NSK Standard Ball Screws
High Speed SS Series

NSK’s high speed and low noise ball screws provide high-level performance for drive systems of industrial machines such as those used in manufacturing. A standard stock series assures quick delivery.
High Speed SS Series (HSS Type); Standard ball screws, high speed and low noise enable further performance improvements to be made.

The HMS and HMD series, originally developed for machine tools, are an addition to NSK’s lineup of standard ball screws. They have a wide range of applications, from general machines to high performance machines such as those requiring high speed and precision.

NSK’s original recirculation system realized high speed and low noise. An optimum recirculation system has been adopted based on the lead.

Permissible rotational speed is more than double d-n limit value: high speed of 160 000

Noise level has been reduced by 50%: a reduction of 6 dB(A)

Vibration has been reduced drastically

Installation dimensions are the same as those of a conventional SS series

Compact design created using offset preload system

Design flexibility has been improved by blank shaft end. New support units are also provided for high speed operation.
The new recirculation system that utilizes NSK’s high speed and low noise technology more than doubles the d·n value from 70,000 to 160,000. To extend the range of the lead to 20 mm, high speed operation of over 60 m/min is possible.

Compared to our conventional products, the average noise level has been reduced by more than 6 dB(A), reducing the number of colliding balls and recirculation parts thanks to high speed, low noise technology. The vibration level of the nut has also been reduced drastically.

**Interchangeability**
Installation dimensions are the same as those of a conventional SS series

**Compact**
By improving the nut manufacturing technology, highly precise screw manufacturing is possible with the long nut. Achieved high-level stiffness and high load capacity equivalent to that of double nut preload by changing the double nut preload to the offset preload of a single nut, and compact sized nut.

**Seal**
Adopted thin seals axially and shorten nut length

**Optional configurations are possible for ball screw length as well as for the shaft end design**
Optional configurations are possible for ball screw length as well as for the shaft end design. The blank shaft ends can be customized according to customers’ requests. See page 11 in NSK’s recommended design when drawing up plans for a shaft end. The support units are available on pages 12-14 in the case of NSK’s recommended design.

**New support unit: For high speeds and heavy loads**
The support unit is applied for the thrust angular contact ball bearing, TAC series, with high precision and rigidity. NSK design is available attached to the support unit, which easily constitutes a system.

**Oil supply**
2 oil holes, M6×1.0, are provided in the nut flange periphery and the end of the nut flange. A plug is standardly screwed into the periphery of the nut flange.
### Ball screw specification

<table>
<thead>
<tr>
<th><strong>Accuracy grade</strong></th>
<th>C5 of JIS B 1192 (1997)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Axial play</strong></td>
<td>Axial play: 0 Offset preload (Z preload)</td>
</tr>
<tr>
<td><strong>Preload system</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Thread direction</strong></td>
<td>Right hand</td>
</tr>
<tr>
<td><strong>Shaft end</strong></td>
<td>Both shaft ends blank (No case hardening: HRC 40 max.)</td>
</tr>
</tbody>
</table>

### Precautions

**Design**

1. One end of the screw shaft is cut through.

2. If a ball screw of which the left shaft end (opposite the driving side) is the shape 1 and if it is supported with the "fixed-fixed" supporting method, you should be aware that the operating life of support bearings may shorten due to thermal expansion of the screw shaft, depending on usage conditions. In this case, you should consider a structure that can accommodate thermal expansion of the screw shaft if necessary. Please consult with NSK for a detailed examination.

3. For general precautions concerning ball screws, please check NSK Catalog No.E3162 "Precision Machine Components".

**Usage**

1. Instructions for shaft end processing

   The high speed SS series has a straight cut shaft end. Therefore, during actual use, the end of the shaft must be machined according to the customer’s specifications. NSK recommends designated suppliers that offer quality assurances and precision guarantees. If any other supplier carries out processing, NSK will not provide a precision guarantee.

2. Service temperature environment of 60°C or less (at the nut outer temperature)

3. Only a rust preventive agent is applied at the time of delivery. Please apply lubricant, oil or grease before using.

4. The seals are installed on the end of the nut with the ball screw shaft. However, the ball screws should be provided with a dust cover to prevent debris such as dust and metal powder from entering.

5. If the nut accidentally comes off the screw shaft, please contact NSK.
# NSK Standard Ball Screws High-Speed SS Series

## Dimension: Lead 5, 10, and 12  Shaft screw dia.32, 40, 45 and 50

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Screw shaft dia.</th>
<th>Lead d</th>
<th>Dia. of hole under</th>
<th>Effective hole tension</th>
<th>Basic load rating</th>
<th>Load</th>
<th>Dynamic Co.</th>
<th>Static Co.</th>
<th>Nut rigidity</th>
<th>Permissible rotational speed (rpm)</th>
<th>Fixed-Free support</th>
<th>Fixed-Fixed support</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSS3309NID050</td>
<td>5</td>
<td>29.2</td>
<td>2.5x2</td>
<td>21 800</td>
<td>35 000</td>
<td>600</td>
<td>30 900</td>
<td>0.010</td>
<td>0.025</td>
<td>0.025</td>
<td>5.3</td>
<td>5.000</td>
</tr>
<tr>
<td>HSS3309NID050</td>
<td>10</td>
<td>34.4</td>
<td>2.5x2</td>
<td>81 200</td>
<td>137 000</td>
<td>2 000</td>
<td>74.5</td>
<td>0.014</td>
<td>0.030</td>
<td>0.030</td>
<td>19.5</td>
<td>14.500</td>
</tr>
<tr>
<td>HSS4510NID100</td>
<td>12</td>
<td>34.4</td>
<td>2.5x2</td>
<td>71 700</td>
<td>154 000</td>
<td>3 050</td>
<td>98.0</td>
<td>0.025</td>
<td>0.040</td>
<td>0.040</td>
<td>30.5</td>
<td>30.000</td>
</tr>
<tr>
<td>HSS5012NID100</td>
<td>12</td>
<td>34.4</td>
<td>2.5x2</td>
<td>71 700</td>
<td>154 000</td>
<td>3 050</td>
<td>111.0</td>
<td>0.030</td>
<td>0.050</td>
<td>0.050</td>
<td>37.5</td>
<td>30.000</td>
</tr>
</tbody>
</table>

### Notes:
- NSK support units are recommended. Refer to Page 12 to 14 for details.
- Only a rust preventive agent is applied at the time of delivery. Please apply lubricant, oil or grease before use.
- Nut rigidity: Values in the table are theoretical values obtained from the elastic deformation between ball grooves with preload and balls.

### NSK Standard Ball Screws
- Only one oil hole is recommended for one lead exists on both ends of a screw. Exercise care when stroke setting.
- Nut rigidity: Values in the table are theoretical values obtained from the elastic deformation between ball grooves with preload and balls.
**Dimension: Lead 16, 20 Shaft screw dia. 40**

- **Seals (both ends)**
  
- **Grinding area**

- **Notes:**
  - NSK support units are recommended. Refer to Page 12 to 14 for details.
  - Only a rust preventive agent is applied at the time of delivery. Please apply lubricant, oil or grease before use.
  - Nut rigidity: Values in the table are theoretical values obtained from the elastic deformation between ball grooves with preload and balls.
  - Permissible rotational speed: Calculated values obtained from the critical speed between the threaded length and NSK’s recommended shaft end design.
  - 1: No case hardening: HRC 40 max.
  - 2: Imperfect hardened areas for one lead exists on both ends of a screw. Exercise care when stroke setting.

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### Table of Specifications

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Screw shaft dia.</th>
<th>Lead</th>
<th>Flank</th>
<th>Effective flank length</th>
<th>Basic load rating</th>
<th>Preload</th>
<th>Dynamic friction torque</th>
<th>Nut rigidity (kgf)</th>
<th>Nut rigidity (kgf/cm²)</th>
<th>Ball nut dimensions</th>
<th>Ball nut dimension</th>
<th>Screw shaft dimension</th>
<th>Lead accuracy</th>
<th>Run-out</th>
<th>Mass (kg)</th>
<th>Permissible rotational speed (min⁻¹)</th>
<th>Internal spatial volume (cm³)</th>
</tr>
</thead>
</table>
| HSS4016N1D1450 | 16               | 3.7×1 | 66.950 | 131.000 | 2,850 | 104.0 | 970 | 85 | 80 | 128 | 48 | 63.5 | 18 | 106 | 106 | 11 | 17.5 | 11 | 1,020 | 350 | 34.1 | 100 | 1,450 | -0.025 | 0.049 | 0.030 | 0.070 | 0.025 | 0.015 | 19.2 | 4,000 | 4,000 | 40
| HSS4016N1D2100 | 20               | 3.7×1 | 69.550 | 131.000 | 2,850 | 116.5 | 980 | 85 | 80 | 128 | 48 | 63.5 | 18 | 102 | 106 | 11 | 17.5 | 11 | 1,020 | 350 | 34.1 | 100 | 1,450 | -0.025 | 0.049 | 0.030 | 0.070 | 0.025 | 0.015 | 22.0 | 4,000 | 4,000 | 47
| HSS4016N1D2900 | 30               | 3.7×1 | 76.000 | 131.000 | 2,850 | 150.0 | 970 | 85 | 80 | 128 | 48 | 63.5 | 18 | 102 | 106 | 11 | 17.5 | 11 | 1,020 | 350 | 34.1 | 100 | 1,450 | -0.025 | 0.049 | 0.030 | 0.070 | 0.025 | 0.015 | 33.5 | 900 | 1,300 | 47
| HSS4020N1D1450 | 16               | 3.7×1 | 66.950 | 131.000 | 2,850 | 104.0 | 970 | 85 | 80 | 128 | 48 | 63.5 | 18 | 106 | 106 | 11 | 17.5 | 11 | 1,020 | 350 | 34.1 | 100 | 1,450 | -0.025 | 0.049 | 0.030 | 0.070 | 0.025 | 0.015 | 19.2 | 4,000 | 4,000 | 40
| HSS4020N1D2100 | 20               | 3.7×1 | 69.550 | 131.000 | 2,850 | 116.5 | 980 | 85 | 80 | 128 | 48 | 63.5 | 18 | 102 | 106 | 11 | 17.5 | 11 | 1,020 | 350 | 34.1 | 100 | 1,450 | -0.025 | 0.049 | 0.030 | 0.070 | 0.025 | 0.015 | 22.0 | 4,000 | 4,000 | 47
| HSS4020N1D2900 | 30               | 3.7×1 | 76.000 | 131.000 | 2,850 | 150.0 | 970 | 85 | 80 | 128 | 48 | 63.5 | 18 | 102 | 106 | 11 | 17.5 | 11 | 1,020 | 350 | 34.1 | 100 | 1,450 | -0.025 | 0.049 | 0.030 | 0.070 | 0.025 | 0.015 | 33.5 | 900 | 1,300 | 47

**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm

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**Unit:** mm
**Dimension: Recommendation for shaft end design**

For drive side: Recommendation for shaft end design

<table>
<thead>
<tr>
<th>Screw shaft diameter</th>
<th>Bear. install.</th>
<th>Parts install.</th>
<th>Shaft length</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>Dia.</td>
<td>L1</td>
<td>Dia.</td>
</tr>
<tr>
<td>32</td>
<td>25</td>
<td>89</td>
<td>#</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
<td>89</td>
<td>#</td>
</tr>
<tr>
<td>45</td>
<td>35</td>
<td>92</td>
<td>#</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
<td>92</td>
<td>#</td>
</tr>
</tbody>
</table>

For side opposite to drive side: Recommendation for shaft end design

<table>
<thead>
<tr>
<th>Screw shaft diameter</th>
<th>Shape</th>
<th>Bear. install.</th>
<th>Parts install.</th>
<th>Support unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>d2</td>
<td>m2</td>
<td>mL2</td>
<td>(xnL)</td>
</tr>
<tr>
<td>32</td>
<td>25</td>
<td>20</td>
<td>-</td>
<td>#</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
<td>22</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>45</td>
<td>35</td>
<td>23</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
<td>25</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes:
- The dimensions of the drawing can be flexibly set within limits.
- The support unit is available with a recommended design.
- The same as that of the drive side.

**New support unit (For high speed and heavy load)**

Heat generation has been reduced via adoption of a low preload type bearing. Along with speedup of the ball screw, permissible rotational speed have been improved.

The new support units are assembled with the thrust angular contact ball bearings, TAC series, which are a high precision, high rigidity, high speed type with the most suitable function and structure. The bearing combination comes in three types as shown in the figure below.

**Support unit reference No.**

Reference No. **WBK 40 DF - 31 H**

- High speed type
- NSK control number
- Bearing combination

Product code for support unit

Bearing bore diameter (mm)
**Dimension: Support unit**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WBK25DF-31H</td>
<td></td>
<td>29 900</td>
<td>48 500</td>
<td>2 280</td>
<td>850</td>
<td>M25×1.5</td>
<td>45</td>
<td>40 500</td>
<td></td>
</tr>
<tr>
<td>WBK25DFD-31H</td>
<td></td>
<td>48 500</td>
<td>2 280</td>
<td>1 250</td>
<td>890</td>
<td>M30×1.5</td>
<td>50</td>
<td>40 500</td>
<td></td>
</tr>
<tr>
<td>WBK30DF-31H</td>
<td></td>
<td>30 500</td>
<td>43 000</td>
<td>2 000</td>
<td>1 310</td>
<td>M35×1.5</td>
<td>55</td>
<td>50 x 100</td>
<td></td>
</tr>
<tr>
<td>WBK30DFD-31H</td>
<td></td>
<td>50 000</td>
<td>86 000</td>
<td>2 000</td>
<td>1 310</td>
<td>M40×1.5</td>
<td>60</td>
<td>55 x 100</td>
<td></td>
</tr>
<tr>
<td>WBK35DF-31H</td>
<td></td>
<td>53 000</td>
<td>100 000</td>
<td>3 000</td>
<td>1 590</td>
<td>M40×1.5</td>
<td>65</td>
<td>60 x 100</td>
<td></td>
</tr>
<tr>
<td>WBK35DFD-31H</td>
<td></td>
<td>53 000</td>
<td>100 000</td>
<td>3 000</td>
<td>1 590</td>
<td>M40×1.5</td>
<td>70</td>
<td>60 x 100</td>
<td></td>
</tr>
<tr>
<td>WBK40DF-31H</td>
<td></td>
<td>54 000</td>
<td>104 000</td>
<td>3 000</td>
<td>1 590</td>
<td>M50×1.5</td>
<td>75</td>
<td>65 x 100</td>
<td></td>
</tr>
<tr>
<td>WBK40DFD-31H</td>
<td></td>
<td>54 000</td>
<td>104 000</td>
<td>3 000</td>
<td>1 590</td>
<td>M50×1.5</td>
<td>80</td>
<td>65 x 100</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Rigidity: Values in the table are theoretical and obtained from the elastic deformation between ball groove and balls.
- Starting torque indicates torque due to the preload of the bearing. It does not include seal torque.
- h5 class of the fits tolerance is recommended.
- Pilot diameter and tapped screws marked with "*", are used for seal unit installation for NSK standard hollow shaft ball screws. They can also be used for the dust cover and damper installation.
- Grease is packed into bearings. It is not necessary to apply grease before use.
- Installation torque of a set screw 490[N·cm] (Reference value)
- Allowable axial load is 0.7 times of the permissible axial load in the dimension table.
- Values in parentheses of basic dynamic load rating and permissible axial load are the values when axial load is applied in a line.
- Contact NSK if the rotational speed is 50 min⁻¹ and below.

**Notes:**
- NSK support units are precisely preloaded and adjusted. Do not disassemble components 1, 2, 4, 6 or 7.
- Lock nut 8 has been exclusively prepared for ball screws. The end surface of the nut is positioned precisely perpendicular to the V thread. Secure the lock nut using a set screw.

**Parts list**

<table>
<thead>
<tr>
<th>Parts No.</th>
<th>Part Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Housing</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Retaining Cover</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>High accuracy thrust angular contact ball bearing</td>
<td>One set</td>
</tr>
<tr>
<td>4</td>
<td>Dust seal</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Collar</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Preload bolt</td>
<td>6 or 8</td>
</tr>
<tr>
<td>7</td>
<td>Shim</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Lock nut</td>
<td>1</td>
</tr>
</tbody>
</table>
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