Product datasheet
Subsea Flow Temperature Monitor SSE.DS2N.Sxx2.B14

CLAMPON®
ULTRASONIC INTELLIGENT SENSORS

1	General		Note
1.1	Model name	ClampOn Subsea Flow Temperature Monitor	
1.2	Service description	Non-invasive, non-intrusive subsea flow temperature monitor (FTM)	
1.3	Model number	SSE.DS2N.SR02.B14 (single RS-485) SSE.DS2N.SC22.B14 (single CANbus)	
1.4	Serial number	YY-MM-XXXXX-FTM, unique for each unit	1

2	Physical		
2.1	Dimensions (⌀ × h)	89 mm × 485/489 mm [3.5 in × 19.1/19.3 in]	2
2.2	Enclosure material	Titanium grades 2 and 5	3
2.3	Weight, in air	5.1 kg [11.2 lb]	2
2.4	Weight, in water (estimated)	4.7 kg [10.4 lb]	2
2.5	ROV handle type	Paddle, fishtail, T-bar or hex nut (for diver)	
2.6	ROV handle coating	NORSOK M-501, System 7B, RAL 2004 orange (default)	
2.7	PBOF hose interface	Siemens MK2 M25 or ODI ¾" per SAE J1926	
2.8	Filling/ventilation port interface	Siemens MK2-2 or ODI ½" per SAE J1926	
2.9	PBOF hose type	Siemens AquaTRON 50 or client specification	
2.10	PBOF hose length	To client specifications but must be minimum 1.5 m [4.9 ft] for pressure compensation	
2.11	EFL connector type	To client specifications, Tronic or ODI	
2.12	Cathodic protection	None	
2.13	Equipment marking	Product label. Client info label where applicable	
2.14	Penetrator type	Glass-to-titanium seal, 8 × single pin	
2.15	Penetrator wire cross section	Maximum 1.5 mm² [AWG 16]	
2.16	Sealing type	EB-weld and O-rings	4

3	Environmental		Note
3.1	Maximum installation depth	3 048 m [10 000 ft]	
3.2	Maximum test pressure	338 bar [4 902 psi]	
3.3	Operating temperature	−5 °C to +40 °C [+23 °F to +104 °F]	5
3.4	Pipe surface temperature	−40 °C to +150 °C [−40 °F to +302 °F]	5
3.5	Storage temperature	−18 °C to +50 °C [0 °F to +122 °F]	
3.6	Shock/vibration	Qualified (Q1 and Q2) in accordance with ISO 13628-6:2006 and API 17F:2017	

4	Operation		
4.1	Rated voltage range, U_{dc}	18 V to 30 V, U_{nom} = 24 V (reverse polarity and transient protection)	6
4.2	Power consumption, at U_{nom}	RS-485: 1.1 W SIIS level 2: 1.5 W	6
4.3	Insulation resistance	>1 GΩ @50 V_{dc} (reading recorded 60 seconds after application of the test voltage)	
4.4	Electronics platform/generation	ClampOn DSP II (with CAN gateway II where applicable)	
4.5	Electronics channel configuration	Single RS-485 or single CANbus	
4.6	Manner of operation	Real-time pipe surface temperature measurement	7, 8
4.7	Unit of measurement	Celsius (°C)	
4.8	Technology	Dual analogue high precision temperature sensors	
4.9	Processing	Digital signal processing (DSP) in instrument	
4.10	Calibration	See note	9
4.11	Design life	30 years	
4.12	Operating range, temperature sensor	−40 °C to +150 °C [−40 °F to +302 °F]	5
4.13	Uncertainty, measured temperature	±0.5 °C [±0.9 °F]	9
4.14	Uncertainty, calculated flow temperature	Typical (steady state) ±1 °C [±1.8 °F], maximum (dynamic conditions) ±6 °C [±10.8 °F] (in range +20 °C to +120 °C [+68 °F to +248 °F])	10, 11
4.15	Response time	Typical 6 minutes (in range +20 °C to +120 °C [+68 °F to +248 °F])	
4.16	Flow conditions	Oil, water, gas, multiphase	
4.17	Pipe material	All steel alloys	7

5	Signal	
5.1	Physical layer/signal types	RS-485 or SIIS level 2 (low-speed fault-tolerant CANbus per ISO 11898-3)
5.2	Communication protocol (half duplex)	RS-485: Modbus RTU according to Modicon PI-MBUS-300 SIIS level 2: CANopen according to CiA 443 profile 3.0.1
5.3	Communication bit rate	RS-485: 1.2 kbps to 115.2 kbps (19.2 kbps factory default) SIIS level 2: 50 kbps or 125 kbps (50 kbps factory default)

6 Installation

6.1	Mounting	Installed in a ClampOn funnel (by ROV, diver or manually topside)
6.2	Locking mechanism	Spring-loaded in funnel J-slots
6.3	Installation torque (typical)	45 N m [33.2 ft lb]
6.4	Retrieval torque (typical)	50 N m [36.9 ft lb]
6.5	Damage torque	>200 N m [147.5 ft lb]

7 Approvals & compliance

7.1	CE marking in conformance with	2014/30/EU (EMC) 2011/65/EU and 2015/863/EU (RoHS)
7.2	RCM marking in conformance with	Radiocommunications Act 1992
7.3	UKCA marking in conformance with	UK SI 2016/1091 (EMC) UK SI 2012/3032 (RoHS)
7.3	EMC generic standards applied	IEC/EN 61000-6-2, IEC/EN 61000-6-4 and IEC 60533
	Conducted emissions	CISPR 16-2-1
	Radiated emissions	CISPR 16-2-3
	ESD immunity	IEC/EN 61000-4-2
	Radiated RF disturbance immunity	IEC/EN 61000-4-3
	Electric fast transient/burst immunity	IEC/EN 61000-4-4
	Surge immunity	IEC/EN 61000-4-5
	Conducted RF disturbance immunity	IEC/EN 61000-4-6
	Power supply failures immunity	IEC/EN 61000-4-11
	Voltage / frequency variations immunity	IEC/EN 61000-4-11
	Conducted LF disturbance immunity	IEC/EN 61000-4-16

Notes

1. Serial number breakdown: YY (year of manufacture), MM (month of manufacture), XXXXX (unique electronics ID), FTM (flow temperature monitor).
2. The weight and dimensions listed is for an instrument with paddle handle ROV interface. Minor adjustments to weight and dimensions will apply for other ROV handle types. Note that the instrument free height is 489 mm, but when installed it is 485 mm due to compression of the spring-loaded top section.
3. Metal parts exposed to seawater are made of titanium grade 2.
4. Electronics enclosed in nitrogen gas-filled (N_2) 1 atmospheric chamber, sealed by EB-welding and helium leak tested. Oil-filled volume sealed by O-ring barriers.
5. Instrument *electronics* operating temperature is −5 °C to +40 °C (as per API 17F 4th Ed. requirements). However, the design of the EB welded electronics chamber and the placement of internal parts allows for the instrument *waveguide* (with temperature elements) to be exposed to a wider pipe surface temperature range (−40 °C to +150 °C). The temperature elements are rated for use in the temperature range −55 °C to +150 °C, but actual operating range is limited to the pipe surface temperature range −40 °C to +150 °C.
6. Average inrush current is <120 % of maximum rated steady state current for 500 ms.
7. The ClampOn Subsea FTM measures pipe surface temperature. The instrument front (waveguide) must have metal-to-metal contact with the pipe surface. Also, the pipe section where the instrument is installed must be insulated. Note that response delay from flow temperature change inside the pipe to registered temperature change on the pipe surface is typically 6 minutes due to the thermal conductivity of the pipe and the instrument enclosure.
8. The ambient temperature and an insulation coefficient (a constant k factor derived from simulations) are required for calculating flow temperature. Calculations to be performed by client in the client control system. See instrument user manual 62-321-00170 for details on how to calculate the flow temperature based on the physical layout of the pipe, and the level and type of insulation.
9. The temperature elements are factory calibrated from supplier. At ClampOn, the temperature elements are verified and tested in the ESS test temperature range (−20 °C to +70 °C). Instruments are tuned by offset and gain adjustment in the tested range to an accuracy ±0.5 °C.
10. The uncertainty of the calculated flow velocity is based on laboratory testing with verified parameters (known ambient temperature, known flow temperature, and known insulation thickness). Wrong or inaccurate inputs will naturally lead to decreased accuracy on calculated flow temperature value. It is required to perform temperature simulations to find the correct k factor to ensure correct calculation of flow temperature.
11. In steady state, the process temperature is stable. In dynamic conditions, the process temperature is fluctuating. Uncertainty for dynamic conditions is higher due to the latency of the temperature change on the outside of the pipe compared to the inside of the pipe.