# Product datasheet
## DSP Particle Monitor TSE.DS2D.SA00.E10

**CLAMPON®**
ULTRASONIC INTELLIGENT SENSORS

| 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<br>Increased safety, Ex e | |
| 1.5 | Serial number | YY-MM-XXXXX | 1 |

| 2 | **Physical** | | |
|---|---|---|---|
| 2.1 | Dimensions (∅ × 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<br>Stainless steel tag plate where applicable | |
| 2.6 | Cable entry configuration | 2 off M25 × 1.5 ISO metric fitted with brass 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, $U_{dc}$ | 18 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)<br>15 μm (in gas) | 5 |
| 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 | |

| 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 °C ≤ $T_{amb}$ ≤ +55 °C…+80 °C | |
| 7.4 | ATEX ambient temperature range | −50 °C ≤ $T_{amb}$ ≤ +55 °C…+80 °C | 12 |
| 7.5 | IECEx certificate | IECEx ULD 20.0023X | 13 |
| 7.6 | IECEx marking | Ex db eb IIB T5…T4 Gb −50 °C ≤ $T_{amb}$ ≤ +55 °C…+80 °C | |
| 7.7 | IECEx ambient temperature range | −50 °C ≤ $T_{amb}$ ≤ +55 °C…+80 °C | 12 |
| 7.8 | cULus file number | E363818 | 13 |
| 7.9 | cULus marking | Class I Zone 1 AEx db eb IIB T5…T4 Gb<br>Ex db eb IIB T5…T4 Gb −50 °C ≤ $T_{amb}$ ≤ +55 °C…+80 °C | 14 |
| 7.10 | cULus ambient temperature range | −50 °C ≤ $T_{amb}$ ≤ +55 °C…+80 °C | 12 |
| 7.11 | CE marking in conformance with | 2014/34/EU (ATEX)<br>2014/30/EU (EMC)<br>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**

1.  Serial number breakdown: YY (year of manufacture), MM (month of manufacture), XXXXX (unique electronics ID).
2.  Various alternatives available. Cable gland and cable by client in accordance with local and/or national Ex installation regulations that apply.
3.  The instrument must be powered from a safety extra low voltage (SELV) power supply.
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 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.
11. Mounting bracket available in stainless steel (standard), carbon steel or duplex. Clamping bands available in stainless steel.
12. The ambient temperature ($T_{amb}$) of −50 °C to +55 °C…+80 °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.
13. See certificate and/or user manual for Specific Conditions of Use.
14. Suitable for use in (and additionally marked) Class I Division 2 Groups C, D T5…T4.
15. The instrument may not be marked with all certificates at the same time.