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Sensirion RS485 and USB Sensor Cable SCC1-RS485 and SCC1-USB

- Robust RS485 Interface for bus and long distance communication in demanding environments
- Easy to use USB Interface for laboratory and desktop use
- Applicable to digital SLQ, SLI, SLS and SLG liquid flow sensors



Product Summary

The SCC1-RS485 sensor cable for Sensirion's flow meters allows the installation and use of I²C based sensors in a demanding industrial automation environment. In addition to the standard commands available for the I²C interface of the sensor, the incorporated microcontroller of the cable provides more complex logic such as a dispense volume totalizer, automatic dispense detection, automatic heater control and data buffer for asynchronous read-out.

The SCC1-USB sensor cable provides the same functionality as the SCC1-RS485 with a plug and play USB interface. Together with the free Sensor Viewer software, this is the perfect combination to start testing a Sensirion liquid flow meter.

Sensirion provides detailed protocol specifications, implementation documentation and a driver DLL with convenient access functions for use under Microsoft Windows®.

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1 Pigtail RS485 and USB Versions

The digital SCC1 sensor cable is available in a pigtail variant and in a version with integrated USB plug. The pigtail cable provides an RS485 interface and needs to be powered by 5 V. The USB cable converts the RS485 to the USB interface and is directly powered by the USB port of the host PC.

Both variants can be connected to the 4-pin M8 connector of Sensirion's liquid flow meters. The interface electronics are molded into the cable. The SCC1-USB has a total length of about 2 m, the SCC1-RS485 is available with a total length of 2 m or 5 m.



Figure 1: SCC1 cable connected to a sensor with pigtail cable (left) and with USB plug (right). Communication interfaces shown in small print.

2 Available Driver DLL and Protocol Documentation

For use under Microsoft Windows®, Sensirion supplies a driver DLL that offers simple C type functions for direct access from any programming language capable of opening DLLs.

Documentation and sample code for the DLL as well as documentation and implementation instructions for the communication protocol are available on request.

3 Specifications for the SCC1-RS485 Sensor Cable with Pigtail End

3.1 RS485 Commands in SHDLC

For using the cable and sensor with a microcontroller, the Sensirion-HDLC (high-level data link control) protocol is used. See separate documentation for the SHDLC command set, guidelines on how to implement the protocol and example code.

3.2 Pigtail Wire Assignment

One side of the SCC1-RS485 cable is connected to the 4-pin M8 connector of Sensirion’s liquid flow meters. The other side has four wires: Two for power supply and ground and two for half-duplex RS485 communication. The wire assignment is defined in Table 1.

WARNING!
Incorrect connection may lead to permanent damage of the cable. Check the wire assignment carefully.

Wire	Function	Symbol
Blue	Supply voltage (5 V)	V _{DD}
White	Ground	GND
Brown	RS485 D+	D+
Black	RS485 D-	D-

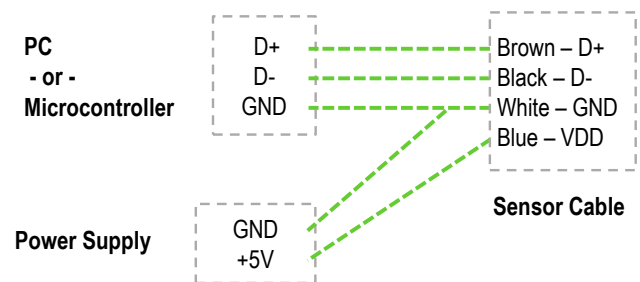


Table 1 and Figure 2: Wire assignment and wiring diagram

3.3 Electrical Specifications SCC1-RS485

Parameter	Min	Typical	Max	Unit
Supply Voltage ¹	3.5	5	7	V
Voltage Stability			+/- 0.3 < 10	V kHz
Current Consumption Sensor measuring, without RS485 communication ²		20	25	mA
Current Consumption Sensor measuring, during RS485 communication ²		20	100	mA

Table 2: Electrical Specifications

3.4 Ground Connection

It is necessary to connect the ground of the sensor cable to the ground of the power supply and to the ground of your system’s RS485 interface. The sensor cable is not equipped with an optocoupler or other electrical isolation between the power supply and the communication lines.

3.5 Baud Rate and RS485 Address

Available baud rates are: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400 baud, with a default of 115200.

The default RS485 address of the SCC1-RS485 cable is 0.

¹ The minimum supply voltage depends on the sensor the cable is used with.

² Including 6 mA for the sensor, see the datasheet of the used sensor for details.

A configuration software for Windows PC to change the baud rate and/or RS485 address is available on the Sensirion website: www.sensirion.com/de/download-center/.

3.6 Maximal Number of Devices

The theoretical maximum of SCC1-RS485 sensor cables that can be connected on one RS485 bus is 255. However, a large number of devices on the same bus requires a well-designed network layout. Depending on the chosen sampling rate and amount of data per reading of the sensor (e.g. 1kHz vs 100 Hz; one signal vs. 3 signals), the bus bandwidth may limit the number of devices to about 3-5 devices (at 1 kHz) or 30 or more devices (100 Hz or lower) for a bus with 115'200 kbit/s.

3.7 Network Topology

The network has to be designed to suit the application's requirements. The recommended network topology for the RS485 network is a linear, multi-drop configuration with short (1-2 m) branch lines to the sensors.

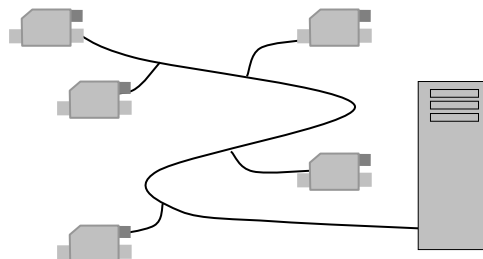


Figure 3: Linear, multi-drop topology with short branch lines

3.8 Termination Resistor

Termination in RS485 networks is used to avoid signal reflections that cause communication errors. Short networks with few cables may also work without termination but with increasing length and number of sensors the termination of the last sensor of the chain should be turned on. In this case it is also recommended to terminate and bias the master with the following resistor network.

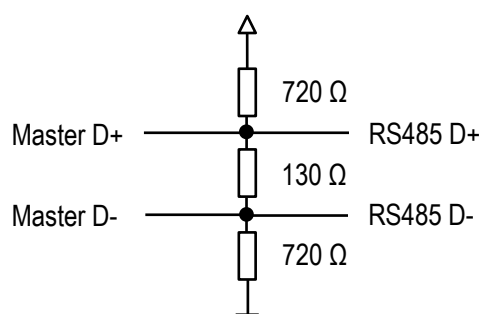


Figure 4: Typical bias network that should be used on the master side

It is also possible to terminate the network manually with a 120 Ohm resistor.

When using the SCC1-USB cable, the termination should not be turned on because it is not possible to terminate the master side.

4 Specifications for the SCC1-USB Sensor Cable with Integrated USB Plug

4.1 PC Driver

When plugging in the SCC1-USB cable, the necessary Virtual Com-Port (VCP) driver should install itself automatically. After the driver has been successfully installed, the device appears in the device manager as “USB Serial Port”. If this does not happen, please install the VCP driver manually from this place:

<http://www.ftdichip.com/Drivers/VCP.htm>.

4.2 COM Port and Baud Rate

The host computer will assign a COM port address to the SCC1-USB cable. The standard baud rate is 115'200, Echo is Off, RS485 address is 0.

If more than one SCC1-USB cables are connected to the same computer, each USB cable will have its own COM port but all cables will have the same RS485 address (0).

A configuration software for Windows PC to change the baud rate and/or RS485 address is available on Sensirion's website: <https://www.sensirion.com/de/download-center/>.

4.3 Electrical Specifications SCC1-USB

Parameter	Min	Typical	Max	Unit
Supply Voltage ³	4.75	5	5.25	V
Voltage Stability			+/- 0.3	V
			< 10	kHz
Current Consumption		20	25	mA

Table 3: Electrical Specifications

5 General Specifications

5.1 Dimensions

Approximate mechanical dimensions of the electronics overmold are shown in Figure 5, dimensions and specifications of the cable are listed in Section 3.

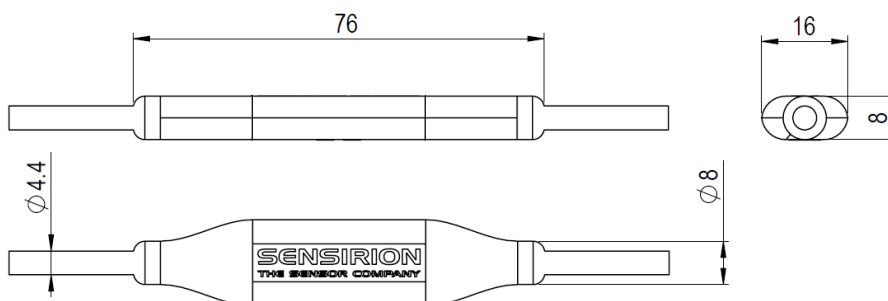


Figure 5: Mechanical dimensions of electronics overmold

³ The minimum supply voltage depends on the sensor the cable is used with.

Parameter	Value
Length of cable on sensor side (including M8 connector)	~10 cm
Length of cable on pigtail end	~190 cm / ~490 cm ⁴
Cable outer jacket diameter on pigtail end	4.4 ± 0.2 mm
Conductor cross section	0.25 mm ² (24 AWG)
Outer diameter of individual wires	1.15 ± 0.05 mm
Minimum bending radius ⁵	10x cable diameter

Table 4: Mechanical specifications

5.2 Materials

Part	Material
Cable jacket	PUR
Wire insulation	PP
Connector housing	PUR
Connector screw ring	Zn Al/Ni
Electronics overmold	Polyamide hotmelt

Table 5: List of materials

5.3 Placing of Incorporated Electronics

The electronics of the sensor cable are housed in the molded bulge of the cable. Because of the power consumption of the electronics, the cable can heat up minimally at the bulge when in use. To avoid disturbing the flow sensor's measurement it we do not advised to attach the bulge to the flow sensor housing.

5.4 Bending and Forces on Cable

Excessive, repetitive bending of the cable at the connections to the molded bulge may lead to cable breakage. Fasten the cable/bulge properly.

5.5 Device Certification

The SCC1 sensor cable is RoHS and REACH compliant. The combination of the RS485 or USB cable with flow meters of the digital SLI-, SLQ-, SLS-, and SLG-series is CE certified; see datasheet of specific flow meter.

6 Ordering Information

Please use the following product names and article numbers when ordering the SCC1 sensor cable.

Product Name	Product	Article No
SCC1-RS485 2m	SCC1-RS485 Sensor Cable (pigtail end), 2 m length	1-100804-01
SCC1-RS485 5m	SCC1-RS485 Sensor Cable (pigtail end), 5 m length	1-101122-01
SCC1-USB	SCC1-USB Sensor Cable, 2m length	1-101007-01

Table 6: Ordering Information

⁴ For SCC1-USB 2m and SCC1-RS485 2m / SCC1-RS485 5m

⁵ Bending radius of the cable. Avoid excessive and repetitive bending at the transition of the cable to the overmold.

7 Important Notices

7.1 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.

7.2 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.

7.3 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 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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8 Revision History

Date	Version	Page(s)	Changes
December 2012	1	all	First official release
September 2013	2	2	Baud rate and RS485 address. USB Variant
October 2013	3	4	CE, RoHS etc. Statement: typo with QT500 corrected
July 2014	4	all	Term 'Controller' removed from cable naming, 5m variant added
May 2018	5	all	New Format, updates on dimensions, materials, termination, and bias network

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