TECHNICAL DATASHEET #TDAX020411A

12 INPUT, 12 OUTPUT VALVE CONTROLLER

7 Universal Signal and 5 Digital Inputs
8-2.5A Proportional and 4-3A On/Off Outputs
1 +5V, 100 mA Reference Voltage
CANopen®

P/N: AX020411A

Features:

- 6 Universal Signal Inputs are user configurable as:
  - 0-5V, 0-10V, 4-20mA or 0-20mA
  - 20Ω to 250 kΩ Resistive
  - 1 Hz to 10 kHz PWM
  - Digital
  - Three of the inputs can be configured as a pulse counter.
- 1 Signal Input is user configurable as:
  - 0-5V, 0-10V, 4-20mA or 0-20mA
  - 1 Hz to 10 kHz PWM
  - Digital
  - Pulse Counter
- 5 PWM/Digital Inputs are user configurable as:
  - 1 Hz to 10 kHz PWM
  - Active High/Active Low Digital
  - Three of the inputs can be configured as a pulse counter.

- 8 Outputs (0…2.5A) drive proportional poppet or spool or On/Off hydraulic valves and are user selectable as:
  - Proportional Current
  - Hotshot Digital
  - PWM Duty Cycle
  - Proportional Voltage
  - On/Off Digital
- 4 Outputs (3A) to drive ON/OFF hydraulic valves
- 1 CANopen® port (SAE J1939 model available)
- 12V or 24Vdc nominal power
- Surge, transient, reverse polarity, overvoltage, undervoltage and short circuit protections
- -40 to +85 °C operating temperature
- Designed for EMC compliance, CE marking
- 48 pin enclosure and connectors (TE Deutsch equivalents)
- IP67 rating
- Vibration compliant
- EDS File

Applications:

- Oil and Gas Equipment Automation
- Off-highway Machine Automation
- Agricultural Equipment

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Ordering Part Numbers:

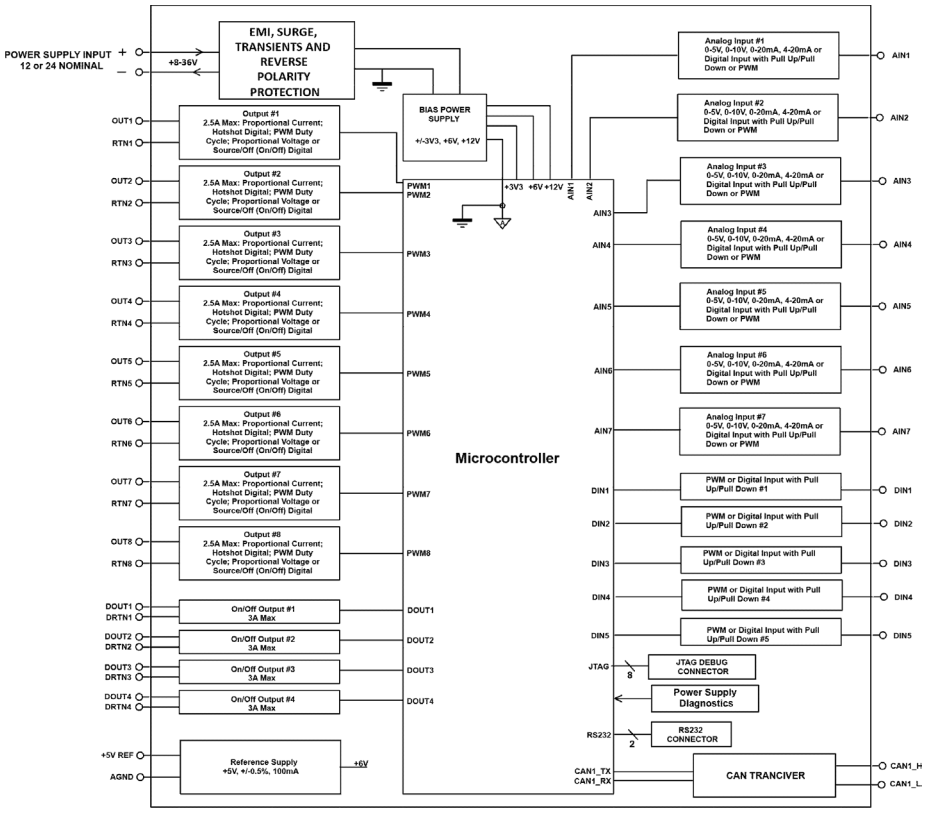
CANopen® Controller:

Model P/N	*Description*	*Protocol*
AX020411A	F4 Microprocessor	CANopen®

Accessories:
Mating Plug Kit: **AX070123**
EDS File

Description: The valve controller provides precise, repeatable control of 8 proportional or on/off solenoids plus 4 on/off solenoids. It is networked on a CANopen® bus. Up to 7 signal inputs and 5 digital inputs are accepted for interface to a PLC, Engine Control Module, switches, command potentiometers or sensors. The controller has altogether twelve inputs, which are divided into Universal and Digital Inputs. Universal Inputs can be configured to measure voltage, current or digital signal and Digital Inputs can be configured to measure digital signals. In addition, Universal Inputs 1 to 6 can be configured to measure resistance. Frequency, signal pulse width and pulse count can be measured with Universal Inputs 1, 3, 5, 7 and Digital Inputs 1, 3, 5. It operates with 12Vdc or 24Vdc power. Designed for rugged machine applications, it features an IP67 rating, CE marking and is suitable for high vibration installations. Controller settings are user configurable to suit many applications. From the control logic perspective, the AX020411A consists of a set of internal functional blocks, which can be individually configured. For more details on control logic, refer to the User Manual.

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/

Input Specifications

Power Supply Input	12 or 24Vdc nominal (8…36 Vdc power supply range) NB. The maximum total current draw permitted on the power supply input pins is 15 Amps @ 24Vdc, at one time. Suitable for engine cranking and load dump
Reverse Polarity Protection	Provided up to -80Vdc
Surge, Transient Protection	Provided
Under-voltage Protection	Provided (hardware shutdown)
Overvoltage Protection	Provided (hardware shutdown)
All Inputs	Up to 12 inputs are selectable by the user from the following. • 7 Universal Signal Inputs • 5 PWM/Digital Inputs All inputs, except for frequency and counter, are sampled every 10ms.
Universal Signal Input Configuration	Inputs 1 through 6 are configurable as the following. • Disable Input • 12-bit Analog to Digital (0…5Vdc, 0…10Vdc) (4…20mA or 0…20mA, Current sense resistor 124Ω) (20Ω to 250 kΩ Resistive) • Digital input (Active High to Vps or Active Low to GND, Amplitude 3.3V to +Vps, Configurable pull up or pull-down resistor) In addition, inputs 1, 3 and 5 are configurable as the following. • PWM Signal (Frequency: 1-10,000 Hz, 0-100% D.C., 1MΩ impedance) • Pulse Counter
Signal Input 7 Configuration	Input 7 is configurable as the following. • Disable Input (No CAN messages associated with that channel are sent.) • 12-bit Analog to Digital (0…5Vdc, 0…10Vdc) (4…20mA or 0…20mA, Current sense resistor 124Ω) • PWM Signal (Frequency: 1-10,000 Hz, 0-100% D.C., 1MΩ impedance) • Pulse Counter • Digital input (Active High to Vps or Active Low to GND, Amplitude 3.3V to +Vps, Configurable pull up or pull-down resistor)
PWM/Digital Input Configuration	PWM/Digital Inputs 1 through 5 are configurable as the following. • Disable input (No CAN messages associated with that channel are sent.) • Digital input (Active High to Vps or Active Low to GND, Amplitude 3.3V to +Vps, Configurable pull up or pull-down resistor) In addition, inputs 1, 3 and 5 are configurable as the following. • PWM Signal (Frequency: 1-10,000 Hz, 0-100% D.C., 1MΩ impedance) • Pulse counter

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	36	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

Input Accuracy and Resolution

Table 2.0. Input Accuracy

Input Type	Accuracy	Resolution
Voltage	+/- 1%	1 [mV]
Current	+/- 1%	1 [uA]
Resistive	+/- 1%	1 [Ω]
PWM	+/- 1% (<5kHz) +/- 2% (>5kHz)	0.01 [%]

Grounds

7 universal signal input grounds
1 PWM/digital signal ground
1 +5V reference ground

Reference Voltages

1 +5V, 100 mA maximum
Regulation at +/-0.5% accuracy is provided.

Output Specifications

Proportional Outputs

8 High side sourcing up to 2.5A
Half-bridge output, current sensing, grounded load
High frequency PWM (25 kHz)

Independent outputs (0…2.5A) are user selectable as:

- Output Disable
- Proportional Current (See Table 3.0.)
- Hotshot Digital
- PWM Duty Cycle
- Proportional Voltage
- On/Off Digital (Normal, Inverse, Latched, Blinking Logic are selectable.)

Current outputs: 1 mA resolution
Voltage outputs: 0.1V resolution
PWM outputs: 0.1% resolution
Digital on/off: Sourcing from power supply or output off
(Note: Load at supply voltage must not draw more than 2.5A.)

NB. The maximum total current draw permitted on the power supply input pins is 15 Amps @ 24Vdc, at one time.

Table 3.0: Proportional Output Adjustments

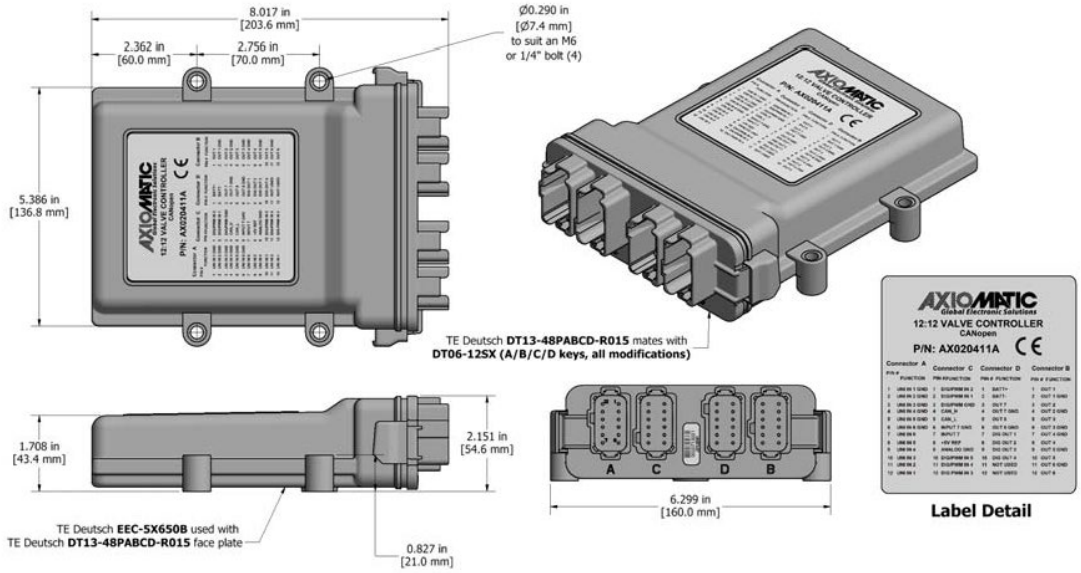
Adjustable Parameter	Description
Output Current Adjustments	0- Imax (2.5A) Both minimum and maximum current settings are user configurable.
Superimposed Dither	Dither adjustments are configurable for each channel. Dither Amplitude: 0 mA (factory default) Adjustable from 0-500 mA. Dither Frequency: 200 Hz (factory default) Adjustable from 50-400 Hz.
Ramp Rates	Ramp adjustments are configurable for each channel. 1,000 mSec (default) Adjustable from 0 to 10,000 mSec (10 sec.).

Output Accuracy	Current outputs +/-1% Voltage outputs +/- 5% PWM outputs +/-0.1%
Digital Outputs	4 High side switching outputs up to 3A (sourcing) Load current monitoring capability Fully protected Note: Outputs up to 5A are possible with a reduction in the operating temperature range.
Protection	Overcurrent protection is provided on all outputs. Short circuit protection is provided on all outputs. Overvoltage and undervoltage protection is provided on all outputs.
Error Conditions	If an error on the input is detected, the output of the controller shuts off.

General Specifications

Operating Conditions	-40 to 85°C (-40 to 185°F)
Weight	1.40 lb. (0.635 kg)
Protection	IP67; Unit is conformal coated within the housing.
Microprocessor	Model : AX020411A - STM32F427ZIT6, 2MByte flash memory, 256 KB RAM
Quiescent Current Draw	60 mA @ 24Vdc; 81 mA @ 12Vdc
Response Time	40 msec.
CAN Interface	1 CAN port (CANopen®) SAE J1939 models are available. See TDAX020410.
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.
Control Logic	Refer to the User Manual for details.
User Interface	EDS File Standard CANopen® tools (not supplied)
Approvals	CE marking
Vibration	MIL-STD-202G, Test 204D and 214A (Sine and Random) 10 g peak (Sine), 7.68 Grms peak (Random)
Shock	MIL- STD-202G, Method 213B, test condition A 50g
Diagnostics	Diagnostics messages are provided over the CAN network for the status of inputs or outputs. Each input or output channel could be configured to send diagnostic messages to the network if the I/O goes out of range, In addition to the I/O channels, one other type of fault can be reported to the network using diagnostic messaging, which is an Over Temperature fault (of the controller processor.) The controller stores diagnostic data in a non-volatile log.
Enclosure and Dimensions	High Temperature Nylon Enclosure - (equivalent TE Deutsch P/N: EEC-5X650B) 4.03 x 4.25 x 1.68 inches 102.44 x 107.96 x 42.67 mm L x W x H including integral connector Refer to the dimensional drawing.
Installation	For mounting information, refer to the dimensional drawing. 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 0.25 inches (6.35 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 inches or 15 cm) and strain relief (12 inches 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.

Dimensional Drawing



Electrical Connections	48-pin Connector (equivalent TE Deutsch P/N: DT13-48PABCD-R015) or Amphenol Face Plate Connector (P/N: ATM13-12PA-12PB-BM03), based on availability.
Mating Plugs	Mates with the following TE Deutsch P/N equivalents: 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 set of these mating plugs is available (P/N: AX070123).

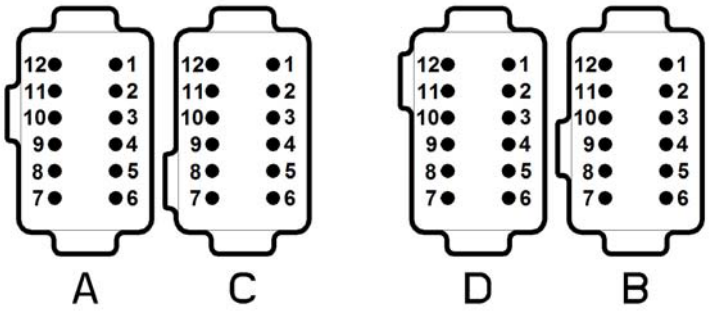


Table 14 Electrical Pin Out

Connector A		Connector C		Connector D		Connector B	
Pin #	Function	Pin #	Function	Pin #	Function	Pin #	Function
1	UN IN 1 GND	1	DIG/PWM IN 2	1	BATT +	1	OUT 1
2	UN IN 2 GND	2	DIG/PWM IN 1	2	BATT -	2	OUT 1 GND
3	UN IN 3 GND	3	DIG/PWM GND	3	OUT 7	3	OUT 2
4	UN IN 4 GND	4	CAN_H	4	OUT 7 GND	4	OUT 2 GND
5	UN IN 5 GND	5	CAN_L	5	OUT 8	5	OUT 3
6	UN IN 6 GND	6	UN IN 7 GND	6	OUT 8 GND	6	OUT 3 GND
7	UN IN 6	7	INPUT 7	7	DIG OUT 1	7	OUT 4 GND
8	UN IN 5	8	+5V REF	8	DIG OUT 2	8	OUT 4
9	UN IN 4	9	+5V REF GND (AGND)	9	DIG OUT 3	9	OUT 5 GND
10	UN IN 3	10	DIG/PWM IN 5	10	DIG OUT 4	10	OUT 5
11	UN IN 2	11	DIG/PWM IN 4	11	NOT USED	11	OUT 6 GND
12	UN IN 1	12	DIG/PWM IN 3	12	NOT USED	12	OUT 6

Form: TDAX020411A-06/09/23