

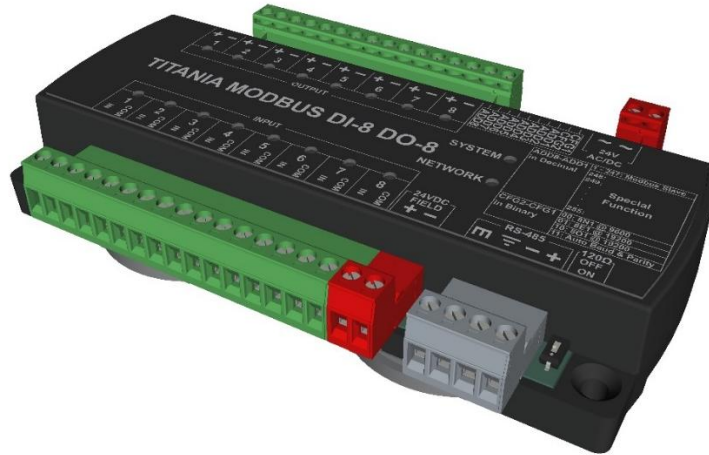
DATASHEET

TITANIA SUPER I/O SERIES

Product Model:

Modbus DI-8 DO-8

1 Introduction



1.1 Product Overview

The Titania Modbus DI-8 DO-8 is an industrial distributed "Super I/O" module designed to extend field-level digital connectivity in automation and control systems. Communicating over isolated RS-485 via Modbus RTU, it integrates seamlessly with PLCs, industrial PCs (IPCs), and SCADA systems.

Unlike standard execution blocks, the Titania features built-in edge computing capabilities, enabling local autonomy for hardware logic, programmable sequencing, and standalone PID control to reduce network dependency.

Engineered for harsh environments, its architecture features full multi-domain galvanic isolation separating the inputs, outputs, communication, and power circuits. Integrated industrial-grade protections—including short-circuit defense, overcurrent limiting, thermal shutdown, and surge suppression—ensure deterministic and reliable operation.

1.2 Features

- **High-Density I/O:** 8-channel isolated digital inputs (supporting dry contact, PNP, and NPN) and 8-channel isolated high-side digital outputs optimized for 24 VDC sourcing loads.
- **Edge Computing & Local Logic:** Supports autonomous functional modes including local interlocks, sequencing, hardware logic, and PID control loops.
- **Robust Electrical Isolation:** Complete galvanic isolation between input, output, communication, and power domains for superior noise immunity.
- **Comprehensive Protection:** Built-in safeguarding against overcurrent, short-circuit, thermal runaway, and electrical surges (EFT/ESD).
- **Advanced Diagnostics:** Real-time LED status indicators for System (SYS), Communication (COM), and individual input/output states.
- **Field Configurable:** On-board DIP switches allow rapid hardware configuration of device addresses, communication settings, and operating modes.
- **Form Factor:** Rugged, compact, and DIN-rail mountable enclosure designed for high-density cabinet aggregation.

1.3 Typical Applications

- **Remote I/O Expansion:** Cost-effective digital expansion for PLCs, IPCs, and SCADA networks.
- **Distributed Machine Control:** Cabinet-level signal aggregation for distributed factory automation.
- **Smart Edge Interlocking:** Local annunciation, emergency interlocks, and fast-response autonomous sequencing.
- **Field Device Sensor Integration:** Direct interfacing with proximity sensors, limit switches, and dry contacts.
- **Actuator & Load Control:** Direct driving of solenoids, industrial relays, sirens, indicators, and small PWM loads.

1.4 Configurable Operating Modes

Set via the onboard DIP switches, the Titania can operate as a standard super I/O node or as an autonomous edge controller / diagnostic node depending on the selected configuration.

Mode	Function	Target Application & Field Use Case
Normal Modbus Slave	Standard RTU operation using the software-configured slave ID (1–255).	Continuous monitoring and control via centralized PLCs, RTUs, or SCADA hosts.
Hardware Logic Gates	Executes localized Boolean logic (AND, OR, NAND, NOR) directly linking physical inputs to outputs	Local Safety Interlocks: Triggering a local valve shutdown if a limit switch is tripped, acting as a failsafe even if the main PLC or network crashes.
Programmable Sequencer	Runs autonomous, time-based digital sequences (e.g., valve chaser or backflush logic).	Self-Cleaning Filter Systems: Automatically running a 5-step backflush sequence on a filter bank every hour without needing PLC code.
Alarm Annunciator	Implements standalone ISA sequence logic with local Acknowledge (ACK), Reset, and Test behaviors.	Local Control Panels: Directly driving industrial stack-lights, sirens, and operator push-buttons for local machine fault signaling.
PWM Output Ramping	Automatically ramps digital outputs from 0% to 100% duty cycle and back.	Inrush Current Protection: Soft-starting heavy DC solenoids, proportional valve testing, or controlling variable-intensity heating elements.

2 System Specifications

Item	Description
LED Indicators	SYS: Green/Red LED for Power, MCU heartbeat, and system fault diagnostics. COM: Green LED flashing for RS-485 TX/RX packet activity; solid red for framing/parity errors. DI1-DI8: Green LEDs indicating active logical high inputs. DO1-DO8: Amber LEDs indicating active high-side outputs.
Isolation	Multi-domain galvanic isolation architecture separating core logic from field connections. Isolation barrier between: - Field I/O to Internal Logic (CPU) - RS-485 Communication Port to Internal Logic - Power Supply Input to I/O and Logic domains
EMS Protection	Electrostatic Discharge (ESD) IEC 61000-4-2: ±15 kV Air, ±8 kV Contact (Industrial Severity Level 4) Electrical Fast Transient (EFT) IEC 61000-4-4: ±2 kV Power Supply Lines, ±1 kV Signal/Data Lines Surge Protection IEC 61000-4-5: ±1 kV Differential Mode, ±2 kV Common Mode
COM Ports	Interface Port: 1 × RS-485 (2-wire, half-duplex, transient-protected) Baud Rate: 9600, 19200, 38400, 115200, Auto-Baud Rate Detection Data Format: 8N1, 8E1, 8O1 Protocol: Modbus RTU Slave / Functional Modes Configurable via Modbus Register or DIP switch
Power	Nominal Input Voltage: 24 VDC Operating Voltage Range: 19.2 to 28.8 VDC (24 VDC ±20%, industrial grade) Circuit Protection: Integrated Reverse Polarity Protection System Power Consumption: 2 to 3 W maximum (excludes external digital output load currents)
Mechanical Specifications	Dimensions (W × L × H): 161 mm × 80 mm × 20 mm (6.34 in × 3.15 in × 0.79 in) Mounting Type: Integrated DIN-rail mountable clip

2.1 I/O Specifications – Digital Input

Item	Description
Channels	8 Channels designated as DI1 to DI8
Type	Dry Contact (Potential Free) Wet Contact (Voltage)
Wet Contact Input Configuration	Sinking (PNP) or Sourcing (NPN)
PNP Logic Levels	ON: 13 to 30 VDC OFF: 0 to 5 VDC
NPN Logic Levels	ON: 0 to 5 VDC OFF: 13 to 30 VDC
Dry Contact Thresholds	ON: Short to COM (Closed Loop) OFF: Open Circuit (High Impedance)
Integrated Digital Input Counters	Natively tracks total pulse count up to 4,294,967,295 (32-bits) counts per channel.
Max. Input Frequency	1 kHz (1,000 Hz)
Hardware Input Filter	Configurable: 1us to 100ms
Input Impedance	10 kΩ
Circuit Protections	• Overvoltage Protection • Integrated Current Limiting (2.5 mA) • Thermal Shutdown protection at 150°C
Industrial Compliance Rating	Fully compliant with international PLC voltage/current input characteristics in accordance with IEC 61131-2, Type 1, 2, and 3

2.2 I/O Specifications – Digital Output

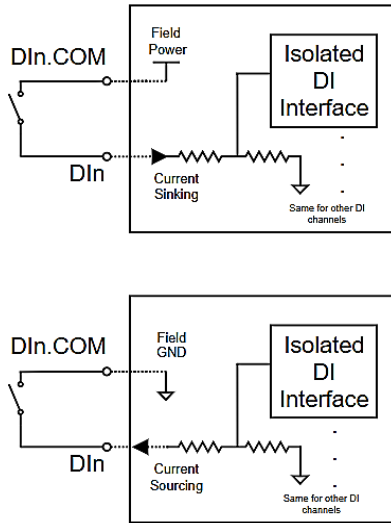
Item	Description
Channels	8 Channels designated as DO1 to DO8
Type	Isolated High-Side Switch (Sourcing/PNP)
Output Voltage Range	ON state: Digital Output Field Supply Voltage – 1V (maximum drop) OFF state: 0 to 2 VDC
Output Current Capacity	Continuous: 0.7 A per channel concurrent for 8 Digital Output channel Peak Surge: -1.1 A (Short duration)
Maximum Leakage Current in OFF state	10 uA
Proportional PWM Support	Available on all 8 channels
PWM Frequency & Resolution	Frequency: 1 Hz to 50 Hz Resolution: 1% steps
Hardware Protections	· Overcurrent Short-Circuit Limiting (Triggers @ 1.1 A) · Overvoltage & Thermal Overload Protection
Overload Protection	Current limiting activates at 1.1 A
Inductive Load Protection	Internal Active Clamp (Field Supply Voltage – 54 VDC)
Power on Value	Programmable
Safe Value	Programmable

2.3 Environment

Operating Temperature	-20°C to +70°C (-4°F to +158°F)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Humidity	10–95% RH, Non-condensing

3 Titania Board Wiring

3.1 Digital Input Wiring for Dry Contact Wiring (Potential-Free Switches)



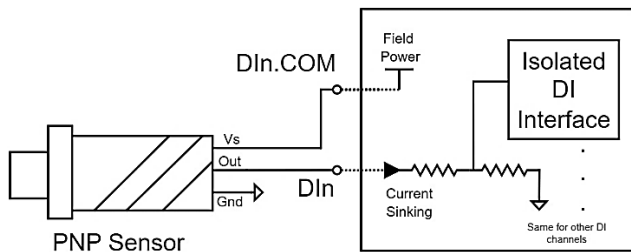
For standard mechanical switches, limit switches, or isolated relay contacts. Because dry contacts are potential-free, polarity orientation is not required.

- **DI1–DI8:** Connect to one terminal of the dry contact
- **DI.COM:** Connect to the remaining terminal of the dry contact

Suitable Input Devices:

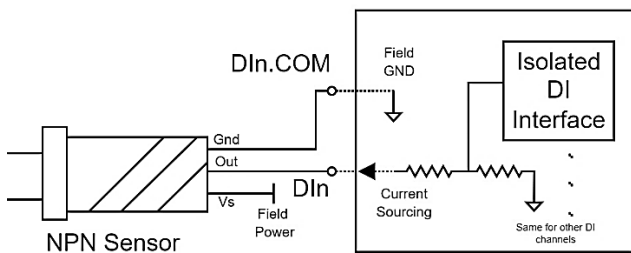
- Manual Operator Switches (**push button, selector switch**)
- Mechanical Position Sensors (**limit switch, reed switch**)
- Process Threshold Switches (**pressure switch, thermostat**)
- Isolated Relay Contacts (**Auxiliary contacts on motor contactors, fault signaling contacts from VFD**)

3.2 Digital Input Wiring for Wet Contact



For channels operating as sinking inputs, use standard 3-wire PNP sensors. The module's **DI.COM** terminal is internally tied to Field Power (+24 VDC) to simplify sensor power distribution.

- **DI.COM:** Connect to Sensor Power (**Vs**)
- **Field GND:** Connect to Sensor Ground (**GND**) with Titania Digital Input Field ground
- **DI1–DI8:** Connect to Sensor Output (**OUT**)



For channels operating as sourcing inputs, use standard 3-wire NPN sensors. In this configuration, the module's **DI.COM** terminal is internally tied to Field GND (0 VDC) to act as a convenient local ground distribution point for the sensors.

- **DI.COM:** Connect to Sensor Ground (**GND**)
- **Field Power:** Connect to Sensor Power (**Vs**) and Titania Digital Input Field Ground
- **DI1–DI8:** Connect to Sensor Output (**OUT**)

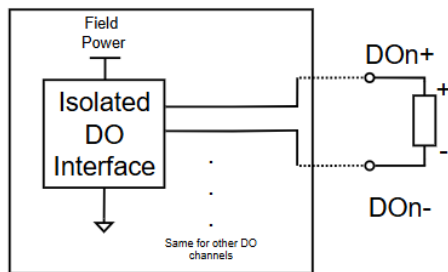
Suitable 3-Wire Sinking Devices

Proximity Sensors: Inductive, capacitive, ultrasonic switches.

Photoelectric Sensors: Through-beam, retro-reflective

Process Switches: Solid-state pressure, flow and level switches NPN discrete outputs.

3.3 Digital Output Wiring



The Titania features isolated high-side sourcing (PNP) outputs that switch the positive DC rail to the load. Each channel includes an integrated active voltage clamp, completely eliminating the need for external flyback diodes when driving inductive loads.

- **DO1-DO8 (+):** Connect to the positive (+) terminal of the load
- **DO1-DO8 (-):** Connect to the negative (-) terminal of the load

Suitable Output Devices:

- Visual & Audible Indicator (**Indicator Lamp, Siren**)
- Electromechanical Actuator (**Solenoid valve, Relay**)
- PWM Load (**Small DC Motor, Dimmable LED, Heater**)
- Safety & Security Devices (**Magnetic Lock, Strobe Light**)

*** End of Document ***