Catalog Number of KHK Stock Gears

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

(Example) Spur Gears

<table>
<thead>
<tr>
<th>S</th>
<th>S</th>
<th>G</th>
<th>1</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Teeth (15)</td>
<td>Module (1)</td>
<td>Other Products (Ground Gears)</td>
<td>Type (Spur Gear)</td>
<td>Material (S45C)</td>
</tr>
</tbody>
</table>

**Material**
- M: SCM415
- K: SCM440
- S: S45C
- SU: Stainless Steel
- P: MC901
- N: MC602ST
- D: Polyacetal
- BS: Brass
- L: Sintered Metal Alloy

**Type**
- S: Spur Gears

**Other Information**
- A: Hubless Gears
- G: Ground Gears
- F: F-loc Hub Gears
- R: Ring Gears
- S: Pinion Shafts
- U: Plastic Gears with Steel Core
- Y: Thin Face Gears
### Features

To meet your requirements, KHK stock gears are made in a variety of types, materials, configurations, modules and numbers of teeth. We also offer products that allow for secondary operations to be performed on the bores, shafts, outside diameters, keyways and set screws. 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 Treatment</th>
<th>Precision</th>
<th>Secondary Operations</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSGA/MSGB</td>
<td>1 to 4</td>
<td>SCM115</td>
<td>Carburized</td>
<td>Ground</td>
<td>N5</td>
<td>×</td>
<td>High strength, abrasion-resistant and compact.</td>
</tr>
<tr>
<td>KSG</td>
<td>1 to 3</td>
<td>SCM440</td>
<td>Thermal refined, gear teeth induction</td>
<td>Ground</td>
<td>N6</td>
<td>△</td>
<td>High strength and high-precision spur gear made of thermally refined and hardened chrome molybdenum steel. Allows secondary operations.</td>
</tr>
<tr>
<td>SSAG</td>
<td>1 to 6</td>
<td>S45C</td>
<td>Gear teeth induction</td>
<td>Ground</td>
<td>N7</td>
<td>△</td>
<td>High-strength spur gear made of thermally refined chrome molybdenum steel. Used as segment gears.</td>
</tr>
<tr>
<td>KS</td>
<td>1 to 5</td>
<td>SCM440</td>
<td>Thermal refined</td>
<td>Cut</td>
<td>N8</td>
<td>△</td>
<td>Hubless gears for lighter and more compact applications. Finished J Series products are also available.</td>
</tr>
<tr>
<td>SSS</td>
<td>0.5 to 3</td>
<td>S45C</td>
<td>Thermal refined, gear teeth induction</td>
<td>Cut</td>
<td>NB</td>
<td>△</td>
<td>Hubless gears for lighter and more compact applications. Finished J and F Series products are also available.</td>
</tr>
<tr>
<td>SS</td>
<td>0.5 to 10</td>
<td>S45C</td>
<td>—</td>
<td>Cut</td>
<td>NB</td>
<td>△</td>
<td>Low cost, large selections of modules and number of teeth. Finished J and F Series products are also available.</td>
</tr>
<tr>
<td>SSA</td>
<td>1 to 5</td>
<td>S45C</td>
<td>—</td>
<td>Cut</td>
<td>N8</td>
<td>△</td>
<td>Narrower face gears for light-duty applications.</td>
</tr>
<tr>
<td>SSAY</td>
<td>0.8, 1</td>
<td>S45C</td>
<td>—</td>
<td>Cut</td>
<td>N8</td>
<td>△</td>
<td>Hubless and narrow faces for even lighter and more compact gears.</td>
</tr>
<tr>
<td>SUS/SUSA</td>
<td>1 to 4</td>
<td>SUS303</td>
<td>—</td>
<td>Cut</td>
<td>N8</td>
<td>△</td>
<td>Hubless and narrow faces for even lighter and more compact gears.</td>
</tr>
<tr>
<td>SUSF</td>
<td>0.5, 1</td>
<td>SUS303</td>
<td>—</td>
<td>Cut</td>
<td>NB</td>
<td>△</td>
<td>Fine-pitch gears with rust resistance, enabled to clamp to shafts without any keys or set screws.</td>
</tr>
<tr>
<td>DSF</td>
<td>0.5, 1</td>
<td>Polycetal (SUS303)</td>
<td>—</td>
<td>Cut</td>
<td>N10</td>
<td>△</td>
<td>Fine-pitch gears can be used without lubrication, easily clamped to shafts without any keys or set screws.</td>
</tr>
<tr>
<td>NSU</td>
<td>1 to 3</td>
<td>MC602ST (S45C)</td>
<td>—</td>
<td>Cut</td>
<td>N9</td>
<td>△</td>
<td>Nylon teeth with S45C hubs that can have keyways and set screws added. Finished J Series products are also available.</td>
</tr>
<tr>
<td>PU</td>
<td>1 to 2</td>
<td>MC901 (SUS303)</td>
<td>—</td>
<td>Cut</td>
<td>N9</td>
<td>△</td>
<td>Nylon teeth with SUS303 hubs for rust-resistance. Finished J Series products are also available.</td>
</tr>
<tr>
<td>PS/PSA</td>
<td>1 to 3</td>
<td>MC901</td>
<td>—</td>
<td>Cut</td>
<td>N9</td>
<td>△</td>
<td>Made of KMC nylon, possible to operate without lubrication. Suitable for food processing machines. Finished J Series products are also available.</td>
</tr>
<tr>
<td>DS</td>
<td>0.5 to 1</td>
<td>Duracan (M90-44)</td>
<td>—</td>
<td>Ignition-tested</td>
<td>N12</td>
<td>△</td>
<td>Low cost, mass-produced products suitable for light-duty office machines.</td>
</tr>
<tr>
<td>BSS</td>
<td>0.5 to 1</td>
<td>Free cutting brass (C360A)</td>
<td>—</td>
<td>Cut</td>
<td>NB</td>
<td>△</td>
<td>Fine-pitch gears with rust resistance. Suitable for mating with DS gears.</td>
</tr>
<tr>
<td>SSR</td>
<td>2 to 3</td>
<td>S45C</td>
<td>—</td>
<td>Cut</td>
<td>N9</td>
<td>△</td>
<td>Allows large gear ratios. Can also be used as segment gears and gear racks.</td>
</tr>
</tbody>
</table>

[NOTE 1] Products with module less than 0.8 are thermal refined, without their gear teeth being hardened.
[NOTE 2] We shape products with module less than 1 if we have no material thermal refinement treatment.
[NOTE 3] The product accuracy class having a module less than 0.8 corresponds to "equivalent" as shown in the table.

- By chamfering the corners of the top land, gear noise is reduced, and the chances of damage due to handling and transportation are decreased. All KHK gears larger than 1.5 have their teeth chamfered.
- Black products are KHK stock gears that have an applied black oxide coating for rust resistance; this is a product characteristic of KHK stock gears.

### Application Examples

KHK stock spur gears are widely used in various industrial machines including food machinery.

- **Food machinery by Jey Machine Co.**
  - SSA/SS spur gears used in timers

- **Cutting machine with stainless steel belt**
  - SSG spur gears used for feeder equipment

- **High-speed automatic wire straightening/cutting machine manufactured by Takashima Sangyo Co.**
  - SS spur gears used for wire feeder

- **Packing machine by New Max**
  - SS Spur Gears, segment shaped by secondary operation

- **Electric wire winder by Sakuma Tekko KK.**
  - SS spur gears used at the handgrip stopper

- **Automatic packing machine**
  - SSA spur gears used for driving

- **SSAY spur gears used for film cutting**
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 trimming 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. Each user computes their own values by applying the actual usage conditions. Also, SUSF F-loc hub spur gears, DSF F-loc hub 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.

<table>
<thead>
<tr>
<th>Gear Type</th>
<th>Formula</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spur Gear</td>
<td>Formula 1 = Formula spur and helical gears on bending strength (JGMA401-01)</td>
<td>The Lewis formula</td>
</tr>
<tr>
<td>Spur Gear</td>
<td>Formula 2 = Formula spur and helical gears on bending strength (JGMA401-01)</td>
<td>The Lewis formula</td>
</tr>
</tbody>
</table>

For provisional selection from the Master Catalog

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

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Scheme

Step 1: Determine the actual load torque applied to the gear and the gear type suitable for the purpose.

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

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

Application Hints

In order to use KHK stock gears safely, carefully read the Application Hints before proceeding. If there are any questions or require clarifications, please contact our technical department or your nearest distributor.

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 reworking, 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 reground jaws for improved precision. Please exercise caution not to crush the teeth by applying too much pressure. Any scarring will cause noise during operation.

④ 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 60% to 70% of the hub diameter (or tooth root diameter), and 50% to 60% for keyway applied modifications.

⑤ In order to avoid stress concentration, round the keyway corners.

Lathe Operations

Tapping & Keyway Slotting

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

<table>
<thead>
<tr>
<th>Total Length Tolerance for Spur and Helical Gears</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
</tr>
<tr>
<td>30 or less</td>
</tr>
<tr>
<td>31 to 100</td>
</tr>
<tr>
<td>Over 100</td>
</tr>
</tbody>
</table>

Where

- a: Center distance
- m: Module
- Z: No. of teeth of pinion
- Zr: No. of teeth of gear

(Example: a=50, m=5, Z=30, Zr=30)

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 secured 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 securing settings using a Mecha-Lock, a POSI-LOCK, or a Spranning, which are parts for engaging the hole and the axis.

⑦ When the two shafts are parallel. Incorrect assembly will lead to uneven teeth contact which will cause noise and wear. (Check the assembly by painting a thin layer of red lead primer or like the one on the gear teeth, meshing them together and rotating them.)

Test example: Abrasion occurred on S554-30 due to poor edge contact (only 30% with proper contact).

Spur Gears

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.

① Common Specifications for Heat Treatment

Hardening location: Gear 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 Specifications for Heat Treatment

Hardened location: Tooth surface, or Tooth surface and Tooth root

Hardness: 50 to 60 HRC

② 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 designate. 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 HV450.” The case depth differs from area to area of a tooth.

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?

② 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 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, follow relevant safety regulations (Occupational Safety and Health Regulations, etc.).

2. Pay attention to the following items when installing, removing, or performing maintenance and inspection of the product.

① Turn off the power switch.

② Do not reach or crawl under the product.

③ Wear appropriate clothing and protective equipment for the work.

Caution Cautions in Performing 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.