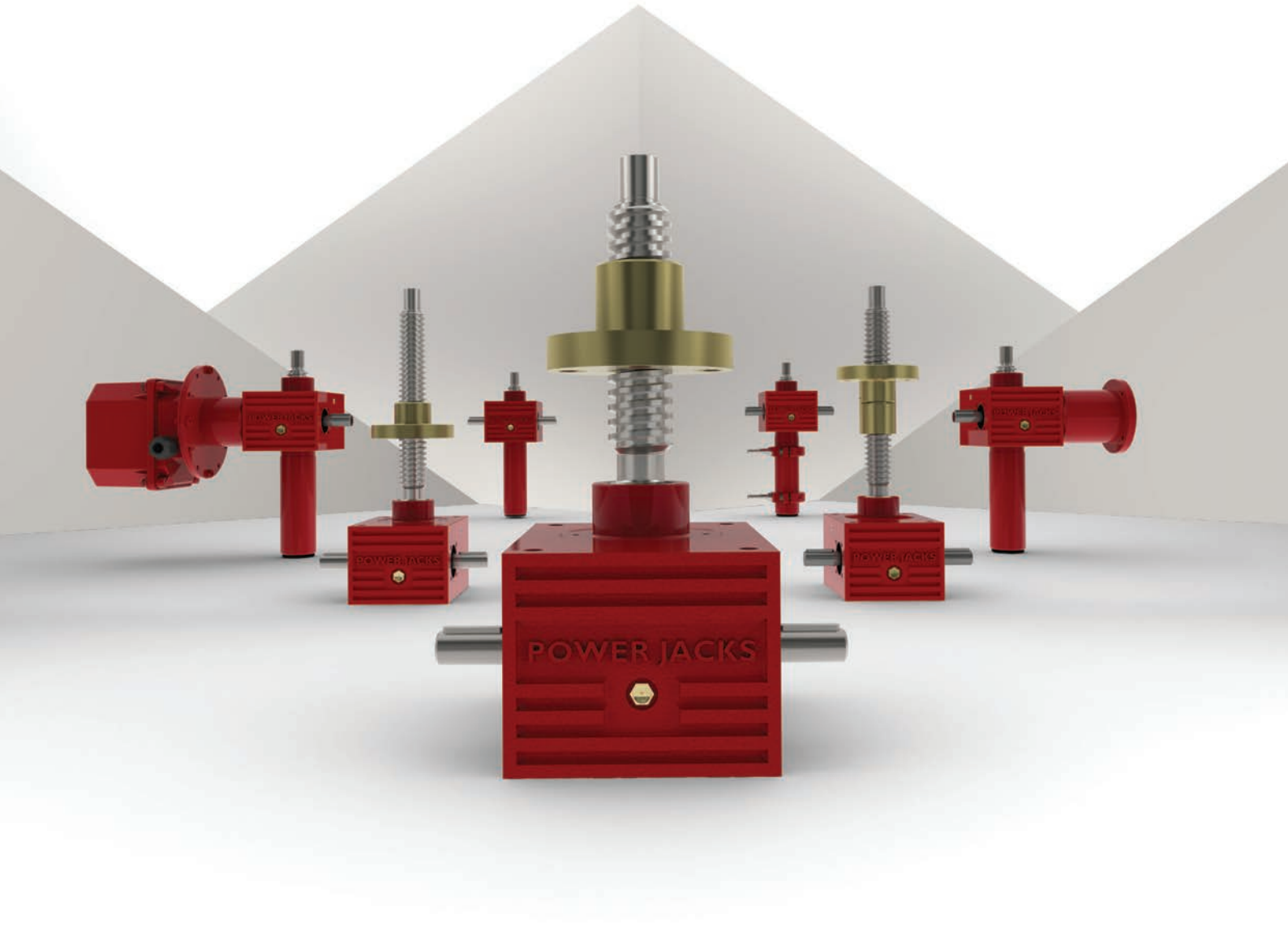
POWERJACKS

PRECISION ACTUATION



C-SERIES 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.

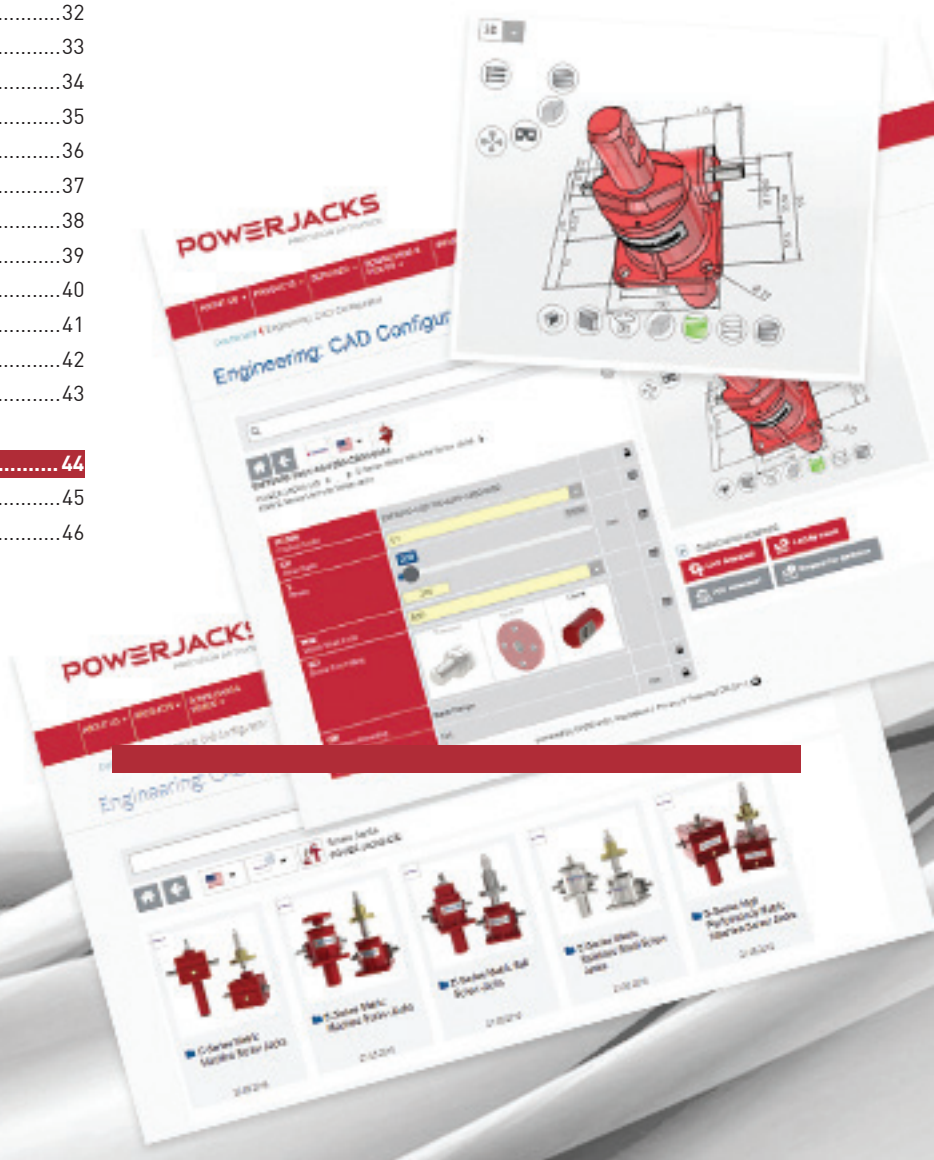
Global Reach

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.

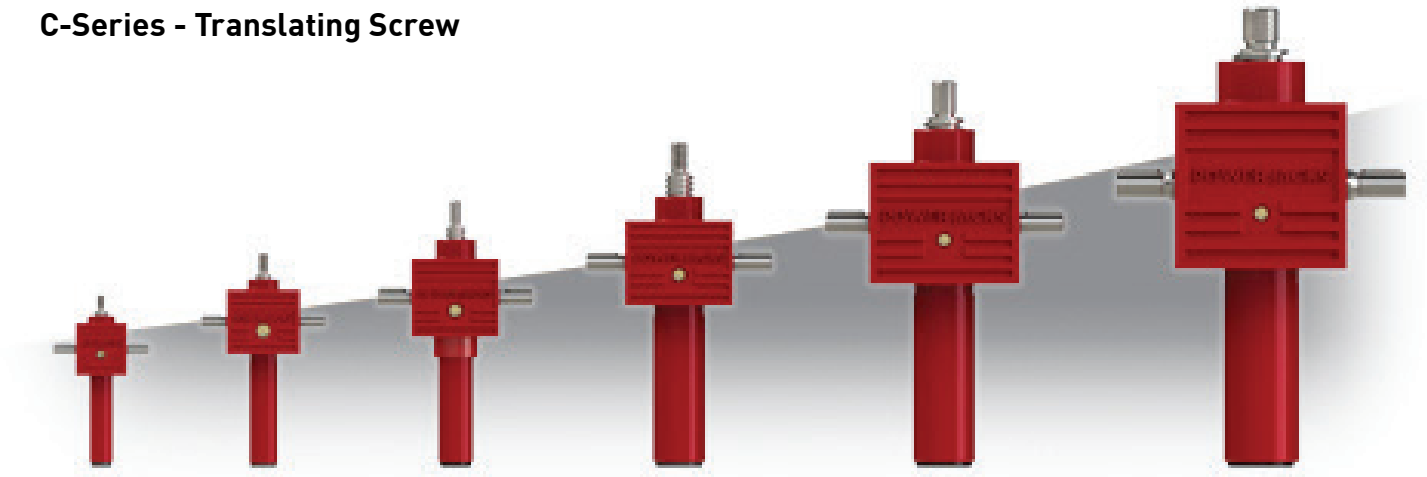
Headquarters & Factory
Local Power Jacks Sales Offices
Local Representative

TRY OUR 3D CAD PORTAL



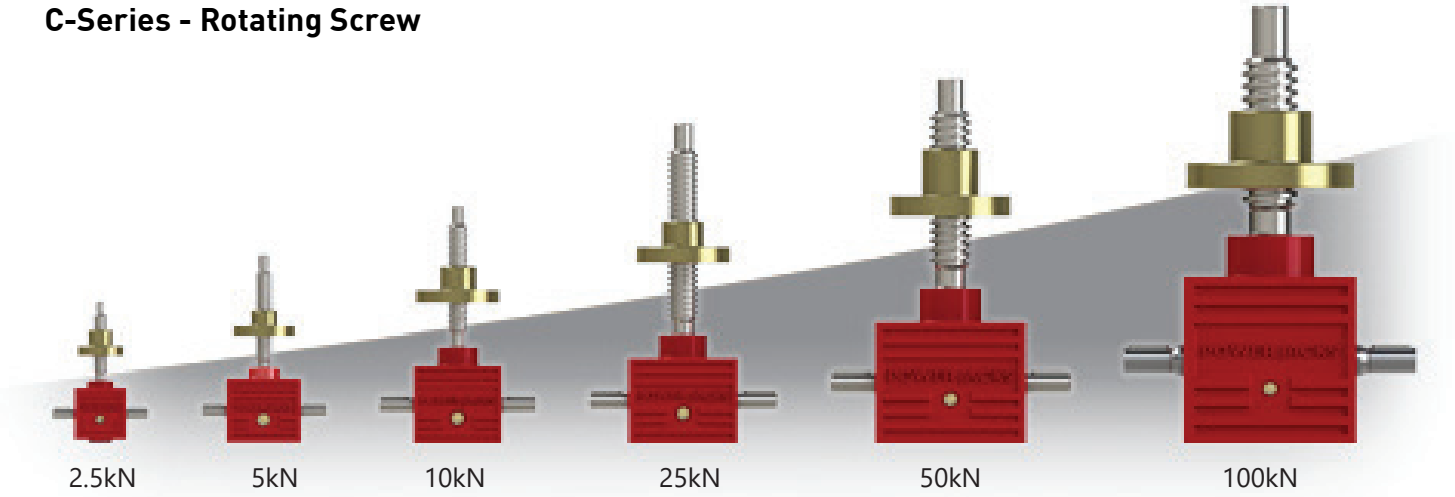
- 2D CAD Drawings
- 3D CAD Models
- Dimensioned Data Sheet

C-Series - Translating Screw

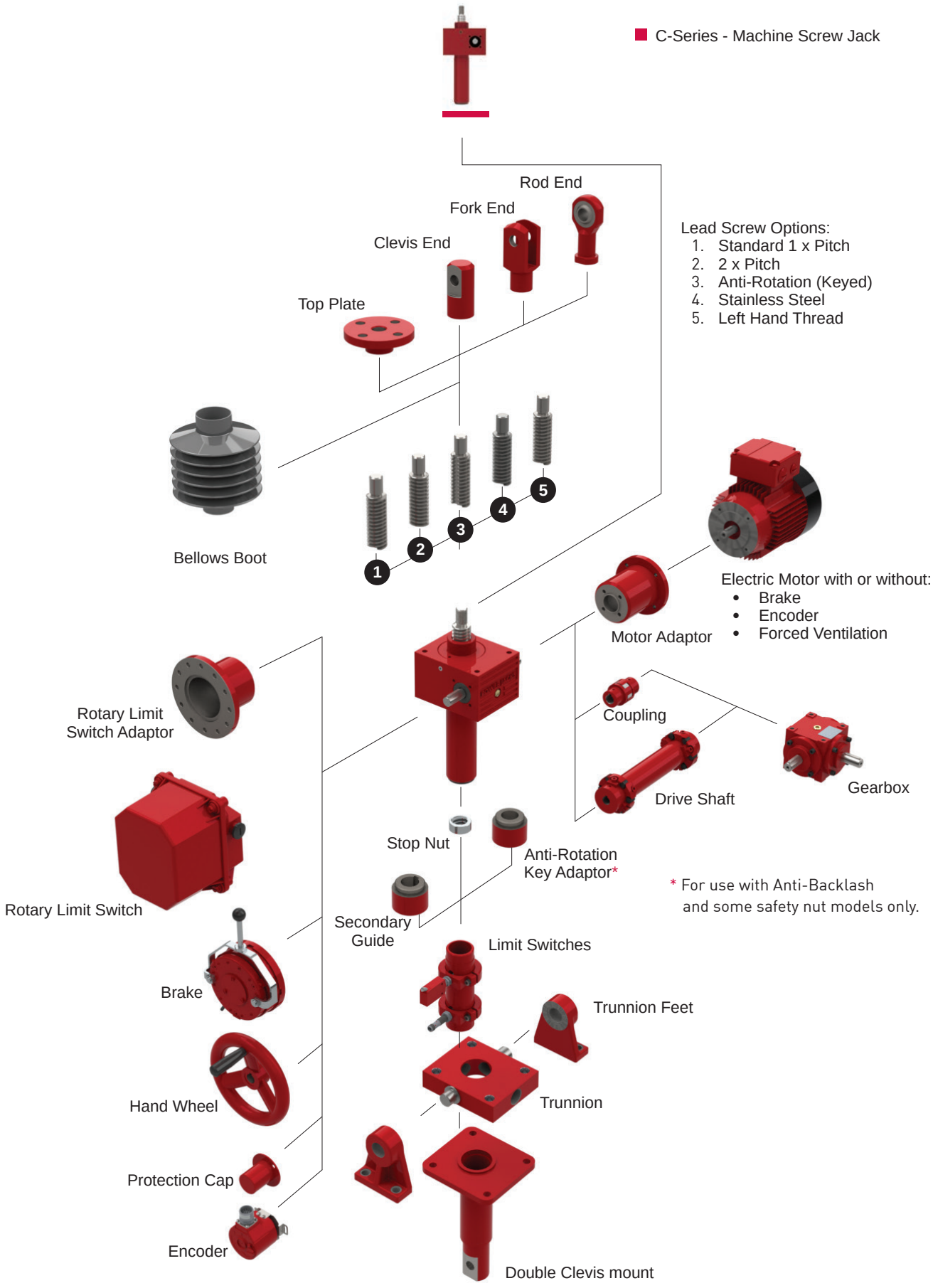


2.5kN 5kN 10kN 25kN 50kN 100kN

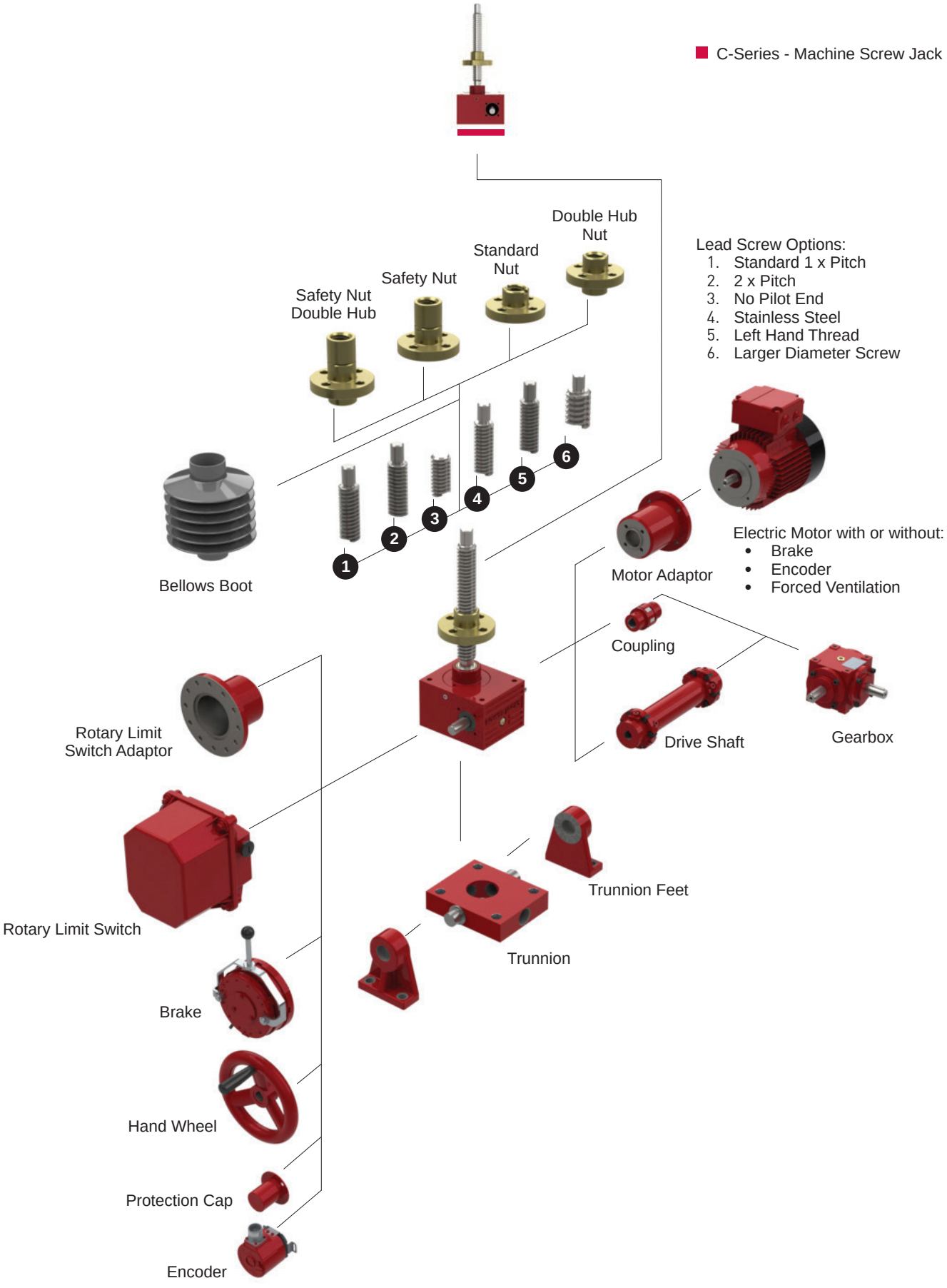
C-Series - Rotating Screw



2.5kN 5kN 10kN 25kN 50kN 100kN



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

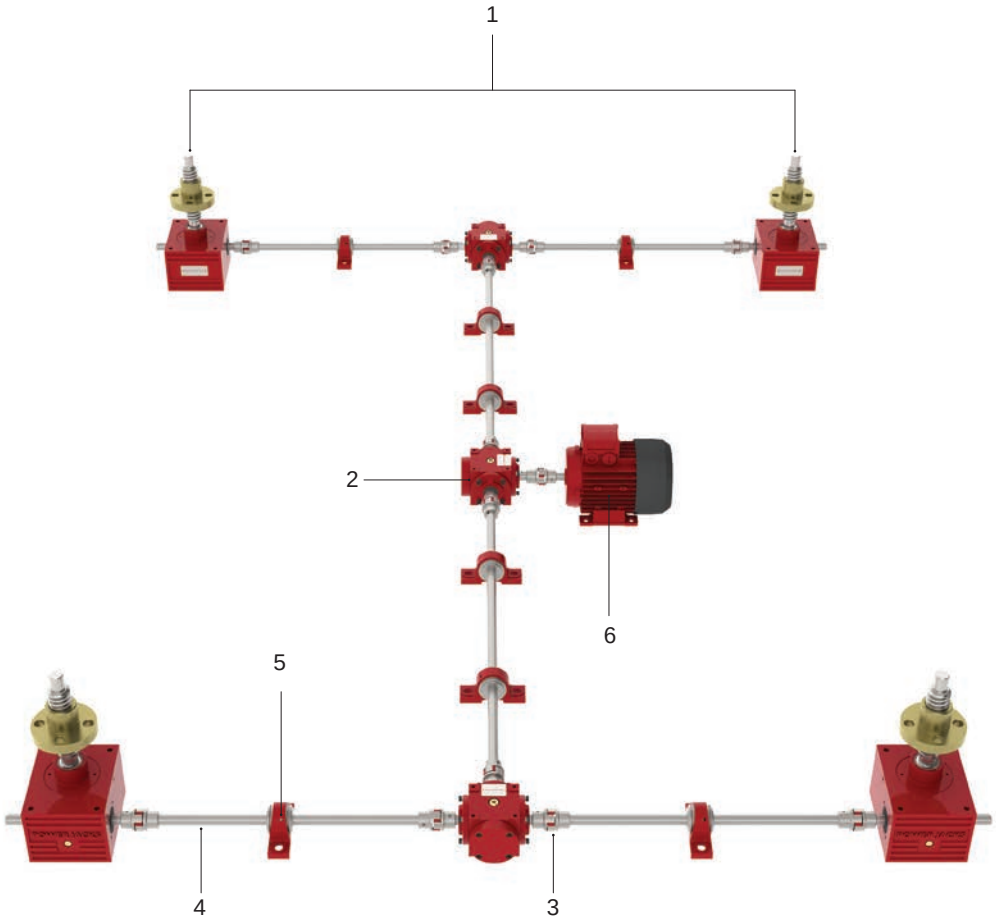


Special Screw Jacks Design Available when you need more than the standard solution.

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
   C-Series Rotating Machine 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.

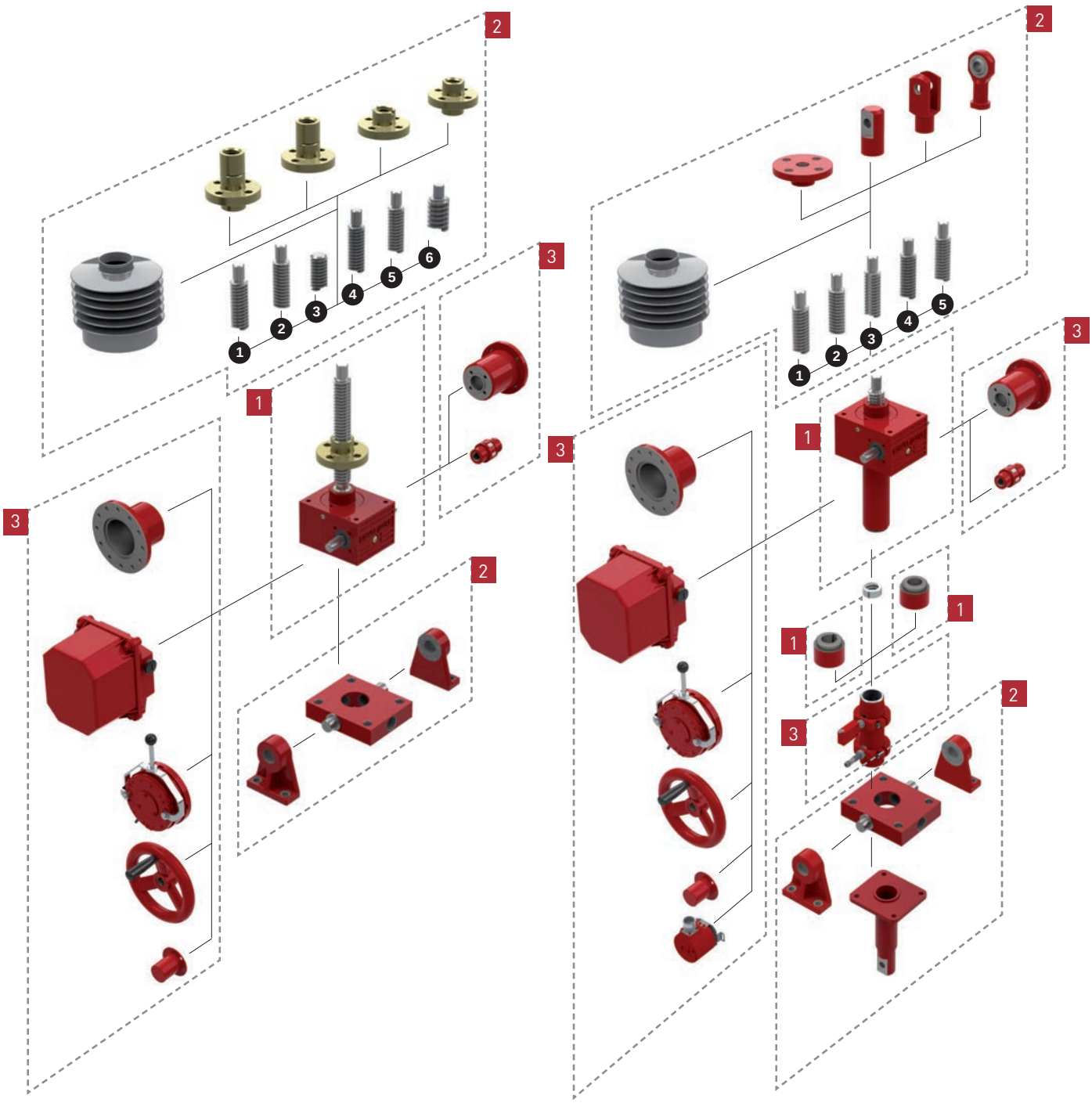
To facilitate electronic control of screw jacks, feedback devices (eg encoder, limit switch) are available, mounted on the screw jack or its motor or another system component.

'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	
C	Series

2 - Screw Type	
M	Machine Screw

3- Screw Configuration	
R	Rotating Screw
T	Translating Screw

4-7 - Capacity	0002	0005	0010	0025	0050	0100
kN	2.5	5	10	25	50	100

8 - Character Space

9-Gearbox Type	
C	Cubic

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 (tapped holes on gearbox side if present)	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

CMT0050-C0A1100-0810-CT00-0000 C-Series, Machine Screw, Translating, 50kN, Cubic, Anti-Backlash mechanism, 6:1 gear ratio, 9mm lead on screw, 810mm Stroke, Clevis End, Trunnion Mount, standard drive features, 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
C	M	T	0	0	5	0	-	C	0	A	1	1	0	0	-	0	8	1	0	-	C	T	0	0	-	0	0	0	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 C-Series Machine Screw Jack with translating screw, 6:1 gear ratio, single start lifting screw (6 mm lead).

Calculate Power and Torque Requirements

Step 1 - Screw Jack Input Speed

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

N = 100 rpm
Input speed should not exceed 1800 rpm.

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

$$P_{in}\text{(kW)} = \frac{\text{15 (kN) x 100 (mm/min)}}{\text{60000 x 0.264}}$$

η_d = 0.264 (Refer P60)
P_{in} = 0.095 kW

Step 3 - Operating Input Torque

$$T_{ino}\text{ (Nm)} = \frac{\text{0.095 (kW) x 9550}}{\text{100 (rpm)}}$$

T_{ino} = 9.1 Nm

Step 4 - Screw Jack Start-Up Torque

$$T_{ins} = \frac{\text{15 (kN) x 6 (mm) x 1 (N° of starts on Lifting Screw)}}{\text{2 x π x 0.201 x 6 (Gear Ratio)}}$$

T_{ins} = 11.9 Nm
η_s = 0.201 (refer P60)

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 = 19 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:

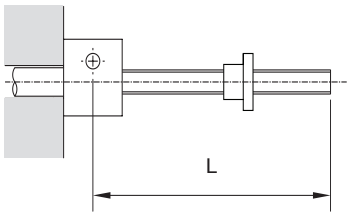
1. Refer to the appropriate critical speed chart.
2. Select the correction factor F_{cs} corresponding to the end support conditions for the application.
3. From the critical speed chart, select the critical speed corresponding to the unsupported screw length (m) and the screw jack load rating (kN).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

Lifting Screw Deflection

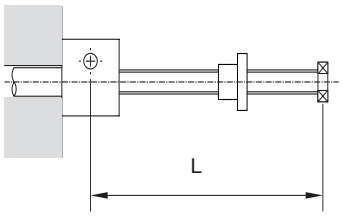
The lifting screw of a screw jack mounted horizontally will deflect under its own weight to some extent. The amount of deflection tolerable (y_T) should be less than 0.5 mm per metre.

Deflection Factors, F_{sd}

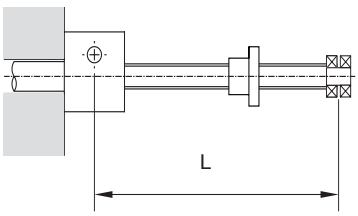
Fixed/Fixed. $F_{sd} = 8$



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:

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

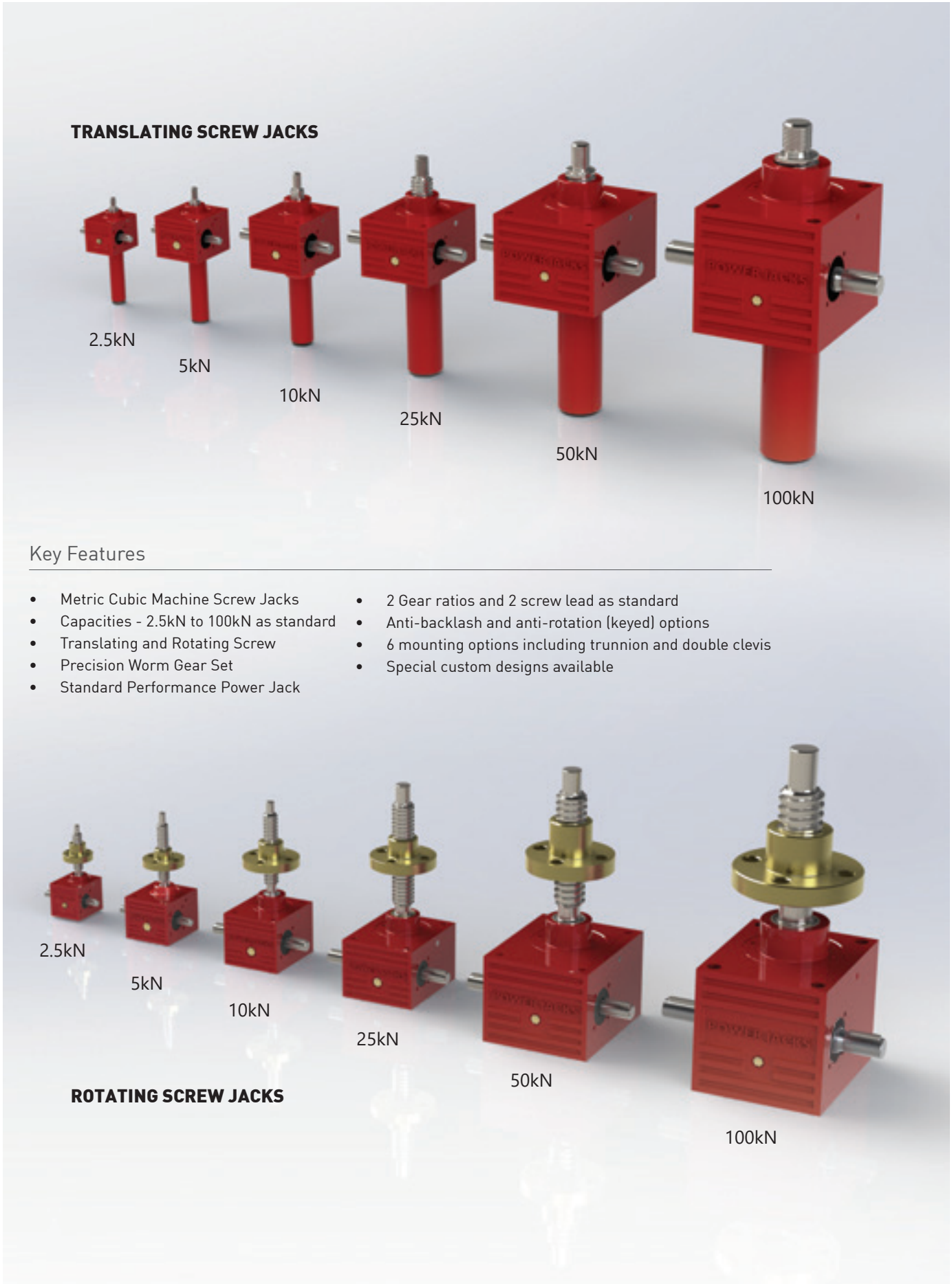
Number of Screw Jacks in System	2	3	4	6-8
Jacking System Efficiency	0.95	0.90	0.85	0.80

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.

C-Series - Machine Screw Jack

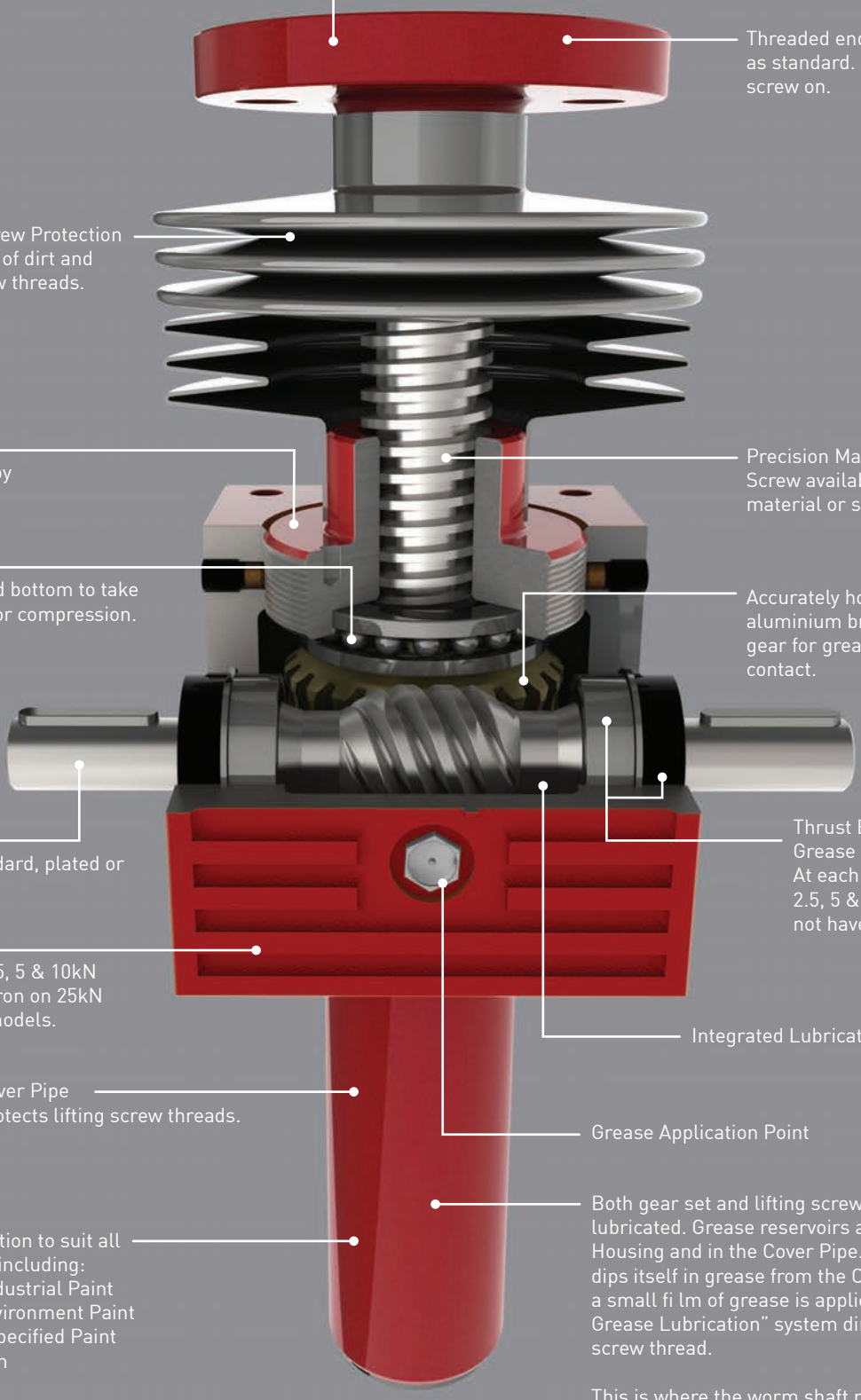
MODULAR CONTEMPORARY CUBIC DESIGN WITH BOLT-ON ACCESSORIES TO TAILOR SCREW JACK FOR YOUR EXACT APPLICATION NEEDS.



Key Features

- Metric Cubic Machine Screw Jacks
- Capacities - 2.5kN to 100kN as standard
- Translating and Rotating Screw
- Precision Worm Gear Set
- Standard Performance Power Jack
- 2 Gear ratios and 2 screw lead as standard
- Anti-backlash and anti-rotation (keyed) options
- 6 mounting options including trunnion and double clevis
- Special custom designs available

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.

Shell Cap
Locked in place by set screws.

Precision Machined Lifting Screw available in standard material or stainless steel.

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

Accurately hobbed aluminium bronze worm gear for greater gear contact.

Worm Shaft
Available in standard, plated or stainless steel.

Thrust Bearings and Grease Seals
At each end of worm.
2.5, 5 & 10kN models do not have separate seals.

Housing
Aluminium on 2.5, 5 & 10kN models, ductile iron on 25kN through 100kN models.

Integrated Lubrication Systems

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

Both gear set and lifting screw are grease lubricated. Grease reservoirs are in the Gearbox Housing and in the Cover Pipe. The lifting screw dips itself in grease from the Cover Pipe. Plus a small fi lm of grease is applied via the "Forced Grease Lubrication" system directly onto the screw thread.

This is where the worm shaft pushes grease through small radial holes in the gear directly onto the screw thread ensuring optimum lubrication.

Translating Screw

Rotating Screw

Typical Applications

Conventional Machine Screw Jacks are most widely used for intermittent duty cycles, as the screw jack incorporates a precision worm gear set in a rugged casting delivering positive, precise actuation. Available in a comprehensive range of materials and fittings with the option for special designs for specific application requirements. Used in a wide variety of industry sectors including metal processing, automotive, energy, civil and aerospace.

Standard Designs

The standard C-Series screw jack is available in translating and rotating screw designs in capacity sizes from 2.5kN to 100kN. It's design is compact and versatile with a large selection of standard options and accessories so you can configure a standard design that is just right for your application. These variants include Anti-Backlash, Anti-Rotation (Keyed) and Safety Nut 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:

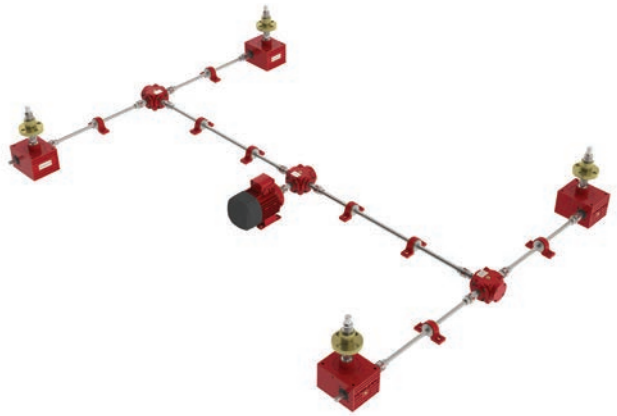
- Screw Jack Input Speed (RPM)
- Operating Input Power (kW)
- Operating Input Torque (Nm)
- Screw Jack Start-up Torque (Nm)
- Mechanical Power and Torque Check

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 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 machine screw jacks are connected in a mechanically linked system then the complete system 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.

SPECIAL EFFECT CAR REVEAL SYSTEM

C-Series Screw Jack System was pivotal to a dramatic 'magic mirror' effect that slowly unveiled the car to impressed onlookers during the UK launch.

The car sat inside a ring of pillars of coloured LED light, and was covered by a mirrored box that had a horizontal split. To make the car appear and disappear, the sides of the mirrored box were moved up and down in synchronisation so the top and bottom halves of the car were revealed at the same time. To keep the mirror operation simple yet effective, a four screw jack system in an H-configuration using 50kN C-Series rotating machine screw jacks was used. To move the mirrors in different directions at the same time using 1 lifting screw per screw jack required a customised design.

A special lifting screw which had right hand and left hand threads on the same screw was built into each of the screw jacks. The screw length matched the height of the installation: the upper half had a right hand thread form and the lower half had a left hand thread form.

A lifting nut with corresponding thread ran on each thread form portion of the screw, so each screw had two lifting nuts. In total the system had eight lifting nuts (two per screw jack) – four connected to the top mirror section and four to the bottom mirror section. As the jacking system was operated, the nuts ran in opposing directions so the mirror sections did likewise at the same speed in a mechanically synchronised manner.

By using a mechanically linked system, the whole operation was controlled by one motor which greatly simplified the control system and minimised costs.

The four C-Series cubic machine screw jacks selected for the system were mechanically linked to the electric motor via three bevel gearboxes from the ultra compact Range-N design.

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

Screw Jack Model [4]			CM-0002		CM-0005		CM-0010		CM-0025		CM-0050		CM-0100	
Capacity	kN		2.5		5		10		25		50		100	
Lead Screw[1]	Diameter (mm)		14		16		20		30		40		55	
	Lead	Option	1	2	1	2	1	2	1	2	1	2	1	2
		mm	3	6	3	6	5	10	6	12	9	18	12	24
Gear Ratios	Option 1		5:1		5:1		5:1		6:1		6:1		8:1	
	Option 2		20:1		20:1		20:1		24:1		24:1		24:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	0.6mm	1.2mm	0.6mm	1.2mm	1mm	2mm	1mm	2mm	1.5mm	3mm	1.5mm	3mm
	Option 2	4 Turn	0.15mm	0.3mm	0.15mm	0.3mm	1mm	2mm	1mm	2mm	1.5mm	3mm	2mm	4mm
Maximum Input Power (kW)	Option 1		0.750		0.250		0.375		1.5		3		3.75	
	Option 2		0.075		0.120		0.19		0.375		0.55		1.125	
Start up torque at full load (Nm)[2]	Option 1		1.2	1.6	2.5	3.3	6.8	9.4	19.8	26.4	56.0	76.0	115.9	156.6
	Option 2		0.6	0.8	1.1	1.4	3.0	4.1	8.7	11.7	25.5	34.7	60.5	81.9
Maximum Through Torque (Nm)[7]	Option 1		3.6		7.5		20.4		59.4		168.0		347.7	
	Option 2		1.8		3.3		9.0		26.1		76.5		181.5	
Static Efficiency[3]	Option 1		0.203	0.300	0.189	0.291	0.236	0.339	0.201	0.302	0.213	0.314	0.206	0.305
	Option 2		0.107	0.159	0.102	0.165	0.133	0.192	0.113	0.171	0.117	0.172	0.132	0.195
Dynamic Efficiency[3]	Option 1		0.268	0.383	0.252	0.37	0.306	0.424	0.264	0.383	0.281	0.398	0.272	0.388
	Option 2		0.159	0.228	0.160	0.234	0.194	0.268	0.167	0.242	0.172	0.244	0.190	0.271
Lead Screw Restraining Torque (Nm)[5]	-		3.6	4.9	8.0	10.5	22	30	76	102	210	290	575	780
Worm Shaft Radial Load (N)[6]			75		150		325		380		740		1000	
Maximum Input Speed (rpm)	-		1800		1800		1800		1800		1800		1800	
Gear Case Material			Aluminium		Aluminium		Aluminium		SG Iron		SG Iron		SG Iron	
Weight (kg) – stroke = 150mm	Translating		0.77		1.7		3.0		8.3		19.5		19.5	
	Rotating		0.85		1.9		3.1		8.7		20.2		20.2	
Weight (kg) – per extra 25mm	Translating		0.027		0.085		0.11		0.21		0.32		0.32	
	Rotating		0.023		0.035		0.05		0.11		0.19		0.19	

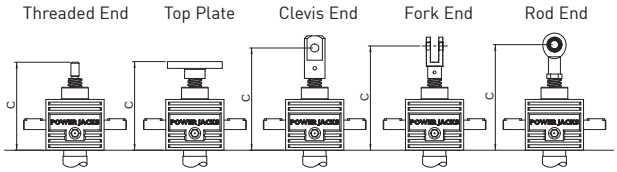
Notes:

1. All metric machine screws have a trapezoidal thread form.
2. For loads of 25% to 100% of screw jack capacity, torque requirements are approximately proportional to the load.
3. Efficiency values for standard grease lubricated worm gear box and lifting screw.
4. All C-Series screw jacks have grease lubricated gearbox and lead screw as standard.
5. Torque required to prevent the lead screw or lead nut from rotating if no anti-rotation device fitted.
6. Radial force applied midway along worm shaft key at 90° to key.
7. Maximum transmittable torque through worm shaft, not through gear set.

Performance

Screw Jack Model			CM-0002	
Capacity	kN		2.5	
Lead Screw	Diameter (mm)		14	
	Lead (mm)		3	6
Gear Ratios	Option 1		5:1	
	Option 2		20:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	0.6mm	1.2mm
	Option 2	4 Turn	0.15mm	0.3mm
Maximum Input Power (kW)	Option 1		0.750	
	Option 2		0.075	
Start up torque at full load (Nm)	Option 1		1.2	1.6
	Option 2		0.6	0.8
Maximum Through Torque (Nm)	Option 1		3.6	
	Option 2		1.8	
Static Efficiency	Option 1		0.203	0.300
	Option 2		0.107	0.159
Dynamic Efficiency	Option 1		0.268	0.383
	Option 2		0.159	0.228
Lead Screw Restraining Torque (Nm)	-		3.6	4.9
Worm Shaft Radial Load (N)			75	
Maximum Input Speed (rpm)	-		1800	
Gear Case Material			Aluminium	
Weight (kg) – stroke = 150mm	Translating		0.77	
	Rotating		0.85	
Weight (kg) – per extra 25mm	Translating		0.027	
	Rotating		0.023	

CMT0002 Closed Heights



Closed Height 'C'	Threaded End	Top Plate	Clevis End	Fork End	Rod End
CMT0002	77	92	77	98	94
Stroke (mm)	With Bellows Boots (B)				
0 - 250	104	118	104	124	120
251 - 500	134	148	134	154	150
501 - 800	132	153	132	155	152
1501 - 2000	290	290	310	313	315

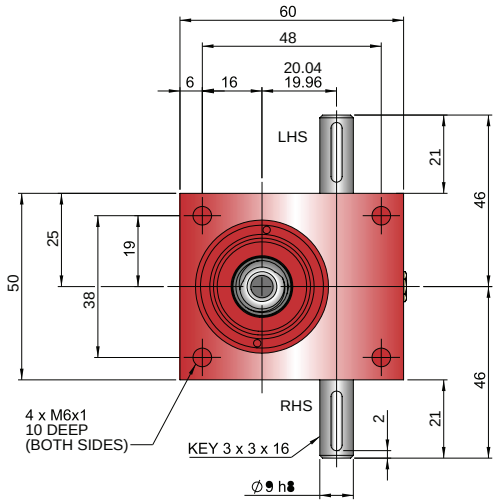
CMT0002 Stop Nut

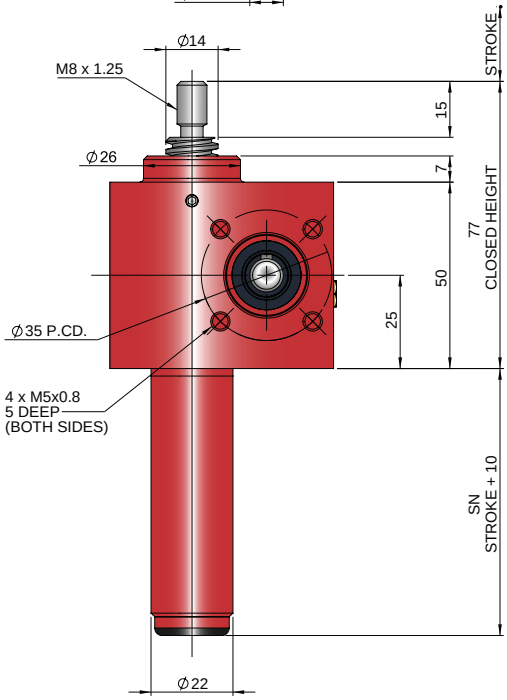
Stop nut provides a full power mechanical stop at the end of the lead screw. To be used as a safety feature in emergency conditions.
SN = Stroke + 25mm

Note:

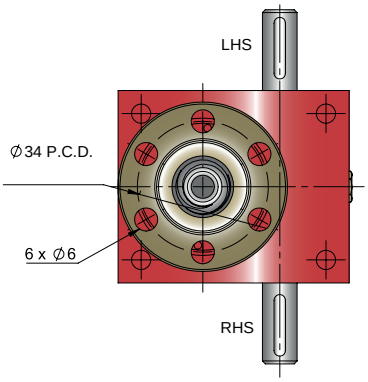
1. All dimension in millimetres unless otherwise stated.
2. Designs subject to change without notice.

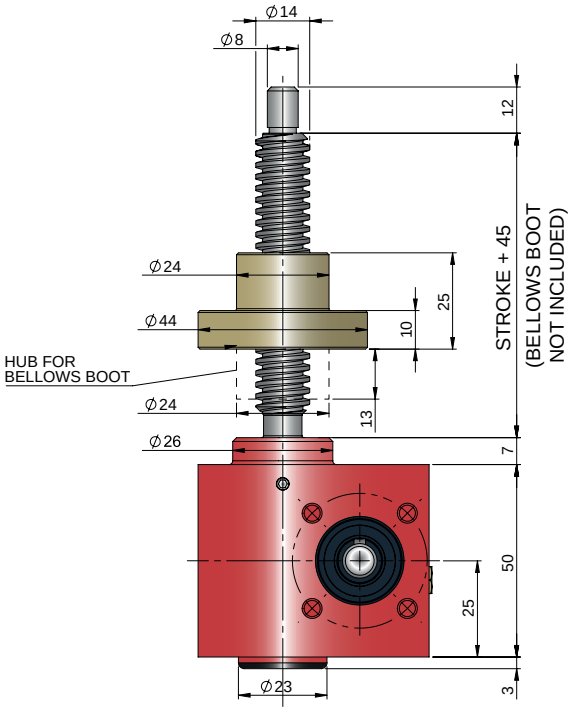
CMT0002-C00



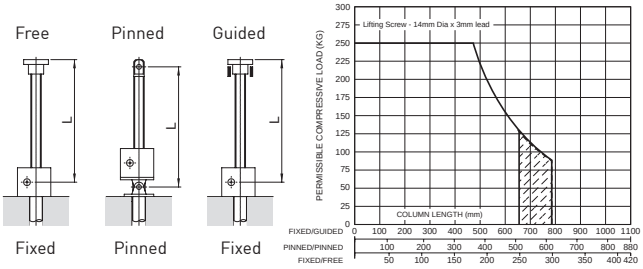


CMR0002-C00

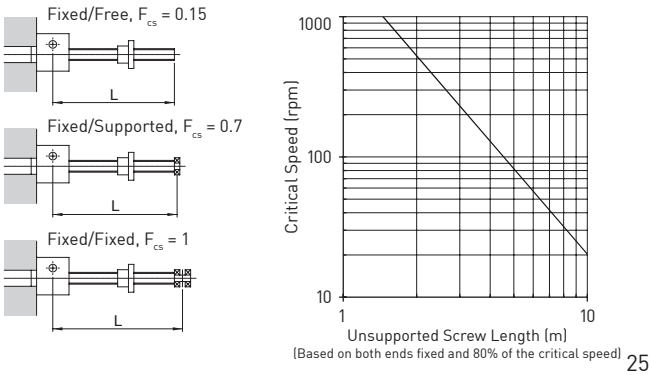




Column Strength

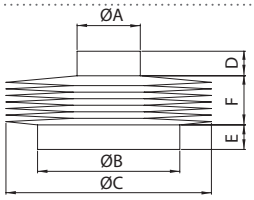


Critical Screw Speed



25

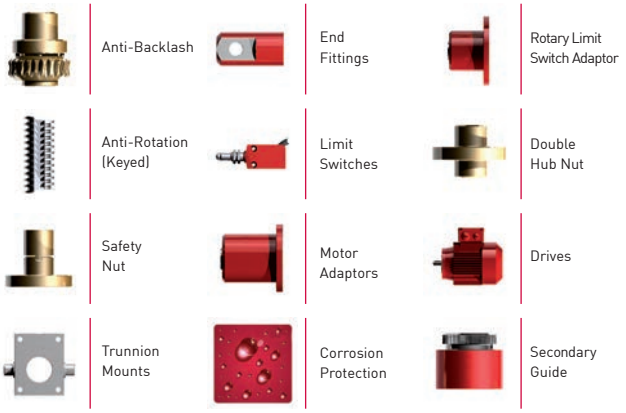
Bellows Boot



	ØA	ØB	ØC	D	E
CMT0002	24	26	100	10	7
CMT0002 (Rod End)	16	26	100	10	7
CMR0002	24	26	100	10	7

Stroke	1 – 500	501 – 1000	1001 – 1500	1500 – 2000
F	30	60	90	170*

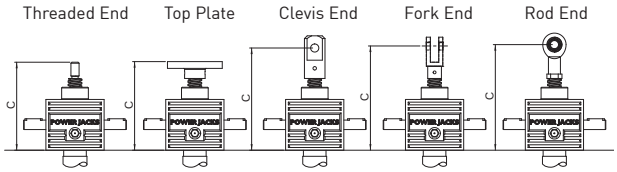
Accessories & Options



Performance

Screw Jack Model			CM-0005	
Capacity	kN		5	
Lead Screw	Diameter (mm)		16	
	Lead (mm)		3	6
Gear Ratios	Option 1		5:1	
	Option 2		20:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	0.6mm	1.2mm
	Option 2	4 Turn	0.15mm	0.3mm
Maximum Input Power (kW)	Option 1		0.250	
	Option 2		0.120	
Start up torque at full load (Nm)	Option 1		2.5	3.3
	Option 2		1.1	1.4
Maximum Through Torque (Nm)	Option 1		7.5	
	Option 2		3.3	
Static Efficiency	Option 1		0.189	0.291
	Option 2		0.102	0.165
Dynamic Efficiency	Option 1		0.252	0.37
	Option 2		0.160	0.234
Lead Screw Restraining Torque (Nm)	-		8.0	10.5
Worm Shaft Radial Load (N)			150	
Maximum Input Speed (rpm)	-		1800	
Gear Case Material			Aluminium	
Weight (kg) – stroke = 150mm	Translating		1.7	
	Rotating		1.9	
Weight (kg) – per extra 25mm	Translating		0.085	
	Rotating		0.035	

CMT0005 Closed Heights



Closed Height 'C'	Threaded End	Top Plate	Clevis End	Fork End	Rod End
CMT0005	97	118	97	120	117
Stroke (mm)	With Bellows Boots (B)				
0 - 250	107	128	108	130	127
251 - 500	117	138	117	140	137
501 - 800	132	153	132	155	152
1501 - 2000	290	290	310	313	315

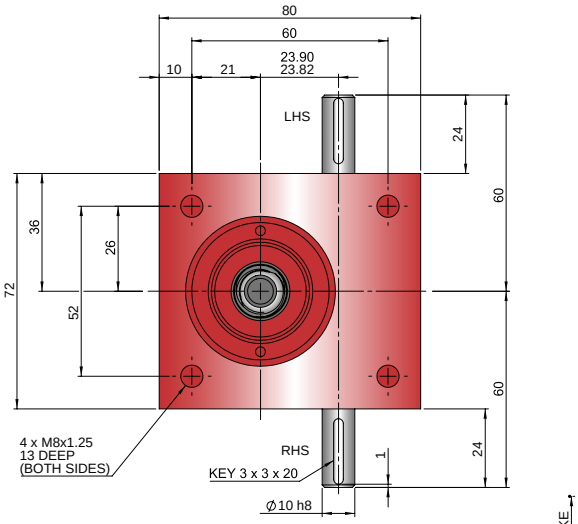
CMT0005 Stop Nut

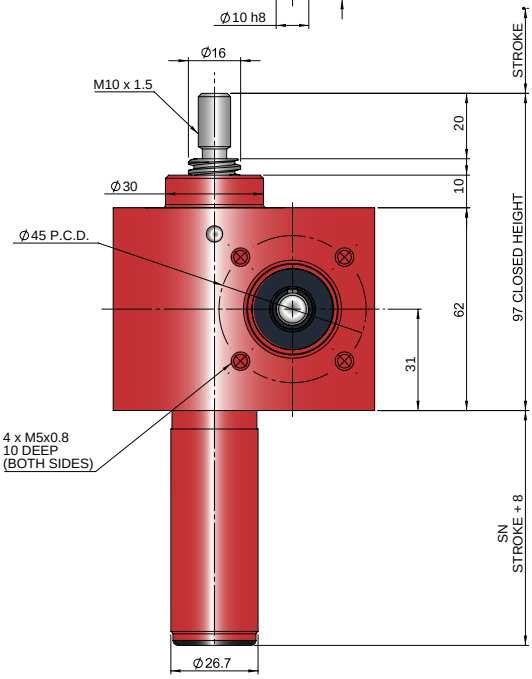
Stop nut provides a full power mechanical stop at the end of the lead screw. To be used as a safety feature in emergency conditions.
SN = Stroke + 25mm

Note:

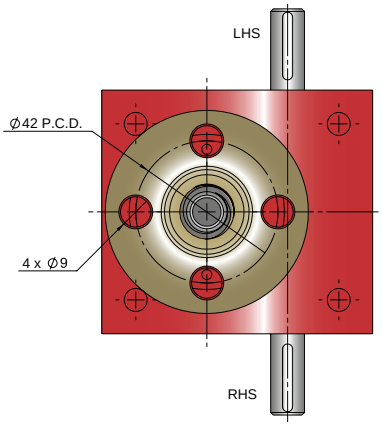
1. All dimension in millimetres unless otherwise stated.
2. Designs subject to change without notice.

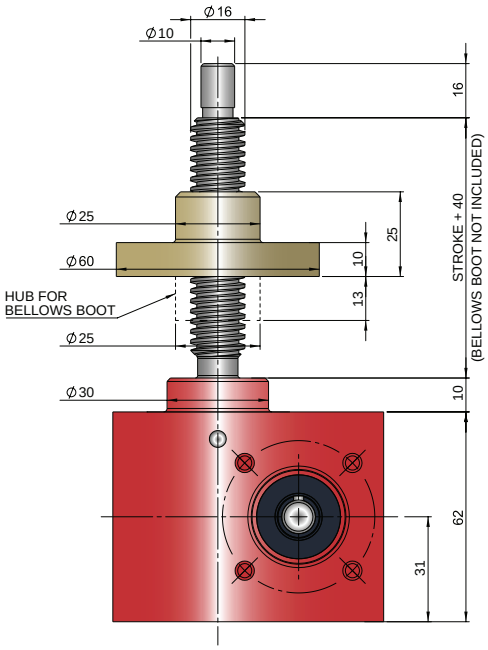
CMT0005-C00



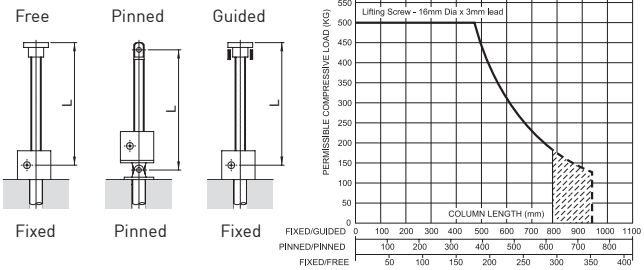


CMR0005-C00

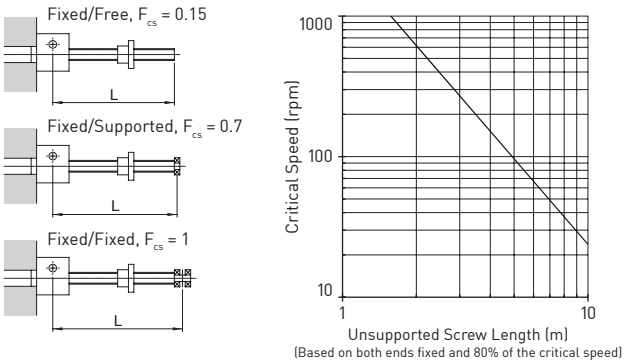




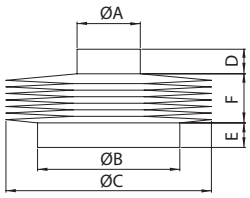
Column Strength



Critical Screw Speed



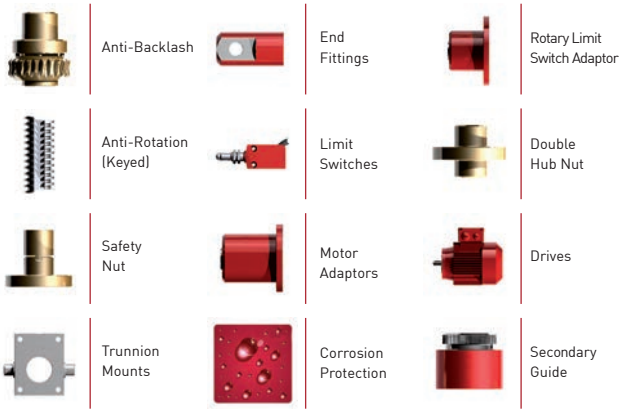
Bellows Boot



	ØA	ØB	ØC	D	E
CMT0005	25	30	100	13	10
CMT0005 (Rod End)	19	30	100	13	10
CMR0005	25	30	100	13	10

Stroke	1 – 500	501 – 1000	1001 – 1500	1500 – 2000
F	30	60	90	170*

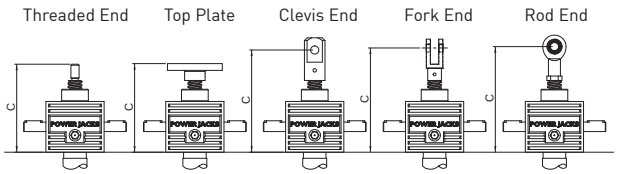
Accessories & Options



Performance

Screw Jack Model			CM-0010	
Capacity	kN		10	
Lead Screw	Diameter (mm)		20	
	Lead (mm)		5	10
Gear Ratios	Option 1		5:1	
	Option 2		20:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	1mm	2mm
	Option 2	4 Turn	1mm	2mm
Maximum Input Power (kW)	Option 1		0.375	
	Option 2		0.19	
Start up torque at full load (Nm)	Option 1		6.8	9.4
	Option 2		3.0	4.1
Maximum Through Torque (Nm)	Option 1		20.4	
	Option 2		9.0	
Static Efficiency	Option 1		0.236	0.339
	Option 2		0.113	0.192
Dynamic Efficiency	Option 1		0.306	0.424
	Option 2		0.194	0.268
Lead Screw Restraining Torque (Nm)	-		22	30
Worm Shaft Radial Load (N)			325	
Maximum Input Speed (rpm)	-		1800	
Gear Case Material			Aluminium	
Weight (kg) – stroke = 150mm	Translating		3.0	
	Rotating		3.1	
Weight (kg) – per extra 25mm	Translating		0.11	
	Rotating		0.05	

CMT0010 Closed Heights



Closed Height 'C'	Threaded End	Top Plate	Clevis End	Fork End	Rod End
CMT0010	130	130	150	153	155
Stroke (mm)	With Bellow Boots (B)				
0 - 500	150	150	170	173	175
501 - 1000	180	180	200	203	205
1001 - 1500	210	210	230	233	235
1501 - 2000	290	290	310	313	315

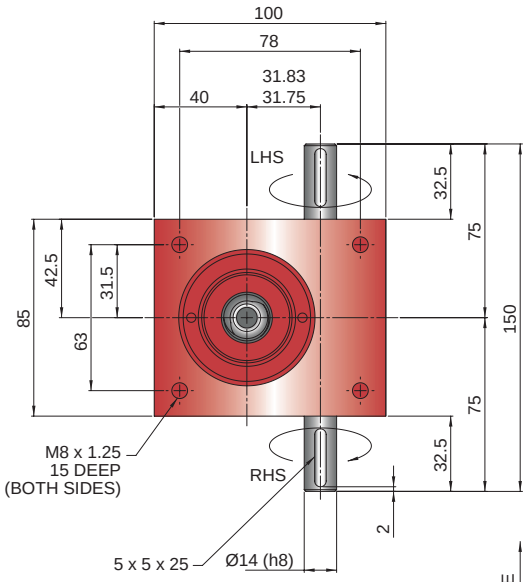
CMT0010 Stop Nut

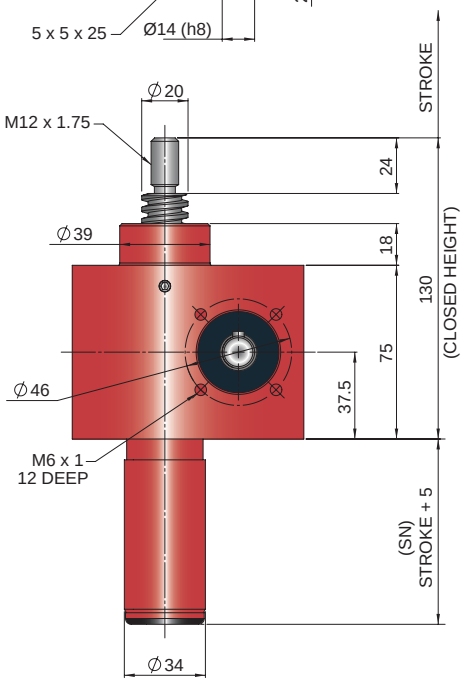
Stop nut provides a full power mechanical stop at the end of the lead screw. To be used as a safety feature in emergency conditions.
SN = Stroke + 25mm

Note:

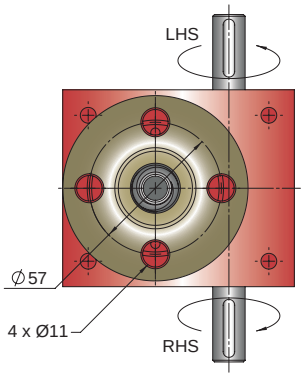
1. All dimension in millimetres unless otherwise stated.
2. Designs subject to change without notice.

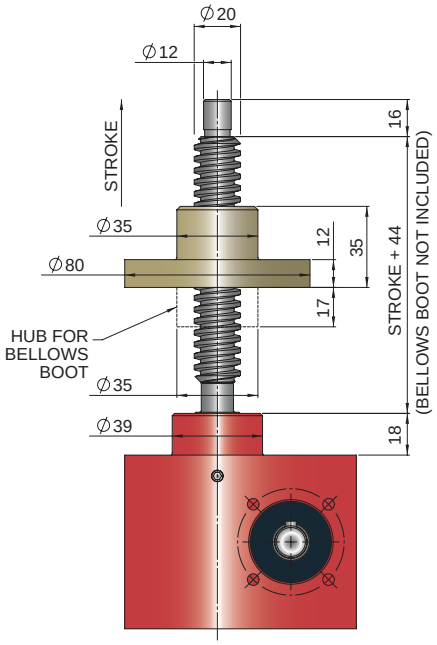
CMT0010-C00



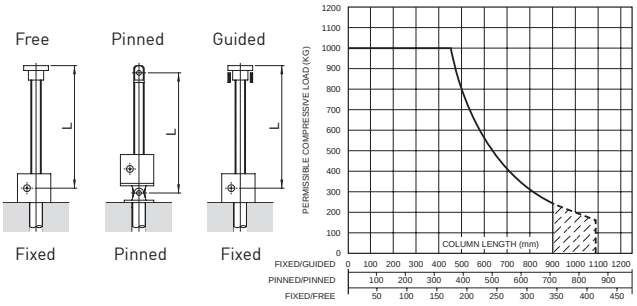


CMR0010-C00

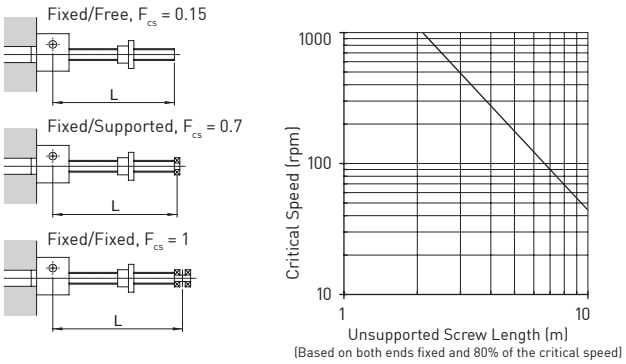




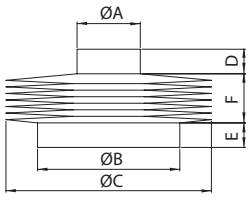
Column Strength



Critical Screw Speed



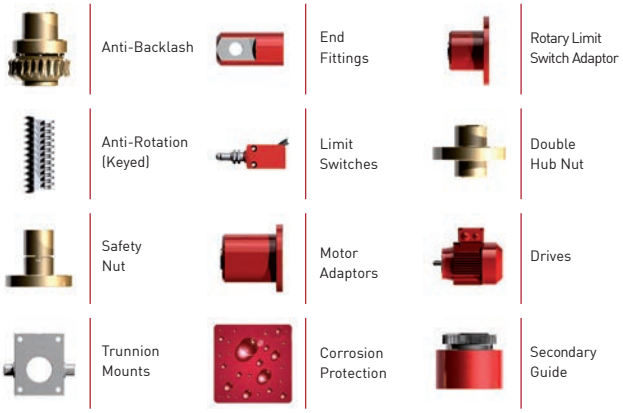
Bellows Boot



	ØA	ØB	ØC	D	E
CMT0010	30	39	110	15	15
CMT0010 (Rod End)	22	39	110	15	15
CMR0010	35	39	110	15	15

Stroke	1 – 500	501 – 1000	1001 – 1500	1500 – 2000
F	30	60	90	170*

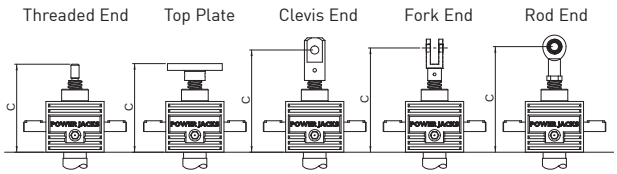
Accessories & Options



Performance

Screw Jack Model			CM-0025	
Capacity	kN		25	
Lead Screw	Diameter (mm)		30	
	Lead (mm)		6	12
Gear Ratios	Option 1		6:1	
	Option 2		24:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	1mm	2mm
	Option 2	4 Turn	1mm	2mm
Maximum Input Power (kW)	Option 1		1.5	
	Option 2		0.375	
Start up torque at full load (Nm)	Option 1		19.8	26.4
	Option 2		8.7	11.7
Maximum Through Torque (Nm)	Option 1		59.4	
	Option 2		26.1	
Static Efficiency	Option 1		0.201	0.302
	Option 2		0.113	0.171
Dynamic Efficiency	Option 1		0.264	0.383
	Option 2		0.167	0.242
Lead Screw Restraining Torque (Nm)	-		76	102
Worm Shaft Radial Load (N)			380	
Maximum Input Speed (rpm)	-		1800	
Gear Case Material			SG Iron	
Weight (kg) – stroke = 150mm	Translating		8.3	
	Rotating		8.7	
Weight (kg) – per extra 25mm	Translating		0.21	
	Rotating		0.11	

CMT0025 Closed Heights



Closed Height 'C'	Threaded End	Top Plate	Clevis End	Fork End	Rod End
CMT0025	145	145	170	195	192
Stroke (mm)	With Bellow Boots (B)				
0 - 500	165	165	190	215	212
501 - 1000	190	190	215	240	237
1001 - 1500	215	215	240	265	262
1501 - 2000	245	245	270	295	292

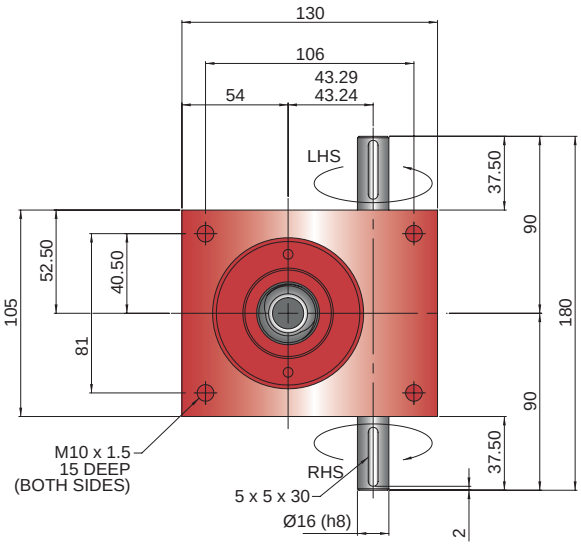
CMT0025 Stop Nut

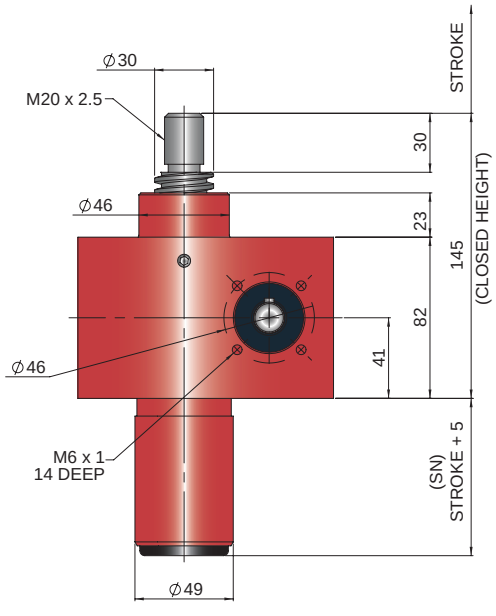
Stop nut provides a full power mechanical stop at the end of the lead screw. To be used as a safety feature in emergency conditions.
SN = Stroke + 21mm

Note:

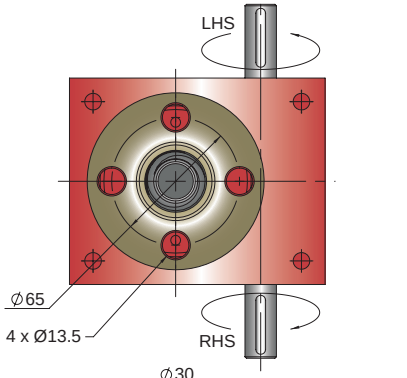
1. All dimension in millimetres unless otherwise stated.
2. Designs subject to change without notice.

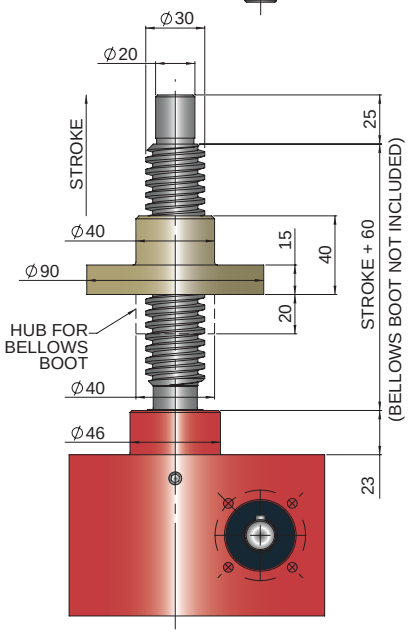
CMT0025-C00



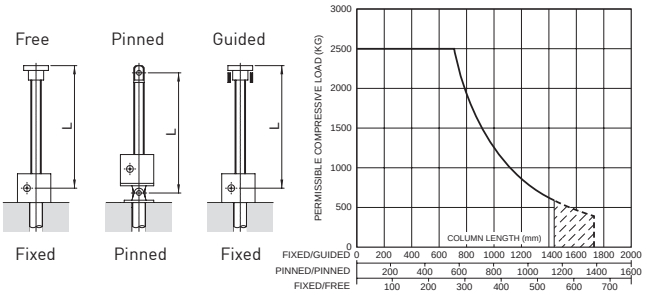


CMR0025-C00

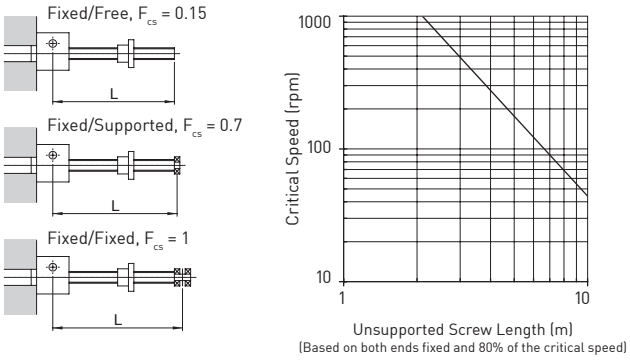




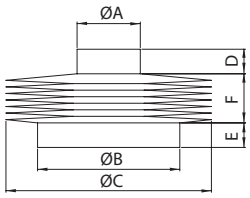
Column Strength



Critical Screw Speed



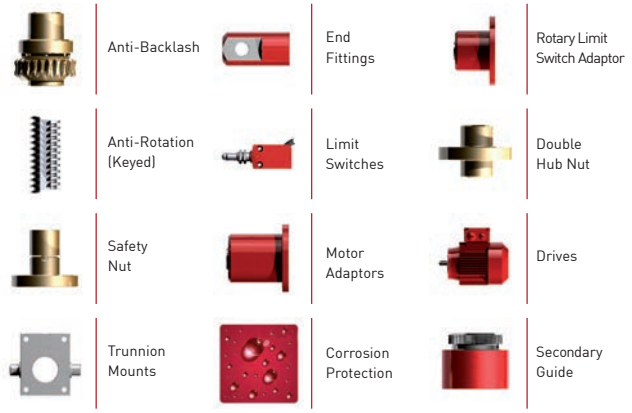
Bellows Boot



	ØA	ØB	ØC	D	E
CMT0025	40	46	120	15	15
CMT0025 (Rod End)	35	46	120	15	15
CMR0025	40	46	120	15	15

Stroke	1 – 500	501 – 1000	1001 – 1500	1500 – 2000
F	30	55	80	110*

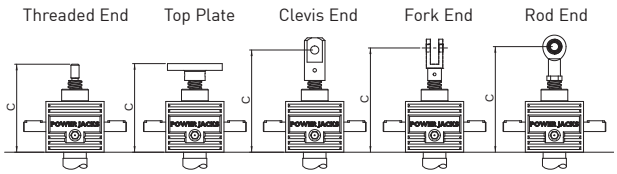
Accessories & Options



Performance

Screw Jack Model			CM-0050	
Capacity	kN		50	
Lead Screw	Diameter (mm)		40	
	Lead (mm)		9	18
Gear Ratios	Option 1		6:1	
	Option 2		24:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	1.5mm	3mm
	Option 2	4 Turn	1.5mm	3mm
Maximum Input Power (kW)	Option 1		3	
	Option 2		0.55	
Start up torque at full load (Nm)	Option 1		56.0	76
	Option 2		25.5	34.7
Maximum Through Torque (Nm)	Option 1		168.0	
	Option 2		76.5	
Static Efficiency	Option 1		0.213	0.314
	Option 2		0.117	0.172
Dynamic Efficiency	Option 1		0.281	0.398
	Option 2		0.172	0.244
Lead Screw Restraining Torque (Nm)	-		210	290
Worm Shaft Radial Load (N)			740	
Maximum Input Speed (rpm)	-		1800	
Gear Case Material			SG Iron	
Weight (kg) – stroke = 150mm	Translating		19.5	
	Rotating		20.2	
Weight (kg) – per extra 25mm	Translating		0.32	
	Rotating		0.19	

CMT0050 Closed Heights



Closed Height 'C'	Threaded End	Top Plate	Clevis End	Fork End	Rod End
CMT0050	195	195	220	260	254
Stroke (mm)	With Bellow Boots (B)				
0 - 500	215	215	240	280	274
501 - 1000	235	235	260	300	294
1001 - 1500	260	260	285	325	319
1501 - 2000	325	325	350	390	384

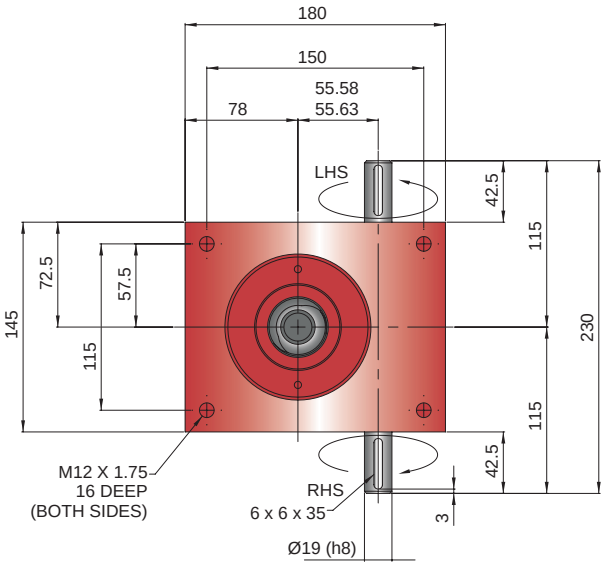
CMT0050 Stop Nut

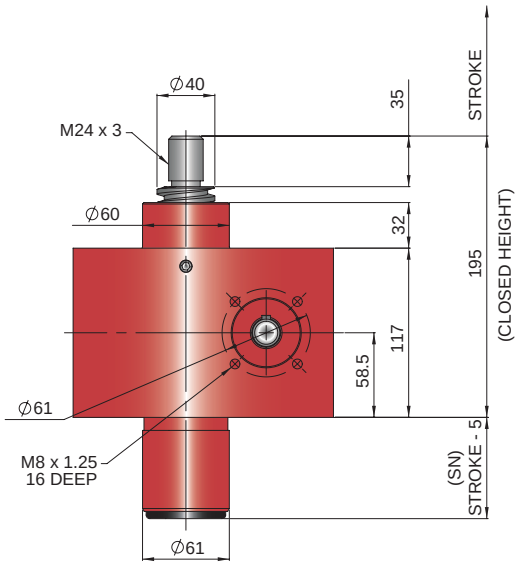
Stop nut provides a full power mechanical stop at the end of the lead screw. To be used as a safety feature in emergency conditions.
SN = Stroke + 21mm

Note:

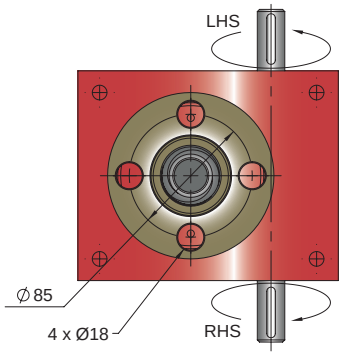
1. All dimension in millimetres unless otherwise stated.
2. Designs subject to change without notice.

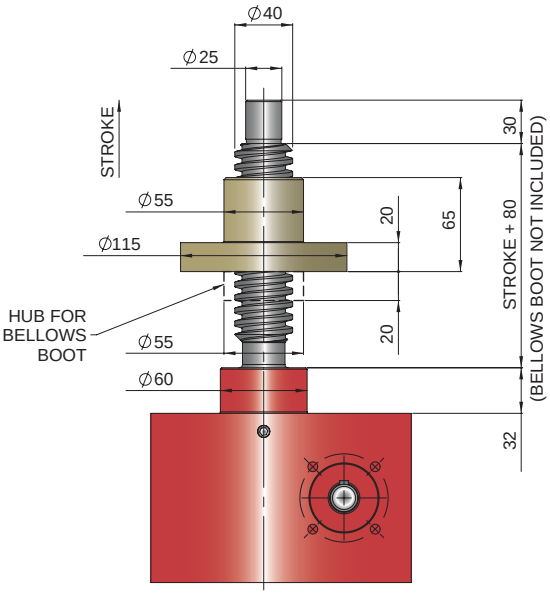
CMT0050-C00



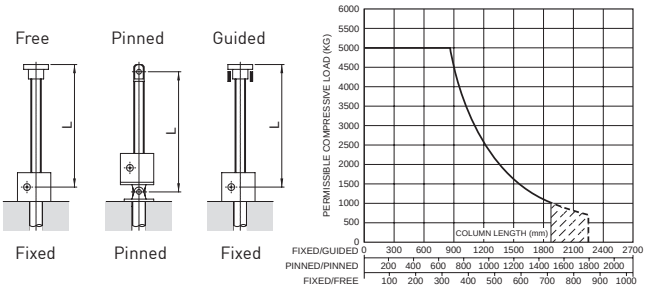


CMR0050-C00

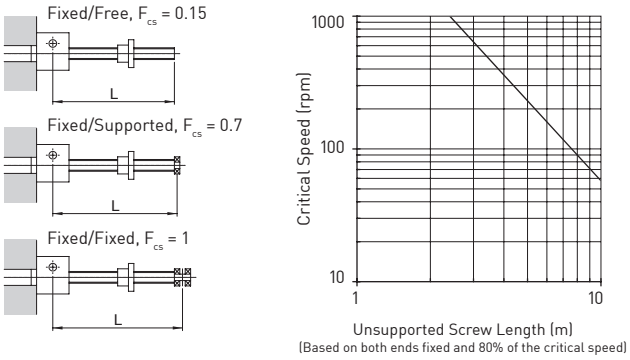




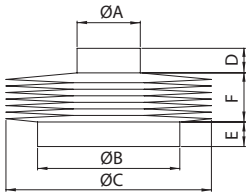
Column Strength



Critical Screw Speed



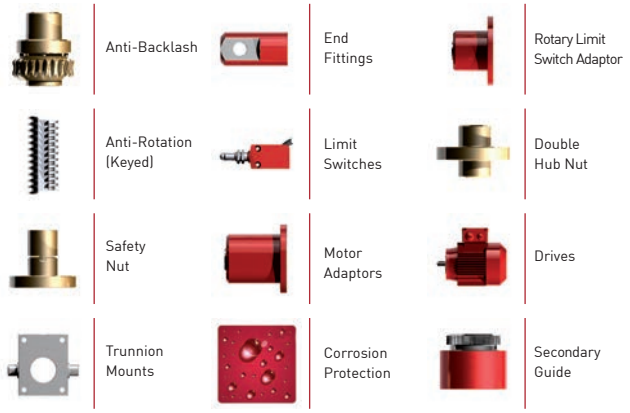
Bellows Boot



	ØA	ØB	ØC	D	E
CMT0050	50	60*	140	15	15
CMT0050 (Rod End)	42	60	140	15	15
CMR0050	55	60	140	15	15

Stroke	1 – 500	501 – 1000	1001 – 1500	1500 – 2000
F	30	50	75	140**

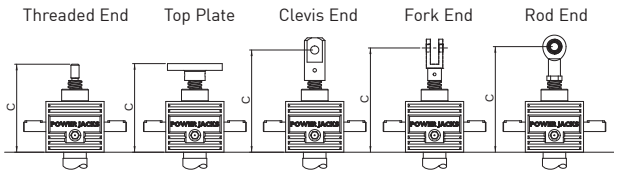
Accessories & Options



Performance

Screw Jack Model			CM-0100	
Capacity	kN		100	
Lead Screw	Diameter (mm)		55	
	Lead (mm)		12	24
Gear Ratios	Option 1		8:1	
	Option 2		24:1	
Turn of worm for travel of lead screw	Option 1	1 Turn	1.5mm	3mm
	Option 2	4 Turn	2mm	4mm
Maximum Input Power (kW)	Option 1		3.75	
	Option 2		1.125	
Start up torque at full load (Nm)	Option 1		115.9	156.6
	Option 2		60.5	81.9
Maximum Through Torque (Nm)	Option 1		347.7	
	Option 2		181.5	
Static Efficiency	Option 1		0.206	0.305
	Option 2		0.132	0.195
Dynamic Efficiency	Option 1		0.272	0.388
	Option 2		0.190	0.271
Lead Screw Restraining Torque (Nm)	-		575	780
Worm Shaft Radial Load (N)			1000	
Maximum Input Speed (rpm)	-		1800	
Gear Case Material			SG Iron	
Weight (kg) – stroke = 150mm	Translating		19.5	
	Rotating		20.2	
Weight (kg) – per extra 25mm	Translating		0.32	
	Rotating		0.19	

CMT0100 Closed Heights



Closed Height 'C'	Threaded End	Top Plate	Clevis End	Fork End	Rod End
CMT0100	250	250	295	354	335
Stroke (mm)	With Bellow Boots (B)				
0 - 500	270	270	315	374	355
501 - 1000	290	290	335	394	375
1001 - 1500	315	315	360	419	400
1501 - 2000	380	380	425	484	465

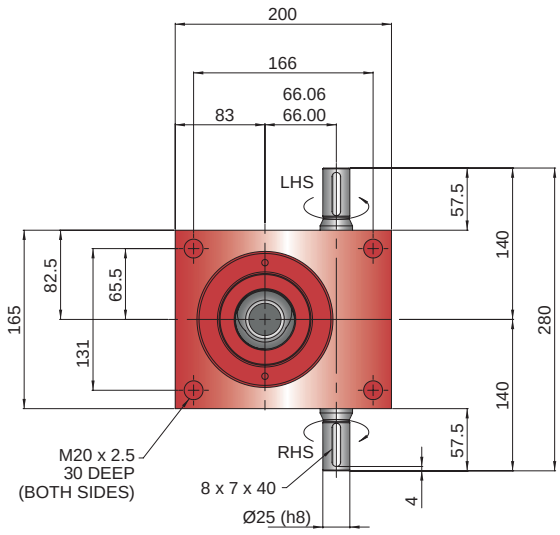
CMT0100 Stop Nut

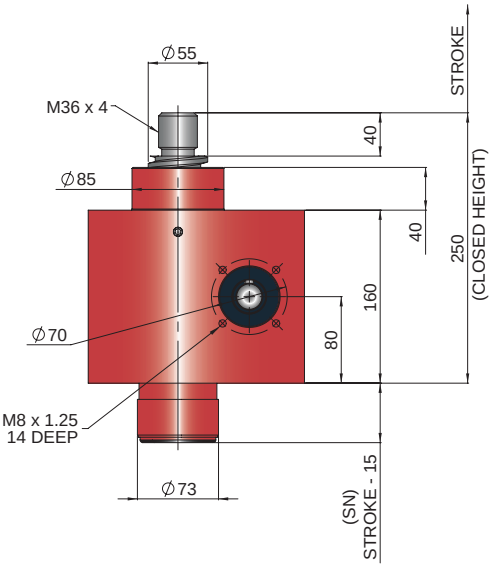
Stop nut provides a full power mechanical stop at the end of the lead screw. To be used as a safety feature in emergency conditions.
SN = Stroke + 37mm

Note:

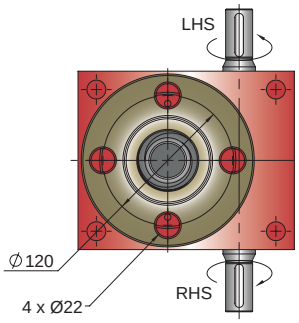
1. All dimension in millimetres unless otherwise stated.
2. Designs subject to change without notice.

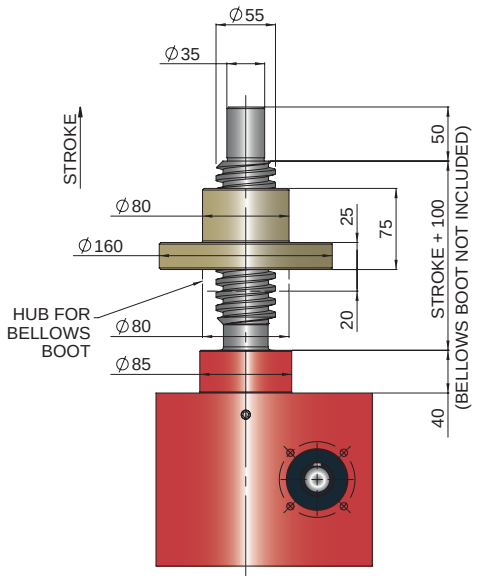
CMT0100-C00



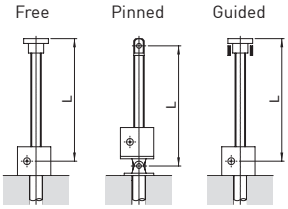


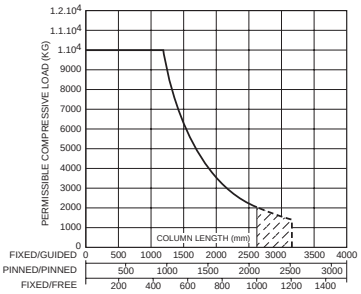
CMR0100-C00



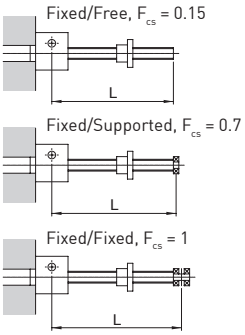


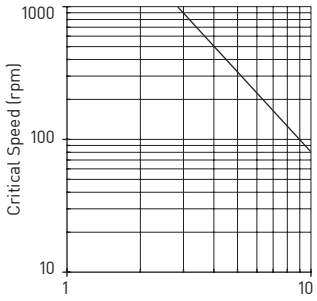
Column Strength





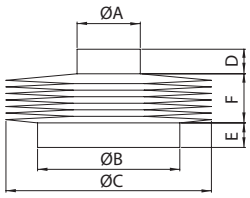
Critical Screw Speed





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

Bellows Boot



	ØA	ØB	ØC	D	E
CMT0100	65	85	150	15	15
CMT0100 (Rod End)	58	85	150	15	15
CMR0100	80	85	150	15	15

Stroke	1 – 500	501 – 1000	1001 – 1500	1500 – 2000
F	30	50	75	140*

Accessories & Options


Anti-Backlash


End Fittings


Rotary Limit Switch Adaptor


Anti-Rotation (Keyed)


Limit Switches


Double Hub Nut


Safety Nut


Motor Adaptors


Drives


Trunnion Mounts


Corrosion Protection

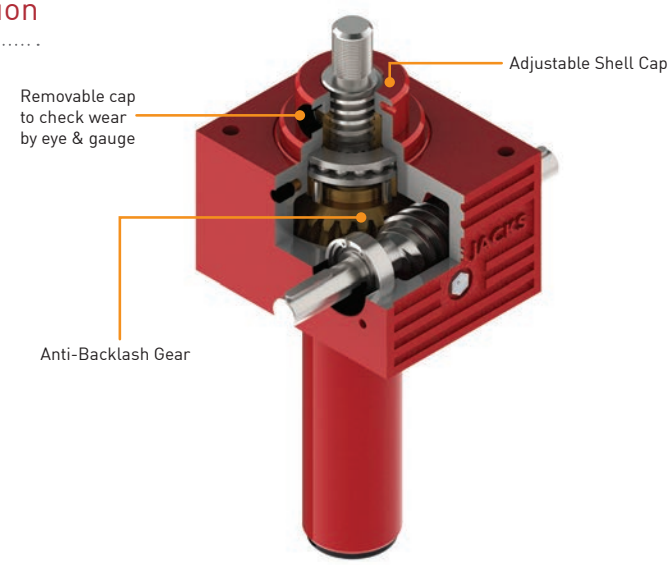

Secondary Guide

Minimise Axial Backlash When Load Changes Direction

The Anti-Backlash feature provides a reliable method to regulate the axial backlash in a screw jack for applications where there is a reversal of loading from tension to compression. The amount of backlash between the screw and worm gear nut can be adjusted (adjust shell cap) to a desired amount or a practical minimum. To avoid binding and excessive wear do not adjust backlash to less than 0.025mm.

The Anti-Backlash feature also acts as a safety device, providing dual nut load carrying unit, when the worm gear becomes worn.

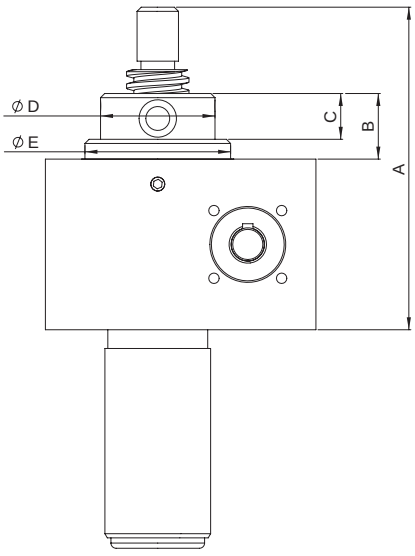
A visual wear indicator is included as standard on all models and a "feeler" gauge can be used to measure the wear. This can be upgraded to use a sensor on request (consult Power Jacks).

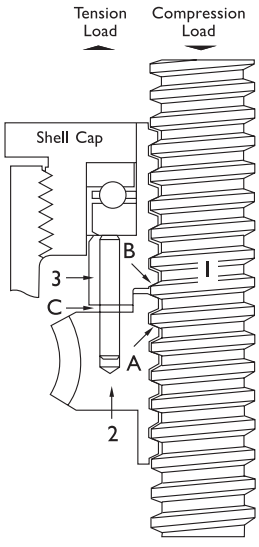


Dimensions for Anti-Backlash

The dimensions for these screw jacks are the same as the standard units except those detailed below.

Model	CMT0002-C0A	CMT0005-C0A	CMT0010-C0A	CMT0025-C0A	CMT0050-C0A	CMT0100-C0A
A	On Request	On Request	140	155	205	260
B			32	32	40	50
C			10	22	28	37
ØD			39	55	70	85
ØE			54	70	95	110



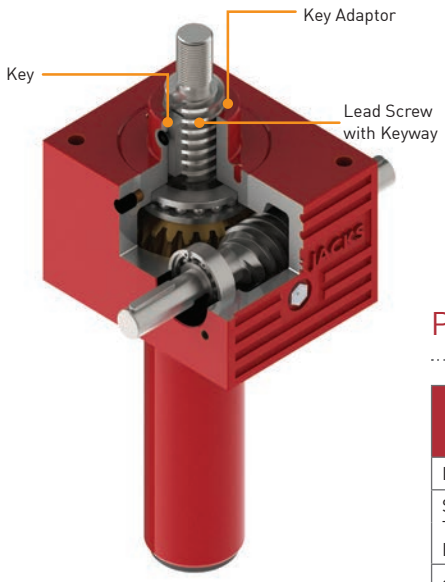


How it works - refer p193

Performance for Anti-Backlash

Model		CMT0002-C0A	CMT0005-C0A	CMT010-C0A		CMT025-C0A		CMT050-C0A		CMT100-C0A	
Lead Screw	Lead (mm)	On Request	On Request	5	10	6	12	9	18	12	24
Start-Up Torque at Full Load (Nm)	Gear Ratio Option 1			7.5	10.4	21.9	29.2	62	85	129	175
	Gear Ratio Option 2			3	4.6	9.8	13.0	28	39	67	90
Static Efficiency	Gear Ratio Option 1			0.212	0.305	0.181	0.272	0.192	0.283	0.185	0.274
	Gear Ratio Option 2			0.120	0.173	0.102	0.154	0.105	0.154	0.119	0.175
Dynamic Efficiency	Gear Ratio Option 1			0.275	0.381	0.238	0.344	0.253	0.358	0.245	0.349
	Gear Ratio Option 2			0.174	0.242	0.151	0.218	0.155	0.219	0.171	0.244
Weight (kg) – stroke = 150mm				3.4		8.8		20.2		36.8	

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



Linear Movement for Rotationally Unconstrained Loads

The Anti-Rotation feature for translating screw jacks stops the lead screw from rotating without the need for end fixing. This is done by keying the lifting screw.

Benefits:

- **Dimensions are the same as the standard translating screw jack**
- Compact unit integrates anti-rotation into gearbox
- Standard round cover pipe for easy installation
- Proven industrial anti-rotation design

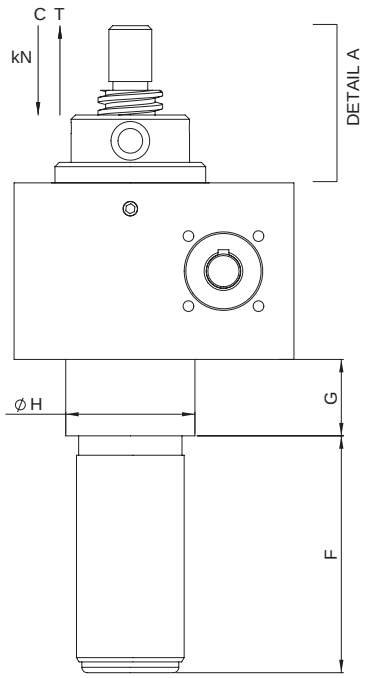
Performance for Anti-Rotation

Model		CMT 0002	CMT 0005	CMT0010		CMT0025		CMT0050		CMT0100	
Lead Screw	Lead (mm)	On Request	On Request	5	10	6	12	9	18	12	24
Start-Up Torque at Full Load (Nm)	Gear Ratio Opt 1			7.2	9.9	20.8	27.7	59	80	122	165
	Gear Ratio Opt 2			3.2	4.4	9.2	12.2	27	37	64	86
Static Efficiency	Gear Ratio Opt 1			0.224	0.322	0.191	0.287	0.203	0.299	0.196	0.290
	Gear Ratio Opt 2			0.124	0.182	0.107	0.162	0.111	0.163	0.125	0.185
Dynamic Efficiency	Gear Ratio Opt 1			0.291	0.403	0.251	0.364	0.267	0.378	0.258	0.368
	Gear Ratio Opt 2			0.184	0.255	0.159	0.230	0.164	0.232	0.180	0.257

Note: Efficiency values for standard grease lubricated worm gear box and lifting screw. Weight is the same as standard unit.

Anti-Rotation with Anti-Backlash or Safety Nut

The anti-backlash and safety nut features can be combined with the anti-rotation feature into one screw jack. For this option the anti-rotation device is located in-line with the cover pipe.



Dimensions for Anti-Backlash with Anti-Rotation (Keyed)

Model	CMT0002-CKA	CMT0005-CKA	CMT0010-CKA	CMT0025-CKA	CMT0050-CKA	CMT0100-CKA
F	On Request	On Request	Stroke +5	Stroke +10	Stroke +15	Stroke +20
G			30	35.5	40	48
ØH			42.5	60	75	90

Dimensions for Safety Nut with Anti-Rotation (Keyed)

Load Direction - Tension

Model	CMT0002-CKR	CMT0005-CKR	CMT0010-CKR	CMT0025-CKR	CMT0050-CKR	CMT0100-CKR
F	On Request	On Request	Stroke +5	Stroke +10	Stroke +15	Stroke +20
G			35	50	59	57
ØH			45	55	70	89

DETAIL A = Same as standard CMT screw jack

Load Direction - Compression

Model	CMT0002-CKS	CMT0005-CKS	CMT0010-CKS	CMT0025-CKS	CMT0050-CKS	CMT0100-CKS
F	On Request	On Request	Stroke +5	Stroke +10	Stroke +15	Stroke +20
G			30	35.5	40	48
ØH			42.5	60	75	90

DETAIL A = Same as standard safety nut screw jack with compression load (Refer P44)

Performance for Anti-Rotation with Anti-Backlash or Safety Nut

Model		CMT 0005	CMT 0010	CMT0010		CMT0025		CMT0050		CMT0100	
Lead Screw	Lead (mm)	On Request	On Request	5	10	6	12	9	18	12	24
Start-Up Torque at Full Load (Nm)	Gear Ratio Opt 1			8.3	11.5	24.8	33.0	65.6	89.3	136	184
	Gear Ratio Opt 2			3.8	5.3	10.3	13.7	30.0	40.9	70.3	95.2
Static Efficiency	Gear Ratio Opt 1			0.201	0.290	0.172	0.258	0.182	0.269	0.176	0.263
	Gear Ratio Opt 2			0.114	0.164	0.097	0.146	0.100	0.146	0.113	0.166
Dynamic Efficiency	Gear Ratio Opt 1			0.261	0.362	0.226	0.330	0.240	0.340	0.233	0.332
	Gear Ratio Opt 2			0.165	0.230	0.143	0.207	0.147	0.208	0.162	0.232
Weight (kg) – stroke = 150mm				3.15		8.75		20		37.3	

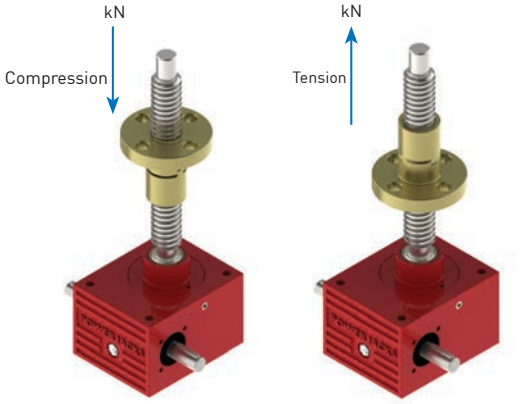
Note: Efficiency values for standard grease lubricated worm gear box and lifting screw. Anti-Rotation with Safety Nut performance is the same as the Anti-Rotaton unit.

Extra Safety for Critical Applications

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

1. In the event of excessive wear on the nut thread the load will be transferred from the standard nut to the safety nut. This will also provide visual wear indication as the gap between the safety nut decreases to zero as the standard lifting nut wears.
2. In the unlikely event of nut thread failure the safety nut will sustain the load. The safety of industrial and human cargo is therefore improved.

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



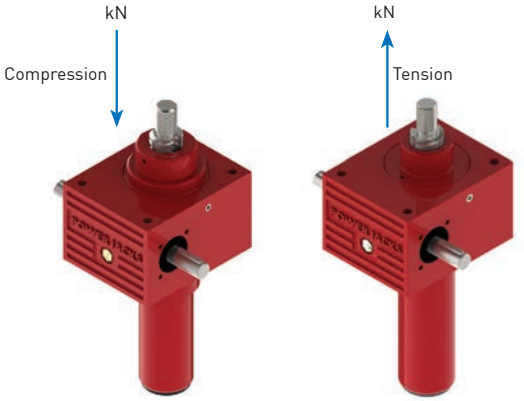
All Safety Nuts are BS EN 1570 Compliant

Translating Screw Jack with Safety Nut

The dimensions for these screw jacks are the same as the standard units except those detailed below.

Load Direction - Compression (C)

Model	CMT0002	CMT0005	CMT0010	CMT0025	CMT0050	CMT0100
A	On Request	On Request	140	155	205	250
B			32	33	40	40
C			10	22	28	40
ØD			39	55	70	85
ØE			54	70	95	85

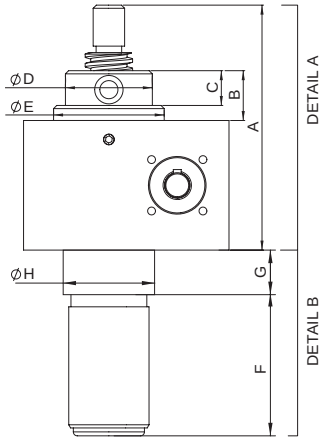


DETAIL A = As per table above

DETAIL B = Same as standard CMT screw jack (Dimension F, G, ØH not applicable)

Load Direction - Tension

Model	CMT0002	CMT0005	CMT0010	CMT0025	CMT0050	CMT0100
F	On Request	On Request	Stroke + 5	Stroke + 10	Stroke + 15	Stroke + 20
G			35	50	59	57
ØH			45	55	70	89



DETAIL A = Same as standard CMT screw jack (Dimension A, B, C, ØD, ØE not applicable)

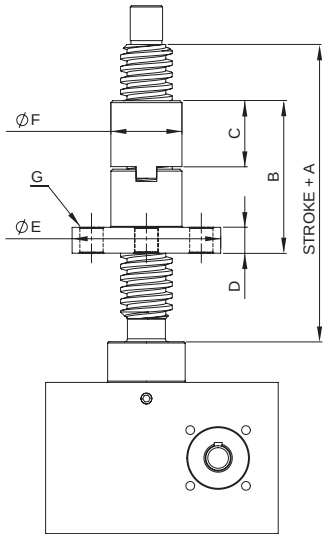
DETAIL B = As per table above

Model	CMT0002	CMT0005	CMT0010	CMT0025	CMT0050	CMT0100
Wieght (kg)	On Request	On Request	2.9	8.0	18.6	34.7

Rotating Screw Jack with Safety Nut

The dimensions for these screw jacks are the same as the standard units except those detailed below. A bellows boot hub can be provided on the flanged half of the safety nut.

Model	CMR0002	CMR0005	CMR0010	CMR0025	CMR0050	CMR0100
A	On Request	On Request	Stroke +76	Stroke +95	Stroke +140	Stroke +170
B			66.5	75	125	145
C			30	33.5	58	67
D			12	15	20	25
ØE			80	90	115	160
ØF			35	40	55	80
G			4 x Ø11 Ø57 PCD	4 x Ø13.5 Ø65 PCD	4 x Ø18 Ø85 PCD	4 x Ø22 Ø120 PCD

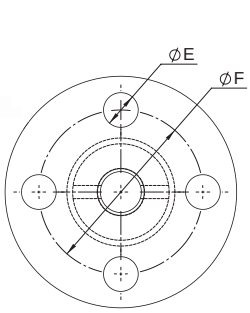


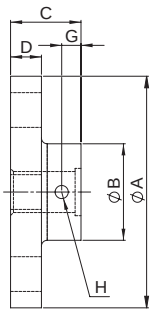
PCD = Pitch Circle Diameter

Nut must be orientated correctly for load direction

Model	CMT0002	CMT0005	CMT0010	CMT0025	CMT0050	CMT0100
Wieght (kg)	On Request	On Request	3.3	9.0	21.1	42.2

Top Plate

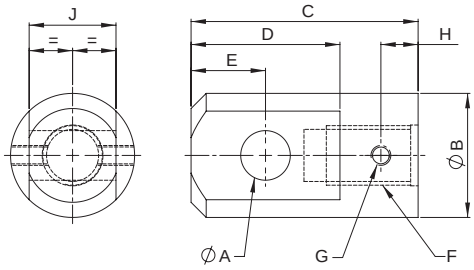




Capacity	2.5kN	5kN	10kN	100kN	50kN	100kN
ØA	Ø50	Ø65	Ø80	Ø100	Ø120	Ø150
ØB	Ø24	Ø25	Ø30	Ø40	Ø50	Ø65
C	16	21	24	31.5	36.5	42
D	6	8	10	12	16	20
ØE	Ø6.5	Ø9	Ø11	Ø13.5	Ø18	Ø22
ØF (PCD)	Ø40	Ø45	Ø55	Ø70	Ø85	Ø110
G	5	7	8	10	10	12
H	M4 x 0.7	M5 x 0.8	M6 x 1	M8 x 1.25	M8 x 1.25	M10 x 1.5
Weight (kg)	0.116	0.225	0.43	0.79	1.5	2.82

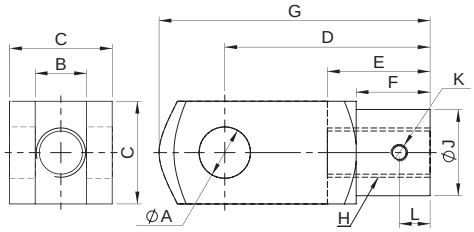
PCD = Pitch Circle Diameter

Clevis End



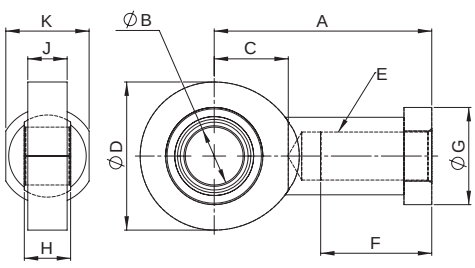
Capacity	2.5kN	5kN	10kN	25kN	50kN	100kN
ØA	Ø8	Ø10	Ø12	Ø16	Ø20	Ø22
ØB	Ø24	Ø25	Ø30	Ø40	Ø50	Ø65
C	40	56	63	79.5	991.5	120
D	20	30	36	46	60	66
E	10	15	18	23	30	33
F	M8 X 1.25 16 Deep	M10 X 1.5 22 Deep	M10 X 1.75 25 Deep	M20 X 2.5 32 Deep	M24 X 3 37 Deep	M36 X 4 42 Deep
G	M4 X 0.7	M5 X 0.8	M6 X 1	M8 X 1.25	M8 X 1.25	M10 X 1.5
H	8	10	15	15	15	20
J	12	15	20	30	35	40
Weight (kg)	0.1	0.15	0.26	0.57	1.0	2.1

Fork End



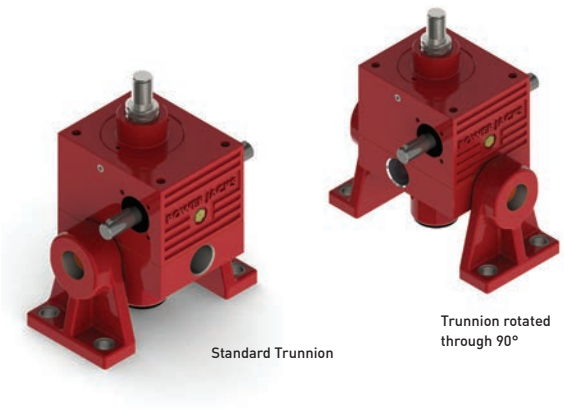
Capacity	2.5kN	5kN	10kN	25kN	50kN	100kN
ØA	Ø8	Ø10	Ø12	Ø20	Ø25	Ø35
B	8	10	12	20	25	35
C	16	20	24	40	50	70
D	32	40	48	80	100	144
E	16	20	24	40	50	72
F	12	15	18	30	36	54
G	42	52	62	105	132	188
H	M8 x 1.25	M10 x 1.5	M12 x 1.75	M20 x 2.5	M24 x 3	M36 x 4
ØJ	Ø14	Ø18	20	34	42	60
K	M4 x 0.7	M5 x 0.8	M6 x 1	M8 x 1.25	M8 x 1.25	M10 x 1.5
L	6	6.5	10	10	15	20
Weight (kg)	0.037	0.054	0.12	0.55	1.1	2.93

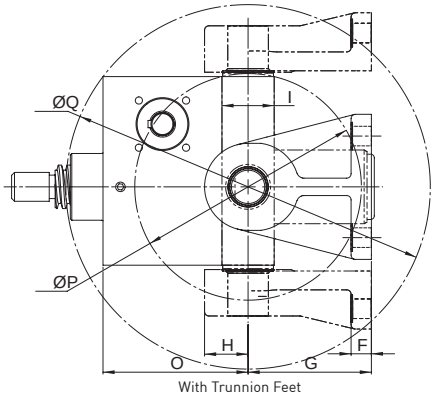
Rod End



Capacity	2.5kN	5kN	10kN	25kN	50kN	100kN
A	36	43	50	77	94	125
ØB	Ø8	Ø10	Ø12	Ø20	Ø25	Ø35
C	13	15	18	27	32	42
ØD	Ø24	Ø29	Ø34	Ø53	Ø64	Ø82
E	M8 x 1.25	M10 x 1.5	M12 x 1.75	M20 x 1.75	M24 x 2	M36 x 3
F	15	20	20	23	48	60
ØG	Ø16	Ø19	Ø22	Ø35	Ø42	Ø58
H	8	9	10	16	20	25
J	6	7	8	13	17	21
K	14	17	19	32	36	50
Weight (kg)	0.046	0.061	0.096	0.35	0.64	1.3

Note: Lead screw threaded end made to suit rod end.





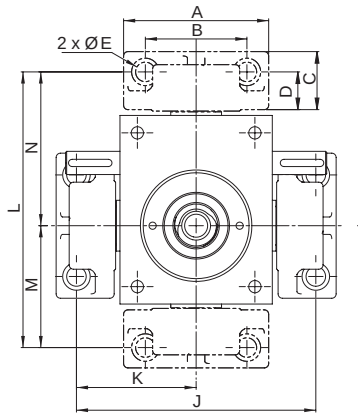
With Trunnion Feet

Trunnion mounts provide a pivot point at the gearbox of the screw jack.

- 2 Pivot Plane Options
- Supplied with or without Trunnion Feet
- Option of Male or Female Trunnions
- Trunnion mounts can be mounted on either side of the screw jacks gearbox

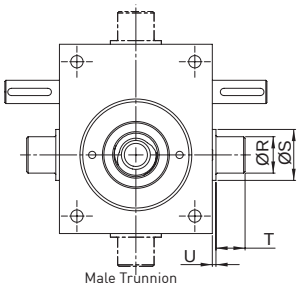
When the trunnions are on the same side as the worm shaft multiple screw jacks can be linked in line with a drive shaft and pivot around a common axis.

The trunnion mounts are connected to the screw jacks gearbox with 4 bolts.

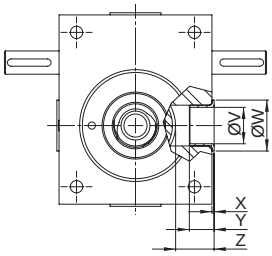


With Trunnion Feet

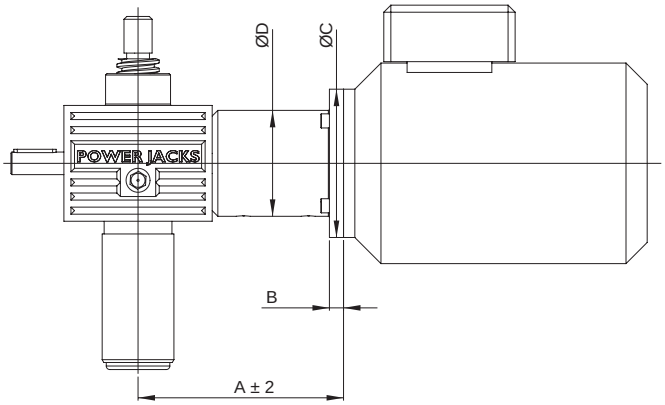
Model	CMT0002 CMR0002	CMT0005 CMR0005	CMT0010 CMR0010	CMT0025 CMR0025	CMT0050 CMR0050	CMT0100 CMR0100
A	On Request	On Request	70	100	140	170
B			42	70	100	120
C			34	40	55	70
D			21	26	35.5	43.5
ØE			11	13.5	18	22
F			12	14	20	25
G			65	85	120	130
H			20	30	42.5	47.5
I			30	36	50	60
J			134	164	226	265
K			67	82	113	132.5
L			149	189	261	300
M			64.5	83.5	118.5	133
N			84.5	105.5	142.5	167
O			90	100	142	190
ØP			124	156.5	210	242
ØQ			216.5	251.5	350	446.5
ØR			20 f7	25 f7	35 f7	45 f7
ØS			30	35	47	58
T			20	20	20	35
U			2.5	2.5	2.5	5
ØV			20	25	35	45
ØW			30	35	47	74
X			1.5	1.5	2	2
Y			16.5	16.5	26	32
Z			22	26	39	40



Male Trunnion



Female Trunnion



Mount an electric motor to the C-Series screw jack with the extensive range of motor adaptors designed to be used in conjunction with a flexible jaw coupling that connects the motor drive shaft to the screw jacks worm shaft.

Model	CMT0002 CMR0002					
IEC Frame	A	B	ØC	ØD	Coupling	Available
On Request	On Request	On Request	On Request	On Request	On Request	On Request

Model	CMT0005 CMR0005					
IEC Frame	A	B	ØC	ØD	Coupling	Available
On Request	On Request	On Request	On Request	On Request	On Request	On Request

Model	CMT0010 CMR0010					
IEC Frame	A	B	ØC	ØD	Coupling	Available
63 B5 D140	122.5	10	140	65	19/24 A14 A11	OR
63 B14 C90	122.5	10	90	65	19/24 A14 A11	**S**
71 B5 D160	122.5	10	160	65	19/24 A14 A14	OR
71 B14 C105	122.5	10	105	65	19/24 A14 A14	**S**
80 B5 D200	132.5	12	200	65	19/24 A14 A19	OR
80 B14 C120	132.5	12	120	65	19/24 A14 A19	**S**

Model	CMT0025 CMR0025					
IEC Frame	A	B	ØC	ØD	Coupling	Available
71 B5 D160	145.5	10	160	75	19/24 A16 A14	OR
71 B14 C105	145.5	10	105	75	19/24 A16 A14	**S**
80 B5 D200	145.5	12	200	75	19/24 A16 A19	OR
80 B14 C120	145.5	12	120	75	19/24 A16 A19	**S**
90 B5 D200	162.5	12	200	75	24/30 A16 A24	OR
90 B14 C140	162.5	12	140	75	24/30 A16 A24	**S**
100 B5 D250	174.5	12	250	75	24/30 A16 B28	OR
100 B14 C160	174.5	12	160	75	24/30 A16 B28	**S**

Model	CMT0050 CMR0050					
IEC Frame	A	B	ØC	ØD	Coupling	Available
80 B5 D200	172.5	12	200	86	19/24 A19 A19	OR
80 B14 C120	172.5	12	120	86	19/24 A19 A19	OR
90 B5 D200	192.5	12	200	95	24/30 A19 A24	OR
90 B14 C140	192.5	12	140	95	24/30 A19 A24	**S**
100 B5 D250	192.5	12	250	95	24/30 A19 B28	OR
100 B14 C160	192.5	12	160	95	24/30 A19 B28	**S**
112 B5 D250	192.5	12	250	95	24/30 A19 B28	OR
112 B14 C160	192.5	12	160	95	24/30 A19 B28	**S**
132 B5 D300	222.5	12	300	95	28/38 A19 B38	OR
132 B14 C200	222.5	12	200	95	28/38 A19 B38	**S**

Model	CMT0100 CMR0100					
IEC Frame	A	B	ØC	ØD	Coupling	Available
90 B5 D200	208.5	12	200	100	24/30 A25 B24	OR
90 B14 C140	208.5	12	140	100	24/30 A25 B24	**S**
100 B5 D250	218.5	12	250	100	24/30 A25 B28	OR
100 B14 C160	218.5	12	160	100	24/30 A25 B28	**S**
112 B5 D250	218.5	12	250	100	24/30 A25 B28	OR
112 B14 C160	218.5	12	160	100	24/30 A25 B28	**S**
132 B5 D300	239.5	12	300	100	28/38 A25 B38	OR
132 B14 C200	239.5	12	200	100	28/38 A25 B38	**S**

Note:

1. NEMA Motor adaptors available on request
2. Motor adaptors are for the support of motor weight only
3. OR = On Request
4. **S = Standard**

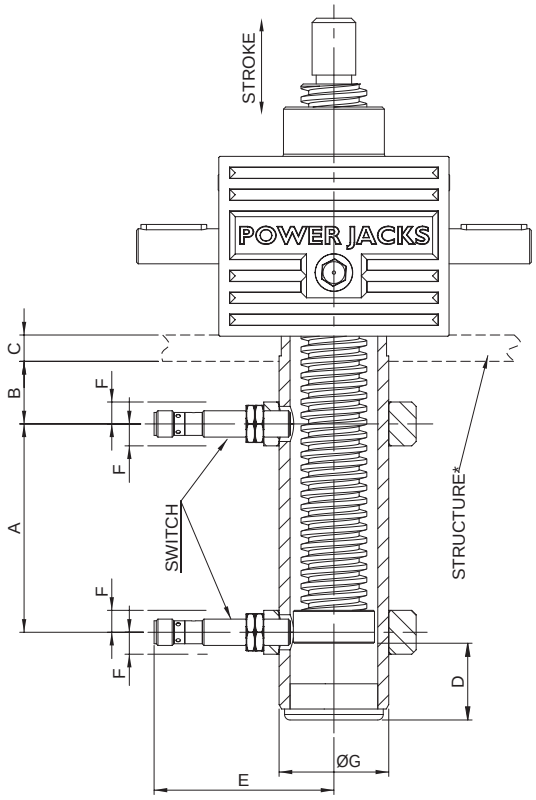
Limit switches can be mounted on the screw jacks cover pipe to signal stroke positions such as end of travel. The switch is triggered by a cam or target disc on the end of the lifting screw.

Features:

1. Inductive Proximity Sensors as standard. Others including electro-mechanical and safety rated available on request.
2. No contact, so no wearing parts.
3. 2 Wire sensor 24VDC for either Normally Closed (NC) or Normally Open (NO) switching.
4. Sensor has rugged one-piece Metal housing.
5. Optical setting aid
6. M12 Plug in connection for fast change-ability.
7. Sensor kit includes–sensor, mounting ring, target ring and modification to screw jack cover pipe.
8. Switch can have a fixed or adjustable mounting.
9. More sensor details in System Components section of Design Guide.

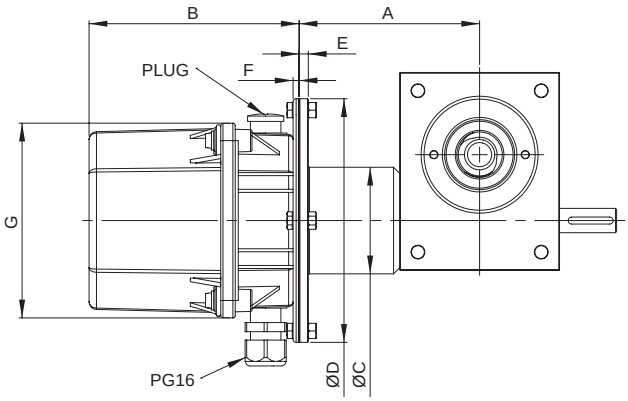
Dimensions

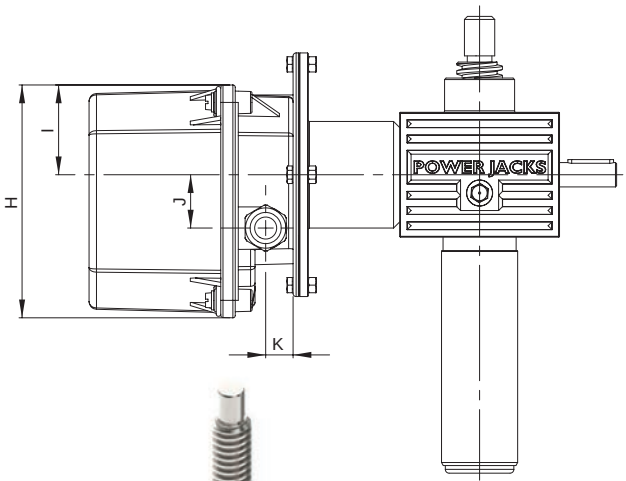
Model	CMT0002	CMT0005	CMT0010	CMT0025	CMT0050	CMT0100
Switch Size	On Request	On Request	M8	M12	M12	M12
A (mm)			Stroke + 15	Stroke + 15	Stroke + 12	Stroke + 24
B (mm)			50	50	50	50
C (mm)			10	15	15	20
D (mm)			34	36	41	46
E (mm)± 5			78.5	84	89	100
F Adjustment (mm)			5	5	5	5
ØG (mm)			34	49	61	73

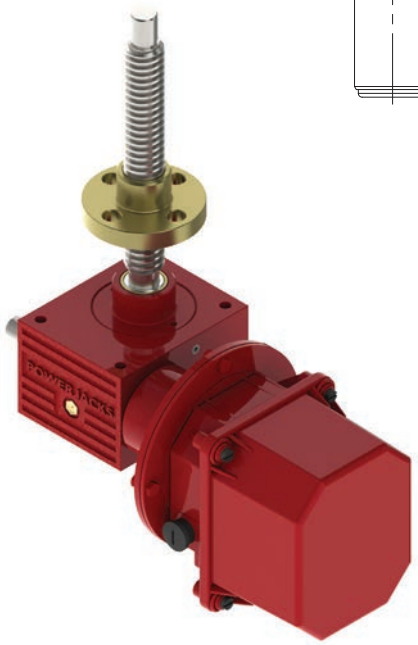


Note:

1. *Structure dimension (C) only required when screw jack is secured on this face. Not required if secured on opposite face.
2. All dimensions in mm unless otherwise stated.
3. Dimensions subject to change without notice.







RLS-51 Rotary cam limit switches can be used as end of travel limit switches with the option of intermediate switches. Each limit switch is individually adjustable over the entire stroke of the screw jack.

- 2 to 8 limit switches in one unit
- Usable revolutions from 4 to 16000
- Switch types include:
  Changeover (Normally Closed/Open), Normally Closed, Gold or Silver contacts
- Maintenance free rotary cam gearbox
- Enclosure IP66 as standard
- Mounting options for B14 (face), B5 (flange) and B3 (foot)
- Available in 3 voltages 250VAC, 24VDC & 80VDC
- Maximum input speed 1800rpm
- Operating temperature –40°C to +80°C
- Options for potentiometer, anti-condensation heaters and encoders
- Stage technology option to VBG70

Mounted onto a screw jacks free worm shaft as an alternative where cover pipe mounted limit switches are not possible e.g. rotating screw jacks.

More RLS-51 rotary limit switch details in System Components section of Design Guide.

Type	CMT-0010 CMR-0010	CMT-0025 CMR-0025	CMT-0050 CMR-0050	CMT-0100 CMR-0100
A	109	119	139	154
ØC	86	86	86	100
ØD	120	120	120	160
E	11	11	11	10

B		Switches			
Size	Revolutions	2	4	6	8
1	4.1, 6.5, 11	132	132	157	157
2	17.5, 29, 48	132	132	157	182
3	75, 125, 205	132	132	157	182
4	323, 540, 880	132	157	182	207
5	1384, 2288, 3735	132	157	182	207
6	5900, 9800, 16000	157	157	182	207

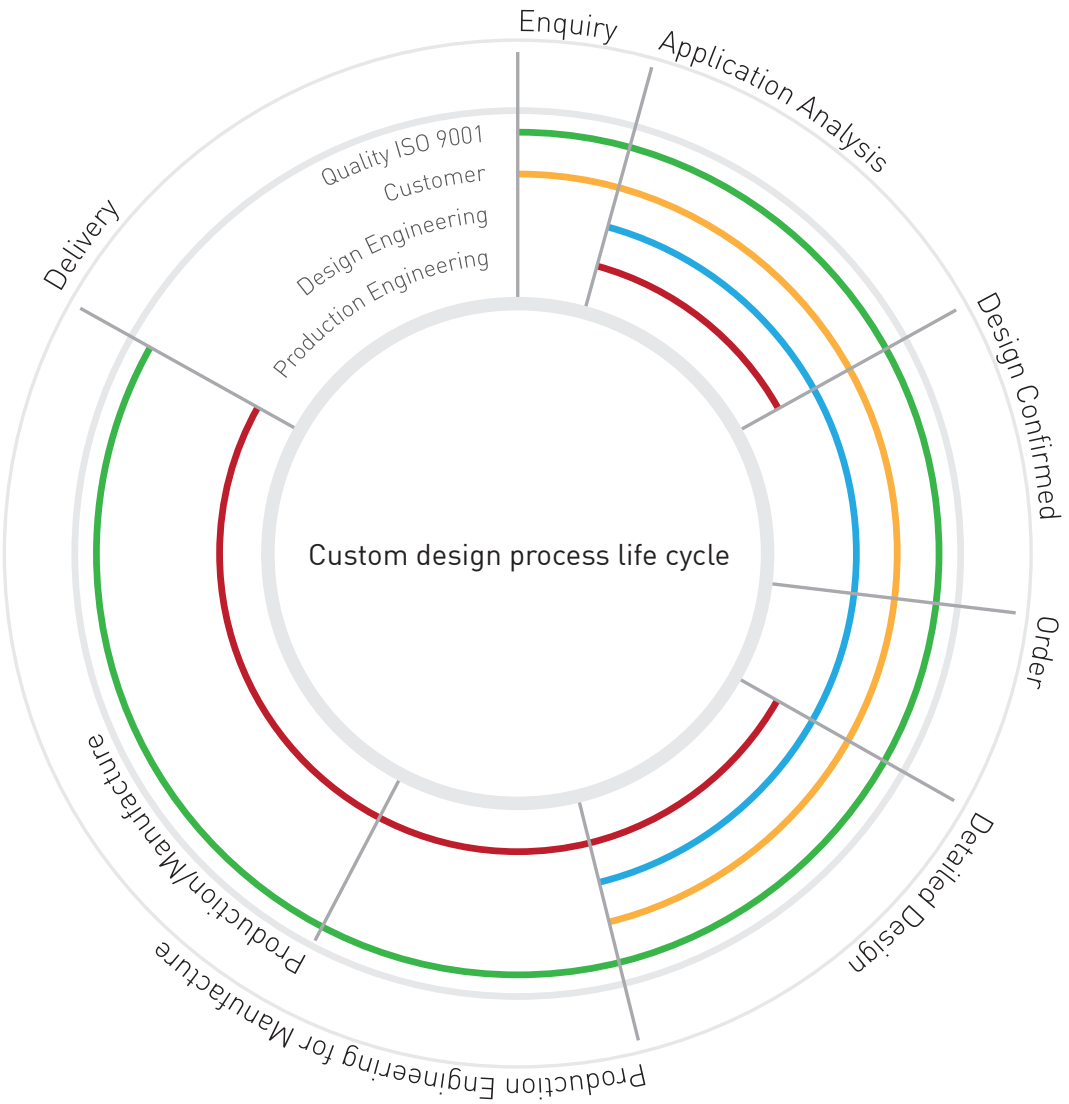
All Units					
F	G	H	I	J	K
4	128	153	59	35	18

Note:

1. All dimension in millimeters unless otherwise stated.
2. Designs subject to change without notice.
3. More information on RLS-51 limit switch see System Component section.
4. RLS-51 limit switch not available for 2.5kN and 5kN model screw jacks.

Special Designs

OUR SCREW JACK DESIGNS ARE FULLY CUSTOMISABLE BY OUR ENGINEERING TEAM SO YOUR APPLICATION CAN BE THE BEST.



Customised Products

For Power Jacks, every order is different.

We're ready every time to assess the precise requirements of the customer and formulate the right solution.

Off-the-shelf solutions are the norm for many engineering companies. And while they're certainly options for our customers, that's only the case if they're precisely the right options.

We pride ourselves on our adaptability – on our readiness to customise basic models, or even to start from scratch, so that we're providing products that offer optimum performance.

It's a customising service across our entire range of products that means customers get exactly what they need.

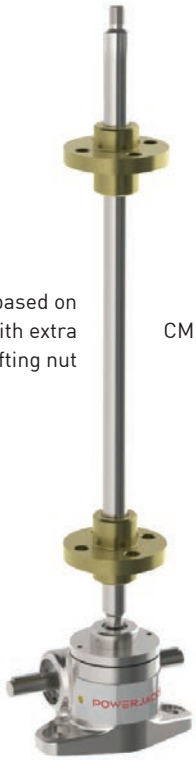
Special screw jack design are divided into 4 categories:

1. E-Class - simple customisation
2. SE-Class - enhanced design for specific performance.
3. HSE-Class - highly enhanced design for specialised performance.
4. XSD - extreme special designs for highly specialised performance.

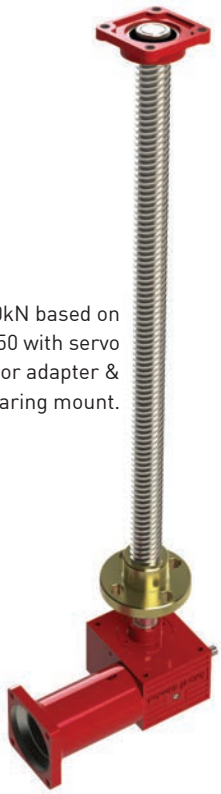
E Class Special Design

Enhances screw jack design by making simple customisation and feature additions. Examples include (but not limited to): Non-Standard Paint, Non-Standard Plating, Non-Standard Lubrication, Non-Standard Seals, Non-Standard Motor Adapter, Plating of Screw Jack Gearbox Housing, 3-Start Thread on Lifting Screw for increased lead, Special Closed Height for Screw Jack, Extended Worm Shaft, etc..

25kN based on CMT0025 with special closed height



10KN based on EMR0010 with extra lifting nut



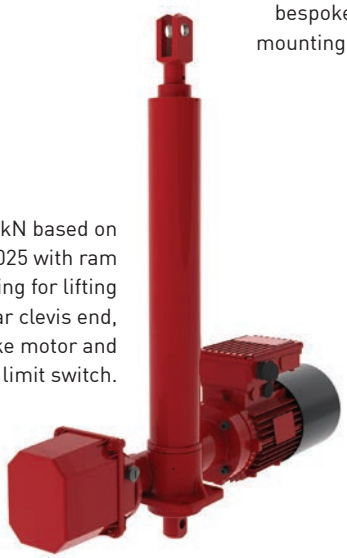
50kN based on CMR0050 with servo motor adapter & bearing mount.

SE Class Special Design

Special Enhancements to screw jack designs where new parts and/or accessories are used to deliver the best performance for the application. Examples include (but not limited to): Integration of Brake to Screw Jack Body, Bespoke End Fitting on Lifting Screw, Lifting Nut with Square Flange, Non-Standard Worm Shaft Design, Cover Pipes on Rotating Screw Jack, etc.

300kN based on EBR0300 with servo motor adapter and bespoke flange and shaft for mounting a safety brake direct to the ball screw.

100kN based on EMT0100 with bespoke clevis end with spherical bearing, trunnions, geared motor and bellows boot.



25kN based on EMR0025 with ram covering for lifting screw, rear clevis end, brake motor and RLS-51 limit switch.

Note
Units are not to scale on illustration

HSE Class Special Design

High Specification Enhancements to screw jack design where significant changes are made to main screw jack design and/or new and/or specialised accessories are integrated. Examples include (but not limited to): Bespoke Clutch on Worm Shaft, Coil Spring Load Limiter, Centre of Gravity Balanced Designs, Bespoke Trunnion Mounts, Telescopic Lifting Screw, Lifting Screw with Left & Right Threaded Sections, Increased Base Thickness for Screw Jack Gearbox Housing etc..

2000kN Based on EMT2000 with bespoke clutches for drives, geared motor integration, monitoring sensors, centre of gravity counter balance and bellows boot.

50kN based on EMT0050 complete stainless steel subsea screw jack with bespoke ROV interface.

200kN based on EMT0200 with bespoke trunnion mount, integrated motor and RLS-51 limit switches, customised fork end and bellows boot.

XSD Class Special Design

eXtreme Special Design for screw jacks where a modification of our existing range is not practical for engineering and/or commercial goals. The way to get the best performance for the application is to design and manufacture a unique product using our state of the art screw jack technology. Examples include (but not limited to): Seismic Rated 3500kN Nuclear Screw Jacks, Large Valve Control Mechanisms, 200degC rated Screw Jacks, Ultra Light Weight Screw Jacks for mobile applications, Solar Tracking Screw Jacks

3500kN Seismic rated Nuclear Screw Jacks complete special design for translating and rotating machine screw jacks.

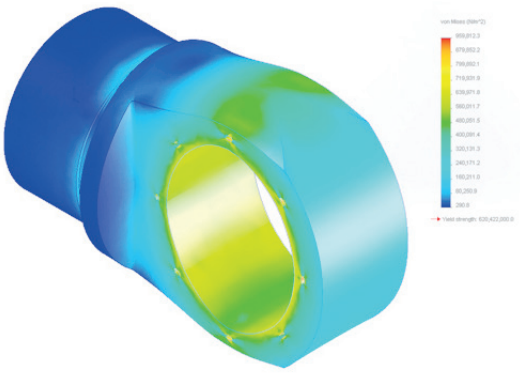
Note
Units are not to scale on illustration

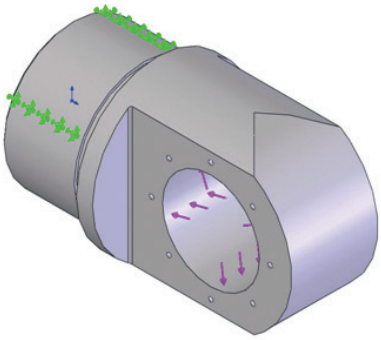
C-Series

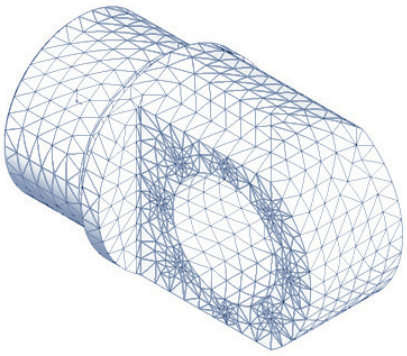
4

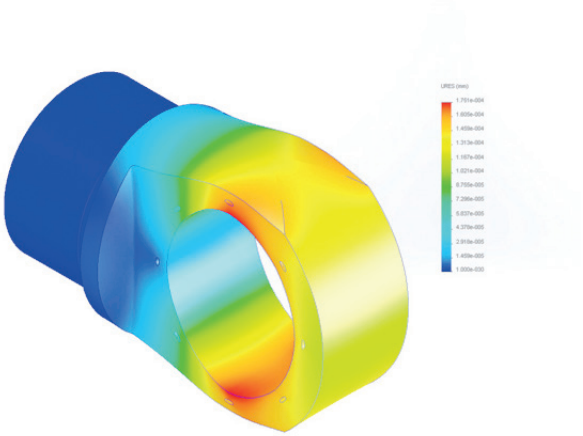
ENGINEERING GUIDE

USEFUL PERFORMANCE & OPERATIONAL DETAIL FOR SCREW JACKS





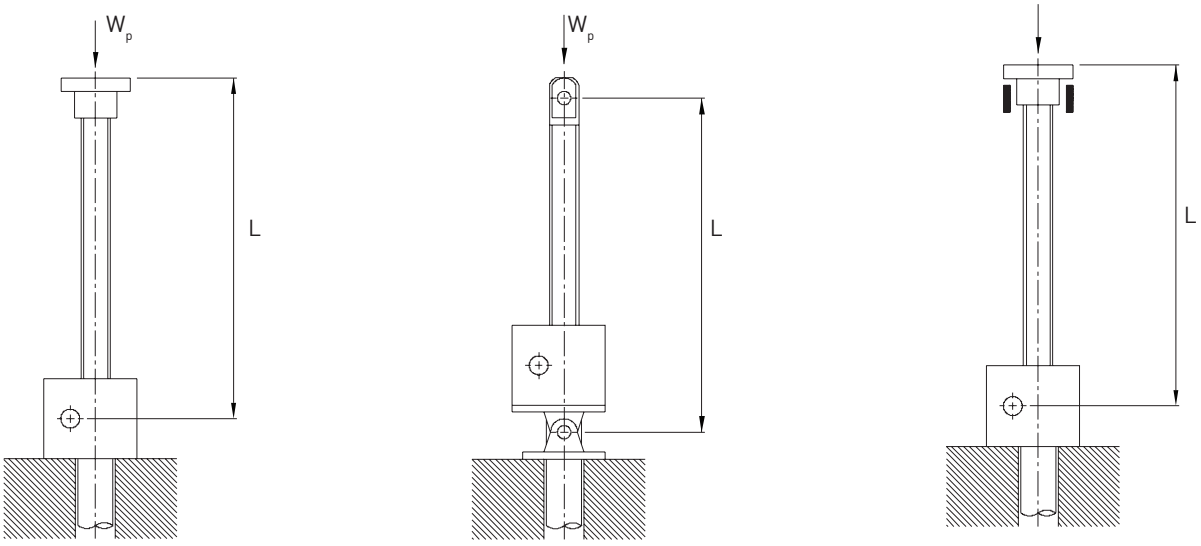




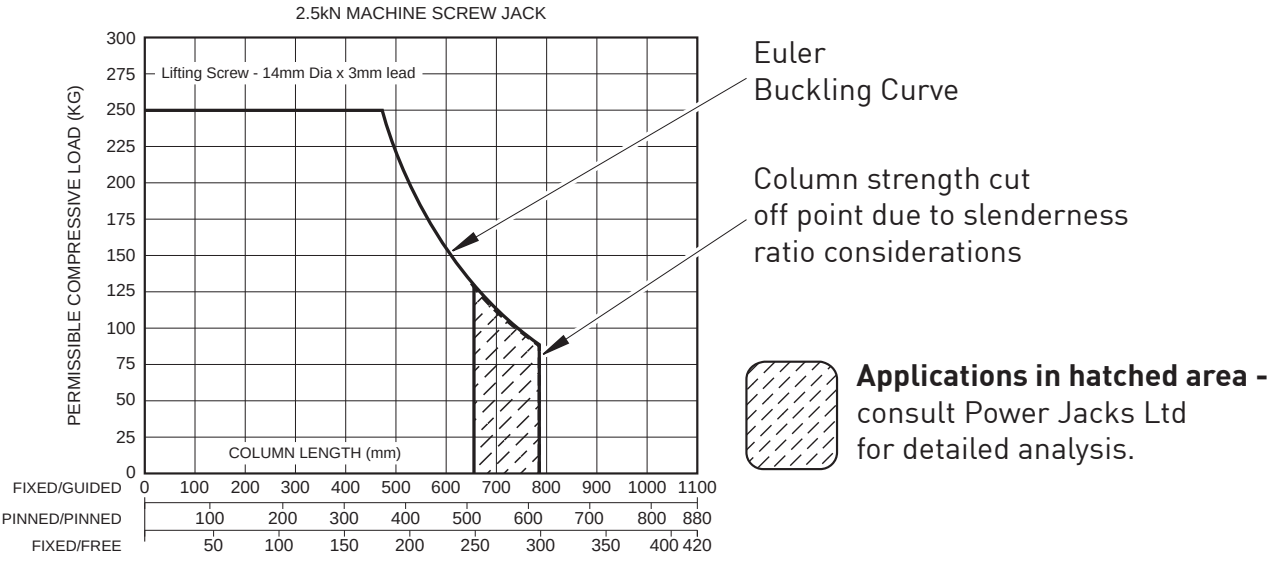
Important Notes

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}

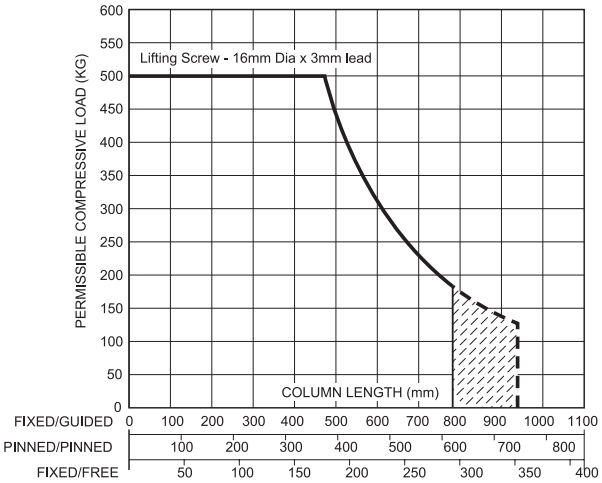


Fixed/Free | Pinned/Pinned | Fixed/Guided

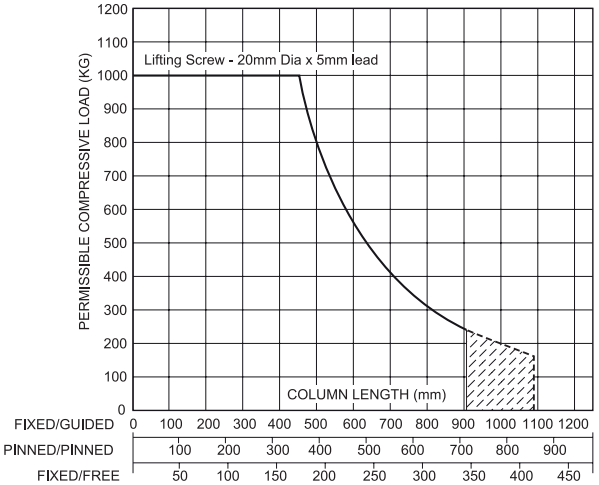


Applications in hatched area - consult Power Jacks Ltd for detailed analysis.

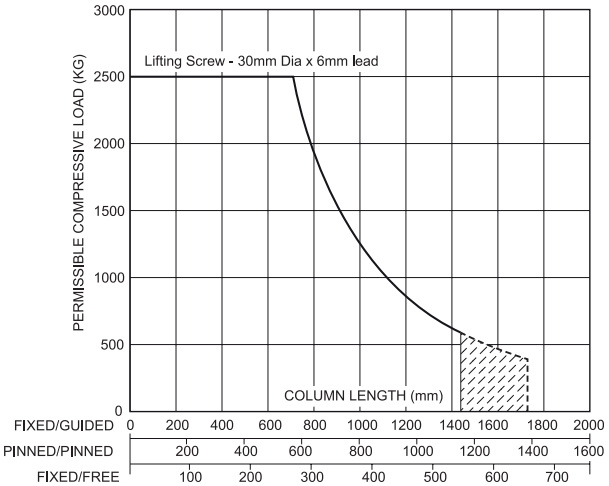
5kN MACHINE SCREW JACK



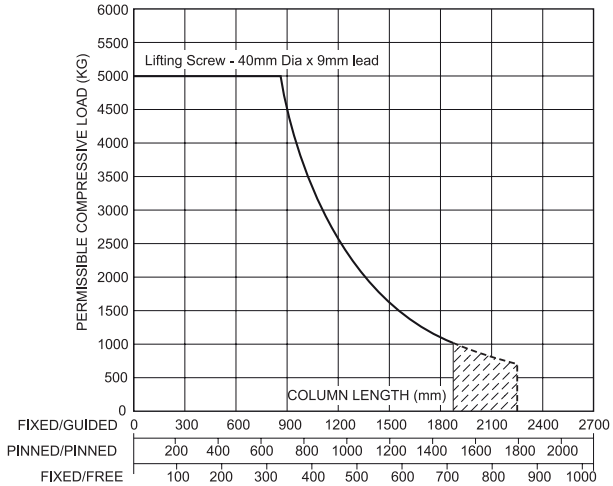
10kN MACHINE SCREW JACK



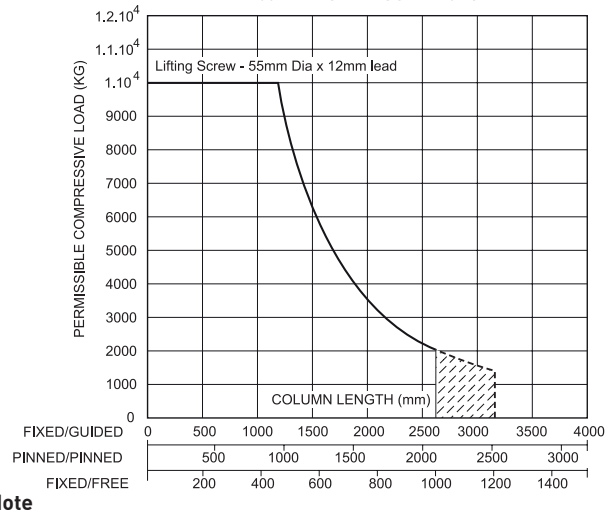
25kN MACHINE SCREW JACK



50kN MACHINE SCREW JACK



100kN MACHINE SCREW JACK

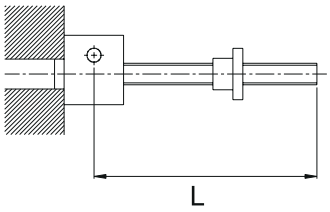


Note

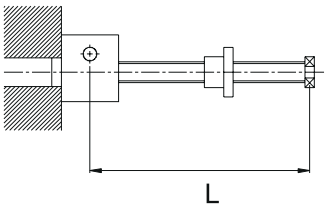
1. Column end constraints based on A.I.S.C. recommended values
2. All screw jack column strength charts show a Euler buckling curve and three scales for the appropriator end condition for the application under analysis.

Critical Screw Speed Factors, F_{cs}

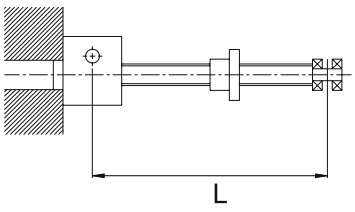
Fixed/Free, F_{cs} = 0.15



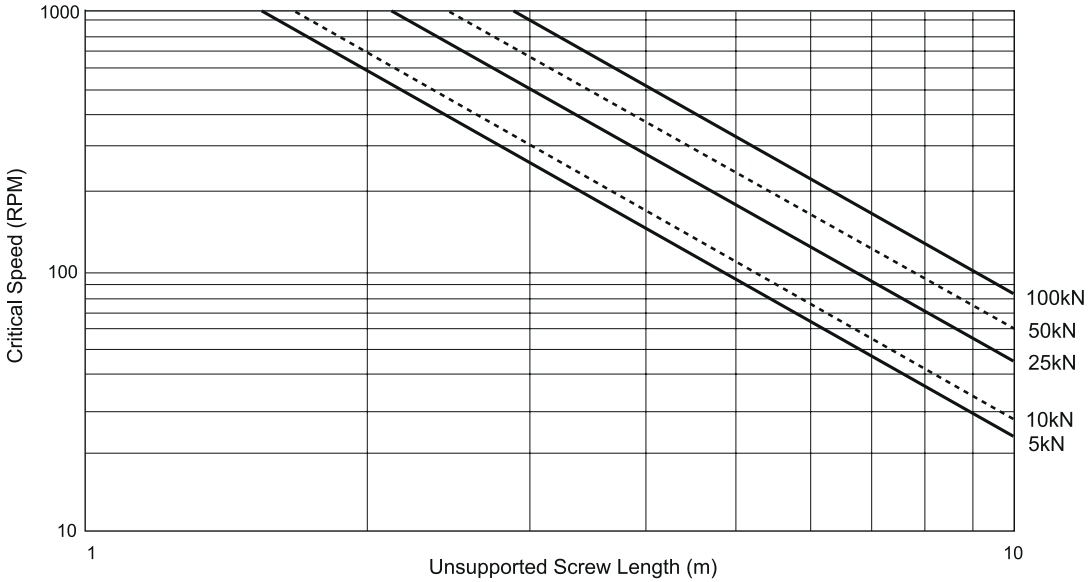
Fixed/Supported, F_{cs}= 0.7



Fixed/Fixed, F_{cs} = 1



Machine Screw Critical Screw Speed (Shaft Whirling)



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

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.

Machine Screw Jacks

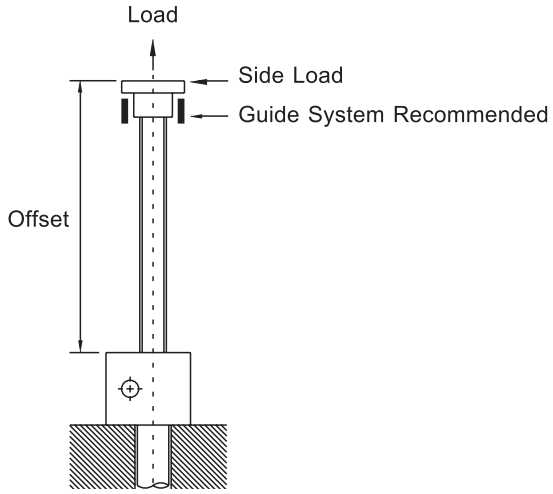
Capacity (kN)	Screw Diam (mm)	Lead (mm)	Key Torque (Nm)
5	16	0.003	8
5	16	0.006	11
10	20	0.005	22
10	20	0.010	30
25	30	0.006	76
25	30	0.012	102
50	40	0.009	210
50	40	0.018	290
100	55	0.012	575
100	55	0.024	780

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

Machine Screw Jacks

Metric Machine Screw Jack					
Capacity (kN)	5	10	25	50	100
Max. Side Load 300mm Offset (N)	100	150	540	1130	2900

*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.

Machine Screw Jacks

Stroke (mm)	5kN	10kN	25kN	50kN	100kN
100	0.7	0.6	0.8	1.0	1.0
200	1.3	1.1	1.4	1.7	1.7
300	1.9	1.5	1.9	2.3	2.3
400	2.5	2.0	2.5	2.9	2.9
500	3.1	2.4	3.1	3.6	3.6
600	3.7	2.8	3.6	4.2	4.2
700	4.3	3.3	4.2	4.8	4.8
800	4.8	3.7	4.8	5.5	5.5
900	5.4	4.2	5.3	6.1	6.1
1000	6.0	4.6	5.9	6.7	6.7

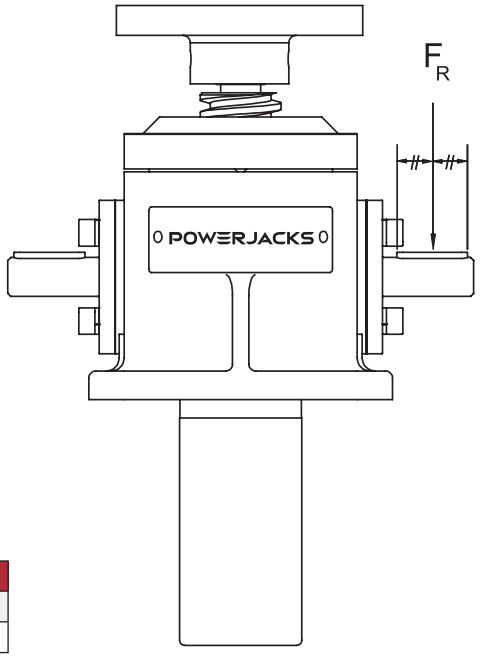
Notes

1. Values quoted above are the maximum expected lateral movement for the given raise and screw jack model.
2. Does not allow for possible deflection due to side loads.
3. Lateral movements are for information only. For best results we recommend guides where possible.
4. Lateral movements will be reduced if the screw jack is fitted with secondary guides.
5. The above movements apply to machine screw jack only
6. Where lateral movement is critical consult Power Jacks for exact values for the application.

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

Machine Screw Jack					
Capacity (kN)	5	10	25	50	100
Radial Load (N)	180	325	380	740	1000

Machine Screw Jacks

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

Note

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

Anti-Backlash Option

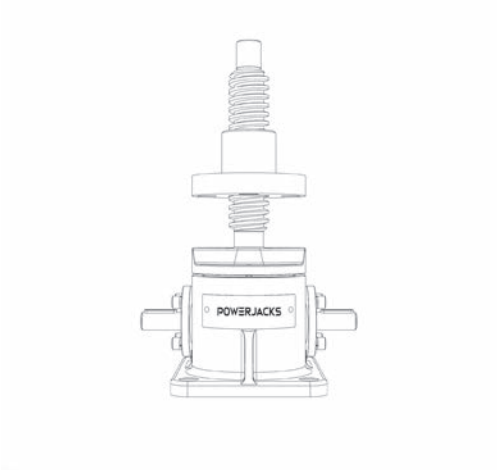
Machine screw jacks fitted with the anti-backlash feature can be adjusted for screw thread and bearing clearances to a minimum of 0.025 mm (0.001"). Some clearances must be maintained to keep torque requirements within reason and to provide adequate space for a lubrication film to form.

Pitch Deviation of Lifting Screw

Lifting Screw	Pitch Deviation
Machine Screw	0.05mm → 0.25mm per 300mm

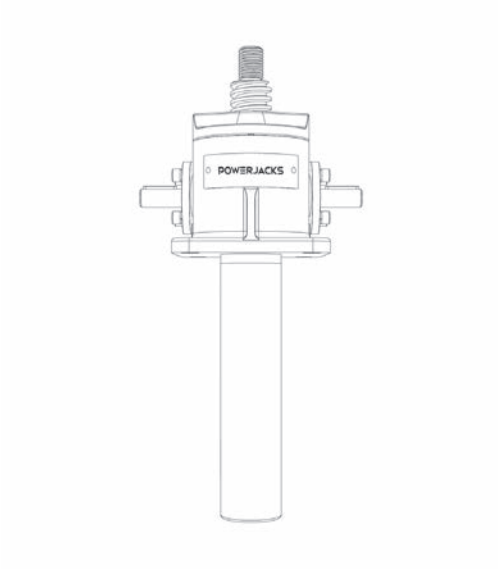
Note

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.



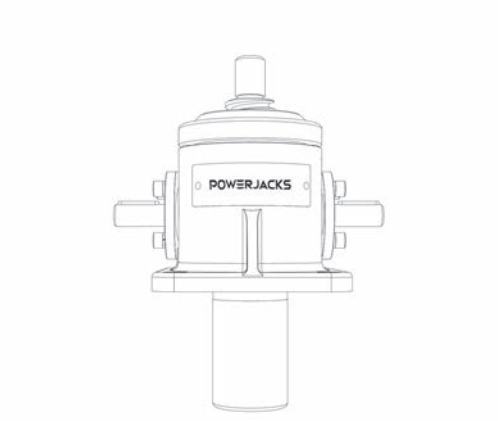
How a Rotating Screw Jack Works

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%.

Axial Backlash in a Screw Jack

Backlash in Standard Machine Screw Jacks

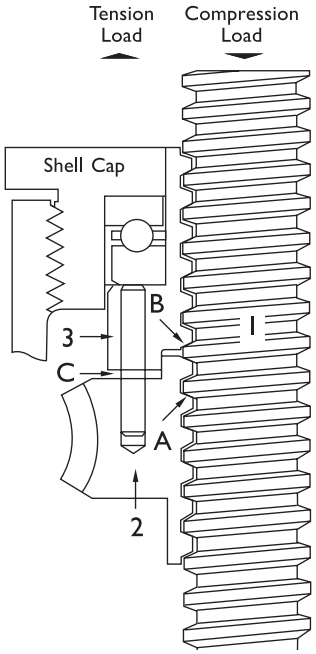
Machine screw jacks have backlash due not only to normal manufacturing tolerances, but to the fact that there must be some clearances to prevent binding and galling when the screw jack unit is under load. Usually, the axial backlash is not a problem unless the load on the screw jack unit changes between compression and tension. If a problem does exist, a unit with the anti-backlash feature should be considered.

Screw Jacks with the Anti-Backlash Device

The anti-backlash device reduces the axial backlash between the lead screw and nut assembly to a regulated minimum. As the backlash will increase as the lead screw thread on the gear wears the anti-backlash device can be adjusted to remove this normal condition.

How the Anti-Backlash Device Works

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



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

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

To avoid binding and excessive wear do not adjust lifting screw backlash to less than 0.025mm (0.001"). This will reduce the calculated separation (C) between the anti-backlash nut and worm gear and will reduce the backlash between the worm gear threads and the lifting screw to the desired minimum value.

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

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 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 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 90ºC (194ºF) 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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