TN 13.398 Basic Load Cell Check

Technical Support

At times a weighing system may be found faulty or the readings may be called into question. There could be a fault with the indicator or the load cells. As the load cells are generally located in a more exposed and demanding situation they are logically the first item to check, working back to the indicator. This note is a brief procedure for checking the load cells in an installation.

First recall any local events that could have caused damage, a lightening storm, an earthquake, flooding. This could point in the initial line of investigation. If the displayed weight is off the scale a severe fault is likely. If the displayed readings are drifting an object may be interfering with weighing or insulation between load cell wires may have broken down.

1 A quick check for obvious damage should be performed;
- 1.1 a cut or damaged cable,
- 1.2 a bent or damaged load cell or mounting (a beam cell can be checked with a rule or straight edge),
- 1.3 an obstruction (sediment build up, pipes, cables) that may be interfering with weighing. Any bridging of the weighed structure bypassing weight from the load cells will affect accuracy.
- 1.4 weld splatter,
- 1.5 corrosion that may have penetrated the load cell.
- 1.6 A damaged or leaking junction box.

2 Check for electrical irregularities. Refer to the specification for cable colour codes.
- 2.1 Open the junction box to access the connection of the load cell cables.
- 2.2 Measure the excitation voltage (between excitation +ve and -ve) and check against the indicator or signal processor specifications. If there is a 6 wire cable check the sense voltage, this should be close to the excitation voltage.
- 2.3 Measure the signal voltage (between signal +ve and -ve), a meter resolution of 0.1mV is required. Depending upon load on the vessel at the time this would typically be between 0 and 30 mV, calculated in mV from

  2.3.1 Signal mV = [current load]/[number of support points(legs)]/[load cell capacity]*[excitation voltage]*[load cell sensitivity (mV/V)]

  2.3.2 If the measured signal is substantially above or below this value the load cell could be over loaded or internally at fault from electrical surge or an internal component failure.

  2.3.3 With no load on the load cell the signal voltage should be typically less than 1mV.

  2.3.4 The fault may be limited to just one load cell. Disconnect the signal wires only of each load cell and measure the signal voltage again for each load cell.

  2.3.5 Measure the voltage between each signal wire and the excitation -ve wire. Both of the voltages should be approximately half of the excitation voltage. The difference between the 2 voltages should be value measured above at 2.3.4 .

- 2.4 If the voltages seem correct then the fault could be with the indicator or wiring to the indicator. If the reading is drifting or unstable the fault could still be within the load cell. If one load cell has a very high signal voltage check the load cell again in case it is bent. The indicator can be checked by connecting a PT load cell simulator to the indicator cable and observing the indicator when the signal mV is within the expected range calculated from the above.

3 Check load cell resistances. Refer to the specification for cable colour codes.
- 3.1 Disconnect the load cell wires completely.
- 3.2 If the load cell cable is of the 6 wire type with sense wires, measure between sense +ve. and excitation +ve. This should be very low, typically less than 1 ohm. The same should be done for sense -ve and excitation -ve.
- 3.3 Check the insulation resistance from the load cell wires to the load cell body. Also for the cable screen or shield to the load cell bridge wires and the load cell body. This test should be performed initially at 50V and the results should all be over 1 gigaohm, a new load cell would be over 5 gigaohms. If the resistance is less than 100 mega ohms there is an insulation problem.
- 3.4 Measure the resistance between excitation +ve. and excitation -ve. This could be 350 ~ 1000 ohms depending upon load cell type and is printed on the certificate accompanying each load cell to enable checking. If it is below 350 ohms or above 1500 ohms the load cell could have an internal fault, possibly caused by an electrical surge from welding or lightening or a manufacturing defect.
- 3.5 Measure the resistance between signal +ve and signal -ve. this should typically be 350 or 700 ohms +/- 5 ohms. Again, refer to the specification for the expected value.

A damaged or mal-functioning load cell identified from the above procedure can be replaced and correct operation of the weighing system should be observed. If a load cell is replaced it is usually necessary to re-calibrate for best accuracy. If a high proportion of load cells are found to be defective in an installation it is usually indicative of an external event causing the fault rather than a manufacturing fault.
If the above brief check indicates a load cell has an internal fault that could be covered by warranty please visit our web site and follow the warranty procedure.

Recording Information.

Reference	***Information***
1.1	
1.2	
1.3	
1.4	
1.5	
1.6	
2.1	
2.2	
2.3.1	
2.3.2	
2.3.3	
2.3.4	
2.3.5	
2.4	
3.1	
3.2	
3.3	
3.4	
3.5	

A typical digital multimeter. A similar instrument from another brand can be used.
Requirements for a digital multimeter for testing load cells.

- Volts up to 20V to measure excitation voltage.
- mV (milivolts) with one decimal position, i.e. 200.0 to measure signal voltage.
- ohms (Ω) preferred with one decimal place or more, up to 2000.0Ω (2kΩ) (1999.9Ω OK)
- ohms measurement up to 10 mega ohms (MΩ) or 20MΩ. If it can measure up to 100MΩ then even better.