PLANETARY ROLLER SCREW - SPIRACON™
3 Step Product Selection Guide

POWER JACKS
3.1.5 How to Select a Spiracon Roller Screw

Step 1 - Load, Speed and Life
From the Technical Chart in Section 3.1.6., make an initial selection of a Spiracon™ model to suit the required maximum dynamic and static loads.

Choose a screw lead and calculate the rotational speed to suit the required linear speed:

Rotational speed = \( \frac{\text{Linear speed (mm/minute)}}{\text{Screw lead (mm)}} \)

Check that the rotational speed is below the maximum speed shown in the Technical Chart for the model selected.

Calculate the total number of revolutions of the screw for the operating life required:

Required no. of screw revs. = Life (hours) x Rotational speed (rpm) x 60

Check the operating life for the selected Spiracon™ model:

\[ C = \text{Dynamic capacity (kN) from Technical Chart} \]
\[ F = \text{Application dynamic load (kN) (or Fm, mean load as below)} \]

\[ \text{Actual no. of screw revs.} = \left( \frac{C}{F} \right)^{3.33} \times 10^6 \]

\[ \text{Actual life in hours} = \frac{\text{No. of screw revs.}}{\text{Rotational speed x 60}} \]

If required, reiterate the calculation to achieve the required life.

Where the dynamic load varies, the mean load (Fm) can be approximated as follows:

\[ F_M = \sqrt{\frac{\sum (F_i \times U_i) + (F_i \times U_j) + \ldots}{U}} \]

\[ F_1, F_2 = \text{constant loads during } U_1, U_2 \text{ revolutions} \]
\[ U = \text{total number of revolutions} \]

Where the dynamic load varies between a minimum (Fmin) and maximum (Fmax) the mean load is:

\[ F_M = \frac{F_{\min} + 2 \times F_{\max}}{3} \]
Step 2 - Critical Speed, Buckling and Deflection

Establish length \( L \) based on the required stroke and bearing support conditions. For length \( L \), check that the rotational speed is below the critical speed limit, given by the formula:

\[
\text{Critical speed limit (rpm)} = \frac{10^7 \times f_1 \times J}{L^2}
\]

Where \( f_1, f_2, \) and \( f_3 \) are defined by the bearing support conditions shown in the diagram overleaf, and \( J \) is the root diameter of the Spiracon™ thread given in the Technical Chart in section 3.1.6.

Where the screw is under a compression load, check that the chosen screw diameter and length \( L \) are within the load limit for buckling, given by the formula:

\[
\text{Load limit (N)} = \frac{10^4 \times f_2 \times J^4}{L^2}
\]

For long horizontal screws, check the deflection of the screw under its own weight:

\[
\text{Deflection (mm)} = \frac{6 \times 10^{-9} \times L^4}{f_3 \times J^2}
\]

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Step 3 - Torque and Power

Calculate the torque required to drive the screw:

\[
\text{Torque (Nm)} = \frac{\text{Dynamic load (N)} \times \text{Lead (mm)}}{2000 \times \pi \times \text{Efficiency (0.85)}}, \quad \text{Power (kW)} = \frac{\text{Torque (Nm)} \times \text{Rotational speed (rpm)}}{9550}
\]

Note: Where there is a high acceleration or inertia, please consult our Technical Sales Department.
Planetary Roller Screw - Spiracon™
Selection Example

Example
Select a standard right hand Spiracon™ screw and nut for the following:

- Dynamic load = 220 kN (in compression)
- Linear speed = 900 mm/minute
- Required life = 2000 hours
- Required stroke = 1200 mm
- Overall screw length = 1850 mm
- Screw mounting = Vertical
- Bearing support condition = 2

Step 1
From the chart in section 3.1.6, make initial selection of:

Model 65 x 36 lead

Select a lead of 36 mm to give a rotational speed of:

\[
\frac{900}{36} = 25 \text{ rpm (OK<1700 rpm)}
\]

Calculate the number of revolutions of the screw to give the required life:

Required no. of screw revs. = 2000 x 25 x 60 = 3 x 10^6

Check the operating life for selected Spiracon™ model:

Actual no. of screw revs. = \( \frac{310^{777}}{220} \times 10^6 = 3.14 \times 10^6 \) (OK>3 x 10^6)

Actual life in hours = \( \frac{3.14 \times 10^6}{25 \times 60} = 2093 \text{ hours (OK>2000 hours)} \)

Step 2
Stroke = 1200 mm
Length (L) = 1600 mm (refer bearing support condition)

Check the critical speed limit:

Speed limit (rpm) = \( \frac{10^7 \times 10 \times 63.7}{1600^2} = 2488 \text{ rpm (OK>25 rpm)} \)

Check for buckling of the screw:

Load limit (N) = \( \frac{10^4 \times 6.5 \times 63.7^4}{1600^2} = 418 \text{ kN (OK>220 kN)} \)
Step 3
The torque and power are:

\[
\text{Torque (Nm)} = \frac{220000 \times 36}{2000 \times \pi \times 0.85} = 1483 \text{ Nm}
\]

\[
\text{Power (kW)} = \frac{1483 \times 25}{9550} = 3.88 \text{ kW}
\]

*The complete product code is SPT-065-36-6-RH-1850-1500-1-0 (refer 3.1.3 for full product code description)*

Example Part Number

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(1) Spiracon™ Screw and Nut
(2) Model 65
(3) 36 mm Lead
(4) 6 mm Pitch
(5) Right Hand Thread
(6) 1850 mm Overall Screw Length
(7) 1500 mm Screw thread Length
(8) 1 Spiracon™ Nut
(9) Standard Mounting Holes

Notes
1. In all cases, the customer should supply a detailed drawing, indicating the screw matching details.
2. Where a standard unit does not meet the customer’s requirements, Power Jacks will be pleased to design a special unit.
3. All goods are sold subject to Power Jacks Standard Terms and Conditions of Sale, full details available upon request.
Note

* = Customer to define at time of ordering

\( \phi j \) = Root diameter of Roller screw
### 3.1.6 Technical Data and Dimensions

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Dimensions are subject to change without notice.
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Power Jacks are an industry leader in the manufacture of quality industrial lifting, positioning, material handling and power transmission equipment. The products are supplied globally to most industry sectors including nuclear, water, oil & gas, chemical, defence, steel, aluminium, automotive, and others.

DESIGN WITH POWER

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