• Zero Backlash
• High Torque
• High Precision

PSA-G
Precision Gearheads

Harmonic Drive® TECHNOLOGIES
When your applications require accurate positioning and precise motion control, Harmonic Drive Technologies offers the perfect solution. Offering zero backlash and high torque, PSA-G gearheads utilize precision, high load output bearings and harmonic drive gearing mounted in superior quality housings. Input options allow compatibility with most servo and stepper motors.

**FEATURES**

- Zero Backlash
- High Torque
- High Precision
- Motor Mounting Options
- High Overhung Load Capacity

**LOADING ANALYSIS**

To select from the ratings table, it is necessary to construct or estimate a torque speed profile diagram as shown in Figures 1 and 2.

Normal operating conditions exhibit momentary peak torques that are substantially higher than constant speed running torques. These peak torques must be carefully considered when selecting a Harmonic Drive gearhead.

**Maximum Repeated Output Torque** $T_1$ – This is the torque required to accelerate the driven components from rest to normal continuous running speed.

**Normal Constant Speed Torque** $T_2$

**Normal Deceleration Torque** $T_3$

**Maximum Momentary Torque** $T_4$ – This is the peak torque generated by sudden shock loads, such as emergency stops or crashes. Particularly severe conditions exist with high output inertia and stringent rapid stop requirements. These high levels of torque must be limited.

**Mean Torque** $T$

Calculate the mean torque.

**Mean Speed** $N$

Calculate the mean speed.
GEARHEAD SPECIFICATIONS

<table>
<thead>
<tr>
<th>PSA</th>
<th>Ratio</th>
<th>Rated Output Torque @1750rpm</th>
<th>Limited for Repeated Output Torque</th>
<th>Limited for Momentary Overload Torque</th>
<th>Static Torque Limit</th>
<th>Maximum Speed</th>
<th>Input Inertia</th>
<th>Weight</th>
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<tr>
<td></td>
<td>lb in</td>
<td>NM</td>
<td>lb in</td>
<td>NM</td>
<td>lb in</td>
<td>NM</td>
<td>RPM</td>
<td>lb in²</td>
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</table>

**Maximum Repeated Output Torque**
This is the maximum allowable torque that should be developed with dynamic torque at the input. Repetitive momentary or continuous running loads (T₁, T₂ and T₃) should not exceed this rating.

**Backdriving**
Harmonic Drive gearing can easily be back-driven unless the input shaft is locked. Under no circumstances should a gearhead be used to support a load without a fail-safe device on the output if there is a risk of injury.

**Maximum Input Speed**
This is limited by the DN value of the wave generator bearing and the type of lubricant used. Maximum input speeds for each size unit using recommended grease are listed in the ratings table.

**Static Torque Limit**
This is the maximum allowable torque that should be applied to the output when the input is locked. A typical example is the torque applied to the output during a work or machining operation when the Harmonic Drive is stationary.

**Rated Output Torque at Rated Speed Tₙ**
Assuming the maximum output torque (Tₘₐₓ) is not exceeded, this is the maximum output torque which can be transmitted at the rated input speed (1750 rpm) to achieve an average wave generator life of L₅₀=35,000 hours.

The following formula is used to calculate the continuous torque rating at input speeds other than 1750 rpm:

\[ T = \left( \frac{1750}{N} \right)^{33} \times T_N \]

- \( T \) = permissible continuous torque
- \( N \) = required speed
- \( T_N \) = rated torque (see chart)

\( T \) must not exceed the limit for repeated output torque.
The efficiency of a Harmonic Drive gearbox is dependent on speed, ratio, load and temperature. For convenience, the above graphs show efficiency against percentage of rated output torque. In applications where the output torque is very low compared to the ratings, or in extreme temperatures, consult our factory.

**TYPICAL APPLICATIONS**

Harmonic Drive Technologies’ gearheads and actuators provide the optimum solution for any high precision motion control application. Examples include:

- Precise Positioning Systems
- Index Tables
- Semiconductor Equipment
- Medical Equipment
- Robotics
- Laboratory Equipment
- Printing Registration
- Wafer Handling
- Laser Positioning

Harmonic Drive Technologies has been providing quality motion control products to a variety of industries for over 40 years. Our intention is to offer a total solution to any motion control problem. We have a full engineering staff on hand to answer any questions, and all our manufacturing is done on-site at our Peabody, Massachusetts factory.
PSA-G PRECISION GEARHEADS

PSA-8G*

PSA-10G*

PSA-14G*

*Consult factory for motor mounting options.
Harmonic Drive Technologies

Solutions for all your High Precision, Motion Control Requirements.

Harmonic Drive Technologies manufactures, markets and develops zero backlash, high ratio motion control products. Our complete line of products includes component gear sets, housed units, gearheads and actuators to satisfy any motion control requirement. Ratios range from 50:1 to 200:1. Higher ratios and custom configurations are also available. We provide our customers with the cost effective, fast time to market, most reliable motion control products, systems and solutions.

The NEW PS series offers Shaft (PSS) and Flange (PSF) output Servo Actuators and Gearheads and miniature Precision Servo Actuators and gearheads (PSA). Each of these units offers the zero-backlash and high torque synonymous with Harmonic Drive gearing with housings and motors as a solution to any motion control application.

Harmonic Drive Technologies has been supplying motion control products to industry for over 40 years. All of our design and manufacturing is done at our plant in Peabody, Massachusetts and we have a complete engineering and technical sales staff on hand to assist you with any motion control problem you may be confronted with.

Feel free to contact us with any questions you may have. We can be reached by phone 978-532-1800, fax 978-532-9406, e-mail info@harmonic-drive.com or on the World Wide Web at harmonic-drive.com.

Harmonic Drive Technologies
MADE IN THE USA
ISO 9001 Certified

Teijin Seiki Boston Inc.
247 Lynnfield Street
Peabody, MA 01960
Tel: 978-532-1800
Fax: 978-532-9406

Teijin Seiki Company Ltd.
3-3-1, Nishishimbashi
Minato-Ku
Tokyo 105-8628 Japan
Tel: 81-3-3578-7461
Fax: 81-3-3578-7471

Teijin Seiki Europe GmbH
Klosterstraße 49
40211 Düsseldorf
Germany
Tel: 49-211-17379-0
Fax: 49-211-364-677