SQC485Iv2

LoRa® RS485 Industrial Node

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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 long-range 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 long-range 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 / LoRaWAN® network. The firmware ecosystem (LoRaWAN Class A/C, Meshtastic®) makes it easy to integrate into existing infrastructure.

1.2 Application Example

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

1.2.1 RS485 / Modbus backhaul (point-to-many)

Multiple Modbus meters each connect to an SQC485Iv2 over RS485; the nodes transmit over LoRa to a shared gateway, which forwards to the cloud via LTE / Ethernet.

Modbus meter → RS485 → SQC485Iv2 → LoRa → LoRa Gateway → LTE / Ethernet → Cloud

1.2.2 Meshtastic mesh relay

Several SQC485Iv2 nodes form a self-healing Meshtastic mesh with no gateway required, each node relaying for the

others.

SQC485Iv2 ↔ LoRa ↔ SQC485Iv2 ↔ LoRa ↔ SQC485Iv2

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.
- LoRa / LoRaWAN (Class A/C) / Meshtastic multiple network modes.
- LoRaWAN AS923-1 (RP002-1.0.5) and Meshtastic (region TW, default Medium Fast @ 920.125 MHz) — all within the Taiwan 920–925 MHz band. Selectable AS923 channel plan (AS1 / AS2); 8-channel plans matching standard SX1302 / SX1303 gateways; Listen-Before-Talk (LBT) and Wake-On-Radio (WOR) supported.
- In LoRa private-network mode, configurable as point-to-point, point-to-many, or mesh.
- Industrial-grade RS485 transceiver — ±70 V bus-fault protection, ±12 kV HBM ESD on bus pins, true fail-safe receiver and thermal shutdown. Far more robust than the low-cost RS485 ICs found in most budget converters, which typically offer none of this fault tolerance.
- Miswiring- and surge-protected RS485 front-end (field-tested): multi-stage industrial protection validated to survive up to 30 V accidentally applied across the A / B terminals — a common installer mistake that destroys most low-cost converters — with the unit fully operational afterwards.
- 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 ~ 85 ° C.

2. Specifications

2.1 General specifications

Table 2.1: General specifications

Parameters	Description
MCU	32-bit CPU core
LoRa chipset	Semtech SX1262
LoRaWAN	AS923-1 — selectable channel plan AS1 / AS2 (RP002-1.0.5), note 1
Meshtastic	Region TW, default Medium Fast @ 920.125 MHz (slot 1)
Operating frequency	920 − 925 MHz (Taiwan / NCC band)
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 30 V miswiring across A/B (tested)
2.4 GHz wireless	BLE 5.0 (internal antenna)
Max. TX power	+22 dBm (firmware-configurable), note 2
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 ~ 85 ° C
Operating humidity	10% ~ 90%, non-condensing
Antenna impedance	50 Ω
RS485 baud rate	1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200

Note 1: LoRaWAN AS923-1 (RP002-1.0.5). Taiwan uses the AS2 / AS923-925 channel plan (923.2–924.8 MHz); the AS1 / AS920-923 plan (921.8–923.4 MHz) is also selectable — both stay within the Taiwan 920–925 MHz band. Mandatory default channels 923.2 / 923.4 MHz (LoRa, BW125); 8 × 125 kHz channels match standard SX1302 / SX1303 gateways. Meshtastic operation uses region TW (920–925 MHz), default Medium Fast preset on channel slot 1 (920.125 MHz, BW250).
Note 2: Taiwan NCC LP0002 §5.8 permits ⩽ 0.5 W (+27 dBm) peak conducted output power outdoor / 1 W (+30 dBm) indoor, with antenna gain up to 6 dBi without power reduction. The +22 dBm hardware output is well within this limit. (LoRaWAN AS923 software default Max EIRP is +16 dBm per RP002-1.0.5; the network server may further limit it.)

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 / FSK modulation, AS923-1. Data rate depends on spreading factor / bandwidth.

Table 2.2.3: LoRa air data rate

Unit	Levels	Air rate
bps	8 (DR0–DR7)	250 / 440 / 980 / 1760 / 3125 / 5470 (SF12–SF7 @125 kHz); 11000 (SF7 @250 kHz); 50000 (FSK)

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 unit ships without on-board 120 Ω line termination (the front-end is optimized for fault tolerance). For the great majority of industrial Modbus / metering applications — which run at moderate baud rates over short-to-medium cable — this is not a practical limitation. The table below gives the recommended maximum bus length at each baud rate when used as shipped.

Table 2.2.6: Recommended bus length (no external 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

> For longer or faster buses, fit a 120 Ω termination resistor at each far end of the bus to restore the full RS-485 range (up to ~1200 m at ⩽ 100 kbps). 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 (Taiwan, 920–925 MHz)

Parameter	Value
Operating frequency range	920 – 925 MHz (Taiwan / NCC band)
Modulation	LoRa / (G)FSK
LoRaWAN	AS923-1 (RP002-1.0.5)
LoRaWAN channel plan (selectable)	AS1 / AS920-923 (921.8–923.4 MHz) · AS2 / AS923-925 (923.2–924.8 MHz)
LoRaWAN default channels	923.2 / 923.4 MHz (LoRa, BW125)
LoRaWAN channels per plan	8 × 125 kHz (multi-SF) + DR6 (250 kHz) + DR7 (FSK) — matches SX1302 / SX1303 8-channel gateways
LoRaWAN data rate	DR0–DR5 (SF12–SF7 @125 kHz), DR6 (SF7 @250 kHz), DR7 (FSK 50 kbps)
LoRaWAN channel capacity	⩾ 24 channels (network-assignable)
LoRaWAN duty cycle / dwell time	< 1% / 400 ms
Meshtastic	Region TW (920.0–925.0 MHz); default Medium Fast preset (SF9, BW250), channel slot 1 = 920.125 MHz
Channel bandwidth	125 / 250 kHz
Listen Before Talk (LBT)	Supported
Wake-On-Radio (WOR)	Supported — default 923.6 MHz / ACK 923.8 MHz, SF9 / BW125
Max conducted TX power	Up to +22 dBm (158 mW), firmware-configurable
LoRa antenna	KYOCERA AVX X9003088-3GDSMB (SMA-M stubby, ~2 dBi); ⩽ 6 dBi → no NCC power reduction
Regulatory power limit (NCC)	⩽ 0.5 W (+27 dBm) outdoor / 1 W (+30 dBm) indoor — peak conducted output (LP0002 §5.8)

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

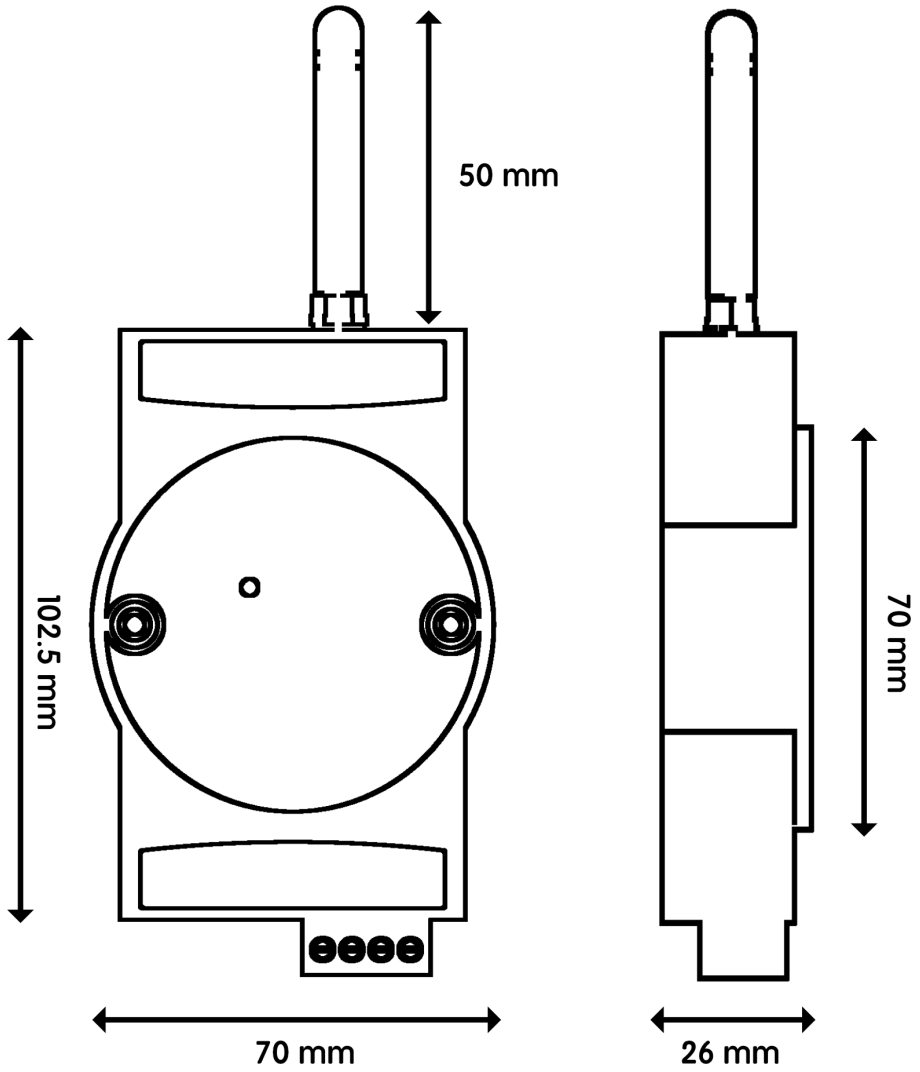
The enclosure is a compact rectangular body with a Ø70 circular front cap (label face). Two mounting holes on the front face allow direct surface mounting. The LoRa SMA connector and USB Type-C port are on the top edge; the pluggable RS485 / power terminal block is on the bottom edge.

Table 3.2: Enclosure dimensions

Parameter	Value	Notes
Body (W × L × D)	60 × 102.5 × 23 mm	Rectangular main body
Front cap diameter	Ø70 mm	Protrudes ~3 mm above body face
Overall height (incl. cap)	26 mm	Body 23 mm + cap 3 mm
Label keep-out (recess)	Ø65 mm	Ø65 sunk face on front cap
Mounting holes	2 × Ø3.5 mm (through)	Ø8 counterbore
Mounting hole pitch	55 mm	Horizontal, centred on cap
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. cap 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)



SQC485Iv2 — 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