

TECHNICAL DATASHEET #TDAX024000  
**4 INPUTS, 2 OUTPUTS SERVO VALVE CONTROLLER**

Four Signal Inputs  
Two Bi-directional 400 mA Outputs  
Two Signal Outputs  
Two Reference Voltages  
Isolated CAN (SAE J1939)  
with Axiomatic Electronic Assistant  
**P/N: AX024000**

**Features:**

The dual servo valve controller provides two bidirectional outputs from -400mA to +400 mA. The outputs will drive two servo valves independently. Two signal outputs are also provided for feedback to a PLC or other similar device.

An isolated SAE J1939 CAN port is provided for networking. Using the Axiomatic Electronic Assistant programming tool, the user can select the desired inputs and outputs for common applications.

Two analog signal inputs are selectable as the following voltage or current signals (Inputs 1 and 2).

- 0-5V, 0-10V, +/- 5V, +/- 10V
- 4-20mA, 0-20mA

Two analog/digital inputs are available as the following signals (Inputs 3 and 4).

- 0-5V, 0-10V
- 4-20 mA, 0-20 mA
- PWM
- Frequency
- or Digital (Active High or Active Low).

Two reference voltages (1 +5V and 1 +10V) are available to power sensors.

A rugged power supply interface accepts 8-36Vdc and is appropriate for battery powered machine applications. The circuitry is conformal coated and packaged in a rugged IP67 rated enclosure for harsh environments. It operates from -40 to 85°C (-40 to 185°F). It has CE marking.

**Applications:**

- servo valve control in motion control, automation
- off-highway and other machines for rugged environments

**Ordering Part Numbers:**

Valve Controller, SAE J1939 (250 kbps): **AX024000**

Valve Controller, SAE J1939 (500 kbps): **AX024000-01**

Valve Controller, non-standard SAE J1939 (1 Mbps): **AX024000-02**

Valve Controller, CANopen®: **AX024001**

Mating Plug Kit: **PL-DTM06-12SA-12SB** (1 DTM06-12S, DTM06-12SB, 2 W12S, 24 contacts)

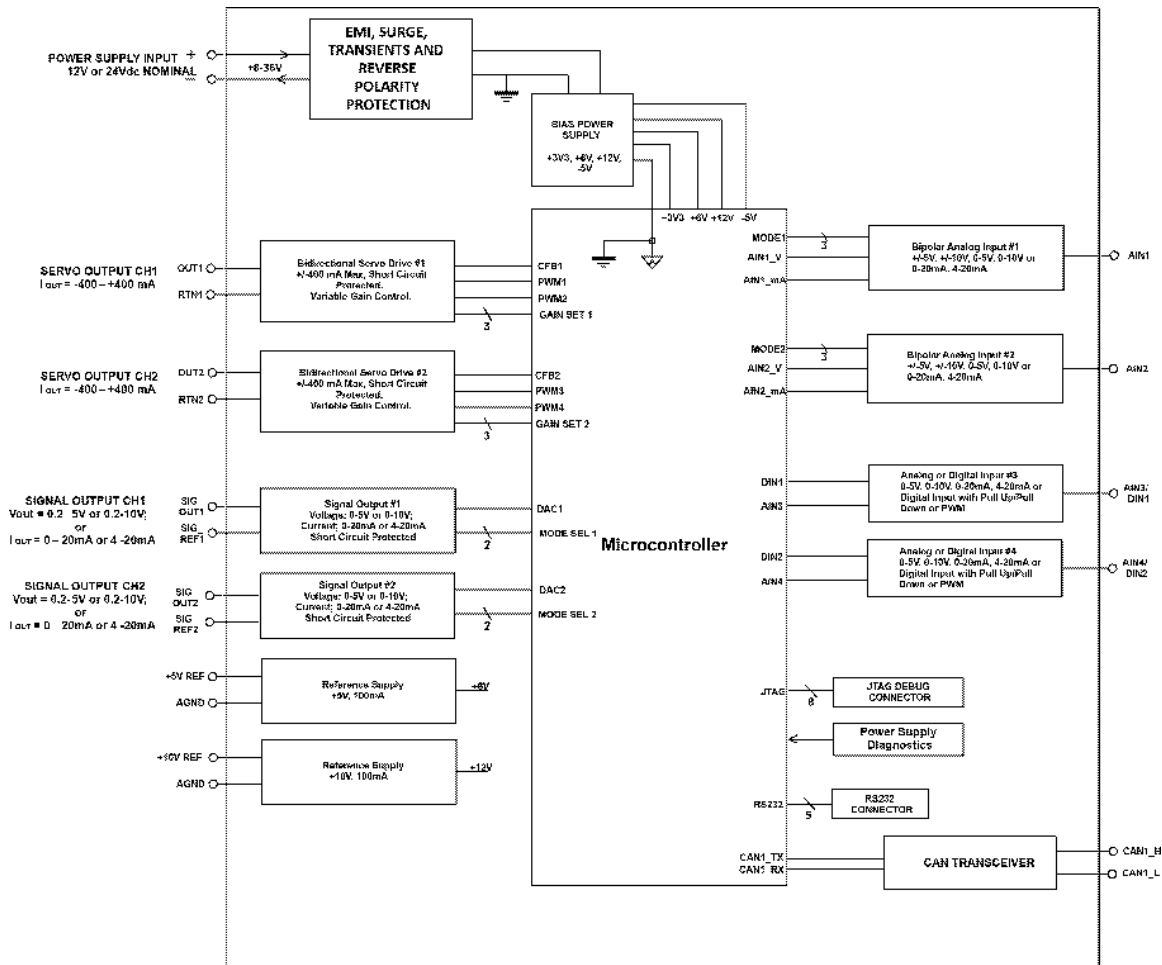
Axiomatic Electronic Assistant KIT, P/Ns: **AX070502**, or **AX070506K**



**Description:** The 4 Inputs 2 Outputs Servo Controller is designed for versatile control of two servo outputs to directly drive servos or other bidirectional loads. In addition to the two servo outputs, there are two signal outputs with voltage and current signal generation. The controller's flexible circuit design gives the user a wide range of configurable input types. The sophisticated control algorithms allow the user to program the controller for a wide range of applications without the need for custom software. The controller has two universal inputs that can be configured to measure analog voltage or current, frequency/PMW or digital signal and two analog inputs that can be configured to measure current and both positive and negative voltages. Measured input data can be sent to a SAE J1939 CAN Network or used to drive outputs directly or through the configurable control algorithms.

The servo outputs are full H-bridge types with the capability of driving up to 400mA through the load in both directions. The signal outputs can be configured to source voltage signals up to 10V and current signals up to 20mA. Any of the four outputs can be configured to use any of the onboard inputs as either a control signal or an enable signal as well as SAE J1939 CAN Network data. A *Windows*-based Axiomatic Electronic Assistant (EA) is used to configure the controller via an Axiomatic USB-CAN device. Setpoint configuration can be saved in a file which can be used to easily program the same configuration into another controller. The configurable properties of the controller are divided into function blocks, namely the Input Function Block, the Output Function Block, the Diagnostic Function Block, the PID Control Function Block, the Lookup Table Function Block, the Programmable Logic Function Block, the Math Function Block, the DTC React Function Block, the CAN Transmit Message Function Block and the CAN Receive Message Function Block. Packaged for rugged environments, the controller has an IP67 rating and is suitable for high vibration applications. It has CE marking.

## 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 Approvals/Limitations and Return Materials Process as described on <https://www.axiomatic.com/service/>.

### Inputs

Power Supply Input	12V or 24Vdc nominal (8...36Vdc power supply range)																																												
Protection	Reverse polarity protection Overvoltage protection up to 150V Overvoltage (undervoltage) shutdown																																												
Input Grounds	Four common input GND connections are provided.																																												
Bipolar Analog Inputs	Two inputs (Input 1 and 2 in Table 2.0.) User selectable as Bipolar or Unipolar Voltage or Current  12-bit Analog to Digital Protected against shorts to GND or +Vsupply  Voltage Types: 1mV resolution, accuracy +/- 1% error Ranges: +/-5V or +/-10V or 0-5V or 0-10V  Current Types: 1uA resolution, accuracy +/- 1% error Ranges: 0-20mA or 4-20mA																																												
Analog or Digital Inputs (Voltage, Current or PWM)	Two inputs (Inputs 3 and 4 in Table 2.0.) User selectable as : Voltage, Current, PWM or Digital  12-bit Analog to Digital (voltage, current) Protected against shorts to GND or +Vsupply  Voltage Types: 1mV resolution, accuracy +/- 1% error Ranges: 0-5V or 0-10V  Current Types: 1uA resolution, accuracy +/- 1% error Ranges: 0-20mA or 4-20mA  PWM Signal Frequency: 1 – 10,000 Hz PWM Duty Cycle: 0 to 100% PWM Input: 0.01% resolution, accuracy +/- 1% error  Digital Input: Active High or Active Low. Amplitude: 3.3V to +Vsupply																																												
Minimum and Maximum Ratings	<table><tr><th colspan="4">Table 1.0. Absolute Maximum and Minimum Ratings</th></tr><tr><th>Characteristic</th><th>Min</th><th>Max</th><th>Units</th></tr><tr><td>Power Supply</td><td>8</td><td>36</td><td>V dc</td></tr><tr><td>Voltage Input</td><td>0</td><td>36</td><td>V dc</td></tr><tr><td>Current Input</td><td>0</td><td>21</td><td>mA</td></tr><tr><td>Current Input – Voltage Level</td><td>0</td><td>12</td><td>Vdc</td></tr><tr><td>Digital Type Input – Voltage Level</td><td>0</td><td>36</td><td>Vdc</td></tr><tr><td>PWM Duty Cycle</td><td>0</td><td>100</td><td>%</td></tr><tr><td>PWM Frequency</td><td>50</td><td>10 000</td><td>Hz</td></tr><tr><td>PWM Voltage pk - pk</td><td>0</td><td>36</td><td>V dc</td></tr><tr><td>RPM Frequency</td><td>50</td><td>10 000</td><td>Hz</td></tr></table>	Table 1.0. Absolute Maximum and Minimum Ratings				Characteristic	Min	Max	Units	Power Supply	8	36	V dc	Voltage Input	0	36	V dc	Current Input	0	21	mA	Current Input – Voltage Level	0	12	Vdc	Digital Type Input – Voltage Level	0	36	Vdc	PWM Duty Cycle	0	100	%	PWM Frequency	50	10 000	Hz	PWM Voltage pk - pk	0	36	V dc	RPM Frequency	50	10 000	Hz
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## Outputs

Outputs	<p>Two +/- 400 mA bidirectional outputs, independent  User selectable as:  Servo Valve Control or Proportional Current  Selectable current ranges from +/- 10mA to +/-400 mA  Accuracy: +/- 1%</p> <p>Output voltage up to 12V</p> <p>Full bridge output  Current sensing resistor</p> <p>Overcurrent protection is provided.  Short circuit protection is provided.</p>
Signal Outputs	<p>Two signal outputs  User selectable as voltage or current:  Voltage: 0.2 - 5Vdc or 0.2 - 10Vdc, 1% accuracy,  Current: 0-20mA or 4-20mA, 1% accuracy.  Short circuit protected.</p>
Reference Voltages	<p>One 5V, 100mA, 1% reference voltage  One 10V, 100mA, 1% reference voltage</p>
Protection for Output Terminals	<p>Fully protected against short circuit to ground and short circuit to power supply rail.  Unit will fail safe in the case of a short circuit condition, self-recovering when the short is removed.</p>

## General Specifications

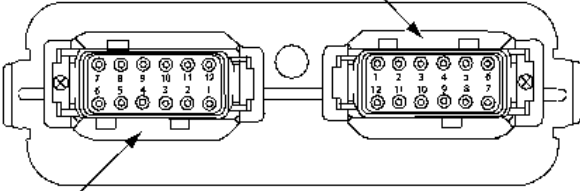
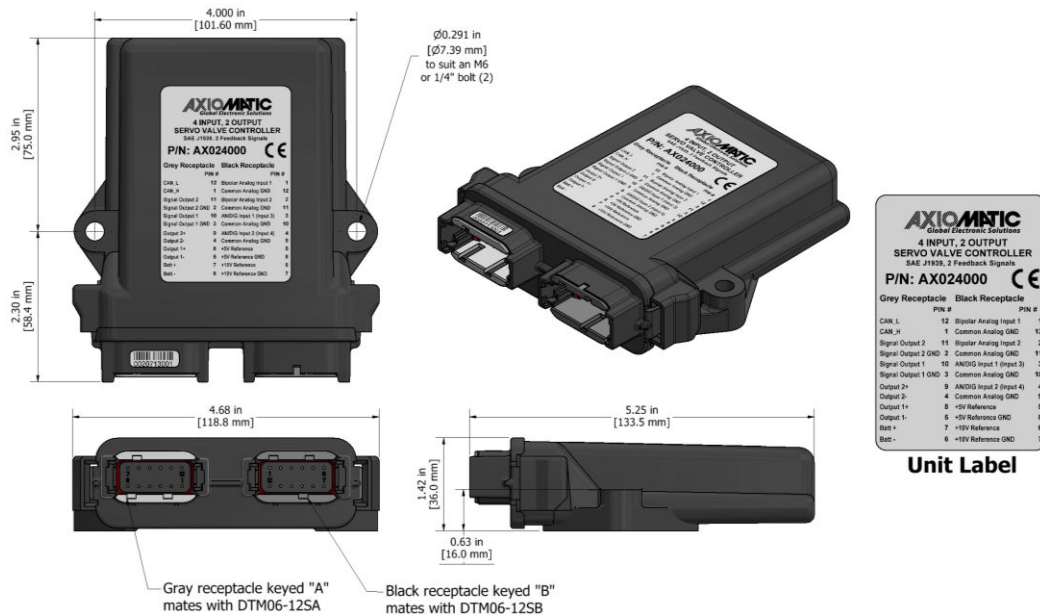
Microcontroller	<p>STM32F205  32-bit, 1MByte flash memory</p>
Typical Quiescent Current	87mA @ 12Vdc; 56mA @ 24Vdc
Response Time	70 ms for 0-400 mA current change
Control Logic	<p>Standard embedded software is provided.  (Application-specific control logic or factory programmed setpoints on request)  Refer to the User Manual for details.</p>
Communications	<p>1 Isolated CAN port (SAE J1939) (The CANopen® version is model AX024001)  Model AX024000 250 kbps baud rate  Model AX024000-01 500 kbps baud rate  Model AX024000-02 1 Mbps baud rate</p>
Network Termination	<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>
User Interface	Axiomatic Electronic Assistant KIT, P/N: <b>AX070502</b> , or <b>AX070506K</b>
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Electrical Connections	<p>Refer to Table 2.0.  24-pin receptacle (equivalent TE Deutsch P/N: DTM13-12PA-12PB-R008)  Mating plugs kits are available on request and include equivalents to TE Deutsch P/Ns: DTM06-12SA and DTM06-12SB with 2 wedgelocks (WM12S), and 24 contacts (0462-201-20141).  20 AWG wire is recommended for use with contacts 0462-201-20141.</p> <p style="text-align: center;"><b>Key Arrangement B (black)</b></p>  <p style="text-align: center;"><b>Key Arrangement A (grey)</b></p> <p style="text-align: center;"><b>FRONT VIEW 24 PIN RECEPTACLE</b></p>

Table 2.0 – Pin out: AX024000

Grey Connector PIN #	Function	Black Connector PIN #	Function
12	CAN_L	6	+10V Reference
1	CAN_H	7	+10V Reference GND
11	Signal Output 2	5	+5V Reference
2	Signal Output 2 GND	8	+5V Reference GND
10	Signal Output 1	4	Analog/Digital Input 2 (Input 4)
3	Signal Output 1 GND	9	Common Analog GND
9	Output 2+ -	3	Analog/Digital Input 1 (Input 3)
4	Output 2-	10	Common Analog GND
8	Output 1+	2	Bipolar Analog Input 2 (Input 2)
5	Output 1-	11	Common Analog GND
7	Batt+	1	Bipolar Analog Input 1 (Input 1)
6	Batt-	12	Common Analog GND

### Dimensional Drawing



Enclosure and Dimensions	High Temperature Nylon PCB Enclosure – (equivalent TE Deutsch P/N: EEC-325X4B) 4.68 x 5.25 x 1.42 inches 118.80 x 133.50 x 36.00 mm (W x L x H excluding mating plug)
Protection	IP67
Vibration	MIL-STD-202G, Method 204D test condition C (Sine) and Method 214A, test condition B (Random) 10 g peak (Sine); 7.68 Grms peak (Random)
Shock	MIL-STD-202G, Method 213B, test condition A 50g (half sine pulse, 9ms long, 8 per axis)
Compliance	CE marking
Weight	0.55 lb. (0.25 kg)
Installation	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. All field wiring should be suitable for the operating temperature range, rated voltage and current. Wiring to the product must be in accordance with all applicable local codes. Install the unit with appropriate space available for servicing and for adequate wire harness access (6 inches or 15 cm) and strain relief (12 in. or 30 cm).

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Form: TDAX024000-12/31/23