### Spur Gears

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>No. of Teeth</th>
<th>Module</th>
<th>Other Products</th>
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<tbody>
<tr>
<td>SC415</td>
<td>G</td>
<td>1 - 15</td>
<td>1.0</td>
<td>Ground Pinion</td>
<td>Spur</td>
<td>S45C</td>
<td></td>
<td></td>
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**Catalog Number of KHK Stock Gears**

The Catalog Number for KHK stock gears is based on the simple format listed below. Please order KHK gears by specifying the Catalog Numbers.

**Example Spur Gears**

- **G**
- **1 - 15**
- **SC415**
- **S45C**
- **Spur Gears**
### Spur Gears

#### Features

To meet your applications, KHK stock gears are made in a variety of types, materials, configurations, modules and numbers of teeth. We also provide finished gears that are ready to use. Secondary operations can be performed to any of the products, allowing for a wider range of designs. The following table lists the main features.

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Module</th>
<th>Material</th>
<th>Heat Treatment</th>
<th>Tooth Surface Finish</th>
<th>Precision</th>
<th>Secondary Operations</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSGA/MSGB</td>
<td>1–4</td>
<td>SCM415</td>
<td>Carburized</td>
<td>Ground</td>
<td>N6</td>
<td>×</td>
<td>Fully hardened, ground and keyway machined gears with excellent accuracy, strength and abrasion resistance.</td>
</tr>
<tr>
<td>KSG</td>
<td>1–3</td>
<td>SCM440</td>
<td>Thermal nitrided gear teeth induction hardened</td>
<td>Ground</td>
<td>N6</td>
<td>△</td>
<td>Gears that have been tempered, hardened and ground that have excellent accuracy, strength and abrasion resistance. Secondary operations can be performed except for the teeth. This product is ideal for the pinion of the KSG Gear.</td>
</tr>
<tr>
<td>SSGS</td>
<td>1.5–3</td>
<td>S45C</td>
<td>Thermal nitrided gear teeth induction hardened</td>
<td>Ground</td>
<td>N7</td>
<td>△</td>
<td>Gears with shafts that have been tempered, hardened and ground. Secondary operations can be performed except for the teeth.</td>
</tr>
<tr>
<td>SSG</td>
<td>0.5–10</td>
<td>S45C</td>
<td>Gear teeth induction hardened with 1° taper</td>
<td>Ground</td>
<td>N7</td>
<td>△</td>
<td>Gears that have been hardened and ground with a good balance of accuracy, wear resistance and cost. Secondary operations are possible except for the teeth.</td>
</tr>
<tr>
<td>SSAG</td>
<td>1–8</td>
<td>S45C</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>KS</td>
<td>1.5–5</td>
<td>SCM440</td>
<td>Thermal nitrided gear teeth induction hardened</td>
<td>Cut</td>
<td>N8</td>
<td>◯</td>
<td>Tempered gears with excellent bending strength. The teeth can be additionally hardened. This product is ideal for the pinion of the KSG Gear.</td>
</tr>
<tr>
<td>SSS</td>
<td>1.0–10</td>
<td>S45C</td>
<td>Thermal nitrided gear teeth induction hardened</td>
<td>Cut</td>
<td>N8</td>
<td>◯</td>
<td>Many types are available at a low price. The teeth can be additionally hardened.</td>
</tr>
<tr>
<td>SSA</td>
<td>1–5</td>
<td>S45C</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>SSV/SSAY</td>
<td>0.8, 1</td>
<td>S45C</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Gears with narrow teeth. Suitable for light loads.</td>
</tr>
<tr>
<td>SUS/SUSA</td>
<td>1–4</td>
<td>SU3203</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Stainless steel gears with rust resistance.</td>
</tr>
<tr>
<td>SUSF</td>
<td>0.5–1</td>
<td>SU3203</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Stainless steel gears with rust resistance. Locking hub allows easy attachment.</td>
</tr>
<tr>
<td>DSF</td>
<td>0.5, 1</td>
<td>Polysleeve (SU3003)</td>
<td>Cut</td>
<td>N10</td>
<td>◯</td>
<td>Gears made of polysleeve. Locking hub allows easy attachment.</td>
<td></td>
</tr>
<tr>
<td>NSU</td>
<td>1–3</td>
<td>MA602ST  (SU450)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Steel hubs are lashed and fixed to reinforced nylon gears for secure fastening.</td>
</tr>
<tr>
<td>PU</td>
<td>1–2</td>
<td>MO901    (SU3003)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Stainless steel hubs are lashed and fixed to nylon gears for secure fastening.</td>
</tr>
<tr>
<td>PS/PSA</td>
<td>1–3</td>
<td>MO901</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Nylon gears can be used with no lubrication.</td>
</tr>
<tr>
<td>DS</td>
<td>0.6–1</td>
<td>Dixinon [8] (M40-44 wire)</td>
<td>—</td>
<td>Principle match</td>
<td>N12</td>
<td>◯</td>
<td>Low-priced gears made through injection molding. Suitable for light loads.</td>
</tr>
<tr>
<td>BSS</td>
<td>0.5–1</td>
<td>Free-cutting Brass (C060A)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Brass gears with excellent machinability.</td>
</tr>
<tr>
<td>SSR</td>
<td>2–3</td>
<td>S45C</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>They have a ring shape with a large number of teeth.</td>
</tr>
</tbody>
</table>

**Note:**
- Products with module under 1 m are nitrided. Gear teeth are not hardened.
- ( ) Possible △ Partly possible × Not possible
- The product accuracy class having a module under 1 corresponds to “acceptable” as shown in the table.

### KHK Technical Information

**Application Examples**

- **Fish processing machine manufactured by TOYO SUISAN KIKAI CO., LTD.**
- **Carton former**
- **Food machinery by Jey Machine Co.**
- **High-speed automatic wire straightening/cutting machine manufactured by Takashima Sangyo Co.**
- **Packing machine by New Max**
- **Electric wire winder by Fukuma Tekko KK.**

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**NOTE 1:** Products with module under 1 m are nitrided. Gear teeth are not hardened.

**NOTE 2:** All products with module less than 1 have no material thermal nitrided treatment.

**NOTE 3:** The product accuracy class having a module under 1 corresponds to “acceptable” as shown in the table.

**NOTE 4:** "Dixinon [8]" is a registered trademark of Polysleeve Co., Ltd. in Japan and as well as other countries.

**KHK stock spur gears (out 5 and higher) have semi-lapping on the tooth tips.**

**Black products are KHK stock gears that have an applied black oxide coating for rust resistance.**
Calculating the load torque applied to the gear and the gear type suitable for the purpose.

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

For provisional selection from the Master Catalog

Calculate the strength under the actual usage conditions.

For strength calculation from the Master Catalog

For strength calculation from the Web Catalog

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

1. Products not listed in this catalog or materials, modules, numbers of teeth and the like not listed in the dimensional tables can be manufactured as custom items. Please see Page 24 for more details.

2. The color and shape of the product images listed on the dimension table page of each product may differ from the actual product.

Be sure to confirm the shape in the dimension table before selection.

3. The details, specifications, dimensions, etc., listed in the catalog may be changed without prior notice. Changes are announced on the KHK website.

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E-mail: info@khkgears.net

38

39
Spur Gears

Application Hints

In order to use KHK stock gears safely, carefully read the Application Hints before proceeding.

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. Plastic gears and ring gears deform particularly easily, so please handle with care.

2. Caution on Performing Secondary Operations
   ① If reaming, it is important to pay special attention to locating the center in order to avoid runout.
   ② The reference datum for gear machining 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 with scroll chucks, we recommend the use of new or renumbered jaws for improved precision. Please exercise caution not to crush the teeth.

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 10 HRC in the range from 45 to 60 HRC
  (Example: 48 to 58 HRC)

- KHK's Specifications 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 tooth 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 effective case depth for S45C, it is specified by JIS as "The distance from the surface of the case to the area with hardness H45." Any case depth differs from area to area of a tooth, so the depth cannot be specified.

Spur Gears

Laer Operations

- The maximum bore size is dictated by the requirement that the strength of the hub is to be higher than that of the gear teeth. The maximum bore size should be 80% to 70% of the hub diameter (or tooth root diameter), and 50% to 65% for keyway applied modifications.
- In order to avoid stress concentration, round the keyway corners.

Tapping & Keyway Slotting

- Use a tapping machine or keyway slotting machine to perform tapping and slotting operations.

KHK Technical Information

3. Points of Caution during Assembly
   ① The recommended center distance tolerance of KHK stock spur gears is H7 for ground gears and H8 for cut gears. Backlash is then adjusted by changing the center distance of mating gears. For more information, please consult the technical section on gear backlash in our separate technical reference book.

   ![Diagram of gear assembly]

   

   \[ \text{where} \quad \begin{align*}
   a & = \text{Center distance} \\
   m & = \text{Module} \\
   Z_1, Z_2 & = \text{No. of teeth of pinion} \\
   Z_3 & = \text{No. of teeth of gear}
   \end{align*} \]

   The table below indicates the tolerance on the total length of KHK stock spur gears. Please refer to this data when designing gearboxes or other components.

   

<table>
<thead>
<tr>
<th>Total Length (mm)</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 or less</td>
<td>0.10</td>
</tr>
<tr>
<td>31 to 100</td>
<td>0.15</td>
</tr>
<tr>
<td>Over 100</td>
<td>0.20</td>
</tr>
</tbody>
</table>

   (Note) The following products are excluded from this table: Spur pinion shafts, injection molded spur gears, fluted hub spur gears, and MG-tyre products.

   Spur gears produce no thrust forces; however, be sure to fasten them firmly with stepped shafts, or collars, to prevent shifting toward the shaft. Keyways are generally used in fastening gears to a shaft, and they should be fastened by applying drilled holes for set screws, or applying flats to the shaft, in case of fastening only with set screws. There are also methods of secure settings using parts for engaging the hole and the axis.

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

   Test example: Abrasion occurred on SSG3-30 due to poor edge contact (only 30% with proper contact). In this example, the gear oil used is equivalent to the JS gear oil category 2, No. 3. The design conditions were lead torque at 218 rpm, 42.5 kgm (13 kW, 1.3 times theallowable bending strength, and 3 times the allowable surface durability torque. The shifting occurred on the poor tooth contact area after 60 hours of continuous operation.

4. Cautions on Starting
   ① Check the following items before starting:
      - Are the gears fastened securely?
      - Is there uneven tooth contact?
      - Is there adequate backlash? (Be sure to avoid zero-backlash.)
      - Has proper lubrication been supplied?
   ② If gears are exposed, be sure to attach a safety cover to ensure safety. Also, be careful not to touch rotating gears.
   ③ For more technical information on lubricating gears, please see the section "Gear Lubrication" in our separate technical reference book.
   ④ If there is any abnormality such as noise or vibration during startup, stop the operation immediately and check the assembly condition such as tooth contact, eccentricity and looseness.

   For more technical information, please see the section "Gear Noise and Countermeasures" in our separate technical reference book.

KHK considers safety a priority in the use of our products.

When handling, adding secondary operations, assembling, and operating KHK products, please be aware of the following issues in order to prevent accidents.

Warning: Precautions for preventing physical and property damage

1. When using KHK products, read the precautions in the catalog carefully in order to use it correctly.
2. Pay attention to the following items when installing, removing, or performing maintenance and inspection of the product:
   - Turn off the power switch.
   - Do not reach or crawl under the product.
   - Wear appropriate clothing and protective equipment for the work.

Caution: Cautions in preventing accidents

1. Before using a KHK product, read the precautions in the catalog carefully in order to use it correctly.
2. Avoid use in environments that may adversely affect the product.
3. Our products are manufactured under a superior quality control system based on the ISO9000 quality management system. If you notice any malfunctions upon purchasing a product, please contact the supplier.