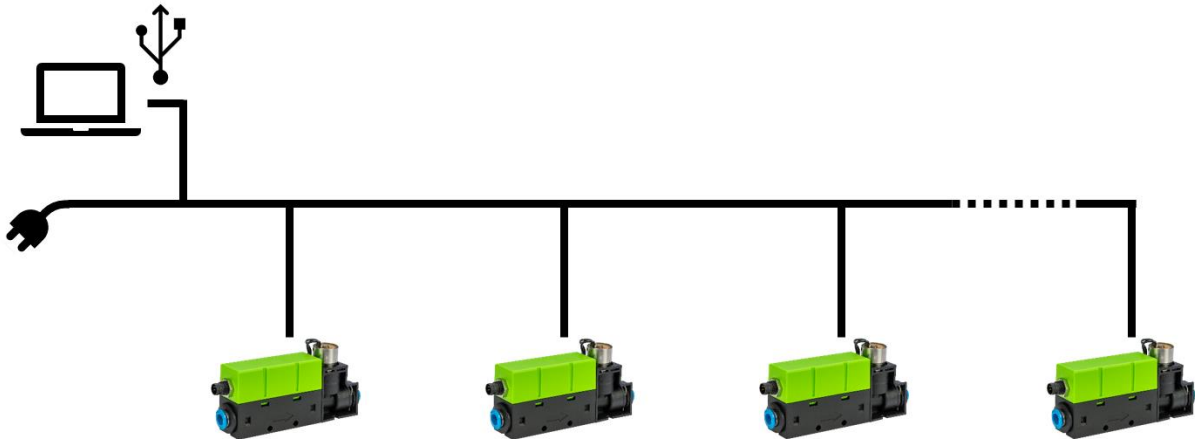# DIY SFC/SFM6000D Evaluation Kit

User built interface for high customization and simultaneous use of multiple mass flow controllers (MFC) and mass flow metters (MFM)

Highlights

- Compatible with provided python drivers
- Allows for simultaneous control of multiple devices at once

This guide provides customers with a customizable way to control their Sensirion devices with a self-made evaluation kit. The components, assembly and operation of the evaluation setup are described in the following.

Contents

1   Components

1.1   Sensirion Mass Flow Controllers

This evaluation kit and its components are designed for the Sensirion SFC6000D mass flow controller and SFM6000D flow meter variants, which are available by distribution: Sensirion Distibutors.

1.2   Bill of Materials

The quantity of components for assembly varies depending on the amount of MFC's (MFM's) one wants to link. **Table 1** relays the components, their quantity and their price (March, 2023) for a configuration with 1 device and 5 devices for reference. The wattage or quantity of the power supplies should be adjusted for higher quantities than 5 devices. The Electrical specifications of the SFC/SFM6000D can be found in its datasheet. Each extra MFC needs an additional M8 single end cable and 4 splicing connectors, as the SFC/SFM6000D M8 connector is 4 pinned.

| Component	Unit Price (chf)	Quantity for 1 MFC/MFM	Quantity for 5 MFC/MFM's	Quantity for X MFC/MFM's
M8 (4 Pin) single end cable	10	1	5	X
Power supply	16	1	1	Must be adjusted according to quantities exceeding 5
USB A to RS485	5	1	1	1
Splicing connector	0.4	4	20	4 * X

Table 1. Bill of Materials for sample evaluation kit. Quantity varies for a different amount of flow controllers and flow meters.

1.3   Python Drivers and installation

The driver, installation guide and documentation can be found in the Useful Resources section.

2 Assembly

2.1 The Daisy Chain
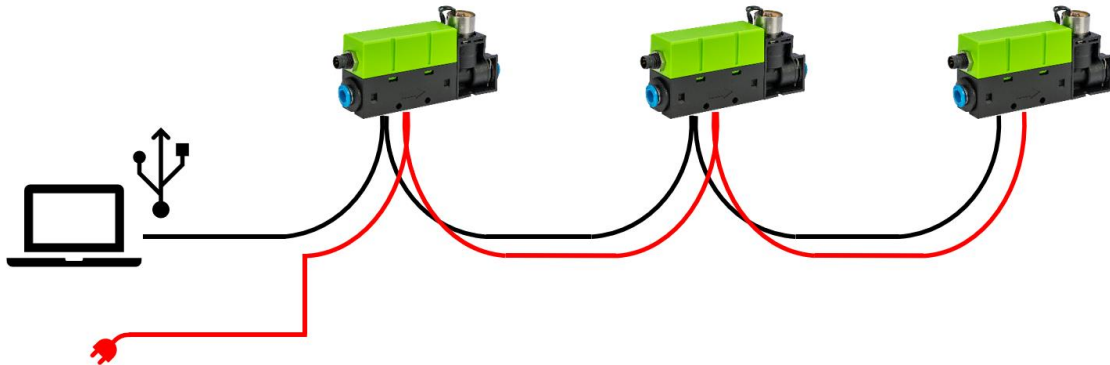
Figure 1. Daisy chain with multiple mass flow controllers. Often the last device in the chain is still connected to a resistor.

To operate multiple flow controllers at the same time they can be connected serially with a daisy chain as illustrated in **Figure 1**. In a daisy chain, devices are connected in series and the signal is propagated from one device to the next. The benefit of daisy chaining is that it simplifies the testing setup and requires less cables. However, if one cable fails it disrupts the entire chain, making it harder to troubleshoot the problem.

The daisy chain described in this guide is a pseudo-daisy chain, as the flow controllers as the signal does not flow through a device to reach the next. The exact setup is illustrated in **Figure 2**.

2.2 Matching wires

The following information and guide are based only on the referenced products in **Table 1** and are not applicable to assembly with other components. **Incorrect matching of wires can lead to the destruction of the connected hardware. Sensirion urges to exercise extreme attention when handling and connecting the power cables and assumes no responsibility in case of any damage or injury**.

2.2.1 Wire assignments

Component	Picture	Pin assignment	
M8 single end cable		Brown	Voltage in
		Blue	GND
		White	Trigger (D+)
		Black	Flash out (D-)
USB A to RS485 cable		Black	GND
		White	Flash out (D-)
		Green	Trigger (D+)
Power supply	-	White on Black	Voltage in
		Black	GND

Table 2. Component wire color assignments only for assembly with the suggested products in **Table 1**.

2.2.2 Splicing connection

The splicing connectors are meant to connect wires with matching signals according to **Table 2**. **Figure 2** shows a node of the daisy chain, which connects an additional MFC.
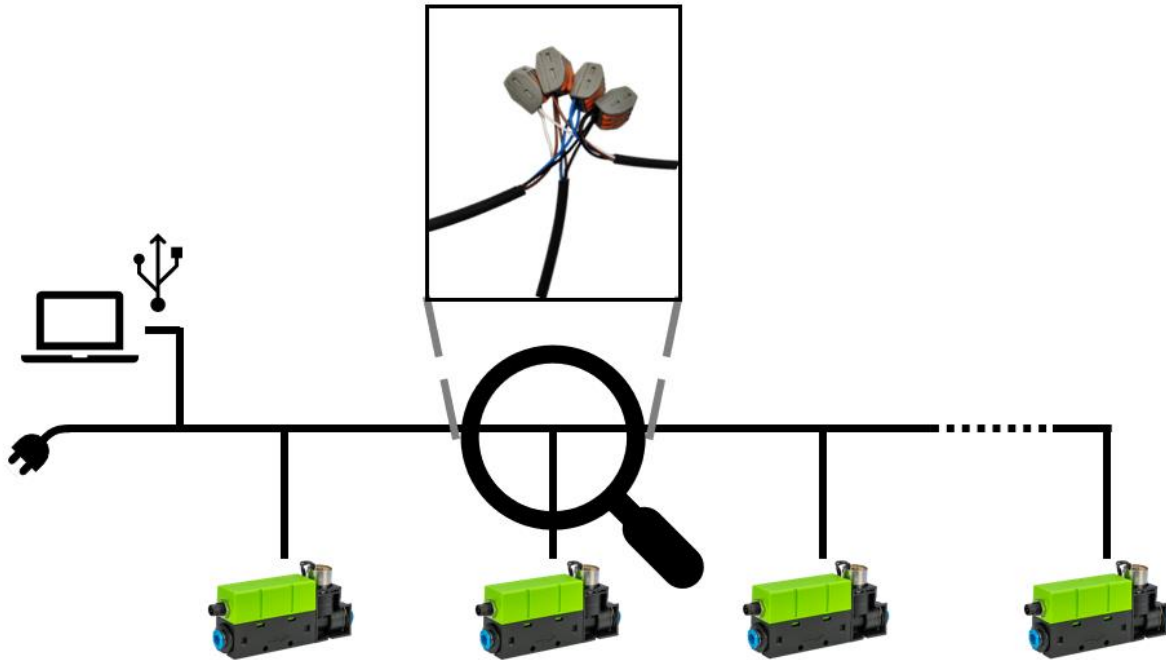
Figure 2. Splicing connectors at one node of the daisy chain.

2.3 Steps of assembly

- Cut the cables of the M8 cable, USB to RS485 cable and the power supply cable to expose the wires beneath
- Connect the GND of the M8, USB to RS485 and power supply with a splicing connector
- Connect he Voltage in of the M8 and power supply with a splicing connector
- Connect the Flash out and Trigger of the M8 and USB to RS485 with respective splicing connectors
- To add another M8 connector to the configuration simply connect its wires according to color as seen in **Figure 2**

2.4 Connection to Computer

To connect the finished kit to the computer simply plug the USB cable into the computer and the power supply into an outlet.

3 Python implementation and Example Application

3.1 Simple setup with python drivers

Add the Python package sensirion-uart-sfx6xxx to your environment. For help with installation and implementation of your evaluation kit refer to the documentation found in the Useful Resources section.
After plugging the USB cable into your computer, verify the COM-Port your setup is connected to. This is the COM-Port you should reference in the ShdlcSerialPort() command as seen in Error! Reference source not found.. An example code snippet for operating 3 MFC's at the same time can be downloaded from the Sensirion github.

3.2 Common Mistakes

3.2.1 Address is not recognized

It is necessary to define the address of your MFC for use. The SHDLC address must be specified over the SHDLC channel as seen in **Error! Reference source not found.**. This must be done with each device individually.

3.2.2 Change to slave address

When changing the slave address with "set_slave_address()" make sure this corresponds to the address set over the "ShdlcChannel()" command.

3.2.3 Correct baud rate

Make sure you set the correct baud rate for your application.

4 Useful resources

4.1 Python Drivers and Documentation

SFC6000/SFM6000 Datasheet
https://sensirion.com/resource/datasheet/sfc6000d_sfm6000d

Python driver
https://github.com/Sensirion/python-uart-sfx6xxx

Installation guide and documentation
Sensirion SFX6XXX SHDLC Python Driver — sensirion_uart_sfx6xxx 1.0.0 documentation

SFC6000/SFM6000 RS485 Guide
https://sensirion.com/resource/application_note/SHDLC_Interface_Reference_SFC6xxx_SFM6xxx_RS485

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. 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 data sheet 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 "ESD, Latchup and EMC" 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.

This warranty does not apply to any equipment which has not been installed and used within the specifications recommended by SENSIRION for the intended and proper use of the equipment. EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH HEREIN, SENSIRION MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT. ANY AND ALL WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED AND DECLINED.

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SENSIRION does not assume any liability arising out of any application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. All operating parameters, including without limitation recommended parameters, must be validated for each customer's applications by customer's technical experts. Recommended parameters can and do vary in different applications.

SENSIRION reserves the right, without further notice, (i) to change the product specifications and/or the information in this document and (ii) to improve reliability, functions and design of this product.

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