Instrument datasheet
DSP Particle Monitor

CLAMPON®
ULTRASONIC INTELLIGENT SENSORS

1	General		Note
1.1	Model name	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)	2.1 kg [4.6 lb]	
2.5	Weight (with mounting bracket)	2.5 kg [5.5 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 certified 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	Power input (from a safety barrier), U_{dc}	24 V	3
3.2	Power consumption (typical/maximum), sensor + safety barrier (PSD 1001C)	1.9 W/ 2.1 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 activated)	10
4.3	Technology	Passive ultrasonic	
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	0.25 mm² to 1.5 mm² [AWG 24 to AWG 16] conductor (stranded) cross section with ferrule with plastic sleeve	

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 $_{c}UL_{us}$ (NEC/CEC) installations	
7.2	ATEX marking	Ex II 1 G Ex ia IIB T4 Ga -40 °C ≤T_{amb} ≤+60 °C	
7.3	ATEX certificate	Presafe 17 ATEX 9492X	13
7.4	ATEX ambient temperature range	-40 °C ≤T_{amb} ≤+60 °C	12
7.5	IECEx marking	Ex ia IIB T4 Ga -40 °C ≤T_{amb} ≤+60 °C	
7.6	IECEx certificate	IECEx PRE 17.0009X	13
7.7	IECEx ambient temperature range	-40 °C ≤T_{amb} ≤+60 °C	12
7.8	$_{c}UL_{us}$ 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	
7.9	$_{c}UL_{us}$ file number	E354507	13
7.10	$_{c}UL_{us}$ ambient temperature range	-40 °C ≤T_{amb} ≤+60 °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, or direct sunlight. 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.