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To:
Purchasers, installers and users of the new SR30-M2-D1

From:
The Hukseflux Team

Memo

Pages: 6
Date: 27 NOV, 2020
Your reference: -
Our reference: -

Subject: Overview important changes SR30-M2-D1

Introduction

Congratulations with your purchase of the new SR30-M2-D1 pyranometer!

SR30-M2-D1 is the successor of the popular SR30-D1 pyranometer. Both are digital spectrally flat Class A (secondary standard) pyranometers, with heating, internal ventilation, tilt sensor and Modbus over RS-485 output. These fine instruments are made to serve you for a long time.

1) **If this is your first SR30:** then please follow SR30-M2-D1 installation instructions in the SR30-M2-D1 user manual. A copy is sent with your Order Confirmation.

2) **If you are replacing an older SR30-D1 or adding SR30-M2-D1 to a system or network including SR30-D1's:** then please read this document first. It provides a brief overview of the key differences between SR30-M2-D1 and the SR30-D1 model, as well as a short installation guide for SR30-M2-D1. Following its instructions allows you to benefit from the improvements SR30-M2-D1 offers:

2.1) **If you keep using the cabling previously used for SR30-D1:** SR30-M2-D1 can be used with the same 5-pole M12-A connectors and cables used for SR30-D1 model. However, in order to profit from the improvements offered by SR30-M2-D1, it is recommended to make minor wiring modifications. Please read the Specifications and Installation sections in this memo carefully.

2.2) **If you use new cabling:** please read the Specifications and Installation sections in this memo carefully, followed by the SR30-M2-D1 user manual.

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Specifications

Main advantages of SR30-M2-D1 over the SR30-D1 model are:

- improved surge immunity through improved design of internal electronics and additional surge protection
- improved signal integrity through the addition of a dedicated RS-485 common connection

This section is limited to electrical specifications of SR30-M2-D1. Other specifications of SR30-M2-D1 are identical or comparable to the SR30-D1 specifications found in the SR30-D1 manual. Modbus registers of SR30-M2-D1 are also identical to the Modbus registers of SR30-D1. Refer to the respective manuals for a complete overview.

Table 1 *SR30-M2-D1 electrical specifications*

CONNECTOR	
Chassis connector	5-pole, male, M12-A connector
POWER SUPPLY	
Operating voltage	8 to 30 V DC
Typical current consumption @ 12 V operating voltage	• low power mode: < 10 mA • medium power mode: < 60 mA • standard operating mode: < 280 mA
DIGITAL COMMUNICATION	
Hardware interface	2-wire (half-duplex) RS-485
RS-485 common mode range	± 25 V
Communication protocol	Modbus
Transmission mode	RTU
INTERNAL PROTECTION MEASURES	
Power supply surge protection (VDC[+] to VDC[-])	TVS diodes
Power supply TVS surge protection standoff voltage	+ 30 V
Power supply TVS surge protection peak pulse power capability	600 W
Power supply reverse polarity protection	included
RS-485 surge protection ([data+]/[data-] to signal ground)	TVS diodes
RS-485 TVS surge protection standoff voltage	± 24 V
RS-485 TVS surge protection peak pulse power capability	350 W
Pyranometer body DC isolation voltage (instrument body to signal ground, V_{iso})	400 V

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Installation

The wiring of SR30-M2-D1 is listed in Table 2 and illustrated in Figure 2.

Differences between SR30-D1 and SR30-M2-D1
From an installation perspective, the most significant difference between SR30-D1 and SR30-M2-D1 is the addition of a dedicated RS-485 signal ground connection (blue signal wire, pin #3) in the SR30-M2-D1 model. The use of this RS-485 signal ground connection helps to maintain the RS-485 signal level within the common mode range of the transceiver, thereby improving signal integrity.

When swapping an SR30-D1 for the SR30-M2-D1 model, it is recommended to disconnect (isolate) the black signal wire from the RS-485 network common and connect the blue signal wire to the RS-485 network signal ground, as shown in Figure 1 below.

The cables supplied by Hukseflux used for SR30-M2-D1 are identical to the cables used for SR30-D1, however with SR30-M2-D1 all 5 wires are in use as compared to only 4 out of 5 with the SR30-D1 model.

NOTE: When SR30-D1 is installed using the recommended SR30-M2-D1 wiring scheme, SR30-D1 RS-485 communication will NOT function reliably.

NOTE: When SR30-M2-D1 is installed using the recommended SR30-D1 wiring scheme, users will NOT benefit from improved signal integrity.

Table 2 *Wiring diagram of SR30-D1 and SR30-M2-D1. The pin numbering is explained in Figure 1.*

PIN	WIRE	SR30-D1	SR30-M2-D1
1	Brown	VDC [+]	VDC [+]
4	Black	VDC [−]	VDC [−]
3	Blue	not connected	RS-485 signal ground
2	White	RS-485 [data+] B / B’	RS-485 [data+] B / B’
5	Grey	RS-485 [data-] A / A’	RS-485 [data-] A / A’
	Yellow	shield	shield

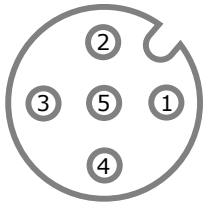

Figure 1 *Connector layout of SR30, indicating PIN numbers (viewed from cable side)*

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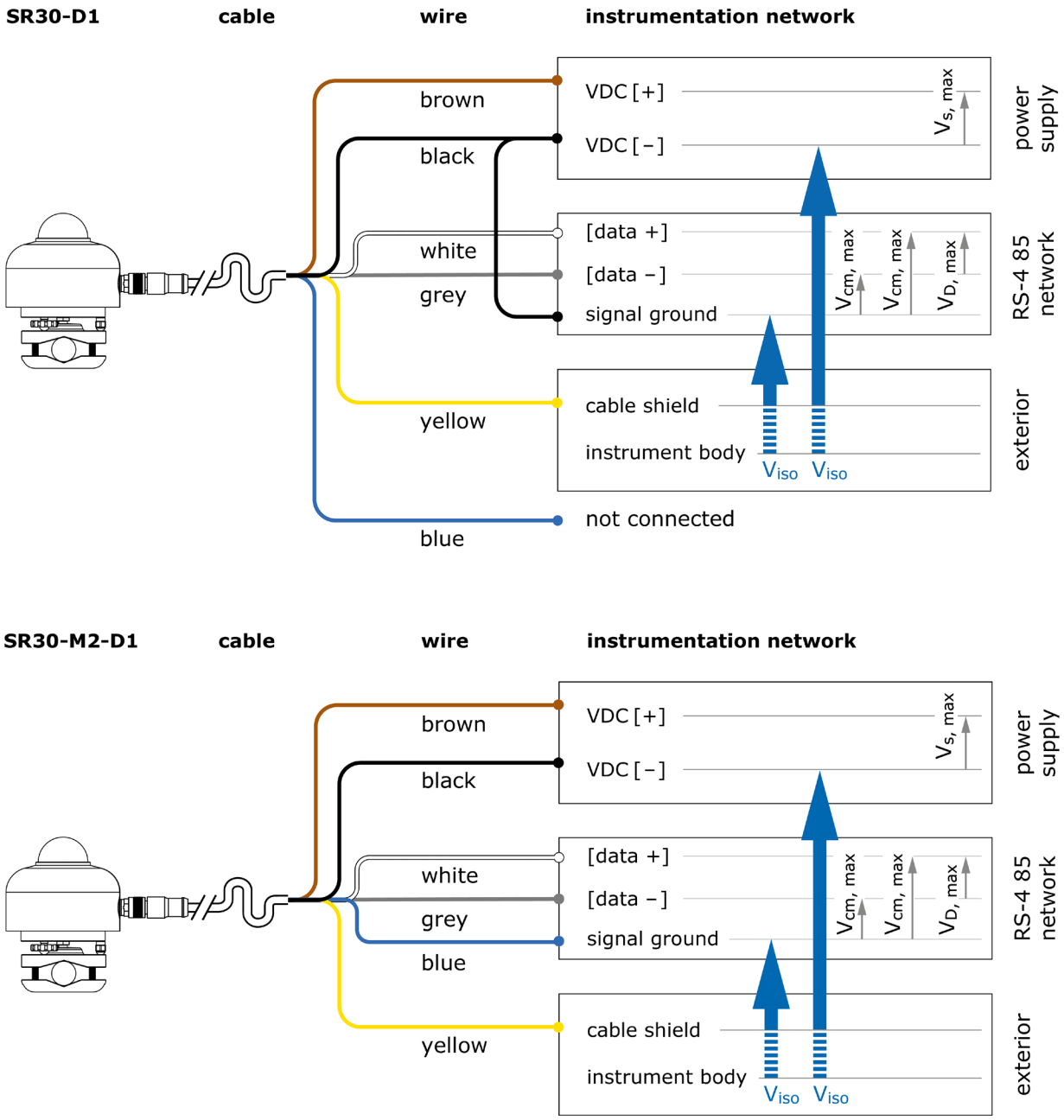

Figure 2 *Comparison of the wiring of SR30-D1 (top) to the wiring of SR30-M2-D1 (bottom)*

Power:
The instrument must be powered by an external power supply, providing an operating voltage in the range specified in Table 1. This is the main power supply for the sensor, using the brown and black signal wires. Do not exceed the maximum recommended operating DC voltage range, as it will damage the sensor.

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Connecting to an RS-485 network:
SR30 is designed for two-wire (half-duplex) RS-485 network communication. In such a network, SR30 acts as a slave, receiving data requests from the master. The typical topology of an RS-485 two-wire network is shown in Figure 3. The RS-485 signal ground (blue signal wire) must be connected to the network common.

At the last nodes in the network, on both sides, line termination resistors (LT) are required to eliminate network signal reflection effects (see Figure 3). Failure to install line termination resistors may compromise signal integrity. According to the EIA/TIA-485 standard, typical LT resistor values range from 120 to 150 Ω. Never place more than two LT resistors on the network and never place the LT resistor on a derivation cable. Installing more than two LT resistors causes excessive loads on the RS-485 bus which may compromise signal integrity and potentially damage the equipment.

To minimise noise on the network when no transmission is occurring, a fail-safe biasing network consisting of a pull up and a pull down resistor is required (see Figure 3). Typical values for both resistors are in the range from 650 to 850 Ω. Fail-safe biasing keeps the RS-485 bus in a well-defined state whenever none of the nodes are driving the bus.

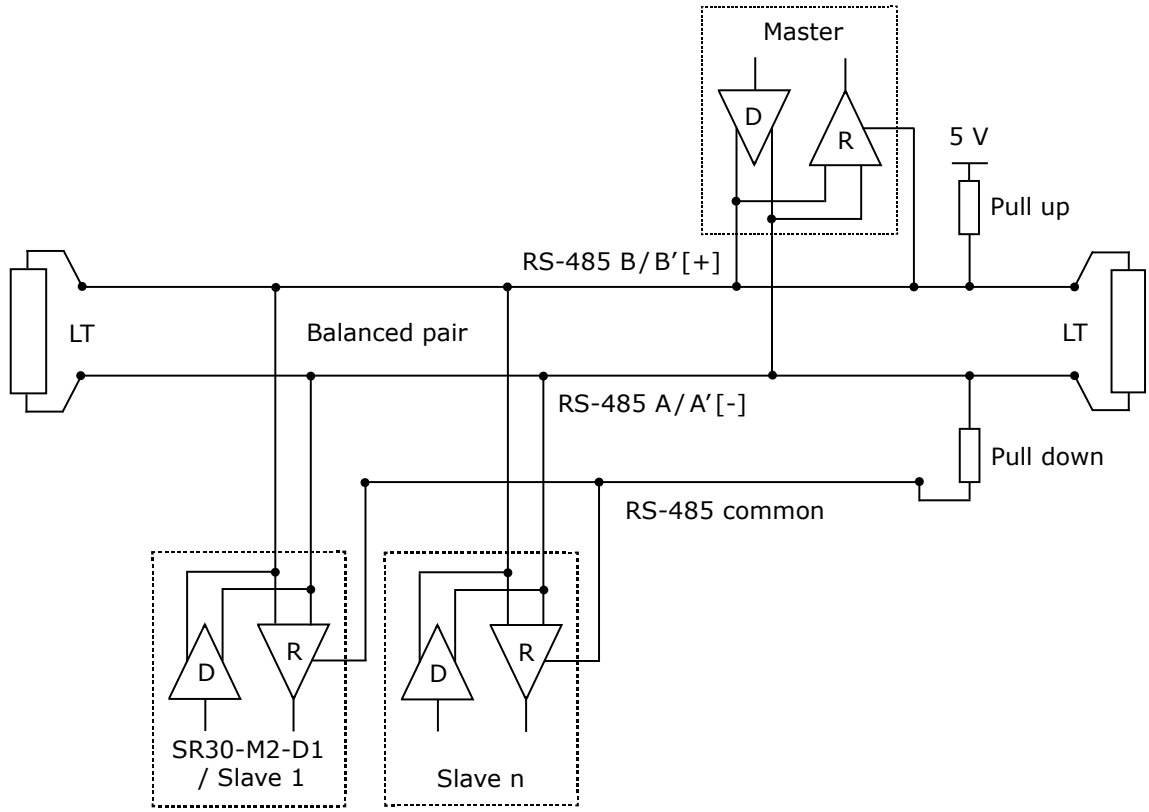

Figure 3 *Typical topology of a two-wire RS-485 network, figure adapted from: Modbus over serial line specification and implementation guide V1.02 (www.modbus.org). Neither the power supply nor any isolated interfaces that may be required are shown in this figure.*

Shield:
The cable shield (called shield in the wiring diagram) is connected to the aluminium instrument body via the connector.

Protective earth:
It is the user's responsibility to verify that the instrument is properly referenced to protective earth. On a coarse level, the instrument has three ports: a DC power port (VDC[+] and VDC[-] wires), a signal port (RS-485 [data+], [data-] and signal ground) and an enclosure port (the instrument body and the cable shield).

Whenever the spatial extend of the entire system (i.e. the maximum distance between any nodes in the network, including dataloggers, cables, other pyranometers or sensors) exceeds 5 metres, one of these ports, and no more or less than one, should be referenced to protective earth, the remaining two ports should be isolated. Preferably, the instrument body is connected to protective earth by bolting the instrument to an electrically conducting grounded platform. In that case it is recommended to connect the instrument to the RS-485 bus through a suitable optical isolator, to power the instrument from a suitable isolated power supply and to leave the shield at the cable end disconnected. Whenever the system is compact (i.e. the spatial extend of the entire system is less than 5 metres) it is recommended to reference at least one of these ports to protective earth. Never directly connect cables longer than 20 metres to the instrument.

Further recommendations:
Radiometers are sensitive equipment. Hukseflux strongly recommends users to employ adequate lightning protection to prevent damage to the radiometer. Furthermore, it is recommended to implement sufficient equipotential bonding of the protective earth over the spatial extend of the entire system/installation.

It remains the responsibility of the customer to provide suitable wiring and installation of the sensor and make sure the instrument is protected from electrical surges.

Conclusion:
- The new SR30-M2-D1 pyranometer offers improvements over its predecessor SR30-D1. Already owning SR30('s)? Please read this memo to benefit from the improvements.
- Need support for SR30-M2-D1? Please consult the user manual on the SR30-M2-D1 product page and, when using the new Hukseflux Sensor Manager software, the user manual on the Hukseflux Sensor Manager support page.
- Need support for model SR30-D1? It has a separate user manual. Please find it here. Full support and recalibration services will continue.
- For the latest software and user manuals, please refer to https://www.hukseflux.com/downloads.