Siargo Ltd.

FS6122H-300F300-0P0-TH0

SIARGO MEMS FLOW SENSING PRODUCTS

MEMS Mass Flow Sensor

VA.2

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Siargo Ltd.

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FS6122H-300F300-0P0-TH0

User Manual

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Siargo Ltd.
3100 De La Cruz Boulevard,
Suite 210,
Santa Clara, CA 95054
USA

Tel: +1(408)969.0368
Email: info@siargo.com

MEMS Mass Flow Sensor

FS6122H-300F300-0P0-TH0

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1. Features

- Specially designed for medical CPAP applications
- Direct measurement of mass flow rate
- Small dead volume with compact form factor
- Digital and analog linear output with fast response time

2. Sensor Performance

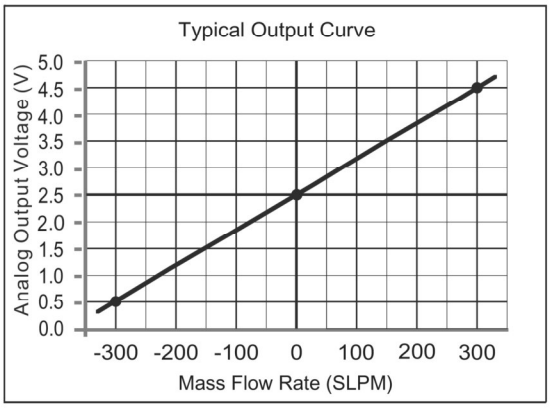
All data unless otherwise noted apply for calibration conditions: air, 20 °C, 101.325 kPa absolute pressure, horizontal mounting.

Spec	Vaule	Unit
Flow Range [1]	-300 ~ +300	SLPM
Accuracy (-250 ~ +250 SLPM)	± (2.5Reading + 0.5FS)	%
(+250 ~ +300 SLPM)	± 5.0Reading	%
(-300 ~ -250 SLPM)	± 10.0Reading	%
Output	Linear, Analog/I^2C (14bit)	
Analog Output	0.5 ~ 4.5	Vdc
Response Time	2	ms
Gas Type	Air	
Supply Voltage	5.0 ± 5%	Vdc
Supply Current	25	mA
Output Pin SN6-50	6 Pins, NS-TECH CD R-6; 0.5m	
Compensated Temperature	-5 ~ +65	℃
Compensated Altitude	-400 ~ +3000 (700 ~ 1060)	m (hPa)
Storage Temperature	-40 ~ +85	℃
Max. Working Pressure	0.1	MPa
Humidity	0~100 (No icing or condensation)	%RH
Warming Up Time [2]	5	sec
Maximum Overflow	1000	SLPM
Maximum Flow Change	300	SLPM/sec

1. There is an voltage output 300 ~ 330 SLPM, and -300 ~ -330 SLPM, but the accuracy is not guaranteed. Please see detailed in section 3.
2. For flow measurement, the warming up time 5 second should be fine. But for stabilisation at zero flow, the warming up time is 5 minutes.

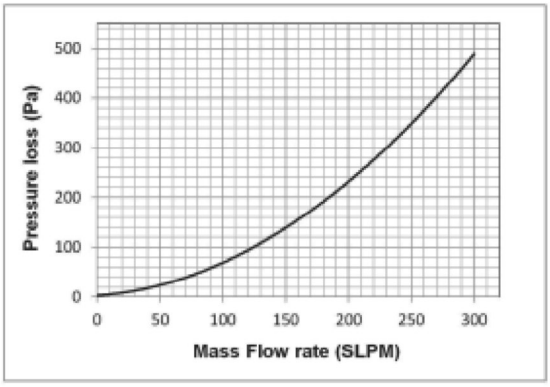
3. Performance Characteristics

Flow Rate (SLPM)	Typical Voltage (Vdc)
-330	0.300
-300	0.500
-250	0.833
-200	1.167
-150	1.500
-100	1.833
-50	2.167
0	2.500
+50	2.833
+100	3.167
+150	3.500
+200	3.833
+250	4.167
+300	4.500
+330	4.700



4. Pressure loss

The pressure loss was measured at 20°C and 101.325kPa. The pressure loss at the reverse flow beared the identical characteristics.



5. Electrical Interface

5.1 Pin Definition

FS6122H-300F300-0P0-TH0 provides a 6-pin interface. The output connecting cable comes with the sensor. The sensor pin layout is shown in Figure 5.1 and the cable color code is defined in Table 5.1.

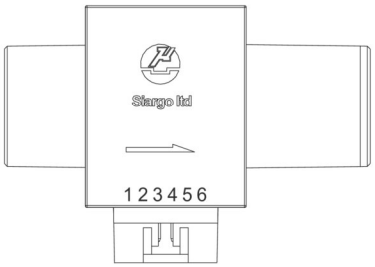


Figure 5.1: Pin layout.

Table 5.1: Pin code.

Pin	Color	Definition
1	White	N/C
2	Green	Fout, Flow sensor analog output
3	Black	GND, Ground
4	Red	VCC, Power supply
5	Yellow	SCL (I^2C)
6	Blue	SDA (I^2C)

5.2 Pin Description

VCC and **GND**: FS6122H-300F300-0P0-TH0 requires a power supply of 5±5% Vdc. The voltage is internally filtered and regulated to power the circuit. The sensor consumes less than 25 mA normally and the minimum supply current must be larger than 25 mA.

Fout: The flow rate analog output. The pin provides 0.5 ~ 4.5 Vdc corresponding with -300 ~ +300 SLPM.

SDA and **SCL:** Serial data line and serial clock line.

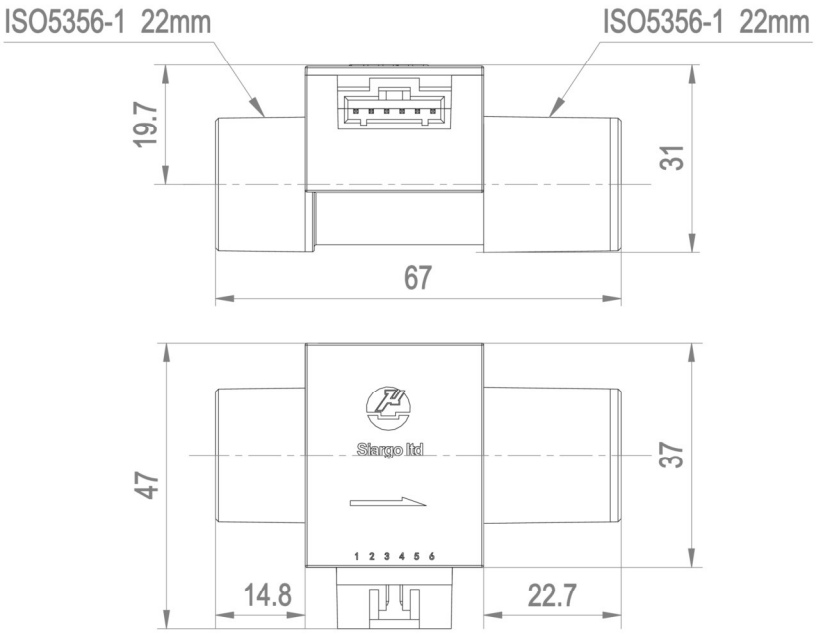
6. Part Number Description

FS6122H-300F300-0P0-TH0

- Without temperature & Humidity sensor
- Forward pressure (0 cmH_2O, 0P0 means of no pressure signal)
- Reverse pressure (0 cmH_2O)
- Forward flow rate (300 SLPM)
- Reverse flow rate (-300 SLPM)
- With micro-Heater

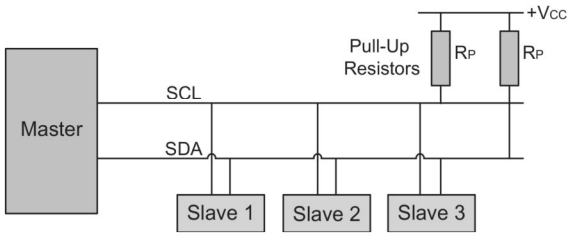
7. Mechanical Dimensions

FS6122H-300F300-0P0-TH0 provides standard ISO-22mm medical connection and can be plug-and-play for CPAP machines. The sensor has a mechanical size of 67 X 47 X 31 mm.



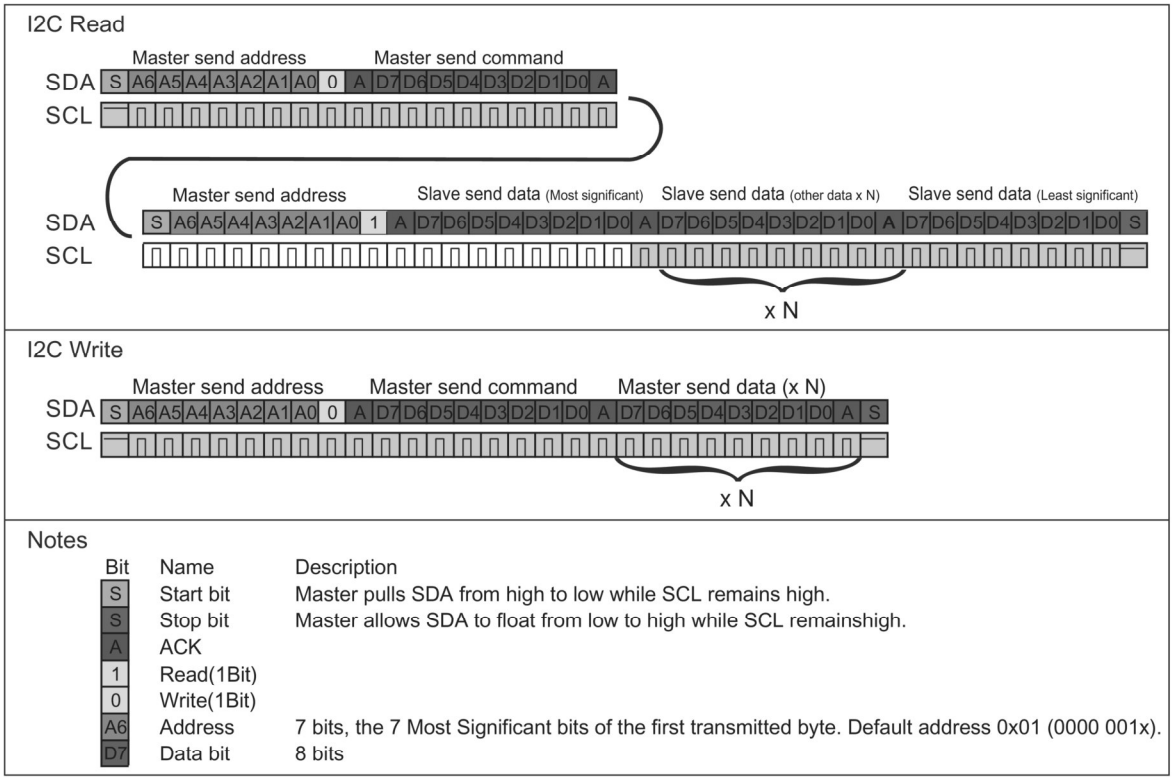
8. I²C Communication

8.1 I²C Connection



Vcc: 3.0 ~ 5.5 Vdc
Rp: 1.0 ~ 10.0 kΩ
I²C bus clock frequency: 100 kHz

8.2 I²C Read and Write Sequences



Notes

Bit	Name	Description
S	Start bit	Master pulls SDA from high to low while SCL remains high.
S	Stop bit	Master allows SDA to float from low to high while SCL remainshigh.
A	ACK	
1	Read(1Bit)	
0	Write(1Bit)	
A6	Address	7 bits, the 7 Most Significant bits of the first transmitted byte. Default address 0x01 (0000 001x).
D7	Data bit	8 bits

8.3 I²C Commands description

Command Byte (Hex)	Length	Command Name	Read / Write	Notes
05H	1	Write the I²C address	W	Bit7 ~ Bit1 can be set *
0AH	2	Write the gas correction factor (GCF)	W	Int16, default value is 1000
0BH	1	Write the filter depth	W	Int8, 0~254
1CH	1	Calibration the offset of flow rate	W	1 byte, any datum, ensure **NO** flow in the pipe
82H	12	Read the sensor SN	R	ASCII
83H	4	Read the flow rate	R	Int32 / 1000 SLPM
85H	1	Read the I²C address	R	Bit7 ~ Bit1
8AH	2	Read the gas correction factor (GCF)	R	Int16, default value is 1000
8BH	1	Read the filter depth	R	Int8, 0~254

* The address is set with Bit7~Bit1，For instance, 08H means address of 4.

Important Notices

Wetted Materials and Compatibility

The sensor body is made of medical compatible plastics (polycarbonate, Covestro Makrolon 2458). 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-933 composed of $HOCH_3$ $(SiO)_nCH_3H$. Other wetted materials may be exposed are Pyrex glass, alumina ceramics, epoxy, gold, aluminum, nickel, FR-4, Pb-free solder.

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 0.1 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.

It is suggested to design your application so that nominal flow rate is approximately 70% of the full scale flow rating of the sensor. Don't use a sensor with a flow range at the extreme cases, for instance, don't use a 200 SLPM sensor for a 2 SLPM application.

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 warranty, representation, or guarantee and shall not assume any liability regarding the suitability of the products described in this manual for any purposes that are not specified in this manual. The users shall be held for full responsibility for validating the performance and suitability of the products for their particular design and applications. For any of the misusage of the products out of the scope described herein, the user shall idemnify and hold Siargo and its officers, employees, subsidiaries, affiliates and sales channels harmless against all claims, costs, damages, and expense or reasonable attorney fee from direct or indirect sources.

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. The product information provided in this manual is believed to be accurate and reliable at the time of release to or made available to the users. However, Siargo shall assume no responsibility for any inaccuracies and/or errors and reserves the rights to make changes without further notice for the relevant information herein.

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

Headquarters

Siargo Ltd.
3100 De La Cruz Boulevard, Suite 210,
Santa Clara, California 95054, USA
Phone: +1-408-969-0368
Email: info@Siargo.com

Representative in Europe

IDENTIC GmbH
In der Siedlerruh 24
69123 Heidelberg / Germany
Phone: +49-(0)6221-7509777
Fax: +49-(0)6221-7509779
Email: info@identic.de