Steel Ring Gears (Spur Gears)

**Specifications**
- **Precision grade**: JIS grade N9 (JIS B1702-1:1998)
- **Gear teeth**: Standard full depth
- **Pressure angle**: 20°
- **Material**: S45C
- **Heat Treatment**: —
- **Tooth hardness**: (less than 194HB)
- **Surface treatment**: Black oxide coating

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Module</th>
<th>No. of teeth</th>
<th>Shape</th>
<th>Outside dia (mm)</th>
<th>Pitch dia (mm)</th>
<th>Outside dia (mm)</th>
<th>Face width (mm)</th>
<th>Allowable torque (N·m)</th>
<th>Allowable torque (kgf·m)</th>
<th>Backlash (mm)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSIR2-120</td>
<td>m2</td>
<td>120</td>
<td>200</td>
<td>236</td>
<td>396</td>
<td>240</td>
<td>400</td>
<td>286</td>
<td>446</td>
<td>20</td>
<td>413</td>
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<tr>
<td>KSIR2-200</td>
<td>m2</td>
<td>120</td>
<td>200</td>
<td>295</td>
<td>495</td>
<td>300</td>
<td>500</td>
<td>355</td>
<td>555</td>
<td>25</td>
<td>807</td>
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<td>m2.5</td>
<td>120</td>
<td>200</td>
<td>354</td>
<td>474</td>
<td>360</td>
<td>480</td>
<td>424</td>
<td>544</td>
<td>30</td>
<td>1390</td>
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<tr>
<td>KSIR2.5-200</td>
<td>m2.5</td>
<td>120</td>
<td>160</td>
<td>354</td>
<td>474</td>
<td>360</td>
<td>480</td>
<td>424</td>
<td>544</td>
<td>30</td>
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<td>474</td>
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<td>424</td>
<td>544</td>
<td>30</td>
<td>1390</td>
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<tr>
<td>KSIR3-160</td>
<td>m3</td>
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<td>160</td>
<td>354</td>
<td>474</td>
<td>360</td>
<td>480</td>
<td>424</td>
<td>544</td>
<td>30</td>
<td>1390</td>
</tr>
</tbody>
</table>

**Established equipment and technology**

Custom gears are also available.
Diameter φ 700mm maximum, Module 6.5 maximum, Cutting Stroke 170 mm

Gear cutting by CNC Gear Shaper

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**Caution on Product Characteristics**
1. The backlash values shown in the table are the theoretical values for the normal direction for the internal ring in mesh with a 30 tooth KSS spur gear.
2. The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 183 for more details.
3. Please check for the involute interference, trochoid interference and trimming interference prior to using internal gears.

**Caution on Secondary Operations**
1. Please read “Caution on Performing Secondary Operations” (Page 183) when performing modifications and/or secondary operations for safety concerns.
2. Avoid performing secondary operations that narrow the tooth width, as it affects precision and strength.
Internal Gears

- Features
  - Internal gears are offered in modules 0.5 to 3 in 50 to 200 teeth. They can be used in many applications including planetary gear drives.
  - Catalog Number KSI KSR
  - Module 0.5 to 3 1 to 3
  - Material S45C S45C
  - Gear Treatment Cut Cut
  - Teeth 180° 180°
  - Precision NEW: 1 NEW: 9
  - Secondary Operations Possible Possible

- Application Examples
  - Internal gears are used to reduce the size of various equipment, such as reduction gears.

- Selection Hints
  - Please select the most suitable products by carefully considering the characteristics of items and contents of the product tables.

- 1. Caution in Selecting the Mating Gears
  - Internal gears can mate with any spur gears of the same module; however, there are cases of involute, trochoidal, and trimmerringe interference occurrences, depending on the number of teeth of the mating gear. The table below contains the assumptions established for these products in order to compute gear strengths.

- Interferences and the symptoms
  - Type SYMPTOMS CAUSES
  - Involute interference The tip of the internal gear digs into the root of the pinion. Too few teeth on the pinion.
  - Trochoid interference The exiting pinion tooth contacts the internal gear tooth. Too little difference in number of teeth of the two gear two.
  - Trimming interference Pinion can slide in or out axially, but cannot move radially. Too little difference in number of teeth of the two gear two.

- Types of planetary gear reduction mechanism
  - (a) Planetary type
  - (b) Solar type
  - (c) Star type

- Calculation of Bending Strength of Gears
  - The gear strength values shown in the product pages were computed assuming a certain application environment. We recommend that each user computes their own values by applying the actual usage conditions. The table below contains the assumptions established for various products in order to compute gear strengths.

- Notes
  - The product accuracy class having a module less than 0.8 corresponds to ‘equivalent’ as shown in the table.

- Application Hints
  - In order to use KHK stock internal gears safely, read the Application Hints carefully before proceeding. Please refer to Page 26 for “Cautions on Handling” and Page 27 for “Cautions on Starting”.

- 2. Points of Caution during Assembly
  - Internal gears are designed to give the proper normal direction backlash when assembled using the center distance given by the formula below. The amount of backlash is given in the product table for each gear.

- Technical Information
  - Gear Ratio and Direction of Rotation
    - (a) Internal gear is driven
    - (b) Internal gear drives

- Gear tooth conditions for planetary gear mechanisms
  - Condition 1: \( z_1 = z_2 + z_h \)
  - Condition 2: \( z_2 = \frac{1}{2} (z_1 + z_h) \)
  - Condition 3: \( z_2 = \frac{1}{2} (z_1 + z_h) \) or \( \frac{1}{2} (z_1 + z_h) + 180^\circ \)

- Note: The direction of rotation of the internal gear is different from that of two spur gears in mesh.

- 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 touch a running gear while it is moving.
    - (3) Wear protective 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 using in environments that may adversely affect the product.
  - 3. Our products are manufactured under a superior quality control system based on the ISO9001 quality management system. If you notice any malfunctions upon purchasing a product, please contact the supplier.