TECHNICAL DATASHEET #TDAX020421

12 Input, 12 Output Valve Controller

CANopen®

5 V Reference Voltage

P/N: AX020421

Features

- All 12 universal signal inputs user configurable as follows.
  - 0-5 V or 0-10 V
  - 0-20 mA or 4-20 mA
  - 1 Hz to 10 kHz PWM/frequency
  - Digital
- 6 inputs user configurable as 40 Ω to 240 kΩ
- All 12 outputs user selectable as follows.
  - Proportional voltage
  - Proportional current
  - PWM
  - On/Off digital
  - Hotshot digital
- 1 CANopen® compliant port
- Standard control logic permits configuration of complex algorithms for control profiles
- Operates at 12 or 24 VDC nominal power (8 to 36 VDC range)
- Protected against input surge, transient, reverse polarity, undervoltage
- 48-pin TE Deutsch enclosure and connectors
- -40 to 85 °C (-40 to 185 °F) operating temperature
- Designed for EMC compliance
- IP67 rating

Applications

- Suitable for vibration and harsh environments of mobile equipment
- Off-highway machine automation
- Agricultural equipment
- Drive proportional poppet or spool or On/Off hydraulic valves

Ordering Part Number

12 Input, 12 Output Valve Controller, CANopen® - P/N: **AX020421**

SAE J1939 model – P/N: **AX020420**

Accessories:
EDS File
Mating Plug KIT P/N: **AX070123**

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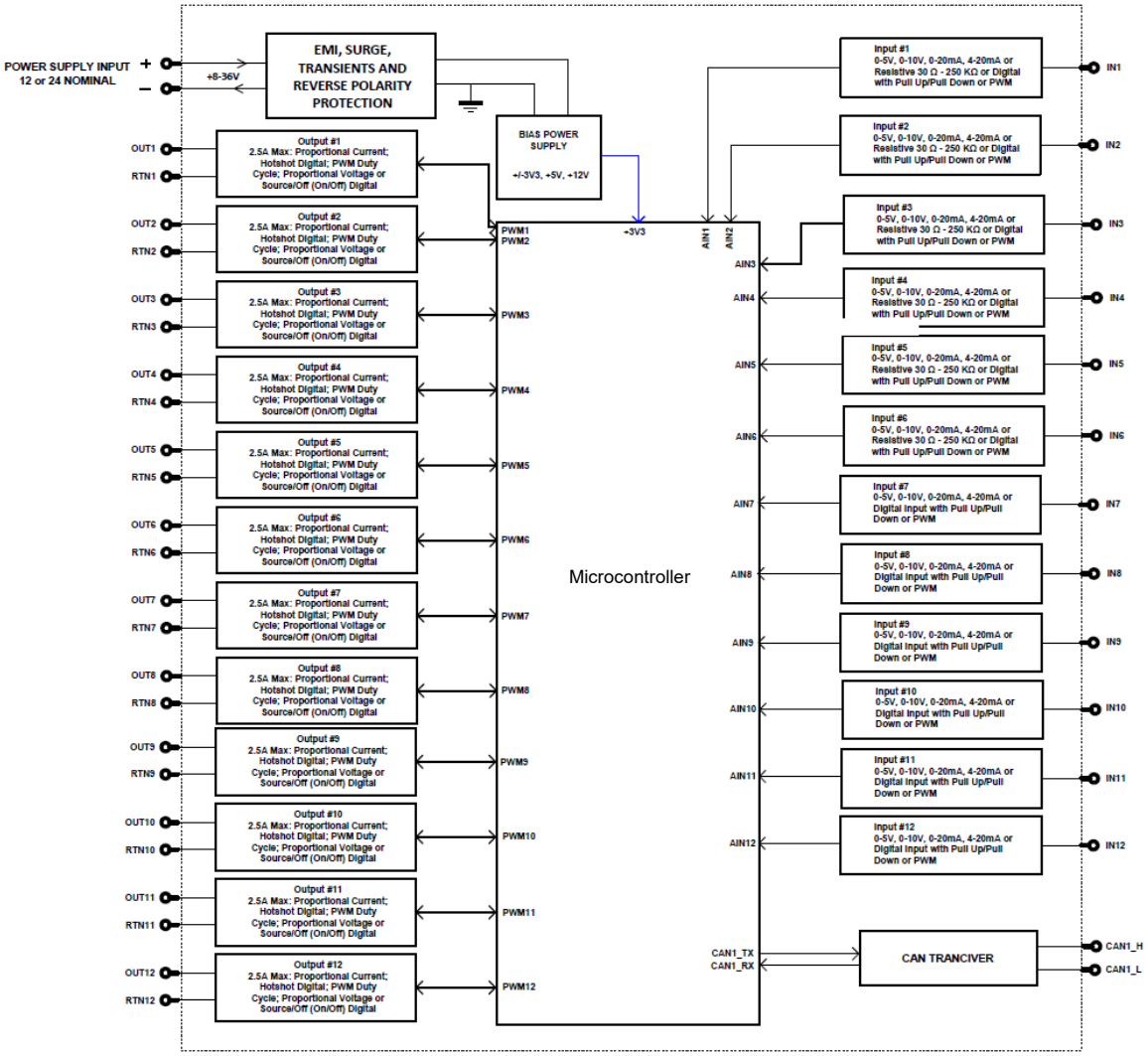
Description

The 12 Input, 12 Output CAN Valve Controller is a device that measures numerous types of input signals as well as drives different outputs. It features 12 universal inputs and has 12 proportional outputs that can provide a current of up to 2.5 A*. Flexible circuit design gives the user a wide range of configurable input and output types. Its powerful control algorithms allow the user to program the controller for a wide range of applications without the need for custom software.

*The total current consumption must not exceed 20 A @ 24 VDC. The total current consumption is a combination of quiescent current and current draw from all the outputs.

Block Diagram



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/.

Power Supply

Power Supply Input	12 or 24 VDC nominal (8 to 36 VDC power supply range) The maximum total current draw permitted on the power supply input pins at any given time is 20 A @ 24 VDC. The total current draw is a combination of quiescent current and current draw from all the outputs.
Quiescent Current	120 mA @ 12 VDC; 70 mA @ 24 VDC
Protection	Surge and transient protection provided Reverse polarity protection up to 60 VDC Undervoltage hardware shutdown at 4.5 VDC

Inputs

Universal Inputs

All 12 inputs are selectable by the user as:

- Voltage type
- Current type
- PWM type
- Frequency type
- Digital type

Voltage Type:
Ranges: 0-5 V or 0-10 V
Resolution: 1 mV
Accuracy: ±0.2 %

Input Impedance		
Range	**Inputs 1 to 6**	**Inputs 7 to 12**
0-5 V	>1 GΩ or 10 kΩ pull-down	1 MΩ or 10 kΩ pull-down
0-10 V	204 kΩ pull-down	

Current Type:
Ranges: 0-20 mA or 4-20 mA
Resolution: 1 µA
Accuracy: ±0.2 %

Input Impedance	
Inputs 1 to 6	**Inputs 7 to 12**
249 Ω	124 Ω

PWM Type:
Signal Frequency: 1 Hz to 10 kHz
Duty Cycle: 0 to 100 %
Resolution: 0.01 %
Accuracy: ±1 %

Frequency Type:
Range: 1 Hz to 10 kHz
Resolution: 0.01 %
Accuracy: ±0.1 %

Digital Type:
Amplitude: Up to +Vsupply

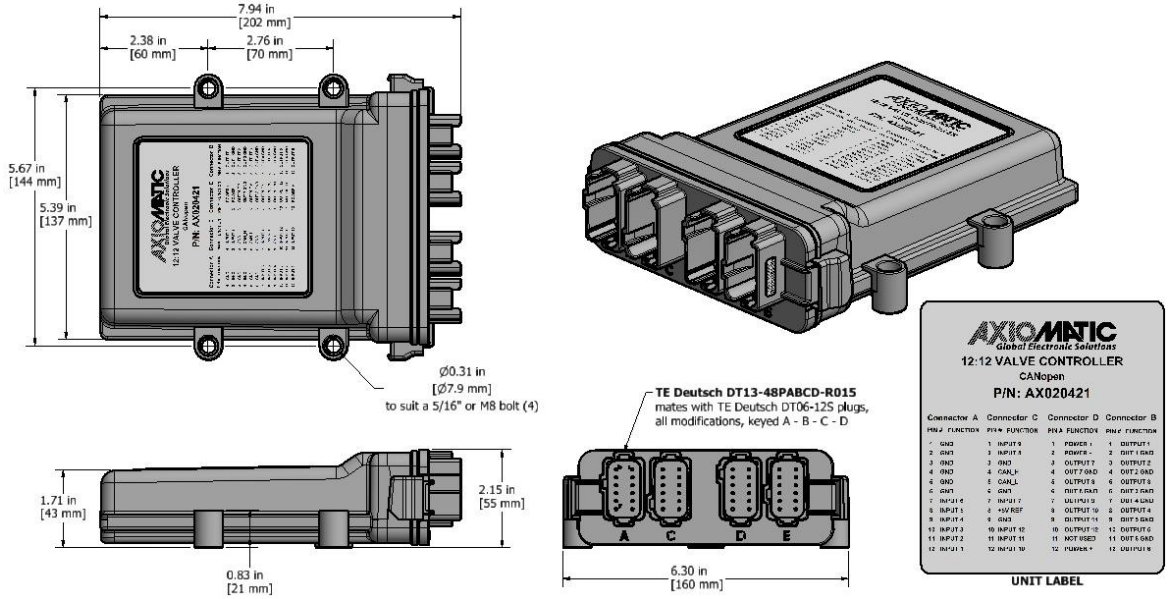
Inputs 1 to 6	**Inputs 7 to 12**
Active High or Active Low with 10 kΩ pull-up or pull-down	1 MΩ impedance or Active High or Active Low with 10 kΩ pull-up or pull-down

Resistive Inputs	Inputs 1 to 6 are selectable by the user as Resistive type. Resolution: 1 Ω Accuracy: ±2.5 % from 40 Ω to 200 kΩ and ±5 % from 200 kΩ to 240 kΩ Range: 40 Ω to 240 kΩ
All Inputs	12-bit Analog to Digital Protected against shorts to Ground or +Vsupply All inputs are sampled every 1 ms.

Outputs

All Outputs	12 independent outputs are user selectable as: • Proportional voltage • Proportional current • PWM • On/off digital • Hotshot digital Half-bridge output, current sensing, grounded load High side sourcing up to 2.5 A (but the total consumption must not exceed 20 A) High frequency drive <u>Proportional Voltage</u>: Resolution: 100 mV Accuracy: ±5 % <u>Current Type</u>: Resolution: 1 mA Accuracy: ±1 % <u>PWM</u>: Resolution: 0.1 % Accuracy: ±0.1 % <u>On/Off Digital</u>: Sourcing from power supply or output off Load at supply voltage must not draw more than 2.5 A. <u>Hotshot Digital</u>: Resolution: 1 mA Accuracy: ±1 %
Protection	Overcurrent protection provided Short circuit protection in hardware

Dimensional Drawing



General Specifications

<table>
<tr><td>Microcontroller</td><td>STM32H747BIT6, 32-bit, 2 MB flash memory, 1 MB RAM</td></tr>
<tr><td>Communication</td><td>1 CANopen® port
Supported baud-rates: 10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s (default), 250 kbit/s, 500 kbit/s, 800 kbit/s, and 1 Mbit/s</td></tr>
<tr><td>Control Logic</td><td>Standard embedded software is provided.
(Application-specific control logic is available on request.)

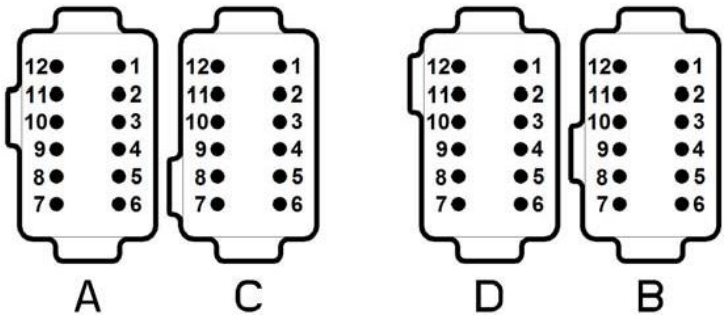
Here is an overview of the function blocks, including TPDO/RPDO for communications, and diagnostic information. For details, refer to the user manual.
<table>
<tr><th>Function Block or Feature</th><th>Comment</th></tr>
<tr><td>CANopen RPDOs</td><td>7 PDOs, 4 Mappable subindexes per PDO</td></tr>
<tr><td>CANopen TPDOs</td><td>7 PDOs, 4 Mappable subindexes per PDO</td></tr>
<tr><td>Conditional Logic</td><td>10 blocks</td></tr>
<tr><td>Constant Data</td><td>15 data points</td></tr>
<tr><td>Lookup Table</td><td>9 blocks</td></tr>
<tr><td>Math</td><td>6 blocks</td></tr>
<tr><td>PID Control</td><td>12 blocks</td></tr>
<tr><td>Programmable Logic</td><td>3 blocks</td></tr>
<tr><td>Set Reset Latch</td><td>5 blocks</td></tr>
<tr><td>Input Diagnostics</td><td>Over & Under Thresholds for each Input</td></tr>
<tr><td>Output Diagnostics</td><td>Open & Short Circuit Detection for each Output</td></tr>
<tr><td>Controller Diagnostics</td><td>Over & under-voltage detection for Power supply
Over-temperature detection
CANopen BusOff event detection</td></tr>
</table></td></tr>
<tr><td>User Interface</td><td>EDS File is provided</td></tr>
<tr><td>Diagnostics</td><td>Diagnostics messages are provided over the CAN network via CANopen EMCY protocol for the status of inputs or outputs. Additional diagnostics provided for over/under-power supply voltage, over-temperature, and CAN BusOff events.</td></tr>
<tr><td>Compliance</td><td>ISO 13766-1:2018
RoHS</td></tr>
<tr><td>Vibration</td><td>MIL-STD-202H, method 204, test condition C
10g peak (Sine component)
MIL-STD-202H, method 214A, test condition I/B
7.56 Grms (Random component)</td></tr>
<tr><td>Shock</td><td>MIL-STD-202H, method 213B, test condition A
50 g peak</td></tr>
<tr><td>Operating Conditions</td><td>-40 to 85 °C (-40 to 185 °F)</td></tr>
<tr><td>Storage Temperature</td><td>-50 to 125 °C (-58 to 257 °F)</td></tr>
<tr><td>Weight</td><td>1.27 lb. (0.58 kg)</td></tr>
<tr><td>Protection</td><td>IP67, Unit is conformal coated and protected by the enclosure.</td></tr>
<tr><td>Enclosure and Dimensions</td><td>High Temperature Nylon housing, TE Deutsch P/N: EEC-5X650B
7.94 in. x 6.30 in. x 2.15 in. (202 mm x 160 mm x 55 mm)
L x W x H including integral connector
Refer to the dimensional drawing.</td></tr>
<tr><td>Mounting</td><td>For mounting information, refer to the dimensional drawing.

Mounting holes sized for 5/16 in. or M8 bolts. The bolt length will be determined by the end-user’s mounting plate thickness. The mounting flange of the controller is 0.83 in. (21 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.</td></tr>
</table>

Electrical Connections

48-pin TE Deutsch connector (P/N: DT13-48PABCD-R015) or Amphenol face plate connector (P/N: ATM13-12PA-12PB-BM03), based on availability.



Connector A		Connector C	
Pin	**Function**	**Pin**	**Function**
1	Ground	1	Input 9
2	Ground	2	Input 8
3	Ground	3	Ground
4	Ground	4	CAN High
5	Ground	5	CAN Low
6	Ground	6	Ground
7	Input 6	7	Input 7
8	Input 5	8	+5V Reference
9	Input 4	9	Ground
10	Input 3	10	Input 12
11	Input 2	11	Input 11
12	Input 1	12	Input 10

Connector D		Connector B	
Pin	**Function**	**Pin**	**Function**
1	Power +	1	Output 1
2	Power -	2	Ground
3	Output 7	3	Output 2
4	Ground	4	Ground
5	Output 8	5	Output 3
6	Ground	6	Ground
7	Output 9	7	Ground
8	Output 10	8	Output 4
9	Output 11	9	Ground
10	Output 12	10	Output 5
11	Not Used	11	Ground
12	Power +	12	Output 6

Mating Connectors

Mates with the following TE Deutsch P/Ns.
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 kit of these mating plugs is available, ordering P/N: **AX070123** (includes 1x plug DT06-12SA, 1x plug DT06-12SB, 1x plug DT06-12SC, 1x plug DT06-12SD, 4x wedgelocks W12S-P012, 48x contact sockets 0462-201-16141, 15x sealing plugs 114017)

Form: TDAX020421-10/14/2025