



## SPECIFICATIONS

Item No.: ACA610T

Description: High Accuracy Voltage Type Single-Axis Inclinometer  
with Full Temperature Compensation

### **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: 2014.4.16

# ACA610T-High Accuracy Voltage Type Single-Axis Inclinometer with Full Temperature Compensation



## General Description

ACA610T is a high precision & full temperature compensation single-axis inclinometer with analog voltage output, high-precision 24bit A / D differential converter inside the product, to ensure the the products output voltage signal linearity, and users no need to do linearity correction by themselves in the future , install then to use, stability and reliability ! In addition, because of ACA610T system integrates high-resolution temperature sensor, with the MCU central processing system secondary temperature compensation, full temperature zero drift can be controlled to 0.0008 °/°C ,normal temperature small measuring range the most accurate up to 0.002 °, in domestic the counterparts products with absolute competitive advantage.

Non-contact installation features make ACA610T with superior system integration, Simply fix the sensor on the measured surface by screws , then can automatically calculate the object posture inclination, easy to operate, easy to install. Newest MEMS high-technology for production , high-precision, small size, with strong ability resistance to external electromagnetic interference and to withstand shock and vibration, has been widely used in the industrial and military fields !

## Features

- Single-Axis Inclinometer
- Accuracy: refer to the technical data
- Output interface :0~5V
- IP67 protection class
- High Resolution: 0.001°
- Measuring Range :±1~±90° optional
- Wide voltage input: 9~36V
- Wide temperature working: -40~+85°C
- Highly anti-vibration performance >2000g
- Small Volume : L90mm×W50mm×H28mm (customized)

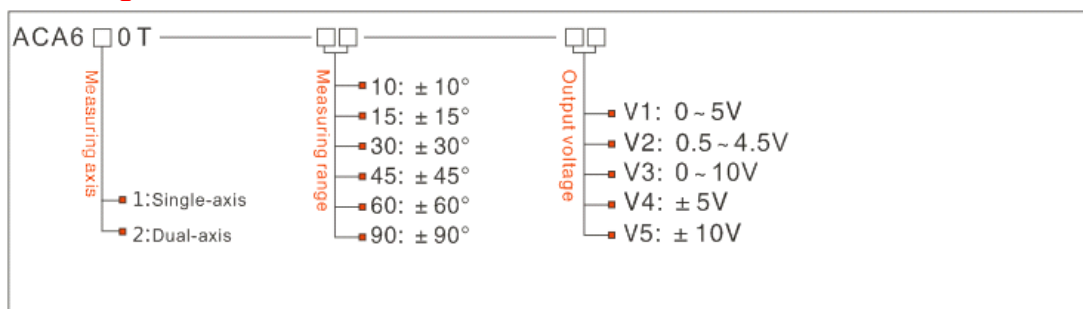
## Application:

- Engineering vehicles automatic leveling
- Precise instrument level control
- Underground drill posture navigation
- Based on the angle direction measurement
- Directional satellite communications antenna pitching angle measurement
- Bridge & dam detection
- Medical facilities angle control
- Railway gauging rule , gauge equipment leveling
- Geological equipment inclined monitoring



# ACA610T-High Accuracy Voltage Type Single-Axis Incliner with Full Temperature Compensation

## Ordering information:



E.g: ACA610T-10-V1: Single-axis/Standard/±10° Measuring range/0-5V Voltage output type

## Technical Data

Parameters	Conditions	ACA610T-10	ACA610T-30	ACA610T-60	ACA610T-90	Unit
Measuring range		±10	±30	±60	±90	°
Measuring axis		X	X	X	X	
Zero output	0° Output	2.5	2.5	2.5	2.5	V
Resolution		0.001	0.001	0.001	0.001	°
Absolute accuracy		0.003	0.01	0.02	0.03	°
Long term stability		0.01	0.02	0.03	0.04	
Zero temperature coefficient	-40~85°	±0.0008	±0.0008	±0.0008	±0.0008	°/°C
Sensitivity temperature coefficient	-40~85°	≤50	≤50	≤50	≤100	ppm/°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	≥100M					
Shockproof	100g@11ms、Times/Axis(half sinusoid)					
Anti-vibration	10grms、10~1000Hz					
Protection glass	IP67					
Cables	Standard 1M length、wearproof、wide temperature、Shielded cables4*0.4mm <sup>2</sup> air-plug connector					
Weight	160g(without cable)					

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

# ACA610T-High Accuracy Voltage Type Single-Axis Inclinometer with Full Temperature Compensation

## 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.

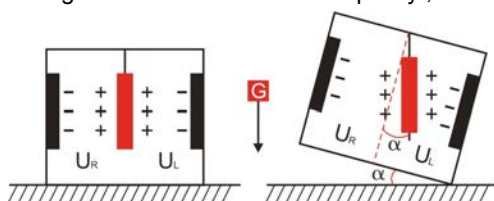
## Mechanical Parameters

- Connectors: 1m cable with air-plug connector (customized)
- Protection glass: IP67(air plug connector)
- Enclosure material : Aluminum Oxide
- Installation : 4\*M4 screws  
2\*3mm plug position(optional)



## 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.

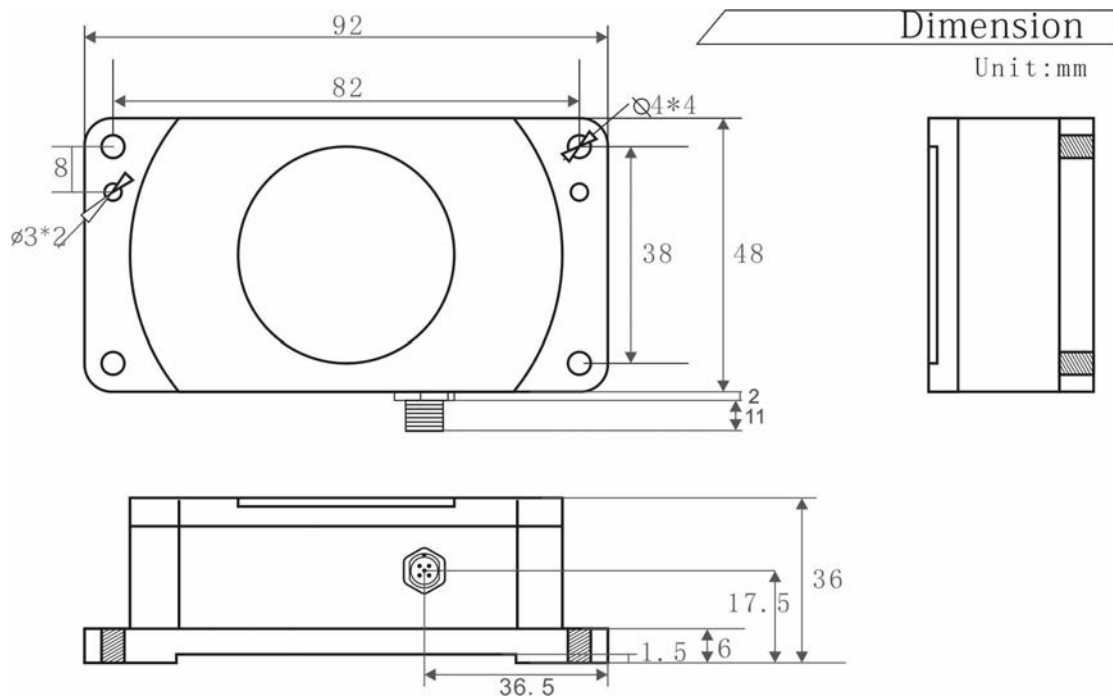


$U_R, U_L$  Respectively is the pendulum left plate and the right plate corresponding to their respective voltage between the electrodes, when the tilt sensor is tilted,  $U_R, U_L$  Will change according to certain rules, so  $f(U_R, U_L)$  On the inclination of  $\alpha$  function:

$$\alpha = f(U_R, U_L)$$

# ACA610T-High Accuracy Voltage Type Single-Axis Inclinometer with Full Temperature Compensation

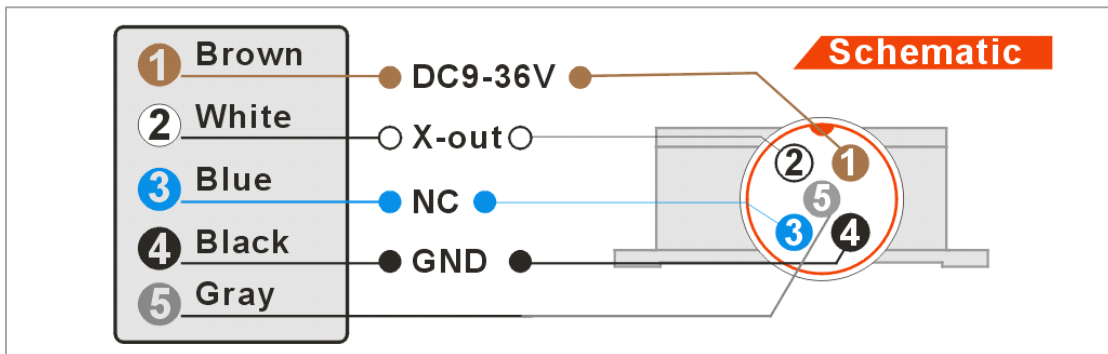
## Dimension



Size: L92×W48×H36mm

## Electrical Connection

Line color function	BLACK	WHITE	BROWN	BLUE S	GRAY
	GND	Out X	DC 9~36V	NC	FACTORY Use only
	Power Negative	X Axis output voltage	Power supply positive		



## Angle output calculation formula

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

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

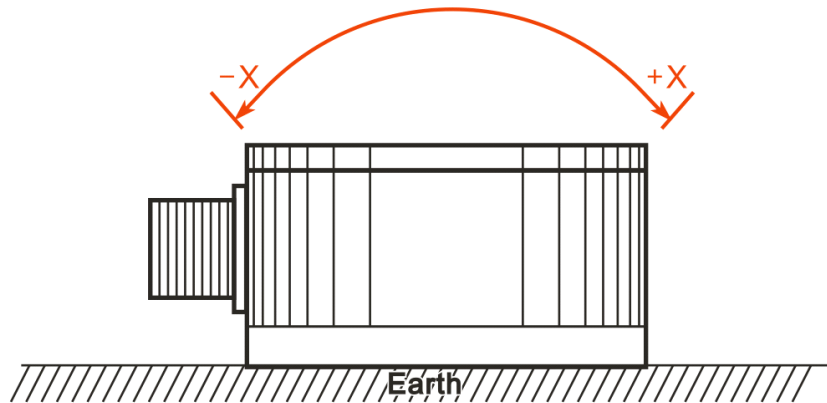
E.g: ACA616T-30-V1 ( $\pm 30^\circ$  Measuring range 0~5V output voltage range )

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

# ACA610T-High Accuracy Voltage Type Single-Axis Inclinometer with Full Temperature Compensation

## Measuring Directions&Fix

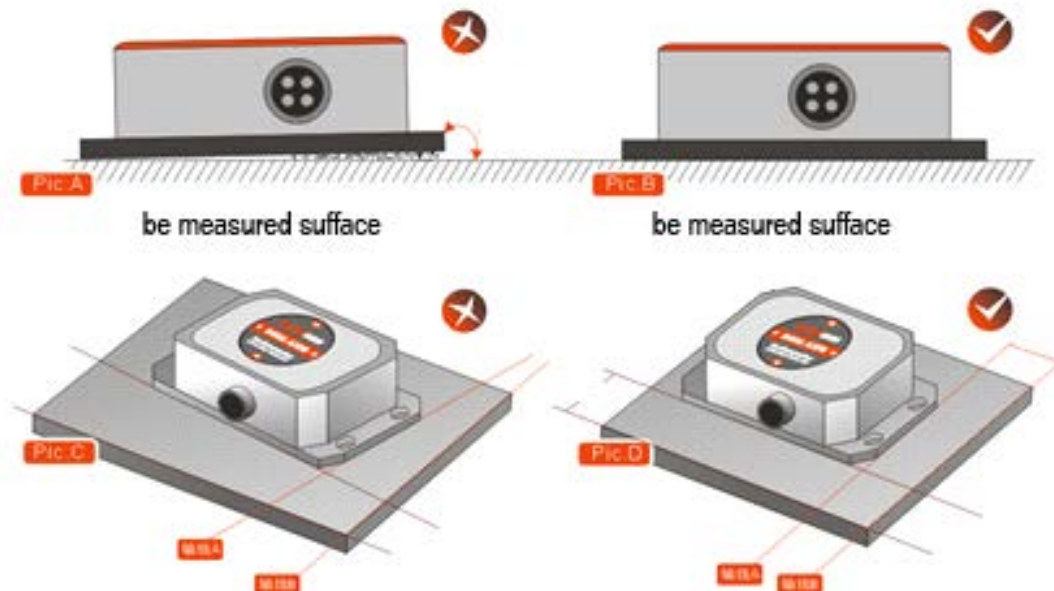
The installation must guarantee the product bottom is parallel to measured face, and reduce the influence of dynamic and acceleration to the sensor. This product can be installed horizontally or mounted vertically (mounted vertically selection is only applicable to the single axis), for installation 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](http://www.rion-tech.net)



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