

MODEL 863 ROTARY SERVO ACTUATOR



The Model 863 is a high performance rotary servo electromechanical actuator that integrates a rare earth brushless DC motor and servo loop control electronics. The 863 servo is used for flight control, throttle control and other utility functions for UAV and aerospace programs. These actuators are designed to operate under extreme environmental conditions and customers find them easy to implement into their systems.

This model is designed to be submersible up to 3 meters for a maximum of 3 hours, allowing it to be used on multiple applications including target drones.

TYPICAL APPLICATIONS

- Unmanned air vehicles — tactical, medium long endurance and MALE / HALE vehicles
 - Control surfaces requiring servo actuation
- Target drones — control surfaces, speed brakes
- Utility actuation - throttle control, doors, spoilers
- Electric aircraft, eVTOL, eSTOL, air taxis and urban air vehicles — tilting mechanism, flight control, landing gear



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FEATURES

- Integrated position servo loop control with either analog or digital communications
- Non-jamming mechanical stops
- 4 stage spur gear train assembly
- Corrosion protected finish output shaft, 0.5 inch SAE spline
- Brushless permanent magnet motor design
- High torque capacity in a small volume
- Single film position transducer
- Digital telemetry feedback
- Electronic stops limit input command
- Signal interface via digital RS-485 electrical protocol
- Thermal management options available for high altitude application
- Water immersion to 3 meters

BENEFITS

- Robust structural design
- Mechanical stops
- Low weight to power performance
- Customizable

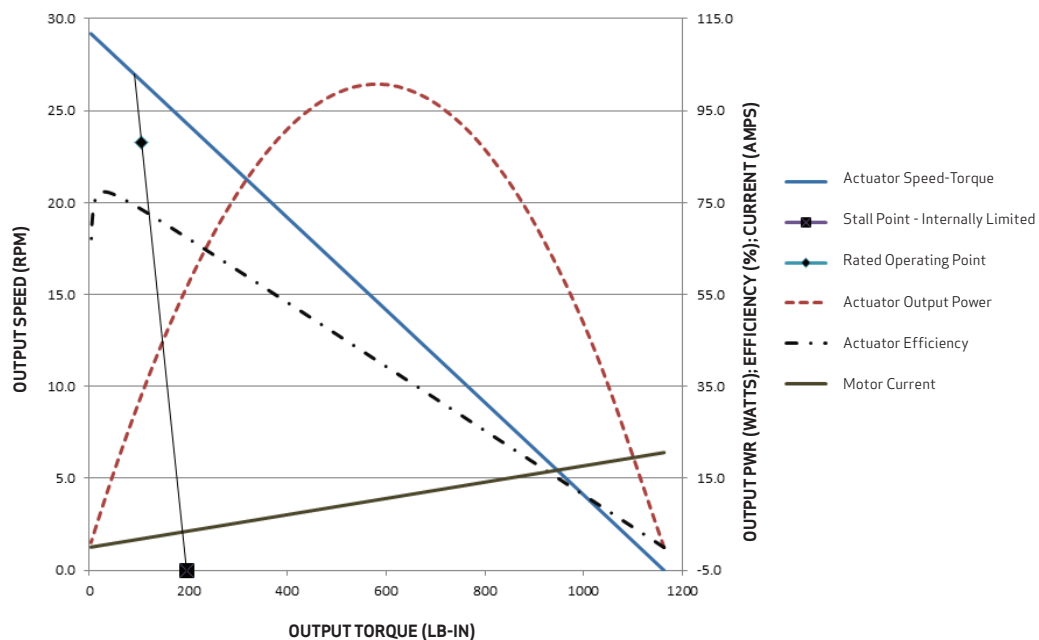
DESIGN AND CONSTRUCTION

- IPC-6012, Class 3
- J-STD-001B, Class 3
- IPC-A-610, Class 3

ENVIRONMENTAL SPECIFICATIONS

Features	MIL-STD-810G Method	Specifications
Operational Vibration	514.6 Procedure I	20 - 2 kHz, 420 sec each axes
Temperature, Humidity and Altitude	520.3 Procedure I	44 hrs; -20° to +70° C; 20 - 95% RH; ambient altitude
Temperature Shock	N/A	150° C (302° F) for 180 secs transitioning to room ambient
Linear Acceleration	513.6 Procedure I	±20 g longitudinal axis (thrust), ±15 g vertical and lateral axis
Operating Shock - Booster Separation	N/A	6 shock pulses 1 ms, 300 g
Altitude	500.4 Procedure II	50,000 ft, 2,000 ft / sec
Temperature Shock	503.5 Procedure I	-40° to +71° C within 10 minutes
Vibration - Captive Carry	514.6 Procedure IV	Endurance: 8.27 Grms random Functional: 4.76 Grms random
Vibration - Free Flight	514.6 Procedure IV	Boost: 24 sec / axis, 14 Grms Remainder: 12 min / axis, 7 Grms
Mechanical Shock	516.6 Procedure I and IV	20 g, 11 ms, saw tooth 40 g, 6 ms, saw tooth

CALCULATED PERFORMANCE CURVES @ 24 VDC AND @ 25°C



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PERFORMANCE DATA SPECIFICATIONS

Features	Model 86300000-05	Model 86300000-40	Model 86300000-50
Operating Voltage	21 to 32 VDC	18 to 32 VDC	21 to 32 VDC
Operating Temperature Range	-40° to +71° C	-40° to +71° C	-40° to +71° C
Operating Altitude Range	Up to 50,000 ft	Up to 50,000 ft	Up to 50,000 ft
Weight	2.0 lbm max	2.0 lbm max	2.0 lbm max
Mechanical Stroke	±51.5°	±51.5°	±51.5°
Electrical Stroke	±45.0° - electronically limited	±45.0° - electronically limited	±45.0° - electronically limited
No Load Speed @ 28 VDC	180° / sec, nominal	180° / sec, nominal	180° / sec, nominal
Static Current @ 28 VDC	< 100 mA	< 100 mA	< 100 mA
Peak Stall Torque	320 in-lbf max - electronically limited	320 in-lbf max - electronically limited	320 in-lbf max - electronically limited
Line Current at Peak Stall Torque	3.1 amps	3.1 amps	3.1 amps
Unpowered Backdrive Torque	3.75 in-lbf max	3.75 in-lbf max	3.75 in-lbf max
Power Point	210 in-lbf @ 120° / sec	210 in-lbf @ 120° / sec	210 in-lbf @ 120° / sec
Electromechanical Stiffness	150 in-lbf / degree, nominal	150 in-lbf / degree, nominal	150 in-lbf / degree, nominal
Maximum Shaft Inertia	2.35 oz-in-sec ²	2.35 oz-in-sec ²	2.35 oz-in-sec ²
Backlash	< = 21 arc min ¹	< = 21 arc min ¹	< = 21 arc min ¹
Small Signal Frequency Response	> 10 Hz at no load	> 15 Hz at no load	> 10 Hz at no load
Electrical Command Interface	4 wire RS-485 full duplex – 115.2 Kbaud ²	R/C PWM 50 to 400 Hz update rate ²	4 wire RS-485 full duplex – 115.2 Kbaud ²
Communication Protocol	See note 2	See note 3	See note 2
Command And Position Resolution	12 bits ²	Command: 2.0 msec = 45° CCW 1.0 msec = 45° CW Position Telemetry: -10 VDC = 45° CCW +10 VDC = 45° CW	12 bits ²
Addressing	Connector pin strapping, up to 16 addresses ²	See note 3	Half duplex RS-485 via channel A ²
Loss Of Communication	Return to zero after 500 millisec ²	N/A	Programmable ²
Water Immersion	3 meters for 3 hours - non-operating	3 meters for 3 hours - non-operating	3 meters for 3 hours - non-operating

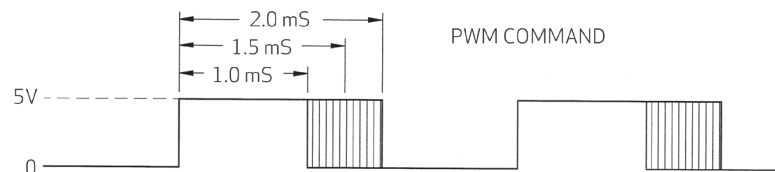
Notes:

¹With ±7 in-lbf reversing load applied to shaft.

²Contact Moog sales to receive detailed protocol information.

³Refer to Figure 1 for the PWM Command for Model 86300000-40.

FIGURE 1



AS VIEWED FROM SHAFT:
COMMAND PULSE WIDTH:
 • 2.000 mSEC = 45° CCW
 • 1.500 mSEC = 0°
 • 1.000 mSEC = 45° CW
 POS TELEMETRY:
 • -10 VDC = 45° CCW
 • +10 VDC = 45° CW

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CONNECTOR PIN ASSIGNMENT

Pin Number	Model 86300000-05 4 Wire RS-485 Full Duplex	Model 86300000-40 RC / PWM	Model 86300000-50 4 Wire RS-485 Full Duplex	*Pin Diagram
1	RS-485 transmit A	R/C PWM input	RS-485 transmit A	
2	RS-485 transmit B	R/C PWM return	RS-485 transmit B	
3	RS-485 receive A	Position feedback low	RS-485 receive A	
4	RS-485 receive B	Position feedback high	RS-485 receive B	
5	Chassis ground	Case ground	Chassis ground	
6	+28 VDC input power	+28 VDC input power	+28 VDC input power	
7	+28 VDC power return	+28 VDC power return	+28 VDC power return	
8	RS-485 return	RS-485 A	RS-485 return	
9	Unit ID return	RS-485 B	Unit ID return	
10	Unit ID "A"	Not used	Unit ID "A"	
11	Unit ID "B"	Not used	Unit ID "B"	
12	Unit ID "C"	Not used	Unit ID "C"	
13	Unit ID "D"	Not used	Unit ID "D"	

*For reference only, Amphenol® catalog pin arrangement.

INVOLUTE SPLINE DATA

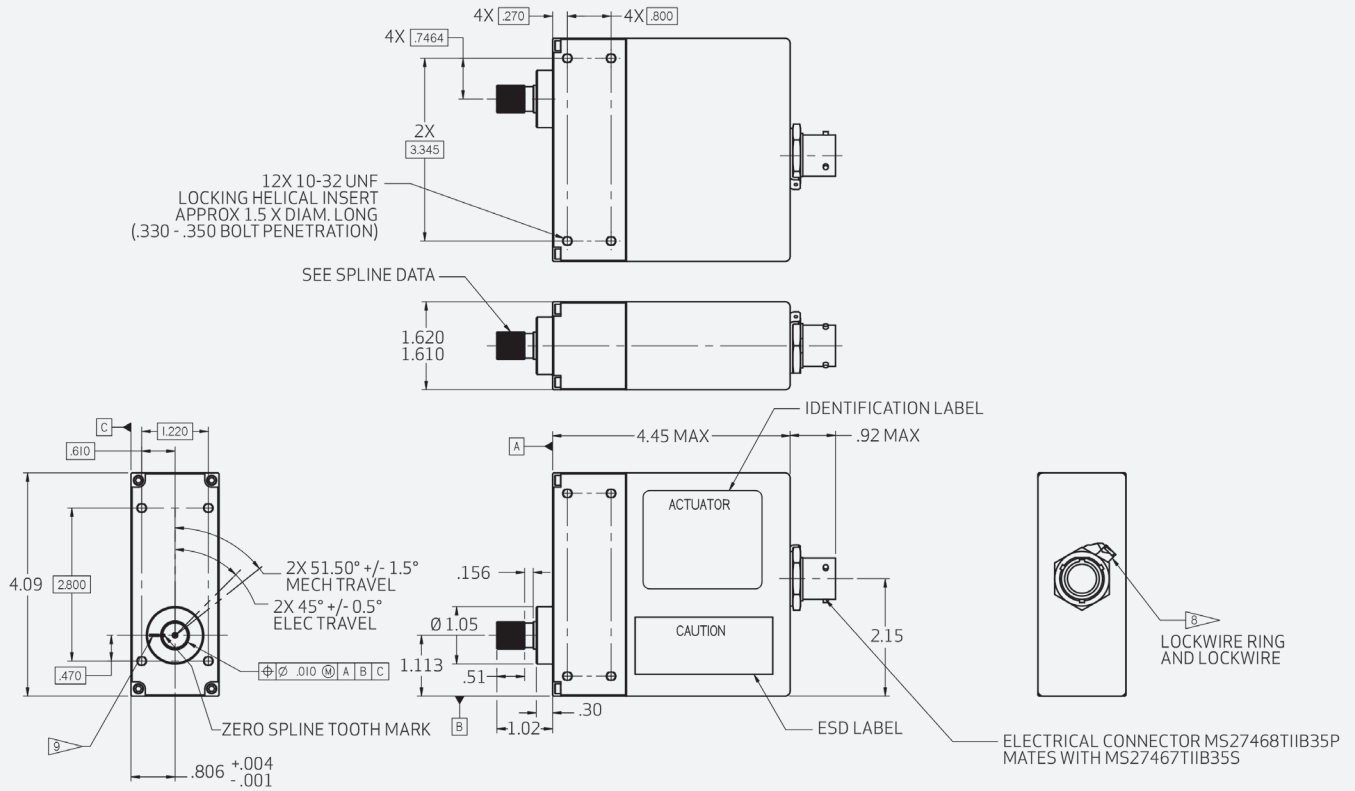
External Involute - Class 5 Fit
Fillet Root, Side Fit Per ANSI B92.1-1976

Features	Model 86300000-50
Number of Teeth	23
Pitch	48 / 96
Pitch Diameter	0.4792
Pressure Angle	45
Base Diameter	0.3388 ref
Major Diameter	0.499 +0 -0.002
Minor Diameter	0.451 min
True Involute Form Diameter	0.465
Effective Circular Tooth Thickness Maximum	0.0369
Actual Circular Tooth Thickness Minimum	0.0345
Measurement Over 0.0400 Diameter Pins	0.5428 min ref

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MECHANICAL DIMENSIONS (INCHES)

Model 86300000-50 Shown Below



*Model 86300000-05 and 86300000-40 are similar to Model 86300000-50 in dimensions.



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