

# 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 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.

#### **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

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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°

### Cabled Communication Ports

Use [Communication with other sensors or topside computers](#)  
Type RS485, half duplex (two signal wires)  
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 -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 4000m 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  $2\sigma$  where  $\sigma$  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  $\sigma$  is defined in 1) and  $\epsilon$  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](http://www.4subsea.com).

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#### 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