LOAD CELL TROUBLESHOOTING GUIDE

Load Cell Checks

With the help of an accurate digital Multimeter and a Megohmmeter, the following information will assist in carrying out primary load cell system checks, either prior to proceeding with calibration of the load cells and instrumentation, or to determine the general health of a weighing system.

We hope you find this fault finding guide useful. However, if you need further assistance please **Contact Us online** or telephone us (**+44 118 941 1387**) for more information.

Mechanical Checks

Check the physical installation of the cells onto the application and any other connections or structures attached to it, prior to system calibration.
Any component causing unexpected resistance to free downward movement of the cells and the structure under loading will induce accuracy errors to the display reading and to any calibration process. Inspect the physical condition of each cell and its mounting. Look for visible signs of overloading, such as deformation, bending or cracks. Any components found in this condition are not recoverable and must be replaced.

Electrical Checks

Determine if the load cells are performing correctly by measuring the output mV reading from the load cells and compare it to what would be expected for a given load, supply voltage and load cell mV/V.
The first test would be to measure the sum (combined value) of the load cell outputs, at the junction box and at the input to the instrumentation.

The procedure is as follows:

- Disconnect the summed signal wires from the instrument (leave the supply [excitation] wires connected). Using the digital Multimeter, measure across the signal wires. The reading should represent the expected output, e.g. if the vessel weight and load value are known and, for example, together they are 65 tonnes, and four load cells of 20 tonne capacity each are fitted to the vessel, and if the load cell sensitivity is 2 mV/V, and an excitation voltage of 9.8 Volts is applied, a signal reading of approximately 15.93 mV would be expected.

  The following is the formula to show how this is arrived at:

$$\text{mV} = \frac{9.8\ \text{(V supply)} \times 2\ \text{(mV/V)} \times 65\ \text{(Te load on cells)}}{80\ \text{(Te Gross Load Cell Capacity)}} = 15.93\text{mV}$$

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- The formula can be transposed to determine any single unknown value.

- The same test can be carried out at the output of the junction box, to identify a possible fault in interconnection cabling. If the measured value of the above test is not as expected, there is a good possibility that one or more of the load cells is faulty, or that there is a cabling fault.

- If the same mV output test is carried out at each individual load cell, (measurement taken from one load cell at a time at the junction box), it will identify uneven loading or a faulty cell.

- If, after carrying out the individual cell output tests, the mean (average) of the individual readings does not equate to the result of the first (combined) test, it would suggest problems in the junction box itself (the termination board) or cabling between the junction box and instrument.

If an individual load cell is suspected, the following tests can be carried out to confirm its condition:

Resistance Tests

Set the Multimeter to OHMS (Ω) and check the input and output resistance as follows:

- Disconnect all load cell wires at junction box

- Connect the meter across the load cell excitation wires and read the input resistance, which should be as stated on the product data sheet.

- Connect the meter across the load cell signal wires and read the output resistance, which should be as stated on the product data sheet.

As a check for moisture ingress, or a break-down of the internal insulation, the resistance to the ground can be measured: twist all the wires together (including the screen) and then connect a megohmmeter between the wires and the load cell body. The expected value is at least 5000 Megohms (MΩ). Perform the test again without the screen wire to eliminate or incriminate it.

Unloaded Output Test

Reconnect the load cell excitation wires at the junction box.

Remove all load from the suspected cell (including the loading assembly if fitted), then perform the

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millivolt output test. The measured output between should be approximately zero mV (allow up to + or - 0.5 millivolts). Any appreciable mV measured suggests a fault such as overload, short circuit or some kind of ingress.

The above test would only be feasible if facilities are available to safely remove the load from the load cell.

There are other tests that can be carried out to determine the exact nature of a fault, but the tests detailed above will be enough to determine where in the system a fault lies.

All the above tests assume that the instrumentation is in satisfactory working order.

Causes of Drift and Instability

There are many possible causes for instability and drift, such as:

- Mechanical influence
- Load cell degradation
- Electrical Influence (noise)
- Cabling & termination
- Compromised calibration
- Instrumentation

Mechanical influence

If the instrument's displayed value is only unstable when the platform or vessel is unloaded, it is possible that the problem is mechanical. So look for resistance to free movement (or too much movement) of the mounting arrangements and load cells including any external connections to the structure.

Determine if any vibration or influence is present caused by other systems operating close by or those physically connected to the structure.

Load Cell Degradation

Normally, if a load cell has an internal fault that causes irregular values or drift, then it would be expected to affect the system whether loaded or unloaded; however the fault in a load cell (such as a poor cabling connection) could be exacerbated by movement taking place around it (refer to the section at the beginning of this document entitled "Load Cell Checks").

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Electrical Influence

If electrical noise is influencing the system, it would normally be present regardless of loading on the platform, however check for continuity of the screen through the system and ensure it is terminated at the end of the line (normally at a dedicated terminal on the instrument/indicator).

To further minimise the possibility of electrical noise interference it is worth remembering the following:

- Keep the length of cabling between load cell and the instrument as short and direct as possible

- Avoid grouping the load cell and instrument communication cabling with other cables, particularly those that generate or induce high voltages or currents, and do not allow the cabling to cross over or run close to other cables

Cabling & termination

Check the integrity of the wiring, especially at points of termination including the junction box and the instrument. Again, if wiring is causing problems due to loose or poor contact it would normally be present regardless of loading, however if movement or vibration is only present when the platform is empty this could be a contributory factor.

Calibration

Has calibration been recently carried out or altered? If so, consider how the calibration was achieved and which method was used (using real weights or the "theoretical" method using the load cell sensitivity).

Instrumentation

A check for good mounting integrity should be made.