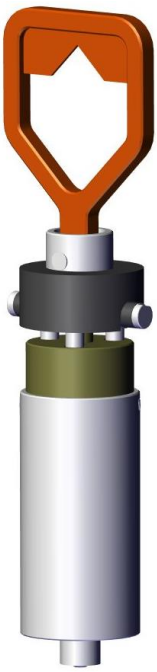
Instrument Datasheet
Subsea Vibration Monitor

CLAMPON
ULTRASONIC INTELLIGENT SENSORS

1	General		Note
1.1	Model description	Subsea Vibration Monitor	
1.2	Part number	Various depending on model type and mechanical configuration	
1.3	Serial number	YY-MM-XXXXX-CV, unique for each unit	1

2	Physical		
2.1	Dimensions (ø x h) (not including handle)	84 mm x 321 mm [3.3 in x 12.6 in]	2
2.2	Handle	Paddle, paddle with V-notch, fishtail, T-bar, hex nut, no handle (non ROV-retrievable)	2
2.3	Jumper type (typical)	Siemens Anguila/Aquatron or ODI	
2.4	Jumper length	According to client specifications	
2.5	Connector type (typical)	Tronic or ODI	
2.6	Enclosure material	Titanium, grade 2/5	3
2.7	Protective coating	ROV handle only	4
2.8	Cathodic protection	None	
2.9	Marking	Standard ClampOn marking label	5
2.10	Weight in air (approximately)	5 kg [11 lb]	6
2.11	Weight in water (estimated)	4.5 kg [9.9 lb]	6
2.12	Ambient temperature	-5 °C to +50 °C [+23 °F to +122 °F]	7
2.13	Maximum installation depth	3 113 m [10 213 ft]	
2.14	Maximum test pressure	345 bar [5000 psi]	
2.15	Sealing	EB-weld, O rings	8
2.16	Hose/jumper interface	Siemens or ODI	9
2.17	Fill/ventilation port	Siemens or ODI	10



3	Electrical		Note
3.1	Power input	12 VDC to 30 VDC (electronics equipped with inverse polarity and transient protection)	
3.2	Power consumption (typical/maximum)	1.5 W @24 VDC/1.5 W @30 VDC (per channel)	11
3.3	Electronics platform	ClampOn DSP	12
3.4	Electronics type	Single electronics or fully redundant	12
3.5	Microprocessor	600 MIPS	
3.6	Non-volatile memory	8 MB	
3.7	Diagnostic features (with software)	Internal self-testing of analogue filters, amplifiers, and flash memory	
3.8	Signal output	CANopen according to CiA443 profile version 3.0.1 *or* Modbus RTU according to Modicon PI-MBUS-300, and/or SIIS Level 3	
3.9	Insulation resistance	>1 GΩ @50 VDC for 60 seconds	
3.10	Penetrator	Glass to titanium seal, 8 x single pin	
3.11	Penetrator wire cross-section	Maximum 1.5 mm^2 [AWG 16]	

4	Operation		
4.1	Manner of operation	Real-time measurement	
4.2	Unit of measurement	mg or mm/s^2	
4.3	Technology	MEMS inertial sensor	
4.4	Processing	DSP in sensor	
4.5	Calibration	All sensors are calibrated at factory	
4.6	MTBF calculation	>30 years @+60 °C [+140 °F] >80 years @+30 °C [+86 °F]	7
4.7	Repeatability	Better than 1 %	
4.8	Accelerometer axes	X, Y and Z-direction	
4.9	Acceleration range	2.5 *g* (default) or 7.5 *g* (configurable)	
4.10	Frequency range, accelerometer	0 Hz to 1 000 Hz	13
4.11	Noise characteristics	50 µg/√Hz (0.4 mg R.M.S. @120 samples/second) @ ±2.5 *g* range	
4.12	Anti-aliasing	Digital oversampling	
4.13	ADC resolution	12 bit	
4.14	Effective post-decimation resolution	>14 bit	

5	Data specifications, raw data streaming		14
5.1	Signal protocol	Proprietary DSP protocol (RS-485, half duplex)	
5.2	Heart beat	1 000 ms	16
5.3	Output file format	.wav 16 bit	
5.4	Output resolution	76 µ*g* per LSB (5 $g/2^{16}$) @ ±2.5 *g* range	

6 Data specifications, internally processed data

6.1	Signal protocol	Modbus RTU (RS-485, half duplex) or CANopen SIIS L2 per CiA 443 profile	
6.2	Internal data processing	RMS velocity, Peak acceleration, Spectrum estimation, unit/dimension conversion, frequency zoom using complex modulation, Raw data snapshots, conversion between amplitude and spectral density, Peaks frequency and Effective frequency.	15, 17
6.3	Amplitude units	mm/s² (acceleration), mm/s (velocity) and mm (displacement)	
6.4	Spectral density units	mm/s²/$\sqrt{\text{Hz}}$ (acceleration density), mm/s/$\sqrt{\text{Hz}}$ (velocity density) or mm/$\sqrt{\text{Hz}}$ (displacement density)	
6.5	Spectrum resolution	Up to 800 lines, <0.05 Hz/line	
6.6	Spectrum frequency range	Configurable upper and lower limits, maximum 0 Hz to 1 000 Hz	16, 17
6.7	Scalar outputs	R.M.S. velocity or peak acceleration	
6.8	Spectrum estimation method	Bartlett's method, configurable window and averaging time	

Notes

1. Serial number breakdown: yy (year of manufacture), mm (month of manufacture), xxxxx (unique electronics ID), CV (Compact Vibration).
2. Overall width and height depends on ROV handle fitted. For configuration shown (with paddle handle), width: 130 mm, height: 485 mm. See also section 2.2.
3. Metal parts exposed to seawater are made of titanium, grade 2. Material certificates to EN 10204 3.1.
4. ROV handle coated according to NORSOK M-501, system 7C, RAL 2004 Orange. Other coatings available upon request. A non ROV-retrievable sensor is available fitted with a POM dome head instead of a handle.
5. Additional label with client marking where applicable.
6. For sensor only. Weight including jumper depends on jumper interface and length.
7. Pipe surface temperature can be up to 150 °C as long as the sensor housing receives ambient water cooling. Temperature calculation shall be carried out if applying insulation around the instrument, in order to verify acceptable temperature for the electronics.
8. Electronics housed in nitrogen gas-filled (N2) 1 atmospheric chamber, sealed by EB-welding and helium leak tested. Oil-filled volume sealed by double O-ring barriers.
9. Jumper interface: MK2 M25 (Siemens), ¾" SAE J1926 (ODI).
10. Fill/ventilation port: MK2-2 (Siemens), ¼" SAE J1926 (ODI).
11. Transient inrush current (0-10 µs): 13 A. Inrush current average 0-1 ms: < 500 mA. Inrush current average 0-500 ms: < 120% of nominal current draw.
12. 1 or 2 channels output depending on electronics type. Electronics ESS tested to ISO 13628-6, Statoil document TR1233, and Total document GS EP SPS 022.
13. Accelerometer adjustment at 0 Hz is performed at factory against the gravitational acceleration. The lowest resonance frequencies of instrument housing and mounting brackets determine the bandwidth where the calibrated uncertainty holds. Typical lowest resonance frequencies are approximately 150 Hz.
14. Raw data streaming and logging: The sensor streams raw data to a ClampOn client running vibration data acquisition software (VDAQ). Some processing is performed in the software, and the results are presented in real-time. All raw data are stored to disk, enabling detailed post-processing and analysis.
15. The sensor unit computes spectra and various other properties of the vibration signal internally. The results of the processing are output in real time over Modbus or CANopen.
16. Factory configurable software parameters. May also be configured in-field by ClampOn authorised personnel.
17. See ClampOn document 62-321-00085, Operation and System integration for ClampOn vibration sensors.