Standard Spindles
Precision Grinding Spindles
Cartridge Spindles
Precision Boring Heads

Easy to mount and replace cartridge type spindles.
A full line-up with perfect designs.
Standard Spindles

The technology of the machine tool is ever-progressing and the requirements of standard spindles are increasing steadily. NSK takes account of such technical requirements and is endeavoring to make standard spindles that are highly precise, highly rigid and highly functional. We are confident that NSK standard spindles will satisfy your needs.

- Cartridge system, easy to mount and exchange.
- Strict quality control to ensure high precision and high rigidity.
- All products in this catalog are available for prompt delivery.

Contents

**PRECISION GRINDING SPINDLES**

Features

1. Preload is always constant, as two sets of tandem duplex bearings are used with constant pressure preload.
2. The most productive spindle, producing good surface finish with high-precision, high-performance grinding.

Contents

- Precision grinding spindle types, features and selection criteria: 3
- SA type (quill type) dimension table: 4
- SC type (external and surface) dimension table: 4, 5
- SF type (surface) dimension table: 5
- Exchangeable grinding wheel arbor <reference dimensions>: 6

**CARTRIDGE SPINDLES**

Features

1. Cartridge design allows for easy mounting to brackets and easy replacement.
2. Convenient for ATC, as the cartridge spindle for machining centers incorporates the entire set of spindle bore components.
3. Highly precise and rigid main spindles for NC lathes are also available.

Contents

- Types of cartridge spindles: 7, 8
- Specifications and dimension table of cartridge spindles for machining centers: 9, 10
- Specifications and dimension table of E-40 economy type: 11, 12
- Specifications and dimension table of cartridge spindles for NC lathes: 11, 12

**PRECISION BORING HEADS**

Features

Head replacement is easy, as the center height, mounting bolt hole spacing, distance from the front mounting bolt holes to the flange end face, and other dimensions, are all standardized.

Contents

- Precision boring head types and features: 13, 14
- Dimension table for JSH**** NW type: 13, 14
- Dimension table for SH**** NW type: 13, 14
- Other Spindles: 15
Types and Features

SA Type
Quill type spindle for various exchangeable wheel arbors. Can be used for a wide range of applications.

SC Type
Two types available - flat-belt driven spindles for medium-size grinding wheels, and V-belt driven spindles for large-size grinding wheels.

SF Type
Flat-belt driven spindle for cup-type grinding wheels. Incorporates precision bearings with high load capacity.

Runout accuracy: Less than 3 μm for all types with outside cylinder diameter of less than 70 mm. Less than 5 μm for all types with outside cylinder diameter of 70 mm or greater. (SA Type: Base of test bar. SC and SF Types: End of spindle shaft.)

Spindles for counterclockwise rotation can be manufactured for special orders.

Selection Criteria

<table>
<thead>
<tr>
<th>Type of Grinding</th>
<th>Type</th>
<th>Suitable Applications</th>
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</thead>
<tbody>
<tr>
<td>Internal grinding</td>
<td>SA</td>
<td>Exchangeable grinding wheel arbor type. Use when grinding various types of holes.</td>
</tr>
<tr>
<td>External grinding</td>
<td>SC</td>
<td>Two types - one for use with medium-size grinding wheels, one for use with large-size grinding wheels.</td>
</tr>
<tr>
<td>Surface grinding</td>
<td>SC</td>
<td>Use when grinding surfaces with the outer circumference of the grinding wheel.</td>
</tr>
<tr>
<td></td>
<td>SF</td>
<td>Use when grinding surfaces with the end face of a cup-type or dish-type grinding wheel.</td>
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</tbody>
</table>

Note: Please select the size suited to the mounting conditions. Please select the spindle suited to the grinding conditions.

SA Type Internal Grinding Spindle
(Exchangeable arbor-type grinding wheel)

- Grease lubrication
- Direction of rotation: Clockwise (viewed from pulley side)
- Runout accuracy: 3 μm or less (for spindle outside diameter: 70 mm or less)
  5 μm or less (for spindle outside diameter: more than 70 mm)

<table>
<thead>
<tr>
<th>Spindle reference No.</th>
<th>Max. rot. speed (min⁻¹)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>30 000</td>
<td>60</td>
<td>220</td>
<td>48</td>
<td>28</td>
<td>8</td>
<td>11.113</td>
<td>3</td>
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<td>SA700</td>
<td>20 000</td>
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<td>SA900</td>
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<td>320</td>
<td>84</td>
<td>63</td>
<td>9</td>
<td>23.813</td>
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</table>

SC Type External and Surface Grinding Spindle
(Medium-size grinding wheel)

- Grease lubrication
- Direction of rotation: Clockwise (viewed from pulley side)
- Runout accuracy: 3 μm or less (for spindle outside diameter: 70 mm or less)
  5 μm or less (for spindle outside diameter: more than 70 mm)

<table>
<thead>
<tr>
<th>Spindle reference No.</th>
<th>Max. rot. speed (min⁻¹)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>L</th>
<th>M</th>
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<tbody>
<tr>
<td>SC6500</td>
<td>6 400</td>
<td>50</td>
<td>180</td>
<td>47</td>
<td>56</td>
<td>65 – 90</td>
<td>9.5 – 13</td>
<td>15.5</td>
<td>41</td>
<td>22.23</td>
<td>50</td>
<td>M14 x 1.5</td>
<td>2</td>
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<td>5 000</td>
<td>60</td>
<td>220</td>
<td>63</td>
<td>70</td>
<td>75 – 115</td>
<td>13 – 19</td>
<td>17</td>
<td>51</td>
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<td>M20 x 1.5</td>
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<td>SC7500</td>
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<td>73</td>
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<td>SC8500</td>
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<td>83</td>
<td>110</td>
<td>125 – 180</td>
<td>19 – 32</td>
<td>24</td>
<td>80</td>
<td>63.5</td>
<td>115</td>
<td>M30 x 1.5</td>
<td>3</td>
</tr>
</tbody>
</table>
NSK Precision Grinding Spindles

SC Type External and Surface Grinding Spindle
(Large-size grinding wheel)

- Grease lubrication
- Direction of rotation: Clockwise (viewed from pulley side)
- Runout accuracy: 3 μm or less (for spindle outside diameter: 70 mm or less)
  5 μm or less (for spindle outside diameter: more than 70 mm)
- Whetstone mount of SC5501 and SC6501 is the same as SC type (for medium-size whetstone).

SF Type Surface Grinding Spindle

- Grease lubrication
- Direction of rotation: Clockwise (viewed from pulley side)
- Runout accuracy: 3 μm or less (for spindle outside diameter: 70 mm or less)
  5 μm or less (for spindle outside diameter: more than 70 mm)

Exchangeable Grinding Wheel Arbor
(Reference dimensions)

Note: If an exchangeable spindle for SA type is required, please manufacture one according to this figure.

Spindle reference No.  A  B  C  D  E  F  G  H  K  L  M  N  P
SC5501  5 700 50 180 47 60 65 – 100 9.5 – 13 15.5 41 22.23 50 M14 x 1.5 2 10
SC6501  4 600 60 220 48 80 75 – 125 13 – 19 17 51 31.75 70 M20 x 1.5 3 10.5
SC7501  3 200 70 250 69 110 150 – 190 16 – 19 24 70 62.2 130 M26 x 1.5 3 10.5
SC8501  2 800 80 280 73 130 150 – 205 19 – 25 24 80 62.2 130 M30 x 1.5 3 10.5

Max. rot. speed (min−1)

Unit: mm

Spindle reference No.  A  B  C  D  E  F  G  H  K  L  M  N  P
SF5500  7 600 50 180 47 48 75 38 13 32 25.4 50 — 7 12
SF6500  6 400 60 220 47 56 90 45 15 35 31.75 60 M22 x 1.5 7 12
SF7500  5 700 70 250 64 63 100 52 15 39 36.1 70 — 9 19
SF8500  5 000 80 280 64 70 115 52 15 39 36.1 80 — 9 23

Max. rot. speed (min−1)

Unit: mm

Spindle reference No.  A  B  C  D  d  E  F  G  H  P  Z
SA600  66 6 50 14 11.13 3 13 3 8 1.25 12 5, 6, 8, 10, 12
SA700  94 8 71 22 17.463 3 20 4 12 1.75 19 5, 6, 8, 10, 12, 14, 16, 18
SA800  105 9 78 25 20.638 4 23 4 14 2 21 6, 8, 10, 12, 14, 16, 18, 21
SA900  118.5 11.5 86.5 30 23.813 6 26 4.5 16 2 26 10, 12, 14, 16, 18, 21, 24

Max. rot. speed (min−1)

Unit: mm

Spindle reference No.  A  B  C  D  d  E  F  G  H  P  Z

Note: The maximum length L, with respect to the exchangeable grinding wheel arbor neck with outer diameter M, can be determined using the table on the right.

When motor speed is 3 000 min−1, motor pulley diameter is φ120 and the maximum dimension of the grinding wheel (E) is used, the grinding speed is approximately 1 800 m/min. If operating conditions deviate from these conditions, please determine the appropriate pulley diameter to obtain a grinding speed of 1 800 m/min with the grinding wheel diameter used.
NSK Cartridge Spindles

Types and Features

For Machining Centers

- **High-rigidity G series** (G-40V, G-45V, G-50V)
  - High radial rigidity is achieved with a double-row cylindrical roller bearing incorporated in the fixed side. The application of a high-speed angular contact ball bearing with a contact angle of 30° for thrust load provides axial rigidity with high-speed operation. The double-row cylindrical roller bearing integrated in the free side provides a large load capacity and ensures smooth axial movement against shaft elongation caused by rising temperatures.

- **High-speed H series** (H-30V, H-40V)
  - A high-speed angular contact ball bearing with a contact angle of 15° is integrated in the fixed side. Although mainly used for high-speed operation, these bearings are also applicable to normal cutting at medium or low speeds since their quadruple configuration maintains rigidity. The free side incorporates a double-row cylindrical roller bearing, as in the high-rigidity series.

- **Economy type** (E-40)
  - As a standard stock product, delivery is swift. Spindle functions required for cutting work are integrated in a compact body available at an unprecedented price. The high level of precision is suitable for a wide variety of fields, including automobiles, electrical appliances, machine tools, optical instruments, and metals. Furthermore, the cartridge bracket can be easily attached and detached. Tool clamps are built into the shaft, facilitating easy tool replacement.

For NC Lathes

- **High-rigidity L series** (L-5, L-6)
  - Same bearing arrangement as the G series for machining centers. High radial rigidity is achieved with a double-row cylindrical roller bearing incorporated in the fixed side. A high-speed angular contact ball bearing with a contact angle of 30° for thrust load provides axial rigidity along with high-speed operation. The double-row cylindrical roller bearing integrated in the free side provides a large load capacity and ensures smooth axial movement against shaft elongation caused by rising temperatures.

- **Economy type** (E-40)
  - As a standard stock product, delivery is swift. Spindle functions required for cutting work are integrated in a compact body available at an unprecedented price. The high level of precision is suitable for a wide variety of fields, including automobiles, electrical appliances, machine tools, optical instruments, and metals. Furthermore, the cartridge bracket can be easily attached and detached. Tool clamps are built into the shaft, facilitating easy tool replacement.

- **V-types are used for vertical installation, while H-types with drain holes are available for horizontal installation.**
- **Built-in tool clamps facilitate easier operation (suitable for ATC).**
- **Use MAS • BT as the tool holder.**
- **Use MAS • I as the pull stud.**
- **The outer casing is provided with a coolant groove.**
- **When cooling, adjust the coolant oil temperature to room temperature. (Flow is approximately 5 L/min)**
- **Insert an O ring between the unit and bracket before cooling the outer casing.**
- **General purpose tool holders (BT #40, pull stud MAS • I) can be used.**
- **The air seal cover type and V pulley are optionally available.**
- **The air seal cover itself is not sold separately. The V pulley is an optional item sold separately; contact NSK for pre-installing a V pulley in the unit.**
- **Contact NSK for special products with custom-tailored specifications, such as high-speed rotating types and shaft-end modified types.**

- **The shape of the shaft end on the mounting part conforms to JIS B6190 A.**
- **V-pulley, synchronized pulley, parallel key, and drive button should be furnished by the customer.**
- **Runout accuracy: All types in this series feature mounting radial and axial runouts of 2 μm or less.**
- **All types in this series are used for horizontal installation and provided with drain holes.**
### NSK Cartridge Spindles

**For Machining Centers**

G series (V type) cross section

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<td>G-50V</td>
<td>50</td>
<td>4000</td>
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<td>11</td>
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<td>520</td>
<td>500</td>
<td>80400</td>
<td>140</td>
<td>1700</td>
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**High-Rigidity G Series**

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<td>185</td>
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<td>G-50V</td>
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<td>69.85</td>
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<td>130</td>
<td>12.5</td>
<td>220</td>
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<td>280</td>
<td>95</td>
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**High-Speed H Series**

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<tr>
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<td>30</td>
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<td>12700</td>
<td>40</td>
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<td>8380</td>
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</tbody>
</table>

**Note 1:** Pulley groove design uses Bando Chemical Industries, Ltd.'s “Banflescrum” specifications.

**5MS-7**

- Number of grooves
- Belt type

**Note 2:** Tool clamp uses ball chuck for National Taper #40 and below, collet chuck for National Taper above #40 (Collet made by BERG Inc.).

**Unit:** mm
### NSK Cartridge Spindles

#### Economy type cross section

- **Unit: mm**
- **Orientation:** Horizontal, vertical (driving end up)
- **Rotation speed:** Maximum 5,000 min⁻¹
- **Direction of rotation:** Both directions
- **Lubrication:** Grease
- **Mass (kg):** 25
- **Runout accuracy (mm):** 0.003 or less at base of test bar, 0.010 or less at a point 300 mm away from base
- **Bearing used:** 7013CTYDBB, N1011
- **Driving side clamped force (N):** 6,860
- **Driving side unclamped force (N):** 9,800
- **Note:** For horizontal installation, remove the set screw to open the drain hole.

#### For NC Lathes

**Cross section of L series**

- **Unit: mm**
- **Specifications**
  - **Type:** L-5, L-6
  - **Shaft-end specification:** JIS
  - **Max. rot. speed (min⁻¹):** 5,000 for L-5, 4,000 for L-6
  - **Rigidity (N·μm) reference:** Axial, Radial (point A)
  - **Allowable static axial load (N):** 41,200 for L-5, 61,800 for L-6
  - **Spindle weight (approx.) (kg):** 60 for L-5, 80 for L-6
  - **Average power consumption (kW):** 5.5 for L-5, 7.5 for L-6

- **Dimensions**
  - **Type:** L-5, L-6
  - **Unit:** mm
  - **Diagram:** Pulley installation location (parallel key: two places, key groove size: 5)
    - **Drain hole:** three holes

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Note: For horizontal installation, remove the set screw to open the drain hole.
Types and Features

SH3000NW (SH3060NW, SH3080NW) Type

[Most suited to low speed, heavy cutting]

This type uses two tapered roller bearings and one angular contact ball bearing. The preload of the tapered roller bearings is adjusted by rotating the round nut mounted on the rear of the spindle. The angular contact ball bearing is spring preloaded, thus the main spindle shaft is supported at 3 points.

JSH 1000NW (JSH1045NW, JSH1060NW, JSH1080NW) Type

[Most suited to light-load, high-speed cutting]

This type uses two ultra-precise angular contact ball bearings on each end. The preload is adjusted by inserting spacers between the bearings.

- Runout accuracy: The radial and axial runout for the boring bar mounting part is less than 3 μm for all types.
- All boring heads have waterproof labyrinth mechanisms, but we recommend using the protective cover as shown in the figures on the right.
- Accessories: Bolts, nuts and a wrench for installation are included with all products.

| Dimensions | Boring head shaft diameter | Max. rot. speed (min⁻¹) | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R | S | T | U | V | W | X | Y | Z | Boring head weight (approx.) (kg) |
| JSH1045NW  | 45                        | 8 000                   | 485| 35| 17| 162| 80 | 102| 110| 8 | 3 – M10 × 1.5 Tap 18 Depth | 32| 25| M16 × 1.5 | 40| 14| Parallel key 5 × 5 × 25 | 136| 14| 68 | 9 | 20 | 136| 36| 16.5| 25| 43 |
| JSH1060NW  | 60                        | 4 000                   | 475| 45| 22| 187| 80 | 102| 150| 30| 3 – M10 × 1.5 Tap 18 Depth | 43| 45| M20 × 1.5 | 58| 19| Parallel key 7 × 7 × 30 | 140| 15| 85 | 9 | 25 | 170| 45| 20 | 30| 70 |
| JSH1080NW  | 80                        | 3 000                   | 480| 45| 22| 202| 118| 142| 185| 46| 6 – M12 × 1.75 Tap 18 Depth | 62| 55| M45 × 1.5 | 74| 19| Parallel key 10 × 8 × 35 | 165| 17.5| 100 | 9 | 30 | 200| 50 | 20 | 30| 100|

| Dimensions | Boring head shaft diameter | Max. rot. speed (min⁻¹) | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | R | S | T | U | V | W | X | Y | Z | Boring head weight (approx.) (kg) |
| SH3060NW   | 60                        | 2 000                   | 475| 18| 9 | 196| 102| 150| 3 – M10 × 1.5 Tap 18 Depth PCD60 | 45| 25| 12 | 120| 50 | 125 | 17.5 | 80 | JIS Type A 3 In | 160| 30 | 20 | 4 | 70 |
| SH3080NW   | 80                        | 1 500                   | 480| 21| 9 | 210| 142| 185| 6 – M12 × 1.5 Tap 18 Depth PCD118 | 50| 30| 2 | 150| 65 | 165 | 17.5 | 100| JIS Type A 4 In | 200| 30 | 20 | 5 | 100|

Note (1) For pilot bush parts, please refer to the pilot bush parts dimensions table on this page.

Note (2) The specification of the V-pulley groove is JIS B 1854 A type.
Specially Designed Spindles With an Introduction to Other NSK Spindles

High-speed Integrated Motor Spindle for Machining Centers

Motor: AC Servo Motor (FANUC)
Use: Machining center
Lubrication: Grease, Grease replenishment
Tool: BT40 HSK-A63

High-Frequency Spindle

Motor: High-frequency motor
Use: NC milling machine, NC router, internal grinding
Lubrication: Grease, oil mist, oil vapor
Option: High-frequency inverter

In addition to standard spindles, the spindles mentioned above are specially designed and manufactured by NSK. Be sure to indicate specially designed spindles in your order.
NSK used environmentally friendly printing methods for this publication.