Double-Nut Caged Ball Screw SBKN

The basic dynamic load rating is 1.8 times larger than comparable models. Achieves long service life.
DN value of 160,000. Supports high-speed operation.
Low noise and long-term maintenance-free operation.

For details, visit THK at www.thk.com

*Product information is updated regularly on the THK website.*
Double-Nut Caged Ball Screw

Supports long service life time and high speed.

The load capability doubled due to the adoption of the double-nut type compared with the single-nut type.

Achieves a rated load approximately 2 times larger than that of the single-nut type.

<table>
<thead>
<tr>
<th></th>
<th>Double-nut SBK3620-7.6</th>
<th>Single-nut SBK3620-7.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic dynamic load rating</td>
<td>88.1kN</td>
<td>48.5kN</td>
</tr>
<tr>
<td>Basic static load rating</td>
<td>170.1kN</td>
<td>85.0kN</td>
</tr>
</tbody>
</table>

The service life time is approximately 6 times larger.

Implements an optimized circulation structure

Achieves high-speed operation with a maximum DN value of 160,000 due to the adoption of an optimized circulation structure with the newly developed end piece and R piece.

Ideal ball circulation structure in the tangential direction
High Speed and Load-Bearing Capacity
Model SBKN uses optimized ball circulation structure and Caged Ball technology to achieve high speed and load durability.

High Speed Durability Test
- Test conditions
  - Model No.: SBKN4030-7.6
  - Rotational Speed: 3800min⁻¹ (DN value: 160,000)
  - Speed: 114mm/min
  - Stroke: 650mm
  - Lubricant: Multemp HRL grease
  - Quantity: 14cm³
  - Acceleration: 9.8m/s²

Result
- Shows no deviation after running 10,000 km.

Caged Ball technology eliminates collisions and friction between balls, minimizing torque fluctuation and achieving smooth, stable operation.

Load Bearing Test
- Test conditions
  - Model No.: SBKN4020-7.6
  - Rotational Speed: 1500min⁻¹ (DN value: 63,000)
  - Speed: 30.0mm/min
  - Stroke: 500mm
  - Lubricant: Multemp HRL grease
  - Quantity: 10cm³
  - Applied load: 41.4 kN(0.38Ca)

Result
- Shows no deviation after running a distance approximately 2 times the calculated service life.

Lubricity
- Conditions
  - Model No.: SBKN4030-7.6
  - Rotational Speed: 100min⁻¹

**Graph**
Double-Nut Caged Ball Screw

Product Overview

Lead Angle Accuracy and Axial Clearance

[Lead angle accuracy]
They comply with JIS (Japanese Industrial Standards) as before as well as ISO (ISO Standards) and DIN (Deutsche Industrie Normen).

Accuracy standard correspondence table

<table>
<thead>
<tr>
<th>Accuracy standards</th>
<th>JIS</th>
<th>ISO (DIN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C0</td>
<td>C1</td>
</tr>
<tr>
<td></td>
<td>C2*</td>
<td>C3</td>
</tr>
<tr>
<td></td>
<td>C5</td>
<td>C7</td>
</tr>
</tbody>
</table>

* THK standard lead angle accuracy applies.

[Axial clearance]
Model SBKN adopts the double-nut preloading method; G0 is the only axial clearance available.

Static safety factor

[Basic static load rating C0a]
The basic static load rating (C0a) is normally the permissible axial load of ball screw. It is necessary to consider the following static safety factor for the calculated load based on the conditions. When the Ball Screw is stationary or in motion, unexpected external force may be applied through an inertia caused by the impact or the start and stop.

Static safety factor f.

\[ f_s \leq \frac{C_{oa}}{Fa} \]

\[ f_s : \text{Static safety factor (Table 1)} \]
\[ C_{oa} : \text{Basic static load rating} [\text{kN}] \]
\[ Fa : \text{Axial load} [\text{kN}] \]

* The basic static load rating (C0a) is a static load with a constant direction and magnitude whereby the sum of the permanent deformation of the rolling element and that of the raceway on the contact area under the maximum stress is 0.0001 times the rolling element diameter. It is defined by the axial load for ball screw. (Specific values of each ball screw are indicated in the specification table for the corresponding model number.)

Nominal Life and Service Life Time

[Basic dynamic load rating C]a
The basic dynamic load rating (C) is used to calculate the service life when the ball screw operates under a load. The basic dynamic load rating (C) is a load with interlocked direction and magnitude under which the nominal life (L) equals to \( 10^6 \) [rev]. (The basic dynamic load rating (C) is indicated in the specification table for the corresponding model number.)

Nominal Life L (Total Number of Revolutions)
The service life of the Ball Screw is calculated from the equation below using the basic dynamic load rating and the applied axial load.

\[ L = \left( \frac{C_a}{f_a \times F_a} \right)^2 \times 10^6 \]

\[ L : \text{Nominal life (total number of revolutions)} [\text{rev}] \]
\[ C_a : \text{Basic dynamic load rating} [\text{kN}] \]
\[ F_a : \text{Load axial load} [\text{kN}] \]
\[ f_a : \text{Load factor (Table 2)} \]

* The rated service life is estimated by calculating the load on the premise that the product is set up in ideal mounting conditions with the assurance of good lubrication. The service life can be affected by the precision of the mounting materials used and any distortion.

Service Life Time \( L_h \)
Once the nominal life (L) has been obtained, the service life time (\( L_h \)) can be obtained using the following equation if the stroke length and the number reciprocations are constant.

\[ L_h = \frac{L \times Ph}{2 \times \xi \times n \times 60} \]

\[ L_h : \text{Service life time} [\text{h}] \]
\[ \xi : \text{Stroke length} [\text{mm}] \]
\[ n : \text{Number of reciprocations per minute} [\text{min}^{-1}] \]
\[ Ph : \text{Lead} [\text{mm}] \]
Lubrication accessories and dust control accessories

Model SBKN is available with the QZ Lubricator for ball screws and contact seal wiper ring W to remove minute contamination and to achieve long term maintenance-free operation.

[QZ Lubricator]

Lubricator QZ is a lubrication system to supply the right amount of lubricant to the raceway of the ball screw shaft.

- **Features**
  - The maintenance interval can be extended significantly
    With normal grease lubrication in a ball screw, oil is lost gradually during operation. QZ Lubricator can extend the maintenance interval supplementing the lost oil in the long run.
  - Environmentally friendly lubrication system
    Since QZ Lubricator applies the right amount of lubricant to the ball raceway by the high-density fiber net, it is an environmentally friendly lubrication system that does not contaminate the surroundings.

[Wiper ring W]

With the wiper ring W, a special resin scraper with high wear resistance and low dust generation removes foreign material and prevents foreign material from entering the ball screw nut while elastically contacting the circumference of the ball screw shaft and the screw thread.

- **Features**
  - Prevents foreign material from entering the ball screw nut
  - Contacts the ball screw shaft at a constant pressure level, thus to minimize the heat generation.
  - High wear resistance, impact resistance, and chemical resistance
  - Extends the maintenance interval even in a severe environment if QZ Lubricator for ball screw and wiper ring W are installed.

Dimensions of the Ball Screw Nut Attached with Wiper Ring (WW) and QZ Lubricator (QZ)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>WW availability</th>
<th>QZ availability</th>
<th>With WW Dimensions</th>
<th>Length of protrusion with QZ attached</th>
<th>Over diameter of protrusion with QZ attached</th>
<th>Dimensions including QZWW</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBKN 3620-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>210</td>
<td>28</td>
<td>69</td>
<td>266</td>
</tr>
<tr>
<td>SBKN 4020-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>210</td>
<td>30.5</td>
<td>79</td>
<td>271</td>
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<tr>
<td>SBKN 4030-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>283</td>
<td>30.4</td>
<td>79</td>
<td>343.8</td>
</tr>
<tr>
<td>SBKN 5020-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>210</td>
<td>35</td>
<td>89</td>
<td>280</td>
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<tr>
<td>SBKN 5030-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>284</td>
<td>35</td>
<td>89</td>
<td>354</td>
</tr>
<tr>
<td>SBKN 5036-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>334</td>
<td>35</td>
<td>89</td>
<td>404</td>
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<tr>
<td>SBKN 5520-7.6</td>
<td>❌</td>
<td>✔️</td>
<td>210</td>
<td>32</td>
<td>95</td>
<td>274</td>
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<td>284</td>
<td>32</td>
<td>95</td>
<td>348</td>
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<tr>
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<td>✔️</td>
<td>334</td>
<td>32</td>
<td>95</td>
<td>398</td>
</tr>
</tbody>
</table>

Unit: mm

THK
## Double-Nut Caged Ball Screw

### Dimensional Table

#### Model SBKN

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Screw shaft Outer diameter</th>
<th>Lead</th>
<th>Ball center-to-center diameter ( dp )</th>
<th>Root diameter of screw shaft ( dc )</th>
<th>No. of circuits under load Row x Rums</th>
<th>Basic Load Rating ( C_0 ) [kN]</th>
<th>Rigidity ( K ) [N/m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBKN3620-7.6</td>
<td>36</td>
<td>20</td>
<td>37.75</td>
<td>30.4</td>
<td>2 x 3.8</td>
<td>88.1</td>
<td>170.1</td>
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<tr>
<td>SBKN4020-7.6</td>
<td>40</td>
<td>20</td>
<td>42</td>
<td>34.1</td>
<td>2 x 3.8</td>
<td>108.9</td>
<td>227.1</td>
</tr>
<tr>
<td>SBKN4030-7.6</td>
<td>40</td>
<td>30</td>
<td>42</td>
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<td>216.7</td>
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<tr>
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<td>44.1</td>
<td>2 x 3.8</td>
<td>121.2</td>
<td>263.7</td>
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<tr>
<td>SBKN5030-7.6</td>
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<td>30</td>
<td>52</td>
<td>44.1</td>
<td>2 x 3.8</td>
<td>120.8</td>
<td>269.9</td>
</tr>
<tr>
<td>SBKN5036-7.6</td>
<td>50</td>
<td>36</td>
<td>52</td>
<td>44.1</td>
<td>2 x 3.8</td>
<td>120.1</td>
<td>271.6</td>
</tr>
<tr>
<td>SBKN5520-7.6</td>
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<td>49.1</td>
<td>2 x 3.8</td>
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<td>SBKN5530-7.6</td>
<td>55</td>
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<td>57</td>
<td>49.1</td>
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<tr>
<td>SBKN5536-7.6</td>
<td>55</td>
<td>36</td>
<td>57</td>
<td>49.1</td>
<td>2 x 3.8</td>
<td>125.9</td>
<td>298</td>
</tr>
</tbody>
</table>

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**Model Number coding**

- **SBKN3620-7.6**: Model No.
- **QZ**: With QZ Lubricator (no symbol without QZ Lubricator)
- **RR**: Symbol for clearance in the axial direction (see page 3)
- **G0**: Seal symbol
- **+1000L**: RR: labyrinth seal on both ends
- **C5**: Overall ball screw shaft length (in mm)

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**Seal symbol**

- **RR**: Labyrinth seal on both ends
- **WW**: Two-sided wiper ring

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**Overall ball screw shaft length**

- **Tw**: Greasing hole
- **A**: (Greasing hole)
### Nut dimensions

<table>
<thead>
<tr>
<th>Unit: mm</th>
<th>Nut mass [kg]</th>
<th>Shaft mass [kg/m]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D</strong></td>
<td><strong>Flange diameter D1</strong></td>
<td><strong>Overall length L1</strong></td>
</tr>
<tr>
<td>73</td>
<td>114</td>
<td>210</td>
</tr>
<tr>
<td>80</td>
<td>136</td>
<td>210</td>
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<tr>
<td>80</td>
<td>136</td>
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<tr>
<td>90</td>
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<td>90</td>
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<td>284</td>
</tr>
<tr>
<td>96</td>
<td>152</td>
<td>334</td>
</tr>
</tbody>
</table>

**Note:** The rigidity values (K) in the table represent spring constants each obtained from the load and the elastic deformation when providing a preload 10% of the basic dynamic load rating (Ca) and applying an axial load three times greater than the preload. These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to regard roughly 80% of the rigidity values (K) in the table as the actual value.

If the applied preload (Fa0) is not 0.1Ca, the rigidity value (Kn) is obtained from the following equation.

\[ Kn = K \left( \frac{Fa0}{0.1Ca} \right)^{\frac{1}{3}} \]

**K:** Rigidity value in the dimensional tables

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**Precautions**

With model SBKN, the raising of both ends of the thread groove is not available.

When designing your system this way, contact THK.
Precautions on Use

- Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
- If you use this product in any environments where cutting chips, coolant, corrosive solution, water, etc. get into the product, prevent them from getting into the product using a bellow, cover, etc.
- Do not use the product at temperature of 80°C or higher. If this temperature is exceeded, the resin/rubber parts may be deformed/damaged, excluding a heat-resistant type. In the case of the specifications with GZ Lubricant, be sure to use it at 50°C or below.
- Use a foreign material such as cutting chips as a product, impair the lubricant after cleaning the product with pure water only, kerosene. Slight rust can still exist in the formation of a Thin film on the rolling surface and the area of contact of rolling elements, with resulting friction. THK recommends periodically rotating the product to prevent rust and maintain the performance of the lubricant. Use the product in a clean environment.
- Do not forcibly drive a pin, key, or other positioning device into the product. This could create indentations on the raceway and impair the product’s function.

- Lubrication
  - Thoroughly remove anti-rust oil and feed lubricant before using the product.
  - Do not mix lubricants of different physical properties. Even lubricants containing the same type of thickening agent may, if mixed, interact in an adverse manner due to disparate additives or other ingredients.
  - For the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and high/low temperature, use a grease that suit the service environment.
  - To use this product without any grease nipples nor oil holes, apply a lubricant directly to the raceway and perform several warm-up strokes with the unit to ensure that lubricant permeates the interior.
  - Lubricant viscosity can vary depending on the temperature. Please keep in mind that the ball screw's sliding resistance may be affected by changes in viscosity.
  - Following lubrication, sliding-resistance within the lubricant can cause the ball screw to exhibit increased rotational torque. Before commencing operations, make sure to run the unit through at least several minutes of operation and disperse the lubricant. The lubricant will be adequately integrated and dispersed.
  - Even when the unit is equipped with seals, excess grease may spatter immediately after lubrication. If necessary, wipe off any spattered grease.
  - Grease inspection and application in accordance with the use frequency are necessary because the property of the grease is deteriorated as the time elapses and the lubrication performance decreases.
  - Though greasing intervals vary depending on the conditions and environments, we recommend greasing the system approximately every 100 km of travel distance (3 to 6 months). Set the final greasing interval and amount with the actual equipment.
  - The application must be designed in such a way that the mounting position and nut’s filler does not prevent lubricant from circulating. If grease usage and application are necessary because the property of the grease is deteriorated as the time elapses and the lubrication performance decreases.
  - When selecting the grease, always consider the effect of the operating environment on the lubricant. Use the product without lubrication may increase wear of the rolling elements or shorten the service life.
  - In the specifications with GZ Lubricant, the minimum necessary grease is applied to the raceway. Note that the lubricant may be fed from the ball screw shaft depending on the property of the lubricant in some conditions as vertical installation.

- Storage
  - When storing the Ball Screw, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding a high temperature, a low temperature and a high humidity environment. When handling this product, wear protective gloves, protective shoes, etc. as needed to ensure safety.
  - Do not disassemble the parts. This will cause loss of functionality.
  - Tilt the screw shaft and the ball screw nut may cause them to fall by their own weight.
  - Take care not to drop or strike the ball screw. This could cause injury or product damage. Failure to do so could cause injury or product damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
  - If assembling this product, do not remove the ball screw nut from the ball screw shaft.
  - When handling this product, protective gear, wear protective gloves, protective shoes, etc. as needed to ensure safety.
  - Do not forcibly drive a pin, key, or other positioning device into the product. This could create indentations on the raceway and impair the product’s function.
  - If an offset or skewing occurs with the ball screw shaft support and the ball screw nut, it may substantially shorten the service life. Pay much attention to components to be mounted and to the mounting accuracy.
  - If any of the rolling elements falls from the ball screw nut, contact THK instead of using the product.
  - If the unit will be positioned vertically, install safety equipment or take other measures to prevent it from toppling over. The ball screw nut may drop by its own weight.
  - Do not use this product beyond its permissible rotational speed. Doing so may cause accidents or component damage. Be sure to use the product within the specification range designated by THK.
  - Do not cause the ball screw nut to overrun. This will lead to problems such as ball displacement, damage to ball circulation components, or indentation on the ball raceway, which may cause a malfunction. If you keep using the product as it is, it may lead to early wear or damage on circulation components.
  - To avoid damaging the product, use the ball screw in combination with an LM Guide, Ball Spline, or other guide element.
  - The appearance and specifications of the product are subject to change without notice. Contact THK before placing an order.

- Disposal
  - The product shall be disposed as an industrial waste in a right manner.

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