Moog compliments its gimbal line by providing additional sized electric propulsion (ep) thruster gimbal assemblies that range from small to large, and one intended to point various sized ep thruster engines. The gimbals can be configured for wide rotation on both axes, limited with the inclusion of range defining hard stops on the thruster axes. Moog has qualified and flown the widest angular range thruster gimbals. Designed and manufactured by Moog, Chatsworth Operations, these thruster gimbals address the growing demand for dedicated thruster gimbals. These gimbals provide vector-pointing capabilities for various propulsion thruster configurations including Xenon, Arc-jet and NTO/MMH etc.

A Moog EP Thruster Gimbal has successfully steered the MUSES-C (Hayabusa) spacecraft to the Itokawa asteroid and returned safely to Earth. The Hayabusa II mission will have taken another journey in 2014 to Asteroid 1999 JU3.

The Moog Model-T EP Propellant Dual Axis Thruster Gimbals have successfully been used for orbit raising and station keeping of heavier payload satellites. There are multiple Model-T TGAs in flight.

**KEY FEATURES**

- The designs are based on the Moog Rotary Actuator having demonstrated a minimum of 15 year on-orbit design life on multiple missions
- High resolution and accuracy
- Dual axis gimbal driven by rotary actuators for cross-axis positioning
- High reliability space qualified stepper motors with Harmonic Drive transmission
- Potentiometer for position telemetry
- Two to Four propellant fuel lines with heaters/thermisters
- Available with MLI blanket
## PHYSICAL CHARACTERISTICS

### Large TGA

<table>
<thead>
<tr>
<th>Description</th>
<th>4-Phase</th>
<th>2-Phase</th>
<th>3-Phase, 1.5 deg</th>
<th>3-Phase, 1.0 deg</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-100 VDC</td>
<td>222 x 267 x 267</td>
<td>222 x 267 x 267</td>
<td>254 x 250 x 250</td>
<td>254 x 250 x 250</td>
</tr>
<tr>
<td>24-28 VDC</td>
<td>222 x 267 x 267</td>
<td>254 x 250 x 250</td>
<td>254 x 250 x 250</td>
<td></td>
</tr>
<tr>
<td>Mount Dimensions</td>
<td>254 x 250 x 250</td>
<td>254 x 250 x 250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Payload Weight Externally Supported (Kg)</td>
<td>23</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

### Performance

- Total Rotational Range of Travel (deg): +/-36 in both X & Y Axis
- Angular Resolution (deg): 0.01125/step
- Angular Velocity (deg/sec): 3
- Incremental Angular Accuracy (deg): +/-0.003
- Operating Temperature Range (deg): -20 C to +80 C
- Max. Power Consumption/Actuator (Watts): 22

### Medium and Small TGA

<table>
<thead>
<tr>
<th>Description</th>
<th>3-Phase, 2.0 deg</th>
<th>2-Phase, 3.0 deg</th>
<th>3-Phase, 3.75 deg</th>
<th>2-Phase, 3.0 deg</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Phase, 2.0 deg</td>
<td>24 - 32 VDC</td>
<td>24 - 32 VDC</td>
<td>24 - 32 VDC</td>
<td>24 - 32 VDC</td>
</tr>
<tr>
<td>2-Phase, 3.0 deg</td>
<td>24 - 32 VDC</td>
<td>24 - 32 VDC</td>
<td>24 - 32 VDC</td>
<td>24 - 32 VDC</td>
</tr>
<tr>
<td>Mount Dimensions</td>
<td>100 x 100</td>
<td>100 x 100</td>
<td>140 x 159 x 159</td>
<td>140 x 159 x 159</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Payload Weight Externally Supported (Kg)</td>
<td>18</td>
<td>18</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

### Performance

- Total Rotational Range of Travel (deg): +/-28 in both X & Y Axis
- Angular Resolution (deg): 0.020
- Angular Velocity (deg/sec): 4
- Incremental Angular Accuracy (deg): +/-0.004
- Operating Temperature Range (deg): -50 C to +105 C
- Max. Power Consumption/Actuator (Watts): 10

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