Principle of working

The XEN-3920 has two membranes which can be used at the same time. Each membrane has a heater resistance and thermocouples. For measuring gasses the heater needs to be heated up. In this application note we heat up the heater resistance to 40 °C above ambient temperature. This was verified by first measuring the heater resistance in an oven at different temperatures. This way we created a calibration curve for the heater resistance over temperature. In this application note we supply the heater resistance with a constant current to reduce the temperature effects on the heater resistance. We found that supplying 0.9 mA would give the desired 40 °C temperature increase. Figure 1 shows an example of the setup.

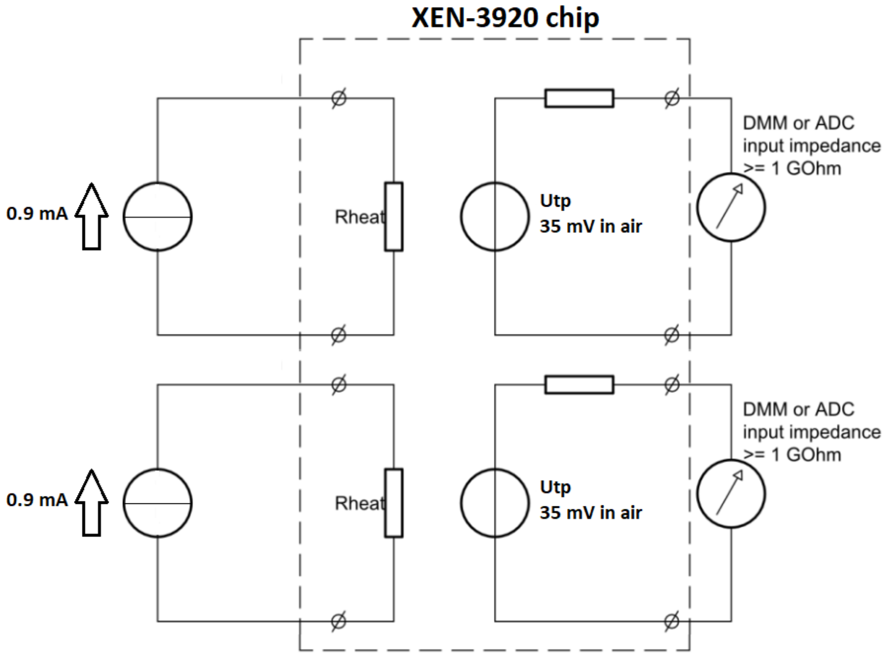

Figure 1: Supplying the XEN-3920 with a constant current of 0.9 mA to obtain a temperature increase of 40 °C of Rheat.

Transfer

The XEN-3920 is able to measure the thermal conductivity of the surrounding gas. This is done by measuring the transfer of the XEN-3920. The transfer of the XEN-3920 is calculated by:

$$Transfer = \frac{Utp}{Iheat \ \times Uheat}$$

Therefore Utp, Iheat and Uheat needs to be measured to obtain the transfer. The value of the resistors of the XEN-3920 can vary from device to device, therefore to be less device depended it is advised to work with the corrected transfer. The corrected transfer is obtained by dividing the value of the transfer by itself at 0 % gas concentration. For example when helium is measured in air then the corrected transfer is obtained by dividing the transfer by the transfer at 100% air.

Measurement results with the XEN-3920:

He in N2		H2 in N2	
Helium (%)	Corrected transfer (V/W)	Hydrogen (%)	Corrected transfer (V/W)
100	0.3252	100	0.2789
95	0.3548	95	0.3000
90	0.3827	90	0.3223
85	0.4120	85	0.3455
80	0.4419	80	0.3697
75	0.4717	75	0.3949
70	0.5023	70	0.4211
65	0.5332	65	0.4486
60	0.5646	60	0.4773
55	0.5965	55	0.5076
50	0.6290	50	0.5395
45	0.6620	45	0.5730
40	0.6959	40	0.6086
35	0.7304	35	0.6462
30	0.7659	30	0.6862
25	0.8020	25	0.7291
20	0.8394	20	0.7751
15	0.8776	15	0.8246
10	0.9170	10	0.8780
5	0.9577	5	0.9364
2	0.9822	2	0.9740
0	1.0000	0	1.0000

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