

TEMPERATURE-STABILIZED MICRO WIRE PIRANI

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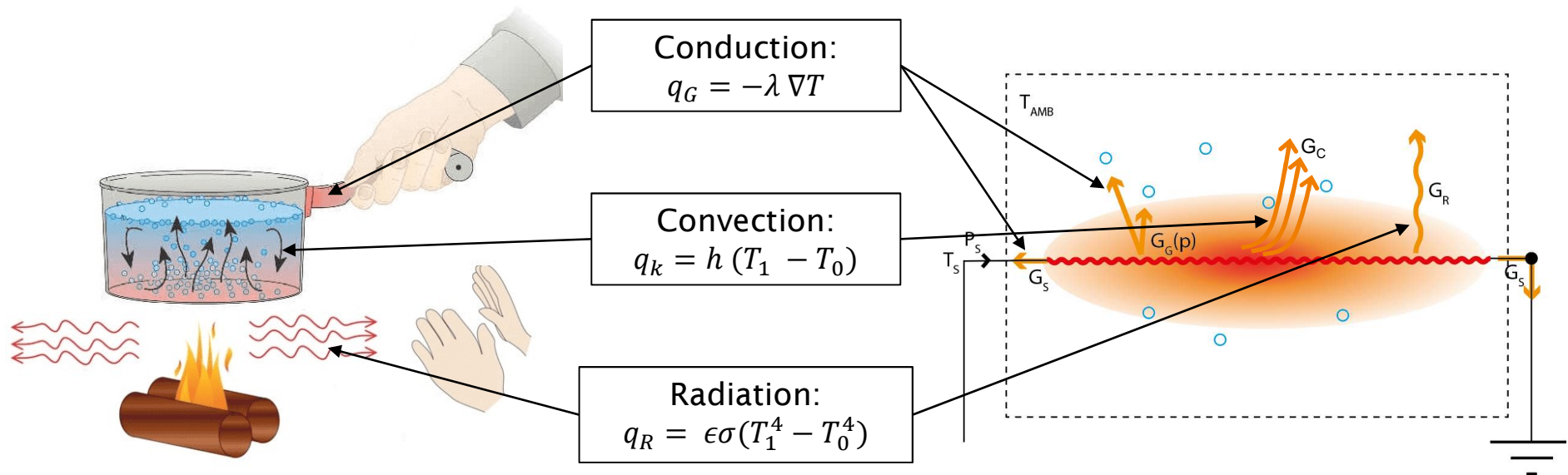
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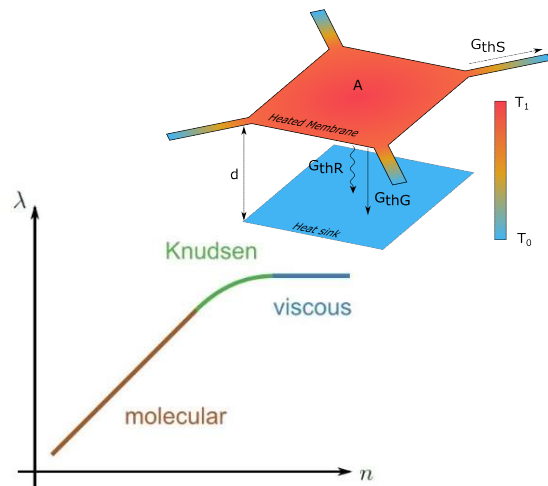
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9th ITG International Vacuum Electronics Workshop 2024

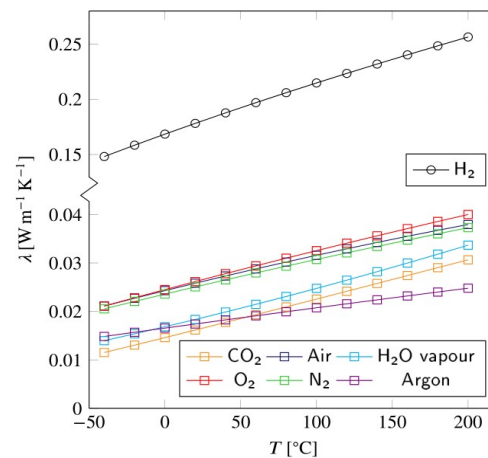
Theory / Working principle of a Pirani sensor



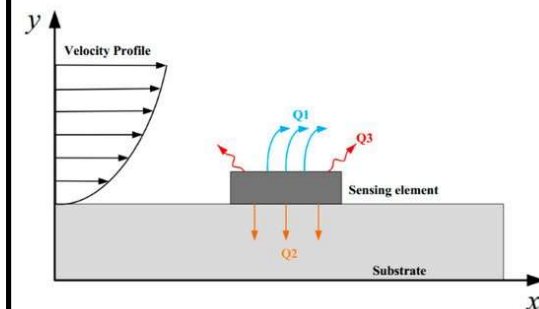
Pirani vacuum gauge: λ of diluted gases is pressure-dependent -> application for vacuum detection



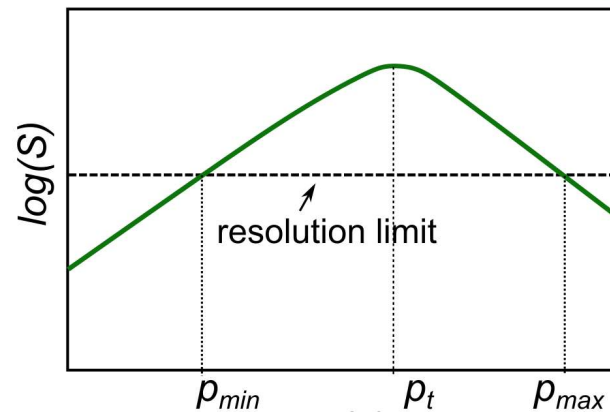
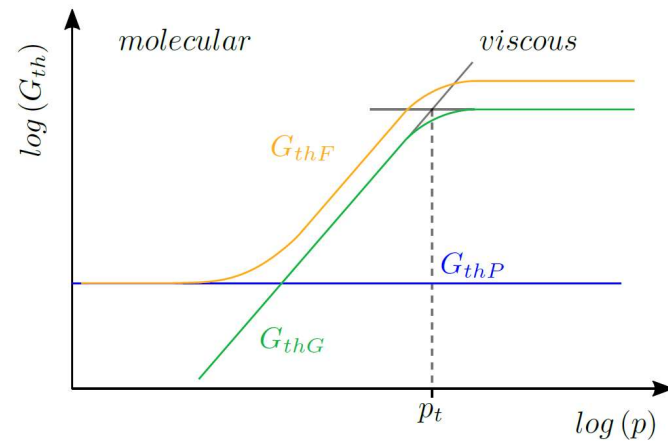
Gas sensor: Detection of gases with significantly different λ with respect to air (e.g. H_2 or CO_2)



Flow sensor: Heat loss via convection depends on flow velocity

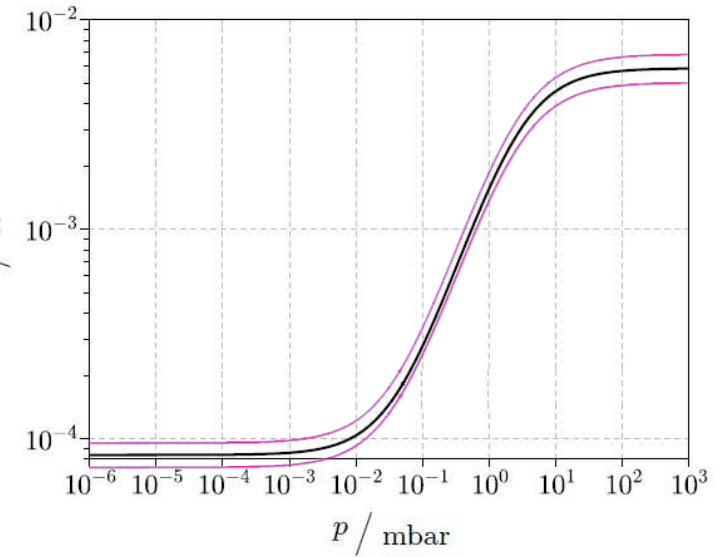


Influence of ambient temperature fluctuation

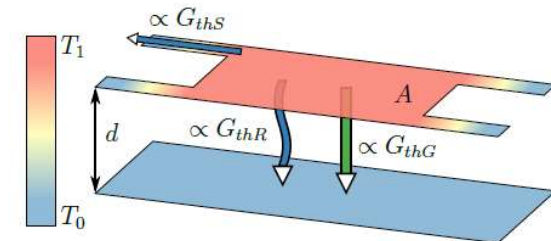


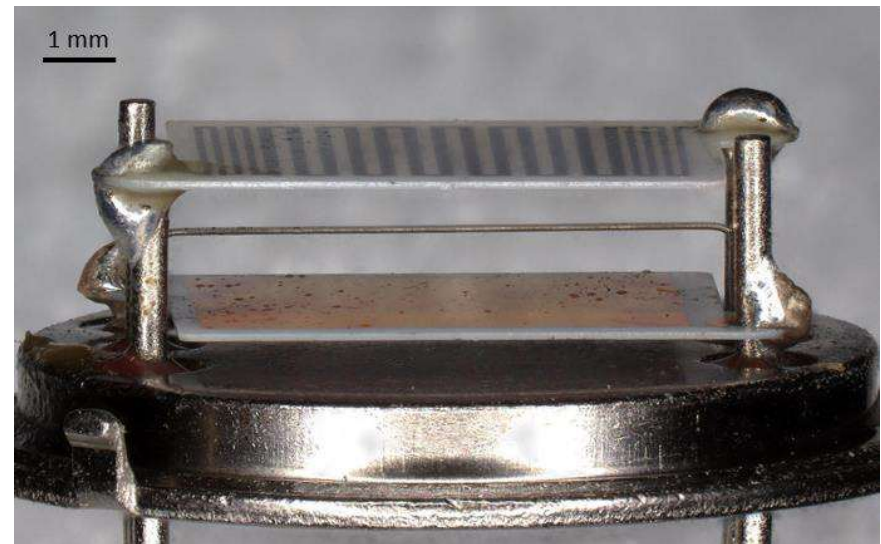
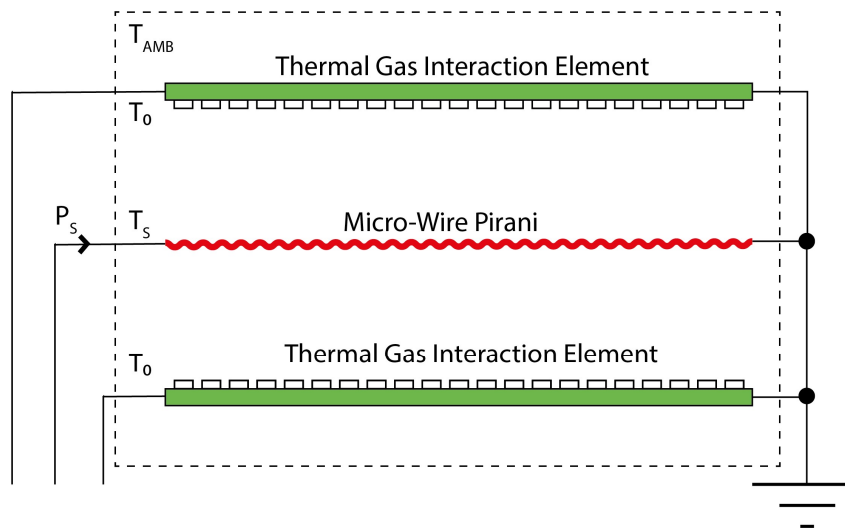
$$P_S = G_{TH} \cdot \overbrace{(T_S - T_{amb})}^{\Delta T}$$

P / W

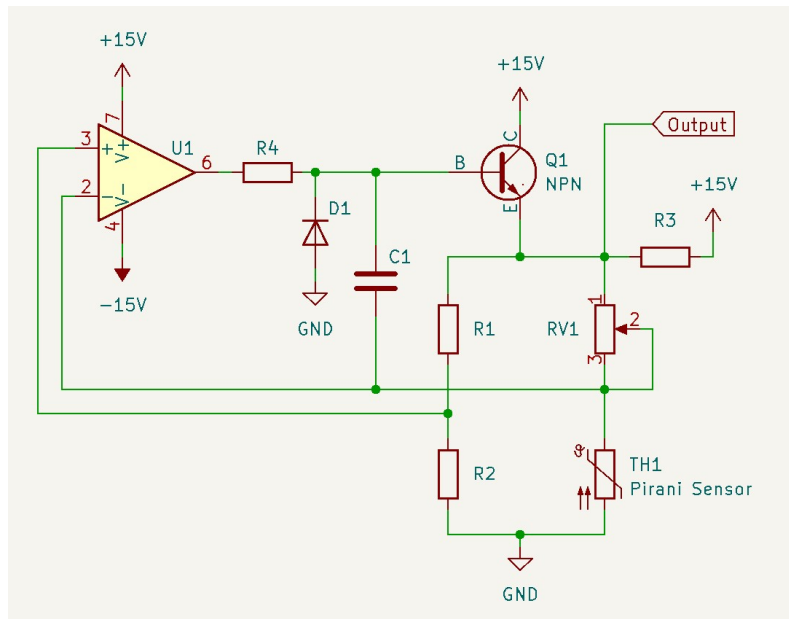


$$S = \frac{\partial V}{\partial(\log_{10} p)}$$

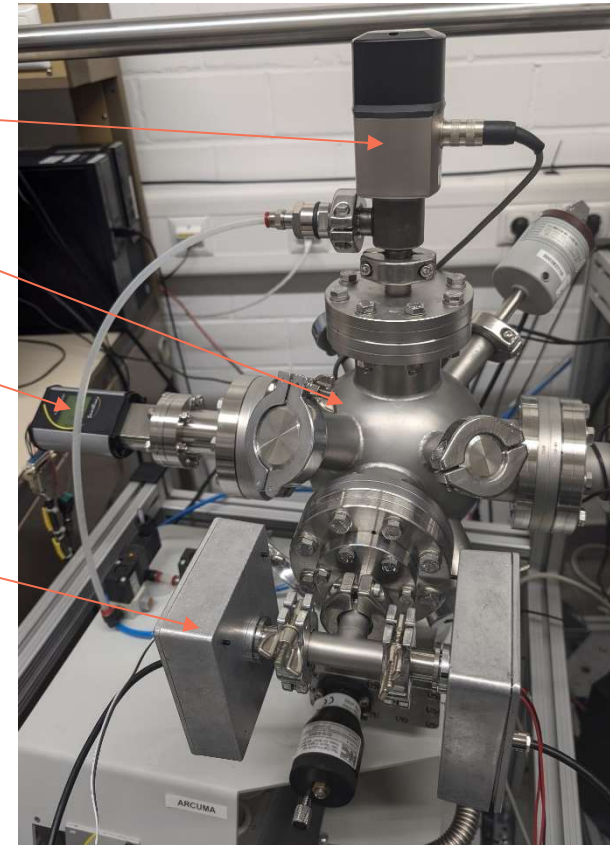
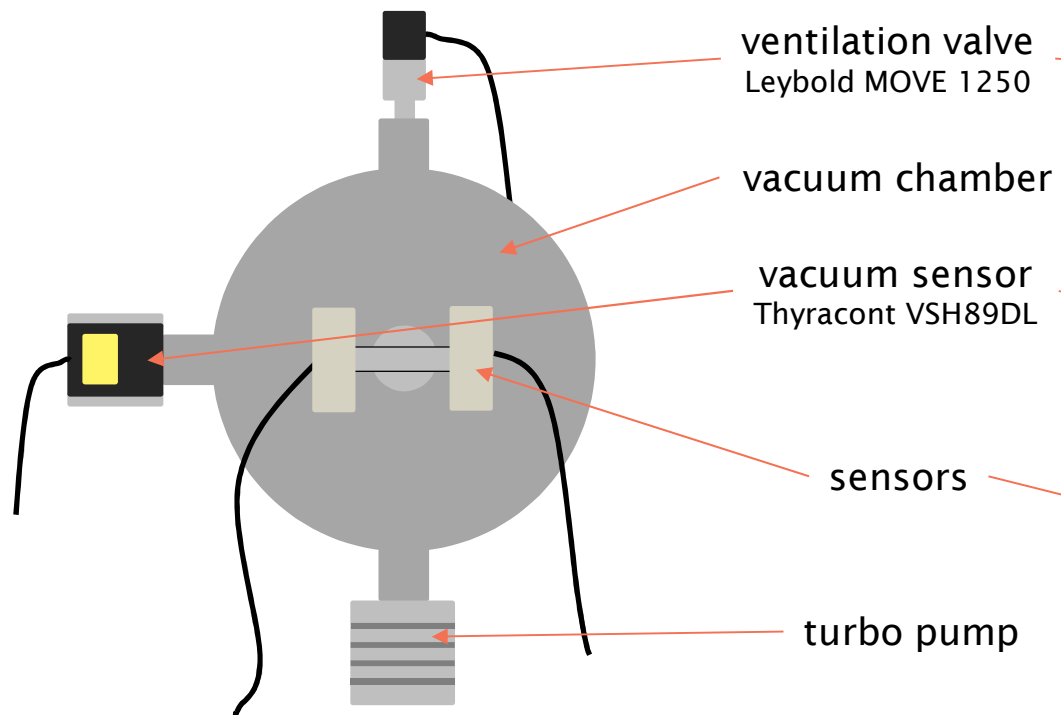


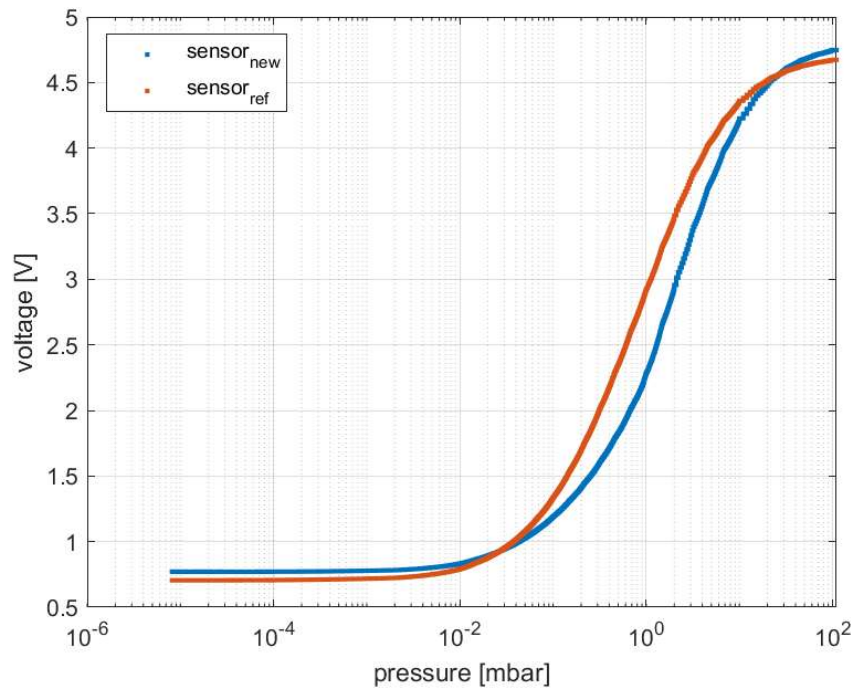


Constant temperature circuit

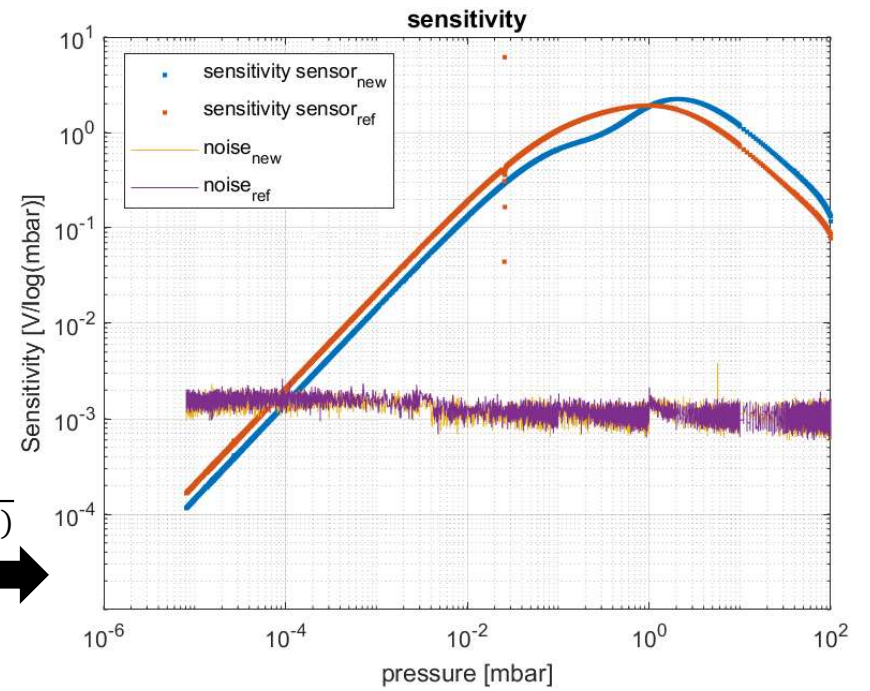


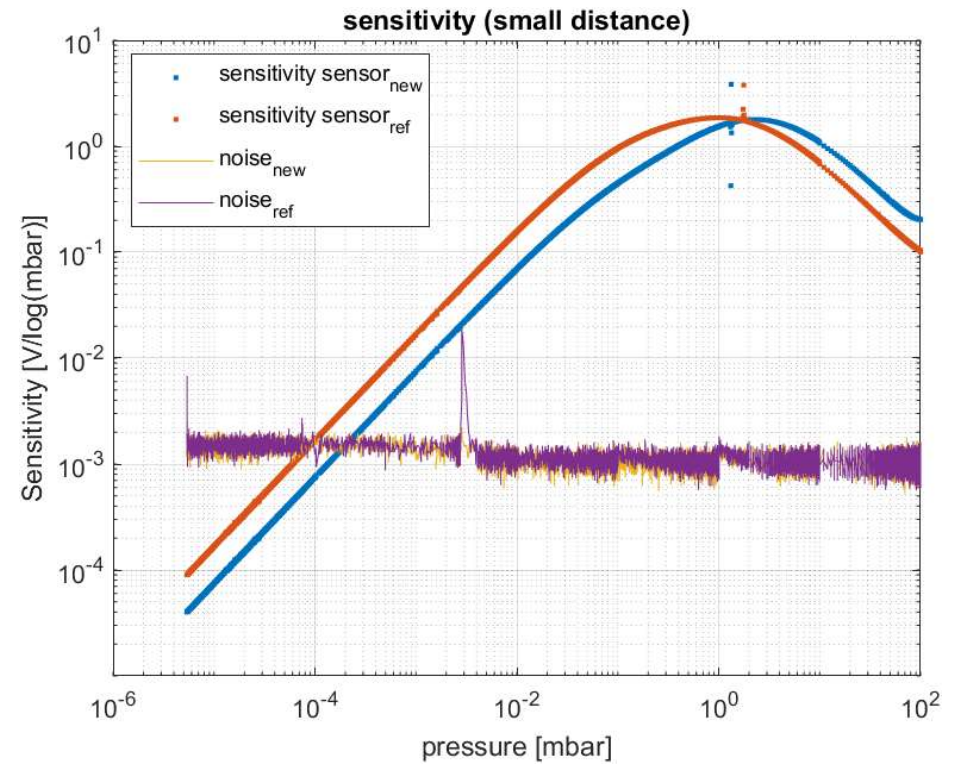
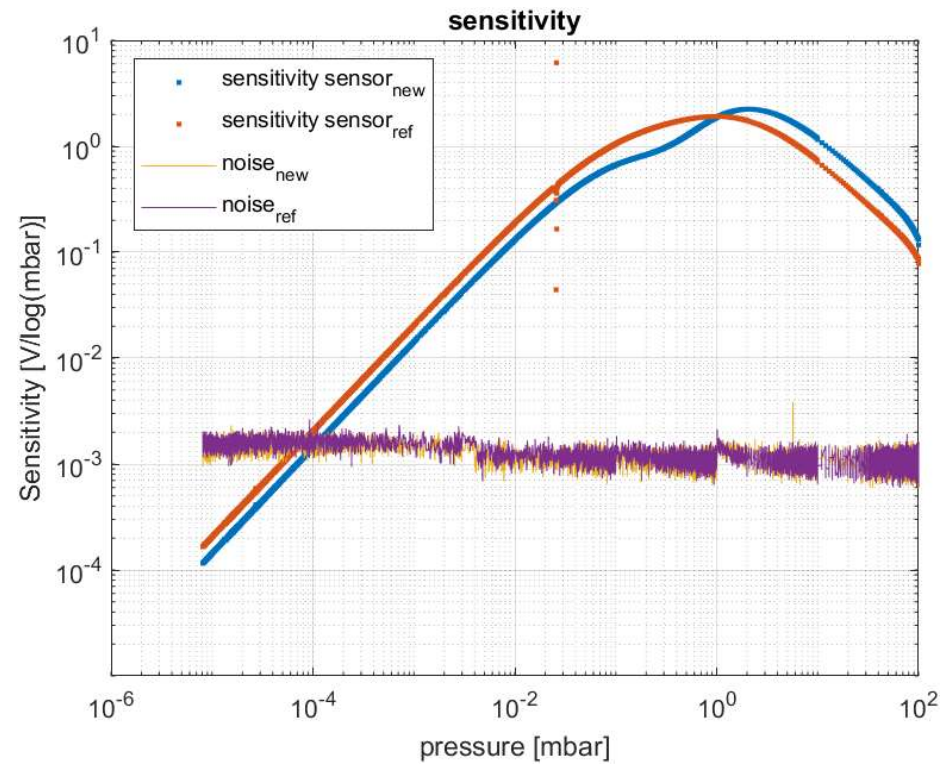
Experimental setup

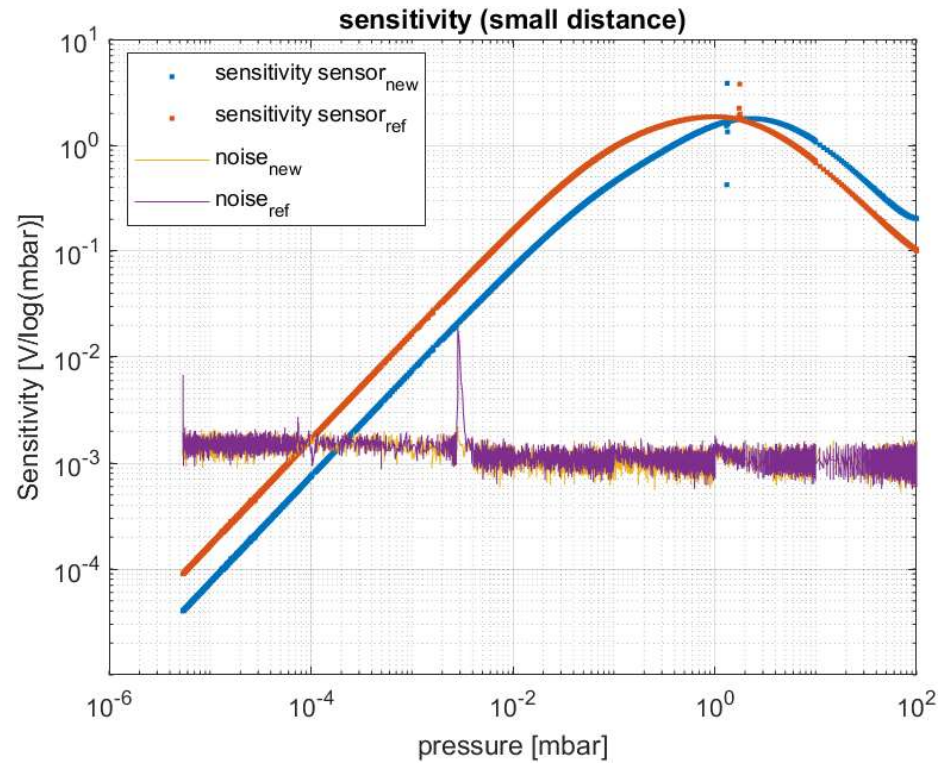




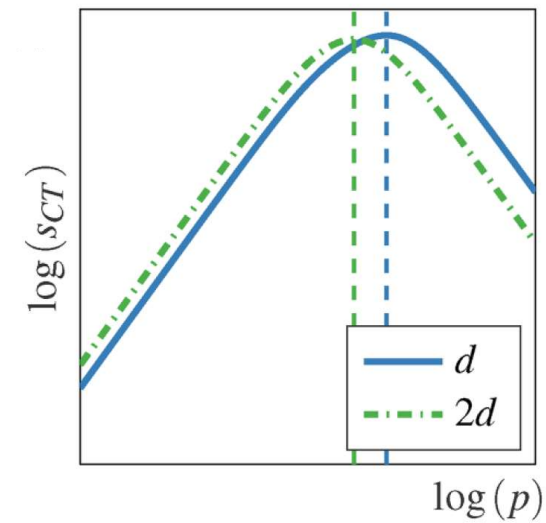
$$S = \frac{\partial V}{\partial (\log_{10} p)}$$



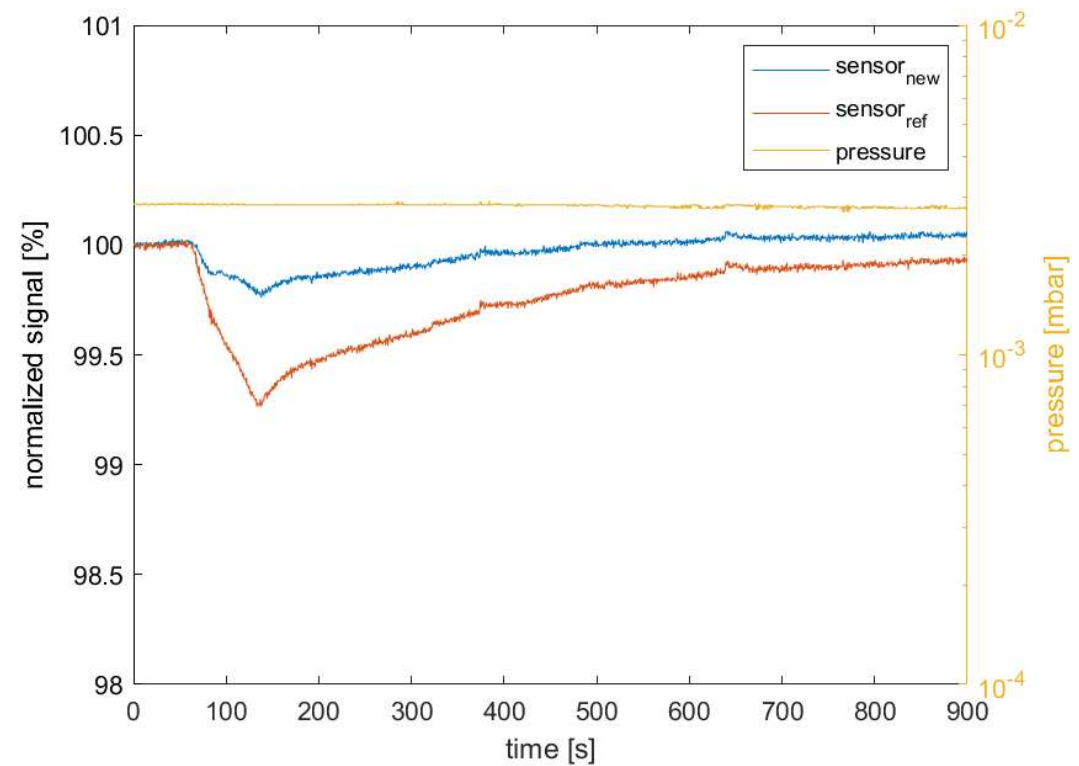
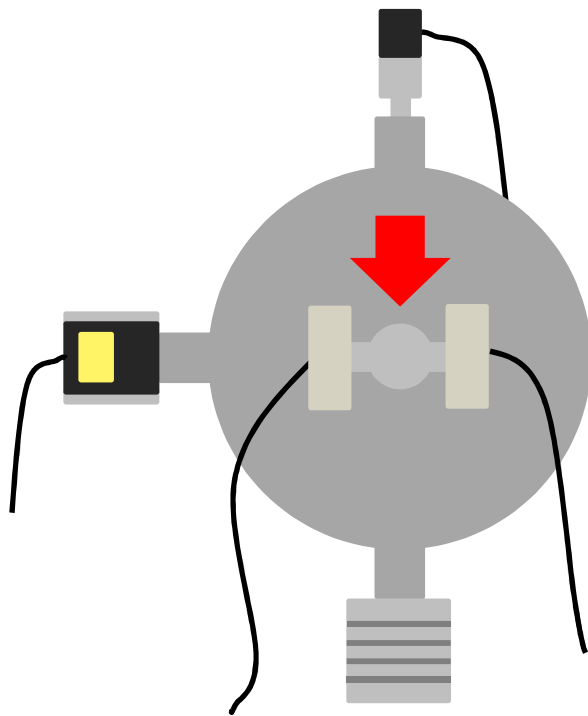




$$S_{norm} = \frac{\ln(10) \frac{\varepsilon A}{G_{thP}} p}{2(\gamma d p + 1)^2 \sqrt{\left(\frac{\varepsilon A}{G_{thP}} \frac{p}{1 + \gamma d p} + 1\right) \left(\frac{\varepsilon A}{G_{thP}} \frac{1}{\gamma d} + 1\right)}}$$



C. Langer, D. Berndt and R. Schreiner, J. Vac. Sci. Technol. B 40, 054203 (2022).



Conclusion

- Noise is approx. on the same level
- Sensitivity curve can be shifted to higher pressures with additional interaction elements
- Sensor drift caused by changes in the ambient temperature can be reduced

Outlook

- Improving distance between wire and interaction elements

Thank you for your attention!

THYRACONT
Vacuum Instruments



ACKNOWLEDGMENT

This work was supported by the German
Federal Ministry of
Education and Research under Project No.
13FH029KX0 (NEOVAK).

