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FCC certification: AT011611744E
RoSH certification: 18300RC20410801

V1.9

HIGH ACCURACY VOLTAGE TILT SENSOR

ACA610T/ACA620T-N

Technical Manual

RION PRODUCT QUALIFICATION

○ CE certification: AT011611743E
○ FCC certification: AT011611744E
○ RoHS certification: 18300RC20410801
○ Revision time:2025-9-16

Note: Product functions, parameters, appearance, etc. will be adjusted as the technology upgrades. Please contact our pre-sales business to confirm when purchasing.

Disclaimer

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GENERAL DESCRIPTION

ACA610T/ACA620T-N is a single/dual axis inclinometer with full temperature compensation analog voltage output. The product uses a high-precision 24 bit A/D differential converter internally to ensure the linearity of the output voltage signal. Users do not need to make linearity corrections later on, and it is ready to use, stable and reliable. ACA610T/ACA620T-N has a competitive advantage among domestic peers due to its system integration of high-resolution temperature sensors, combined with MCU central processing system for secondary temperature compensation. The full temperature zero drift can be controlled at 0.0005 °/℃, and the measured accuracy of small range at room temperature can reach 0.003 ° C.

The non-contact installation feature makes ACA610T/ACA620T-N have good system integration. Simply fix the sensor on the surface of the object being measured with screws, and the posture and inclination angle of the object can be automatically calculated. The operation is simple and the installation is convenient. MEMS technology production is widely used in the industrial field due to its small size, strong resistance to external electromagnetic interference, and strong ability to withstand impact and vibration.

FEATURES

★ Single / Dual axis inclination measurement
★ Accuracy: 0.003°
★ Wide temperature working: -40~+85℃
★ Highly anti-vibration performance >2000g
★ Temperature drift 0.0005°/℃
★ Measure Range :±1~±90° optional
★ Wide voltage input: 11.5~36V
★ IP67 protection grade
★ High Resolution: 0.0007°

APPLICATION

★ Engineering vehicles automatic leveling
★ Precision instrument level control
★ Underground drill posture navigation
★ Geological equipment inclined monitoring
★ Railway gauging rule , gauge equipment leveling
★ Bridge & dam detection
★ Medical facilities angle control
★ Direction measurement based on inclination

SPECIFICATIONS

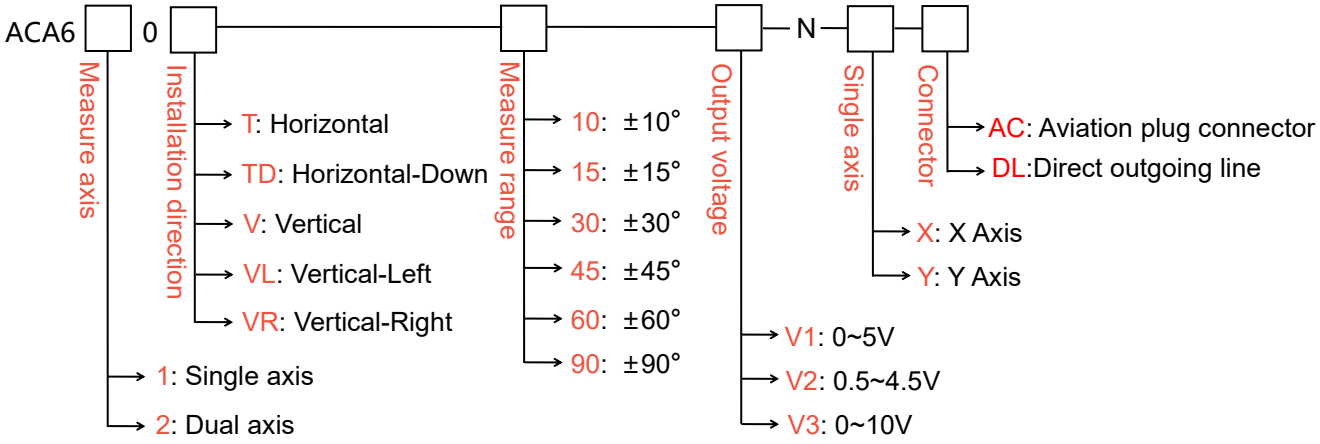
ACA610T/620T-N		Conditions	Parameters				Unit
Measure range			±10	±30	±60	±90	°
Measure axis			X Y	X Y	X Y	X Y	axis
Zero output		0° output	2.5	2.5	2.5	2.5	V
Resolution			0.0007	0.0007	0.0007	0.0007	°
Measure accuracy	MAXE	Room temp.	0.003	0.01	0.02	0.03	°
	RMSE	Room temp.	0.003	0.003	0.005	0.008	°
Zero Temp. coefficient		-40 ~ 85℃	0.0005	0.0005	0.0005	0.0005	°/℃
Sensitivity temp-coefficient		-40 ~ 85℃	≤50	≤50	≤50	≤50	ppm/℃
Power on time			0.5	0.5	0.5	0.5	S
Response frequency		20Hz					
EMC		According to EN61000 and GBT17626					
MTBF		≥98000 hours/times					
Insulation Resistance		≥100MΩ					
Shockproof		100g@11ms、3 axial direction (half sinusoid)					
Anti-vibration		10grms、10 ~ 1000Hz					
Protection grade		IP67					
Cables		Aerospace plug ST1214-P7 square flange male socket connector, 2-meter long/wear-resistant/wide temperature/shielded cable, wire weight ≤ 200g					
Weight		≤260g(without cable)					

Resolution: refers to the sensor in measuring range to detect and identify the smallest changed value.
MAXE: refers to the biggest error of the product within the range and at multiple angle points.
RMSE: refers to the root mean square difference between the measured value and the actual angle of the product within the range and for multiple times (more than 16 times).
Zero Temp. Drift Coefficient: the change rate of the indication value relative to normal temperature within the rated operating temperature range of the sensor at the zero degree.
Sensitivity Temp. Drift Coefficient: The percentage change rate with tempe. of the full-scale indication relative to the full-scale indication at room temperature of the sensor in its rated operating temp. range.

ELECTRONIC CHARACTERISTICS

PARAMETERS	CONDITIONS	MIN	STANDARD		MAX	UNIT
Power supply	Standard	11.5	12	24	36	V
Working current			40			mA
Output overload	Resistive	10				kΩ
	Capacitive				20	nF
Working temp.		-40			+85	℃
Store temp.		-40			+85	℃

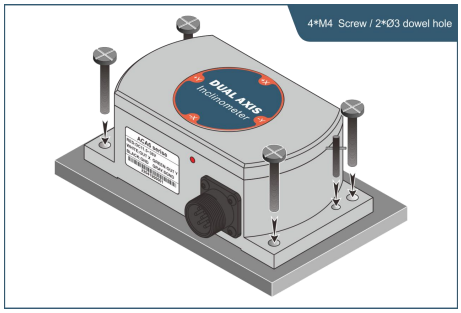
ORDERING INFORMATION



E.g: ACA610T-10-V1-N-X-AC: Single axis / Horizontal installation / ± 10°Measure range / 0~5V Output voltage / Single Axis X Axis / Aviation plug connector.

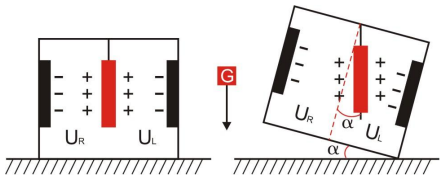
MECHANICAL PARAMETERS

○ Connectors : Aviation connector
(1 meter direct lead wire; length optional)
○ Protection grade : IP67
○ Enclosure material : Aluminum Oxide
○ Recommended to use : 4*M4 screws
2*3mm plug position



WORKING PRINCIPLE

Adopting imported core control unit and utilizing the principle of capacitive micro pendulum. Using the principle of Earth's gravity, when the tilt unit tilts, the Earth's gravity will produce a component of gravity on the corresponding pendulum, and the corresponding capacitance will change. By amplifying, filtering, and converting the capacitance, the tilt angle can be obtained.



U_R, U_LRespectively is the pendulum left plate and the right plate corresponding to their respective voltage between theelectrodes, 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 α function:

$\alpha = (U_R, U_L)$

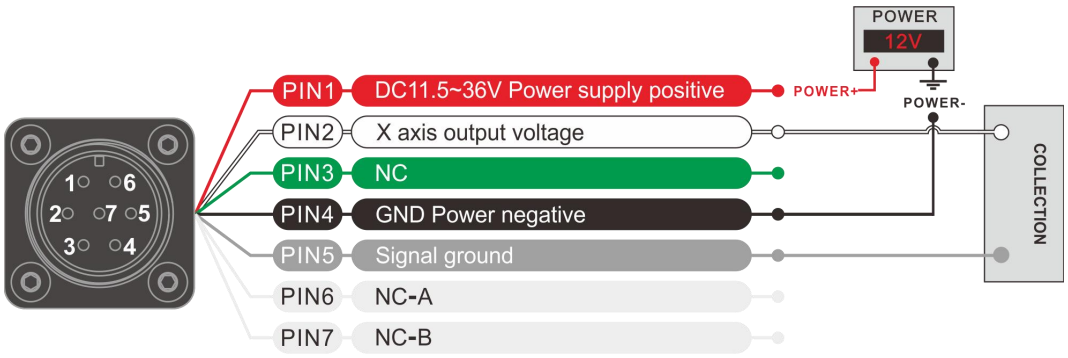
ANGLE OUTPUT CALCULATION FORMULA

Angle=(output voltage－Zero position voltage)÷Angle sensitivity
Angle sensitivity=output voltage range÷ Angle measuring range
E.g：**ACA616T-30-V1-N** (±30° Measure range 0～5V output voltage range)
Angle sensitivity= 5÷60=0.83333 V/°

ELECTRICAL CONNECTION

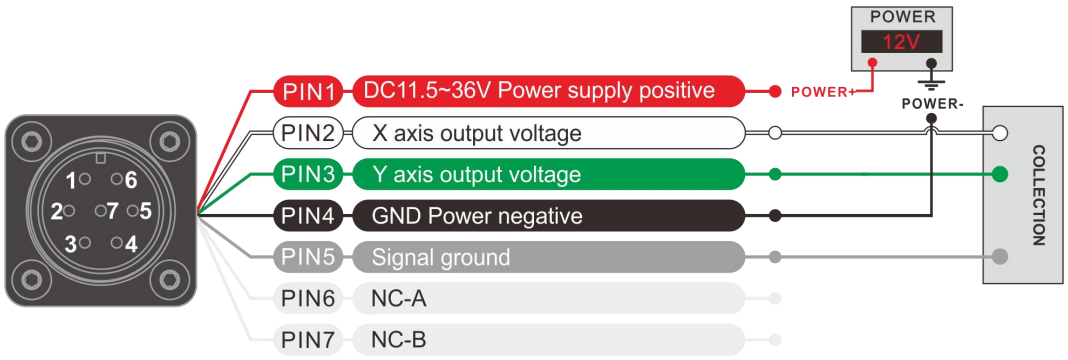
SINGLE AXIS ELECTRICAL CONNECTION

Wire Color function	RED	WHITE	GREEN	BLACK	GRAY
	DC11.5~36V	X axis output voltage	NC	GND	Signal GND



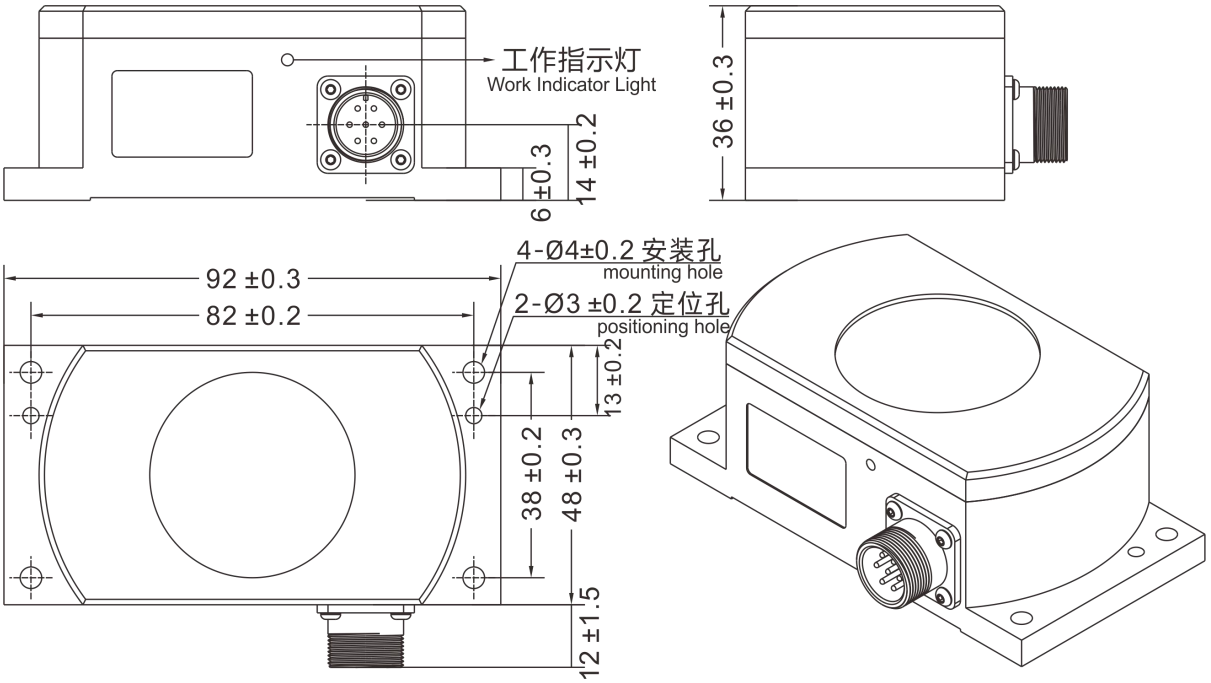
DUAL AXIS ELECTRICAL CONNECTION

Wire Color function	RED	WHITE	GREEN	BLACK	GRAY
	DC11.5~36V	X axis output voltage	Y axis output voltage	GND	Signal GND



* Signal ground: output voltage signal. Connect the GND of acquisition device.

SIZE



Shell size: L92×W48×H36mm

Installation size: L82×W38×H6mm

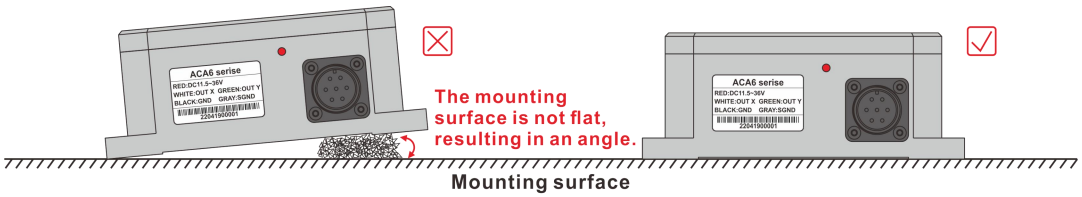
Suggest using screws: 4 M4 screws/2 M3 dowel pins

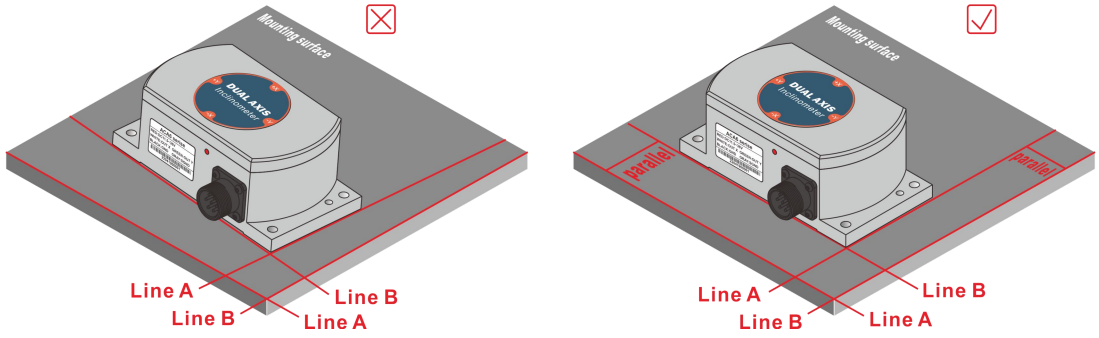
PRODUCTION INSTALLATION NOTES

Please install the tilt sensor according to the correct method. Incorrect installation can cause measurement errors, especially paying attention to the first "surface" and second "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.

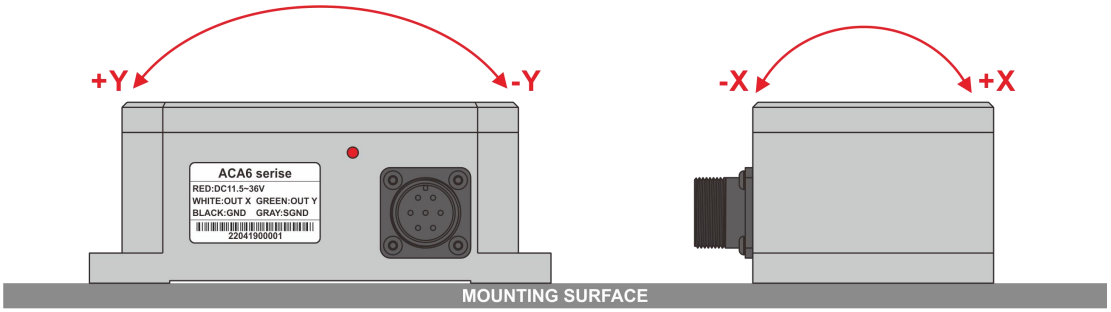
2) The sensor axis and the measured axis must be parallel ,the two axes do not produce the angle as much as possible.



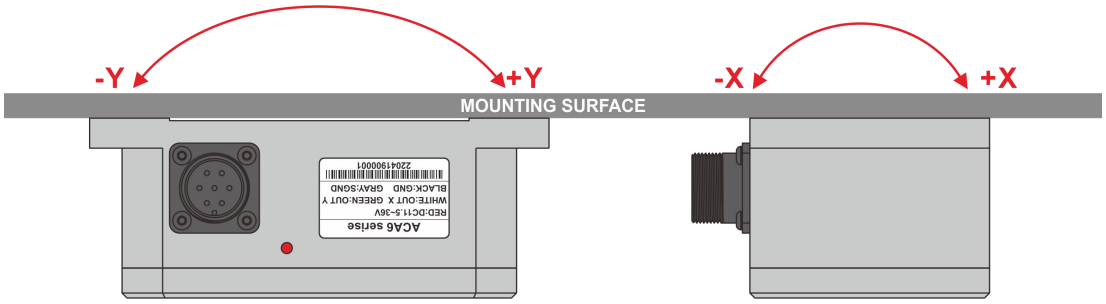


PRODUCT INSTALLATION DIRECTION

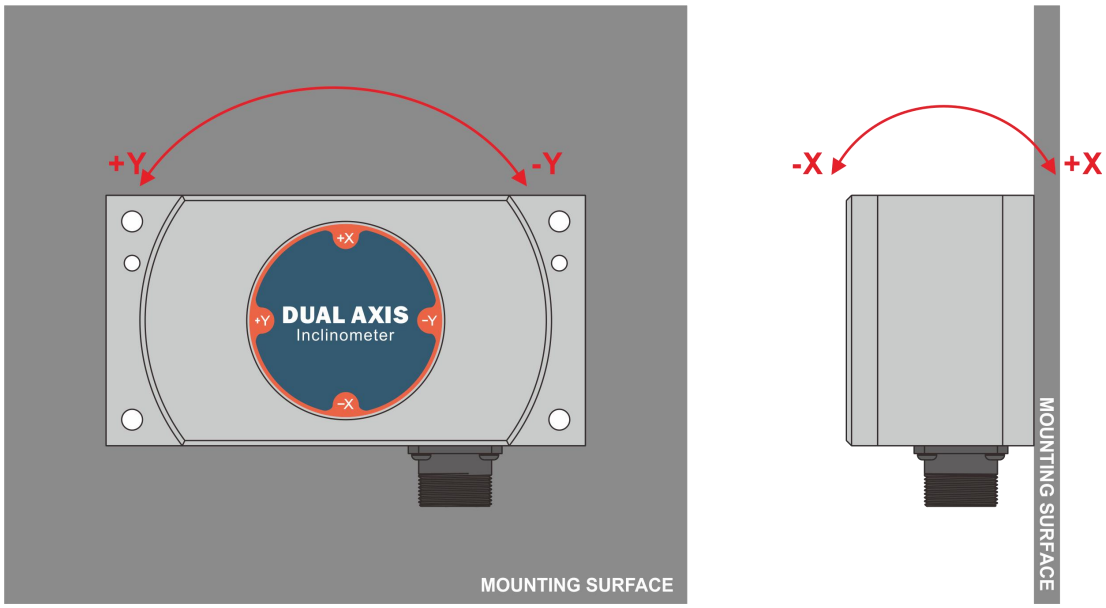
During installation, keep the sensor mounting surface parallel to the target surface to be measured, and reduce the impact of dynamics and acceleration on the sensor. This product can be installed horizontally or vertically, please refer to the following diagram for the installation method:



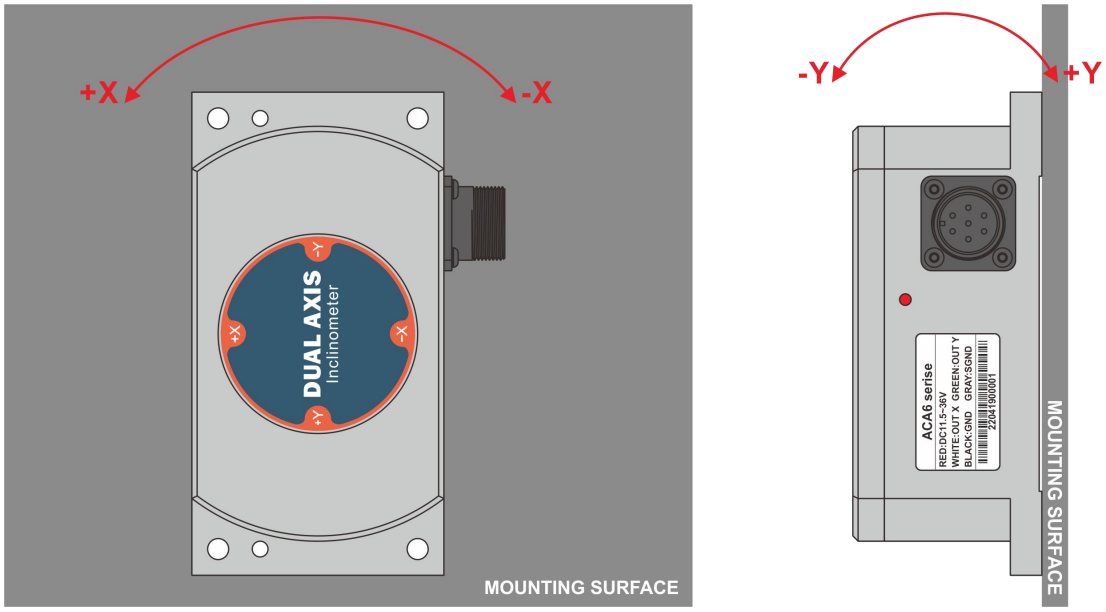
Horizontal installation



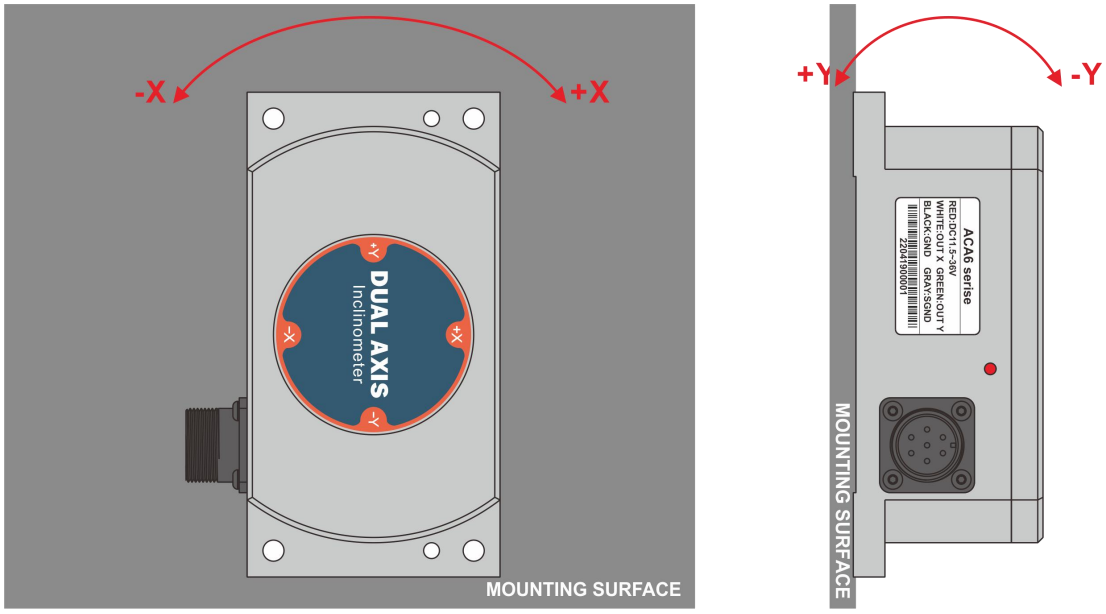
Horizontal-down installation



Vertical installation



Vertical-Left installation



Vertical-Right installation