For reduced pressures, below 100 kPa, the output of the XEN-3880 is very pressure dependent, see the Application Note on Vacuum Measurement.

For elevated pressures (above 100 kPa), the pressure sensitivity of the thermal conductivity of gases is much smaller, and the XEN-3880 has a small sensitivity for pressure.

For nitrogen the influence is relatively large, with a decrease of the transfer (in V/W) of XEN-3880-P2-R-W of about 12% when going from 100 kPa to 10 MPa. Fig. 1 shows the curve up to 7.5 MPa for nitrogen. For helium the influence is much smaller, with a decrease of only about 2% when going from 100 kPa to 10 MPa. For a 50%-50% mixture of helium and nitrogen, a decrease was found of the order of 3%.

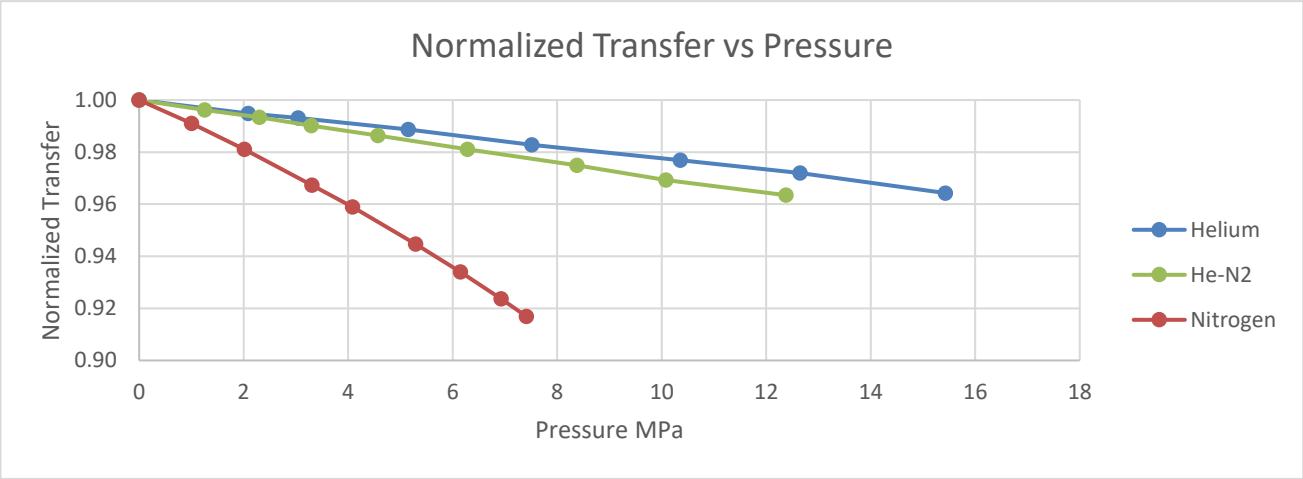

Figure 1: Normalized transfer for XEN-3880-P2-R-W, measured as a function of pressure between 100 kPa and 20 MPa. Vacuum effects below 100 kPa are not taken into account.

For hydrogen, no measurements have been carried out, but the thermal conductivity of hydrogen is reported to increase with pressure from 185 mW/Km at 100 kPa to 193 mW/Km at 10 MPa, an increase of the order of 4%. The decrease in transfer when measuring pure hydrogen at 100 kPa and then at 10 MPa is therefore expected to be about 4% as well.

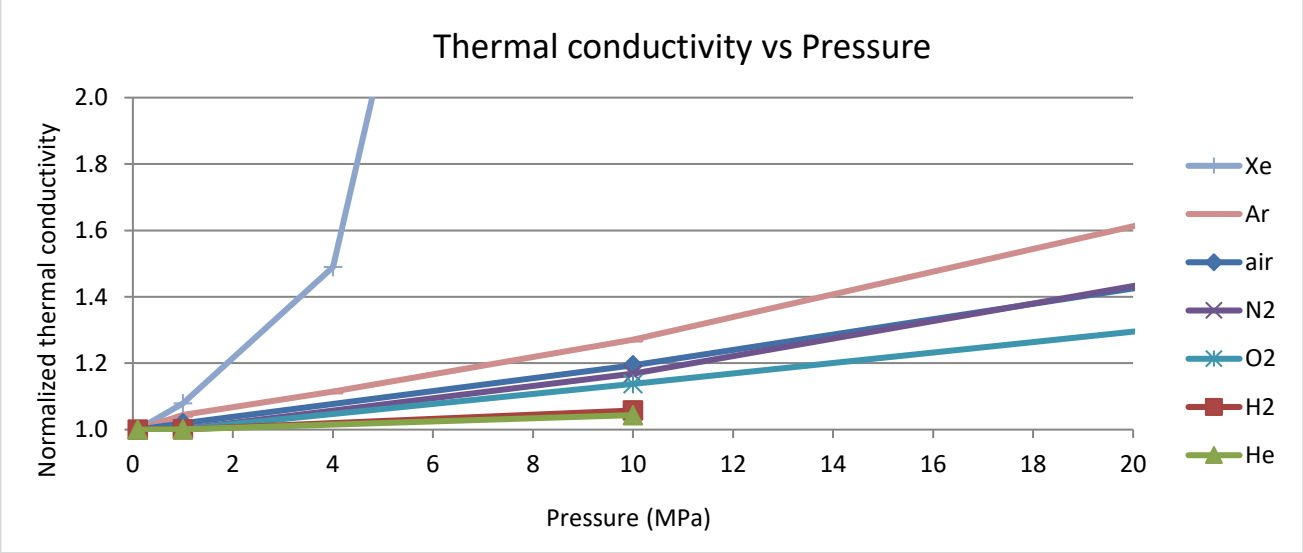

Figure 2: The thermal conductivity of some gases as a function of pressure, normalized to the value at 100 kPa (atmospheric pressure).

Fig. 2 shows the thermal conductivities of some selected gases as a function of pressure, normalized to the value at 100 kPa (atmospheric pressure), and 300 K. If shows that hydrogen and helium have a small dependence on pressure, as expected. Air, oxygen and nitrogen show already a considerably larger dependence.

The effect of pressure on the thermal conductivity of argon is really much larger. At 10 MPa (100 bar) it is almost 30% increased, and it can be expected that the transfer of the XEN-3880 in Argon will be perhaps 20% lower at 10 MPa, compared to 100 kPa. Xenon is a special case, as the critical point of Xenon is around 290 K and 5.8 MPa.