Model 446231

Rate Integrating Gyroscope replaces GG1111AJ03



U.S. Dynamics (USD) has greatly enhanced the performance of the electro-mechanical gyroscope, allowing customers to improve and sustain their legacy systems, without radical redesign, re-engineering or re-qualification.

Military and Related Applications

For over 30 years, USD's Precision Instrument Division has manufactured thousands of single axis rate integrating gyros for the U.S. Navy, U.S. Air Force, Raytheon, Lockheed Martin, General Dynamics as well as supporting scientific and commercial applications. The centerpiece of our gyro manufacturing program is the USD 446 Series. Typical applications for this product include attitude control, aided navigation, heading and attitude reference, antenna and seeker stabilization and turret, camera, sight and platform stabilization.

Features

The 446 gyro is an all-welded, hermetic instrument, capable of meeting performance requirements in extreme operating environments of vibration, shock, altitude, humidity and temperature. The heart of the gyro consists of a synchronous hysteresis motor whose high reliability is enhanced by preloaded inertial grade ball bearings and advanced lubricants. The spin motor assembly is dynamically balanced using state-of-the-art high precision balancing equipment and then run-in for a minimum of 96 hours to fully channel the lubricants. Instead of jewel bearings that yield a surface contact with the gimbal shaft, miniature high precision ball bearings are used to provide a point contact with the shaft reducing friction and drag. This enables precise alignment and axial positioning of the gimbal within the gyro case and for high performance applications radial play can be limited to 20 millionths of an inch. Dynamic characteristics of the gyro are maintained throughout the temperature range by means of a bellows-operated, variable-orifice, damping compensator. The compensator is a mechanical device and requires no power source. With an internal gimbal balancing device both g-sensitive and g-insensitive drift components can be precisely trimmed after final assembly. All gyros are temperature cycled to stress relieve all components and assure maximum drift stability.

Interchangeability

In addition to being a direct form, fit and function replacement for the Honeywell GG1111 series of gyroscopes, the USD 446 gyro can be easily interchanged with many other manufacturers gyros. Whether it's a drop-in replacement or an application that requires slight mounting changes, USD will work with the customer to achieve a solution to extend the operating life of a legacy system.

Reliability

The 446 gyro's high performance and durability is the result of many features, not the least of which is the extended life of its spin motor bearings. Capable of exceeding 4,000 hours life at extreme temperature, this result is achieved through a specially developed retainer and bearing design, high temperature lubricants and a proprietary cleaning process. The high reliability of our gyro provides direct user benefits and less system downtime, reduced spares requirements and more favorable life cycles costs.

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OPTIONS

Utilizing our expert engineering staff, we can design and build many different mounting brackets with the gyro aligned in the bracket to 1 milliradian or better. This enables the customer to bolt down the gyro and just plug it in for a quick, easy, low cost integration of a superior performing gyro.

USD can also design and fabricate all the associated electronics necessary to achieve optimum performance. This includes state of the art servos, demodulators, buffer cards, motor, pickoff and torquer driver cards that would out-perform existing electronics in all aspects including very low noise input and output signals.

Performance Characteristics

Spin Motor:

Voltage (2 Phase)	7 volts rms
Frequency	800 Hz, sine
Current - Start/phase	0.600amps rms max
- Run/phase	0.450 amps rms max
Power - (Total)- Start	5.0 watts max
- Run	4.0 watts max
Angular Momentum	12,400 GM-CM²/sec
Rotor Speed	400 rps

Signal Generator

Voltage	5 volts rms
Frequency	12800 Hz
Current	6 mA nom
Load	10K, 500 ohms
Phase Shift - Room	-
- OTR	-3+/- 7 deg
Sensitivity	6 v/rad nominal
Null - Room	7 mV max
- OTR	12 mV max

Torque Generator:

Max Rate, Continuous	100 deg/sec
Intermittent	-
Resistance	89+/- 12 @ 20 °C max
Scale Factor	1.1 deg/sec/ma
Temp. Dependence Max	- 0.01%/deg F
Linearity	<0.1 % F.S.

Note: Torquer temperature sensitivity can be compensated to less than 0.003 %/deg F

Gryo Performance:

Transfer Function	68+/-6.8 mV/deg
Time Constant	1.3 msec nom
Drift Max	
G– Insensitive	58 deg/hr uncomp
G– Sensitive	17 deg/hr/GVect
G2—Sensitive	0.2 deg/hr/g² pk
Damping (Nominal)	19,000 Dyne-CM-sec

Environments:

Operation Temperature	185 +/-5 Htd deg F
Storage Temperature	-32to 190 deg F
Shock	180 g peak, 10 msec
Vibration 20 - 2000 Hz	20 g peak sine
20 - 2000 Hz	1 g²/Hz

Comment: Built-in heater and sensor