TECHNICAL DATASHEET #TDAX031221

21x Inputs, 6x Outputs Dual CANopen® Controller

21x Isolated Inputs (Analog, Digital, Encoder, and Magnetic Pick-Up)
6x Outputs (4x Isolated Analog, 2x Relay)
2x Isolated CAN Ports (CANopen®)
EDS File for Configuration
P/N: AX031221

Features

- 9x analog (0-1 V, 0-2.5 V, 0-5 V, 0-10 V, 0-20 mA, or 4-20 mA) or digital inputs
- 4x universal inputs (0-1 V, 0-2.5 V, 0-5 V, 0-10 V, 0-20 mA, 4-20 mA, frequency / RPM, or PWM)
- 5x digital, frequency / RPM, or PWM inputs
- 2x encoder inputs
- 1x magnetic pick-up input
- 4x isolated analog outputs (-5 to 5 V, 0-5 V, -10 to 10 V, 0-10 V, 4-20 mA, or 0-20 mA)
- 2x relay outputs (max. 2 A, 250 VDC, NO contact)
- 2x isolated CANopen® ports
- 12, 24, or 48 VDC nominal input power with surge and transient, reverse polarity, over-voltage, under-voltage, and short circuit protection
- Complete isolation between power, input, output, and CAN
- -40 to 85 °C operating temperature
- 48-pin TE Deutsch enclosure and connectors
- IP67 rating, suitable for moist and vibrating environments
- EDS file provided for configuration

Applications

- Power gen set engine control systems
- Oil and gas equipment automation
- Off-highway machine automation

Ordering Part Number

21x Inputs, 6x Outputs Dual CANopen® Controller – P/N: **AX031221**

Accessories:
EDS File
Mating Plug KIT – P/N: **AX070123** *(See General Specifications below for details.)*

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Description

The controller features complete isolation between power, inputs, outputs and CAN. It operates with 12, 24, or 48 VDC power input. It accepts multiple inputs including: 9x analog (0-1 V, 0-2.5 V, 0-5 V, 0-10 V, 0-20 mA, or 4-20 mA) or digital signal inputs; 4x universal inputs (0-1 V, 0-2.5 V, 0-5 V, 0-10 V, 0-20 mA, 4-20 mA, frequency / RPM, or PWM); 5x digital, frequency / RPM, or PWM inputs; 2x encoder inputs; and 1x magnetic pick-up sensor input. It provides multiple outputs, including: 4x isolated analog outputs (-5 to 5 V, 0-5 V, -10 to 10 V, 0-10 V, 4-20 mA, or 0-20 mA); and 2x relay outputs (max. 2A, 250 VDC, NO contact).

The AX031221 belongs to a family of Axiomatic smart I/O modules with configurable internal architecture. This provides users with flexibility, allowing them to build their own custom controller with required functionality from a set of predefined internal functional blocks through CANopen® interface.

The controller is rugged with an IP67 rating and is suitable for engine applications.

Block Diagram

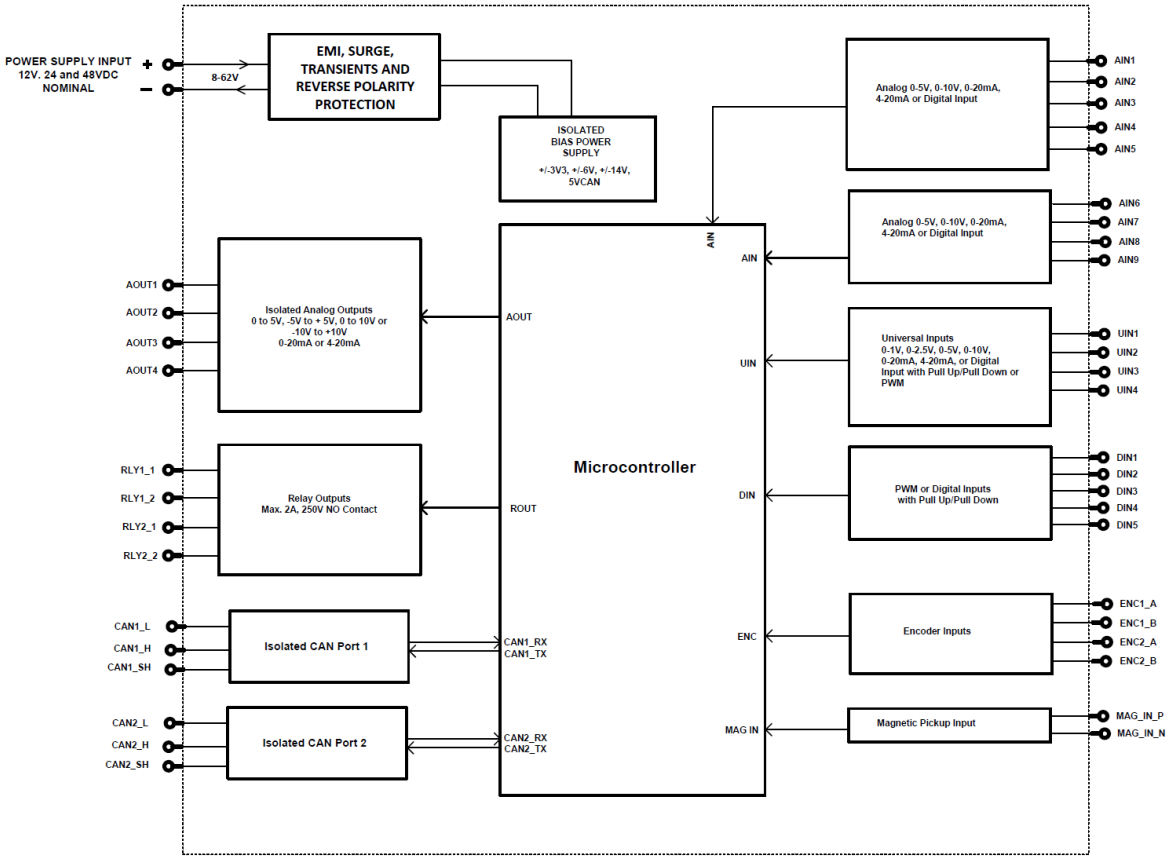

Figure 1 – Block Diagram

Dimensional Drawing

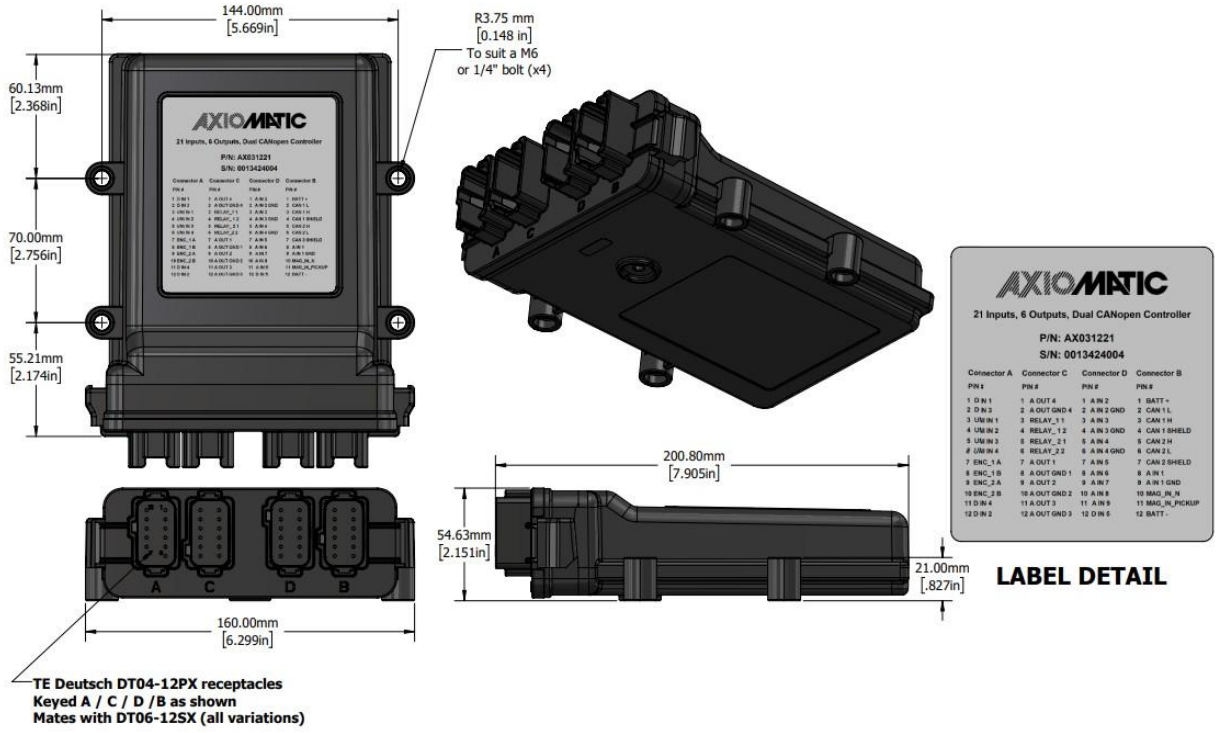

Figure 2 – Dimensional Drawing

Technical Specifications

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Limitations & Return Materials Process as described on https://www.axiomatic.com/service/.

Input Power

Input Power	12, 24, or 48 VDC nominal 8 to 62 VDC power supply range, isolated up to 400 VDC
Quiescent Current	140 mA @ 12 VDC; 90 mA @ 24 VDC; 46 mA @ 48 VDC (typical)
Protection	Surge and transient protection Reverse polarity protection Undervoltage protection provided. Hardware shuts down at 6.48 V and recovers at 6.53 V. Overvoltage protection provided. Hardware shuts down at 62.5 V and recovers at 62 V.

Outputs

Analog Outputs	4x isolated analog outputs as voltage or current 16-bit digital to analog (voltage, current)
	Voltage Type: Range: -5 to 5 V, 0 to 5 V, -10 to 10 V, 0 to 10 V Resolution: 1 mV Accuracy: ±0.5 % error
	Current Type: Range: 0 to 20 mA, 4 mA to 20 mA Resolution: 0.5 µA Accuracy: ±0.5 % error
Relay Outputs	2x relay outputs Max. 5 A, 250 V, NO contact
Protection	Protected against short circuit to Ground and +Vcc.

Inputs

Inputs	21x isolated inputs classified as follows. Refer to the table below for details. • 5x analog / digital inputs (voltage, current, digital, frequency / RPM, or PWM) • 4x analog / digital inputs (voltage, current, or digital) • 4x universal inputs • 5x digital or PWM inputs • 2x encoder inputs • 1x magnetic pick-up input 12-bit analog to digital (voltage, current) 16-bit counter (PWM, frequency / RPM) Some inputs share timers with each other. If one of these inputs is set to measure frequency / RPM or PWM, the corresponding input will not be able to use the same mode.

Table – Inputs – User Programmable Options

9x Analog / Digital Inputs	5x inputs (1 to 5) selectable as voltage, current, digital, frequency, or PWM types 4x inputs (6 to 9) selectable as voltage, current, or digital types
Voltage Type	Range: 0-1 V, 0-2.5 V, 0-5 V, 0-10 V Resolution: 1 mV Accuracy: ±1 % error
Current Type	Range: 0 to 20 mA, 4 to 20 mA Resolution: 1 µA Accuracy: ±1 % error Current Sense Resistor: 124 Ω
Digital Type	Active High Amplitude: 0 to 36 VDC
Frequency / RPM Type	Range: 1 to 50 Hz, 10 Hz to 1 kHz, 100 Hz to 10 kHz Accuracy: ±1 % error Impedance: 1 MΩ
PWM Type	Duty Cycle: 0 to 100 % Resolution: 0.01 % Accuracy: ±1 % error Impedance: 1 MΩ
	Inputs 2 and 3 share a counter base. Inputs 4 and 5 share another counter base. Inputs are sampled every 1 ms. Protected against shorts to Ground or +Vcc
4x Universal Inputs	4x inputs selectable as voltage, current, digital, frequency, or PWM types
Voltage Type	Range: 0-1 V, 0-2.5 V, 0-5 V, 0-10 V Resolution: 1 mV Accuracy: ±1 % error
Current Type	Range: 0 to 20 mA, 4 to 20 mA Resolution: 1 µA Accuracy: ±2 % error Current Sense Resistor: 124 Ω
Digital Type	Active High or Active Low
Frequency / RPM Type	Range: 1 to 50 Hz, 10 Hz to 1 kHz, 100 Hz to 10 kHz Accuracy: ±1 % error Impedance: 1 MΩ
PWM Type	Duty Cycle: 0 to 100 % Resolution: 0.01 % Accuracy: ±1 % error Impedance: 1 MΩ
	Universal inputs 3 and 4 share a counter base. Configurable 10 kΩ pull-up or pull-down resistor for digital, frequency, or PWM types Protected against shorts to Ground or +Vcc
5x Digital Inputs	5x inputs selectable as digital, frequency, or PWM types
Digital Type	Active High or Active Low Amplitude: 0 to 36 VDC
Frequency / RPM Type	Range: 1 to 50 Hz, 10 Hz to 1 kHz, 100 Hz to 10 kHz Accuracy: ±1 % error Impedance: 1 MΩ
PWM Type	Duty Cycle: 0 to 100 % Accuracy: ±1 % error Impedance: 1 MΩ
	Configurable 10 kΩ pull-up or pull-down resistor for digital, frequency, or PWM types
2x Encoder Input Pairs	2x A and B signal encoder input pairs Threshold Low to High: 3.5 V Hysteresis: Min. 0.5 V, Max. 1.5 V 10 kΩ pull-down resistor
1x Magnetic Pick-Up Input	1x magnetic pick-up input Frequency Range: 0.5 to 50 Hz, 10 Hz to 1 kHz, 100 Hz to 10 kHz Amplitude: 100 mV to 100 V RMS

General Specifications

Microcontroller	STM32H723ZGT6, 32-bit, 1 MB flash memory, 564 KB SRAM
Isolation	400 VDC Power, inputs, outputs, and CAN are isolated from each other.
Control Logic	Standard embedded software is provided. *(Application-specific control logic or factory programmed set point file on request)*
Communications	2x isolated CANopen® ports
Baud Rate	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, and 1 Mbit/s
Network Termination	It is necessary to terminate the network with external termination resistors. The resistors are 120 Ω, 0.25 W minimum, metal film or similar type. They should be placed between CAN High and CAN Low terminals at both ends of the network.
User Interface	An EDS file is provided for interfacing with the device using standard CANopen® tools.
Compliance	RoHS
Protection	IP67
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Storage Temperature	-55 to 125 °C (-67 to 257 °F)
Weight	1.29 lbs. (585 g)
Enclosure and Dimensions	High Temperature Nylon Enclosure (TE Deutsch P/N: EEC-5X650B) 6.299 in. x 7.905 in. x 2.151 in. (160 mm x 200.8 mm x 54.63 mm) L x W x H including integral connector Refer to the dimensional drawing.
Installation	For mounting information, refer to the dimensional drawing. Mounting holes sized for ¼ in. or M6 bolts. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.25 in. (6.35 mm) thick. If the module is mounted without an enclosure, it should be mounted to reduce the likelihood of moisture entry. Install the unit with appropriate space available for servicing and for adequate wire harness access (6 in. or 15 cm) and strain relief (12 in. or 30 cm). Wires should be of the appropriate gauge to meet requirements of applicable electrical codes and suit the specifications of the connector. The module must be mounted in an enclosure in hazardous locations. All field wiring should be suitable for the operating temperature range of the module. All chassis grounding should go to a single ground point designated for the machine and all related equipment.

Electrical Connections

48-pin Connector (TE Deutsch P/N: **DT13-48PABCD-R015**)

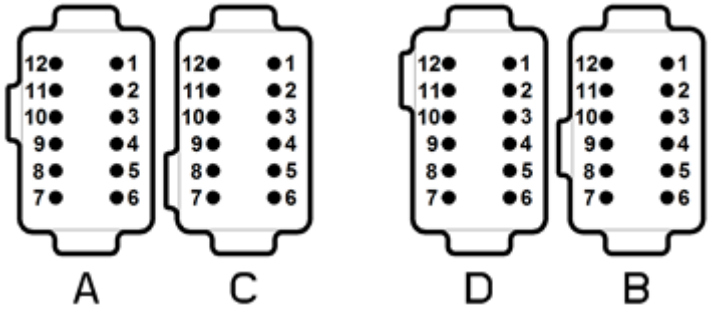

Table 3 - Electrical Pin Out

Connector A		Connector C	
Pin	**Function**	**Pin**	**Function**
1	Digital Input 1	1	Analog Output 4
2	Digital Input 3	2	Ground B
3	Universal Input 1	3	Relay Output 1 +
4	Universal Input 2	4	Relay Output 1 -
5	Universal Input 3	5	Relay Output 2 +
6	Universal Input 4	6	Relay Output 2 -
7	Encoder Input 1 A	7	Analog Output 1
8	Encoder Input 1 B	8	Ground B
9	Encoder Input 2 A	9	Analog Output 2
10	Encoder Input 2 B	10	Ground B
11	Digital Input 4	11	Analog Output 3
12	Digital Input 2	12	Ground B

Connector D		Connector B	
Pin	**Function**	**Pin**	**Function**
1	Analog Input 2	1	Battery +
2	Ground A	2	CAN 1 Low
3	Analog Input 3	3	CAN 1 High
4	Ground A	4	CAN 1 Shield
5	Analog Input 4	5	CAN 2 High
6	Ground A	6	CAN 2 Low
7	Analog Input 5	7	CAN 2 Shield
8	Analog Input 6	8	Analog Input 1
9	Analog Input 7	9	Ground A
10	Analog Input 8	10	Magnetic Input -
11	Analog Input 9	11	Magnetic Input +
12	Digital Input 5	12	Battery -

Mating Plugs

Mates with the following TE Deutsch P/N equivalents:
DT06-12SA Plug, DT 12 Way A Key
DT06-12SB Plug, DT 12 Way B Key
DT06-12SC Plug, DT 12 Way C Key
DT06-12SD Plug, DT 12 Way D Key
A set of these mating plugs is available from Axiomatic under P/N: AX070123.

Form: TDAX031221 – 03/09/2026