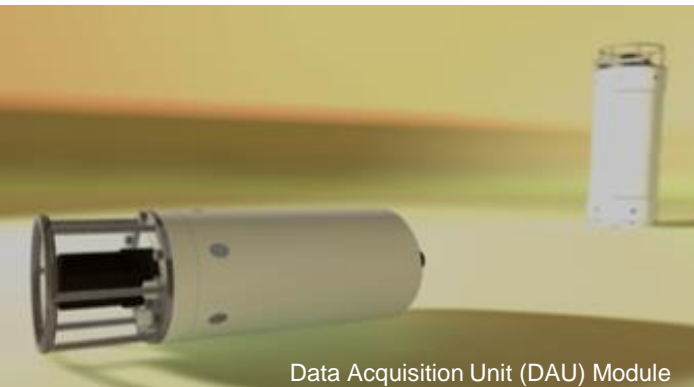


Anchor Leg Load Monitoring System (ALLMS)

A reliable monitoring system for mooring lines and legs



Data Acquisition Unit (DAU) Module

Indirect measurement method

ALLMS is based on indirect measurement method. It provides a fulfilling answer to requirements of all offshore operators without questioning the design of their assets or putting weight on their operational implementations.

It can be combined with our STANN (Simulation Trained Artificial Neural Network) software, unique patented solution based on DGPS information and Artificial Neural Network technology, to provide a complete Mooring Lines integrity monitoring system.

Performance Benefits for our Clients

- High level of reliability and availability:
 - More than 100,000 operating hours cumulated since 2009
 - Operational availability of 99 percent estimated considering a mobilization time of 14 days for subsea intervention
- Mooring lines integrity management on a day-to-day basis
- Suitable to different environments (harsh seas, severe weather) and customer needs
- Immediately warns the operator in case of an overstressed or broken mooring line
- Calculations of average tension variations versus predictions and design limits

General Specifications

Technical overview

- ALLMS is a modular system made of standard components.

Deployment

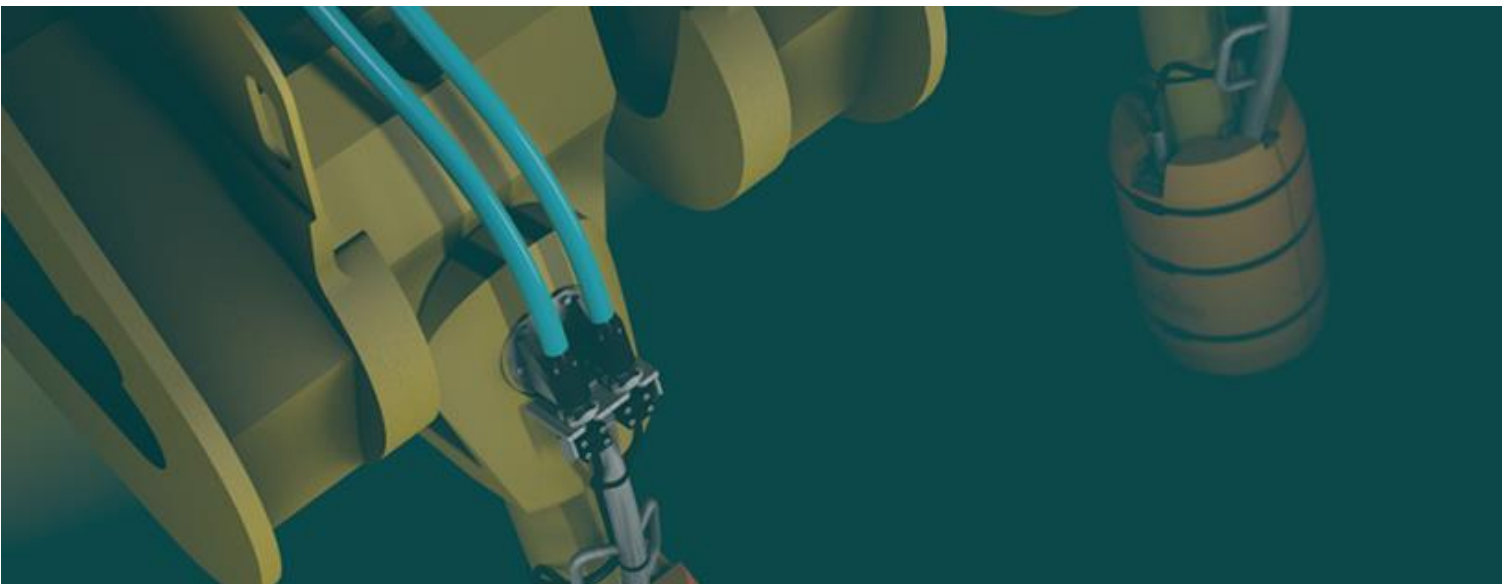
- ALLMS can be deployed by diver or ROV (Remote Operated Vehicle) on new or existing production fields.

Main applications

- ALLMS is suitable for all types of moored floating facilities:
 - Floating Offshore Wind Turbine (FOWT)
 - Spread moored FPSOs
 - Turret moored FPSOs
 - Tensioned leg platform (TLP)
 - Semi-submersibles
 - Offloading buoys
 - Spars
 - Drilling rigs
 - Drilling semi-submersibles

Data management

- ALLMS is supported by a global software solution Cyxense Surveillor®, main features include:
 - Data logging
 - GPS and vessel draft correlation
 - Operator Human-Machine Interface (HMI)



Technologies

Different technologies can be used within the system

Depending on its objectives:

- for breakage or overstress alarms, top angles are measured by inclinometers or DGPS information are processed by an artificial neural network (patented solution)
- for stress cycling monitoring, load cells or vibrating wires (extension/compression measurements) measure parameters enable tension calculations

To measure loads

Two sensing technologies:

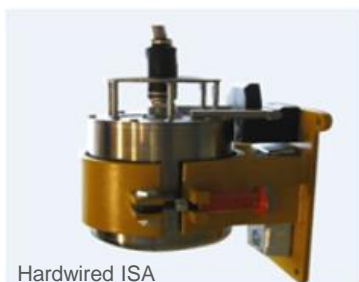
- Vibrating wire strain gauges
- Compressive load cells

One subsea electrical junction box

One subsea cable



ISA module



Hardwired ISA

Instrumentation Subsea Assembly (ISA)

The ISA is the main component to measure angles:

- One (or two) biaxial inclinometer(s)
- One data logger for local data storage (option)
- One (or two) mooring line breaking detector(s) (option)
- A suitable support to fix the ISA module onto the chain connector, with protection against corrosion and marine growth
- Light subsea beacons
- Acoustic communication (option)

ALLMS Projects List

Operator / Client Type	Measurement	Project Location
IOC	Angle	FPSO – Angola
IOC / Contractor	Angle	FPSO – Norway
IOC	Motion & load	OOL/Calm Buoy – Nigeria
NOC / Contractor	Load	BSR - Brazil
IOC / Contractor	Angle & motion	FLNG – Australia
IOC / Contractor	Load	TLP - USA-GoM
IOC / Contractor	Load	TLP - USA-GoM
Indep. / Contractor	Integrity	FPSO - Israël

IOC: International Oil Company – NOC: National Oil Company – Indep.: Independent Companies - OOL: Offloading Lines – BSR: Buoyancy Supporting Risers