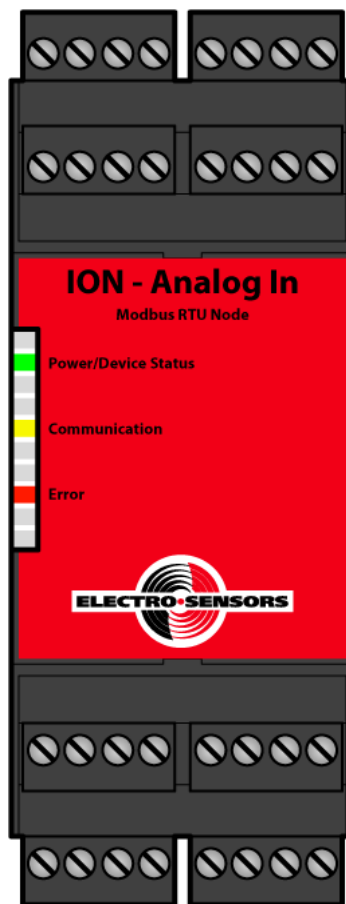




ION – Analog Input

Modbus RTU Node

USERS MANUAL



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Description

The ION Analog Input Modbus RTU Node is a 24Vdc powered, DIN rail mountable industrial data acquisition device with twelve 0/4-20mA signal inputs (In1 → In12), six sensor power outputs and a Modbus RTU/RS485 slave interface. The twelve analog input signal levels are continuously and independently measured and available for access over Modbus.

Installation/Mounting

Attaching to DIN rail

Orient the unit vertically with the LED LENS on the LEFT and the ROTARY SWITCHES (located behind the removable front cover) on the RIGHT (see Figure 1).

Slide the rear clip bottom groove onto the DIN rail bottom edge (rear clip springs should be pointing up and behind the rail bottom edge).

While pushing UP on the unit (compressing the rear clip springs), push the unit BACK until the rear clip top clears the rail top edge and snaps into place.

Detaching from DIN rail

Push the unit UP (compressing the rear clip springs) until the clip top can tilt free from the DIN rail top edge, tilt the unit top slightly forward enough to free it. Be careful not tilt too much (the rear clip springs can break).

Now lower the unit to free it from the rail bottom edge.

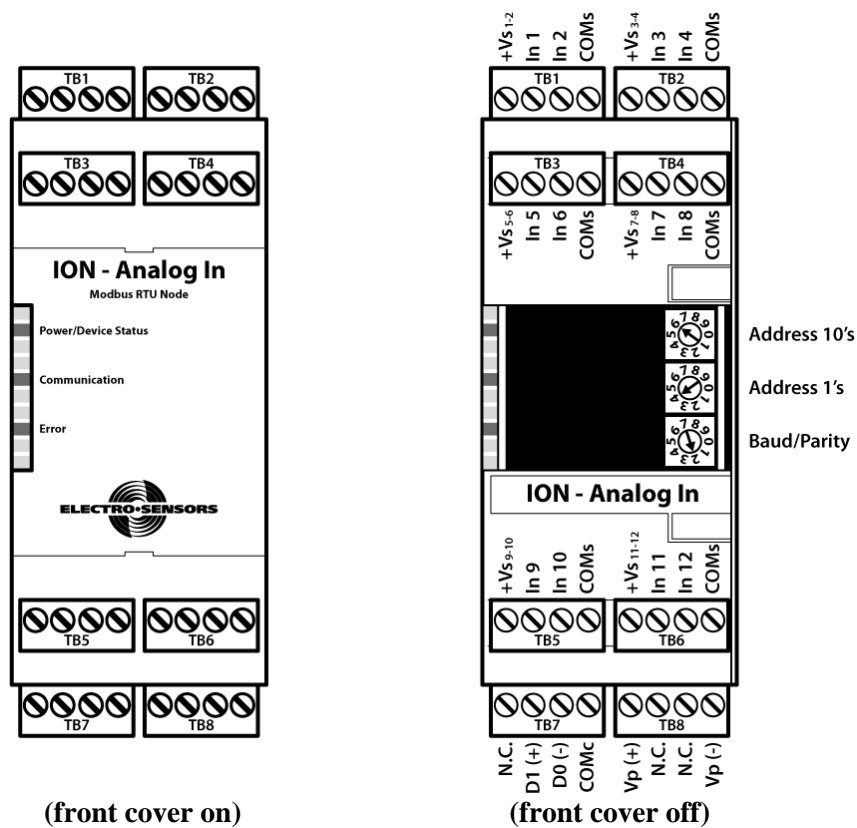


Figure 1

Terminal blocks (see Figure 1)

Sensor connection terminals are organized into 6 pluggable 4-terminal blocks (TB1 ... TB6), each with:

- 1 Sensor DC power output terminal (+Vs)
- 2 Sensor signal input terminals (In)
- 1 Signal common terminal (COMs)

Modbus RTU/RS485 terminals are located on 1 pluggable 4-terminal block (TB7 – lower left) with:

- 1 unused terminal (N.C.)
- 1 D1 (+) terminal (EIA/TIA-485 B)
- 1 D0 (-) terminal (EIA/TIA-485 A)
- 1 COMc common terminal (EIA/TIA-485 C)

24Vdc Power In terminals are located on 1 pluggable 4-terminal block (TB8 – lower right) with:

- 1 Vp(+) terminal to connect to external power supply + (+24Vdc, red)
- 2 unused terminals (N.C.)
- 1 Vp(-) terminal to connect to external power supply – (Common, blk)

Wiring sensors to inputs (see Figure 1 and Figure 2)

Connect sensors to Vs, In and COMs terminals within the SAME TERMINAL BLOCK (as shown in Figure 2).

Notes:

Each Vs terminal provides enough power for two “2-wire” (+ and –) 4-20mA devices.

Each Vs terminal provides enough power for one “3-wire” (V+, signal and common) 4-20mA device only.

When powering a 3-wire device from Vs, no other sensor should be connected to that same terminal block.

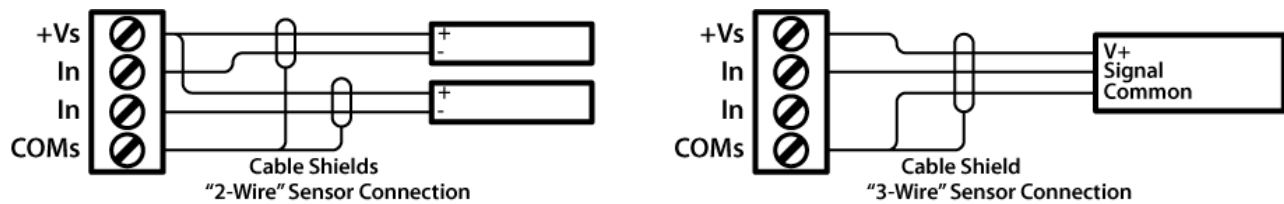


Figure 2

Setting the rotary switches (see Figure 1)

Three rotary switches (two slave Address, one Baud/Parity) are located under the removable front cover.

Remove the front cover by prying it free at the indented pry points (re-attach it after switches are set).

Set the slave Address switches to a UNIQUE value (in range 01 → 99; do not set to 00) within the Modbus network.

Set the Baud/Parity switch for the SAME baud rate, parity and stop bit setting as ALL other devices on the network.

Serial Baud/Parity switch

Setting	Baud rate	Data bits	Parity / Stop bits
0	9.6k	8	None / 2
1	19.2k	8	None / 2
2	38.4k	8	None / 2
3	57.6k	8	None / 2
4	115.2k	8	None / 2
5	9.6k	8	Even / 1
6	19.2k	8	Even / 1
7	38.4k	8	Even / 1
8	57.6k	8	Even / 1
9	115.2k	8	Even / 1

Table 1

Note: In Figure 1 the Address is 64 and the Baud / Data / Parity / Stop settings are 38.4k / 8 / None / 2.

Supported Modbus function codes

03 Read Holding Registers (4XXXX)

04 Read Input Registers (3XXXX)

Sensor signal data

Each input has a dedicated 16-bit Modbus Input Register and Holding Register for reading its signal data.

For any analog input, the corresponding 16-bit input and holding register values are the same.

Analog Input	Input Register	Holding Register	Data Range (0 → 20.800mA input)
In1	30001	40001	0 → 20800 (1 count/μA)
In2	30002	40002	0 → 20800 (1 count/μA)
In3	30003	40003	0 → 20800 (1 count/μA)
In4	30004	40004	0 → 20800 (1 count/μA)
In5	30005	40005	0 → 20800 (1 count/μA)
In6	30006	40006	0 → 20800 (1 count/μA)
In7	30007	40007	0 → 20800 (1 count/μA)
In8	30008	40008	0 → 20800 (1 count/μA)
In9	30009	40009	0 → 20800 (1 count/μA)
In10	30010	40010	0 → 20800 (1 count/μA)
In11	30011	40011	0 → 20800 (1 count/μA)
In12	30012	40012	0 → 20800 (1 count/μA)

Note: Signal over-range (current exceeding 20.8mA) is indicated by 65,535 (0xFFFF)

LED operation

Power/Device status (green)	ON:	Device is powered
Communication (yellow)	ON:	Device is polled by a Modbus master at least once per second.
Error (red)	ON:	Fault (signal over-range)
	Flashing:	Communications fault (e.g. incorrect slave address, baud rate, message length; CRC or character error)

Specifications

DC Power input (TB8)

V _p (V _p (+) – V _p (-))	24Vdc ±5%
I	300mA (max) – sensor DC power outputs (+Vs) fully loaded (40 mA each)
NOTE	Apply 24Vdc power across the TB8 V _p (+) and V _p (-) terminals. See Figure 1. DO NOT apply power to Modbus RTU/RS485 terminals.

Sensor DC power outputs (+Vs)

V	V _p – 1V
I	40mA (max): each Vs terminal can supply two 2-wire 4-20mA sensors. Each +Vs output terminal is protected by an internal device which shuts off power when overloaded. To reset a +Vs terminal's power, remove ALL load from that terminal and wait 1 minute.

Signal current inputs (In1 ... In12)

Range	0 → 20.8mA (measurable)
R _{in}	510Ω

Signal current measurement

Resolution	1 μA (1 count per μA: e.g. codes 4,000 → 20,000 indicate 4.000 → 20.000 mA)
Accuracy	±0.1% ± 1 count (1 μA) max error
Range	0 → 20,800 (normal range codes for 0.000 → 20.800 mA) 65,535 (0xFFFF) (OVER-RANGE code for current > 20,800 mA)
Conversion rate (each input)	600 mS (12 input signals are sequentially converted, 1 every 50 mS)

RS485 serial port (TB7)

Isolation voltage	1kV (min)
Differential output voltage	1.5V (min) @ 54Ω line impedance
Configuration	2-wire RS485
Baud/Parity/Stop-bits	(see Table 1) set with 1 rotary Baud/Parity switch (see Figure 1)
NOTES	Connect the TB7 terminals to a half-duplex “2-wire” configured RS485 network: D1(+), D0(-) and COMc terminals - see p. 2 Terminal Blocks and Fig 1. DO NOT connect power sources to TB7 terminals or the RS485 network.

Modbus RTU slave

Query → response latency	1mS (max) – master query message end to ION response message start
Slave address	(01 → 99) set directly with 2 rotary Address switches (see Figure 1)
Supported function codes	See Supported Modbus function codes
Supported data addresses	See Sensor signal data

Electrical isolation/grounding

3 isolated electronic circuits: sensors/power, internal digital and RS485 port.
The sensors and 24Vdc power input (V_p) share the same circuit.

Operating temperature

-40 → +185°F (-40 → +85°C)

Dimensions

4.65 in (118 mm) H, 1.77 in (45 mm) W, 4.88 in (124 mm) D

Weight

0.50 Lb (0.23 kg)