



RTU CONTROLLER · MODBUS RTU

6ADI4Ro2AVo2Alo

6 Universal Inputs · 4 Relays · 2× 0–10 V · 2× 4–20 mA · Modbus RTU

INPUTS	6 universal · digital, 0–10 V, 4–20 mA, NTC
RELAYS	4 × Omron · 16 A @ 250 V AC
OUTPUTS	2× 0–10 V · 2× 4–20 mA analog outputs
BUS	RS-485 Modbus RTU · up to 247 devices
POWER	11–30 V DC · DIN-rail 6M · –40 to +55 °C

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1 Introduction

The **FoxIoT 6ADi4Ro2AVo2Alo** is a DIN-rail Modbus RTU controller with **6 universal inputs, 4 relay outputs, 2 analog voltage outputs (0–10 V)**, and **2 analog current outputs (4–20 mA)**. It is built for full closed-loop control from a single unit — reading field sensors, switching loads, and driving analog actuators without additional modules.

Each input reads digital signals, 0–10 V analog, 4–20 mA (with an external resistor), or 10k NTC thermistors. Relays 1–3 are SPDT (NC·C·NO contacts), Relay 4 is SPST-NO (C·NO only). All four are Omron G2RL-1-E rated at 16 A @ 250 V AC. Analog voltage outputs drive VFD reference inputs, damper actuators, and LED dimmers; analog current outputs drive standard 4–20 mA loops. Both output types are software-configurable and update in real time over Modbus.

A built-in **rule engine** runs 16 internal automations independently of the Modbus master — thermostat control, switch logic, VPP failover — so critical functions continue even if the communication link fails. Firmware updates are delivered in-field over Modbus, and a coil-voltage-reduction mode lowers power while relays are active.

1.1 Key features

- 6 universal inputs (digital, 0–10 V, 4–20 mA with resistor, 10k NTC), 16-bit.
- 4 × Omron G2RL-1-E relays — relays 1–3 SPDT, relay 4 SPST-NO — 16 A @ 250 V AC.
- 2 × analog voltage outputs, 0–10 V, ≥ 1 k Ω load (10 mA max).
- 2 × analog current outputs, 0–20 mA (4–20 mA mode selectable).
- RS-485 Modbus RTU, 300–115200 bps; 1/8-unit-load driver addresses up to 247 devices on a single bus (no repeaters).
- Built-in rule engine — 16 rules, standalone and safe fallback operation.
- Software coil voltage reduction — lowers power and heat while relays are held on.
- Front-panel buttons for on-site configuration and manual relay switching — incl. an offline mode for local backup control when the Modbus master is down. Full remote configuration over Modbus.
- Wide –40 to +55 °C range, protected I/O and RS-485 bus pins.

1.2 Typical applications

- **Industrial automation** — monitor analog signals (temperature, pressure, voltage) and control machinery via relays and analog outputs.
- **Building automation (HVAC)** — thermostat rule logic, damper and VFD control via 0–10 V or 4–20 mA outputs, relay switching of contactors and heaters.
- **VFD control** — read sensor feedback on inputs, drive motor speed via 0–10 V or 4–20 mA, with standalone fallback rules when the master is offline.
- **Energy management & VPP** — Communication-Driven Voltage Failover rule lets a VPP platform override a local analog output; on comms loss, the output reverts to following the measured input automatically.
- **Agriculture & greenhouses** — environmental monitoring and proportional control of fans, heating valves, and dosing pumps.

About this manual. This document covers hardware installation, configuration, and operation of the 6ADi4Ro2AVo2Alo. For Modbus register definitions, communication examples, and rule configuration, see the [Modbus Register Map](#).

Related documents

Datasheet / product overview

foxiot.eu/products/rtu-controllers/6adi4ro2avo2aio



Modbus Register Map

foxiot.eu/downloads/FoxIoT-6ADi4Ro2AVo2Alo-Modbus-RTU-Registers-v1_1.pdf



Wiring Instructions

foxiot.eu/downloads/FoxIoT-6ADi4Ro2AVo2Alo-Wiring-Instructions-v1_0.pdf



2 Safety

Read and understand this manual before installation or maintenance.

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

Electrical hazard — risk of severe injury or death. Relay outputs may switch mains voltage (e.g. 230 V AC). A lethal shock is possible if terminals are touched during operation. **Always disconnect power before any installation or maintenance.** Mains wiring must be performed only by qualified personnel in accordance with local electrical regulations.

- **DIN-rail mounting** — ensure the controller is fully engaged on the rail inside an electrical cabinet, with the mounting clip locked to prevent movement.
- **Low-voltage wiring** — use appropriate low-voltage wire for power and inputs. Do not route low- and high-voltage wiring together.
- **Modbus data line** — use twisted-pair cable with controlled impedance ($\approx 120 \Omega$) on the RS-485 lines.

- **Relay wiring** — use properly rated wiring when switching high-voltage equipment.
- **Separate power sources** — if using multiple power sources (control supply and relay-switched supply), ensure adequate isolation between them.

Relay output limits

Relays 1–3 are SPDT rated up to **250 V AC / 24 V DC, 16 A (resistive)**. Relay 4 is SPST-NO with the same current and voltage ratings. The 16 A rating applies to purely resistive loads. Motors and inductive loads switch at lower usable current (e.g. 200,000 operations at 8 A, 250 V AC, $\cos\phi = 0.4$). High-inrush capacitive loads (LED drivers, power supplies) can weld contacts — use an inrush limiter or an external contactor rated for such loads. Full contact ratings and electrical life are listed under [Specifications](#).

2.3 Handling, storage & environment

Handle with care to avoid mechanical shock. Do not press hard on the top-side buttons. 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. For altitudes above 2000 m or non-standard environments, consult FoxIoT.

3 Quick Start

A minimal path to get the controller powered, addressed, and talking Modbus. **Read the [Safety](#) section first.**

1. **Mount** the unit on the DIN rail inside the cabinet, lock the clip.
2. **Wire power** — 11–30 V DC to the PWR terminals (observe polarity).
3. **Wire RS-485** — A (+) to master A (+), B (–) to master B (–), add a $\approx 120\ \Omega$ bus termination resistor if the device is at the end of the segment.
4. **Wire analog outputs** (if used) — the 0–10 V and 4–20 mA outputs land on their own terminals; see the [Wiring Instructions](#) for terminal assignments and their ground reference.
5. **Set the address & serial parameters** — the device ships at **address 1, 9600 bps, 8E1**. To change them, power **off**, then power on, and within 10 s hold Buttons 1 + 2 until **Input LED 1 blinks** — you are in configuration mode (see [§7](#)).
6. **Verify communication** — the green Traffic LED blinks on valid Modbus activity. You are ready to read inputs, switch relays, and set analog output values.

4 Specifications

4.1 Electrical

Parameter	Value
Nominal voltage	12 V or 24 V DC
Operating voltage range	11–30 V DC
Idle power consumption	0.35 W @ 12 V / 0.5 W @ 24 V
Power (all relays on, coil reduction enabled)	1.8 W @ 12 V / 2.1 W @ 24 V
Power (all relays on, coil reduction disabled)	3.0 W @ 12 V / 3.3 W @ 24 V
Reverse-voltage protection	Up to 30 V

4.2 Inputs

Parameter	Value
Channels	6 universal
Max input voltage	30 V DC
Digital active / inactive threshold	2.5–30 V / 0–1.5 V
Software debounce filter	50 ms
Analog resolution	16-bit
Analog range	0–10 V DC
Analog accuracy	$\pm 0.1\%$ or ± 3 mV (whichever greater), 0.05–10 V
Analog sampling rate	>100 Hz
Input impedance	>5 M Ω
Software pull-up	10 k Ω @ 10 V (per input, software-enabled)
4–20 mA input	Via external resistor to GND (250 Ω → 1–5 V · 500 Ω → 2–10 V)
NTC mode	10k NTC thermistor ($\beta = 3435$ or $\beta = 3977$), direct connection

4.3 Relay outputs

Parameter	Value
Channels	4 (relays 1–3: SPDT · relay 4: SPST-NO)
Relay model	Omron G2RL-1-E
Contact rating	250 V AC / 24 V DC, max 16 A (resistive)
Mechanical life	20 million operations
Electrical life	30,000 ops @ 16 A 250 V AC · 200,000 ops @ 8 A 250 V AC ($\cos\phi$ 0.4)
Coil voltage reduction	Software-controlled (lowers idle power and heat)

4.4 Analog voltage outputs (0–10 V)

Parameter	Value
Channels	2
Output range	0–10 V DC
Minimum load resistance	$\geq 1\text{ k}\Omega$
Max output current	10 mA
Isolation	Not isolated (referenced to supply GND)
Output update rate	>1000 Hz

4.5 Analog current outputs (4–20 mA)

Parameter	Value
Channels	2
Output range	0–20 mA (4–20 mA mode selectable via Modbus)
Max loop impedance	$\leq 1.0\text{ k}\Omega$ at 24 V DC / $\leq 450\text{ }\Omega$ at 12 V DC
Isolation	Not isolated (referenced to supply GND)
Output update rate	>1000 Hz

4.6 Communication

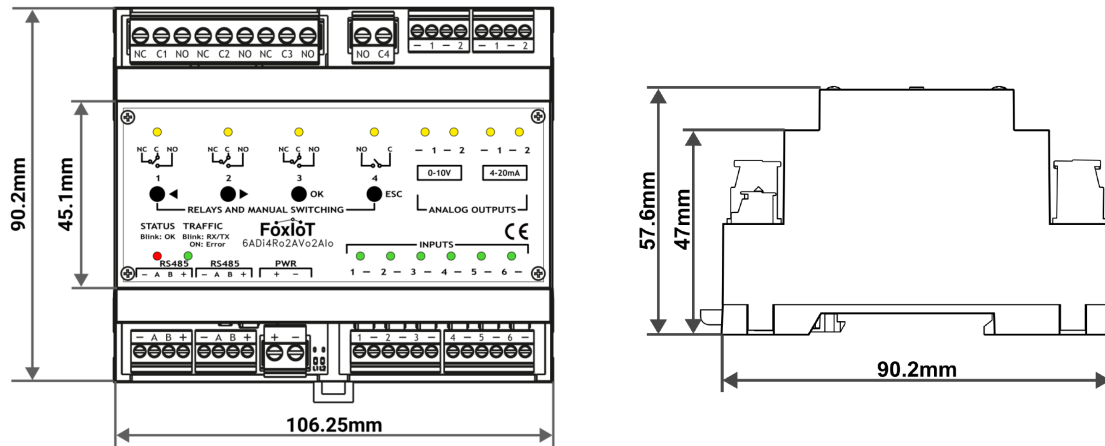
Parameter	Value
Interface	RS-485, Modbus RTU slave
Baud rates	300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200
Data format	8N1 / 8N2 / 8E1 / 8O1
Modbus address (via Modbus / buttons)	1–247 / 1–247
Bus pin protection / ESD	±30 V / ±16 kV HBM
Fail-safe receiver	Open-circuit, short-circuit, idle-bus
Bus driver loading	1/8 unit load (up to 256 nodes per bus)
Network capacity	Up to 247 devices on a single bus, no repeaters (Modbus address limit)
Common-mode range	–20 V to +25 V

4.7 Processor

Parameter	Value
Type	32-bit ARM Cortex-M33
Clock	Up to 76.8 MHz

4.8 Mechanical

Parameter	Value
Mounting	DIN-rail (TH35)
Module size	6M (6 × 17.5 mm slots)
Dimensions (L × W × H)	106 × 90 × 58 mm
Install clearance	Allow ~5 mm below the module for the DIN-rail release clip
Weight	265 g
Connectors	Pluggable terminal blocks — inputs: 2×6-pin (≤1.5 mm ²), RS-485: 2×4-pin two ports (≤1.5 mm ²), power: 1×2-pin (≤2.5 mm ²), relays: 4×3-pin (≤2.5 mm ²), 0–10 V outputs: 1×4-pin (≤1.5 mm ²), 4–20 mA outputs: 1×4-pin (≤1.5 mm ²)



6ADi4Ro2AVo2Alo dimensions (mm)

4.9 Environmental & certifications

Parameter	Value
Operating temperature	−40 to +55 °C
Storage temperature	−40 to +60 °C
Relative humidity	<90 %, non-condensing
Altitude	Up to 2000 m
CE compliance	2014/30/EU (EMC), 2014/35/EU (LVD)

5 How It Works

This section explains how each channel works conceptually. For terminal assignments and complete wiring diagrams covering every connection scenario, see the [Wiring Instructions](#).

5.1 Input channels

The 6 universal inputs each read digital levels, 0–10 V analog, and — with an external resistor — 4–20 mA current loops. A single input can be monitored simultaneously as both a voltage and a digital state without reconfiguration. Mode is set per input via [Modbus registers](#).

Digital input: suitable for dry (potential-free) contacts, switches, and open-collector outputs. A software-controlled 10 kΩ pull-up to a precise 10 V source can be enabled per input; 50 ms software debounce filtering prevents false triggering. The maximum safe input voltage is 30 V DC.

Analog input (0–10 V): 16-bit resolution, ±0.1 % accuracy, >100 Hz sampling. Input impedance >5 MΩ is suitable for most voltage-output transmitters.

4–20 mA input: place a 250 Ω resistor (for 1–5 V range) or 500 Ω resistor (for 2–10 V range) between the input terminal and GND. The controller reads the resulting voltage; the Modbus register map provides the scaling.

NTC mode: inputs can be configured for direct connection of a 10k NTC thermistor ($\beta = 3435$ or $\beta = 3977$). The internal pull-up is automatically managed during measurement. Use this mode for temperature-based thermostat rules without an external transmitter.

5.2 Relay outputs

Relays 1–3 expose all three contacts (NC·C·NO), allowing both normally-open and normally-closed wiring. Relay 4 exposes C·NO contacts only (SPST-NO). Each relay is an Omron G2RL-1-E rated 16 A @ 250 V AC for resistive loads.

Coil voltage reduction: after a relay activates, the controller automatically lowers the coil drive voltage, reducing power consumption and heat generation while keeping the relay latched. This extends relay lifetime and allows all four relays to be held on simultaneously within the power budget. The feature is software-controlled and can be disabled if required.

Each relay has a yellow front-panel LED showing its state (OFF / ON / BLINKING).

5.3 Analog voltage outputs (0–10 V)

Two independent 0–10 V outputs for driving VFD speed-reference inputs, modulating damper actuators, controlling valve positioners, or dimming LED drivers. Minimum load resistance is ≥ 1 k Ω . Both outputs update >1000 times per second and are set via Modbus [holding registers](#). A yellow LED lights when the output is above 0 V.

5.4 Analog current outputs (4–20 mA)

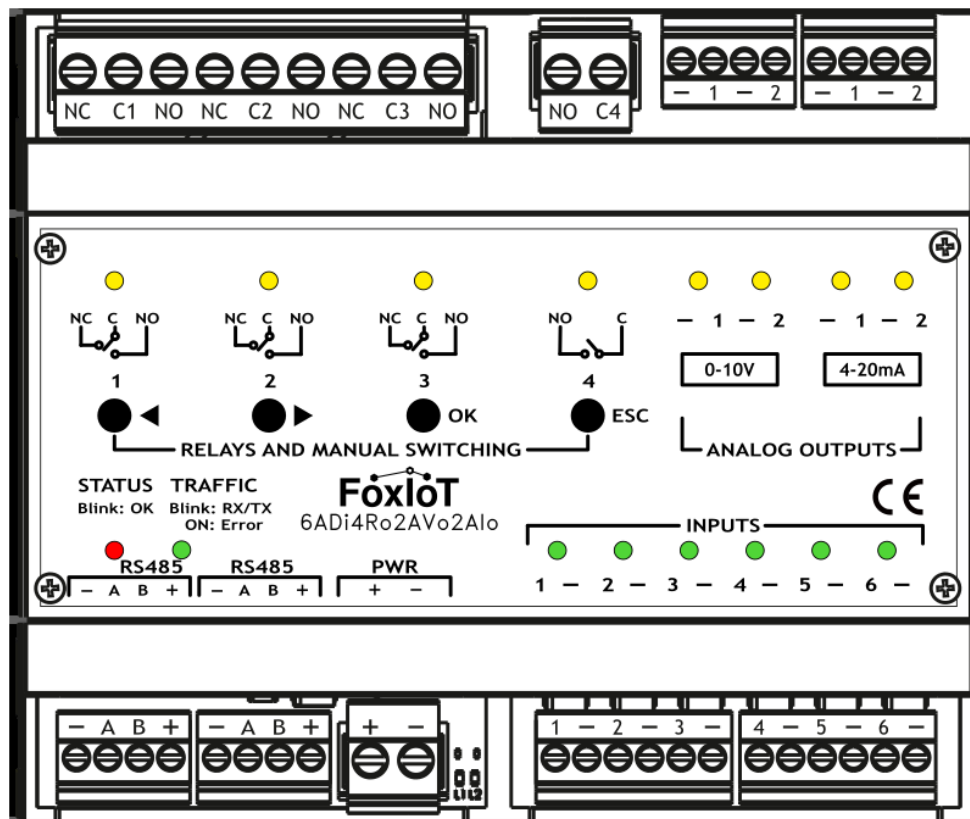
Two independent current-loop outputs for driving standard 4–20 mA actuators, VFDs, and PLCs. The physical output range is 0–20 mA; when 4–20 mA mode is enabled in Modbus, the output is clamped to never go below 4 mA (useful for wire-break detection by the downstream device). A yellow LED lights when the output is above 0 mA.

VPP / wire-insertion use case. The 6ADi4Ro2AVo2Alo can be inserted in series in an existing 4–20 mA control loop: connect one side of the broken loop to an input channel, the other to a current output. Under normal conditions, a Communication-Driven Voltage Failover rule makes the output mirror the input transparently. When a VPP platform commands an override via Modbus, the output follows the commanded value instead. If communications are lost, the output automatically reverts to following the input — local fallback with no manual intervention required. See the [Wiring Instructions](#) for the series-insertion wiring diagram.

5.5 Communication & power

A single RS-485 port operates as a Modbus RTU slave. A fail-safe receiver handles open-circuit, short-circuit, and idle-bus conditions correctly. The ± 30 V bus protection and ± 16 kV ESD protection tolerate accidental wiring errors. Power input is 11–30 V DC with reverse-polarity protection.

5.6 LEDs, buttons & rule engine



6ADi4Ro2AVo2Alo front panel

LED indicators:

LED	Colour	Meaning
Relay 1–4	Yellow	OFF = relay open · ON = relay closed · BLINKING = rule active
0–10 V out 1–2	Yellow	ON when output > 0 V
4–20 mA out 1–2	Yellow	ON when output > 0 mA
Input 1–6	Green	ON when input is in active (digital-high) state
STATUS	Red	Blinking = normal operation · Solid = error · Off = no power
TRAFFIC	Green	Short blink = bus activity · Long blink = controller responded · Solid = communication error · Off = no activity

Buttons: 4 front-panel buttons provide direct relay toggling and on-site Modbus configuration (see [§7](#)). Button behaviour is configurable via Modbus — Standard Toggle, Offline Mode (buttons only active when master is silent), and Relay Disable Mode (block Modbus control of that relay) are supported.

Rule engine: 16 rules run continuously regardless of Modbus communication status. Supported rule types:

Rule type	Description
Toggle Relay	Links one input to one relay; relay toggles on each input change
Flexible Switch Control	Multiple inputs → multiple relays via bitmask; optional countdown timer
Thermostat Control	Activates/deactivates relays based on NTC temperature vs. setpoint with hysteresis
Analog Threshold Control	Same as thermostat but compares measured voltage instead of temperature
Communication-Driven Voltage Failover	Analog output follows local input; Modbus can override; reverts on comms loss

Rules are configured via [Modbus registers](#) and survive power cycling (stored in non-volatile memory). All 16 rules can run simultaneously; rules must be disabled before modifying their parameters, then re-enabled to take effect.

6 Installation

- 1. Unpack and inspect** the device for transport damage. Check the model label and ratings.
- 2. Mount** on a TH35 DIN rail inside an electrical cabinet. Tilt the top onto the rail, hook the upper clip, then press the bottom inward until the lower clip locks. To remove, use a flat-head screwdriver to release the bottom clip, then tilt and lift.
- 3. Wire** inputs, relay contacts, analog outputs, RS-485, and power using the pluggable terminal blocks. The blocks unplug from the device, so you can wire them off the unit (easier access) and plug them in afterwards — and swap or re-wire a block later without disturbing the rest of the wiring.

For terminal assignments and wiring diagrams, see the [Wiring Instructions](#).

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.

7 Configuration

7.1 Front-panel buttons — quick setup

Set the **Modbus address, baud rate, and serial format** on-site with the four front-panel buttons — no software or laptop. The buttons work independently of Modbus, so this is also your **recovery path** if a wrong setting ever breaks communication.

The storyboard that follows walks the whole procedure with a worked example — **address 15, baud 57600, serial format 8N1**. The panel diagram and reference after it cover every value and the details.

Quick Setup — Front-Panel Buttons

Worked example: Address 15 · Baud 57600 · Format 8N1
 ○ off ● on ● blinking

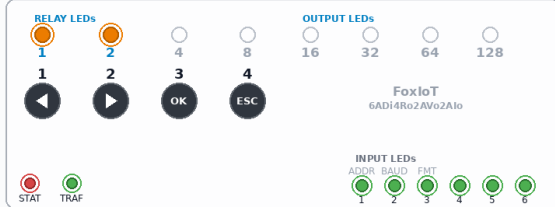
● INPUT LED 1 = Address

● INPUT LED 2 = Baud rate

● INPUT LED 3 = Format

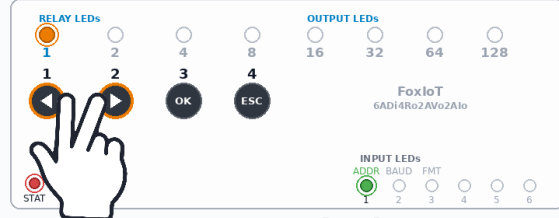
1 Power on

⌚ 10 s



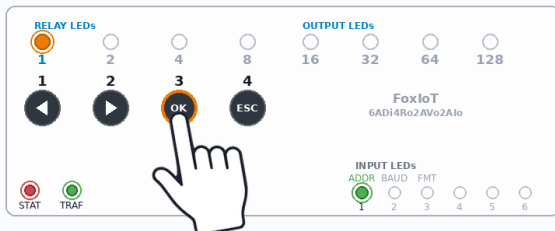
Switch the controller power off and on. You now have 10 seconds — while relay LEDs 1 and 2 blink, press buttons 1 and 2 together to enter config mode.

2 Enter config mode



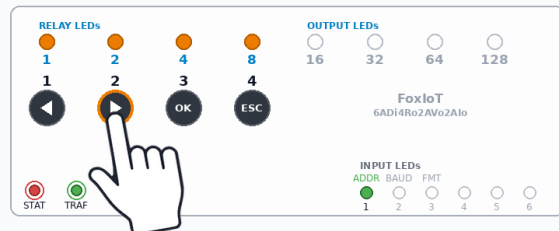
Press buttons 1 and 2 together (◀ + ▶). When STAT and TRAF blink faster and Input LED 1 (Address) starts blinking, you are in config mode. The relay LEDs show the current address (1).

3 Select the address



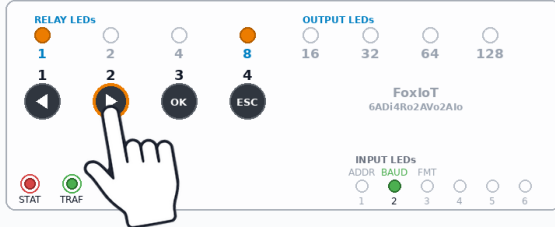
Input LED 1 (Address) is blinking. Press **OK** — the LED turns solid and you can now change the value.

4 Dial in 15



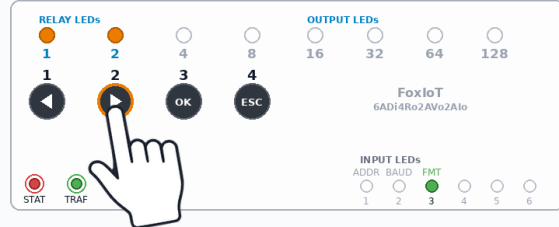
Press ▶ until the LEDs that are on add up to 15 (1 + 2 + 4 + 8). Press **OK** to save.

5 Set baud 57600



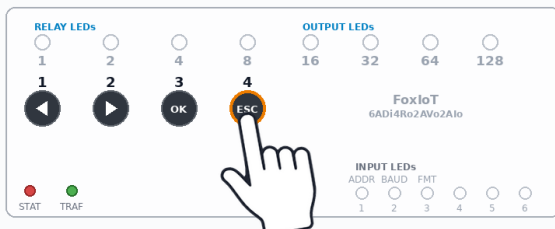
Press ▶ to move to Input LED 2 (Baud rate) — it now blinks. Press **OK**. 57600 is option 9. Press ▶ until the LEDs that are on add up to 9 (1 + 8). Press **OK** to save.

6 Set format 8N1



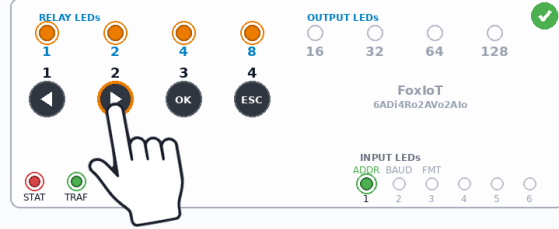
Press ▶ to move to Input LED 3 (Format) — it now blinks. Press **OK**. 8N1 is option 3. Press ▶ until the LEDs that are on add up to 3 (1 + 2). Press **OK** to save.

7 Save & exit



Press **ESC**. The LEDs stop blinking, then the controller saves to memory and reboots.

8 Verify



Re-enter config mode. Step ▶ from setting to setting (Address, Baud, Format) and add up the blinking LEDs: 15, then 9, then 3.

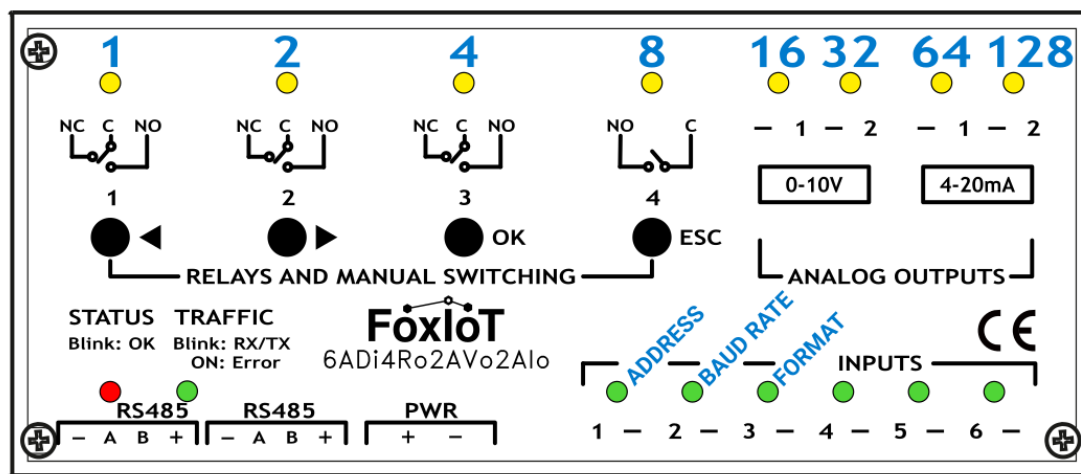
Each LED has a number: 1·2·4·8 · 16·32·64·128. Add up the LEDs that are on (solid or blinking) — that is the value.

7.2 Front-panel buttons — in detail

Use the panel diagram and the tables below for any value the worked example doesn't cover — a different address, baud rate, or serial format.

The configuration panel

This is the exact front panel. Relay/output LEDs run across the top with their binary weights (1 · 2 · 4 · 8 · 16 · 32 · 64 · 128), the four buttons sit in the middle, and Input LEDs 1–3 (Address, Baud rate, Format) select the setting.



6ADi4Ro2AVo2Alo configuration-mode panel

Buttons

Button	In menu	While editing a value
1 (←)	Move to previous setting	Decrease value
2 (→)	Move to next setting	Increase value
3 (OK)	Select / start editing	Save value
4 (ESC)	Exit configuration	Cancel the edit

LEDs

Input LEDs 1–3 pick the setting (LEDs 4–6 stay off):

Input LED	Setting
1	Address
2	Baud rate
3	Serial format

The selected **Input LED** shows the state — **blinking** = highlighted (navigating), **solid** = you are editing it.

The **relay and output LEDs** show the value — relay LEDs are worth $1 \cdot 2 \cdot 4 \cdot 8$, output LEDs $16 \cdot 32 \cdot 64 \cdot 128$, and the value is the **sum of the LEDs that are on**.

Enter and exit

- **Enter:** power-cycle the controller — unplug the power terminal block (or switch off the supply), wait a couple of seconds, then reconnect. Within **10 seconds** of power-up, hold **Buttons 1 + 2** together until Input LED 1 starts blinking.
- **Exit:** press **ESC** until the LEDs stop blinking. If you changed a setting, the controller saves it to **non-volatile memory and reboots**; if not, it simply exits.
- No button press for **60 seconds** exits on its own (saving any change).

Reading the value from the LEDs — just add up the ones that are on

- You never switch a LED yourself — you step a number with **◀▶** and the LEDs display it.
- A setting **opens at its current value** and the LEDs **update live** as you step.
- Step until the LEDs that are on **add up** to the value you want. Nothing on = **0**.

Relay/output LEDs on	Add their weights	Value
1st relay	1	1
2nd + 4th relay	2 + 8	10
all four relays	1 + 2 + 4 + 8	15
1st + 3rd relay, 1st output	1 + 4 + 16	21
all eight	1 + 2 + 4 + 8 + 16 + 32 + 64 + 128	255

For any value, the [LED value reference chart](#) at the end of this manual shows the exact LED pattern for **0–255**.

Working out the LEDs for a number: take the **biggest weight that fits**, subtract it, and repeat. For **15** — 8 (→ 7), 4 (→ 3), 2 (→ 1), 1 (→ 0) = all four relay LEDs.

Changing a value

- Press **OK** on a setting to edit it — the Input LED turns **solid**.
- Each press of **▶** adds **1**, **◀** subtracts 1. The setting opens at its **current** value, so step up or down — don't count from zero.
- Press **OK** to save (the Input LED blinks again), or **ESC** to cancel the edit. **ESC keeps the old value**, and anything you already saved stays saved.
- Overshot? The value **wraps around** — keep pressing **▶** until it comes back, or step back with **◀**. Saved the wrong value? Open the setting again and re-step it — the new **OK** replaces the old.

Settings and values

- **Address** is the number itself — set the LEDs to add up to it.
- **Baud rate** and **serial format** use an **option number** from the tables below (option 9 for 57600, option 3 for 8N1) — not the bps value or the format name.
- Every value is **guarded to its range and wraps around**, so you can never set an invalid one.

Address — Input LED 1

Range	Default
1–247	1

The address skips **0** and wraps **247 → 1**, so the LEDs never need to reach 248–255.

Baud rate — Input LED 2

Option	Baud rate (bps)
1	300
2	600
3	1200
4	2400
5	4800
6	9600 — default
7	19200
8	38400
9	57600
10	115200

Serial format — Input LED 3

Option	Format
1	8E1 — default
2	8N2
3	8N1
4	8O1

Worked example — set address 10, baud 115200, format 8E1. (Factory-fresh device; on a used unit each setting opens at its saved value, so step to the target rather than counting.)

- 1. Enter config mode:** power-cycle, then within 10 s **hold Buttons 1 + 2** until Input LED 1 blinks.
- 2. Address → 10:** Input LED 1 blinking → **press OK** (opens at the default, **1**) → **press ►** until the **2nd and 4th relay LEDs** are on ($2 + 8 = 10$) → **press OK** to save.
- 3. Baud → 115200:** **press ►** to Input LED 2 → **press OK** (opens at default **option 6**) → **press ►** to **option 10** ($6 \rightarrow 7 \rightarrow 8 \rightarrow 9 \rightarrow 10$), relay LEDs **2 + 8** on → **press OK** to save.
- 4. Format → 8E1:** **press ►** to Input LED 3 → **press OK** (opens at **option 1**, already 8E1, the default) → **press OK** again to keep it.
- 5. Save & exit:** **press ESC** until the LEDs stop blinking — the controller reboots to apply.
- 6. Check it took:** re-enter config mode and step through — Address **10**, Baud **option 10**, Format **option 1**.

7.3 Remote configuration (via Modbus)

All parameters — input modes, relay control, analog output values, rule definitions, and communication settings — can be read and written remotely over Modbus RTU. This is suitable for automated setup, bulk device configuration, and runtime control. For the full register list, see the [Modbus Register Map](#).

8 Operation

The 6ADi4Ro2AVo2Alo operates as a Modbus RTU slave over RS-485. Input data, relay states, analog output setpoints, rule parameters, and device configuration are all accessible via [Modbus registers](#), allowing direct integration with PLCs, SCADA systems, and gateways.

Inputs are read as 16-bit raw ADC values (voltage) and as digital state bits via Modbus input registers.

Relays are controlled by writing to their holding registers (1 = ON, 0 = OFF). **Analog outputs** are set by writing a 16-bit value to the corresponding holding register. The register map defines the full scaling for each output type.

The rule engine runs independently of Modbus in the device firmware. Rules execute continuously and respond instantly to input changes without requiring a master poll cycle.

9 Firmware Update

The 6ADi4Ro2AVo2Alo supports in-field firmware updates over Modbus, allowing new features and fixes without physical access to the device. Do not disconnect power or communication during an update. After updating, verify the firmware version via its Modbus register and confirm settings are unchanged. The update procedure is documented in the [Modbus Register Map](#).

10 Troubleshooting

10.1 Status & traffic LEDs

LED	State	Meaning
STATUS	Blinking	Normal operation — powered and running
STATUS	Off	No power, or device failed to start
STATUS	Solid on	Device error — power-cycle to reset
TRAFFIC	Short blink	Valid Modbus packet received on the bus
TRAFFIC	Long blink	Controller responded to a request
TRAFFIC	Solid on	Communication error — check baud, parity, A/B wiring
TRAFFIC	Off	No communication activity

10.2 Common problems

Problem	Likely cause	Action
No power	Supply disconnected, low voltage, or reversed polarity	Verify 11–30 V DC, correct polarity
No communication	Wrong address / baud / format, A–B wiring swapped	Match master settings; A(+)→A(+), B(–)→B(–); check bus termination
Digital input not detected	Pull-up disabled, or contact not closing	Enable 10 kΩ pull-up for dry contacts; verify contact and GND reference
Analog input wrong/unstable	Wrong mode, pull-up on, wiring noise	Disable pull-up; for 4–20 mA fit a 250 / 500 Ω resistor; use shielded cable
0–10 V output reads low	Load resistance too low	Minimum load is ≥ 1 kΩ; check for short or low-impedance path
4–20 mA output not reaching setpoint	Loop impedance too high for supply voltage	Max loop: ≤ 1.0 kΩ at 24 V DC / ≤ 450 Ω at 12 V DC — use 24 V supply for 500 Ω loads
Relay does not switch	Wrong Modbus command, or relay damaged	Write 1=ON / 0=OFF to relay holding register; if LED is on but relay does not click, the relay may be damaged
Relay ignores button press	Button mode disabled or remapped	Check button mode register in Modbus configuration
Rule not activating	Rule disabled, or wrong trigger configuration	Ensure rule is enabled; verify input channel and threshold settings (see Modbus Register Map)

11 Maintenance

Disconnect all power sources — controller supply and any connected external circuits — before handling the device. Observe all [Safety](#) precautions.

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

- **Cleaning** — wipe the enclosure with a dry or slightly damp lint-free cloth; no solvents or abrasives.
- **Connectors** — periodically inspect terminals for oxidation or debris; clean with electronics-approved contact cleaner or compressed air.
- **Periodic inspection (every 12 months)** — check for mechanical damage, secure mounting, and loose or frayed cables; tighten terminals; verify LEDs and Modbus diagnostics; confirm the device runs the latest firmware.

Do not open the enclosure — there are no user-serviceable parts inside. Opening voids the warranty.

12 Ordering Information

Item	Order code	Description
6ADi4Ro2AVo2Alo	RTU-6ADI4RO-R1	6 universal inputs · 4 relays · 2× 0–10 V · 2× 4–20 mA · RS-485 Modbus RTU
DIN-rail PSU	ACC-PSU-24D	24 V DC · 1.5 A (30 W)

Order through hello@foxiot.eu or your distributor.

13 Appendix — LED value reference chart

The front-panel LEDs show a value as a sum of lit LEDs (see [Reading the value from the LEDs](#)). This chart lists every value from **0 to 255** with its exact LED pattern — find your number, then set the relay and output LEDs to match. Filled = on, hollow = off.

LED Value Reference — 0 to 255

Binary LED weights: RELAY LEDs = 1, 2, 4, 8 OUTPUT LEDs = 16, 32, 64, 128

● = LED ON ○ = LED OFF

RELAY LEDs: 1 2 4 8 OUTPUT LEDs: 16 32 64 128

0-63	64-127	128-191	192-255
0 ○○○○ ○○○○	64 ○○○○ ○○○○	128 ○○○○ ○○○○	192 ○○○○ ○○○○
1 ●○○○ ○○○○	65 ●○○○ ○○○○	129 ●○○○ ○○○○	193 ●○○○ ○○○○
2 ○●○○ ○○○○	66 ○●○○ ○○○○	130 ○●○○ ○○○○	194 ○●○○ ○○○○
3 ●●○○ ○○○○	67 ●●○○ ○○○○	131 ●●○○ ○○○○	195 ●●○○ ○○○○
4 ○○○● ○○○○	68 ○○○● ○○○○	132 ○○○● ○○○○	196 ○○○● ○○○○
5 ●○○● ○○○○	69 ●○○● ○○○○	133 ●○○● ○○○○	197 ●○○● ○○○○
6 ○○○● ○○○○	70 ○○○● ○○○○	134 ○○○● ○○○○	198 ○○○● ○○○○
7 ●○○● ○○○○	71 ●○○● ○○○○	135 ●○○● ○○○○	199 ●○○● ○○○○
8 ○○○● ○○○○	72 ○○○● ○○○○	136 ○○○● ○○○○	200 ○○○● ○○○○
9 ●○○● ○○○○	73 ●○○● ○○○○	137 ●○○● ○○○○	201 ●○○● ○○○○
10 ○○○● ○○○○	74 ○○○● ○○○○	138 ○○○● ○○○○	202 ○○○● ○○○○
11 ●○○● ○○○○	75 ●○○● ○○○○	139 ●○○● ○○○○	203 ●○○● ○○○○
12 ○○○● ○○○○	76 ○○○● ○○○○	140 ○○○● ○○○○	204 ○○○● ○○○○
13 ●○○● ○○○○	77 ●○○● ○○○○	141 ●○○● ○○○○	205 ●○○● ○○○○
14 ○○○● ○○○○	78 ○○○● ○○○○	142 ○○○● ○○○○	206 ○○○● ○○○○
15 ●○○● ○○○○	79 ●○○● ○○○○	143 ●○○● ○○○○	207 ●○○● ○○○○
16 ○○○○ ●○○○	80 ○○○○ ●○○○	144 ○○○○ ●○○○	208 ○○○○ ●○○○
17 ●○○○ ●○○○	81 ●○○○ ●○○○	145 ●○○○ ●○○○	209 ●○○○ ●○○○
18 ○○○○ ●○○○	82 ○○○○ ●○○○	146 ○○○○ ●○○○	210 ○○○○ ●○○○
19 ●○○○ ●○○○	83 ●○○○ ●○○○	147 ●○○○ ●○○○	211 ●○○○ ●○○○
20 ○○○○ ●○○○	84 ○○○○ ●○○○	148 ○○○○ ●○○○	212 ○○○○ ●○○○
21 ●○○○ ●○○○	85 ●○○○ ●○○○	149 ●○○○ ●○○○	213 ●○○○ ●○○○
22 ○○○○ ●○○○	86 ○○○○ ●○○○	150 ○○○○ ●○○○	214 ○○○○ ●○○○
23 ●○○○ ●○○○	87 ●○○○ ●○○○	151 ●○○○ ●○○○	215 ●○○○ ●○○○
24 ○○○○ ●○○○	88 ○○○○ ●○○○	152 ○○○○ ●○○○	216 ○○○○ ●○○○
25 ●○○○ ●○○○	89 ●○○○ ●○○○	153 ●○○○ ●○○○	217 ●○○○ ●○○○
26 ○○○○ ●○○○	90 ○○○○ ●○○○	154 ○○○○ ●○○○	218 ○○○○ ●○○○
27 ●○○○ ●○○○	91 ●○○○ ●○○○	155 ●○○○ ●○○○	219 ●○○○ ●○○○
28 ○○○○ ●○○○	92 ○○○○ ●○○○	156 ○○○○ ●○○○	220 ○○○○ ●○○○
29 ●○○○ ●○○○	93 ●○○○ ●○○○	157 ●○○○ ●○○○	221 ●○○○ ●○○○
30 ○○○○ ●○○○	94 ○○○○ ●○○○	158 ○○○○ ●○○○	222 ○○○○ ●○○○
31 ●○○○ ●○○○	95 ●○○○ ●○○○	159 ●○○○ ●○○○	223 ●○○○ ●○○○
32 ○○○○ ○○○○	96 ○○○○ ○○○○	160 ○○○○ ○○○○	224 ○○○○ ○○○○
33 ●○○○ ○○○○	97 ●○○○ ○○○○	161 ●○○○ ○○○○	225 ●○○○ ○○○○
34 ○○○○ ○○○○	98 ○○○○ ○○○○	162 ○○○○ ○○○○	226 ○○○○ ○○○○
35 ●○○○ ○○○○	99 ●○○○ ○○○○	163 ●○○○ ○○○○	227 ●○○○ ○○○○
36 ○○○○ ○○○○	100 ○○○○ ○○○○	164 ○○○○ ○○○○	228 ○○○○ ○○○○
37 ●○○○ ○○○○	101 ●○○○ ○○○○	165 ●○○○ ○○○○	229 ●○○○ ○○○○
38 ○○○○ ○○○○	102 ○○○○ ○○○○	166 ○○○○ ○○○○	230 ○○○○ ○○○○
39 ●○○○ ○○○○	103 ●○○○ ○○○○	167 ●○○○ ○○○○	231 ●○○○ ○○○○
40 ○○○○ ○○○○	104 ○○○○ ○○○○	168 ○○○○ ○○○○	232 ○○○○ ○○○○
41 ●○○○ ○○○○	105 ●○○○ ○○○○	169 ●○○○ ○○○○	233 ●○○○ ○○○○
42 ○○○○ ○○○○	106 ○○○○ ○○○○	170 ○○○○ ○○○○	234 ○○○○ ○○○○
43 ●○○○ ○○○○	107 ●○○○ ○○○○	171 ●○○○ ○○○○	235 ●○○○ ○○○○
44 ○○○○ ○○○○	108 ○○○○ ○○○○	172 ○○○○ ○○○○	236 ○○○○ ○○○○
45 ●○○○ ○○○○	109 ●○○○ ○○○○	173 ●○○○ ○○○○	237 ●○○○ ○○○○
46 ○○○○ ○○○○	110 ○○○○ ○○○○	174 ○○○○ ○○○○	238 ○○○○ ○○○○
47 ●○○○ ○○○○	111 ●○○○ ○○○○	175 ●○○○ ○○○○	239 ●○○○ ○○○○
48 ○○○○ ○○○○	112 ○○○○ ○○○○	176 ○○○○ ○○○○	240 ○○○○ ○○○○
49 ●○○○ ○○○○	113 ●○○○ ○○○○	177 ●○○○ ○○○○	241 ●○○○ ○○○○
50 ○○○○ ○○○○	114 ○○○○ ○○○○	178 ○○○○ ○○○○	242 ○○○○ ○○○○
51 ●○○○ ○○○○	115 ●○○○ ○○○○	179 ●○○○ ○○○○	243 ●○○○ ○○○○
52 ○○○○ ○○○○	116 ○○○○ ○○○○	180 ○○○○ ○○○○	244 ○○○○ ○○○○
53 ●○○○ ○○○○	117 ●○○○ ○○○○	181 ●○○○ ○○○○	245 ●○○○ ○○○○
54 ○○○○ ○○○○	118 ○○○○ ○○○○	182 ○○○○ ○○○○	246 ○○○○ ○○○○
55 ●○○○ ○○○○	119 ●○○○ ○○○○	183 ●○○○ ○○○○	247 ●○○○ ○○○○
56 ○○○○ ○○○○	120 ○○○○ ○○○○	184 ○○○○ ○○○○	248 ○○○○ ○○○○
57 ●○○○ ○○○○	121 ●○○○ ○○○○	185 ●○○○ ○○○○	249 ●○○○ ○○○○
58 ○○○○ ○○○○	122 ○○○○ ○○○○	186 ○○○○ ○○○○	250 ○○○○ ○○○○
59 ●○○○ ○○○○	123 ●○○○ ○○○○	187 ●○○○ ○○○○	251 ●○○○ ○○○○
60 ○○○○ ○○○○	124 ○○○○ ○○○○	188 ○○○○ ○○○○	252 ○○○○ ○○○○
61 ●○○○ ○○○○	125 ●○○○ ○○○○	189 ●○○○ ○○○○	253 ●○○○ ○○○○
62 ○○○○ ○○○○	126 ○○○○ ○○○○	190 ○○○○ ○○○○	254 ○○○○ ○○○○
63 ●○○○ ○○○○	127 ●○○○ ○○○○	191 ●○○○ ○○○○	255 ●○○○ ○○○○

LED order is left-to-right by weight: 1, 2, 4, 8, 16, 32, 64, 128. Filled amber circle = ON.

LED value reference chart — every value from 0 to 255

14 Warranty, Support & RMA

14.1 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.

14.2 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.

14.3 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.

14.4 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.

15 Compliance & Disposal

This product is designed and manufactured to comply with applicable EU directives and standards for industrial electronic equipment.

Topic	Detail
CE — EMC	Directive 2014/30/EU (Electromagnetic Compatibility)
CE — Low Voltage	Directive 2014/35/EU (Low Voltage Directive)
RoHS	Directive 2011/65/EU (restriction of hazardous substances)
WEEE	Directive 2012/19/EU (waste electrical & electronic equipment)

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 for proper recycling — see [recycling & disposal](#). The crossed-out wheeled-bin symbol indicates separate collection within the EU.

For declarations of conformity and the latest compliance documents, contact support@foxiot.eu or see foxiot.eu.

Revision History

Version	Date	Notes
1.1	2026-09-30	Relay DC rating corrected to 24 V DC (Omron G2RL-1-E rated load 16 A @ 24 V DC).
1.0	2026-06-14	Initial release.