WOLF GATEWAY · LINUX EDGE CONTROLLER

Wolf-2RS485

2 Independent RS-485 Ports · Modbus RTU

FIELD BUS	2 × RS-485 Modbus RTU · independent baud rates
BRIDGING	Modbus RTU · M-Bus via converter ↔ MQTT · REST · Modbus TCP
NETWORK	10/100 Ethernet · optional 4G/LTE
SOFTWARE	Wolf-OS platform · Wolf-App automation
POWER	9–30 V DC · 0.7 W typ.
INSTALLATION	DIN-rail · –40 to +55 °C

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1 Introduction

The **FoxIoT Wolf-2RS485** is a Linux-based industrial edge controller in the Wolf Gateway family. It pairs the Wolf motherboard with a 2RS485 expansion card that adds **two independent RS-485 ports**, each with its own transceiver, baud rate, and protocol settings. The ports poll field devices over Modbus RTU, and the gateway forwards the device data to your cloud, SCADA, or VPP platform — via MQTT, REST, or Modbus TCP over Ethernet or 4G/LTE.

The hardware runs **Wolf-OS** (the Linux platform) and **Wolf-App** (drop-in automation software). Expansion cards are detected automatically at boot, so the platform configures its drivers without manual setup.

1.1 Key features

- 2 × RS-485 ports (SN65HVD1781DR transceivers), each independently configurable.
- 300–115200 bps per port — two buses with different baud rates on one gateway.
- TX / RX indicator LEDs per port.
- ±15 kV HBM ESD and ±30 V bus-fault protection, built-in 120 Ω terminator per port.
- Modbus RTU field bus, MQTT / REST / Modbus TCP on the network side.
- 10/100 Ethernet, optional 4G/LTE (mini-PCIe modem + SIM).
- Runs Wolf-OS and Wolf-App, automatic expansion-card detection.
- DIN-rail, 9–30 V DC, –40 to +55 °C.

1.2 Typical applications

- **Multi-device Modbus networks** — connect meters, inverters, and controllers on two separate RS-485 buses, each at its own baud rate. Aggregate the data via MQTT, REST, or Modbus TCP.
- **Modbus TCP ↔ RTU gateway** — a TCP-capable PLC or SCADA polls the RTU devices directly. Wolf-App translates each Modbus TCP request to RTU on the bus and returns the response — transparent, no register mapping.
- **RS-485 to M-Bus** — attach an external M-Bus converter on one port and Modbus RTU devices on the other. One gateway reads both networks.
- **Protocol bridging** — bridge two Modbus RTU networks with different baud rates and device profiles.

> **About this manual.** This manual covers the **hardware** of the Wolf-2RS485 — installation, wiring, power, and the on-board ports. Software (operating system, networking, automation, cloud) is documented separately: see the **Wolf-OS** and **Wolf-App** manuals listed below.

Related documents

Document	Link
Datasheet / product overview	foxiot.eu/products/wolf-gateway/wolf-2rs485
Wolf-OS (platform)	foxiot.eu/products/wolf-gateway/wolf-os
Wolf-App (automation)	foxiot.eu/products/wolf-gateway/wolf-app

Document	Link
First-time setup guide	foxiot.eu/wolf-setup
Firmware releases	foxiot.eu/firmware/wolf-gateway

2 Safety

Read and understand this manual before installation or maintenance. The following guidance protects personnel and equipment.

2.1 General safety guidelines

- Only qualified personnel should install, wire, or service the device.
- Use appropriate personal protective equipment when working with electrical components.
- Do not operate the device if it appears damaged or has been exposed to moisture.
- Ensure all wiring and connections comply with local regulations and standards.
- Keep the working area clean and free of conductive materials.

2.2 Electrical installation safety

All circuits on the Wolf-2RS485 are low-voltage (SELV). The device has no mains terminals — but the power supply feeding it connects to mains, so mains wiring of the PSU must be performed only by qualified personnel in accordance with local electrical regulations.

- **DIN-rail mounting** — mount on a 35 mm DIN rail inside an electrical cabinet, secured so the unit cannot shift or fall.
- **Low-voltage wiring** — power the unit from an isolated (SELV) supply. Use appropriate low-voltage wire for power and data. Do not route low- and high-voltage wiring together (may be prohibited locally).
- **Modbus data buses** — use 120 Ω twisted-pair cable on the RS-485 buses. For long runs or electrically noisy environments use shielded twisted pair, with the shield earthed at one point only. Each port already includes an on-board 120 Ω terminator, so add a terminator only at the far end of each bus.

2.3 Handling, storage & environment

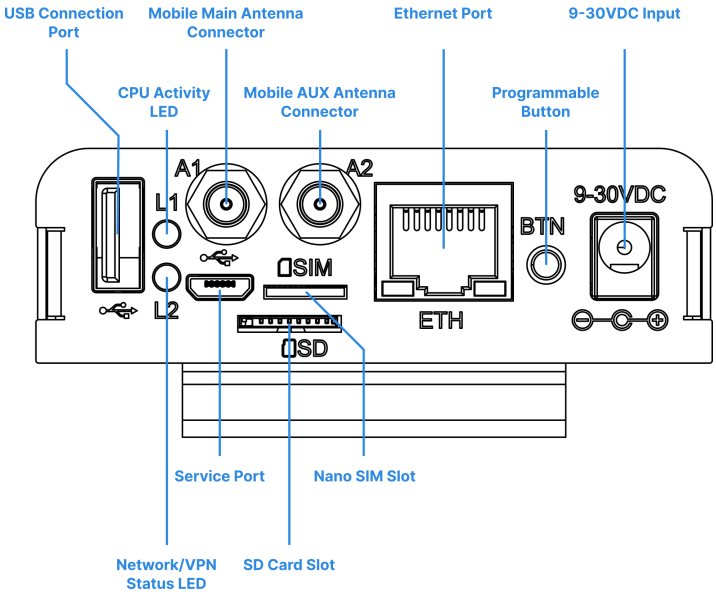
Handle with care to avoid mechanical shock. Store in the original packaging in a clean, dry place within the rated temperature range. The device is for indoor cabinet use. Outdoor installation is possible only inside a suitably rated weatherproof enclosure (IP65 or higher). Avoid excessive humidity/condensation, direct sunlight or radiant heat, and corrosive gases, dust, or vibration.

3 Specifications

3.1 Connectors and ports

The unit has two connection sides. The motherboard carries the network and storage ports plus the DC jack. The expansion card carries the field side — the two RS-485 ports and the POWER terminals. Power can enter on either side (DC jack or POWER terminals) — use one source only.

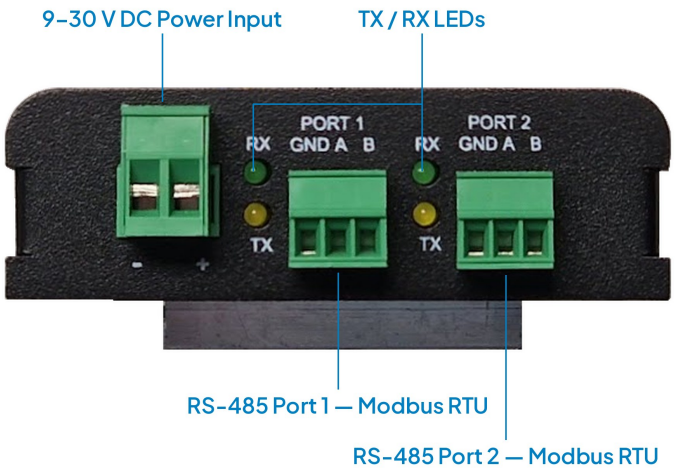
Network, power, and storage connect on the motherboard front:



Wolf-2RS485 front ports

Front Port	Function
USB	USB 2.0 host, software-switchable power, over-current protection
Service Port	Micro USB 2.0 — console and firmware upgrade
ETH	10/100 Mbps Ethernet (RJ45)
A1 / A2	4G/LTE antenna connectors — A1 main, A2 Rx-diversity (optional)
Nano SIM	SIM slot for the LTE modem
SD	Micro-SD card slot, software-switchable power
BTN	User-programmable button
L1 / L2	Programmable status LEDs — L1 heartbeat, L2 user
9–30 VDC	DC jack (2.1 / 5.5 mm) power input

Field wiring connects on the expansion card:



Wolf-2RS485 expansion-card connectors

Connector	Function
POWER – +	9–30 V DC supply input
PORT 1 — GND A B	RS-485 · Modbus RTU · A (+) / B (–) · TX / RX LEDs
PORT 2 — GND A B	RS-485 · Modbus RTU · A (+) / B (–) · TX / RX LEDs

RS-485 polarity. On these connectors A is positive (non-inverting) and B is negative — the common industry convention. The RS-485 standard's A/B lettering is a well-known source of confusion (often cited as the opposite), so if a device won't communicate, try swapping A and B.

3-wire bus. Each port has a dedicated **GND** terminal — run it with the A/B pair so all devices on the bus share a common signal reference. Because each port has a built-in terminator, the Wolf-2RS485 must sit at one physical end of the bus. Wire devices in a daisy-chain — no star topology, keep stubs short.

3.2 Motherboard

Parameter	Value
CPU	NUC980 ARM926EJ-S @ 300 MHz
Memory	128 MB DDR II
Storage	128 MB NAND Flash
Ethernet	10/100 Mbps RJ45
USB	Micro USB 2.0 (FW upgrade) + USB 2.0 host (software-switchable power, over-current protection, 1 A)
SD Card	Micro-SD slot with detection, software-switchable power
SIM	Nano SIM (for LTE modem)
Mini PCIe	USB 2.0 + GPIOs, software-switchable power (4G/LTE/NB-IoT/WiFi modules)

Parameter	Value
Crypto	Hardware acceleration — AES-256, RSA-2048, SHA-512, ECC-256, HMAC, RNG (Linux software is not limited to these)
RTC	Real-time clock (battery backup optional)
Sensors	Onboard PCB temperature, input voltage monitoring
Status LEDs	2× programmable (heartbeat + user by default)

3.3 Expansion card (2RS485)

Parameter	Value
RS-485 ports	2 × independent (SN65HVD1781DR transceivers)
Baud rate	300–115200 bps per port, independently configurable
Protection	±15 kV HBM ESD · ±30 V bus fault (on-board TVS), per port
Termination	120 Ω built-in, per port
Fail-safe bias	On-board bias resistors — do not add external bias
Bus capacity	32 unit loads per bus — up to 256 devices only if all are 1/8 UL · cable up to ~1200 m, baud-rate dependent
Indicators	TX / RX LEDs per port
Card detection	On-board EEPROM (auto-detected by the platform at boot)

3.4 Communication & network

Parameter	Value
Field bus	2 × RS-485 Modbus RTU, 300–115200 bps (standard rates), independent
M-Bus	Via an external RS-485 ↔ M-Bus converter on either port
Ethernet	10/100 Mbps RJ45
Cellular	Optional 4G/LTE — Quectel EC25-EUX (mini-PCIe) + nano-SIM
Network protocols	MQTT, REST, Modbus TCP — client, server, and transparent RTU↔TCP gateway (Wolf-App)
Remote access	VPN — WireGuard (built-in) · OpenVPN (Wolf-OS package)

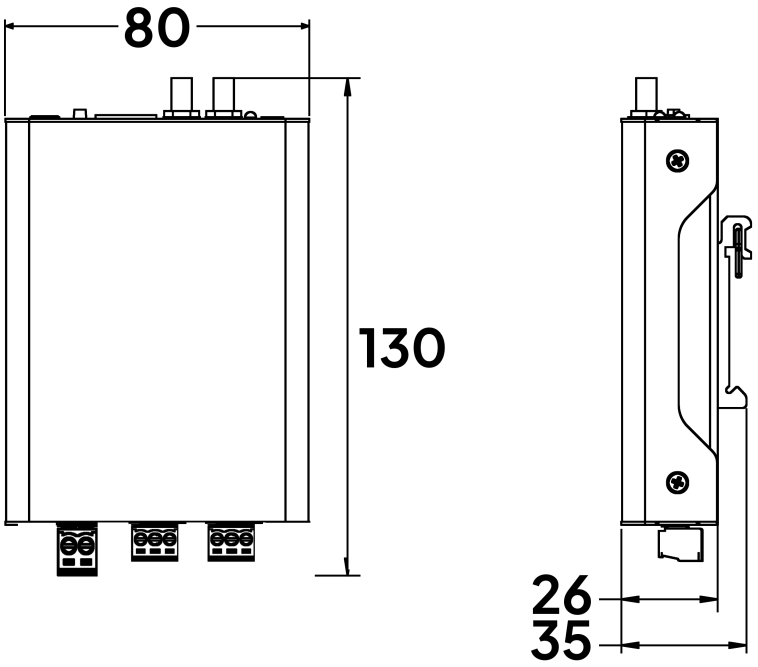
3.5 Power

Parameter	Value
Input range	9–30 V DC — DC jack (2.1 / 5.5 mm) or POWER – / + terminals (one source only)
Average power	0.7 W @ 12 V DC
Reverse-voltage protection	Yes

Figures are for the base unit. The optional 4G/LTE modem draws additional power depending on network state and signal quality.

3.6 Mechanical & environmental

Parameter	Value
Mounting	DIN-rail
Dimensions	130 × 80 × 35 mm
Weight	~350 g
Operating temperature	–40 to +55 °C
Storage temperature	–40 to +75 °C
Humidity	5–90 % (non-condensing)



Wolf-2RS485 mechanical dimensions (mm)

4 How It Works

4.1 Platform & expansion card

The Wolf motherboard runs Wolf-OS (the Linux platform) and Wolf-App (the ready automation software), while the 2RS485 expansion card provides the field ports. Wolf-OS identifies the card at boot via an on-board EEPROM and loads the right drivers automatically — no driver setup. Port settings (baud rate, parity, protocol) are configured in Wolf-App. Two programmable status LEDs (L1 heartbeat, L2 user) indicate operation.

4.2 Two independent ports

Each port has its own transceiver and its own configuration — baud rate, parity, and protocol settings. The buses never share traffic, so a slow legacy device on one port does not hold back a fast bus on the other. The TX and RX LEDs next to each port show live traffic: TX blinks when the gateway polls, RX blinks when a device answers.

4.3 Startup & power-loss behavior

The card has no outputs — a reboot or power loss does not switch anything in the field. After boot, Wolf-App resumes polling automatically and reports current values.

4.4 Communication

Modbus RTU is the primary field protocol — both ports poll field devices with it. A port can also serve other RS-485 devices and, through an external RS-485 ↔ M-Bus converter, M-Bus meters. On the network side, Wolf-App forwards data over MQTT, REST, or Modbus TCP via Ethernet or an optional 4G/LTE modem — and can bridge between the two ports, so two Modbus networks with different settings exchange data through one gateway.

5 Installation

Read the Safety section before installing.

> Disconnect all power before wiring. Do not route low- and high-voltage wiring together. Double-check polarity and that every connection is secure before powering on.

1. **Unpack and inspect** the device for transport damage, and check the model and ratings.

2. **Mount** — first hook the top edge of the clip over the top of the 35 mm DIN rail, then press the unit down to compress the top spring and push the bottom in against the rail. The spring then presses the unit firmly against the rail.

3. **Wire the buses** — connect GND, A, and B of each bus to the pluggable PORT 1 and PORT 2 terminals — see Connectors and ports under Specifications. Use twisted-pair cable with A/B on the same pair, daisy-chain the devices with the Wolf-2RS485 at one physical end of the bus, and terminate the far end with 120 Ω.

4. **Network** — connect Ethernet, or fit the nano-SIM and connect the antenna to A1 for 4G/LTE. A second antenna on A2 (Rx-diversity) is recommended for better reception.

5. **Power** — apply 9–30 V DC, via the DC jack or the POWER – / + terminals on the expansion card. Use only one source — do not connect both at the same time.

6. **Configure** — set the baud rate and protocol per port and map the devices in **Wolf-App**. See Software & Configuration and the first-time setup guide.

See the full **connection diagram** (power, both RS-485 buses, and an M-Bus branch through an external converter) in the Connection Diagram appendix (landscape page) at the end of this manual.

Controller removal. To remove the unit, push it down to compress the top spring clip, then pull the bottom edge toward you and lift it off the rail — no tool needed.

6 Software & Configuration

The Wolf-2RS485 has no display or local controls apart from the programmable button — all setup and operation happen in software. This hardware manual does not duplicate the software documentation. For networking, secure updates, automation, and cloud connectivity, use the dedicated manuals:

- **Wolf-OS** — the Linux platform: networking, secure updates, system services. See foxiot.eu/products/wolf-gateway/wolf-os.
- **Wolf-App** — drop-in automation: cloud/VPP connectivity, MQTT / REST / Modbus TCP, per-port bus configuration, and rules. See foxiot.eu/products/wolf-gateway/wolf-app.
- **First-time setup** — step-by-step at foxiot.eu/wolf-setup.
- **Firmware releases** — bundles and changelogs at foxiot.eu/firmware/wolf-gateway.

7 Maintenance

The device is designed for indoor cabinet use and needs minimal maintenance.

- **Cleaning** — disconnect power, then wipe the enclosure with a dry or slightly damp lint-free cloth, no solvents or abrasives.
- **Connectors** — periodically inspect the power, data, and network connections, and clean oxidation or debris with electronics-approved contact cleaner or compressed air.
- **Periodic inspection (every 12 months)** — check for mechanical damage, secure mounting, and loose cables, and confirm the recommended firmware version.
- **Firmware** — Wolf-OS and Wolf-App update in-field as signed bundles. Do not remove power during an update. Releases and changelogs: foxiot.eu/firmware/wolf-gateway.

Do not open the enclosure. There are no user-serviceable parts inside. Opening it voids the warranty — see Warranty limitations.

8 Troubleshooting

Hardware-side checks for common field issues. Software diagnostics — networking, automation, and logs — are covered in the Wolf-OS and Wolf-App manuals.

Symptom	Check
L1 green LED not blinking	By default L1 (green) blinks as a heartbeat. At boot it stays solid, then begins blinking after ~30 s. If it never starts, measure the POWER – / + terminals: confirm 9–30 V DC, correct polarity, and that voltage stays within limits (over-voltage can cause permanent damage).
No Modbus RTU comms	Watch the port's TX / RX LEDs first: TX blinking means the gateway is polling, RX blinking means a device is answering. If TX never blinks, the gateway is not polling — check the port configuration in Wolf-App before touching the wiring. TX without RX points at wiring or device settings. Wire A (+) to every device's A (+) and B (–) to B (–), polarity consistent along the whole chain. Use twisted-pair cable of the correct impedance, with A/B on the same pair, and run the port's GND terminal with the pair so all devices share a common reference. The port has an on-board 120 Ω terminator at its end — check that the far end of the bus is terminated too. Once wiring is confirmed correct, check baud rate, stop bits, and parity — parity is the most common misconfiguration, and each port has its own settings.
No Ethernet	Check the RJ45 cable and switch port. The RJ45 connector has built-in link/activity LEDs — confirm the link LED shows a connection. IP and DHCP configuration is covered in the Wolf-OS docs.
Can't reach the device / IP unknown	Boot into recovery mode for a fixed IP, or factory-reset to restore defaults (network reverts to DHCP). See the first-time setup guide.
No 4G/LTE	Confirm the SIM is seated and the antenna connected (main antenna on A1). Most LTE problems are not hardware: the SIM PIN must be removed before inserting the card, the operator must have activated the data service, and the APN must be correct. Wolf-App configures the modem automatically — see the setup guide.

9 Ordering Information

Item	Order code	Description
Wolf-2RS485	GW-WOLF-RS-R1	2 independent RS-485 ports, Modbus RTU
Wolf-2RS485-LTE	GW-WOLF-RS-R1-LTE	As above, with 4G/LTE modem (Quectel EC25-EUX)
Plug-in power adapter	ACC-PSU-12P	12 V DC, 1.5 A (2.1 / 5.5 mm jack)
DIN-rail PSU	ACC-PSU-24D	24 V DC, 1.5 A
LTE antenna	ACC-ANT-M-LTE	Magnet-mount, for the -LTE variant

Order through hello@foxiot.eu or your distributor.

10 Warranty, Support & RMA

10.1 Warranty conditions

FoxIoT OÜ provides a limited warranty for **36 months from the date of purchase**, covering defects in materials and workmanship under normal use, in accordance with this manual and the product's environmental specifications. During the warranty period FoxIoT will repair or replace defective units at no charge, provided the product has not been modified, misused, or subjected to adverse conditions.

- Valid only for original products from FoxIoT OÜ.
- Proof of purchase may be required.
- Warranty service is limited to repair or replacement.
- The warranty does not cover associated costs such as removal, reinstallation, or transportation.

Independent of the warranty period, FoxIoT provides security updates for at least **5 years** from the product's release, as required by EU CRA 2024/2847.

10.2 Warranty limitations

The warranty does **not** apply in the following cases:

- Physical damage from mishandling, impact, fire, or water exposure.
- Damage from improper installation, incorrect wiring, or operation outside the specified limits.
- Modifications or repairs by unauthorized personnel.
- Normal wear and tear.
- Software issues related to non-standard configurations.

> The warranty is void if the product has been opened or tampered with in any way not approved by FoxIoT OÜ.

10.3 Technical support

Contact our support team through:

Email	support@foxiot.eu
Support hours	Monday–Friday, 10:00–16:00 EET (Estonian time)
Languages	English, Estonian

Have your device's serial number, firmware version, and a clear description of the problem ready when contacting support.

10.4 RMA process (Return Material Authorization)

To return a product for repair or replacement you must obtain a valid **RMA number** from support — devices returned without one are not accepted.

1. Contact technical support to report the issue.
2. Provide the serial number, a clear description of the issue, and proof of purchase.
3. Receive an RMA number and return instructions.

4. Package the product carefully to prevent shipping damage and include the RMA number.

5. Send the unit to the return address provided by support.

Returns through an authorized reseller or distributor must still be submitted to FoxIoT support to obtain an RMA number. The reseller manages end-customer logistics and documentation. Direct end-customer returns are accepted after support verifies the purchase channel and warranty eligibility.

11 Compliance & Standards

The Wolf Gateway platform is designed and documented to EU industrial and cybersecurity requirements. Product security information is published per the EU Cyber Resilience Act (Regulation 2024/2847).

11.1 Product cybersecurity context

The Wolf platform applies a defense-in-depth strategy:

- **Signed firmware** — Wolf-OS and Wolf-App ship as digitally signed bundles. The updater verifies each bundle's signature before installing it.
- **Secure remote access** — use the built-in VPN (OpenVPN, WireGuard) for remote management. Do not expose management interfaces directly to the public internet.
- **Intended environment** — install inside a locked electrical cabinet, on a segmented automation network behind a firewall.
- **Security updates** — provided for at least 5 years, per EU CRA 2024/2847. Report vulnerabilities to security@foxiot.eu.

Topic	Detail
Directives	EMC 2014/30/EU · RoHS 2011/65/EU · WEEE 2012/19/EU
Cyber Resilience	EU CRA (Reg. 2024/2847) — product security information published
Secure boot & updates	Signed Wolf-OS / Wolf-App firmware bundles
Vulnerability reporting	security@foxiot.eu — coordinated disclosure

Product Security Information (CRA-UI-001) and signed firmware releases are published at foxiot.eu/legal/security. Report vulnerabilities to security@foxiot.eu.

Disposal (WEEE). Do not dispose of this device with household waste. At end of life, return it to a designated WEEE collection point or to FoxIoT OÜ — see recycling & disposal.

12 Connection Diagram

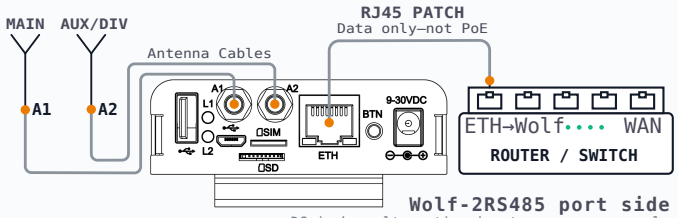
Wolf-2RS485

CONNECTION DIAGRAM

CD-WG-2RS485 · Rev 1.0 · 2026-06 · foxiot.eu

NETWORK & ANTENNA

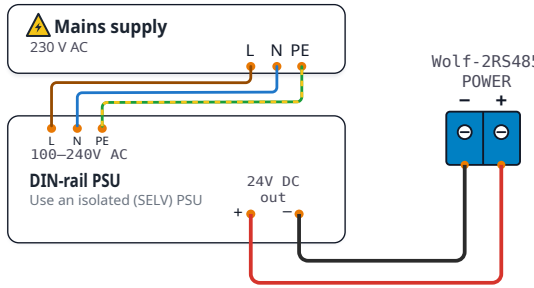
A1 = LTE main
A2 = Rx-diversity (optional)



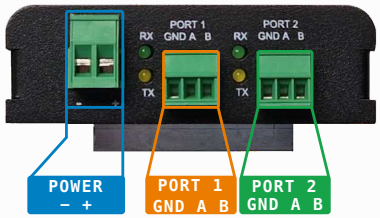
Wolf-2RS485 port side

DC jack = alternative input · one source only

POWER



WOLF-2RS485 connector side



POWER
9-30V DC · DIN

2 x RS-485
Modbus RTU

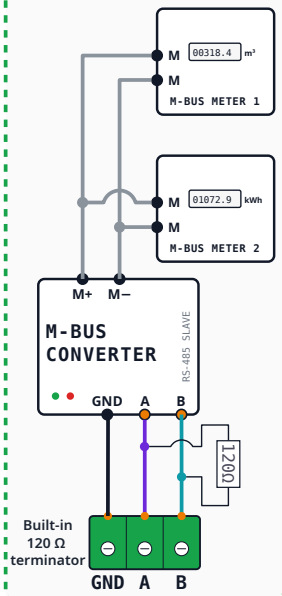
BAUD RATE
300-115200 bps each

TERMINATION
120 Ω built-in per port

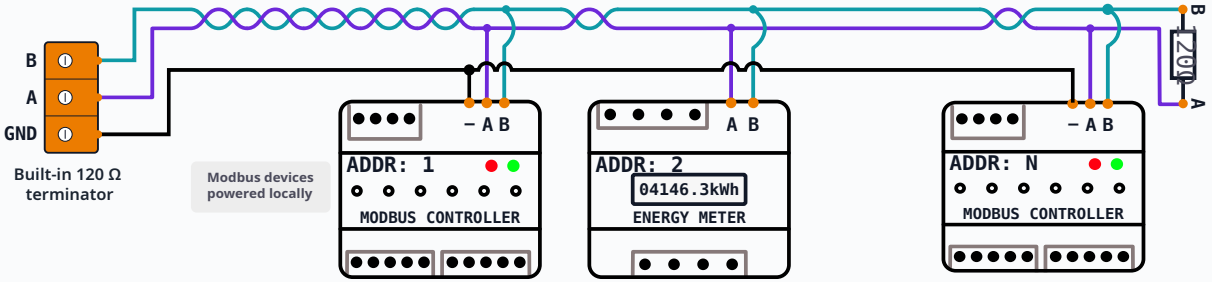
All field wiring connects here. Colors match the zones around the sheet.

PORT 2 M-BUS

M-Bus is 2-wire and polarity-free. Converter and meters powered locally.



PORT 1 MODBUS RTU



WIRE KEY

AC MAINS
- Phase / Line (L)
- Neutral (N)
- PE / earth

DC POWER
- + supply (e.g. +24 V)
- − / 0 V / GND · RS-485 common

RS-485 DATA
- RS-485 A
- RS-485 B
- twisted pair (A/B)

OTHER
- signal / data / M-Bus
- live 230 V

CONNECTION TABLE

FROM	TO	WIRE
LTE antenna	Wolf A1	
Aux antenna	Wolf A2	
Router	Wolf ETH	
Mains L	PSU L	
Mains N	PSU N	
Mains PE	PSU PE	
PSU +	Wolf +	
PSU −	Wolf −	
Wolf P1 GND	MOD #1 −	
Wolf P1 A	MOD #1 A	
Wolf P1 B	MOD #1 B	
MOD #1 A	Meter A	
MOD #1 B	Meter B	
MOD #1 −	MOD #N −	
Meter A	MOD #N A	
Meter B	MOD #N B	
120 Ω	MOD #N A	
120 Ω	MOD #N B	
Wolf P2 GND	Conv GND	
Wolf P2 A	Conv A	
Wolf P2 B	Conv B	
120 Ω	Conv A	
120 Ω	Conv B	
Conv M+	Mtr 1 M	
Conv M−	Mtr 1 M	
Mtr 1 M	Mtr 2 M (wire 1)	
Mtr 1 M	Mtr 2 M (wire 2)	

Wolf-2RS485 connection diagram — power, two RS-485 Modbus buses, and an M-Bus branch via an external converter

Revision History

Version	Date	Notes
1.0	2026-06-11	Initial release.