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Characterisation of an integrated SMD multisensor for compressed air in LTCC technology

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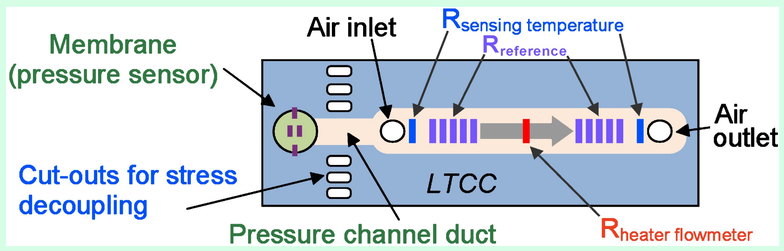
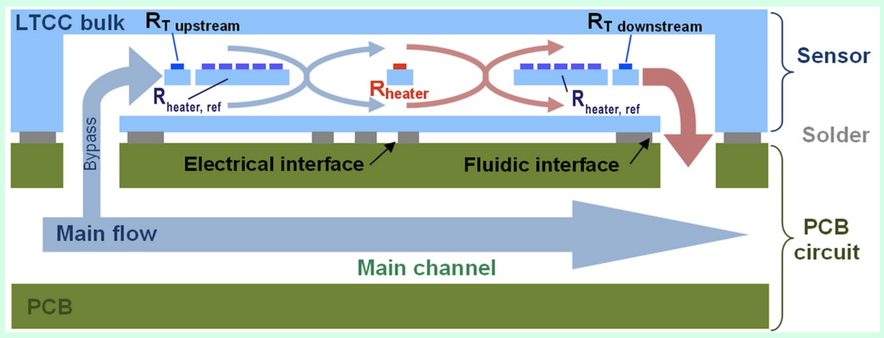
Industrial compressed air multisensor

Applications
- Process control
- Monitoring of valves, circuits, etc. → **better reliability**

Features
- Robust measurement of pressure, flow & temperature
- Solderable as an SMD component onto fluidic boards
- Bypasseable for large flows



Concept for compressed air flow-pressure-temperature multisensor

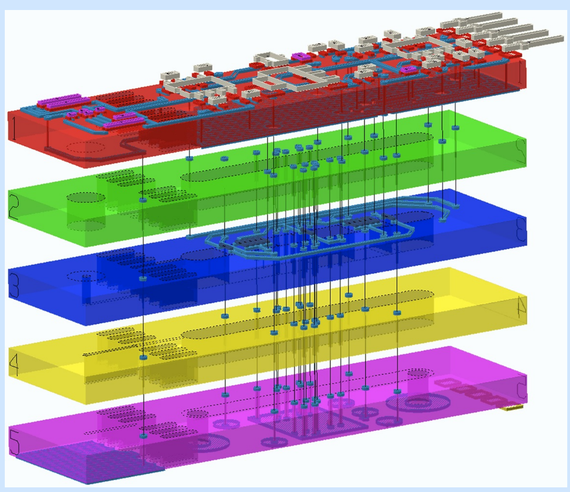


Cross section: soldering & bypassing for large flows

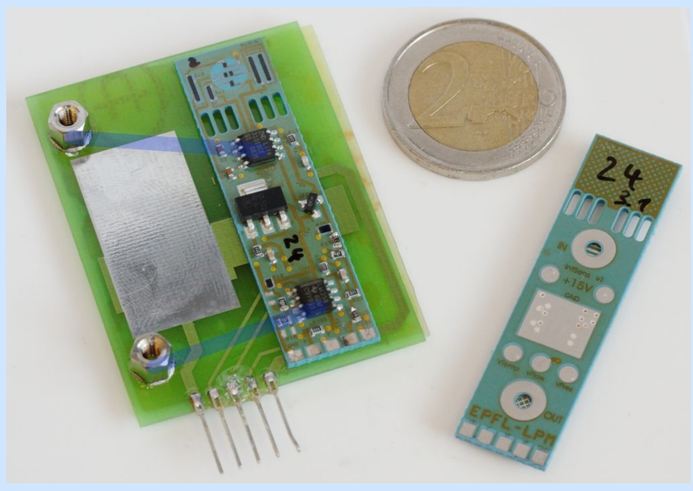
Fabrication : LTCC technology

Advantages
- Thermal, mechanical & chemical stability
- High 3D structuration capability
- Possible to integrate many active sensing materials

Sensing
- Flow : hot-wire anemometer → **PTC thermistors**
- Temperature → extra PTC thermistors
- Pressure → **piezoresistor** bridge on membrane
- + Adapted electronics



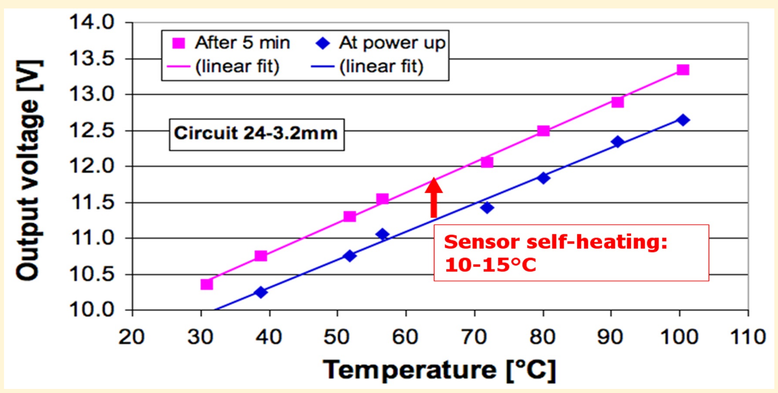
3D view of the 5 used LTCC layers



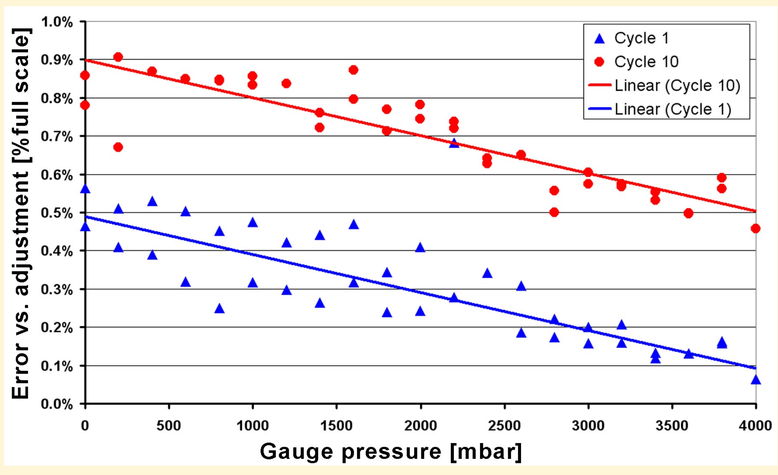
Resulting LTCC multisensor & test board

Results

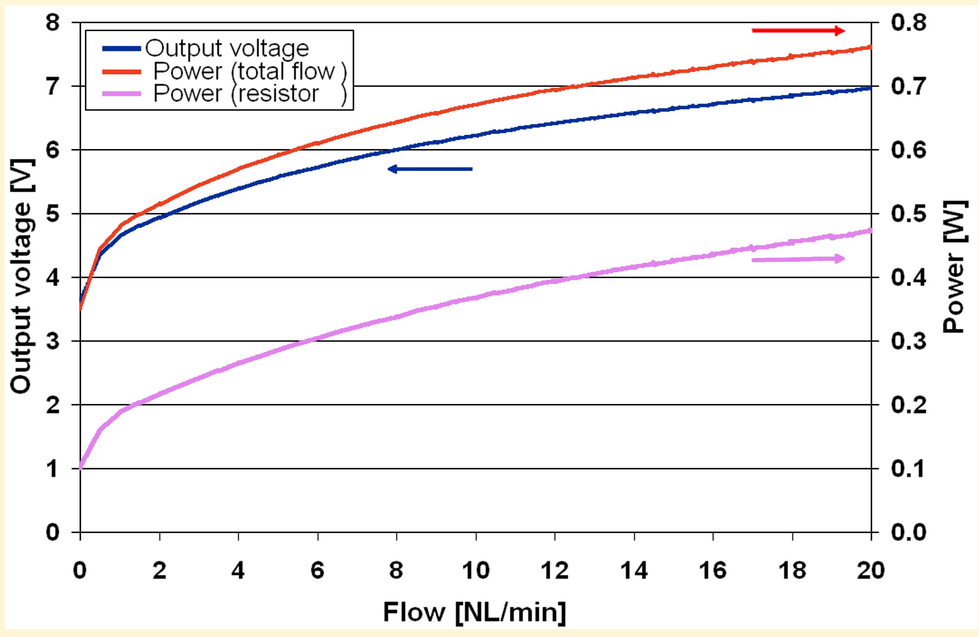
- Very precise pressure output for typical compressed air conditions (≈8 bar)
- Nonlinear flow output suitable for sensing wide ranges
- Temperature signal for diagnostics purposes



Temperature output



Pressure output



Flow sensor output signal

Conclusions

- Robust multisensor for compressed air achieved
- Reliable measurement of pressure, flow & temperature
- Assembly as an "electrofluidic SMD" demonstrated

Outook

- Reduce required power for flow measurement
- **Mixed fluidic / electronic boards**