



Patent No. : ZL 201830752890.0

V1.3

HIGH PRECISION VOLTAGE TYPE INCLINOMETER

RION HCA510T/HCA520T-N

Technical Manual



RION QUALIFICATION CERTIFICATION

- Quality management system certification: GB/T19001-2016 idt ISO19001:2015 standard (Certificate No.: 128101)
- Quality management system certification: IATF16949: 2016 (Certificate No.: T178487)
- Intellectual property management system certification: GB/T29490-2013 standard (Certificate No.: 41922IP00281-06R0M)
- High-tech Enterprise (Certificate No.: GR201844204379)
- Chinese National Intellectual Property Appearance Patent (Patent No. : ZL 201830752890.0)
- Date of revision: 2022-5-11

Note: The product functions, parameters, appearance, etc. will be adjusted with the technical upgrade. Please contact our pre-sales business to confirm when purchasing.

HCA510T / 520T VOLTAGE TYPE INCLINOMETER



► GENERAL DESCRIPTION

HCA510T/HCA520T-N is a high-precision analog voltage output single / dual axis inclination sensor. The highest precision in a small range can reach 0.003° . It is one of the few high-precision inclinometers in China. Its function is mainly used to measure the inclination of the object based on 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.

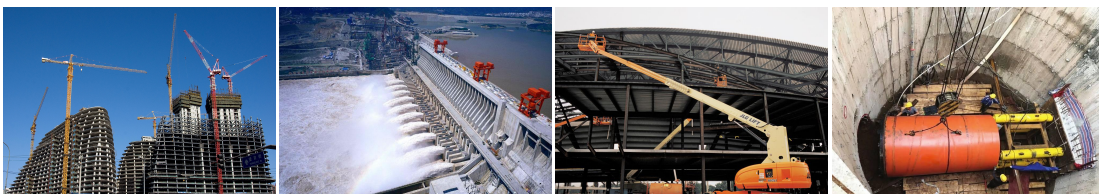
This product uses non-contact measurement principle, can real-time output current posture inclination, Simple to use, and no need to retrieve the relative changed surface to install. Latest MEMS higher technology production, high-precision, small size, strong resistance to external electromagnetic interference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

► FEATURES

- ★ Single / dual axis inclination measurement
- ★ Accuracy: Refer to technical data
- ★ Output mode 0 ~ 5V
- ★ IP67 protection
- ★ High resolution 0.001°
- ★ Range $\pm 1 \sim \pm 90^\circ$ optional
- ★ Wide voltage input 11.5 ~ 36V
- ★ Wide temperature operation $-40^\circ\text{C} \sim +85^\circ\text{C}$
- ★ High vibration resistance $> 2000\text{g}$
- ★ Small size $L90 \times W59 \times H34\text{mm}$

► APPLICATION

- ★ Equipment vehicle leveling
- ★ High-altitude platform safety protection
- ★ Attitude navigation of underground drilling rig
- ★ Direction measurement based on tilt angle
- ★ Mining machinery, oil drilling equipment
- ★ Alignment control, curve control
- ★ Pitch angle measurement of directional satellite communication antenna
- ★ Bridge and Dam monitoring
- ★ Angle control of medical equipment
- ★ Leveling of railway gauge and gauge
- ★ Tilt monitoring of geological equipment
- ★ Equipment level control



HCA510T / 520T VOLTAGE TYPE INCLINOMETER

► SPECIFICATIONS

HCA510T/HCA520T-N		CONDITION	PARAMTERS				UNIT
Measure range			±10	±30	±60	±90	°
Measure axis			X / XY	X / XY	X / XY	X / XY	
Zero output		0° output	2.5	2.5	2.5	2.5	V
Resolution			0.001	0.001	0.001	0.001	°
Measure accuracy	MAXE	Room temp.	0.005	0.01	0.02	0.03	°
	RMSE	Room temp.	0.003	0.003	0.005	0.008	°
Zero Temp. coefficient		-40 ~ 85°C	0.0005	0.0005	0.0005	0.0005	°/°C
Sensitivity temp. coefficient		-40 ~ 85°C	≤100	≤100	≤100	≤100	ppm/°C
Power on time			0.5	0.5	0.5	0.5	S
Response frequency		20Hz					
EMC		According to EN61000 and GBT17626					
MTBF		≥50000 hours/times					
Insulation Resistance		≥100MΩ					
Shockproof		100g@11ms、3 Axial Direction (Half Sinusoid)					
Anti-vibration		10grms、10 ~ 1000Hz					
Protection glass		IP67					
Cables		Standard configuration: 2m length, wear-resistant, wide temperature, shielded cable 7P * 6.8mm aviation connector, cable weight ≤110g					
Weight		≤250g(Excluding cable)					

*This parameter only list ± 10 °, ± 30 °, ± 60 ° series for reference. For other measurement ranges, please refer to the nearest neighbor parameter.

KEY WORDS

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).

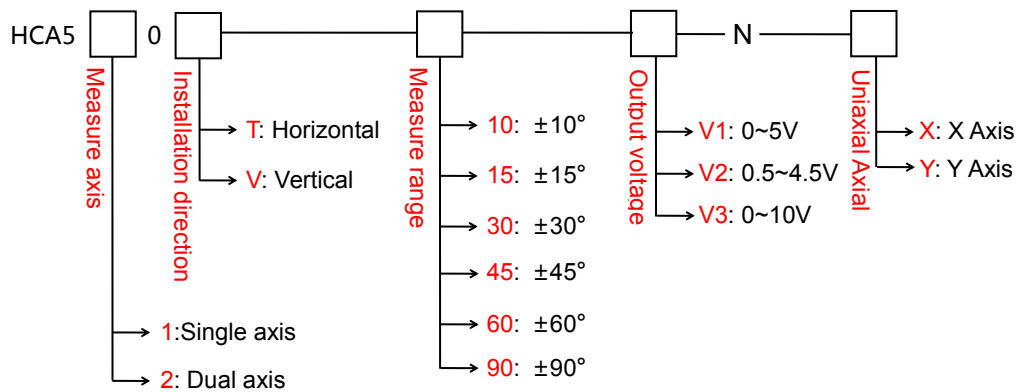
Zero Temperature Drift Coefficient: the change rate of the indication value relative to normal temperature within the rated operating temperature range of the sensor at the zero degree.

Sensitivity Temperature Drift Coefficient: The percentage change rate with temperature of the full-scale indication relative to the full-scale indication at room temperature of the sensor in its rated operating temperature range.

► ELECTRONIC CHARACTERISTICS

PARAMETERS	CONDITION	MIN	STANDARD	MAX	UNIT
Power supply	Standard	11.5	12 24	36	V
Working current			40		mA
Output load	Resistive	10			kΩ
	Capacitive			20	nF
Working temperature		-40		+85	°C
Store temperature		-40		+85	°C

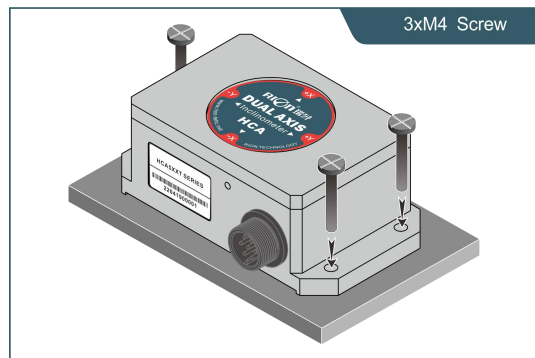
► **ORDER INFORMATION**



E.g:HCA510T-10-V1-N-X:Single axis/standard horizontal measurement/±10°measure range /0~5V output/X Axis.

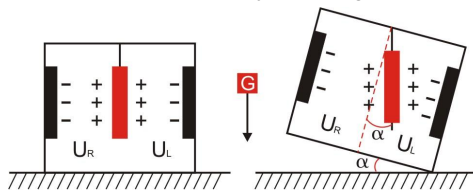
► **MECHANICAL PARAMETERS**

- Connector: aviation connector
- (1m Direct Leading Cable can Be Customized)
- Protection level: IP67
- Shell material: aluminum alloy shield oxidation
- Installation: Three M4 screws



► **WORKING PRINCIPLE**

Adopt the 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 α function:
 $\alpha = f(U_R, U_L,)$

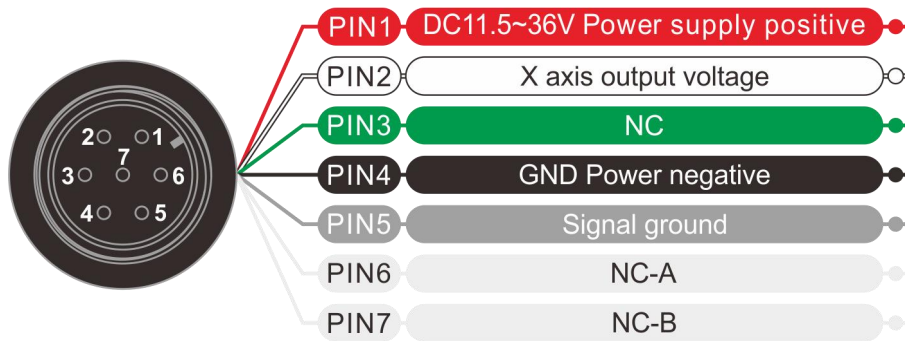
► **ANGLE OUTPUT CALCULATION FORMULA**

Angle=(output voltage—Zero position voltage)÷Angle sensitivity
Angle sensitivity=output voltage range÷ Angle measuring range
E.G : HCA510T-30-V1-N (±30° measuring range 0 ~ 5V output voltage range)
Angle sensitivity= 5÷60=0.83333 V/°

► **ELECTRICAL CONNECTION**

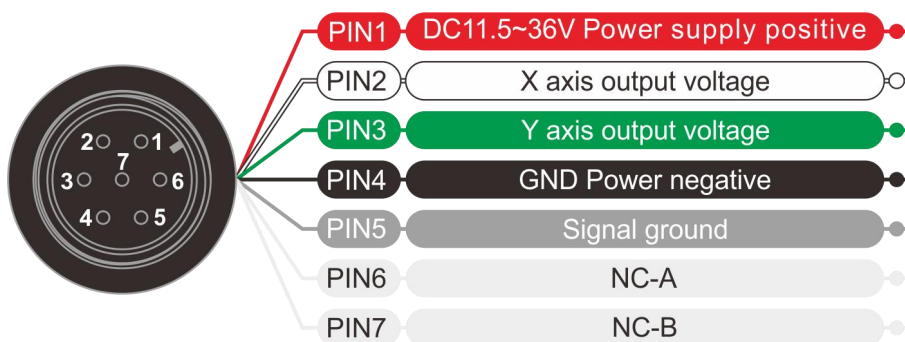
SINGLE AXIS CABLE WIRE CONNECTION

Wire Color	RED	WHITE	GREEN	BLACK	GRAY
function	DC11.5~36V Power supply positive	Out X X axis output voltage	NC	GND Power negative	Signal ground



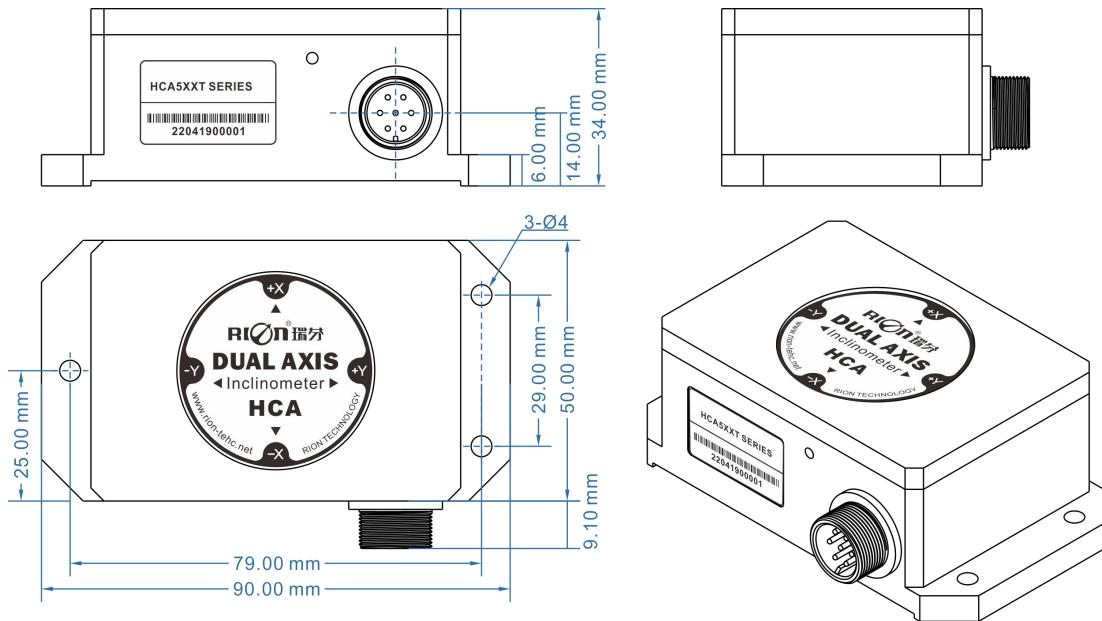
DUAL AXIS CABLE WIRE CONNECTION

Wire Color	RED	WHITE	GREEN	BLACK	GRAY
function	DC11.5~36V Power supply positive	Out X X axis output voltage	Out Y Y axis output voltage	GND Power negative	Signal ground



HCA510T / 520T VOLTAGE TYPE INCLINOMETER

► DIMENSION



Shell size: L90×W59×H34mm

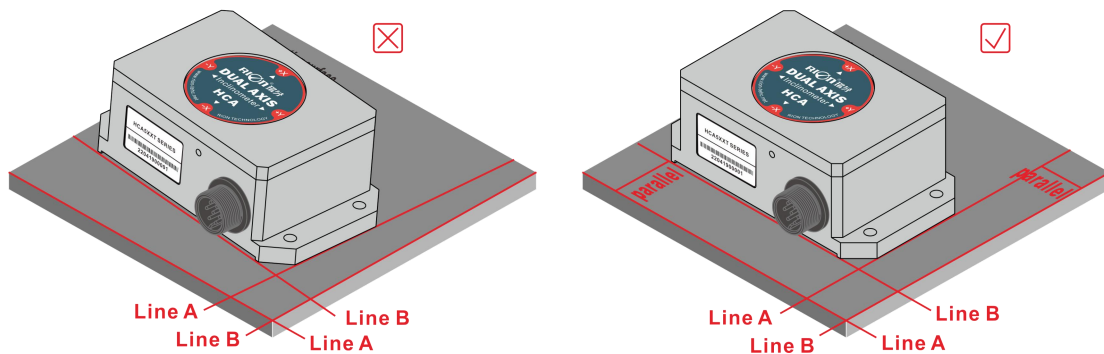
Installation size: L79×W29×H6mm

mounting screws: 3M4 screws

► PRODUCTION INSTALLATION NOTES

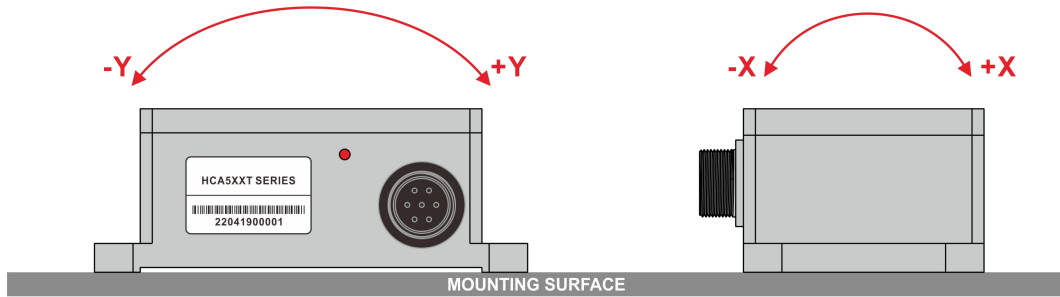
Please follow the correct way to install tilt sensor, incorrect installation can cause measurement errors, with particular attention to the "surface", "line".

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

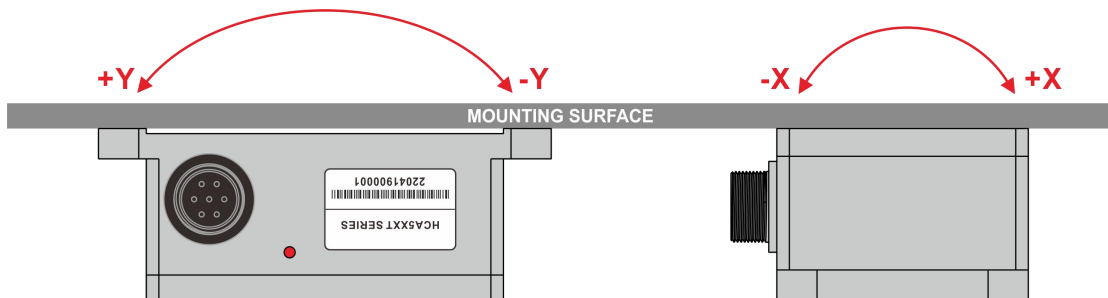


► **MEASURING DIRECTIONS**

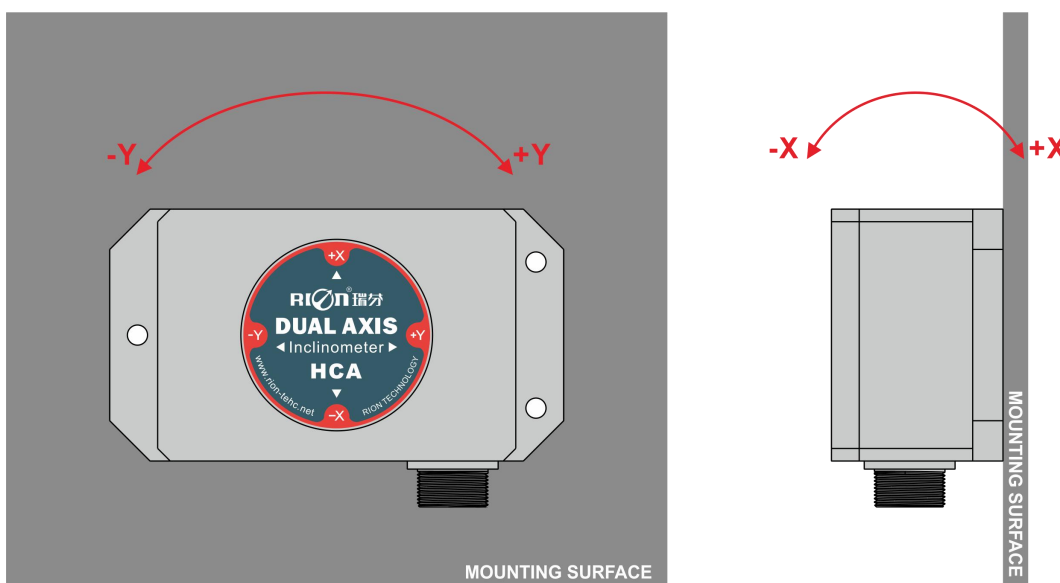
The installation must guarantee the product bottom is parallel to measured face, and reduce the influence of dynamic and acceleration to the sensor. This product can be installed horizontally or mounted vertically, for installation please refer to the following scheme.



Horizontal installation

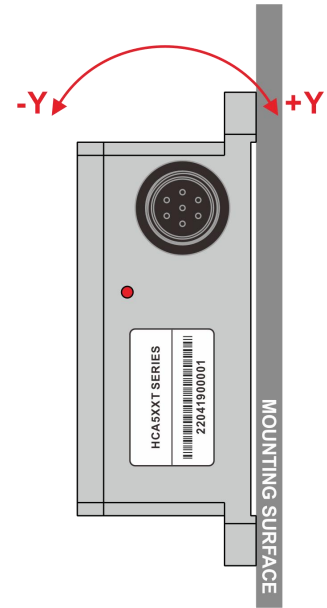
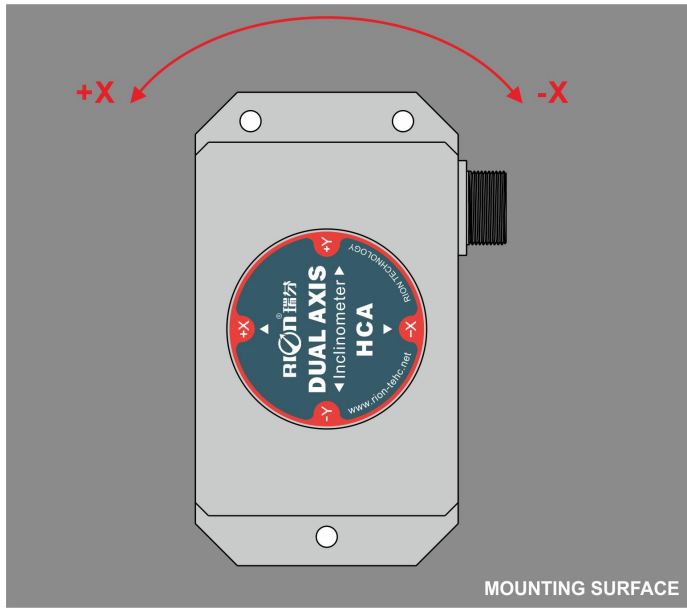


Horizontal-down installation

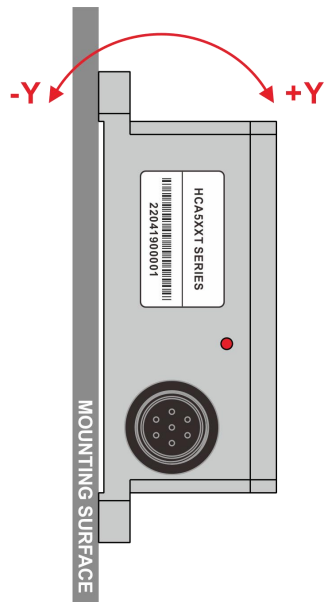
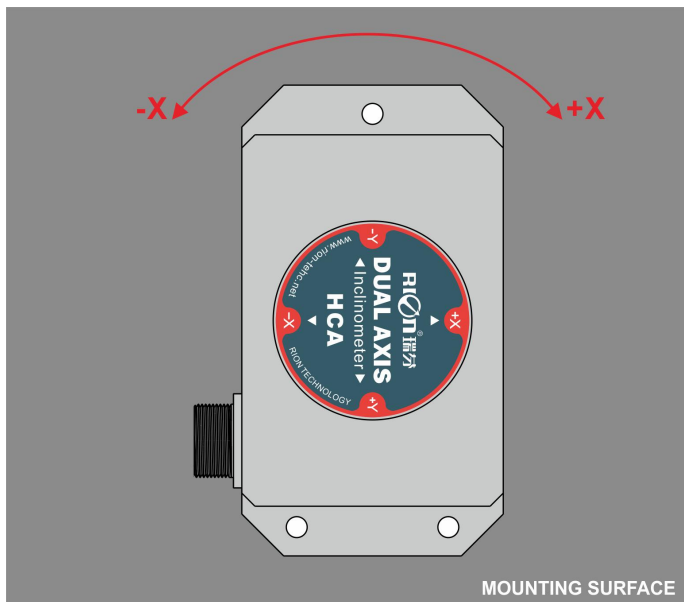


Vertical installation

HCA510T / 520T VOLTAGE TYPE INCLINOMETER



Vertical-left installation



Vertical-right installation



Add: Block 1 & Block 6, COFCO(FUAN) Robotics Industrial Park , Da Yang Road No. 90,

Fuyong Distict, Shenzhen City, China

Tel : (86) 755-29657137 (86) 755-29761269

Fax: (86) 755-29123494

E-mail: sales@rion-tech.net

Web: www.rionsystem.com/en/