

## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE



The Heavy Duty inclinometers are robust inclination sensors specially designed for applications involving rough handling and exposure to rigorous conditions. The die cast aluminium housing and the metal connector enhance the mechanical strength of the sensor and make it ideal for heavy duty usage.

### Main Features

- Dual Axis Inclinometer  $\pm 80^\circ$
- Single Axis Inclinometer  $360^\circ$
- High Resolution:  $0.01^\circ$
- Accuracy:  $0.1^\circ$
- Die-cast Aluminium Alloy Housing
- Digital Interface: RS232, Code ASCII
- Analog Interface: Voltage, Current
- High Protection Class: IP 69K, IP68, IP67

### Electrical Features

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

### Programmable Parameters

- Preset
- Baud Rate
- Software Filters
- Resolution
- Analog Teach-in

### Applications

- Measurement of Inclinations and Rotational Movements
- Construction Machines
- Cranes
- Mobile Platforms
- Marine & Offshore Machinery

## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE

### Technical Data

#### Electrical Data

Model		INC-080	INC-360
Measurement Range		± 80°	360°
Number of Axes		2	1
Analog Interface	Voltage	0.5 to 4.5 V , 0° = 2.5 V Load ≥ 10 KΩ with 12 VDC	0.5 to 4.5 V , 0° = 0.5 V Load ≥ 10 KΩ with 12 VDC
	Current	4 mA to 20 mA , 0° = 12 mA Load ≤ 270 Ω <sup>1</sup>	4 mA to 20 mA , 0° = 4 mA Load ≤ 270 Ω <sup>1</sup>
Digital Interface		RS232 (ASCII Format)	
Baud Rate		Max. 115200 Baud (Programmable)	
Resolution		0.01°	
Accuracy (T = -10 °C to +40 °C)*		0.1°	
Sensor Response Time		10 ms (without filter)	
Recommended Measurement Rate		Up to 10 Hz	
Supply Voltage**		10 to 30 V DC (Absolute Maximum Ratings)	
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 Data

Housing Material	Die-cast Aluminum Alloy
Potting Material	Polyurethane
Shock (EN 60068-2-27)*	≤ 100 g (half sine, 6 ms)
Vibration (EN 60068-2-6)*	1.5 mm (10 Hz to 58 Hz) & ≤ 20 g (58 Hz to 2000 Hz)
Weight	170 gm / 6 oz

<sup>1</sup> R<sub>L</sub> < 500Ω with 15V DC

\* Further data available on request

\*\* Inclinometers should be connected only to subsequent electronics whose power supplies comply with EN 50178 (Protective Low Voltage)

## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE

### Environmental Conditions

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 Counter Connector), IP68, IP67

### MTBF Data

Failure Rate [FIT]	759
MTBF [Hours]	1,317,822
MTBF [Years]	150

The data mentioned above were calculated for electronics under the following conditions:

SNA: Non-mobile operation

Tu: 40°C - Mean component of ambient temperature

Zf: Continuous operation for 8760 h per year

### Default Factory Settings

Description	Value
Operational Mode	Continuous Mode
Resolution	0.01°
Output Transmission Rate	100 ms
Baud Rate	9600 Baud
Moving Average Filter	20
Angle Offset	0°

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### Programmable Parameters

The parameters of inclinometer can be re-configured using the RS232 interface . Additionally Preset can also be done through a (soon to be available) Analog Teach-in. (Refer User Manual for additional information).

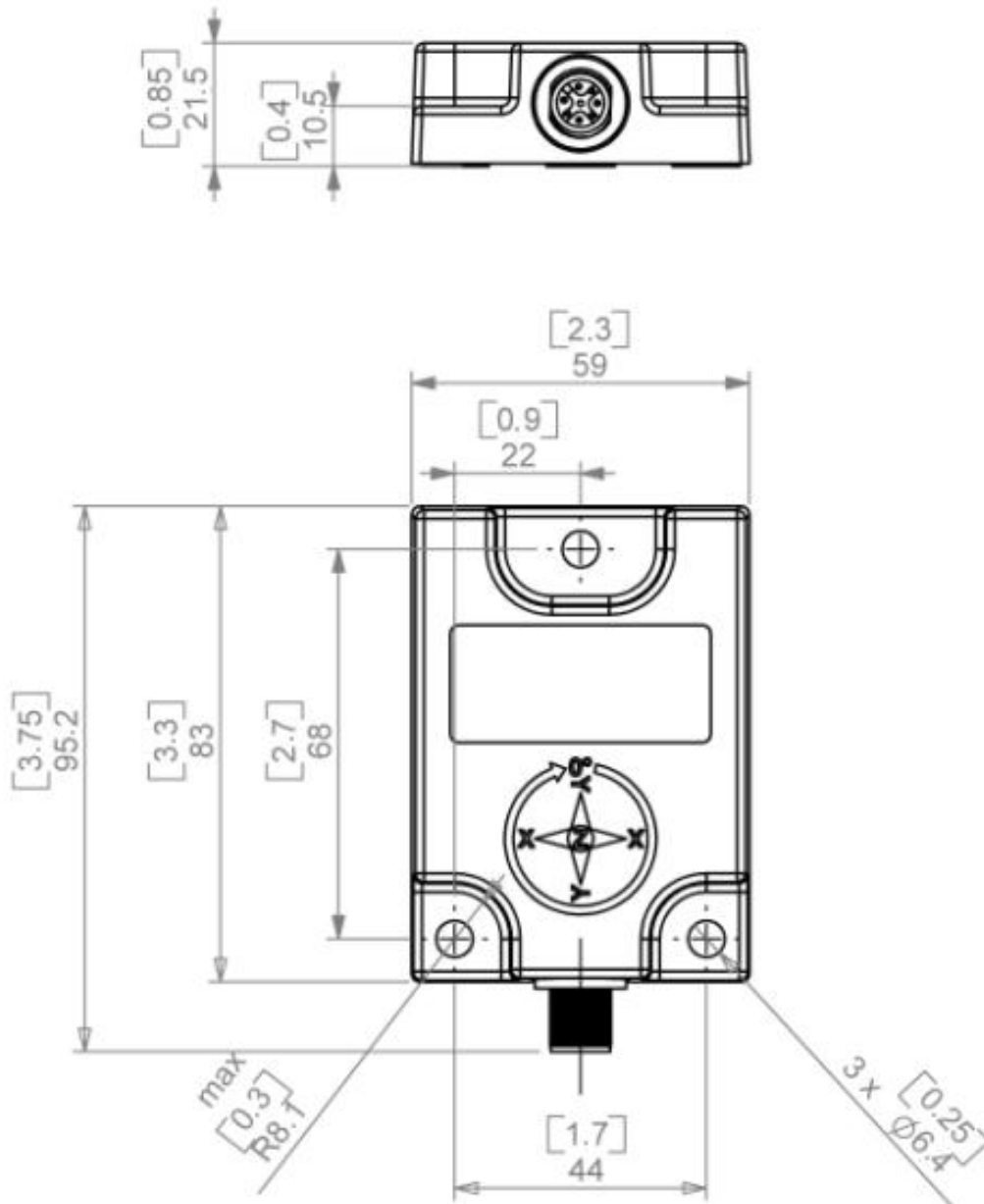
Modes of Operation	Can be switched between Polled Mode or Continuous mode.
Baud rate	The Baud rate can be programmed to lie between ranges of 2400 Baud and 115200 Baud.
Output Transmission Rate	The transmission rate of angular values can be adjusted to lie between 62.5 ms and 10 seconds per value.
Moving Average Filter	Used to calculate the output position value as an average over last N values where N varies from 2 to 100 measurements in steps of $N = n^2$ , $n = 1, 2, 3 \dots$
Resolution <sup>2</sup> Per 1°	The parameter, resolution per degree is used to program the desired number of angular divisions per 1° of rotation.
Preset Value	The current position value is set to the mid angle position by the parameter preset.

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<sup>2</sup> The resolution programming functionality is not yet fully operational.

## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE

### Mechanical Drawing – Heavy-Duty Housing

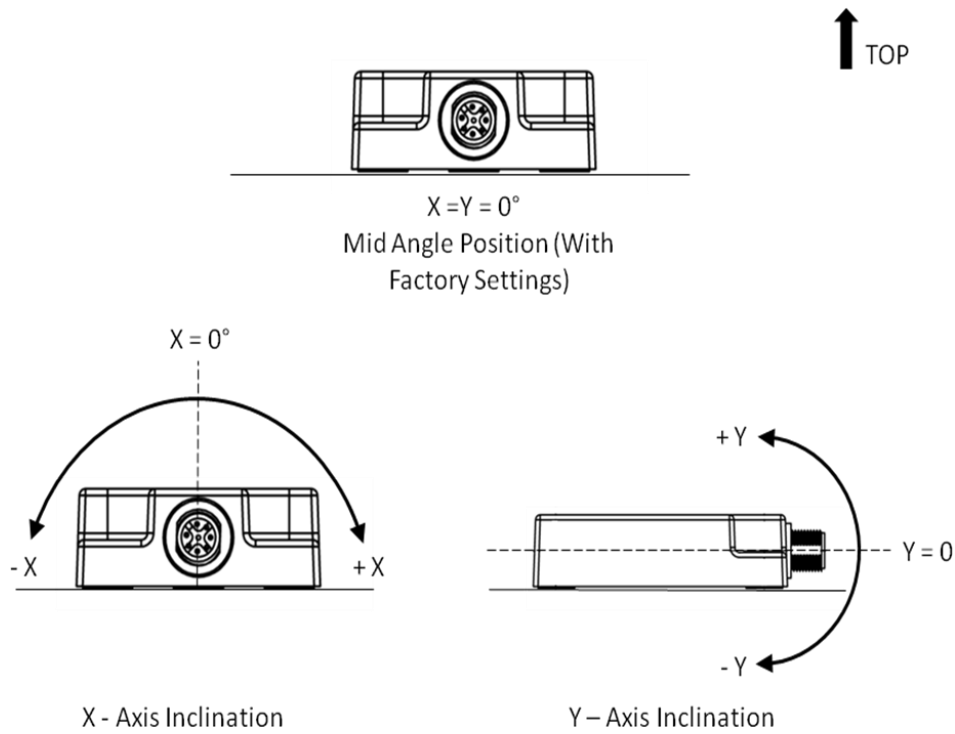


Dimensions in mm and [inches]  
For more detailed drawings please refer website.

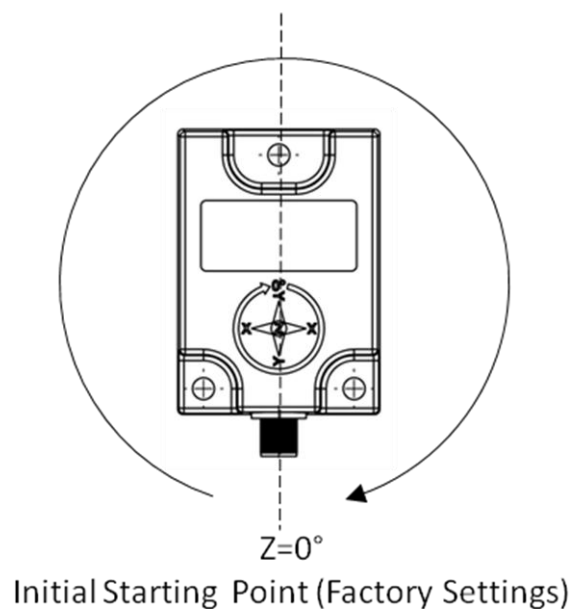
## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE

### Measurement Axes

INC-080 – Dual Axis Inclinometer



INC-360 – Single Axis Inclinometer



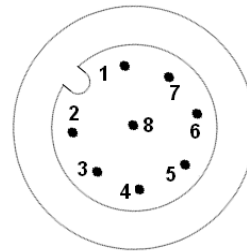
## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE

### Pin Assignment

The inclinometer is connected via an 8 pin M12 A-coded round connector.

(Standard M12, Male side at sensor, Female at connector counterpart or connection cable).

Pin	Description of INC-080	Description of INC-360
1	V <sub>S</sub> Supply Voltage	V <sub>S</sub> Supply Voltage
2	RxD (RS232 Receive)	RxD (RS232 Receive)
3	TxD (RS232 Transmit)	TxD (RS232 Transmit)
4	Ground	Ground
5	X-axis Analog Output	Z -Axis Analog Output
6	Preset/Set1 (Teach-In)	Preset/Set1 (Teach-In)
7	Y-axis Output Analog	Unused, Do Not Connect
8	DIR/Set 2 (Teach-In)	DIR/Set 2 (Teach-In)

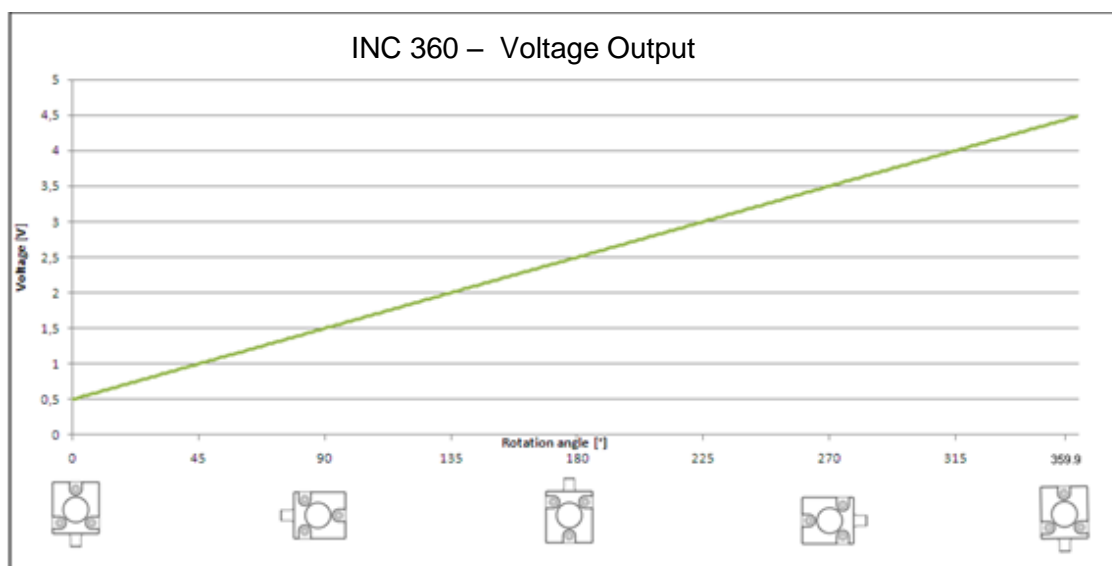


For more detailed information about setup, measurement axes and programming, refer RS232-Analog Manual.

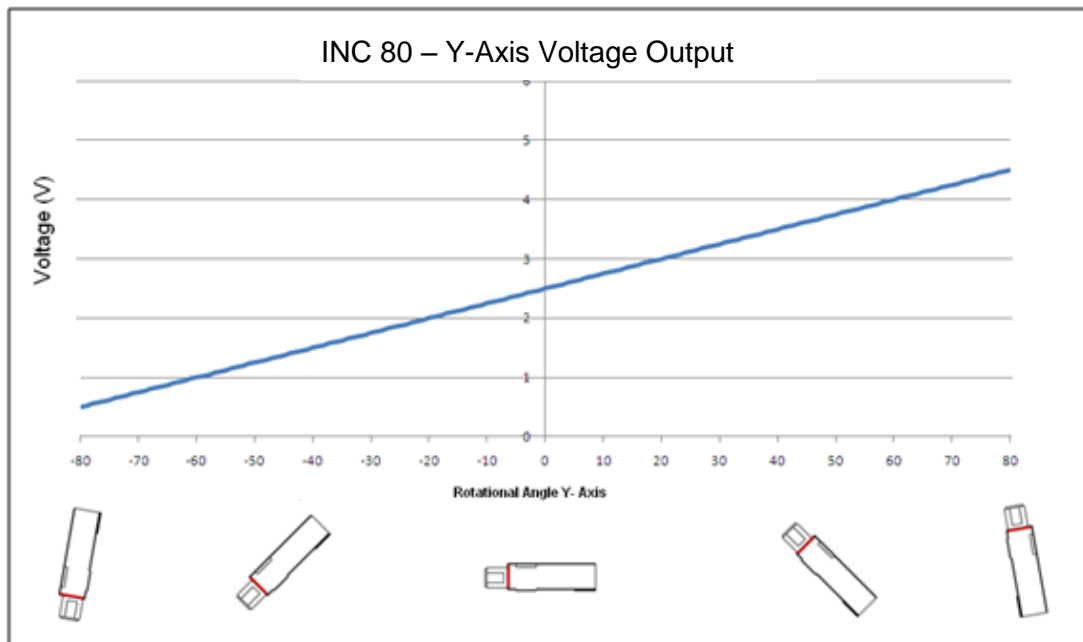
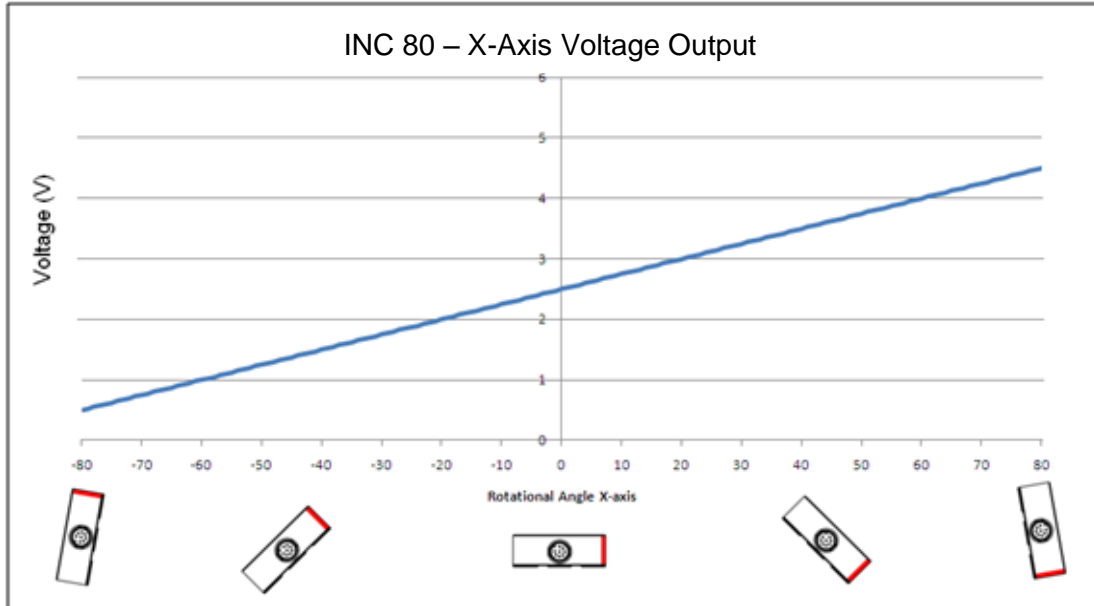


Please read the instruction leaflet carefully prior to installation.

### Voltage Output



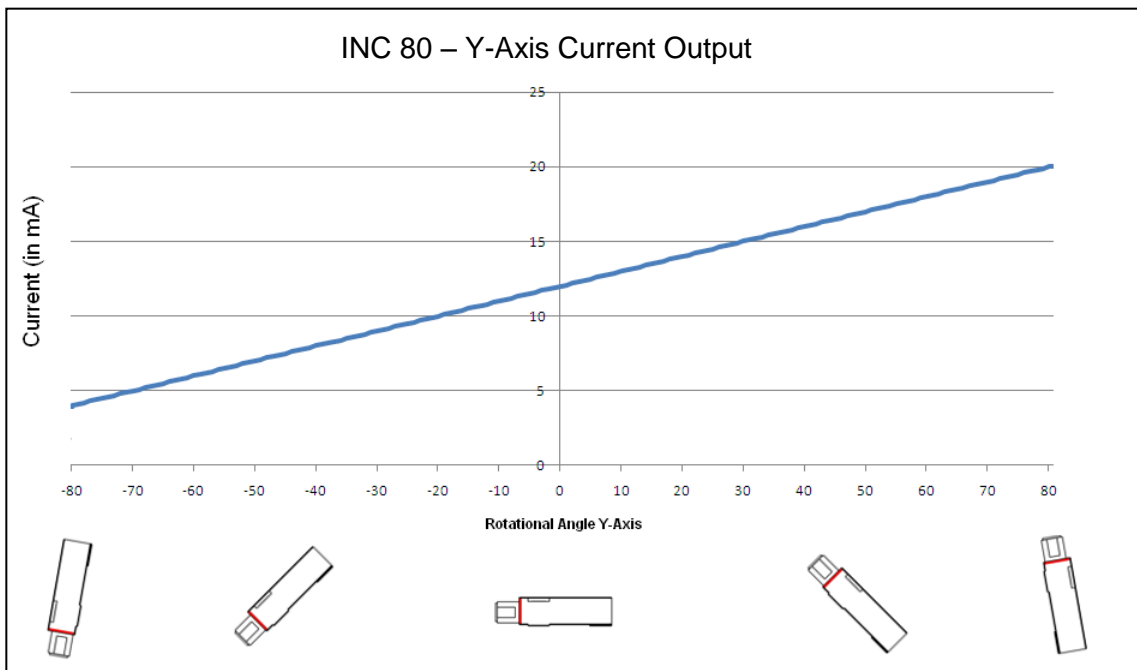
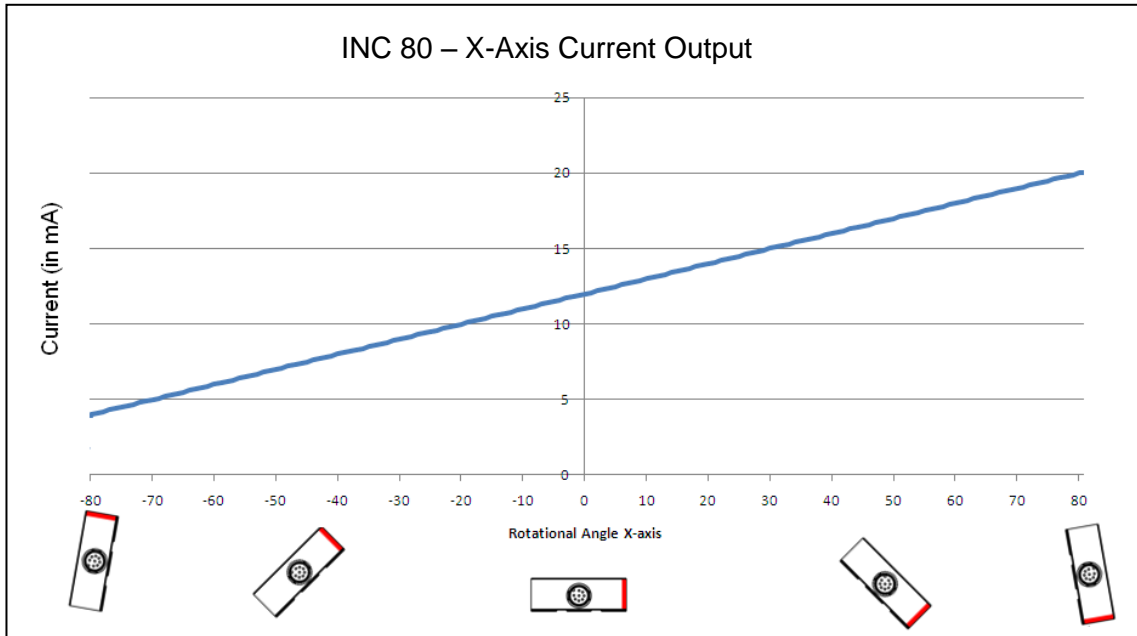
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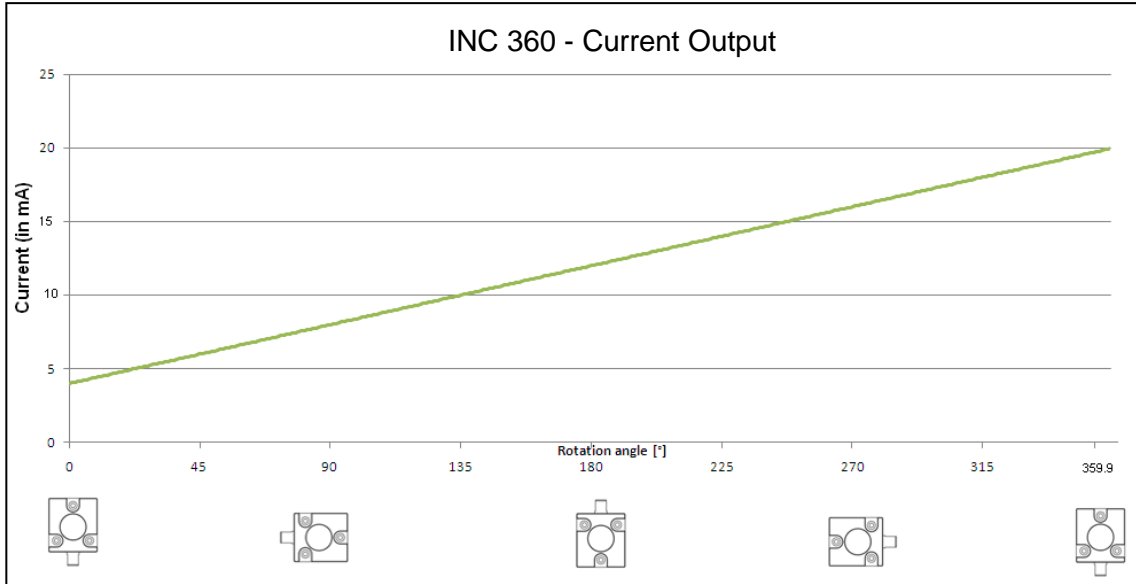


## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE

### Current Output



## HEAVY DUTY INCLINOMETER ANALOG & RS232 INTERFACE



### Models/Ordering Description

Description	Type key	XXX-	X-	XXX-	X-	X	X	X-	XX
Range	360° (1 axis) ± 80° (2 axis)	360 080							
Number of axis	One for 360° Version Two for ± 80° Version		1 2						
Interface	RS232 + Voltage 0.5 to 4.5 V RS232 + Voltage 0 to 10 V RS232 + Current 4 to 20 mA			SVO SV2 SC0					
Version	Software Version				0				
Mounting	Vertical for 360° Version Horizontal for ± 80° Version					V H			
Housing Material	Heavy-Duty						H		
Inclinometer Series	Version II							2	
Connection	Connector								PM

### Typical Type-keys

INC-360-1-SV00-VH2-PM  
 INC-080-2-SV00-HH2-PM  
 INC-360-1-SC00-VH2-PM  
 INC-080-2-SC00-HH2-PM

We do not assume responsibility for technical inaccuracies or omissions. Specifications are subject to change without notice.