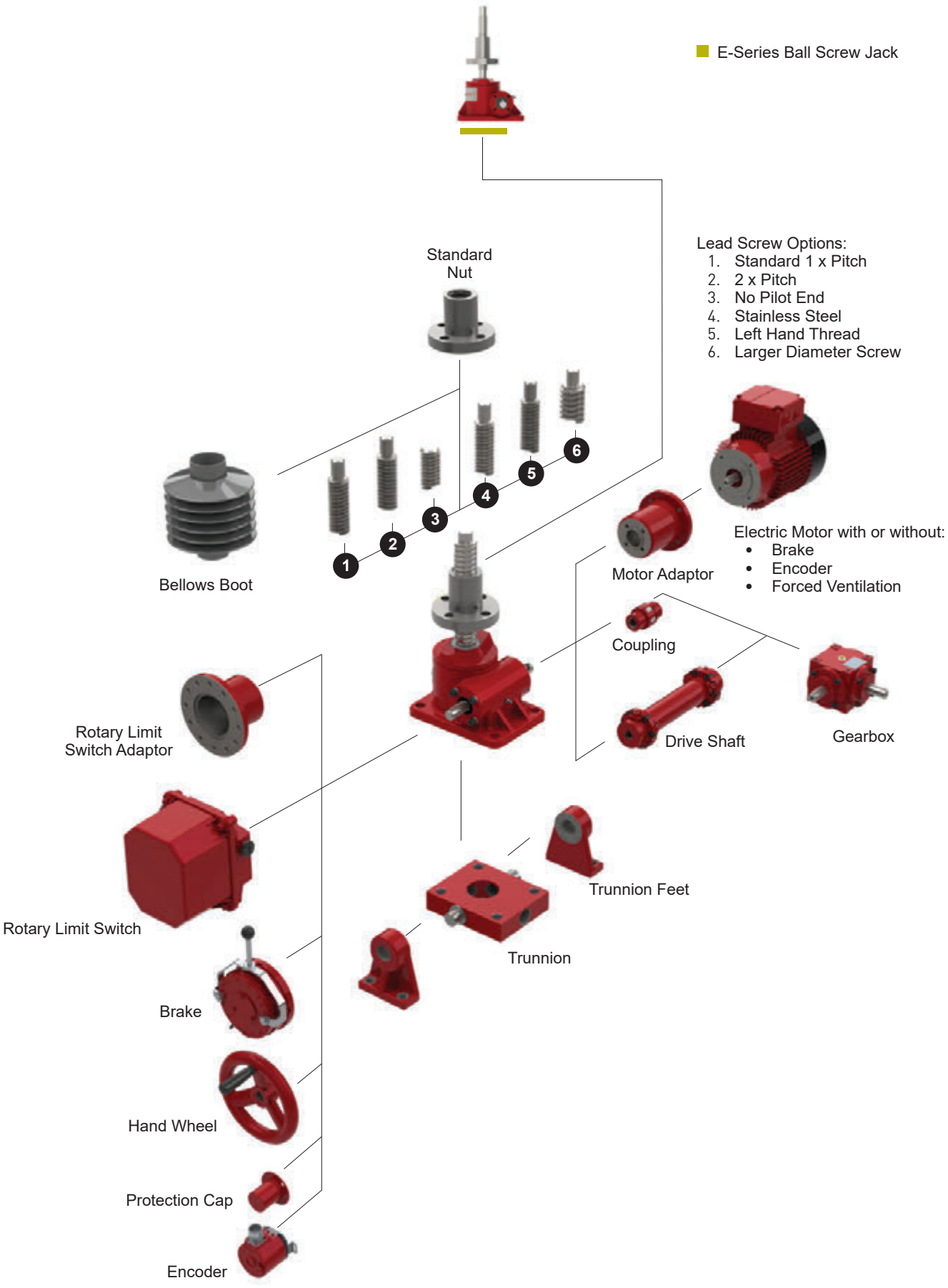
TRY OUR 3D CAD PORTAL



- 2D CAD Drawings
- 3D CAD Models
- Dimensioned Data Sheet



■ Special Screw Jacks Design Available when you need more than the standard solution.

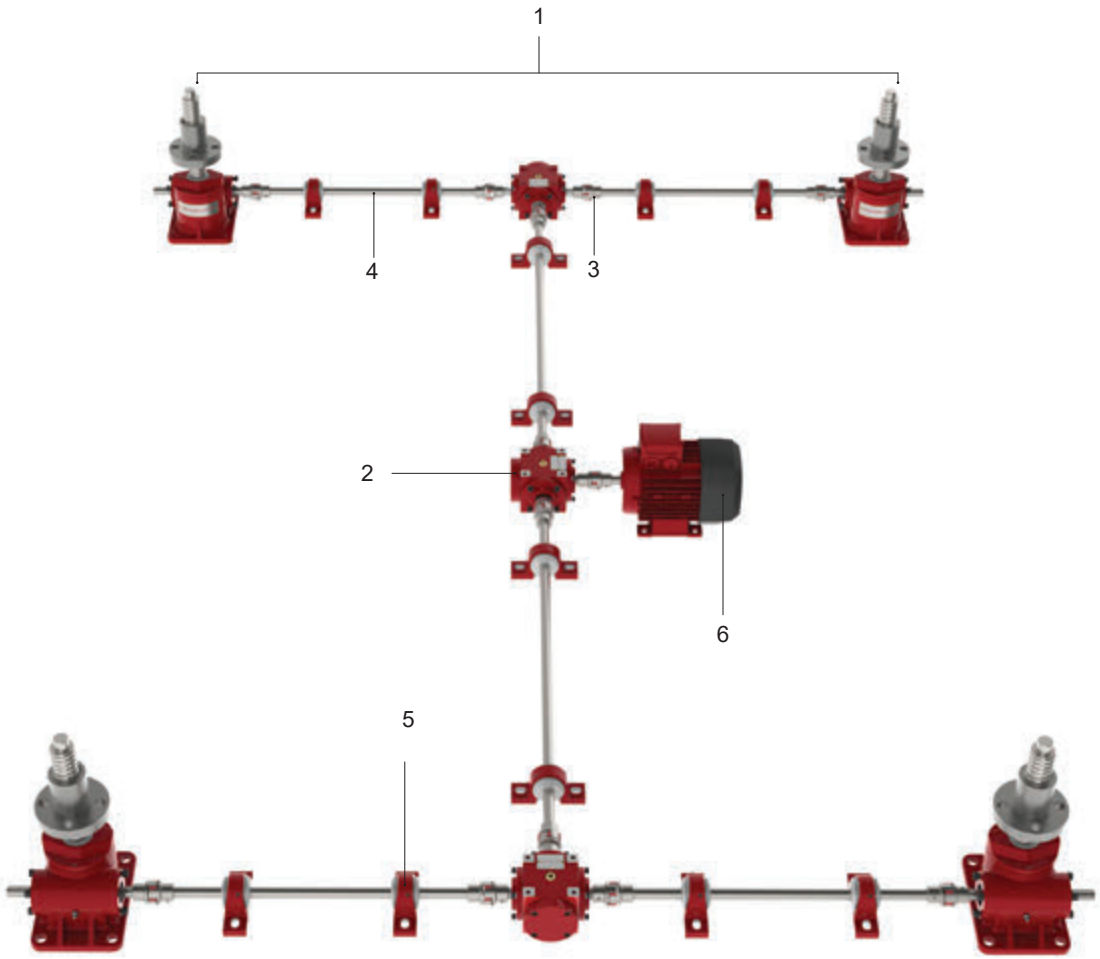


■ Special Screw Jacks Design Available when you need more than the standard solution.

Screw jacks can be connected together in systems so that multiple units can be operated and controlled together. These jacking system arrangements or configurations can be built in many formats with the use of bevel gearboxes, motors, reduction gearboxes, drive shafts, couplings, plummer blocks and motion control devices.

Four of the most popular system configurations are the 'H', 'U', 'T' and 'I' configured jacking systems. Note that multiple screw jacks can be linked together mechanically or electrically. The latter is useful if there is no space for linking drive shafts.

Typical 'H' configuration System



1. Screw Jack
   E-Series Rotating Ball Screw Jack shown here.
2. Bevel Gearbox
   Range-N Spiral Bevel Gearboxes
3. Flexible Coupling
   A range of couplings are available to suit each systems requirements including Jaw, Spacer and Geared types.
4. Drive Shaft
   Every drive shaft is manufactured to order for each system design. Self supporting drive shafts (spacer couplings) are also available.
5. Shaft Supports (plummer blocks).
6. Electric Motor
   Standard electric motors in 3 phase, 1 phase, DC and servo designs. Supplied as a basic motor or as part of a geared motor. Brakes are available for all motors.

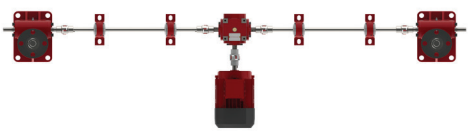
Jacking systems are not limited to the number of screw jacks shown here. They are regularly supplied to clients with 2, 4, 6, 8 jack systems. Larger systems can extend up to 16 or higher. With the use of electronic synchronisation/control multiple systems or screw jacks can be used in unison. Extending the possible number of screw jacks used in unison in excess of 100.

To facilitate electronic control of screw jacks, feedback devices (eg encoder, limit switch) are available, mounted on the screw jack or its motor or another system component.

'U' Configuration System

'I' Configuration System

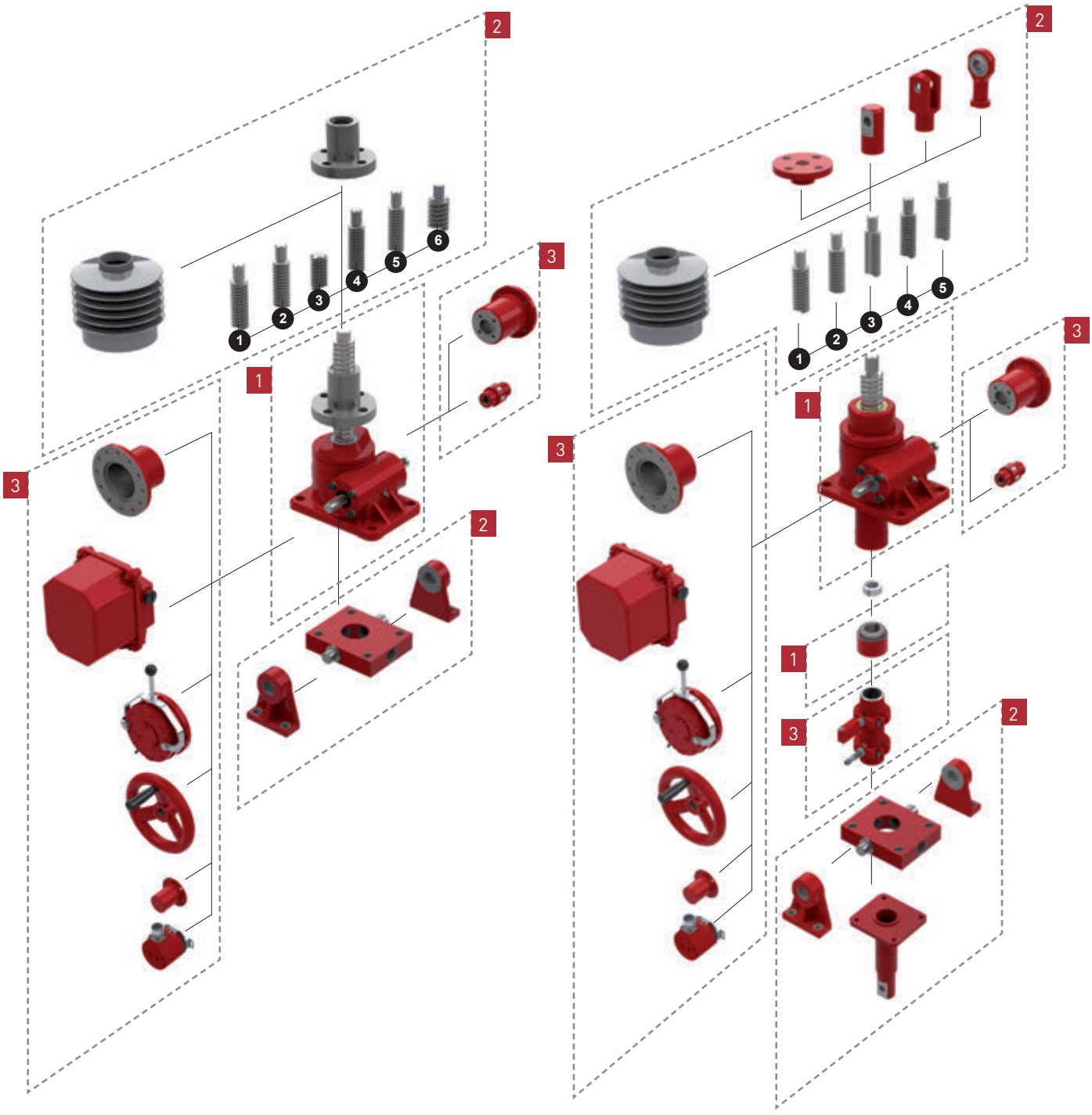
'T' Configuration System



1	GROUP-1 - Screw Jack Gearbox Definition

2	GROUP-2 - Screw Jack Features

3	GROUP-3 - Accessories



1 GROUP-1 - Screw Jack Gearbox Definition

1-Screw Jack Series	
E	Series

2 - Screw Type	
B	Ball Screw

3- Screw Configuration	
R	Rotating Screw
T	Translating Screw

4-7 - Capacity	0010	0025	0050	0100	0200	0300	0500
kN	10	25	50	100	200	300	500

8 - Character Space

9-Gearbox Type	
U	Upright
I	Inverted

10 - Gearbox Feature - 1	
0	None
K	Anti-Rotation (Keyed)
C	Secondary Guide
E	Anti-Rotation (keyed) with Secondary Guide
H	Double Hub Nut #1, #12
T	Trunnion Nut
U	Trunnion Nut with Feet

11 - Gearbox Feature - 2	
0	None
A	Anti-Backlash (this option is zero backlash for ball screws)
B	Anti-Backlash with wear monitor - Visual
C	Anti-Backlash with wear monitor - Sensor
R	Safety Nut Tension
S	Safety Nut Compression
T	Safety Nut Tension with Wear Monitor - visual
U	Safety Nut Compression with wear monitor - visual
V	Safety Nut Tension with Wear Monitor - Sensor
W	Safety Nut Compression with wear monitor - Sensor

12 - Gear Ratio	
1	Option 1 Ratio
2	Option 2 Ratio
A	Option 1 Ratio with gear rotation monitor #12
B	Option 2 Ratio with gear rotation monitor #12

13 - Lifting Screw Lead	
1	Option 1 Lead - Right Hand (Standard) #4
2	Option 2 Lead - Right Hand #4
A	Option 1 Lead - Left Hand #5
B	Option 2 Lead - Left Hand #5

14 - Worm Shaft Type #16	
0	Standard Material
N	Nickel Plated Worm Shaft
S	Stainless Steel Worm Shaft

15 - Worm Shaft Ends	
0	Both
L	Left Hand Only
R	Right Hand Only
X	Both with Protective Cap on LHS #11
Y	Both with Protective Cap on RHS #11

16 - Character Space

2 GROUP-2 - Screw Jack Features

17-20 - Stroke	0000
Stroke in mm	0-9999

21 - Character Space

22 - End Type #16 #17	
E	Threaded End
C	Clevis End
T	Top Plate
F	Fork End (standard available up to 200KN)
R	Rod End (standard available up to 200KN)
J	Plain End
P	Pilot End #1
N	No Pilot End #1

23 - Gearbox Mounting	
B	Base Mount
C	Second Clevis on Cover Pipe Standard #6 #9
E	Second Clevis on Cover Pipe 90 degree #9
T	Trunnion Mount Standard #2
U	T + Trunnion Feet
X	Trunnion Mount 90 degree #3
Y	X + Trunnion Feet

24 - Lifting Screw Material #16	
0	Standard
S	Stainless Steel
M	Standard with Low Friction Coating (Molycote)
A	Standard with Protective Coating (Armaloy)

25 - Lifting Screw Covers	
0	Cover Pipe & No Bellows Boot #15
B	Cover Pipe & Fabric Bellows Boot #9
F	Fabric Bellows Boot x 2 - Rotating Screw
R	Cover Pipe & Rubber Bellows Boot #9
S	Rubber Bellows Boot x 2 - Rotating Screw
N	No Cover Pipe & No Bellows Boot #9
W	Cover Pipe & PU Waterproof Bellows Boot #9
X	PU Waterproof Bellows Boot x2 - Rotating Screw

26 - Character Space

3 GROUP-3 - Accessories

27 - Drive Type			
0	None, Standard Features	H	Hand Wheel - LHS
A	Motor Adapter Only, B14 - LHS	J	Hand Wheel - RHS
B	Motor Adapter Only, B14 - RHS	R	Rotation Indicator (Visual) on worm shaft - LHS
C	Motor Adapter B14 & Coupling - LHS	T	Rotation Indicator (Visual) on worm shaft - RHS
E	Motor Adapter B14 & Coupling - RHS		

28- Motor Frame Size / Drive Interface Size			
0	Not Applicable	F	112 Size IEC Frame
A	63 Size IEC Frame	G	132 Size IEC Frame
B	71 Size IEC Frame	H	160 Size IEC Frame
C	80 Size IEC Frame	I	180 Size IEC Frame
D	90 Size IEC Frame	J	200 Size IEC Frame
E	100 Size IEC Frame		

29 - Mounting Kit for Limit Switches & Stop Nuts #18			
0	None	P	Inductive Proximity Sensor, 2, End of Stroke, Adjustable #9
C	RLS-51 Rotary Cam Limit Switch - RHS	S	SKA Rotary Cam Limit Switch - RHS
D	RLS-51 Rotary Cam Limit Switch - LHS	T	SKA Rotary Cam Limit Switch - LHS
E	RLS-51 Rotary Cam Limit Switch - RHS with Stop Nut	U	SKA Rotary Cam Limit Switch - RHS with Stop Nut
F	RLS-51 Rotary Cam Limit Switch - LHS with Stop Nut	V	SKA Rotary Cam Limit Switch - LHS with Stop Nut
M	Electro-Mechanical Limit Switch, 2, End of Stroke, Adjustable #9	W	Stop Nut

30 - Paint, Lubricant, Seals #13 #14	
0	Standard Paint, Lubricant & Seals
1	Standard Paint & Food Grade Lubricant & Standard Seals
2	Standard Paint, Nuclear Grade Lubricant & Seals
3	Standard Paint, High Temperature Lubricant & Seals
4	Standard Paint, Low Temperature Lubricant & Seals
5	Standard Paint, Biodegradable Lubricant & Standard Seals
A	No Paint, Standard Lubricant & Seals
B	No Paint & Food Grade Lubricant & Standard Seals
C	No Paint, Nuclear Grade Lubricant & Seals
D	No Paint, High Temperature Lubricant & Seals
E	No Paint, Low Temperature Lubricant & Seals
F	No Paint, Biodegradable Lubricant & Standard Seals
G	Standard Primer, Lubricant & Seals
H	Standard Primer & Food Grade Lubricant & Standard Seals
I	Standard Primer, Nuclear Grade Lubricant & Seals
J	Standard Primer, High Temperature Lubricant & Seals
K	Standard Primer, Low Temperature Lubricant & Seals
L	Standard Primer, Biodegradable Lubricant & Standard Seals
M	Epoxy Paint, Standard Lubricant & Seals
N	Epoxy Paint & Food Grade Lubricant & Standard Seals
P	Epoxy Paint, Nuclear Grade Lubricant & Seals
R	Epoxy Paint, High Temperature Lubricant & Seals
S	Epoxy Paint, Low Temperature Lubricant & Seals
T	Epoxy Paint, Biodegradable Lubricant & Standard Seals

Notes:

#1 Rotating screw models only.

#2 Trunnions on same side as worm shaft (standard).

#3 Trunnions at 90° to worm shaft.

#4 Standard right hand thread form. Worm shaft turns clockwise to extend screw.

#5 Left hand thread form. Worm shaft turns anti-clockwise to extend screw.

#6 Standard is clevis axis parallel to worm shaft.

#7 Limit switch mounting included.

#8 Plain End "A" has same dimensions as "E - threaded end" except no thread form.

#9 Translating screw models only.

#10 Basic Translating and Rotating units in both Upright and Rotating versions (all variant & accessories on application).

#11 All models except E-Series 5 kN & 10 kN models

#12 Models 10 - 100kN only

#13 Power Jacks defined standard paint - available as a data sheet.

#14 Power Jacks defined standard lubricant.

#15 For Rotating Screw Jacks the "Cover Pipe" may actually be a "Plug"

#17 If Lifting Screw is Stainless Steel material then the End Fitting is Stainless Steel as well by default.

#18 Limit Switches not included. Limit switch specification to be detailed as separate item.

Product Code Example

EBR0025-I001200-0500-FB0B-CAE0 E-Series, Ball Screw, Rotating, 25kN, Inverted, No extra gearbox features, 6:1 gear ratio, 10mm lead on screw, 500mm Stroke, Fork End, Base Mount, Bellows Boot screw protection, Motor Adapter & Coupling Kit for IEC 63 Frame size on Left Hand Side (LHS), RLS-51 rotary canm limit switch on Right Hand Side (RHS) with Stop Nut, standard paint and lubrication.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
E	B	R	0	0	2	5	-	I	0	0	1	2	0	0	-	0	5	0	0	-	F	B	0	B	-	C	A	E	0

Five Step Guide to Initial Screw Jack Selection

The following selection procedure is applicable for Machine Screw and Ball Screw Jacks.

Calculate Power and Torque Requirements

Select a screw jack from the tables with adequate load carrying capacity and note the screw jack static and dynamic efficiency for required input speed.

Step 1 - Screw Jack Input Speed

$$N\ (rpm) = \frac{\text{Linear Speed (mm/min) x Gear Ratio}}{\text{Pitch (mm) x N° of Starts on Lifting Screw}}$$

Input speed should not exceed 1800 rpm. Number of starts on lifting screw is usually 1, unless otherwise stated.

Note: Screw Lead = Pitch x No of Starts

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

$$P_{in}(kW) = \frac{\text{Load (kN) x Linear Speed (mm/min)}}{60000 \times \eta_d}$$

η_d = Dynamic Screw Jack Efficiency

Step 3 - Operating Input Torque

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

Step 4 - Screw Jack Start-Up Torque

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

η_s = Static Screw Jack Efficiency

Note: Screw Lead = Pitch x No of Starts

Step 5 - Mechanical Power and Torque Check

Check whether the screw jack 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 screw jack performance tables.

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

Example Selection

Application Constraints

- Load on Screw Jack = 15 kN in Tension
- Linear Speed required = 100 mm/min

Consider all application constraints then choose a screw jack that looks suitable for the application with a load rating equal to or greater than the maximum working load. For this example, a 25 kN E-Series Ball Screw Jack with translating screw, 6:1 gear ratio, single start lifting screw (5 mm lead).

Calculate Power and Torque Requirements

Step 1 - Screw Jack Input Speed

$$N\ (rpm) = \frac{100\ (mm/min) \times 6\ (Gear\ Ratio)}{5\ (mm) \times 1\ (N°\ of\ starts\ on\ Lifting\ Screw)}$$

N = 120 rpm
Input speed should not exceed 1800 rpm.

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

$$P_{in}(kW) = \frac{15\ (kN) \times 100\ (mm/min)}{60000 \times 0.662}$$

$\eta_d = 0.662$
$P_{in} = 0.038$ kW

Step 3 - Operating Input Torque

$$T_{ino}\ (Nm) = \frac{0.038\ (kW) \times 9550}{100\ (rpm)}$$

$T_{ino} = 3.63$ Nm

Step 4 - Screw Jack Start-Up Torque

$$T_{ins} = \frac{15\ (kN) \times 5\ (mm) \times 1\ (N°\ of\ starts\ on\ Lifting\ Screw)}{2 \times \pi \times 0.565 \times 6\ (Gear\ Ratio)}$$

$T_{ins} = 3.52$ Nm
$\eta_s = 0.565$

Step 5 - Mechanical Power and Torque Check

Find the screw jacks mechanical power and torque rating from the performance data tables (refer P60).

$P_{mechanical} = 1.5$ kW > P_{in} and $T_s = 5.9$ Nm > T_{ins}

Therefore the screw jack selected is suitable for application for initial constraints tested, further analysis may be required to ensure the screw jack is suitable for all application conditions. Continue with further selection calculations or consult Power Jacks Ltd.

Screw Jack Constraints for Detailed Selection

Lifting Screw Column Strength

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

1. Determine the maximum column strength (L) for the screw jack being considered.
2. Referring to the relevant column buckling chart 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 screw jack 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).

$W_{phc} = W_p \times 0.7$ **(Permissible compressive load for personnel risk applications)**

Note *1. For detailed analysis of screw jacks and their systems consult Power Jacks.*
2. Safety factor of 3.5 for column strength's used for normal industrial cargo.

Lifting Screw Critical Speed

For fast operating rotating screw jacks, the critical speed (rotational speed) of the lifting screw needs to be considered in case of shaft whirling. To calculate the critical speed for rotating screw jacks:

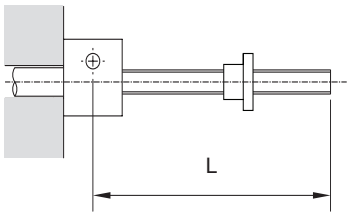
1. Refer to the appropriate critical speed chart.
2. Select the correction factor F_{cs} corresponding to the end support conditions for the application.
3. From the critical speed chart, select the critical speed corresponding to the unsupported screw length (m) and the screw jack load rating (kN).
4. Calculate the limiting critical speed with the formula: **Limiting Critical Speed** = Critical screw speed x F_{cs}

Lifting Screw Deflection

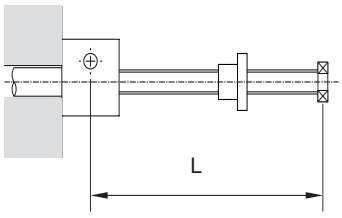
The lifting screw of a screw jack mounted horizontally will deflect under its own weight to some extent. The amount of deflection tolerable (y_T) should be less than 0.5 mm per metre.

Deflection Factors, F_{sd}

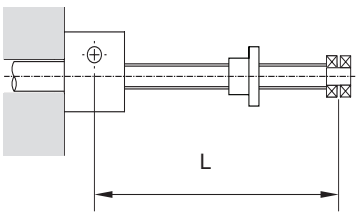
Fixed/Fixed. $F_{sd} = 8$



Fixed/Fixed. $F_{sd} = 186$



Fixed/Fixed. $F_{sd} = 384$



Deflection, y, (mm) = $\dfrac{6 \times 10^{-9} \times L^4}{F_{sd}\,(d\text{-}p)^2}$

Deflection Tolerable, y_T, (mm) = $\dfrac{0.5 \times L}{1000}$

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.

Screw Jack Input 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 screw jack analysis consult Power Jacks Ltd.

Side Loads on Screw Jacks

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 screw jack, they must not exceed those tabulated in the Engineering Guide, Side Load Rating Section, and it must be noted that any such loads will adversely affect the life of the lifting screw and nut.

Radial Forces on Screw Jack Worm Shaft

For applications where a screw jack is belt driven, radial force (F_R) values exerted on the worm shaft must not exceed those tabulated in the Engineering Guide Section. Values are tabulated for the metric machine screw jacks and ball screw jacks. The values are maximum values for the screw jacks at rated load regardless of worm speed or load direction.

Screw Jack Self-Locking

Approximately 50% of machine screw jacks are self-locking 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 is recommended. 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 jacks and roller screw jacks always require a brake as their high efficiency makes them self-lowering.

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

Note 1. Self lowering can occur in any jacking system not fitted with a brake, where high levels of vibration are present in the application.
2. Power Jacks recommend the use of a brake on single screw jack applications in the vertical position.

Jacking System Power Input

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

$$P_s = \frac{\text{Input Power per Screw Jack (kW) x Number of Screw jacks}}{\text{Arrangement Efficiency x Gearbox Efficiency}}$$

Number of Screw Jacks in System	2	3	4	6-8
Jacking System Efficiency	0.95	0.90	0.85	0.80

Gearbox Efficiency = Bevel Gearbox Efficiency x Reduction Gearbox Efficiency
Bevel Gearbox Efficiency = 0.95 typical
Reduction Gearbox Efficiency = Consult unit details, if no reduction gearbox present assume efficiency of 1.

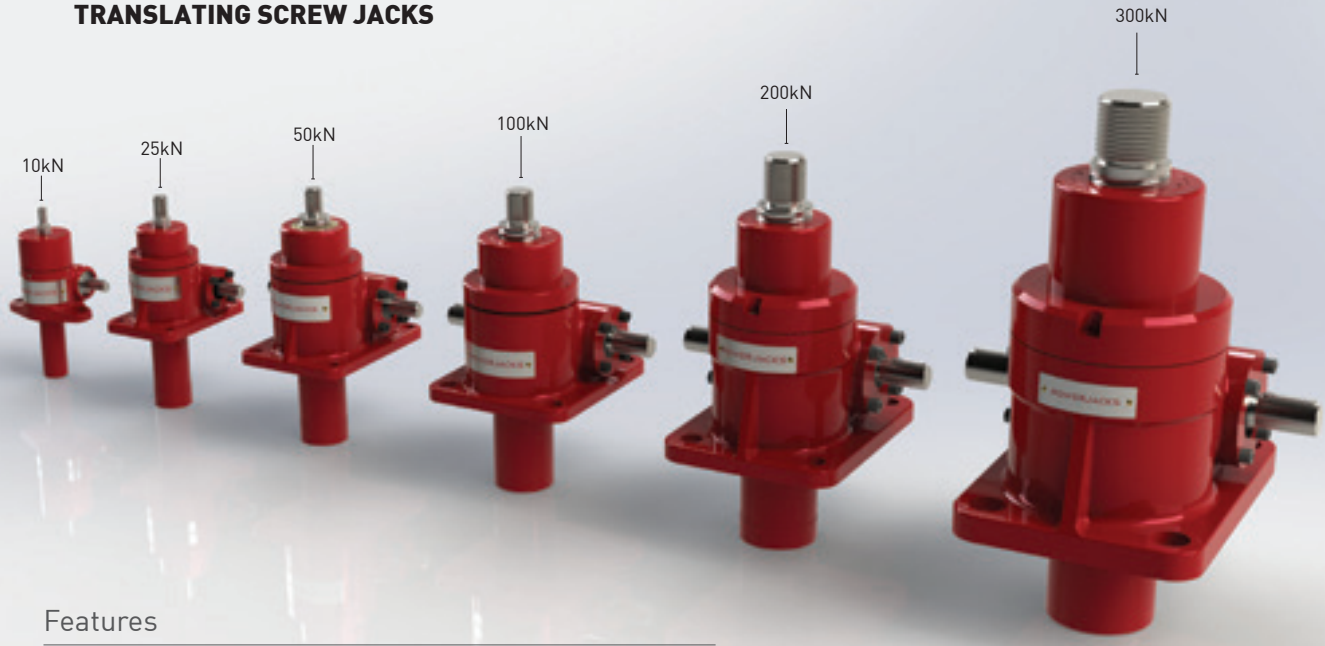
Note
For Screw Jacks connected in-line, the worm shaft can transmit up to 3 times the torque for a single screw jack at its maximum capacity, except the E--0200 (200kN) Unit which can transmit 1.5 times the torque.

E-Series Ball Screw Jack

HIGH EFFICIENCY BALL SCREW JACK IN A COMPACT DESIGN WITH INTEGRATED SAFETY DEVICE.

Overall operating efficiency is as high as 70% in some models, depending on the worm gear ratio.

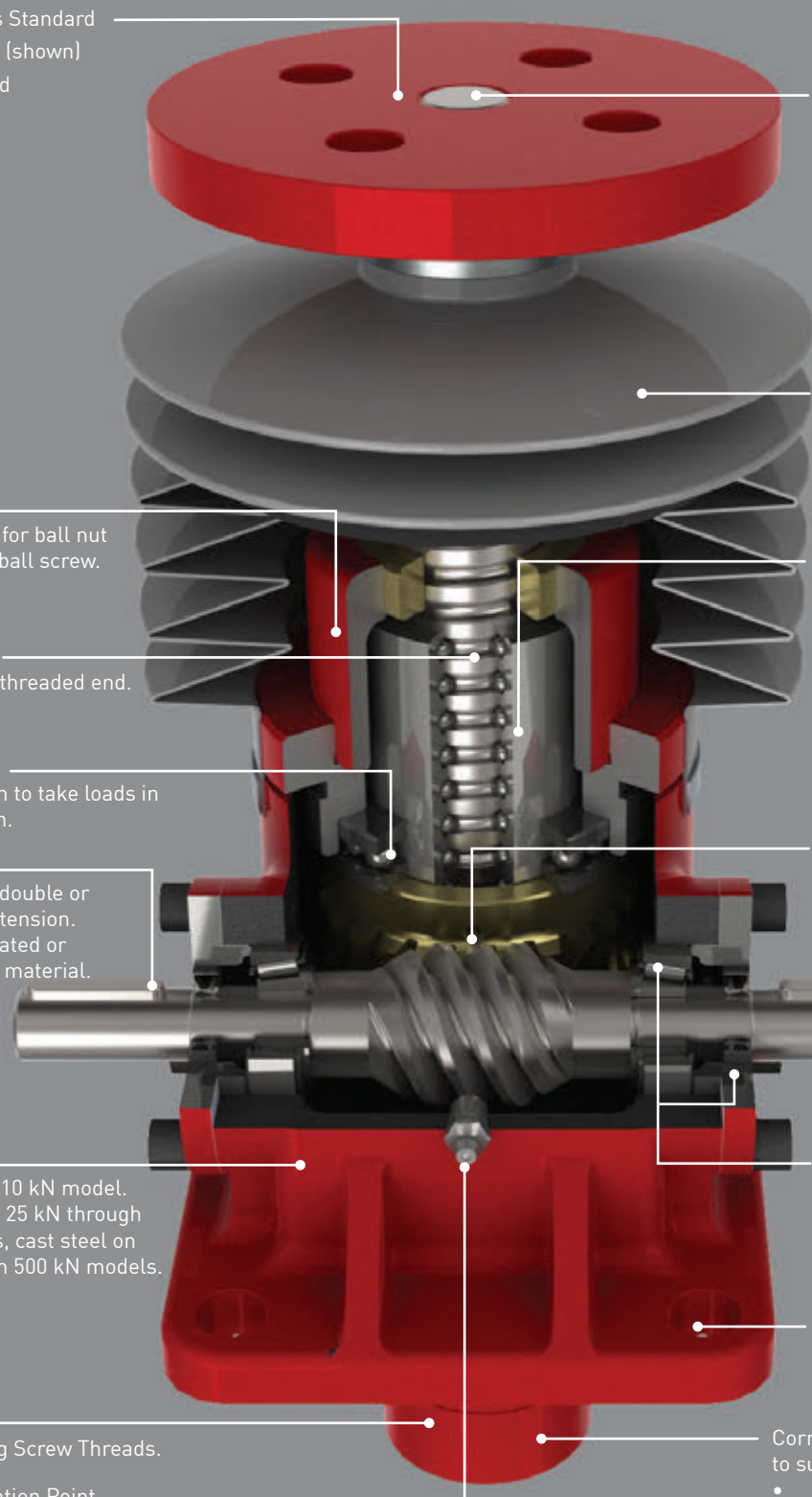
TRANSLATING SCREW JACKS



Features

- High Efficiency Power Jack
- Metric Single Face Ball Screw Jacks
- Capacities - 10kN to 300 kN as standard
- Integral Safety Device for 25kN & above as standard
- Translating and Rotating Screw in Upright and Inverted types
- Precision Worm Gear Set and Ball Screw Drive
- 2 Gear ratios and 2 screw leads as standard
- Pre-loaded and Anti-rotation ball screw options
- 6 mounting options including trunnion and double clevis
- Special custom designs available

ROTATING SCREW JACKS



End Fittings as Standard
1. Top Plate (shown)
2. Clevis End
3. Fork End
4. Rod End

Threaded end on screw as standard. End fittings screw on.

Bellows Boot
Screw protection prevents ingress of dirt and debris onto screw threads.

End Cap
Protective cap for ball nut with guide for ball screw.

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

Ball Screw
Standard with threaded end.

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

Worm Shaft
Available with double or single shaft extension. In standard, plated or stainless steel material.

Accurately hobbed aluminium bronze worm gear for greater gear contact.

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

Thrust Bearings and Grease Seals at each end of worm. 10kN version does not have separate seal.

Mounting Bolt Holes.

Cover Pipe
Protects Lifting Screw Threads.

Grease Application Point.

Corrosion Protection
to suit all economic needs including:
- Standard Industrial Paint
- Arduous Environment Paint
- Customer Specified Paint
- Plated Finish

Translating Screw

Upright

Inverted

Rotating Screw

Upright

Inverted

Typical Applications

Ball Screw Jacks are generally used when the application has a relatively high duty cycle or the input power for a given screw jack is to be minimised. The high efficiency of the ball screw & nut significantly increase the efficiency of a screw jack in comparison to a Machine Screw Jack. Due to their high efficiency they nearly always require a brake to hold position. They are used in a wide variety of applications including Automotive, Steel, Glass, Defence, Nuclear and Solar industries.

Standard Designs

The standard E-Series ball screw jack is available in translating and rotating screw designs in capacity sizes from 10kN to 500kN. The design is optimised for performance and a compact form, which includes an added safety device as standard for most models. There is a large selection of options and accessories (section-7) that allows you to configure a standard design that is just right for your application. These options include Zero-Backlash and Anti-Rotation designs.

Special Designs

We can fully customise our screw jacks so that your application can be the best.

Customisation can be anything from a small modification such as an extra bolt hole on an end fitting to a completely new design of screw jack based on our class leading technology.

For more details please see the Special Screw Jack information in Section-8 or contact us today with your requirements. Our team are looking forward to working with you.

Selecting the Right Screw Jack

Consider all application constraints then choose a product that looks suitable for the intended application. Calculate the power and torque requirements. This is a 5 step process:

- Screw Jack Input Speed (RPM)
- Operating Input Power (kW)
- Operating Input Torque (Nm)
- Screw Jack Start-up Torque (Nm)
- Mechanical Power and Torque Check

Systems

The screw jacks can be connected together in systems so that multiple units can be operated and controlled together. These jacking system arrangements or configurations can be built in many formats with the use of bevel gearboxes, motors, reduction gearbox , drive shafts, couplings, plummer blocks and motion control devices.

The use of bevel gearboxes allows the distribution of drive throughout a jacking system. The gearboxes come in 2,3 and 4 way drive types. See the Bevel Gearbox Section-10 for more details.

Bevel gearboxes and other system components can also be supplied in stainless steel or other corrosion resistant designs.

Two of the most popular system configurations are the 'H' and 'U' configured jacking systems. Remember that multiple screw jacks can be linked together mechanically or electrically. The latter is useful if there is no space for linking drive shafts.

If multiple ball screw jacks are connected in a mechanically linked system then the complete system in some designs may be considered self-locking. If you would like this checked consult Power Jacks. Alternatively, to be sure, include a brake on the system either as a stand alone device or as a brake motor.

CAVENDISH LABORATORY ANTENNA DISH

Position adjustment of Arcminute Microkelvin Imager (AMI) to achieve a pointing accuracy of better than half a minute of arc (1/120 of a degree). 10 x antenna dishes all in close proximity of each other. Measuring the weight of the universe by analysing "dark matter".

10 x off 50kN E-Series special metric ball screw jacks based on EBT0050 in translating screw configuration with a stroke of 1050mm. These ball screw jacks operate in normal UK outdoor conditions and allow the antenna to operate at wind speeds of up to 50mph.

For more application examples see the 'Power at Work' brochure or www.powerjacks.com.

Screw Jack Standard Performance

Model			EBT0010 EBR0010	EBT0025 EBR0025		EBT0050 EBR0050		EBT0100 EBR0100		EBT0200 EBR0200		EBT0300 EBR0300	EBT0500 EBR0500
Capacity (kN)			10	25		50		100		200		300	500
Lifting Screw	Diameter (mm)		20	25		40		50		63		80	On Request
	Lead	Option	1	1	2	1	2	1	2	1	2	1	
		Lead (mm)	5	5	10	10	20	10	20	10	20	20	
Gear Ratios	Option 1		5:1	6:1		6:1		8:1		8:1		10 2/3:1	
	Option 2		20:1	24:1		24:1		24:1		24:1		32:1	
Turn of worm for travel of Lifting Screw	Option 1	6 Turn	6mm	5mm	10mm	10mm	20mm	7.5mm	15mm	7.5mm	15mm	11.25mm	
	Option 2	24 Turn	6mm	5mm	0mm	10mm	20mm	10mm	20mm	10mm	20mm	7.5mm	
Maximum Input Power (kW)	Gear Ratio Option 1		0.375	1.5		3		3.75		3.75		6.0	
	Gear Ratio Option 2		0.19	0.375		0.55		1.125		1.125		1.9	
Start-up Torque at full load (Nm) †	Gear Ratio Option 1		2.7	5.9	11.1	23.4	44.6	36.4	68.5	75.2	139.4	182	
	Gear Ratio Option 2		1.2	2.6	4.9	10.7	20.4	19.1	35.8	39.4	72.9	107.3	
Maximum Through Torque (Nm)			20	59		168		347		396		1440	
Lead Screw Restraining Torque (Nm)			9	23	43	88	167	181	340	370	690	1030	
Worm Shaft Maximum Radial Load (N)			325	380		740		1000		1600		2170	
Maximum Input Speed (rpm)			1800	1800		1800		1800		1800		1800	
Gear Case Material			Aluminium	SG Iron		SG Iron		SG Iron		Steel		Seel	
Weight (kg) - stroke = 150mm	EMT		2.36	8.45		14.9		24.3		42.4		92.4	
	EMR		2.6	8.85		16.54		28.8		49.58		113.78	
Weight (kg) - per extra 25mm	EMT		0.11	0.21		0.32		0.58		0.84		1.55	
	EMR		0.05	0.11		0.19		0.36		0.52		1.13	
Ball Nut Safety Device			On Request	Standard		Standard		Standard		Standard		On Request	

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

Efficiency - Option 1 Gear Ratio

Model	EBT0010 EBR0010	EBT0025 EBR0025		EBT0050 EBR0050		EBT0100 EBR0100		EBT0200 EBR0200		EBT0300 EBR0300	EBT0500 EBR0500
Gear Ratio	5:1	6:1		6:1		8:1		8:1		10 2/3:1	On Request
Lifting Screw Lead (mm)	5	5	10	10	20	10	20	10	20	20	
Static Efficiency	0.603	0.565	0.600	0.567	0.595	0.546	0.581	0.529	0.571	0.492	
Dynamic Efficiency	0.681	0.662	0.692	0.663	0.687	0.645	0.674	0.631	0.665	0.595	

Efficiency - Option 2 Gear Ratio

Model	EBT0010 EBR0010	EBT0025 EBR0025		EBT0050 EBR0050		EBT0100 EBR0100		EBT0200 EBR0200		EBT0300 EBR0300	EBT0500 EBR0500
Gear Ratio	20:1	24:1		24:1		24:1		24:1		32:1	On Request
Lifting Screw Lead (mm)	5	5	10	10	20	10	20	10	20	20	
Static Efficiency	0.341	0.320	0.340	0.310	0.325	0.348	0.370	0.337	0.364	0.278	
Dynamic Efficiency	0.429	0.419	0.438	0.407	0.422	0.450	0.470	0.440	0.465	0.371	

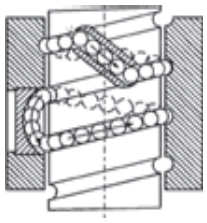
Note

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

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.

Solid formed nylon wiper seals on the ball nut prevents ingress of foreign matter and retain lubrication within the nut.



Standard

Ball Screw Life

Theoretical service life can be expressed in either L_{10} 10^6 revolutions or L_h10^3 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)										
Model	Capacity (kN)	Pitch (mm)	5	10	25	30	50	75	100	150	200	250	300
E28501	10	5	20.5	2.5	-	-	-	-	-	-	-	-	-
E3802	25	5	381	48	3	-	-	-	-	-	-	-	-
E38021	25	10	1 775	222	14	-	-	-	-	-	-	-	-
E3805	50	10	11 978	1 497	96	55	12	-	-	-	-	-	-
E38051	50	20	17 039	2 130	136	79	17	-	-	-	-	-	-
E3810	100	10	32 287	4 036	258	149	32	10	4	-	-	-	-
E38101	100	20	38 503	4 813	308	178	39	11	5	-	-	-	-
E3820	200	10	162 327	20 291	1 299	752	162	48	20	6	3	-	-
E38201	200	20	320 060	40 008	2 560	1 482	320	95	40	12	5	-	-
E3830	300	20	903 882	112 985	7 231	4 185	904	268	113	33	14	7	4

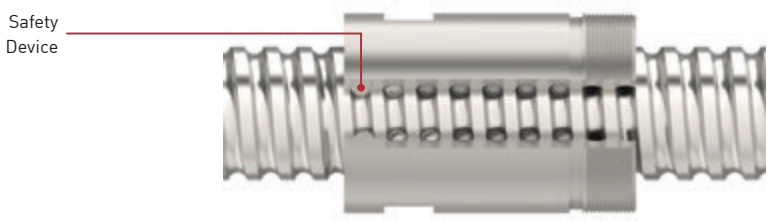
Use the following formulae to calculate the service life in terms of hours running:

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

Where **L**$_h$= Service Life (hours)
L$_{10}$= Service Life (revolutions)
n$_m$= Mean Screw Jack Input Speed (rpm)
Gr = Gear Ratio

Note: 1. Ball screw life based on dynamic load calculated according to DIN69051 Part 4.

Extra Safety As Standard with Integral Safety Device



25kN TO 200kN Power Jacks Metric Ball Screw Jacks 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 screw jack 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 10kN & 300kN ball screw jack does not have safety device as standard, if required consult Power Jacks Ltd.

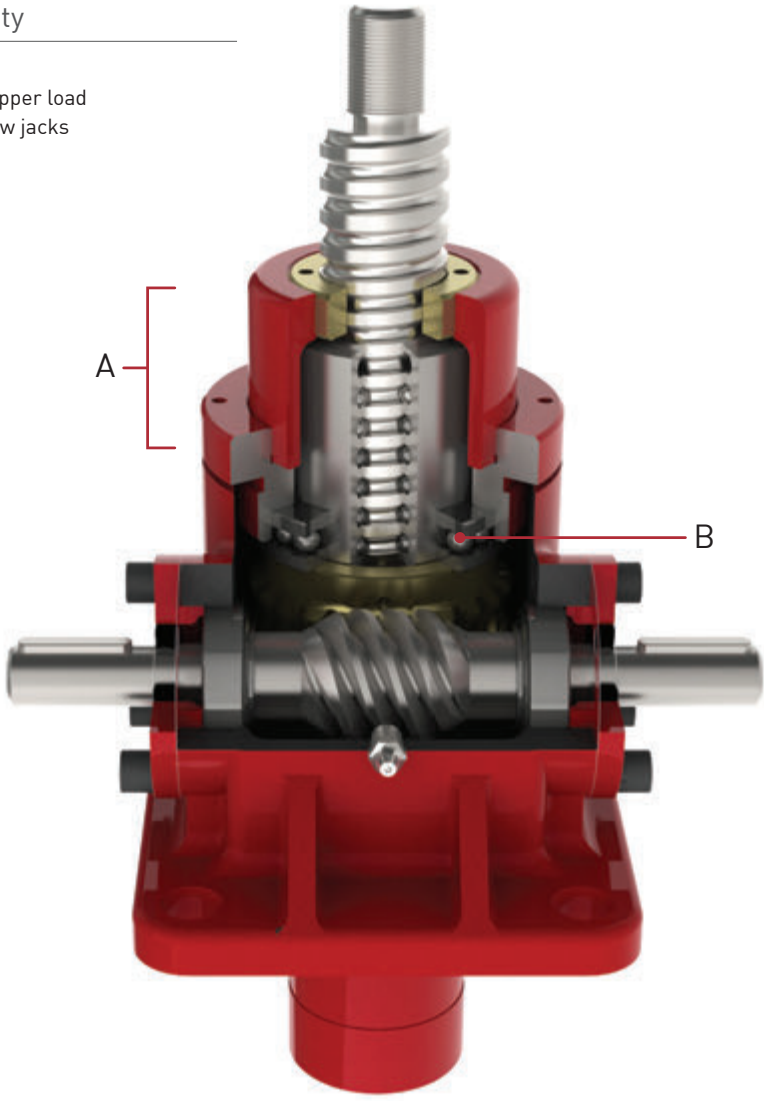
Optimal Ball Nut Alignment & Load Capability

Better by Design Power Jacks Ball Screw Jacks mount the upper load bearing directly on top of the gear the same as all other screw jacks in our range.

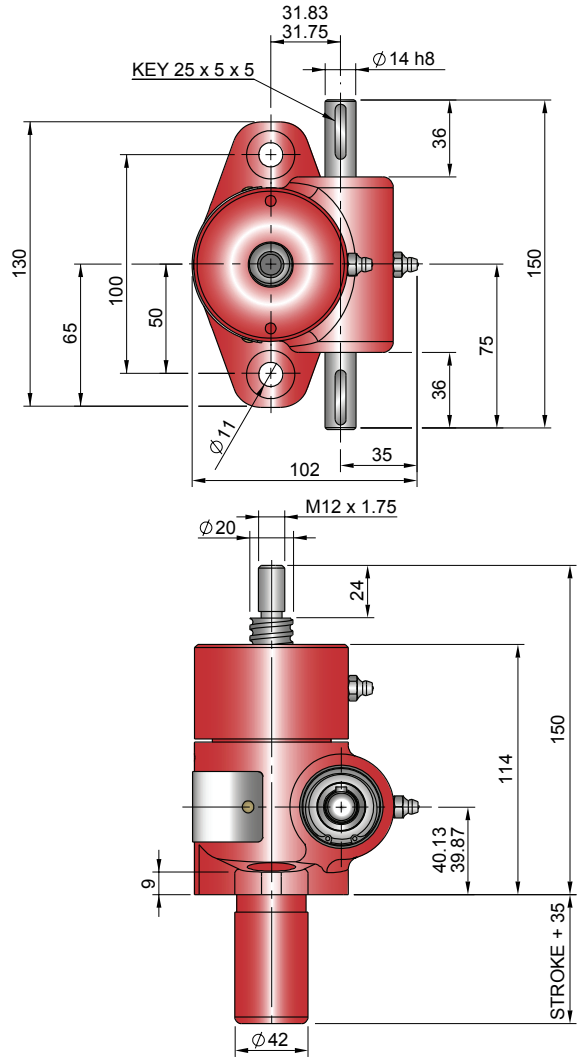
Advantages:

A. Compact Design
B. Optimum Gear Holding & Accuracy

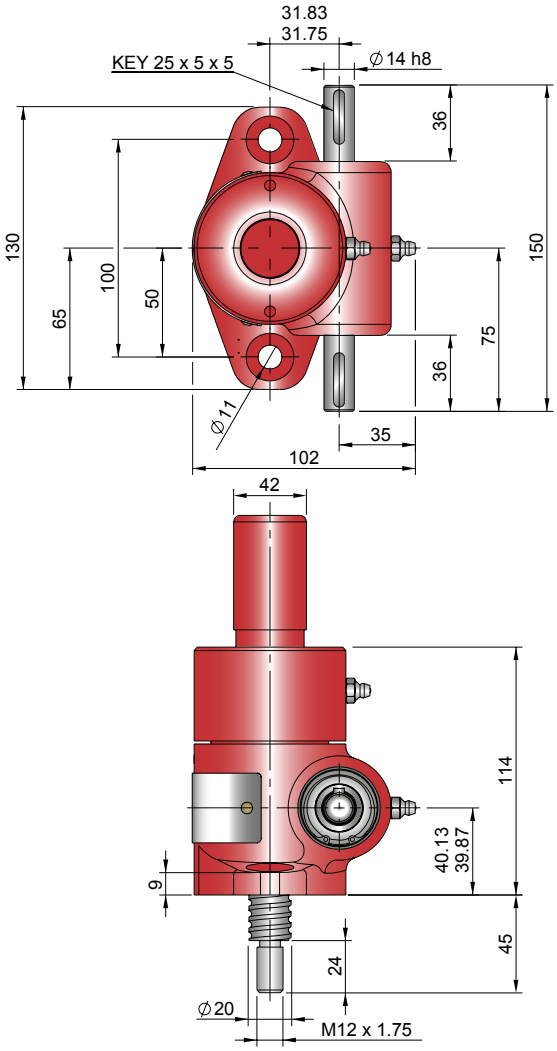
BETTER BY DESIGN



Upright EBT0010-U00



Inverted EBT0010-I00



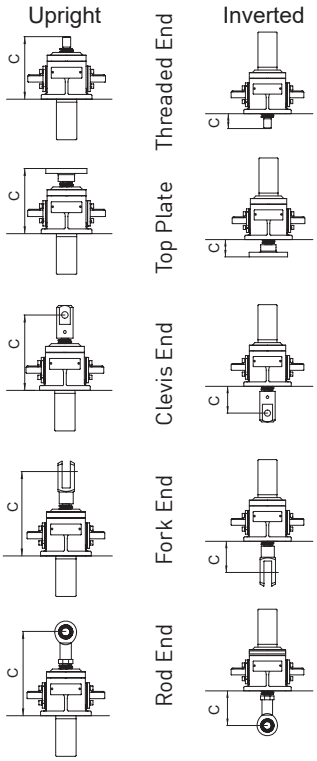
Performance

Model			EBR0010 EBT0010
Capacity	kN		10
Lifting Screw	Diameter (mm)		20
	Lead	Option	1
		mm	5
Gear Ratio Option 1	Gear Ratio		5:1
	Static Efficiency		0.603
	Dynamic Efficiency		0.681
Gear Ratio Option 2	Gear Ratio		20:1
	Static Efficiency		0.341
	Dynamic Efficiency		0.429
Max. Input power (kW)	Gear Ratio Option 1		0.375
	Gear Ratio Option 2		0.18
Start up torque at full load (Nm)	Gear Ratio Option 1		2.7
	Gear Ratio Option 2		1.2

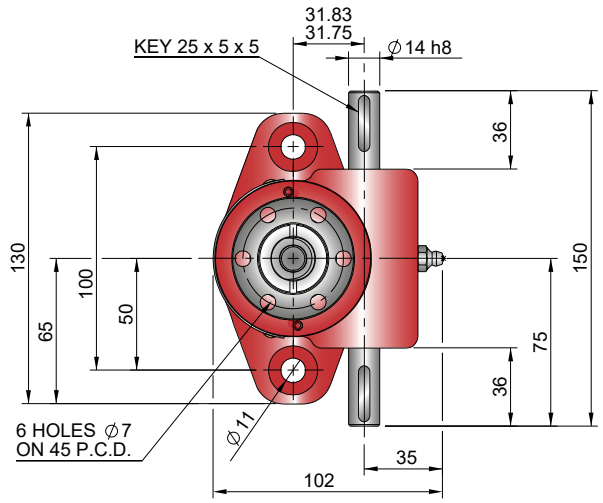
Model			EBR0010 EBT0010	
Capacity	kN		10	
Lifting Screw Lead (mm)			5	
Turn of worm for travel of lifting screw	Gear Ratio 1	6 Turn	6mm	
	Gear Ratio 2	24 Turn	6mm	
Maximum Through Torque (Nm)			20	
Lifting Screw Restraining Torque (Nm)			9	
Worm Shaft Maximum Radial Load (N)			325	
Maximum Input Speed (rpm)			1800	
Gear Case Material			Aluminium	
Weight (kg) - stroke = 150mm			EMT	2.36
			EMR	2.6
Weight (kg) - per extra 25mm stroke			EMT	0.11
			EMR	0.05

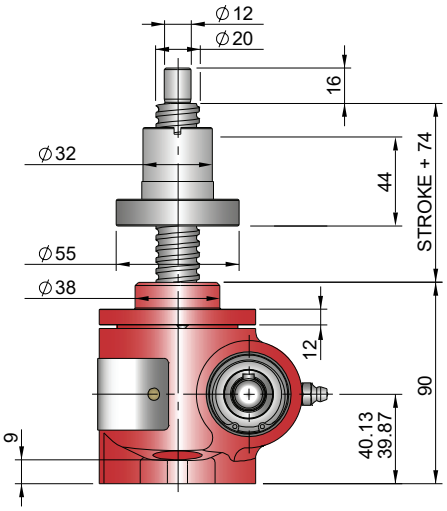
Note: All dimension in millimetres unless otherwise stated.
Designs subject to change without notice

Closed Height

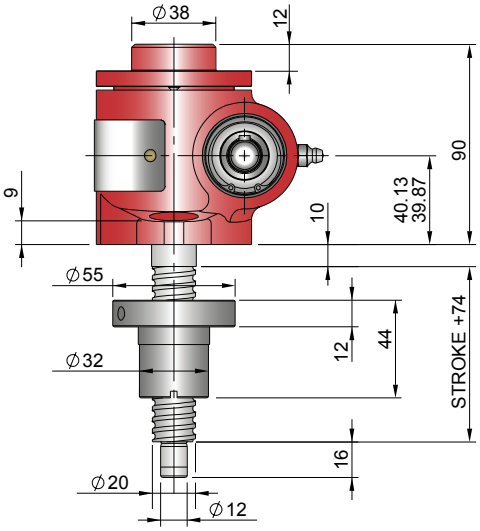


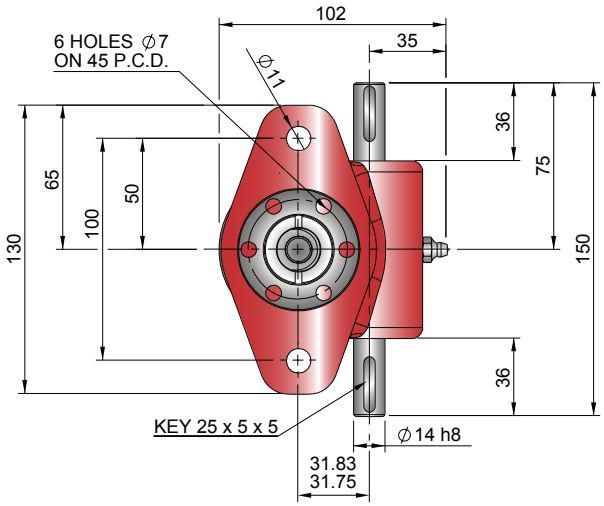
Upright EBR0010-U00





Inverted EBR0010-I00

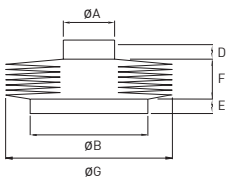




Closed Height & Bellows Boots

Closed Height "C"	Threaded End		Top Plate		Clevis End		Fork End		Rod End	
	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted
EBT0010	125	45	125	45	145	65	148	98	150	70
Stroke (mm)	EBT0010 with Bellows Boots									
1-300	166	61	166	61	186	81	189	84	209	104
301-600	182	77	182	77	202	97	205	100	225	120
601-1050	206	101	206	101	226	121	229	124	249	144
1051-1500	230	125	230	125	250	145	253	148	273	168

Model	A	B	D	E	G
EBT0010	30	70	12	12	114

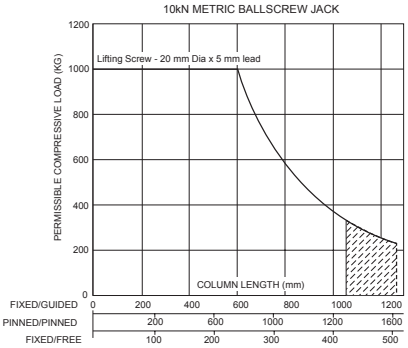


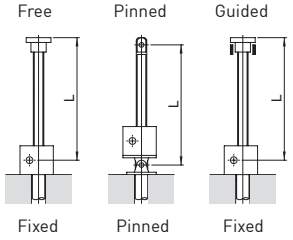
Stroke	1-300	301-600	601-1050	1051-1500
EBT0010	16	32	56	80

Note:

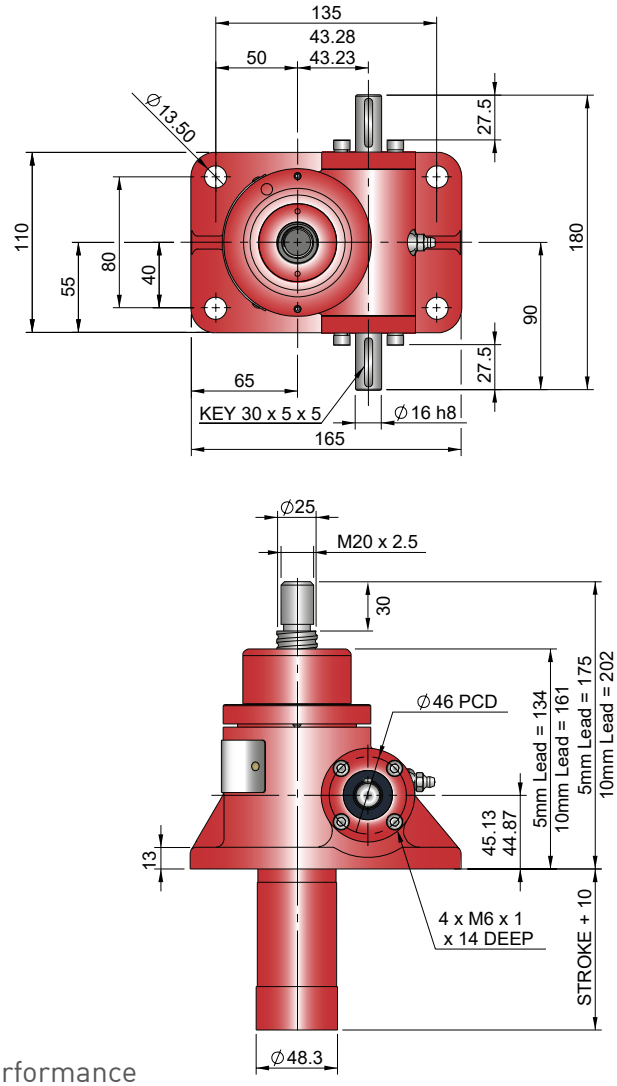
1 Inverted Screw Jacks - Bellows Boot Closed Height assumes screw jack mounted on a structure with thickness = 10mm
2 Inverted Screw Jacks - Recommended bellows boot mounting plate ØB x (E +5mm) thick.
3 Inverted Screw Jacks - Screw Jack mounting plate & bellows boot mounting plate are customers own supply
4 † Control tapes fitted (increase outer diameter by 20mm approximately).
5 For horizontal installations with than 450 mm of stroke, internal boot guides are recommended.
6 Customers with threaded end screw jacks must provide a fixing for the unattached bellows boot collar.
7 Bellows boots for Rotating Screw Jacks, other sizes, stroke and materials please consult Power Jacks.

Column Strength

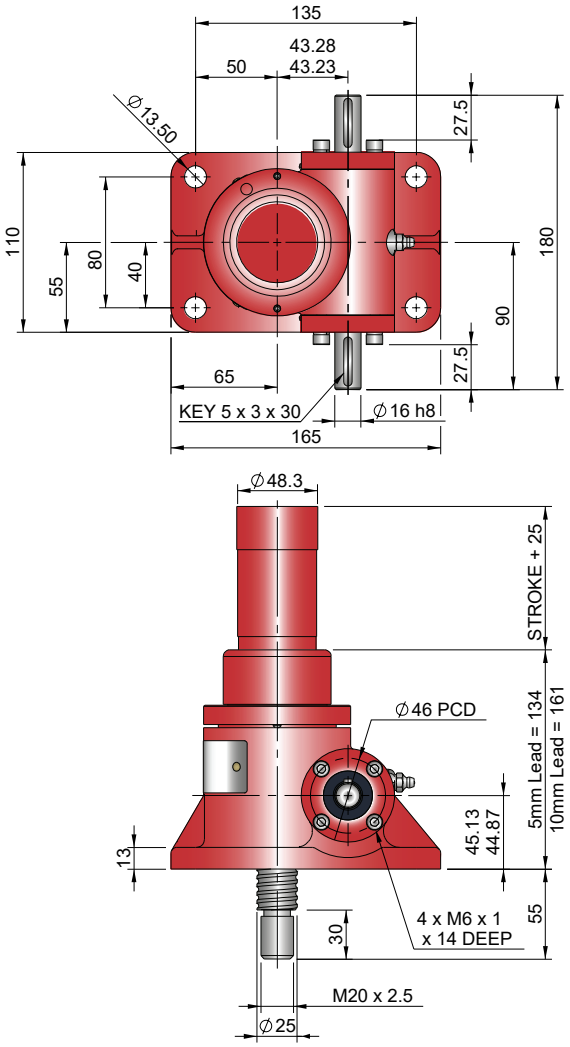




Upright EBT0025-U00



Inverted EBT0025-I00



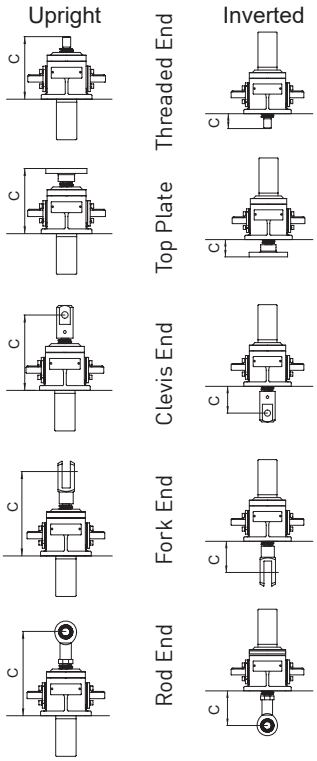
Performance

Model			EBT0025 EBR0025	
Capacity	kN		25	
Lifting Screw	Diameter (mm)		25	
	Lead	Option	1	2
		mm	5	10
Gear Ratio Option 1	Gear Ratio		6:1	
	Static Efficiency		0.565	0.600
	Dynamic Efficiency		0.662	0.692
Gear Ratio Option 2	Gear Ratio		24:1	
	Static Efficiency		0.320	0.340
	Dynamic Efficiency		0.419	0.438
Max. Input power (kW)	Gear Ratio Option 1		1.5	
	Gear Ratio Option 2		0.375	
Start up torque at full load (Nm)	Gear Ratio Option 1		5.9	11.1
	Gear Ratio Option 2		2.6	4.9

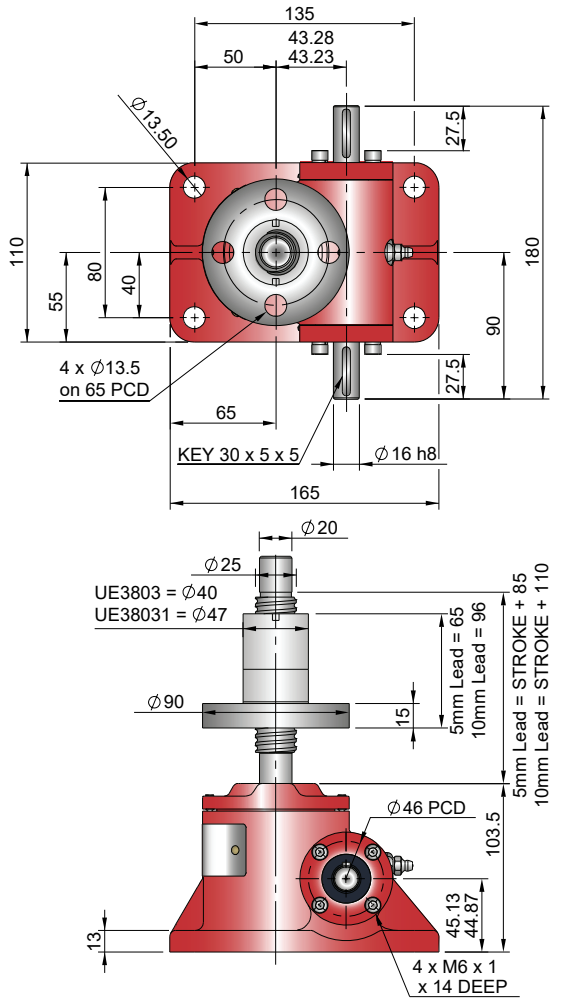
Model			EBT0025 EBR0025	
Capacity	kN		25	
Lifting Screw Lead (mm)			5	10
Turn of worm for travel of lifting screw	Gear Ratio 1	6 Turn	5mm	10mm
	Gear Ratio 2	24 Turn	5mm	10mm
Maximum Through Torque (Nm)			59	
Lifting Screw Restraining Torque (Nm)			23	43
Worm Shaft Maximum Radial Load (N)			380	
Maximum Input Speed (rpm)			1800	
Gear Case Material			SG Iron	
Weight (kg) - stroke = 150mm			EMT	8.45
			EMR	8.85
Weight (kg) - per extra 25mm stroke			EMT	0.21
			EMR	0.11

Note: All dimension in millimetres unless otherwise stated.
Designs subject to change without notice

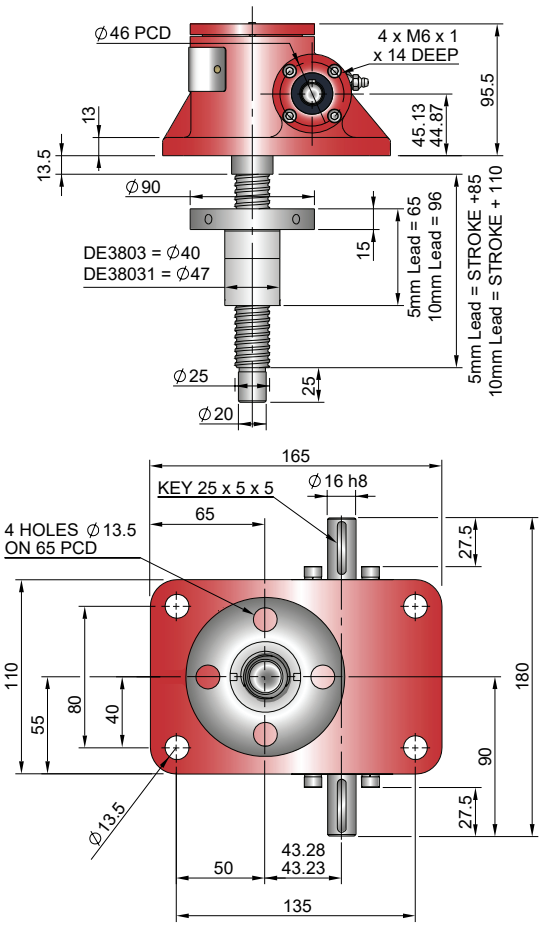
Closed Height



Upright EBR0025-U00



Inverted EBR0025-I00



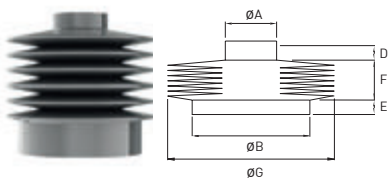
Closed Height & Bellows Boots

Closed Height "C"	Threaded End		Top Plate		Clevis End		Fork End		Rod End	
	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted
EBT0025	145	55	145	55	170	80	194	104	190	100
Stroke (mm)	EBT0025 with Bellows Boots									

Lead (mm)	5	10	5 &10	5	10	5 &10	5	10	5 &10	5	10	5 &10	5	10	5 &10
1-300	180	200	100	180	200	100	205	225	125	229	249	149	240	260	160
301-600	190	210	110	190	210	110	215	235	135	239	259	159	250	270	170
601-1050	210	230	130	210	230	130	235	255	155	259	279	179	270	290	190
1051-1500	230	250	150	230	250	150	255	275	175	279	299	199	290	310	210

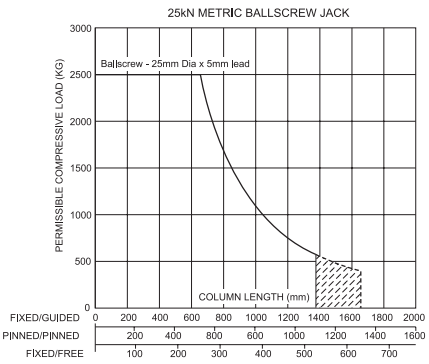
Model	A	B	D	E	G
EBT0025	40	66	15	15	120

Stroke	1-300	301-600	601-1050	1051-1500
EBT0025	20	30	50	70

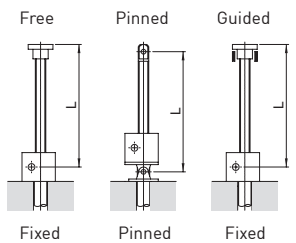


Note:
1. Inverted Screw Jacks - Bellows Boot Closed Height assumes screw jack mounted on a structure with thickness = 10mm
2. Inverted Screw Jacks - Recommended bellows boot mounting plate ØB x (E +5mm) thick.
3. Inverted Screw Jacks - Screw Jack mounting plate & bellows boot mounting plate are customers own supply
4. † Control tapes fitted (increase outer diameter by 20mm approximately).
5. For horizontal installations with than 450 mm of stroke, internal boot guides are recommended.
6. Customers with threaded end screw jacks must provide a fixing for the unattached bellows boot collar.
7. Bellows boots for Rotating Screw Jacks, other sizes, stroke and materials please consult Power Jacks.

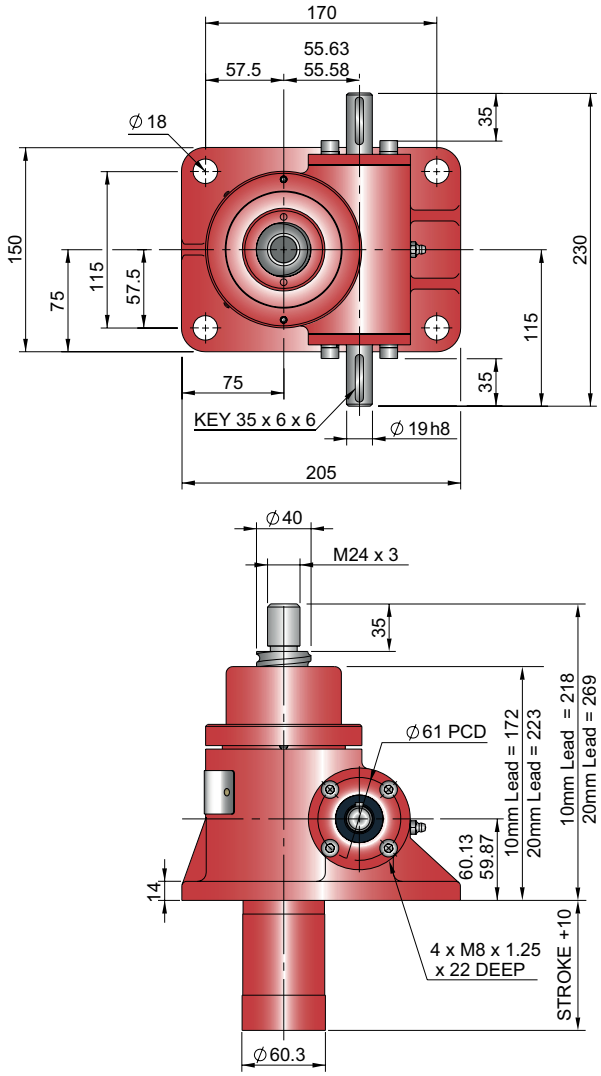
Column Strength



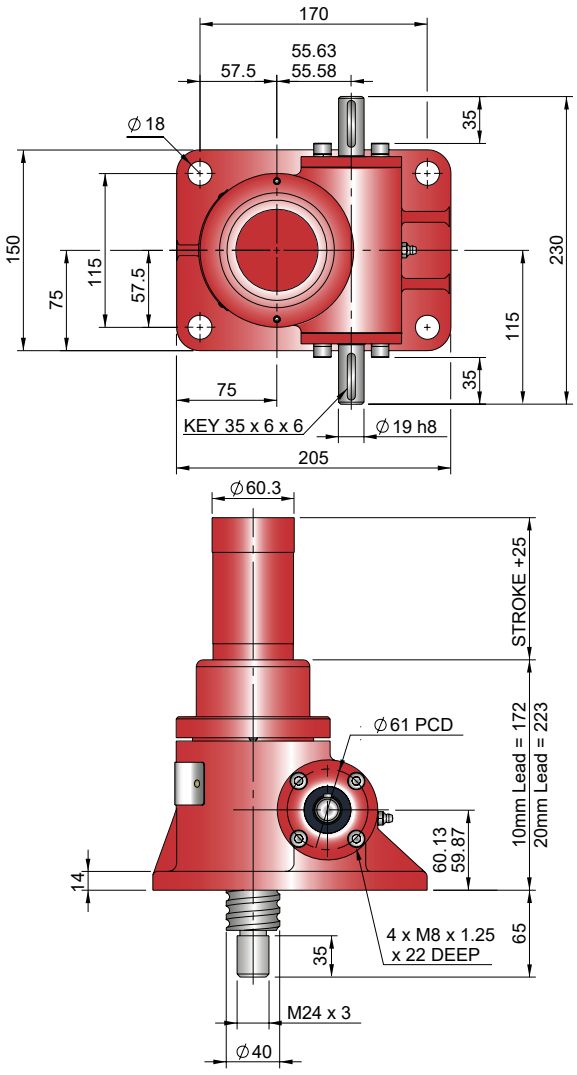
Note: For 25mm Dia x 10mm lead column strength chart refer to Engineering Guide



Upright EBT0050-U00



Inverted EBT0050-I00



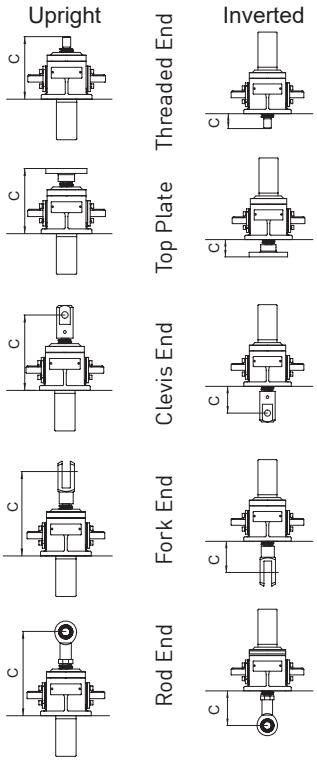
Performance

Model			EBT0050 EBR0050	
Capacity	kN		50	
Lifting Screw	Diameter (mm)		40	
	Lead	Option	1	2
		mm	10	20
Gear Ratio Option 1	Gear Ratio		6:1	
	Static Efficiency		0.567	0.595
	Dynamic Efficiency		0.633	0.687
Gear Ratio Option 2	Gear Ratio		24:1	
	Static Efficiency		0.310	0.325
	Dynamic Efficiency		0.407	0.422
Max. Input power (kW)	Gear Ratio Option 1		3.0	
	Gear Ratio Option 2		0.55	
Start up torque at full load (Nm)	Gear Ratio Option 1		23.4	44.6
	Gear Ratio Option 2		10.7	20.4

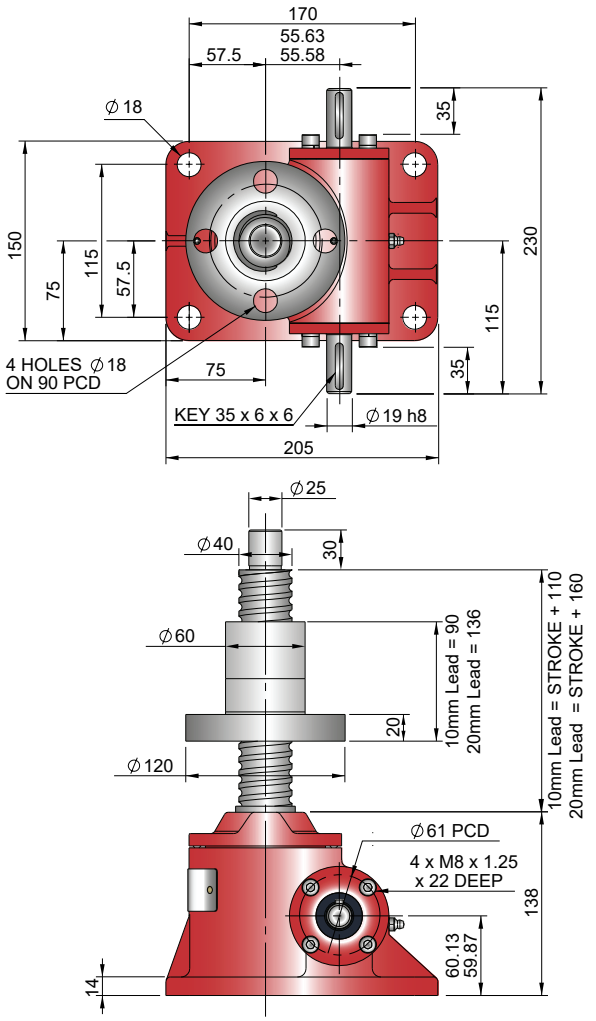
Model			EBT0050 EBR0050	
Capacity	kN		50	
Lifting Screw (mm)			10	20
Turn of worm for travel of lifting screw	Gear Ratio 1	6 Turn	10mm	20mm
	Gear Ratio 2	24 Turn	10mm	20mm
Maximum Through Torque (Nm)			168	
Lifting Screw Restraining Torque (Nm)			88	167
Worm Shaft Maximum Radial Load (N)			740	
Maximum Input Speed (rpm)			1800	
Gear Case Material			SG Iron	
Weight (kg) - stroke = 150mm			EMT	14.9
			EMR	16.54
Weight (kg) - per extra 25mm stroke			EMT	0.32
			EMR	0.19

Note: All dimension in millimetres unless otherwise stated.
Designs subject to change without notice

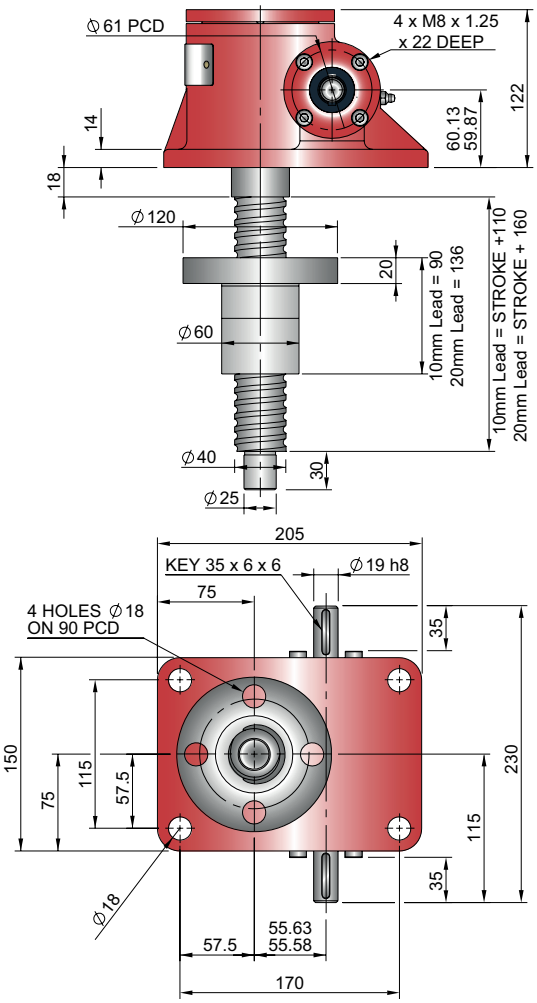
Closed Height



Upright EBR0050-U00



Inverted EBR0050-I00

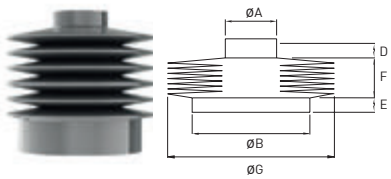


Closed Height & Bellows Boots

Closed Height "C"	Threaded End		Top Plate		Clevis End		Fork End		Rod End	
	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted
EBT0050	185	65	185	65	210	90	248	128	242	122

Stroke (mm)	EBT0050 with Bellows Boots														
Lead (mm)	10	20	10 &20	10	20	10 &20	10	20	10 &20	10	20	10 &20	10	20	10 &20
1-300	230	270	105	230	270	105	255	295	130	293	333	168	302	342	177
301-600	240	280	115	240	280	115	265	305	140	303	343	178	312	352	187
601-900	255	295	130	255	295	130	280	320	155	318	358	193	327	367	202
900-1050	260	300	135	260	300	135	285	325	160	323	363	198	332	372	207
1051-1500	280	320	155	280	320	155	305	345	180	343	383	218	352	392	227

Model	A	B	D	E	G
EBT0050	50	85	15	15	140

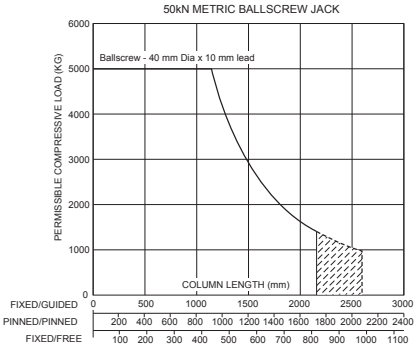


Stroke	1-300	301-600	601-900	901-1050	1050 -1500
EBT0050	20	30	45	50	70

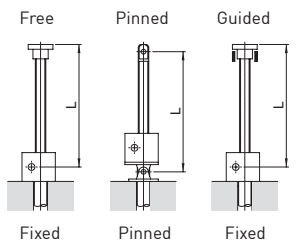
Note:

1 Inverted Screw Jacks - Bellows Boot Closed Height assumes screw jack mounted on a structure with thickness = 15mm
2 Inverted Screw Jacks - Recommended bellows boot mounting plate ØB x (E +5mm) thick.
3 Inverted Screw Jacks - Screw Jack mounting plate & bellows boot mounting plate are customers own supply
4 † Control tapes fitted (increase outer diameter by 20mm approximately).
5 For horizontal installations with than 450 mm of stroke, internal boot guides are recommended.
6 Customers with threaded end screw jacks must provide a fixing for the unattached bellows boot collar.
7 Bellows boots for Rotating Screw Jacks, other sizes, stroke and materials please consult Power Jacks.

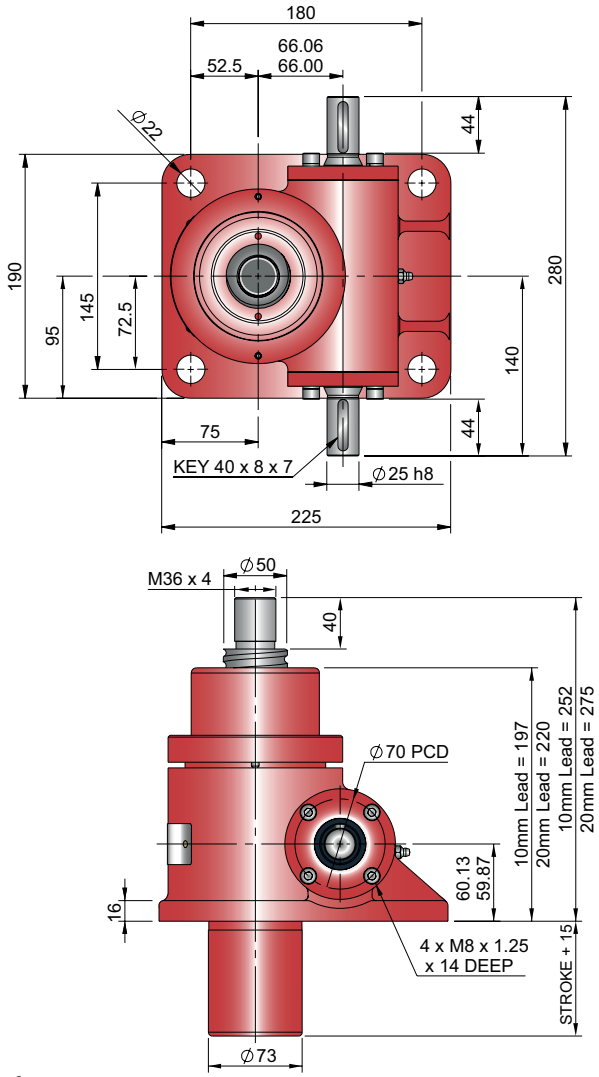
Column Strength



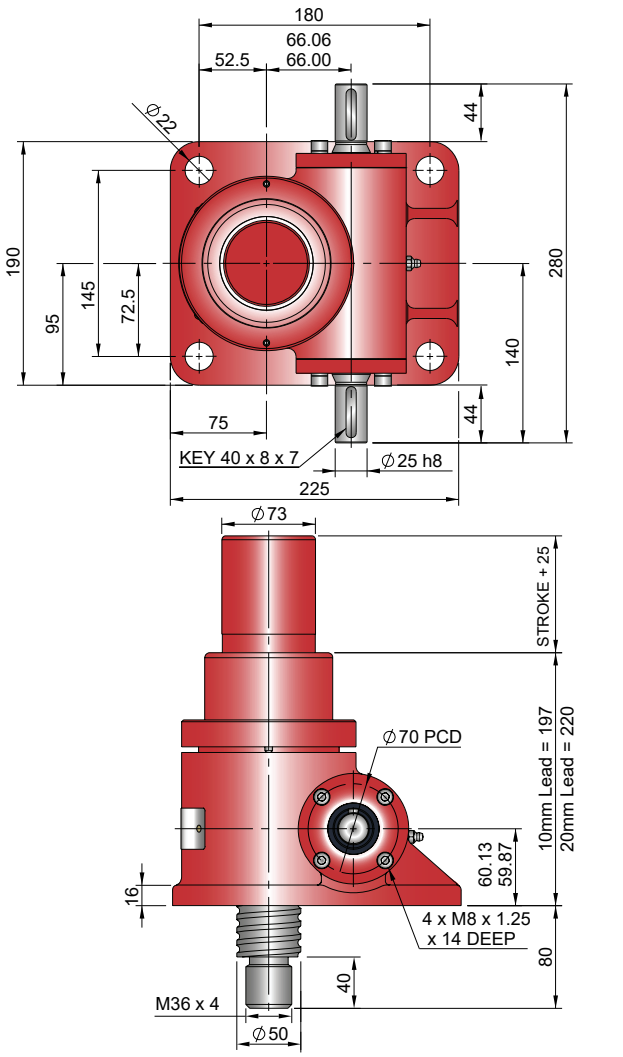
Note: For 40mm Dia x 20mm lead column strength chart refer to Engineering Guide



Upright EBT0100-U00



Inverted EBT0100-I00



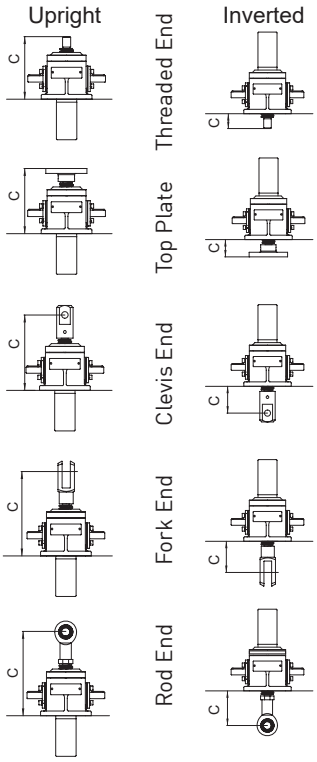
Performance

Model			EBT0100 EBR0100	
Capacity	kN		100	
Lifting Screw	Diameter (mm)		50	
	Lead	Option	1	2
		mm	10	20
Gear Ratio Option 1	Gear Ratio		8:1	
	Static Efficiency		0.546	0.581
	Dynamic Efficiency		0.645	0.674
Gear Ratio Option 2	Gear Ratio		24:1	
	Static Efficiency		0.348	0.370
	Dynamic Efficiency		0.450	0.470
Max. Input power (kW)	Gear Ratio Option 1		3.75	
	Gear Ratio Option 2		1.125	
Start up torque at full load (Nm)	Gear Ratio Option 1		36.4	68.5
	Gear Ratio Option 2		19.1	35.8

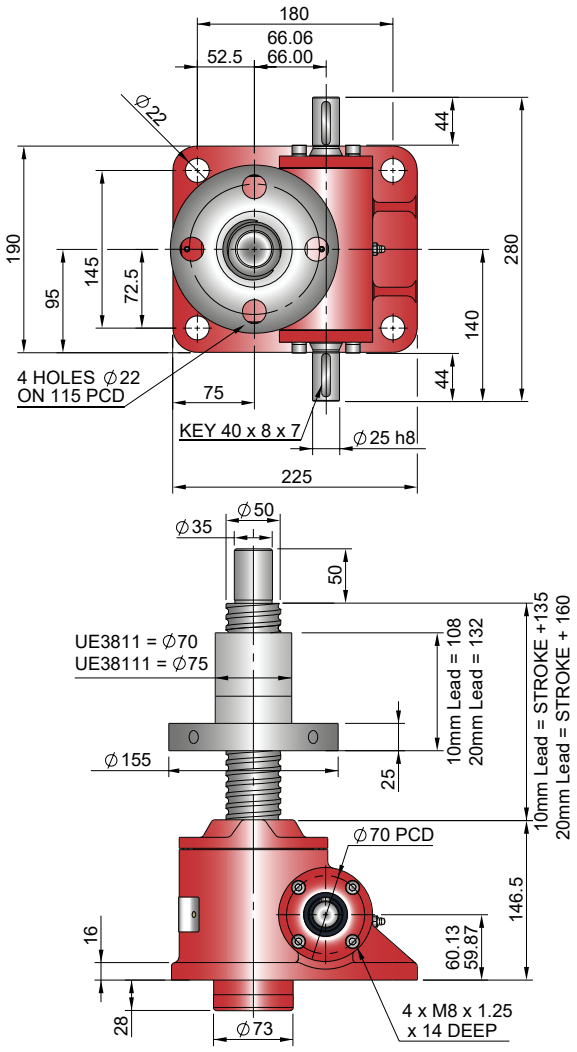
Model			EBT0100 EBR0100	
Capacity	kN		100	
Lifting Screw (mm)			10	20
Turn of worm for travel of lifting screw	Gear Ratio 1	6 Turn	7.5mm	15mm
	Gear Ratio 2	24 Turn	10mm	20mm
Maximum Through Torque (Nm)			347	
Lifting Screw Restraining Torque (Nm)			181	340
Worm Shaft Maximum Radial Load (N)			1000	
Maximum Input Speed (rpm)			1800	
Gear Case Material			SG Iron	
Weight (kg) - stroke = 150mm			EMT	24.3
			EMR	28.8
Weight (kg) - per extra 25mm stroke			EMT	0.58
			EMR	0.36

Note: All dimension in millimetres unless otherwise stated.
Designs subject to change without notice

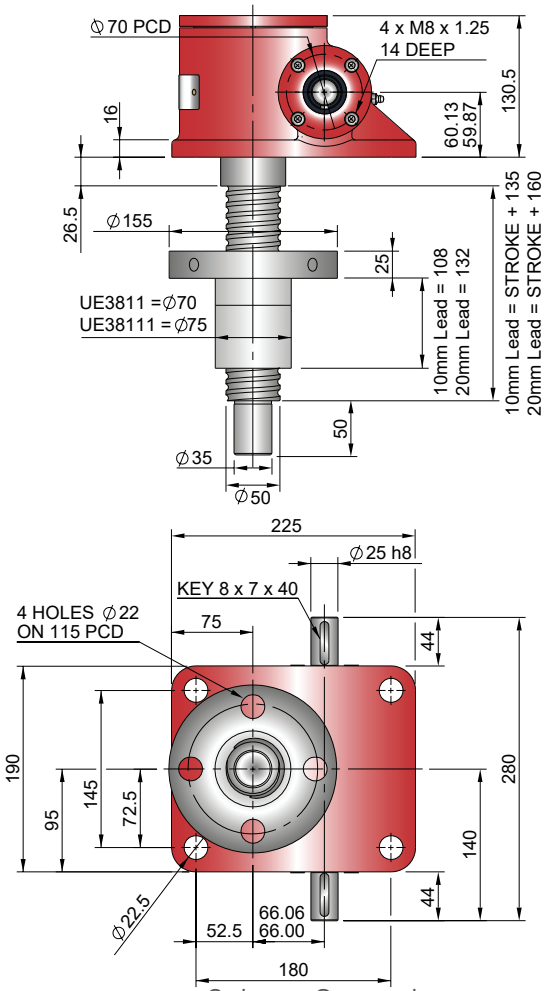
Closed Height



Upright EBR0100-U00



Inverted EBR0100-I00

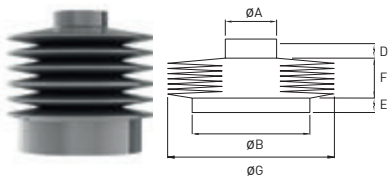


Closed Height & Bellows Boots

Closed Height "C"	Threaded End		Top Plate		Clevis End		Fork End		Rod End	
	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted
EBT0100	200	80	200	80	245	125	302	182	283	163
Stroke (mm)	EBT0100 with Bellows Boots									
Lead (mm)	10	20	10 &20	10	20	10 &20	10	20	10 &20	10	20	10 &20	10	20	10 &20
1-300	255	285	120	255	285	120	300	330	165	337	367	202	353	383	218
301-600	265	295	130	265	295	130	310	340	175	347	377	212	363	393	228
601-1050	285	315	150	285	315	150	330	360	195	367	397	232	383	413	248
1051-1500	305	335	170	305	335	170	350	380	215	387	417	252	403	433	268

Model	A	B	D	E	G
EBT0100	65	100	15	15	150

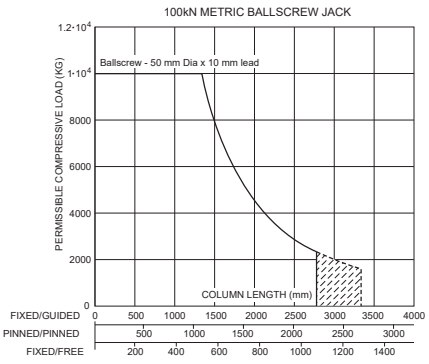
Stroke	1-300	301-600	601-1050	1051-1500
EBT0100	20	30	50	70



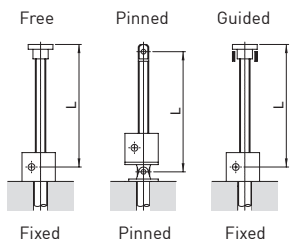
Note:

1 Inverted Screw Jacks - Bellows Boot Closed Height assumes screw jack mounted on a structure with thickness = 20mm
2 Inverted Screw Jacks - Recommended bellows boot mounting plate ØB x (E +5mm) thick.
3 Inverted Screw Jacks - Screw Jack mounting plate & bellows boot mounting plate are customers own supply
4 † Control tapes fitted (increase outer diameter by 20mm approximately).
5 For horizontal installations with than 450 mm of stroke, internal boot guides are recommended.
6 Customers with threaded end screw jacks must provide a fixing for the unattached bellows boot collar.
7 Bellows boots for Rotating Screw Jacks, other sizes, stroke and materials please consult Power Jacks.

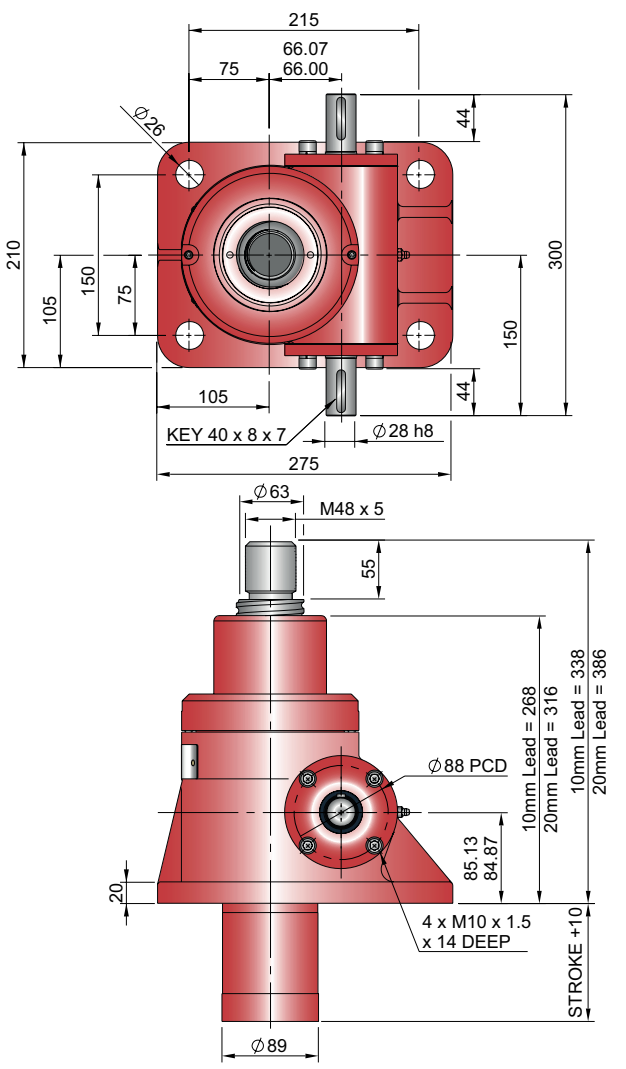
Column Strength



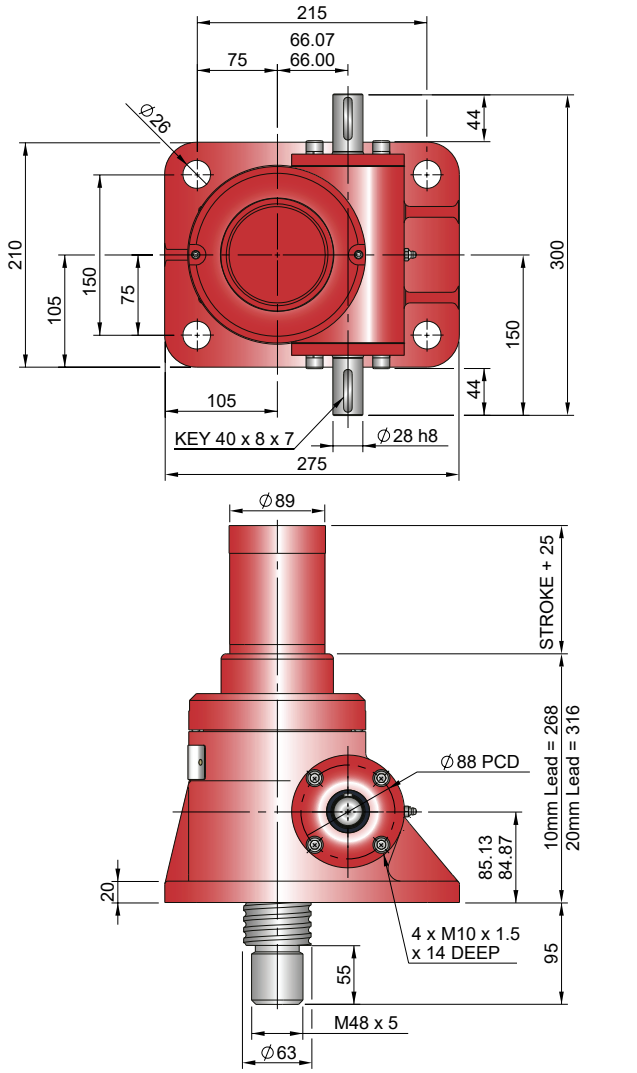
Note: For 50mm Dia x 20mm lead column strength chart refer to Engineering Guide



Upright EBT0200-U00



Inverted EBT0200-I00



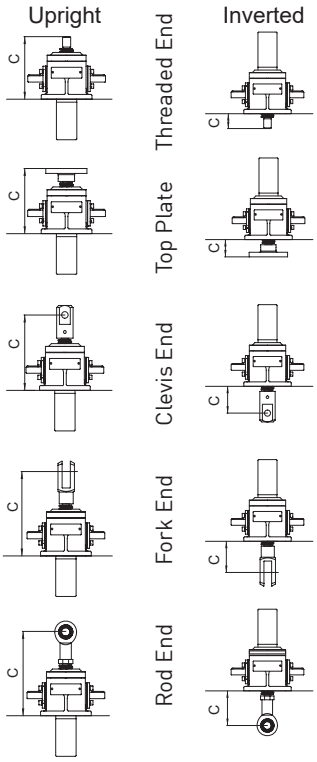
Performance

Model			EBT0200 EBR0200	
Capacity	kN		200	
Lifting Screw	Diameter (mm)		63	
	Lead	Option	1	2
		mm	10	20
Gear Ratio Option 1	Gear Ratio		8:1	
	Static Efficiency		0.529	0.571
	Dynamic Efficiency		0.631	0.665
Gear Ratio Option 2	Gear Ratio		24:1	
	Static Efficiency		0.337	0.364
	Dynamic Efficiency		0.440	0.465
Max. Input power (kW)	Gear Ratio Option 1		3.75	
	Gear Ratio Option 2		1.125	
Start up torque at full load (Nm)	Gear Ratio Option 1		75.2	139.4
	Gear Ratio Option 2		39.4	72.9

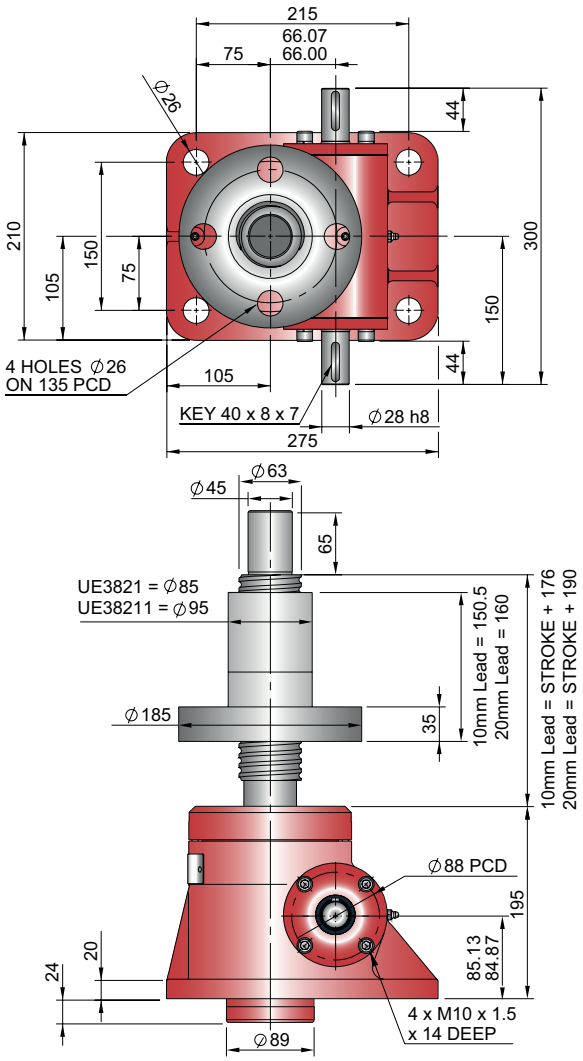
Model			EBT0200 EBR0200	
Capacity	kN		200	
Lifting Screw (mm)			10	20
Turn of worm for travel of lifting screw	Gear Ratio 1	6 Turn	7.5mm	15mm
	Gear Ratio 2	24 Turn	10mm	20mm
Maximum Through Torque (Nm)			396	
Lifting Screw Restraining Torque (Nm)			370	690
Worm Shaft Maximum Radial Load (N)			1600	
Maximum Input Speed (rpm)			1800	
Gear Case Material			Steel	
Weight (kg) - stroke = 150mm			EMT	42.4
			EMR	49.58
Weight (kg) - per extra 25mm stroke			EMT	0.84
			EMR	0.52

Note: All dimension in millimetres unless otherwise stated.
Designs subject to change without notice

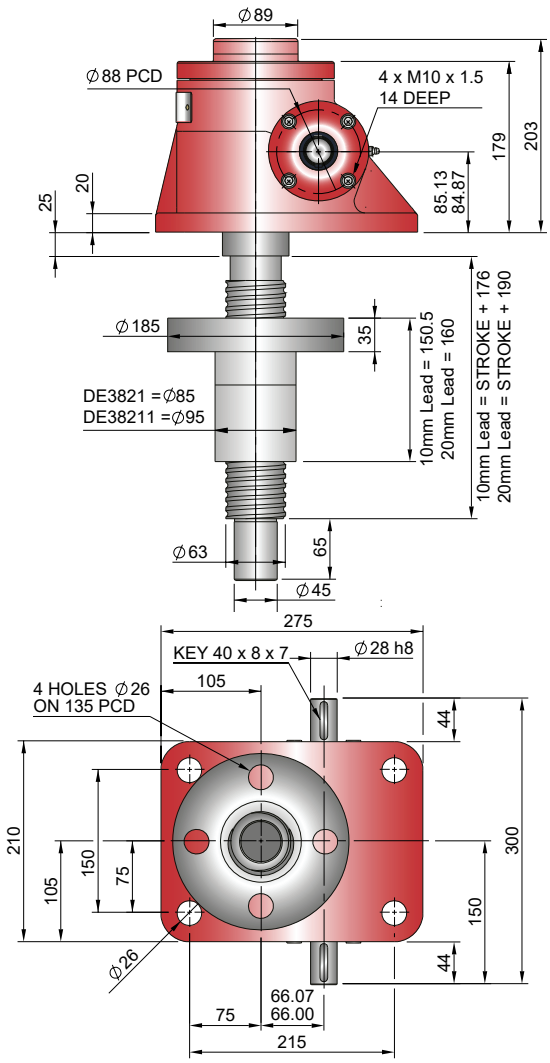
Closed Height



Upright EBR0200-U00



Inverted EBR0200-I00

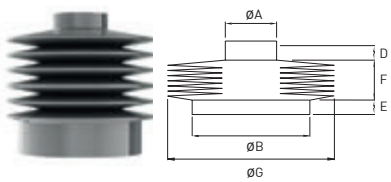


Closed Height & Bellows Boots

Closed Height "C"	Threaded End			Top Plate			Clevis End			Fork End			Rod End		
	Upright		Inverted	Upright		Inverted	Upright		Inverted	Upright		Inverted	Upright		Inverted
EBT0200	200		80	200		80	245		125	302		182	283		163
Stroke (mm)	EBT0200 with Bellows Boots														
Lead (mm)	10	20	10 &20	10	20	10 &20	10	20	10 &20	10	20	10 &20	10	20	10 &20
1-300	348	396	140	348	396	140	393	441	185	483	531	275	470	518	262
301-600	358	406	150	358	406	150	403	451	195	493	541	285	480	528	272
601-1050	378	426	170	378	426	170	423	471	215	513	561	305	500	548	292
1051-1500	398	446	190	398	446	190	443	491	235	533	581	325	520	568	312

Model	A	B	D	E	G
EBT0200	75	105	20	20	165

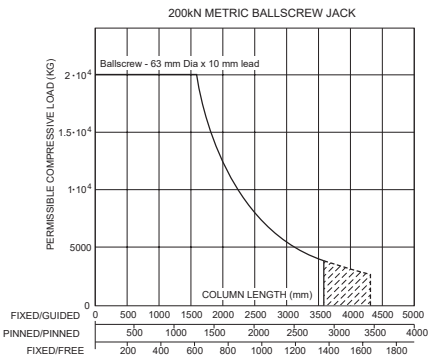
Stroke	1-300	301-600	601-1050	1051-1500
EBT0200	20	30	50	70



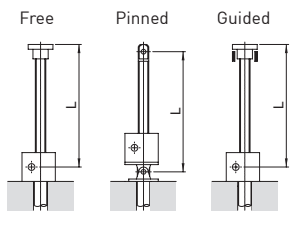
Note:

1 Inverted Screw Jacks - Bellows Boot Closed Height assumes screw jack mounted on a structure with thickness = 20mm
2 Inverted Screw Jacks - Recommended bellows boot mounting plate ØB x (E +5mm) thick.
3 Inverted Screw Jacks - Screw Jack mounting plate & bellows boot mounting plate are customers own supply
4 † Control tapes fitted (increase outer diameter by 20mm approximately).
5 For horizontal installations with than 450 mm of stroke, internal boot guides are recommended.
6 Customers with threaded end screw jacks must provide a fixing for the unattached bellows boot collar.
7 Bellows boots for Rotating Screw Jacks, other sizes, stroke and materials please consult Power Jacks.

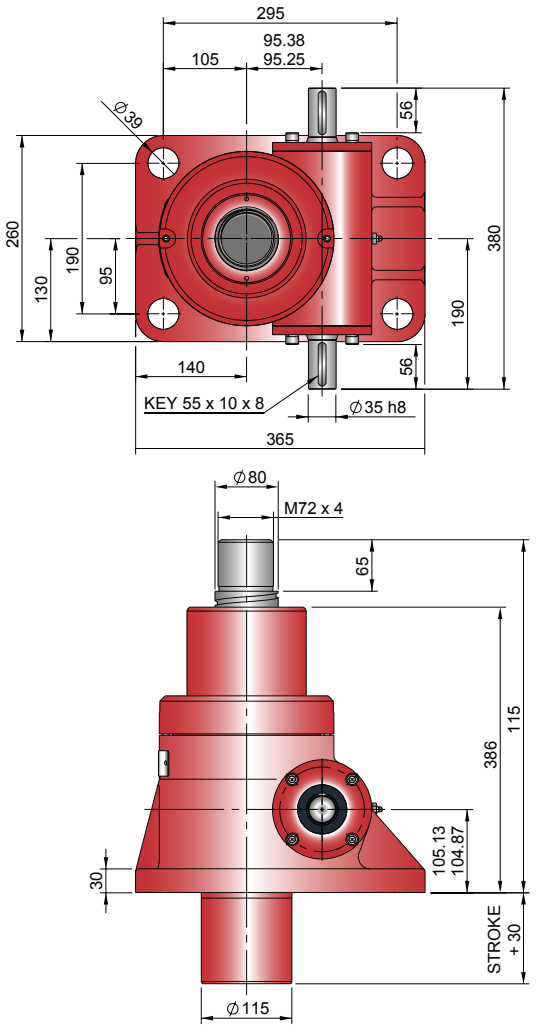
Column Strength



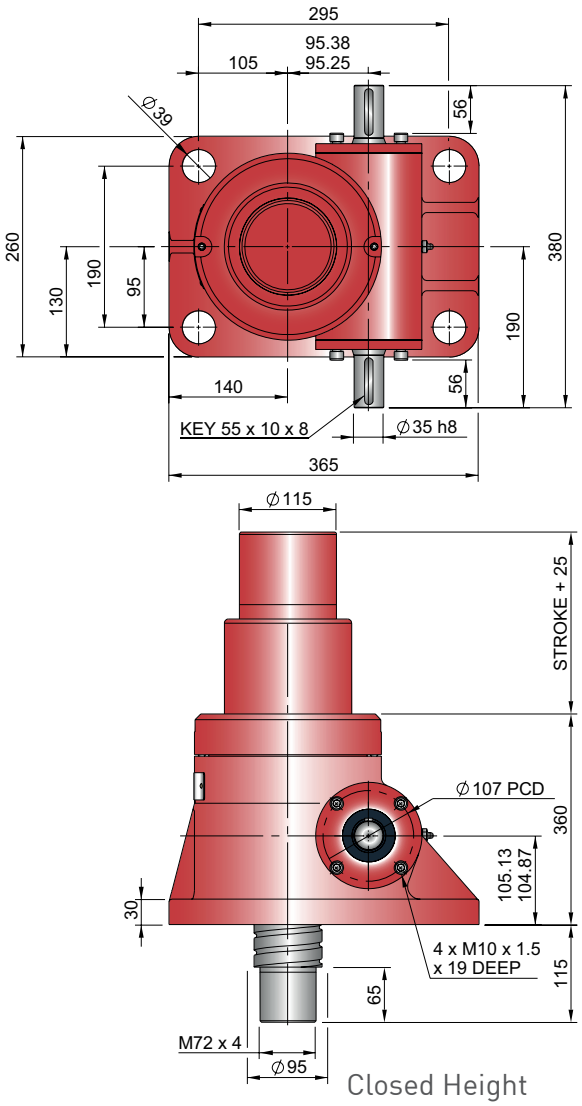
Note: For 63mm Dia x 20mm lead column strength chart refer to Engineering Guide



Upright EBT0300-U00



Inverted EBT0300-I00



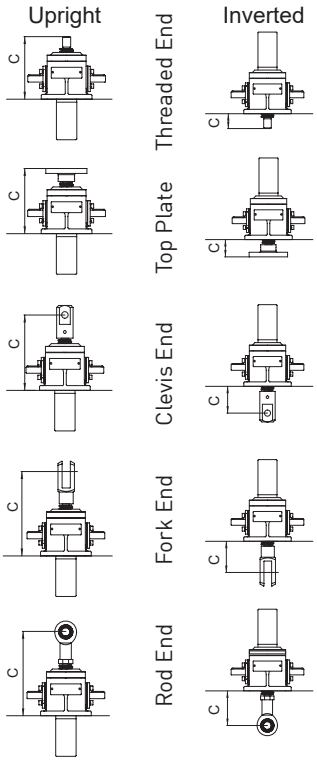
Performance

Model			EBT0300 EBR0300
Capacity	kN		300
Lifting Screw	Diameter (mm)		80
	Lead	Option	1
		mm	20
Gear Ratio Option 1	Gear Ratio		10 2/3:1
	Static Efficiency		0.492
	Dynamic Efficiency		0.595
Gear Ratio Option 2	Gear Ratio		32:1
	Static Efficiency		0.278
	Dynamic Efficiency		0.371
Max. Input power (kW)	Gear Ratio Option 1		6.0
	Gear Ratio Option 2		1.9
Start up torque at full load (Nm)	Gear Ratio Option 1		182
	Gear Ratio Option 2		107.3

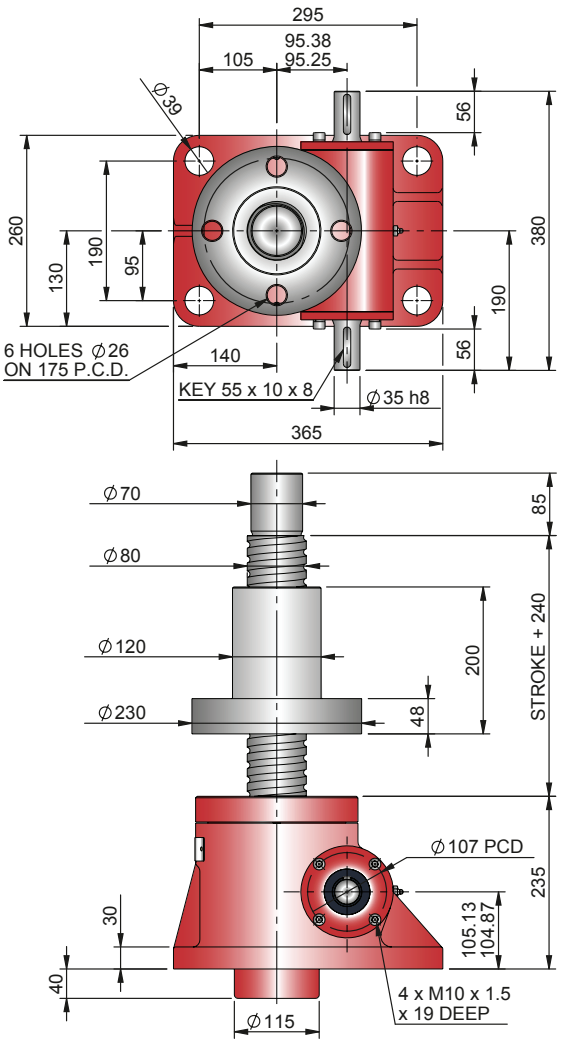
Model			EMT0300 EMR0300
Capacity	kN		300
Lifting Screw (mm)			20
Turn of worm for travel of lifting screw	Gear Ratio 1	6 Turn	11.25mm
	Gear Ratio 2	24 Turn	7.5mm
Maximum Through Torque (Nm)			1440
Lifting Screw Restraining Torque (Nm)			1030
Worm Shaft Maximum Radial Load (N)			2170
Maximum Input Speed (rpm)			1800
Gear Case Material			Steel
Weight (kg) - stroke = 150mm		EMT	92.4
		EMR	113.78
Weight (kg) - per extra 25mm stroke		EMT	1.55
		EMR	1.13

Note: All dimension in millimetres unless otherwise stated.
Designs subject to change without notice

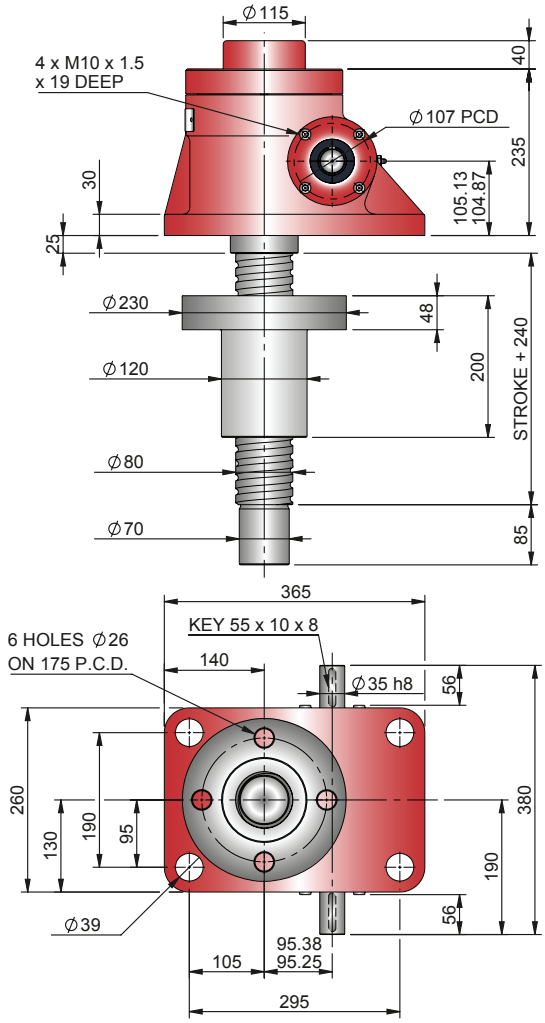
Closed Height



Upright EBR0300-U00



Inverted EBR0300-I00

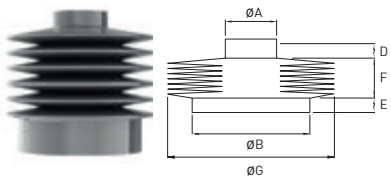


Closed Height & Bellows Boots

Closed Height "C"	Threaded End		Top Plate		Clevis End		Fork End		Rod End	
	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted	Upright	Inverted
EBT0300	325	115	325	115	365	155	148	98	150	70
Stroke (mm)	EBT0300 with Bellows Boots									
1-300	470	135	470	135	510	175	-	-	-	-
301-600	480	145	480	145	520	185	-	-	-	-
601-1050	500	165	500	165	540	205	-	-	-	-
1051-1500	520	185	520	185	560	225	-	-	-	-

Model	A	B	D	E	G
EBT0300	110	150	20	20	180

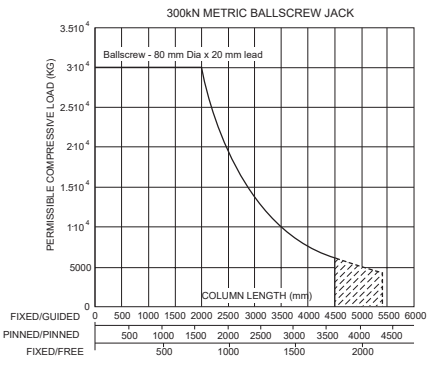
Stroke	1-300	301-600	601-1050	1050-1500
EBT0300	20	30	50	70

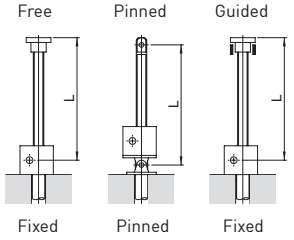


Note:

1. Inverted Screw Jacks - Bellows Boot Closed Height assumes screw jack mounted on a structure with thickness = 30mm
2. Inverted Screw Jacks - Recommended bellows boot mounting plate ØB x (E +5mm) thick.
3. Inverted Screw Jacks - Screw Jack mounting plate & bellows boot mounting plate are customers own supply
4. † Control tapes fitted (increase outer diameter by 20mm approximately).
5. For horizontal installations with than 450 mm of stroke, internal boot guides are recommended.
6. Customers with threaded end screw jacks must provide a fixing for the unattached bellows boot collar.
7. Bellows boots for Rotating Screw Jacks, other sizes, stroke and materials please consult Power Jacks.

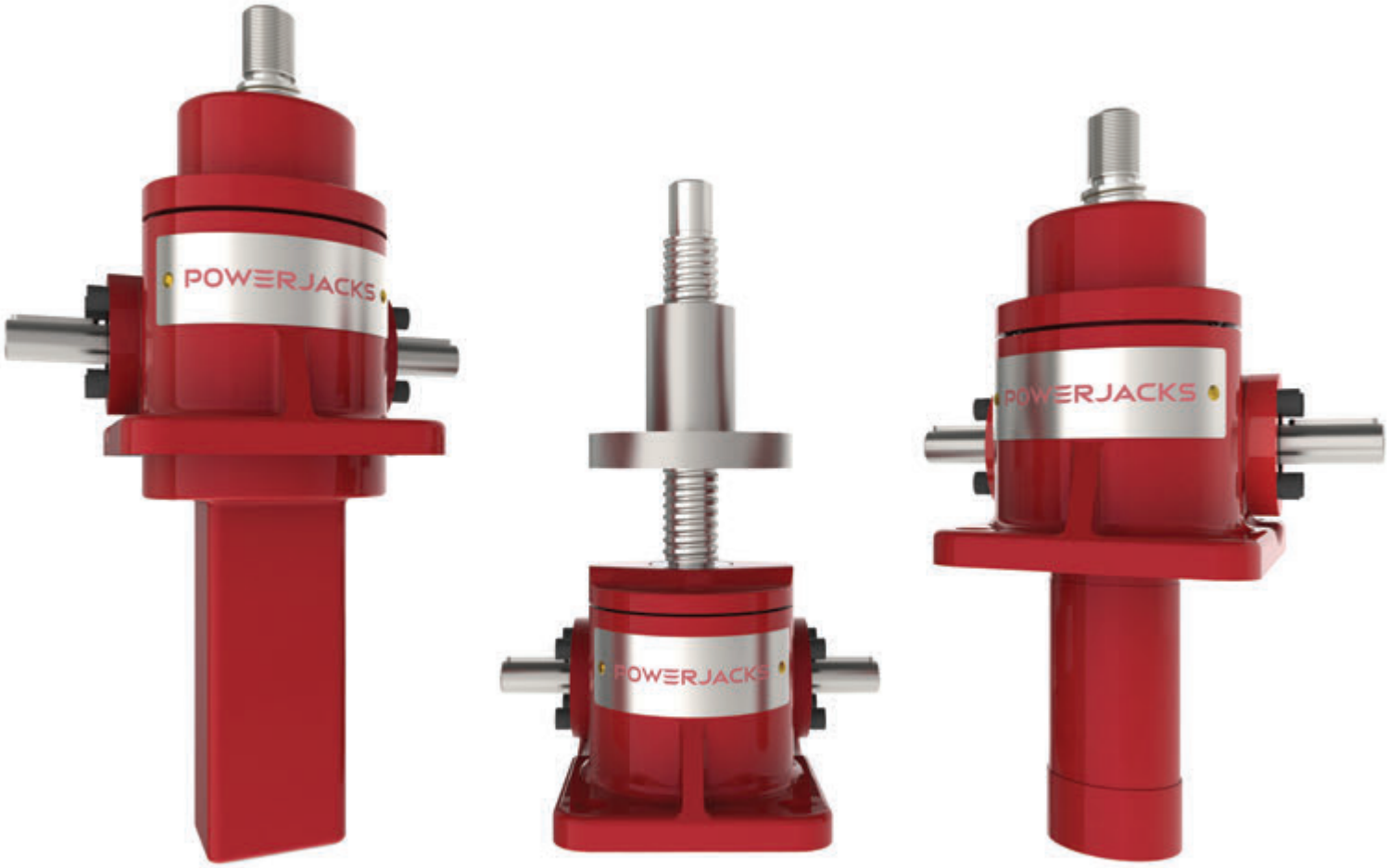
Column Strength



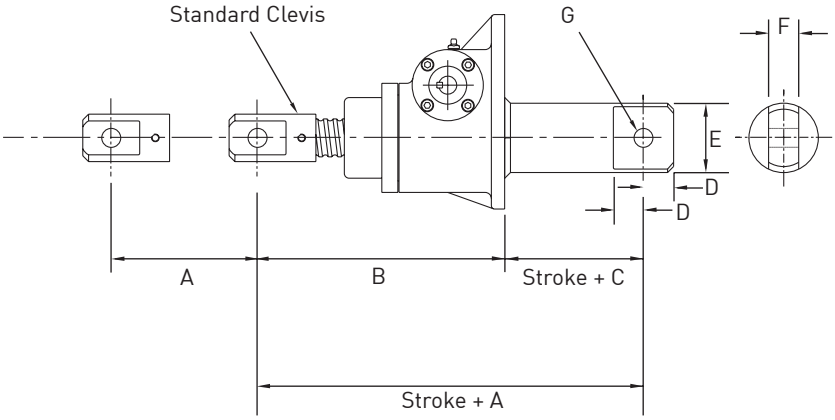


E-Series Ball Screw Jack

PERFORMANCE ENHANCED VARIANTS TO SOLVE SPECIFIC APPLICATION REQUIREMENTS


POWERJACKS
POWERJACKS
POWERJACKS

Double Clevis



Model	EBT0010	EBT0025		EBT0050		EBT0100		EBT0200		EBT0300	EBT0500
Capacity	10	25	25	50	50	100	100	200	200	300	500
Lead Option	1	1	2	1	2	1	2	1	2	1	1
A	Available on Request	260	287	313	364	427	450	525	573	Available on Request	Available on Request
B		202	229	245	296	299	322	386	434		
C		58	58	68	68	128	128	139	139		
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.

Reduced Backlash Ball Screw Jacks

Metric Ball Screw Jacks 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. Preloading on the ball nut is obtained by the "Interference Ball" method. By fitting Interference balls in the ball nut to obtain a diametrical interference fit and using the original track form, a four-point contact results.

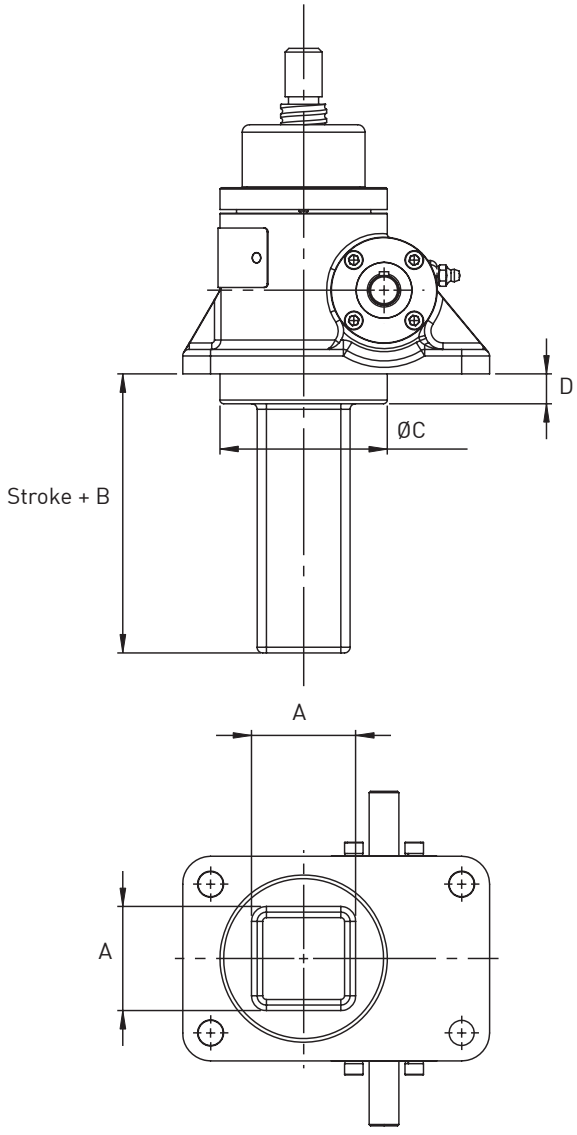
The anti-rotation device is available for translating ball screw models only. It is used only when the load to be moved (actuated) may rotate, i.e. the screw is unguided and does not prevent rotation.

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	EBT0010	EBT0025	EBT0050	EBT0100	EBT0200	EBT0300	EBT0500
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

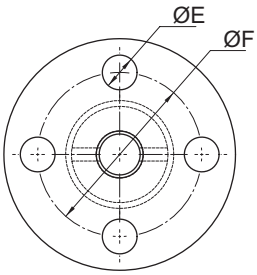
1. AOR = Application On Request, consult Power Jacks Ltd.
2. All dimensions in millimetres unless otherwise stated.

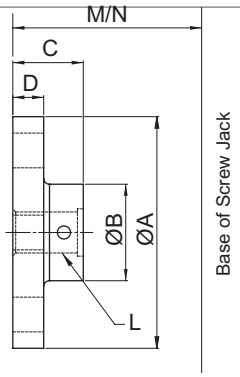


E-Series Screw Jack

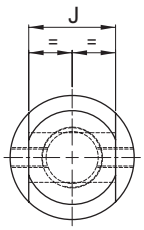
ACCESSORIES FOR BALL SCREW JACKS

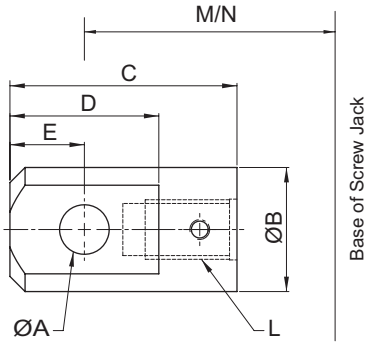
Top Plate



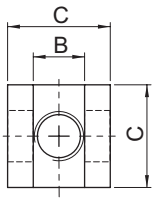


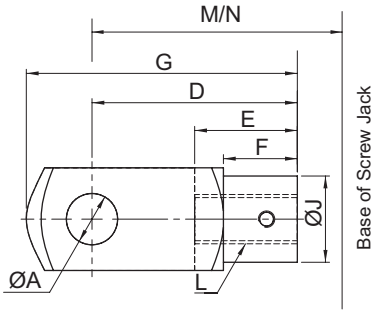
Clevis End



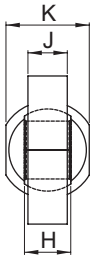


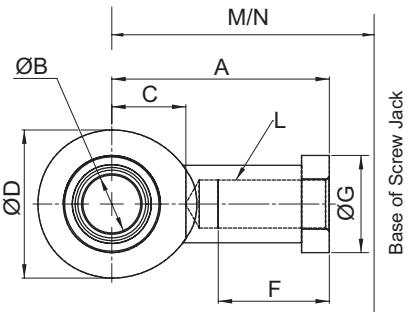
Fork End





Rod End





	Capacity (kN)		10	25	50	100	200	300	500
Top Plate	ØA		80	100	120	150	170	240	280
	ØB		30	40	50	65	75	110	150
	C		25	31.5	36.5	42	58	67	92
	D		10	12	16	20	25	30	35
	ØE x QTY		11 x 4	13.5 x 4	18 x 4	22 x 4	26 x 4	33 x 4	33 x 4
	ØF (PCD)		55	70	85	110	120	170	215
	L		M12 x 1.75	M20 x 2.5	M24 x 3	M36 x 4	M48 x 5	M72 x 4	M100 x 4
	N[#2]	Upright	150	175	218	252	338	445	-
		Inverted	45	55	65	80	95	115	-

	Capacity (kN)		10	25	50	100	200	300	500
Clevis Plate	ØA		12	16	20	22	30	45	60
	ØB		30	40	50	65	75	110	150
	C		63	79.5	91.5	120	143	167	217
	D		36	46	60	66	80	120	150
	E		18	23	30	33	40	60	75
	J		20	30	35	40	50	80	110
	L		M12 x 1.75	M20 x 2.5	M24 x 3	M36 x 4	M48 x 5	M72 x 4	M100 x 4
	N[#2]	Upright	170	200	243	297	383	485	-
		Inverted	65	80	90	125	140	155	-

	Capacity (kN)		10	25	50	100	200	300	500
Fork End	ØA		12	20	25	35	50	Available on Request	Available on Request
	B		12	20	25	35	50		
	C		24	40	50	70	96		
	D		48	80	100	144	192		
	E		24	40	50	72	96		
	F		18	30	36	54	73		
	G		62	105	132	188	265		
	ØJ		20	34	42	60	82		
	L		M12 x 1.75	M20 x 2.5	M24 x 3	M36 x 4	M48 x 5		
	N[#2]	Upright	173	224	281	354	473		
		Inverted	68	104	128	182	230		

	Capacity (kN)		10	25	50	100	200	300	500
Rod End	A		50	77	94	125	160	Available on Request	Available on Request
	ØB		12	20	25	35	50		
	C		18	27	32	42	60		
	ØD		34	53	64	82	112		
	F		23	40	48	60	68		
	ØG		22	35	42	58	75		
	H		10	16	20	25	35		
	J		8	13	17	21	30		
	K		19	32	36	50	65		
	L		M12 x 1.75	M20 x 1.5	M24 x 2	M36 x 3	M45 x 3		
	N[#2]	Upright	175	220	275	335	440		
		Inverted	70	100	122	163	197		

Note

1. N = For Ball Screw Jacks, Standard Lead only.

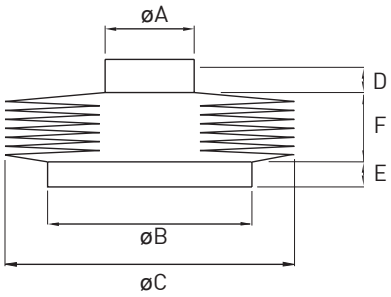
Features

- 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.

Boot Dimensions

Model	A	B	C	D	E
EBT0010	30	75	114	12	12
EBT0025	40	66	120	15	15
EBT0050	50	85	140	15	15
EBT0100	65	100	150	15	15
EBT0200	75	105	165	20	20

Model	A	B	C	D	E
EBT0300	110	150	180	20	20
EBT0500	Available on Request				



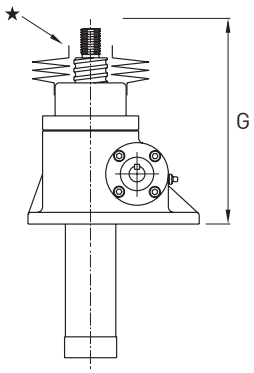
Model		EBT0010	EBT0025	EBT0050	EBT0100	EBT0200	EBT0300
F	Stroke 0 → 300	16	20	20	20	20	20
	Stroke 301 → 600	32	30	30	30	30	30
	Stroke 601 → 900	-	-	45	-	-	-
	Stroke 601 → 1050	56	50	-	50	50	50
	Stroke 901 → 1050	-	-	50	-	-	-
	Stroke 1051 → 1500	80	70	70	70	70	70

Note

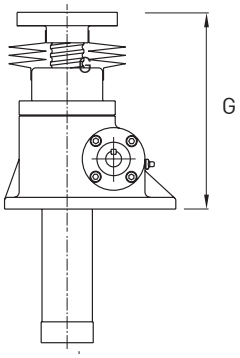
1. F = Bellows boot minimum closed thickness
2. - = Not applicable consult Power Jacks Ltd
3. † = Control tapes fitted (approximately 20 mm increase to outer diameter).
4. Supplied complete with a set of corrosion-resistant 'jubilee' clips (2) suitable for fitting over collar diameters.
5. For horizontal installation exceeding 450 mm of travel, internal boot guides are recommended.
6. Customers with threaded end screw jacks must provide a fixing for the unattached collar (★).
7. Bellows boots for rotating screw jacks consult Power Jacks Ltd.
8. For other sizes, strokes and materials please contact Power Jacks Ltd.
9. All dimensions in millimetres unless otherwise stated.
10. Dimensions subject to change without notice.
11. Screw Jack mounting plate and bellows boot mounting plate are usually all part of the customers superstructure (★ ★). For other options consult Power Jacks.

Closed Heights

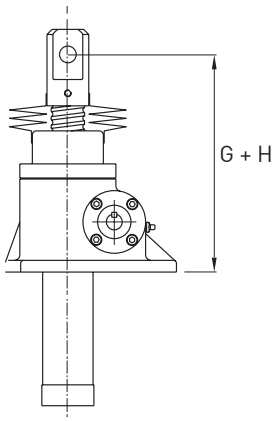
Threaded End



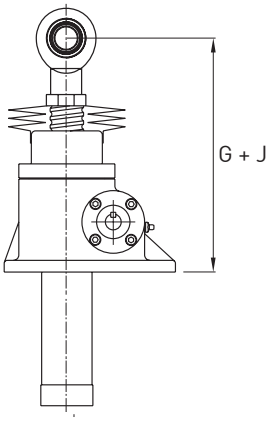
Top Plate



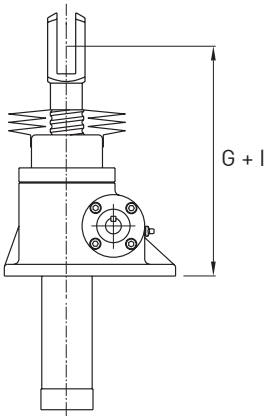
Clevis End



Rod End



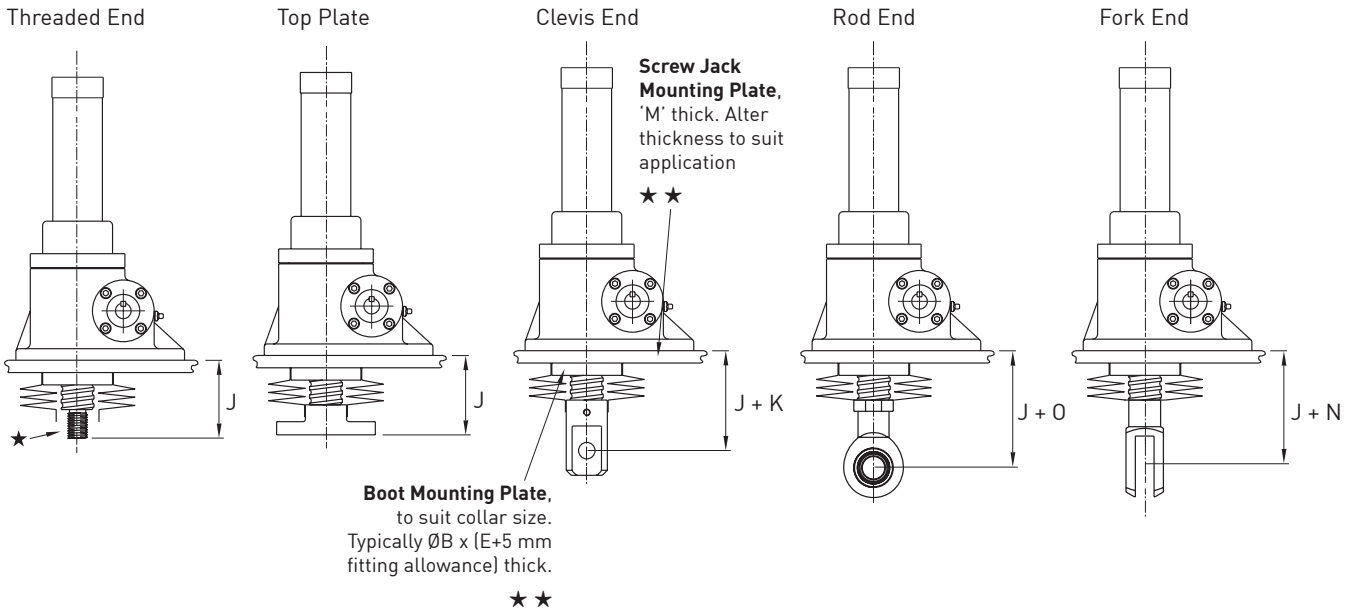
Fork End



Closed Height for all Upright Metric Ball Screw Jacks

Model		EBT0010	EBT0025		EBT0050		EBT0100		EBT0200		EBT0300
	Lead Option	1	1	2	1	2	1	2	1	1	1
G	Stroke 0 → 300	166	180	200	230	270	255	285	348	396	470
	Stroke 301 → 600	182	190	210	240	280	265	295	358	406	480
	Stroke 601 → 900	-	-	-	255	295	-	-	-	-	-
	Stroke 601 → 1050	206	210	230	-	-	285	315	378	426	500
	Stroke 901 → 1050	-	-	-	260	300	-	-	-	-	-
	Stroke 1051 → 1500	230	230	250	280	320	305	335	378	446	520
H	Extra Closed Height for Clevis	20	25	25	25	25	45	45	45	45	40
I	Extra Closed Height for Fork	23	49	49	63	63	82	82	135	135	Request
J	Extra Closed Height for Rod End	43	60	60	72	72	98	98	122	122	Request

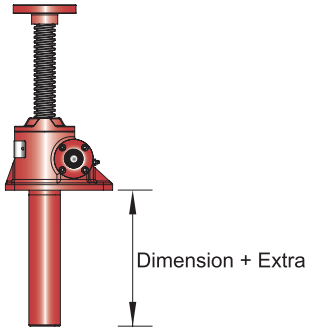
Closed Heights

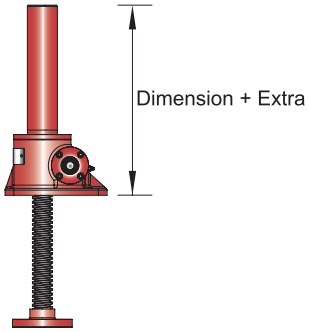


Closed Height for all Inverted Metric Ball Screw Jacks

	Model	EBT0010	EBT0025		EBT0050		EBT0100		EBT0200		EBT0300
	Lead Option	1	1	2	1	2	1	2	1	2	1
M	Mounting Plate	10	15	15	15	15	20	20	20	20	30
G	Stroke 0 → 300	61	100	100	105	105	120	120	140	140	135
	Stroke 301 → 600	77	110	110	115	115	130	130	150	150	145
	Stroke 601 → 900	-	-	-	130	130	-	-	-	-	-
	Stroke 601 → 1050	101	130	130	-	-	150	150	170	170	165
	Stroke 901 → 1050	-	-	-	135	135	-	-	-	-	-
	Stroke 1051 → 1500				155	155	170	170	190	190	185
K	Extra Closed Height for Clevis	20	25	25	25	25	45	45	45	45	40
N	Extra Closed Height for Fork	23	49	49	63	63	82	82	135	135	Request
O	Extra Closed Height for Rod End	43	60	60	72	72	98	98	122	122	Request

Stop Nut



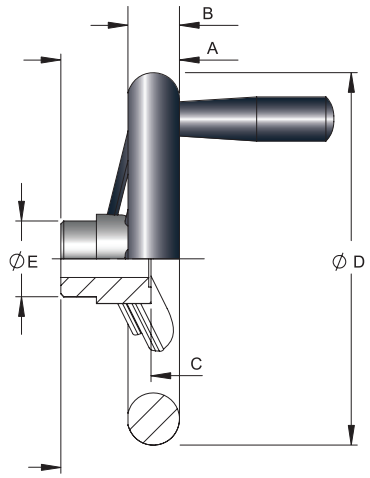


Ball Screw Jack

Model	Extra (mm)	
	Upright	Inverted
EBT0010	On Request	
EBT0025	30	30
EBT0050	57	57
EBT0100	60	60
EBT0200	56	56
EBT0300	On Request	
EBT0500	On Request	

Note
These are full power stop nuts. They should only be used as an emergency stop safety feature.

Hand Wheels

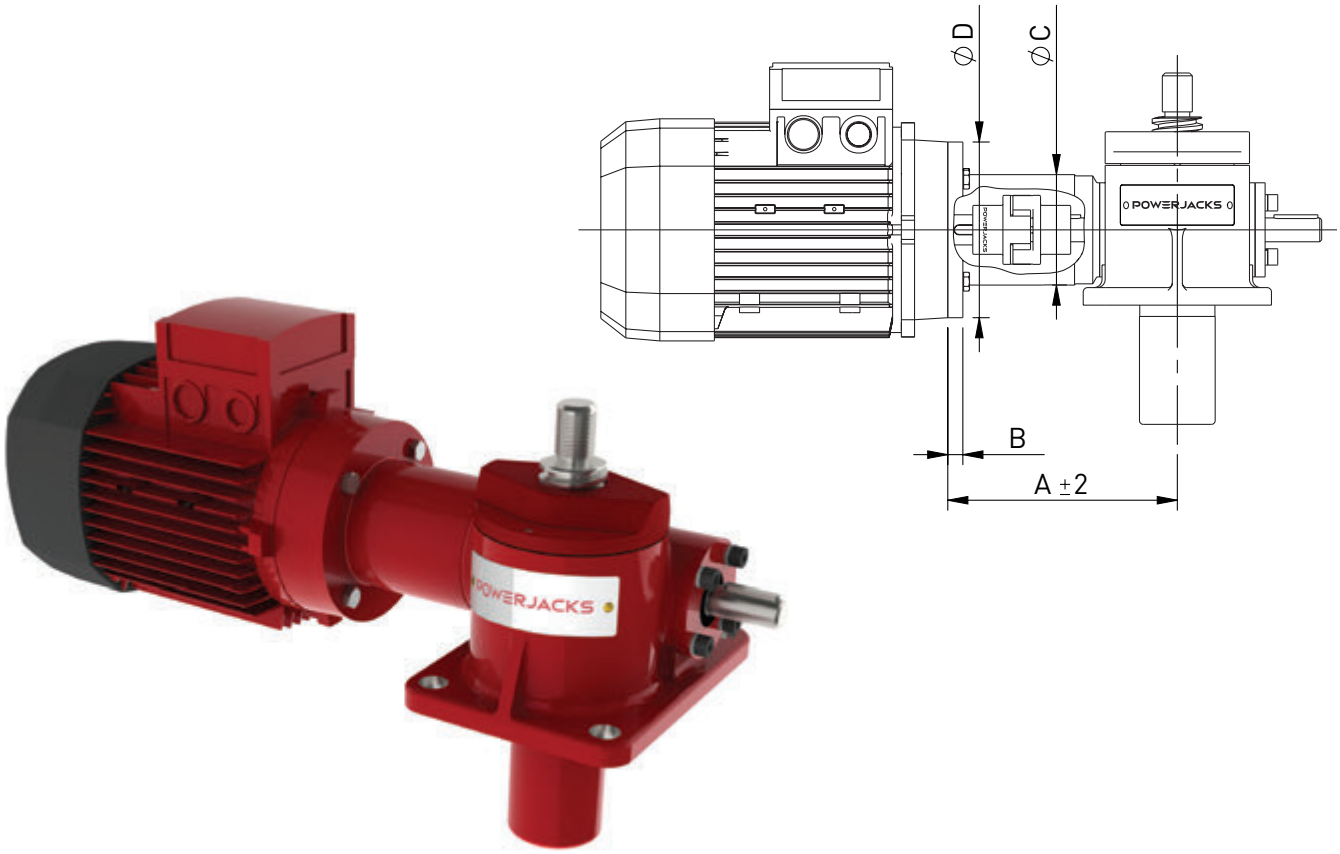


Model	A	B	C	D	E	H7 Bore
HW 005	40	14	36	98	24	Ø10
HW 010	50	22	38	157	32	Ø14
HW 025	56	24	43	198	40	Ø16
HW 050	56	24	43	198	40	Ø19
HW 100	66	30	44	247	49	Ø25
HW 200	78	32	56	288	58	Ø28
HW 300	108	40	77	375	58	Ø35
HW 500	108	40	77	375	58	Ø40

Notes:
1. Material: Polished aluminium casting and rotating handle
2. Bored and keyed to BS4235 Part 1
3. All dimensions in millimetres unless otherwise stated
4. Other types of hand wheels are available on request. Consult Power Jacks.

- Standard adapters for 25 kN - 200 kN metric machine screw and ball screw jacks
- Designed for standard IEC frame sizes
- Allows direct motor coupling on either side of the screw jack input shaft
- Complete with drive coupling and mounting hardware

Note
- When direct coupling a motor to a screw jack, it is necessary to match motor power to screw jack load so the motor does not exceed the maximum power for the screw jack gear set.



Motor Adapters		Capacity (kN)															
		25				50				100				200			
Frame Size	Motor Mounting	A	B	ØC	ØD	A	B	ØC	ØD	A	B	ØC	ØD	A	B	ØC	ØD
71	B14 C105	142.5	10	71	105	-	-	-	-	-	-	-	-	-	-	-	-
80	B14 C120	146.5	12	81	120	171	12	86	120	-	-	-	-	-	-	-	-
90	B14 C140	157.5	12	81	140	183	12	88	140	208	12	98	140	218	12	125	140
100	B14 C160	168	12	81	160	193	12	88	160	218	12	98	160	228	12	125	160
112	B14 C190	168	12	81	160	193	12	88	160	218	12	98	160	228	12	125	160
132	B14 C200	-	-	-	-	218	14	95	200	240	14	98	200	250	14	125	200

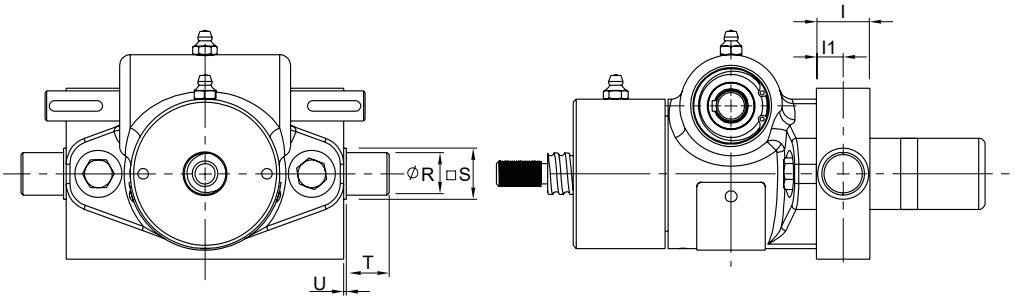
Notes:
1. Motor Adapters for IEC Frames with B5 Flange mounts available on request.
2. Motor Adapters for screw jacks of capacities 300kN and above are available on request.
3. Adapters for geared motors are available on request for all types of geared motor or gear head.
4. Motor Adapters for Servo Motors available on request.
5. Motor Adapters for NEMA Frame motors are available on request.
6. All dimensions in millimetres unless otherwise stated.
7. Dimensions subject to change without notice.

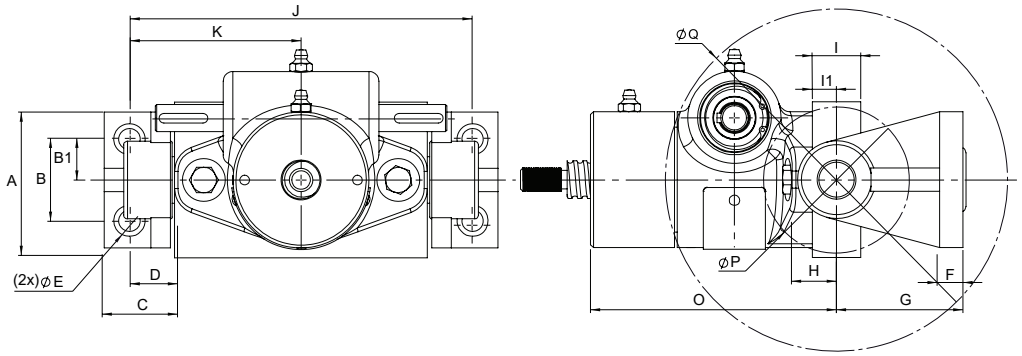
Base mounted trunnions are an ideal bolt-on accessory for a screw jack to add a pivot point to the gearbox of the screw jack. These base mounted trunnions can be used for both translating and rotating screw jacks with any lifting screw type.

Available in both male or female designs with the option to add standard trunnion feet. Most designs offer trunnions in 2 mounting positions.

If you need trunnions fitted at another position on a screw jack then please contact us as we can provide customised trunnion mounts to suit your exact applications needs

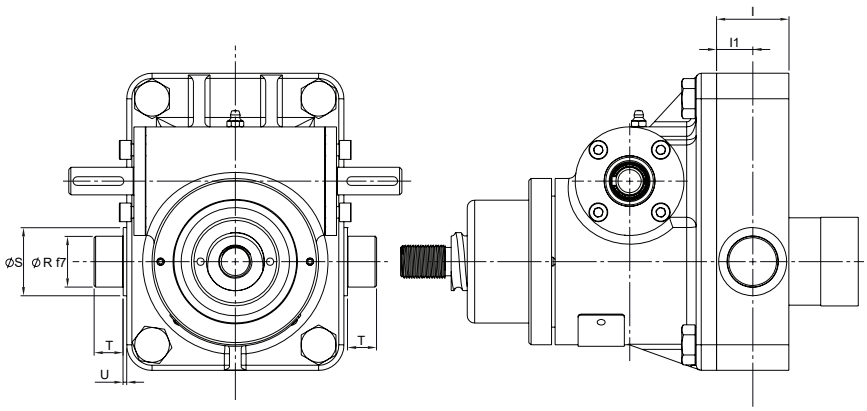
10kN Trunnion Mounts

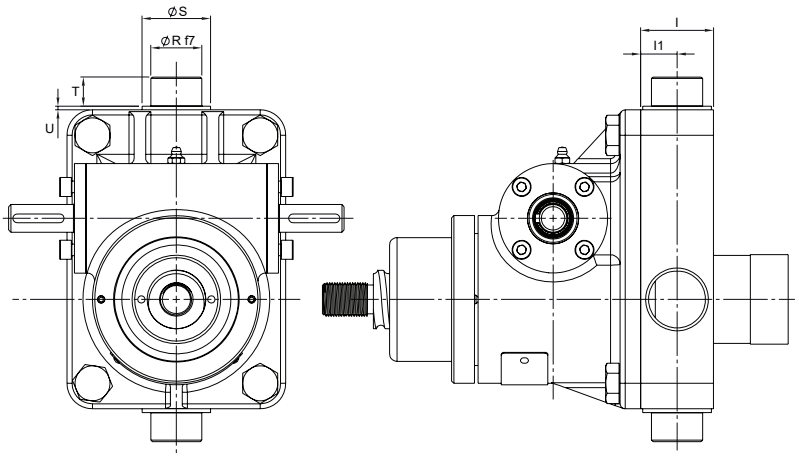


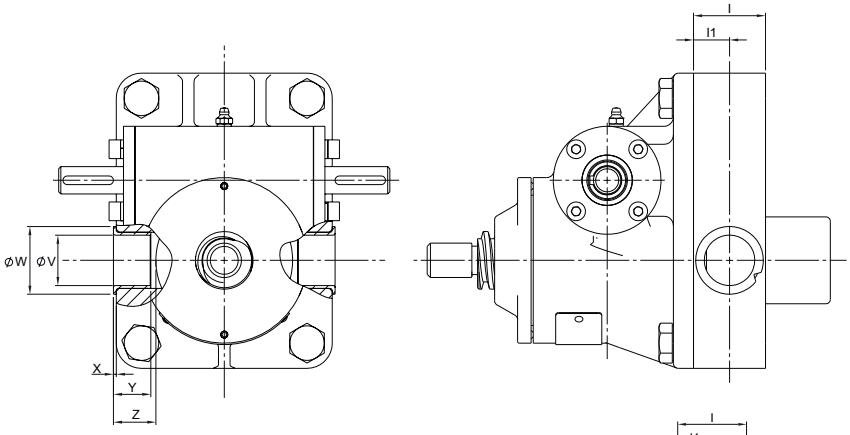


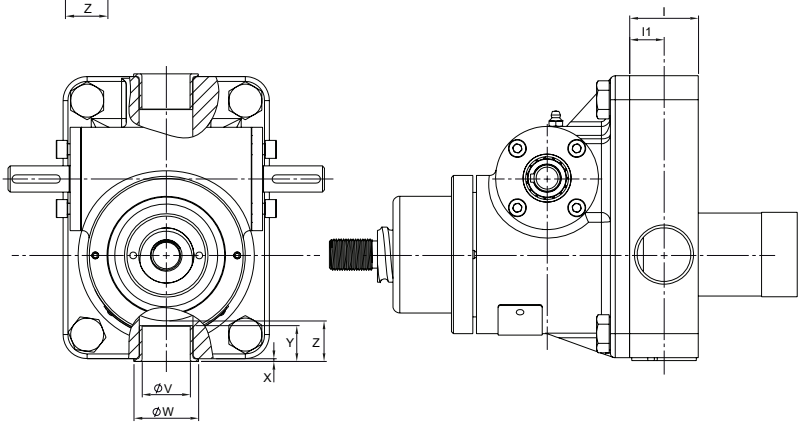
Capacity	A	B	B1	C	D	ØE	F	G	H	I	I1	J	K	O	P	Q	ØR (h6)	S	T	U
10kN	70	42	21	35	22	11	12	65	20	25	12.5	181	90.5	114	84	209	20	24	20	2.5

25kN to 500kN Trunnion Mounts

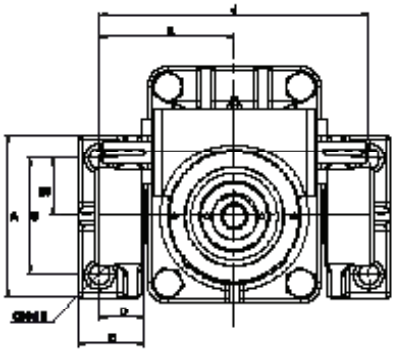


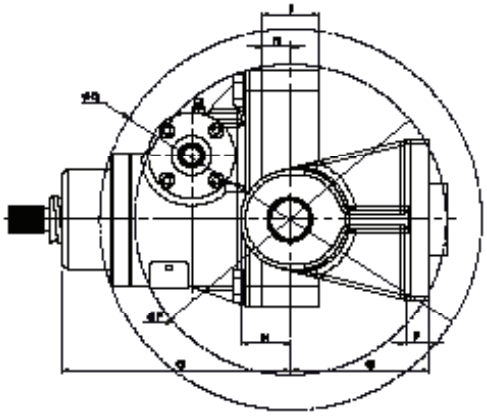


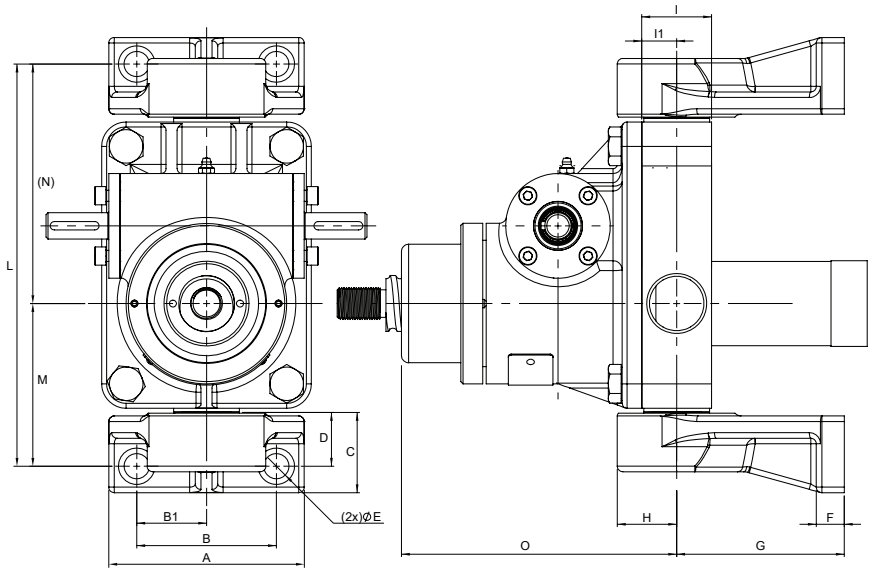




25kN to 500kN Trunnion Mounts







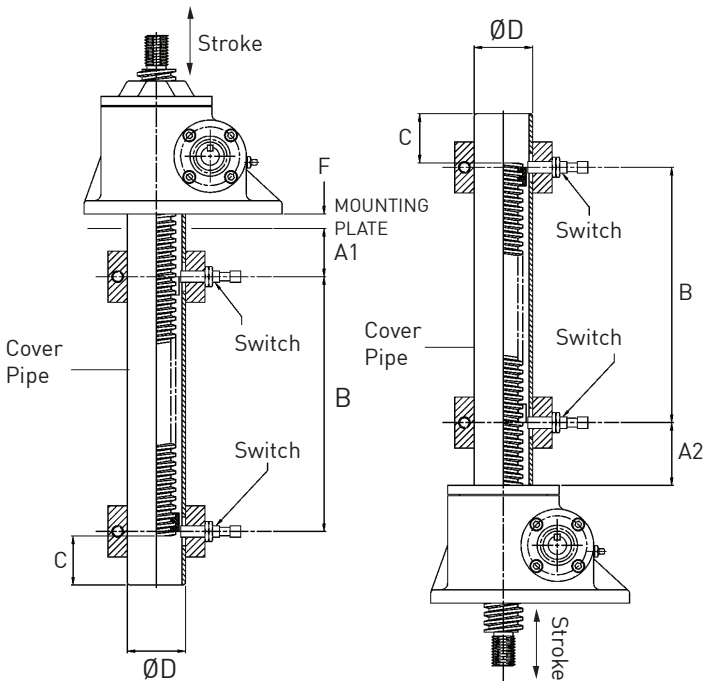
Capacity	A	B	B1	C	D	ØE	F	G	H	I	I1	J	K	L
25kN	100	70	35	40	26	13.5	14	85	30	36	18	171	85.5	226
50kN	140	100	50	55	35.5	18	20	120	42.5	50	25	233	116.5	288
100kN	170	120	60	70	43.5	22	25	130	47.5	60	30	292	146	327
200kN	220	150	75	90	61	33	25	170	59	85	42.5	344	172	409
300kN	280	190	95	120	80	39	35	180	60	100	45	434	217	539
500kN	360	250	125	155	100	51	40	200	70	120	55	514	257	749

Capacity	M	N	O	P	Q	ØR (f7)	S	T	U	V	W	X	Y	Z
25kN	95.5	130.5	152	208	248	25	35	20	2.5	25	35	1.5	16.5	26
50kN	116.5	171.5	197	270	332	35	47	20	2.5	35	47	2	26	39
100kN	126	201	227	312	361	45	58	35	5	45	74	2	32	40
200kN	172	237	311	361	500	60	75	45	5	60	78	2	42	45
300kN	227	312	405	473	578	70	85	70	6	70	90	3	53	58
500kN	332	417	Request	643	681	80	95	70	6	80	110	2	62	62

Notes:
Dimension "O" is for units with Option-1 lead only. For Option-2 lead units add extra height.

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 screw jacks cover pipe.

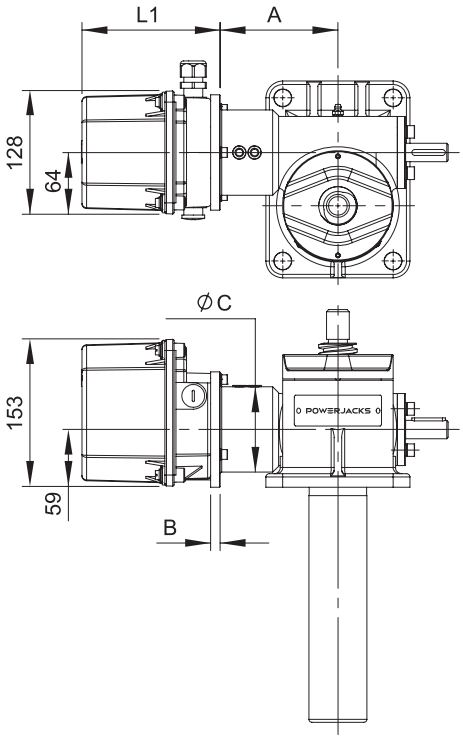


Upright & Inverted Machine Screw Jacks								
Capacity Rating (kN)	Switch Dia (mm)	A1 (mm)	A2 (mm)	B (mm)	C (mm)	D (Ømm)	F (mm)	Switch Adjustment (mm)
10	8	40	40	Stroke + 20	40	33.4	10	±5
25	12	35	60	Stroke + 15	60	48	15	±5
50	12	40	70	Stroke + 25	65	60	15	±5
100	12	55	85	Stroke + 25	77	73	20	±10
200	12	65	80	Stroke +25	77	89	20	±10
300	18	65	80	Stroke +40	96	141	30	±10
500	18	95	95	Stroke +40	108	168	30	±15

Note
1. All dimensions in mm unless otherwise stated.

End of Travel Electro-Mechanical Switches

The screw jacks can be fitted with electro-mechanical limit switches in a similar design. For dimensions please consult Power Jacks Ltd.



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 enclosure (IP66). Operating temperature -40°C to +80°C.

More RLS-51 rotary limit switch details in System Components section of design guide

Screw Jack Capacity (kN)								
	25				50			
Adapter Mounting	Std. Part	A	B	ØC	Std. Part	A	B	ØC
B5	×	-	-	-	×	-	-	-
B14	✓	117	10	70	✓	133	10	89

Screw Jack Capacity (kN)								
	100				200			
Adapter Mounting	Std. Part	A	B	ØC	Std. Part	A	B	ØC
B5	✓	150	13	98	✓	174	13	125
B14	×	-	-	-	×	-	-	-

The mounting kit includes the flexible coupling and drive adapter.

Gear Size	Usable revs. selected	Usable revs. theoretical with 15° cam discs	Gear Ratio	1 rev. of the drive shaft - corresp. to an ang. motion of cam disc =°	Change - over contact reset rev. at driving shaft	Max drive speed (RPM)	Min drive shaft speed (only for change - over contact)	L1 (mm) Limit Switches			
								2	4	6	8
1	4.1	4.16	4.285	84	0.00714	1000	0.67	132	132	157	157
	6.5	6.88	7.083	50.8	0.0118	1200	1.1				
	11	11.23	11.56	31.14	0.0193	1500	1.8				
2	17.5	17.84	18.361	19.6	0.0306	1800	2.9	132	132	157	182
	29	29.5	30.35	11.86	0.0505	1800	4.7				
	48	48.13	49.538	7.27	0.0825	1800	7.7				
3	75	76.45	78.678	4.57	0.131	1800	12.2	132	132	157	182
	125	126.39	130.054	2.77	0.2166	1800	20.2				
	205	206.26	212.272	1.69	0.3536	1800	33				
4	323	327.6	337.135	1.06	0.5616	1800	52	132	157	182	207
	540	541.5	557.284	0.65	0.9284	1800	87				
	880	883.8	909.59	0.4	1.515	1800	141				
5	1384	1403.7	1444.62	0.25	2.406	1800	224	132	157	182	207
	2288	2320.2	2387.96	0.15	3.978	1800	371				
	3735	3787.1	3897.58	0.09	6.493	1800	606				
6	5900	6014.77	6190.204	0.06	10.313	1800	*	157	157	182	207
	9800	9942.2	10232.407	0.04	17.047	1800	*				
	16000	16227.6	16701.17	0.02	27.824	1800	*				

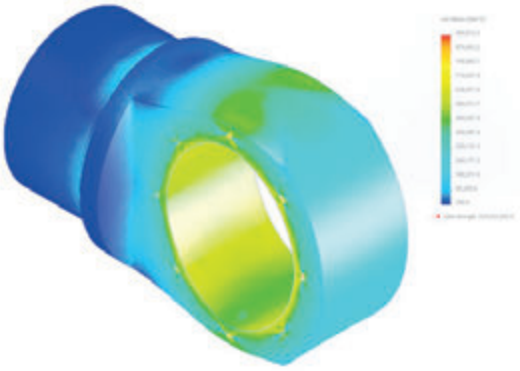
Note
1. More than 8 contacts on request.
2. Dimensions with more than 8 contacts and with special executions, eg. potentiometer, on request.
3. RLS-51 B5 Flange thickness = 4mm.
4. Options available include Anti-condensation heaters, potentiometer, pulse transmitter, encoder, aluminium housing and VBG-70 STAGE technology.
5. Mounting kits available for all screw jacks. For those not listed, consult Power Jacks.

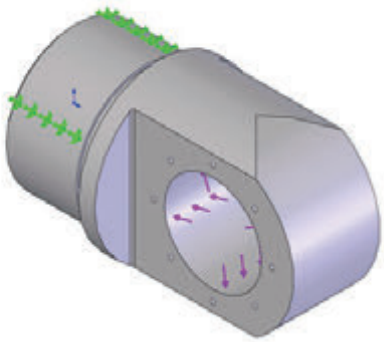
E-Series

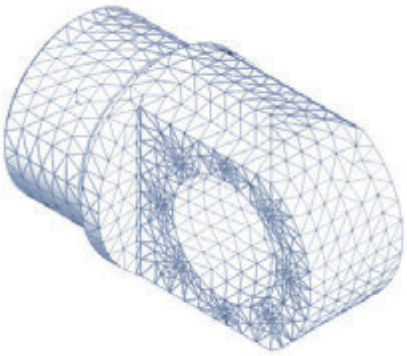
4

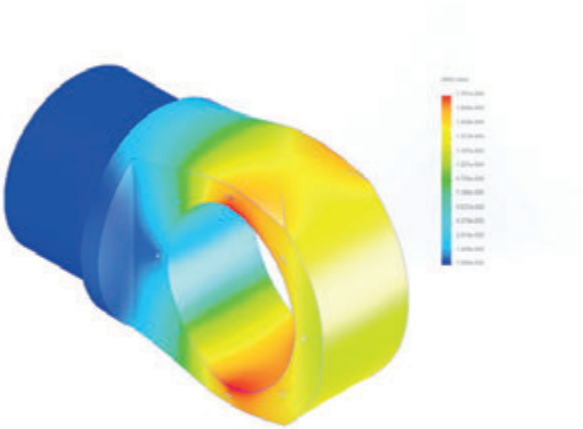
ENGINEERING GUIDE

USEFUL PERFORMANCE & OPERATIONAL DETAIL FOR SCREW JACKS





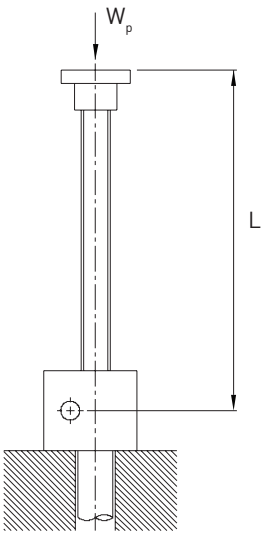




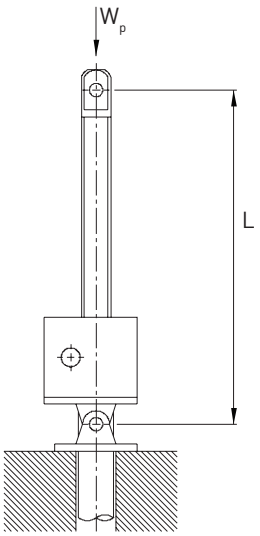
Important Notes

1. All 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 (WP) for human cargo multiply the load selected from the chart by 0.7 e.g. $W_{PHC} = W_P * 0.7$.

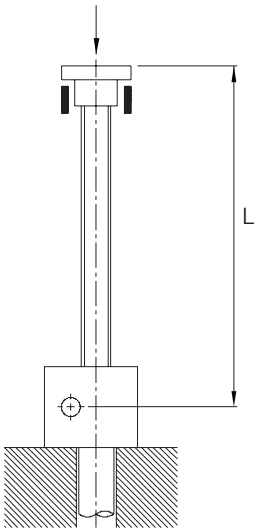
Column Length Correction Factors, F_{cb}



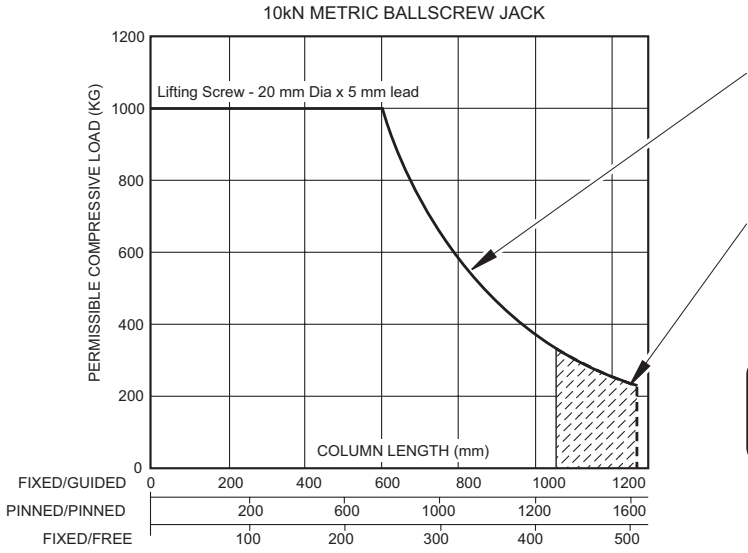
Fixed/Free



Pinned/Pinned



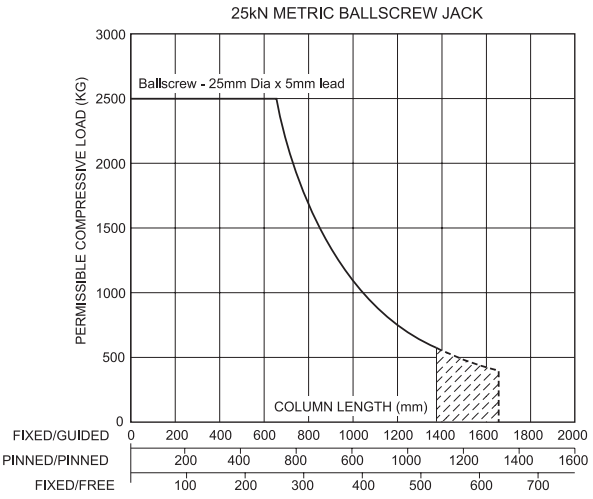
Fixed/Guided

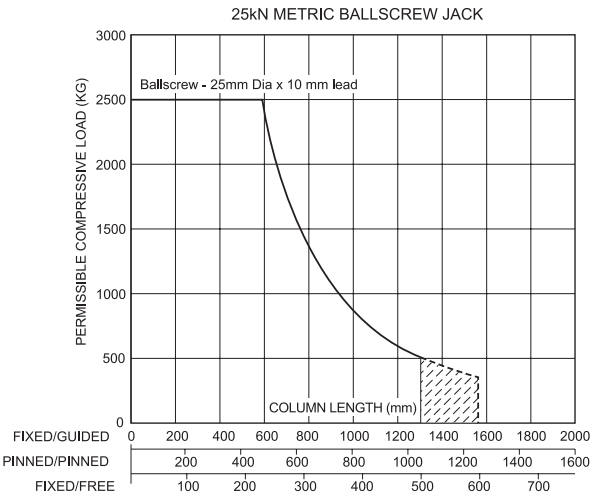


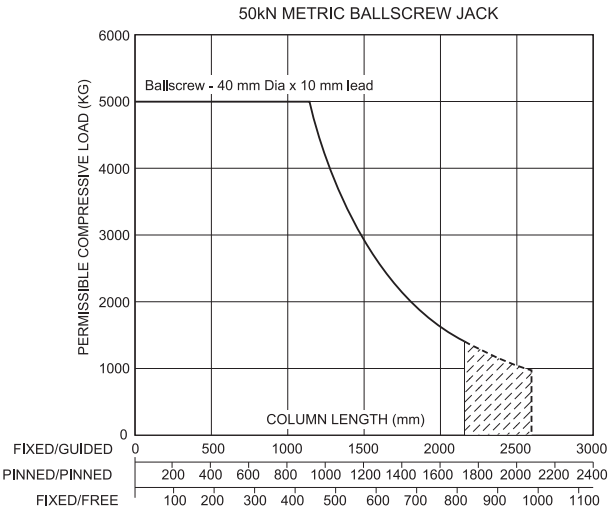
Euler
Buckling Curve

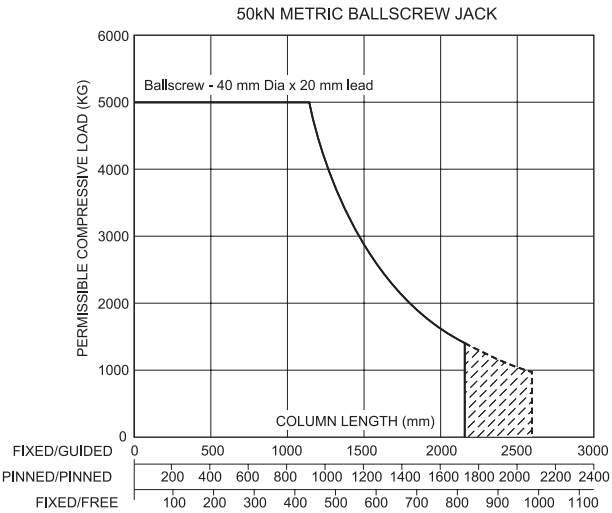
Column strength cut
off point due to slenderness
ratio considerations

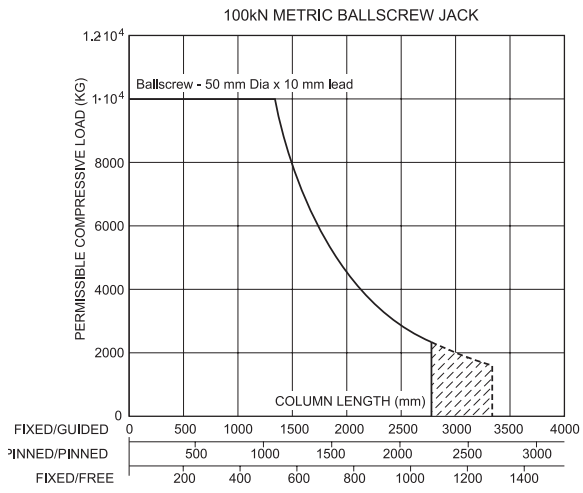
Applications in hatched area -
consult Power Jacks Ltd
for detailed analysis.

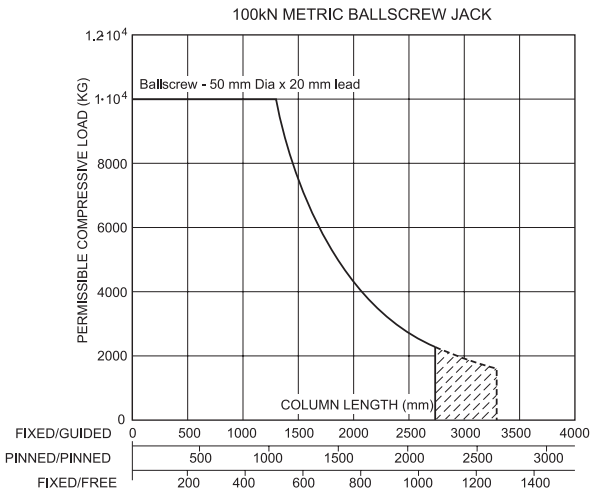

25kN METRIC BALLSCREW JACK
Ballscrew - 25mm Dia x 5mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE

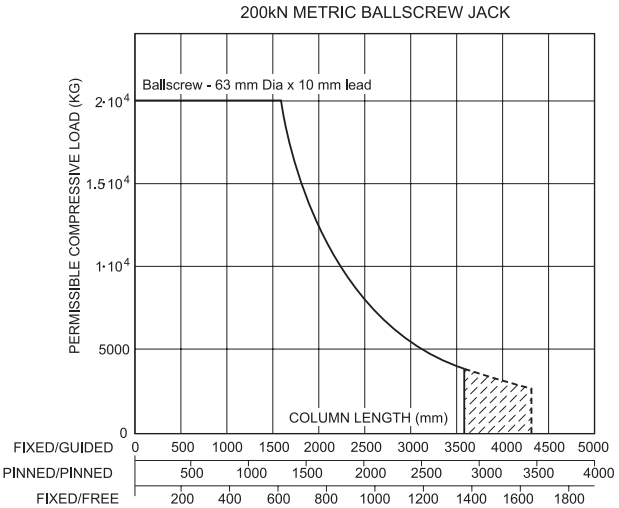

25kN METRIC BALLSCREW JACK
Ballscrew - 25mm Dia x 10 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE

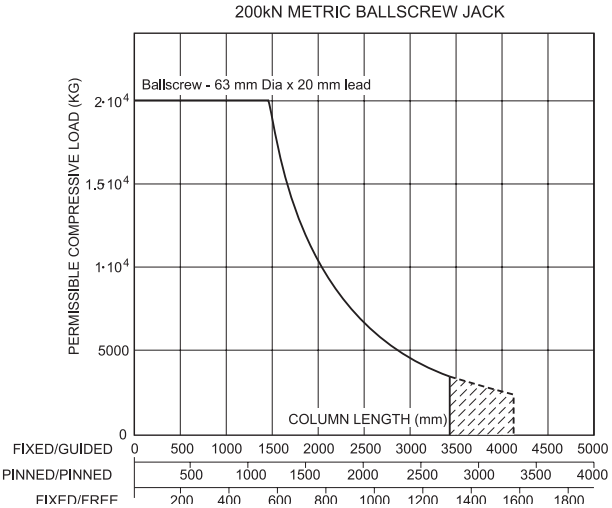

50kN METRIC BALLSCREW JACK
Ballscrew - 40 mm Dia x 10 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE

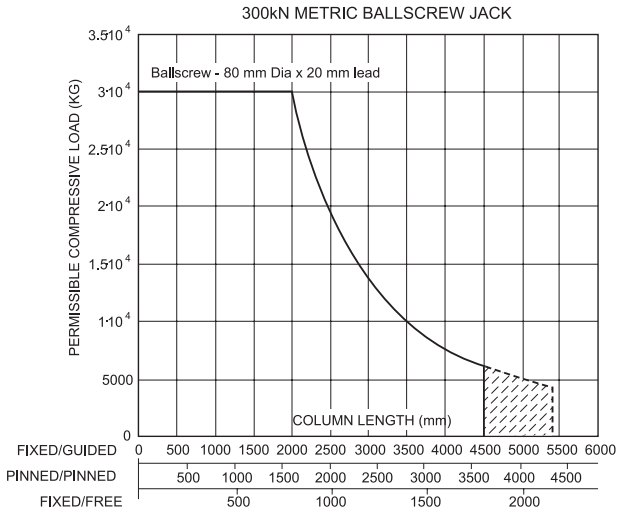

50kN METRIC BALLSCREW JACK
Ballscrew - 40 mm Dia x 20 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE


100kN METRIC BALLSCREW JACK
Ballscrew - 50 mm Dia x 10 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE


100kN METRIC BALLSCREW JACK
Ballscrew - 50 mm Dia x 20 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE

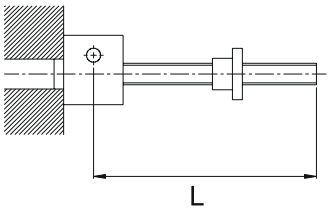

200kN METRIC BALLSCREW JACK
Ballscrew - 63 mm Dia x 10 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE


200kN METRIC BALLSCREW JACK
Ballscrew - 63 mm Dia x 20 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED

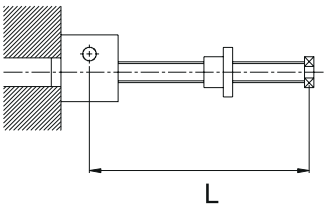

300kN METRIC BALLSCREW JACK
Ballscrew - 80 mm Dia x 20 mm lead
PERMISSIBLE COMPRESSIVE LOAD (KG)
COLUMN LENGTH (mm)
FIXED/GUIDED
PINNED/PINNED
FIXED/FREE

Critical Screw Speed Factors, F_{cs}

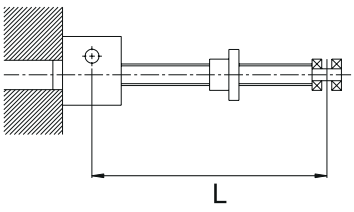
Fixed/Free, F_{cs} = 0.15



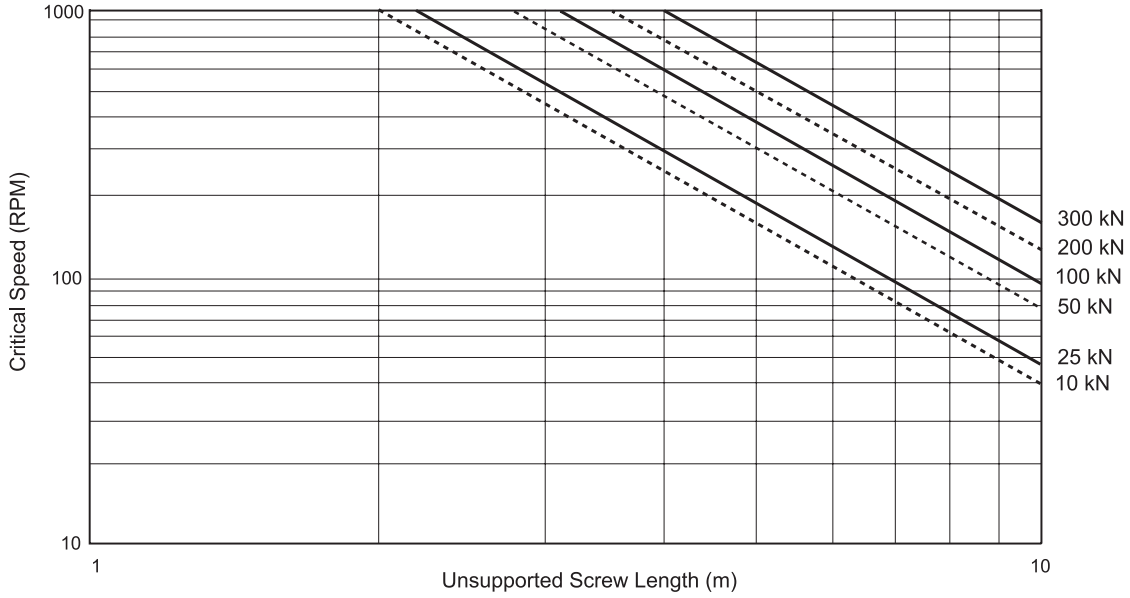
Fixed/Supported, F_{cs}= 0.7



Fixed/Fixed, F_{cs} = 1



Ball Screw Critical Screw Speed (Shaft Whirling)



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

Screw Jack Key Torque

The key torque (restraining 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. It is not affected by the screw jack unit gear ratio.

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

Ball Screw Jacks

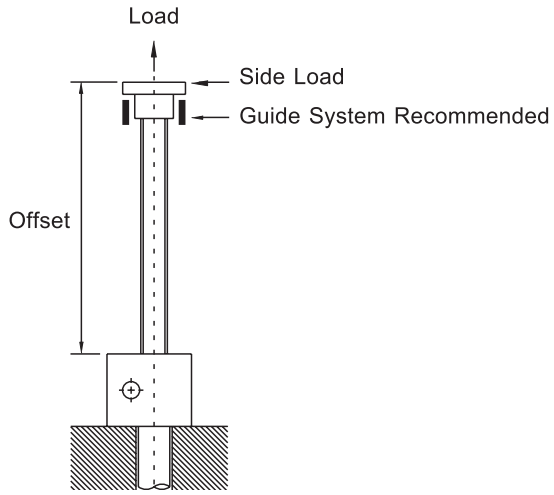
Capacity (kN)	Screw Diam (mm)	Lead (mm)	Key Torque (Nm)
10	20	0.005	9
10	-	-	-
25	25	0.005	23
25	25	0.01	43
50	40	0.01	88
50	40	0.02	167
100	50	0.01	181
100	50	0.02	340
200	63	0.01	370
200	63	0.02	690
300	80	0.02	1030
500	On Request		

Maximum Jack Side Load Ratings with Full Jack Rated Load in Tension

Ball Screw Jacks

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

*Consult Power Jacks.



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

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

Note
The correct units must be used

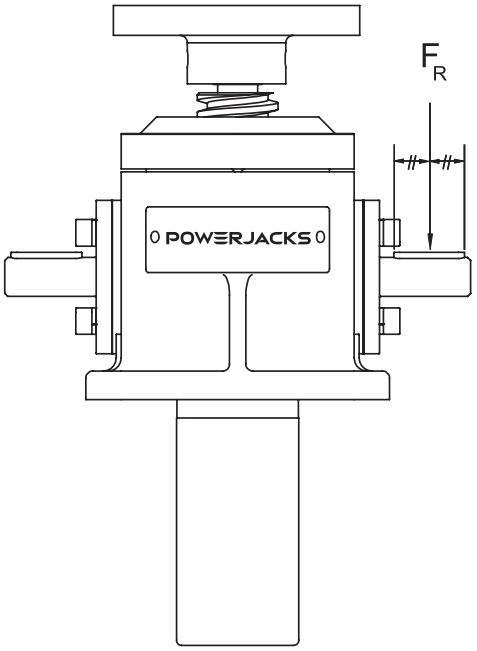
Important Notes

1. **These figures are for Screw Jacks 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 screw jacks in compression consult Power Jacks Ltd.
6. For precise calculations for your application consult Power Jacks Ltd.

For applications where a screw jack 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 screw jacks 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 screw jack housing in order to reduce bearing loads and shaft stresses and to prolong life.

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

Where
- F_R = Radial Load (N)
- **T** = Torque applied to the screw jacks input shaft (Nm)
- **K** = Factor from table below
- **D** = PCD 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

Ball Screw Jack				
Capacity (kN)	25	50	100	200
Radial Load (N)	440	1100	1200	1600

Ball Screw Jacks

Component	Normal Backlash
Ball Track and Nut	0.05mm → 0.15mm (0.002" → 0.006")
Load Bearings	0.00mm → 0.03mm (0.000" → 0.003")
Total	0.05mm → 0.18mm (0.0002" → 0.007")

Note

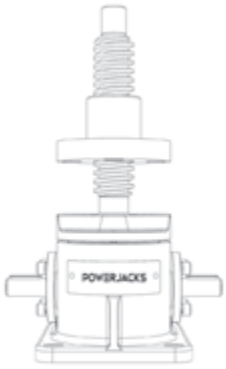
1. For exact backlash ratings for an individual unit consult Power Jacks.
2. Ball nuts can be supplied with zero backlash or with adjustable backlash via a special twin nut assembly (twin nut assembly for rotating screw units only). Consult Power Jacks for details.
3. Altering the load bearings preload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

Pitch Deviation of Lifting Screw

Lifting Screw	Pitch Deviation
Machine Screw	0.05mm → 0.25mm per 300mm
Ball Screw	0.025mm → 0.050mm per 300mm (DIN Class 5.7)

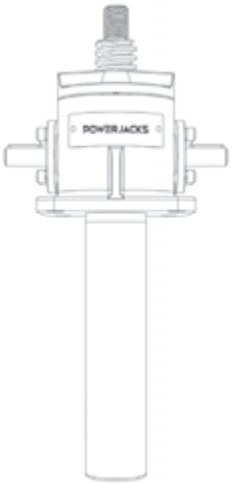
Note

1. Pitch deviation is cumulative and **NOT** detrimental to the operation of the Screw Jack
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.



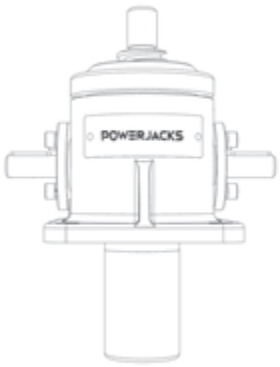
How a Rotating Screw Jack Works

The rotation of the worm shaft causes the worm gear to rotate. For rotating screw jacks the lead screw is fixed to the worm gear and they rotate at the same speed. The lifting nut moves along the lead screw. As the worm gear turns, the friction forces on the screw thread act to turn the nut also. The greater the load on the screw jack unit, the greater the tendency of the nut to turn. If the nut turns with the screw, it will not raise the load. Therefore the nut needs to be fixed to a structure to prevent rotation. The restraining torque required for the structure, also known as the "lead screw key torque" can be found on the product performance tables in this catalogue or requested from Power Jacks.



How a Translating Screw Jack Works

The rotation of the worm shaft causes the worm gear to rotate. For translating screw jacks the worm gear is threaded to accommodate the lead screw thread. The lead screw translates through the gear. As the worm gear turns, the friction forces on the screw thread act to turn the screw also. The greater the load on the screw jack unit, the greater the tendency of the screw to turn. 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 use a screw jack with an anti-rotation mechanism (keyed screw jack). Lead screw key torque (refer to the product performance tables in this catalogue or request from Power Jacks) must be checked as excessively heavy unguided loads could break the Anti-rotation mechanism (key).



Anti-Backlash Screw Jack – When To Use

For reduced axial backlash of the lead screw in the screw jack select a model with the "Anti-Backlash" mechanism. This is typically used when the load direction changes from tension to compression and minimal axial backlash is required. This design is only available for translating screw jacks. It can be combined with Anti-Rotation mechanism as well.

Input Torque Required for a Screw Jack

The input torque for a single screw jack depends on the load, the worm gear ratio, type of screw (machine screw, ball screw or roller screw) and the pitch of the lead screw. Torque values are listed in the individual product specification charts based on capacity loads. For loads from 25% to 100% of screw jack model capacity, torque requirements are approximately proportional to the load.

Note
The input torque, as well as the efficiency and side load ratings, is the same for both translating screw and rotating screw jacks.

Maximum Input Power & Speed for a Screw Jack

The input power to the screw jacks should not exceed the power rating shown in the specifications table. Maximum input speed in rpm (revolutions per minute) to a screw jacks worm shaft should not exceed 1800 rpm for C & E-Series screw jacks.

Efficiency of a Screw Jack

Screw Jack model efficiencies are listed in the individual product specification charts.

Expected Life of a Screw Jack

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

Screw Jack with Anti-Rotation (Keyed) Mechanism

This design is only available for translating screw jacks. If the structure/object connected to the lead screw is not prevented from rotating or the lead screw is not always in contact with the structure then a screw jack with an "Anti-Rotation" mechanism (keyed) should be used.

Standard Screw Jacks - How To Prevent The Load from Rotating

For multiple screw jack systems, fix the lead screw end fittings (e.g. top plate or clevis) to the common member being lifted by all the units. For single screw jack applications, bolt the lead screw end fitting (e.g. top plate or clevis) to the load and ensure the load is guided to prevent rotation.

A guided load is always recommended to ensure that the screw jack does not receive any side load and so guidance can be scaled suitably for the load without altering the screw jack design unnecessarily. Note that an external guidance system can provide a higher restraining "key" torque than compared to an anti-rotation mechanism in a screw jack.

Self-Locking of Screw Jacks

Screw Jacks with 24:1 or higher gear ratios are considered self-locking in most cases. Consult Power Jacks for a recommendation specific to your application.

All screw jacks with multi-start lifting screws are considered not to be self-locking.

All ball screw and roller screw jacks are considered not to be self-locking.

Screw Jacks considered not self-locking will require a brake or other holding device.

Shock Loads on a Screw Jack

Shock loads should be eliminated or reduced to a minimum, if they cannot be avoided, the screw jack model selected should be rated at twice the required static load.

For severe shock load applications, the load bearings can 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%.

Column Strength of the Screw Jack

Column strength of a screw is determined by the relationship between the screw length and its diameter. For column strength charts consult product literature or Power Jacks.

Side Loads on a Screw Jack

Screw jacks are designed primarily to move and position loads and any side loads (loads not acting axially on lead screw) should be avoided. The units will withstand some side loads, depending on the diameter of the lifting screw and the extended length of the lifting screw. Where side loads are present, the loads should be guided and the guides, rather than the screw jacks, 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.

Allowable Duty Cycle of Screw Jack

Because of the efficiency of conventional worm gear screw jacks, the duty cycle is intermittent at rated load. At reduced loading, the duty cycle may be increased. Ball screw jacks are more efficient than machine screw jacks and so can provide a higher duty cycle. In addition Power Jacks have special designs for high duty cycle screw jacks. For detailed analysis consult Power Jacks Ltd.

Maximum Operating Temperatures For E-Series Screw Jack

Normal operation at ambient temperatures of up to 90ºC. Operations above 90ºC will require special lubricants. For temperatures above 90ºC, the life of even special lubricants is limited. Therefore consult Power Jacks on your application. For temperatures above 90ºC, advise Power Jacks of full particulars of the duration of such temperatures. Power Jacks suggest that a lubricant manufacturer be consulted for type of grease and lubrication schedule. As a general rule, the screw jack unit should be shielded to keep ambient temperatures to 90ºC or less.

Minimum Temperature For E-Series Screw Jacks

With the standard lubricant and materials of construction, the screw jacks are suitable for use at sustained temperatures of -20ºC. Below -20ºC, low temperature lubricant should be used and no shock loads are present. Power Jacks application engineers must be consulted in these instances for a recommendation. Screw Jacks with standard material of construction and lubrication may be safely stored at temperatures as low as -55ºC.

Thermal / Heat Build-Up in a Screw Jack as it is operated

The duty cycle, the length of the screw, the magnitude of the load, and the efficiency of the screw jack all have a direct influence on the amount of heat generated within the screw jack. Long lifts can cause serious overheating. Note that Power Jacks have special designs with higher thermal capacities than conventional worm gear screw jacks (consult Power Jacks for more details).

Screw Jacks to Pivot a Load

A screw jack can be built to pivot a load by two methods:

1. Double Clevis Screw Jack
   The screw jack can be furnished with a clevis at both ends (commonly referred to as a double clevis screw jack). The bottom clevis is welded to the bottom end of an extra strong cover pipe, which is fitted to the base of the screw jack. This cover pipe still performs its primary function of encasing the lifting screw in its retracted portion. The clevis ends can be replaced with other pivot options such as Fork End or Rod End.

2. Clevis - Trunnion Mounting
   The screw jack is fitted with the pivot end fitting (e.g. Clevis, Fork or Rod End) on the lead screw and a trunnion mount adapter is bolted to the screw jacks base plate.

The design of the structure in which these types of screw jacks are to be used must be constructed so that screw jack can pivot at both ends. Use only direct compression or tension loads, thereby eliminating side load conditions.

Corrosion Resistant Properties

Screw Jacks can be supplied with alternative materials and/or paint specifications for high corrosive areas. These options include stainless steel, chrome plating, electro-nickel plating, epoxy paint, etc. Check the unit specification is suitable before installation.

Using Screw Jacks within a Rigid Structure or Press

Power Jacks recommend that the screw jack 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 screw jack unit. Unless these precautions are taken, it is possible to overload the screw jack without realising it.

Screw Jack Drift after Drive Motor is Switched Off

The screw jack 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 screw jack and the inertia of the rotor in the motor.

For machine screw jacks with no load, the amount of drift will depend upon the size and speed of the motor. For example, a 1500 RPM input directly connected to a screw jack without a load will give on average 35mm to 60mm of drift; a 1000 RPM input will give about 1/2 as much drift. Note that the drift varies as the square of the velocity (RPM). The drift of the screw jacks screw can be controlled by using a magnetic brake on the motor. Variations of drift will also be seen if the motor drives the screw jack via a reduction gearbox.

Screw Jacks Operation where Vibration is Present

Screw Jacks will operate in areas with vibration, however the vibration may cause the lead screw to "creep" or "inch" under load. For applications involving slight vibration, select the higher of the worm gear ratios. If considerable vibration is present, use a motor equipped with a magnetic brake, which will prevent the screw jack from creep and/or back-driving.

Use of Screw Jacks Fitted With Emergency Stop Disc

To prevent over travel of the lead screw, a stop disc or nut can be fitted to a screw jack that is hand operated. It should not be used as a full power stop.

Use of Screw Jacks Fitted With Emergency Stop Nut

For motor driven units, it is possible for the full capacity of the screw jack or even a greater force (depending on the power of the motor) to be applied against the stop. These stops are called "full power stop nuts". They must only be used as an emergency device and if such a condition occurs, an assessment made to discover why it happened in order to carry out preventative action. If the full power stop nut is used at full load in an emergency it might be driven into the unit jamming so tightly that 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 screw jack 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.

Screw Jack System Arrangements

Perhaps the greatest single advantage of Power Jacks screw jacks is that they can be linked together mechanically, to lift, lower, move or position in unison. Typical mechanical system arrangements link 2, 4, 6 or 8 screw jacks together and are driven by one motor. As an alternative, screw jacks can be individually driven by electric motors and with suitable feedback devices, such as encoders, be synchronised electronically by a control system.

Connecting Screw Jacks in Series

The number of screw jacks that can be connected in series is limited by input torque requirements on the first worm shaft in the line. For the C & E-Series the torque on the worm shaft of the first screw jack should not exceed 300% of its rated full load torque (this does not include the 200kN screw jacks which are rated at 150%).

Efficiency of a Multiple Screw Jack System

In addition to individual device efficiencies, the efficiency of the screw jack 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, bearings, and for a normal amount of misalignment in positioning the screw jacks and gearboxes. For efficiency values consult Power Jacks product literature or engineers.

Number of Screw Jacks in System	2	3	4	6-8
Jacking System Efficiency	0.95	0.90	0.85	0.80

Screw Jack Fitted with 3rd Party Accessories

If your screw jack is fitted with a device not manufactured by Power Jacks then please consult the provided manual for this device.

Installation and Maintenance Tips

The following installation and maintenance tips are for the C & E-Series, Metric machine screw and ball screw jacks models. General care should be taken to ensure that equipment is sufficient to handle the load.

1. The structure on which the screw jack unit is mounted should have ample strength to carry the maximum load, and be rigid enough to prevent undue deflection or distortion of the screw jack unit supporting members.
2. It is essential that the screw jack 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 screw jack, 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 jacking system is then ready for normal operation.
3. The screw jack should have a greater stroke than is needed in the screw jack installation. If it is necessary to operate the screw jack at the extreme limits of travel, it should be done with caution.

CAUTION: Do not allow screw travel below catalogue closed height of the screw jack 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 jacks 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 jack models. Backlash in excess of 50% of the thread thickness indicates the need to replace the worm gear.
7. Unless otherwise specified, screw jacks are shipped packed with grease which should be sufficient for one month of normal operation. For normal operation, the screw jacks should be lubricated about once a month, using one of the following extreme pressure greases or their equivalent:

Shell	Gadus S2V220AC2 (Alvania WR2)
BP	Energrease LC2
Castrol	Spheerol EPL2
Mobil	Mobilux EP2

For severe conditions, the screw jacks 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. On ball screw jack 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.

9. Due to the high efficiency of the ball screw jack design, a brake must be used in conjunction with motor selected to position the screw jack.

Useful Formulae for Screw Jack Calculations

Lifting Screw Lead

Lifting Screw lead (mm) = Screw Pitch (mm) *Number of Starts on Lifting Screw

Calculation of the Linear Speed

When the worm shaft speed is known, the linear speed can be determined with this formula:

$$\text{Linear Speed (mm/min)} = \frac{\text{RPM of Worm Shaft x Lifting Screw Lead (mm)}}{\text{Gear Ratio}}$$

or alternatively

$$\text{Linear Speed (mm/min)} = \frac{\text{RPM of Worm Shaft}}{\text{Turns of Worm for 1mm Travel}}$$

Calculation of Screw Jack Input Torque

$$\text{Input Torque (Nm)} = \frac{\text{Load (kN) x Lifting Screw Lead (mm)}}{2 \times \pi \times \text{Efficiency x Gear Ratio}}$$

or alternatively

$$\text{Input Torque (Nm)} = \frac{\text{Input Power (kW) x 9550}}{\text{Input Speed (rpm)}}$$

Calculation of Screw Jack Input Power

$$\text{Input Power (kW)} = \frac{\text{Load (kN) x Lifting Screw Lead (mm) x Input Speed (rpm)}}{60000 \text{ x Efficiency x Gear Ratio}}$$

or alternatively

$$\text{Input Power (kW)} = \frac{\text{Load (kN) x Linear Speed (mm/min)}}{60000 \text{ x Efficiency}}$$

Useful Formulae for Screw Jack Calculations

Power	Metric	Imperial
Lifting Motion	$P = \frac{m \times g \times v}{\eta \times 1000}$	$P = \frac{w \times v}{\eta \times 33000}$
Linear Motion	$P = \frac{F_R \times v}{1000}$	$P = \frac{F_R \times v}{33000}$
	$F_R = \mu \times m \times g$	$F_R = \mu \times w$
Rotary Motion	$P = \frac{T \times n}{9550}$	$P = \frac{T \times n}{63000}$
Torque		
	$T = F_R \times r$	$T = T \times r$
Linear Motion	$T = \frac{P \times 9550}{n}$	$T = \frac{P \times 6300}{n}$

Symbol	Quantity	Metric Units	Imperial Units
P	Power	kW	HP
T	Torque	Nm	lbf.in
F_R	Resistance due to Friction	N	lbf
m	Mass	kg	-
W	Weight	-	lb
g	Gravitational Acceleration	9.81 ms^{-2}	32.185 ft^{-2}
v	Velocity	ms^{-1}	ft/min
η	Efficiency	decimals	decimals
μ	Coefficient of Friction	decimals	decimals
n	Rotational Speed	rpm	rpm
r	Radius	m	in

Useful Formulae for Screw Jack Calculations

Moment of Inertia	**Metric**	**Imperial**
Solid Cylinder	$J = \frac{1}{2} \times m \times r_{od}^2$	$WK^2 = \frac{1}{2} \times W \times r_{od}^2$
Hollow Cylinder	$J = \frac{1}{32} \times \varpi \times \rho \times d_{od}^4$	$WK^2 = \frac{\varpi}{32} r \times l \times d_{od}^4$
	$J = 0.098 \times \rho \times l \times d_{od}^4$	$WK^2 = 0.1 \times \rho \times l \times d_{od}^4$
Hollow Cylinder	$J = \frac{1}{2} \times m \times (r_{od}^2 - r_{id}^2)$	$WK^2 = \frac{1}{2} \times W \times (r_{od}^2 - r_{id}^2)$
	$J = \frac{1}{32} \times \varpi \times \rho \times l \times (d_{od}^4 - d_{id}^4)$	$WK^2 = \frac{\varpi}{32} \times \varpi \times \rho \times l \times (d_{od}^4 - d_{id}^4)$
	$J = 0.098 \times \rho \times l \times (d_{od}^4 - d_{id}^4)$	$WK^2 = 0.1 \times \rho \times l \times (d_{od}^4 - d_{id}^4)$

Acceleration or Braking Time

$$T_{acc} = \frac{J \times n}{9.55 \times T_{acc}} \qquad T_{acc} = \frac{WK^2 \times n}{308 \times T_{acc}}$$

Symbol	Quantity	Metric Units	Imperial Units
J	Moment of Inertia (metric)	kgm^2	-
WK^2	Moment of Inertia (imperial)	-	$lb.ft^2$
T_{acc}	Torque due to Acceleration or Braking	Nm	lbf.ft
m	Mass	kg	-
W	Weight	m	lb
g	Outer Radius	m	ft
v	Internal Radius	m	ft
η	Outer Diameter	m	ft
μ	Internal Diameter	m	ft
n	Density	kg/m^3	kg/m^3
r	Time for Acceleration or Braking	s	s
r	Rotational Speed	rpm	rpm

POWERJACKS
PRECISION ACTUATION

Power Jacks specialises in the design and manufacture of precision linear actuation, positioning and lifting equipment.

Our products are supplied globally across many sectors including Industrial Automation, Energy, Transport, Defence and Civil.

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