

SMS Motion™

Autonomous and retrofittable motion and vibration sensor



Technical Data Sheet

SMS Motion™ is an autonomous subsea sensor and data logger containing a 3-axis MEMS accelerometer and a 3-axis MEMS gyroscope, rated for 3000 m water depth. The sensor can be configured to operate at frequencies from 10Hz up to 1024 Hz, depending on the application. The sensor's low power consumption allows for continuous logging at 10 Hz for more than 360 days on internal batteries.

Wireless Configuration and Data Transfer

The sensor can be configured via the SMS Magic Hand™ optical modem during mobilization, and raw data and statistical data can easily be transferred to a topside computer during a logging campaign by letting an ROV hold the SMS Magic Hand™ modem in front of a sensor. Easy installation by ROV and easy retrieval of sensors to topside if service and/or memory card download is necessary.

Sensors in Network

Two or more sensors can be connected by cable on the proprietary RS485-based SenseBus, facilitating synchronized data sampling /logging and a single wireless access point from a topside computer via a ROV-carried SMS Magic Hand™. Alternatively, they can be cabled and reached with RS485-based SenseBus or Modbus RTU directly from a topside computer. This configuration also allows running sensors on external power instead of internal batteries.

Individual Sensor Calibration

Each sensor is individually calibrated in a precise motorized jig and in a temperature chamber, and key parameters are stored in a lookup table. In use the sensor measures the chip temperature, reads data from the lookup table, and compensates all measurements to bring offset and gain error to a minimum over the specified temperature range of the sensor.

Vibration Monitoring

SMS Motion™ can be used for vibration monitoring and applications include vortex induced low frequency vibration (VIV) of pipelines and risers, flow induced vibration (FIV), flow induced pulsation (FIP/FLIP), and slugging on subsea jumpers.



A funnel-shaped receptacle allows precise and repeated placement by ROV

4Subsea helps operators reduce cost of operations and maximise life of assets using autonomous sensors in combination with data analytics and specialist engineering competence. Products in the Smart Monitoring Sensors (SMS) range are **SMS Motion™**, **SMS Strain™**, **SMS Magic Hand™**, **SMS Gateway™**, **SMS ComCentral™**, **SMS Vision™** and **SMS Guard™**. Technology applications include monitoring of wellhead integrity, risers, mooring lines, subsea spools and manifolds, as well as monitoring of pipelines and subsea structures for oil & gas and offshore wind sub-structures.

Motion sensor		
	Gen 1	Gen 2
Generic		
Sample rates	10.24 Hz, 25.6 Hz, 51.2 Hz, 128 Hz, 256 Hz	5.12 Hz, 10.24 Hz, 51.2 Hz, 102.8 Hz, 512 Hz, 1024 Hz
Temperature operating range	-6°C - 40°C	-20°C to 60°C
Calibrated temperature range	Dependent on filter setting	0Hz to 0.2 * samplerate (e.g. 0Hz - 2.048Hz with samplerate 10.24Hz)
Acceleration part		
Measurement range	+/- 2g, +/- 4g, +/- 8g or +/- 16g	+/- 2g, +/- 4g, +/- 8g or +/- 16g
Noise level, Ax, Ay	0.00175 (m/s ²) / √hz	0.00045 (m/s ²) / √hz
Noise level, Az (vertical)	0.0026 (m/s ²) / √hz	0.00055 (m/s ²) / √hz
Gyroscope part		
Measurement range	+/- 250°/s, +/- 500°/s, +/- 1000°/s +/- 2000°/s	+/- 15°/s, +/- 31°/s, +/- 62°/s, +/- 125°/s, +/- 250°/s, +/- 500°/s, +/- 1000°/s +/- 2000°/s
Noise level, Gx, Gy, Gz	0.0035 (°/s) / √hz	0.0020 (°/s) / √hz
Use as Pitch and roll inclinometer (available at sample rate of 10.24 Hz only)		
Angular Orientation range	+/- 90°	+/- 90°
Calibrated range	+/- 5°	+/- 5°
Pitch and Roll Noise level	0.012°rms	0.012°rms
Resolution 1)	0.024°	0.024°
Static accuracy 2)	0.072°	0.072°

Cabled Communication Ports

Use [Communication with other sensors or topside computers](#)

Type **RS485**

Baud rate **9600 - 115200**

Power input **5.0V - 24V DC (3.6V on request)**

Optical Communication Port

Use [Configuration, setup, data transfer via ROV](#)

Optical modem **SMS Magic Hand™**

Range **0.5m to 1.0m in water (6m in air)**

Baud rate **115200**

Mode of operation **Half duplex**

Wavelength **890 nm**

Eye safety **Class 1 (IEC60825-1)**, i.e. eye-safe under all operating conditions

Logging Features

Logged data **Ax, Ay, Az (acceleration), Gx, Gy, Gz (gyroscope), Roll, Pitch, Temperature**

Logging mode **Continuous (no inactive periods)**

Sampling/logging frequency **10 Hz - 256 Hz**

Storage capacity **32 GB**

Typical logging time **68 months of continuous logging of 6 DOF @ 10Hz frequency**

The sensor is designed and tested in accordance with ISO13628-6, API 17F.



Downloading Speed

Raw data **15 min. for 24h of raw data sampled at 10 Hz**

LED Indicator

Type **Red LED heartbeat indicator**

Housing

Material **Stainless steel 316L**

Length **393 mm**

Diameter **114 mm (top section)**

Weight in air **9.4 kg (with two batteries)**

Weight in water **7.4 kg (with two batteries)**

Environmental

Design Temperature **-18°C to 70° C**

Test Temperature **-18°C to 70° C**

Operating temperature **-5°C to 40° C**

Storage temperature **-18°C to 50° C**

Pressure rating **3000m water depth**

Battery Operation

Standard batteries **2 x double D-cell 3.6V Lithium**

Can operate with one battery

Battery capacity **68000mAh (nominal at 25° C and 10mA)**

Battery capacity **52000mAh (nominal at 0° C and 10mA)**

Current consumption **< 6mA**

Typical service life **12 months (2° C, 10 Hz)**

Optional battery pack **6 x double D-cell (36 months service life)**

1) Resolution is defined as 2σ where σ is the standard deviation or rms value of the sensor noise level (which depends on the bandwidth).

2) Accuracy is defined as $2\sigma + \epsilon$ where σ is defined in 1) and ϵ is the total error over the entire angle- and temperature range.

4Subsea is a leading provider of technology and services that help operators optimise energy production from subsea oil & gas fields and offshore wind farms. We combine domain expertise with data analytics and digital services to maximise lifetime of assets, reduce operational cost and optimise future projects through data-driven design.

The company was established in 2007 and clients include the major energy operators as well as the large suppliers of subsea equipment. 4Subsea is headquartered in Asker, Norway with additional offices in Bergen, Kristiansand, Stavanger, Rio de Janeiro, and Aberdeen. 4Subsea is a company in the Subsea 7 Group. More info at www.4subsea.com.

4Subsea - Share ideas, move forward

Contact

+47 66 98 27 00
contact@4subsea.com
www.4subsea.com

Asker (HQ)

Hagaløkkvn 26
1383 Asker
Norway

Bergen

Nordåsdaalen 25
5235 Rådal
Norway

Kristiansand

Narviga 21
4633 Kristiansand
Norway

Stavanger

Kvålkroken 30
4323 Sandnes
Norway

Rio de Janeiro

Av. Rio Branco 89,
Room 802 - Centro
RJ 20040-004 Brazil

Aberdeen

18 Chattan Place
Aberdeen, AB 10 6RD
Scotland, UK