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* Electronic Assistant®**
***Developed with* Simulink®**

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 Electronic Assistant® programming tool, the user can select the desired inputs and outputs for common applications. The firmware was developed using Simulink®.

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**
Mating Plug Kit: **PL-DTM06-12SA-12SB** (1 DTM06-12S, DTM06-12SB, 2 W12S, 24 contacts)
Electronic Assistant®: **AX070502**

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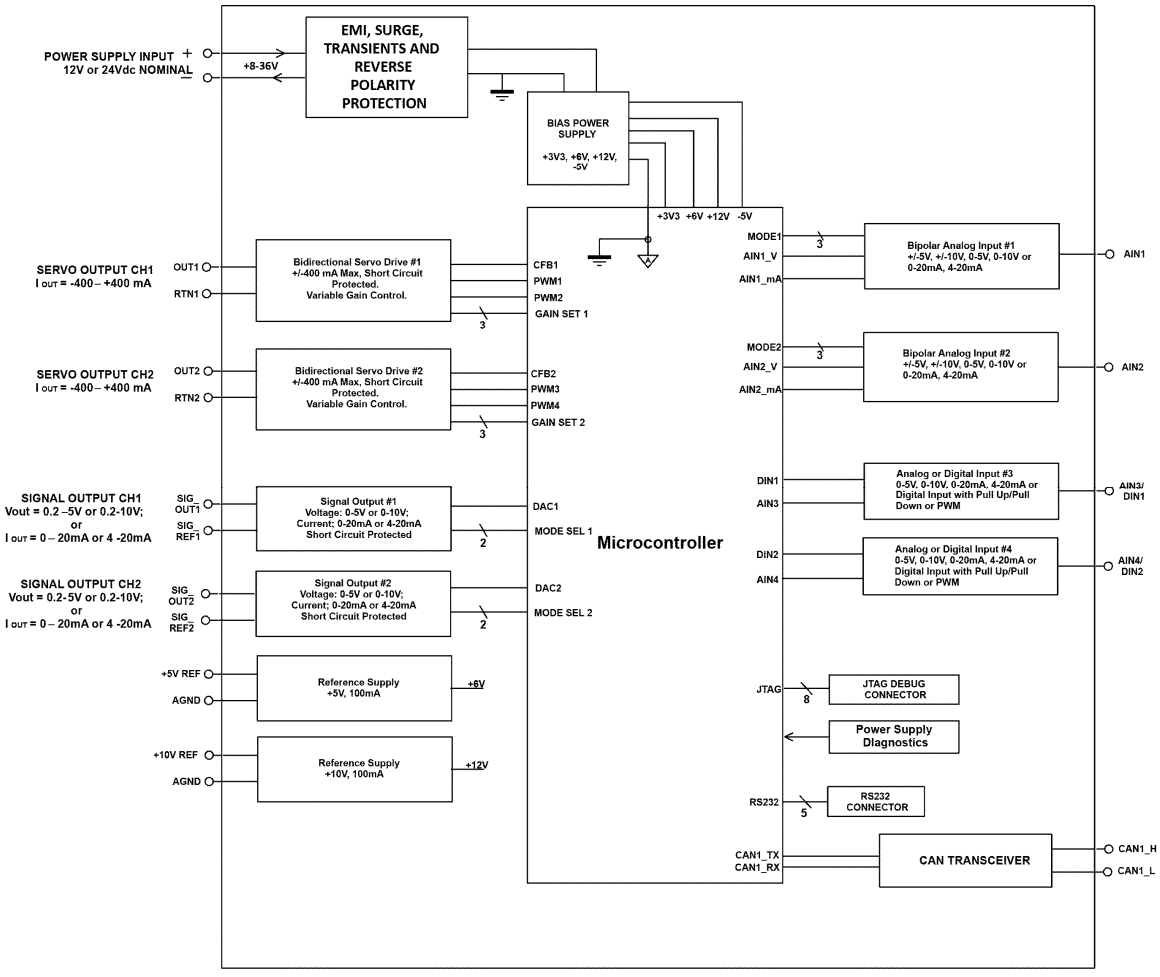
Description: The 4 Inputs 2 Outputs Servo Controller is designed for versatile control of two servo outputs to directly drive servos or other bidirectional loads. In addition to the two servo outputs, there are two signal outputs with voltage and current signal generation. The controller's flexible circuit 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 on board 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 www.axiomatic.com/service.html.

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 Ramges: 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 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

Outputs

Outputs	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% Output voltage up to 12V Full bridge output Current sensing resistor Overcurrent protection is provided. Short circuit protection is provided.
Signal Outputs	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.
Reference Voltages	One 5V, 100mA, 1% reference voltage One 10V, 100mA, 1% reference voltage
Protection for Output Terminals	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.

General Specifications

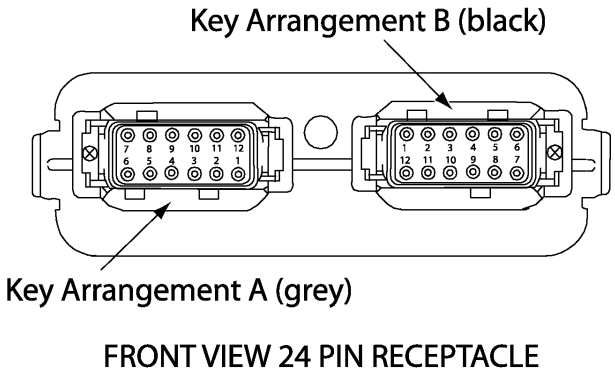
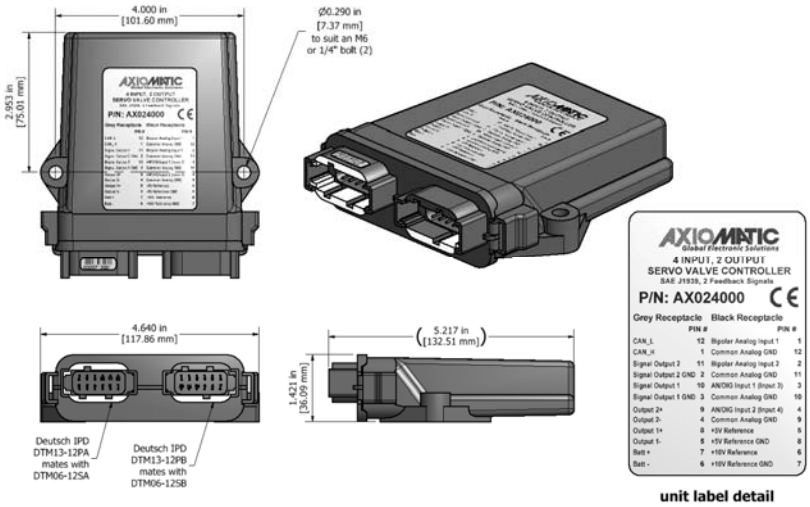
Microprocessor	STM32F205 32-bit, 1MByte flash memory
Typical Quiescent Current	87mA @ 12Vdc; 56mA @ 24Vdc
Response Time	70 ms for 0-400 mA current change
Control Logic	Standard embedded software is provided. (Application-specific control logic or factory programmed setpoints on request) Refer to the User Manual for details.
Simulink®	Model **AX024000** was developed using Simulink®. **Simulink®** is a model-based design tool from Mathworks®. Using Simulink®, the OEM machine designer may simulate their control system with the Axiomatic module included. This permits fine tuning of the design parameters and testing of functionality prior to machine prototype installation. The Hardware Interface Library for Simulink® is available from Axiomatic on request.
Communications	1 Isolated CAN port (SAE J1939) (CANopen® on request) Model AX024000 250 kbps baud rate Model AX024000-01 500 kbps baud rate Model AX024000-02 1 Mbps baud rate
Network Termination	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.
User Interface	Electronic Assistant® P/N: AX070502
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Electrical Connections	Refer to Table 2.0. Deutsch DTM series 24 pin receptacle (DTM13-12PA-12PB-R008) Mating plugs kits are available on request and include Deutsch 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.  FRONT VIEW 24 PIN RECEPTACLE

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

Enclosure and Dimensions	High Temperature Nylon housing, Deutsch IPD PCB Enclosure (EEC-325X4B) 4.62 x 5.24 x 1.43 inches 117.42 x 133.09 x 36.36 mm (W x L x H excluding mating plug)  unit label detail
Protection	IP67
Vibration	Contact Axiomatic.
Shock	Contact Axiomatic.
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).

Note: CANopen® is a registered community trade mark of CAN in Automation e.V.
Electronic Assistant® is a registered trademark of Axiomatic Technologies Corporation.
Simulink® is a registered trademark of The Mathworks, Inc. Form: TDAX024000-03/23/18