



SPECIFICATIONS

Item No.: ACA2400

Description: High Accuracy Digital Type Dual-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
- Gyro accelerometer test standard: QJ 2318-92 Gyro accelerometer test methods
- 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.10
- Date:2016.10.27

ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation



General Description

ACA2400 is a analog balanced servo inclinometer which manufactured by Rion company, the principle is composed of the non-contact displacement sensor, torque motor, error & amplifier circuit, the feedback circuit and cantilever mass five parts. This series inclinometer accuracy is far superior than the inclinometer relative to the electrolyte principle or the capacitance principle on the nonlinearity, repeatability, hysteresis, temperature drift and working temperature, resistance shock anti-vibration and other properties. Internal integration of the 24 ARM high-end system, resolution 0.0005°, precision 0.005°, temperature drift: 0.0008 °C / °, it is a highly competitive industry product nowadays. Non-contact installation features make ACA2400 with superior system integration, Simply fix the sensor on the measured surface by screws, then can automatically calculate the object posture inclination, easy to use, no need to find the relative change two surfaces for mounting. With strong ability resistance to external electromagnetic interference and to withstand shock and vibration, in the domestic counterparts products with absolute competitive advantage, specialized in application in the industrial and military fields where the high-end user requirements.

Features

- Dual-Axis Inclinometer
- Response frequency: 50Hz
- Wide temperature working: -40~+85°C
- Size: L110×W65×H32mm
- RS485、TTL are optional
- IP67 Protection
- Measuring Range :±1~±90° optional
- Wide voltage input: 9~36V
 - Resolution: 0.0005°
 - ZERO Temp. Drift ±0.0008
 - Water-proof air-plug

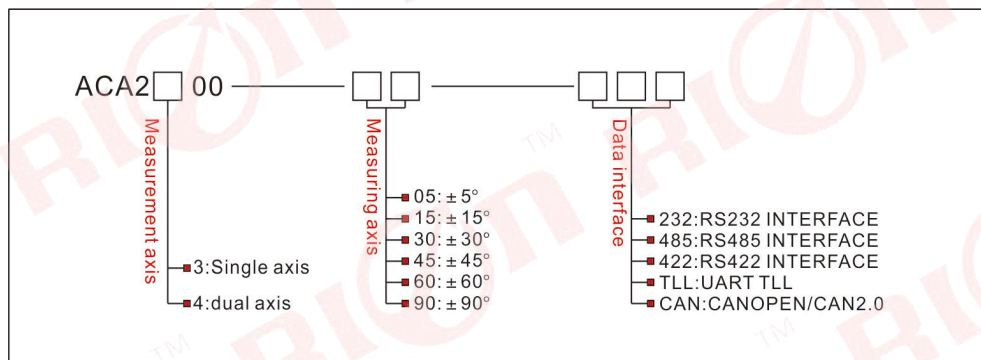
Application:

- Engineering vehicles automatic leveling
- Precise equipment 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



ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

Ordering information:



E.g: ACA2400-05-232: Dual-axis/±5°Measuring range/RS232 output

Technical Data

Parameters	Conditions	ACA2400T-05	ACA2400T-10	ACA2400T-15	
Measuring range		±05	±10	±15	°
Measuring axis		X, Y	X, Y	X, Y	
Resolution		0.0005	0.0005	0.0005	°
Absolute accuracy	@25℃	0.003	0.005	0.006	°
Long term stability		0.002	0.003	0.005	°
Zero temperature coefficient	-40~85°	±0.0008	±0.0008	±0.0008	°/℃
Sensitivity temperature coefficient	-40~85°	≤50	≤50	≤50	ppm/℃
Power on time		0.5	0.5	0.5	S
Response time		0.005	0.005	0.005	S
Output rate	5Hz、15Hz、35Hz、50Hz can be set				
Out signal	RS232/RS485/RS422/TTL/CAN				
Electromagnetic compatibility	According to EN6100 and GBT17626				
MTBF	≥50000 hours / times				
Insulation Resistance	≥100 M				
Shockproof	100g@11ms、imes/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)				

ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

Electronic Characteristics

Parameters	Conditions	Min	Standard	Max	Unit
Power supply	Standard	9	24	36	V
	customized		Other voltage		V
Working current	No-load		50		mA
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.

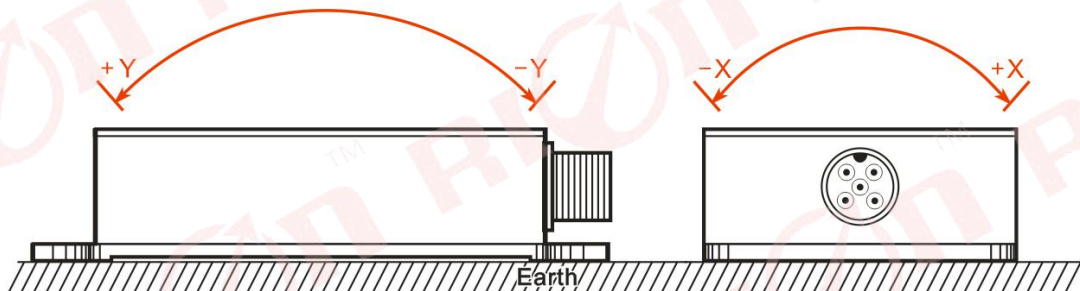
Mechanical Parameters

- Connectors: 1m cable with air-plug connector (customized)
- Protection glass: IP67(air plug connector)
- Enclosure material : Aluminum Shield Oxide
- Installation : 4*M5 screws



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.

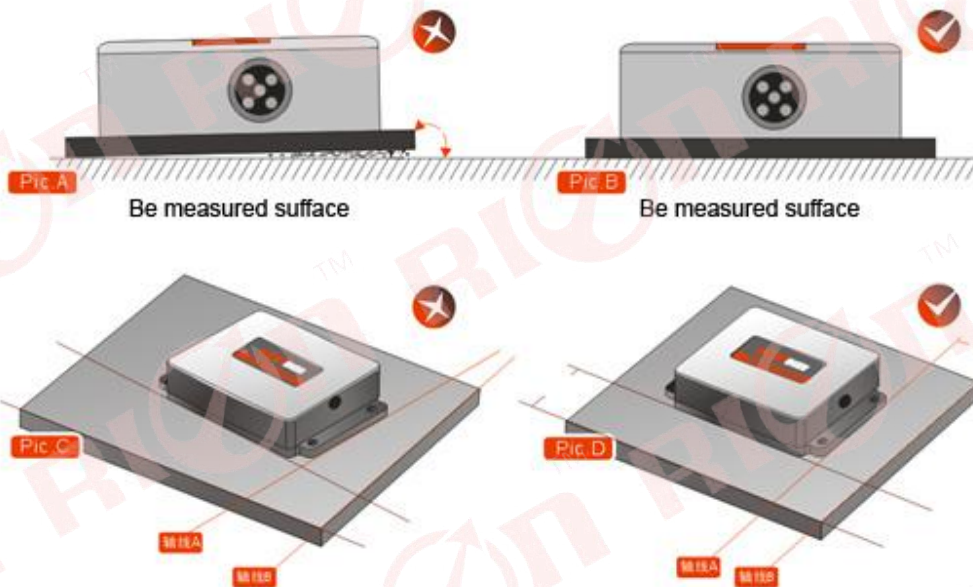


ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

Production installation notes :

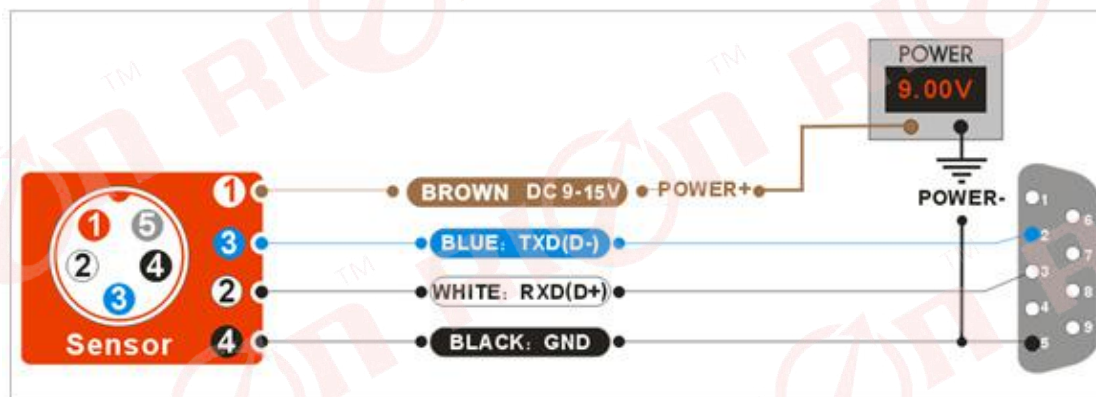
Please follow the correct way to install tilt sensor, incorrect installation can cause measurement errors, with particular attention to the "surface", "line": 1) The Sensor mounting surface and the measured surface must be fixed closely, smoothly, stability, if mounting surface uneven likely to cause 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



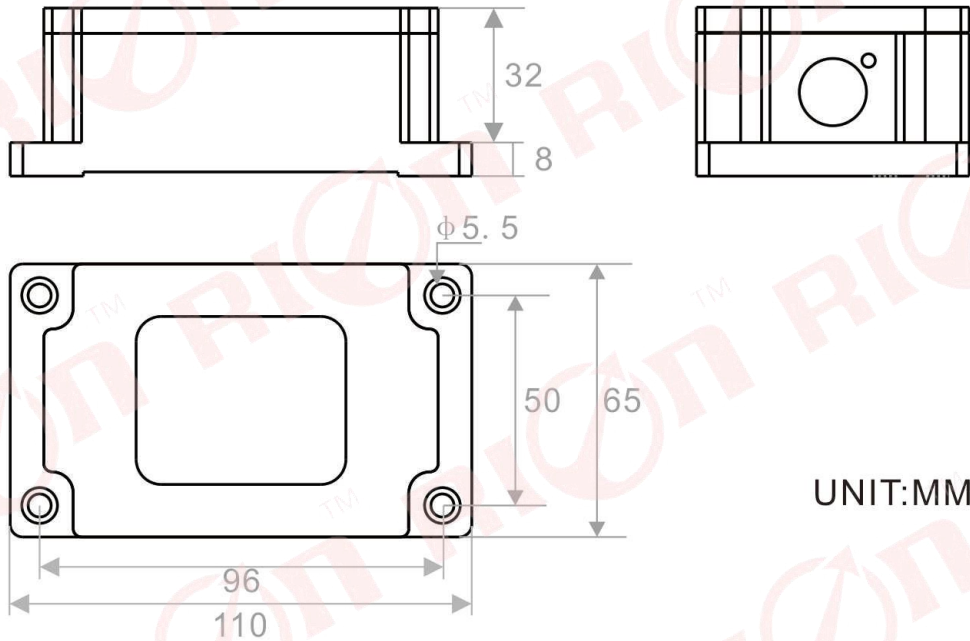
Electrical Connection

Line color function	BLACK	WHITE	BLUE	BROWN	GRAY
	GND	RS232(RXD) Or RS485(D+)	RS232(TXD) Or RS485(D-)	Vcc 9~36V Power supply positive	FACTORY Use only



ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

Dimension

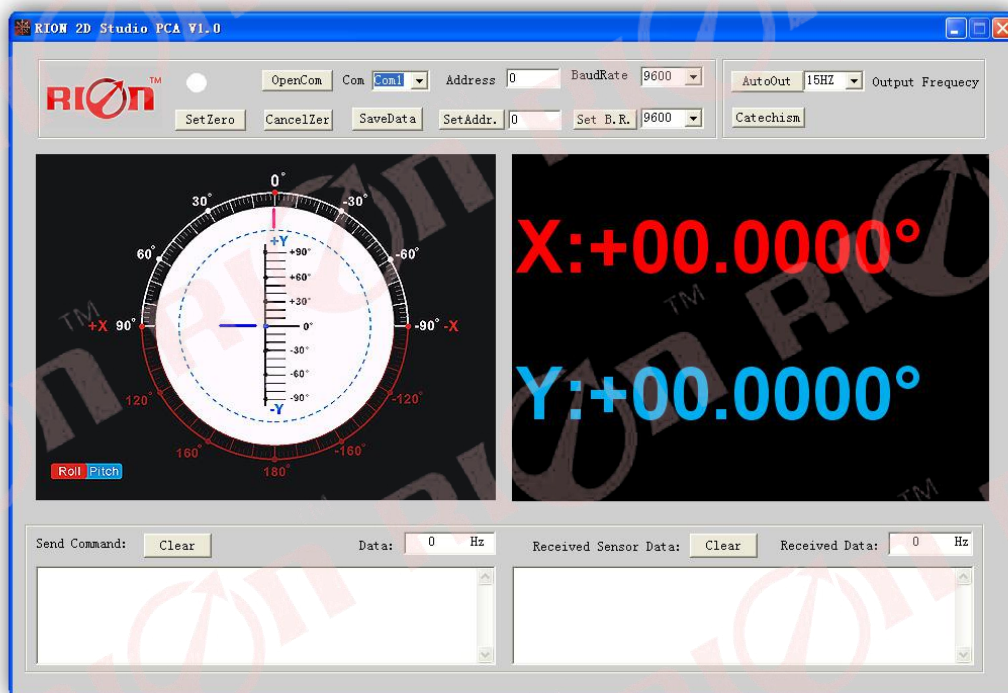


UNIT:MM

Size: L110×W65×H40mm

RION serial port tester software

You can download the RION angle debugging software from RION's official website for the preliminary angle debugging, also you Can download public version of the serial port assistant software on line for using .



ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

Open/Close: Open and close COM port;

Com: Select the the device corresponding to the COM port

Address: Fill in the sensor current address code, the factory default is 00

Set Address: Set the sensor address code input box on the right to enter the desired address code, click Set Addr button

Save Data: Save the data, click here data can be synchronized Save angle data, the file is stored by default in the C: ---- COMDATA file

Set Zero: Set relative zero, the sensor current angle is 00.00 degrees

Cancel Zero: Unset the relative zero, to restore the sensor to the factory absolute zero;

Baud Rate: Select the sense baud rate , the factory default is 9600;

Set Baud Rate: Set the sensor baud rate, on the right of the selection box to select corresponding baud rate then click SetB.R. button;

Auto Output: Switch the sensor to automatically output mode, in the automatic output mode can be filled with different output frequency in Hz;

Catechism: The sensor switch to answer pattern, such as choosing the answer type, must input "send command" (command, please refer to the specification) on the left of "Send Command" input box, but also can fill in the transmit frequency in the Send Data, the unit Hz;

Note: after install the RION's debugging software, if can not open, please operate by the following steps (please appear to the administrator status to operate):

- 1) Copy these three files mscomm.srg、mscomm32.ocx、mscomm32.dep from the folder to C:/Windows/system32 path below.
- 2) Click "Start" --"run" --"regsvr32 mscomm32.ocx", You are prompted to install successful dialog.

Product Protocol

1.DATA FRAME FORMAT:

(8 bits date, 1 bit stop, No check, Default baud rate 9600)

Identifier (1byte)	Date Length (1byte)	Address code (1byte)	Command word (1byte)	Date domain	Check sum (1byte)
68					

Date format: hexadecimal

Identifier: Fixed68

Data length: From data length to check sum (including check sum) length

Address code: Accumulating module address, Default :00

Date domain will be changed according to the content and length of command word

Check sum: Data length、Address code、Command word and data domain sum,No carry.

二、COMMAND word analysis

Desc.	Meaning/Example	Description
0X01	read X axis angle command eg: 68 04 00 01 05	data field(0 byte) no data field command
0X81	sensor responds eg: 68 07 00 81 10 26 87 60	data field(4 byte) SS AA BB BB, data field is 4 bytes responding angle value(BCD compressed)

ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

	A5	code), SS is sign bit(00 is positive, 10 is negative), AA is two digit integer value, BBBB is three digit decimal. other axis data is the same. eg: 10268760 indicates -26.8760 deg
0X02	responding command read Y axis angle E.g: 68 04 00 02 06	data field(0 byte) no data field command
0X82	sensor responds read Y axis angle eg 68 07 00 82 00 16 25 05 C9	4 bytes responding angle value(BCD compressed code), SS is sign bit(00 is positive, 10 is negative), AA is two digit integer value, BBBB is three digit decimal. other axis data is the same. eg: 00162505 indicates +16.2505 deg
0X04	Meanwhile read angle command E.g: 68 04 00 04 08	Data domain(0byte) No Data domain command
0X84	sensor data response E.g: 68 10 00 84 00 00 20 08 10 00 25 28 10 35 00 80 DE	Data field(9byte) 68 is prefix of data packets, fixed. 10 is data length, fixed. 00 is address code, revisable. 84 is command code, fixed. 00 00 20 08 the four red bytes are the X axis returned angle value in compact BCD code. the high order 0 of first byte is sign bit(0: positive; 1: negative), 00 0 are three digit integer value, 20 08 are four decimal digit. other axis data analysis method is similar. the angle is +000.2008 deg by analyzing. 10 00 25 28 the four blue bytes are Y axis returned angle value, analysis method is similar to X axis 10 35 00 80 , the four green bytes are internal temperature value, analysis method is similar to X axis. DE check sum, hexadecimal sum of all data, exclude prefix 68, if surpass one byte, pick
0X05	Setting relative/absolute ZERO: Can set the current angle to Zero degree, relative measurement, can also be set to absolute ex-factory zero, power off save E.g: 68 05 00 05 00 0A	Data domain (1byte) 00: absolute ZERO 01: relative ZERO
0X85	Sensor answer reply command E.g: 68 05 00 85 00 8A	Data domain (1byte) Data domain in the number means the sensor response

ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

		<p>results</p> <p>00 Setting successfully</p> <p>FF Setting failure</p>
0X0B	<p>Setting communication rate</p> <p>E.g: 68 05 00 0B 03 13</p> <p>The command setting is effective after power off then restart (power off with save function)</p>	<p>Data domain (1byte)</p> <p>Baud rate: default :9600</p> <p>00 means 2400</p> <p>01 means 4800</p> <p>02 means 9600</p> <p>03 means 19200</p> <p>04 means 38400</p> <p>05 means 115200</p>
0X8B	<p>Sensor answer reply command</p> <p>E.G:68 05 00 8B 90</p>	<p>Data domain (1byte)</p> <p>Data domain in the number means the sensor response results</p> <p>00 Success FF Failure</p>
0X0C	<p>Setting sensor output mode</p> <p>Response rule;</p> <p>Need upper computer send reading angle command , the sensor answer the corresponding angle</p> <p>Automatic output rule:</p> <p>The sensor with power on can Automatically output X angle , output frequency is 20HZ (Power off with save function)</p> <p>E.g: 68 05 00 0C 00 11</p>	<p>Data domain (1byte) Factory default: 00</p> <p>00 Answer reply mode</p> <p>01 5Hz Automatical output mode</p> <p>02 15Hz Automatical output mode</p> <p>03 25Hz Automatical output mode</p> <p>04 35Hz Automatical output mode</p> <p>05 50Hz Automatical output mode</p> <p>06 100 Hz Automatical output mode</p> <p>07 200Hz Automatical output mode</p> <p>08 300Hz Automatical output mode</p>
0X8C	<p>The sensor answer reply command</p> <p>E.g: 68 05 00 8C 00 91</p>	<p>Data domain (1byte)</p> <p>Data domain in the number means the sensor response results</p> <p>00 Success FF Failure</p>
0X0F	<p>Setting module address command</p> <p>The sensor default address is 00, 1, such as a plurality of sensor to be connected with a bus cable, e.g RS485.requires each sensor is set to a different address, in order to achieve control and response angle .</p> <p>2, If successfully changed the new address, follow all of the commands and responding Packet address code has to switch to the new address code which already changed then to be effective, otherwise the sensor will not respond to commands.(power off with save function)</p>	<p>Data domain (1byte) XX Module address</p> <p>Address from 00 to EF range</p> <p>Note: All products have a common address :FF, If forget the address what has been set during operation , can use FF address to operate the product can still normally respond</p>

ACA2400T -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

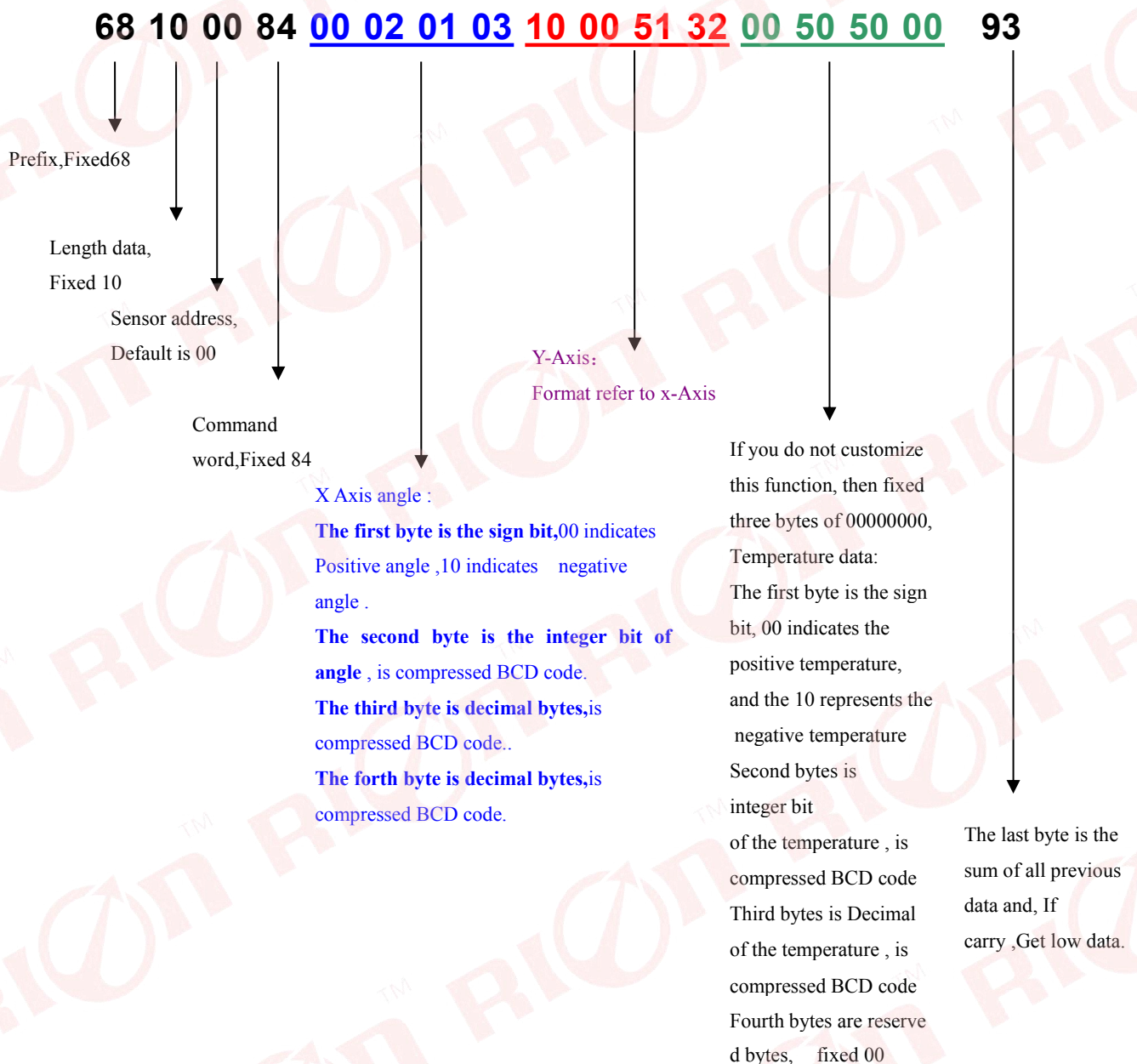
	<p>E.g: 68 05 00 0F 01 15 Setting the address to 01 68 05 FF 0F 00 13 Use the common address to reset address to 00</p>	
0X8F	<p>The sensor answer reply E.g: 68 05 00 8F 94</p>	<p>Data domain (1byte) , Data domain in the number means the sensor response results 00 Success FF Failure</p>
0X0D	<p>Query relative/absolute ZERO Used to query the sensor current ZERO mode is relative ZERO or absolute ZERO E.g : 68 04 00 0D 11</p>	<p>Data domain (0byte) No data domain commands</p>
0X8D	<p>The sensor answer reply command E.g:68 05 00 8D 00 92</p>	<p>Data domain (1byte) , Data domain in the number means the sensor response results 00 Absolute ZERO 01 Relative ZERO</p>

(RION Inclinometer data format)

Baud rate: (9600 , 8 data bits, 1data top, No check)

For example:

X-Axis: +02.0103° Y-Axis: -00.5132°
Temp: +50.500°



※ More products information, please refer to the company's Website : www.rion-tech.net

Product specifications are to upgrade or change, without prior notice!





深圳市瑞芬科技有限公司

CHINA SHENZHEN RION TECHNOLOGY CO.,LTD.

•INCLINOMETER •TILT SWITCH •ACCESSORIES •NORTH FINDER •TURNTABLE
•ELECTRONIC COMPASS •DIGITAL INCLINOMETER •ACCELEROMETER
•ATTITUDE AND HEADING REFERENCE SYSTEM •ELECTRONIC GYROSCOPE

T : 0755-29657137/29761269

F : 0755-29123494

W : www.rion-tech.net

E : sales@rion-tech.net

A : 4 th Floor Block 1, COFCO(FUAN) Robotics Industrial Park , Da Yang Road 90, Fuyong Distict, Shenzhen City, China

Attitude Solution Provider
姿态方案解决专家!