BALL SCREW SUPPORT BEARINGS
NSKHS – BSBD SERIES

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As one of the world’s leading manufacturers of rolling bearings, linear technology components and steering systems, we can be found on almost every continent – with production facilities, sales offices and technology centres – because our customers appreciate short decision-making channels, prompt deliveries and local service.

NSK commenced operations as the first Japanese manufacturer of rolling bearings back in 1916. Ever since, we have been continuously expanding and improving not only our product portfolio but also our range of services for various industrial sectors. In this context, we develop technologies in the fields of rolling bearings, linear systems, components for the automotive industry and mechatronic systems. Our research and production facilities in Europe, Americas and Asia are linked together in a global technology network. Here we concentrate not only on the development of new technologies, but also on the continuous optimisation of quality – at every process stage.

Among other things, our research activities include product design, simulation applications using a variety of analytical systems and the development of different steels and lubricants for rolling bearings.
Partnership based on trust – and trust based on quality

Total Quality by NSK: The synergies of our global network of NSK Technology Centres. Just one example of how we meet our requirements for high quality.

NSK is one of the leading companies with a long tradition in patent applications for machine parts. In our worldwide research centres, we not only concentrate on the development of new technologies, but also on the continual improvement of quality based on the integrated technology platform of tribology, material technology, analysis and mechatronics. More about NSK at www.nskeurope.com or call us on +44 (0) 1636 605 123
Modern machine tools require ball screws that can accurately position a work piece or machine component, quickly and efficiently. The BSN / BSF range of bearings are support bearings designed to specifically meet these demanding requirements.

The double row configuration, with a 60° contact angle, enables the bearings to support large axial forces in both directions, while providing the accuracy and stiffness required by modern high precision machinery. The bearings are supplied sealed, greased for life and ready for installation. The bearings can be supplied as pairs (DT) for higher loads. In this case, the individual bearings are matched together.

Continually developing products with greater strength and higher accuracy, NSK’s new NSKHPS series fully incorporates the advantages of NSK’s world class design, materials, and manufacturing technology, setting a new standard for bearings.
**Types**

NSKHPS BSBD series is available for both housing mounting (BSN type) and face mounting (BSF type) with through holes for easy mounting. All types are greased for life and equipped with low friction contact lip seals with triple lip structure, achieving high grease retention and dust-proof performance while allowing high speeds.

**Heavy series**

A heavy series type is available on some sizes. This type has the same inner ring dimensions, but a larger ball size and outer ring diameter, allowing higher axial loads and stiffness.
Matched Pairs

If higher load capacities and/or stiffness are requested, a matched pair (DT) version can be ordered. A "V" is marked on the outer diameter surfaces of the bearings for proper matching and alignment. Matching surfaces are adjusted in order to control preload of each individual bearing.

In case of pairs of the BSF series, the number and position of the through holes are different, please refer to the tables on page 12-13 for details.

Fixing Bolts *

In order to cope with the high loads applied to the ball screw support bearings, especially in those cases with belt driven ball screws where permanent radial force arises, NSK recommends to use bolts to class 10.9.

*Fixing bolts are not included.
Feature | Benefit
--- | ---
60° contact angle | Enables bearings to support large axial forces
Double row | Supports axial load in two directions
Contact lip seal (seal runs in inner ring groove) | Provides excellent sealing characteristics, with low friction and heat generation
Greased | Greased for life (under normal operating conditions)
Relubrication facilities | Enables relubrication of bearing during operation if required
Mounting holes (BSF only) | Easy mounting of bearing, directly onto machinery
Extraction groove (BSF only) | To help with removal of bearing from machine
Set screws (BSF only) | Plugs relubrication holes to prevent contamination

Example: B5 F 30 80 DDU H P2B DT
- No symbol: single bearing
- DT: paired bearing
- Class 2 running accuracy
- Special exterior dimensions
- Preload
- Seal type
**Design of Shaft & Housing**

It is of utmost importance that shafts and housings are accurately and precisely mated in order to take full advantage of the precision bearings’ capabilities, which include rotational accuracy and low heat generation. When the inner ring or outer ring is mounted onto a shaft or into a housing with some interference, the shape of shaft or housing (out of roundness) is transferred to the bearing raceway surfaces and affects running accuracy. The mating parts should be very accurate.
Basic Static Load Ratings

When subjected to an excessive load or a strong shock load, rolling bearings may incur a local permanent deformation of the rolling elements and raceway surface if the elastic limit is exceeded. The elastic deformation increases in area and depth as the load increases, and when the load exceeds a certain limit, the smooth running of the bearing is impeded.

In ISO the basic static load rating is defined as that static load which produces the following calculated contact stress at the centre of the contact area between the rolling element subjected to the maximum stress and the raceway surface, being for ball bearings 4,200 MPa. In this most heavily contacted area, the sum of the permanent deformation of the rolling element and that of the raceway is nearly 0.0001 times the rolling element’s diameter.

Limiting Axial Load for Ball Screw Support Bearings

Limiting axial load is defined as the maximum load whose large contact ellipse between the ball and raceway does not cause overriding of the shoulder of the raceway groove (Fig. 2). In the case of Ball Screw Support Bearings BSBD Series, the basic static axial load rating $C_0a$ exceeds the limiting axial load by ball override, because the shoulder height of raceway groove is not considered in the ISO calculation. In that case, limiting axial load is more important than $C_0a$ (Fig. 3).

Lubrication

Ball screw support bearings BSBD series are greased with sufficient grease volume for the operating life of the bearing. Depending on the operating and environmental conditions of the application, relubrication may be necessary. In this case, use grease compatible with mineral oil base grease. BSF and BSN are equipped with lubrication holes in the outer ring. The BSF series has axial and radial threaded holes fitted with grub screws for easy selection of the relubrication position.
BSN Type

The BSN Type bearings are double row, angular contact thrust ball bearings, with a 60° contact angle. They are equivalent to two single row bearings in a back-to-back arrangement, with a single outer ring. Bearings are supplied ready to be mounted. They come greased with long life lithium soap grease, with synthetic hydrocarbon base oil as well as mineral oil.

Under normal operating conditions, the bearings are greased for life. A relubrication groove located on the outside surface of the outer ring allows the bearings to be relubricated during operation if required. The bearings are sealed on both sides. The low friction contact lip seal runs in a groove in the inner ring. This gives excellent sealing characteristics, while minimising torque and heat generation.

Preload is set during manufacture so that the correct loading is achieved when the lock nut is tightened to provide the recommended clamping force.

Note 1. Starting torque indicates torque due to the preload of the bearing only. If you need further information please consult NSK
Note 2. Heavy series
Note 3. See definition on page 9
Note 4. Tolerances are valid for all sizes except for sizes mentioned in the sketch

<table>
<thead>
<tr>
<th>Bearing Numbers</th>
<th>Boundary Dimensions (mm)</th>
<th>Reference Dimensions (mm)</th>
<th>Basic Dynamic Load Rating (kN)</th>
<th>Basic Static Load Rating (kN)</th>
<th>Limiting Axial Load (kN)</th>
<th>Inertia (kg·cm²)</th>
<th>Axial rigidity (N/µm)</th>
<th>Tilting rigidity (Nm/mrad)</th>
<th>Mass (kg)</th>
<th>Limiting Speed (min⁻¹)</th>
<th>Starting torque (Nm)</th>
<th>Recommended Clamping Force (N)</th>
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Note 1. Starting torque indicates torque due to the preload of the bearing only. If you need further information please consult NSK
Note 2. Heavy series
Note 3. See definition on page 9
Note 4. Tolerances are valid for all sizes except for sizes mentioned in the sketch

BSN Type

The BSN Type bearings are double row, angular contact thrust ball bearings, with a 60° contact angle. They are equivalent to two single row bearings in a back-to-back arrangement, with a single outer ring. Bearings are supplied ready to be mounted. They come greased with long life lithium soap grease, with synthetic hydrocarbon base oil as well as mineral oil.

Under normal operating conditions, the bearings are greased for life. A relubrication groove located on the outside surface of the outer ring allows the bearings to be relubricated during operation if required. The bearings are sealed on both sides. The low friction contact lip seal runs in a groove in the inner ring. This gives excellent sealing characteristics, while minimising torque and heat generation.

Preload is set during manufacture so that the correct loading is achieved when the lock nut is tightened to provide the recommended clamping force.
BSF Type

The BSF Type of bearings is equivalent to the BSN range of bearings, with an extended outer ring, with bolt holes for easy direct mounting.

Relubrication holes in outside surface and face of the outer ring allow for relubrication during operation if required. The holes are closed off with set screws. An extraction groove on the outer surface of the outer ring aids removal of the bearing.

Design for d = 60 mm

Design for d = 50 mm

Note 1. Starting torque indicates torque due to the preload of the bearing only. If you need further information please consult NSK
Note 2. Heavy series
Note 3. See definition on page 9
Note 4. Tolerances are valid for all sizes except for sizes mentioned in the sketch
BSN-DT Series

BSN-DT Series

The matched DT pairs are essentially the same as the individual bearings. The two bearings have been manufactured to match together in a paired version. Both bearings have a V-shaped mark on the outer diameter to ensure that they are arranged correctly.

<table>
<thead>
<tr>
<th>Bearing Numbers</th>
<th>Boundary Dimensions (mm)</th>
<th>Reference Dimensions (mm)</th>
<th>Basic Dynamic Load Rating (kN)</th>
<th>Basic Static Load Rating (kN)</th>
<th>Limiting Axial Load&lt;sup&gt;(3)&lt;/sup&gt; (kN)</th>
<th>Inertia (kg·cm&lt;sup&gt;2&lt;/sup&gt;)</th>
<th>Axial rigidity (N/µm)</th>
<th>Tilting rigidity (Nm/mrad)</th>
<th>Mass (kg)</th>
<th>Limiting Speed (min&lt;sup&gt;-1&lt;/sup&gt;)</th>
<th>Starting torque&lt;sup&gt;(1)&lt;/sup&gt; (Nm)</th>
<th>Recommended Clamping Force (N)</th>
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<td>30 72 76 0.6 49.1 64.4 98.0 188.0 133.0 3.600 1,800 990 1.480 3,900</td>
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</table>

Note 1. Starting torque indicates torque due to the preload of the bearing only. If you need further information please consult NSK
Note 2. Heavy series
Note 3. See definition on page 9
Note 4. Tolerances are valid for all sizes except for sizes mentioned in the sketch

*BSN60110<sup>(4)</sup>: d = 0 / -0.008
D = 0 / -0.015
BSF-DT Series

The matched DT pairs are essentially the same as the individual bearings. The two bearings have been manufactured to match together in the paired version. All sizes except one have different fixing holes in the outer ring. Both bearings have a V-shaped mark on the outer diameter to ensure that they are arranged correctly during the mounting process.

### BSF-DT Series

The matched DT pairs are essentially the same as the individual bearings. The two bearings have been manufactured to match together in the paired version. All sizes except one have different fixing holes in the outer ring. Both bearings have a V-shaped mark on the outer diameter to ensure that they are arranged correctly during the mounting process.

### Table: BSF-DT Series

<table>
<thead>
<tr>
<th>Bearing Numbers</th>
<th>Boundary Dimensions (mm)</th>
<th>Reference Dimensions (mm)</th>
<th>Fixing screws</th>
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<th>Basic Static Load Rating (kN)</th>
<th>Limiting Axial Load (kN)</th>
<th>Inertia (kg·cm²)</th>
<th>Axial Rigidity (Nm/grad)</th>
<th>Limiting Speed (min⁻¹)</th>
<th>Starting Torque (Nm)</th>
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<td>12 128.0 269.0 182.0 10.400 2,310 2,000 5,120 2,100 2.03</td>
<td>18,700 I</td>
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<td>BSF50115-DT</td>
<td>50 115 68 0.6</td>
<td>70.1 82.2 94 8.8 59 3</td>
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<td>11 78.0 220.0 143.0 10.000 2,310 2,220 3,620 2,800 0.66</td>
<td>15,400 I</td>
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<td>50 140 108 0.6</td>
<td>78.1 97.3 113 11 99 3</td>
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<td>12 188.0 440.0 299.0 29.000 2,610 3,560 8,920 2,500 2.11</td>
<td>19,100 I</td>
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Note 1. Starting torque indicates torque due to the preload of the bearing only. If you need further information please consult NSK.

Note 2. Heavy series

Note 3. See definition on page 9

Note 4. Tolerances are valid for all sizes except for sizes mentioned in the sketch.
NSK Sales Offices – Europe, Middle East and Africa

UK
NSK UK Ltd.
Northern Road, Newark
Nottinghamshire NG24 2JF
Tel. +44 (0) 1636 605123
Fax +44 (0) 1636 643276
info-uk@nsk.com

France & Benelux
NSK France S.A.S.
Quartier de l’Europe
2, rue Georges Guynemer
78283 Guyancourt Cedex
Tel. +33 (0) 1 30573939
Fax +33 (0) 1 30570001
info-fr@nsk.com

Germany, Austria, Switzerland, Nordic
NSK Deutschland GmbH
Harkortstraße 15
40880 Ratingen
Tel. +49 (0) 2102 4810
Fax +49 (0) 2102 4812290
info-de@nsk.com

Italy
NSK Italia S.p.A.
Via Garibaldi, 215
20024 Garbagnate Milanese (MI)
Tel. +39 02 995 191
Fax +39 02 990 25 778
info-it@nsk.com

Middle East
NSK Bearings Gulf Trading Co.
JAFZA View 19, Floor 24 Office 2/3
Jebel Ali Downtown, PO Box 262163
Dubai, UAE
Tel. +971 (0) 4 804 8205
Fax +971 (0) 4 884 7227
info-me@nsk.com

Poland & CEE
NSK Polska Sp. z o.o.
Warsaw Branch
Ul. Migdałowa 4/73
02-796 Warszawa
Tel. +48 22 645 15 25
Fax +48 22 645 15 29
info-pl@nsk.com

Russia
NSK Polska Sp. z o.o.
Russian Branch
Office 1703, Bldg 29,
18th Line of Vasilievsky Ostrov,
Saint-Petersburg, 199178
Tel. +7 812 3325071
Fax +7 812 3325072
info-ru@nsk.com

South Africa
NSK South Africa (Pty) Ltd.
25 Galaxy Avenue
Linbro Business Park
Sandton 2146
Tel. +27 (011) 458 3600
Fax +27 (011) 458 3608
nsk-sa@nsk.com

Spain
NSK Spain, S.A.
C/ Tarragona, 161 Cuerpo Bajo
2ª Planta, 08014 Barcelona
Tel. +34 93 2892763
Fax +34 93 4335776
info-es@nsk.com

Turkey
NSK Rulmanları Orta Doğu Tic. Ltd. Şti
19 Mayıs Mah. Atatürk Cad.
Ulma Engin İş Merkezi No: 68/3 Kat. 6
PK.: 34736 - Kozyatağı - İstanbul
Tel. +90 216 4777111
Fax +90 216 4777104
turkey@nsk.com

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