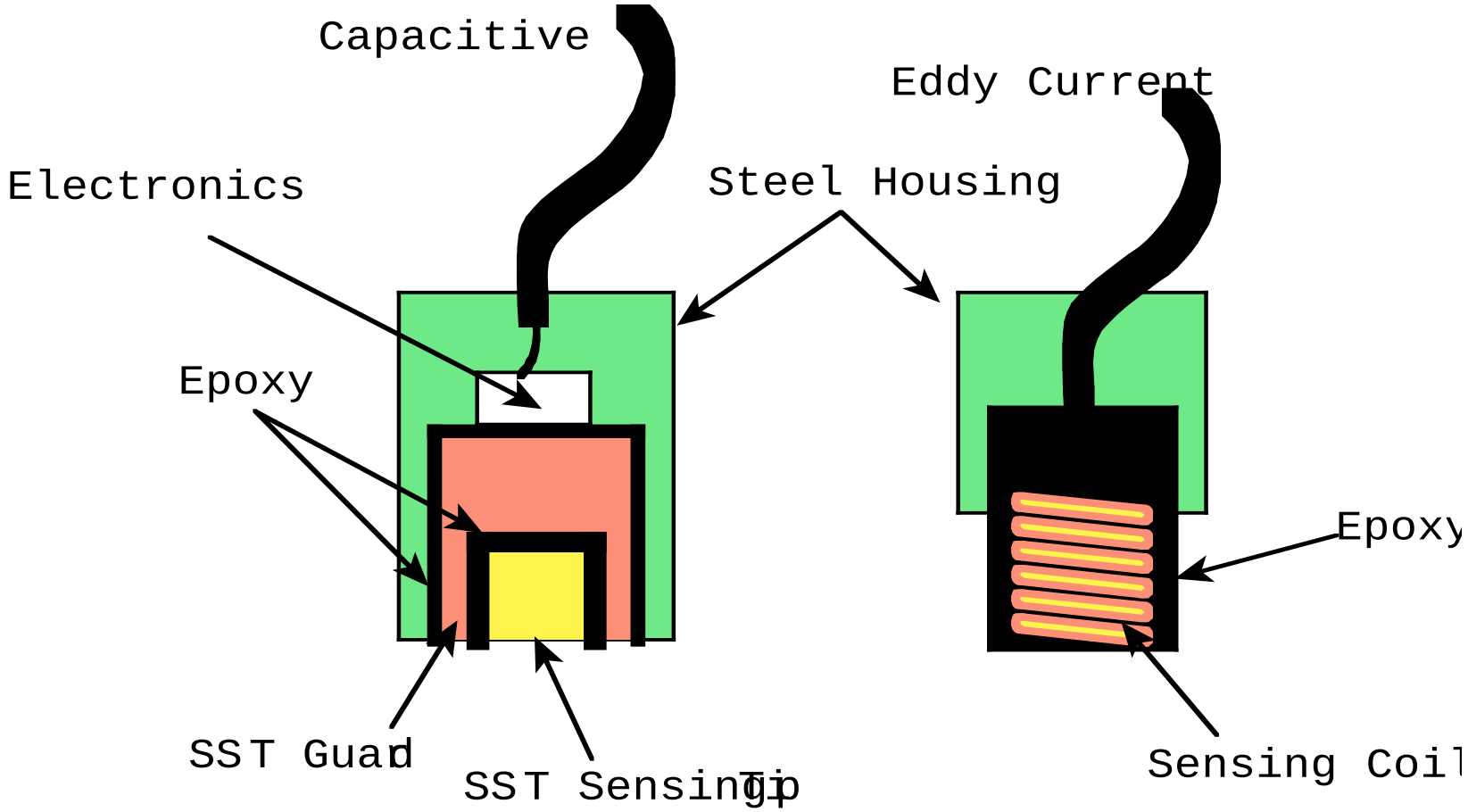
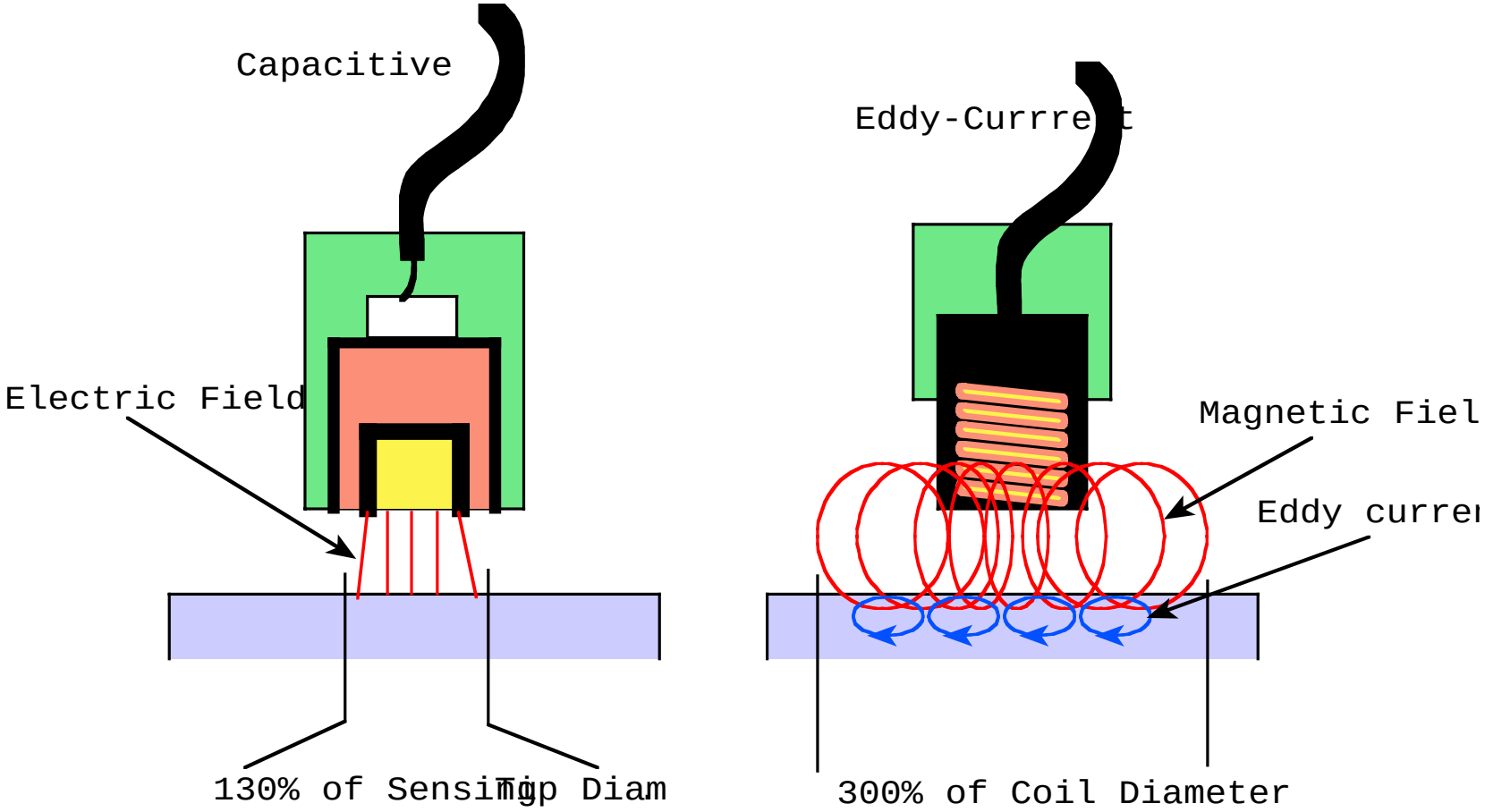
Choosing Between Capacitiv and Eddy-Current Sensors

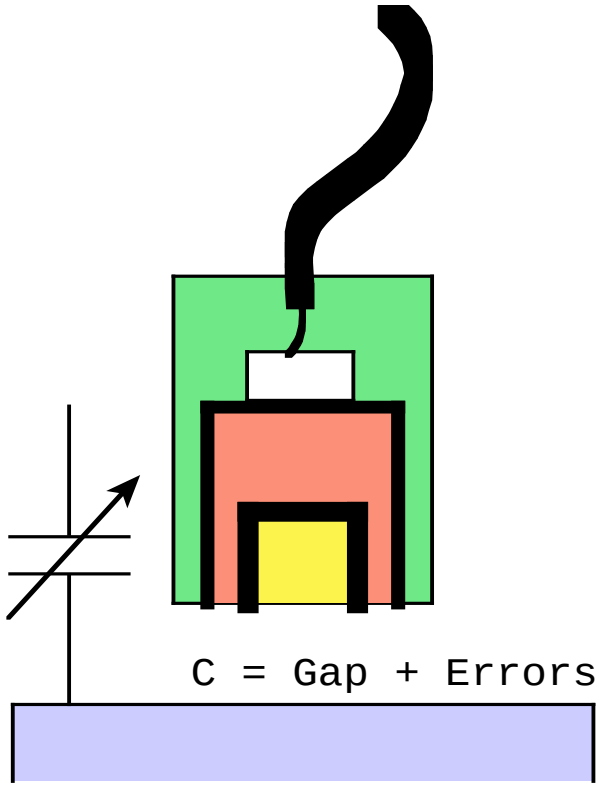
Construction



Fields and Target Size

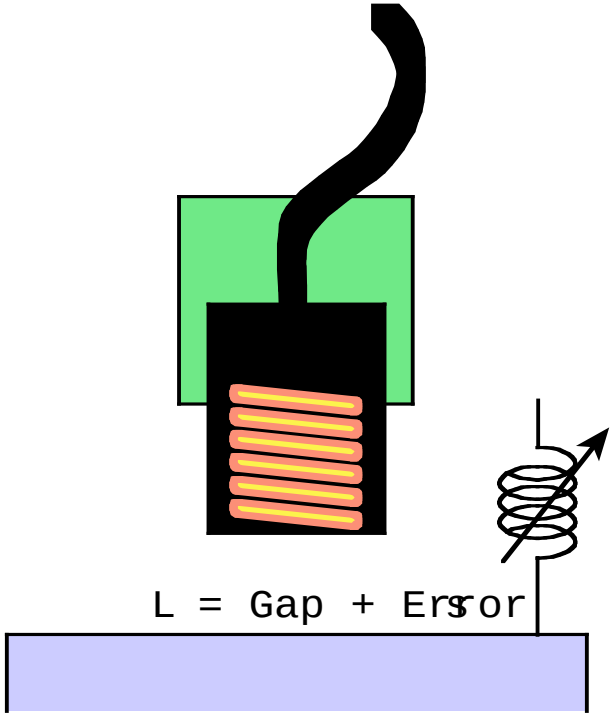


Transduction Technique



C = Gap + Errors

500kHz - 1MHz
Excitation



L = Gap + Errors

500kHz - 2.5MHz
Excitation

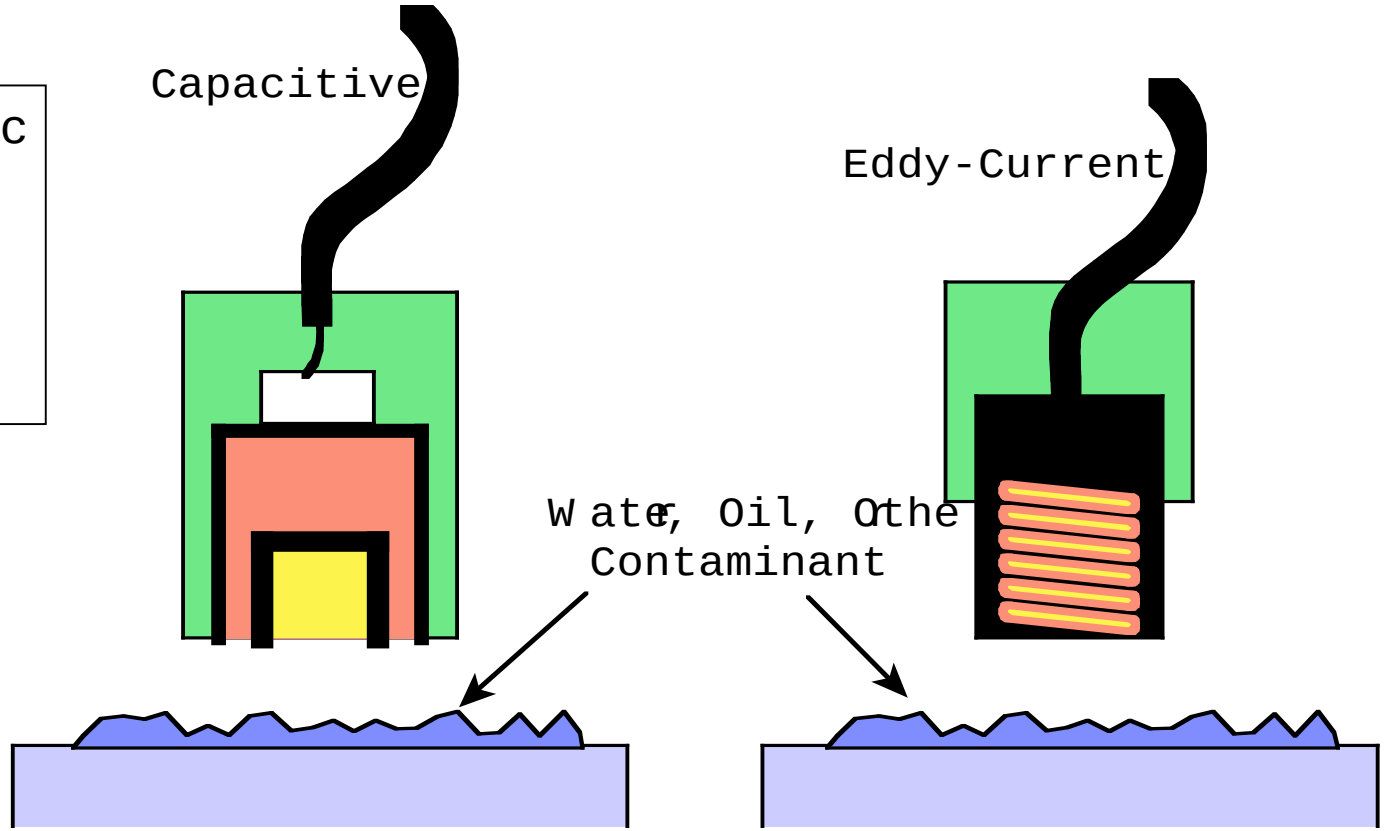
Selecting Capacitive vs. E

- Select to minimize error sources
- Following slides list error source di

Gap Contamination

Some Dielectric constants:

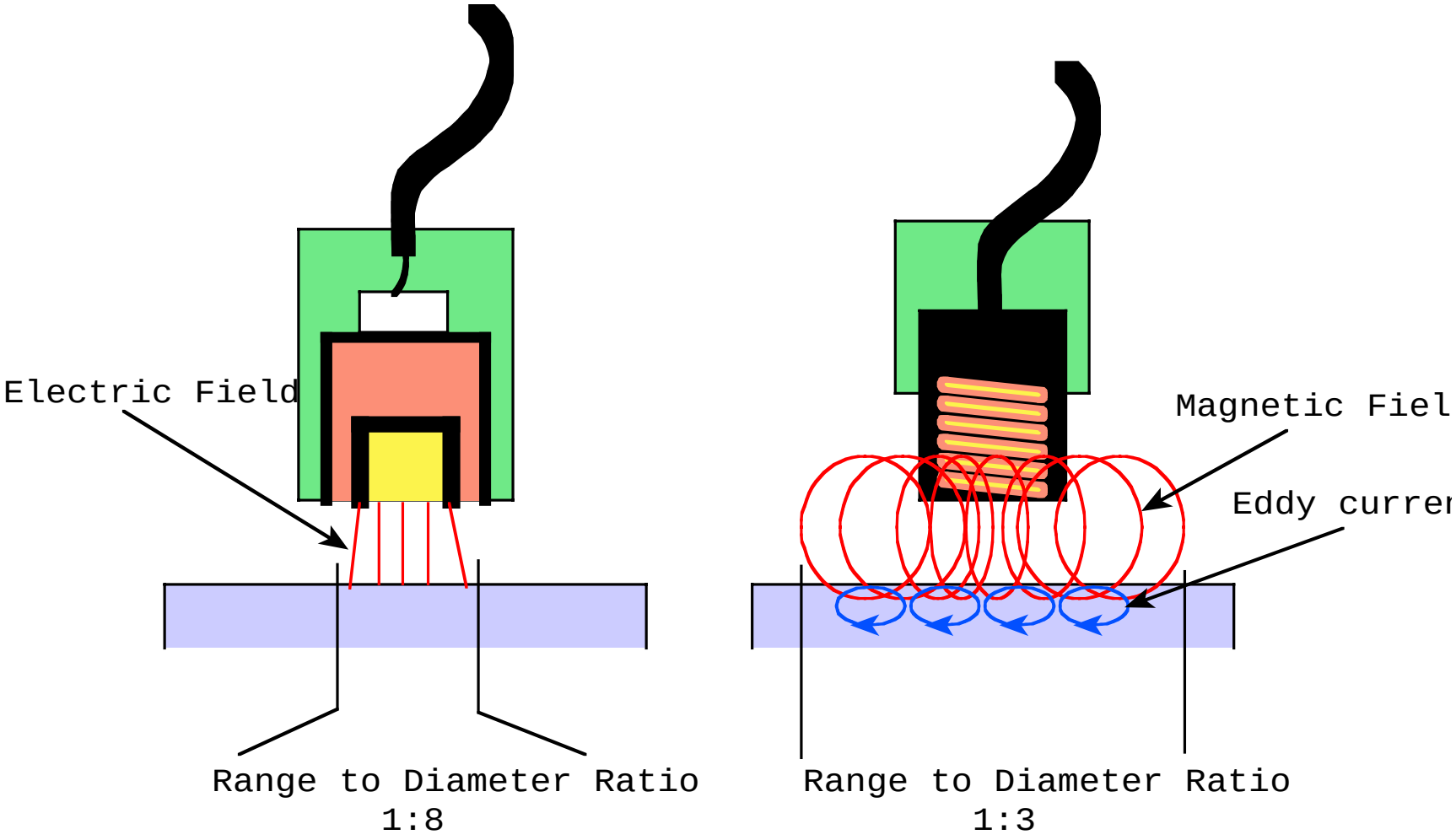
Air: 1.0006
Water: 80
Oil: 8-12



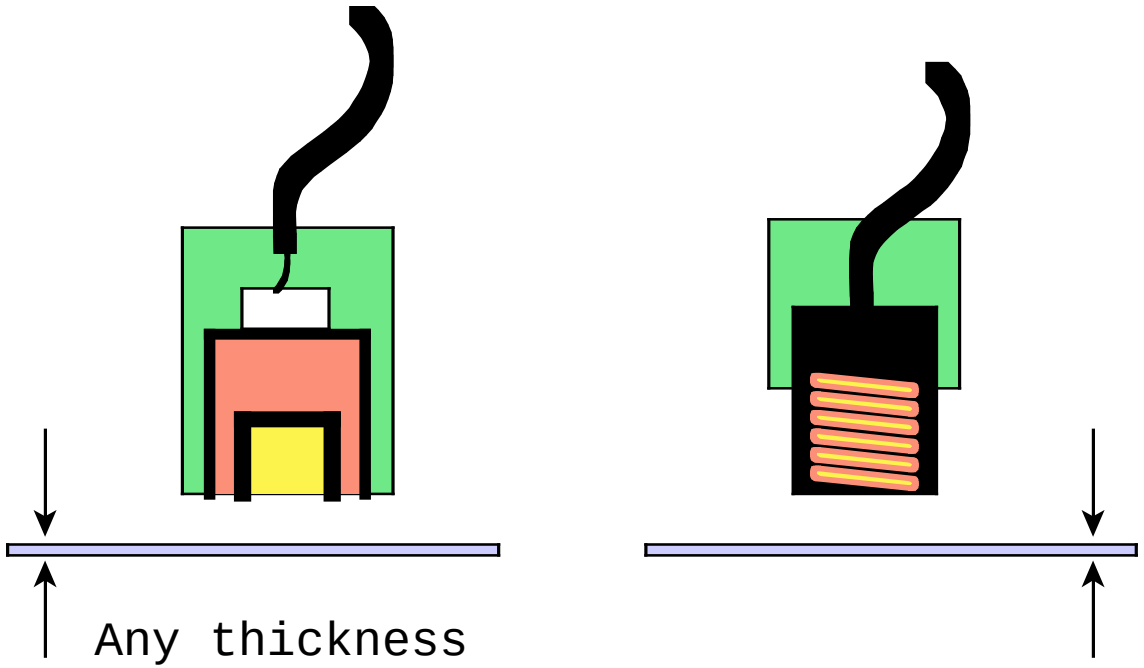
Output is affected by dielectric change.

Output is NOT affected by contamination.

Range: Sensor Diameter



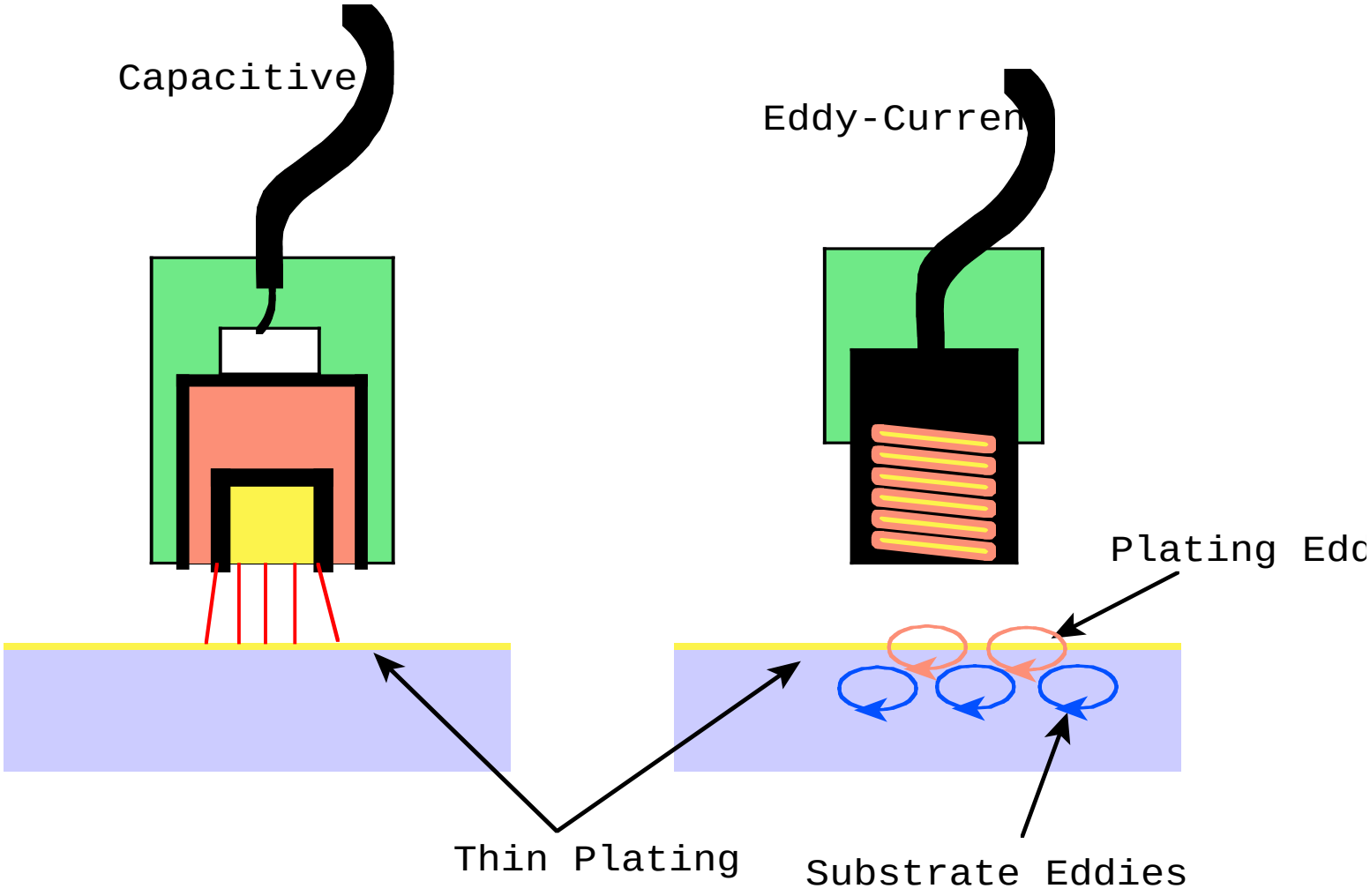
Minimum Target Thickness



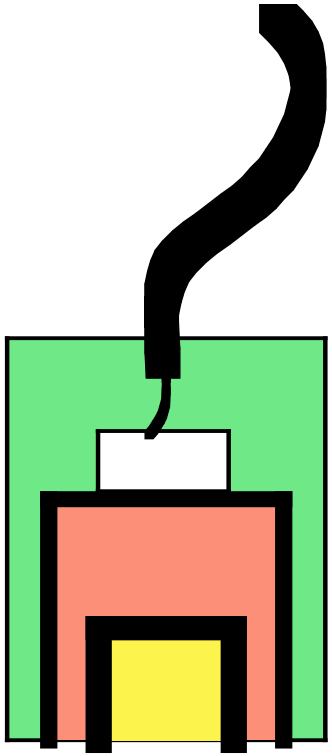
Eddy-Current
Minimum thicknesses

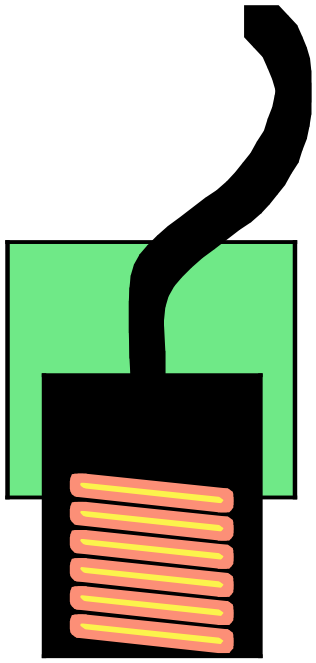
Silver: 0.19mm
Copper: 0.20mm
Gold: 0.22mm
Aluminum: 0.24mm
Zinc: 0.37mm
304 SST: 0.40mm
Lead: 0.69mm
Brass: 1.59mm
Nickel: 0.04mm
1040 Steel: 0.01mm
416 Stainless: 0.08mm
Iron: 0.59mm

Plated Targets



Material Properties





Rubber, Semiconductor, SiC, Saltwater, Metal

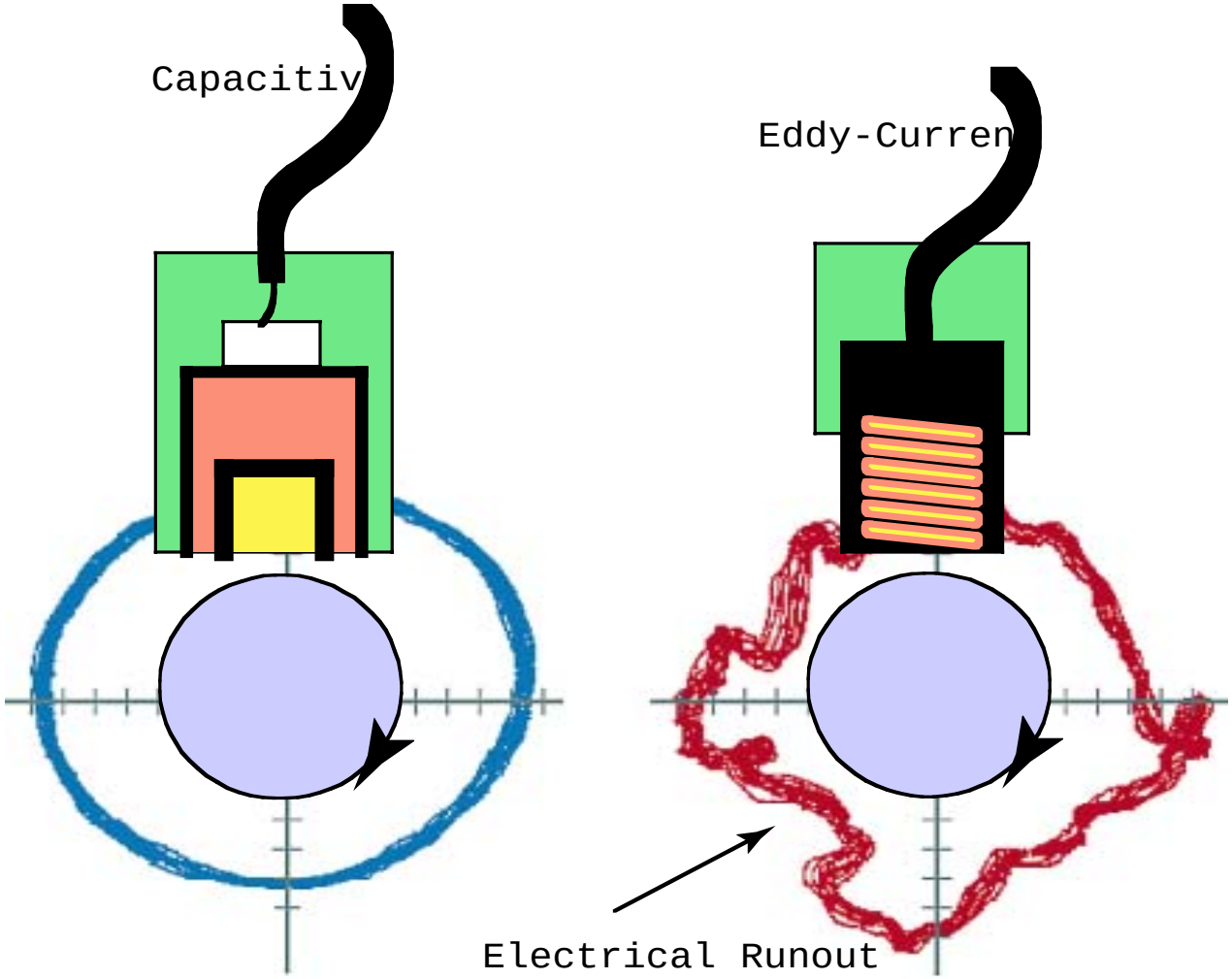
Copper

Steel

Iron

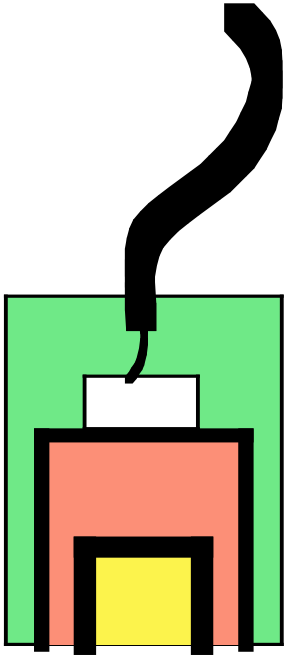
Aluminum

Rotating Targets



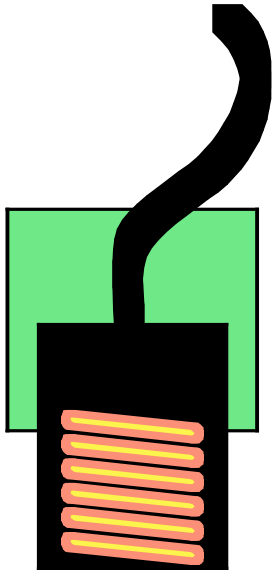
Temperature Ranges

Capacitive



Drivers: 4¡C - 50¡C
Probes: 4¡C - 50¡C

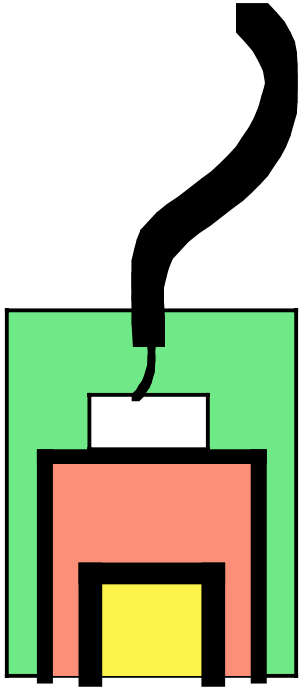
Eddy-Current



Drivers: 4¡C - 50¡C
Std. Probes: -25¡C-+
Ext. Probes: -25¡C-+

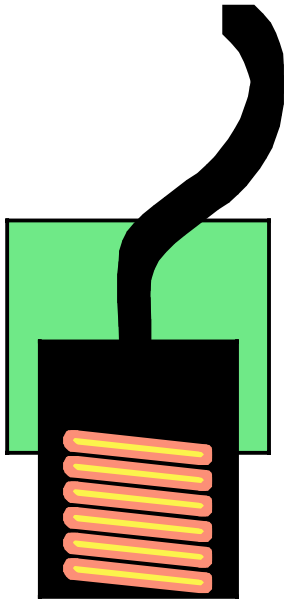
Vacuum Compatibility

Capacitive



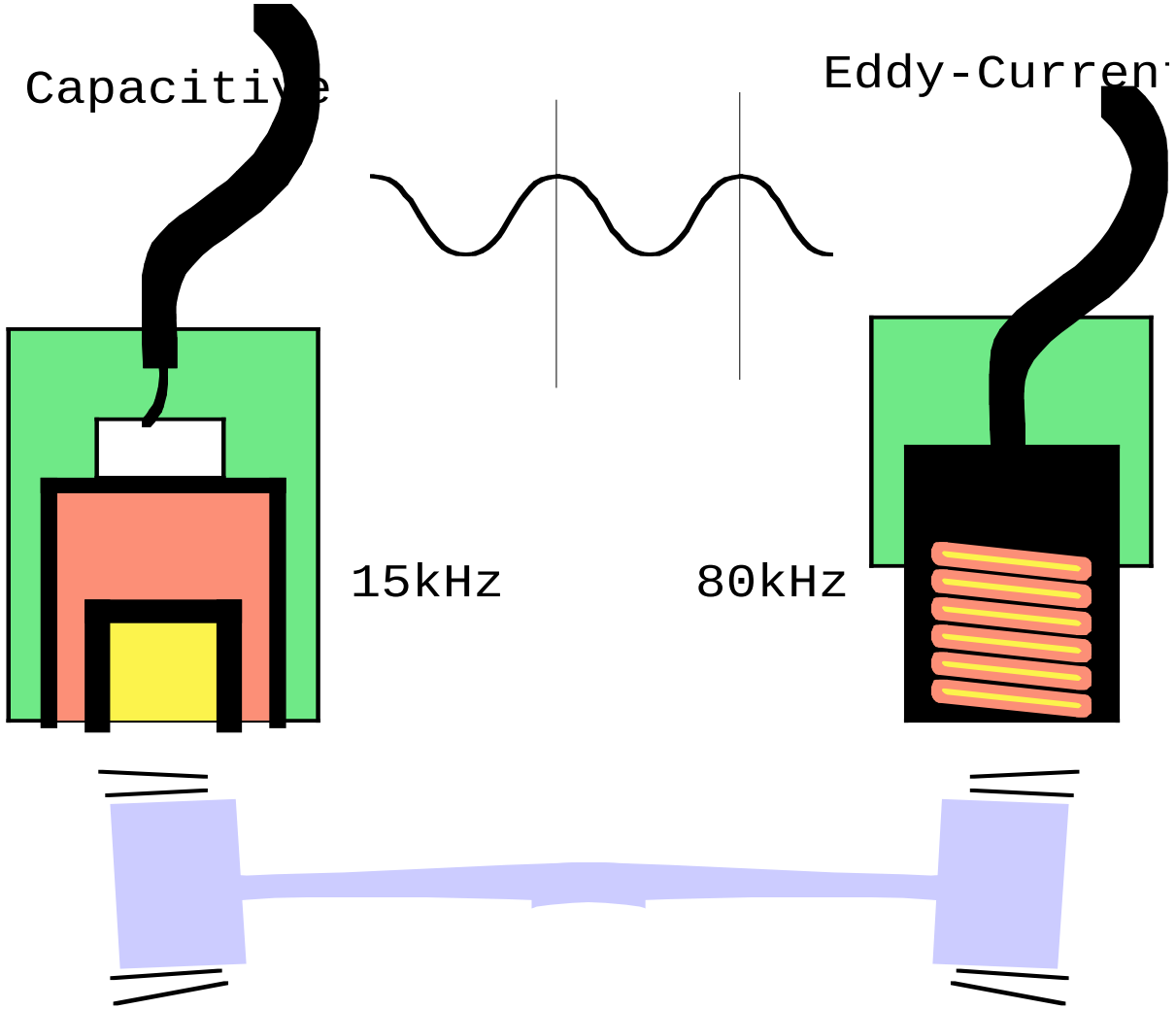
40 W

Eddy-Current

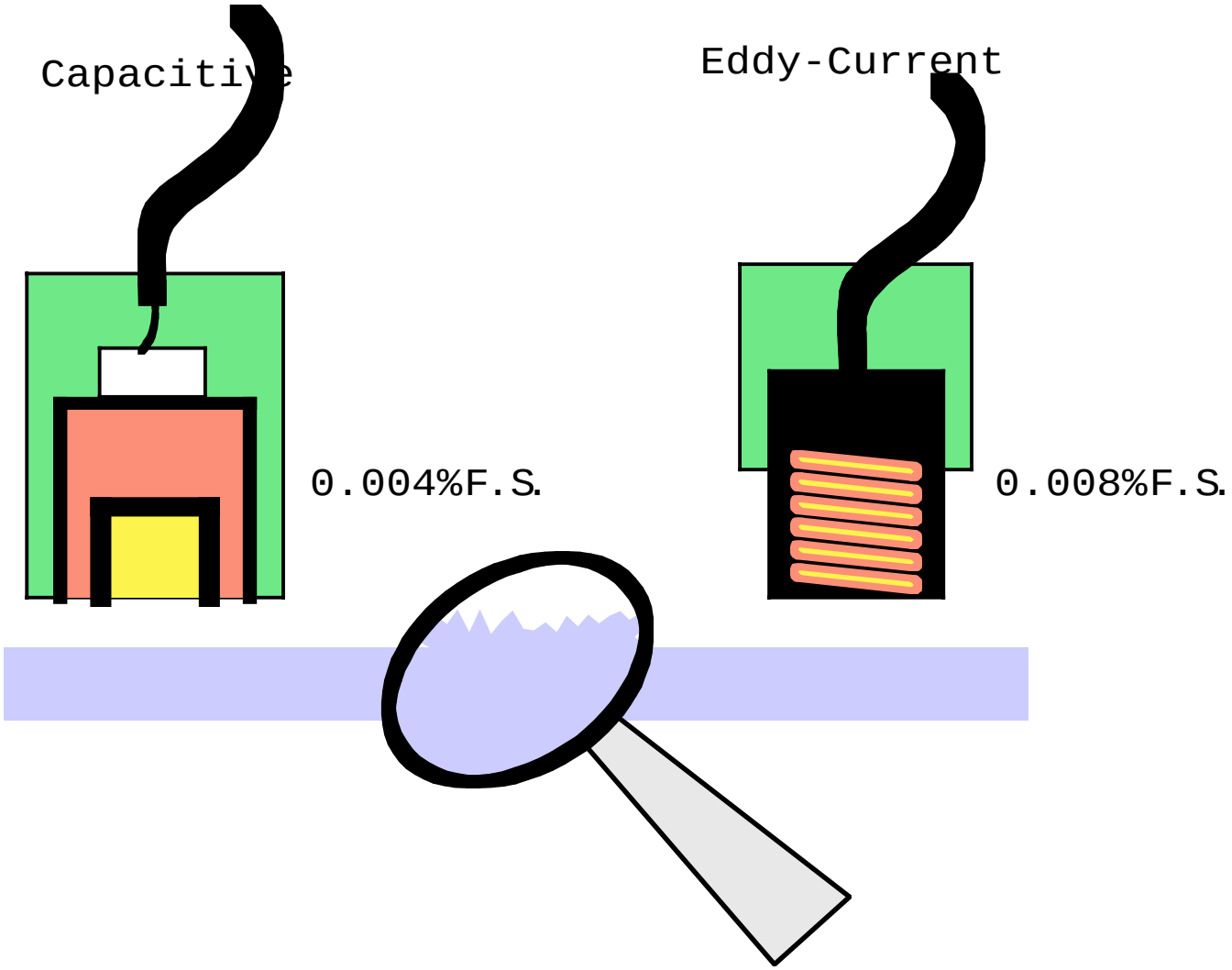


40 W - 10mW

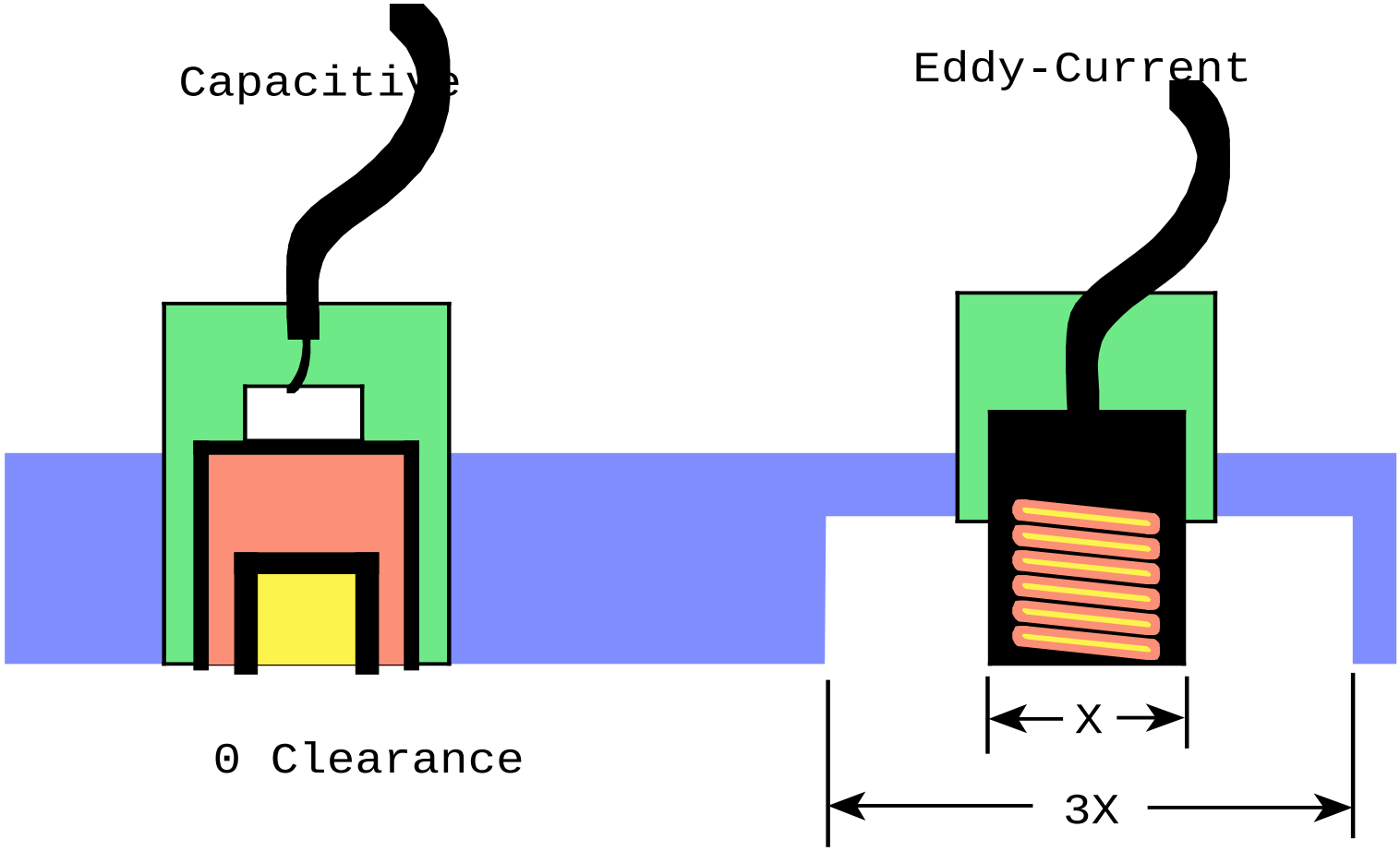
Bandwidth



Resolution

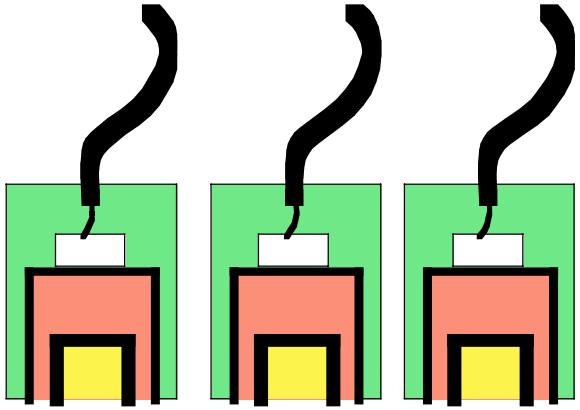


Flush Mounting Clearances



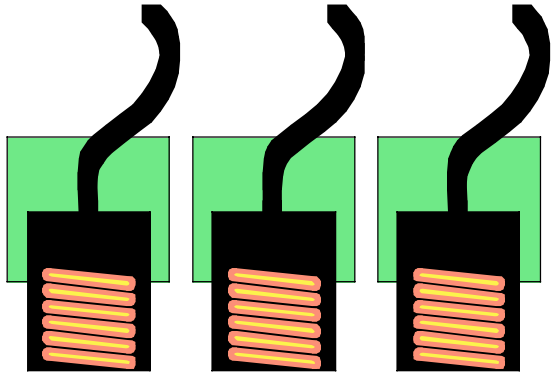
Multiple Proximate Probes

Capacitive



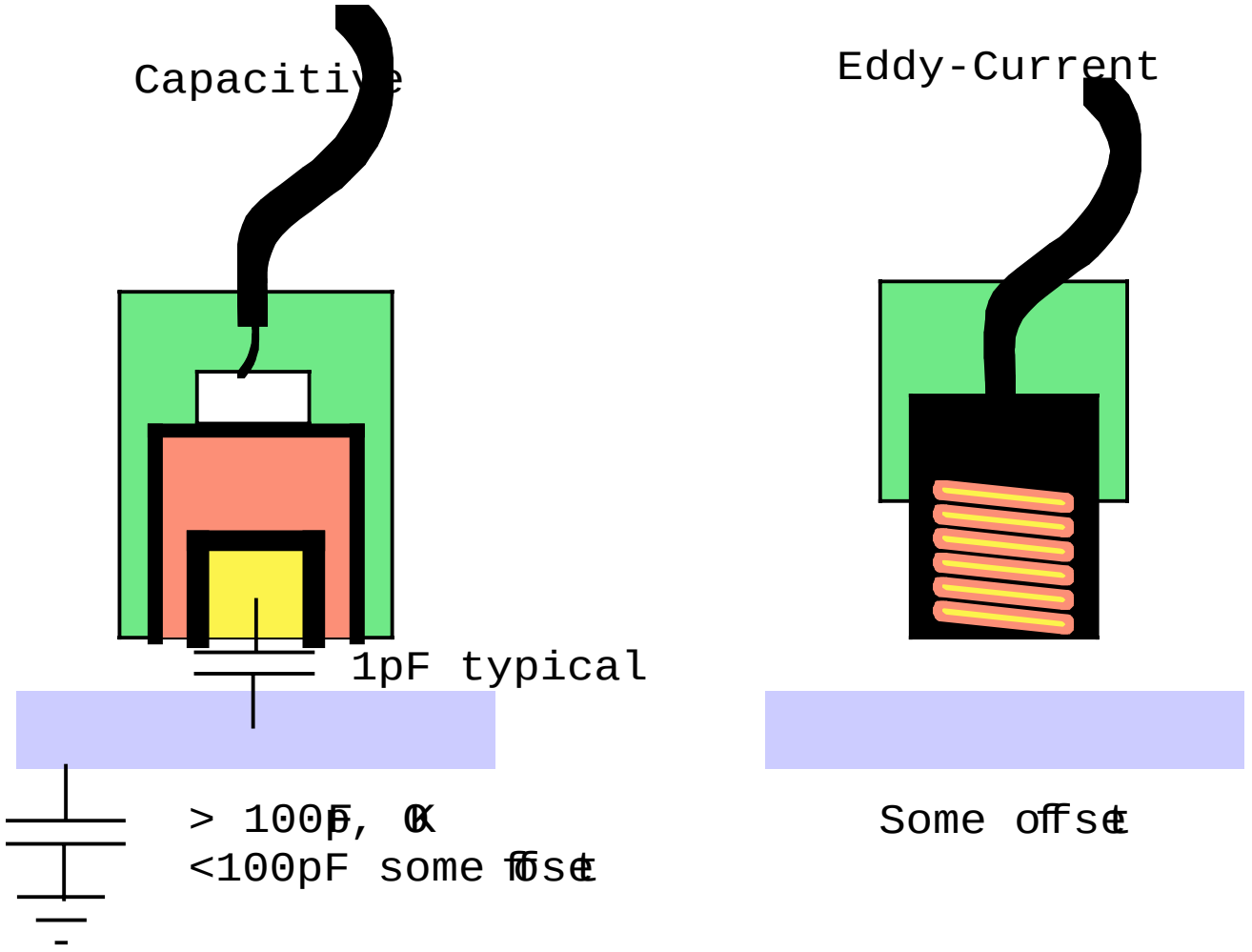
OK

Eddy-Current



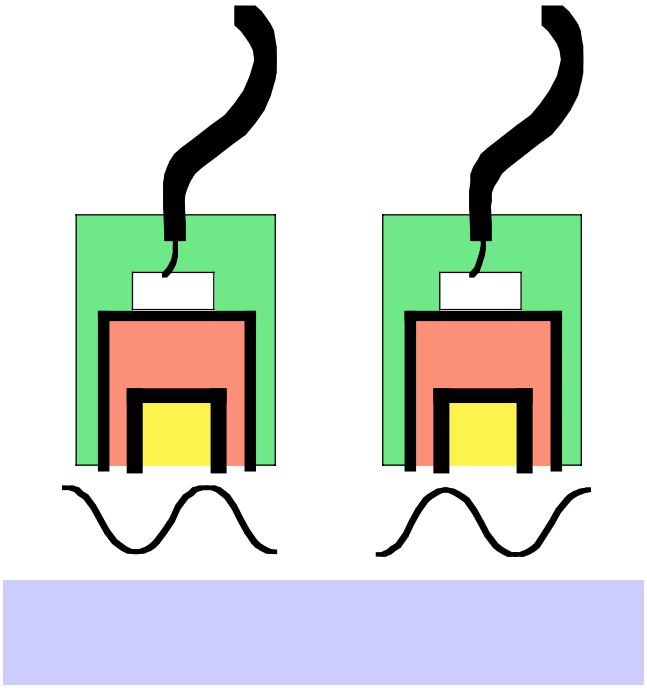
Special calibration

Ungrounded Targets



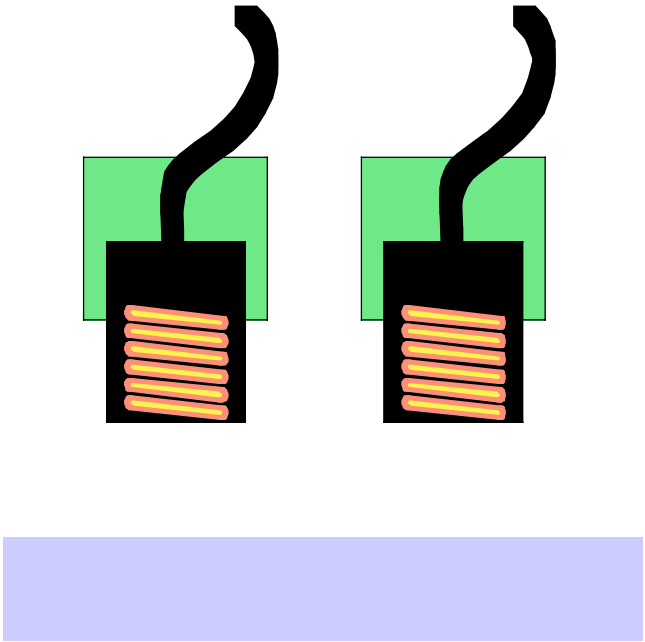
Ungrounded Solution (Cap)

Capacitive



180¡ Phase,
No grounding necessary

Eddy-Current



180¡ Phase,
no advantage

Comparison

	Cap	Eddy
Gap Contamination	—	+++
Small Target	+++	+
Large range/small probe	+	+++
Thin targets	+++	+
Plated targets	+++	+
Changing material properties	+++	+
Wide temp. range	+	+++

	Cap	Eddy
Bandwidth	++	+++
Resolution	+++	++
Flush mounting	+++	+
Proximate probes	+++	+
Ungrounded Target	++	++
Vacuum	+++	++
Budget	++	+++

New Eddy-Current Technology

- Digital Signal Processing Core
  - Near perfect linearity
  - Near zero probe temperature drift
  - Development nearly complete

Conclusion

- Technology choice based on applicatio
  - Minimize error sources
  - Maximize strengths
- Use the comparison checklist