Screw Jack Selection

Product codes

Having selected a suitable screw jack using the criteria given on pages 4 - 7, a product code to specify the jack should be developed using the following coding system.

<table>
<thead>
<tr>
<th>Jack Model</th>
<th>Nominal Capacity (kN)</th>
<th>Screw Jack</th>
<th>Gearbox Execution</th>
<th>Gear Ratio</th>
<th>End Attachment</th>
<th>Protective Bellows</th>
<th>Travel of Jack</th>
</tr>
</thead>
<tbody>
<tr>
<td>J00</td>
<td>5</td>
<td>Translating TS</td>
<td>Upright</td>
<td>Low</td>
<td>Flanged end</td>
<td>P.V.C</td>
<td>V</td>
</tr>
<tr>
<td>J01</td>
<td>10</td>
<td>Keyed KS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J02</td>
<td>25</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J03</td>
<td>50</td>
<td>Translating with backlash limiter TB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J04</td>
<td>100</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>J05</td>
<td>200</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J06</td>
<td>300</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J07</td>
<td>500</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J08</td>
<td>750</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J09</td>
<td>1000</td>
<td>Rotating RS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example coding: **J05-KS-U-L-F-N-0500**

This describes a 200kN Jack fitted with a keyed screw, upright gearbox, low gear ratio, fitted with a flanged end, without bellows. The unit is capable of 500mm travel. In cases where a customised design involving non-standard features is required, the basic coding should be supplemented by the word ‘non-standard’ and those features either described, shown on a sketch, or a specific drawing number quoted.

When the order is being processed the product code will be confirmed with a suffix indicating the appropriate non-standard feature reference ie NS1, NS2 etc.

**Notation of symbols table**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>cf</td>
<td>Coefficient of constraint</td>
</tr>
<tr>
<td>D</td>
<td>Major O/D of jack lifting screw - mm</td>
</tr>
<tr>
<td>d_r</td>
<td>Root diameter of jack lifting screw - mm</td>
</tr>
<tr>
<td>d_m</td>
<td>Minimum root diameter required - mm</td>
</tr>
<tr>
<td>f</td>
<td>Coefficient of bearing stiffness</td>
</tr>
<tr>
<td>i</td>
<td>Gear ratio</td>
</tr>
<tr>
<td>L_u</td>
<td>Ultimate load - kN</td>
</tr>
<tr>
<td>L_d</td>
<td>Dynamic load applied to a jack - kN</td>
</tr>
<tr>
<td>L_n</td>
<td>Nominal capacity - kN</td>
</tr>
<tr>
<td>L_s</td>
<td>Total dynamic load - kN</td>
</tr>
<tr>
<td>L_f</td>
<td>Total static load - kN</td>
</tr>
<tr>
<td>l</td>
<td>Length of screw - mm</td>
</tr>
<tr>
<td>l_p</td>
<td>Pitch of lifting screw thread - mm</td>
</tr>
<tr>
<td>l_t</td>
<td>Length of travel - mm</td>
</tr>
<tr>
<td>O_d</td>
<td>Operating time per day - min</td>
</tr>
<tr>
<td>O_l</td>
<td>Operating time in life - hour</td>
</tr>
<tr>
<td>O_y</td>
<td>Operating time per year - hour</td>
</tr>
<tr>
<td>P_i</td>
<td>Input power - kW</td>
</tr>
<tr>
<td>P_s</td>
<td>System power - kW</td>
</tr>
<tr>
<td>S_c</td>
<td>Critical speed - rpm</td>
</tr>
<tr>
<td>S_c_i</td>
<td>Worm input speed - rpm</td>
</tr>
<tr>
<td>S_r</td>
<td>Travel rate - mm/rev</td>
</tr>
<tr>
<td>S_s</td>
<td>Lifting screw rotational speed - rpm</td>
</tr>
<tr>
<td>S_s_e</td>
<td>Travel speed - mm/min</td>
</tr>
<tr>
<td>T_i</td>
<td>Input torque for nominal capacity - Nm</td>
</tr>
<tr>
<td>T_s</td>
<td>Input torque for dynamic load - Nm</td>
</tr>
<tr>
<td>n_e</td>
<td>Overall efficiency of jacks - %</td>
</tr>
<tr>
<td>n_s</td>
<td>System efficiency factor</td>
</tr>
<tr>
<td>9550</td>
<td>Constant for converting Nm/Rev/J/min to kW</td>
</tr>
<tr>
<td>392.55x10^5</td>
<td>Constant for critical speed</td>
</tr>
</tbody>
</table>
Design and specification

Kelston's design engineers are on hand to study and clarify the customer's design requirements. Details are agreed prior to the selection process. Kelston can also provide design support to aid with the layout of the jacking system or we supply a total design solution and supply a total service.

We can advise on screw jack selection, drive train and system configuration, drive motor and control systems, and installation sequences and techniques. It is important at the design stage that the installation and maintenance instructions have been taken into consideration, see page 15.

Lifting speed

An optimum lifting or travel speed is required and several options are available to achieve this speed, or as close to it as possible, which include:

1. Lifting screw lead, i.e., the linear distance travelled along the lifting screw for each revolution of the screw.
2. Worm gear reduction ratio, i.e., the ratio between the rotational speed of the input worm shaft to the output lead screw drive worm wheel. Rotational speed to the jack input worm shaft. This can be varied by altering the drive motor basic speed by gearing or by an electrical frequency inverter or hydraulic control valves.

Loading

The known total system load may have a dynamic and a static element to it.

The dynamic load is the load imposed on the Jack when moving and should take into consideration accelerating forces.

The static load is the load imposed on the jack when not moving and may include some process-imposed load when the jack is in a static state. Screw jacks should be deployed in the system so that the total load is equally distributed.

Operating cycles

Long travel, high loads and continuous operating cycles can produce excessive heat. It is advisable that the thermal capacity of the jack is checked out by a Kelston engineer where prolonged use is required. Failure to recognise this problem can result in lubrication temperature limits being exceeded, followed by breakdown of lubrication.
Screw Jack Selection

System guide

Attachment
The travelling elements of screw jacks must be attached to the load to prevent them from rotating and to allow linear movement.

In the case of a TS screw jack this is the end of the lifting screw and in the case of a RS screw jack it is the lifting nut.

In certain applications where the lifting screw has to be lowered to allow the load to be removed or the lifting screw cannot be attached to the load, then a keying arrangement can be added internally to the jack to allow the lifting screw to translate. This screw jack version is designated KS (keyed screw).

Mounting
The structure on which the Jacks are to be mounted should have ample strength to carry the maximum load and should be rigid enough to prevent deflection or distortion of the jack support members.

The jack mounting foot has been designed to accommodate fixing by using socket headed cap screws to BS 4168.

Safety distances between moving and stationary components must be established otherwise there is the risk of the system blocking and causing damage to the screw jacks and system components.

The screw jack should be specified to have a greater travel than is needed in the actual installation. This will create clearance and allow for safe overrun should it happen.

Guiding
Jacking systems are influenced by the structure which is being moved.

Guide systems and compensation must be employed to limit the effects of expansion, contraction and deflection, and guide the moving parts parallel to the jack lifting screws.

Maintenance and lubrication
The design must allow adequate access to inspect and carry out routine maintenance including onsite re-lubrication.

Operating conditions
At the design stage, it is important to consider the ambient conditions that the jack will be working in and, with a Kelston engineer, make provision for extra sealing, cooling or preheating, or whatever is required.
Screw Jack Selection

Selecting a screw jack

1. A decision in conjunction with Kelston will have been taken to use a screw jack.

2. To help determine the correct selection of jack, complete the application data sheet on page 16. The configuration will have been selected from either, upright or inverted, rotating screw or translating screw, keyed screw or non-keyed and the number of jacks required for the system will also have been decided. See illustrations below.

Inverted Rotating Screw Jack  
Upright Translating Non-Keyed Screw Jack  
Inverted Translating Keyed Screw Jack

3. The operating orientation will have been determined, either vertical, horizontal or moving through an arc with trunnion mounting. See illustrations below.

Horizontal  
Vertical  
Moving through an arc

4. Determine the maximum dynamic load $L_{td}$ and the maximum static load $L_{ts}$ imposed on the jack and the direction in which these loads are applied.

\[
L_{s} \text{ (Static load applied to a jack kN)} = \frac{L_{ts} \text{ (Total static load kN)}}{\text{Number of jacks}}
\]

\[
L_{d} \text{ (Dynamic load applied to jack kN)} = \frac{L_{td} \text{ (Total dynamic load kN)}}{\text{Number of jacks}}
\]
Screw Jack Selection

Selecting a screw jack

5. Determine if the jack with the nominal rating just greater than the maximum load (static or dynamic) will satisfy the minimum selection criteria. Select the jack model from table below.

<table>
<thead>
<tr>
<th>Jack Model</th>
<th>J00</th>
<th>J01</th>
<th>J02</th>
<th>J03</th>
<th>J04</th>
<th>J05</th>
<th>J051</th>
<th>J06</th>
<th>J07</th>
<th>J08</th>
<th>J09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Capacity (kN)</td>
<td>5</td>
<td>10</td>
<td>25</td>
<td>50</td>
<td>100</td>
<td>200</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>750</td>
<td>1000</td>
</tr>
</tbody>
</table>

See relevant jack model technical data section as shown

**Technical Data**

<table>
<thead>
<tr>
<th>Worm Gear Reduction Ratios</th>
<th>High (Hi)</th>
<th>Low (Lo)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20:1</td>
<td>5:1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lifting Screw D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezoidal thread</td>
</tr>
<tr>
<td>Pitch (l₁)</td>
</tr>
<tr>
<td>Lead single start (q)</td>
</tr>
<tr>
<td>Root diameter (d₁)</td>
</tr>
</tbody>
</table>

- Keyed screw jacks input torque values will increase by 8%
- Axial backlash limiters may increase the body height

6. Calculate the jack input speed \( S_{i,n} \) rpm.
The required travel speed \( S_{t} \) mm/min for the application will be known. From the selected model’s technical data, select a travel rate \( S_{r,s} \) that will satisfy the travel speed for the application. The input speed \( S_{i,n} \) can now be calculated.

\[
S_{i,n} = \frac{S_{t}}{S_{r,s}} \text{ (Worm input speed - rpm)}
\]

7. Calculate the required torque \( T_{i,n} \) Nm.
From the selected jack model data page note the input torque \( T_{i} \) for the nominal capacity, lead and reduction ratio.

\[
T_{i,n} = \frac{T_{i}}{L_{c,d}} \times L_{n,1} \text{ (Input torque for dynamic load Nm)}
\]

8. Calculate the input power \( P_{i,n} \) kW.

\[
P_{i,n} = \frac{T_{i,n}}{9550} \times \frac{S_{i}}{S_{t} \text{ (Worm input speed - rpm)}} \text{ (Power input - kW)}
\]

9. Calculate Life hours \( O_{l} \) hours.

\[
O_{l} = \frac{l_{1 \text{, Length of travel mm}} \times 2}{S_{t} \text{ (Travel speed mm/min) \times 60min/hr}} \times \text{x no. of cycles/day \times x no. of days/year \times x years in life}
\]

10. Check that the calculated input power does not exceed the power rating, see power rating curves for the selected jack model. The gear rating figures shown are for 400 running hours. Where input speeds exceed 600rpm, careful consideration must be given to the type of lubrication.

If the power rating is exceeded, check against the next model size up and re-calculate steps 5 to 11.
Screw Jack Selection

Selecting a screw jack

11. If the sense of load direction puts the lifting screw in compression, check the column stability.

**Compression Load Conditions**

The bearing support at the worm wheel can be considered to be an almost fixed end. This leads to the three general conditions of end fixing shown. These conditions give the coefficients of constraint (cf) as indicated. Other values of (cf) as appropriate can be used.

- The minimum screw root diameter \( d_{mn} \) mm is calculated using the following formula:

\[
d_{mn} = \sqrt[4]{\frac{L_u \times l^2}{100 \times cf}}
\]

- \( L_u \) = Ultimate load = 1.25 \( L_s \) kN
- \( L_s \) = Static load kN
- \( l \) = Length of screw mm
- \( cf \) = Coefficient of constraint
- \( d_{mn} \) = Minimum root diameter mm
- \( d_r \) = Screw root diameter > \( d_{mn} \) mm

+++If this column check fails, check against the next model size up and recalculate steps 5-11.
Selecting a screw jack

If the screw jack configuration is a rotating screw, check the critical speed.

**Critical Speed**

- Where a rotating screw jack is selected, the critical speed of the screw must also be checked. Failure to select a screw with sufficient diameter for the rotating speed will result in vibration and noise. One of the bearing support conditions shown will generally apply. The end of the screw which is mounted in the jack gear box can be considered as a rigid double bearing in all cases.
- The three general cases of end bearing arrangement giving the coefficients of bearing stiffness ‘f’, as appropriate, can be used.
- To avoid undue noise and vibration, and possible failure, the screw rotational speed should not be within the speed range +20% of the critical speed.

\[
S_c = \frac{f \times d_r}{l} \times 392.55 \times 10^5
\]

- \(S_c\) = Critical speed rpm
- \(f\) = Coefficient of bearing stiffness
- \(d_r\) = Screw root diameter mm
- \(l\) = Length of screw mm

The screw rotational speed < 0.8 \(S_c\) or > 1.2 \(S_c\)

If the critical speed check fails, check against the next model size up and recalculate steps 5-12.

**Thermal**

By its design, a worm screw jack can generate thermal problems. These generally arise between the screw thread and the mating thread in the worm wheel of the lifting nut. This can occur where long screws, high-duty cycles or high loads relative to the nominal capacity of the jacks selected are involved. It is advisable to have the thermal capacity of the jack assessed by a Kelston engineer. Failure to recognise this problem can result in lubrication temperature limits being exceeded, followed by breakdown of lubrication. This will result in metal-to-metal contact and possible friction welding of the components, leading to high power demands from the primary drive and ultimate failure of the system.
System layout guide

Once the power for one jack has been calculated, it is then necessary to determine the power required for the complete system. The following factors should be used according to the number of jacks in the system.

System efficiency factor ($\eta_s$)
- 2 Jacks = 0.92
- 3 Jacks = 0.90
- 4 Jacks = 0.83
- 6 Jacks = 0.78

Where jacks are arranged in line with the motor driving from one end, the jack worm shaft can transmit up to 300% of the specified input torque quoted for the nominal capacity. The power for the system is calculated as follows:

\[
P_s (\text{System power kW}) = \frac{P_{\text{in}} (\text{Power input kW}) \times \text{number of jacks}}{\eta_s (\text{System efficiency factor})}
\]
Establish the parameters for the lifting system by completing the check list on page 16

Select appropriate screw jack from model pages based on the max static/dynamic load required

Calculate input worm speed calculate torque and power required check power rating select larger screw jack if required

How is the screw loaded?

Calculate load tension

Load compression

Check column stability

Screw stability select larger screw jack if required and re-calculate

System layout

Calculate system power

Select motor

Define additional features

Order selection
Sample calculations 1

Example 1

Application: 4 off upright translating screw jack system arranged in a plan ‘H’ configuration required to raise and lower an applied total dynamic and static load of 130kN evenly distributed over the 4 off screw jacks. The load is to be raised and lowered over a working travel of 1400mm at a travel speed of 750mm/minute. The total applied load is compressive and the load is well guided. Jacks are base mounted with a fixed end on structure.

The duty is 4 cycles per day, 320 days per year, with a 5-year design life. The jacking system is located indoors in a clean, dry atmosphere at a constant temperature of 20°C.

1. **Selection of screw jack**
   Based upon the total applied dynamic load of 130kN over the 4 off screw jacks the load to be raised and lowered by 1 off screw jack is:

   \[
   L_d = \frac{L_{td} \times \text{Number of jacks}}{\text{Total dynamic load kN}}
   \]

   \[
   L_d = \frac{130kN \times 4}{4} = 32.5 kN
   \]

   Total load per jack indicates a screw jack model J03 (50kN nominal capacity).

2. **Calculate input worm speed**
   Selecting a 6:1 ratio

   \[
   S_{in} = \frac{S_r \times S_t}{S_r \times S_t} = \frac{S_r \times S_t}{1.5 \times 1.5}
   \]

   \[
   S_{in} = \frac{750 \text{mm/min}}{1.5 \text{mm/rev}} = 500 \text{rpm}
   \]

3. **Check the power rating**

   \[
   T_{in} = \frac{T_n \times L_d}{L_n \times L_d}
   \]

   \[
   T_{in} = \frac{51 \text{Nm} \times 32.5 \text{kN}}{33.15 \text{Nm} \times 50 \text{kN}} = 33.15 \text{Nm}
   \]

   \[
   P_{in} = \frac{T_{in} \times S_{in}}{9550 \text{ (Constant for converting Nm/Rev to kW)}}
   \]

   \[
   P_{in} = \frac{33.15 \text{Nm} \times 500 \text{rpm}}{9550} = 1.73 \text{kW}
   \]
Screw Jack Selection

Sample calculations 1

\[
O_t \text{ (Operating time in life hrs)} = \frac{L_t \text{ (Length of travel mm)} \times 2}{S_v \text{ (Travel speed mm/min)} \times 60 \text{ min/hr}} \times \text{no. of cycles/day} \times \text{no. of days/year} \times \text{years in life}
\]

\[
= \frac{1400 \text{ mm} \times 2}{750 \text{ mm/min}} \times 4 \text{ cycles} \times 320 \text{ days} \times 5 \text{ years} = 398.22 \text{ hrs}
\]

Design operational total running hours are 398.22 hours.
Power rating taken from graph is 2.60kW for 400 hours life therefore model J03 is suitable.

4. **Check column stability** - well guided cf(coefficient of constraint) = 3
Compressive applied load both static and dynamic
Static load \( L_s = 32.5 \text{kN} \); dynamic load \( L_d = 32.5 \text{kN} \)
Check Screw minimum section diameter \( d_{mn} \)
Applying column formula to establish

\[
d_{mn} \text{ (Min root dia mm)} = \sqrt[4]{\frac{L_c \text{ (Ultimate load)} = 1.25 \times L_s \text{ (kN)} \times L \text{ (Length of screw)}}{100 \times cf \text{ (Coefficient of constraint)}}}
\]

or

\[
= \sqrt[4]{\frac{32.5 \text{kN} \times 1.25 \times 1600}{100 \times 3}} = \phi 24.26 \text{mm}
\]

Model J03 screw root diameter \( d_r = 28.6 \text{mm} \)
The screw jack model J03 lifting screw is therefore suitable.

5. **System layout and system power requirements.**
Taking the calculated power input \( P_{s in} \) we can establish the absorbed running system power to raise and lower the total load of 130kN at a rate of 750mm/minute.

System power for a 4off jack system is:

\[
P_s \text{ (System power kW)} = \frac{P_{s in} \text{ (Power input kW)} \times \text{number of jacks}}{\eta_s \text{ (System efficiency factor)}}
\]

or

\[
= \frac{1.73 \text{kW} \times 4\text{off}}{0.83} = 8.33 \text{kW}
\]

6. **Installed motor power**
As the calculated absorbed running power is 8.33kW, the installed motor power will be 11kW.

7. **Additional features**
11kW electric motor
3off bevel gearboxes with gear ratios of 3:1 & 1:1
Set of interconnecting drive shafts and drive couplings
Set of drive shaft support bearings

8. **Selected screw jack product code is:**
Model J03TSUFN1400 (refer to product coding on page 1).
Example 2

Application: screw jack system of 2 off mechanically synchronised jacks via interconnecting drive shafting arranged in a ‘T’ plan layout configuration. The jacking system is required to raise and lower a well guided structure vertically over a working travel of 1600mm at a constant travel speed of 800mm/minute. The applied loads will be compressive with the total static load being 500kN at full travel and 300kN dynamic throughout the travel. The applied static load is held for 1 hour at full extension and then the system is lowered under the dynamic load to a parked position and then the cycle is repeated.

The duty cycle is one full cycle every 3 hours, 12 hours per day, 300 days per year with a 5-year design life. The environment is dusty with some moisture and a 30°C ambient temperature.

1. **Selection of screw jack**

Based upon the total applied static load of 500kN over the 2 off screw jacks, the applied static load on 1 off screw jack is:

\[
L_s = \frac{L_{ts}}{2} = \frac{500kN}{2} = 250kN
\]

The static load applied to each jack of 250kN indicates a screw jack model J06 (300kN nominal capacity).

2. **Calculate input worm speed**

Selecting a 10.66:1 ratio

\[
S_{in} = \frac{S_t \times S_r}{S_{in}} = \frac{800mm/min \times 1.5mm/rev}{1.5mm/rev} = 533rpm
\]

3. **Calculate the power rating**

\[
L_d = \frac{L_{td}}{2} = \frac{300kN}{2} = 150kN
\]

\[
T_{in} = \frac{T_{n} \times L_{td}}{L_{n}} = \frac{382Nm \times 150kN}{300kN} = 191Nm
\]

\[
P_{in} = \frac{T_{in} \times S_{in}}{9550 \times S_{in}} = \frac{191Nm \times 533rpm}{9550} = 10.66kW
\]

Power rating taken from graph is 6.5kW so the J06 jack is not suitable, consider next size range.
Now consider jack model J07

2a. Calculate input worm speed
Selecting a 10.66:1 ratio

\[ S_i \text{ (Worm input speed - rpm)} = \frac{S_t \text{ (Travel speed - mm/min)}}{S_r \text{ (Travel rate - mm/rev)}} \]

or

\[ \frac{800 \text{ mm/min}}{1.5 \text{ mm/rev}} = 533 \text{ rpm} \]

3a. Check the power rating

\[ L_d \text{ (Dynamic load applied to jack kN)} = \frac{L_m \text{ (Total dynamic load kN)}}{\text{Number of jacks}} \]

or

\[ \frac{300 \text{ kN}}{2} = 150 \text{ kN} \]

\[ T_d \text{ (Input torque for dynamic load Nm)} = \frac{T_c \text{ (Input torque for nominal capacity Nm)}}{L_d \text{ (Dynamic load applied to jacks kN)}} \times L_m \text{ (Nominal capacity kN)} \]

or

\[ \frac{715 \text{ Nm} \times 150 \text{ kN}}{500 \text{ kN}} = 214.5 \text{ Nm} \]

\[ P_o \text{ (Power input - kW)} = \frac{T_o \text{ (Input torque for dynamic load - Nm)}}{9550 \text{ (Constant for converting Nm/Rev(j/min) to kW)}} \times S_i \text{ (Worm input speed - rpm)} \]

or

\[ \frac{214.5 \text{ Nm} \times 533 \text{ rpm}}{9550} = 11.97 \text{ kW} \]

Power rating taken from graph is 15.5kW, so the J07 jack is suitable.

4. Check column stability – well guided cf(coefficient of constraint) = 3
Compressive applied load per jack is 250kN

\[ d_m \text{ (Min root dia mm)} = 4 \left( \frac{L_u \text{ (Ultimate load)} x L_v \text{ (Length of screw)}}{100 \times cf \text{ (Coefficient of constraint)}} \right)^{1/4} \]

or

\[ \frac{250 \text{ kN} \times 1.25 \times 2000^2}{100 \times 3} = \Omega 45.18 \text{ mm} \]

The model J07 lifting screw root diameter \( d_r \) = 92mm. The screw jack model J07 lifting screw is therefore suitable.

5. System power
System power for a 2off jacking system is:

\[ P_s \text{ (System power kW)} = \frac{P_o \text{ (Power input kW)} \times \text{number of jacks}}{\eta_s \text{ (System efficiency factor)}} \]

or

\[ \frac{11.97 \text{ kW} \times 2\text{off}}{0.92} = 26.02 \text{ kW} \]

6. Installed motor power
As the calculated absorbed running power is 26.02kW, the installed motor power will be 30kW

7. Additional features
1off 30kW/533rpm geared motor unit
Drive couplings and set of drive shafting
1off 3 way 1:1 bevel gearbox
Drive shafting support bearing assemblies

8. Selected screw jack product code is: model J07TSULFV0800 with PVC bellows fitted against ambient dust and moisture. (refer to product coding on page 1).
Installation and maintenance instructions

1. The jack should be received in good condition and free from any transport distress. If in doubt contact our technical sales team on +44(0)117 947 3100.

2. The structure on which the jacks are mounted should have ample strength to carry the maximum load and should be rigid enough to prevent deflection or distortion of the jack support members.

3. The jack mounting foot has been designed to accommodate fixing by using socket-headed cap screws to BS 4168. The jack should have a greater raise than is needed in the actual installation. Should it be necessary to operate the jacks at the extreme limits of travel, it should be done with caution.

4. The jack should not be closed below the specified closed height dimension.

5. The jack should be installed by competent and trained personnel.

6. The jack should be aligned in the installation so that no external forces are imposed on the unit. The lifting screws should be perfectly plumb and parallel to the guide system.

7. A load greater than the rated load must not be imposed on the jack.

8. Rotating screw – The lifting screw pilot end should be supported in a bearing and be well lubricated.

9. Translating screw – The screw end fitting should be fitted with care. The fitting should be axially shocked home and radial pinned with dog point socket-set screws, the dog point holes being drilled to cause minimal damage to the threads. The jack end fittings, where articulated, and all pins and linkages must be well lubricated.

10. End of stroke limit switches should be commissioned before operating the jacking system automatically. If during installation the jack must be powered, sufficient personnel should be made available and extreme care must be taken to ensure that the unit or the load does not bottom out.

Maintenance

1. Good practice with regard to cleanliness and housekeeping should be maintained.

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

3. Jacks fitted with a backlash Limiter – when the backlash has gone out of acceptable limits, adjust the end cap setting gap as described on the installation assembly. When the setting gap has reached its minimum size, the safe useful life of the gear/screw mesh has been used up and the gear set and lifting screw must be replaced.

4. On a scheduled basis:
   a) Where fitted, the operation of emergency limit switches should be checked.
   b) Holding down bolt tightness should be checked.
   c) Lubricant in the jack body should be topped up to replace any being lost through normal migration.
   d) Lubricant on the screw should be applied to replace any wiped off due to normal operation of the jack.

Lubrication

1. The jacks are shipped with the jack bodies packed with grease and the lifting screw coated with molybdenum disulphide dry film spray. Note: Before operation, the lifting screw should be coated with the recommended grease. The grease is a high temperature bentone clay-thickened, mineral-oil base with molybdenum disulphide additives.

2. The proprietary grease used in the factory fill is:
   FOREST LUBRICANTS – MOLY-BENTONE MULTI- PURPOSE GREASE Z.1735/2

3. Please consult a Kelston engineer for details of alternative lubricants that are available.
Screw Jack Selection

Application data sheet

<table>
<thead>
<tr>
<th>Project Reference:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: / /</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting position of jack/actuator</th>
<th>VERTICAL</th>
<th>HORIZONTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of jacks/actuators in the system</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total dynamic Load</th>
<th>kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total static load</td>
<td>kN</td>
</tr>
<tr>
<td>Side thrust by system (not recommended)</td>
<td>kN</td>
</tr>
<tr>
<td>Off centre load (if any)</td>
<td>kN</td>
</tr>
<tr>
<td>Off centre distance (if any)</td>
<td>mm</td>
</tr>
<tr>
<td>Max. dyn. load/unit compression/tension</td>
<td>kN</td>
</tr>
<tr>
<td>Max. static load/unit compression/tension</td>
<td>kN</td>
</tr>
<tr>
<td>Max. side thrust/unit</td>
<td>kN</td>
</tr>
<tr>
<td>Mean load</td>
<td>kN</td>
</tr>
<tr>
<td>Stroke</td>
<td>mm</td>
</tr>
<tr>
<td>Travel speed for out stroke</td>
<td>mm/min</td>
</tr>
<tr>
<td>Dwell time</td>
<td>min</td>
</tr>
<tr>
<td>Travel speed for in stroke</td>
<td>mm/min</td>
</tr>
<tr>
<td>Dwell time</td>
<td>min</td>
</tr>
<tr>
<td>Number of cycles, per hour</td>
<td>#</td>
</tr>
<tr>
<td>Number of cycles, per day</td>
<td>#</td>
</tr>
<tr>
<td>Number of working days, per year</td>
<td>#</td>
</tr>
<tr>
<td>Number of years life</td>
<td>#</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL CONDITIONS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dusty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct sunlight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High humidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrosive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radioactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>MAX °C</td>
<td>MIN °C</td>
</tr>
<tr>
<td>Specify any noise level limit at 1 metre</td>
<td>dBA</td>
<td></td>
</tr>
<tr>
<td>Altitude above sea level</td>
<td>m</td>
<td></td>
</tr>
<tr>
<td>Environmental Protection Classification</td>
<td>IP</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>感應</th>
<th>COMPRESSION</th>
<th>TENSION</th>
<th>COMPRESSION &amp; TENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>NO</td>
<td>If NO how many stops?</td>
<td>Dwell time (min)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is OUT stroke continuous?</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is IN stroke continuous?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Can the structure impose side loads by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expanding?</td>
</tr>
<tr>
<td>Contracting?</td>
</tr>
<tr>
<td>Deflecting?</td>
</tr>
<tr>
<td>Is the system guided?</td>
</tr>
<tr>
<td>Is a safety nut/wear detector required?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRIME MOVER</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelston supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumatic motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand wheel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is positional control required?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelston supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic oil pressure</td>
<td></td>
<td>Bar</td>
</tr>
<tr>
<td>Air pressure</td>
<td></td>
<td>Bar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>V</th>
<th>Ph</th>
<th>Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric supply AC/DC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>