Accurate, User-Configurable, Multi-Mount, All-in-One Inclinometer

DESCRIPTION

The H6MM inclinometer provides highly accurate, dual axis inclination sensing in a rugged environmentally protected housing. This unit incorporates MEMS sensing elements referenced to gravity with integrated temperature compensation over the entire industrial operating range of -40° to +85°C.

The H6MM provides two continuous and fully configurable analog outputs. These outputs can be individually set to current, voltage or open collector switch modes. The voltage output can be set to any value between 0V and 10V, the current output can be set to any value between 0mA and 24mA – either to any angle range between ±180°. The current and voltage outputs are linear with respect to the input angle directly.

The open collector switch output connects to signal common and can be set to trip above, below, between, or outside any angle threshold or window range. The transistor output can be used directly or to drive an external relay (up to 250mA drive capability).

The H6MM includes a polled, half–duplex (2-wire), RS-485 digital interface for angle measurements and configuration. The H6MM-CANOPEN includes CAN bus hardware implementing the CANopen protocol per CiA DS-301 and DSP-410.

All analog output parameters can be configured via the RS-485 interface to meet your specifications through the Flex Series Development Kit and software allowing the end customer to modify the sensor as needed right from a PC – providing full flexibility for R&D and OEM production lines. Horizontal and Vertical mounting are also user configurable.

Used as integrated devices by original equipment manufacturers (OEMs) or as standalone sensors for test and measurement, the H6MM is made for applications where high accuracy and long-term stability are required in noisy and wide temperature changing environments. For use with most applications including commercial, industrial, and military applications.

FEATURES

- *Dual Axis*
- *Horizontal and Vertical Mount*
- *Scalable Angle Range up to ±180°*
- *Fully Temperature Compensated*
- *Multiple, Simultaneous, Configurable Outputs*
  - *Current*
  - *Voltage*
  - *Open Collector Switch*
  - *RS-485*
  - *CANopen*
- *Daisy-chain Multiple Sensors*
- *Vibration and shock resistant*
- *Environmentally sealed IP68*
- *Rugged Aluminum housing*
  - *Optional Stainless Steel 316*
- *EMC protected to 100V/m*
- *Reverse Polarity Protection*
- *Overvoltage/overcurrent protection*
- *-40° to +85°C Operating Temperature*
- *CE Certified*

INDUSTRIES

- *Aerospace & Defense*
- *Construction*
- *Mining*
- *Offshore*
- *Transportation*

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TABLE 1: H6 SENSOR SPECIFIATIONS

INPUT PARAMETERS

SUPPLY VOLTAGE	+11..36 VDC Non-Regulated
SUPPLY CURRENT[1]	22mA @ 24VDC (Digital Output only)
	30mA nominal @ 24VDC (Analog Output - no load)
	75mA max @ 24VDC (Analog and Digital Outputs enabled)
	85mA max @ 12VDC (Analog and Digital Outputs enabled)
ANALOG MEASURING RANGE	Scalable within 360°
DIGITAL MEASURING RANGE	±180°
INPUT PROTECTION	Reverse Polarity, ESD & Surge Protected

ABSOLUTE ACCURACY OVER FULL OPERATING TEMPERATURE

RANGE: ±180°	±0.1º typical, ±0.2º absolute max
RESOLUTION	0.05º
RESPONSE TIME	6 user-configurable options from 4Hz to 0.3Hz

ANALOG CURRENT & VOLTAGE OUTPUT PARAMETERS

OUTPUT RANGES	Current	4..20 mA, 0..20 mA (Configurable within 0..24mA)	$R_{sense} \leq \dfrac{V_{supply} - 2.5}{0.020} - R_{wire}$
	Voltage	0..5 V, 0..10V (Configurable within 0..10V)	1kΩ load min.
SENSITIVITY[2]	Relative to Scaled Range		
NULL (0º)	Fully Configurable		

SWITCH OUTPUT PARAMETERS

OUTPUT MODE	Open Collector Switch to Signal Common
TRIP MODES	Fully Configurable (Window, Threshold, etc.)
SWITCH CAPABILITY	250mA @ 36V max

RS-485 DIGITAL OUTPUT PARAMETERS

OUTPUT TYPE	RS-485 Half Duplex (2-wire)
INCLINATION OUTPUT	32-Bit IEEE Packetized Float
BAUD RATE	125K Default (Configurable from 9600 to 250K)
BYTE FORMAT	8 Data Bits, No Parity, 1-stop Bit, No Flow Control
PACKET FORMAT	See Installation Manual for Packet Details and Commands
INFORMATION RATE	Polled (up to 20 times/sec)

CANOPEN DIGITAL OUTPUT PARAMETERS

CERTIFICATION	CiA201903-301V42/303-0233
OUTPUT TYPE	CANopen Half Duplex (2-wire) per CiA DS-301
INCLINATION OUTPUT	Per CiA DSP-410
BAUD RATE	500K Default (Configurable from 125K to 1M)
FUNCTIONS	TPDO (polled, cyclic, synchronized), parameterization per SDO and object registers, SYNC Consumer, EMCY Producer, Heartbeat Producer

TEMPERATURE RANGES	
OPERATING TEMPERATURE	-40ºF..+185ºF (-40ºC..+85ºC)
STORAGE TEMPERATURE	-49ºF..+194ºF (-45ºC..+90ºC)
MECHANICAL CHARACTERISTICS	
HOUSING	Aluminum, IP68, All-weather, Submersible
WEIGHT	18.6 oz. (525 Grams)
MOUNTING HOLES	Accept #8 or M4.5 screws (See Dimensional Drawing)
MOUNTING PLANE	User-configurable: Flat Horizontal Surface or Vertical Mount
OUTLINE DIMENSIONS	4.34" x 3.26" x 1.8" [110mm x 82.8mm x 45.7mm]
ELECTRICAL CONNECTION	See Electrical Connection Drawing

Notes:

1. Supply Current varies depending on outputs connected. Digital output only assumes analog output section is always active however current loop is not connected.

2. Sensitivity defined as (max analog output range) / (sensor input angle range). Ex, A current range set to 4..20mA with a ±30° input range will have a corresponding sensitivity of 16mA/60° or 0.267mA/°.

FIGURE 1: **Dimensions (inches [mm])**
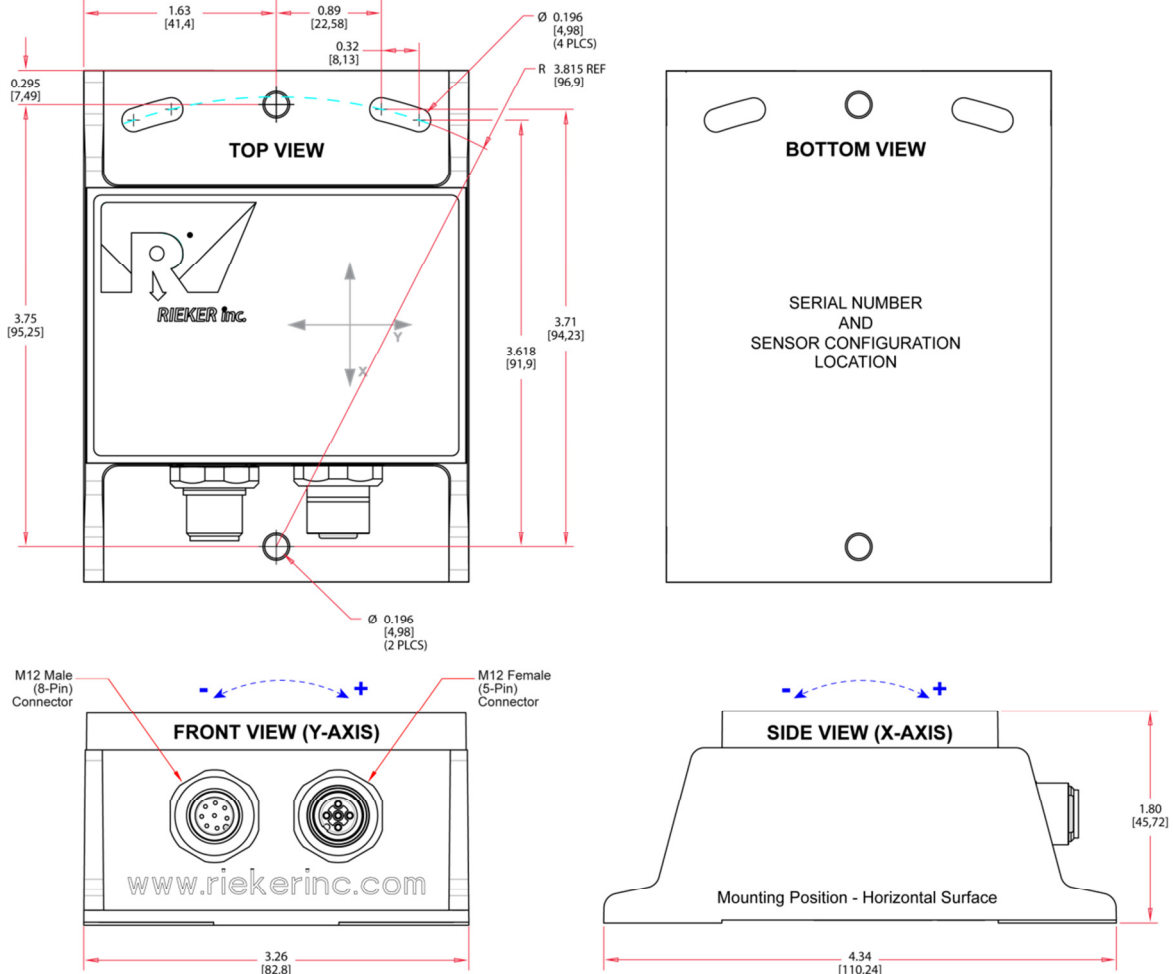
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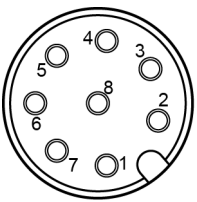**FIGURE 2:** **Mounting Positions**

The H6MM allows the end user to select between horizontal and vertical mounting positions via a special Flex Configurator Kit that includes Rieker Flexware app, (sold separately). Default output polarity shown is also configurable via the Flexware app. Note: The factory default mounting position is horizontal, lid up.
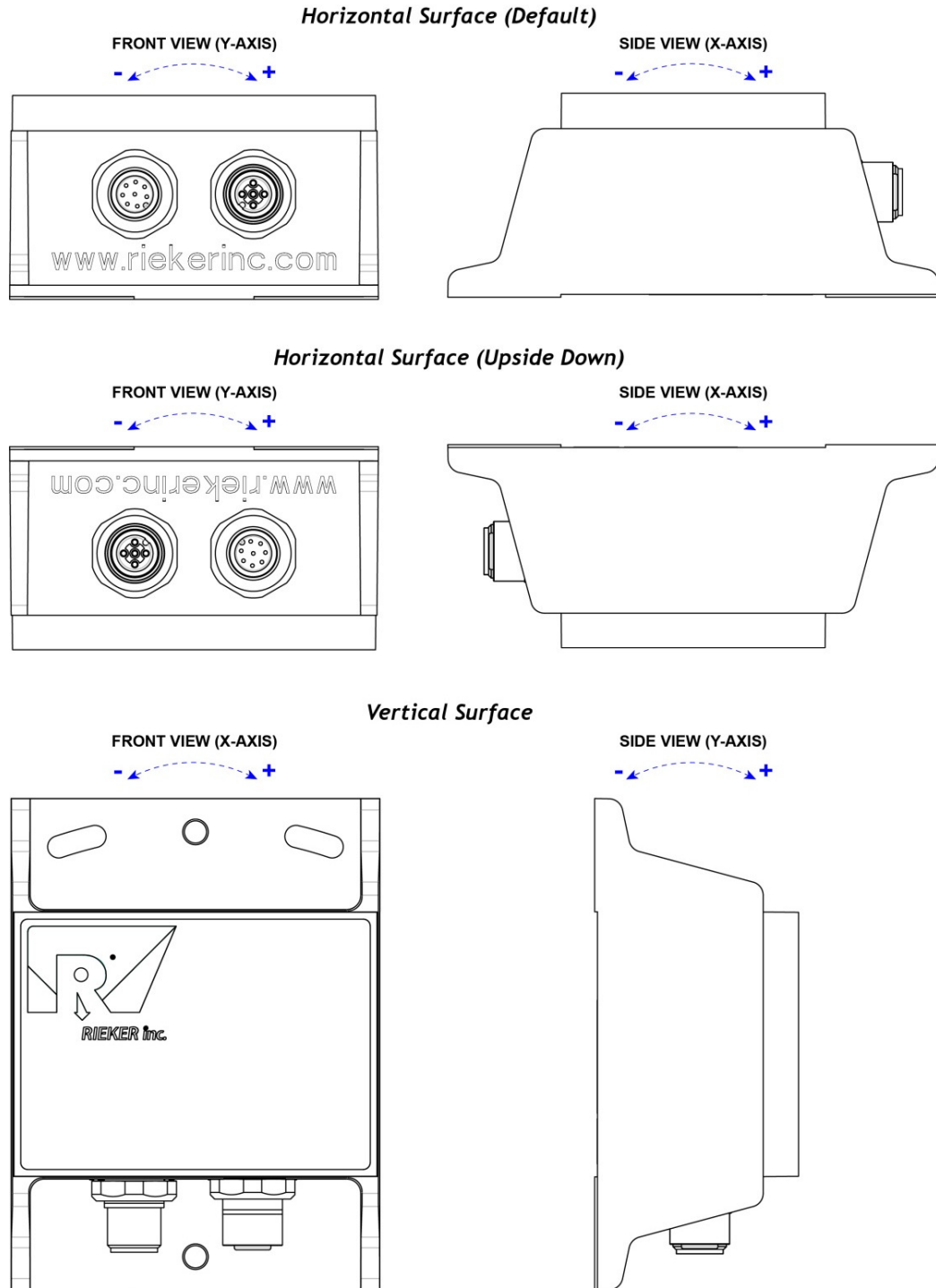
Horizontal Surface (Default)

FRONT VIEW (Y-AXIS) − +

SIDE VIEW (X-AXIS) − +

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Horizontal Surface (Upside Down)

FRONT VIEW (Y-AXIS) − +

SIDE VIEW (X-AXIS) − +

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Vertical Surface

FRONT VIEW (X-AXIS) − +

SIDE VIEW (Y-AXIS) − +

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TABLE 2: MALE 8-PIN INPUT CONNECTOR
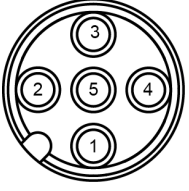
PIN	FUNCTION
1	SUPPLY VOLTAGE +11.. +36VDC
2	POWER / SIGNAL COMMON
3	RS485 D+ OR CAN HI
4	RS485 D- OR CAN LO
5	NO CONNECTION OR CAN SHIELD
6	ANALOG OUTPUT 1 (DEFAULT: X-AXIS)
7	ANALOG OUTPUT 2 (DEFAULT: Y-AXIS)
8	NO CONNECTION

M12 (male 8-pin)
Pin Assignment
FRONT VIEW

TABLE 3: FEMALE 5-PIN DIGITAL OUTPUT DAISY CHAIN CONNECTOR

PIN	FUNCTION
1	CAN SHIELD
2	SUPPLY VOLTAGE +11..+36VDC
3	POWER COMMON
4	RS485 D+ OR CAN HI
5	RS485 D- OR CAN LO

M12 (female 5-pin)
Pin Assignment
FRONT VIEW

TABLE 4: CURRENT SENSE

Rsense is dependent upon supply voltage and cable/wire resistance. Ensure the following equation is met:

$$R_{sense} <= \frac{V_{supply} - 2.5}{0.020} - R_{wire}$$

QUICK REFERENCE	
SUPPLY VOLTAGE	SENSE RESISTOR
12V	200-350 OHMS
24V	200-1000 OHMS
28V	200-1000 OHMS

TABLE 5: ACCESSORIES (SOLD SEPARATELY)

Flex Series Configurator Kit
- Flexware™ Toolkit Applications
- USB Interface Cable from Sensor to PC
- PN: Dev-Kit-C

Input / Output Interface & Daisy-chain Cables
- I/O Cable, mating connector to sensor, varying cable lengths w/ pigtail leads for input power and output.
- Daisy-chain cable, M12 8-pin to M12 5-pin, varying cable length for sensor to sensor connection.

Termination Resistor for Daisy-Chain Configuration
- Terminating Resistor M12 5-pin male

Display Box
- Single or Dual Line LCD
- 0.1º Resolution
- Battery or 12..24VDC input supply

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