



SPECIFICATIONS

Item No.: HCA520T

Description: High Accuracy Voltage Type Dual-axis Inclinometer

Production implementation standard reference

- Enterprise quality system standards: ISO9001: 2008 standard (certification number: 128101)
- Tilt sensor production standards: GB / T 191 SJ 20873-2003 inclinometer general specification of Level
- The Academy of metrology and quality inspection Calibrated in accordance to: JJF1119-2004 Electronic Level calibration Specification
- Software development reference standard: GJB 2786A-2009 military software development General requirements
- Product environmental testing standards: GJB150
- Electromagnetic anti-interference test standards: GB / T 17626
- Version: Ver.09
- Date: 2014.4.17

HCA520T-High Accuracy Voltage Type Dual-axis Inclinometer



General Description

HCA520T is a high accuracy dual axis inclinometer with analog voltage output, small measuring range and the highest precision up to 0.003° , it is one of the few high-precision inclinometers in mainland. It is mainly used to measure the inclination of the object with respect to the horizontal plane, built-in micro solid pendulum, by measuring the static gravity field changes then convert into inclination change, the changes in mode output voltage (0~5V). The internal use high-resolution differential digital-to-analog converter, by the internal MCU system secondary linearity and temperature correction, the customer no need to do a secondary linearity correction, meanwhile also reducing the error caused by environmental changes on the accuracy of the product.

This product uses non-contact measurement principle, can real-time output current posture inclination, Simple to use, and no need to retrieve the relative changed surface to install. Latest MEMS higher technology production, high-precision, small size, strong resistance to external electromagnetic interference ability, the ability to withstand shock and vibration. It is the ideal choice for industrial equipment, platform measuring attitude!

Features

- Dual-Axis Inclinometer
- Accuracy: refer to the technical data
- Output interface :0~5V
- IP67 protection class
- High Resolution: 0.001°
- Measuring Range : $\pm 1 \sim \pm 90^\circ$ optional
- Wide voltage input: 9~36V
- Wide temperature working: $-40 \sim +85^\circ\text{C}$
- Highly anti-vibration performance $>2000\text{g}$
- Small Volume : L90mm×W50mm×H33mm (customized)

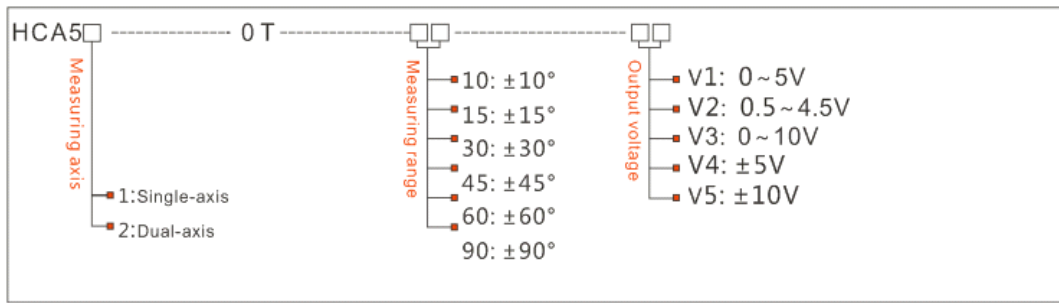
Application:

- Engineering vehicles automatic leveling
- Aerial platform vehicle, lifter safety & protection
- Underground drill posture navigation
- Based on the angle direction measurement
- Directional satellite communications antenna pitching angle measurement
- Mining machinery, oil-well drilling equipment
- Alignment control, curve control
- Bridge & dam detection
- Medical facilities angle control
- Railway gauging rule, gauge equipment leveling
- Geological equipment inclined monitoring
- Equipment level control



HCA520T-High Accuracy Voltage Type Dual-axis Incliner

Ordering information:



E.g: HCA520T-10-V1: Dual-axis /Standard / $\pm 10^\circ$ Measuring range/0-5V output

Technical Data

Parameters	Conditions	HCA520T-10	HCA520T-30	HCA520T-60	HCA520T-90	unit
Measuring range		± 10	± 30	± 60	± 90	$^\circ$
Measuring axis		X,Y	X,Y	X,Y	X,Y	
Zero output	0° Output	2.5	2.5	2.5	2.5	V
Resolution		0.001	0.001	0.001	0.001	$^\circ$
Absolute accuracy		0.005	0.01	0.02	0.05	$^\circ$
Long term stability		0.01	0.02	0.05	0.08	
Zero temperature coefficient	-40~85°	± 0.002	± 0.002	± 0.002	± 0.002	$^\circ/\text{C}$
Sensitivity temperature coefficient	-40~85°	≤ 50	≤ 50	≤ 50	≤ 100	ppm/ $^\circ\text{C}$
Power on time		0.5	0.5	0.5	0.5	S
Response time		0.05	0.05	0.05	0.05	s
Response frequency		1~20	1~20	1~20	1~20	Hz
Electromagnetic compatibility	According to EN61000 and GBT17626					
MTBF	≥ 50000 hours/times					
Insulation Resistance	$\geq 100M$					
Shockproof	100g@11ms、3Times/Axis(half sinusoid))					
Anti-vibration	10grms、10~1000Hz					
Protection glass	IP67					
Cables	Standard 1M length、wearproof、wide temperature、Shielded cables4*0.4mm2 air-plug connector					
Weight	150g(without cable)					

* This Technical data only list $\pm 10^\circ$, $\pm 30^\circ$, $\pm 60^\circ$, $+ 90^\circ$ series for reference, other measuring range please refer to the adjacent parameters

Electronic Characteristics

Parameters	Conditions	Min	Standard	Max	Unit
Power supply	Standard	9	12、24	36	V
Working current			40		mA
Output overload	Resistive	10			kΩ
	Capacitive			20	nF
Working temperature		-40		+85	°C
Store temperature		-55		+100	°C

Key words:

Resolution: Refers to the sensor in measuring range to detect and identify the smallest changed value.

Absolute accuracy: Refers to in the normal temperature circumstances, the sensor absolute linearity, repeatability, hysteresis, zero deviation, and transverse error comprehensive error.

Long term stability: Refers to the sensors in normal temperature conditions, the deviation between the maximum and minimum values after a year's long time work.

Response time: Refers to the sensor in an angle change, the sensor output value reached the standard time required.

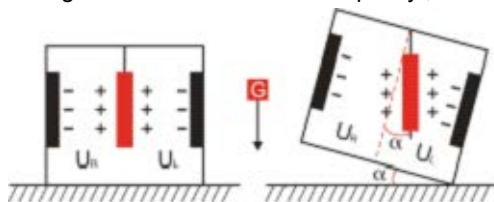
Mechanical Parameters

- Connectors: 1m cable with air-plug connector (customized)
- Protection glass: IP67
- Enclosure material : Aluminum Oxide
- Installation : 3*M4 screws



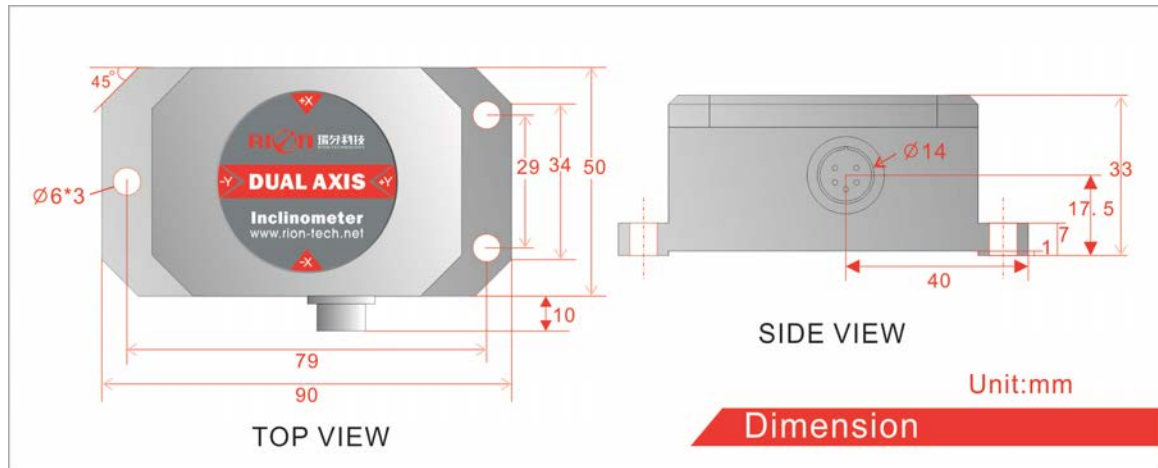
Working Principle

Adopt the European import of core control unit, using the capacitive micro pendulum principle and the earth gravity principle, when the the inclination unit is tilted, the Earth's gravity on the corresponding pendulum will produce a component of gravity, corresponding to the electric capacity will change, by enlarge the amount of electric capacity , filtering and after conversion then get the inclination.



U_1, U_2 Respectively is the pendulum left plate and the right plate corresponding to their respective voltage between the electrodes, when the tilt sensor is tilted, U_1, U_2 will change according to certain rules, so $f(U_1, U_2)$ On the inclination of α function:
 $\alpha = f(U_1, U_2)$

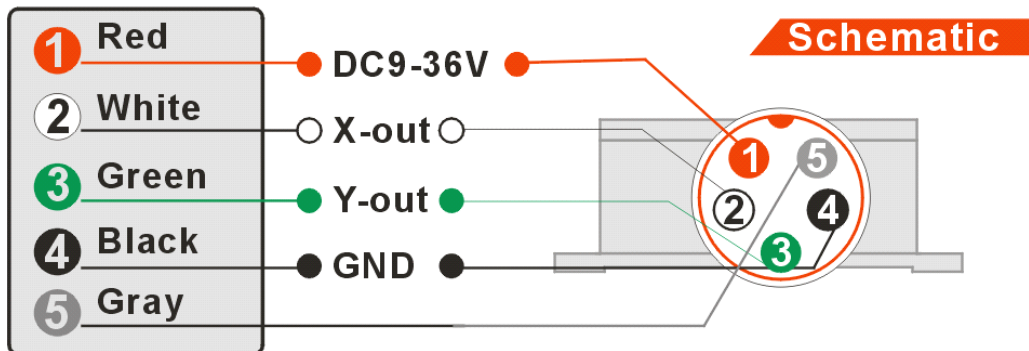
Dimension



Size: L90×W50×H33mm

Electrical Connection

Line color	BLACK	WHITE	RED	GREEN
function	GND Power Negative	Out X X Axis output voltage	Vcc power supply positive	Out Y Y Axis output voltage



Angle output calculation formula

$$\text{Angle} = (\text{output voltage} - \text{Zero position voltage}) \div \text{Angle sensitivity}$$

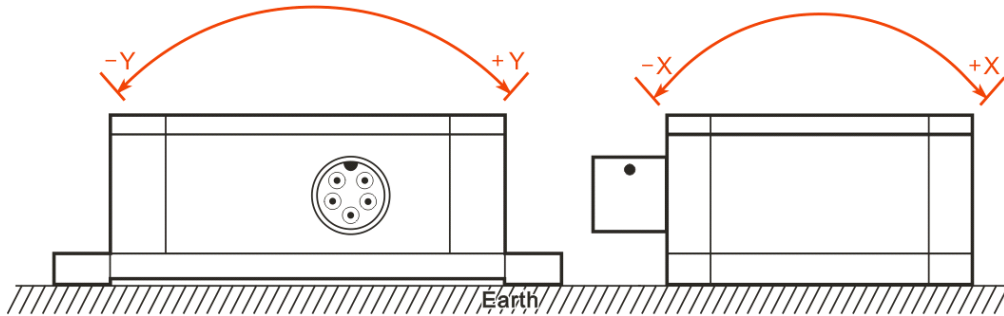
$$\text{Angle sensitivity} = \text{output voltage range} \div \text{Angle measuring range}$$

E.g: HCA510T-30-V1 ($\pm 30^\circ$ Measuring range 0~5V output voltage range)

$$\text{Angle sensitivity} = 5 \div 60 = 0.83333 \text{ V}^\circ$$

Measuring Directions&Fix

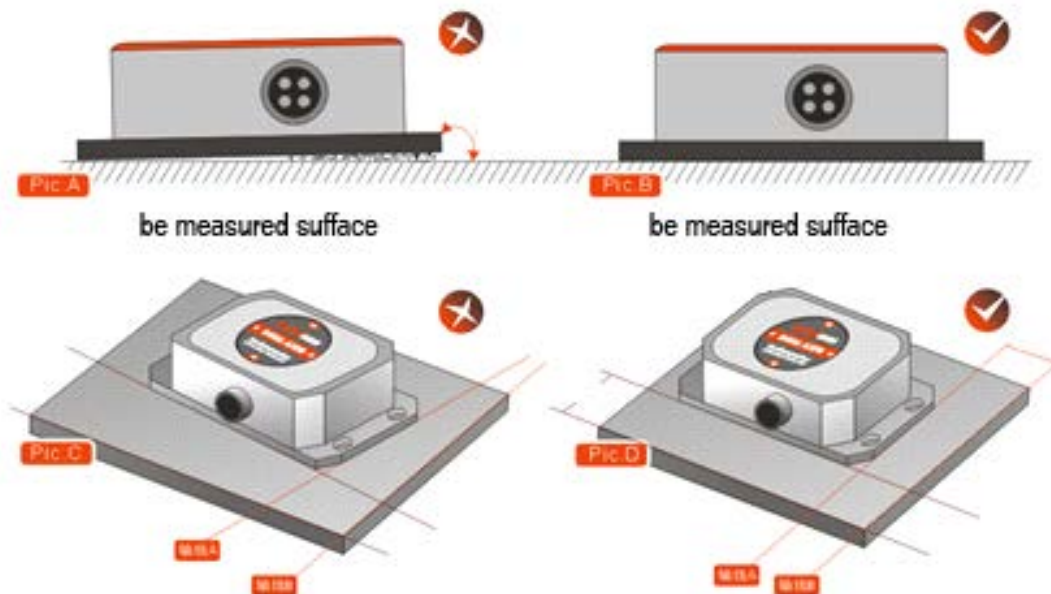
The installation must guarantee the product bottom is parallel to measured face, and reduce the influence of dynamic and acceleration to the sensor. This product can be installed horizontally or mounted vertically (mounted vertically selection is only applicable to the single axis), for installation please refer to the following scheme.



Production installation notes :

Please follow the correct way to install tilt sensor, incorrect installation can cause measurement errors, with particular attention to the "surface", "line"::

- 1) The Sensor mounting surface and the measured surface must be fixed closely, smoothly, stability, if mounting surface uneven likely to cause the sensor to measure the angle error. See Figure Pic.AB
- 2) The sensor axis and the measured axis must be parallel, the two axes do not produce the angle as much as possible. See Figure Pic.CD



※More information please visit Rion's company website: www.rion-tech.net



深圳市瑞芬科技有限公司
CHINA SHENZHEN RION TECHNOLOGY CO.,LTD.

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T: 0755-29657137 / 29761269 F: 0755-29123494
W: www.rion-tech.net E: sales@rion-tech.net
A: 中国·深圳市宝安区82区华丰科技园 五期3F

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