BEIJERT ENGINEERING
Precision Technology
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Presents :
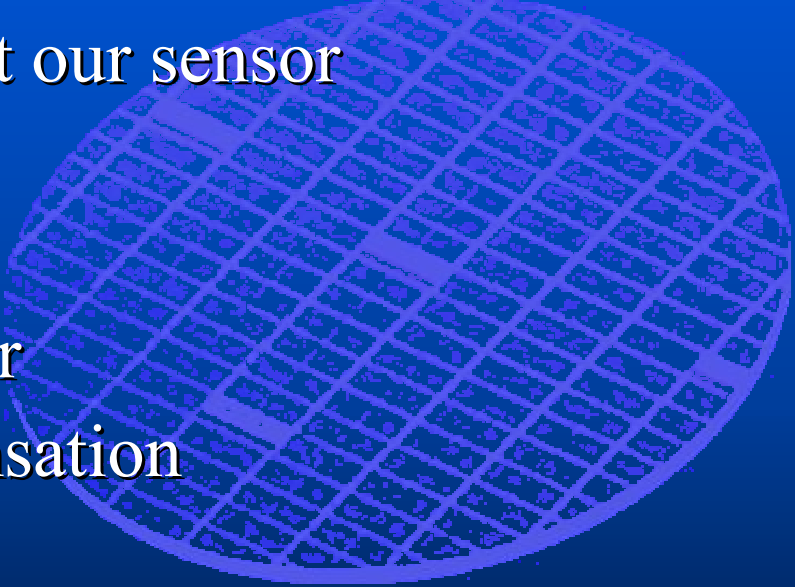
**Gram Force Measurement Technology
in a Low Cost Analyzer**

SouthWest Test WorksShop
San Diego June 2004

Beijert Engineering

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2. What is so special about our sensor
3. Why piezo
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# What can gram force do for you

- CONTACT FORCE
- CONTACT RESISTANCE
- SCRUB DEPTH VARIATION
- GENERAL QUALITY CONTROL
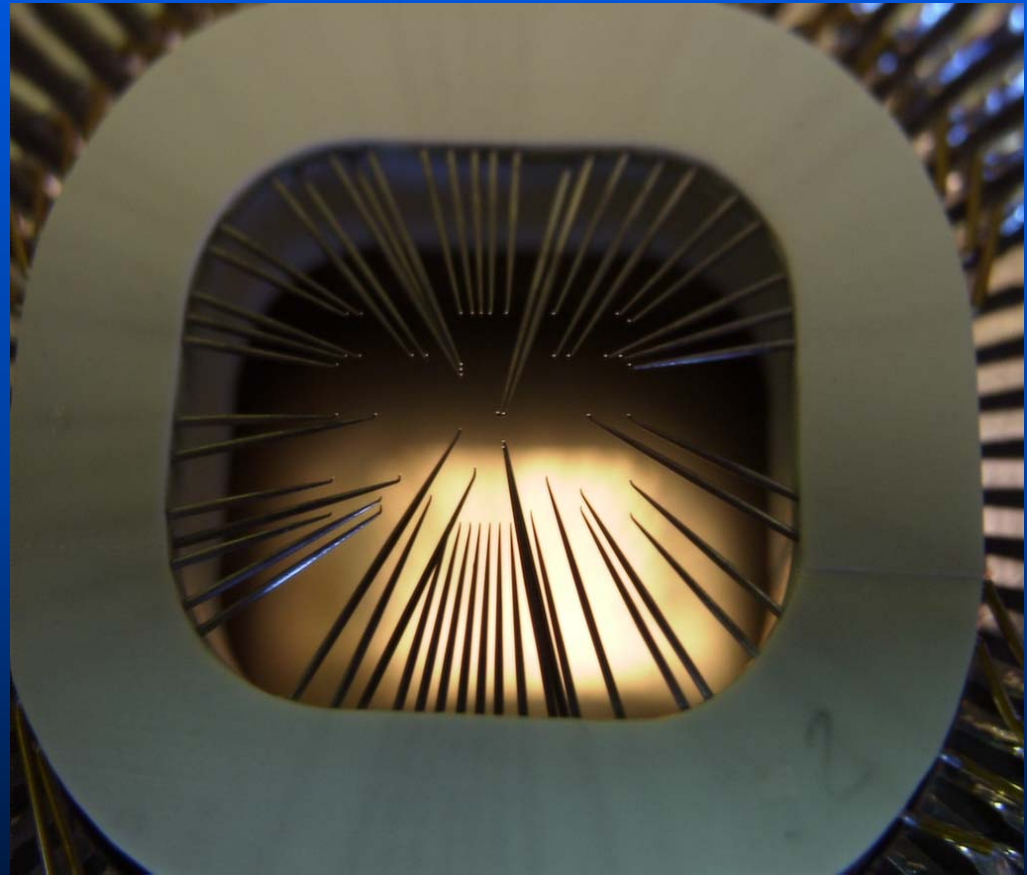- AGING MONITOR
- PROBE DIMENSIONS MONITOR

# What can gram force do for you

- Importance of constant gramforce
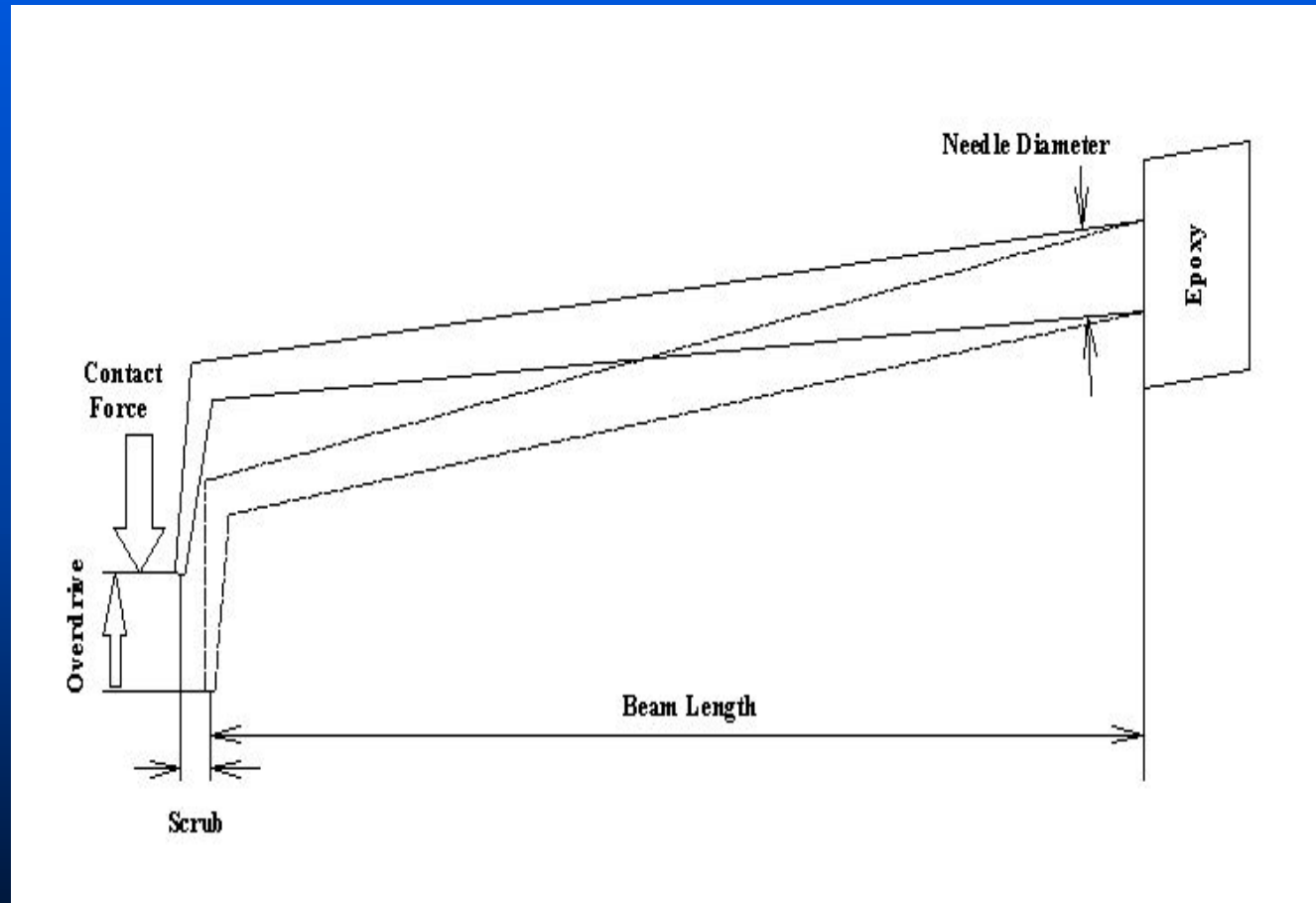- Same probe length

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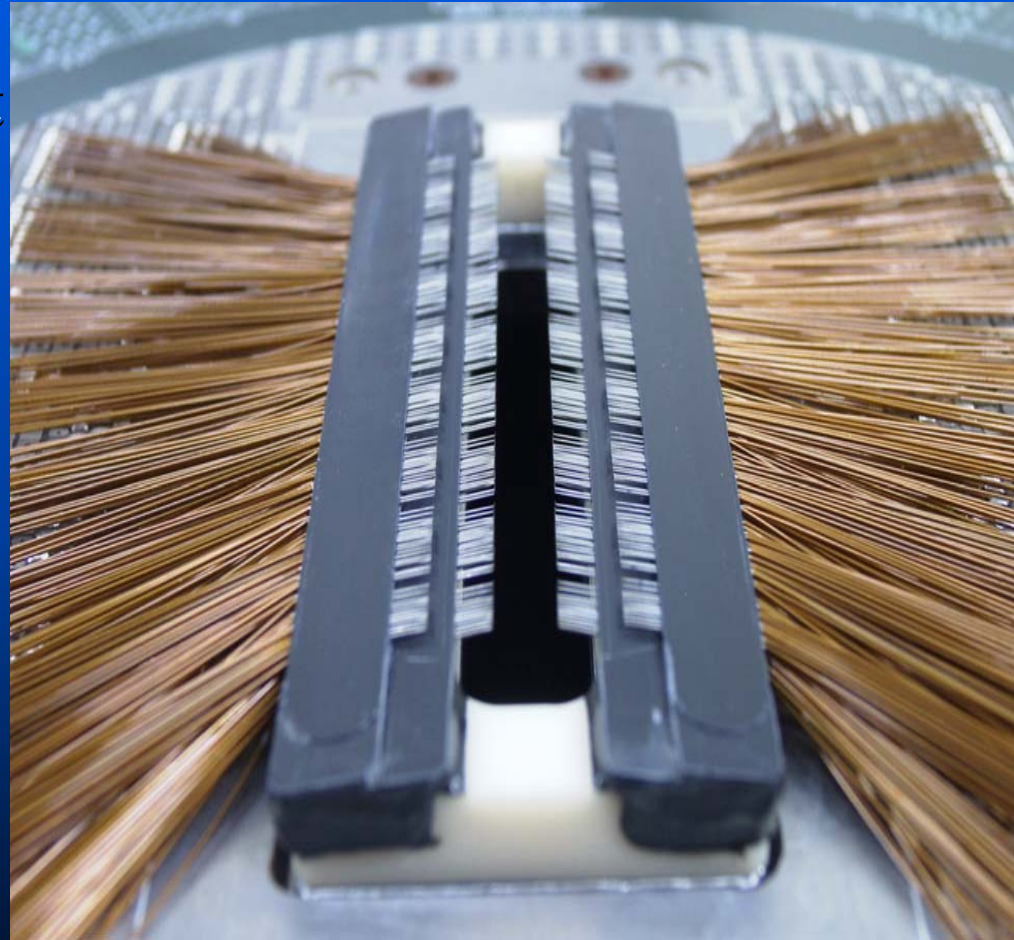
# What can gram force do for you

- Different probe length

- Using thicker needles

# What can gram force do for you

- Key factors
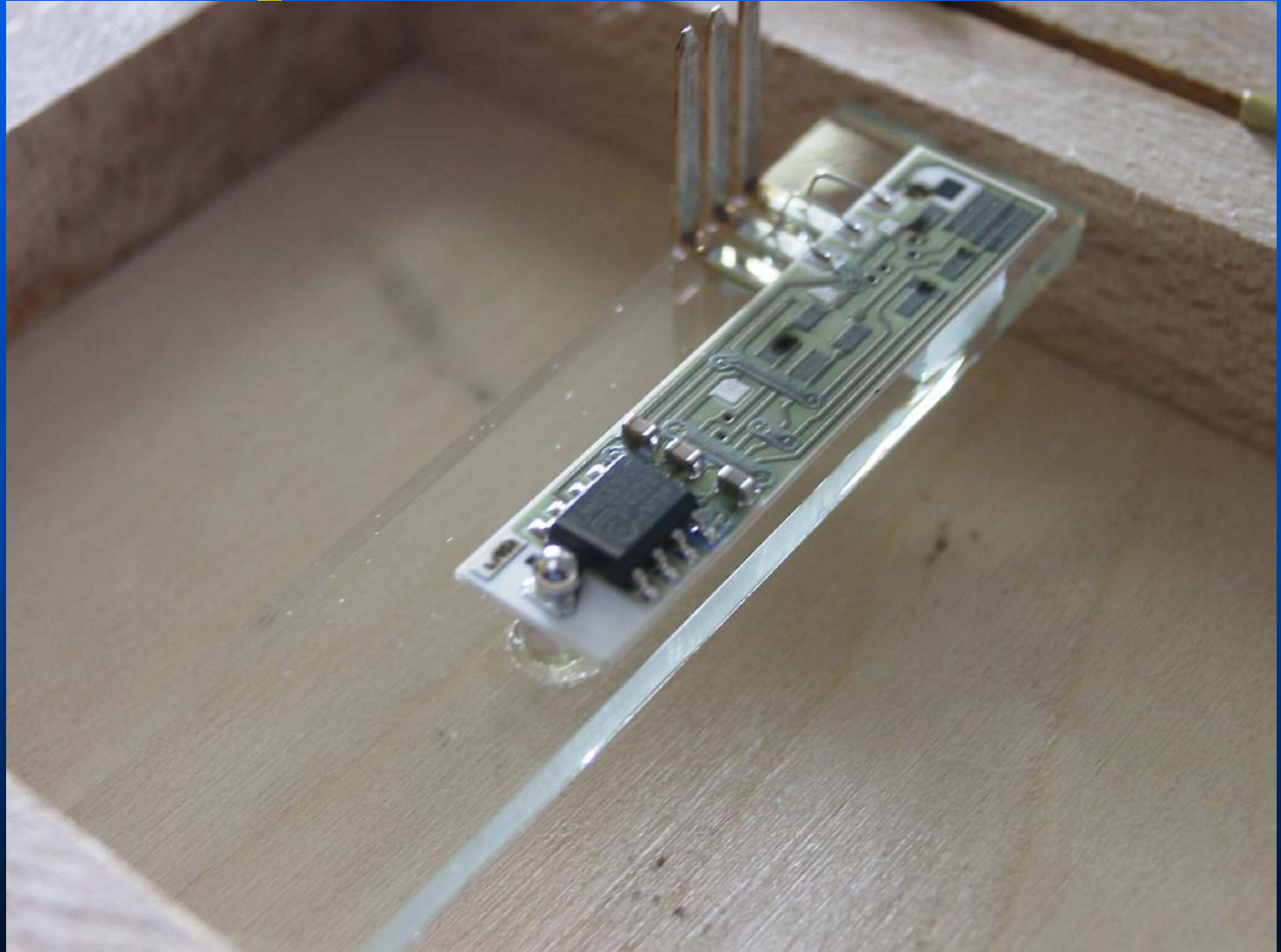
# What can gram force do for you
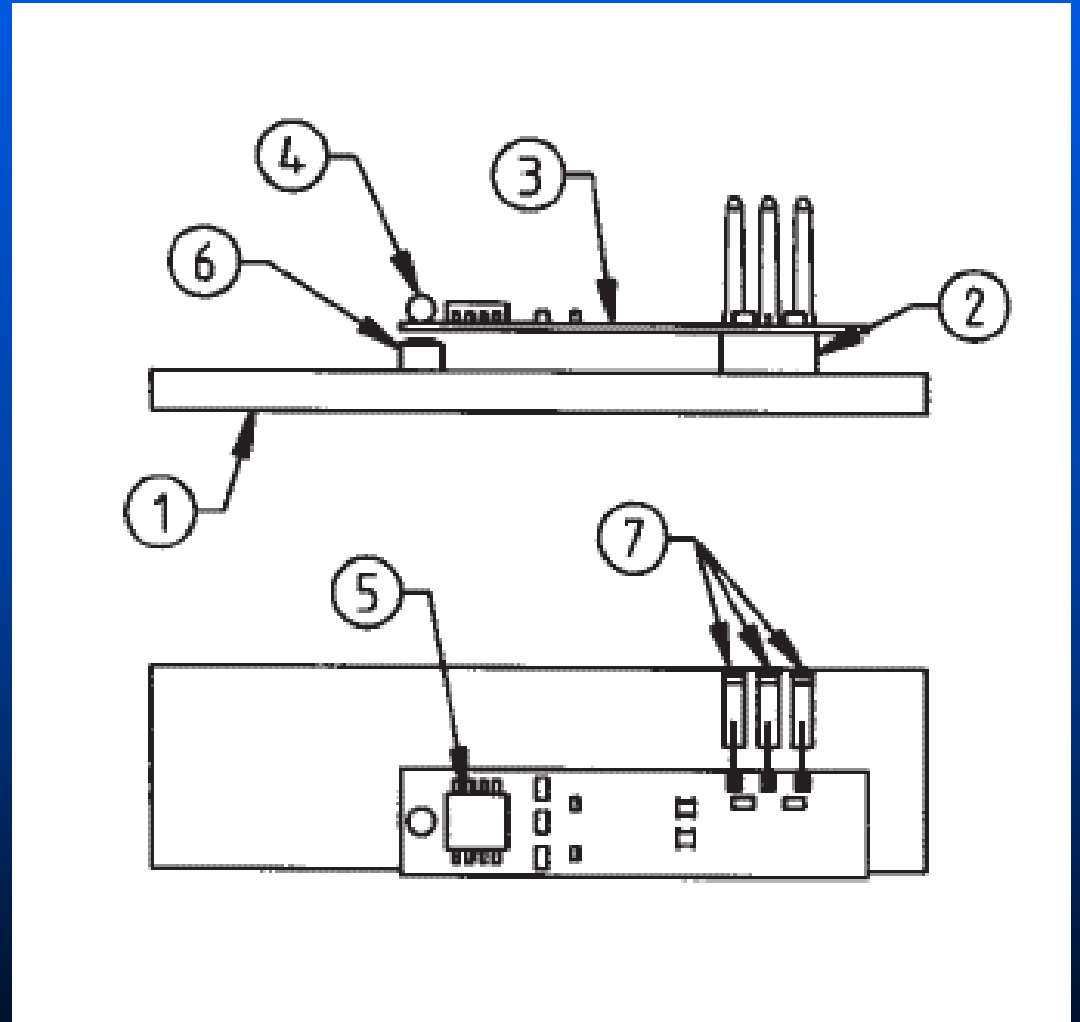
$$F = \frac{3\pi\beta D^4 E\delta}{64L^3}(g)$$

- E = Young's modelus of elasticity module.
- β = probe angle

# What is so special about our sensor

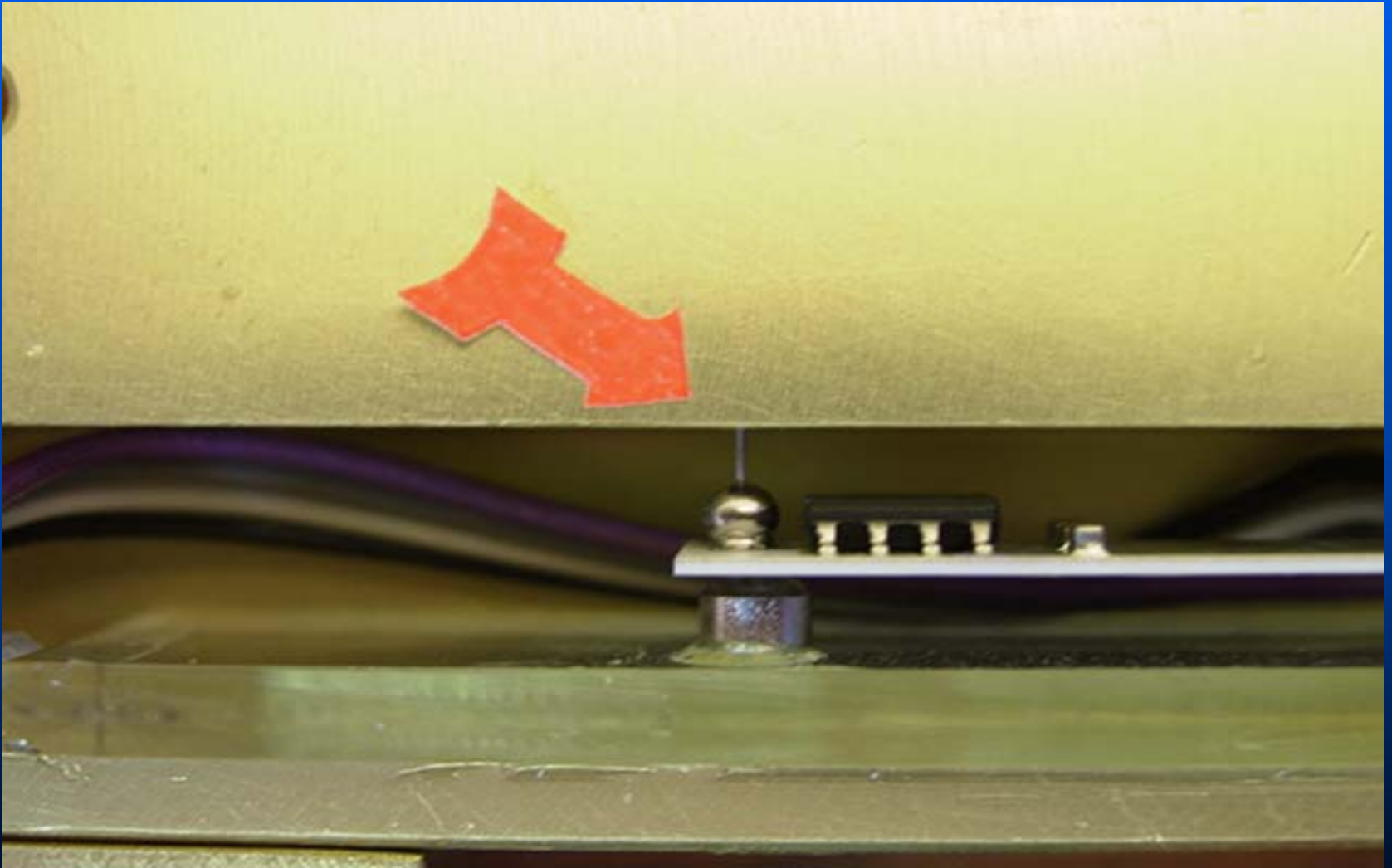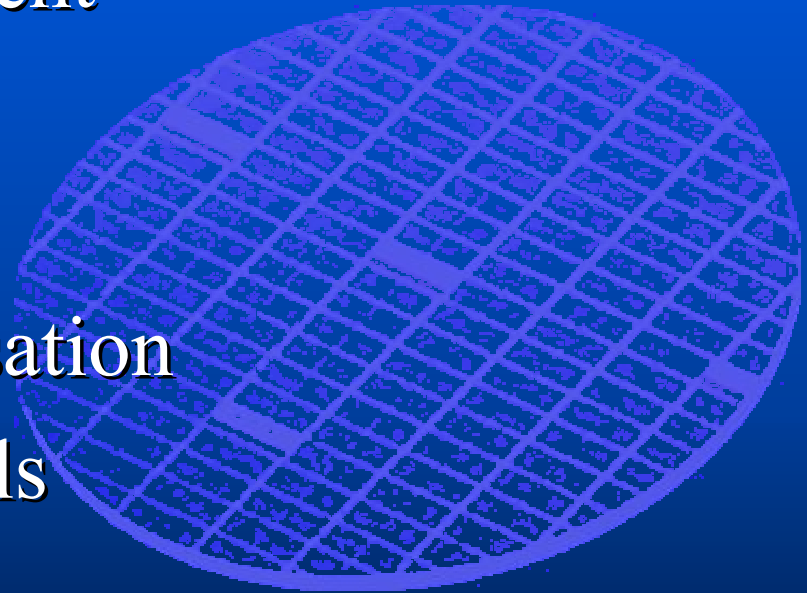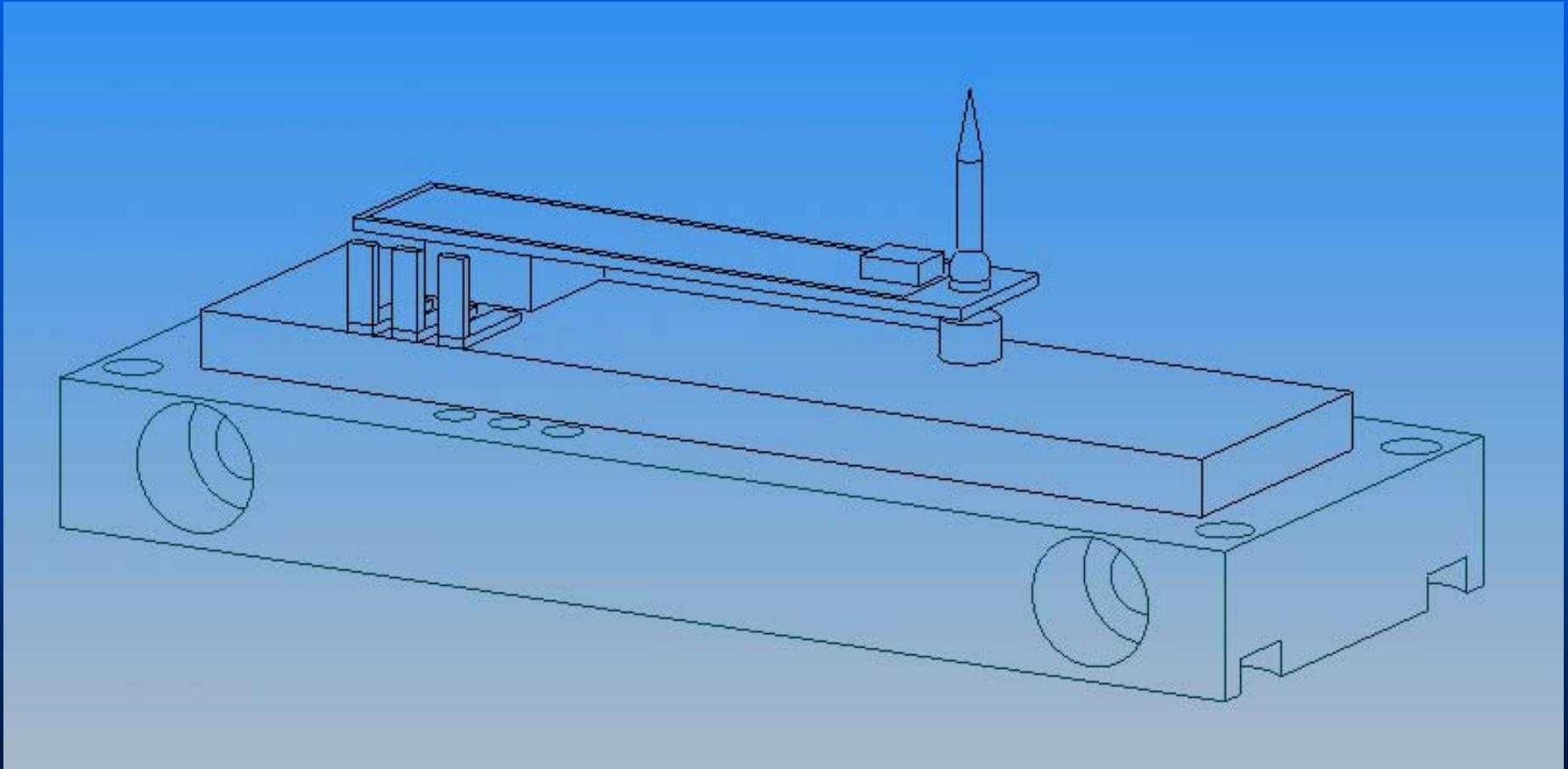# What is so special about our sensor

# What is so special about our sensor

# Why piezo

- **Very small measurement**
- **Very accurate**
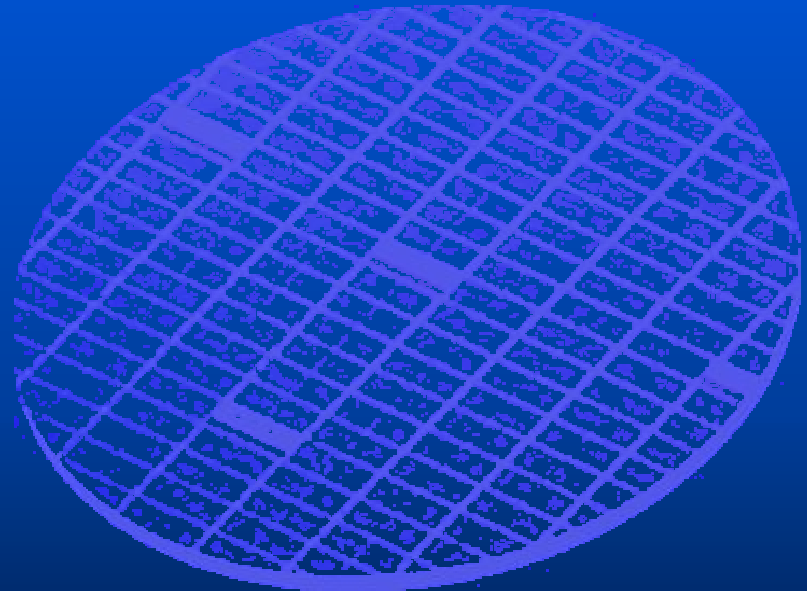- **Linear**
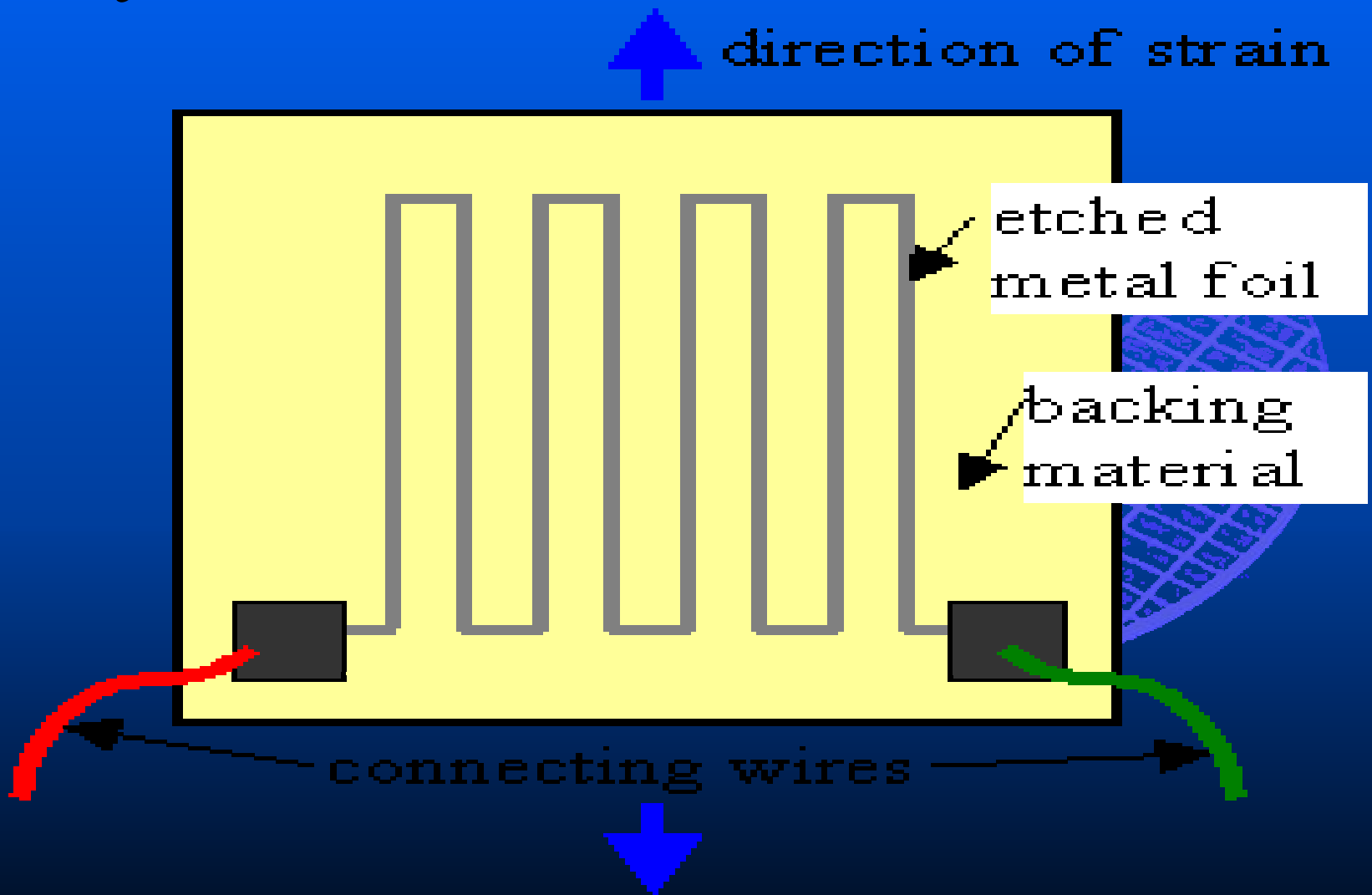- **Temperature compensation**
- **Piezo electrical crystals**

# A new revolution?

# A new revolution?

- Lifetime

- Accuracy

- System integration

# Why not a strain resistor

direction of strain

etched metal foil
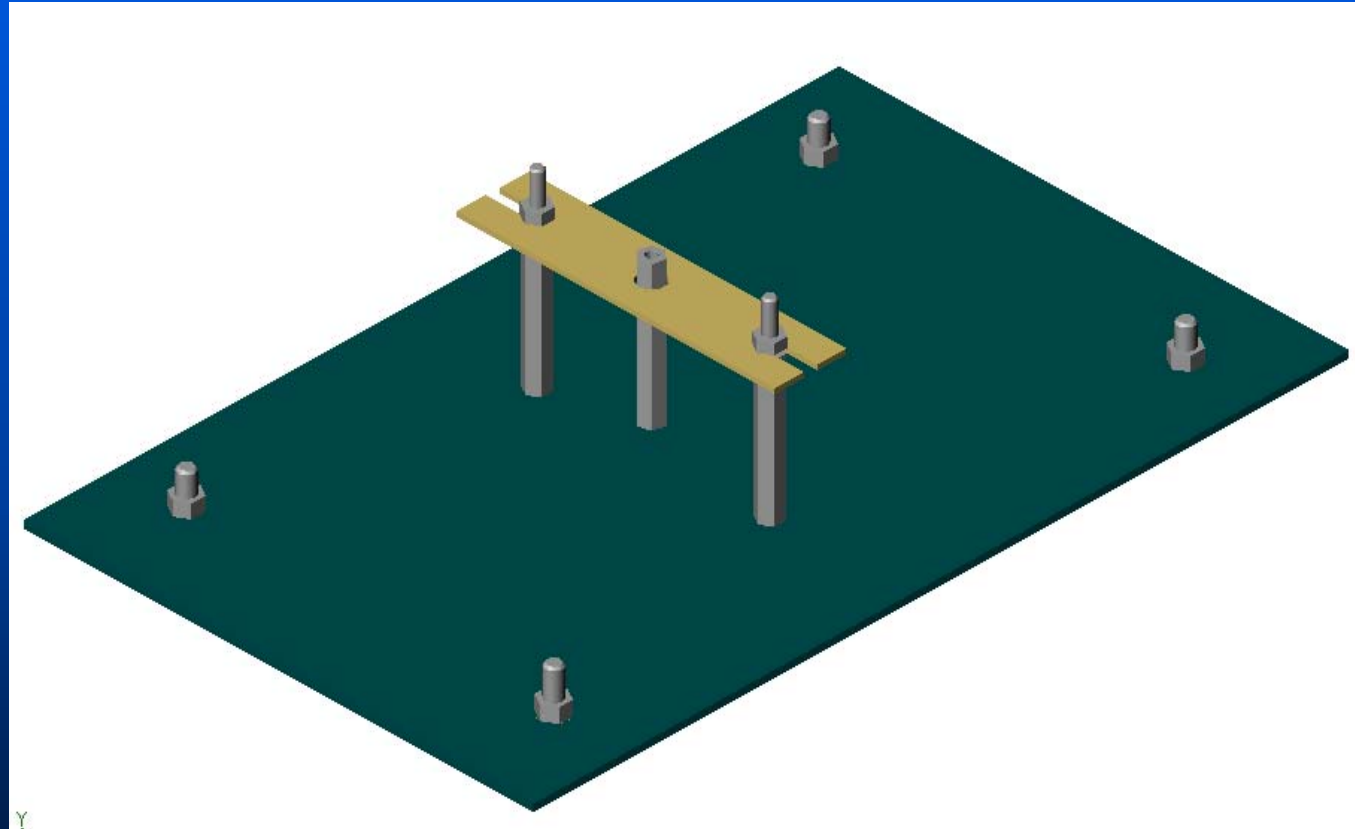
backing material

connecting wires

# Why not a strain resistor

- Not accurate

- Needs full compensation

- Aging

- Others

# Calibration and compensation

- Calibration plate

# Calibration and compensation

- load for linear check

# Characteristics

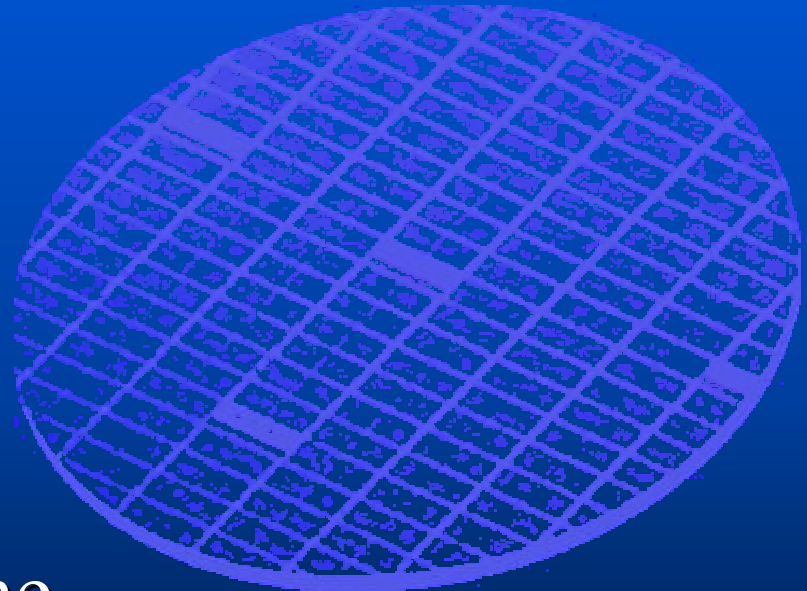**Piezo**

| Non Linearity: | +/- 0,1% FS |
|---|---|
| Hysteresis: | +/- 0,01% FS |
| Repeatability: | 0,1% FS max. |
| Rated Output | 1,5mV/V min. |

**Load cell**

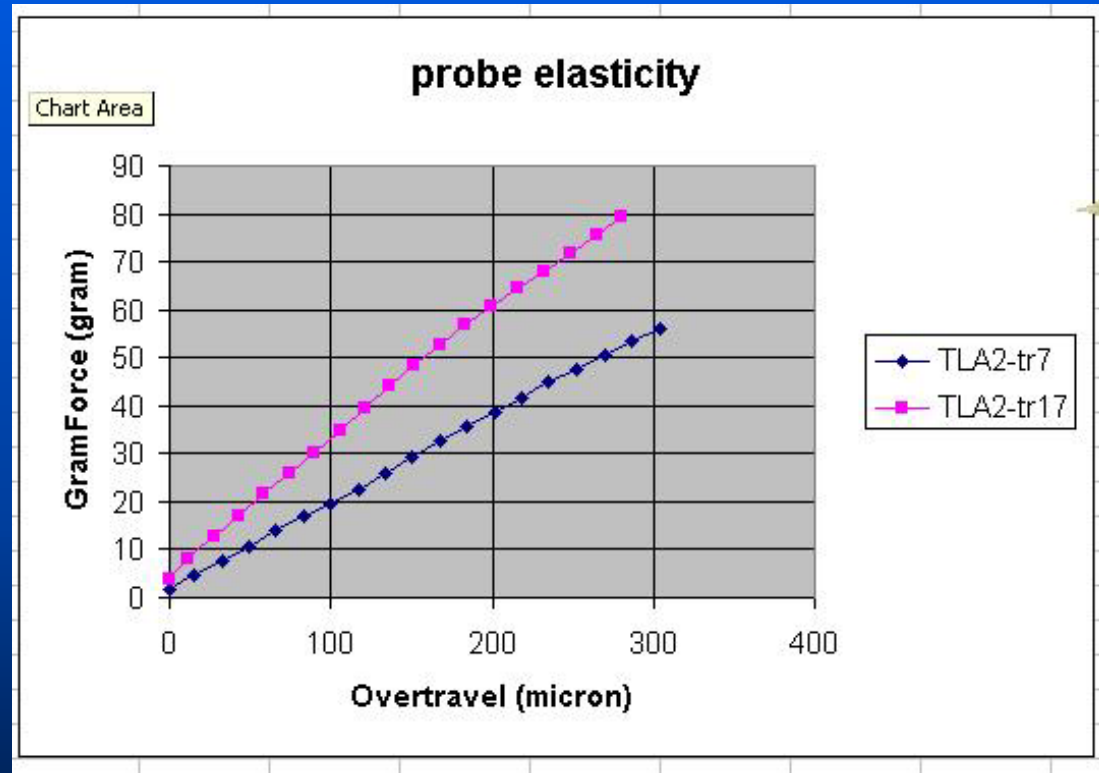| Non Linearity: | +/- 0,5% FS |
|---|---|
| Hysteresis: | +/- 0,5% FS |
| Repeatability: | 0,5% FS max. |
| Rated Output | 1,5mV/V min. |

# Specifications

- Pressure range sensor
- Accuracy
- Long term stability
- Overload
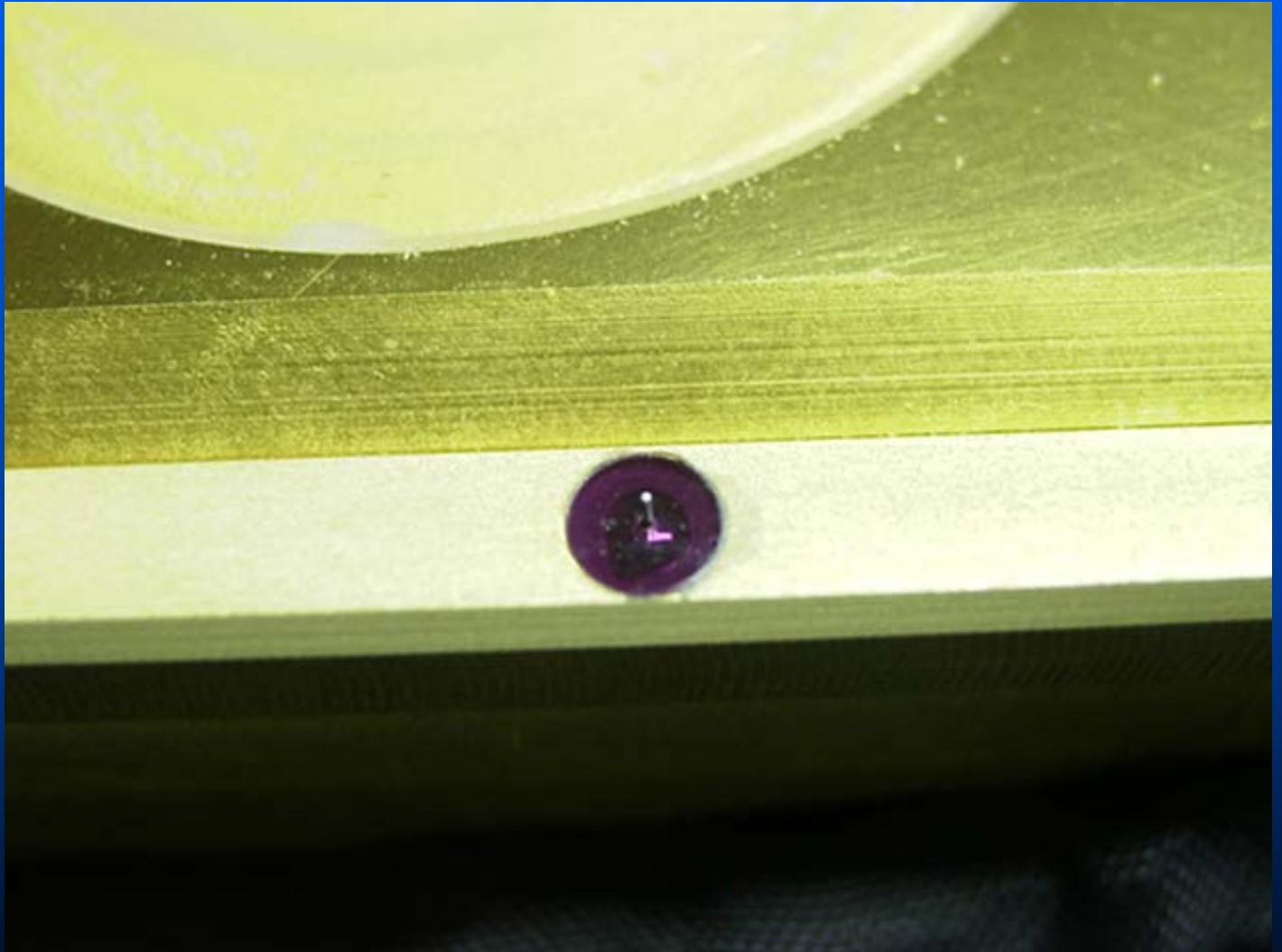- Probe pitch
- Dynamic responds time

# Specifications

- See the difference in probes

- See the linearity in probes

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# Final GF

# Summary

- ■ Low cost FG sensor

- ■ No hysterese

- ■ Very stable results

- ■ Efficient add-on