TECHNICAL DATASHEET #TDAX024010

4 INPUTS, 2 BIDIRECTIONAL 10 - 400 mA OUTPUTS
VALVE CONTROLLER, DIN rail mount

Features:
- Two bidirectional outputs from -400mA to +400 mA
- Isolated SAE J1939 CAN port
- Two analog signal inputs are selectable as the following voltage or current signals (Inputs 1 & 2).
  - 0-5V, 0-10V, 0 to +/- 5V, 0 to +/- 10V
  - 4-20mA, or 0-20mA
- Two analog/digital inputs are available as the following signals (Inputs 3 & 4).
  - 0-5V, 0-10V,
  - 4-20 mA, 0-20 mA,
  - PWM,
  - Frequency,
  - or Digital (Active High or Active Low).
- 12Vdc or 24Vdc nominal
- One reference voltage (+5V) is available to power sensors.
- Operates from -40 to 85°C (-40 to 185°F).
- Two LED indicators
- IP20
- DIN rail mount
- CE marking
- Configurable via Electronic Assistant®
- The firmware was developed using Simulink®.
- A Near Field Communications Antenna is provided for simple configurations (Google Play App):
  - Place the phone next to the antenna and configure while unpowered.
  - The E-Write NFC Android Application provides flexible user configurability for application-specific input-output relationship with slope or time response.
  - Protected and secure communications

Applications:
- servo valve control in motion control, industrial automation

Ordering Part Numbers:
Valve Controller, SAE J1939 (250 kbps): AX024010
Valve Controller, SAE J1939 (500 kbps): AX024010-01
Valve Controller, SAE J1939 (1 Mbps): AX024010-02

Electronic Assistant®: AX070502
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.

Figure 1.0 - Block Diagram

Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply Input</td>
<td>12V or 24Vdc nominal (9…36Vdc power supply range)</td>
</tr>
<tr>
<td>Protection</td>
<td>Reverse polarity protection</td>
</tr>
<tr>
<td></td>
<td>Overvoltage protection up to 38V</td>
</tr>
<tr>
<td></td>
<td>Under voltage shutdown at 7.5V</td>
</tr>
<tr>
<td>Input Grounds</td>
<td>Three common input GND connections are provided.</td>
</tr>
</tbody>
</table>
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, 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>
<thead>
<tr>
<th>Characteristic</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>9</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>
</tbody>
</table>
### 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 +Vps  
Full bridge output  
Current sensing resistor  
Overcurrent protection is provided. Short circuit protection is provided. |

### Reference Voltages

| Reference Voltages | One 5V, 100mA, 1% reference voltage |

### Protection for Output Terminals

| 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 | STM32F205VG7  
32-bit, 1MByte flash memory |
| Typical Quiescent Current | 60mA @ 12Vdc; 35mA @ 24Vdc |
| Response Time | 70 ms for 0 to 400 mA current change. |
| LED Indicators | 2 bicolour LED’s (Red and Green)  
Power, heartbeat, input fault indication and output fault indication |
| Control Logic | Standard embedded software is provided. Setpoints are user configurable. (Application-specific control logic or factory programmed setpoints on request) Refer to the User Manual for details. |
| Communications | Near Field Communication  
Full-duplex  
Data rate: 106 kbit/s  
Compiles with ISO1443 (RF protocol), ISO13239, and ISO7816  
Protected and secure configuration |
| User Interface | E-WRITE NFC Application is available from Google Play.  
https://play.google.com/store?hl=en |
| Software Reflashing | Electronic Assistant® P/N: AX070502 |
| Simulink® | Model AX024010 was developed using Simulink®. Simulink® is a model-based design tool from Mathworks®.  
Simulink® is a model-based design tool from Mathworks®.  |
| CAN bus | 1 Isolated CAN port (SAE J1939)  
AX024010: 250 kbps baud rate  
AX024010-01: 500 kbps baud rate SAE J1939  
AX024010-02: 1 Mbps baud rate SAE J1939 |
| 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. |
| Operating Conditions | -40 to 85 °C (-40 to 185 °F) |
| Enclosure and Dimensions | Phoenix Contact: ME MAX 22.5 G 2-2 KMGY – 2713638 or PHO ME MAX 22.5 2-2 KMGY – 2713625 (vented)  
Polyamide, UL94V0, cULus recognized, China RoHS  
DIN rail TH 35-7.5  
99 x 114.5 x 22.5 x 99 mm (L x H x W x D)  
Refer to Figure 2.0. |
| Protection | IP20 |
| Electrical Connections | 4 Phoenix Contact PSPT 2,5/ 4-ST KMGY spring clamp connectors Accepts 24-14 AWG wire. Refer to Table 2.0 and Figure 2.0. for pin out. |
| Compliance | CE marking |
| Weight | 0.30 lb. (0.136 kg) |
| Installation | DIN rail mount  
TH 35-7.5 |
**Figure 2.0 – Dimensions**

**Table 2.0 – Pin out: AX024010**

<table>
<thead>
<tr>
<th>PIN #</th>
<th>Function</th>
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<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BATT +</td>
<td>1</td>
<td>Output 1+</td>
<td>1</td>
<td>Bipolar Analog</td>
<td>1</td>
<td>+5V Reference</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Output 1-</td>
<td>2</td>
<td>Analog/Digital</td>
<td>2</td>
<td>Common Analog GND</td>
</tr>
<tr>
<td>3</td>
<td>CAN_H</td>
<td>3</td>
<td>Output 2+</td>
<td>3</td>
<td>Bipolar Analog</td>
<td>3</td>
<td>Common Analog GND</td>
</tr>
<tr>
<td>4</td>
<td>CAN_L</td>
<td>4</td>
<td>Output 2-</td>
<td>4</td>
<td>Analog/Digital</td>
<td>4</td>
<td>Common Analog GND</td>
</tr>
</tbody>
</table>

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.