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Sumitomo Precision Products Co., Ltd.

**Announcement of development on a Small & Redundant Inertia Measurement Unit (IMU)  
For Inertial Navigation System using MEMS Gyroscope & Accelerometer**

Sumitomo Precision Products Co., Ltd. has developed a MEMS Small & Redundant Inertial Measurement Unit (IMU) “MRN-01” jointly with Japan Aerospace Exploration Agency (JAXA).

MRN-01 is the Inertial Measurement Unit (IMU) using commercial electric parts and developed for inertial navigation (a method to calculate its position and velocity by integral calculus of gyroscope\* and accelerometer measurements) and attitude control of launch vehicles, satellites and rovers in space environment. It achieves a low cost initiative to develop a high accuracy MEMS gyroscope widely used in industry in order to replace ring laser gyroscopes widely used for inertial navigation of launch vehicles. We have improved the digital temperature compensation and the MEMS sensor head characteristics of best in class our MEMS silicon ring vibration gyroscope to maintain highly accurate inertial measurements in space environment. As a result, the MRN-01 has achieved over 10 times higher accuracy than conventional MEMS gyroscopes.

Equipment for a launch vehicle needs to be resistant to such a high vibration, wide temperature range, a severe radiation environment. In response to those requirements, the MRN-01 has been developed as one IMU configuration to use two redundant IMU units in it (tolerant to single failure).



**Small Inertial  
Measurement Unit  
“MRN-01”**

**1. Main feature of MRN-01**

- ◇ Using High accuracy MEMS Gyro and MEMS Accelerometer
- ◇ Two redundant IMU units configuration with mutual data transfer
- ◇ Two redundant MPUs in each IMU unit with mutual monitoring of MPU calculation
- ◇ One fault operative system as IMU
- ◇ Low cost IMU using commercial electrical parts with radiation mitigation techniques include redundant electronic circuits, redundant modules and current monitoring

**2. Application of MRN-01**

MRN-01 can be used not only launch vehicles but also attitude control of satellites and inertial navigation of rovers.

Toward the promising future, Sumitomo Precision Products will continuously develop MEMS-type gyroscope sensors and inertial sensor systems technology in order to meet customer’s needs and wants.

**Sumitomo Precision Products Co., Ltd.**

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\* Gyroscope is an equipment to measure the rotational velocity and used in Inertial Navigation System. There are several types and the optical type ring laser gyro is the highest accuracy followed by fiber optical type gyroscope then MEMS type gyroscope.

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<Reference >

Technical data

Weight	1.3 kg
Size	152(W)mm × 105(L)mm × 80(H)mm
Power Consumption	Less than 5W
Gyroscope performance	Range: ±400deg/s Bias Instability: less than 0.2deg/h
Accelerometer performance	Range: ±30G Bias Instability: less than: 0.09 mg
Output Cycle	100Hz
Power Supply	12VDC±1V