**Safety**

**Warning** Means that improper use or handling could result in a risk of death or serious injury.

**Caution** Means that improper use or handling could result in personal injury or damage to property.

This product cannot be used for the following applications:
- Sack tightener
- Aircraft equipment
- Nuclear power equipment
- Equipment and apparatus used in domestic homes
- Equipment that directly works on water bodies
- Equipment for transport of human beings
- Equipment for use in a special environment
- Medical equipment

Please consult Harmonic Drive LLC (Harmonic Drive) in advance to use any of our product for the aforementioned applications. Fail-safe devices that prevent an accident must be designed into the equipment when the products are used in any equipment that could result in personal injury or damage to property in the event of product failure.

**Design Precautions** Be certain to read the catalog when designing the equipment.

- **Handle all the components and parts with care.**
- **To prevent accidents,** always tighten the bolts to the tightening torque specified in the table below. The bolt(s) or screw(s) is (are) the designated one(s) for installation. In an affected assembly, be sure to tighten the output shaft bolt to the specified tightening torque.
- **When assembling gearheads into your equipment,** check the flatness of your mounting surface and look for any burrs on it. Some right angle gearhead models weigh as much as 130 lbs (60 kg). No thread for an eyebolt is provided because the gearhead may be accidentally dropped when the eyebolt is used. The weight and center of gravity are determined by the mounting orientation. Some left angle gearhead models weigh as much as 100 lbs (45 kg). Use two hand holes for lifting. The weight and center of gravity are determined by the mounting orientation. Always tighten the bolts to the tightening torque specified in the table below. Please refer to the technical note for the recommended fastening methods (including bolts used and tightening torque) for installation.
- **Operating the load to the output flange**

**Operational Precautions** Be certain to read the catalog before operating the equipment.

- **Select the appropriate lubricant.**
- **Use the lubricant properly to prevent accidents.**
- **Use the lubricant properly to prevent accidents.**
- **Use caution when cleaning the product and parts.**
- **Use caution when cleaning the product and parts.**
- **Caution: Always tighten the bolts to the tightening torque specified in the table above. If the bolt is not tightened to the torque value recommended in the catalog, the product may not achieve the specified performance and product failure may result.**

---

**Handling Lubricant**

- **For proper handling of lubricants:**
  - **Lubricant is too thin can result in a problem.**
  - **Lubricant is too thin can result in a problem.**
  - **Lubricant is too thin can result in a problem.**

- **When handling the lubricant:**
  - **Carefully handle the lubricant.**
  - **Caution: Always handle the lubricant properly to prevent accidents.**
  - **Caution: Always handle the lubricant properly to prevent accidents.**

- **Storing the lubricant:**
  - **Tightly seal the container after use.**
  - **Tightly seal the container after use.**
  - **Tightly seal the container after use.**

- **Disposal of waste oil and containers:**
  - **Follow applicable regulations regarding waste disposal.**
  - **Follow applicable regulations regarding waste disposal.**
  - **Follow applicable regulations regarding waste disposal.**

---

**Assembly**

**Assembly and mount your gearhead in accordance with these instructions to achieve the best performance.** Be sure to use the recommended bolts and a torque wrench to achieve the proper tightening torques as recommended in the tables below.

**Gear assembly procedure (HPGP / HPG / CSF-GH / CSF-GH)**

To properly mount the motor to the gearhead, follow the procedure outlined below, refer to figure 3-1:

1. Turn the input shaft coupling and align the bolt with the rubber cap first.

2. For HPG/HPGH/RPGH series, apply a sealant to the surface of the motor flange that will contact the gearhead mounting flange.

3. **Recommended sealant:** LONGIT BEEF II 100

4. With the speed reducer in an upright position as illustrated in the figure below, slowly insert the motor shaft into the coupling of speed reducer. Slide the motor shaft into the input shaft coupling by inserting the motor shaft into it without letting it drop down. If the speed reducer cannot be positioned upright, slowly insert the motor shaft into the coupling of speed reducer, then tighten the motor shaft before inserting the motor shaft coupling into it without letting it drop down. When assembling gearheads into your equipment, check the flatness of your mounting surface and look for any burrs on it. Some right angle gearhead models weigh as much as 130 lbs (60 kg). No thread for an eyebolt is provided because the gearhead may be accidentally dropped when the eyebolt is used. The weight and center of gravity are determined by the mounting orientation. Some left angle gearhead models weigh as much as 100 lbs (45 kg). Use two hand holes for lifting. The weight and center of gravity are determined by the mounting orientation. Always tighten the bolts to the tightening torque specified in the table below. Please refer to the technical note for the recommended fastening methods (including bolts used and tightening torque) for installation.

5. Fasten the motor to the gearhead flange with bolts.

6. Tighten the input shaft coupling bolt to the recommended torque specified in the table below. The installation method is already inserted into the input shaft coupling when downloaded. Check the bolt size on the confirmation drawing provided.

7. **Bolt tightening torque:**

8. Insert the rubber cap provided. This completes the assembly. (Size 11: Fanatten screw with a gasket in two places)

---

**Warranty**

**EXCLUSIVE WARRANTY:** Seller warrants that new and unused product sold by Seller shall be free from defects in material or workmanship for a period of one (1) year from the date of shipment. This WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR INFRINGEMENT.

The Buyer shall promptly notify Seller in writing of any alleged defect. Warranty claims must be made by the Buyer who originally purchased the product from Seller. This warranty is not transferable to a third party.

The Seller's obligation under the warranty is limited to circumstances where the product has been used under normal conditions for which it was designed and has been installed, operated and maintained in accordance with the product specification and handling instructions. This Warranty does not cover defects which were the result of misuse, improper installation or repair, alterations or modifications by the Buyer or any third party, any natural disaster or any loss, damage, defect, claim or non-performance resulting from or attributable to the Buyer's use of the product outside the range of the Seller's specifications.

---

**Model and Code Examples**

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Size</th>
<th>Reduction Ratio</th>
<th>Output Configuration</th>
<th>Input Configuration</th>
<th>Special Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPGP</td>
<td>A</td>
<td>50</td>
<td>G</td>
<td>50</td>
<td>100</td>
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<tr>
<td>HPF</td>
<td>A</td>
<td>50</td>
<td>F</td>
<td>50</td>
<td>100</td>
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</tbody>
</table>

- **Speed reducer assembly (HPGP / HPG / CSF-GH / CSF-GH)**

- **Mounting the load to the output flange**

Follow the specifications in the table below when mounting the load onto the output flange.

---

**Output flange mounting specifications**

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Size</th>
<th>Number of bolts</th>
<th>Bolt size</th>
<th>Tightening torque</th>
<th>Transmission torque</th>
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</thead>
<tbody>
<tr>
<td>HPGP</td>
<td>A</td>
<td>8</td>
<td>M6</td>
<td>2.65</td>
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<td>HPF</td>
<td>A</td>
<td>8</td>
<td>M6</td>
<td>2.65</td>
<td>26</td>
</tr>
</tbody>
</table>

**Note:**
- **Recommended bolts:** JIS B 1176 Hexagon socket head bolt. * Strength classifications 13.0 or higher in JIS B 1000.
Safety

Warning

This product cannot be used for the following applications:

- Equipment for transport of humans
- Equipment for use in a special environment
- Medical equipment
- Vacuum environments
- Automotive equipment
- Personal recreation equipment
- Equipment that directly works on human bodies

Caution

- Steel parts: Other parts

Operational Precautions

- Do not take the product apart or disassemble it.
- Do not operate the product or parts of it without the correct orientation.
- If you are using it in an environment that is not suitable for the product, follow the instructions regarding product selection.
- Do not disassemble the products.
- Do not use it in an inappropriate environment.

Handling Lubricants

- Use protective gear when handling lubricants. Protective gloves and protective clothing should be worn when handling lubricants.
- If there is a leak, clean the area around the leak with a dry cloth and then replace the protective gear.
- Store lubricants in a cool, dry place.

Disposal

- Do not dispose of lubricants in the environment. Dispose of lubricants by following the proper procedures. Contact the manufacturer for specific disposal instructions.

Assembly

Assemble and mount your gearbox in accordance with these instructions to achieve the best performance. Be sure to use the recommended bolts and move a torque wrench to achieve the proper tightening torque as specified in the tables below.

Motor assembly procedure

1. Turn the input shaft coupling and align the bolt head with the rubber cap hole.
2. Insert the motor to the gearhead flange with bolts.
3. Secure the motor to the gearhead flange with bolts.

Speed reducer assembly

1. Insert the reducer cap provided. This completes the assembly.
2. Be sure to use the bolts for the tightening torque specified in the table.

Warranty

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Model and code examples

HPGP - 11 A - 05 BL3 - Z - F0 - Motor Code

HPF - 25 A - 11 F0 - U1 - SP1

CSF - 20 - 100 - GH - F0 - Motor Code

All information has been made to ensure that the information in this catalog is complete and accurate. However, Harmonic Drive LLC is not liable for any errors, omissions or inaccuracies in the reported data. Harmonic Drive LLC reserves the right to change the product specifications, for any reason, without prior notice. For complete details please refer to our current Terms and Conditions posted on our website.

Warranty

EXCLUSIVE WARRANTY: Seller warrants that new and unused product sold by Seller shall be free from defects in material or workmanship for a period of one (1) year from the date of shipment. THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR INFRINGEMENT.

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### Safety

**Warning**
- Improper use or handling could result in a risk of death or serious injury.

**Caution**
- Improper use or handling could result in personal injury or damage to property.

This product cannot be used for the following applications:
- Space flight equipment
- Aircraft equipment
- Nuclear power equipment
- Environment equipment or industrial equipment
- Equipment that works by the use of explosive gas or flammable gas

**Equipment for explosion forcement**
- Automotive equipment
- Equipment for use in a special environment
- Medical equipment

Please consult Harmonic Drive LLC (also see instructions for the advanced application). Fail-safe devices that prevent an accident must be designed into the equipment when the products are used in any equipment that could result in personal injury or damage to property in the event of system failure.

#### Design Precautions

To be certain that the design when configuring the equipment:

1. **Caution**
   - Be aware of any environmental conditions.
   - Ensure that the equipment is properly configured as specified in the catalog data and the mounting configuration.

2. **Caution**
   - Ensure that the equipment is properly configured as specified in the catalog data and the mounting configuration.

#### Operational Precautions

To be certain that the design when configuring the equipment:

1. **Caution**
   - Ensure that the equipment is properly configured as specified in the catalog data and the mounting configuration.

2. **Caution**
   - Ensure that the equipment is properly configured as specified in the catalog data and the mounting configuration.

### Warning

- Assemble and mount your gearhead in accordance with these instructions to achieve the best performance.

#### Assembly

Assemble and mount your gearhead in accordance with these instructions to achieve the best performance.

#### Motor assembly procedure

1. **Caution**
   - Be sure to use the recommended bolts and a torque wrench to achieve the proper tightening torques as recommended in the tables below.

**HPGP**

- HPF
- CSF-GH
- CSF-GH
- CSF-GH

![Figure 3-1](image-url)

**Motor Code**

- HPGP
- HPF
- CSF-GH
- CSF-GH
- CSF-GH

![Table 4-1](image-url)

**Output Configuration**

- HPGP
- HPF
- CSF-GH
- CSF-GH
- CSF-GH

![Table 4-2](image-url)

**Input Configuration**

- HPGP
- HPF
- CSF-GH
- CSF-GH
- CSF-GH

![Table 4-3](image-url)

**Speed reducer assembly**

- **HPGP**
- **HPF**
- **CSF-GH**
- **CSF-GH**
- **CSF-GH**
- **HPF**

![Table 5](image-url)

**Mounting the load to the output flange**

Follow the specifications in the table below when mounting the load onto the output flange.

### Warranty

EXCLUSIVE WARRANTY: Seller warrants that new and unused product sold by Seller shall be free from defects in material or workmanship for a period of (1) year from the date shipped. THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR INFRINGEMENT.

The Buyer shall promptly notify Seller in writing of any alleged defect. Warranty claims must be made by the Buyer who originally purchased the product from Seller. This warranty is not transferable to a third party.

The Seller’s obligation under this warranty is limited to circumstances where the product has been used under normal conditions for which it is designed and has been installed, operated and maintained in accordance with the product specification and handling instructions. This warranty does not cover defects which were the result of misuse, improper installation or repair, alterations or modifications by the Buyer or any third party, any natural disaster or any loss, damage, defect, claim or non-performance resulting from or attributable to the Buyer’s use of the product outside the range of the Seller’s specifications.

#### Model and code examples

**HPGP**

- **11 A 05**
- **BL3 - Z - F0**
- **Motor Code**

![Table 6](image-url)

**CSF**

- **20 - 100 - GH - F0**
- **Motor Code**

![Table 7](image-url)

**HPF**

- **25 A 11 F0 U1 SP1**

![Table 8](image-url)

**Output flange mounting specifications**

- **Bolt**
- **Input Torque**
- **Transmission Torque**

![Table 9](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 10](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 11](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 12](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 13](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 14](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 15](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 16](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 17](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 18](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 19](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 20](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 21](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 22](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 23](image-url)

**Bolt**

- **Input Torque**
- **Transmission Torque**

![Table 24](image-url)
**Safety**

**Caution**
- Means that improper use or handling could result in a risk of death or serious injury.
- Means that improper use or handling could result in personal injury or damage to property.

This product cannot be used for the following applications:
- Space flight equipment
- Aircraft equipment
- Nuclear power equipment
- Equipment and apparatus used in domestic homes
- Equipment and apparatus used in public places
- Equipment for transport of humans
- Equipment for use in a special environment
- Medical equipment

Please consult Harmonic Drive LLC beforehand for the application of the products. Fail-safe devices that prevent an accident must be designed into the equipment when the products are used in any equipment that could result in personal injury or damage to property in the event of product failure.

**Design Precautions**

Be certain to read the catalog when designing the equipment.

- **Caution**
  - Always be aware of the operational environment.
  - Be aware of the operational orientation (mounting).
  - Always be aware of the operational capacity.

- **Warning**
  - The output may exceed the rated capacity under abnormal conditions.
  - Use of the product is only allowed under the proper operational environment, capacity and conditions.

- **Operational Precautions**
  - When disposing of the product, disassemble it and sort the component parts by material type and dispose of the parts as industrial waste in accordance with the applicable laws and regulations. The component parts can be classified into three categories.
  - (1) Polymers: Rubber parts, plastic parts, electromagnetic parts
  - (2) Metal parts: Steel parts, other metal parts
  - (3) Steel parts: Other parts

**Handling Lubricants**

- **Caution**
  - When using lubricants, be aware of the following:
  - Do not use lubricants other than those specified in the catalog. Component parts may wear out due to the incorrect lubricant.

**Design Considerations**

- **Warning**
  - Avoid using the following parts:
  - Be aware of the operational conditions and orientation.

**Solution**

- Be certain to use the recommended lubricant.

**Motor assembly procedure**

To properly mount the motor to the gearhead, follow the procedure outlined below, refer to figure 3–1:

1. Turn the input shaft coupling and align the bolt head with the rubber cap hole.
2. Install the input flange.
3. Apply an appropriate amount of sealant to the surface of the motor flange to prevent oil leakage.
4. Insert the motor shaft into the input shaft coupling by guiding the motor shaft into it without letting it drop down. If the speed reducer cannot be tightened properly, slightly move the motor shaft into the coupling of speed reducer.
5. Tighten the input shaft coupling bolt to the recommended torque specified in the table below. The bolt-eye is already inserted into the input shaft coupling when delivered. Check the bolt size on the specification drawing provided.
6. Insert the rubber cap provided. This completes the assembly. (Size 11: Fasten screws with a gasket in two places)

**Warranty**

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**Model and code examples**

**HPGP**

- Model Name: HPGP
- Size: 11
- Input Flange: F0
- Output Configuration: U1
- Option: SP1

**HPF**

- Model Name: HPF
- Size: 25
- Input Flange: F0
- Output Configuration: U1
- Option: SP1

**CSF**

- Model Name: CSF
- Size: 20
- Input Flange: F0
- Output Configuration: U1
- Option: SP1

**Speed reducer assembly**

- **HPGP**
- **HPF**
- **CSGF-GH**
- **CSGF-SG**
- **HPF**
- **HPN**

<table>
<thead>
<tr>
<th>Model and code examples</th>
<th>HPGP</th>
<th>HPF</th>
<th>CSF-GH</th>
<th>CSF-SG</th>
<th>HPF</th>
<th>HPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>HPGP</td>
<td>HPF</td>
<td>CSF-GH</td>
<td>CSF-SG</td>
<td>HPF</td>
<td>HPN</td>
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</tbody>
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**Mounting the load to the output flange**

Follow the specifications in the table below when mounting the load onto the output flange.

<table>
<thead>
<tr>
<th>Output flange mounting specifications</th>
<th>HPGP</th>
<th>HPF</th>
<th>CSF-GH</th>
<th>CSF-SG</th>
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</tbody>
</table>

**Motor Code**

- **CSF-20, 100, 140, 200**
- **HPF-25, A-11, F0, U1, SP1**

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Size</th>
<th>Input Flange</th>
<th>Output Configuration</th>
<th>Option</th>
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<tbody>
<tr>
<td>CSF</td>
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</tbody>
</table>

**Harmonic Drive LLC**

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- 203-348-4280
- www.harmonicdrive.com

All efforts have been made to ensure that the information in this catalog is complete and accurate. However, Harmonic Drive LLC is not liable for any errors, omissions or inaccuracies in the catalog. Harmonic Drive LLC reserves the right to change the product specifications, for any reason, without prior notice. For complete details please refer to our current Terms and Conditions and model specifications. Please contact our sales office or distributor if any anomaly is detected.
MOUNTING THE LOAD TO THE OUTPUT FLANGE

<table>
<thead>
<tr>
<th>Size</th>
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<tbody>
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<td>8</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Bolt size</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
</tr>
<tr>
<td>Mounting FOC</td>
<td>93</td>
<td>45</td>
<td>83</td>
<td>94</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Tightening torque</td>
<td>1.5</td>
<td>1.3</td>
<td>1.5</td>
<td>3.0</td>
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<td>3.1</td>
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<td>3.1</td>
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<td>2</td>
<td>5.0</td>
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<td>5.0</td>
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<tr>
<td>kgf·cm</td>
<td>84</td>
<td>297</td>
<td>807</td>
<td>3907</td>
<td>7977</td>
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</table>

GEARHEADS WITH AN OUTPUT SHAFT

<table>
<thead>
<tr>
<th>HP</th>
<th>HP</th>
<th>HP</th>
<th>HP</th>
<th>HP</th>
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<tbody>
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<tr>
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<tr>
<td>Tightening torque</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>kgf·cm</td>
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<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td>Transmission torque</td>
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<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>kgf·cm</td>
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GEARHEADS WITH A DOUBLE SHAFT

<table>
<thead>
<tr>
<th>HP</th>
<th>HP</th>
<th>HP</th>
<th>HP</th>
<th>HP</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>23</td>
<td>23</td>
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<td>23</td>
</tr>
<tr>
<td>Number of bolts</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Bolt size</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
</tr>
<tr>
<td>Mounting FOC</td>
<td>93</td>
<td>93</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>kgf·cm</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Transmission torque</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>kgf·cm</td>
<td>84</td>
<td>84</td>
<td>84</td>
<td>84</td>
</tr>
</tbody>
</table>

LUBRICATION

Prevention of grease and oil leakage

<table>
<thead>
<tr>
<th>Common to all models:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Use the recommended greases.</td>
</tr>
<tr>
<td>- Provisions for proper sealing to prevent grease leakage are incorporated into the gearheads. However, please note that some leakage may occur depending on the application or operating condition. Discuss other sealing options with our representatives engineers.</td>
</tr>
<tr>
<td>- When mounting the gearhead horizontally position the gear as the rubber cap in the adapter flange is facing upwards.</td>
</tr>
</tbody>
</table>

HP/HPP/HPPR/HPPR Series

- Using the double sealed bearing (DDU type) for the HP/HPP/HPPR series gearhead will result in a slightly lower efficiency compared to the standard product. |
- An oil seal without a spring is used in the input shaft side of HP/HPR series with an input shaft (HPG-151) and HPPR series hollow shaft reducer. An option for an oil seal with a spring is available for improved seal reliability, however, the efficiency will be slightly lower (available for HIF and HPP for sizes 14 and larger). |
- Do not remove the needle plug and seal cap of the HP/HPP series right angle gearhead. Removing them may cause leakage of grease or affect the precision of the gear. |

Lubricant

<table>
<thead>
<tr>
<th>HP/HPD/HPP/HPPR Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>The standard lubrication for the HP/HPP/HPPR/HPPR series gearheads is grease.</td>
</tr>
<tr>
<td>All gearheads are lubricated at the factory prior to shipment and additional application of grease during assembly is not required.</td>
</tr>
<tr>
<td>The gearheads are lubricated for the life of the gear and do not require re-lubrication.</td>
</tr>
<tr>
<td>High efficiency is achieved through the unique planetary gear design and gear selection.</td>
</tr>
</tbody>
</table>

Lubricants

<table>
<thead>
<tr>
<th>Harmonic Gear SK-2A (B) (D)</th>
<th>Moseco Industrial Drive Systems Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base oil of Refined mineral oil</td>
<td>SAE 80W-90, 80W-140, Long-life Oil, Mean castor Oil, Additive: Extreme pressure agent, LIGHT GREASE</td>
</tr>
<tr>
<td>Base oil of Refined mineral oil</td>
<td>SAE 80W-90, 80W-140, Long-life Oil, Mean castor Oil, Additive: Extreme pressure agent, LIGHT GREASE</td>
</tr>
<tr>
<td>Base oil of Refined mineral oil</td>
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</tr>
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<td>Base oil of Refined mineral oil</td>
<td>SAE 80W-90, 80W-140, Long-life Oil, Mean castor Oil, Additive: Extreme pressure agent, LIGHT GREASE</td>
</tr>
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<td>Base oil of Refined mineral oil</td>
<td>SAE 80W-90, 80W-140, Long-life Oil, Mean castor Oil, Additive: Extreme pressure agent, LIGHT GREASE</td>
</tr>
</tbody>
</table>

PRECAUTIONS WHEN CHANGING THE GEARSE

Strictly observe the following instructions when changing the gearse to avoid problems such as grease leakage or increasing in operating temperature.

- The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or distributor for operation outside of the ambient operating temperature range. |
- The temperature rise of the gear depends upon the operating cycle, ambient temperature and heat conduction and radiation as affected by the customers installation of the gear. A housing surface temperature of 70°C is the maximum allowable limit.
### Mechanical Tolerances

Support mechanical precision is achieved by integrating the output flange with a high-precision cross roller bearing as a single component. The mechanical tolerances of the output shaft and mounting flanges are specified below.

#### Mounting the load to the output flange

#### BH5 tightening torque for output flange (Part B in Figure 6-1)

<table>
<thead>
<tr>
<th>Size</th>
<th>righthand</th>
<th>lefthand</th>
<th>righthand</th>
<th>lefthand</th>
</tr>
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<tbody>
<tr>
<td>6</td>
<td>8.8</td>
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<td>8</td>
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<tr>
<td>10</td>
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</tr>
<tr>
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<tr>
<td>14</td>
<td>24.3</td>
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<tr>
<td>16</td>
<td>29.7</td>
<td>29.7</td>
<td>32</td>
<td>32</td>
</tr>
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</table>

#### BH5 tightening torque for output flange (Part B in Figure 6-1)

<table>
<thead>
<tr>
<th>Size</th>
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<th>lefthand</th>
<th>righthand</th>
<th>lefthand</th>
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<tr>
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<tr>
<td>16</td>
<td>29.7</td>
<td>29.7</td>
<td>32</td>
<td>32</td>
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</table>

#### BH5 tightening torque for output flange (Part A in Figure 6-1)

<table>
<thead>
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<th>righthand</th>
<th>lefthand</th>
</tr>
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<td>10</td>
</tr>
<tr>
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<tr>
<td>10</td>
<td>15.5</td>
<td>15.5</td>
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</tr>
<tr>
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<td>20</td>
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<td>24.3</td>
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<td>16</td>
<td>29.7</td>
<td>29.7</td>
<td>32</td>
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### Gearheads with an output shaft

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<thead>
<tr>
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<th>HPF</th>
<th>HPF</th>
<th>HPF</th>
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<td>15.5</td>
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<td>20</td>
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### Lubrication

#### Gearheads with an output shaft

<table>
<thead>
<tr>
<th>HPF</th>
<th>HPF</th>
<th>HPF</th>
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<td>11.4</td>
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<td>15.5</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

### Ambient operating temperature range: -10°C to +40°C

The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or distributor for operation outside of the ambient operating temperature range.

### Precautions when changing the grease

Strictly observe the handling instructions when changing to avoid problems such as gearcase leakage or increase in running torque.

- **Note:** The amount of grease listed in Table 6-2 is the amount used to lubricate the gear at assembly. This should be used as a reference. Do not exceed this amount when re-greasing the gearhead.
- **Note:** Remove grease from the gearhead and refill it with the same quantity. The adverse effects listed above normally do not occur until the gear has been re-greased 2 times. When re-greasing 3 times or more, it is essential to remove grease (using air pressure or other means) before re-lubricating with the same amount of grease that was removed.
Manufacturer: Nippon Oil Co.

High efficiency is achieved through the unique planetary gear design and grease selection. The gearheads are lubricated for the life of the gear and do not require re-lubrication. All gearheads are lubricated at the factory prior to shipment and additional application of grease during assembly is not necessary. The standard lubrication for the HPG/HPGP/HPF/HPN series gearheads is grease.

The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or applications engineers.

Lubricant

The standard lubrication for the HPG/HPGP/HPF/HPN series gearheads is grease. All gearheads are lubricated at the factory prior to shipment and additional application of grease during assembly is not necessary.

Ambient operating temperature range: –10°C to +40°C

When to change the grease

The life of the Harmonic Drive® gear is affected by the grease performance. The grease performance varies with temperature and deteriorates with temperatures. Therefore, the grease will need to be changed sooner than usual when operating at higher temperatures. The graph on the right indicates when to change the grease based upon the temperature and the total number of input rotations when the average load torque is less than or equal to the rated output torque at 2000 rpm. Also, using the formula below, you can calculate when to change the grease when the average load torque exceeds the rated output torque at 2000 rpm.

Formula to calculate the grease change interval when the average load torque exceeds the rated output torque at 2000 rpm

\[ T_{\text{avg}} > T_{\text{rated}} \]

\[ T_{\text{avg}} = \frac{1}{n} \sum_{i=1}^{n} T_i \]

Grease quality for Reference value of grease refill amount for replacement

When to change the grease

LUB: when the average load torque is equal to or less than the rated output torque at 2000 rpm

HPF

<table>
<thead>
<tr>
<th>Number of bolts</th>
<th>Bolt size</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing with a rubber contact seal on both sides D type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HPF/HPG/HPN/HPN Series

Using the double sealed bearing (D type) for the HPF/HPG series gearhead will result in a slightly lower efficiency compared to the standard product. All oil seal without a spring is used in the input shaft side of HPG series with an input shaft (HPG-1U) and HPF series hollow shaft output.

When mounting the gearhead horizontally position the gearhead so the rubber cap in the adapter flange is facing upwards.

Sealing

Common to all models:

Provisions for proper seating to prevent grease leakage from the input shaft are incorporated into the gearhead.

A double lip Teflon oil seal is used for the output shaft (HPGP/HPG uses a single lip seal), gaskets or o-rings are used on all mating surfaces, and non contact shielded bearing are used for the gear shaft coupling (Double sealed bearings (D type) are available as an option). On the CSG/CSF-GH series, non contact shielded bearing and a Teflon oil seal with a spring is used. When mounting with a rubber with a rubber contact seal on both sides.

Harmonic Grease® SK-2

Product appearance: Yellow

Dropping point: 198°C

Consistency: 265 to 295 at 25°C

Additive: Extreme pressure agent

Soap radical: Lithium soap

Base oil: Refined mineral oil

Standard: NLGI No. 2

Ambient operating temperature range: –10°C to +40°C

Prevention of grease and oil leakage

Common to all models:

Use the recommended greases.

Provisions for proper seating to prevent grease leakage are incorporated into the gearheads. However, please note that some leakage may occur depending on the application or operating condition. Discuss other sealing options with our applications engineers.

When mounting the gearhead horizontally position the rubber cap in the adapter flange is facing upwards.

HPF/HPG/CSF-GH Series

Contact us when using HarmonicDrive® CSG/CSF-GH series with the output shaft facing downward (motor on top) at a temperature rise of 80°C or more.

Greaseheads with an output shaft

Do not subject the output shaft to any impact when mounting a pulley, pinion or other parts.

An impact to the output shaft will deteriorate the speed reduction precise and may cause reduced life or failures.

Table 5-3

<table>
<thead>
<tr>
<th>Size</th>
<th>Number of bolts</th>
<th>Bolt size</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing with a rubber contact seal on both sides D type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lubrication

Mechanical Tolerances

Superior mechanical precision is achieved by integrating the output flange with a high-precision cross roller bearing as a single component. The mechanical tolerances of the output shaft and mounting flange are specified below.

Output Flange: FI (Flange)

Output shaft: J2 [J20], J2 [J20] (shaft output)

<table>
<thead>
<tr>
<th>HPF</th>
<th>HPS</th>
<th>CSG-GH</th>
<th>CSG-GH</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
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<td>40</td>
<td>60</td>
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<tr>
<td>14</td>
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</tr>
<tr>
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<td>60</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>HPG</th>
<th>HPS</th>
<th>CSG-GH</th>
<th>CSG-GH</th>
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<td>80</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CSF-GH</th>
<th>CSF-GH</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>65</td>
</tr>
<tr>
<td>65</td>
<td>80</td>
</tr>
</tbody>
</table>

Table 4-2

<table>
<thead>
<tr>
<th>Size</th>
<th>Number of bolts</th>
<th>Bolt size</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing with a rubber contact seal on both sides D type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Precautions when changing the grease

Strictly observe the following instructions when changing the grease to avoid problems such as grease leakage or increase in running torque.

Note that the amount of grease listed in Table 8-2 is the amount used to lubricate the gear at assembly. This should be used as a reference. Do not exceed this amount when re-greasing the gearhead.

Harmonic grease from the gearhead and refill it with the same quantity. The adverse effects listed above normally do not occur until the gear has been re-greased 2 times. When re-greasing 3 times or more, it is essential to remove grease [using air pressure or other means] before re-lubricating with the same amount of grease that was removed.

<table>
<thead>
<tr>
<th>Size</th>
<th>Number of bolts</th>
<th>Bolt size</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing with a rubber contact seal on both sides D type</td>
<td></td>
<td></td>
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</tbody>
</table>

Harmonic Drive LLC
241 Lynfield Street, Pepperell, MA
www.harmonicdrive.net
Harmonic Drive, Harmonic Drive System and HarmonicPlanetary are registered trademarks of HarmonicDrive LLC.

20190610 P/N 7381-184
High efficiency is achieved through the unique planetary gear design and grease selection.

A housing surface temperature of 70ºC is the maximum allowable limit.

Do not remove the screw plug and seal cap of the HPG series right angle gearhead. Removing them may cause leakage of oil and diester oil and deteriorate the speed reducer precision and may cause reduced life.

The standard lubrication for the CSG/CSF-GH series gearheads is grease. All gearheads are lubricated at the factory prior to shipment and additional application of grease during assembly is not necessary.

The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or distributor for operation outside of the ambient operating temperature range.

The temperature rise of the gear depends upon the operating cycle, ambient temperature and heat conduction and radiation as affected by the customer’s installation of the gear. A housing surface temperature of 70°C is the maximum allowable limit.

Strictly observe the following instructions when changing the grease to avoid problems such as grease leakage or increase in running torque.

Note that the amount of grease listed in Table 6-2 is the amount used to lubricate the gear at assembly. This should be used for an average load torque at 2000 rpm.

The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or distributor for operation outside of the ambient operating temperature range.

When to change the grease

The life of the Harmonic Drive® gear is affected by the grease performance. The grease performance varies with temperature and deteriorates with temperatures. Therefore, the grease will need to be changed sooner than usual when operating at higher temperatures. The graph on the right indicates when to change the grease based upon the temperature and the total number of input rotations when the average load torque is less than or equal to the rated output torque at 2000 rpm. Also, using the formula below, you can calculate when to change the grease when the average load torque exceeds the rated output torque at 2000 rpm.

Formula to calculate when to change the grease

\[ T_{	ext{avg}} = \frac{T_{	ext{avg}}}{T_{	ext{avg}} - T} \]

Life of grease

<table>
<thead>
<tr>
<th>Grease</th>
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</tr>
</thead>
<tbody>
<tr>
<td>HPGX-1</td>
<td>3,000 hours</td>
</tr>
<tr>
<td>HPGX-2</td>
<td>6,000 hours</td>
</tr>
</tbody>
</table>

Grease quantity for Reference value of grease refill amount for replacement

<table>
<thead>
<tr>
<th>Grease</th>
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</tr>
</thead>
<tbody>
<tr>
<td>HPGX-1</td>
<td>0.8 kg</td>
</tr>
<tr>
<td>HPGX-2</td>
<td>2.1 kg</td>
</tr>
</tbody>
</table>

Dropping point

<table>
<thead>
<tr>
<th>Grease</th>
<th>Dropping point</th>
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<tbody>
<tr>
<td>HPGX-1</td>
<td>-30°C</td>
</tr>
<tr>
<td>HPGX-2</td>
<td>-30°C</td>
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Consistency

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<tr>
<th>Grease</th>
<th>Consistency</th>
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<tbody>
<tr>
<td>HPGX-1</td>
<td>265 to 295 at 25°C</td>
</tr>
<tr>
<td>HPGX-2</td>
<td>282 at 25°C</td>
</tr>
</tbody>
</table>

Additive

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<tr>
<th>Grease</th>
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<tbody>
<tr>
<td>HPGX-1</td>
<td>Extreme pressure</td>
</tr>
<tr>
<td>HPGX-2</td>
<td>Extreme pressure</td>
</tr>
</tbody>
</table>

Ambient operating temperature range: –10°C to +40°C

The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or distributor for operation outside of the ambient operating temperature range.

Manufacturer: Harmonic Drive Systems Inc.

This has been developed exclusively for smaller sized Harmonic Drive® and allows smooth wave generator rotation.

Table 8-2

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