

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 figured 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.

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 and logging. One sensor is configured as BusMaster (any sensor on the bus can take this role) and a topside computer can via a ROV-carried SMS Magic Hand™ download data, reconfigure the sensor or upgrade firmware. Any sensor on the bus can be reached from one single access point, the BusMaster.

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.

Acceleration Sensor

Range +/-2g (optional +/-4, 8 or 16)

Noise level, Ax, Ay 0.00052g rms @ 5Hz bandwidth

Noise level, Az (vertical) 0.00087g rms @ 5Hz bandwidth

Gyroscope Sensor

Range +/- 250°/s

Noise level, Gx, Gy, Gz 0.012°/s rms @ 5Hz bandwidth

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™**, 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.

Used as Pitch and Roll Inclinometer

Angular orientation range +/- 90°
Calibrated range +/- 5°
Frequency range 0Hz (stationary) to 0.5Hz
Pitch and Roll noise level 0.012° rms (fs=10Hz)
Resolution (1) 0.024° (fs=10Hz)
Static accuracy (2) 0.072°

SenseBus Communication Port

Use [Communication with other sensors & modules](#)
Type RS485, half duplex (two signal wires)
Baud rate 115200
Power input +3.6V

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 -1024 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

Operating temperature 0° C to 40° C
Storage temperature -5° 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.



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

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.

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