


TECHNICAL DATASHEET #TDAX06070X  
**Triaxial Inclinometer with Gyro**

**±180° Pitch/Roll Angle**  
**Pitch Angle Rate Acceleration**  
**SAE J1939, Analog Output or RS-232 Options**  
**2 M12 Connectors, IP67**  
**with Electronic Assistant®**

**P/N: AX06070X**

*An internal gyroscope minimizes the influence of dynamic linear acceleration on slope sensor readings.*

**Features:**

- Reliable, real-time, accurate and stable slope angle data
- MEMS-based accelerometer measures angle with respect to gravity
- MEMS gyroscope measures angular rate around the axis
- Measures pitch and roll inclination angles in a full ±180 degree orientation range
- Outputs accelerations in 3 orthogonal directions
- Provides an angular rate of rotation of the pitch angle
- Output: SAE J1939
- 12V, 24Vdc nominal power supply
- Aluminum enclosure, 2 round 5-pin A-coded M12 connectors, gasket, encapsulation
- IP67 protection
- CE mark pending
- Configurable using the **Electronic Assistant®** 



**Applications:**

- Level, tilt, pitch and acceleration monitoring in agricultural, off-highway and mining equipment
- Platform levelling and stabilization in industrial machines
- Robotics position sensing
- Navigation system component

**Ordering Part Numbers:**

**Inclinometers:**

**AX060700** – Triaxial Inclinometer, CAN (SAE J1939)

**Accessories:**

**Electronic Assistant®** over CAN (SAE J1939): **P/N: AX070502**

## Description:

The Triaxial Inclinometer measures pitch and roll inclination angles in a full  $\pm 180$  degree orientation range. Pitch angle is compensated by a gyroscope to minimize the influence of dynamic linear accelerations. The unit can also output gravity angle and unit accelerations in three orthogonal directions as well as an angular rate of rotation around the pitch angle.

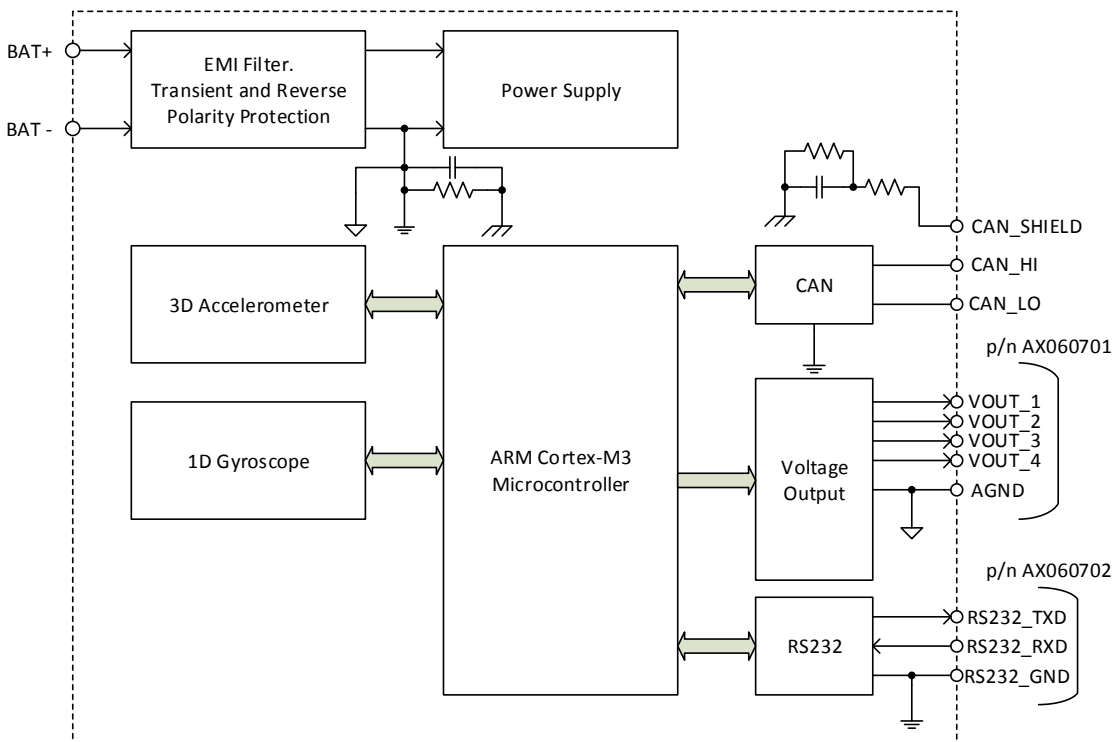
The angles are measured by a set of MEMS sensors, which senses acceleration caused by the gravity force in three orthogonal directions. The output signals from the MEMS sensors are normalized and processed by a microcontroller.

Inclinometer model options include: CAN networking via SAE J1939. Refer to the block diagram below.

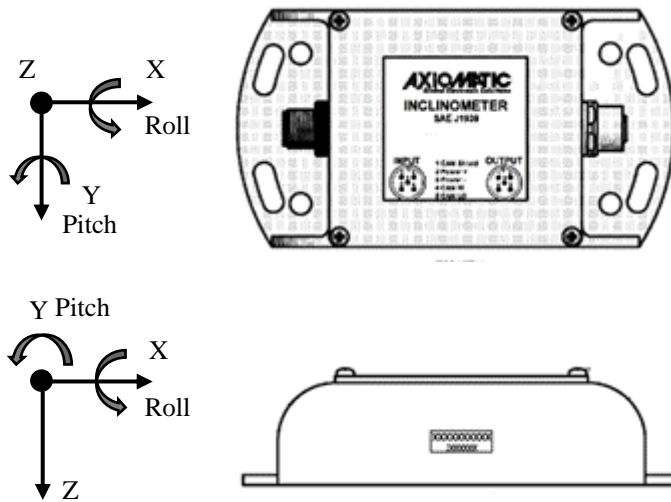
The inclinometer is IP67 rated and is packaged in a cast Aluminum housing. A dual 5-pin M12 connector configuration allows for networking the sensor in a machine control system. Other configurations are available on request.

The inclinometer transmits angular and angular rate data over the CAN bus using a standard J1939 protocol. The unit's default configuration can be changed using the PC-based Axiomatic Electronic Assistant® software.

## Block Diagram



## Unit Orientation



## 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](http://www.axiomatic.com/service.html).

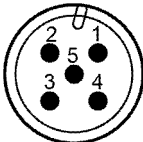
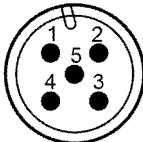
### Power Supply Input

Power Supply Input	12V, 24V nominal (9...36 VDC power supply range) Suitable for engine cranking, jump start and load dump conditions found in mobile equipment.
Supply Current	45 mA maximum at 24Vdc 85 mA maximum at 12Vdc
Protection	Reverse polarity and transient protection is provided.

### Outputs

Static Parameters	Inclinometer	Gyroscope
Measurement Range	±180° Pitch & Roll 0...180° Gravity	±100°/s Pitch
Resolution	±0.35° Maximum (All angles, except angle listed below.) 0.1° (Pitch angle with gyro compensation) Effective resolution (3.46* NoiseRMS) at cut-off frequency, Fc=5Hz	±0.11°/s Effective Resolution (3.46*NoiseRMS). Maximum at cut-off frequency, Fc=5Hz
Initial Accuracy	±1.5° Maximum, at 25°C	±2.5°/s Maximum, at 25°C
Temperature Drift	±1.5°C Maximum, at 0° over the full temperature range -40...85°C	±1.2°/s Maximum, at 0° over the full temperature range -40...85°C
Nonlinearity	±0.7% Maximum @ 25 °C	±0.5% Maximum @ 25 °C
Cross-Axis Sensitivity	±2.5% Maximum @ 25 °C	±1.7% Maximum @ 25 °C
Dynamic Parameters	Inclinometer	Gyroscope
Cut-off frequency, Fc	User configurable 1...50 Hz (5 Hz default)	User configurable 1...50 Hz (5 Hz default)
Settling Time	≤0.2 s Typical at default Fc. From 0 to 95% of the static output value.	≤0.1 s Typical at default Fc. From 0 to 95% of the static output value.

<b>CAN Parameters</b>	
CAN	1 or 2 CAN ports depending on model SAE J1939 (CANopen® is available on request.) For data transmission and for access to the configuration of the inclinometer. By default, the inclinometer transmits angular and angular rate information on the CAN network in PGN 61459, Slope Sensor Information. User configurable PGNs are also available on request.
Protection	Short circuit to ground Connection to the power supply (24V maximum)
ISO 11898	120 Ohm terminated twisted pair, baud rate up to 1MBit/s. Termination resistor is not installed.  A mating plug with CAN termination, P/N: AX070114, can be ordered for applications requiring a termination of the CAN network.

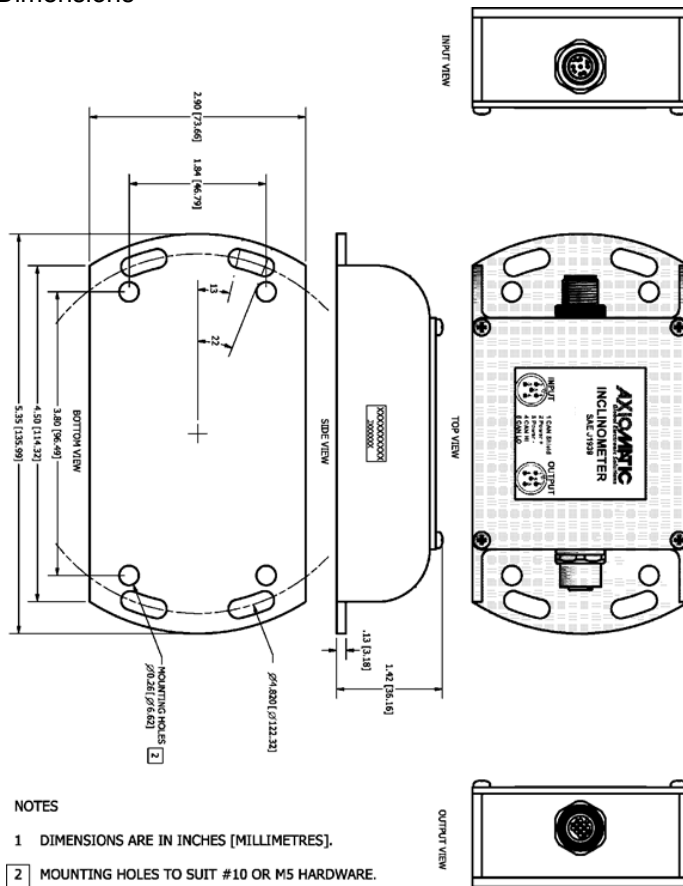
<b>Model AX060700: CAN</b>	
CAN	1 CAN port, SAE J1939 There is only one CAN port supported by the unit. Both CAN connectors are physically connected together to facilitate cable routing in the user system.
Electrical Connections Model AX060700	P/N: AX060700 (CAN SAE J1939)  <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>INPUT CONNECTOR</p>  <p>M12 Male FRONT VIEW</p> </div> <div style="text-align: center;"> <p>OUTPUT CONNECTOR</p>  <p>M12 female FRONT VIEW</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>1. CAN SHIELD 2. Power + 3. Power - 4. CAN HI 5. CAN LO</p> </div> <div style="text-align: center;"> <p>1. CAN SHIELD 2. Power + 3. Power - 4. CAN HI 5. CAN LO</p> </div> </div>

### General Specifications

Microprocessor	STM32, 32-bit, 128 Kbyte flash program memory
Sensors	MEMS acceleration and MEMS gyroscope sensors
Control Logic	User programmable functionality using Axiomatic Electronic Assistant®
User Interface	Axiomatic Electronic Assistant®, P/N: AX070502
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Enclosure and Dimensions	Cast Aluminum enclosure 2 Round M12 5-pin A-coded integral connectors Encapsulated, Lid Gasket Dimensions: 2.90 x 5.35 x 1.42 inches 73.66 x 135.99 x 36.16 mm (L x W x H)
Protection	IP67
CE Compliance	CE mark pending for EMC Directive RoHS compliant
Vibration and Shock	The sinusoidal component of the vibration testing was conducted following MIL-STD-202G, method 204D, test condition C (10g peak). A resonant frequency analysis was performed, no resonances were noted. Sweep Characteristic: 10Hz to 2000Hz to 10Hz Sweep Period: 20 Minutes Test Duration: 8hrs/axis Test Intensity: 10g Peak  The random component of the vibration testing was conducted meeting or exceeding the requirements of MIL-STD-202G, method 214A, test condition I/B (7.68 Grms): Frequency Range: 5Hz to 2000Hz Test Duration: 8hrs/axis Overall Grms: 7.68 Grms

	<p>The shock component of the vibration testing is based on MIL-STD-202G, method 213B, test condition A. The pulse duration was shortened to 9 ms from the standard 11 ms due to our vibration system limits. Eight pulses per axis were performed instead of six. The test was conducted as follows:</p> <p>Pulse Type: half sine  Pulse Duration: 9 ms  Peak Value: 50 g  Pulses per axis: 8</p>
Weight	0.85 lb, 0.39 kg
Installation	<p>Mounting holes accept #10 or M6 screws. The thickness of the mounting flange is 0.25 inch or 6.35 mm.</p> <p>The CAN wiring is considered intrinsically safe. All field wiring should be suitable for the operating temperature range of the module. CAN wiring may be shielded using a shielded twisted conductor pair and the shield must be grounded on the other end. All chassis grounding should go to a single ground point designated for the machine and all related equipment.</p>

## Dimensions



Note: CANopen® is a registered community trade mark of CAN in Automation e.V.

Form: TDAX06070X-10/02/17