# T-SERIES INDUSTRIAL INCLINOMETER

Analog Interface

## Introduction

T-Series industrial inclinometers are compact high performance sensors used to determine inclination in roll and pitch axes with excellent precision and at a high value. Whether using a molded plastic housing or an AW6082-T6 aluminum alloy housing, both versions offer mechanical stability and an encapsulated sensor. Both have a high environmental protection rating making them ideal for measuring tilt in harsh industrial environments.

## Main Features

- Dual Axis Measurement Range up to ±60°
- Option for a Single Axis Measurement Range of 360°
- High Resolution: 0.01°
- High Accuracy: 0.1°
- Glass Fiber Reinforced Plastic Housing available
- Factory Calibrated Linearity
- Temperature Compensated for Bias and Sensitivity
- Analog Interface: Voltage, Current
- Highest Protection Class: IP69K, IP68

## Electrical Features

- Highly Integrated Circuit in SMD-Technology
- Reverse Polarity Protection
- Over Voltage Peak Protection

## Applications

- Measurement of Inclination (pitch and roll) and Rotational Movements
- Cranes and Construction Machines
- Robotic Arms & Positioning Systems
- Mobile Platform stabilization
- Marine & Offshore Machinery

## SPECIFICATIONS

### Electrical

| | | | | | |
|---|---|---|---|---|---|
| **Model** | | T- M2 (or P2)- (Range) | | | T-M1 (or P1) - 360 |
| | | 15 | 30 | 60 | |
| **Measurement Range** | | ± 15° | ± 30° | ± 60 | 360° |
| **Number of Axes** | | 2 (Standard), 1 optional | | | 1 |
| **Analog Interface** | **Voltage** | 0.5 to 4.5 V, 0° = 2.5 V<br>Load ≥ 10 KΩ with 12 V DC | | | 0.5 to 4.5 V, 0° = 0.5 V<br>Load ≥ 10 KΩ with 12 V DC |
| | **Current** | 4 mA to 20 mA, 0° = 12 mA<br>Load ≤ 270 Ω1 | | | 4 mA to 20 mA, 0° = 4 mA<br>Load ≤ 270 Ω[1] |
| **Resolution** | | 0.01° | | | |
| **Accuracy (T = -10 °C to +40 °C)[2]** | | 0.1° | | | |
| **Sensor Response Time** | | 10 ms (Without Filter) | | | |
| **Recommended Measurement Rate** | | Up to 10 Hz | | | |
| **Supply Voltage[3]** | | 10 to 30 V DC (Absolute Maximum Ratings) for Voltage Analog Interface<br>15 to 30 V DC (Absolute Maximum Ratings) for Current Analog Interface | | | |
| **Power Consumption** | | ≤ 0.7 W | | | |
| **EMC** | | Emitted Interference: EN 61000-6-4 | | | |
| | | Noise Immunity: EN 61000-6-2 | | | |
| **Connection** | | Connector Output, 8 Pin M12 male (A-coded) | | | |

### Mechanical

| | |
|---|---|
| **Housing Material (Plastic)** | Glass Fiber Reinforced PBT (Polybutylene Terephthalate) |
| **Housing Material (Metal)** | AW6082 Corrosion resistant Aluminum alloy, passivated |
| **Potting Material** | PUR (Polyurethane) |
| **Shock (EN 60068-2-27)[2]** | ≤ 100 g (half sine, 6 ms) |
| **Vibration (EN 60068-2-6)[2]** | 1.5mm (10 to 58 Hz) & ≤ 20 g (58 to 2000 Hz) |
| **Weight** | 75 gm / 3 oz |

[1] RL < 500Ω with 15 V DC
[2] Further data available on request
[3] Inclinometers should be connected only to subsequent electronics whose power supplies comply with EN 50178 (Protective Low Voltage)

### Environmental

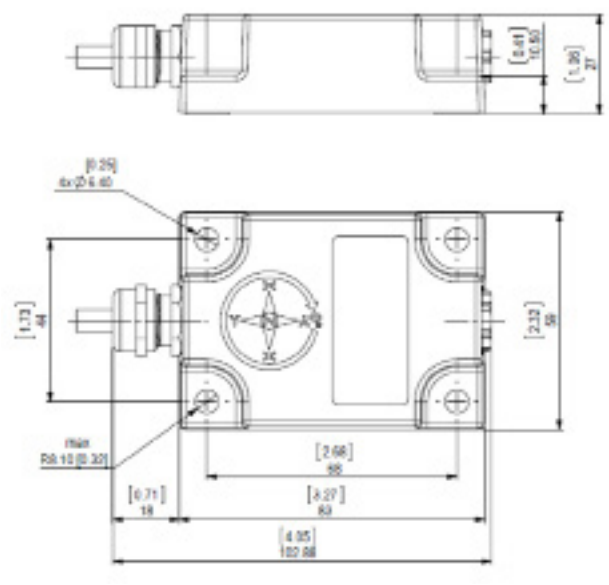
| | |
|---|---|
| **Operating Temperature** | -40 °C to +85 °C / -40 °F to 185 °F |
| **Humidity** | 98 % Relative Humidity, Non-Condensing |
| **Protection Class (EN 60529)** | IP 69K (With Appropriate Mating Connector and mounting), IP68 |

## DIMENSIONS

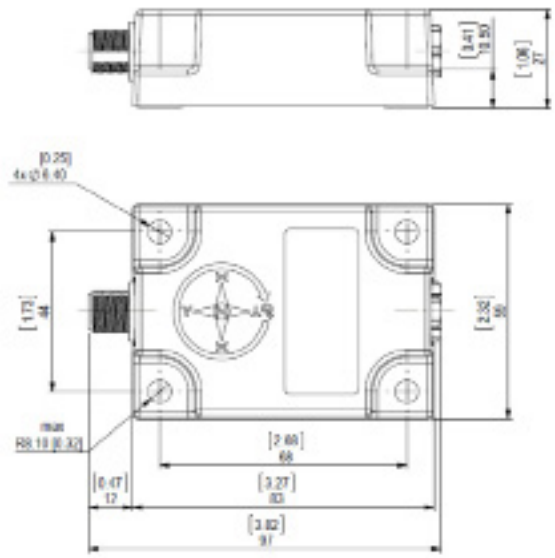
Dimensions in mm and [inches]

## Metal Housing Option

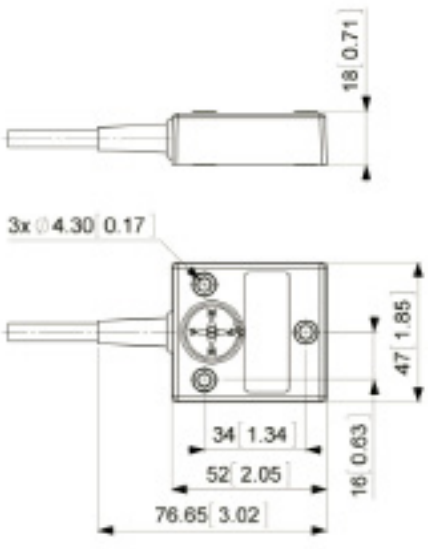
Cable Termination



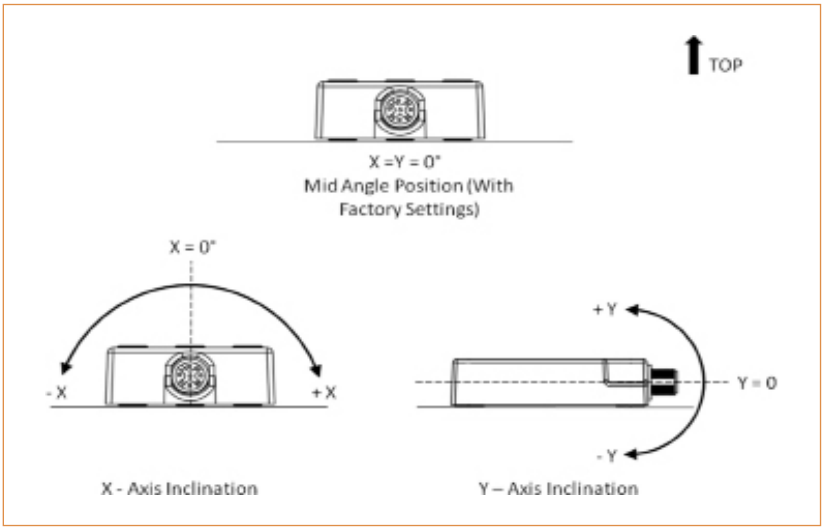
Connector Termination



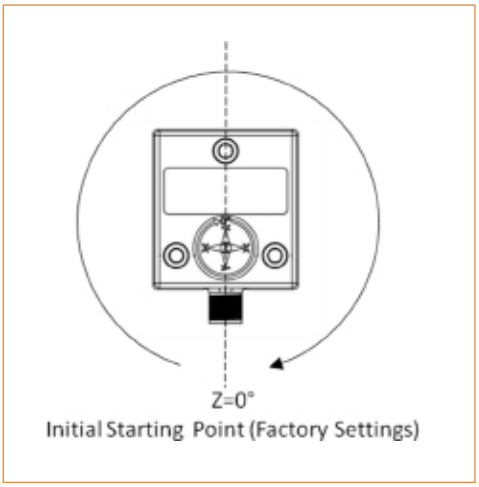
## Plastic Housing Option



## MEASUREMENT AXES (TWO AXIS UNITS)



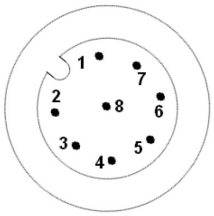

## MEASUREMENT AXIS - 360 (SINGLE AXIS INCLINOMETER)



## PIN ASSIGNMENT

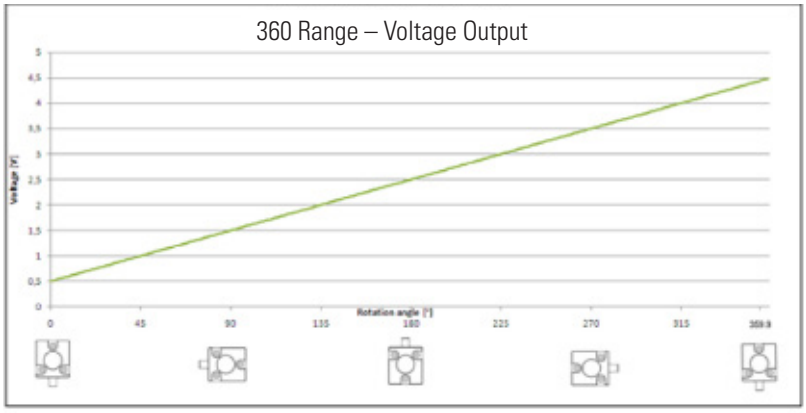
The inclinometer is connected via an 8 pin M12 A-coded round connector. (Standard M12, Male side at sensor, Female at mating connector).

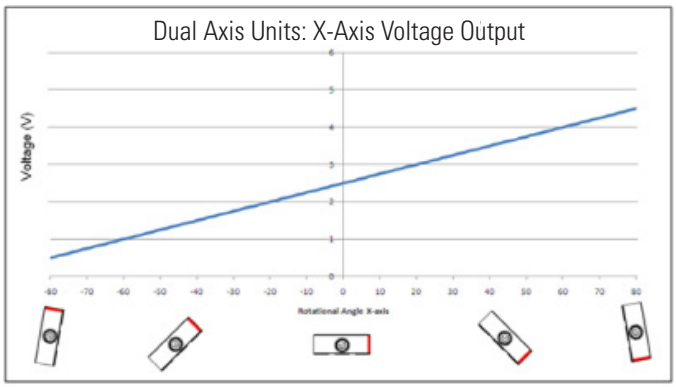
| Pin | Cable Color | Dual-Axis Units | Single Axis, 360° Units |
|---|---|---|---|
| 1 | Red | VS Supply Voltage | VS Supply Voltage |
| 2 | Gray | Spare (N/C) [1] | Spare (N/C) |
| 3 | Pink | Spare (N/C) | Spare (N/C) |
| 4 | Yellow | Ground (Signal Common) | Ground (Signal Common) |
| 5 | Green | X-axis Analog Output[2] | Z -Axis Analog Output[2] |
| 6 | Brown | Spare (N/C) | Spare (N/C) |
| 7 | Blue | Y-axis Output Analog2 | Spare (N/C) |
| 8 | White | Spare (N/C) | Spare (N/C) |

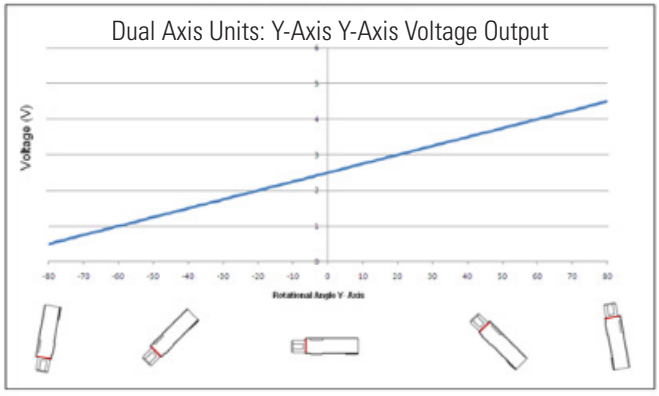



[1] Items marked Spare (N/C) should not be connected
[2] For single axis units, either the X-axis or the Y-axis is active as specified in the model. If not active, treat the axis as a Spare (N/C)

## VOLTAGE OUTPUT



## ORDERING OPTIONS

Example : T-M1X-15-A1-CS2

T – M1X – 15 – A1 – CS2

### Series

**T = Tilt Measurement**

### Housing/Axes

**M1X =** Metal, 1 Axis, X direction (Roll)
**M1Y =** Metal, 1 Axis, Y direction (Pitch)
**M2 =** Metal, 2 Axes
**P1X =** Plastic, 1 Axis, X direction (Roll)
**P1Y =** Plastic, 1 Axis, Y direction (Pitch)
**P2 =** Plastic, 2 Axes
Note: With a 360° range, use the 1 axis designation (i.e. M1)

### Measurement Range

**15 =** ± 15°
**30 =** ± 30°
**60 =** ± 60°
**360 =** ± 360°

### Output Type

**A1 =** 4-20 mA
**A4 =** 0 – 5V (Nominal)
Actual range is 0.5 to 4.5 VDC

### Termination Options

**M12/8 =** 8 Pin Connector
**CS1 =** Cable, 1 M
**CS2 =** Cable, 2 M
**CS5 =** Cable, 5 M
**CS10 =** Cable 10 M

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