PROFINET

OPERATING BULLETIN

For CODA-Series Coriolis Mass Flow Instruments

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Introduction

This bulletin covers the hardware, GSDML file installation, module map, and acyclic data records for PROFINET communication on CODA-series Coriolis mass flow meters (K) and controllers (KC, KF, KG). For general instrument operation, refer to *DOC-MANUAL-CODA*.

CODA instruments with PROFINET are identified by their dual Ethernet connectors (RJ45 or M12, depending on your CODA configuration). CODA PROFINET devices are Conformance Class B and support linear, star, and ring (MRP) topologies.

Hardware

Ethernet Connectors

CODA PROFINET instruments are equipped with two Ethernet ports. Depending on the device configuration, the instrument uses either standard RJ45 connectors or IP67-rated 4-pin M12 connectors (D-coded). Either port can be used to communicate with the PROFINET IO controller or to daisy-chain to the next device on the segment. The device provides a 10/100 Mbps embedded switch between the two ports, enabling linear, star, and ring (MRP) topologies.

M12 Connector Pinout (IP67 Configuration)

IP67-rated CODA PROFINET instruments use 4-pin D-coded M12 connectors. The diagram and table below identify pin number and location for each port.

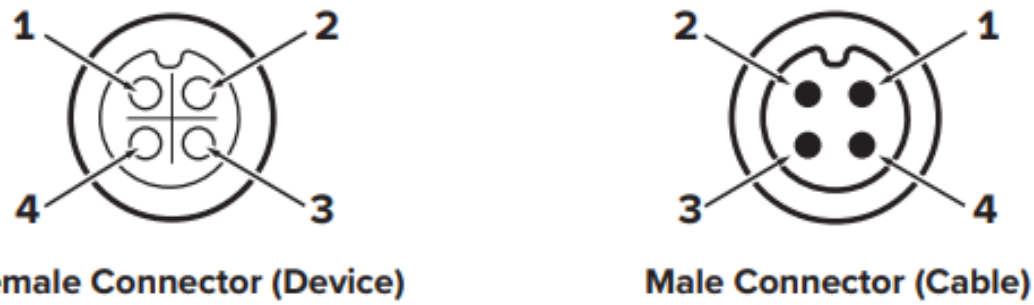

Figure 1. IP66/67 M12 4-pin and M8 4-pin connector pinout diagrams (from DOC-PINOUT-IP66-67EIP-ECAT-PROFINET-ModbusTCPIP).

Pin	Signal	Description
1	Tx+	Transmit Data +
2	Rx+	Receive Data +
3	Tx–	Transmit Data –
4	Rx–	Receive Data –

Table 1. M12 4-pin D-coded Ethernet connector pinout (female, device side, ×2). Applies to IP67 (M12) CODA configurations only.

LED Status Indicators

RJ45 CODA PROFINET instruments have two LEDs per Ethernet port — a Link LED (green, solid when the port has an active network connection) and a Data IO LED (yellow, blinks during data transmission and reception). M12 configurations do not have per-port LEDs.

Both RJ45 and M12 configurations have two additional status LEDs on the instrument body: the **Ready LED** and the **NET LED**. Their states are described below.

LED State	Ready LED	NET LED
Off	Startup	Startup
Blinking Red	—	No active data exchange
Blinking Green	Flash LED command active	—
Solid Green	Configuration complete	Active data exchange

Table 2. Ready LED and NET LED status indicators.

GSDML File

Alicat provides a GSDML (General Station Description Markup Language) file that describes the CODA device's module configuration and I/O data to the PROFINET engineering software. Install the GSDML file before adding the CODA to your IO controller project.

Item	Details
File name	GSDML-V2.42-ALICAT-CODA-20240226.xml (contained in Alicat-CODA-GSDML_v2.42.zip)
Download	https://downloads.alicat.com/software/Alicat-CODA-GSDML_v2.42.zip
Also available at	alicat.com/manuals

Table 3. GSDML file details.

Adding the CODA to Your PROFINET Project

The procedure below describes GSDML installation and device configuration using Siemens TIA Portal. For other PROFINET engineering tools, consult your software documentation for the equivalent steps.

GSDML Installation (TIA Portal)

1. Download and extract **Alicat-CODA-GSDML_v2.42.zip**.
2. In TIA Portal, open **Options** → **Manage general station description files (GSD)**.
3. Browse to the extracted folder, select **GSDML-V2.42-ALICAT-CODA-20240226.xml**, and click **Install**.
4. After installation, the CODA appears in the hardware catalog under **Other field devices** → **PROFINET IO** → **I/O** → **Alicat Scientific**.

Configuring the Device

1. In TIA Portal Network View, drag the CODA device from the hardware catalog onto the PROFINET IO system connected to your PLC.
2. In the device properties, set the **PROFINET device name**. The device name must be unique on the network and follow DNS naming conventions (lowercase letters, digits, and hyphens only).
3. Assign an **IP address** for the CODA. The IO controller will push this address to the device via DCP during startup, using the device name to identify the correct instrument.
4. In Device View, confirm the module slots are populated as described in the Module Map section.
5. Map the module I/O addresses to PLC tags in the tag table.
6. Download the configuration to the PLC. The NET LED on the CODA turns solid green when active data exchange begins.

Note: The MAC address printed on the CODA instrument label can be used to identify the device on the network during commissioning.

PROFINET Communication

CODA PROFINET devices support both cyclic I/O data exchange and acyclic data record access. Cyclic data is exchanged on every bus cycle using the fixed module slots described in the Module Map section. Device configuration and diagnostic parameters are accessible via acyclic read/write data records at Slot 0, Subslot 1, Address 262.

Device Identity

Parameter	Name	Value	Notes
Vendor ID	Alicat Scientific	0x044E	
Device ID	CODA	0x1003	
DAP Module Identity	Alicat Float Readings	0x00003021	
Conformance Class		B	
Netload Class		III	
Default Device Name		alicat	DNS-compatible; must match project setting

Table 4. CODA PROFINET device identity.

Module Map

The CODA PROFINET device uses two physical slots. **Slot 1** carries process data from the device to the PLC (input). **Slot 2** carries control data from the PLC to the device (output). For each slot, select one of two module options in your PROFINET configuration tool. All Float32 values are 32-bit IEEE 754 floating point in little-endian byte order.

Slot 1 — Input Module (Device → PLC)

Select Module 1 (basic) or Module 3 (extended). Module 3 adds a Mass Flow Setpoint echo and Valve Drive to the Module 1 payload.

Module 1 — 32 Bytes Input

Byte Offset	Name	Type	Notes
0–3	Device Status	Unsigned32	See Device Status Word section
4–7	Density	Float32	kg/m³
8–11	Temperature	Float32	°C
12–15	Volumetric Flow	Float32	m³/hr
16–19	Mass Flow	Float32	Units depend on device configuration
20–23	Totalizer	Float32	g
24–27	Totalizer Time	Float32	Seconds
28–31	STP Volumetric Flow	Float32	m³/hr

Module 3 — 40 Bytes Input

Byte Offset	Name	Type	Notes
0–3	Device Status	Unsigned32	See Device Status Word section
4–7	Density	Float32	kg/m³
8–11	Temperature	Float32	°C
12–15	Volumetric Flow	Float32	m³/hr
16–19	Mass Flow	Float32	Units depend on device configuration
20–23	Totalizer	Float32	g
24–27	Mass Flow Setpoint	Float32	Units depend on device configuration
28–31	Totalizer Time	Float32	Seconds
32–35	STP Volumetric Flow	Float32	m³/hr
36–39	Valve Drive	Float32	0.0 = fully closed, 1.0 = fully open

Slot 2 — Output Module (PLC → Device)

Select Module 2 (basic) or Module 4 (extended). Module 4 appends batch target size and valve drive control to the Module 2 payload.

Module 2 — 6 Bytes Output

Byte Offset	Name	Type	Notes
0–1	Device Control	Unsigned16	See Device Control Word section
2–5	Mass Flow Setpoint	Float32	Units depend on device configuration

Module 4 — 14 Bytes Output

Byte Offset	Name	Type	Notes
0–1	Device Control	Unsigned16	See Device Control Word section
2–5	Mass Flow Setpoint	Float32	Units depend on device configuration
6–9	Batch Target Size	Float32	Units depend on device configuration
10–13	Valve Drive	Float32	0.0 = fully closed, 1.0 = fully open

Table 5. CODA PROFINET module map. Install Module 1 or 3 in Slot 1 (input); install Module 2 or 4 in Slot 2 (output). All Float32 values are 32-bit IEEE 754, little-endian byte order.

Device Control Word

The Device Control word is an Unsigned16 (16-bit) value at byte offset 0 in the output module (Module 2 or 4). It is used to send commands to the instrument.

Bit(s)	Name	Description
0	Tare	Initiate a flow tare at the current no-flow condition.
1	Reset Totalizer	Reset the totalizer to zero.
2	Start Batch Run	Reset and start a new batch dispensing run.
3–4	Valve Override	0 = No override (normal control) 1 = Normal 2 = Fully closed 3 = Fully open
5	Manual Valve Control	When set, bypasses the PID control loop and drives the valve to the fractional position written to the Valve Drive field of the output module (0.0 = fully closed, 1.0 = fully open). Clear this bit to resume PID flow control.
6–15	Reserved	Set to 0.

Edge-Triggered Commands

Commands are **processed on change**. Sending the same Device Control value repeatedly will not re-issue the command. To send sequential identical commands (for example, two tare operations in a row), write 0x0000 between commands.

Example: To tare the instrument, write 0x0001, then write 0x0000 to clear before sending any further commands.

Device Status Word

The Device Status word is an Unsigned32 (32-bit) value at byte offset 0 in the input module (Module 1 or 3). It reports the current instrument state.

Bit(s)	Name	Description
0	Zero Operation in Progress	A tare operation is currently running.
1	Density Under-range	Measured density is below the measurable range.
2	Density Over-range	Measured density is above the measurable range.
3	Batch Control Running	A batch dispensing operation is currently active.
4–31	Reserved	Always 0.

Acyclic Data Records — Address 262

Device configuration and diagnostic parameters are accessible via acyclic read/write data records at **Slot 0, Subslot 1, Address 262**. In TIA Portal, use the *RDREC* and *WRREC* instructions with the index values listed below. All values use little-endian byte order.

Index	Name	Type	Access	Notes
1	Fullscale Mass Flow	REAL	Get	Units depend on Index 15
2	Fullscale Density	REAL	Get	kg/m³
3	Exp Alpha	REAL	Get/Set	Exponential filter alpha gain
4	STP Density	REAL	Get/Set	kg/m³
5	Fullscale Volumetric Flow	REAL	Get	Units depend on Index 16
6	P-Gain	REAL	Get/Set	PID proportional gain
7	I-Gain	REAL	Get/Set	PID integral gain
8	D-Gain	REAL	Get/Set	PID derivative gain
9	Crack	REAL	Get/Set	Valve crack-open offset
10	Power-Up Setpoint	REAL	Get/Set	Setpoint applied at startup
11	Setpoint Source	UINT8	Get/Set	Setpoint input source selection
12	Valve Override	UINT8	Get/Set	Valve override mode
13	Feedback Select	UINT8	Get/Set	Control loop feedback variable
14	Device Type	UINT8	Get	Instrument type code
15	Mass Flow Units	UINT8	Get/Set	Engineering units for mass flow
16	Volumetric Flow Units	UINT8	Get/Set	Engineering units for volumetric flow
17	Totalizer Select	UINT8	Get/Set	Totalizer variable selection
18	Totalizer Units	UINT8	Get/Set	Units depend on Index 17
19	Serial Number	STRING	Get	Instrument serial number
20	Hardware Revision	STRING	Get	Hardware revision string
21	Batch Size Target	REAL	Get/Set	Target batch size
22	Default P-Gain	REAL	Get	Factory default PID P-gain
23	Default I-Gain	REAL	Get	Factory default PID I-gain
24	Default D-Gain	REAL	Get	Factory default PID D-gain
25	Default Crack	REAL	Get	Factory default valve crack offset
26	STP Volumetric Flow Units	UINT8	Get/Set	Engineering units for STP volumetric flow
27	STP Temperature	REAL	Get/Set	°C — reference temperature for STP calculation
28	Gas Index	UINT16	Get/Set	Selected gas index

Table 6. Acyclic data records at Slot 0, Subslot 1, Address 262. All REAL values are 32-bit IEEE 754 floating point. Little-endian byte order.

Troubleshooting

Symptom	Likely Cause	Resolution
Device not found in TIA Portal scan	GSDML not installed, wrong adapter, or no power	Install the GSDML file and confirm device descriptions are refreshed. Verify the correct Ethernet adapter is selected in TIA Portal. Check power and cable connections (RJ45 or M12, depending on your CODA configuration).
NET LED blinking red	No active data exchange	Verify the PLC is in RUN mode and the PROFINET IO system is active. Confirm the device name in the TIA Portal project matches the name configured on the CODA (default: alicat).
NET LED off after power-up	Device name or IP not assigned	Confirm the station name in the TIA Portal project matches the CODA device name. Download the configuration and ensure the controller is online.
Ready LED off	Startup or no configuration	Wait for the device to complete startup. If the LED remains off, verify the GSDML is installed and the device is configured correctly in TIA Portal.
Ready LED blinking green	Flash LED command active	A Flash LED command was issued. This is normal and will stop automatically after 15 seconds.
No process data in PLC	Device not in active data exchange	Confirm the NET LED is solid green. Check that the module slots are correctly configured in TIA Portal and the PLC is online.
Incorrect readings in PLC	Module slot or address mismatch	Verify module slot assignments in TIA Portal match the GSDML specification. Confirm data types (Float32 / Unsigned16 / Unsigned32) and byte offsets match this document. Byte order is little-endian.
Commands not executing (tare, reset, etc.)	Device Control value not changing	Device Control is edge-triggered. Write 0x0000 between commands so the next command is detected as a new value.
Acyclic record access fails	Incorrect slot, subslot, or index	Use Slot 0, Subslot 1, Address 262 with the correct index number. Confirm the RDREC/WRREC instruction parameters match.

For issues not listed above, contact Alicat support:

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