- **TECHNICAL DATASHEET #TDAX060910-AX062018**

Triaxial Gyroscope Inclinometers

SAE J1939
2 M12 Connectors
with Electronic Assistant

P/N: AX060910, AX062018

Features:

- Reliable, real-time, accurate and stable slope angle as well as pitch, roll and yaw
- MEMS-based accelerometer data measures angle with respect to gravity
- MEMS gyro and MEMS accelerometer sensor data is fused to lead to an effective measuring unit under most operating conditions
- Measures pitch and roll inclination angles in a full ±180 degree orientation range
- Outputs gravity angle, pitch, roll and yaw angular rates and accelerations in 3 orthogonal directions
- SAE J1939
- Automatic baud rate detection (suitable for 250 kbps, 500 kbps and 1 Mbps networks)
- 12V, 24Vdc nominal power supply
- Aluminum enclosure, 2 round 5-pin A-coded M12 connectors, gasket, encapsulation (Option: 1 5-pin M12 connector)
- IP67 protection
- Configurable using the **Electronic Assistant**

Applications:

- Agricultural, off-highway and mining equipment
- Platform levelling and stabilization in industrial machines
- Robotics position sensing
- Navigation system component

General Description:

The unit measures pitch and roll inclination angles in a full ±180 degree orientation range. The angles can be compensated by a 3D or 1D gyroscope to minimize the influence of dynamic linear accelerations caused by vibrations and machine operational movements.

The unit can also output gravity angle; pitch, roll and yaw angular rates (the 1DG version – only roll angular rate) and unit accelerations in three orthogonal directions. The inclinometer transmits angular data over CAN bus using a standard J1939 protocol. The unit original configuration can be changed using Axiomatic Electronic Assistant® PC-based configuration tool.

Ordering Part Numbers:

Inclinometers:
AX060910 – Triaxial, 3 Gyroscope Inclinometer, CAN (SAE J1939), 2 M12 Connectors
AX062018 – Triaxial, 1 Gyroscope Inclinometer, CAN (SAE J1939), 2 M12 Connectors

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

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Technical Specifications:

Angular Measurements

Parameter	Value	Remarks
Measurement Range	±180° – Pitch & Roll 0…180° – Gravity	Defaults: • AX060910, ±90° Pitch & Roll; • AX062018, ±90° Pitch & ±180° Roll.
Gyro Compensation	Pitch, Roll, Gravity Roll	AX060910 AX062018
Resolution	0.06°	Effective Resolution (3.46*NoiseRMS). Maximum at Cut-Off Frequency Fc=5Hz
Initial Accuracy	±2.0°	Maximum
Temperature Drift	±3.0°	Maximum, in the full temperature range: -40…85°C
Nonlinearity	±0.1%	Maximum
Cross-Axis Sensitivity	±1.0%	Maximum
Cut-off frequency, Fc	1…35 Hz, 5 Hz default; 8 Hz with gyro compensation	User selectable (except for the gyro compensation)
Maximum Dynamic Acceleration	±6g	Maximum short-term linear acceleration per axis with gyro compensation

Angular Rate Measurements

Parameter	Value	Remarks
Measurement Range	±300°/s	Only Roll Angular Rate in AX062018
Resolution	0.2°/s	Effective Resolution (3.46*NoiseRMS). Maximum at Cut-Off Frequency Fc=5Hz
Offset Error	±1.3°/s	Maximum
Offset Temperature Drift	±0.6°/s	Maximum, in the full temperature range: -40…85°C
Sensitivity Error	±3%	Maximum, in the full temperature range: -40…85°C
Nonlinearity	±0.5°/s	Maximum, in the full temperature range: -40…85°C
Cross-Axis Sensitivity	±1.7%	Maximum
Cut-off frequency, Fc	1…35 Hz, 5 Hz default	User selectable

Inputs

Parameter	Value	Remarks
Supply Voltage	9…36 VDC	12V, 24V – nominal
Supply Current[1]	40 mA 75 mA	Maximum at 24V Maximum at 12V
Protection	Reverse polarity, Transients	
Jump Start Protection	Can withstand 80Vdc @ 25 °C for 2 minutes	Will restart once voltage drops back to the device's operating range.

[1] CAN bus is connected.

CAN Output

Parameter	Value	Remarks
Number of ports	1 CAN Port	To output data and change the internal configuration of the inclinometer.
Communication standards	SAE J1939	Full support for a J1939 ECU is provided. By default, the inclinometer transmits angular information on the CAN network in PGN 61481, Slope Sensor Information. User configurable PGNs are also available. The update rate is 10 mSec.
	Baud Rate	Automatic Baud Rate Detection. Refer to user manual. 250 kbit/s, 500 kbit/s, 667 kbit/s or 1 Mbit/s are supported.
	ISO 11898	120Ohm terminated twisted pair, baud rate up to 1MBit/s. Termination resistor is not installed.
	Bosch CAN protocol specification 2.0, Part A, B.	For the internal CAN controller.
Protection	Short circuit to ground	
	Connection to the power supply	Only for 12V systems. 24V max

General Specifications

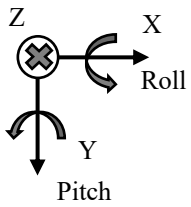
Parameter	Value
Sensor Type	MEMS gyro and MEMS accelerometer
Internal Logic	User Configurable with Electronic Assistant (EA), AX070502
Operating Temperature	-40…+85 °C
Environmental Protection	IP67
Vibration and Shock	MIL-STD-202G, method 204D, test condition C. Sinusoidal. 10G Peak, 10Hz-2000Hz-10Hz, 20 Minutes, 8hrs/axis. Custom, meets or exceeds: MIL-STD-202G, method 214A, test condition I/B. Random. 7.68 Grms, 10Hz to 2000Hz, 8hrs/axis.
Shock	Custom, based on: MIL-STD-202G, method 213B, test condition A. Half-Sine. 50G Peak, 9ms, 8pulses/axis.
Size	See dimensional drawing.
Weight	0.80 lb. (0.36 kg)

Compliance

Standard	Description	Conditions
IEC 60529	Degrees of protection provided by enclosures (IP Code).	IP67. Mating connectors compliant with IEC 61076-2-101:2012 should be installed.
CE Marking	EMC Directive RoHS Directive	

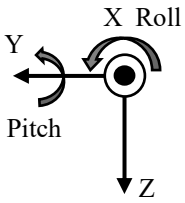
Installation Instructions:
The CAN wiring is considered intrinsically safe. All field wiring should be suitable for the operating temperature range of the module. CAN wiring may be shielded using a shielded twisted conductor pair and the shield must be connected to the CAN_SHIELD pin.

The unit coordinates, together with the Pitch and Roll directions are shown on the inclinometer label.
For 3D gyroscope modifications:



Z points vertically into the picture

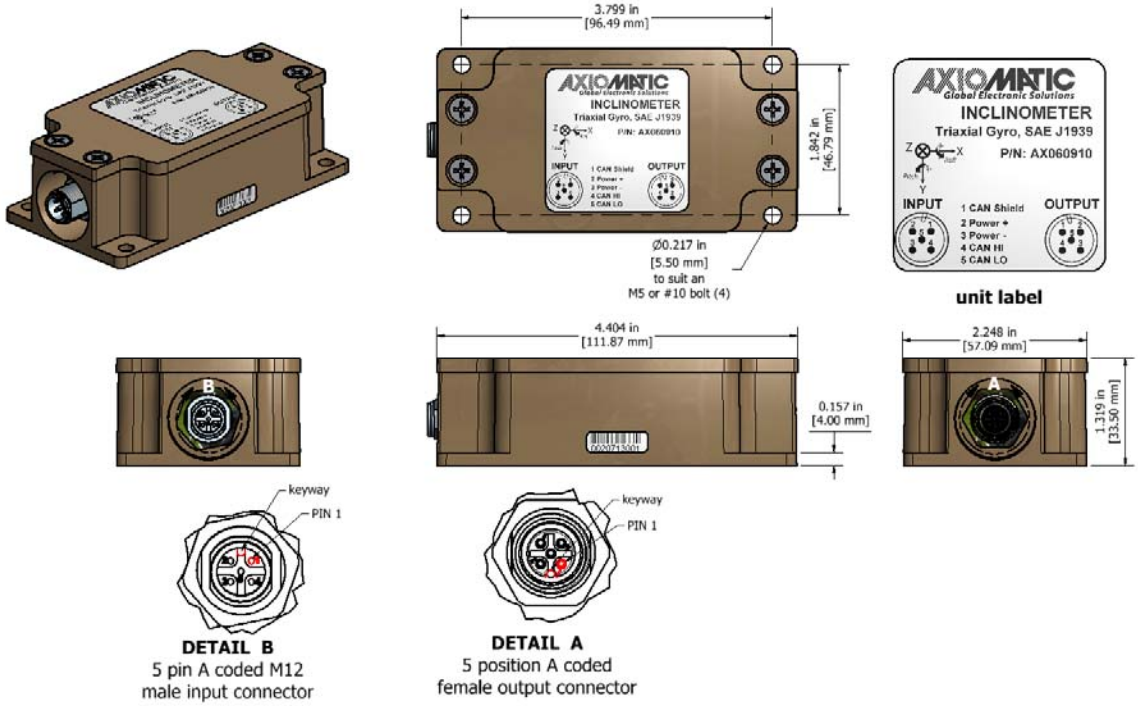
For 1D gyroscope modifications:



Install Vertically

X points horizontally toward the viewer
Z points down
Y points left

Dimensions:



Electrical Connections:
Model: AX060910, AX062018
There is only one CAN port supported by the unit. Both CAN connectors are physically connected to facilitate cable routing in the user system.

The unit contains two 5-pin M12 A-coded round connectors with CiA-303-1 pinout. Use mating connectors compliant with IEC 61076-2-101:2012.

CAN

M12 Male
FRONT VIEW

1. CAN SHIELD
2. Power +
3. Power -
4. CAN HI
5. CAN LO

CAN

M12 female
FRONT VIEW

1. CAN SHIELD
2. Power +
3. Power -
4. CAN HI
5. CAN LO

Form: TDAX060910-AX062018-04/16/20