

# AE-MAESTRO

## Integrated Lift Control System

### AP-06 INSTALLATION MANUAL

### for Pre-Torque and Load Measuring Device

**Document Name** : AE-MAESTRO PRE-TORQUE and LOAD SENSOR  
INSTALLATION MANUAL

**Document Code** : AP06\_AEM\_INSEN\_PRET\_SENSOR

**Document Version** : 1.01

**Software Version** : 2.20u (Lift Control) / 2.20g (Motor Driver)

#### PREFACE

This document is written to guide installation of the LOAD SENSOR for PRE-TORQUE application.

**This document should be used together with the AE-MAESTRO User Manual R1.07 or higher.**

**Read section 5.5 in User Manual for a complete discussion of the functions of the related parameters.**



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## LOAD SENSOR FACILITIES AND METHODS OF THE APPLICATION

- The controller can use load measuring device installed for measuring the load inside the cabin to estimate the size and direction of the rollback at start.
- It applies a pre-torque to the motor to prevent any rollback at start.
- This application has two methods:
- **Digital:** Uses **digital outputs (up to 3)** of the load sensor.
- **Analog:** Uses **analog output (max 10V DC)** of the load sensor.
- **Analog** output gives to the controller much **more precise** information about the cabin load than the digital one.
- Using digital outputs helps to the controller to know the direction of the rollback and limited information about the load, however analog method gives direct information about the load.
- Therefore, **analog output should be preferred whenever available.**
- However, some devices may not have analog output or there may be problems in interfacing analog signals, in this case digital output should be used with up to **3 channels.**



## SETTING UP LOAD MEASURING DEVICE

- Be sure that you have installed the load sensors and its controller by following the instructions given in its manual.
- Set the load measuring device to **factory defaults.**
- **Reset** it to **ZERO LOAD**, while no load is in the cabin as well as on it.
- Take the car to the **lowest floor.**
- Then, set **%40 ... %50 load** into the cabin.
- This load should be in the **center of the cabin**, not only one side.
- Then **calibrate** the device by entering set total load to the device.
- After calibration carry on the following **tests**:
  - 1) The display of the device should show a **smaller value**, when you **take any load from cabin.**
  - 2) The display of the device should show a **greater value**, when you **put any load into the cabin**
  - 3) When there is **no load** in and on the cabin the device should show **ZERO** load.
- If the load measuring device behaves logically as described above, then you can continue for interfacing it to the lift controller.
- Otherwise, you should firstly find the problem related to the device or mechanical system before going further.
- Consult to the manufacturer of the load measuring device and its installation manual to overcome it.

## TYPE AND LOCATION OF CONNECTIONS

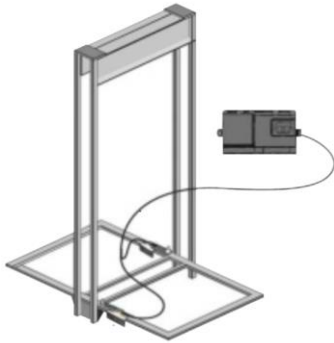
There are mainly 2 main methods to measure cabin weight

**1) By using load sensors under the cabin.**

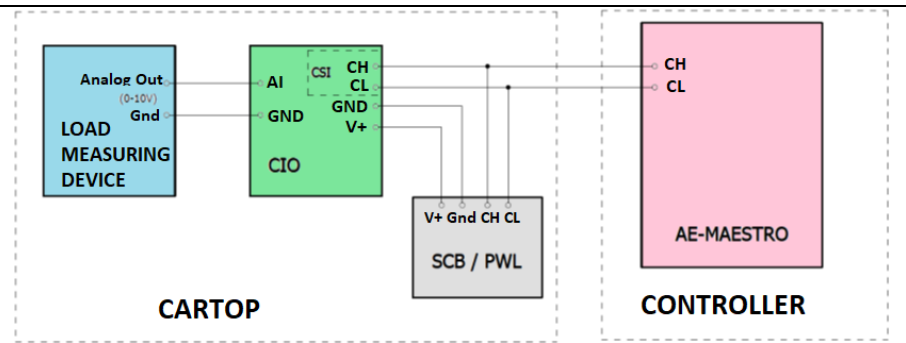
In this application load measuring device is on top of the car.

If **digital outputs** are used, then use the programmable inputs (Nxx) in the **cartop** controller terminals.

For **analog output** use the connection diagram below. Cable between analog output of the load measuring device and CIO card must be as short as possible!



### CONNECTION OF INTERFACE BOARD CIO FOR ANALOG OUTPUT

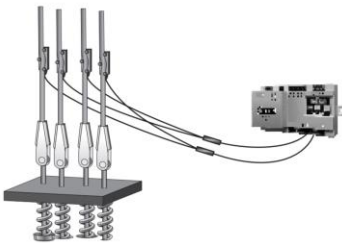


**2) By using sensors of rope tension.**

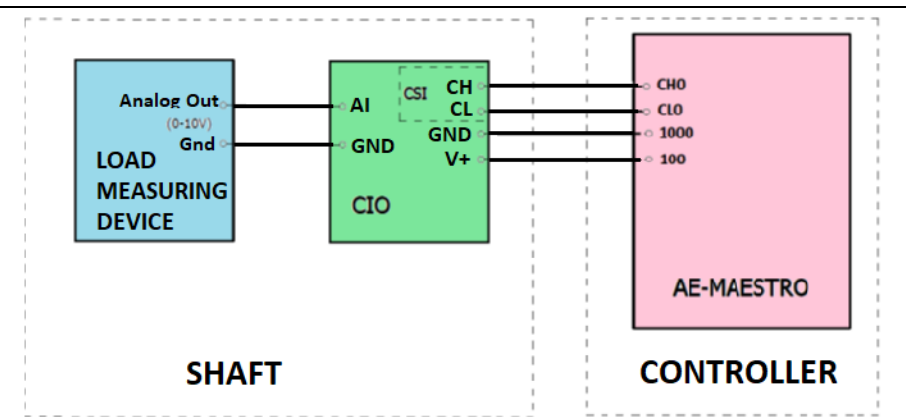
In this application load measuring device is in the shaft near to the machine room

If **digital outputs** are used, then use the programmable inputs (Ixx) in the **main controller box**.

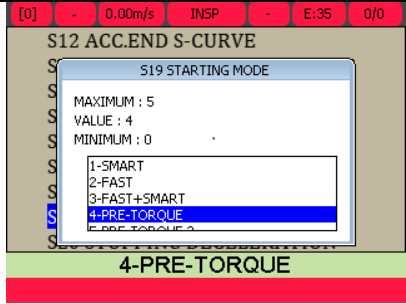
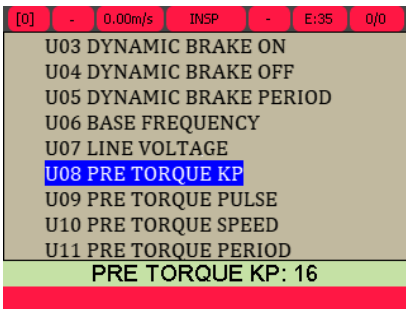
For **analog output** use the connection diagram below. Cable between analog output of the load measuring device and CIO card must be as short as possible!



### CONNECTION OF INTERFACE BOARD CIO FOR ANALOG OUTPUT



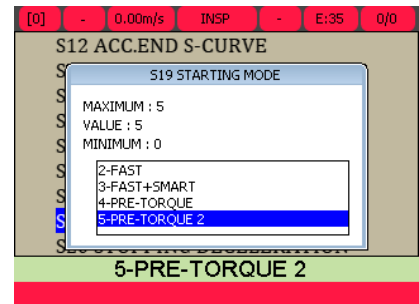
## SETTING UP DIGITAL METHOD

<ul style="list-style-type: none"> <li>Set <b>S19-STARTING MODE</b> in <b>SPEED PARAMETERS</b> as <b>S19=4</b>.</li> <li>Define digital inputs <b>LS1, LS2</b> and <b>LS3</b> to any free programmable input.</li> <li>For this method, no additional board is required.</li> <li>If the load sensors are <b>under the cabin</b>, then define the inputs in the <b>cartop</b> controller terminals.</li> <li>If the load sensors are <b>on the ropes</b>, then define the inputs in the <b>main controller box</b>.</li> </ul>																													
<ul style="list-style-type: none"> <li>Up to <b>3 digital inputs</b> can be connected to the digital <b>outputs of the load measuring device</b>.</li> <li>These outputs should be adjusted to be active at: <ul style="list-style-type: none"> <li>If 3 outputs are used, then define and set <b>LS1, LS2</b> and <b>LS3</b> as <b>25%, 50% and 75% loads</b>, respectively.</li> <li>If 2 outputs are used, then define and set <b>LS1</b> as <b>30% and LS2</b> as <b>70% loads</b>.</li> <li>If only one output is used, then define and set <b>LS1</b> as <b>50% load</b>.</li> </ul> </li> <li>So, the controller knows the size of the load in the cabin.</li> </ul>	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="4">DEFINITION OF DIGITAL INPUTS</th> </tr> <tr> <th>CL: Cabin Load at starting</th> <th>LS1</th> <th>LS2</th> <th>LS3</th> </tr> </thead> <tbody> <tr> <td>*: do not care</td> <td>25%</td> <td>50%</td> <td>75%</td> </tr> <tr> <td>CL &lt; 25%</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>25% &lt;= CL &lt; 50%</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>50% &lt;= CL &lt; 75%</td> <td>*</td> <td>1</td> <td>0</td> </tr> <tr> <td>CL &gt; 75%</td> <td>*</td> <td>*</td> <td>1</td> </tr> </tbody> </table> <p style="font-size: small;">x% : Cabin Load at starting / Nominal Load of the car</p>	DEFINITION OF DIGITAL INPUTS				CL: Cabin Load at starting	LS1	LS2	LS3	*: do not care	25%	50%	75%	CL < 25%	0	0	0	25% <= CL < 50%	1	0	0	50% <= CL < 75%	*	1	0	CL > 75%	*	*	1
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<ul style="list-style-type: none"> <li>If rollback still presents, go to <b>P09-SPECIAL PARAMETERS</b> menu and adjust parameters <b>U08, U09, U10</b> and <b>U11</b> to get a better result.</li> <li>The functions of these parameters are described below.</li> <li>If no rollback but jerk is present, then decrease U08.</li> <li>Please be aware of that the configuration that gives best comfort <b>may vary depending on the motor type and application</b>. You may need some trials.</li> <li>You can find detailed discussion in Section 5.5 in user manual.</li> </ul>																													

PARAMETERS USED IN PRE-TORK OPERATION			Used For
U08	PRE TORQUE KP	It determines the gain in this process. Increasing value makes pre-torque stronger.	S19 = 5 S19 = 4
U09	PRE TORQUE PULSE	This parameter determines after how many pulses of rollback will the system start to apply pre-torque.	S19 = 5 S19 = 4
U10	PRE TORQUE STARTING SPEED	This parameter determines after which rollback speed will the system start to apply pre-torque.	S19 = 5 S19 = 4
U11	PRE TORQUE PERIOD	It determines Ti interval of the process. Decreasing this parameter makes pre-torque stronger	S19 = 5 S19 = 4

## PRE-TORQUE ADJUSTMENTS WITH ANALOG OUTPUT

- Adjust **S19 = 5**.
- Place **CIO** board as close as possible to the load measuring device and connect it to the load measuring device as shown in above.
- The cable between analog output of the load measuring device and CIO is very sensitive to electromagnetic disturbances. Therefore, try to make it as short as possible and far away from the cables carrying line or motor signals.
- Activate and adjust the analogue output of the load measuring device to give 10V (full scale) at full load (capacity of the cabin).
- Go to **R19-CLEAR LOAD DATA** in **SERVICES** menu to clear load data.



- Press **ESC** button when you are on the main screen.
- You can follow the weight readings of the controller on this screen.
- When there is no load in the cabin **WEIGHT** must be **0**.
- **WEIGHT** should show a smaller value when **you take any load from cabin**.
- **WEIGHT** should show a **greater value** when you **put any load into the cabin**
- If the system works in this manner, then it means that the controller can read the load inside the cabin correctly. Otherwise you should find the problem before starting operation.

The screenshot shows a table of parameters and their values. The "Weight" parameter is highlighted in a yellow circle. The table is as follows:

PARAMETER	VALUE	PARAMETER	VALUE
Serial No:	521491919	Date:	01.09.2020
Control Board:	2.21a	Clock:	09:05
Motor Driver:	2.20v	Total Start	65871
Hand Terminal:	2.20t	Start:	79
SD Version:	1.0n	Weight:	0
KW:	15		

- You may get jerk in starting for a while. However, after a number of travels the device will start to estimate required pre-torque and will compensate for rollback.
- The parameters **U08...U11**, which are described above are also valid for analog output method, too.
- If no rollback but jerk is present, then decrease U08.

U08	PRE TORQUE KP
U09	PRE TORQUE PULSE
U10	PRE TORQUE STARTING SPEED
U11	PRE TORQUE PERIOD