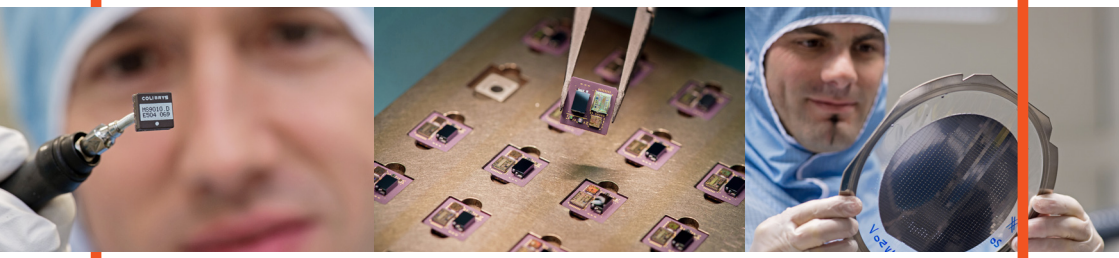
Established, Accurate and Robust

MEMS ACCELEROMETERS

Aerospace - Defense - Energy - Railway
Seismic - Test & Measurement

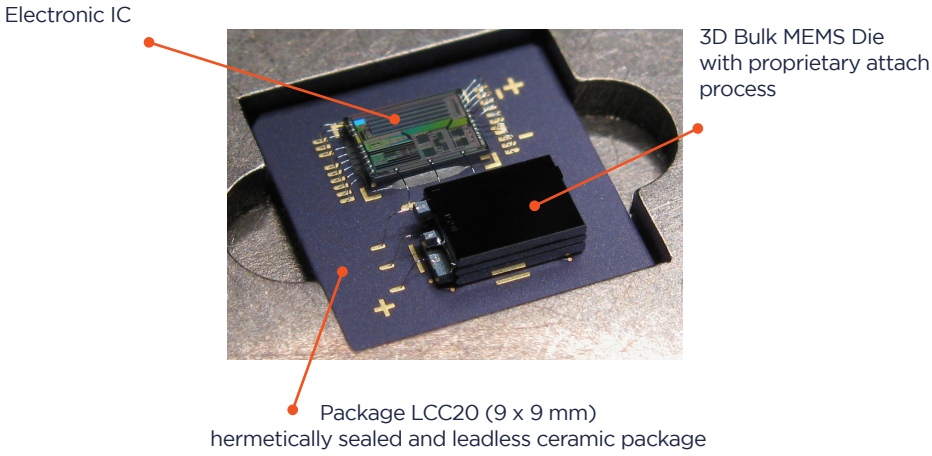
SAFRAN



Single-Axis MEMS Analog Accelerometer Design

Born at the heart of the micro technology Swiss hub, pioneer of MEMS technologies, Safran Sensing Technologies Switzerland provides high-end capacitive accelerometers. Designed for accuracy, these sensors offer high-performance and long-term reliability. More than a manufacturer of high-end sensors, Safran Sensing Technologies Switzerland is a proven partner for those who demand a constant supply of high-tech marvels.

Bulk technology is among the key differentiators of Safran Sensing Technologies Switzerland. It offers more stability and precision than any other capacitive technology.



Why us ?

Field-Proven

Established

- **ITAR FREE products**
- Free of export licence products
- In-house Fabrication for more than 30 years
- Part of Safran Group

Accurate

- **Qualification based on MIL Standard**
- Bulk technology: highest stability and precision
- “Navigation Grade” Accelerometers Know-How
- 100% of parts tested over full temperature and dynamic range
- High Process Capability and Performances (CPk >2)
- Used with high-end gyroscopes (FOG, HRG)
- Seismic grade B applications (below 1ug resolution)

Robust

- **Qualified for harsh environments in the oil and gas market**
- Sucessfully integrated into Gun-hard applications (20’000g)
- Tested up to TID (Total Ionizing Dose) 50kRad for space app.
- Our technology is used in aeronautics DAL-A (“Design Assurance Level”) applications for more than 20 years.

MEMS ACCELEROMETERS

INERTIAL SENSORS & TILT

2g - 100g

MS1000
Tactical Grade
Performance
IMU, AHRS

MS1000L
Cost effective
IMU

HIGH TEMP. SENSORS

2g - 30g

TS1000T
High-temperature
MWD, LWD, RSS

MS1000T
Drilling, high performances
MWD, LWD, RSS

VIBRATION SENSOR

2g - 200g

VS1000
Low-noise vibration sensor
SHM, Bogie Monitoring, Instrumentation

SEISMIC SENSOR

2g - 5g

SI1000
Seismic sensor class B
SHM, Safety System

PRODUCT MATRIX

Market	Domain	Applications	MS1000	MS1000L	MS1000T	TS1000T	VS1000	SI1000
Aerospace and Defense	Air	AHRS (Attitude Heading Reference Systems) INS (Inertial Navigation System) Stand-by Instruments Aircraft Vibration Monitoring Flight Data Recorder	•	•				
	Sea	Pointing Stabilization Towed Array	•	•				
	Missiles	Precise Guidance Missiles Smart Missiles Anti-tank Guided bombs	•	•				
	Land	Dead Reckoning navigation Autonomous North finding Weapon launch systems	•	•				
	New Space	Small Sat Launchers	•	•				
Mobility	Air	UAV eVTOL Drones	•	•				
	Sea	North Finding Heave measurements ROV	•	•				
	Transportation	Bogie monitoring Train positioning Autonomous vehicles	•	•			•	
Industrial	Energy	MWD (Measurement while drilling) LWD (Logging while Drilling) RSS (Rotary Steerable System) Geothermal Drilling	•	•	•	•		
		Wind Turbines Instrumentation	•				•	•
	Test and Measurements	SHM (Structural Health Monitoring) MHM (Machine Health Monitoring) Preventive maintenance Instrumentation Automotive testing Construction monitoring Seismic Monitoring	•	•			•	•
	Manufacturing	Tilt measurement Mining Drones Autonomous agriculture	•	•				

Export Free*, ITAR Free

MS1000

TACTICAL GRADE MEMS ACCELEROMETER

Key features (±2g) :

- **In-run bias stability** (@10s) **:** 3 µg
- **Long term bias repeatability:** 0.24mg
- **Low Noise:** 7 µg/√Hz
- **Non linearity:** ±0.3% (of full scale)
- **Reliable in harsh environments**
- **LCC20, hermetically sealed package**
- **SWaP[1] :** 9x9x3,5mm³ - 1.5gr - 10mW
- **Operational Temperature:** -40°C to 125°C

Ranges & performances

datasheet at www.safran-sensing-technologies.com

Key Parameter, typical values	MS1002*	MS1005*	MS1010*	MS1016	MS1030	MS1100	Unit
Full-Scale acceleration	± 2	± 5	± 10	± 16	± 30	± 100	g
In run bias stability (@10s)	3	7.5	15	24	45	150	µg
Noise in band	7	17	34	54	102	340	µg/√Hz
Long-term Bias Repeatability	0.24	0.6	1.2	1.9	3.6	12.0	mg
Bias Temperature Coefficient	0.07	0.18	0.37	0.6	1.1	3.7	mg/°C
Scale Factor Sensitivity	1350	540	270	169	90	27	mV/g
Residual Bias modeling error	0,14	0,35	0,7	1,1	2,1	7,0	mg

* The MS1002, MS1005, MS1010 accelerometers are dual-use goods (category 7A101) and as such are subject to export control. Please contact us for additional information.
1: SWaP: Size Weight and Power

Featured Applications

Aerospace & Defense :

- Inertial Measurement Units (IMUs)
- Attitude and Heading Reference System (AHRS)
- Weapon launch systems – Platform stabilization
- GPS aided guidance & navigation UAV systems short and mid-range guidance Satellites

Naval & Land :

- Autonomous Vehicles, Robotics
- North finding, Antenna, Sonar orientation
- ROV guidance, Weapon launch systems
- Ship navigation and control
- Mobile mapping
- Train positioning (GPS dead reckoning)
- MWD – drilling guidance

Export Free, ITAR Free

MS1000L

COST EFFECTIVE MEMS ACCELEROMETER

Key features (±2g) :

- **In-run bias stability** (@10s) **:** 3 µg
- **Long term bias repeatability:** 1.5mg
- **Low Noise:** 7 µg/√Hz
- **Non linearity:** ±0.3% (of full scale)
- **Reliable in harsh environments**
- **LCC20, hermetically sealed package**
- **SWaP[1] :** 9x9x3,5mm³ - 1.5gr - 10mW
- **Operational Temperature:** -40°C to 125°C

Ranges & performances

datasheet at www.safran-sensing-technologies.com

Key Parameter, typical values	MS1002L	MS1005L	MS1010L	MS1030L	MS1050L	MS1100L	Unit
Full-Scale acceleration	± 2	± 5	± 10	± 30	± 50	± 100	g
In run bias stability (@10s)	3	7.5	15	45	75	150	µg
Noise in band	7	17	34	102	170	340	µg/√Hz
Long-term Bias Repeatability	1.5	3.7	7.5	22	37	75	mg
Bias Temperature Coefficient	0.1	0.25	0.5	1.5	2.5	5	mg/°C
Scale Factor Sensitivity	1350	540	270	90	54	27	mV/g

1: SWaP: Size Weight and Power

Featured Applications

Aerospace & Defense :

- Inertial Measurement Units (IMUs)
- Flight Control System
- Flight Data Recorders
- Weapon launch systems – platform stabilization
- GPS aided guidance
- Short range guidance

Naval & Land :

- Autonomous Vehicles, Robotics
- North finding, Antenna, Sonar orientation
- ROV guidance, Weapon launch systems
- Ship navigation and control
- Mobile mapping
- Train positioning (GPS dead reckoning)
- MWD – drilling guidance

Export Free, ITAR Free

MS1000T

HIGH TEMPERATURE MEMS ACCELEROMETER

Key features (±2g):

- **High temperature range:** -40°C to 175°C
- **Excellent long term bias repeatability:** ±0.45mg
- **Non-linearity:** <0.3% of full scale
- **Residual bias model** <±0.3mg
- **SWaP[1] :** 9x9x3.5mm^3 - 1.5gr - 10mW
- **Robust to repetitive shocks**

Ranges & performances

datasheet at www.safran-sensing-technologies.com

Key Parameter, typical values	MS1002T	MS1030T	Unit
Full-Scale acceleration	± 2	± 30	g
Residual Bias modeling error[2]	0.3	4.5	mg
Long-term Bias repeatability	0.45	6.5	mg
Residual Scale factor modeling error	120	120	ppm
Noise in band	7	102	µg/√Hz
Non-Linearity (IEEE norm)	0.3	0.3	% FS
Endurance shocks (500 times)	1000	1000	g

1: SWaP: Size Weight and Power
2: Using 3rd order polynomial compensation from -40°C to +150°C.

Featured Applications

- Measurement While Drilling (MWD)
- Logging While Drilling (LWD)
- Rotary Steerable Systems (RSS)
- Geothermal drilling
- Borehole Survey
- Geological Exploration

Export Free, ITAR Free

TS1000T

HIGH TEMPERATURE MEMS ACCELEROMETER

Key features (±2g) :

- **High temperature range:** -40°C to 175°C
- **Excellent long term bias repeatability:** ±2mg
- **Non-linearity:** <0.3% of full scale
- **Residual bias model** <±0.6mg
- **SWaP**[1] **:** 9x9x3.5mm^3 - 1.5gr - 10mW
- **Robust to repetitive shocks**

Ranges & performances

datasheet at www.safran-sensing-technologies.com

Key Parameter, typical values	TS1002T	TS1005T	TS1010T	Unit
Full-scale acceleration	± 2	± 5	± 10	g
Residual Bias modeling error[2]	0.6	1.5	3.0	mg
Long-term Bias repeatability	2	5	10	mg
Residual Scale factor modeling error	300	300	300	ppm
Noise in band	7	17	34	µg/√Hz
Non-Linearity (IEEE norm)	0.3	0.3	0.3	% FS
Endurance shock (500 times)	1500	1500	1500	g

1: SWaP: Size Weight and Power
2: Using 3rd order polynomial compensation from -40°C to +150°C.

Featured Applications

- Measurement While Drilling (MWD)
- Logging While Drilling (LWD)
- Rotary Steerable Systems (RSS)
- Geothermal drilling
- Borehole Survey
- Geological Exploration

Export Free, ITAR Free

VS1000

VIBRATION SENSOR

Key features (±2g):

- **Low Noise:** < 7 µg/√Hz
- **Analog differential output**
- **Temperature and self-test function**
- **Repetitive high-shocks resistance**
- **Smart overload system**
- **SWaP[1] :** 9x9x3.5mm³ - 1.5gr - 10mW

Ranges & performances

datasheet at www.safran-sensing-technologies.com

Key Parameter, typical values	VS1002	VS1005	VS1010	VS1030	VS1050	VS1100	VS1200	Unit
Full-scale acceleration	± 2	± 5	± 10	± 30	± 50	± 100	± 200	g
Frequency response (±5 %)	0-700	0-1150	0-2000	0-2300	0-2700	0-2900	0-2500	Hz
Frequency response (±3dB)	0-1150	0-1900	0-3200	0-4000	0-4500	0-5000	0-7000	Hz
Non-linearity (full scale)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	%
Noise (in band)	7	17	34	102	170	339	678	µg/√Hz
Scale factor (nominal)	1'350	540	270	90	54	27	13.5	mV/g
Scale factor temperature coefficient	120	120	120	120	120	120	120	ppm/°C
Bias temp. coefficient (min./max.)	± 0.2	± 0.5	± 1	± 3	± 5	± 10	± 20	mg/°C
Shock survivability	6'000	6'000	6'000	6'000	6'000	6'000	6'000	g

1: SWaP: Size Weight and Power

Featured Applications

- Bogie security monitoring
- Rolling stock fatigue analysis
- Test & Measurement
- Structural health monitoring (SHM)
- Automotive testing (ride quality)
- Track monitoring system
- Vibration monitoring instrumentation
- Preventive maintenance

Export Free, ITAR Free

SI1000

HIGH-END MEMS ACCELEROMETER SEISMIC MEASUREMENTS

Key features (±3g):

- **Low Noise:** < 0.7 µg/√Hz
- **Analog differential output**
- **Temperature and self-test function**
- **Operational Temperature:** -40°C to +85°C
- **SWaP[1] :** 9x9x3.5mm³ - 1.5gr - 90mW
- **Measurement range:** ± 3 to ± 5g

Ranges & performances

datasheet at www.safran-sensing-technologies.com

Key Parameter, typical values	SI1003	SI1005	Unit
Full-scale acceleration	± 3	± 5	g
White Noise	0.7	1.2	µg/√Hz
Noise (Integrated over 0.1Hz to 100Hz)	8	13	Qg
Dynamic range (0.1Hz to 100Hz)	108.5	108.5	dB
Scale Factor Sensitivity	900	540	mV/g
Bandwidth (± 3dB)	550	700	Hz

1: SWaP: Size Weight and Power

Featured Applications

- Structural health monitoring (SHM)
- Earth-related safety systems and alerts
- Strong motion detection
- Construction monitoring and site evaluation
- Low-noise industrial test&measurement
- Bridges, dams, power plants, high buildings rails, hospitals

POWERED BY TRUST

Safran Sensing Technologies Switzerland SA
Av. des Sciences 13
1400 Yverdon-les-Bains
Switzerland

sales@colibrys.com

www.safran-sensing-technologies.com

SAFRAN