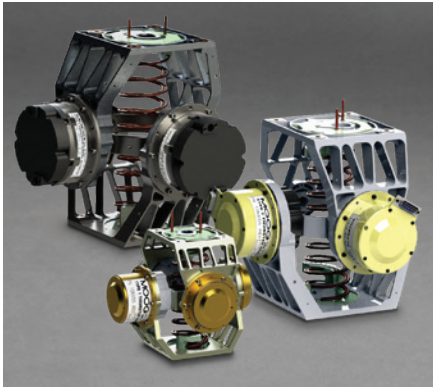# ELECTRIC PROPULSION THRUSTER GIMBAL ASSEMBLIES (TGA)

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.

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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.

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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
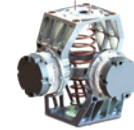- Available with MLI blanket

MOOG
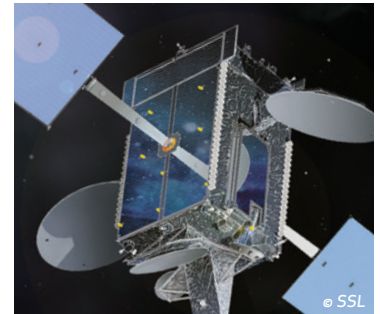
ELECTRIC PROPULSION THRUSTER GIMBAL ASSEMBLIES (TGA)

PHYSICAL CHARACTERISTICS

Large TGA

|	Model-T		Model-L	
Description	4-Phase 70-100 VDC	2-Phase 24 -28 VDC	3-Phase, 1.5 deg 24 - 32 VDC	3-Phase, 1.0 deg 24 - 32 VDC
Dimension (mm)	222 x 267 x 267	222 x 267 x 267	254 x 250 x 250	254 x 250 x 250
Weight (Kg)	5	5	6	6
Payload Weight Externally Supported (Kg)	23	30	30	30
Performance				
Total Rotational Range of Travel (deg)	+/-36 in both X & Y Axis		+/-36 in both X & Y Axis	
Angular Resolution (deg)	0.01125/step	0.01125/step	0.0075	0.00625
Angular Velocity (deg/sec)	3	3	2.25	1.9
Incremental Angular Accuracy (deg)	+/-0.003	+/-0.003	+/-0.003	+/-0.003
Absolute Angular Accuracy (deg)	0.03	0.03	0.015	0.012
Operating Temperature Range (deg)	-20 C to +80 C	-20 C to +100 C	-50 C to +105 C	-50 C to +105 C
Max. Power Consumption/Actuator (Watts)	22	15	18	18

PHYSICAL CHARACTERISTICS

Medium and Small TGA
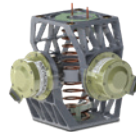
	Model-M		Model-S	
Description	3-Phase, 2.0 deg 24 - 32 VDC	2-Phase, 3.0 deg 24 - 32 VDC	3-Phase, 3.75 deg 24 - 32 VDC	2-Phase, 3.0 deg 24 - 32 VDC
Dimension (mm)	221 x 231 x 231	221 x 231 x 231	140 x 159 x 159	140 x 159 x 159
Mount Dimensions (mm)	100 x 100	100 x 100	76 x 76	76 x 76
Weight (Kg)	4	4	2	2
Payload Weight Externally Supported (Kg)	18	18	6	6
Performance				
Total Rotational Range of Travel (deg)	+/-28 in both X & Y Axis		+/-18 in both X & Y Axis	
Angular Resolution (deg)	0.020	0.030	0.0375	0.030
Angular Velocity (deg/sec)	4	6	12	9
Incremental Angular Accuracy (deg)	+/-0.004	+/-0.006	+/-0.016	+/-0.015
Absolute Angular Accuracy (deg)	0.020	0.030	0.015	0.012
Operating Temperature Range (deg)	-50 C to +105 C	-50 C to +105 C	-50 C to +105 C	-50 C to +105 C
Max. Power Consumption/Actuator (Watts)	10	10	5	6

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