

Application Note for SFM3x00-AW and SFM3x00-D Mass Flow Meters

Connector Interface for SFM3x00-AW and SFM3x00-D Flow Sensors

Summary

The autoclavable SFM3x00-AW and the disposable SFM3300-D mass flow meters are intended for expiratory or proximal respiratory applications. In these applications the sensor has to be sterilized or replaced regularly. As this is mostly done by medical personnel, the sensor's

connector interface is designed for simple and user friendly connecting and disconnecting. This document includes the mechanical design description of the connector interface as well as recommendations on additional functions to implement on the connector side.

1. Introduction

This application note describes the connector interface of the SFM3x00-AW/D flow sensor and provides several suggestions for additional functions. Sensirion provides the sensor without a connector. This application note provides all relevant information to enable the customer to design a customized and branded connector solution.

This application note applies to the following sensors:

- SFM3200-AW (autoclavable & washable)
- SFM3300-AW (autoclavable & washable)
- SFM3300-D (disposable)
- SFM3400-AW (autoclavable & washable)
- SFM3400-D (disposable)

2. Connector Recommendations

The connector interface of the SFM3x00-AW sensor is designed to enable easy and user friendly connecting and disconnecting of the sensor. Sensirion's proposed connecting method is to utilize a connector-cap. In the following you can find recommendations on how to design this cap which attaches mechanically to the connector interface of the sensor and allows electrical communication via the printed circuit board (PCB) pad interface.

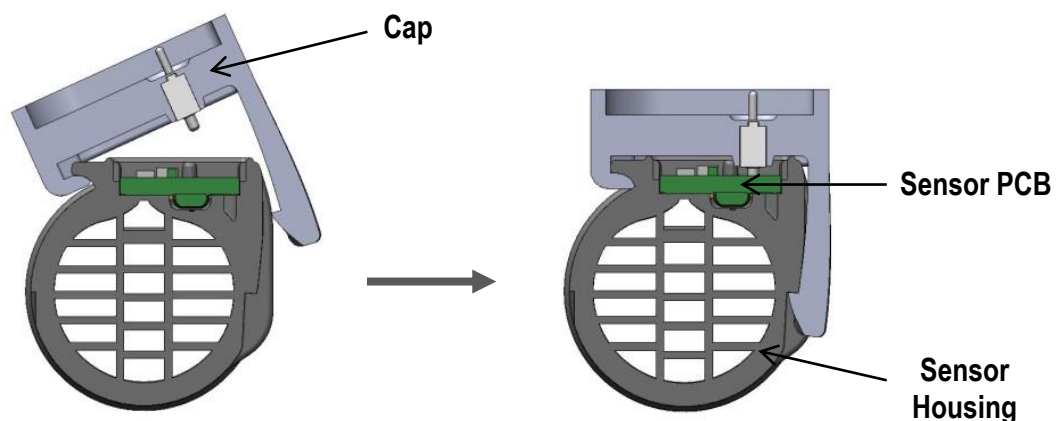


Figure 1: Cross sectional view of snap-on cap and sensor housing

2.1 Mechanical Snap-On Connection

Figure 1 shows a cross sectional view with the drawing plane perpendicular to the flow direction of the SFM3200-AW sensor and an attached cap. The sensor housing is colored dark grey, the PCB green and the connection-cap in light grey. In order to allow easy and secure fastening and removal of the sensor for either disposal or autoclaving, the sensor connector interface is designed with a simple snap-fit mechanism.

The following figure shows the top view of the sensor's connector interface.

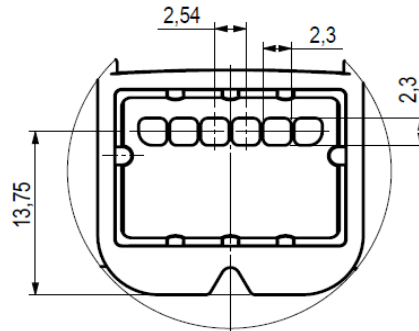


Figure 2: Top view of the sensor's connector interface with dimensions in mm

The CAD file of the connector interface can be downloaded from the Sensirion download center:

<http://www.sensirion.com/mfm-download>

2.2 Electrical Connection

Connection to Pads:

Pads on the PCB are best contacted via spring-loaded pins. Recommended component: Preci-Dip 811-S1-006-10-014101

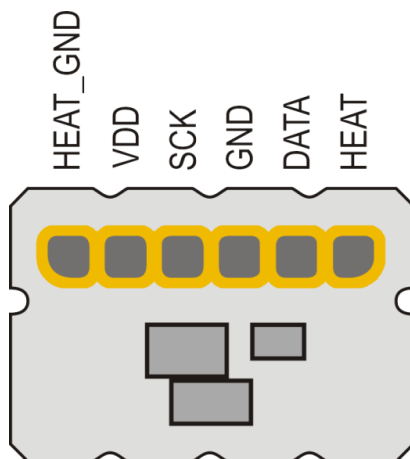


Figure 3: PCB pad layout

1	HEAT	Heater resistance (chapter 3.3)
2	Data	I ² C, data
3	GND	I ² C, ground
4	SCK	I ² C, clock
5	VDD	Supply voltage
6	HEAT_GND	Heater resistance (chapter 3.3)

3. Additional Recommended Functionalities

Several additional functionalities which significantly increase the robustness of communication as well as add additional capabilities can easily be achieved by integrating a small PCB with a microprocessor unit (MPU) inside the cap.

3.1 Protocol/Bus Conversion

For increased communication robustness the sensor cables carrying the I²C protocol are recommended to not exceed 10 cm in length. As most proximal and expiratory applications easily require sensor cables of 1 m and more, Sensirion recommends to use the in-cap PCB and MPU to convert the sensor protocol from I²C to a protocol of choice, which is better suited for long distances (e.g.: RS485 or CAN bus).

3.2 Reset and On/Off Capability

The suggested reset and on/off functionality is easily implemented with the in-cap MPU controlling the VDD supply voltage of the sensor.

3.3 Heater

In specific applications it might be necessary to take scenarios of condensation or even icing of the sensor element into consideration. To allow the sensor to operate in such harsh environments, a resistor has been placed on top of the PCB which is intended to be used as a heater element. Depending on the condition, the heater will prevent water condensation and icing-up of the sensor element. The heater resistor is specified to 51 Ohms and 0.5 W and thus the supplied voltage drop over the resistor should never exceed 5 V, respectively the current should not exceed 99 mA for full heating power. This heater option is best implemented with the in-cap MPU.

Accuracy can be affected by the use of the heater. As the sensor is calibrated with the heater in the off-state, the applied heater power and the sensor assembly can have an influence in the stated accuracy specifications. The reason is that the heating of the sensor's housing with the resistor can induce a thermal gradient which in turn can slightly degrade accuracy specifications. Depending on the heater power applied and the accuracy requirements, additional testing in specific design-environment is recommended.

4. Cap/Cable Commercial Availability

For commercial availability of the cap/cable assembly Sensirion has partnered with the cable manufacturer company Nicolay. Nicolay will be offering a cap/cable assembly from around mid-2018 with the above mentioned functionality and a degree of customizability. For any further details and inquiries, please directly contact Nicolay:

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Revision history

Date	Author	Version	Changes
August 2015	VRR	v1.0	Released version
February 2017	ALAN	v1.1	Added SFM3400 suitability, updated download center link and graphic in 2.2
December 2017	ALAN	v1.2	Added address of Nicolay contact for cap inquiries

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