TECHNICAL DATASHEET #TDAX130510

ISOLATED DUAL CHANNEL UNIVERSAL SIGNAL CONVERTER

2 Analog (Bipolar), Resistive, Digital, Frequency (RPM) or PWM Signal Inputs
2 Analog (Bipolar), Digital, Frequency or PWM Signal Outputs
4-way Isolation, 12 or 24 Vdc
+5V reference (50 mA)
CAN (SAE J1939)
Developed with Simulink®
With Axiomatic Electronic Assistant

P/N: AX130510

Description: The isolated dual channel universal signal converter accepts two voltage, current, resistive, frequency, RPM, PWM or digital control signal inputs and converts them into two signal outputs (analog voltage, analog current or digital signal). The control can be networked to a SAE J1939 networked engine control system. The unit has 4-way isolation between power, inputs, outputs and CAN.

Using the Axiomatic Electronic Assistant programming tool, the user can select the desired inputs from the following signal options.

- 0-5 V, 0-10 Vdc, +/- 5 Vdc, or +/- 10 Vdc
- 4-20 mA, 0-20 mA or 0-200 mA
- 20 Ohms to 250 kOhm
- Frequency/RPM
- PWM
- or Digital (Active High or Active Low)

A +5V, 50 mA reference is available to power a sensor input.

The outputs can also be programmed as 0-5 Vdc, 0-10 Vdc, +/- 5 Vdc, +/- 10 Vdc, 0-20 mA, 4-20 mA, Frequency, RPM, PWM or digital on/off signals.

A rugged power supply interface accepts 12 Vdc or 24 Vdc nominal for battery powered machine applications. The unit carries an IP67 rating. The rugged enclosure with an integrated TE Deutsch equivalent 12 pin connector is suitable for harsh environments. It operates from -40 to 85°C (-40 to 185°F). The sophisticated control algorithms allow the user to program the controller for a wide range of applications without the need for customer software.

Applications:

- power gen set engine control systems
- oil and gas equipment automation
- off-highway machine automation

Ordering Part Numbers:

Isolated Dual Channel Universal Signal Converter, SAE J1939, 250 kbps: **AX130510**
Isolated Dual Channel Universal Signal Converter, SAE J1939, 500 kbps: **AX130510-01**
Isolated Dual Channel Universal Signal Converter, SAE J1939, 1 Mbps: **AX130510-02**

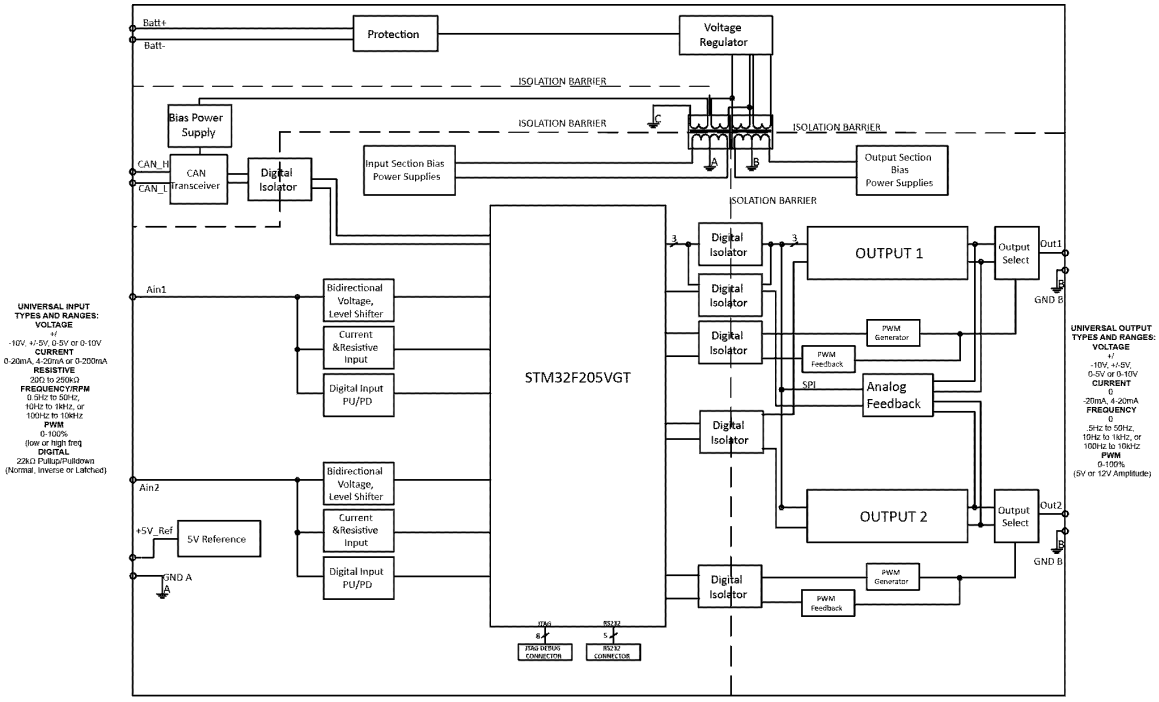
Accessories:

Mating Plug Kit, P/N: **PL-DTM06-12SA**
Axiomatic Electronic Assistant KIT, P/Ns: **AX070502, AX070505K,** or **AX070506K**

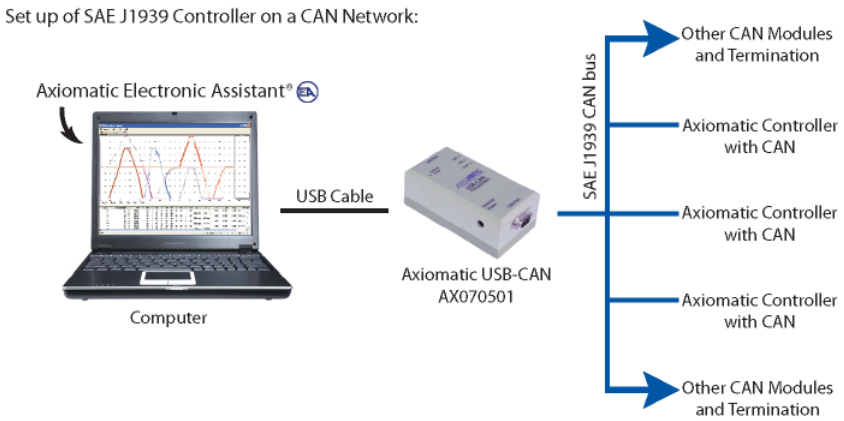
Axiomatic Technologies Oy
Höytämöntie 6
33880 LEMPÄÄLÄ, Finland
Tel. +358 103 375 750
salesfinland@axiomatic.com
www.axiomatic.fi

Axiomatic Technologies Corporation
1445 Courtneypark Dr. E.
Mississauga, ON Canada L5T 2E3
Tel. 1 905 602 9270
sales@axiomatic.com
www.axiomatic.com

Block Diagram



User Interface



The controller belongs to a family of Axiomatic smart controllers with programmable internal architecture. This provides users with flexibility, allowing them to build their own custom controller, with functionality tailored to their requirements, from a set of predefined internal functional blocks, using the PC-based Axiomatic Electronic Assistant software tool. Application programming is performed through the CAN interface, without disconnecting the controller from the user's system.

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/.

Power Supply

Power Supply Input	12 Vdc or 24 Vdc nominal 9…36 Vdc power supply range Shutdown voltage is 8.0 Vdc.
Protection	Reverse polarity protection Overvoltage protection is up to 45 V.

Inputs

Inputs	2 Universal Signal Inputs User programmable as Voltage, Current, Resistive, Frequency, RPM, PWM or Digital signal input types. Refer to Table 1.0.

Table 1.0 –User Programmable Universal Inputs

Analog & Digital Input Functions	Voltage Input, Current Input, Resistive Input or Digital Input
Voltage Input	0-5 V (Impedance 110 kΩ) 0-10 V (Impedance 130 kΩ) +/- 5V (Impedance 110 kΩ) +/- 10V (Impedance 130 kΩ)
Current Input	0-200 mA (Impedance 5 Ω); 1V max. 0-20 mA (Impedance 249 Ω) 4-20 mA (Impedance 249 Ω)
Resistive	20 Ohms to 250 kOhms Self-calibrating
Digital Input Level	Accepts 5 V TTL Accepts up to Vps Threshold: Low <1 V High >2.2 V
Digital Input	Active High or Active Low with 10 kOhm pull-up or pull-down
Timer Input Functions	PWM Input, Frequency Input, RPM Input
PWM Input	Low Frequency (10 Hz to 1 kHz) High Frequency (100 Hz to 10 kHz) 0 to 100% D.C.
Frequency/RPM Input	0.5 Hz to 50 Hz; 10 Hz to 1 kHz; or 100 Hz to 10 kHz 1 to 99% D.C.

Maximum and Minimum Ratings

Characteristic	Min	Max	Units
Power Supply	9	36	V dc
Voltage Input	0	36	V dc
Current Input 0(4)-20 mA	0	12	Vdc
Current Input 0-200 mA	0	1V	Vdc
Resistive Input	30	250 000	Ω
Digital Input	0	36	Vdc
PWM Duty Cycle	0	100	%
PWM Low Frequency	10	1 000	Hz
PWM High Frequency	100	10 000	Hz
PWM Voltage pk - pk	0	36	V dc
RPM Frequency	0.5	10 000	Hz

Input Grounds	1 provided
Protection	All inputs are protected against short to GND. All inputs, except current inputs, are protected against shorts to Nominal Vps (36Vdc).
Input Accuracy and Resolution	

Input Type	Input Range	Accuracy	Resolution
Voltage	0-5V	+/- 0.5%	1 mV
	0-10V	+/- 0.5%	1 mV
	-5V to 5V	+/- 0.5%	1 mV
	-10V to 10V	+/- 0.5%	1 mV
Current	0(4)-20mA	+/-1%	1 µA
	0-200mA	+/-1%	1 µA
Resistive	30-250kΩ	+/-1%	1 Ω for lower ranges 1 kΩ for higher ranges
Frequency	0.5Hz-50Hz	+/-0.3%	0.01 Hz
	10Hz-1kHz	+/-0.3%	0.1 Hz
	100Hz-10kHz	+/-0.3%	1 Hz
PWM	Low Frequency	+/-0.1%	0.01%
	High Frequency	+/-0.1%	0.01%

Outputs

Outputs	2 Isolated Signal Outputs Voltage, Current or Digital (Digital/Frequency or PWM) The outputs are user selectable as follows. Refer to Table 2.0.

Table 2.0: Programmable Outputs

Analog Voltage or Current Outputs:	Voltage Output: 0-5 Vdc, 0-10 Vdc, +/- 5Vdc or +/- 10Vdc Maximum load is 50 mA. Current Output: 0-20 mA or 4-20 mA Maximum load resistance is < 500 Ohms. Compliance Voltage is 10V.
PWM, Frequency or Mixed PWM/Frequency Output:	0.1 Hz to 50 kHz 0-100% D.C. 5 V or 12 V Amplitude Push pull output Maximum load is 50 mA. Over-current protection (50 mA)
Digital Output:	Digital Level Digital ON/OFF 5 V or 12 V Amplitude Maximum load is 50 mA.

Output Accuracy and Resolution

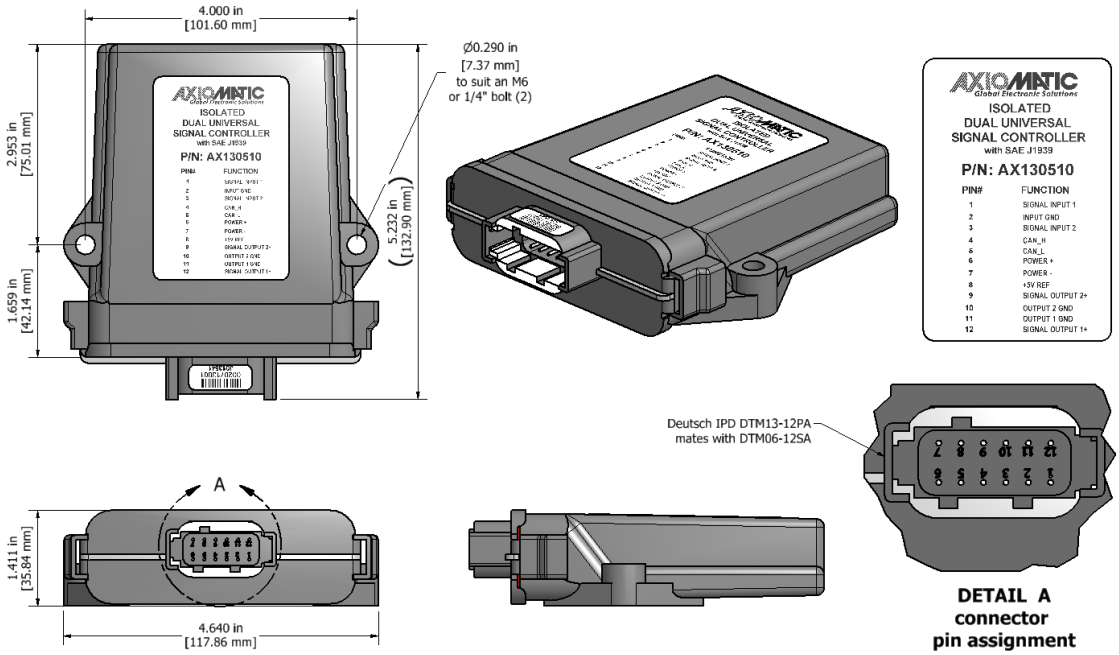
Output Type	Output Range	Output Accuracy	Output Resolution	Output Feedback Accuracy
Voltage	0-5V	+/- 0.5%	1.2 mV	+/- 1%
	0-10V	+/- 0.5%	2.44 mV	+/- 1%
	+/- 5Vdc	+/- 0.5%	2.44 mV	+/- 1%
	+/- 10Vdc	+/- 0.5%	4.88 mV	+/- 1%
Current	0(4)-20mA	+/- 0.5%	4.88 µA	+/- 2%
Digital	On/Off	N/A	N/A	N/A
Frequency	0.1Hz-50kHz	+/- 0.1%	0.01 – 40 Hz	+/- 0.5%
PWM	Low Frequency	+/- 0.5%	0.01%	+/- 0.8%
	High Frequency	+/- 0.5%	0.01%	+/- 0.8%

Voltage Reference	+5V, 50 mA Ground is shared with Input Grounds.
Protection for Output Terminals	Fully protected against short circuit to output ground. Unit will fail safe in the case of a short circuit condition, self-recovering when the short is removed.

General Specifications

Microcontroller	STM32F205VGT
Isolation	300 Vrms 4-way Digital Isolation (Power, Inputs, Outputs and CAN are isolated from each other.)
Typical Quiescent Current	150 mA @ 12Vdc; 75 mA @ 24Vdc
Response Time	30 mSec.
Control Logic	Standard embedded software is provided. *(Request application-specific control logic or a factory programmed set point file.)* The configurable properties of the controller are divided into function blocks, namely Input Function Block, Output Function Block, Diagnostic Function Block, PID Control Function Block, Lookup Table Function Block, Programmable Logic Function Block, Math Function Block, DTC React Function Block, CAN Transmit Message Function Block, CAN Receive Message Function Block and Inching Control Block. Refer to the User Manual for details.
Simulink® Block Library	Model **AX130510** was developed using Simulink®. **Simulink®** is a model-based design tool from Mathworks®.
Communications	1 Isolated CAN port (SAE J1939) (CANopen® on request) Models: AX130510 – 250 kbps baud rate AX130510-01 – 500 kbps baud rate AX130510-02 – 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	The AX130510 setpoints can be viewed and programmed using the standard J1939 memory access protocol through the CAN port and the PC-based Axiomatic Electronic Assistant. The Axiomatic EA can store all setpoints in one setpoint file and then flash them into the unit in one operation. The setpoint file is created and stored on disk using a command *Save Setpoint File* from the Axiomatic EA menu or toolbar. The user then can open the setpoint file, view or print it and flash the setpoint file into the AX130510. The Axiomatic Electronic Assistant KIT, P/Ns: **AX070502**, **AX070505K** or **AX070506K** for the *Windows* operating systems comes with a royalty-free license for use on multiple computers. It includes an Axiomatic USB-CAN converter to link the device's CAN port to a *Windows*-based PC.
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Storage Temperature	-55 to 125 °C (-67 to 257°F)
Protection	IP67
Vibration	MIL-STD-202G, Test 204D and 214A (Sine and Random) 10 g peak (Sine) 7.86 Grms peak (Random)
Shock	MIL-STD-202G, Test 213B 50g
Weight	0.55 lb. (0.249 kg)
Enclosure	High Temperature Nylon enclosure – (Equivalent TE Deutsch P/N: EEC-325X4B) Flammability Rating: UL 94V-0 4.64 x 5.232 x 1.41 inches 117.86 x 132.90 x 35.84 mm (W x L x H excluding mating plugs) 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 0.63 inches (16 mm) thick. If the module is mounted without an enclosure, it should be mounted vertically with connectors facing left and right to reduce likelihood of moisture entry. 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. No wire or cable harness should exceed 30 meters in length. The power input wiring should be limited to 10 meters. All field wiring should be suitable for the operating temperature range. 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).

Dimensional Drawing



Electrical Connections	12-pin receptacle (equivalent to the TE Deutsch DTM P/N: DTM13-12PA-R008) 20 AWG wire is recommended for use with contacts 0462-201-20141. Mating plug KIT: Available from Axiomatic as p/n: **PL-DTM06-12SA**. It is comprised of the following TE Deutsch part equivalents: plug (DTM06-12SA); wedgelock (WM12S); and 12 contacts (0462-201-20141) as well as 6 sealing plugs (0413-204-2005).

Pin #	Description
1	Analog/Digital Input 1
2	Input GND
3	Analog/Digital Input 2
4	CAN_H
5	CAN_L
6	Power +
7	Power -
8	+5V Reference
9	Analog/Digital Output 2+
10	Output GND 2
11	Output GND 1
12	Analog/Digital Output 1+

Form: TDAX130510-05/31/23