3 Encoder, 7 Signal Inputs CAN Controller

3 Encoder, 1 Universal Signal, 6 Digital/PWM/Hz Inputs
CAN (SAE J1939) or CANopen®
with Axiomatic Electronic Assistant

P/N: AX030140

Features:

- 1 user selectable universal signal input:
    - 0-5 V
    - 0-10 V
    - 0-20 mA
    - 4-20 mA
    - PWM (low or high frequency)
    - Frequency/RPM
    - Counter
    - Digital
- 4 user selectable digital signal inputs:
    - PWM (low or high frequency)
    - Frequency/RPM
    - Digital
- 2 digital inputs
- 3 encoder inputs
- 3-way isolation between power, inputs and CAN
- 12V, 24V, 48 Vdc (nominal) power input
- 1 CAN port (SAE J1939) or CANopen®
- Rugged enclosure and connectors (TE Deutsch equivalents)
- Standard control logic
- CE/UKCA mark (EMC Directive)
- Axiomatic Electronic Assistant for parameter configuration

Description: The 3 Encoder, 7 Signal Input Module accepts up to 3 encoders; 1 analog or digital type signal inputs (0-5V, 0-10V, 0-20 mA or 4-20 mA, Digital, PWM, Frequency/RPM or Counter); 4 digital type signal inputs (Digital, PWM, Frequency/RPM) and 2 Digital inputs. The modules can be connected to a variety of analog machine sensors or levers, PLC's, switches, PWM signals, etc. It interfaces with the machine's CAN network (SAE J1939). Standard embedded software is provided. A rugged IP67 rated enclosure and a wide-ranging power supply input section for 12V, 24V or 48Vdc power makes the module suitable for applications in the harsh environment of mobile equipment with on-board battery power. All setpoints are user configurable using the Axiomatic Electronic Assistant.

Applications: The controller is designed to meet the rugged demands of construction equipment, power generator sets, and industrial machine control applications.
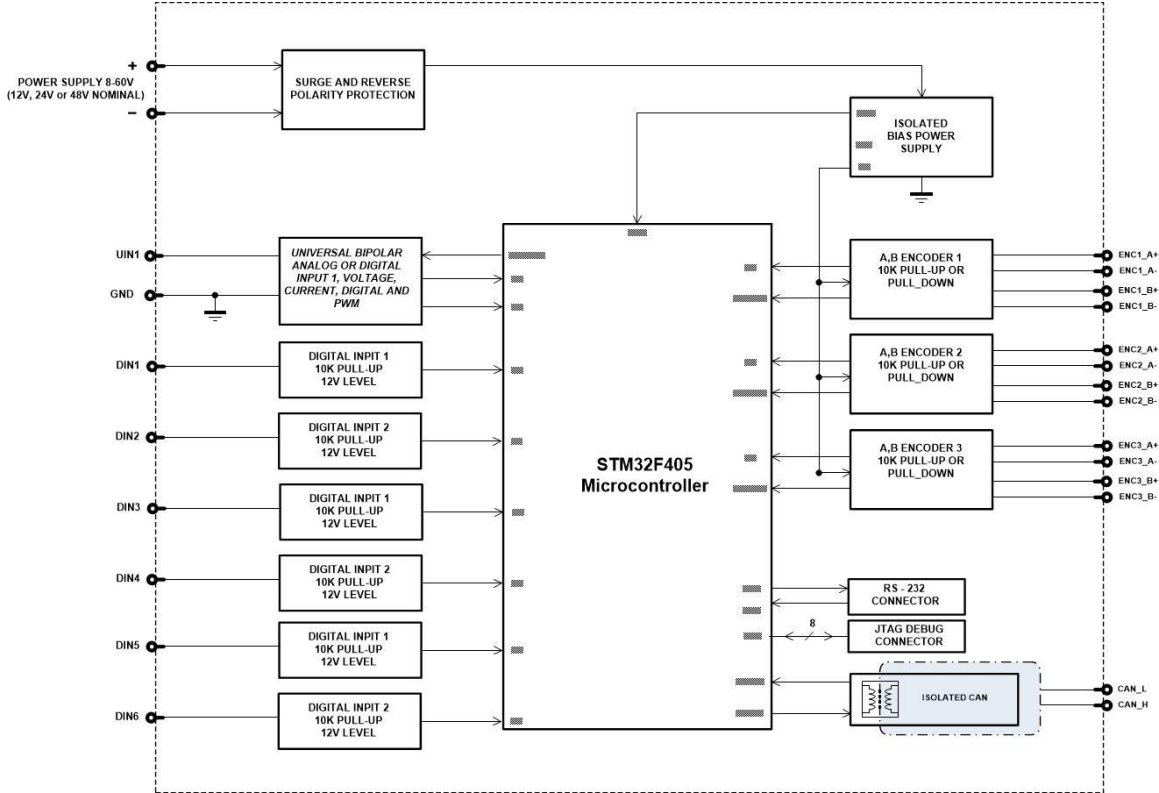
Ordering Part Numbers:

Model P/N	Baud Rate
AX030140	SAE J1939, 250 kbps
AX030140-01	SAE J1939, 500 kbps
AX030140-02	SAE J1939, 1 Mbps
AX030141	CANopen®

Accessories:
PL-DTM06-12SA-12SB Mating Plug Kit (1 DTM06-12S, DTM06-12SB, 2 WM12S, 24 contacts)
Axiomatic Electronic Assistant Configuration KIT, P/N: **AX070502, AX070505K,** or **AX070506K**

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/.

Power Input Specifications

Power Supply Input - Nominal	12, 24 or 48Vdc nominal operating voltage 8…60 Vdc power supply range for voltage transients
Surge Protection	Provided
Reverse Polarity Protection	Provided
Quiescent Current	55 mA @ 12Vdc; 28 mA @ 24Vdc Typical

Signal Input Specifications

Encoder Inputs	Three 2-phase, phase A and B incremental encoder inputs Range: 0.5 to 60 kHz Amplitude: up to +Vps 1 MOhm impedance or Active High with 10K Pullup or Active Low with 10K Pulldown resistor to GND

Universal Input	1 user selectable input • Analog 12-bit (0-5V, 0-10V, 0-20 mA, 4-20 mA) • PWM 12-bit (low or high frequency) – auto detect 0.5 to 50 kHz, 0-100% • Frequency/RPM – auto detect 0.5 to 50 kHz, 0-100% • Counter input 16-bit • Digital (active high/active low) [ON when input $\geq$ 1.5V] The "**Input Sensor Type**" setpoint is used to configure input type. All inputs with the exception of 16-Bit Counter are sampled every 1ms. Analog Input types have a 12-bit resolution. With current inputs, short circuit protection is provided.
Digital Inputs 1-6	4 user selectable inputs • PWM 12-bit (low or high frequency) • Frequency/RPM auto detect 0.5 to 50 kHz, 0-100% • Digital (active high with 10K pullup) [ON when input $\geq$ 1.5V] 2 digital inputs (inputs 3 and 6) • Digital (active high with 10K pullup) [ON when input $\geq$ 1.5V]
Minimum and Maximum Ratings	**Table 1.0. Absolute Maximum and Minimum Ratings** | Characteristic	Min	Max	Units
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Power Supply	8	60	V dc
Voltage Input	0	43	V dc
Current Input	0	21	mA
Current Input – Voltage Level	0	12	Vdc
Digital Type Input – Voltage Level	0	43	Vdc
PWM Duty Cycle	0	100	%
PWM Frequency	50	20 000	Hz
PWM Voltage pk - pk	0	43	V dc
RPM Frequency	50	20 000	Hz	
Input Accuracy	**Table 2.0. Input Accuracy** 	Input Type	Accuracy	Resolution
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Voltage	+/- 1%	1 [mV]
Current	+/- 1%	1 [uA]
PWM	+/- 1% (<5kHz) +/- 2% (>5kHz)	0.1 [%]
Frequency/RPM	+/- 1%	0.01 [Hz]	
Input Impedance	0-5V: 1 MOhm 0-10V: 170 kOhm 0(4)-20mA: 249 Ohm Frequency/Digital Input: Pull Up/Pull Down 1 MOhm
Scan Rate	Each input is scanned in 100uS. A complete scan of 10 inputs occurs with new measured values every 1mS.
Analog GND	1 Analog GND connections is provided.

General Specifications

Microcontroller	STM32F405RG
Isolation	3-way isolation between power, inputs and CAN 400 Vrms
Communications	1 CAN port (2.0B, SAE J1939) Model AX030140 – 250 kbps baud rate Model AX030140-01 – 500 kbps baud rate Model AX030140-02 – 1 Mbps baud rate A CANopen® model is available, ordering part number AX030141.
EMC Compliance	CE/UKCA marking
Vibration	MIL-STD-202G, Method 204D, test condition A – 10 g peak (Sine) MIL-STD-202G, Method 214A, test condition B – 7.68 Grms (Random)
Shock	MIL-STD-202G, Method 213B, test condition A 50 g half sine pulse, 6 ms, 6 pulses per axis
User Interface	User configuration and diagnostics are provided with the Axiomatic Electronic Assistant.
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	Configurable properties of the controller are divided into function blocks, namely input function block, diagnostic function block; lookup table function block, programmable logic function block, math function block, constant data block and conditional block, CAN receive message function block and CAN transmit message function block. Input function block includes properties used to select input sensor functionality. Diagnostic function block properties are used to configure fault detection and reaction functionalities. The Math function block gives user an opportunity to process inputs with basic mathematical of logical functions. The CAN transmit message function block configures properties of the messages sent to the CAN bus. The software was designed to provide flexibility to the user with respect to messages sent from the module (ECU) over the CAN bus, by providing: • Configurable ECU Instance in the NAME (to allow multiple ECU's on the same network) • Configurable Input Parameters • Configurable PGN and Data Parameters • Configurable Diagnostic Messaging Parameters, as required • Diagnostic Log, maintained in non-volatile memory The CAN Transmit function block is used to send any output from another function block (i.e. input, math) to the J1939 network. The ECU has ten CAN Transmit Messages and each message has 5 signals. The "**Transmit PGN**" setpoint sets PGN used with the message. The user should be familiar with the SAE J1939 standard and select values for PGN/SPN combinations as appropriate from section J1939/71. By default, all messages are sent on Proprietary B PGNs as broadcast messages. None of the application layer PGNs are supported as part of the default configurations, but they can be selected as desired for transmit function blocks. Setpoints are accessed using standard Memory Access Protocol (MAP) with proprietary addresses. The Axiomatic Electronic Assistant (EA) allows for quick and easy configuration of the unit over CAN network. Refer to the User Manual UMAX030140 for details. The AX030140 can be upgraded with new application firmware over the CAN bus using the Axiomatic Electronic Assistant. *For application-specific control logic, contact Axiomatic.*
Electrical Connections	24-pin receptacle (equivalent TE Deutsch P/N : DTM13-12PA-12PB-R008) Mating plug: equivalent 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. Refer to Table 3.0 for pinout.
Enclosure and Dimensions	High Temperature Nylon Enclosure – (equivalent TE Deutsch P/N: EEC-325X4B) Flammability Rating: UL 94V-0

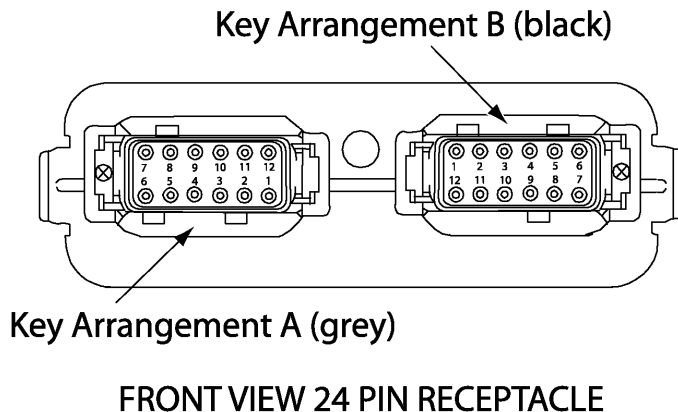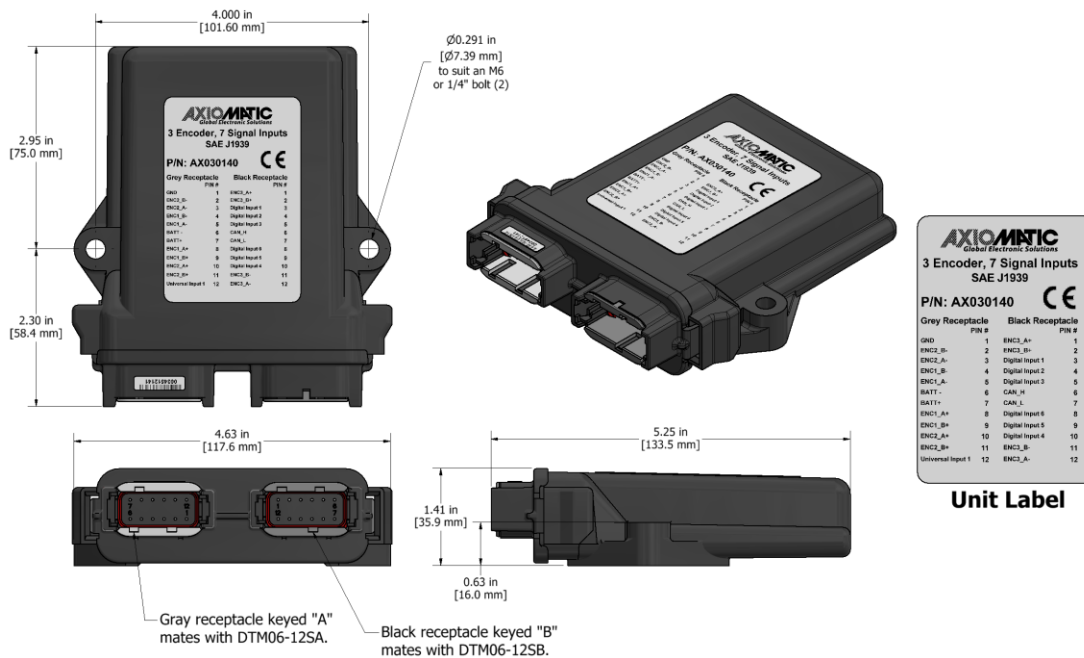|	
	4.63 x 5.25 x 1.41 inches 117.60 x 133.50 x 35.90 mm (W x L x H excluding mating plugs)
Operating Temperature	-40 to 85°C (-40 to 185°F)
Storage Temperature	-50 to 125°C (-58 to 257°F)
Weight	0.55 lb. (0.25 kg)
Protection	IP67, Unit is conformal coated in its enclosure.
Mounting	Mounting holes sized 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. 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).

Dimensions and Typical Connections:

Gray receptacle keyed "A" mates with DTM06-12SA.

Black receptacle keyed "B" mates with DTM06-12SB.

Unit Label

Key Arrangement B (black)

Key Arrangement A (grey)

FRONT VIEW 24 PIN RECEPTACLE

Table 3.0. Electrical Pin Out			
Grey Connector		**Black Connector**	
Pin #	**Function**	**Pin #**	**Function**
1	Analog GND	1	ENC3_A+
2	ENC2_B-	2	ENC3_B+
3	ENC2_A-	3	Digital Input 1
4	ENC1_B-	4	Digital Input 2
5	ENC1_A-	5	Digital Input 3 (Digital only)
6	Batt -	6	CAN_H
7	Batt +	7	CAN_L
8	ENC1_A+	8	Digital Input 6 (Digital only)
9	ENC1_B+	9	Digital Input 5
10	ENC2_A+	10	Digital Input 4
11	ENC2_B+	11	ENC3_B-
12	Universal Input	12	ENC3_A-

CANopen® is a registered community trademark of CAN in Automation e.V.

Form: TDAX030140-05/31/23