1 Dynamic Differential Pressure Sensor Performance

Table 1: Overview ASP1400 Gas Sensor Performance

Parameter	Condition	Minimum	Typical	Maximum	Units
Differential Pressure					
Principle of measurement	Dynamic mass flow generated by differential pressure				
Dynamic Range	direct measurement	-100		100	Pa
	customer specific solutions		< 3500		Pa
Lowest Detectable Pressure	< 1 Pa		0.002		Pa
Medium	no liquids		Gas		
Calibration gas			Dry air(1)		
Resolution	$\Delta p \approx 100$ Pa, p_{abs}=1.013 bar		0.04		Pa
	$\Delta p < 1$ Pa, p_{abs}=1.013 bar		0.001		Pa
Overpressure Resistance			1	1.5	bar
Gas Flow(2)	air, 100 Pa diff. pressure		0.4		ln/min(3)
Repeatability	Range 0.5 Pa to 100 Pa		0.002% FS (4) 0.08 % m.V.		
Accuracy	dry air / 20 C / 966 mbar		0.05 % FS (5) 1.5 % m.V.		
Offset	20°C		0.004	0.02	% FS
Response Time	depends on resolution setting (see Section 3, Table 2)	142		1280	ms
Operating Temperature		0 [32]		70 [158]	°C [°F]
Ambient Temperature Coefficient	Zero		< 0.002		% FS / °C
	Span		< 0.09		% m.V. / °C
Position sensitivity (inclination)	p_{abs}=1 bar, small air flow		±0.004		% FS
Temperature Sensor	Measures temperature inside the sensor, but not of the surrounding air(6)				
Dynamic Range		0		70	°C
Resolution			0.1		°C
Accuracy		3	2		°C

Note: All data for dry air at 20°C and 966 mbar unless otherwise noted.

(1) Contact us for other gases
(2) Due to dynamic measurement principle (see Figure 4)
(3) 1 ln/min = 1 norm liter per minute = 1 liter/min at 0°C and p = 1013.25 mbar
(4) Error = % of full scale (FS) or % of measured value, whichever is bigger.
(5) Accuracy:
0.05 % of full scale (FS) for measured values between 0-3.3% of full scale (i.e. 0-3.3 Pa) and
1.5 % of measured value (m.V.) for measured values between 3.3-100% of full scale (i.e. 3.3-100 Pa)
(6) The sensors warms up by about 7°C (depending on supply voltage and ventilation).

1.1 Differential Pressure Characteristics

Figure 2 shows the differential pressure vs. the digital output of the ASP1400.

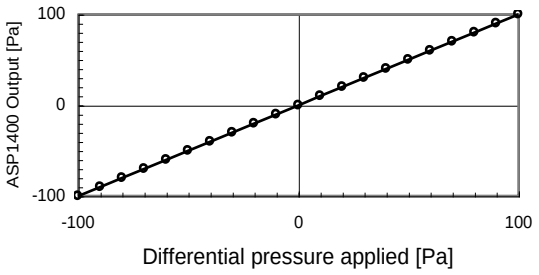

Figure 2: ASP1400 transfer characteristics.

1.2 Sensor Principle and Gas Types

The ASP1400 device measures differential pressure indirectly. The sensor effectively uses a calorimetric method, where fluid motion is converted into thermal information. A heating resistor on a thermally insulated membrane is kept above ambient temperature. In the presence of gas flow, the temperature distribution up- and downstream is disturbed. This asymmetry is then measured. Due to the minimal thermal mass of the membrane, symmetrical arrangement, and accurate temperature measurement, the revolutionary specifications of the ASP1400 devices are achieved.

The above mentioned thermal principle requires information about the gas type to be measured. The standard ASP1400 is calibrated for differential pressure measurements of dry air. Please contact SENSIRION, if you would like to use the sensor for applications with other gases.

In Figure 3 the repeatability of the ASP1400 devices is compared with the repeatability of a typical differential pressure sensor. It emphasizes the superior performance of the ASP1400 device.

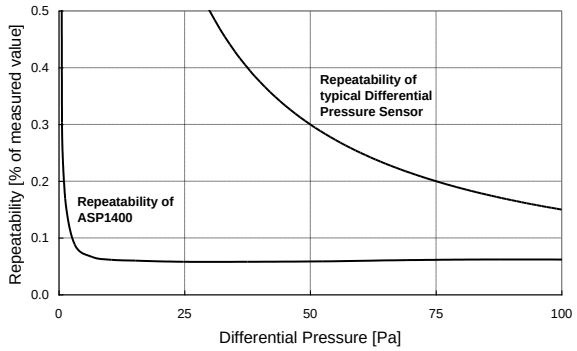

Figure 3: Comparison of the repeatability of the ASP1400 CMOSens® sensor with a typical differential pressure sensor.

1.3 Gas Flow and Pressure Difference

The ASP1400 is calibrated for differential pressure measurements. However, there is a well defined relation between pressure drop and mass flow. This relationship is shown in Figure 4. On request the ASP1400 can also be calibrated to measure mass flow instead of differential pressure (for more details refer to the documentation of the SENSIRION Mass Flow Meter ASF1430).

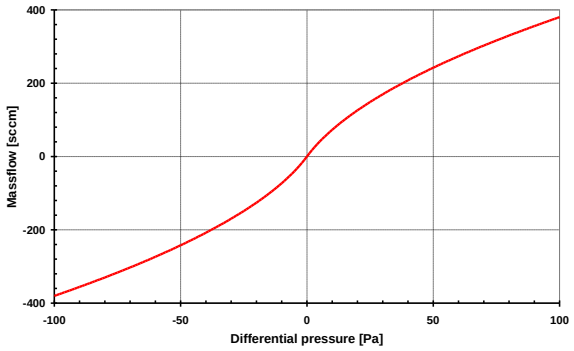

Figure 4: Differential Pressure vs. Mass Flow of ASP1400 device.

1.4 High Precision Differential Pressure Measurement in Bypass solutions

The ASP1400 differential pressure sensor is exceptionally well suited in conjunction with customer specific bypass configurations (see Figure 5). SENSIRION's expertise in packaging and flow measurement combined with the accurate low differential pressure measurement ability of the ASP1400, enables the design of novel bypass solutions over a wide dynamic range.

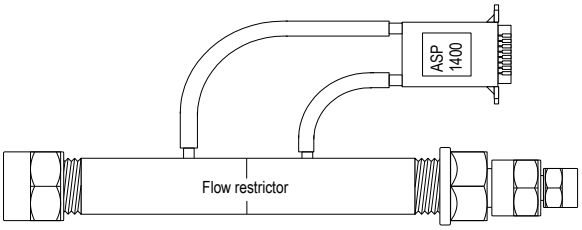

Figure 5: ASP1400 device using an example bypass configuration.