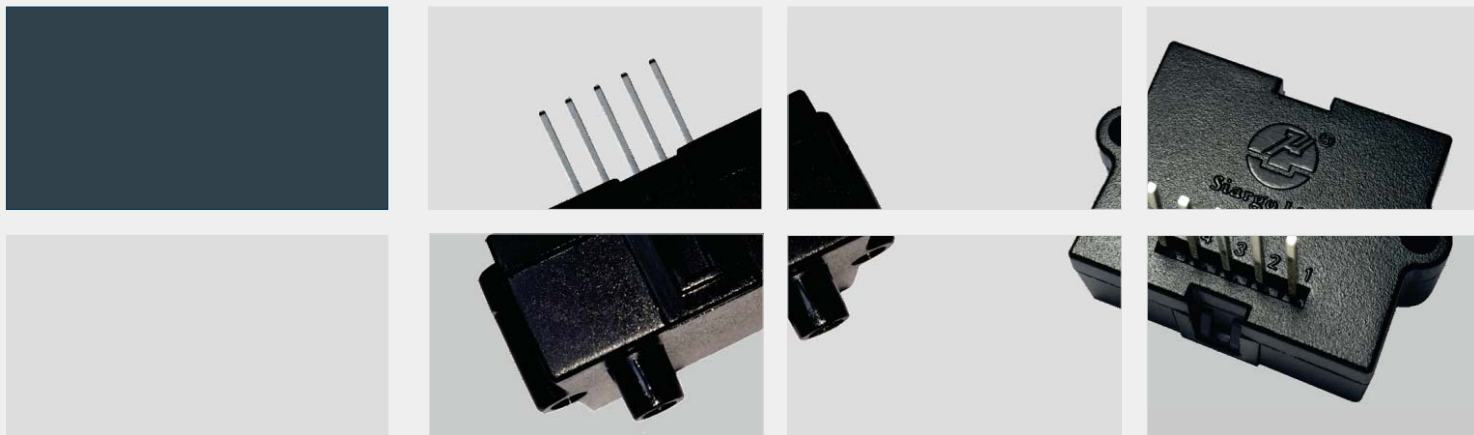




Siargo Ltd.



# Model FSP1000

SIARGO MEMS FLOW SENSING PRODUCTS

**MEMS digital differential pressure sensor**

VA.0



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Siargo Ltd.

# MEMS Digital Differential Pressure Sensor

FSP1000 Series

## User Manual

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# MEMS Digital Differential Pressure Sensor

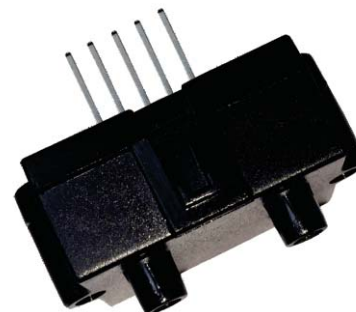


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## Model FSP1000

### Features

- Designed for applications in HVAC and CPAP equipment
- High sensitivity at low differential pressure
- Temperature compensated and altitude independent
- Digital and analog linear output with fast response time
- Small form factor and low power consumption



## 1. Sensor Performance

### 1.1 Performance Specifications

All data unless otherwise noted apply for measurement conditions: air, 20 °C, 101.325 kPa absolute pressure, in a fixed flow channel of 8mm in diameter.

Pressure range	$\pm 250, \pm 500$	Pa
	$\pm 1.0, \pm 2.0$	inch H <sub>2</sub> O
Supply voltage	3.0 ~ 3.6	Vdc
Output	Linear, Analog/ I <sup>2</sup> C	
Output volatage	0.4 ~ 2.4	Vdc
Output resolution	12	bit
I <sup>2</sup> C bus clock frequency	100	kHz
I <sup>2</sup> C addresses	Read 0x03; Write 0x02	
Output pin	5 Pin header	
Response time	5.0	msec
Pneumatic flow resistance	<95 ml/min @500Pa	
Span accuracy	$\pm(2.0+0.2FS)$	%
Span repeatability	$\pm 0.5$	%
Span temperature shift	<0.3	% /10°C
Compensated temperature	-5 ~ +65	°C
Offset tolerance	$\pm 0.5$	Pa
Offset long term stability	0.1	Pa/year
Offset repeatability	$\pm 0.1$	Pa
Altitude correction	Null, fully compensated	
Storage temperature	-40 ~ +85	°C
Pressure rating	2.0	bar
Humidity	0 ~ 100 (no condensation)	%RH
Warming up time	<50	msec
Vibration	20g; MIL-STD-883E, Method 2002.4.	
Compliance	RoHS and REACH	

**Note:** customizable flow range and others are available upon requests.

## 1.2 Flow Characteristics

The FSP1000 provides a linear analog output. The typical output characteristics of FSP1000-250 illustrated in Figure 1.1. The data are obtained at 3.0 Vdc supply.

Differential pressure	Typical analog output
Pa	mV
-250	400
-200	600
-150	800
-100	1000
-50	1200
0	1400
50	1600
100	1800
150	2000
200	2200
250	2400

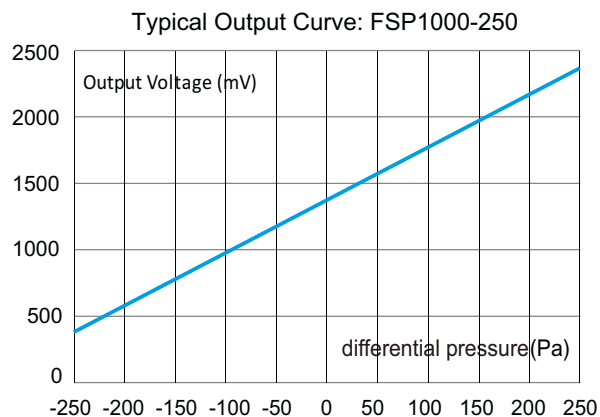
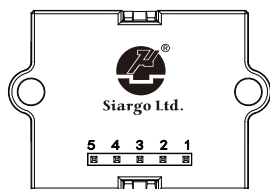


Figure 1.1: The typical analog output curve

## 2. Electrical Interface

### 2.1 Pin Definition

The FSP1000 provides a 5-pin electrical interface. The sensor pin configuration is shown in Figure 2.1.



Pin #	Definition
1	SDA (I <sup>2</sup> C)
2	Analog output (+)
3	Power supply (+)
4	GND, ground (-)
5	SCL (I <sup>2</sup> C)

Figure 2.1: Pin configuration.

### 2.2 Pin Description

**VCC and GND:** The FSP1000 requires a power supply of 3.0~3.6 Vdc. The voltage is internally filtered and regulated to power the circuit. The sensor consumes less than 10 mA normally but the minimum supply current must be larger than 10 mA for stable performance.

**Vout:** The analog output pin.

**SDA and SCL:** For I<sup>2</sup>C, please contact Siargo for protocol.



### 3. Mechanical Dimensions and Mountings

The FSP1000 provides two mounting holes for easy installation. Be sure to use the sensor by current direction.(P1 is inlet and P2 is outlet of the gases.) The sensor dimensions are shown in Figure 3.1.

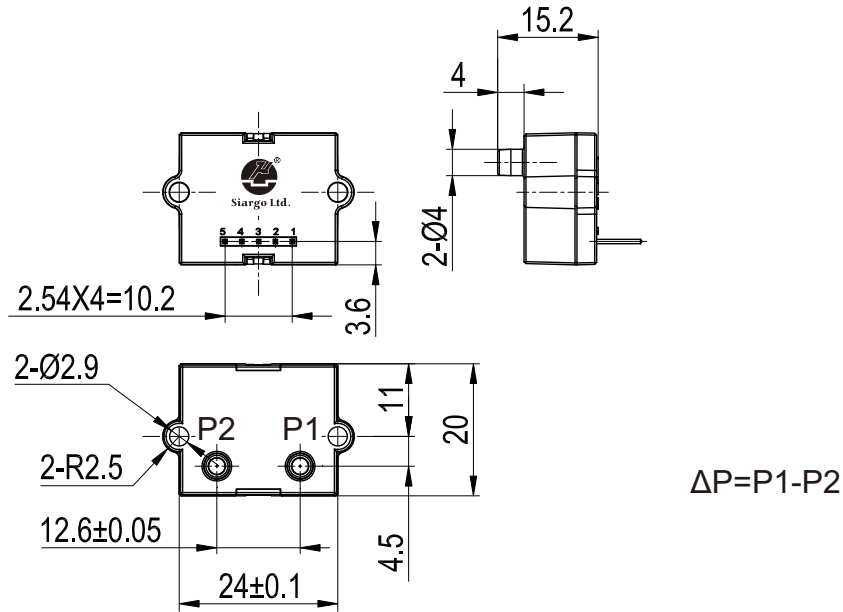
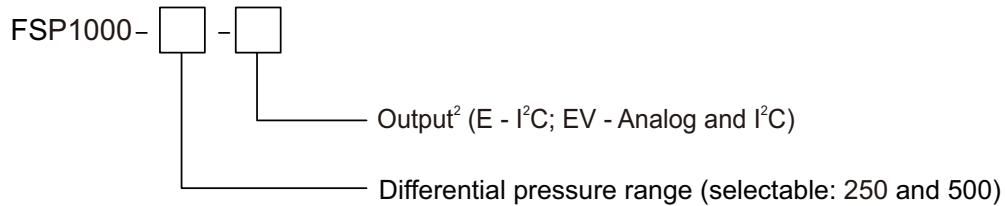


Figure 3.1: Mechanical dimensions.

### 4. Ordering Guide

#### 4.1 Sensor Selection

The sensor part number is composed of the model number and output format. Refer to the followings for details.



1 Differential pressure range number only, for example, 250 meaning differential pressure range of ±250 Pa.  
 2 The sensor shipped with I<sup>2</sup>C. Analog output is optional.

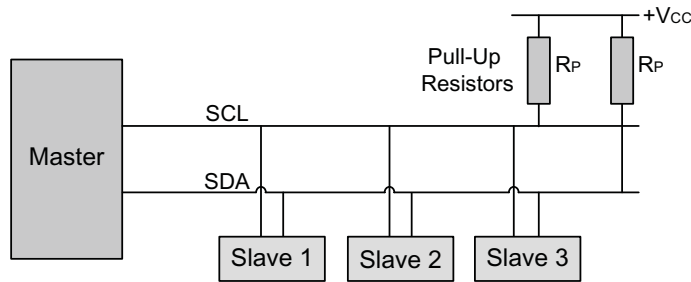
#### 4.2 Order Contact and Customer Support

The sales offices are listed at the end of this document. For small quantities, the order can be placed either through Siargo website: [www.siargo.com](http://www.siargo.com) or the sales office. For large quantities, please contact the sales office or distributors or sales representatives.

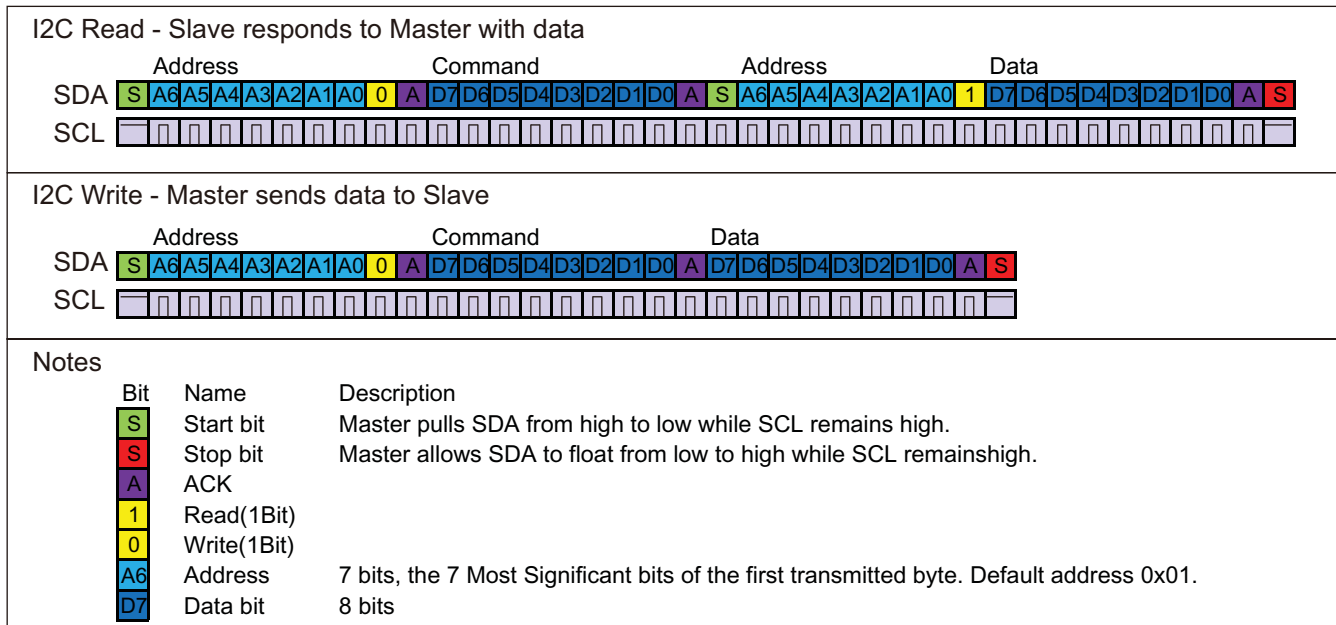
Siargo is making every effort to ensure the quality of the products. In case of questions and/or product supports, please contact customer service listed at the end of the document. We will respond your request in a timely fashion and will work with you toward your complete satisfaction.

## 5. I<sup>2</sup>C Communication

### 5.1 I<sup>2</sup>C Connection



### 5.2 I<sup>2</sup>C Read and Write Sequences



### 5.3 I<sup>2</sup>C Commands description

Command Byte (Hex)	Length	Command Name	Read <sup>1</sup>	Write <sup>2</sup>	Notes
02H	12	Read/Write the Sensor SN	☉	●	ASCII
03H	4	Read differential pressure	☉		Int32/1000 Pa
05H	1	Read/Write the I <sup>2</sup> C address	☉	☉	Bit7 ~ Bit1 can be set <sup>3</sup>
0BH	1	Read/Write the filter depth	☉	☉	Int8, 0~254
1CH	1	Calibration the offset		☉	1byte, ensure <b>NO</b> flow in the pipe

1) ☉ means the commands is available for any user.  
 2) ● means the commands is available only for the manufacturer.  
 3) The address is set with Bit7~Bit1, For instance, 08H means address of 4.  
 4) When reading information, add 80H to the command byte. For instance, read differential pressure command is 83H.



## Important Notices

### Wetted Materials and Compatibility

The sensor body is made of polycarbonate. The sensor chip comprises of silicon, silicon nitride and silicon dioxide and the sensor chip surfaces are passivated with silicon nitride and silicon dioxide. The electronic sealing is provided by RTV (room temperature vulcanizing) silicone sealant WR-704 composed of  $\text{HOCH}_3(\text{SiO})_n\text{CH}_3\text{H}$ .

### Cautions for Handling and Installations

The product at the time of shipment is fully inspected for product quality and meets all safety requirements. Additional safety measures during handling and installation should be applied. To prevent ESD (electrostatic discharge) damage and /or degradation, take customary and statutory ESD precautions when handling. Do power the product with the correct polarity, voltage & amperage. All precautions and measures for electrical voltage handling must apply. The product sealing is ensured to work under working pressure of 0.5 MPa and is leakage proof before the shipment. But cautions and further leakage test are important at installation as well since any leakage could cause severe safety issue.

This product contains no user serviceable components. Do not attempt to disassemble, substitute parts or perform unauthorized modifications to the product. Doing so will forfeit the terms of the warranty and cause the liability to any damages thereafter. It should only be serviced by authorized personnel. Upon requests, Siargo will provide necessary technical support and/or training of the personnel.

### Cautions for Product Applications

The product is designed for use with general purpose gases such as air and nitrogen. It is advised that the products are best used for non-explosive clean gases. The sensors cannot be used for gas metrology of fluoride or fluoride-containing gases. For updates of the product certification information, please contact the manufacturer. Use for other gases such as extreme corrosive and toxic may cause the product malfunctioning or even severe damages.

Don't expose the product's electronics other than the inner flow channel to any liquids, the unit does not have a water proof electronics. Don't flow gas in conditions that can cause condensing water vapor to be trapped inside the unit during operation as the accuracy could be significantly influenced.

### Warranty and Liability

(Effective January 2010)

Siargo warrants the products sold hereunder, properly used and properly installed under normal circumstances and service as described in this user manual, shall be free from faulty materials or workmanship for 180 days for OEM products, and 365 days for non-OEM products from the date of shipment. This warranty period is inclusive of any statutory warranty. Any repair or replacement serviced product shall bear the same terms in this warranty.

Siargo makes no other warranty, express or implied and assumes no liability for any special or incidental damage or charges, including but not limited to any damages or charges due to installation, dismantling, reinstallation or any other consequential or indirect damages of any kind. To the extent permitted by law, the exclusive remedy of the user or purchaser, and the limit of Siargo's liability for any and all losses, injuries or damages concerning the products including claims based on contract, negligence, tort, strictly liability or otherwise shall be the return of products to Siargo, and upon verification of Siargo to prove to be defective, at its sole option, to refund, repair or replacement of the products. No action, regardless of form, may be brought against Siargo more than 365 days after a cause of action has accrued. The products returned under warranty to Siargo shall be at user or purchaser's risk of loss, and will be returned, if at all, at Siargo's risk of loss. Purchasers or users are deemed to have accepted this limitation of warranty and liability, which contains the complete and exclusive limited warranty of Siargo, and it shall not be amended, modified or its terms waived except by Siargo's sole action.

This warranty is subject to the following exclusions:

- (1) Products that have been altered, modified or have been subject to unusual physical or electrical circumstances indicated but not limited to those stated in this document or any other actions which cannot be deemed as proper use of the products;
- (2) Siargo does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies;
- (3) Products re-sold to the third parties.



## Contact Information

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