

**INCLINOMETER
YX-1000V
PRODUCT SPECIFICATION**

1 General description

This document describes an inclinometer module, suitable to be built-in in various industrial applications. Inclinometer is available in 1 axis configuration, for horizontal mounting. The sensor technology used is 3D MEMS, with appropriate ASIC circuitry. Output signals are **analogue voltage**.

1.1 Inclinometer Features

- Available range: $\pm 15^\circ$
- 量程: $\pm 15^\circ$
- Controlled frequency response
- Easy to use and design in
- Analogue voltage output
- 模拟电压信号输出
- one axis inclination measurement
- Built-in failure detection

1.2 Benefits

- Excellent long term stability
- Outstanding shock durability
- High resolution
- Harsh environment robustness

2 Specifications

2.1 Operating specification

Parameter	Condition	Min.	Typ	Max.	Units
Supply voltage		4.85	5	5.15	V
Current consumption	No load		4.5		mA
Output load	Resistive	45	20		k Ω
	Capacitive			20	nF
Operating temperature		-40		85	$^\circ\text{C}$

2.2 Performance Specification

Parameter	Condition	Min.	Typ	Max.	Units
Measuring range ⁽¹⁾			± 15		$^\circ$
Offset ^(2,3,4)	Output @ 0°		$V_{dd}/2 \pm 0.4$		V
Offset calibration error ^(3,4,5)			± 0.2	± 0.3	$^\circ$
Offset temperature error ^(3,4,6)	-5...50 $^\circ\text{C}$		± 0.06	± 0.1	$^\circ$
	-25 $^\circ\text{C}$...70 $^\circ\text{C}$		± 0.12	± 0.2	$^\circ$
Sensitivity ^(3,4,7)	@ 0° (offset position)	148	150	152	mV / $^\circ$
Sensitivity calibration error ^(3,4,8)			± 1		%
Sensitivity temperature error ^(3,4,9)	-5...50 $^\circ\text{C}$			± 0.5	%
	-25 $^\circ\text{C}$...70 $^\circ\text{C}$	-1		± 1	%

Nonlinearity ⁽¹⁰⁾			± 0.04	±0.06	°
Frequency response –3dB	True DC response		5		Hz
Output noise DC...10 Hz	@ 0° (offset position)		< 0.002		°

- Note 1. The measuring range is limited by sensitivity, offset and supply voltage rails of the device.
- Note 2. Offset specified as $V_{offset} = V_{out}(@0^\circ)$ [V], offset will be drift for mechanical fixing,so after fixing,calibrate offset.
- Note 3. +5V supply voltage used in calibration and testing.
- Note 4. See proposed connection in picture 2.
- Note 5. Offset calibration error specified as $Offset_Calib_error = \arcsin(Offset_Calib_error_in_g) [^\circ]$,
 $Offset_Calib_error_in_g = \{V_{out}(@0^\circ) - 2.5 V\} / V_{sens} [g]$, $V_{sens}=8.595 V/g$.
- Note 6. Offset temperature error specified as $Offset_Error_@_temp. = \arcsin(Offset_Error_@_temp_in_g) [^\circ]$,
 $Offset_Error_@_temp_in_g = \{V_{out} @ temp. - V_{out} @ room temp.\} / V_{sens} [g]$, $V_{sens}=8.595 V/g$.
- Note 7. Sensitivity target in calibration 8.595 V/g ($\rightarrow 150 mV/^\circ$)
Sensitivity specified as $V_{sens} = \{V_{out}(@+10^\circ) - V_{out}(@-10^\circ)\} / (2 * \sin(10^\circ) g) [V/g]$.
- Note 8. Sensitivity calibration error specified as $Sensitivity_calibr_error = \{V_{sens} - V_{sens_nom}\} / V_{sens_nom} \times 100\% [^\circ]$,
 V_{sens_nom} = nominal sensitivity.
- Note 9. Sensitivity temperature error specified as
 $Sensitivity_temp_error = \{V_{sens} @ temp - V_{sens} @ room temp\} / V_{sens} @ room temp \times 100\% [^\circ]$.
- Note 10. From best fit sine-function to output through -10° and $+10^\circ$ (SINE COMPENSATED).

2.3 Absolute maximum rating

Parameter	Condition	Min.	Typ	Max.	Units
Supply voltage				5,5	V
Current consumption	No load			5	mA
Output load	Resistive	45			kΩ
	Capacitive			10	nF
Storage temp		-40		125	°C
Mechanical shock	1m drop on concrete	20 000			g

2.4 Electrical Connection

Connector: see picture 2.

Pin No.	Name	Function
1	V _{cc}	Power supply
2	NC	Not connected
3	GND	Ground
4	Out Y	Y axis output voltage

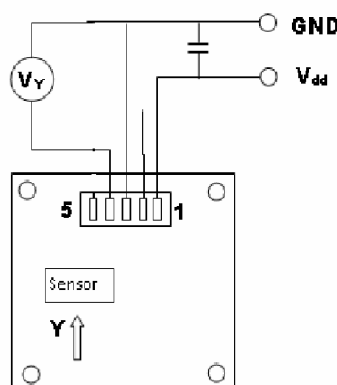
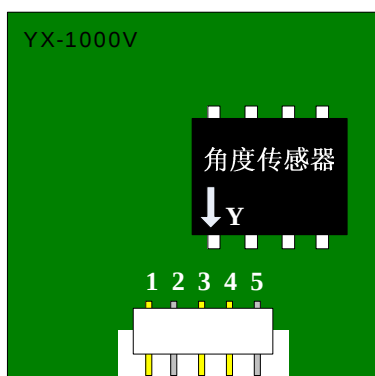
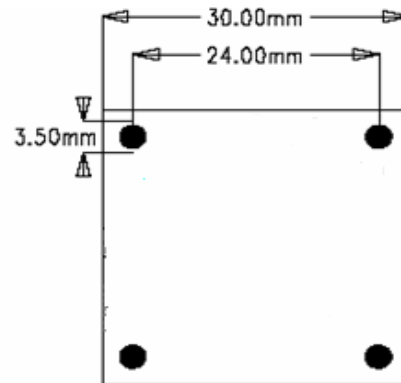


Figure 2. Connection

3 Mechanical specification

3.1 Dimensions

- PCB layer: four layers
- PCB thickness: 1.6 mm
- Size: 30 mm × 30 mm
- Mounting holes: $\varnothing$ 3.5 mm
- Weight: < 15 g
- Connector: Molex 53261-0590, mates with Molex 51021-0500



Picture 3. YX-1000V mechanical dimensions.

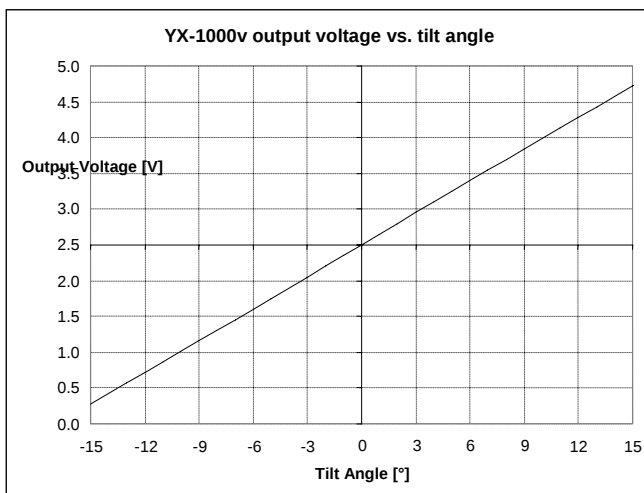
3.2 Mounting

The sensor module is to be mounted with 4 screws, dimension M3, on a horizontal plane.

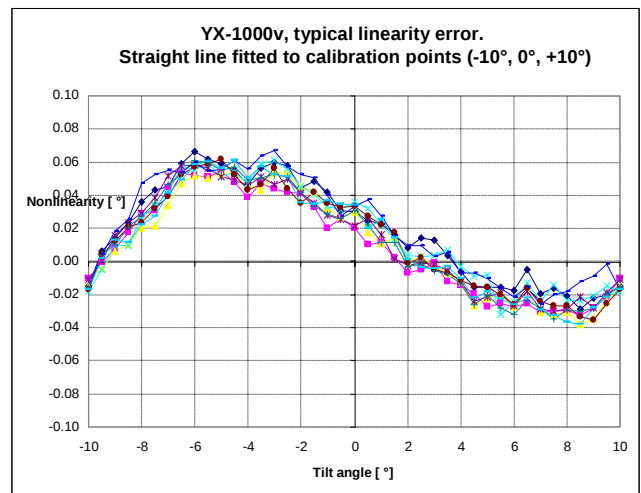
The mounting surface must be electrically isolated, and in well defined position.

It is advised to adjust the offset position after final assembly of the sensor, to achieve maximum performance.

4 Typical performance



YX-1000v output signal.



Typical nonlinearity