### Features of MHP High Ratio Hypoid Gears

A pair of MHP high-ratio hypoid gears are able to produce an amazing reduction of speed of 60:1 in one stage.

1. **Total-cost reduction**
   - The MHP provides a compact gear assembly body replacing several stages of reduction gears. This reduces the cost sharply.
2. **High efficiency**
   - Compared to worm gear drives, the MHP has less sliding contact. The resulting higher efficiency allows the use of smaller motors (See the graph on the right).
3. **High rigidity**
   - The carburized hypoid gears lead to small motors (See the graph on the right).
4. **Compact gear assembly**
   - The size of the gear housing is nearly the same as outer diameter of the large gear. (See the diagrams below)

### Comparison of MHP and Worm Gear

#### Comparison of the efficiency of MHP High Ratio Hypoid Gear and Worm Gear

#### How to determine the radial and thrust loads

Before using the MHP high-ratio hypoid gears, be sure to confirm the direction of radial and thrust loads. Following equations are used to compute these loads. The radial and thrust load coefficients are given on the product pages.

#### Radial load calculation

\[ W_{ro} = \text{Radial load on the pinion or R(N)} \]
\[ W_{ro} = W_{ro} \times T_{o} \times \frac{n}{z} \]

\[ W_{rlo} = \text{Radial load coefficient of pinion or R (given on the product pages)} \]
\[ T_{o} : \text{Torque of gear or R(N-m)} \]
\[ n : \text{Number of teeth of pinion or L} \]
\[ z : \text{Number of teeth of gear or R} \]

\[ W_{rlo} = W_{rlo} \times T_{o} \]

\[ W_{rlo} = \text{Radial load coefficient of gear or R (given on the product pages)} \]
\[ T_{o} : \text{Torque of gear or R(N-m)} \]

#### Thrust load calculation

\[ W_{tp} = \text{Thrust load on the pinion or L(N)} \]
\[ W_{tp} = W_{tp} \times T_{o} \times \frac{n}{z} \]

\[ W_{tp} = \text{Thrust load coefficient of pinion or L (given on the product page)} \]
\[ T_{o} : \text{Torque of gear or R(N-m)} \]
\[ n : \text{Number of teeth of pinion or L} \]
\[ z : \text{Number of teeth of gear or R} \]

\[ W_{tp} = W_{tp} \times T_{o} \]

\[ W_{tp} = \text{Thrust load coefficient of gear or R (given on the product pages)} \]
\[ T_{o} : \text{Torque of gear or R(N-m)} \]

### Variations in tooth contact due to poor alignment of gears

If the gear engagement position is out of the normal position, variations in tooth contact, as illustrated below, may appear:

#### (1) Tooth contact in case of a shaft-angle error

#### (2) Tooth contact in case of a shaft-offset error

#### (3) Tooth contact in case of a pinion set position error

#### (4) Tooth contact in case of a gear set position error
## Helix Hands and Offset Position

MHP High Ratio Hypoid Gears are designed to be right hand helix for gears, left hand helix for pinions. The opposite helix hand gears are not available for these products. Also, the offset position is already set, so please refer to the illustration below when designing or assembling.

### Specifications
- **JIS B 1704** - JIS grade 3
- Gear teeth: Gleason
- Pressure angle: 20°
- Material: SK5/4A/15
- Heat treatment: Carburizing
- Tooth hardness: 50~60HRc

#### Module 1.5

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Reduction ratio</th>
<th>Nominal module</th>
<th>Actual module</th>
<th>No. of teeth</th>
<th>Shape</th>
<th>Pitch circle diameter</th>
<th>Price incl.</th>
<th>Code No.</th>
<th>Driving side</th>
<th>Driving side</th>
<th>Reduction</th>
<th>Allowable transmission torque (kNm)</th>
<th>Allowable transmission torque (hp ft)</th>
<th>Backlash (mm)</th>
<th>Weight (kg)</th>
<th>Catalog No.</th>
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<tbody>
<tr>
<td>MHP1-0453R</td>
<td>15</td>
<td>m1 1.067</td>
<td>45 R</td>
<td>B9</td>
<td>12</td>
<td>30</td>
<td>48</td>
<td>19</td>
<td>16.3</td>
<td>7</td>
<td>14</td>
<td>8.40 (10)</td>
<td>44.4 (10)</td>
<td>0.10</td>
<td>0.20</td>
<td>0.05~0.15</td>
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<td>45 R</td>
<td>B8</td>
<td>14</td>
<td>40</td>
<td>78</td>
<td>28</td>
<td>23.7</td>
<td>10</td>
<td>20</td>
<td>0.94 (6)</td>
<td>4.20 (8)</td>
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<td>0.20</td>
<td>0.05~0.15</td>
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<tr>
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<td>60 R</td>
<td>B8</td>
<td>20</td>
<td>26</td>
<td>106</td>
<td>41</td>
<td>81.1</td>
<td>21</td>
<td>94</td>
<td>0.34 (6)</td>
<td>15.4 (8)</td>
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<td>0.20</td>
<td>0.05~0.15</td>
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<tr>
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<td>m1 1.05</td>
<td>60 R</td>
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<td>12</td>
<td>34</td>
<td>60</td>
<td>21</td>
<td>17.8</td>
<td>8</td>
<td>16</td>
<td>1.733 (8)</td>
<td>9.4 (10)</td>
<td>0.10</td>
<td>0.20</td>
<td>0.05~0.15</td>
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<tr>
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<td>m1.5 1.733</td>
<td>60 R</td>
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<td>14</td>
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<td>23.9</td>
<td>10</td>
<td>20</td>
<td>1.733 (8)</td>
<td>9.4 (10)</td>
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</tr>
</tbody>
</table>

① The allowable torques are obtained from the results of experimentation with the pinion at 600 rpm, lubricated with Kingstar SG-O (NHO4 A63E).
② Radial and thrust load coefficients are the factors used for calculation of those loads. As shown in the figure B8, CW and CCW stand for clockwise and counterclockwise rotation. A plus sign means that the two gears in a set move away each other when load is applied. A minus sign means that two gears in a set approach each other when load is applied. For more details, see the section "How to determine the radial and thrust loads" on Page 306.

③ Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
④ In the illustration, the area surrounded with "..." line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

**Note:** Specifications and data in this document are subject to change without notice. For more detailed information, please refer to the latest catalog or contact KHK directly.