GAM GPL Series
ROBOTIC PLANETARY GEARBOXES

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ELECTROMATE
Toll Free Phone (877) SERVO98
www.electromate.com
sales@electromate.com
Robotic Planetary Gearboxes

GAM’s GPL Series Robotic Planetary Gearboxes provide the lowest backlash and high tilting rigidity for horizontal and vertical robotic and motion control applications.

- With a backlash of $\leq 0.1$ arcmin, the GPL Series can be considered a zero backlash gearbox
- Best-in-the-market torsional rigidity for $\leq 0.6$ arcmin lost motion
- Patented design guarantees the backlash will not increase over the life time of the gearbox
- Industry-accepted proven performance
- Seven sizes with nominal output torque of 445 to 3505 Nm and ratios of 50:1 to 200:1
- Flanged solid shaft output or flanged hollow shaft output (up to 75 mm through hole)
- GAM Motor Adapter Plate ready to mount your motor

With seven sizes, two output options, and ratios up to 200:1, there is a GPL for your application.

### Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Backlash $\leq 0.1$ arcmin</td>
<td>Highest precision for your application</td>
</tr>
<tr>
<td>Lowest lost motion $\leq 0.6$ arcmin</td>
<td>Superior accuracy even with low torque</td>
</tr>
<tr>
<td>High torsional rigidity</td>
<td></td>
</tr>
<tr>
<td>Patented self-adjusting backlash system</td>
<td>Constant precision throughout the entire lifetime</td>
</tr>
<tr>
<td>High torque density 58-73 Nm/kg</td>
<td>Smaller gearbox, lighter overall system</td>
</tr>
<tr>
<td>Fully-loaded life 20,000 operating hours</td>
<td>Longer lifetime, reduced maintenance costs</td>
</tr>
<tr>
<td>Efficiency $&gt; 90%$</td>
<td>Lower power consumption, smaller motor</td>
</tr>
<tr>
<td>Quiet $&lt; 70$ dB</td>
<td>Reduced workplace noise exposure</td>
</tr>
<tr>
<td>High output, acceleration and emergency stop torque</td>
<td>More security for your application</td>
</tr>
<tr>
<td>Superior tilting and torsional stiffness</td>
<td>Allows precise positioning</td>
</tr>
<tr>
<td>Low vibration</td>
<td>High repeatability</td>
</tr>
<tr>
<td>Lowest breakaway torque</td>
<td>Better control of the overall system</td>
</tr>
<tr>
<td>Standard mineral oil</td>
<td>Reduced lubrication cost</td>
</tr>
<tr>
<td>Low operating temperature</td>
<td>Longer component and lubricant life</td>
</tr>
<tr>
<td>Low moment of inertia</td>
<td>Excellent dynamic performance</td>
</tr>
<tr>
<td>Compact design, low weight</td>
<td>Lighter overall design</td>
</tr>
<tr>
<td>GAM flange input with motor adapter and clamp</td>
<td>Ready to mount your motor</td>
</tr>
</tbody>
</table>
Applications
The GPL Series can be used in a variety of applications where zero-backlash, high tilting and torsional rigidity, and long life are required. With the large output mounting flange, through-hole option, and servo-ready mount, the GPL is ideal for many robotic and motion control applications:

- Robots
- Handling systems
- Tool changers
- Positioning
- Rack & pinion
- Pick & place
- Turntables
- and many more

Industries
The GPL Series is ideal for many industries including:

- Robotics
- Automation
- Packaging Machines
- Machine tool builders
- Turntables
- Printing industry
- Welding Systems
- Medical
- Navigation
- and many more

![Articulated Robot with GPL Planetary Gearbox in the base](image1)

![Precision Turntable driven by GPL Planetary Gearbox](image2)
Design Features

- Integrated helical input stage for high input ratios and high input speeds
- Main bearing to absorb high external forces
- Ground gears for lowest backlash with high repeatability, low noise and high transmission accuracy
- Hollow shaft for cables or supply lines
- Output flange for high torsion and tilting stiffness

Superior Performance

The GPL Series provides superior performance compared to cycloidal gearboxes

<table>
<thead>
<tr>
<th>Feature</th>
<th>GAM Planetary</th>
<th>Cycloidal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backlash</td>
<td>&lt;0.1 arcmin, remains constant throughout the whole lifetime of the gearbox</td>
<td>Backlash can increase after approximately one year, requiring adjustment</td>
</tr>
<tr>
<td>Torque</td>
<td>Torque of the gearbox rated with output speed n2=15 rpm</td>
<td>Some published torques rated for output speed of n2=5 rpm</td>
</tr>
<tr>
<td>Service Life</td>
<td>20,000 operating hours</td>
<td>6,000 hours</td>
</tr>
<tr>
<td>Efficiency</td>
<td>&gt;90%</td>
<td>&gt;85%</td>
</tr>
<tr>
<td>Power Density</td>
<td>Highest power density (Nm/kg) in comparison to other manufacturers' gearboxes</td>
<td></td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>S1 (continuous) duty cycle is possible as the teeth are in contact immediately when operation starts; high input speeds up to 6600 rpm are possible.</td>
<td>Lower input speeds per published catalog values</td>
</tr>
</tbody>
</table>
ROBOTIC PLANETARY GEARBOXES

GPL Series Models

Solid Shaft with Flange (F)  
Hollow Shaft with Flange (H)

GAM Motor Adapter Plate  
for quick and easy motor mounting

Technical Specifications

<table>
<thead>
<tr>
<th>GPL Gearbox</th>
<th>056</th>
<th>080</th>
<th>112</th>
<th>160</th>
<th>224</th>
<th>300</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Ratios (F)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal Ratios (H)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer Diameter mm</td>
<td>180</td>
<td>200</td>
<td>232</td>
<td>248</td>
<td>263</td>
<td>301</td>
<td>329</td>
</tr>
<tr>
<td>Nominal Output Torque Nm</td>
<td>445</td>
<td>770</td>
<td>1165</td>
<td>1450</td>
<td>1820</td>
<td>2690</td>
<td>3505</td>
</tr>
<tr>
<td>Length (F) ** mm</td>
<td>91</td>
<td>102.25</td>
<td>118.25</td>
<td>122.5</td>
<td>132</td>
<td>148.75</td>
<td>161</td>
</tr>
<tr>
<td>Length (H) ** mm</td>
<td>103.3</td>
<td>116.5</td>
<td>128.25</td>
<td>132.5</td>
<td>141</td>
<td>160.25</td>
<td>172</td>
</tr>
<tr>
<td>Max Radial Force (Dynamic) N</td>
<td>11,000</td>
<td>11,500</td>
<td>18,000</td>
<td>19,000</td>
<td>20,000</td>
<td>26,500</td>
<td>29,000</td>
</tr>
<tr>
<td>Power Density Nm/kg</td>
<td>57.8</td>
<td>68.8</td>
<td>73.3</td>
<td>72.9</td>
<td>65.7</td>
<td>71.9</td>
<td>69.7</td>
</tr>
<tr>
<td>Torsional Stiffness (F)* Nm/arcmin</td>
<td>165</td>
<td>260</td>
<td>430</td>
<td>570</td>
<td>680</td>
<td>1130</td>
<td>1350</td>
</tr>
<tr>
<td>Torsional Stiffness (H)* Nm/arcmin</td>
<td>185</td>
<td>305</td>
<td>480</td>
<td>690</td>
<td>820</td>
<td>1240</td>
<td>1460</td>
</tr>
<tr>
<td>Tilting Stiffness (F)* Nm/arcmin</td>
<td>1170</td>
<td>1560</td>
<td>2230</td>
<td>2300</td>
<td>2620</td>
<td>5490</td>
<td>6260</td>
</tr>
<tr>
<td>Tilting Stiffness (H)* Nm/arcmin</td>
<td>2090</td>
<td>2730</td>
<td>3315</td>
<td>3670</td>
<td>4100</td>
<td>8810</td>
<td>10,250</td>
</tr>
<tr>
<td>Through Hole Diameter (H)* mm</td>
<td>33</td>
<td>42</td>
<td>50</td>
<td>55</td>
<td>60</td>
<td>68.5</td>
<td>75</td>
</tr>
<tr>
<td>Backlash</td>
<td>≤ 0.1 arcmin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lost Motion</td>
<td>≤ 0.6 arcmin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>≥ 90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* (F) = Solid Flange Output; (H) = Hollow Shaft Output  ** Length of main body, does not include input pinion housing and motor adapter
About GAM
Founded in 1990 by Gary A. Michalek, GAM is a U.S. owned and operated manufacturer of precision motion control components used in automated machinery. We offer a broad product range of gear reducers, servo couplings, and other specialized mechanical drive solutions. Our customers are in a wide variety of industries including aerospace, automotive, medical, material handling, energy, packaging, machine tool, robotics and semiconductor.

What makes us different?
1. A wide range of standard products
2. Flexibility - Customized solutions at a value to our customers
3. Excellent customer service (customers often tell us “we are good to work with”)

Our mission is to be flexible and give great service!
We are the market leader, known for our flexibility to offer our customers the best solution to meet their unique application requirements. We are passionate about helping our customers and employees be successful! Our customer service is driven through the entire organization, and our lean manufacturing enables us to deliver standard, modified, or customized products quickly, and at a price that is a value, no matter what quantity.

Capabilities
• Application Engineering - Upfront collaboration to understand customer requirements
• Design Engineering - Highly skilled team of engineers to develop standard, modified, and customized solutions
• U.S. Manufacturing - Flexible systems, state-of-the-art CNC equipment and assembly cells to bring the ideas to life
• Quality Control - Quality management system and dedicated staff to ensure products are produced to specification

Our Core Values
• Teamwork
• Action-Oriented
• Long-term Relationships
• Professionalism
• Fun
Find the exact solution you are looking for at GAM!

GAM’s product range of gear reducers, couplings, and other specialized mechanical drive solutions is one of the largest in the industry. Even with such a wide offering, we realize that you may not find a standard product that meets your exact requirements.

One of our greatest strengths is our ability to modify standard designs, provide completely customized solutions, and integrated product assemblies to meet your specific application requirements. And, because of our flexible manufacturing, we can cost-effectively produce small batches of customized product in short lead-times. So if you can’t find what you are looking for, just ask!

A few examples of our customized solutions:

- Low backlash planetary gearbox with special output shaft length
- Reinforced compact planetary gearbox with spline output shaft
- Spiral bevel gearbox with special mounting features for unique application
- Flange output gearbox with special input shaft designed for explosion-proof application
GAM is your complete source for Gear Reducers, Servo Couplings, and other precision mechanical drive solutions used in automation technology.

With one of the largest product offerings in the motion control industry as well as the engineering expertise and manufacturing capabilities to develop customized solutions, GAM can help with your application.

Being flexible to meet the needs of customer requests and great service are what set us apart from the rest.

GAM Can.

GAM Website
- Clean layout for easy navigation
- Continually updated with pertinent news and information
- Online Catalog with over 16,000 products
- Search products on performance specifications or by part number

Sizing Tool
- Quickly size the right gear reducer, coupling, or linear mount product compatible with your motor
- Over 9,000 popular servomotors available
- Easily narrow down the products that match
- Compare matching products side-by-side

Download CAD models
- All products configured to your specifications
- Quickly downloadable in popular 2D / 3D CAD formats
- Models available in .PDF and 3D PDF
- Motor selection tool for simple adapter plate generation

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