SDP3x for Drones - Differential Pressure Sensors

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- Differential Pressure Sensors SDP3x for Drones

Airspeed Sensor Revolutionizes Workflow with PX4 VTOL Drones

In many drone applications the airspeed is important information for reliable and controlled take off, landing and flight. The airspeed is most effectively measured with a pitot tube and a differential pressure sensor. Recently, PX4 integrated the SDP3x differential pressure sensor into an airspeed sensor development kit for VTOL and fixed wing UAV applications, which is fully integrated with the open source autopilot.

The integration includes a full aerodynamic software compensation model for the sensor and pitot tube making it a plug and play solution.

The development kit is now available at our launching partner Drotek. Buy it now.

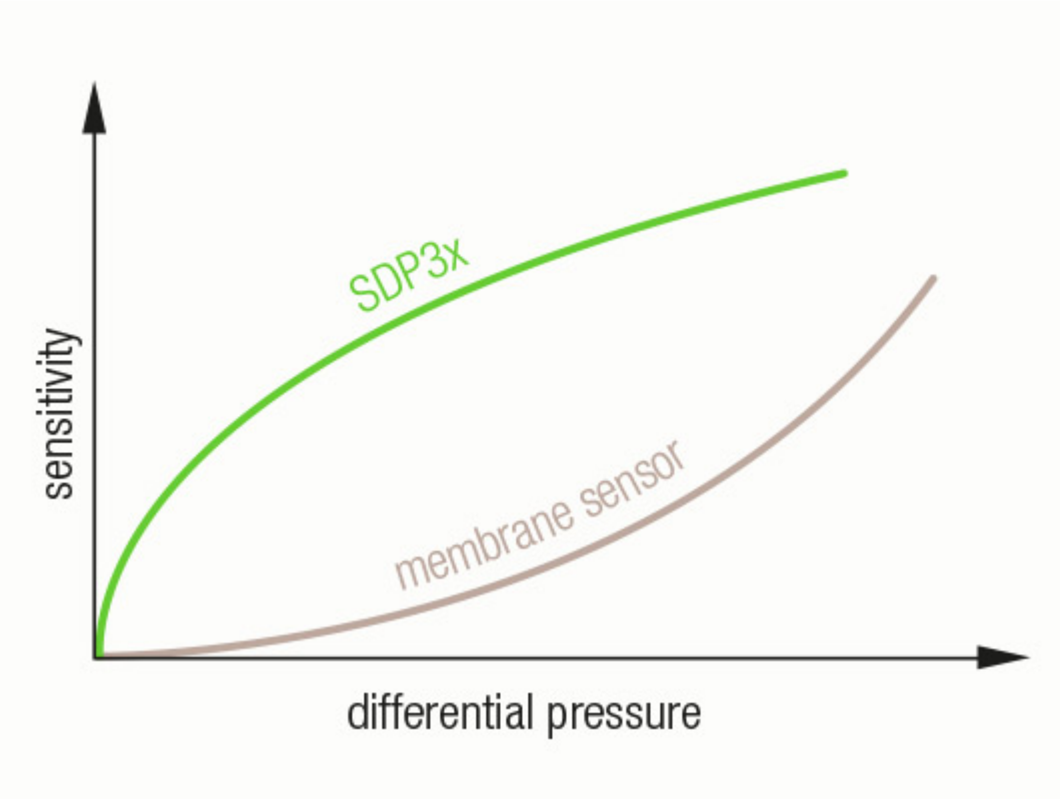
Lorenz Meier, founder and chief architect at PX4-Pro, says about the SDP3x sensor:

"Most airspeed sensors require calibration before every flight to guarantee accuracy, and are not sensitive enough to produce reliable readings at low airspeeds. The fully calibrated and temperature-compensated SDP3x sensor solves these problems and offers unprecedented accuracy and resolution. The calibration-free setup enables instant launch of VTOL drones, dramatically increasing the user experience for end users. And high sensitivity at low airspeeds allows closed-loop control during the transition phase from hovering to forward flight, increasing the reliability and safety of VTOL drones."

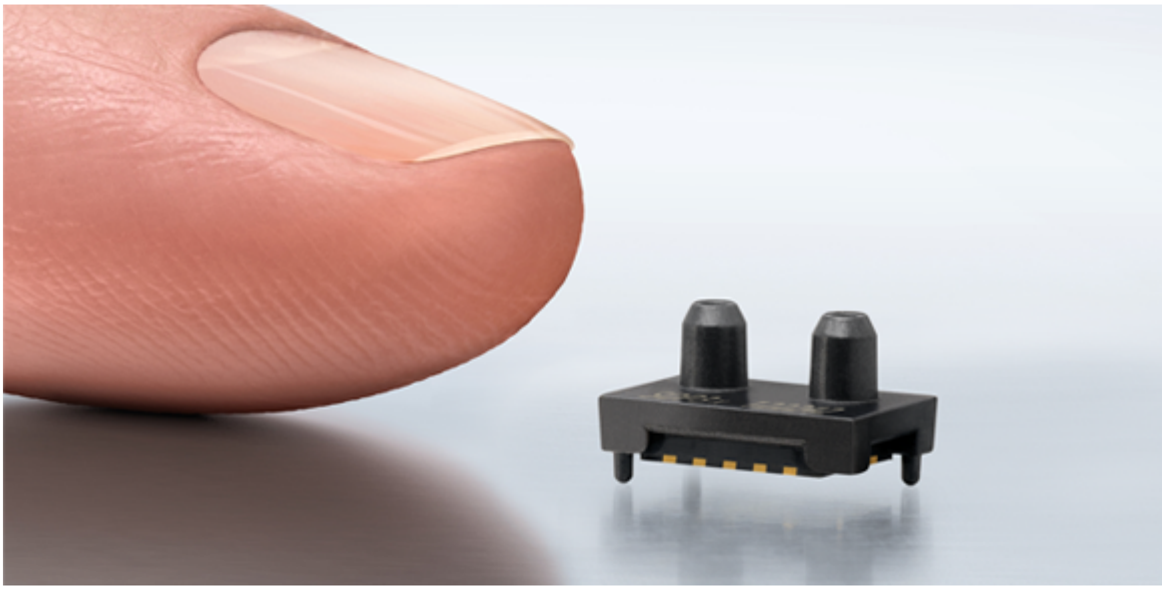
Technical Background

The outstanding performance of the SDP3x sensors is based on Sensirion's CMOSens® Technology, which combines the sensor element, signal processing and digital calibration on a small CMOS chip. The differential pressure is measured by the thermal sensor element using flow-through technology.

The sensitivity at low differential pressures is of extra benefit when using a pitot tube for measuring airspeed, because of the quadratic function of the velocity to the differential pressure.



Comparison of SDP technology versus membrane sensor



Differential Pressure Sensors SDP3x

Highest Sensitivity at Lowest Pressure Differences

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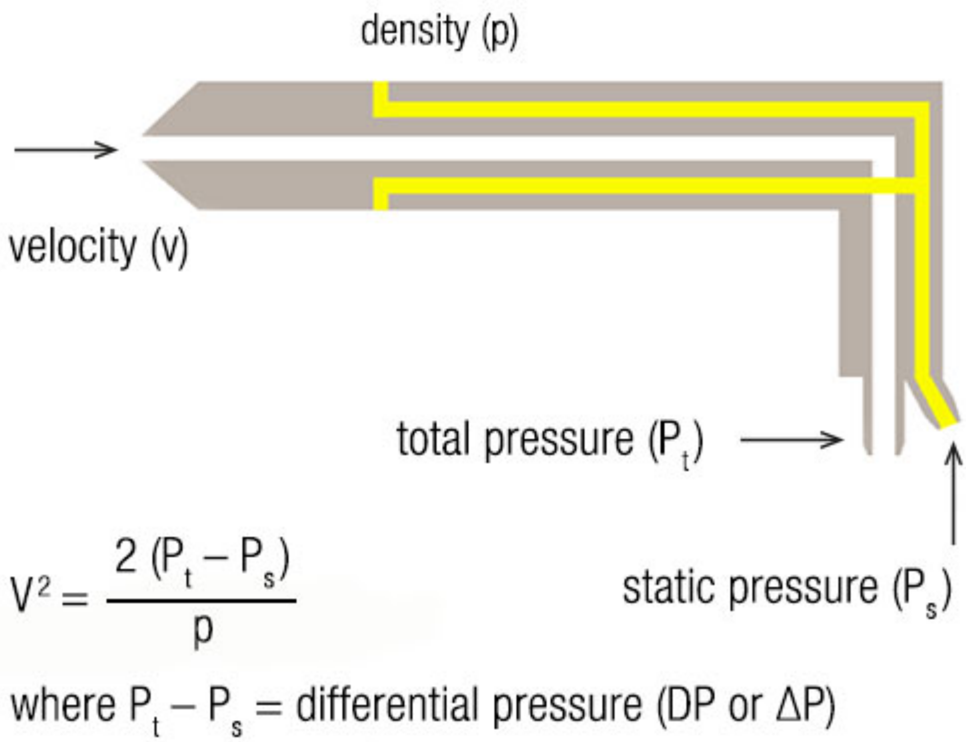
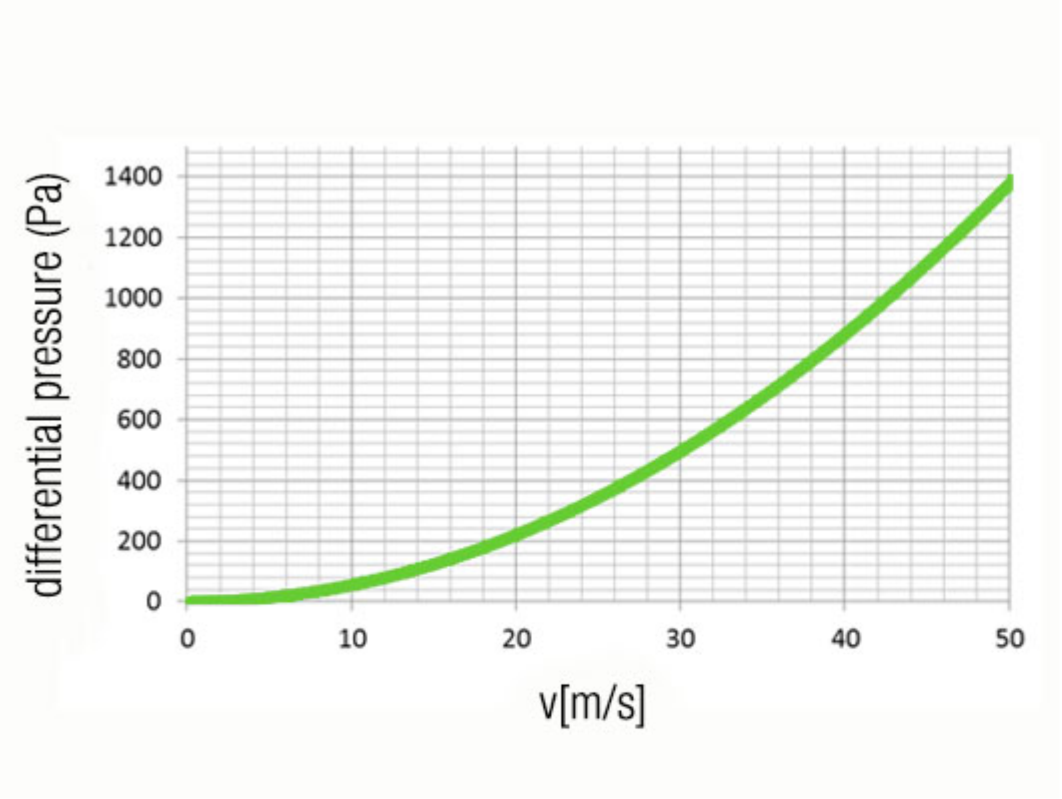


How a pitot tube works



Differential pressure over velocity

Density Compensation

Since the SDP3x uses a different measurement principle than a membrane sensor, a different compensation of the density is required:

$$v = [\frac{p_0}{p}\sqrt{\frac{T}{T_0}}]\sqrt{2\frac{dp_{sensor,DP}}{\rho(p_0,T_0)}}$$

whereas ρ(p_0,T_0) is the air density (1.1289 kg/m3) during calibration at Sensirion with calibration pressure p_0 (966 mbar) and calibration temperature T_0 (298.15 K), while p is the current absolute air pressure (e.g. measured with a barometric absolute pressure sensor), and T the air temperature. For reading out the differential pressure (DP) and temperature from the SDP3x, use command 0x3615.

The SDP3x Versions

- Table Overview Differential Pressure Sensor SDP3x

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