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.

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.

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

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
Calibrated temperature range	-6˚C - 40˚C	-20˚C to 60˚C
Calibrated frequency 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	$0.00175 \, (m/s^2)/\sqrt{hz}$	$0.00045 \, (m/s^2)/\sqrt{hz}$
Noise level, Az (vertical)	$0.0026 \, (m/s^2)/\sqrt{hz}$	$0.00055 \, (m/s^2)/\sqrt{hz}$
Gyroscope part		
Measurement range	+/-250˚/s, +/- 500˚/s, +/- 1000˚/s +/- 2000˚/s	+/-15º/s, +/-31˚/s, +/-62˚/s, +/-125˚/s, +/-250˚/s, +/- 500˚/s, +/- 1000˚/s +/- 2000˚/s
Noise level, Gx, Gy , Gz	$0.0035 \, (˚/s)/\sqrt{hz}$	$0.0020 \, (˚/s)/\sqrt{hz}$
Use as Pitch and roll inclinometer (available at sample rate of 10.24 Hz onlyt)		
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˚

[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.

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)

More product information →