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: Helical Gears

<table>
<thead>
<tr>
<th>K</th>
<th>H</th>
<th>G</th>
<th>1 - 20</th>
<th>R</th>
</tr>
</thead>
</table>

- **K**: Material (SCM440)
- **H**: Helical Gears
- **G**: Ground Gears
- **1 - 20**: No. of Teeth
- **R**: Direction of Helix (R)

Other Information:
- **S**: 5SC
- **H**: Helical Gears
- **G**: Ground Gears
Characteristics

KHG stock helical gears are quiet, compact and economical. They are suitable wherever you require high-speed rotation including in machine tools, speed reducers and other industrial machinery. The following table lists the main features.

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>KHG</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module</td>
<td>1 ~ 3</td>
<td>2 ~ 3</td>
</tr>
<tr>
<td>Material</td>
<td>SCM440</td>
<td>S45C</td>
</tr>
<tr>
<td>Heat Treatment</td>
<td>Ground</td>
<td>Cut</td>
</tr>
<tr>
<td>Tooth Surface Finish</td>
<td>Possible except for tooth</td>
<td>Possible</td>
</tr>
<tr>
<td>Precision &amp; Tol (mm)</td>
<td>N6</td>
<td>N8</td>
</tr>
</tbody>
</table>

Features

Advanced grinding equipment allows for efficient production

The use of electro deposition grinding wheel produces consistent precision with shorter grinding usage, making products affordable.

Selection Hints

It is important to thoroughly understand the contents of the product tables as well as "CAUTION" notes before making the selection. You must specify the right or left hand by including the letter R or L in the catalog number when ordering.

1. Caution in Selecting the Mating Gears.

We have two different types of KHG helical gear products, one is a KHG gear type, and the other is a SH gear type. Each type of gear has different module systems, pressure angle designations and helix angles. Since the KHG Gears are of the transverse module style, and the SH gears are of normal module style, KHG and SH gears are not interchangeable. Please keep this in mind when making your selection.

Also, right hand and left hand helical mating gears are packaged as a set. See the photos below for reference and for help in making a proper selection. The table shows the possible combinations.

Mating Helical Gear Selection Chart (Allowable × Not allowable)

<table>
<thead>
<tr>
<th>Catalog No. &amp; Helix Hand</th>
<th>KHG</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>elves</td>
<td>RH</td>
<td>LH</td>
</tr>
<tr>
<td>RH</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LH</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Helix Direction

<table>
<thead>
<tr>
<th>Left (L)</th>
<th>Right (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinion (L) &amp; Rack (R)</td>
<td>Pinion (R) &amp; Rack (L)</td>
</tr>
</tbody>
</table>

2. Caution in Selecting Gears Based on Gear Strength

Allowable bending strength and surface durability values shown in product tables were computed by assuming a certain application environment. They should be used as reference only. We recommend that each user computes his own values by applying the actual usage conditions.

To find more information on gear strength calculations, please refer to separate technical reference book, in the section "Bending Strength of Spur and Helical Gear." (Page 71) or "Surface Durability of Spur and Helical Gear" (Page 78).

Calculation assumptions for Bending Strength of Gears

![Calculation table]

**NOTE 1** The formula for gear strength is based on JGMA Standard. The units for the rotational speed (rpm) and the load (kgf/mm²) were matched to the units needed in the equation.

**NOTE 2** The allowable bending stress at the root of ³² is calculated from JGMA01-01, and set to 3/3 of the value in the consideration of the use of planetary, idler, or other gear systems, loaded in both directions.

Calculation assumptions for Surface Durability (Except where it is common with bending strength)

![Calculation table]

**NOTE 1** 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.
**Helical Gears**

**Application Hints**

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

KHK CO., LTD. TECHNICAL DEPARTMENT
E-mail export@khhkgears.co.jp

1. Caution on Performing Secondary Operations

① If you are 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 the rework requires using scroll chucks, we recommend the use of new or reworked jaws for improved precision. If chucking by the teeth, please apply the pressure carefully to avoid crushing the teeth which will lead to noisy gears.
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.

① In order to avoid stress concentrations, leave radii on the keyway corners.

**Tapping & Keyway Slotting**

⑦ To avoid problems of reduced gear precision and other manufacturing difficulties, do not attempt to machine the gears to reduce face widths.
⑧ KHG Ground Helical Gears are already stress relieved. But if you subject them to a heavy turning operation such as removing the hubs, the residual stress may cause deformation.
⑨ When heat-treating SH Helical Gears, it is possible to get thermal stress cracks. It is best to subject them to penetrant inspection afterwards. If the tooth strength is not sufficient, it can be increased approximately four times by heat-treating. On the other hand, the precision of the gear will drop about one grade.

**Heat Treatment**

**Common Specifications for Heat Treatment**

Area: Tooth surface, or, Tooth surface and Tooth root
Hardness: Within 10 HRC in the range from 45 to 60 HRC. (e.g. 48 - 58 HRC)

**KHG’s Specifications for Heat Treatment**

Area: Tooth surface, or, Tooth surface and Tooth root
Hardness: From 50 to 60 HRC.

⑩ Hardness and Depth of Gear-teeth Induction Hardening
The hardening method and the state of hardened teeth area are varied 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, there may be a case that 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 HV450.” The case depth differs from area to area of a tooth.

**Application Examples**

**KHK Technical Information**

2. Points of Caution in Assembling

① KHK stock helical gears are designed to give the proper backlash when assembled using the center distance given by the formula on the right (center distance tolerance of H7 ~ H8). The amount of backlash is given in the product table for each gear.
② Please refer to overall length tolerance for Helical Gear on page 33.
③ Because of the helix of the gear teeth, helical gears in mesh produce thrust forces in the axial direction. The axial thrust bearings must be able to resist these forces. The direction of the thrust forces depend on the helix hand and the direction of rotation as shown below. For details, please refer to separate technical reference book, section of “Gear Forces” (Page 107).