

2 Universal Inputs, Dual Valve Controller

2 Universal Inputs

2-3A Outputs

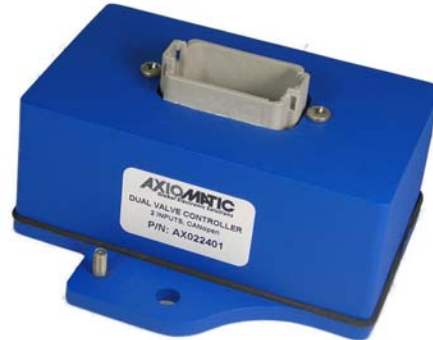
1 +5V Reference

CANopen®

P/N: AX022401

Features:

- 2 universal inputs (Voltage [V], Current [mA], Resistive [kΩ], PWM [%], Frequency [Hz], RPM, Digital)
- 2 outputs to drive hydraulic valves (0-3A)
- 1 +5V reference to power a potentiometer or low-power transducer
- Fully protected outputs
- 12V, 24V or 48VDC nominal
- 1 CAN port (CANopen®)
- Rugged IP67 packaging and connectors
- User programmable functionality
- .EDS provided to interface to standard CANopen® tools



Applications:

The controller is designed to meet the rugged demands of mobile equipment, marine and heavy duty industrial machine applications.

These applications include, but are not limited to:

- **Proportional Fan Drive Control**
- PID Closed Loop Valve Control
- Hydraulic Valve Control

Ordering Part Numbers:

2 Universal Inputs, Dual Valve Controller, CANopen®: **AX022401**

EDS File, User Manual: **CD-AX022401**

Accessories: AX070105 Mating Plug Kit (DT06-12SA, W12S, 12 0462-201-16141, 3 plugs)

Description:

The 2 Universal Inputs, Dual Output Valve Controller is designed for extremely versatile control of the two proportional outputs to directly drive coils or other loads. Its flexible circuit design gives the user a wide range of configurable input or output types. The sophisticated control algorithms allow the user to program the controller for a wide range of applications without the need for custom software. An EDS file is provided to interface to standard CANopen® tools.

The two outputs can be setup to drive: proportional current (up to 3A each); hotshot digital current; proportional voltage (up to supply); proportional PWM; or straight on/off digital loads. Both outputs are high-side driven (sourcing) outputs.

The controller also has two fully programmable universal inputs that can be setup to read: voltage; current; resistive; frequency; or digital input signals. It also has a single +5Vref that can source up to 30mA to provide a reference for a potentiometer or low-power transducer.

The 2i2o is a highly programmable controller, allowing the user to configure it for their application. Its sophisticated control algorithms allow for open or closed loop drive of the proportional outputs. It can be operated as either a self-contained control system, driving the outputs directly from the on-board inputs, and/or it can be integrated into a CANopen® network of controllers. All I/O and logical function blocks on the unit are inherently independent from one another, but can be programmed to interact in a large number of ways. Refer to Figure 1B.

BLOCK DIAGRAMS

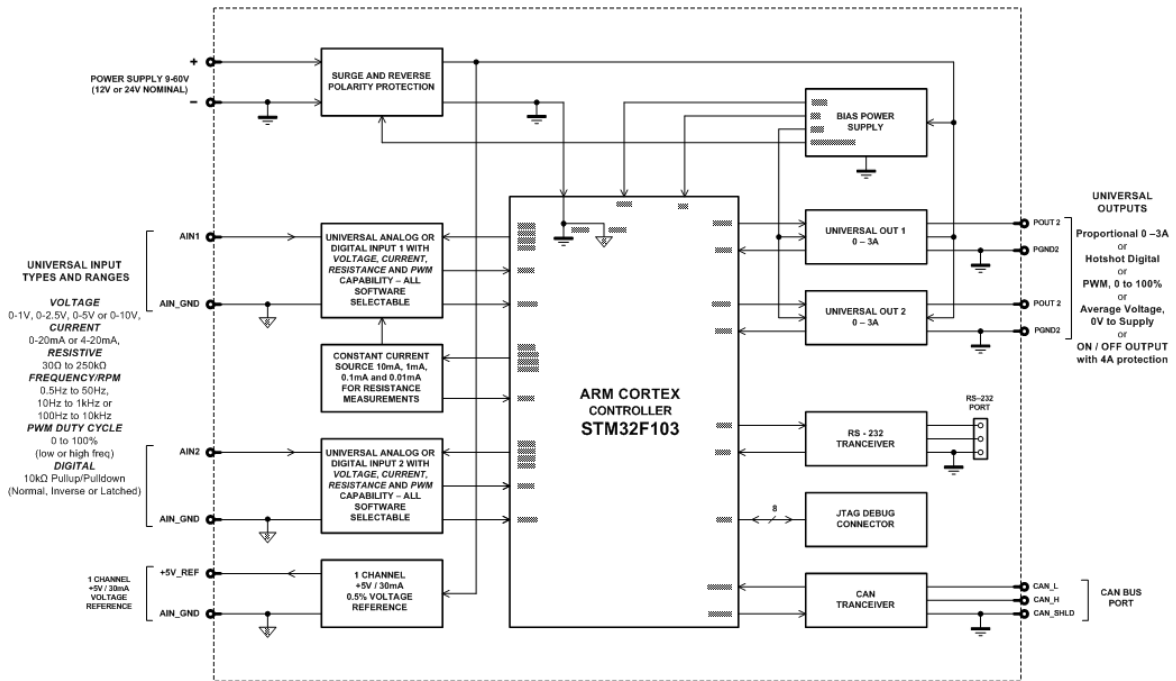


Figure 1A – Hardware Block Diagram

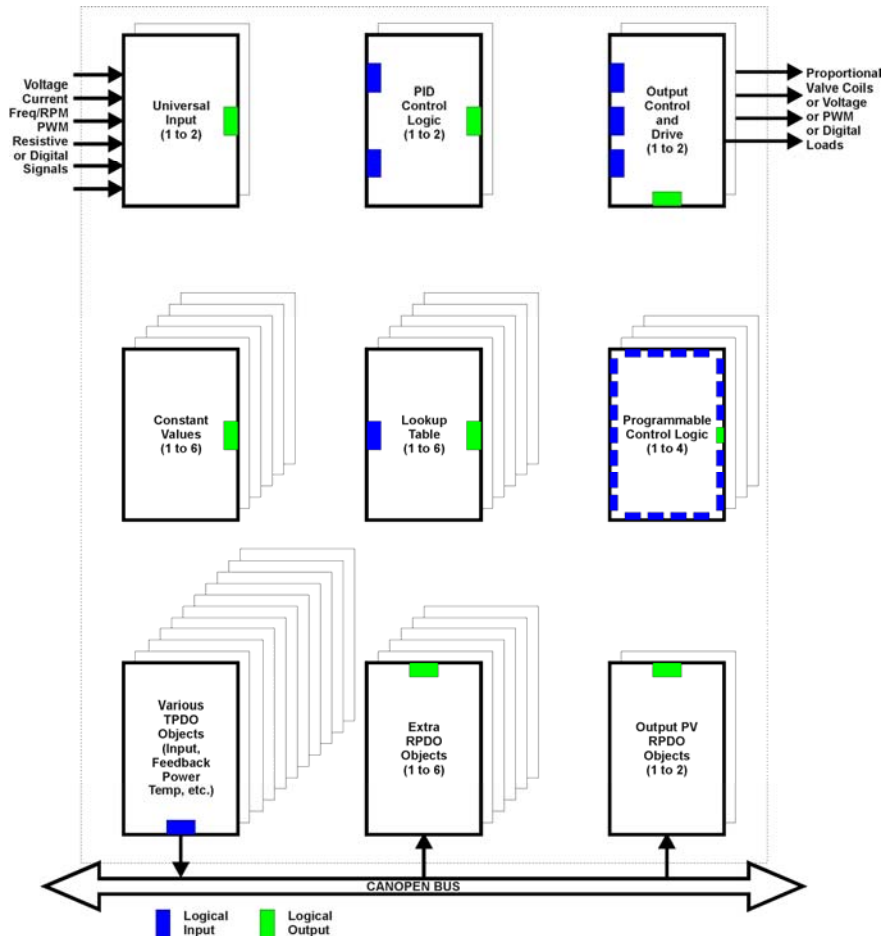


Figure 1B – Logical Functional Block Diagram

Technical Specifications:

Power Supply Input

Power Supply Input - Nominal	12, 24, 48VDC nominal (8...60 VDC power supply range)
Protection	Reverse polarity protection is provided. Overvoltage protection up to 65V is provided. Overvoltage shutdown of the output load is provided. Undervoltage (hardware and software shutdown at 7.5V) is provided.

Inputs

CAN	CANopen® (Refer to TDAX022400 for details on the SAE J1939 model.)
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Universal Signal Inputs	2 universal inputs are provided. See below. All input modes are user selectable. Inputs are sampled multiple times per millisecond. Protected against shorts to GND or +Vcc All input channels can handle negative voltage inputs down to -2VDC due to voltage spikes or noise.
Analog Input Functions	Voltage [V], Current [mA], Resistive [kΩ], PWM [%], Frequency [Hz], RPM
Voltage Input	0-1V (Impedance 1 MΩ) 0-2.5V (Impedance 1 MΩ) 0-5V (Impedance ~135 KΩ) 0-10V (Impedance ~127 KΩ)
Current Input	0-20mA (Impedance 249 Ω) 4-20mA (Impedance 249 Ω)
Resistive Input	25 Ω to 250 kΩ
PWM Input	0 to 100% (at 10 Hz to 1kHz or 100 Hz to 10 kHz) Selectable 10kΩ pullup to +5V or pulldown to AGND resistor (or 1MΩ)
Frequency Input	0.5 Hz to 50 Hz, 10 Hz to 1 kHz, or 100 Hz to 10 kHz Selectable 10kΩ pullup to +5V or pulldown to AGND resistor (or 1MΩ)
Digital Input Function	5V CMOS, Active High or Active Low Selectable 10kΩ pullup to +5V or pulldown to AGND resistor (or 1MΩ) Normal, Inverse or Latched (push-button) response Debouncing is provided.
Input Accuracy	<1% full scale error (all types)
Input Resolution	12-bit Analog to Digital (voltage, current, resistive) Voltage Type: 1mV resolution Current Type: 1uA resolution Resistive Type: 0.1 Ω resolution 15-bit Timer (frequency, RPM, PWM) 0.5 to 50Hz Range: 0.01Hz resolution 10Hz to 1kHz Range: 0.1Hz resolution 100 Hz to 10kHz Range: 1Hz resolution RPM Type: 0.01 RPM resolution PWM Type: 0.01% resolution
Error Detection/Reaction	Out of Range High and Low detection EMCY code generation (object 1003h) and fault reaction possible (1029h) Output(s) shutdown function can be enabled.
Independence	Inputs are fully independent from one another with one exception: a) The ADC timer and Input 1 timer are shared. Therefore, if one input has to be analog, and the other a timer input, use IN2 for the timed input. Otherwise, both inputs can be setup as timer inputs.

Voltage Reference	One provided 5V +/- 0.2% error Can source up to 50mA without derating Protected from connection to the power supply rail.
Analog GND Reference	One provided for inputs

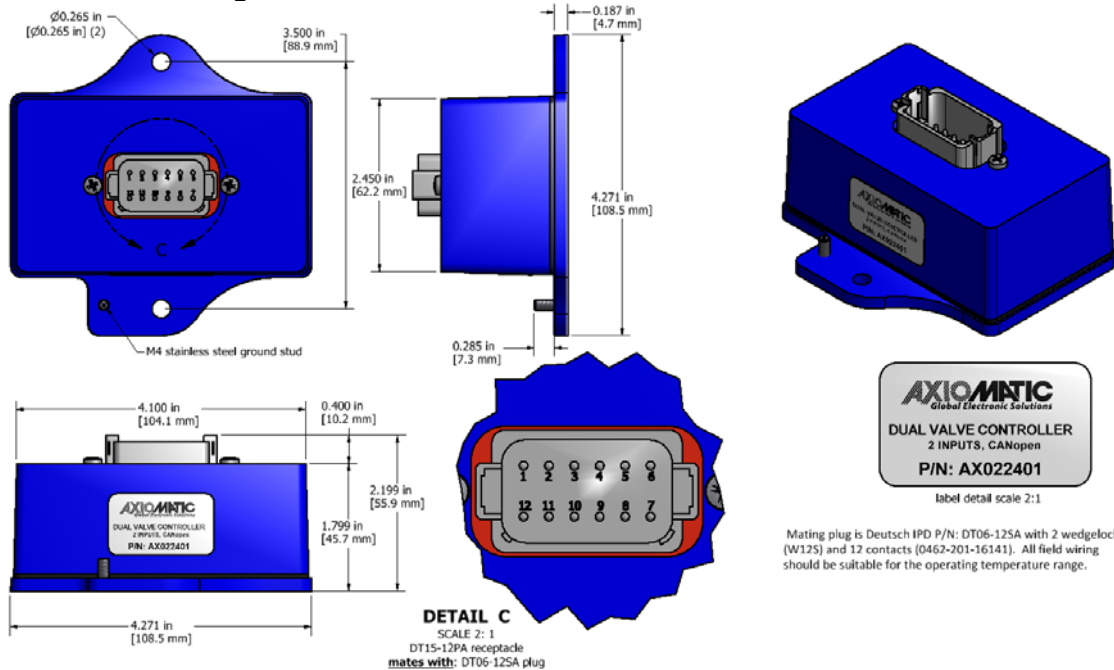
Outputs

Analog Output Functions	Current [mA], Voltage [V], PWM [%], Digital On/Off, Hotshot On/Off
Output Type	High side switch (sourcing output) up to 3A, Grounded Load Current sensing for close-loop control, current feedback on object 2370h
Current PID Loop	Factory calibrated. User configurable (use with caution)
Output Resolution and Accuracy	Output Current mode 1mA resolution, +/- 2% full scale error Output Voltage mode 0.1V resolution, +/-3% full scale error Output PWM DC mode 0.1% resolution, +/- 1% full scale error
Protection for Output+	Fully protected against short circuit to ground and short circuit to power supply rail. Grounded short circuit protection will engage at 4.5A +/- 0.5A Unit will fail safe in the case of a short circuit condition, self-recovering when the short is removed
Error Detection/Reaction	EMCY code generation (object 1003h) and fault reaction possible (1029h) when an open or short circuit is detected at the output (current mode only)
Independence	Outputs are fully independent from one another with two exceptions: a) both use the same AO Dither Frequency (object 2320h sub-index 1) b) both use the same AO Output Frequency (object 2380h sub-index 1) If either output is configured as a current output (proportional or hotshot), output drive frequency remains fixed at 25kHz for both outputs
Power GND Reference	One provided for outputs

General Specifications

Quiescent Current	70 mA at 12 V Typical 40 mA at 24 V Typical 27 mA at 48 V Typical																												
Microprocessor	32-bit, 128 KByte or larger program memory																												
Diagnostics	Refer to the User Manual for details.																												
Additional Fault Feedback	There are several types of faults that the controller will detect and provide a response: unit power supply undervoltage and overvoltage, microprocessor over temperature and lost communication. They can be sent to the CAN bus.																												
Control Logic	User programmable functionality using SDO object access, per CiA DS-301 Refer to the User Manual for details.																												
Communications	1 CAN 2.0B port, protocol CiA CANopen® By default, the 2i2o Controller transmits measured input (FV object 7100h) and output current feedback (FV object 2370h) on TPDO1																												
User Interface	.EDS provided to interface to standard CANopen ® tools																												
Packaging	Aluminum enclosure, integral Deutsch IPD connector Encapsulated 4.27 x 4.27 x 2.14 inches 108.49 x 108.49 x 54.28 mm L x W x H including integral connector																												
Protection	IP67 rating for the product assembly NOTE : Deutsch IPD connectors are rated at IP67 for submersion (3 ft., 0.9 m) and IP69K for high pressure, high temperature wash down applications.																												
Weight	1.3 lbs. (0.59 kg)																												
Temperature Rating	Operating: -40 to 85°C (-40 to 185°F) Storage: -50 to 105°C (-58 to 221°F)																												
Electrical Connections	12 pin Deutsch IPD connector P/N: DT15-12PA A mating plug kit is available as Axiomatic P/N: AX070105 . Wires should be of the appropriate gauge to meet requirements of applicable electrical codes and suit the specifications of the connector(s). 16AWG or 18AWG wiring is recommended for this connector. <table border="1" data-bbox="641 1554 1323 1921"> <thead> <tr> <th colspan="2">CAN and I/O Connector</th> </tr> <tr> <th>Pin #</th> <th>Description (Notes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Output 2 +</td> </tr> <tr> <td>2</td> <td>Output 1 +</td> </tr> <tr> <td>3</td> <td>P_GND (Out1 and Out2 GND)</td> </tr> <tr> <td>4</td> <td>A_GND (In1 and In2 GND)</td> </tr> <tr> <td>5</td> <td>CAN_L</td> </tr> <tr> <td>6</td> <td>CAN_H</td> </tr> <tr> <td>7</td> <td>CAN_Shield</td> </tr> <tr> <td>8</td> <td>Input 2 +</td> </tr> <tr> <td>9</td> <td>Input 1 +</td> </tr> <tr> <td>10</td> <td>+5Vref (up to 50 mA)</td> </tr> <tr> <td>11</td> <td>BATT -</td> </tr> <tr> <td>12</td> <td>BATT +</td> </tr> </tbody> </table>	CAN and I/O Connector		Pin #	Description (Notes)	1	Output 2 +	2	Output 1 +	3	P_GND (Out1 and Out2 GND)	4	A_GND (In1 and In2 GND)	5	CAN_L	6	CAN_H	7	CAN_Shield	8	Input 2 +	9	Input 1 +	10	+5Vref (up to 50 mA)	11	BATT -	12	BATT +
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Dimensional Drawing



Dimensions: inches [mm]

<p>Installation</p>	<p>Mounting holes sized for ¼ inch or M6 bolts. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.63 inches (16 mm) thick.</p> <p>The unit can be mounted on the valve directly.</p> <p>If the module is mounted without an enclosure, it should be mounted to reduce the likelihood of moisture entry.</p> <p>Install the unit with appropriate space available for servicing and for adequate wire harness access (6 inches or 15 cm) and strain relief (12 inches or 30 cm).</p> <p>The CAN wiring is considered intrinsically safe. The power wires are not considered intrinsically safe and so in hazardous locations, they need to be located in conduit or conduit trays at all times. The module must be mounted in an enclosure in hazardous locations for this purpose.</p> <p>All field wiring should be suitable for the operating temperature range of the module.</p> <p>All chassis grounding should go to a single ground point designated for the machine and all related equipment.</p>
<p>Network Termination</p>	<p>It is necessary to terminate the network with external termination resistors. The resistors are 120 Ohm, 0.25W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network.</p>

Note: CANopen® is a registered community trade mark of CAN in Automation e.V.

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 Approvals/Limitations and Return Materials Process as described on www.axiomatic.com/service.html.

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