



**STRAINSTALL UK LIMITED**

# MoorAlert

## The Mooring Load Monitoring System

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## **C O N T E N T S**

MoorAlert **Summary**

**Benefits of the MoorAlert System**

**System Details**

**Testing, Calibration and Documentation**

**Installation and Commissioning**

**Quality Assurance**

**Further Information**

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### MoorAlert System Description

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The Strainstall MoorAlert Mooring Load Monitoring System is designed to measure and record the tension in vessel mooring lines at a jetty. The action of wind, tide and wash from passing ships on a moored vessel can impart severe loads and mooring lines must be able to absorb these forces.

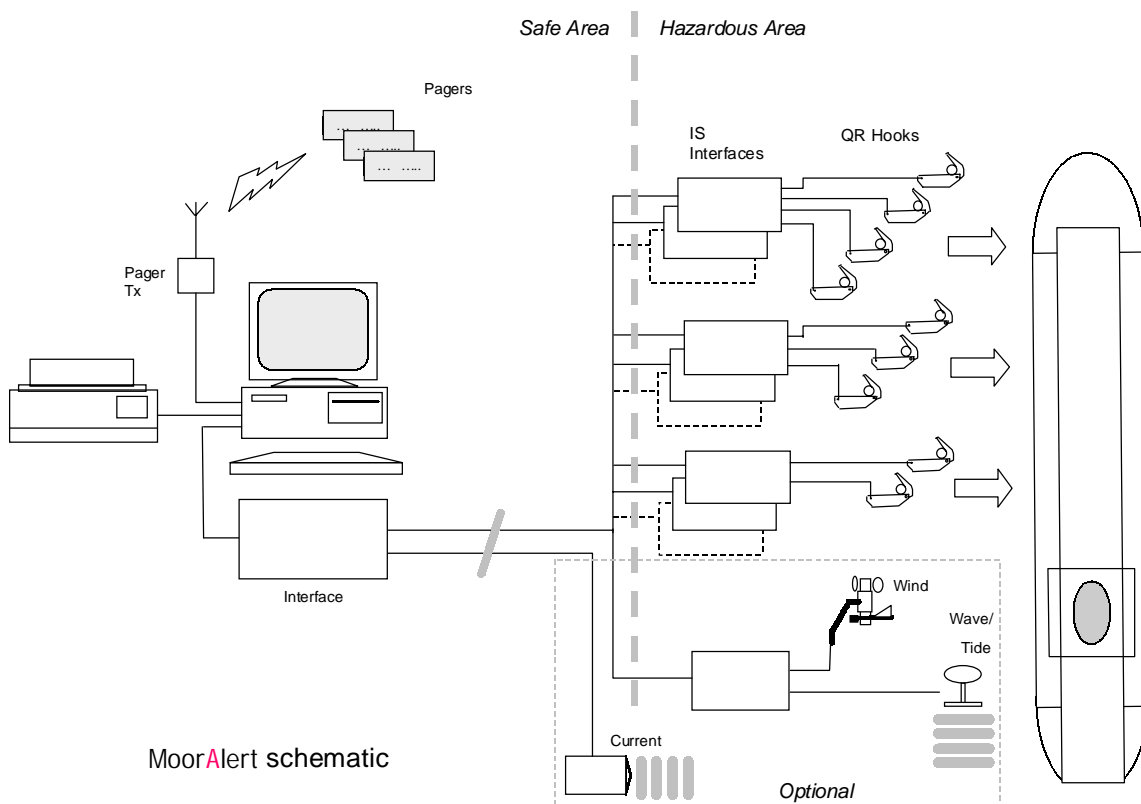
MoorAlert enables each mooring line to be pre-tensioned to acceptable values of load and to detect any deviation from these pre-determined values which may affect the performance of that line.



Quick Release Hook with load measuring pins fitted

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### MoorAlert System Description



MoorAlert schematic

MoorAlert carries out the following functions:

**Load Measurement** - performed by Load Measuring Pins (LMPs) which are installed in place of the rear horizontal swivel pin in quick-release mooring hooks on the jetty. The forces acting on the pin are converted into an electrical signal which is fed into the signal conditioning equipment.

**Signal Conditioning** - The electrical signal is fed into a digital interface unit which converts this analogue signal into a digital signal so that it can be transmitted via data bus to the display equipment in the control room.

**Display** - The digital signals are passed to a desktop PC where data is logged and processed to provide a graphic representation of the jetty on a high resolution colour monitor. The graphic user interface shows the layout of the jetty, position of the moored vessel and mooring lines in use. The loads are displayed as bar graphs which change colour in the event of overload or slack line occurring along with an audible and visual alarm.

**Data logging** - The data is stored on the PC hard drive and printed as required. The mooring patterns of vessels using the jetty regularly can also be stored, enabling easy recall of the number of lines, alarm points, etc. to simplify the set up procedure.

**As each MoorAlert System is tailored to suit the Client's requirements, Strainstall would be pleased to discuss any variations that may be needed to meet the Client's specification.**

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#### **The Benefits of a MoorAlert System**

There are four significant factors to be considered when evaluating a MoorAlert installation proposal. These are:

- a) Whether the berth is subjected to severe meteorological or oceanographic conditions.
- b) Whether the volume and tonnage of passing shipping is sufficient to create significant surge forces in the mooring patterns of ships secured adjacent to the main navigational channel.
- c) Whether the density of other hazardous substance carrying vessels in the port area is such that the potential danger of a breakout are greatly increased.
- d) Whether loading/unloading restrictions dependent upon a) and b) above may be relaxed as the vessel is now secured to its berth under a greater degree of control.

Total vessel breakouts are not common, but partial breakouts are more frequent and the financial consequences of any mooring accident can be enormous, particularly when the following factors are taken into account:

- i) Additional use of tugs to hold the vessel under control following a partial or total breakout:
- ii) Drydocking for hull inspection and possible repair following either collision or grounding.
- iii) Structural damage to jetties and dock structures.
- iv) Disruption of an entire port complex by the obstruction of the main navigation channel following grounding.
- v) Environmental pollution through ruptured cargo or bunker tanks; or fractured loading/unloading arms.
- vi) Major risk of fire, particularly in the case of VLCCs or LNG carriers.

MoorAlert can make a major contribution to port and environmental safety. The information it provides enables the Terminal Superintendent or the vessel master to continuously assess the efficiency of the vessel's mooring pattern and to take the necessary actions to ensure that maximum mooring safety is maintained. Significant operational economies can result from the improved use of berthing time and the lessened requirement for stand by tugs during periods of uncertain weather, while the risk of a total or partial breakout is greatly reduced.

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## MoorAlert System Description

### MoorAlert System Details

#### Outline

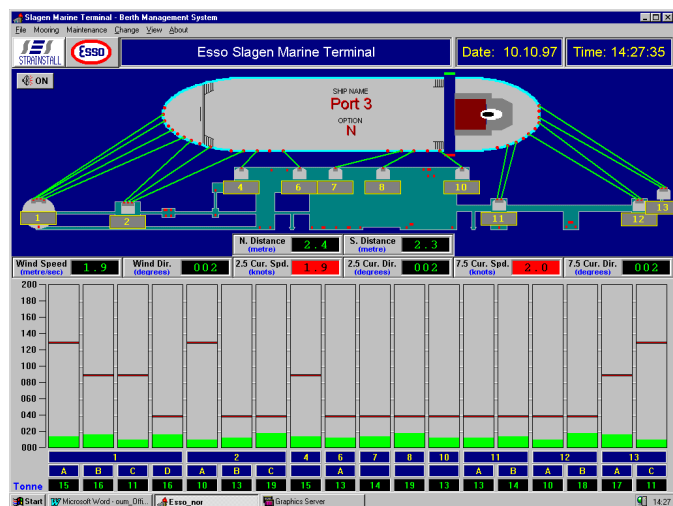
The basic MoorAlert consists of a number of load sensors (LMP) installed into the quick release mooring hooks (QRH) and which convert the tension forces in the mooring lines to electrical signals that are directly proportional to the loads.

The signal from each mooring hook is fed, via intrinsically safe zener barriers to a multichannel digital amplifier which boosts the small signals and converts them to a digital signal which can be sent over long cables, without any loss of accuracy, to the Interface Unit in the Control Room.

In the Interface Unit the incoming digital load signals are terminated in a serial interface unit. The signals are then passed to a main Display Computer (PC) where the loads are computed based on the calibration values of each load pin.

#### Displays

The load results are displayed on a 15" high resolution colour visual display unit (VDU). The display shows the jetty in plan view, the position of the moored vessel, the actual mooring lines in use and the loads on the mooring lines. The load is shown as a number of coloured vertical columns which change in height as the loads change. In the event of overload or underload (slack line), the appropriate column changes colour and flashes to attract attention and an alarm sounds in accordance with the specified requirement.



A colour printer is also provided for hard copy of mooring configuration, load trend, alarm history etc. as required.

#### Control

The standard system is controlled by means of simple commands on a keyboard and the VDU prompts the operator by asking for the next information to be fed in. In this way the vessel's name and size, the number of hooks in use, the overload rating of individual or the whole set of hooks, the minimum permitted tension of the lines and other details can be entered into the PC to provide a comprehensive display and record of the moorings.

The mooring patterns of regular vessels can be stored on the PC hard disk to provide recall of the details of number of lines, particular hooks, alarm points etc., and allow simplified set up.

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### MoorAlert System Description

#### Components

A MoorAlert system comprises the following components:

Load Measuring Pins - Manufactured from High Tensile Stainless Steel, rated to between 60 and 150 tonnes depending on the application, and designed to suit the quick release hook supplied. The pins are certified for use in hazardous areas. The signal from each pin is led through screened 4 core armoured cable using stainless steel fittings.



Dimensions	To suit Hook
Proof Load	150% of load rating
Pin Material	High tensile stainless steel FV520B.
Straingauge Protection	Hermetically sealed and inert gas filled chamber.
Sealing	Fully welded construction with additional mechanical barriers to ingress of water, to IP 67 standard.
Pressure Test	1 metre depth of water.
Pressure Rating	Designed for at least 50 metres depth of water.
Bridge Resistance	700 ohm nominal.
Bridge Supply	5V nominal, 15V maximum.
Bridge Output	1.5 mV/V nominal at rated load.
Power Consumption	35 mW.
Connection	Glanded armoured hose protected 4 core screened signal cable.
Operating Temperature Range	-20 to +60C standard.
Linearity	<± 2% FRO nominally.

Digital Interface Unit - Contains an analogue to digital signal converter with power supply and zener barrier units in the signal and power lines to regulate the voltages transmitted between the hazardous and non-hazardous areas.

Display Computer and operator's terminal - fitted with the required I/O cards and software to process the RS232 data from the Digital Interface Unit, plus a mouse and keyboard. A 15" VGA Colour Monitor is supplied as standard. Larger or higher resolution monitors can be supplied on request.

The standard MoorAlert application software is configured to meet the requirements of each individual system.

Printer - Ink-Jet printer for hard copy as required.



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#### **Options**

Uninterruptible Power Supply - Provides at least 20 minutes of power to the system in the event of a mains power failure.

Remote Repeater Displays - Further workstations can be situated in other areas of the jetty or control room to display a duplicate of the main control monitor, connected by cable, fibre-optic cable or radio telemetry depending on the nature of the installation. There are two versions available, Desktop PC or Laptop PC which can be used in non-hazardous areas.

An intrinsically safe Remote Repeater Display is available for use in hazardous areas.

MoorAlert Console - A floor-standing 19" rack cabinet is available to house the entire control system, (PC, Monitor, PSUs, Digital Interface).

Integration into Berth Management System - MoorAlert can be integrated with other transducers and instrumentation such as anemometers, thermometers, current speed and direction, vessel approach and docking equipment and so on.

#### **Testing, Calibration and Documentation**

All inspection, test and calibration work is carried out to a strict set of standard procedures. Test equipment used has valid Calibration Certification traceable to National Standards. All MoorAlert systems are fully tested in house at component level and under simulated conditions.

Strainstall provides comprehensive documentation with the delivered equipment including Operation and Maintenance Manuals, connection schedules and Calibration Certificates. All documentation is written in English.

#### **Installation and Commissioning**

It is recommended that the installation and commissioning of the MoorAlert system be controlled and supervised by an Strainstall senior engineer, with the client's subcontractor carrying out the actual installation. Where the MoorAlert system is to be retro-fitted to an existing mooring hook, it is recommended that the hook be removed from the jetty and the strip down and re-assembly with the new LMP take place in the workshop. In the case of new installations, the LMPs should be installed into the mooring hook by the hook manufacturer and the whole system tested prior to despatch.

#### **Quality Assurance**

Strainstall operate a Quality System accredited by the British Standards Institution to BS5750: Part 2 (1987), EN29002 (1987) and now ISO 9002 (1987). A copy of the Strainstall Quality Manual can be supplied to customers on request.

#### **Further Information**

A list of existing world-wide MoorAlert installations is available, as is a more detailed technical overview of a Strainstall MoorAlert System. Please do not hesitate to contact Strainstall with any enquiries regarding an existing or planned installation.