



## Overview

For continuous monitoring of the mooring lines of e.g. FPSOs and offloading buoys, both direct load measurements and angle measurements are employed. A challenge experienced by the industry is that previously delivered angle measurement instrumentation has been prone to malfunction, primarily due to the dynamic forces exerted on the cabling crossing the area between the hull and the mooring line. Scanmatic has addressed this by developing a series of ruggedized inclinometers with a novel cabling solution.

Commercially off the shelf high quality sensors are placed inside pressure-proof subsea enclosure of stainless steel or titanium. The inside of the enclosure is filled with a polyurethane casting material in order to provide a galvanic barrier between the sensor and the housing material, prevent water intrusion and to protect the sensor against impact and vibrations.

A specially developed robust gel-filled subsea cable, designed for dynamic applications, is offered as the preferred choice of cabling. This cable is protected by a special plastic material which is molded onto the cable. This serves as a bend stiffener, assuring that the cable does not exceed its minimum bend radius. The plastic material has extreme qualities with regards to shock absorption, impact and vibration dampening, bend, stretch and compression restriction and abrasion protection.

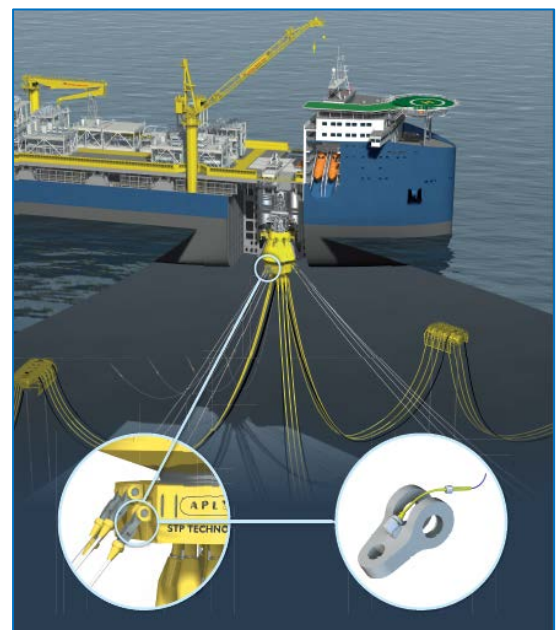
Scanmatic typically delivers the ATEX/IECEX data acquisition solution which interfaces with a top side control system for relevant presentation and alarm handling.

## Applications

- Mooring Line Integrity Monitoring
  - Early warning of mooring line failure
  - Increased situational awareness
- Structural Analysis
- Lifetime Estimation

## Features:

- Subsea inclinometer
- High accuracy
- Redundancy
- Extremely rugged
- Superior cable bend stiffener
- Custom engineering and adaptation
- Data acquisition and system integration



## Specifications of inclinometers

The inclinometer solutions are typically custom made to meet customer demands and special project requirements. Two delivered examples are presented here.

Inclinometer SM2875_ATEX	
Description	ATEX approved, intrinsically safe subsea inclinometer with capacitance-based sensor without moving parts. 0 – 90 degree measuring range.
Material	Stainless steel (SS316) or Titanium
Chassis connection	Flying lead or chassis connector
Dimensions	Length: 300 mm Height: 120 mm Width: 200 mm Weight: 10 kg
Environmental	Operating temperature range: -20° C to +60° C Depth rating: 15 bar
Electrical	Operating voltage: 18 ... 28 VDC Power consumption: Approx. 0.5 W Signal interface: 4-20 mA, 2 wire
Basic accuracy	+/- 0.4°
ATEX approval	Ex ib IIB T4 Gb, Ui=28VDC, Ii=110mA, Ci<15nF, Li<0.5mH

Inclinometer SM2877	
Description	Redundant sensor with Teledyne ODI diver wet mateable chassis connector. 0 – 90 degree measuring range.
Material	Stainless steel (SS316) or Titanium
Chassis connection	Teledyne NSD – 099-01-0-S-1
Dimensions	Length: 325/260 mm (w/wo chassis connector) Height: 120 mm Width: 100 mm Weight: 16.6 kg
Environmental	Operating temperature range: -10° C to +40° C Depth rating: 10 bar
Electrical	Operating voltage: 9 ... 30 VDC, with wrong polarity protection Power consumption: Approx. 0.5 W Signal interface: Sensor A: 4-20 mA with HART, 2-wire Sensor B: 4-20 mA, 2 wire
Basic accuracy	Sensor A: +/- 0.2° Sensor B: +/- 0.1°
Other	<ul style="list-style-type: none"> <li>- Activated with magnetic key</li> <li>- Possibility of "alarm mode" where unit only transmits if depth and/or inclinometer values exceeds pre-configured range for increased battery lifetime. Alive-signal e.g. once every 24 hours</li> </ul>

