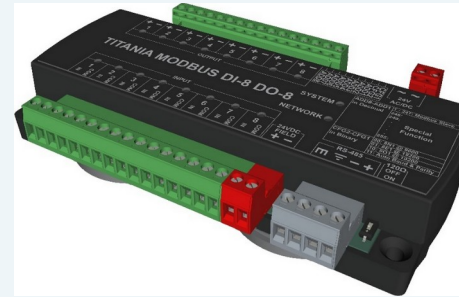


INDUSTRIAL EDGE INTELLIGENCE / PRODUCT DATASHEET

TITANIA

8DI / 8DO Industrial Super I/O

Industrial isolated digital I/O with high-speed counters, protected high-side outputs, programmable safe states and local logic, sequencing, alarm and PWM functions over Modbus RTU.



8 DI DRY CONTACT, PNP AND NPN	8 DO PROTECTED HIGH-SIDE SOURCING	1 kHz INPUT COUNTING AND FREQUENCY	RS-485 MODBUS RTU WITH AUTOMATIC BAUD DETECTION
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ENGINEERING SUMMARY Titania combines isolated field I/O, per-channel diagnostics and Modbus RTU with local processing. It can operate as conventional remote I/O or execute selected logic, sequence, alarm and PWM functions close to the machine.

MODEL Modbus DI-8 DO-8

DOCUMENT TTN-DS-2026-001

REVISION Rev 08

ISSUE DATE 22 July 2026

DISTRIBUTED I/O WITH LOCAL AUTONOMY

PLC Expansion • Machine Control • Interlocks • Counters • Alarm Panels • PWM Loads

Tachyonic Intelligence Sdn Bhd | 87-G, Jalan Puteri 5/7, Bandar Puteri, Puchong, 47100 Selangor

01 PRODUCT OVERVIEW

Remote I/O with local autonomy

Titania aggregates field signals at the machine while preserving deterministic behaviour through protected outputs, programmable safe states, watchdog supervision and optional autonomous function profiles.

Purpose and deployment

Eight isolated digital inputs accept dry-contact, PNP or NPN field devices. Every input can be used for state monitoring, filtering, edge-selected counting and pulse-frequency measurement.

Eight isolated high-side sourcing outputs drive 24 VDC loads and provide programmable power-up and communications-loss states, PWM capability and driver-fault information where supported.

Local logic, pattern matching, sequencing, alarm-annunciator behaviour and frequency/PWM functions can reduce master traffic and preserve selected machine functions during network interruption.

Typical applications

- PLC and SCADA I/O expansion
- Distributed machine and cabinet I/O
- Conveyor and packaging interlocks
- Pump, fan and valve sequencing
- Alarm annunciators and tower lights
- Pulse counting and speed monitoring
- Solenoids, relays, sirens and indicators

Key product capabilities

Eight universal digital inputs

Dry-contact, PNP and NPN operation with configurable filtering and per-channel status.

Counters and frequency measurement

32-bit accumulation, selectable rising/falling edge and pulse-frequency readback up to the stated input limit.

Eight protected sourcing outputs

High-side 24 VDC outputs with current limiting, short-circuit, overvoltage and thermal protection.

Power-up and safe states

Define output states after reset and after communication loss; verify them during commissioning.

PWM and output shaping

Per-channel frequency, duty cycle, ramp, hold and intensity parameters for suitable loads.

Logic and pattern functions

Input masks, polarity, Boolean gate selection and pattern matching mapped to output actions.

Programmable sequencer

Channel mask, step interval, pulse width, sequence delay, one-shot/repeat control and loop pattern.

Diagnostics and visibility

System, communication and channel LEDs plus Modbus status, counter, frequency and output-fault information.

APPLICATION BOUNDARY Local logic and autonomous modes are control conveniences, not certified safety functions. Safety-related interlocks require a separately designed and validated safety system. Output current, inrush, ambient temperature and enclosure conditions must be considered together.

02 FUNCTIONAL ARCHITECTURE

Isolated field I/O and local processing path

The field interface, logic core, communications and power domains are separated so local functions can continue according to the configured operating profile.

01 ACQUIRE Dry / PNP / NPN input states	02 FILTER Debounce and edge selection	03 PROCESS Counters, frequency and logic	04 CONTROL Safe states, PWM and sequence	05 PUBLISH Modbus status and configuration
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Functional layers

Digital-input layer Eight inputs with dry-contact and wet-contact operation, status indication and configurable filtering.	Counter / frequency layer 32-bit counts, selectable edge, clear command and pulse-frequency measurement.
Digital-output layer Eight high-side outputs with commanded state, programmable startup/safe value and supported driver-fault status.	PWM / shaping layer Frequency, duty, resolution, limits, ramp-up, ramp-down, hold and intensity configuration.
Logic layer Input mask, gate mode, input polarity and pattern-match behaviour for local output decisions.	Sequencer layer Active-channel mask, step interval, pulse width, loop pattern, sequence delay and one-shot/repeat control.
Alarm layer Alarm masks, flash interval and annunciator behaviours for local signalling applications.	Management layer Modbus address/format, response delay, watchdog, save, reboot and factory-reset control.

DETERMINISTIC LOCAL BEHAVIOUR Program and acceptance-test power-up state, communication-loss state, watchdog interval and every autonomous mode before connecting loads to automatic operation. Document the final masks, timing units and firmware revision.

03 COMMUNICATIONS AND INTEGRATION

RS-485 Modbus RTU integration

The module uses two-wire half-duplex RS-485 and a Modbus RTU slave model. Direct I/O, counters, diagnostics and configuration are separated into standard Modbus data classes.

1-247	0-50 ms	4 + auto	8E1 / 8O1 / 8N1 / 8N2
SLAVE ID RANGE	RESPONSE DELAY	BAUD SELECTION	SERIAL FORMATS

PARAMETER	SPECIFICATION / BEHAVIOUR
Physical interface	1 x transient-protected, 2-wire half-duplex RS-485 port.
Slave address	1 to 247.
Baud selection	Automatic detection or fixed 9600, 19200, 38400 and 115200 bps.
Parity / stop bits	Even, odd or none; 8E1, 8O1, 8N1 and 8N2 formats.
Response delay	0 to 50 ms for master timing and multi-drop compatibility.
Watchdog	Configurable communications-loss supervision for safe-state transfer.
Configuration source	Modbus registers and hardware DIP selections according to firmware/hardware revision.
Identity data	Device code, hardware/firmware revision, manufacturing date, serial number, I/O totals and DIP-switch value.

Supported Modbus access

FUNCTION	REGISTER CLASS	TYPICAL USE
0x01 / 0x05 / 0x0F	Coils	Read/write output commands, startup/safe states, counter edge selection and counter-clear commands.
0x02	Discrete Inputs	Read physical DI status and supported DO fault status.
0x04	Input Registers	Read identity, 32-bit counters and pulse-frequency values.
0x03 / 0x06 / 0x10	Holding Registers	Read/write communication, filters, PWM, alarm, sequencer and logic configuration.

NETWORK PRACTICE Use a daisy-chain trunk, termination at the two physical ends, short stubs, unique slave IDs and a documented shield/common strategy. Avoid star wiring and undocumented bias networks.

04 DATA MODEL AND CONFIGURATION

Workbook-aligned I/O data and local-function controls

The ranges below follow the decimal reference notation in the supplied PiLoT Standard Modbus Register workbook. Only the first eight channel entries are used by this 8DI/8DO product.

Status and measured-value groups

REFERENCE	GROUP	CONTENT
10033-10544	DI status	Physical input state; first eight entries used.
10545-11056	DO fault status	Output-driver fault state; first eight entries used where supported.
30001-30038	Identity / inventory	Device and firmware identity, serial data, channel totals and DIP value.
30065-31088	DI counters	UINT32 counter values; two words per channel.
31089-31600	Pulse frequency	UINT16 input-frequency values; first eight entries used.
LED / local status	Front-panel indication	System, communication, DI and DO state indication complements Modbus status.

Command and configuration groups

REFERENCE	GROUP	CONTROL PURPOSE
00001	Sequence pattern	Linear loop or pendulum loop selection.
00033-00544	Output status coils	Direct output ON/OFF command; first eight entries used.
00545-01056	Safe-value coils	Communication-loss default state; first eight entries used.
01057-01568	Power-startup coils	Power-reset default state; first eight entries used.
01569-02080	Counter edge coils	0 rising edge, 1 falling edge; first eight entries used.
02081-02592	Counter-clear coils	Write 1 to clear the selected DI counter.
400001-400007	Common management	Address, serial format, delay, watchdog and system commands.
401665-403200	PWM blocks	Frequency, duty cycle and resolution; first eight channel entries used.
403201-403712	DI filter	Selectable filter time per input.
410369-410380	Alarm / simulation / sequence	Flash, masks, frequency simulation, waveform, step, pulse, delay and control.
410381-412428	Logic blocks	Input mask, gate mode, polarity and pattern; first eight output allocations used.

TIME-BASE AND SCALING NOTE Some workbook descriptions use values such as 500 and 1000 with inconsistent unit wording. Confirm milliseconds/seconds, scaling, enumeration and supported function profile against the firmware-specific register map before commissioning.

05 TECHNICAL SPECIFICATIONS

Digital input, digital output and system performance

Electrical values consolidate the supplied Titania datasheet and register workbook. Final configuration and thermal/load behaviour must be verified for the installed enclosure and ambient conditions.

System, power and communications

ITEM	SPECIFICATION / CAPABILITY
Supply	24 VDC nominal; 19.2 to 28.8 VDC operating range.
System consumption	2 to 3 W maximum, excluding external output-load current.
Communications	2-wire half-duplex RS-485; Modbus RTU; automatic or fixed baud selection.
Isolation architecture	Separate field I/O, logic, RS-485 communications and power domains as stated in the source specification.
EMC design levels	ESD ± 15 kV air / ± 8 kV contact; EFT ± 2 kV power / ± 1 kV signal; surge ± 1 kV differential / ± 2 kV common mode, as stated in the source design.
Indicators	SYS, COM, DI1-DI8 and DO1-DO8 status indication.
Mechanical	161 x 80 x 20 mm (W x L x H); integrated DIN-rail mounting clip.
Environment	-20 to +70 °C operating; -40 to +85 °C storage; 10 to 95% RH non-condensing.

Digital inputs

ITEM	SPECIFICATION / CAPABILITY
Channels / type	8 channels, DI1-DI8; dry contact or wet contact; PNP sinking or NPN sourcing configuration.
PNP logic levels	ON 13-30 VDC; OFF 0-5 VDC.
NPN logic levels	ON 0-5 VDC; OFF 13-30 VDC.
Dry contact	ON closed to DI.COM; OFF open circuit.
Input impedance	10 k Ω .
Maximum input frequency	1 kHz.
Counter	32-bit accumulation, 0 to 4,294,967,295.
Filter selections	Disabled, 1 μ s, 8 μ s, 200 μ s, 1 ms, 2.5 ms, 10 ms, 30 ms or 100 ms.
Protection / design reference	Overvoltage protection, 2.5 mA stated current limiting and 150 °C stated thermal shutdown; designed to align with IEC 61131-2 input characteristics, subject to final declaration.

SPECIFICATION BASIS Values originate from the supplied product information and Modbus workbook. Final production limits, tolerances and supported firmware features remain subject to the applicable engineering release.

06 PRODUCT ENGINEERING DATA

Digital output and load engineering data

Output-driver capability, safe-state behaviour and installation limits for field loads.

Digital outputs

ITEM	SPECIFICATION / CAPABILITY
Channels / type	8 isolated high-side sourcing (PNP) outputs, DO1-DO8.
ON-state voltage	Field-supply voltage minus up to 1 V maximum drop.
OFF-state / leakage	0-2 VDC; 10 μ A maximum leakage.
Continuous current	0.7 A per channel with all eight channels active, subject to ambient and thermal conditions.
Peak / current limit	Approximately 1.1 A short-duration surge and overload limiting.
PWM	1-50 Hz; 0-100% duty cycle in 1% steps.
Inductive protection	Internal active clamp; nominal 54 V clamp characteristic referenced in the source design.
Safe / startup state	Programmable per channel.
Protection / feedback	Overcurrent, short-circuit, overvoltage and thermal protection with supported fault status over Modbus.

Load application checks

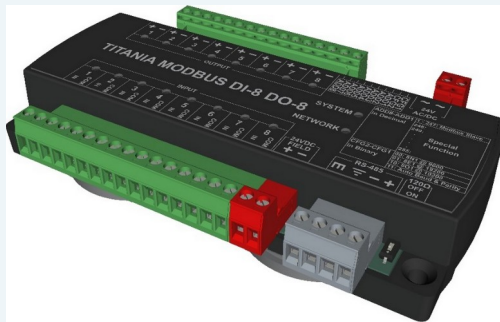
CHECK	ENGINEERING REQUIREMENT
Simultaneous loading	Assess all eight channels together; enclosure temperature and conductor routing affect thermal margin.
Inrush current	Use measured inrush, not only steady-state current, when selecting a direct-connected load.
Inductive energy	The internal clamp has finite energy capability; use an external suppression or interposing device where required.
PWM suitability	Confirm that the load tolerates the selected frequency and repetitive switching.
Branch protection	Provide external overcurrent protection sized for conductors, supply and connected loads.
Fault recovery	Define whether an output retries, latches off or requires host intervention according to firmware behaviour.

LOAD ENGINEERING Output current, inrush, switching frequency, load inductance, enclosure temperature and simultaneous-channel loading must be assessed together. Use external interposing relays/contactors where the field load exceeds the module rating or requires galvanic separation not provided by the output channel.

07 INSTALLATION AND MECHANICAL INTEGRATION

Power, inputs, outputs and RS-485

Confirm terminal legend on the delivered hardware before energising. Field commons, output supply and RS-485 reference must follow the product drawing for the applicable revision.



Illustrative product image

Terminal and supply planning

- Provide 24 VDC within the stated range and observe reverse-polarity protection limits.
- Separate input field reference, output-load supply and communications wiring according to the terminal drawing.
- Use suitable branch protection for field loads and consider total current and enclosure heating.
- Keep RS-485 as a linear trunk with correct polarity, end termination and a defined bias network.
- Program power-up and communications-loss states before connecting automatic loads.

INSTALLATION ITEM	REQUIREMENT
Power input	Verify polarity, supply range, branch protection and conductor size before connecting field loads.
Dry-contact input	Connect the contact between DIx and DI.COM using the required field reference; account for contact bounce with the input filter.
PNP sensor	Use sinking-input configuration and connect sensor supply, output and common according to the terminal drawing.
NPN sensor	Use sourcing-input configuration and connect sensor ground, output and field power according to the terminal drawing.
High-side output	Connect the load to the sourcing output terminals. Verify voltage, current, inrush and inductive energy.
RS-485	Use twisted pair, correct A/B polarity, short stubs and termination only at the two physical ends.
Ground / shield	Follow the cabinet grounding design and avoid uncontrolled shield-current paths.
Thermal / spacing	Maintain airflow and clearances appropriate to simultaneous output current and enclosure ambient temperature.

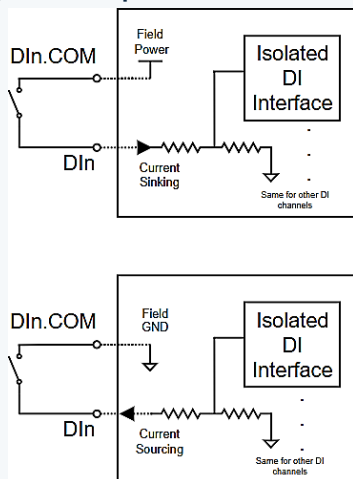
CABINET INTEGRATION Maintain conductor separation, airflow and service access. Confirm the terminal legend on the delivered hardware and keep the released wiring drawing with the panel documentation.

08 FIELD WIRING

Digital input and output wiring

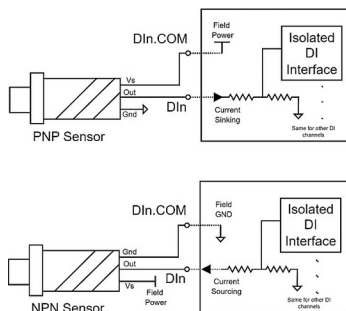
Reference wiring arrangements for dry contacts, PNP/NPN sensors and high-side outputs.

Dry contact input



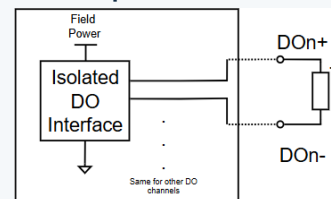
Connect the potential-free contact between DIx and DI.COM. Select the field reference required by the configured input mode.

PNP / NPN sensor



PNP: sinking input. NPN: sourcing input. Verify sensor supply, common reference and polarity before energising.

High-side output



Connect the load across the output channel terminals. Confirm continuous current, inrush and inductive behaviour.

WIRING CHECK	ACCEPTANCE GUIDANCE
Input common	Referenced exactly as shown for dry, PNP or NPN operation; no unintended common between isolated domains.
Sensor supply	Within sensor and module limits with the required 0 V or +24 V reference.
Output supply	Sized for simultaneous load and inrush; external branch protection fitted.
Inductive load	Internal clamp suitability confirmed; external suppression used where energy exceeds the design.
RS-485 trunk	Linear topology, correct polarity, short stubs and termination at both physical ends.
Protective earth / shield	Connected according to the cabinet EMC plan without uncontrolled shield loops.

INSTALLATION CHECK Segregate field power and communications where practical, verify every output inrush and test each safe-state transition before automatic operation.

09 COMMISSIONING AND DIAGNOSTICS

From wiring verification to autonomous operation

Commission the module as conventional remote I/O first. Then enable counters, PWM, logic, sequencer, alarm or frequency-simulation functions one at a time and document the acceptance result.

01 INSPECT Supply, commons and RS-485	02 COMMUNICATE Address and serial format	03 CONFIGURE DI Mode, filter and edge	04 CONFIGURE DO Startup and safe values	05 TEST FUNCTIONS Counter, PWM, logic and sequence	06 RELEASE Record firmware and settings
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Acceptance and diagnostic checks

CHECK	ACCEPTANCE GUIDANCE
SYS LED	Confirm power, MCU heartbeat and absence of system-fault indication.
COM LED	Verify stable Modbus activity and no recurring framing/parity error indication.
DI LED / status	Compare physical input indication, discrete-input state and field-device operation.
Counter / frequency	Apply a known pulse source and verify edge selection, increment, clear command and measured frequency.
DO LED / command	Compare command coil, output indication and measured load voltage/current.
DO fault status	Under controlled test conditions, verify supported short/open/over-temperature indication according to the driver implementation.
Watchdog / safe value	Stop master polling and confirm each output moves to the programmed safe state after the configured interval.
Power-up value	Cycle power under controlled conditions and verify every output starts in the programmed state.
Local modes	Validate masks, polarity, patterns, sequence timing, alarm masks and PWM limits before process connection.

INPUT FILTER SELECTION Choose a filter shorter than the minimum legitimate pulse width. Excessive filtering can suppress valid pulses; insufficient filtering can count contact bounce or electrical noise.

10 ORDERING AND COMPANION DOCUMENTS

Configuration and release documentation

Specify field-device types, load characteristics, autonomous functions and network settings. Companion engineering documents must match the delivered hardware and firmware.

Ordering configuration

ORDERING ITEM	REQUIREMENT
Base product	Titania Modbus DI-8 DO-8 Super I/O.
Input application	Dry-contact, PNP or NPN field-device mix, pulse width and maximum input frequency.
Output application	Load voltage, continuous current, inrush, inductance, switching and PWM requirements.
Autonomous functions	Required logic, pattern, sequencer, alarm, PWM/PID or frequency-simulation profile.
Power / enclosure	24 VDC supply capacity, branch protection, enclosure ambient and thermal margin.
Network plan	Slave ID, baud/parity format, response delay, termination, bias and watchdog philosophy.
Documentation revision	Register map, terminal drawing, installation guide and firmware release note must match the ordered release.

Related engineering documents

DOCUMENT	PURPOSE
PiLoT Standard Modbus Register.xlsx	Source workbook for Titania functions and common register groups.
Titania Modbus register map	Released address, data type, scaling, access and enumeration definitions.
Terminal and wiring drawing	Power, RS-485, DI, DO and common connections for the hardware revision.
Installation guide	DIN-rail mounting, grounding, EMC, thermal and load-derating requirements.
Commissioning procedure	DI mode, counter, safe-state, watchdog and autonomous-function acceptance tests.
Firmware release note	Supported local functions, time bases, limitations and corrections.

RELEASE PACKAGE The datasheet summarises product capability. Detailed design work must use the matching mechanical/terminal drawing, installation guide, firmware release note and Modbus register map.

11 DOCUMENT CONTROL

Revision history, release checklist and contact information

Document identification and release status for procurement, design and commissioning records.

Revision history

REVISION	DATE	DESCRIPTION
Rev 01	10 June 2026	Initial product datasheet.
Rev 02	19 July 2026	Professional layout and Modbus feature summary.
Rev 03	22 July 2026	Unified design system and expanded technical/register content.
Rev 04	22 July 2026	Updated company contact details.
Rev 05	22 July 2026	Standardised both products to a common master layout.
Rev 06	22 July 2026	A4 master template, Inter typography for DOCX/PDF, and enhanced technical content following established industrial datasheet conventions.
Rev 08	22 July 2026	Fixed-layout A4 Word edition generated from the Inter-embedded PDF to eliminate font substitution on systems without the Inter font family.

Design-release checklist

CONTROL	RELEASE REQUIREMENT
Hardware revision	Matches the product label and ordered variant.
Firmware revision	Matches the required functions and register map.
Mechanical / terminal drawing	Released drawing is included in the project file.
Network settings	Slave ID, baud, parity, delay, termination and watchdog are recorded.
Commissioning record	Acceptance tests, thresholds/safe states and baseline/configuration are retained.
Change control	Any later hardware, firmware or register-map update is assessed before deployment.

DOCUMENT STATUS Specifications are subject to engineering release and may change without notice. Verify the hardware, firmware, terminal drawing and Modbus register-map revision before design freeze, commissioning or safety-related use.

CONTACT

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