

**MOORASSURE™**  
Mooring Line Tension Monitoring System



INTEGRIpod™ acoustic inclinometer and receiver for mooring lines



The **MOORASSURE™** mooring line tension monitoring system is used to confirm the integrity and performance of mooring systems by monitoring the mean angle of mooring lines and deduce mean tension from it.

The **INTEGRIpod™** acoustic inclinometer is placed in a holder to allow its retrieval and installation by ROV or diver. The logger holders can be attached to chain links or on the chain stopper below the chain table.

**SYSTEM DESCRIPTION**

On each mooring line, an **INTEGRIpod™** inclinometer is attached to measure its mean angle. Using underwater acoustic linkers, the measured angle is periodically transmitted to vessel-mounted acoustic receivers. The measured mooring line angles are collected by a topside data acquisition system.

A number of hull-mounted acoustic receivers are connected using electrical cables to an industrial rack-mounted data acquisition system located on the topside.

The calculated mooring line tension is displayed and compared with preset thresholds. Where measurements exceed predefined threshold, alarms are raised. The software also has options to evaluate polyester cable creep.

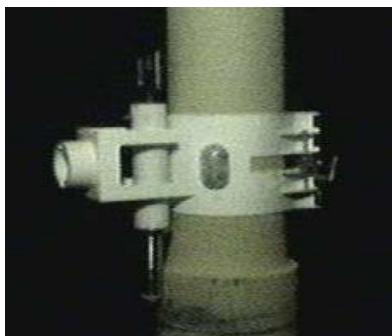
Using the measured mooring line angles and incorporating vessel GPS and vessel draft, the mean tension of each mooring line is deduced using a mooring line mathematical model.

**OPTIONS**

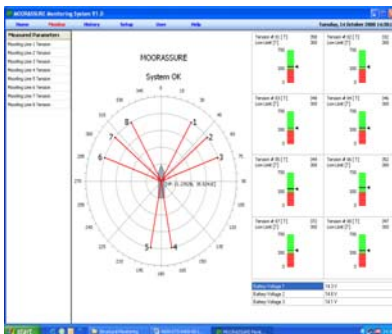
- Integration with **INTEGRIfuff™**, a retrofit dynamic chain tension sensor
- User customized software



Permanently installed pod holders on chain stoppers to allow pods to be installed by ROV or divers



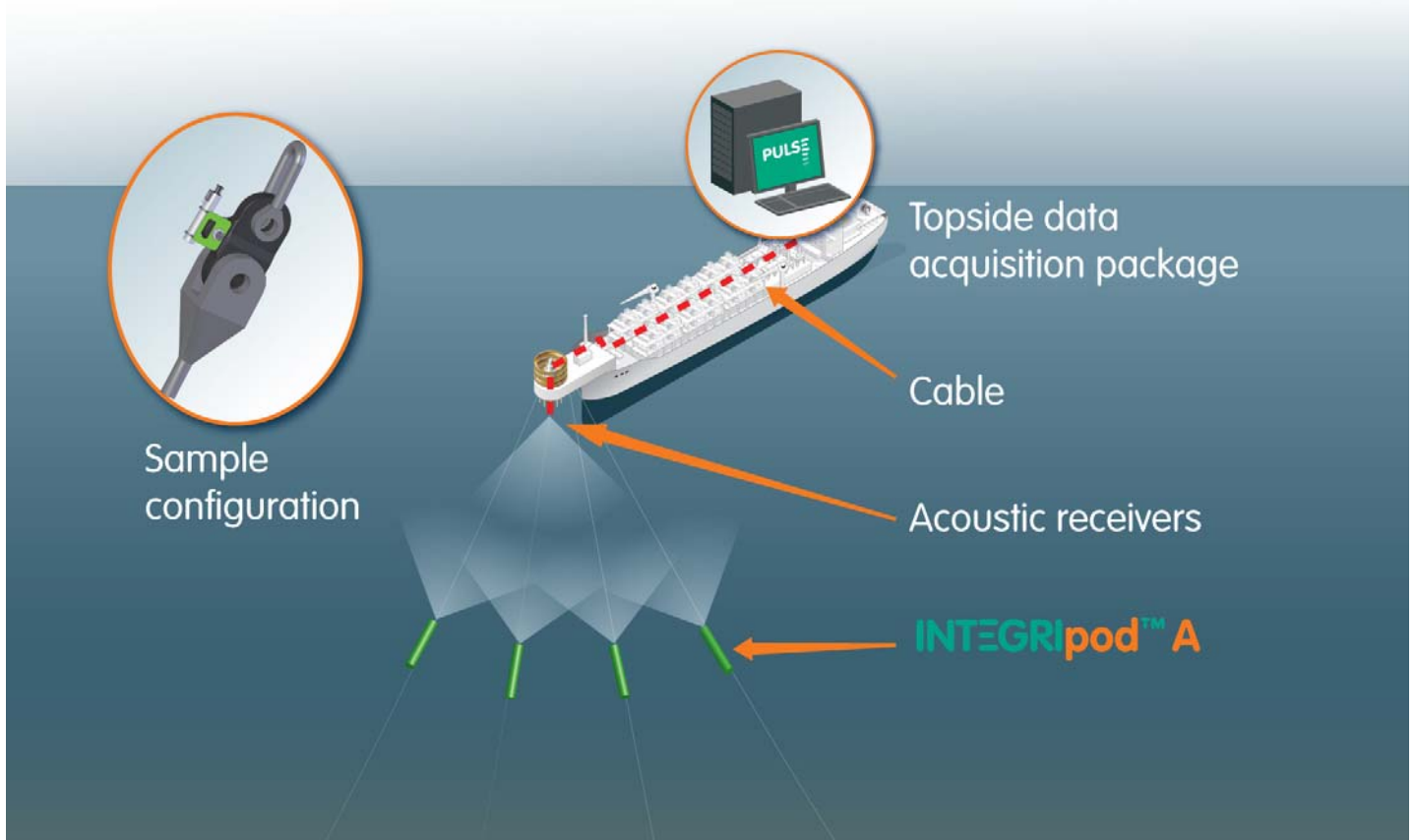
ROV or diver installed pod holders on mooring structures to allow pods to be installed



Software screenshot

**FEATURES**

- Raise alarm when a mooring line fails
- Monitor performance of mooring lines
- Monitor mooring cable creep
- Underwater cable free acoustic communication
- Ultra-low power design to extend the battery life and prolong service period.



**SPECIFICATIONS**

Items	Description
Inclinometer type	Tri-axial inclinometers (1 main set + 1 redundant set)
Inclination measurement resolution	0.1 ° (inclination range from 0 deg to 50 deg to vertical)
Inclination measurement accuracy	0.2 ° after calibration
Deduced tension accuracy	< 5% of full tension range
Temperature measurement resolution	0.5 °C
Acoustic transmission distance	Up to 1000 m
Diver/ROV serviceable	Yes
Holders for subsea devices	Tailored interface to suit client requirement
Topside data acquisition system	3 receiving modems with 100 m of subsea cables 3 winches for subsea deployment of modems 100 m of topside electrical cable Topside data acquisition system based on an industrial PC Standard / user specified software running on the PC
Logging and data downloading program	Logging period: 10, 20 and 30 min. programmable (20 min. default) Sampling rate: 0.1Hz, 0.2Hz, 0.4Hz and 1Hz programmable (0.2Hz default) Logging cycle: 1, 2, 4, 12, 24 hrs. programmable (4 hrs. default) Downloading cycle: multiple of logging cycle programmable (24 hrs. default)
Battery Life	5 years with a default logging/data downloading program
Dimension	114 mm outside diameter and 1 m length
Weight	26 kg in air with battery, 15 kg in water



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