

Correction of the SulfiLogger H₂S sensor signal at pressures different from atmospheric pressure

The SulfiLogger H₂S sensor measures the partial pressure. Partial pressure is, however, not a relevant unit for most applications. Hence, the unit partial pressure is converted into ppm for gas phase measurements and mg/L for water phase measurements.

Partial pressure is converted to ppm as:

$$C_{H_2S} (ppm) = \frac{p_{H_2S}}{p_{total}} \cdot 10^6$$

Where p_{H_2S} is the H₂S partial pressure and p_{total} is the total pressure.

The total pressure is assumed equal to atmospheric pressure $p_{total} = 1 \text{ atm}$

The sensor shows the H₂S concentration (ppm) assuming atmospheric pressure. If the process pressure is different from atmospheric pressure, the H₂S signal can be corrected to reflect the ppm value at the process pressure.

Correcting the sensor signal at pressures different from atmospheric pressure

The actual ppm concentration at the process pressure can be calculated as:

Actual H₂S concentration (ppm) = SulfiLogger H₂S sensor signal (ppm) · Correction factor

$$\text{Correction factor} = \frac{1 \text{ atm}}{\text{total pressure (atm)}} = \frac{1 \text{ atm}}{1 \text{ atm} + x \text{ atm}}$$

Where x is the difference from atmospheric pressure (atm).

Example

If the sensor is installed where the process pressure is 0.5 bar above atmospheric pressure and the sensor is displaying a value of 450 ppm, the signal can be corrected as below:

$$\text{Actual H}_2\text{S concentration (ppm)} = 450 \text{ ppm} \cdot \frac{1 \text{ atm}}{1 \text{ atm} + 0.493462 \text{ atm}} = 301 \text{ ppm}$$

Notes on partial pressure

The total pressure is the sum of the partial pressure exerted by the gases in the mixture. When the total pressure increases, the H₂S partial pressure increases. When the H₂S partial pressure increases, the total pressure increases. As mentioned above, the sensor responds to the H₂S partial pressure.

