To order J Series products, please specify: Catalog No. + J + BORE.

<table>
<thead>
<tr>
<th>Bore in</th>
<th>8x3.3</th>
<th>10x3.3</th>
<th>12x3.3</th>
<th>14x3.8</th>
<th>16x4.3</th>
<th>18x4.4</th>
<th>20x4.9</th>
<th>22x5.4</th>
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</thead>
<tbody>
<tr>
<td>M12</td>
<td>150</td>
<td>150</td>
<td>130</td>
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<td>110</td>
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<td>130</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>110</td>
</tr>
</tbody>
</table>

* The precision grade of J Series products is Surface Treatment Gear teeth induction hardened Gear teeth Standard full depth grade JIS grade N7 (JIS B1702-1: 1998) equivalent to the value shown in the table.

** Semi-custom standard products**

- No effort spent on design
- Simply select the gears you need from the catalog, eliminating design costs.
- Fast delivery available

Products are delivered with a consistent production system and within the lead time listed in the catalog (for orders of 5 units or less).

**Reliable quality**

- The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 24 for more details.
- The backlash values shown in the table are the theoretical values for the backlash in the normal direction of a pair of identical gears in mesh.
- Products marked with ** are semi-custom standard products. The delivery will take about 25 business days after the order is received.
- For semi-custom standard products weighing 15 kg or more, eyebolt mounting screws (2-M12 depth 25 mm) are manufactured around the periphery of the boss side surfaces.
- Please read "Cautions on Performing Secondary Operations" (Page 26) when performing modifications and/or secondary operations for safety concerns.
- Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).

- **Catalog No.**
- **Screw size**
- **Material**
- **Bending strength**
- **Surface durability**
- **Design note**

**Catalog No.**

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Keyway</th>
<th>Bore H7</th>
<th>Bore H7</th>
<th>Bore H7</th>
<th>Bore H7</th>
<th>Bore H7</th>
<th>Bore H7</th>
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<tr>
<td>KSSG6-20</td>
<td>20</td>
<td>150</td>
<td>130</td>
<td>110</td>
<td>90</td>
<td>70</td>
<td>50</td>
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<td>130</td>
<td>110</td>
<td>90</td>
<td>70</td>
<td>50</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>KSSG6-30</td>
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<td>150</td>
<td>130</td>
<td>110</td>
<td>90</td>
<td>70</td>
<td>50</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>

**Screw size**

- 8x3.3
- 10x3.3
- 12x3.3
- 14x3.8
- 16x4.3
- 18x4.4
- 20x4.9
- 22x5.4

**Material**

- 45#C

**Bending strength**

- Surface durability

**Design note**

- The no. of ground spur gears:

<table>
<thead>
<tr>
<th>Number of Ground Spur Gears</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSSG6-20</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>70</td>
<td>75</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>KSSG6-25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
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<td>70</td>
<td>75</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>KSSG6-30</td>
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<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>70</td>
<td>75</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>

**Catalog No.**

- KSSG6-20
- KSSG6-25
- KSSG6-30

**Keyway**

- J

**Bore H7**

- 60
- 28
- 88

**Weight (kg)**

- 43.4
- 38.3
- 33.8

**[Caution on J Series]**

- As available on request products, these require a lead-time for shipping within 7 working days (excludes the day ordered), after placing an order.
- Up to 5 units are supported. For quantities of 6 or more pieces, we need to quote price and lead time.
- Keyways are made according to JIS B1701 standards, JIS 2 tolerance. Certain products which would otherwise have a very long tapped hole are counterbored to reduce the length of the tap.
- Areas of parts which have been re-worked will not be black oxide coated.
- For products having a tapped hole, a set screw is included.
Surface hardening comes as standard.

The surface durability is increased about 4 times with Hardened Plus.
Ideal as a mating pinion for hardened racks (H Series) and laser hardened racks (HL Series).
Use to improve the durability of gears.

Hardened Plus compatible products
- SS/SSA/SSCP Spur Gears
- KS/KSSCP Thermal Refined Spur Gears

Induction hardening specification
- Area: Tooth surface hardening
- Hardness: HRC 50 to 60
- Depth: 1 mm or more

- Hardness and depth of gear-teeth induction hardening
- The hardening method and the state of the hardened teeth area vary depending on the size of gears.
- The hardening depth is where the Vickers hardness from the tooth surface to the deep area is up to HV450 (from JIS G 0559: 2008).
- Note that hardening specifications of Hardening Plus above will be near the standard pitch diameter of the gear.

Note 1: The surface durability values shown in the table are calculated values according to the assumed usage conditions. Please calculate the actual surface durability in the KHK Web Catalog.
Note 2: The gear precision decreases by about one grade after hardening.
The bore dimension tolerance H7 will also be ungraded.
Note 3: Black oxide processing cannot be performed again after hardening.
Selection Hints

Please select the most suitable products by carefully considering the characteristics of items and contents of the product tables. It is also important to read all applicable "CAUTION" notes shown below before the final selection.

1. Caution in Selecting the Mating Gears

- ① Basically, all spur gears, internal gears and racks can be paired as long as the module and pressure angle match. Products with different materials, tooth widths, or methods of cutting the teeth can be mated.
- ② When using a pinion with an internal gear with a small difference in the numbers of teeth, there are possibilities of involute interference, trochoid interference and trammel interference. See the internal gear interference portion of the technical section to avoid problems in assembling these items. (Page 182)

2. Caution in Selecting Gears Based on Gear Strength

The gear strength values shown in the product pages were computed by assuming a certain application environment. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. Also, KSSSF-F-lochub spur gears, KDSF-F-lochub spur gears and various F series that use the friction coupling method to fasten the gear shaft need additional consideration for starting torque.

The table below contains the assumptions established for various products in order to compute gear strengths.

### Calculation of Bending Strength of Gears

<table>
<thead>
<tr>
<th>Item</th>
<th>Allowable bending stress at root (kgf/mm²)</th>
<th>Direction of load</th>
<th>Allowable Hertz stress (kgf/mm²)</th>
<th>Allowable tangential force at the pitch circle</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of teeth of mating gears</td>
<td>100 rpm</td>
<td>100 rpm</td>
<td>1.15</td>
<td>100 rpm</td>
</tr>
</tbody>
</table>

### Calculation of Surface Durability (Except where it is common with bending strength)

<table>
<thead>
<tr>
<th>Item</th>
<th>Formula of spur and helical gears on surface durability (JGMA402-01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinematic viscosity of lubricant</td>
<td>100cSt(50℃)</td>
</tr>
<tr>
<td>Gear support</td>
<td>Symmetric support by bearings</td>
</tr>
<tr>
<td>Allowable Hertz stress (kgf/mm²)</td>
<td>106</td>
</tr>
</tbody>
</table>

When selecting KHK standard gears, glance over the Characteristics and Caution on Performing Secondary Operations in the respective dimension tables.

- ① Products not listed in this catalog or materials, modules, number of teeth and the like not listed in the dimensional tables can be manufactured as custom items. Please see Page 16 for more details about custom-made orders.
- ② The color and shape of the product images listed on the dimension table page of each product may differ from the actual product. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. Also, KSSSF-F-lochub spur gears, KDSF-F-lochub spur gears and various F series that use the friction coupling method to fasten the gear shaft need additional consideration for starting torque. The table below contains the assumptions established for various products in order to compute gear strengths.

### Definition of Bending Strength of Gears

The allowable bending strength of a gear is defined as the allowable tangential force at the pitch circle based on the mutually allowable root stress of two meshing gears under load.

### Definition of Surface Durability

The surface durability of a gear is defined as the allowable tangential force at the pitch circle, which permits the force to be transmitted safely without incurring surface failure. The allowable gear tooth load of a gear is defined as the allowable tangential force at the pitch circle based on the mutual gear tooth strength of two meshing gears under load.

### Step 1

Determine the actual load torque applied to the gear and the gear type suitable for the purpose.

#### Service Conditions

- Gear strength formula

\[ F_{\text{lim}} = \frac{K}{F_{\text{t}}^{0.8}} \]

#### Step 2

Select provisionally from the allowable torque table of the Master Catalog based on the load torque.

#### Step 3

We recommend that each user computes their own values by applying the actual usage conditions to determine the suitability of the gear strength.

When selecting KHK standard gears, glance over the Characteristic and Caution on Performing Secondary Operations in the respective dimension tables.

- ① Products not listed in this catalog or materials, modules, number of teeth and the like not listed in the dimensional tables can be manufactured as custom items. Please see Page 16 for more details about custom-made orders.
- ② The color and shape of the product images listed on the dimension table page of each product may differ from the actual product. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. Also, KSSSF-F-lochub spur gears, KDSF-F-lochub spur gears and various F series that use the friction coupling method to fasten the gear shaft need additional consideration for starting torque.

The table below contains the assumptions established for various products in order to compute gear strengths.
1. Cautions on Handling

① KHK products are packaged one by one to prevent scratches and dents, but if you find issues such as rust, scratches, or dents when the product is removed from the box after purchase, please contact the supplier.

② Depending on the handling method, the product may become deformed or damaged. Resin gears and ring gears deform particularly easily, so please handle with care.

2. Cautions on Performing Secondary Operations

① If reboring, it is important to pay special attention to locating the center in order to avoid runout.

② The reference datum for gear cutting is the bore. Therefore, use the bore for locating the center. If it is too difficult to do for small bores, the alternative is to use one spot on the bore and the runout of the side surface.

③ If reworking using scroll chucks, we recommend the use of new or reurbed jaws for improved precision. Please exercise caution not to crush the teeth by applying too much pressure. Any scoring will cause noise during operation.

Induction Hardening

If you apply induction hardening to the gear teeth of S45C products, you need to designate the hardness and where to apply the heat treatment. Below is an example of common specifications and KHK’s specifications for hardening:

- **Common Specifications for Heat Treatment**
  - Hardened location: Tooth surface or tooth surface and tooth root
  - Hardness: Within the range of 45 to 60 HRC and 10 HRC width
  - Example: 48 to 58 HRC

- **KHK’s Specification for Heat Treatment**
  - Hardened location: Tooth surface, or Tooth surface and Tooth root
  - Hardness: 50 to 60 HRC

*Hardness and Depth of Gear–teeth Induction Hardening*

The hardening method and the state of the hardened teeth area vary depending on the size of gears.

Since different hardening treatment is applied in accordance with the module and number of teeth, the hardness level you designate is referred to as the hardness of the reference diameter. For some of our products, the hardness at tooth tip/root may not be equal to the hardness you designated.

As to the effect vs. case depth for S45C, it is specified by JIS, as “The distance from the surface of the case to the area with hardness HV450.”

- **To avoid problems of reduced gear precision and other manufacturing difficulties, do not attempt to machine the gears to reduce face widths.**
- **When induction-hardening S45C products, thermal stress cracks may appear. Also, note that the precision grade of the product declines by 1 or 2 grades, as deformation on material may occur. If you require tolerance for bore or other parts, machining is necessary after heat treatment.**

3. Points of Caution during Assembly

① KHK stock spur gears are designed to give the proper backlash when assembled using the center distance given by the formula below (center distance tolerance of H7–H8). For the backlash of each product, please refer to the dimension table.

Backlash may be adjusted by changing the center distance of mating gears. For more information, please consult the technical section on gear backlash (page 56) in our separate technical reference book.

② Verify that the two shafts are parallel. Incorrect assembly will lead to uneven tooth contact which will cause noise and wear. (Check the assembly by painting a thin layer of red lead primer or the like on the gear teeth, meshing them together and rotating them.)

4. Cautions on Starting

① Check the following items before starting.
  - Are the gears installed securely?
  - Is there uneven tooth contact?
  - Is there adequate backlash?
  - Be sure to avoid zero–backlash.
  - Has proper lubrication been supplied?

② If the gears are exposed, be sure to attach a safety cover to ensure safety. Also, be careful not to touch rotating gears.

③ Gears can be lubricated with the “grease lubrication method”, “splash lubrication method (oil bath method)”, or “forced lubrication method (circulation lubrication method).”

For initial operation, the lubricant may deteriorate markedly, so check the condition of the lubricant after starting. For more technical information, please see the section “Gear Lubrication” (Page 112) of our technical reference book.

④ If there is any abnormality such as noise or vibration during startup, check the gears and assembly condition. “High gear accuracy”, “smooth gear teeth surface” and “correct tooth contact” are some of the measures against gear noise. For more technical information, please see the section “Gear Noise and Countermeasures” (Page 119) of our technical reference book.

**KHK Technical Information**

- **Gear oil (equivalent to JIS gear oil category 2 No. 3) The design conditions were load torque at 278 rpm, 42.5 kg/cm² (12 kW), 1.5 times the allowable bending strength, and 3 times the allowable surface durability torque.**

The pitting occurred on the poor tooth contact area after 60 hours of continuous operation.

**Poor Tooth contact and pitting**

- **Test example: Abrasion occurred on KSSG3–30 due to poor edge contact (only 30% with proper contact).**