

## Standard MEMS Inclinometer

DIGITAL ADVANCED SENSORS **DAS**

# MSENS-IN



Standard MEMS sensor series MSENS is representative sensor series of DAS that applied Extended Kalman Filter and provides high performance and reliability.

MSENS can be applied for wide applications such as heavy industries, warehouse and factory automation, robot industries, medical and other various industry areas.

- High performance MEMS based inclinometer (tilt sensor)
- Micro-Processor mounted for stable sensing and data processing
- Extended Kalman Filter, noise filtering and temperature compensation
- Customized specifications for applying various industry areas



### General Specifications

Item	Specification	
Measuring Range <sup>1)</sup>	Uniaxial	+/-1 ... +/-180 deg
	360	0 ... 360 deg
	Biaxial	+/-5 ... +/-80 deg
Resolution	0.1 deg	
Non-Linearity	0.25% FS	
Response	< 0.1sec	
Output	0.5 ... 4.5Vdc 4.32 ... 19.68mA RS485 <sup>2)</sup>	
Power Source	10 ~ 30Vdc	
Current Consumption	< 60mA @ 12Vdc	
Operating Temp.	-20 ... +85 celsius	
Waterproof	IP65	
Dimensions <sup>3)</sup>	W42 x D57 x H20mm	
Weight	68g	
Cables	Shielded 3C / 4C, 50cm	

#### <sup>1)</sup> Measuring Range

\*Uniaxial : Set freely within +/-1 ... +/-180 deg  
e.g. -30 ... +90 deg / 0 ... +120 deg

\*Uniaxial 360 deg : 0 ... 360 deg (Fixed)

\*Biaxial : Each axis within +/-5 ... +/-80 deg

#### <sup>2)</sup> Self-designed-protocol

#### <sup>3)</sup> Without Mounting

### Sensing Directions

X-axis [Floor]	X-axis [Wall]
Y-axis [Floor]	Y-axis [Wall]

### Wiring Connections

MSENS series is wired by MG610331-5 plug (Korea Electric Terminal Co., Ltd.). The plug can be deleted when placed order.

Axial	Color	Analog	RS485 <sup>4)</sup>
Uniaxial	RED	V+	
	BLACK	GND (COM)	
	GREEN	X+	A (T+)
Biaxial	WHITE	Y+	B (T-)

<sup>4)</sup> RS485 has always 4C.

### Analog Data Descriptions

1) Deg. from Analog – Vdc output

$$= \left( \frac{\text{Measuring Range}}{\text{Output V Range}} \right) \times (\text{Output V} - \text{Zero Offset})$$

Measuring Range : max range – min range  
 Output V Range : 4.5V – 0.5V = 4V  
 Zero Offset : 2.5V  
 e.g. Measuring range  $\pm 90^\circ$ , Output 3.5V,

$$\left(\frac{+90 - (-90)}{4}\right) \times (3.5 - 2.5) = +45^\circ$$

## 2) Deg. from Analog – mA output

$$= \left(\frac{\text{Measuring Range}}{\text{Output mA Range}}\right) \times (\text{Output mA} - \text{Zero Offset})$$

Output mA Range : 19.68 – 4.32 = 15.36mA  
 Zero Offset : 12mA

## RS485 Protocol

### 1) Communication Standards

Baudrate	9,600	Data Bits	8
Stop Bits	1	Parity	None

### 2) Data Format (ASCII)

= STX + X deg + SP + Y deg + ETB +  
 Check Sum + \$

- ✓ [SP + Y deg] is skipped for uniaxial.
- ✓ Check Sum : Substitute ASCII of each bytes for HEX and calculate by XOR.

### 3) Commands (not case sensitive)

Carriage Return and Line feed must be attached to end of any commands.

e.g. #DATA+CR+LF

#DATA	Measure data once.
#READ	Measure data continuously.
#STOP	Stop measuring.
#INFO	Check the sensor information.
#DAS1178	Enter ID set mode.
#ID {NO} <sup>4)</sup>	Set ID to {NO}.

<sup>4)</sup> ID can be set within 0...80.

(in HEX, plus B0 to ID : B0...FF)

<sup>5)</sup> To complete ID set, Set ID on ID set mode, power off and on again.

- ✓ Multiple sensors on parallel connection, can measure individual sensor data ; set individual sensor ID and send below command in HEX. (CR+LF is unnecessary.)
- ✓ Command : Sensor ID [B0 ... FF] + 05

e.g. (HEX) B1 05

## Ordering Code

Format : MSENS-IN-(1)-(2)-(3)-(4)-(5)

(1)	S	Uniaxial
	D	Biaxial
	360	Uniaxial 360
(2)	MV	0.5 ... 4.5Vdc output
	MA	4.32 ... 19.68mA output
	485	RS485 output
(3)	Measuring Range	(Settable)
(4)	F	sensing direction of [Floor]
	W	sensing direction of [Wall]
(5)	CW	Clockwise (default)
	CCW	Counter-Clockwise

e.g. MSENS-IN-S-MV-90-F-CW

## Options

- 1) Receptacle P/N : MG64REC
- 2) Cable length : additional cost per meter
- 3) The plug can be deleted when placed order.

## NOTES

- 1) Ground connection is recommended in noise occurred environment.
- 2) MEMS based inclinometer (tilt sensor) measures tilt (degree) by gravity. Check sensing directions before use.
- 3) Check wiring connections before use.
- 4) 12 months warranty is provided after released. Warranty provided only in case of using for designed purpose correctly.
- 5) Specifications, design and components of the system can be changed without prior notice to improve its performances.

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