



### CHARACTERISTICS

MEMS technology
High protection level IP67 and wide temperature range from -40°C ... +85°C
Stable accuracy over whole temperature range
Resolution up to 0,01°
Single axis 0° to 360° or ±180°
Double axes ± 1° to ± 60°



### ADVANTAGES

Instantaneous Gyro-compensated measure
Excellent accuracy
Reliability and long service life for outdoor applications
Very compact dimensions
High shock/vibration resistance



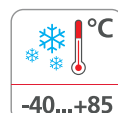
High protection level



Shock/vibration resistant



Reverse polarity protection



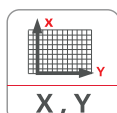
Wide range temperature



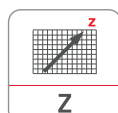
MEMS sensors technology



Analog output



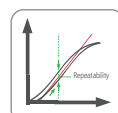
Horizontal version



Vertical version



High accuracy



High repeatability



Directive 2011/65/EU



EU conformity

# TLP300

## INCLINATION SENSOR

Inclination Sensor in MEMS Technology



### PRODUCT DESCRIPTION

TLP300 is available with one or two measurement axes. The inclinometer working principle is based on a micro machined silicon capacitive transducer (developed with MEMS technology).

Utilizing gyro-compensated MEMS technology, the sensor position signal is instantaneous with no delays and has a static excellent linearity.

TLP300 is suited for applications (cranes, aerial platforms, drilling machines and excavators) in harsh environments which are exposed to motion, shock and vibration, especially for mobile machines.



### PRODUCT CODE

TLP300.	<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	ORDER CODE

<b>a</b>	Power supply
<b>2</b>	= 9 ... 30 V DC (STD)
<b>3</b>	= 12 ... 30 V DC (only for outputs 4; 7)

<b>b</b>	Measurement direction
<b>O</b>	= Dual axes
<b>V</b>	= Single axis (for 0...XXX° version)
<b>V1</b>	= Single axis (for ±XXX° version)

<b>c</b>	Range
<b>XXX</b>	= FS angle deg for single axis*
<b>XXX</b>	= ± angle deg. for double axes**

<b>d</b>	Output
<b>2</b>	= 0,5 ... 4,5 V DC
<b>3</b>	= 0 ... 5 V DC
<b>4</b>	= 0 ... 10 V DC
<b>7</b>	= 4 ... 20 mA

<b>e</b>	Type of connection
<b>1</b>	= Male connector M12x5, PUR cable 30cm
<b>2</b>	= Male flange connector 1xM12, 5-pin

<b>f</b>	Version output
<b>S</b>	= Single
<b>R</b>	= Redundant (only for vertical versions)***

<b>g</b>	Version output
<b>0</b>	= Static (without gyro-compensated)
<b>1</b>	= Dynamic (with gyro-compensated)

\* = value for O = 050 (±50°) ; V = 090 (0 ... 90°) ; V1 = 040 (±40°)

\*\* = value of 010 means range ±10°

\*\*\* = Output Z1 = CW & Output Z2 = CCW

The company reserves the right to make any kind of design or functional modification at any moment without prior notice.



### TECHNICAL SPECIFICATION

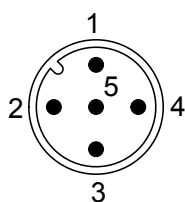
Measuring range	$\pm 1^\circ$ to $\pm 60^\circ$ for horizontal version $0^\circ$ to $360^\circ$ for vertical version or $\pm 180^\circ$
Accuracy (+25 °C)	$< \pm 0,3^\circ$
Resolution	0.01°
Temperature coefficient	0,01 °/°C
Protection	IP67
Temperature range	-40°C ... +85°C [-40°F ...+185°F]
Material housing	PA6 + GF30%
Initialing time	<0,3 s after power on
Weight	approx. 100 g [3.53 oz]
Shock resistance	acc. to EN 60068-2-27 30 G, 11 ms
Vibration resistance	acc. to EN 60068-2-6 10 ... 500 Hz



### ELECTRICAL CHARACTERISTICS

Power supply	9 ... 30 V DC (STD) see more detail on order code
Reverse polarity protection	YES
Electromagnetic compatibility	acc. to EN 61326-1, EN 61326-3-1
CE compliant	acc. to EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

### ANALOG ELECTRICAL CONNECTION M12 X 5 PINS



Pinout

	Single axis	Dual axes
1	+Vin	+Vin
2	V / I out Z 2*	V / I out Y
3	GND	GND
4	V / I out Z 1	V / I out X
5	zero input**	zero input**

\* = ONLY FOR REDUNDANT VERTICAL VERSIONS IN OTHER CASES SHOULD NOT BE CONNECTED

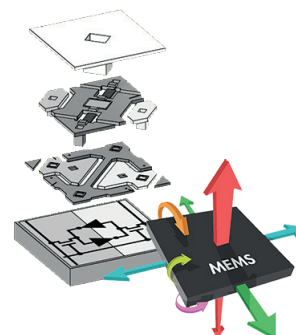
\*\* = CONNECT TO GND FOR TWO SECONDS IN ORDER TO HAVE OFFSET



### OPERATING PRINCIPLE

#### Operating principle

MEMS (acronym for Micro Electro Mechanical Systems) technology enables both electronic circuits and opto-mechanical devices to incorporate on the same silicon substrate, using manufacturing technologies similar to those used for the implementation of integrated circuits.



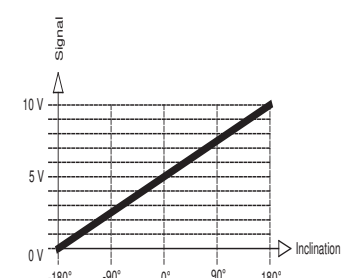
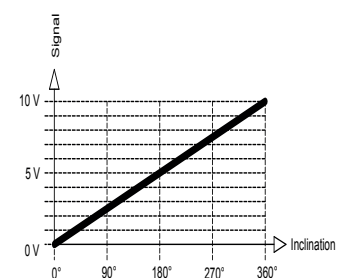
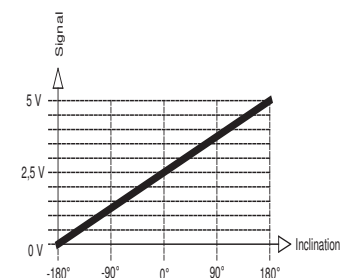
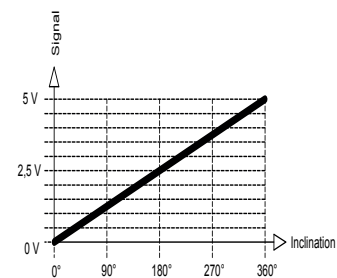
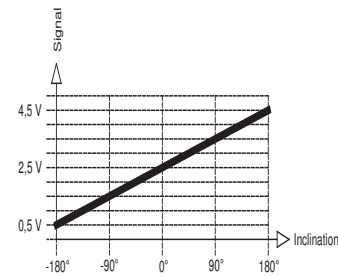
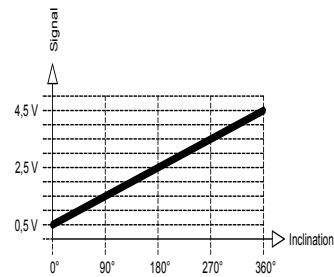
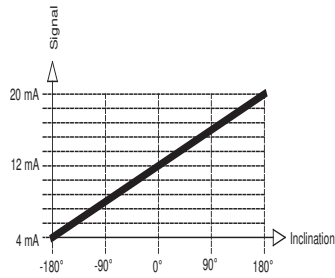
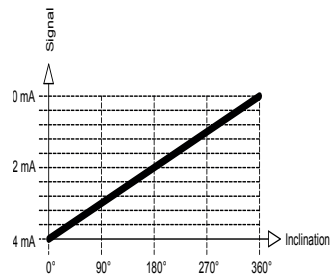


### ANALOG OUTPUTS

#### Single axis

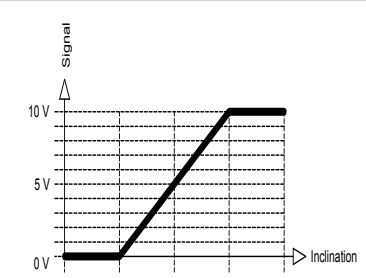
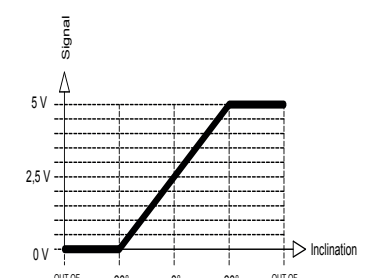
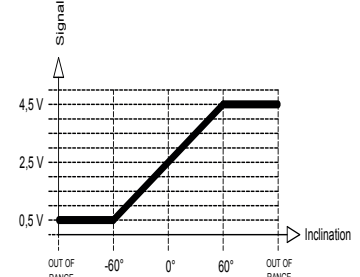
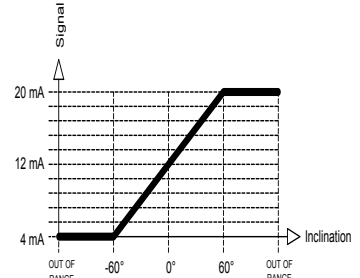
$V = 0 \dots 360^\circ$

$V1 = \pm 180^\circ$



#### Dual axes

$O = \pm 60^\circ$





### DIRECTION AXES

## Dual axes

### TSM dual axes TLP300 inclination sensor

The 2-dimensional inclination sensor must be mounted with the base plate in horizontal position, i.e. parallel to the horizontal line.

The sensor can be inclined both towards the X and Y axis at the same time.  
For each axis a separate measured value is provided.



+X



-X



+Y



-Y



## Single axis

### TSM single axis TLP300 inclination sensor

The 1-dimensional inclination sensor must be installed with its Z-axis in line with the force of gravity, as illustrated below.

The 1-dimensional sensor default position is 0° as shown in the following illustration.

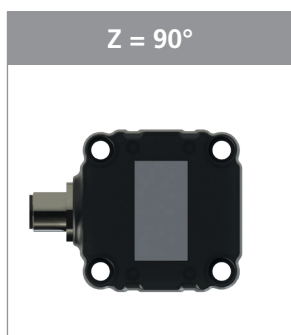


V (0...360°)

Z = 270°

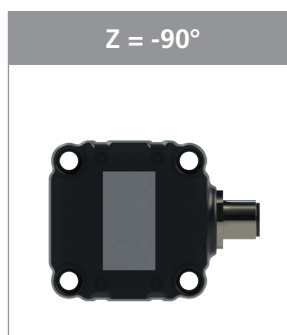


Z = 90°

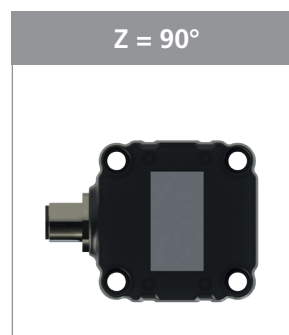


V1 (± 180°)

Z = -90°



Z = 90°

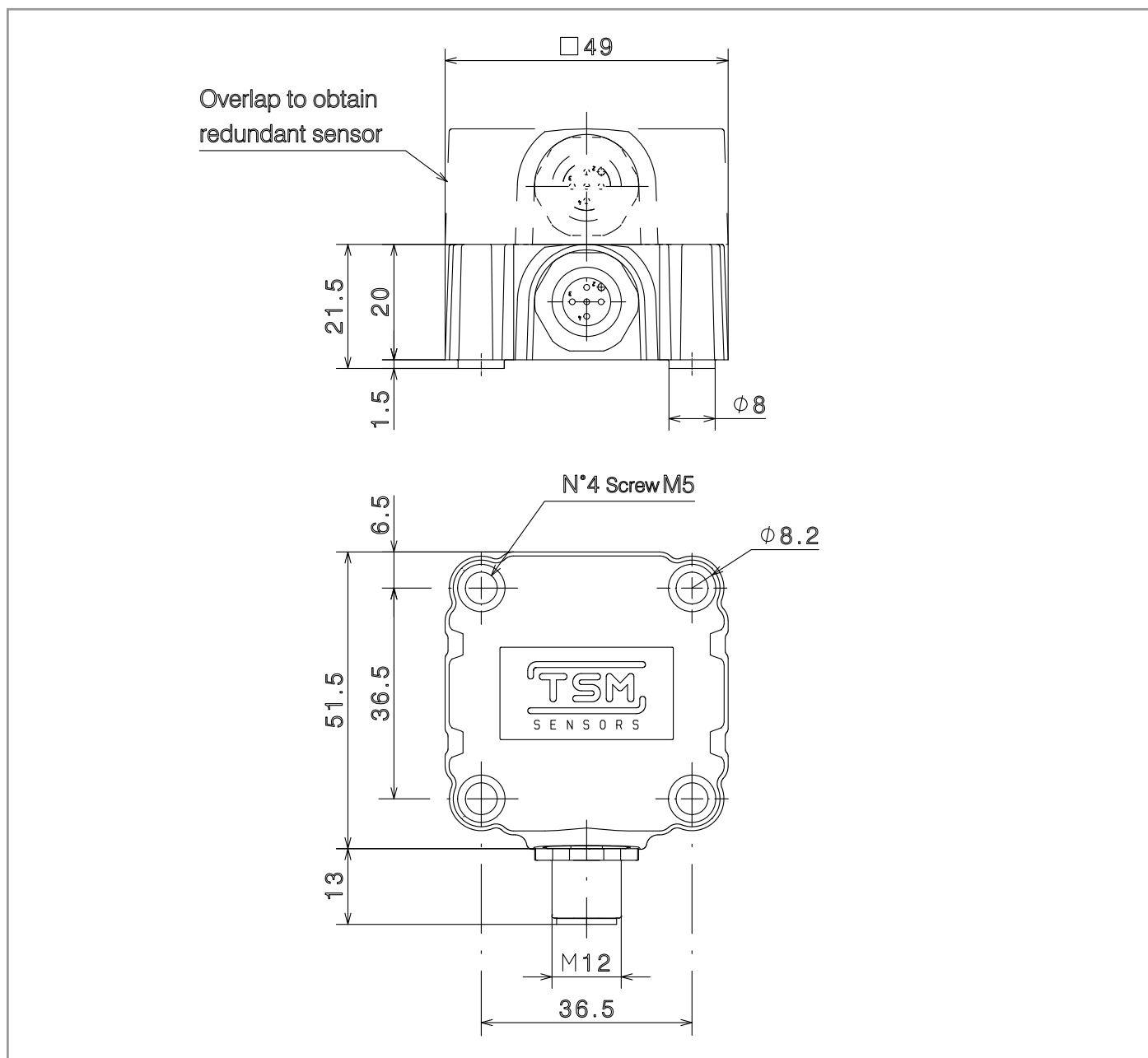


## INCLINATION SENSOR

## Inclination Sensor in MEMS Technology



### DIMENSIONS [mm]



DATA SHEET - Rev.3 - 09012019