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 10 Hz 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

**Downgrading 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 2σ + ε where σ is defined in 1) and ε is the total error over the entire angle- and temperature range.

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4Subsea is a leading provider of technology and services that help operators maintain production from subsea oil and gas fields and offshore wind farms. By combining expert engineering competence, practical experience and a digital service, we ensure the integrity of assets all the way from reservoir to deck.

The company was established in 2007 and clients include all the major oil and gas operators as well as the large suppliers of subsea equipment. 4Subsea is headquartered in Asker, Norway with additional offices in Bergen, Kristiansand, Stavanger, Macaé, and Rio de Janeiro, and with local presence in Aberdeen and Perth. More info at www.4subsea.com.

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