Datasheet

AIO-422-R1 Analog I/O Module

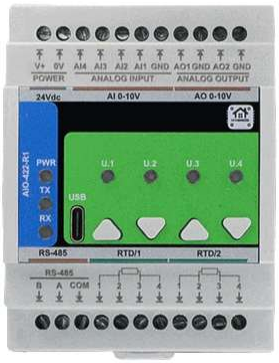
Part No.: AIO-422-R1

Manufacturer: ISYSTEMS AUTOMATION S.R.L.

Hardware Version: V1.0

Architecture: Modular (MCU Board + Field Board)

Controller: RP2350A



Functional Overview

The AIO-422-R1 is a DIN-rail mounted mixed-signal expansion module providing 4 analog voltage inputs (0–10 V), 2 analog voltage outputs (0–10 V), and 2 RTD temperature channels. The module communicates via RS-485 (Modbus RTU) and supports USB-C configuration and firmware update.

Board	Function
MCU Board	RP2350A controller, RS-485 communication, USB-C interface, power conversion
Field Board	4x Analog Inputs, 2x Analog Outputs, 2x RTD inputs

The module operates as a Modbus RTU slave over RS-485 and supports configuration and firmware update via USB-C.

Technical Specifications

Specification	Details
Microcontroller	RP2350A dual-core microcontroller
Storage	External QSPI Flash (32 Mbit)
Power Input	24 V DC nominal (18–30 V DC recommended)
Input Protection	1 A time-lag fuse, reverse polarity diode, TVS surge suppression, EMI filtering
Main Logic Supply	Buck regulator 24 V → 5 V (~4.96 V nominal), 3.3 V LDO regulator
Analog Inputs	4 × voltage inputs, 0–10 V nominal range
ADC	ADS1115, 16-bit resolution
Input Impedance	>100 kΩ
Analog Outputs	2 × voltage outputs, 0–10 V nominal range
DAC	MCP4725A0, 12-bit resolution
Max Output Current	10 mA recommended per channel
RTD Channels	2 × PT100/PT1000 (2/3/4-wire)
RTD Interface	MAX31865, 15-bit temperature resolution
RS-485	Half-duplex Modbus RTU with surge protection and fail-safe biasing
USB	USB-C, 5 V logic, ESD protected
Typical Power Consumption	0.2–0.4 W

Typical module power consumption: 0.2–0.5 W (logic only).

Maximum module power consumption: approximately 1W.

Top Terminal Block (1–11)

Front view – terminals numbered from left to right.

Pos	Marking	Signal	Description
1	+	+24V	24 V DC supply input
2	–	0V	Power supply return
3	AI4	AI4	Analog Input 4 (0–10 V)
4	AI3	AI3	Analog Input 3 (0–10 V)
5	AI2	AI2	Analog Input 2 (0–10 V)
6	AI1	AI1	Analog Input 1 (0–10 V)
7	GND	AGND	Analog input ground
8	AO1	AO1	Analog Output 1 (0–10 V)
9	GND	AGND	Analog output ground
10	AO2	AO2	Analog Output 2 (0–10 V)
11	GND	AGND	Analog output ground

Bottom Terminal Block (12–22)

Front view – terminals numbered from left to right.

Pos	Marking	Signal	Description
12	A	RS485_A	RS-485 A line
13	B	RS485_B	RS-485 B line
14	COM	RS485_COM	RS-485 COM
15	1	RTD1_1	RTD1 terminal 1
16	2	RTD1_2	RTD1 terminal 2
17	3	RTD1_3	RTD1 terminal 3
18	4	RTD1_4	RTD1 terminal 4
19	1	RTD2_1	RTD2 terminal 1
20	2	RTD2_2	RTD2 terminal 2
21	3	RTD2_3	RTD2 terminal 3
22	4	RTD2_4	RTD2 terminal 4

Installation, Environmental & Mechanical

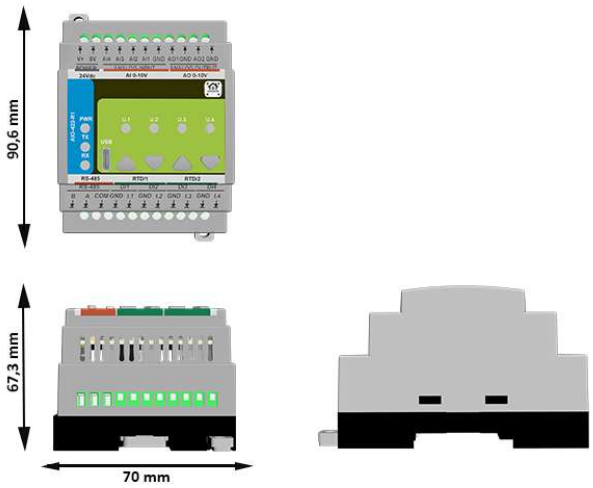
Specification	Details
Terminal Type	Pluggable screw terminal blocks, 5.08 mm pitch
Wire Cross Section	0.2–2.5 mm² (AWG 24–12)
Tightening Torque	0.4–0.6 Nm

Specification	Details
Operating Temperature	0 °C to +40 °C
Storage Temperature	−10 °C to +55 °C
Relative Humidity	0–90 % RH, non-condensing
Ingress Protection	IP20 (inside cabinet only)
Maximum Altitude	2000 m
Pollution Degree	2

Specification	Details
Dimensions	71.5 × 90 × 59 mm (L × W × H)
DIN units	4 division units (≈ 72 mm DIN rail mounting width)
Net weight	Xxx g
Gross weight	Xxx+98 g
Pack size	140× 125 × 94 mm (L × W × H)
Mechanical drawing	Front + side views with DIN-clip depth (see below)
Notes	All dimensions shown in millimeters unless stated otherwise
Mounting	35 mm DIN rail (EN 50022)
Enclosure Material	PC/ABS, UL94-V0

Install only inside a control cabinet with ventilation; the cabinet must include a protective front plate covering all module connection terminals and a closing protective door; not for outdoor or exposed installation.

All wiring terminals must be protected against accidental contact by an insulating front plate, wiring duct, or terminal cover. Exposed live terminals are not permitted.



Cable Recommendations & Shield Grounding

This section applies to Analog (0–10V), Temperature (RTD / 1-Wire), and RS-485. Use shielded, twisted constructions and bond shields correctly to reduce EMI and ground-loop issues.

General Routing Rules

- Route low-level signal cables separately from power wiring.
- If crossing power cables is unavoidable, cross at 90°.
- Keep cable runs as short as practical.
- Avoid parallel runs with high-current conductors.

Analog (0–10V) Cable

- Construction: twisted pair (Signal + GND) per channel
- Shielding: overall shield (standard) or individually shielded pairs (high-EMI)

Examples: J-Y(ST)Y (overall shield) or LI2YCY PIMF (shielded twisted pairs; one pair per channel)

Temperature Cable

RTD (PT100/PT1000)

Recommended: shielded multi-core for 2/3-wire; shielded pairs for best accuracy (4-wire)

Examples: J-Y(ST)Y (overall shield) or LI2YCY PIMF (pairs; e.g. 2×2×0.50 for 4-wire)

1-Wire (DS18B20)

- Recommended: shielded 3-core (+5V / DATA / GND) for typical installations
- High-EMI / long runs: shielded pairs + overall shield (e.g. LI2YCY PIMF 2×2×0.50)
- Topology: daisy-chain (bus). Avoid star wiring.
- Stubs: keep sensor stubs ≤ 0.5 m.
- Pull-up (DATA): 4.7 kΩ typical; 2.2–3.3 kΩ for long/heavy loads.

RS-485 Cable

- Twisted pair recommended (120 Ω characteristic impedance).
- Shielded cable recommended in industrial environments.
- Use one twisted pair for A/B.
- Use second conductor as COM reference if required.

Examples: J-Y(ST)Y 2×2×0.5 mm² or LI2YCY PiMF 2×2×0.50

Shield Grounding

- Bond cable shield(s) to cabinet PE/EMC ground at one end (PLC side recommended).
- Do not connect shields directly to signal terminals (A/B/COM).

Compliance & Certifications

The WLD-521-R1 module is CE marked and designed to comply with applicable European Union directives. The manufacturer maintains technical documentation and a signed EU Declaration of Conformity (DoC).

EMC 2014/30/EU · LVD 2014/35/EU · RoHS 2011/65/EU

Standards: EN 61000-6-1 · EN 61000-6-3 · EN 62368-1 · EN IEC 63000

Safety Notice

The power input and signal terminals are SELV circuits.

Installation by qualified personnel only.

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