Differential Pressure Sensor Datasheet

General Description

The SDP1000-L025 differential pressure sensors for air covers -62Pa to +62Pa. The SDP1000 is mounted in a rugged housing and is equipped with a standard audio jack for easy usage with SMT data acquisition units.

The SDP1000 differential pressure sensor features a unique dynamic range, zero offset and unsurpassed long term stability. This makes it an ideal fit for mobile applications where it is used in different orientations.

Although the output of the differential pressure sensor is analog, the internal linearization and temperature compensation are performed digitally. This results in a superior accuracy, outstanding resolution (up to 0.05 Pa), and lowest temperature dependence.

Its leading performance is based on Sensirion's proprietary CMOSens® sensor technology which combines the sensor element with amplification and A/D conversion on one single silicon chip. The differential pressure is measured by a thermal sensor element. In contrast to other thermal differential pressure sensors only a very small amount of air is required. This leads to a reliable operation even under harsh conditions. In comparison to membrane based sensors the SDP1000 differential pressure sensor show an extended measurement range, better offset stability and improved reproducibility even at low pressure ranges. In addition the SDP1000 is robust against pressure bursts and shows no sensitivity to the mounting orientation.

The Differential Pressure Sensor is based on a proprietary technology used to reduce output offset and common mode errors. Output offset errors due to change in temperature, warm-up instability, and position sensitivity are significantly reduced when compared to conventional compensation methods. The sensor uses a silicon, micro machined stress concentration enhanced structure to provide a very linear output to measured pressure.

Features

- ±62 Pa (±0.25 INCH H20) range
- Fully bidirectional calibration
- Fully calibrated and temperature compensated
- Excellent accuracy and reproducibility even below 10 Pa
- Not sensitive to mounting orientation
- SMT gateway facilitates zero offset and initialization
- Compatible with SMT WiDAQ and A2 data acquisition units

Typical Applications

- Building science research
  - Air flow direction through building envelope
  - Differential pressure tracking between building envelope and external air
- Environmental controls
- HVAC

Ordering Information	
Differential Pressure Sensor with 6 foot cable and audio termination	SDP-1000-L025-006-AUDIO
Differential Pressure Sensor with 6 foot CAT5 cable	SDP-1000-L025-006-CAT5
Pressure Hose 5'	SDP-HOSE-005

Specifications	
Measurement Range	-62 Pa to +62 Pa
Power	4.75 to 5.25V - Typical 5V
Full Scale Output	4V at +62 Pa 0.2V at -62 Pa
Zero Pressure Output	2.1V
Accuracy	0.5% FS
Repeatability	0.3% measured value
Offset stability	Max ±0.1 Pa/year
Additional error over temperature	0.003 %FS/ºC
Resolution	0.1 Pa
Admissible Overpressure	1 bar
Burst Pressure Capability	2 bars

Environmental	
Media	Air
Operating temperature	-10°C to 60°C
Storage Temperature	-40°C to 80°C
Humidity Limits	0% to 95% RH (non condensing)

Specifications are subject to change without notice

Temperature Compensation

The differential pressure sensor features a sophisticated built-in temperature compensation circuit. The temperature is measured on the CMOSens chip by means of a PTAT bandgap reference temperature sensor. Its data is fed into a compensation circuit which is also integrated on the CMOSens® sensor chip. No external temperature compensation is required.

Altitude Correction

The differential pressure can be compensated by a correction factor according to the following equation:

$Dp_{eff} = Dp_{sensor} * P_{cal} / P_{amb}$

Dp_{eff} is the effective differential pressure
Dp_{sensor} is the pressure read by the sensor
P_{cal} / P_{amb} can be derived from the following table:

Altitude [meter]	Ambient Pressure (P_{amb}) [mbar]	Correction Factor P_{cal} / P_{amb}
0	1013	0.95
250	984	0.98
425	966	1.00
500	958	1.01
750	925	1.04
1500	842	1.15
2250	766	1.26
3000	697	1.38

Figure 1. Altitude Correction Factors

Pressure Sensor Connection to Audio Jacks

Figure 2. Insert audio jack into AUX port on the Mobile WiDAQ. BiG Input 5.

Note: Mobile WiDAQs need to have the Internal RH sensor removed and 5V set to always ON. Contact SMT for details if you want to use this with your Mobile WiDAQ.

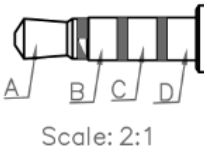


Figure 3. Insert audio jack into voltage port (inputs 3 and 4) on the SMT-A2 BiG Input 6.

No.	Audio Jack	Function
1	A (Red)	+5V
2	B (Black)	Pressure
3	C (Yellow)	Thermistor
4	D (Green)	Ground
5	NC	Shield

Table 1. Audio Cable Pin-out

Pressure Sensor to CAT5 Cable

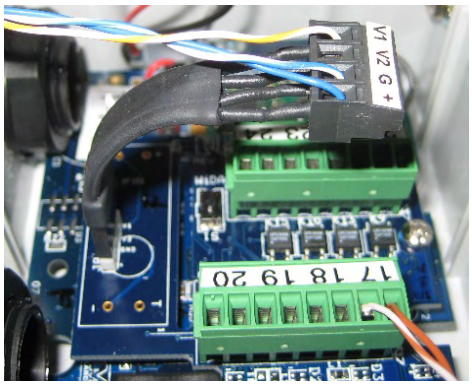


Figure 4. Pressure sensor wiring to Industrial WiDAQ

8 Channel Resistance, 2 Channel Voltage WiDAQ

Only one pressure sensor can be used with this configuration.

WiDAQ Input	CAT5 Cable	Function
17-24		Resistance
+	Blue	+5V
GND	White/Blue	GND
V2	White/Orange	No Connect
V1	White/Orange	Pressure 1

8 Channel Voltage WiDAQ - ***8 pressure sensors***

WiDAQ Input	CAT5 Cable	Function
17,19,21,23	Blue	+5V
18,20,22,24	White/Orange	Pressure X
GND	White/Blue	GND

Mounting

Use two sided tape or Velcro to secure sensor to surface.

Attach the hose securely over the port so that it has a tight fit. Route the hose from the Hi port to the area high-pressure area and the Lo port to the low-pressure area. This is a differential pressure sensor, therefore the difference in pressure will be recorded, if the Hi and Lo ports are interchanged the polarity will be opposite to what is expected.

Hose extensions are not required if one side is already in the desired space.

Sensor hose lengths can be adjusted by cutting them with a scissors.

The recommended hose requires an inner diameter of 3.18 to 3.8mm)(1/8 to 3/20 inch). Due to the dynamic measurement principle, a small air flow is required which leads to a dependence on the length of the hose. Tubes up to 1m show less than 1% error of the measured value.

Length of the connecting hose	Deviation of Measured Value
0.5 m (20 inch)	-0.4%
1.0 m (40 inch)	-0.8%
2.0 m (80 inch)	-1.6%
4.0 m (160 inch)	-3.2%

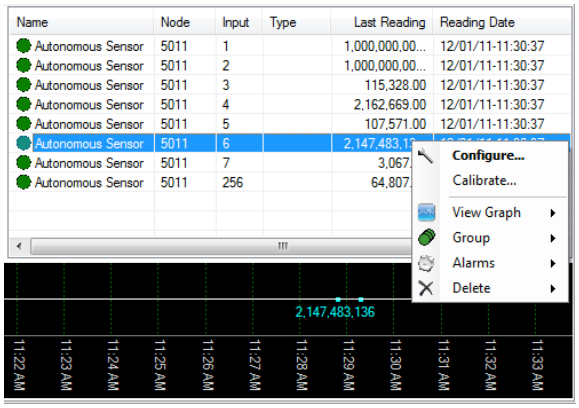
Configuration in BiG and Analytics

Calibration

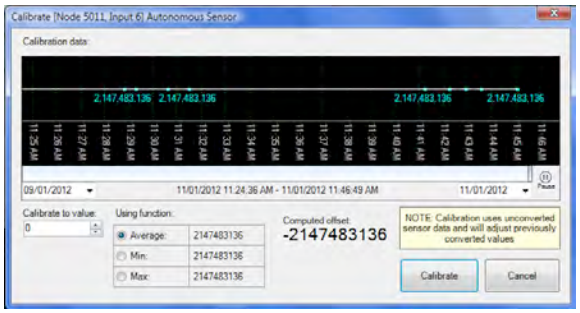
After installation, the sensor will need to be configured and calibrated for optimal accuracy.

- When using the SMT-A2 the pressure sensor will appear as Input 6.
- When using the WiDAQ the pressure sensor will appear as Input 5.

1. Connect one of the supplied pressure hoses between the Hi and Lo ports so the pressure difference will be equal or 0.
2. Allow the A2 to take a few samples. Either wait the timer period or force the A2 to send a reading by selecting Measure.



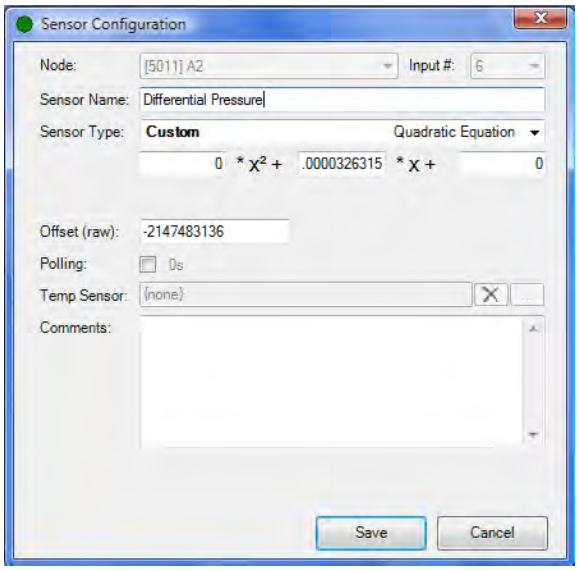
3. Right click on the pressure sensor node in BiG and select calibrate.



4. Adjust the graph so only the values obtained when the ports were looped together are displayed. They should be very close to 2.1V.
5. Select Calibrate.
6. If the sensor is physically disturbed this calibration may need to be done again. Note that all past values are adjusted with respect to the new calibration point.

BiG Configuration

1. Right click on the sensor input in BiG and select Configure.



2. Input the sensor name or location where the sensor is.
3. For the Sensor Type under Custom, select Quadratic Equation
4. Input **0.0000326315** for the *x* value as shown above.
5. The offset will contain an average of the values recorded during the calibration.
6. No temperature sensor is required to be associated for compensation. When using the A2 an integrated thermistor or configuration resistor may appear under Input 5.

Analytics Configuration

1. Once *synchronize* is selected from the Jobs tab. The information on BiG will by transferred to Analytics.
2. Settings can be adjusted on Analytics and will Synchronize with BiG upon the next synchronization.