



## **3Bmust International S.r.l.**

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# **LMI (LOAD MOMENT INDICATOR) FOR RETROFIT**

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### 0 AIM OF THE DOCUMENT:

The aim of the document is to introduce a selection of reference design developed by 3Bmust according the experience of several years in electronic design for cranes and lifting machines.

These systems have been designed specifically to fit equipments of cranes that need to be updated with Load Moment Indicator, or replacing an older LMI system in order to reach safety requirements.

### 1 SYSTEMS DESCRIPTION:

The following systems are proposed with several configuration to meet a wide range of applications for both **Telescopic crane** and **Crawler/Lattice crane**:

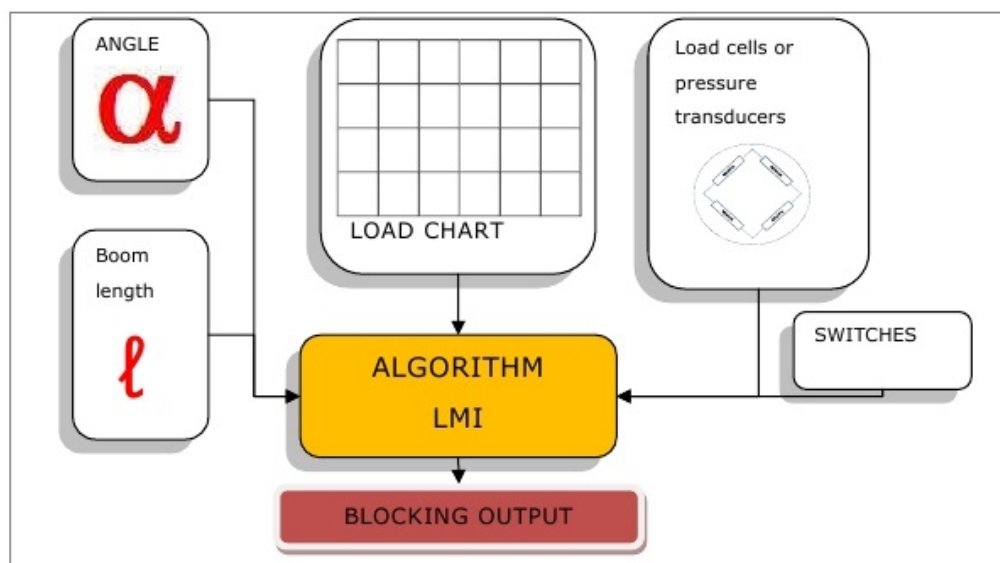
#### 1.1 The LMI SW Engine:

The SW kernel of the main unit manages a dedicated unstopable task of sensors reading and comparison of the load tables with a maximum run task time of 100ms.

This process continuously update the main screen with actual load, maximum load, boom angle, load percentage for safety function, and other parameters for operating mode such as the number of lines.

Unsafe condition is detected with visual and acoustic alarms at 90% of the max load, shown on the screen and activation of blocking output when the 100% (programmable threshold) is reached.

Configuration of operating modes and the load tables are under first level password.





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## **2 CLS SYSTEM:**

The CLS system is a basic equipment for load and moment indication and limitation with single channel safety function.

The main unit contains a LCD display and a powerful logic control unit with input/output resources and direct CAN-BUS connection.

The system is able to accept a wide range of sensors such as:

- Pressure transducers (for telescopic cranes)
- Traction Load cell at dead end of rope (for crawler cranes and telescopic if pressure transducers not applicable)
- A2B
- Up to 3 cable reel (3 analog or 2 can-bus) with angle sensor
- Manual cable reel (crawler cranes)
- Switch inputs for automatic machine configuration detection.
- Blocking output
- Siren output
- Planarity sensor (optional)

## **3 VIEW SYSTEM:**

The VIEW system is an equipment for load moment indication compliant with EN13849 safety function regulation (cat.2 PL, reachable = d).

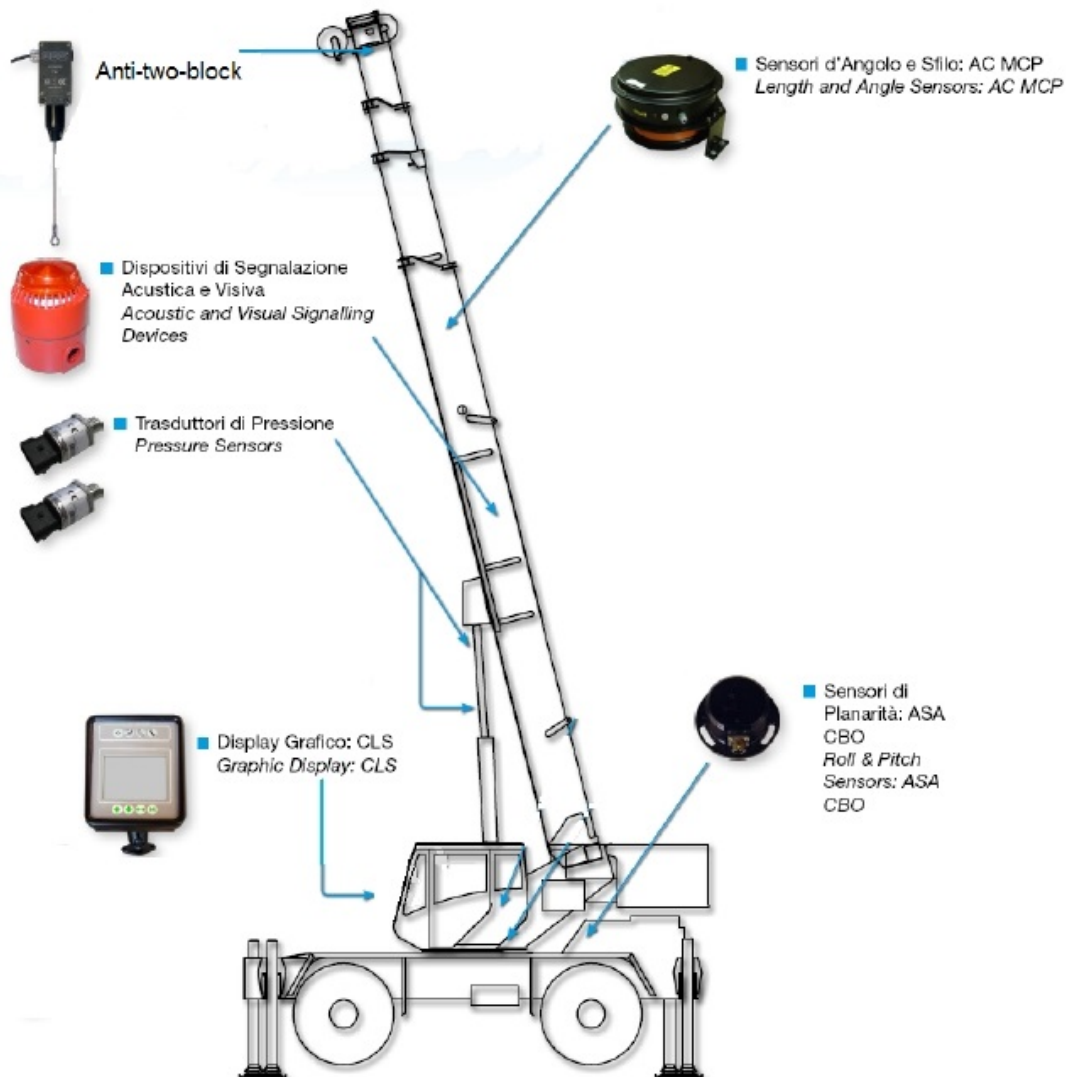
The display VIEW allows excellent graphic resolution and multipage menus for complete machine control.

The main unit MIDAC PLUS is a double processor for logic control unit with input/output resources and direct CAN-BUS connection.

The system is able to accept a wide range of sensors and outputs such as:

- Pressure transducers (for telescopic cranes)
- Traction Load cell at dead end of rope (for crawler cranes and telescopic if pressure transducers not applicable)
- Line Tension Meter
- A2B
- Up to 3 automatic cable reel CAN-BUS with angle sensor.
- Manual cable reel (crawler cranes)
- Switch inputs for automatic machine configuration detection.
- Configurable block outputs
- Siren outputs

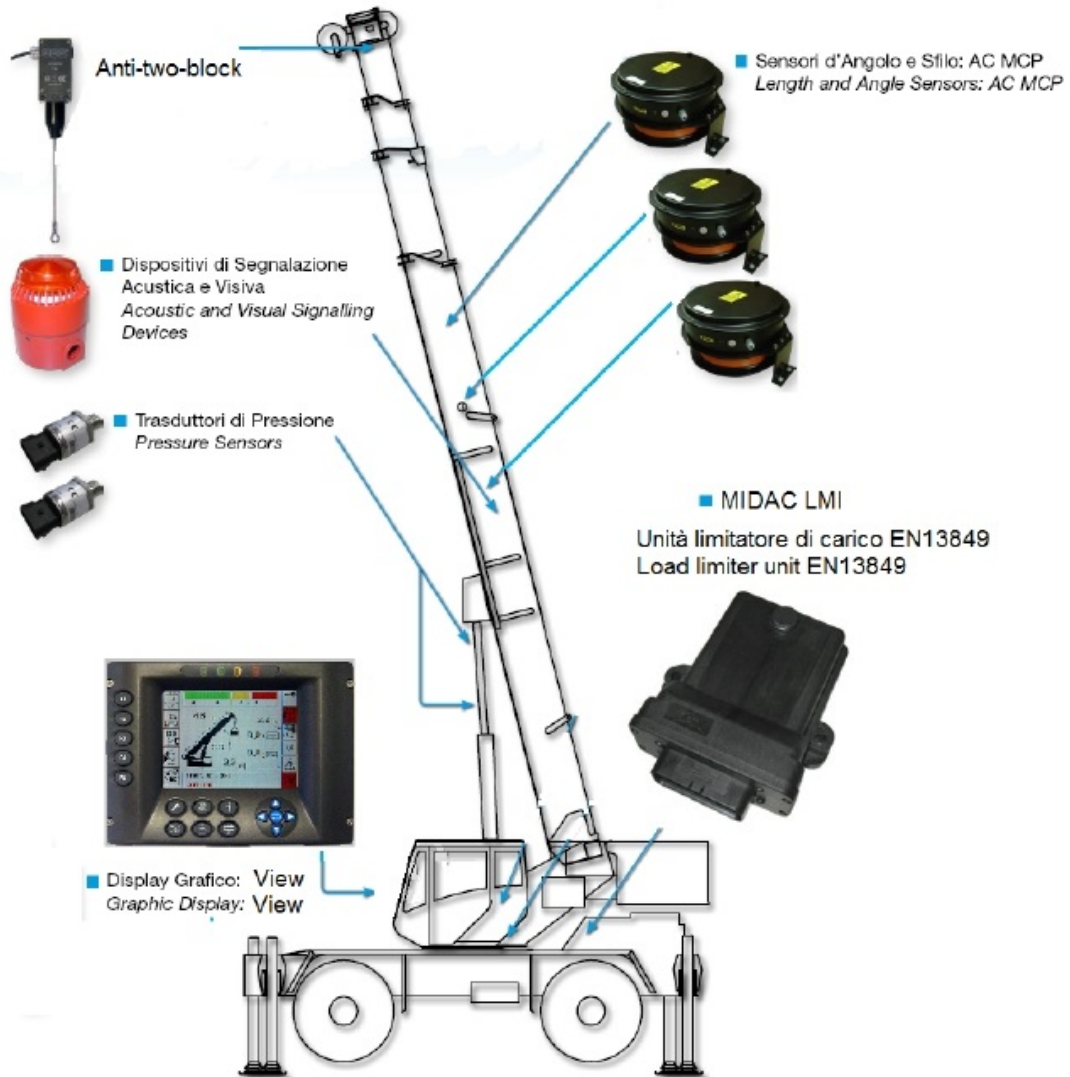
#### 4 CLS SYSTEM BLOCK DIAGRAM (FOR TELESCOPIC CRANES):



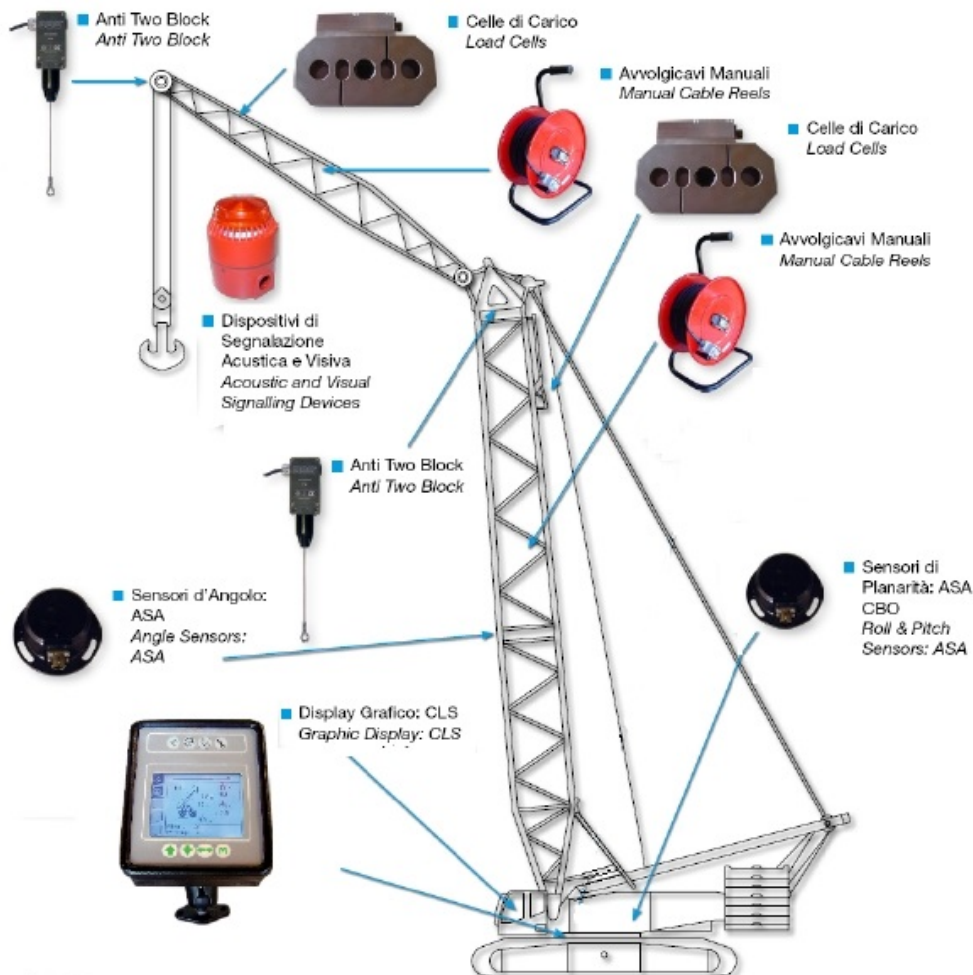


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## 5 VIEW EN13849 SYSTEM BOCK DIAGRAM FOR TELESCOPIC CRANES:



## 6 CLS SYSTEM BLOCK DIAGRAM FOR CRAWLER CRANES:



### 6.1 Line tension meter:

The use of load cells at the dead end of rope can create a limitation in the number of ropes available with the LMI functionalities. The typical example is the use of jib with single rope. To cover these working conditions, 3Bmust has developed the Line tension meter.

The 3Bmust Line Tension Meter LTM is designed to install on a running rope to measure the load applied.

The rope tension is monitored using a 'Triple Pulley' arrangement (with the pulley size to suit the wire diameter), where the wire applies a force proportional to wire tension, to the 'Offset' centre pulley, containing the load sensor.



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The line tension meter can be integrated in the CLS and View systems as a simple load cell.



Line tension meter

## 6.2 SW tools reference list :

SW tool name	Feature
WINLOADER	Download/Upload SW in the central units
WINSCOPE	Parameters analyzer for standard SW
WINSOPENET	Parameters analyzer for VT3 SW
HW KEY (optional)	Hardware protection key

## 7 SYSTEM CABLING:

Connectorized cables are available upon request.

## 8 EMERGENCY CIRCUIT:

These systems will preserve the original emergency circuit of the machine.

## 9 REFERENCE DOCUMENTATION:

The collection of data required to design the LMI application has to be sent to £Bmust using the document CRANE DATA REV.4