

SQC485lv2-MH

LoRa® RS485 Industrial Node — Meshtastic



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1. Description

1.1 Overview



SQC485Iv2 — LoRa RS485 Industrial Node

The SQC485Iv2 is a ruggedized industrial wireless node that converts industrial RS485 / Modbus bus data into LoRa wireless data. It integrates a 32-bit CPU core and a Semtech SX1262 LoRa transceiver.

It accepts a wide 8–30 V industrial supply — or 5 V from the USB Type-C port — and combines high-power LoRa, robust industrial RS485, USB Type-C and BLE 5 in a single compact node. USB Type-C provides power, programming and console access, while BLE 5 enables convenient wireless provisioning in the field.

This is a highly reliable device for industrial IoT scenarios, providing a method to bring legacy RS485 instruments onto a LoRa network. It runs Meshtastic as a self-healing private mesh.

A LoRaWAN variant (SQC485Iv2-LW) on the same hardware is documented in the separate SQC485Iv2-LW datasheet.

1.2 Application Example

The SQC485Iv2 bridges field-side RS485 equipment to a LoRa network for cloud delivery.

1.2.1 Meshtastic mesh relay

Several SQC485Iv2 nodes form a self-healing Meshtastic mesh with no dedicated gateway required, each node relaying for the others; a node with an internet uplink (MQTT) can forward to the cloud.

SQC485Iv2-MH ↔ LoRa ↔ SQC485Iv2-MH ↔ LoRa ↔ SQC485Iv2-MH → (MQTT uplink) → Cloud

1.2.2 RS485 / Modbus telemetry over mesh

Multiple Modbus meters each connect to an SQC485lv2-MH over RS485; readings propagate over the Meshtastic mesh to a node with an internet (MQTT) uplink, which forwards to the cloud.

Modbus meter → RS485 → SQC485lv2-MH → Meshtastic mesh → MQTT uplink node → Cloud

For detailed networking modes and configuration, refer to the Siliqs documentation (see section 4.1).

1.3 Product Features

- DC 8–30 V wide-voltage industrial input, or 5 V via USB Type-C (≥ 500 mA) — automatic source selection between the two.
- Meshtastic self-healing mesh in the 920–925 MHz band; default BW 500 kHz / SF9 at 922.0 MHz, up to +22 dBm. Listen-Before-Talk (LBT) supported.
- Self-healing private mesh — configurable point-to-point, point-to-many, or multi-hop mesh, no dedicated gateway required.
- Industrial-grade RS485 transceiver — ± 70 V bus-fault protection, ± 12 kV HBM ESD on bus pins, true fail-safe receiver and thermal shutdown.
- Miswiring- and surge-protected RS485 front-end (field-tested): multi-stage industrial protection validated to survive up to 25 V accidentally applied across the A / B terminals.
- USB Type-C for programming and console, ESD-protected.
- Internal 2.4 GHz antenna for BLE provisioning (enclosed, no external connector).
- Operating temperature range: $-40 \sim 85^\circ\text{C}$.

2. Specifications

2.1 General specifications

Table 2.1: General specifications

Parameters	Description
MCU	32-bit CPU core
LoRa chipset	Semtech SX1262
Network	Meshtastic; default BW 500 kHz / SF9 at 922.0 MHz, note 1
Operating frequency	920 – 925 MHz
RS485 transceiver	Industrial-grade, half-duplex — ± 70 V bus-fault protection, ± 12 kV HBM ESD, true fail-safe receiver, thermal shutdown
RS485 protection	Multi-stage industrial fault & surge protection; survives up to 25 V miswiring across A/B (tested)
2.4 GHz wireless	BLE 5.0 (internal antenna)
Max. TX power	+22 dBm (firmware-configurable)
Max. receiving sensitivity	−148 dBm (SF12)
Supply voltage	8 ~ 30 V DC (POW_IN), or 5 V DC via USB Type-C (≥ 500 mA); automatic source selection
Operating temperature	$-40 \sim 85^\circ\text{C}$
Operating humidity	10% ~ 90%, non-condensing
Antenna impedance	50 Ω
RS485 baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200

Note 1: Default Meshtastic configuration — custom LoRa config BW 500 kHz / SF9 at 922.0 MHz, within the 920–925 MHz band. A LoRaWAN variant (SQC485lv2-LW) on the same hardware is documented separately.

2.2 Operating conditions

2.2.1 Power supply range

Table 2.2.1: Power supply range

Parameter	Min.	Typical	Max.	Unit
Device operating input voltage (POW_IN)	8	12 / 24	30	V
USB Type-C input voltage	4.75	5.0	5.25	V
USB Type-C input current	—	—	500	mA
Regulated system rail	—	3.3	—	V

The device may be powered from the 8–30 V industrial input (POW_IN) or from the 5 V USB Type-C port; an automatic power-path selects whichever source is present. A USB host or charger supplying at least 500 mA at 5 V is sufficient for full operation, including LoRa TX peaks.

2.2.2 Power consumption

Typical operating currents at the 3.3 V rail (RS485 idle). RX/TX figures are SX1262 datasheet-derived references.

Table 2.2.2: Working current

Mode	Board Rev.	Current	Notes
RX Listening (ref.)	—	~27 mA	MCU active + SX1262 RX
TX @ +22 dBm (peak, ref.)	—	~140 mA	SX1262 PA peak

2.2.3 Air data rate

LoRa (CSS) modulation. Data rate depends on spreading factor / bandwidth.

Table 2.2.3: Air data rate

Configuration	SF	Air rate (approx.)
Default (BW 500 kHz)	SF9	~7.0 kbps
BW 500 kHz range	SF7 ... SF12	~21.9 kbps ... ~1.2 kbps

2.2.4 TX Power levels

Table 2.2.4: TX Power levels

Unit	Levels	TX Power
dBm	4	22 (default) / 17 / 14 / 10

2.2.5 Interface (connectors and pinout)

Table 2.2.5: Interface

Symbol / Name	Type	Function
POW_IN	Socket	8–30 V DC industrial supply
485A	Socket	RS485 interface A
485B	Socket	RS485 interface B
USB-C	Connector	Programming / power / console
LoRa ANT	On-board SMA connector	External LoRa antenna (sub-GHz)
2.4G ANT	Internal	BLE antenna

2.2.6 RS485 bus length vs data rate

The A/B pair carries an on-board 340 Ω termination (2 × 680 Ω in parallel) — a "soft" termination above the 120 Ω nominal line impedance, best suited to lower-to-moderate-speed Modbus over short-to-medium cable (the typical industrial metering case). Recommended maximum bus length by baud rate:

Table 2.2.6: Recommended bus length (on-board 340 Ω soft termination)

Baud rate	Recommended max bus length
9600 bps	~1000 m
19200 bps	~500 m
38400 bps	~250 m
57600 bps	~170 m
115200 bps	~100 m

The table lengths are limited by reflections off the soft 340 Ω termination, not by RS485 itself. The 340 Ω sits only at this node's A/B point; a bus is properly terminated at its two physical cable ends with ~120 Ω. If this node is at one end of the bus, add a 120 Ω at the opposite end; if it is mid-bus, fit 120 Ω at both ends (the 340 Ω then only lightly loads the bus — by design). The transceiver's maximum data rate is 115200 bps; with proper end-termination the bus reaches ~1000–1200 m. Estimates assume good twisted-pair cable (≈ 5 ns/m), are intentionally conservative, and vary with cable quality, node count and EMI environment.

2.2.7 RF / radio parameters

Table 2.2.7: RF / radio parameters (LoRa)

Parameter	Value
Operating frequency	920 – 925 MHz; default 922.0 MHz
Network	Meshtastic
Modulation	LoRa (CSS)
Bandwidth / spreading factor / coding rate	BW 500 kHz / SF9 / CR 4/5
Max TX power	+22 dBm (158 mW), firmware-configurable
Max receiving sensitivity	~ -123 dBm (SF9 / BW 500 kHz)
Listen Before Talk (LBT)	Supported (CAD + CSMA)
LoRa antenna	KYOCERA AVX X9003088-3GDSMB (SMA-M stubby, ~2 dBi)

2.2.8 BLE / 2.4 GHz RF parameters

Table 2.2.8: BLE / 2.4 GHz RF parameters

Parameter	Value
Standard	Bluetooth Low Energy 5.0
Frequency range	2402–2480 MHz (40 channels, 2 MHz spacing) within the 2400–2483.5 MHz ISM band
Modulation	GFSK, adaptive frequency hopping (AFH)
Use	Wireless provisioning / commissioning (low power)
Antenna	Internal PCB antenna (not user-accessible)
Antenna gain	≤ 6 dBi (no power reduction per NCC LP0002 §4.10)
Max conducted TX power	+3 dBm (2 mW), configurable
Regulatory power limit (NCC)	≤ 0.125 W (+21 dBm) peak conducted — frequency-hopping system, < 75 hop channels (LP0002 §4.10.1.2)

3. Hardware resource

3.1 Block diagram

The functional signal chain is summarized below (graphical block diagram to be added).

Table 3.1: Functional blocks

Stage	Components	Function
Power input	Protected input + buck converter + LDO	8–30 V DC down to regulated 3.3 V rail
Power path	Automatic source ORing	Selects between USB-5V and the 8–30 V main supply
Core	32-bit MCU + SX1262 module	MCU, LoRa radio, internal 2.4 GHz antenna
RS485	Industrial RS485 transceiver + multi-stage protection	±70 V fault-protected, surge- and miswiring-protected RS485 to 485A / 485B
USB	USB Type-C + ESD protection	Programming / console

3.2 Physical dimensions

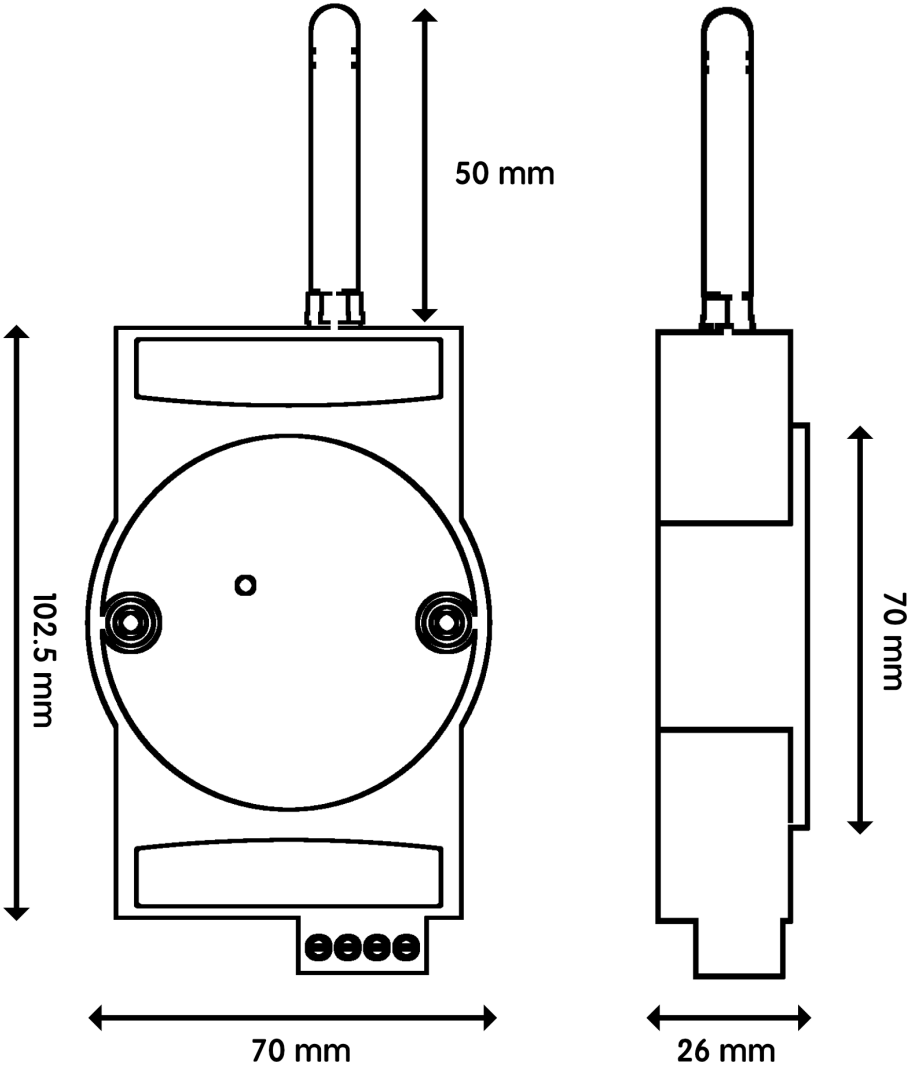
The enclosure is a compact rectangular body with a Ø70 raised circular label face on the front. Two mounting holes on the front face allow direct surface mounting. The LoRa SMA connector and USB Type-C port are on the top edge; the pluggable RS485 / power terminal block is on the bottom edge.

Table 3.2: Enclosure dimensions

Parameter	Value	Notes
Body (W × L × D)	60 × 102.5 × 23 mm	Rectangular main body
Front label-face diameter	Ø70 mm	Raised ~3 mm above body face
Overall height (incl. label face)	26 mm	Body 23 mm + label face 3 mm
Label keep-out (recess)	Ø65 mm	Ø65 sunk area on the front label face
Mounting holes	2 × Ø3.5 mm (through)	Ø8 counterbore
Mounting hole pitch	55 mm	Horizontal, centred on label face
RS485 / power terminal	4-pin pluggable, 5.08 mm pitch	Bottom edge (V / G / A / B)
LoRa antenna connector	SMA (female)	Top edge
USB Type-C	On top edge	Programming / power / console
Overall depth (incl. front bulge)	26 mm	See dimension drawing below

Dimensions exclude the external antenna and the mating terminal-block plug. All values ± 0.5 mm (preliminary, from the mechanical model).

Figure 3.2: Dimension drawing (front and side views, mm)



SQC485lv2 — front and side dimension drawing

4. Resource

4.1 Relevant resource

- Siliqs product store: <https://siliqs.net>

4.2 Contact Information

Siliqs

- Web: <https://siliqs.net>
- Email: support@siliqs.net

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