



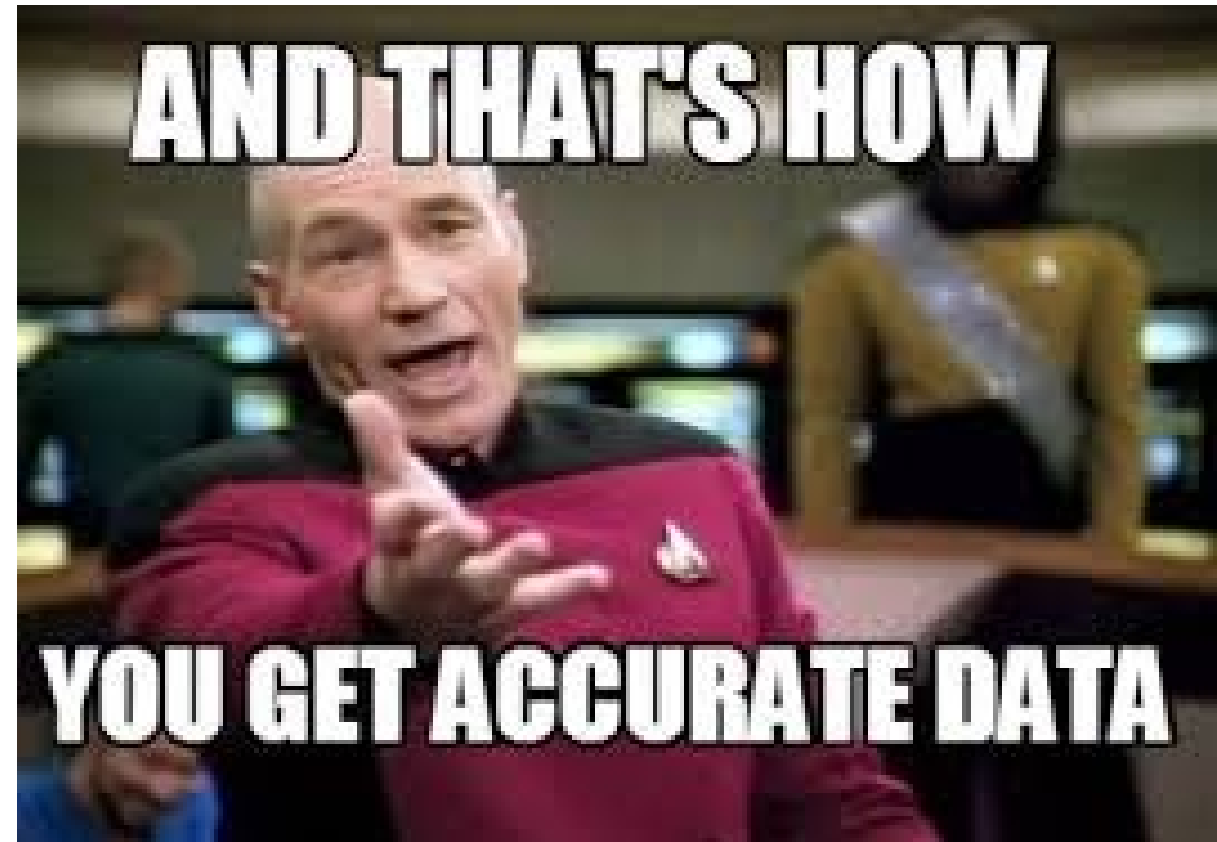
Using the right tool for the job





# Accuracy

- What standards are you testing to?
- Specifications of the device being tested.
- Specifications of the test device
- Combination of tolerances



# Weights

- What class needed?
- How many decimals?
- Handling of precision Weights and effects
- Quadrants
- Re-Zeroing



# Weight Classification

- Higher class number means less accuracy.

Weight	Class 0	Class 4	Class 7
15kg	19.5mg	150mg	
3.3g			
10g	0.025mg	0.5mg	21mg
1g	0.017mg	0.1mg	4.5mg



# Detecto 6745 – Baby scale for NICU

- **Capacity:** 6745: 30 lb x 0.1 oz / 15 kg x 0.005 kg - 6745KG: 15 kg x 0.005 kg
- Overall Dimensions:** 26 in W x 14.2 in D x 7.5 in H / 66 cm W x 36 cm D x 19 cm H
- Tray Dimensions:** 26 in W x 12.2 in D / 66 cm W x 31 cm D
- Display:** 6-digit, 7-segment 1.0 in / 25 mm high transfective LCD
- Power:** 6 C size Alkaline, Ni-Cad or NiMH batteries (not included) or 100-240VAC, 12VDC/1.2A medical UL-approved AC adapter (included)
- Weight Units:** Pounds and Ounces / Kilograms
- Integrated Measuring Tape:** 0 - 22 in / 0 - 56 cm
- Connectivity Port:** RS232 serial output for connectivity with a PC or printer for patient records
- Net Weight:** 18 lb / 8 kg
- Shipping Weight:** 22 lb / 10 kg
- Country of Origin:** USA
- UPC Codes:** 6745: 809161140705 - 6745KG: 809161302806
- Keys:** ON, ZERO, UNITS, PRINT, OFF
- Weighing Units Settings:** Pounds and Ounces only, Kilograms only, Pounds and Ounces / Kilograms, Kilograms / Pounds and Ounces
- Battery Life:** The 6745 can operate for 200 hours of continuous use when using alkaline batteries, or 50 hours of continuous use with fully charged Ni-Cad or NiMH batteries

# Weight Handling

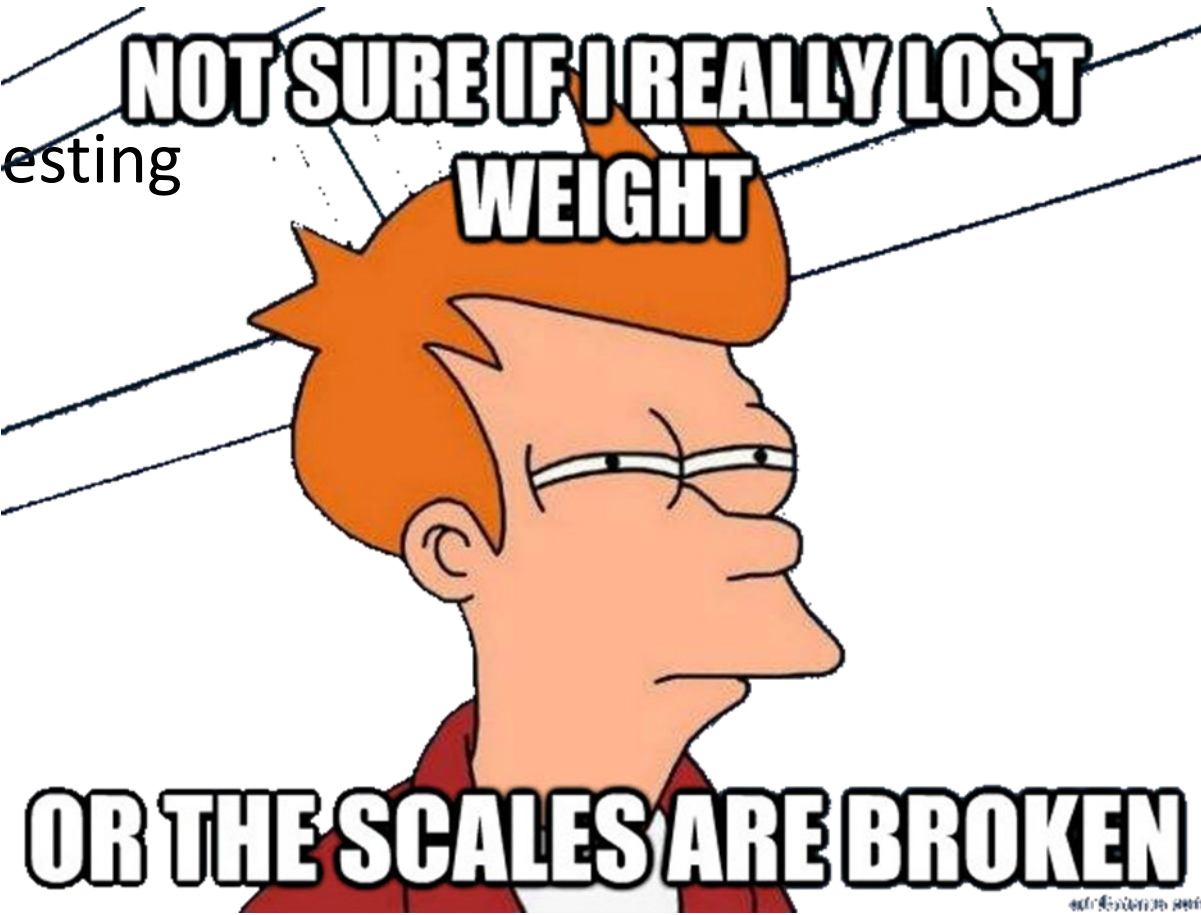
- Always use lint free gloves/cloth or plastic/teflon tweezers
- Never slide weight on scale
- Always place weights in approved weight box for storage and between measurements
- Do not place near magnetic sources
- Do not clean with cleaners
- If dropped weight must be recalibrated.





# Scale Calibration

- Warm up device for 30 minutes prior to testing
- Always zero balance before calibration
- Use the quadrant method for verification
- Perform multiple tests for repeatability
- Test the full range if possible



# Temperature

- Thermocouple

- J Range -40c to 760c
- K Range -200c to 1200c

- Advantages – Low Cost, Fast response time
- Disadvantages 1%-3% accuracy. Dependent on measuring de
  - Consider accuracy of the probe and the multimeter



Fluke 87V

vs

Fluke 52

Voltage (.05% +1)

80BK probe 2.2C or 2%

.05% +.3C



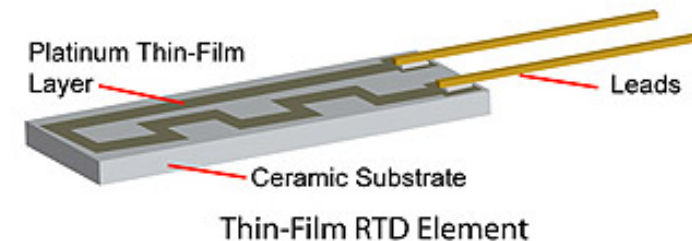
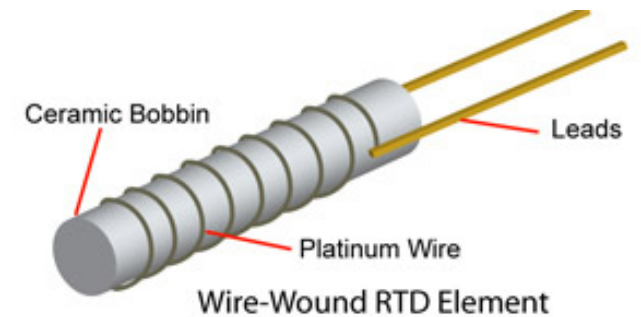
# Temperature

- RTD – Resistance Temperature Sensors
  - -270C to 850C

Send a current to the probe and measure the resulting voltage  
2wire vs 4 wire. 4 wire method used to compensate for lead resistance.

Advantage – Very Stable, Higher temperature ranges

Disadvantage -Most expensive.



# Temperature

- Thermistor
  - Like an RTD resistance changes with temperature changes
    - Range -55C to 150C
    - Typically best option for measurements below 150C
    - Advantage – Best performance in range
    - Disadvantage – limited range

Sensor type	Thermistor	RTD	Thermocouple
Temperature Range (typical)	-100 to 325°C	-200 to 650°C	200 to 1750°C
Accuracy (typical)	0.05 to 1.5°C	0.1 to 1°C	0.5 to 5°C
Long-term stability @ 100°C	0.2°C/year	0.05°C/year	Variable
Linearity	Exponential	Fairly linear	Non-linear
Power required	Constant voltage or current	Constant voltage or current	Self-powered
Response time	Fast 0.12 to 10s	Generally slow 1 to 50s	Fast 0.10 to 10s
Susceptibility to electrical noise	Rarely susceptible High resistance only	Rarely susceptible	Susceptible / Cold junction compensation
Cost	Low to moderate	High	Low

# Incubator Testing



- Common Parameters to be tested

- Temp (accuracy, overshoot, rise time, uniformity) Air Velocity, Sound Level, Humidity, O<sub>2</sub>, and Scale.

Temp Spec from Drager 8000 Isolette <0.8C

Temp ex. Fluke 87V

Fluke Biomedical

INCU II

2.2C accuracy or 2%

INCU 0.05C

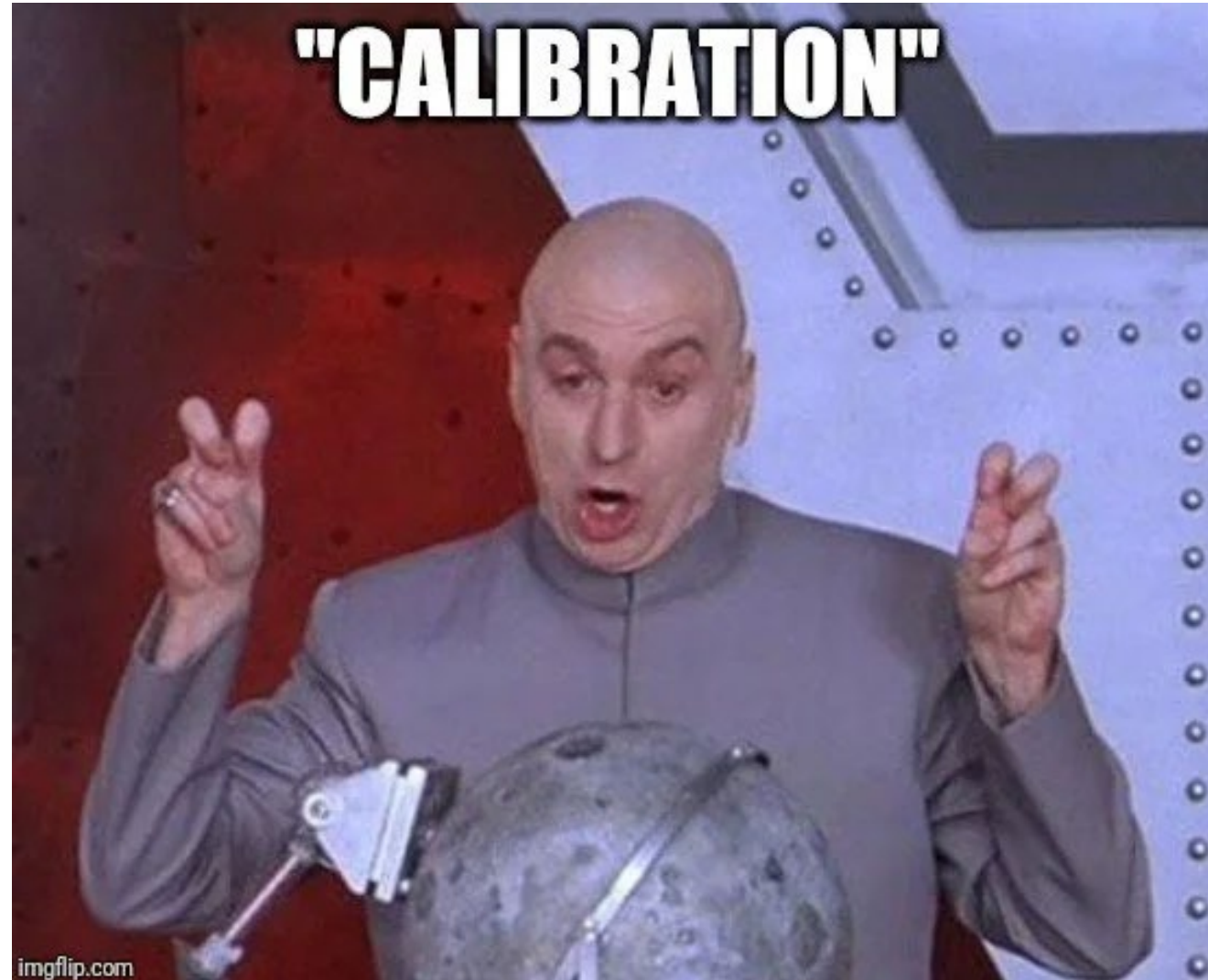
Environmental Changes – Opening hood changes the environment

# Light meters

- Bilimeters – What is the Spectral range needed?
  - Flourescent approx. 460nm      Newer LEDs approx. 480nm
  - Radiology Reading stations - Luminance
  - Mammography – 350 cd/m<sup>2</sup>
  - Other modalities – 250 cd/m<sup>2</sup>
- Medical Light sources – Illuminance
- Usually measured in Lux

# Calibration Standards

- Standard
- With Data
- ISO 17025





# Operating Environment

- Temperature
- Humidity
- Elevation
- Stabilization



# MD EXPO

Orlando, FL • October 29-31, 2023



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**Thank You!**