

## Datasheet SDP8xx-Analog

### Differential Pressure Sensor with Analog Output

- Configurable analog output
- Calibrated and temperature compensated
- Excellent repeatability, no drift



### Product Summary

The SDP800 sensor family is Sensirion's series of differential pressure sensors designed for high-volume applications. The sensors measure the pressure of air and non-aggressive gases with superb accuracy and no offset drift. The sensors cover a pressure range of up to  $\pm 500$  Pa ( $\pm 2$  inch H<sub>2</sub>O /  $\pm 5$  mbar) and deliver outstanding accuracy, also at the lower end of the measuring range.

The SDP800 features an analog ratiometric voltage output, which is configurable to linear or square root by a separate pin. The outstanding performance of these sensors is based on Sensirion's patented CMOSens® sensor technology, which combines the sensor element, signal processing, digital calibration and analog output on a small CMOS chip. The differential pressure is measured by a thermal sensor element using flow-through technology. The well-proven CMOS technology is perfectly suited for high-quality mass production and is the ideal choice for demanding and cost-sensitive OEM applications.

### Benefits of Sensirion's CMOSens® Technology

- High reliability and long-term stability
- Best signal to noise ratio
- Industry-proven technology with a track record of more than 15 years
- Designed for mass production
- High process capability

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## 1. Sensor Performance

### 1.1 Differential Pressure Specification<sup>1</sup>

| Parameter                               | Configuration | SDP806/SDP816-500Pa                                      | SDP806/SDP816-125Pa                                   |
|---|---------------|--|---|
| Measurement range <sup>2</sup>          | Linear        | - 50 to 500 Pa<br>(-0.2 to 2 inH <sub>2</sub> O)         | - 12.5 to 125 Pa<br>(-0.05 to 0.5 inH <sub>2</sub> O) |
|   | Square Root   | - 500 to 500 Pa<br>(-2 to 2 inH <sub>2</sub> O)          | - 125 to 125 Pa<br>(-0.5 to 0.5 inH <sub>2</sub> O)   |
| Zero point accuracy <sup>3,4,5</sup>    |               | 0.1 Pa <sup>5</sup>                                      | 0.08 Pa <sup>5</sup>                                  |
| Span accuracy <sup>3,4,5</sup>          |               | 3% of reading <sup>5</sup>                               | 3% of reading <sup>5</sup>                            |
| Zero point repeatability <sup>4,5</sup> |               | 0.05 Pa <sup>5</sup>                                     | 0.04 Pa <sup>5</sup>                                  |
| Span repeatability <sup>4,5</sup>       |               | 0.5% of reading <sup>5</sup>                             | 0.5% of reading <sup>5</sup>                          |
| Span shift due to temperature variation |               | < 0.5% of reading per 10°C                               | < 0.5% of reading per 10°C                            |
| Offset stability                        |               | < 0.05 Pa/year   | < 0.05 Pa/year  |
| Temperature and pressure compensation   |               | Mass flow compensated differential pressure <sup>6</sup> |   |
| Response time (T <sub>63</sub> )        |               | < 5 ms   |   |
| Internal digital resolution             |               | 16 bit   |   |
| Calibrated for                          |               | Air, N <sub>2</sub>                                      |   |
| Media compatibility                     |               | Air, N <sub>2</sub> , O <sub>2</sub> , non-condensing    |   |
| Calibrated temperature range            |               | -20 °C to +85 °C   |   |

<sup>1</sup> Unless otherwise noted, all sensor specifications are valid at 25°C with VDD = 3.3 V and absolute pressure = 966 mbar.

<sup>2</sup> For other pressure ranges contact Sensirion

<sup>3</sup> Includes repeatability

<sup>4</sup> Total accuracy/repeatability is a sum of zero-point and span accuracy/repeatability.

<sup>5</sup> Output voltage integral non linearity and output voltage noise are not included. Note that the effect of output voltage integral non linearity and output voltage noise on accuracy is highly dependent on the output configuration (linear or square root).

<sup>6</sup> For more information about temperature and pressure compensation consult the selection guide in the differential pressure download center on our website.

## 2. Specifications

### 2.1 Electrical Specifications

| Parameter                                   | Symbol            | Condition | Min.            | Typ. | Max. | Units           | Comments |
|---|-------------------|-----------|-----------------|------|------|-----------------|----------|
| Supply                                      |                   |           |                 |      |      |                 |          |
| Supply Voltage                              | V <sub>DD</sub>   |           | 2.7             |      | 5.5  | V               |          |
| Power-up/down level                         | V <sub>POR</sub>  |           | 2.3             | 2.5  | 2.7  | V               |          |
| Supply current                              | I <sub>DD</sub>   |           |                 | 3.8  | 5.5  | mA              |          |
| Ratiometric analog voltage output           |                   |           |                 |      |      |                 |          |
| Output range                                |                   |           | 10%             |      | 90%  | V <sub>DD</sub> |          |
| Resistive load to GND                       |                   |           | 10 <sup>1</sup> | 100  |      | kOhm            |          |
| Resistive load to VDD                       |                   |           | 1000            |      |      | kOhm            |          |
| Capacitive load                             | C <sub>load</sub> |           |                 |      | 100  | nF              |          |
| Output voltage Integral Non Linearity (INL) |                   |           |                 |      | 5    | mV              |          |
| Output voltage noise (RMS)                  |                   |           |                 | 0.5  |      | mV              |          |

### 2.2 Timing Specifications

| Parameter     | Symbol          | Condition | Min. | Typ. | Max. | Units | Comments                           |
|---------------|-----------------|-----------|------|------|------|-------|------------------------------------|
| Power-up time | t <sub>PU</sub> |           |      |      | 25   | ms    | Time to first reliable measurement |

### 2.3 Mechanical Specifications

| Parameter              | Symbol             | Condition | Min. | Typ. | Max. | Units | Comments |
|------------------------|--------------------|-----------|------|------|------|-------|----------|
| Allowable overpressure | P <sub>max</sub>   |           |      |      | 1    | bar   |          |
| Rated burst pressure   | P <sub>burst</sub> |           | 5    |      |      | bar   |          |
| Weight                 | W                  |           |      |      | 6    | g     |          |

### 2.4 Materials

| Parameter        |   |
|------------------|---|
| Wetted materials | PBT (polybutylene terephthalate), glass (silicon nitride, silicon oxide), silicon, gold, FR4, silicone as static sealing, epoxy, copper alloy, lead-free solder |
| REACH, RoHS      | REACH and RoHS compliant  |

### 2.5 Absolute Maximum Ratings

| Parameter                                | Rating                       | Units |
|--|------------------------------|-------|
| Supply Voltage V <sub>DD</sub>           | -0.3 to 5.5                  | V     |
| Max Voltage on pins (Inputs)             | -0.3 to V <sub>DD</sub> +0.3 | V     |
| Input current on any pin                 | ±70                          | mA    |
| Operating temperature range <sup>2</sup> | -40 to +85                   | °C    |
| Storage temperature range                | -40 to +85                   | °C    |
| Max. humidity for long term exposure     | 40°C dew point               |       |
| ESD HBM (human body model)               | 2                            | kV    |

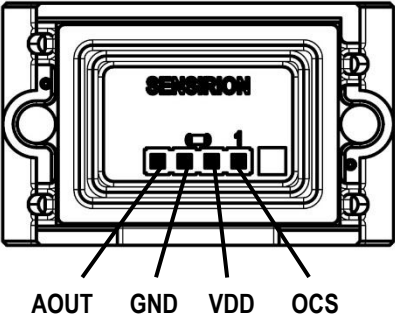
<sup>1</sup> For a resistive load to GND less than 100kOhm a 1nF capacitor to GND on the AOUI is recommended

<sup>2</sup> For Air and N<sub>2</sub>. Long term exposure to (high concentrations of) O<sub>2</sub> at high temperatures can reduce the product lifetime

### 3. Pin Assignment

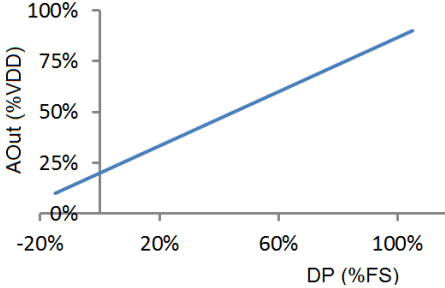
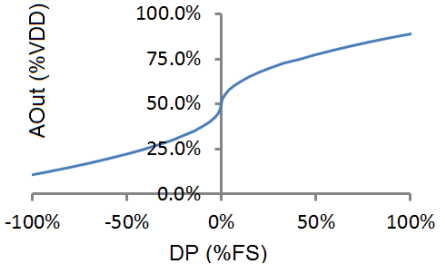
The pin assignments of the SDP8xx-Analog can be found in *Table 1*.

| Pin no. | Name | Description                       |
|---------|------|-----------------------------------|
| 1       | OCS  | Output curve selection input      |
| 2       | VDD  | VDD Supply                        |
| 3       | GND  | Connect to ground                 |
| 4       | AOut | Ratiometric analog voltage output |



**Table 1:** SDP8xx-Analog pin assignment (bottom view)

#### 3.1 OCS: Output Curve Selection Input

| Config.     | Polarity   | Description  | Conversion to physical values<br>AOut[V], VDD[V], Differential Pressure (DP) [Pa] |  |
|-------------|------------|--|---|--|
| Linear      | Low (GND)  | Analog output is configured as a linear output. The sensor is not fully bi-directional in this configuration: -10% full-scale to 100% full scale.    | 500Pa   | $DP = \frac{750 \cdot AOut}{VDD} - 150$  |
|             |            |  | 125Pa   | $DP = \frac{190 \cdot AOut}{VDD} - 38$   |
| Square Root | High (VDD) | Analog output is a fully bi-directional output with square root conversion. The benefits are that the bidirectional output has a more stable zero point and higher sensitivity at lower pressures.  | 500Pa   | $DP = \text{sign}\left(\frac{AOut}{VDD} - 0.5\right) \cdot \left(\frac{AOut}{VDD \cdot 0.4} - 1.25\right)^2 \cdot 525$ |
|             |            |  | 125Pa   | $DP = \text{sign}\left(\frac{AOut}{VDD} - 0.5\right) \cdot \left(\frac{AOut}{VDD \cdot 0.4} - 1.25\right)^2 \cdot 133$ |

#### 3.2 AOut Pin

The AOut pin gives out an analog ratiometric voltage, representing the measured differential pressure value. Please note the resistive and capacitive loads as mentioned in section 2.1.

Formulas for converting AOut [V] to differential pressure [Pa] can be found in section 3.1.

## 4. Package Outline

### 4.1 Dimensions SDP80x – Manifold Connection

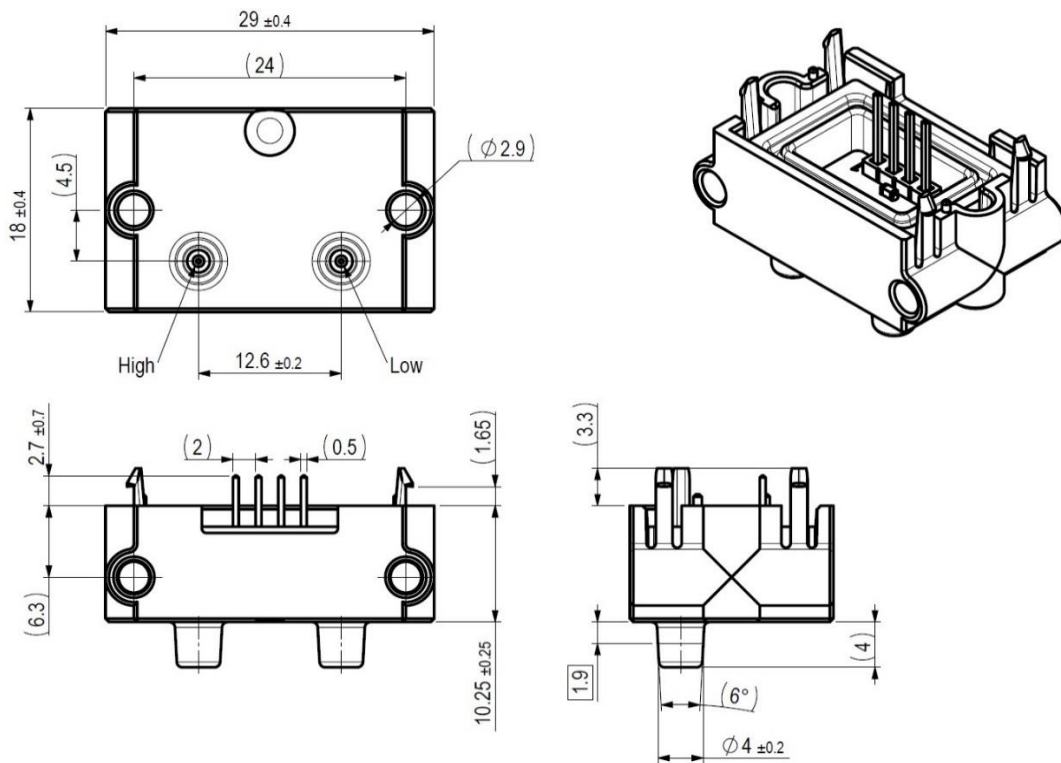


Figure 1: SDP80x. All dimensions in mm.

### 4.2 Dimensions SDP81x – Tube Connection

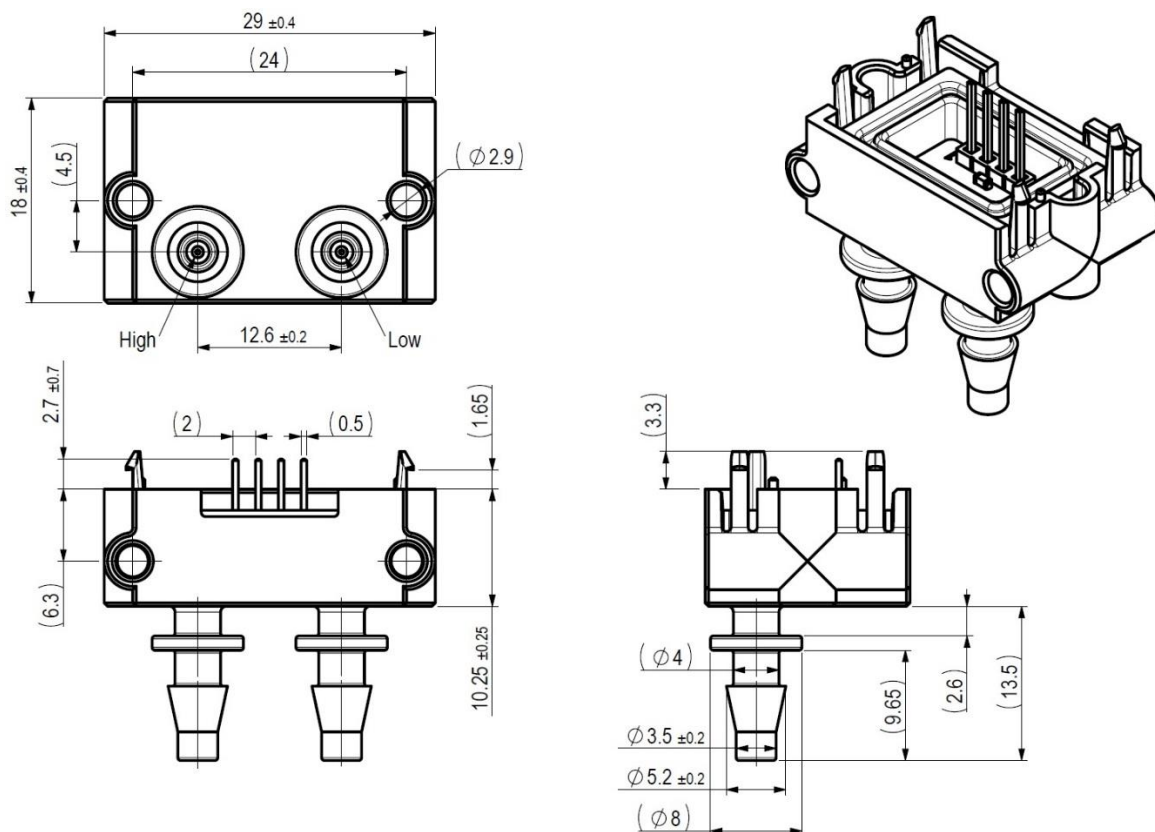
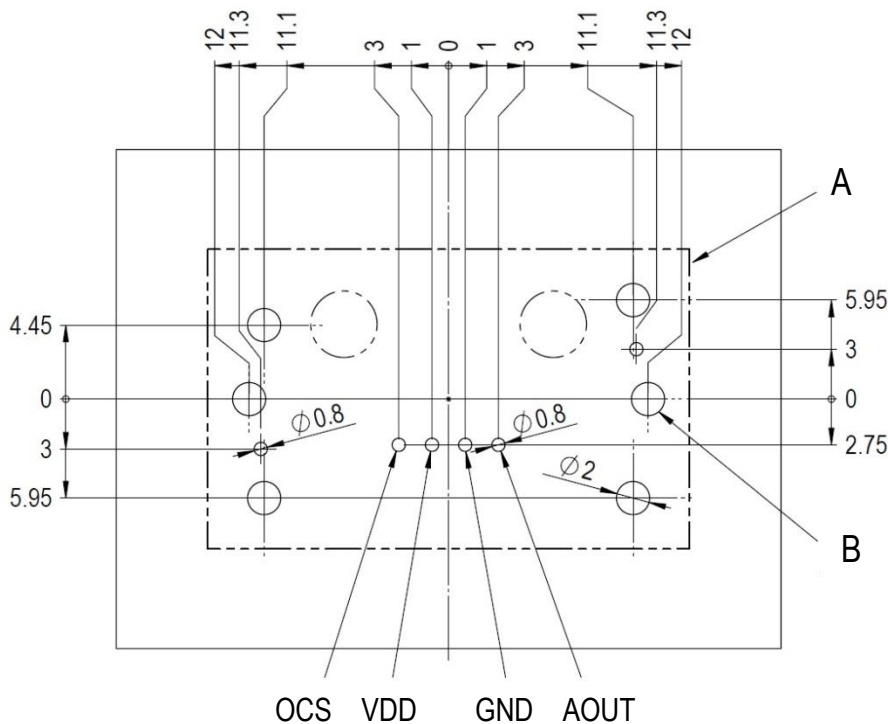


Figure 2: SDP81x. All dimensions in mm.

### 4.3 Footprint



**Figure 3:** Footprint for PCB mounting (top view = sensor side). All dimensions in mm.

A: Overall sensor dimensions

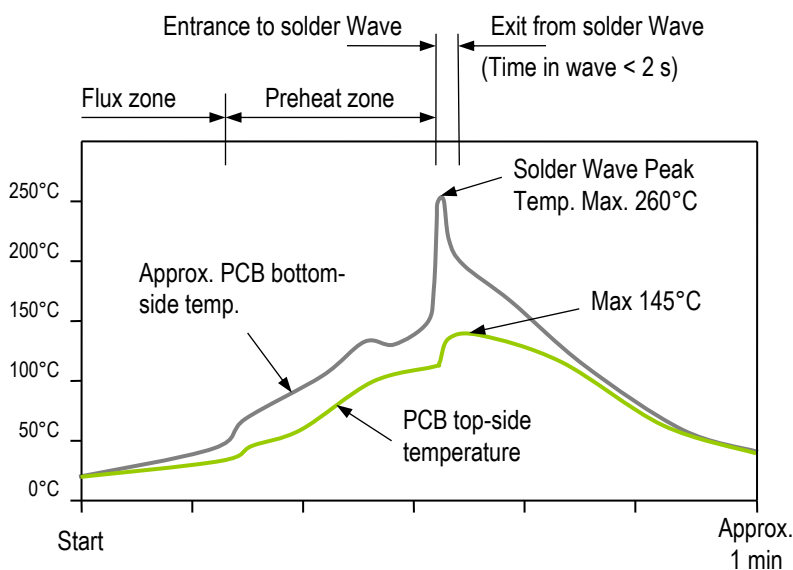
B: Holes for additional mounting screws (optional)

In case the sensor is not mounted on a PCB and is connected with a cable the SDP800 series cap is recommended.

### 5. Soldering

Standard wave soldering systems may be used for soldering SDP800 series sensors. Reflow soldering is **not** feasible and may damage the sensor.

The sensor ports must be protected from solder splash and flux during soldering. *Figure 4* shows an appropriate temperature profile with maximum temperature values.



**Figure 4:** Suitable wave soldering profile.

The characteristics of wave soldering machines vary, so any soldering setup must be tested before production use.

## 6. Shipping Package

SDP8xx are shipped in trays of 80pcs. The tray dimension is 355mm x 255mm x 21.5mm. By piling them up, the height per tray can be considered as 19mm.

## 7. Ordering Information

Use the part names and item numbers shown in the following table when ordering SDP8xx differential pressure sensor. For the latest product information and local distributors, visit [www.sensirion.com](http://www.sensirion.com).

| Part name    | Description / Output           | Differential Pressure<br>Temperature Compensation | Product number |
|--------------|--------------------------------|---|----------------|
| SDP806-500Pa | Manifold mount, 500Pa, Analog  | Mass Flow   | 1-101504-01    |
| SDP816-500Pa | Tube connection, 500Pa, Analog | Mass Flow   | 1-101595-01    |
| SDP806-125Pa | Manifold mount, 125Pa, Analog  | Mass Flow   | 1-101598-01    |
| SDP816-125Pa | Tube connection, 125Pa, Analog | Mass Flow   | 1-101596-01    |

## Revision History

| Date       | Author | Version | Changes  |
|------------|--------|---------|----------|
| 21.03.2018 | ANB    | V1      | Released |
|            |        |         |          |

## Important Notices

### Warning, personal injury

**Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury (including death). Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the datasheet and application notes. Failure to comply with these instructions could result in death or serious injury.**

If the Buyer shall purchase or use SENSIRION products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless SENSIRION and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SENSIRION shall be allegedly negligent with respect to the design or the manufacture of the product.

### ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.

See application note "Handling Instructions" for more information.

### Warranty

SENSIRION warrants solely to the original purchaser of this product for a period of 12 months (one year) from the date of delivery that this product shall be of the quality, material and workmanship defined in SENSIRION's published specifications of the product. Within such period, if proven to be defective, SENSIRION shall repair and/or replace this product, in SENSIRION's discretion, free of charge to the Buyer, provided that:

- notice in writing describing the defects shall be given to SENSIRION within fourteen (14) days after their appearance;

- such defects shall be found, to SENSIRION's reasonable satisfaction, to have arisen from SENSIRION's faulty design, material, or workmanship;
- the defective product shall be returned to SENSIRION's factory at the Buyer's expense; and
- the warranty period for any repaired or replaced product shall be limited to the unexpired portion of the original period.

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