

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 mm ² to 2.5 mm ² [AWG 20 to AWG 14] stranded conductor (with ferrule with plastic sleeve) cross section



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Product datasheet

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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.

Instrument datasheet

ClampOn DSP Particle Monitor



1	General	Note
1.1	Model name	ClampOn DSP Particle Monitor
1.2	Model number	TSE.DS2I.SA00.A10
1.3	Explosion protection principle	Intrinsically safe, Ex i
1.4	Serial number	YY-MM-XXXXX, unique for each unit 1

2	Physical	
2.1	Dimensions (ø × h)	80 mm × 144 mm [3.1 in × 5.7 in]
2.2	Enclosure material	Stainless steel 316L
2.3	Enclosure protective coating	None, not certified with any type of coatings
2.4	Weight (sensor only)	2.2 kg [4.9 lb]
2.5	Weight (with mounting bracket)	2.6 kg [5.7 lb]
2.6	Ambient temperature	See "Approvals & certification"
2.7	Ingress protection	IP66/IP68 (1 meter for 24 hours), in accordance with IEC 60529
2.8	Equipment marking	Metallised polyester certification label Stainless steel tag plate where applicable
2.9	Cable entry configuration	1 off M20 × 1.5 ISO metric fitted with Ex blanking element by default 2
2.10	Cable gland	None by default 2
2.11	Cable length and type	None by default 2



3	Electrical	Note
3.1	Rated voltage (from a safety barrier), U_{dc}	24 V 3
3.2	Power consumption (typical/maximum), sensor + safety barrier (PSD 1001C)	1.9 W/ 2.2 W
3.3	Electronics platform/generation	ClampOn DSP II
3.4	Microprocessor	600 MIPS
3.5	Non-volatile memory	8 MB
3.6	Vibration accelerometer	3-axis MEMS 4

4	Operation	
4.1	Manner of operation	Real-time measurement
4.2	Unit of measurement	Raw value (and g/s if SandQ+ algorithm is configured) 10
4.3	Technology	Passive ultrasonic using piezoelectric transducer
4.4	Processing	DSP in sensor unit
4.5	Calibration	All sensors are calibrated to a master signal at factory
4.6	Design life	25 years
4.7	Repeatability	Better than 1 % 5
4.8	Flow conditions	Oil, water, gas, multiphase
4.9	Minimum flow velocity	0.5 m/s [1.6 ft/s] 6
4.10	Minimum particle size	Oil: 25 µm, gas: 15 µm 5
4.11	Minimum sand rate	0.01 g/s 5
4.12	Pipe material	All steel alloys 7

5	Signal	8
5.1	Signal types (galvanically isolated)	RS-485 and 4-20 mA 3
5.2	RS-485 (half duplex) protocol	Modbus RTU or proprietary DSP 9, 10
5.3	RS-485 baud rate	2.4 kbps to 115.2 kbps
5.4	4-20 mA (passive, sink), 4-wire	Configurable raw value range up to 5 000 000. Default 0 to 500 000 9, 10

6	Installation	
6.1	Mounting	Mounting bracket clamped to pipe by non-invasive, non-intrusive stainless steel clamping bands, or welded to pipe surface. Sensor screws into the mounting bracket 7, 11
6.2	Terminal block connection data	0.5 mm ² to 1.5 mm ² [AWG 20 to AWG 16] conductor (stranded) cross section with ferrule with plastic sleeve

Instrument datasheet

ClampOn DSP Particle Monitor



7 Approvals & certification			14
7.1	Hazardous area location approval	Zone 0, 1, 2 for ATEX/IECEx installations and Zone 0, 1, 2 or Division 1 for cULus (NEC/CEC) installations	
7.2	ATEX certificate	Presafe 17 ATEX 9492X	13
7.3	ATEX marking	Ex II 1 G Ex ia IIB T4 Ga $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$	
7.4	ATEX ambient temperature range	$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$	12
7.5	IECEx certificate	IECEx PRE 17.0009X	13
7.6	IECEx marking	Ex ia IIB T4 Ga $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$	
7.7	IECEx ambient temperature range	$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$	12
7.8	cULus file number	E354507	13
7.9	cULus marking	Class I Division 1 Groups C, D T4 Class I Zone 0 AEx ia IIB T4 Ga Class I Zone 0 Ex ia IIB T4 Ga	
7.10	cULus ambient temperature range	$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$	12
7.11	CE marking in conformance with	2014/34/EU (ATEX Directive) and 2014/30/EU (EMC Directive)	

Notes

1. Serial number breakdown: yy (year of manufacture), mm (month of manufacture), xxxxx (unique electronics ID).
2. Various solutions available.
3. Irrespective of whether in a hazardous or non-hazardous area, all signal and power connections to and from the sensor must be via certified safety barriers with intrinsically safe outputs in accordance with the Ex certificates' electrical data. Only use certified safety barriers supplied or recommended by ClampOn.
4. For vibration measurement details, see instrument datasheet addendum. Vibration output is optional and not activated in instrument by default.
5. Depends on flow conditions.
6. Minimum velocity for particle detection depends on flow medium, particle size and pipe configuration.
7. Sensor waveguide must have metal-to-metal contact with the pipe surface.
8. Factory configurable software parameters via RS-485 interface. May also be configured in-field by ClampOn authorised personnel.
9. 4-20 mA only recommended for raw value trending. ClampOn recommends digital (Modbus RTU or DSP) output to enable sand calculation.
10. The sensor 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 sensor for this calculation is a simplified version of that used when running the calculation in ClampOn monitoring software on a centralized controller.
11. Mounting bracket available in stainless steel (standard), carbon steel or duplex. Clamping bands available in stainless steel or Inconel.
12. The ambient temperature (T_{amb}) marked on the equipment refers to the temperature of the surroundings, irrespective of any external source of heating, such as process temperature (T_{pipe}), or direct sunlight. Equipment is certified for process temperature $\leq +125^{\circ}\text{C}$. If there is a risk the ambient temperature of the surroundings will exceed T_{amb} , steps must be taken to mitigate this risk, such as installing a sunshade, insulating the pipe, or moving the equipment to another location.
13. See certificate and/or installation instructions for electrical parameters (for IS calculations), and specific conditions of use.
14. The sensor may not be marked with all certificates at the same time.