Calibration

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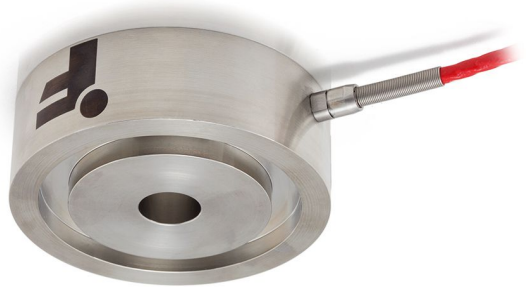
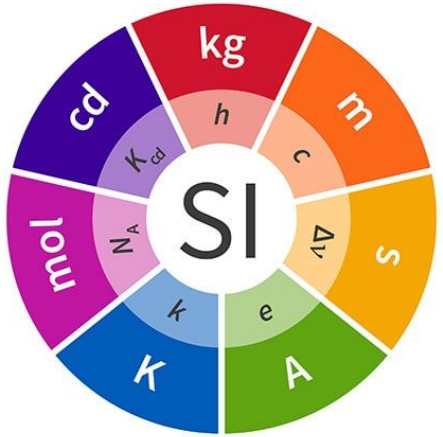
GEARS 2023

Image: Fluke

Calibration ensures we translate the measured parameter into the correct real-world approximation of reality





“In short, if measurement results matter, calibration matters.”

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Image: Futek, Sensors One, Fluke

Calibrations are not forever and should be updated frequently

- New sensor
- Repair or modification of apparatus
- Moving apparatus
- After a shock/temperature/load anomaly
- Elapsed time (calibration schedule)
- Elapsed on time (100 hour inspections)
- Before/after critical measurements
- Questionable output
- Output not matching sister instruments
- Requirements (legal or standards)

In the lab we often utilize a transfer standard to calibrate our “field” instruments or instruments with a traceable calibration

TRANS•TEK INCORPORATED

CALIBRATION RECORD

10 Industrial Drive, P.O.Box 338, Ellington, CT 06029 Tel. (860) 872-8351 Fax (860) 872-4211

MODEL NUMBER: 0245-00000 SERIAL # D-217081

Tolerance:
Min: 0.31 *Max: 0.38*
< 0.5% F.S.

Sensitivity : 0.3559 VDC / inch(es) / Volt Input
Maximum Non-linearity: 0.2804% F.S.
Calculation Method: Best Fit Line Thru Zero
Calculated Line: Y = 8.5935 X + 0.0000
Working Range: ±2 inches
Tested at: 24.0110817 VDC Input and > 1 Megaohm Output Load

If the core is not permanently attached to the extension rod, then the transducer was calibrated with the core's marked end towards the transducer's lead end.

CALIBRATION DATA:

POSITION	OUTPUT VDC		ERROR
inch(es)	Data	Zero Adjusted	% F.S.
-2.0000	-17.1425	-17.1399	-0.1378
-1.6000	-13.7898	-13.7872	0.1096
-1.2000	-10.4108	-10.4082	0.2803
-0.8000	-6.9661	-6.9635	0.2590
-0.4000	-3.4911	-3.4885	0.1492
0.0000	-0.0026	0.0000	0.0000
0.4000	3.4880	3.4906	0.1554
0.8000	6.9342	6.9368	0.1810
1.2000	10.3569	10.3595	0.1380
1.6000	13.7302	13.7328	-0.0493
2.0000	17.0885	17.0911	-0.2804

Calibrated by: _____ Date: 04/15/2021

Per S022-0020 Revision: 2

NOTE: Please refer to attached bulletin for additional information
CALIBRATION NOTE:
BATCH CODE #210415I100603

Ref. #:1

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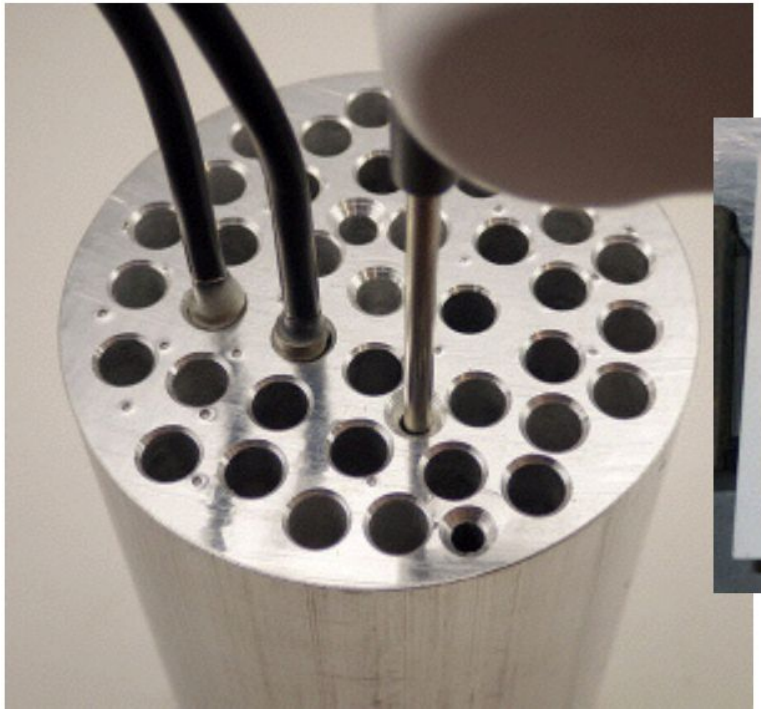
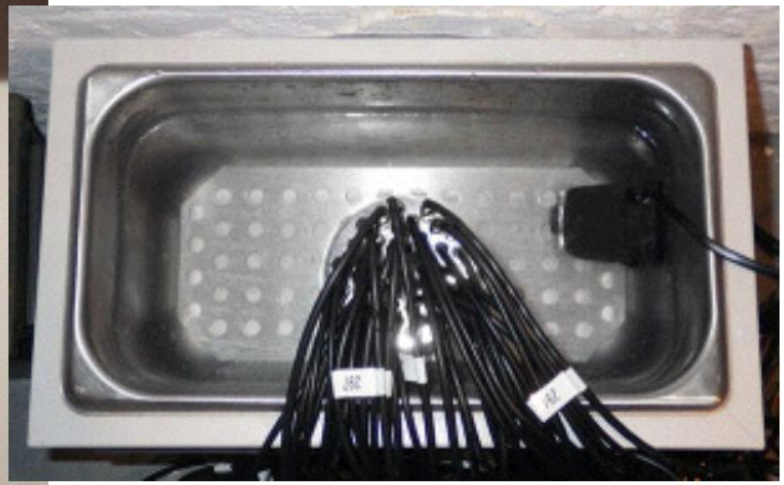
We take the transducer to known conditions (controlling everything else as best we can) and record the output





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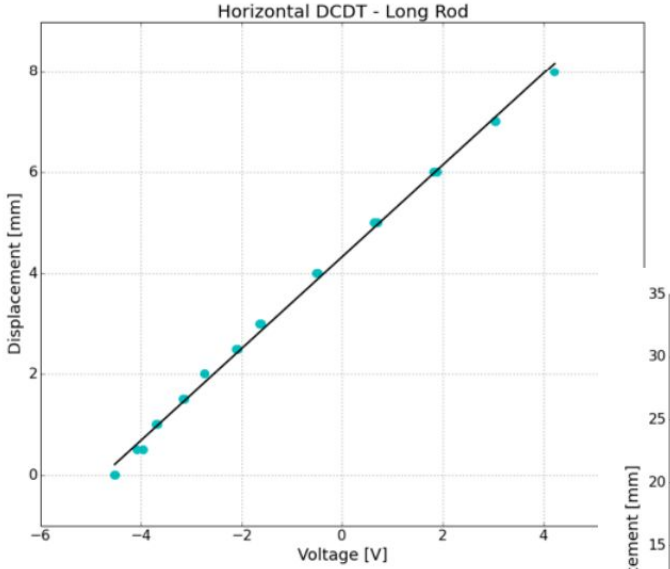
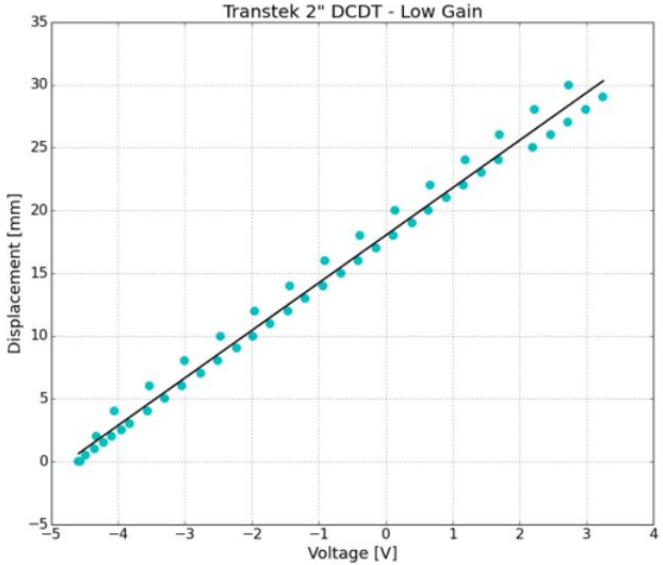
Images: Edward Mallon

We can then fit a transfer function and accept or reject the result





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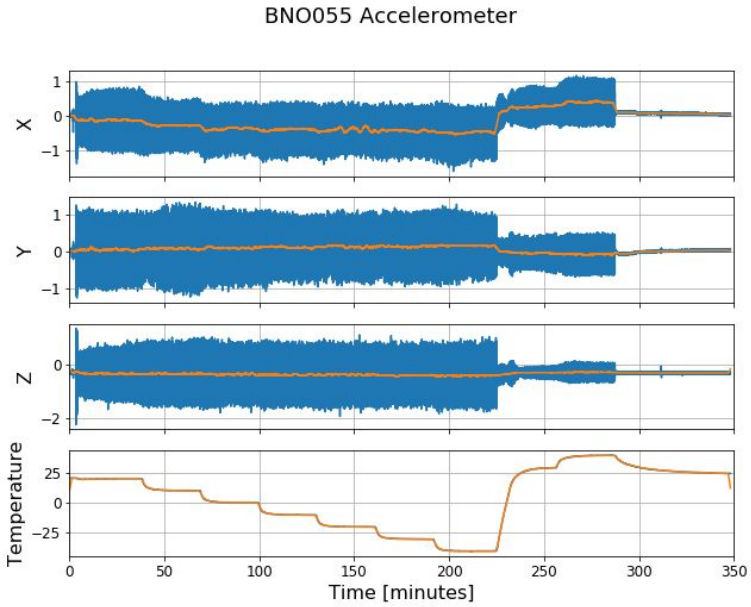
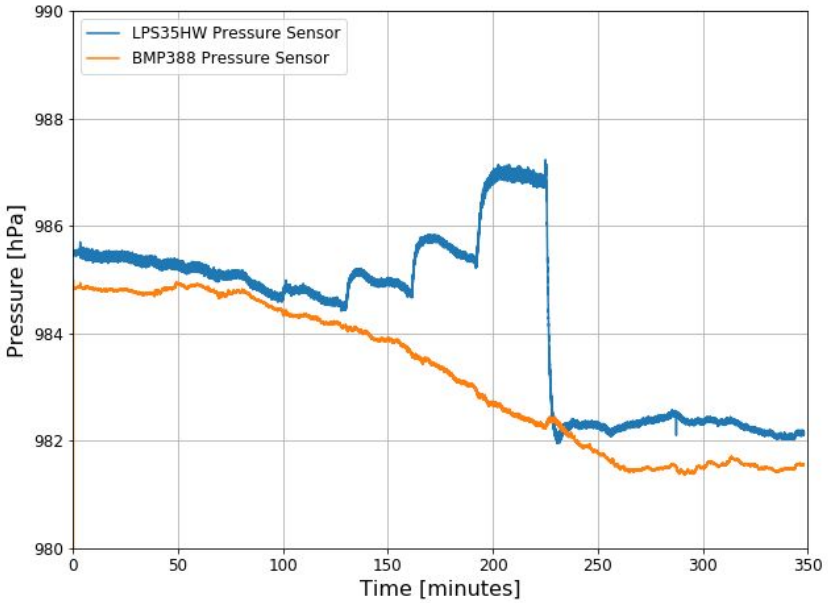
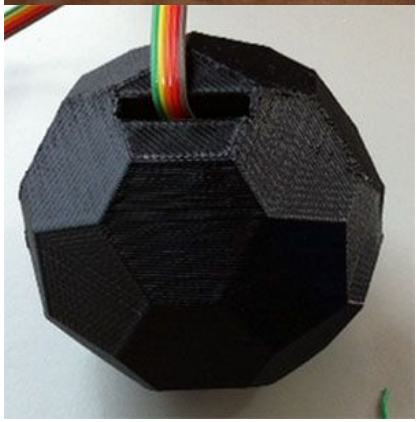
The biggest thing to remember is cross-sensitivity issues!

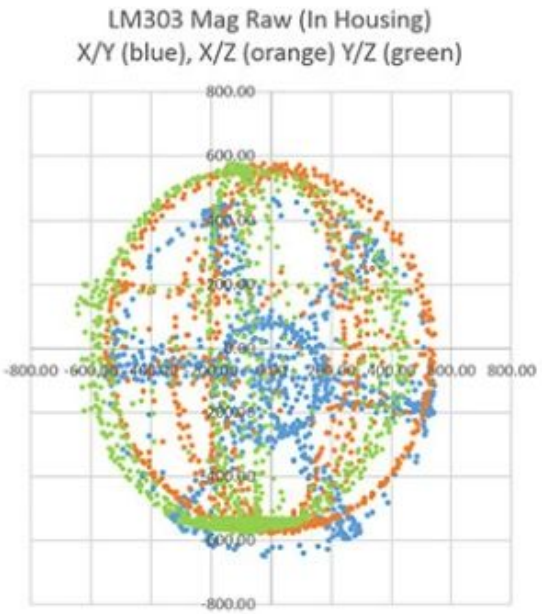


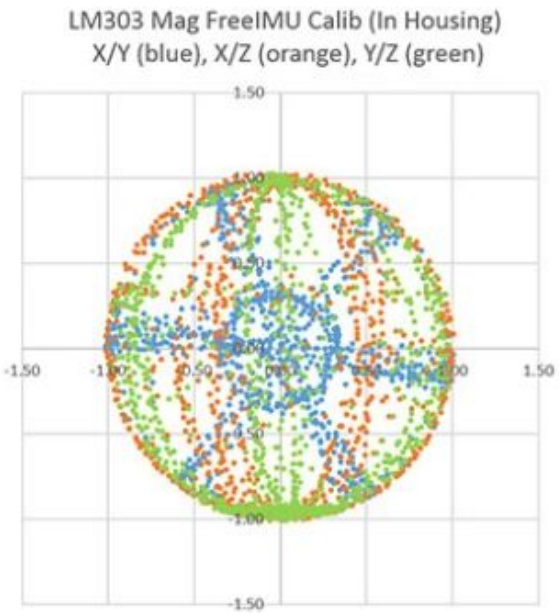


"Everything is a temperature sensor, some things sense other stuff too" - Elecia White

You can also calibrate sensors with natural sources







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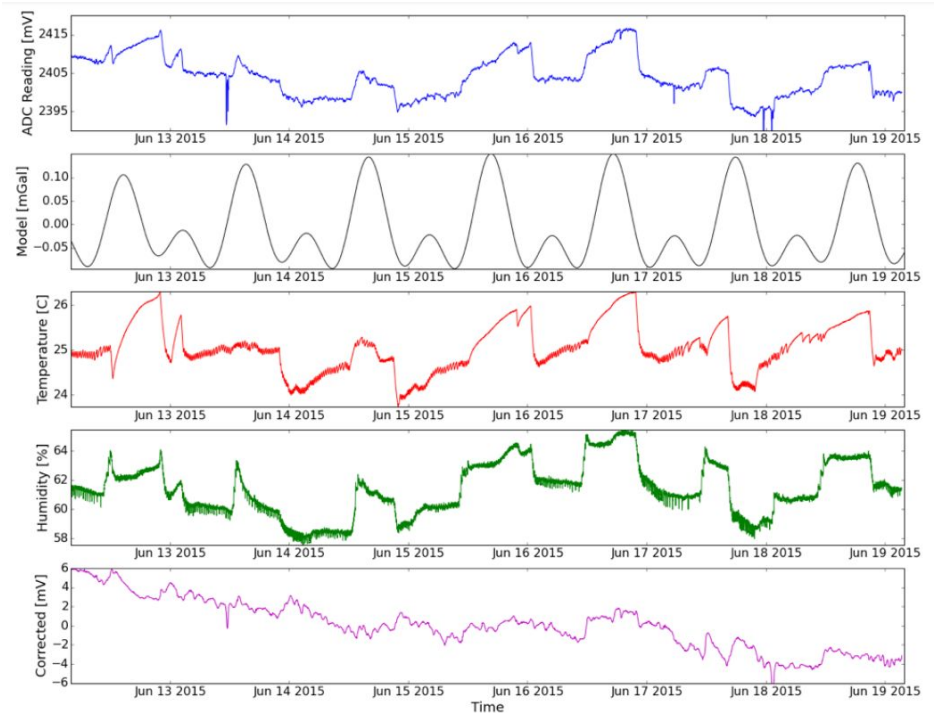
Images: Cave Pearl Project

Lots of variables to think about/control



- Temperature
- Humidity
- Pressure
- Orientation
- Time of day
- Traffic/Noise Sources
- Tides
- And on and on

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Our recommendations for general equipment

- ASTM if available (just have a procedure recorded)
- Semiannual for first 3 years, annual afterwards
- Before any critical experiment (time vs time cost)
- Against NIST traceable standard (which needs calibrated) or by a lab

Keep a calibration history log in great detail

44 mm Solid "V"		44mm Solid "H"		62mm "V"		62mm "H"	
10.94 mV/kN	12/10/2009	HG 111.366 mV/kN	3/27/2009	17.82 mV/kN	3/27/2009	HG 173.877 mV/kN	3/27/2009
11.33 mV/kN	1/5/2010	LG 11.58 mV/kN	3/27/2009	18.52 mV/kN	1/5/2010	LG 18.08 mV/kN	3/27/2009
11.15 mV/kN	12/5/2010	HG 110.212 mV/kN	12/10/2009	18.10 mV/kN	1/10/2011	HG 207.152 mV/kN	1/5/2010
10.869606 mV/kN	2/5/2014	LG 11.46 mV/kN	12/10/2009	18.462238 mV/kN	2/5/2014	LG 21.54 mV/kN	1/5/2010
10.829 mV/kN	8/29/2014	HG 114.473 mV/kN	1/7/2011	18.523 mV/kN	8/29/2014	HG 196.333 mV/kN	1/7/2011
10.786349 mV/kN	2/10/2015	LG 11.90 mV/kN	1/7/2011	18.363185 mV/kN	2/10/2015	LG 20.415 mV/kN	1/7/2011
		HG 108.604244	2/5/2014			HG 200.497461 mV/kN	2/5/2014
		LG 11.588748	2/5/2014			LG 20.939407 mV/kN	2/5/2014
		HG 108.71 mV/kN	5/11/2014			HG 208.905 mV/kN	8/29/2014
		LG 11.315 mV/kN	5/11/2014			LG 21.789 mV/kN	8/29/2014
		HG 106.08 mV/kN	8/1/2014			HG 211.236884 mV/kN	2/10/2015
		LG 11.473 mV/kN	8/1/2014			LG 21.393971 mV/kN	2/10/2015
		HG 111.453 mV/kN	8/29/2014			CELL REBUILT	
		LG 11.658 mV/kN	8/29/2014			HG 184.014209 mV/kN	3/6/2015
		HG 119.423363 mV/kN	2/10/2015			LG 18.721994 mV/kN	3/6/2015
		LG 11.742750 mV/kN	2/10/2015				