MODULUS Combo Input/Output Modules with 8 Process Analog Inputs

Modulus Combo Input/Output modules extend the I/O capacity of Modulus SCADA controllers, providing a combination of 8 optically isolated discrete inputs, 4 relay outputs, 8 analog inputs and the option of an additional 4 analog inputs or outputs. The discrete inputs can be ordered as 12/24V or 120/240V. Both AC and DC signals are supported. The analog inputs are process type, individually software configurable for current or voltage sensor signals.

Modulus Combo Input/Output modules have two serial ports (bus port plus a general purpose port), supporting industry standard protocols such as Modbus, DF1, SDX (AES-128 encryption), and SDI-12. The modules also have an Ethernet port supporting Modbus, Ethernet IP, MQTT, and SDX protocols, as well as Ethernet-Serial bridging and Ethernet Routing.

Modulus Combo I/O modules have built-in web pages for configuration, programming, monitoring and manuals. No application software is needed; just a web browser. Custom user documentation can also be loaded into the module, so that drawings, datasheets, etc. are always available for site support and maintenance.

STANDALONE OPERATION
Modulus Combo I/O modules can serve as standalone devices with SCADA communications, local and web human machine interfaces (HMIs), trending and data logging, alarming, reporting, and programmable logic control.

COMMUNICATIONS
Combo I/O modules have an Ethernet port and up to two serial ports to communicate with Modbus devices and Allen Bradley PLCs. They can serve as communications concentrators or master controllers, as well as providing web and data access to any other Modulus modules on the high-speed bus. They support Ethernet to Serial bridging, and routing through Ethernet ports in other Modulus modules on the bus.

GRAPHICAL, MOBILE, AND LOCAL HMIs
Configurable graphical and mobile device web interfaces, including the tools and libraries to build custom screens, are built in. The front panel display can also be customized to show live process values and states, and make setting changes.

HISTORICAL TRENDING AND EVENT LOGGING
Combo I/O modules have an internal flash disk, as well as a micro SD memory card slot to record over 100 years of data! Use built-in web tools to retrieve and display historical trend and event data and extract it as spreadsheet files.

REPORTING
Reports with custom graphics and logos can be created in minutes, showing live values, totals, trend/event data, alarm summaries, etc. They can be called up on demand, or sent out automatically.

ALARMING
A Combo I/O module can manage alarm conditions on any of it’s local inputs, as well as over 500 conditions monitored by communications with other devices. Alarms conditions can be displayed locally and annunciated with a discrete output, as well as by text message and e-mail alerts over the Internet via its Ethernet port. The module maintains a journal spreadsheet file of when alarms occurred, when they were acknowledged, by whom, and when the alarm conditions cleared.

PROGRAMMABLE LOGIC
Combo I/O modules support programmable logic written in ladder logic, function block and text languages; all with 32-bit integer and floating point math. Programmable logic can supplement the built-in functions of the module.

PID AND PUMP CONTROL
Combo I/O modules have a quad PID controller and a triplex pump controller (float or level control) with error detection and alarming. The module is an ideal solution for SCADA operation of wells, lift stations, and booster pump stations.

REDUNDANCY
Combo I/O modules support redundancy for enhanced reliability. If a module goes off-line, a designated backup can take over automatically.
FIELD I/O

**Digital Inputs:** 8
- Optically isolated, bipolar (AC/DC, not polarity sensitive)
- I/O Range:
  - [8x-3002, 8x-3003, 8x-3012, 8x-3013] 0 to 30V (OFF < 6V, ON > 9V)
  - [81-3102, 81-3103, 81-3112, 81-3113] 0 to 240V (OFF < 60V, ON > 90V)
  - [82-3102, 82-3103, 82-3112, 82-3113] 0 to 120V (OFF < 60V, ON > 90V)
- I/O Current:
  - [8x-3002, 8x-3003, 8x-3012, 8x-3013] 1.2mA @ 12V, 3mA @ 24V
  - [81-3102, 81-3103, 81-3112, 8x-3113] 1.2mA @ 120V, 3mA @ 240V
- Filtering: Individually configurable: 5Hz, 10Hz, 50Hz, 100Hz, 500Hz, 1KHz, 2KHz+

**Digital Outputs:** 4
- Relay contacts, Form A (normally open)
- Contact Output Rating: 240/277 Vac, 30Vdc, 3A maximum per output (resistive load). Do not exceed 8A total of all 4 outputs.
- A snubber diode (DC) or RC snubber (AC) must be used across the relay contacts or load connections for any inductive load.

**Analog Inputs:** 8
- 16-bit, Delta Sigma, individually selectable input ranges
- Input Ranges:
  - 20mA (minimum input for full accuracy is 0.5mA)
  - 5V and +/- 5V, 10V and +/- 10V, 30V
- Maximum signal level: 35Vdc on any range

**OPTIONAL FIELD I/O**

Either one of the options below can be added to the base configuration

**Analog Inputs (option):** 4
- 16-bit, Delta Sigma, individually selectable input ranges
- Input Ranges:
  - 20mA (minimum input for full accuracy is 0.5mA)
  - 5V and +/- 5V, 10V and +/- 10V, 30V
  - +/- 250mV
  - 65K ohms
  - J, K, T, E, R, S thermocouple (ungrounded type)
  - 2.2K, 10K (type II, II and 11.K shunt)
  - 1KΩ RTD (2 wire)

**Analog Outputs (option):** 4
- 12-bit
- Output Ranges:
  - 20mA [8x-3012] or 10V [8x-3013]

**COMMUNICATIONS**

**Ethernet:** 1
- 10/100mb/s (10/100 Base-T)
- Modbus TCP & UDP (master/slave), Ethernet IP (master/slave PLC5 & SLC5/05 emulation), SDX (AES-128 Encryption), MQTT, Ethernet to Serial bridging
- HTTP (server), FTP (server & client), E-mail (SMTP and POP3), ICMP (ping; server & client), NTP (client), DHCP (server & client), DNS, DDNS

**Serial:** 1
- RS-485 (This port is available if not used for bus communications with other modules.)
- RS-232, RS-485, RS-422, SDI-12 (This port is always available for general purpose communications.)
- Baud Rates: 115K, 38.4K, 19.2K, 9600, 4800, 2400, 1200 baud
- Protocols: Modbus RTU (master/slave), DF1 (slave), SDI-12 (general purpose port only)

**HMIs**

Local:
- 128x32 graphical, wide temperature range yellow OLED and single pushbutton

Graphical:
- Web based, graphic library included. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android

Mobile:
- Web based, text only, up to 50 registers. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android

**PROGRAMMING**

Languages:
- Ladder Logic, Function Block, Text—built-in web based graphical and text editor and debugger

Capacity:
- 64KB logic, 2MB source code, 32-bit integer and floating point math

**STORAGE**

Registers:
- 504 Numeric registers, 504 Boolean registers

Internal Flash disk:
- 32MB

**CLOCK**

Real Time Clock:
- Temperature compensated with 3-day super-capacitor auto-recharge backup power

Stability:
- +/- 3ppm from –30°C to 70°C

**GENERAL**

I/O Power:
- 10Vdc to 30Vdc,

Power Consumption (average)
- Not using Ethernet, relays OFF: 18mA @ 12Vdc / 13mA @ 24Vdc (Ethernet power saver enabled)
- Using Ethernet, relays OFF: 78mA @ 12Vdc / 43mA @ 24Vdc
- Additional current per relay ON: 10mA @ 12Vdc / 5mA @ 24Vdc
- Additional with AI option: 10mA @ 12Vdc / 5mA @ 24Vdc
- Additional with AO option: Loop current from I/O power (20mA @ 12Vdc / 20mA @ 24Vdc per output used)

Field Wiring Termination:
- [81-3xxx] screw terminal blocks, [82-3xxx] lever terminal blocks, 3.5mm, 22 to 14GA wires

Temperature:
- -40°C to 70°C (operating), -40°C to 85°C (storage)

Humidity:
- <95% RH (non-condensing)

Enclosure:
- Polyamide, light gray (RAL 7035)

Mounting:
- 35mm DIN rail with bus connector block

Specifications subject to change without notice. Consult factory to ensure that you are working with current information.
Modulus Combo (8 Process Analog Inputs) I/O Module DIMENSIONS and WIRING

**OPTICALLY ISOLATED DISCRETE INPUTS**

The discrete inputs on a terminal block share a common with only the inputs on that same block and are isolated from all other I/O points. All inputs are bipolar (not polarity sensitive).

**RELAY OUTPUTS**

The relay outputs on a terminal block share a common with only the other outputs on that same block and are isolated from all other I/O points.

*A snubber diode (DC) or RC snubber (AC) must be used across the relay contacts or load connections for any inductive load.*

**PROCESS ANALOG INPUTS**

The analog inputs on terminal blocks 4 and 5 share a common that is isolated from all other I/O points.
Refer to the installation manual for additional installation details and precautions.

**OPTIONAL ADDITIONAL ANALOG INPUTS on TB6 (8x-3003 / 8x-3103)**

The optional 4 analog inputs on terminal block 6 (model numbers 8x-3003 and 8x-3103) share a common that is isolated from all other I/O points. These inputs support 20mA and voltage signals, as well as resistance and 2-wire sensors (3-wire RTDs are not supported).

**OPTIONAL ANALOG OUTPUTS on TB6 (8x-3012/3013 and 8x-3112/3113)**

The optional 4 analog outputs on terminal block 6 (model numbers 8x-3012/3013 and 8x-3112/3113) share a common with the module main input power. The main input power is also utilized as the source for analog output power (+16Vdc is recommended).

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Note: Groups of 4 sensors should be of the same type (loop powered or "self" powered / 2-wire / 3-wire) when using 82-00xx field wiring panels.

**V / 20 mA Control Wiring**