

ULTRASONIC INTELLIGENT SENSORS

ClampOn Subsea Particle Monitor

DIGITAL SIGNAL PROCESSING



ADVANTAGES

- **Non-intrusive**
- **Real time measurement**
- **High sensitivity**
- **Noise cancelling**
- **ROV deployable/retrievable**
- **Onboard sand calculation**
- **Optional vibration monitoring**

BACKGROUND

All factory owners or operators want to operate their plant as efficiently and profitably as possible. An oil or gas well can be regarded as a factory, and the ClampOn Subsea Particle Monitor gives operators the best tool for maximizing profits, by means of controlling and minimizing the production of sand, hence producing at highest production rate with no sand or an acceptable sand rate. Sand production in oil and gas wells is a serious issue for oil and gas producers. The challenge is not merely to avoid sand production, but also to optimize well productivity, as even small quantities of particles in the well flow can cause significant damage.

ClampOn's instruments are in operation on thousands of wells every day, and the company is the world's largest supplier of sand monitoring systems.

The ClampOn Subsea Particle Monitor is the answer for operators who want to keep their wells producing safely at the highest level possible; i.e. anyone who needs a quantitative, real-time and accurate measure of produced sand particles.



ClampOn Subsea Particle Monitor.

CLAMPON SUBSEA PARTICLE MONITOR IS USED FOR

- Finding maximum sand free production rate
- Establishing maximum acceptable sand rate
- Sand event alarm
- Onboard sand calculation
- Well optimization
- Well testing
- Sand Management

OPERATING PRINCIPLE

The unique, patented ClampOn Subsea Particle Monitor provides operators focusing on sand management and corrosion-erosion issues with even more accurate information than previously available. The Subsea sensor measures sand/particles through passive ultrasonic technology; it detects the ultrasonic signal that is generated by particles impacting on the inside of the pipe wall, just after the bend where the sensor is located. The instrument has onboard Digital Signal Processing (DSP) for analyzing of the data picked up by the instrument. Measurement is done in real time and results are continuously displayed on the control PC/system, giving the operator immediate and reliable data when a well starts producing sand. The Subsea Particle Monitor can even do internal calculation of sand rate, eliminating the need for topside processing. As an option, the instrument can also be supplied as a combined Sand and Vibration Monitor.

INSTALLATION

The ClampOn Subsea Particle Monitor is easy to install and operate. Its non-intrusive design and clever clamp-on fixtures makes it an effortless job to install, both at yard and in the field for retrofit systems. Permanent subsea installation is normally done by the subsea EPC contractor, but retrofit or non-permanent solutions are available for ROV or diver installation. Installation point is downstream of a bend/elbow, where the turbulent flow profile is fully developed, enabling users to measure even the smallest amount of fine particles.

The instruments continuous real-time measurements (1Hz) are transferred through the Subsea Electronics Module (SEM) to a topside control system – a dedicated PC with ClampOn Sand Monitor software, or directly to the operators control system.

Once a ClampOn system is installed, it requires very little maintenance. It's all about taking value from the data and information it provides!



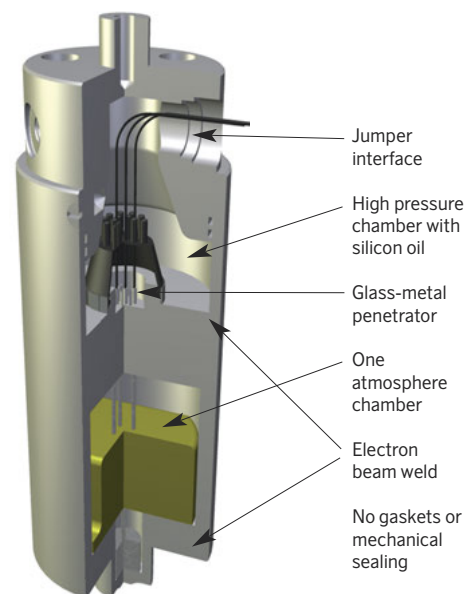
ClampOn Subsea Particle Monitor on pipe with Compact Funnel.



CLAMPON'S SUBSEA PHILOSOPHY

Subsea operating conditions, and in particular deepwater environments, demand technical solutions that combine flexibility with high performance and extremely long service life. To ensure our instruments meets all industry requirements within safety, lifetime and performance the Subsea sensor is designed with:

- 1 atm. Electronics chamber
- EB welding (no gaskets or seals)
- Independent redundant electronics (option)
- Titanium body
- Glass-metal penetrator
- 5th generation ClampOn DSP (DSP-II)



Cross section of a subsea sensor, showing the two chambers and the glass-metal penetrator.

KEY SPECIFICATIONS

- | | |
|---------------------------|---|
| • Method of operation: | Passive acoustics (ultrasonic) |
| • Processing: | Intelligent DSP electronics inside sensor unit |
| • Method of installation: | Non-intrusive, clamped to pipe surface |
| • Minimum particle size*: | Oil/water: 25 microns/1PPM
Air/gas: 15 microns/1PPM |
| • Minimum sand rate*: | 0.01 g/s |
| • Minimum flow velocity*: | 0.5 m/s |
| • Repeatability: | Better than 1% |
| • Interface options: | RS485, Modbus, Canbus, SIIS |
| • Two-way communication: | Yes |
| • Software upgradeable: | Yes |
| • Flow regimes: | Oil, gas, water, multiphase |
| • Optional features: | Onboard Sand Calculation
Self Diagnostics
Vibration monitoring
Temperature measurement |
| • Max water depth: | 3048 meters [10000 ft.] |
| • Design lifetime (MTBF): | 220 000 hours (25 years) |
| • Housing material: | Titanium |
| • Hose/jumper interface: | Bennex or ODI / jumper or bulkhead |
| • Dimensions/Weight: | ø90 x 324mm [ø3,5" x 12,8"] / 7kg air (5kg water) |
| • Power supply: | 12-28VDC, 1.2W (single electronics) |

* Depending on flow conditions

All specifications are subject to change without notice.



ULTRASONIC INTELLIGENT SENSORS

NORWAY: ClampOn AS, Vaagsgaten 10, NO-5160 Laksevaag, Bergen, Norway, Phone: +47 5594 8850, Fax: +47 5594 8855, e-mail: mail@clampon.com – **USA:** ClampOn, Inc., 15720 Park Row, Ste. 300 (77084), PO Box 219206 (77218-9206), Houston, TX, USA, Phone: +1 281 492 9805, Fax: +1 281 492 9810, e-mail: infoinc@clampon.com – **WEB:** www.clampon.com

ClampOn Subsea Funnels



ULTRASONIC INTELLIGENT SENSORS



***ClampOn Funnels for mounting of ClampOn Subsea Sensor,
from left: Funnel for bend, Standard Funnel,
Bulkhead Funnel and Retrofit Funnel***

Description

ClampOn has a range of funnels for different applications. Our funnels are designed in-house and cater to all the most typical pipe dimensions. Non-typical dimensions and applications can be engineered on request. The

illustration above shows our funnel models on a 6" pipe. Each of the models have their respective applications (description on the back). All funnels are made out of carbon steel. Our Standard, Bend and Retrofit models come

with bolts for mounting anodes. All our models can accommodate anodes depending on the pipe dimension. In each case, the anode is dimensioned to last beyond the design life of the funnel. All funnels have no welded parts.

Norway: ClampOn AS, Vaagsgaten 10, NO-5160 Laksevaag, Bergen, Norway, Phone: +47 5594 8850, e-mail: mail@clampon.com
USA: ClampOn, Inc., 15720 Park Row, Ste. 300 (77084), Houston, TX, USA, Phone: +1 281 492 9805, email: infoinc@clampon.com

www.clampon.com

Funnel Options:

- Dimensions: Clamp engineered to fit different pipe dimensions.
- Coating: Typically NORSOK M-501:2022 7B and 7C or Xylan 1424. Other coatings available on request.*
- Funnels could be installed under insulation, depending on type and thickness of insulation material.*
- Standalone parking bracket available on request.*
- Cathodic protection: Anode* or earthing straps.
- Retrofit funnel handle: Paddle (standard), fishtail or T-Bar.
- Standard Fasteners A4-80, Under insulation L7M/7M, other materials available on request

* Additional cost upon selection

Note: Not all combinations of model, option and dimension may be available. Always check with ClampOn for availability.



ClampOn Subsea sensor in Funnel

ClampOn Standard Funnel

Our default funnel suitable for most applications, including where insulating the pipe and preventing heat loss is important.

ClampOn Bulkhead Funnel

For applications where cable entry from the top of the funnel is required.

ClampOn Retrofit Funnel

Can be installed by ROV and is used on ad hoc service jobs or for mounting sensors in locations that do not already have a funnel installed. Can be supplied with buoyancy elements.

ClampOn Bend Funnel

This model is designed to be mounted on a bend.

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



Norway: ClampOn AS, Vaagsgaten 10, NO-5160 Laksevaag, Bergen, Norway, Phone: +47 5594 8850, e-mail: mail@clampon.com

USA: ClampOn, Inc., 15720 Park Row, Ste. 300 (77084), Houston, TX, USA, Phone: +1 281 492 9805, email: infoinc@clampon.com

www.clampon.com