AVIONI Electronic Technologies Co., Ltd.

Load Moment Indicator for Knuckle Boom Cranes

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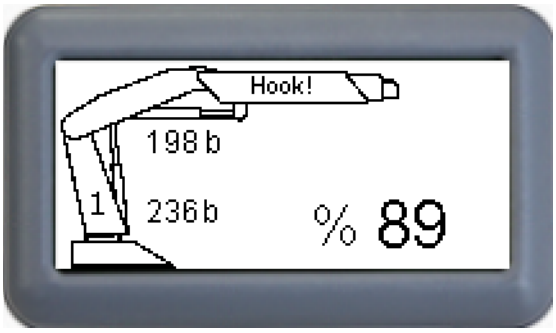
Table of Contents

1. User Interface

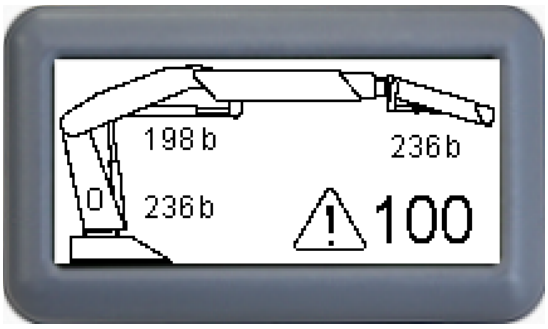
LMI.2 Load Moment Indicator (Rated Capacity Indicator) includes 3" touchscreen display. The following SPLASH screen is displayed for 3 seconds when the system is switched on.

Splash Screen

By touching the Splash screen to switch to SETTINGS (See Section.4 Settings) or wait for 3 seconds to start LMI system. The User Interface screen of the system is as follows.



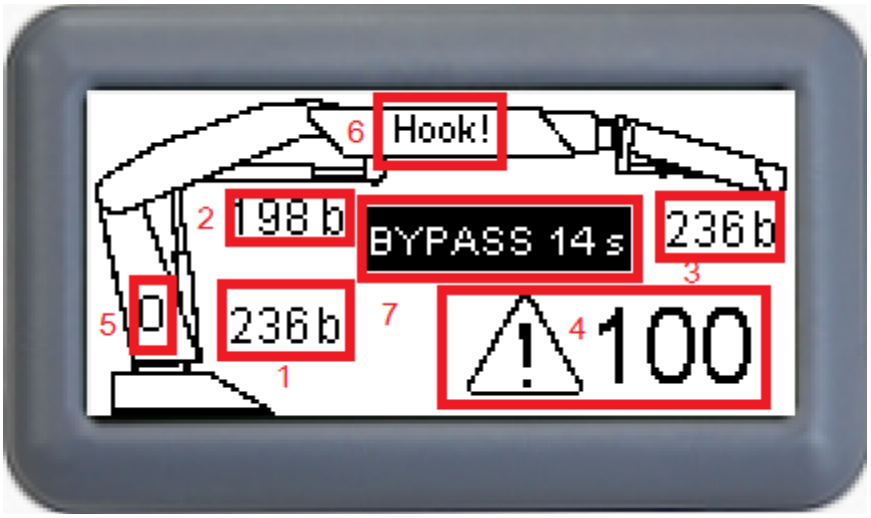
Without JIB



With JIB

Depending on the operation of the crane with or without JIB mode, the selected visual screen is displayed. JIB mode is selected from the SETTINGS menu.

The images and descriptions on the User Interface are described below.



User Interface

1. Pressure value representing the main boom lifting moment (in BAR unit)

2. Pressure value representing the knuckle boom lifting moment (in BAR unit)

3. Pressure value representing the JIB boom lifting moment (in BAR unit)

4. Percentage of lift moment: It is the ratio of the instantaneous moment values to the limit values.

   a. It is a safe working area between 0% and 89%. It is warned by an external green lamp.
   b. It is the zone of approaching the danger limit of 90% .. 99%. It is warned by external yellow lamp and intermittent buzzer (buzzer).
   c. 100% and above indicates that the moment limit has been reached. It is stimulated by external red lamp and continuous buzzer sound. A warning symbol ⚠ is displayed instead of the % mark on the display.

5. Indicates the status of the signal transmitted to the main cut-off valve (Dump Valve).

   0: Indicates that it is in danger and the signal transmitted to the valve has been interrupted.

   1: Indicates that it is in normal operating state and the dump valve is energized.

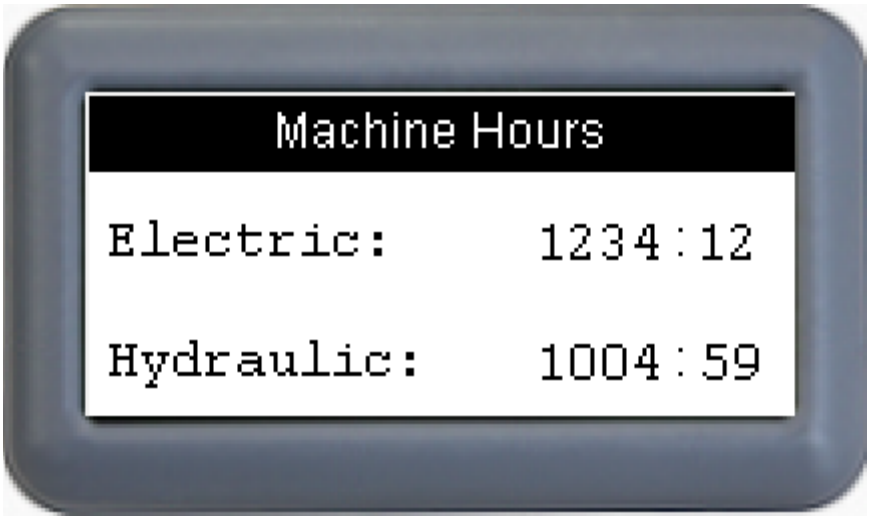
6. If the system uses the hook limit switch (Anti-2-Block Switch), it indicates that the hook switch has stopped the movement.

7. **Bypass Time:** The load moment indicator system can be deactivated for 15 seconds. In this case, the responsibility is entirely in the operator. After the bypass time is completed, it is necessary to wait 30sec for the next bypass. Bypass is a non-mandatory feature that should only be used when really needed. If the Bypass Switch is not connected during installation, this feature can be completely disabled.

2. Machine Hours

Machine usage times are recorded as statistical information. It does not affect the operation of the load moment indicator and prepared for tracking of operators and vehicle owners.

Touching the User Interface opens the Machine Hours screen. When touching the Machine Hours screen, it returns to the User Interface.



Machine Work Hours Screen

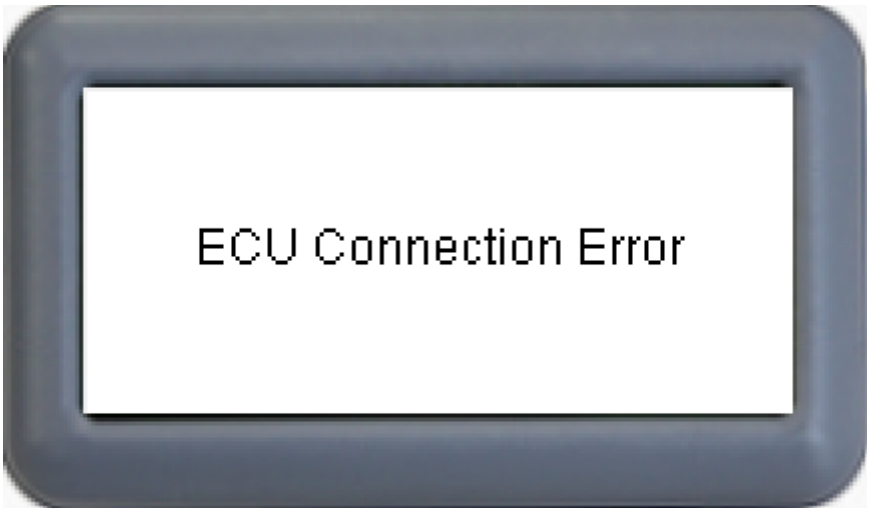
The Electric Work Hour is increasing during the time the system is energized. It automatically resets after 9999 hours.

Hydraulic Work Hour increases as long as the dump valve is energized. It shows how efficiently the system is used and automatically resets after 9999 hours.

3. Alarm/Error Information Screen

In the event of a malfunction or malfunction in the load moment indicator system, the signal transmitted to the dump valve is automatically closed. And error information is shown on the display.

If the emergency stop button is pressed, the display shows "EMERGENCY STOP". In addition, the buzzer with audible warning and dashed red lamp gives a light warning.



Alarm/Error Information Screen

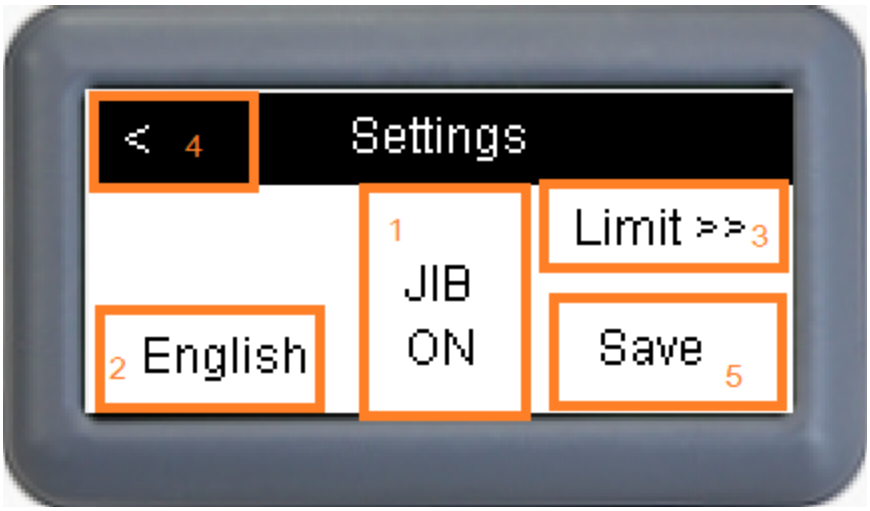
Alarm or Error Information as follows:

a. Emergency Stop
b. Main Boom Pressure Sensor Error
c. Knuckle Boom Pressure Sensor Error
d. Jib Boom Pressure Sensor Error
e. ECU Connection Error: (indicates that the connection between the load moment control unit and the display is off)

If the error is cleared, the system returns to User Interface.

4. Settings

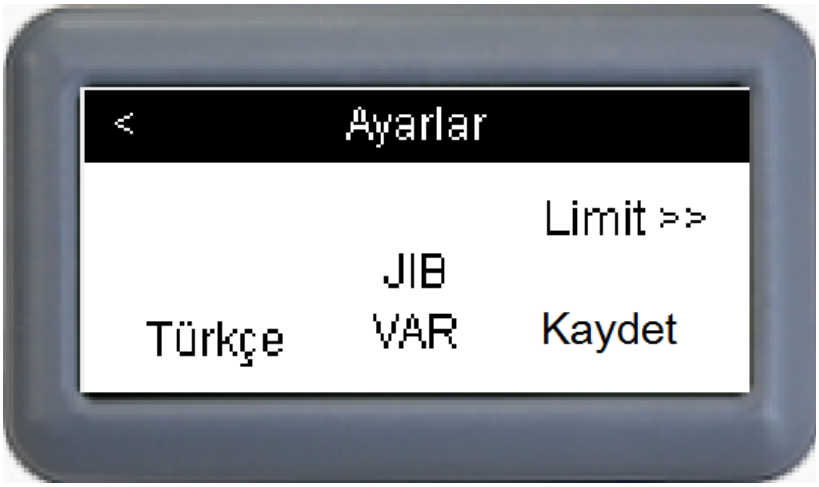
Touching the splash screen 1 time within 3s after switching on the system opens the SETTINGS screen.



Settings Screen

1. **Jib Mode:** The choice of with/without jib is achieved by touching this zone once. In each touch, the system selects between JIB On or JIB Off.

2. **Language Selection:** In each touch the system changes the interface language between Turkish and English. If requested, any different language can be uploaded to the system. By selecting language the entire system interface, including the alarm / error information screen, is displayed in the selected language, not only the settings screen.



Turkish "Settings" Screen

3. **Limits:** It is the section where the load moment limits of the system are defined and the system is put into operation. The following is described in detail.

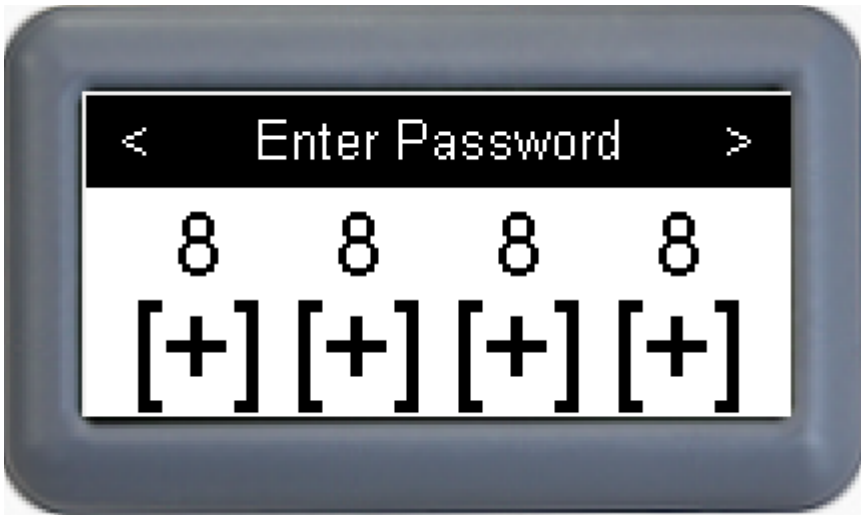
4. In the case of a return, the system opens the User Interface.

5. The system puts the current state into permanent memory every minute. This includes limit values or JIB mode selection. However, after entering the limits, it is useful to save by pressing the Save button. Otherwise, the entered values may not be saved when the switching the system off.

5. Limits (Commissioning or Calibration)

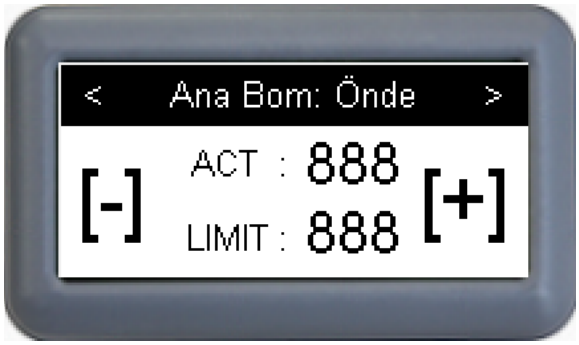
The commissioning screen is the section where the load moment limits of the system are defined. The system must be operated once and must not be accessible except for authorized personnel. Therefore, a password is required before entering the screen.

For information on the 4-digit password defined in the system, please contact AVIONI authorized sales or service points.

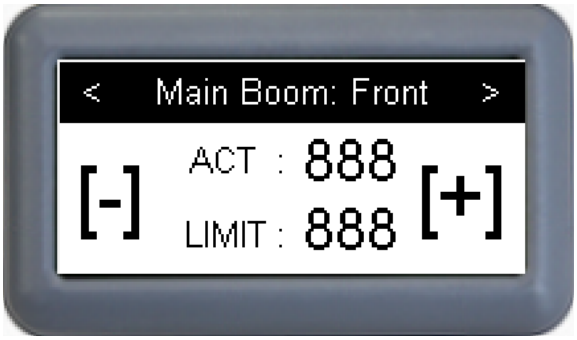


Password Screen

The password is entered by pressing the [+] buttons on the screen. After being sure that the correct password is entered, pressing the > button in the upper right corner switches to the LIMIT identification screens. If the password is entered incorrectly, the previously entered values will be reset for security reasons. In this case, the 4-digit password must be re-entered.



Limit Screen in Turkish

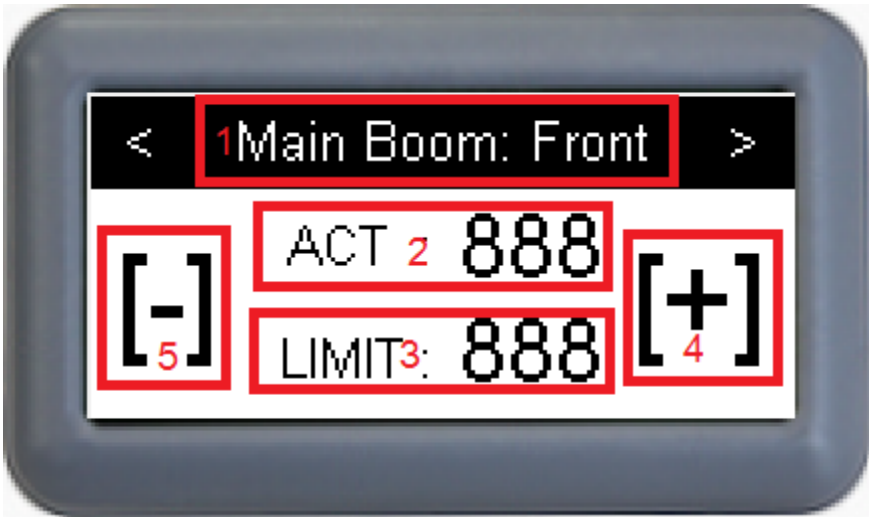


Limit Screen in English

The limitation screens change according to the selected user language.

4 or 6 limit must be defined according to the position of the crane (in front / rear cab) and the operation mode (with /without Jib).

1. Moment limit of Main boom, crane is in front of the cab.
2. Moment limit of Main boom, crane is at the rear.
3. Moment limit of Knuckle boom, crane is in front of the cab.
4. Moment limit of Knuckle boom, crane is at the rear.
5. Moment limit of Jib boom, crane is in front of the cab.
6. Moment limit of Jib boom, crane is at the rear.



Limit Definition Screen

Limit Definition Screen:

1. Indicates the limit for which position of the crane is defined. You can switch to the previous or next limit identification screen with the buttons on the right and left.

2. ACT: The pressure value in the BAR from the corresponding pressure sensor of the crane.

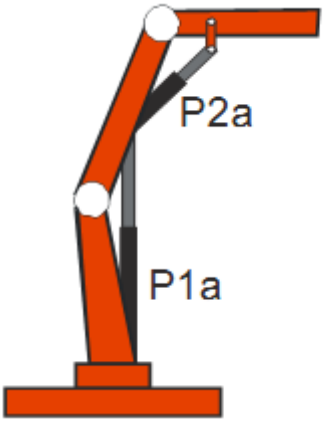
3. LIMIT: It is the pressure value determined as the limit. The system constantly compares ACT value with LIMIT value and calculates load moment according to this value. Entering this value lower than required will cause the crane to operate below its current capacity. When the LIMIT value is entered more than it should be is very dangerous as it will cause it to run on the capacity of the vehicle. To determine the appropriate limits, see **Section 6. How to Define Limits** Setting Limits. The maximum value is limited to 400 BAR.

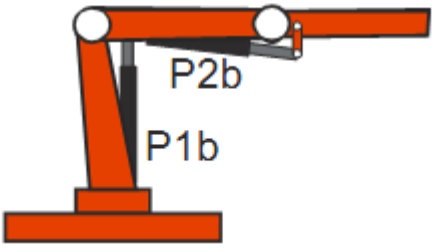
4. Pressing this button increases the limit value by 1 BAR. Keeping pressed for more than 1 sec will increase the values quickly.

5. Pressing this button decreases the limit value by 1 BAR. Keeping pressed for more than 1 sec will decrease the values quickly.

6. How to Define Limits

The crane manufacturer identifies the load limits at which distance (or boom extension). This is shown in the Loadchart table, which shows the limit values. If the load diagram cannot be found, please contact the crane manufacturer.





For pressure calibration, the maximum pressure on the Main Boom (P1) and Knuckle Boom (P2) cylinders must be read from the display. Therefore, the booms are moved to each of the 2 positions above and are extended so that the load chart permits. The permissible load quantity is lifted and the pressure values are measured in the load chart.

For example:

P1a = 200 bar

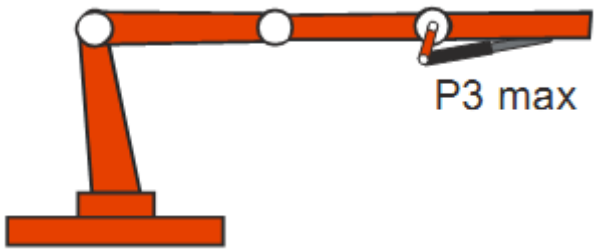
P2a = 170 bar

and

P1b = 190 bar

P2b = 180 bar

The HIGHER one of the measured values in each 2 positions is set to LIMIT. So, limit values are **P1_limit = 200** bar and **P2_limit = 180**. If low values are entered instead of high values, the system will cut-off at low limits (earlier than it should be cut-off).



If the crane has a JIB, the booms are extended as above. When fully extended, the permissible load is lifted and the pressure P3 read from the display at the same time is set as the limit pressure.

In order for the system to cut the dump valve off, it is sufficient for one of the 3 pressure sensors to reach its limit. The pressure value (P1) on the lifting cylinder and the pressure value (P2) in the crusher cylinder are inversely proportional, like a seesaw. Therefore, it is unlikely that an early cut or calibration value between P1 and P2 will force the cylinder.

As the limit pressure is entered for the longest boom value for the P3 cylinder, it is not possible to force the early cut or cylinder limits.

However, the lifting values of the crane are different depending on the crane is in **front of the cab or rear**. The control system allows to set different limit values in front of and rear the vehicle. In this way, it will not automatically allow turning to the front of the cab with a load that creates high pressure.