# LOW PRESSURE RANGE SENSOR WITH COMPENSATED OUTPUT: SPD0.3GDsil

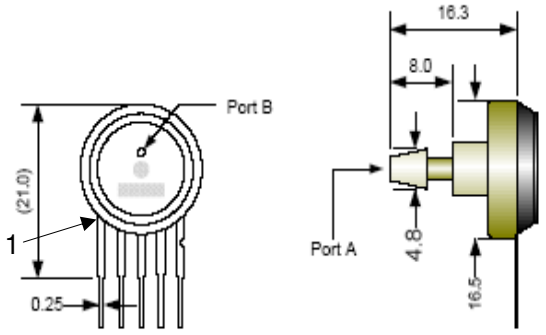
This Smartec pressure sensor has an amplified analogue output. The sensor is compensated for offset, sensitivity, temperature drift and nonlinearity. The sensor has a range of 0.3 PSI FS and the output is Digital. Other pressure ranges (from 0.3 to 100 psi) on request.

## Electrical Characteristics

**Performance characteristic @ Vcc = 5 V and 25 °C.**

| Parameter | Min | Typ | Max | Units. |
|---|---|---|---|---|
| Supply Voltage | 2.7 | 5 | 5.25 | V |
| Supply Current | | - | 2.0 | mA |
| Pressure range | 0 | | 0.3 | psi |
| Zero Output | | 0666 | | Hex |
| Span Output(ratiometric) | | 3996 | | Hex |
| Accuracy (all errors included) | | ±1.8 | | %FS+1LSB |
| Linearity | | ±••• | | %FS |
| Response time | | 1 | | ms |
| Pressure overload | | | 5x | psi |
| Temperature compensating | 0 | | 50 | °C |
| Storage temperature | -40 | | 125 | °C |

Wetted materials are:




**Dimensions in mm**

| Pin# | Description |
|---|---|
| 1 | **Gnd** |
| 2 | **Vcc** |
| 3 | **Out** |
| 4 | **Gnd** |
| 5 | **Gnd** |

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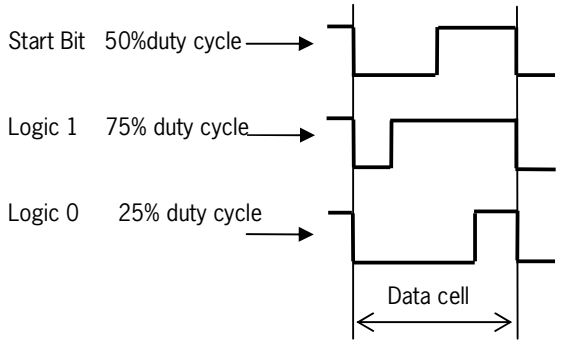
## Hardware Communications

In the table below the hardware output specifications are depicted.

| Output Parameter | Min | Typ | Max | Unit | Remarks |
|---|---|---|---|---|---|
| Rise time | | | 9 | µs | |
| load Capacitance | 0 | 1 | 15 | nF | |
| Voltage level-low | | 0 | 0,2x | Vcc | CMOS driver |
| Voltage level high | 0,8x | 1x | | Vcc | with respect to Vcc |
| ESD protection | | | >4000 | V | for all pins |

It is advised to apply a 100nF capacitor between Vdd and Vss.

The digital interface protocol is based on bit serial manchestercode output. This represents a signal duty cycle of 75% is a logical 1 and a duty cycle of 25% represents a logical 0. Below in little drawing the manchestercode is depicted.




## Output format

The output of the sensor is a two byte word. The first byte contains the most significant 6 bits of the 14 bit output word and the second byte represent the least 8 significant bits of the 14 bits output. The first two bits of the first byte are zero. The format of the pressure sensor output is depicted below:

### Digital pressure sensor output a two bytes package


**Data byte –high** **Data byte –low**

S Start Bit

X Data Bit

P Parity Bit

**Between the two data bytes there is a stop bit (always "1") with the length of half of the data cell (not drawn)**

The transmission speed depends on the update rate and ranges up to1 KHz.

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The software has to determine the digital output speed by the “Start Bit”. This Start bit is 50% low and 50% high. Based on this in formation the speed of the incoming data can be interpreted. The parity is defined as even meaning in case the number of 1’s in the word is even the parity is zero and in case the number is odd the parity bit is 1.
Between the high and lower byte there is a stop bit, level 1, with the length of half the data cell (not drawn in picture).

## From 14 bits incoming data to pressure value.

The digital SPD series pressure sensors are calibrated to a straight line transfer function between the incoming pressure and the outgoing digital word. The pressure can easily be calculated from the transfer function. Below is explained how the pressure can be derived from the 14-bits data word.

The pressure is presented as a 14-bits digital word. The digital word is between 0 and 3FFF in Hexadecimal or from 0 to 16383 in decimal. For the ease of calculation we use only the decimal presentation.

In general the upper 10% and the lower 10% of the numeric range of the 14 bits are outside the pressure range.
To make it more clear for the user two examples are given how to calculate the relation between pressure and digital output.

## 0.3 psi sensor.

The relation between the pressure and the output digital word can be calculated as given below:

In case a 0 – 0.3 psi sensor the lower end of the scale will be hex 0666 or decimal 1638 ( = 10% of the full scale of 16383 and the 0.3 psi value will be hex 3996 or dec14,742 (= 90% of 16,383)
This means the 0.3 psi range will be transferred to 13,104 decimal values (= 14,742 – 1683). This means each psi will be equal to 13,104 dec points
The transfer function can be determined by the formula below.

Ouput (dec) = Pressure (psi) X 13,104 + 1,683

or

$$\text{Pressure (psi)} = \frac{\text{Output (dec)} - 1{,}683}{13{,}104}$$

We always advise to limit the transfer from 10 to 90% of the binary range. This means an over- and under-pressure can be detected.

## Order Code:

**SPD0.3GDsil** 0.3 PSI Gauge sensor with serial digital output.
(For other pressure range please contact your distributor)