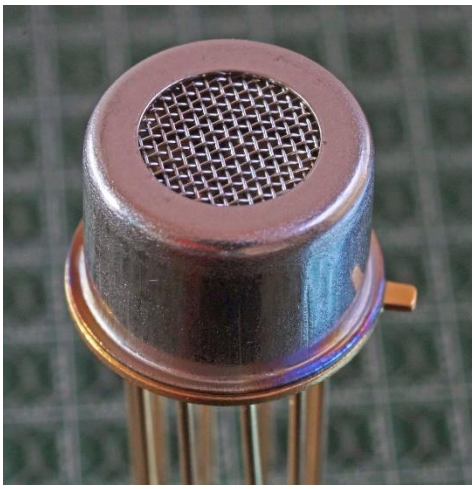
Thermal Conductivity Gauge

The XEN-3920-PRW thermal conductivity gauge measures thermal conductivity of the surrounding gas. Operating on the principle that gases differ in their thermal conductivity, it can be used to measure gas concentration in binary mixtures or quasi-binary mixtures where component gases have different thermal conductivity. It can also be used to measure pressure in vacuum systems.

The sensor chip consists of a silicon frame with 2 silicon-nitride membrane2. In the center of each membrane is a heater, with a thermopile measuring its temperature. The chip measures the thermal conductance between the ambient and the center of the membrane. A silicon cover (Roof) on top of the membrane and a welded cap with filter (W) suppress flow sensitivity.



Features

- Long-term stable analysis of gases in binary and quasi-binary mixtures
- High sensitivity and resolution
- Operating temperature: -250 °C to 150 °C
- Humidity: 0 to 95% RH, non-condensing
- Temperature measurement with Pt100 (P2) or Pt1000 (P3) element
- Negligible flow sensitivity

Technical Specification

Ambient temperature 22 °C and 1 V power supply

Dimensions	
size naked die (mm³)	2.50 x 3.33 x 0.3
Size TO-5 header (mm²)	9 Φ x 6
Length pins (mm)	14
weight on TO-5 (g)	0.72
weight on TO-5 + cap + filter (g)	1.05
Output	
in vacuum at < 1 mPa (V/W)	tbd
in air at 100 kPa (V/W)	42
in air at 10 MPa (V/W)	tbd
in helium at 100 kPa (V/W)	tbd
in helium at 10 MPa (V/W)	tbd
Time constant	
in air (ms)	9
in vacuum (ms)	36
Stability	
short term, 1 day (ppm)	1
long term, 1 year (ppm)	300
Thermal resistance	
membrane (kK/W)	100
membrane + air (kK/W)	23
Maximum heating voltage	
in air (V)	2.5
in vacuum (V)	1

Some Applications

- Hydrogen, helium and natural gas measurement
- Testing of hydrogen systems with helium
- Vacuum measurement in packages & vacuum systems
- Gas concentration measurement

Principle of operation

The XEN-3920 performs a measurement of the thermal resistance between the hot junctions of its thermopiles in the center of the membranes and the cold junctions on the frame of the chip. This is achieved by heating the center of the membranes using the heater resistors. The resulting temperature increase of the center is measured by the thermopiles. The actual temperature increase depends upon the effective thermal resistance between membrane center and ambient, this is influenced by the thermal resistance of the ambient gases.

Housing

The XEN-3920-P2RW or P3RW is available mounted on TO-5, special housings on request. Right membrane indicated by -r, left membrane indicated by -l.

TO-5