Load-cell calibration report

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2016-08-24

Introduction

The goal of this analysis is to determine the calibration equation and sensor accuracy for an Omega LCL-005 (0--5 lb) load cell.

The test setup is illustrated in Figure 1. Precision weights (0.1% accuracy) are used to apply the reference force (lb) to the load cell and the resulting voltage readings (mV) from the sensor are recorded. The test procedure follows the ANSI/ISA standard.

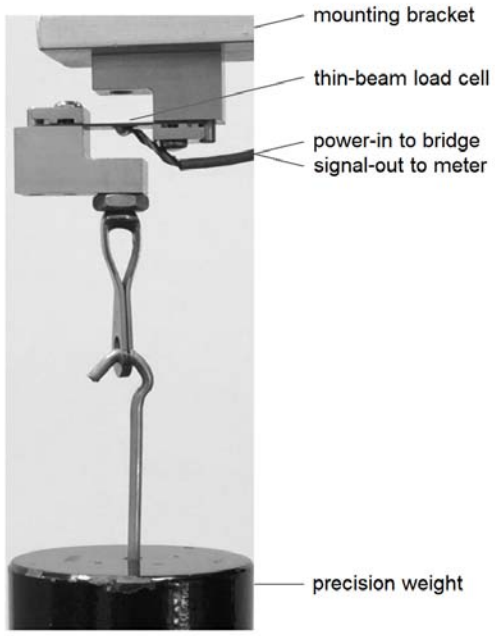

Figure 1. Load cell calibration test setup

Data

The calibration data are shown in Table 1. The maximum force (4.5 lb) is 90% of the 5 lb sensor limit, per the ANSI/ISA standard. The NA entries in the first and last columns are artifacts of the ANSI/ISA test procedure (the test starts and stops at a mid-range test point in the same direction).

Table 1. Calibration data

Input (lb)	Cycle 1 (mV)	Cycle 2 (mV)	Cycle 3 (mV)
1.5	NA	29.9	30.2
2.5	51.1	49.4	49.7
3.5	70.4	70.0	NA
4.5	88.8	91.6	NA
3.5	69.4	69.0	NA
2.5	49.5	50.1	NA
1.5	30.7	30.8	NA
0.5	8.7	10.9	NA

Results

The calibration data and calibration curve are shown in Figure 2. The maximum $\pm$ deviations of the data from the best-fit curve (residuals) are the values used to estimate sensor accuracy.

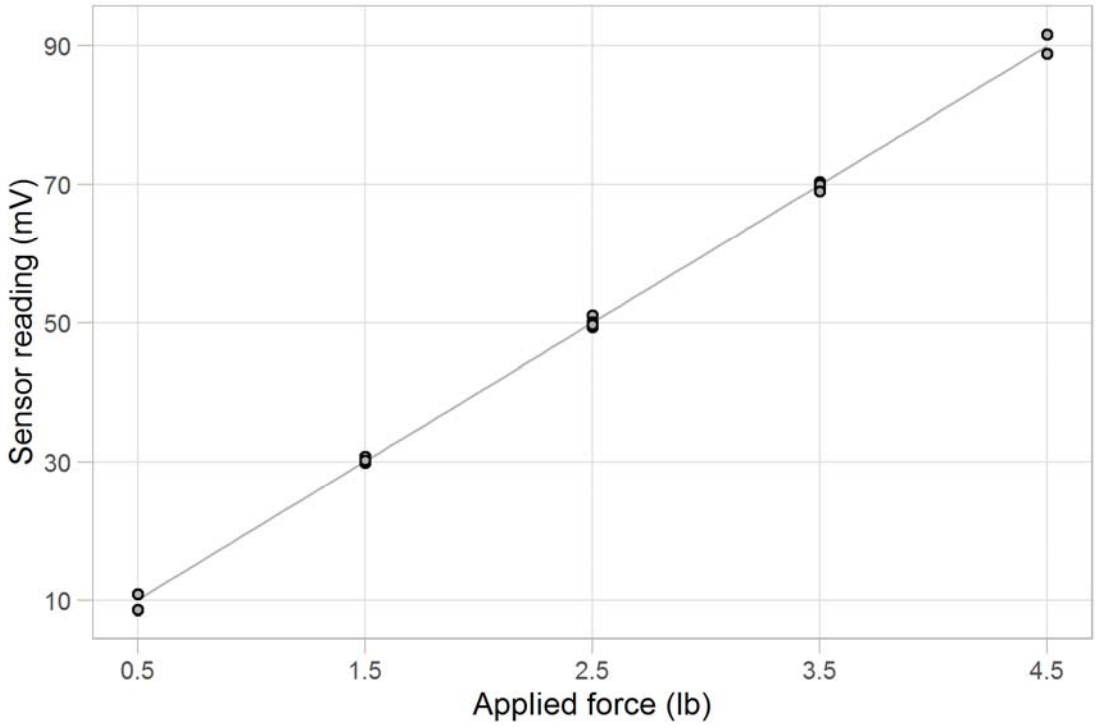

Figure 2. Load cell calibration curve

The calibration equation is

$$y = 19.950x + 0.137$$

with x in lb and y in mV.

The largest residual is 1.7 mV and the output span is 82.9 mV, yielding a sensor accuracy as a percent of reading of

$$\pm 2.1\%.$$

The accuracy of the precision weights, 0.1%, is less than one tenth the load cell accuracy, thereby meeting the requirements of the ANSI/ISA standard.