High-speed Integrated Motor Spindle for Machining Centers

Spindles with ISO-40 equivalent taper deliver high-speed performance of operating speeds up to 20,000 min⁻¹ while reducing energy consumption and noise using NSK’s new grease replenishing system.

For more information about NSK products, please contact:

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We will gratefully acknowledge any additions or corrections.

Best-in-class speed

NSK’s ROBUST Series bearings and FANUC’s integrated, high-performance motor deliver the highest speed for this class of spindle. The maximum speed of 20 000 min⁻¹ \((d_m 1.7\times10^6)\) was achieved under position-preloaded grease lubrication.

Ultra low noise

NSK’s design technology combined with its outstanding bearing technology and proven expertise result in ultra low noise of 69 dB with reduced vibration at 20 000 min⁻¹.

World-class performance with the highest available speed

The highly functional High-speed Integrated Motor Spindle for Machining Centers maximizes the machining ability of Class #40 high-speed machining centers. NSK realized the world’s highest speed performance of 20 000 min⁻¹ by thoroughly developing heavy cutting ability, ultra low noise, and lower environmental load.

Integrated motor utilization technology

Four technologies supporting NSK high-speed spindles

Bearing technology + design technology

Up to 20 000 min⁻¹ \((d_m 1.7\times10^6)\) under position-preloaded grease lubrication.

Low environmental load

Air consumption was cut back by 70% with oil consumption brought down to zero, significantly reducing both energy consumption and waste.

Wide-range heavy cutting

Boasting high-speed performance of 500 cm³/min for steel and 3,700 cm³/min for aluminum, NSK Integrated Motor Spindle supports the machining of dies and aluminum parts over a wide range of machining performance, from low to high speeds.

MACHINING CENTER

Integrated Motor Spindle
High-performance Machining

Superior machining performance in Class #40
Wide range of machining performance for extensive machining needs, from low-speed heavy cutting to high-speed machining.

Mounted with a highly rigid bearing for the highest performance in its class
A high rotational speed of 20,000 rpm was achieved under position-preloaded bearings of φ70 mm in bore diameter. In addition, four rows of front bearings and two rows of rear bearings, for a total of six rows, were adopted to dramatically enhance spindle rigidity.

NSK’s state-of-the-art precision bearing technology
Incorporates the ROBUST Series, proven bearings for machine tools. Ceramic balls are used for higher speed, high rigidity, and high reliability.

New grease replenishing system supports 10,000 hours of maintenance-free performance
NSK’s new proprietary, environmentally friendly grease replenishing system automatically delivers a small quantity of grease into the bearing interior at intermittent intervals.

Improved grease life
Continuous fresh supply of lubricant to components improves grease life.

Reduced energy consumption
With air consumption lowered by at least 70%, as little as 50 NL/min of air is required.

Ultra low noise
Eliminates grating wind noise caused by oil-air lubrication and reduces noise level to as low as 69 dB at 20,000 min⁻¹.

Environmentally sound
No oil is consumed, and therefore no oil particles are released into the air.

Built-in motor structure results in low vibration
Direct-drive system with no gears or couplings produces low vibration.

Low vibration
Provides improved quality in cut surface and extends tool life.

Simplified assembly
Incorporating spindle shaft and motor into single unit eliminates need for centering and aligning spindle shaft and motor.

Compact
The spindle incorporates motor between bearings at front and rear and is therefore lighter and more compact than direct-coupled units.

Easier maintenance
Unique cartridge structure allows components to be quickly replaced.

Motor mounted with FANUC NC gives the highest possible motor performance.

Cool running
Adopts optimum core shape design and state-of-the-art low iron loss material. Current ripple is lowered with HRV2 control.

Winding switching system
Winding switching system supports a wide power band range, from low to high speeds.

Highly functional integrated motor delivers strong output
Motor mounted with FANUC NC gives the highest possible motor performance.

Cool running
Optimization of internal design realizes cool running.

Improved anti-seizure property
Improved heat robustness to handle changes in ambient temperatures.

Ceramic ball
Adopts a high-precision ceramic ball for the rolling element to provide high speed, high precision, and high rigidity.

Test amplifier: SPM-30i
High-speed Integrated Motor Spindle

A wide variety of peripheral devices are offered in an all-in-one format for “plug-and-play” ease of use.

**Advantages of all-in-one spindle unit**

- **Reduced production lead time**
  - Significantly reduces time from order to completion of spindle adjustment.
  - Also reduces running stock.

- **Curbs maintenance costs**
  - Spindles can be used for different machines in the factory.
  - Reduces spare unit inventory.

**Specifications of High-speed Integrated Motor Spindle**

The following numbers will be included in the specification drawing of supplied products. When ordering, please mention the reference numbers for the product you would like to purchase.

**Reference number example:** W-B 11 00 01 3 0

<table>
<thead>
<tr>
<th>Motor model</th>
<th>11: α112S/20000iB</th>
<th>12: α112L/20000iB</th>
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<tbody>
<tr>
<td>Range</td>
<td>0: Standard position</td>
<td>1: Special position</td>
</tr>
<tr>
<td>Spindle taper/rotational speed</td>
<td>0: BT40/15000</td>
<td>1: BT40/20000</td>
</tr>
<tr>
<td></td>
<td>2: HSK-A63/15000</td>
<td>3: HSK-A63/20000</td>
</tr>
<tr>
<td>Lubrication system</td>
<td>0: Packed grease</td>
<td>1: Automatic grease replenishment</td>
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<tr>
<td>Monitor switch</td>
<td>0: None</td>
<td>1: Monitor switch</td>
</tr>
<tr>
<td></td>
<td>2: Upper and lower position limits of the tool releasing cylinder</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Monitor switch/Upper and lower position limits of the tool releasing cylinder</td>
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</tr>
<tr>
<td>Coolant (Option)</td>
<td>0: None</td>
<td>1: Through-spindle coolant</td>
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<tr>
<td></td>
<td>2: Flood coolant nozzle</td>
<td>3: Through-spindle coolant / Flood coolant nozzle</td>
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<tr>
<td>Seal</td>
<td>0: Standard seal</td>
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</table>

**Dimensions**

- 6-φ14 drill thru
- ø20 c’bore, 13 depth

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<th>Item</th>
<th>Unit</th>
<th><strong>Type S</strong></th>
<th><strong>Type L</strong></th>
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<tbody>
<tr>
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<td>BT40/HSK-A63</td>
<td>BT40/HSK-A63</td>
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<tr>
<td>Rotational speed</td>
<td>(min⁻¹)</td>
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<td>20000</td>
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<tr>
<td>Output (short time/continuous)</td>
<td>(kW)</td>
<td>18.5 (10 min) /11</td>
<td>22 (15 min) /18.5</td>
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<td>Torque</td>
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