



# Tactical Grade MEMS Accelerometer MS1000

15 May 2018

Inertial sensors market spans an enormous range in terms of performances and englobes different sensor technologies. Navigation systems providing flight control on aircrafts have to count on autonomous, accurate and proven sensors – accelerometers and gyroscopes – to ensure safe and comfortable flights. Those high-end inertial sensors are distinguished by two grades of performances:

- Navigation Grade – the highest grade sensors commercially available, with the best overall performances in terms of position definition and orientation. System position performance in autonomous navigation mode: 1 nmi/hour.
- Tactical Grade – high grade of sensors, ensuring autonomous navigation during short periods of GNSS systems' outage. System position performance in autonomous mode: 10 nmi/hour.

## **MEMS Technology for INS:**

Key challenge for navigation systems is making them smaller, less expensive and more robust while preserving high-end performances grade. MEMS accelerometers, based on batch manufacturing, offer a very attractive SWaP. MEMS sturdy design and rugged assembly ensure performances repeatability even under high shock and vibration.

## **Safran Colibrys MEMS Solution for INS:**

The MS1000 by SAFRAN Colibrys is a new generation of high-performance MEMS accelerometers, specially designed for inertial applications. It is based on Colibrys' 25 years expertise in MEMS development and production for industrial, aerospace, defense, energy and industrial applications.

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# TECHNICAL NOTE

In Q2 2017 Safran Colibrys has successfully introduced the first g-ranges of MS1000. In 2018 we have released **the whole line of accelerometer g-ranges (2, 5, 10, 30 and 100g)** concurrently with **the full qualification for production**.

The defining features of Safran Colibrys accelerometers are the robustness in harsh environments, the full performance and the entire lifetime, the low power consumption and the small form factor.

MS1000 implements an innovative microelectromechanical design and electronics which unleash unbeatable tactical grade performances with regard to long term bias and scale factor repeatability, in-run bias and vibration rectification error (VRE). Below is an abstract of key performances for the inertial applications on the example of MS1010 (+/-10g range):

- **Bias performances:** residual modeling error: 0.7 mg (Fig.1); long term repeatability: 1.2 mg
- **Scale factor performances:** residual modeling error: 120 ppm (Fig.2); long term repeatability: 400 ppm

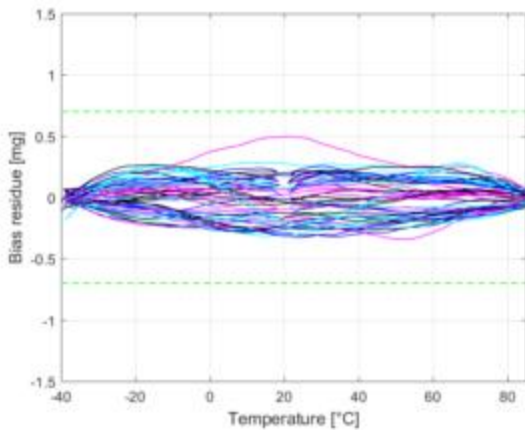


Fig.1: Bias residual modeling error, MS1010

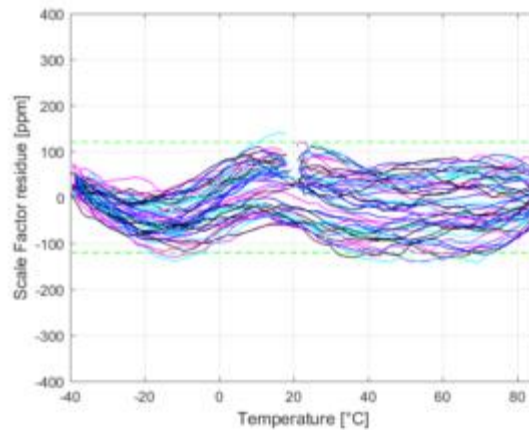


Fig.2: Scale Factor residual modeling error, MS1010

MS1000 long term bias and scale factor performances were evaluated by characterization after applying severe environmental test plan and ageing, simulating accelerometer lifecycle in real-life system conditions. The performances of MS1000 has been validated through the acceptance test procedure, and are performed on 100% of parts during manufacturing process.

Complete accelerometer performances per range are presented in the MS1000 datasheet.

The MS1000 goes beyond the defined boundaries for MEMS and becomes an alternative to Quartz accelerometers.

# TECHNICAL NOTE



MEMS accelerometer MS1000 may be integrated in tactical grade navigation systems coupled with RLG, FOG, HRG gyros, with bias class error of around 1°/hour. MS1000 is compatible with design requirements of aeronautical hybrid INS of small civil and military transportation aircrafts, autopilots of UAV, helicopter AHRS.

Accelerometers are available for purchase via our Distributor channels. For more information please check this page. Please note that the MS1002, MS1005, MS1010 accelerometers are dual use goods (category 7A101) and as such are subject to export control.

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