Converting
Differential pressure to volumetric flow for SENSO-V and SENSO-V+

Basic formula

$$\dot{V} = K_1 \cdot \sqrt{\frac{2 \times \Delta p}{\rho}}$$

$\dot{V}$ Volumetric flow m^3/s
K_1 Constant m^2
Δp Pressure difference Pa
ρ Air density kg/m^3

Variants

or $$\dot{V}_h = K_3 \cdot \sqrt{\frac{\Delta p}{\rho}}$$

or $$\dot{V}_h = K_2 \cdot \sqrt{\frac{2 \times \Delta p}{\rho}} \quad *$$

$\dot{V}_h$ Volumenstrom m^3/h

$K_2 = K_1 \cdot 3600 \ \frac{m^2 \cdot s}{h}$

$K_3 = K_1 \cdot 3600 \cdot \sqrt{2} \ \frac{m^2 \cdot s}{h} = K_1 \cdot 5091 \frac{m^2 \cdot s}{h}$

* used in SENSO products

The K-Value is provided by the manufacturer of the instrument with which the pressure difference is obtained and is theoretically

$$K_1 = \alpha \cdot \varepsilon \cdot A_d$$

α Orifice coefficient (dimensionless)
ε Expansion coefficient (dimensionless)
A_d Aperture cross-section of the differential pressure device m^2

$$\Delta p = w^2 \cdot \frac{\rho}{2} \Rightarrow w = \sqrt{\frac{2 \times \Delta p}{\rho}}$$

w Velocity m/s

Measurement units

$$Pa = \frac{N}{m^2} = \frac{kg}{s^2 \cdot m}$$

$$N = \frac{kg \cdot m}{s^2}$$