

Instrument Datasheet Addendum

Vibration Monitoring with ClampOn UIS



ClampOn DSP Vibration Monitor

Operation	
Calibrated uncertainty, acceleration ¹	±1 %
Accelerometer axes	X, Y and Z-direction
Acceleration range	2.5 g (default) or 7.5 g (configurable)
Frequency range, accelerometer ¹	0 Hz to 1 000 Hz
Noise characteristics	50 µg/√Hz (0.4 mg R.M.S. @ 120 samples/second) @ ±2.5 g range
Anti-aliasing	Digital oversampling
ADC resolution	12 bit
Effective post-decimation resolution	>14 bit

Data specifications, raw data streaming	
Signal protocol ²	RS-485 (half duplex), Proprietary DSP protocol
Output file format ²	.wav 16-bit
Output resolution	76 µg per LSB (5 g/2 ¹⁶) @ ±2.5 g range

Data specifications, internally processed data	
Signal protocol ³	RS-485 (half duplex), Modbus RTU CANopen (SIS L2)
Internal data processing ^{4,5}	Spectrum estimation, unit/dimension conversion, R.M.S. calculation, relative phase between axes, peak-hold averaging, frequency zoom using complex modulation, raw data snapshots, conversion between amplitude and spectral density
Amplitude spectrum units	mm/s ² (acceleration), mm/s (velocity) or mm (displacement)
Spectral density units	mm/s ² /√Hz (acceleration density), mm/s/√Hz (velocity density) or mm/√Hz (displacement density)
Spectrum resolution	Up to 800 lines, <0.05 Hz/line
Spectrum frequency range	Configurable upper and lower limits, maximum 0 Hz to 1 000 Hz ⁴
Scalar outputs	R.M.S. velocity Peak acceleration
Spectrum estimation method	Bartlett's method, configurable window and averaging time

- ### Notes
- 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.
 - 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.
 - See the Instrument Datasheet for the delivered instrument.
 - See ClampOn document 62-321-00068, System integration for ClampOn vibration sensors.
 - 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.

INDONESIA DISTRIBUTOR



SAKA NUSA PERSADA

PT Saka Nusa Persada

Ruko Tabespot Blok G.5 No. 20, BSD City
Jl. BSD Raya Pusat, Lengkong Kulon, Pagedangan
Tangerang, Banten 15339, Indonesia
+62 21 2953 8924
info@sakanusapersada.id
www.sakanusapersada.id

Product datasheet

DSP Particle Monitor TSE.DS2D.SA00.E10

1	General	Note
1.1	Model name	ClampOn DSP Particle Monitor
1.2	Service description	Non-invasive non-intrusive topside particle monitor
1.3	Model number	TSE.DS2D.SA00.E10
1.4	Explosion protection principles employed	Flameproof enclosure, Ex d Increased safety, Ex e
1.5	Serial number	YY-MM-XXXXX 1

2	Physical	
2.1	Dimensions (ø × h)	114 mm × 168 mm [4.5 in × 6.6 in]
2.2	Enclosure material	Stainless steel 316L
2.3	Enclosure protective coating	None by default
2.4	Weight (instrument only)	3.2 kg [7.1 lb]
2.5	Equipment marking	Polyester certification label Stainless steel tag plate where applicable
2.6	Cable entry configuration	2 off M25 × 1.5 ISO metric fitted with Ex blanking element
2.7	Cable gland	By client 2
2.8	Cable	By client 2



3	Environmental	
3.1	Maximum installation altitude	2 000 meters [6 562 feet]
3.2	Ingress protection	IP66/IP68 (10 meters [32.8 feet] for 7 days) tested to IEC 60529 and UL Type 4X tested to UL 50E
3.3	Ambient temperature	See Compliance section
3.4	Storage and transportation temperature	-20 °C to +40 °C
3.5	Storage and transportation humidity	30 % to 70 % (non-condensing)
3.6	Shock (tested to IEC 60068-2-27)	40 g, 6 ms, 100 shocks in each direction
3.7	Vibration (tested to IEC 60068-2-6)	2 Hz to 13.2 Hz (1.0 mm displacement) and 13.2 Hz to 100 Hz (0.7 g acceleration)

4	Operation	
4.1	Rated voltage range, U_{dc}	12 V to 28 V, $U_{nom} = 24$ V (instrument equipped with reverse polarity and transient protection) 3
4.2	Power consumption, at U_{nom}	1.2 W
4.3	Electronics platform/generation	ClampOn DSP II
4.4	Manner of operation	Real-time measurement
4.5	Unit of measurement	Raw value (and g/s if SandQ+ algorithm is configured) 10
4.6	Technology (for particle measurement)	Passive ultrasonic using piezoelectric transducer
4.7	Technology (for vibration measurement)	3-axis MEMS accelerometer 4
4.8	Processing	Digital signal processing (DSP) in instrument
4.9	Calibration	Instrument is factory calibrated
4.10	Design life	30 years
4.11	Repeatability	Better than 1 %
4.12	Flow conditions	Oil, water, gas, multiphase
4.13	Minimum flow velocity	0.5 m/s [1.6 ft/s] 6
4.14	Minimum detectable particle size	25 µm (in oil) 5 15 µm (in gas)
4.15	Minimum sand rate	0.01 g/s 5
4.16	Pipe material	All steel alloys 7

5	Signal	8
5.1	Signal types (galvanically isolated)	RS-485 and 4-20 mA
5.2	RS-485 (half duplex) protocol	Modbus RTU (default) or proprietary DSP 9, 10
5.3	RS-485 bit rate	2.4 kbps to 115.2 kbps (19.2 kbps default)
5.4	4-20 mA	Type 4 fully isolated 4-wire transmitter in accordance with ISA 50.00.01. Configurable raw value range 0 to 5 000 000 (default 0 to 500 000) 9, 10

6	Installation	
6.1	Mounting	Mounting bracket clamped to pipe using stainless steel clamping bands or welded to pipe surface. Collar nut secures instrument in mounting bracket 7, 11
6.2	Terminal block connection data	0.5 mm² to 2.5 mm² [AWG 20 to AWG 14] stranded conductor (with ferrule with plastic sleeve) cross section

Product datasheet

DSP Particle Monitor TSE.DS2D.SA00.E10



7 Compliance			15
7.1	Hazardous area location approval	Zone 1, 2 for ATEX/IECEx installations and Zone 1, 2 or Division 2 for cULus (NEC/CEC) installations	
7.2	ATEX certificate	UL 20 ATEX 2422X	13
7.3	ATEX marking	Ex II 2 G Ex db eb IIB T5...T4 Gb $-50^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C} \dots +80^{\circ}\text{C}$	
7.4	ATEX ambient temperature range	$-50^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C} \dots +80^{\circ}\text{C}$	12
7.5	IECEx certificate	IECEx ULD 20.0023X	13
7.6	IECEx marking	Ex db eb IIB T5...T4 Gb $-50^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C} \dots +80^{\circ}\text{C}$	
7.7	IECEx ambient temperature range	$-50^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C} \dots +80^{\circ}\text{C}$	12
7.8	cULus file number	E363818	13
7.9	cULus marking	Class I Zone 1 AEx db eb IIB T5...T4 Gb Ex db eb IIB T5...T4 Gb $-50^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C} \dots +80^{\circ}\text{C}$	14
7.10	cULus ambient temperature range	$-50^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C} \dots +80^{\circ}\text{C}$	12
7.11	CE marking in conformance with	2014/34/EU (ATEX) 2014/30/EU (EMC) 2011/65/EU and 2015/863/EU (RoHS)	
7.12	RCM marking in conformance with	Radiocommunications Act 1992	
7.13	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 frequency magnetic field immunity	IEC/EN 61000-4-8	
	Dips and interruptions 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

- Serial number breakdown: YY (year of manufacture), MM (month of manufacture), XXXXX (unique electronics ID).
- Various alternatives available. Cable gland and cable by client in accordance with local and/or national Ex installation regulations that apply.
- The instrument must be powered from a safety extra low voltage (SELV) power supply.
- For vibration measurement details, see instrument datasheet addendum. Vibration output is optional and not activated in instrument by default.
- Depends on flow conditions.
- Minimum velocity for particle detection depends on flow medium, particle size and pipe configuration.
- Sensor waveguide must have metal-to-metal contact with the pipe surface.
- Factory configurable software parameters via RS-485 interface. May also be configured in-field by ClampOn authorised personnel.
- 4-20 mA only recommended for raw value trending. ClampOn recommends digital (Modbus RTU or DSP) output to enable sand calculation.
- The instrument can be configured to calculate the sand rate, totals, and alarms internally using live flow input from a control system using an RS-485 interface, Modbus RTU or DSP protocol. The SandQ+ algorithm used by the instrument for this calculation is a simplified version of that used when running the calculation in ClampOn monitoring software on a centralized controller.
- Mounting bracket available in stainless steel (standard), carbon steel or duplex. Clamping bands available in stainless steel.
- The ambient temperature (T_{amb}) of -50°C to $+55^{\circ}\text{C} \dots +80^{\circ}\text{C}$ marked on the instrument refers to the temperature of the immediate surroundings. The instrument will have different T-classes (see Ex certificate) depending on any external source of heating, such as process temperature (T_{pipe}), or direct sunlight. If there is a risk the T_{amb} and T_{pipe} temperature ratings will exceed those listed in the Ex certificate, steps must be taken to mitigate this risk, such as installing a sunshade, insulating the pipe, or moving the instrument to another location.
- See certificate and/or user manual for Specific Conditions of Use.
- Suitable for use in (and additionally marked) Class I Division 2 Groups B, C, D T5...T4.
- The instrument may not be marked with all certificates at the same time.