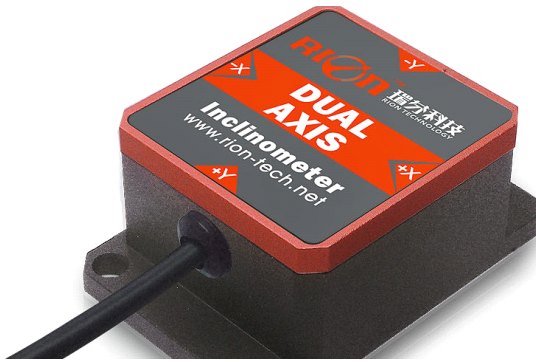# SPECIFICATIONS

Item No.：LCA326T

Description: Digital 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
- 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
- Ver:.05
- Date:2014.4.16

General Description

LCA326Tseries products which launched by RION company is a new generation digital type small size MEMS inclinometer , Built-in two channel gravity tilt unit, by measuring the static gravity acceleration then convert into the inclination change. Thus can measure the inclinometer output relative to the horizontal tilt and pitch tilt. Output RS232, RS485 or TTL level interface standard optional. Because of built-in MCU control system, that make the sensor output linearity get two amendments, made up the analog type precision drop because of insufficient correction led to .

This product adopts the non-contact measuring principle, can real-time output the current attitude angle, simple to use, no need to find the relative variation of the two surface for mounting. It is a ideal choice for Industrial automation control and platform measuring attitude,strong ability of resisting external electromagnet interference, can be adapted to long-term working in the industry harsh environment. This product is suitable for the static and slow changes dynamic measurement, not suitable for rapid changes dynamic measuring.

Features:

- ●Dual-Axis Inclinometer
- ●Long-term stability 0.2°
- ●Output mode RS232/RS485/TTL (optional)
- ●IP67 protection class
- ●Resolution: 0.1°

- ●Measuring Range :±10～±90° optional
- ●DC+5V input
- ●Wide temperature working: -40～+85℃
- ●Highly anti-vibration performance >3500g
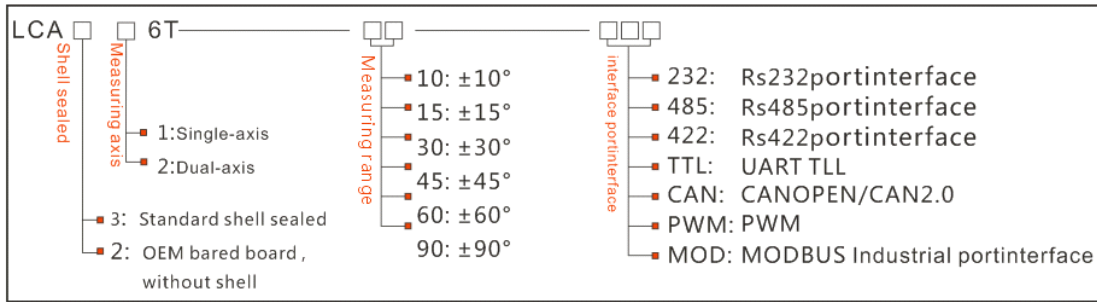- ●Small size : 55×37×24mm（customized）

Application:

- ●Electric blind man chair leveling
- ●Satellite antenna positioning
- ●Car Chassis Measurement
- ●engineering mechanical measurement of dip angle

- ●Cloud deck operating monitor
- ● Medical equipment leveling
- ● Four - wheeled positioning system

Ordering information:

E.g：LCA326T-10-232：Dual-axis/standard/±10°Measuring range/RS232 output

Technical Data

Parameters	Conditions	LCA326T-10	LCA326T-30	LCA326T-60	LCA326T-90	unit
Measuring range		±10	±30	±60	±90	°
Measuring axis		X,Y	X,Y	X,Y	X,Y	
Resolution		0.1	0.1	0.1	0.1	°
Absolute accuracy		0.1	0.2	0.3	0.4	°
Long term stability		<0.5	<0.5	<0.5	<0.5	
Zero temperature coefficient	-40～85°	±0.008	±0.008	±0.008	±0.008	°/℃
Sensitivity temperature coefficient	-40～85°	≤150	≤150	≤150	≤150	ppm/℃
Power on time		0.5	0.5	0.5	0.5	S
Response time		0.05	0.05	0.05	0.05	S
Output rate	5Hz、15Hz、35Hz、50Hz can be setting					
Output signal	RS232/RS485/RS422/TTL/PWM/CAN/MODBUS can be customized					
EMC	According to EN61000 和 GBT17626					
MTBF	≥45000 hours/times					
Insulation Resistance	≥100M					
Shockproof	100g@11ms、3Times/Axis(half sinusoid))					
Anti-vibration	10grms、10～1000Hz					
Protection glass	IP67					
Cables	Standard 1M length、wearproof、grease proofing、wide temperature、Shielded cables 4*0.4mm2					
Weight	90g(without cable)					

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

Electrical Characteristics

Parameters	Conditions	Min	Standard	Max	Units
Power supply	Standard	4.5	5	7	V
	customized		9-36v		V
Working current	non-loaded		40		mA
Working temperature		-40		+85	℃
Store temperature		-55		+100	℃

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 lead cable（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.
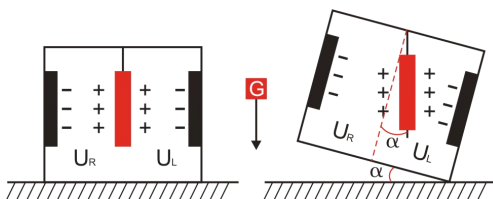

U_R, U_L Respectively is the pendulum left plate and the right plate corresponding to their respective voltage between the electrodes, when the tilt sensor is tilted, U_R, U_L Will change according to certain rules, so $f(U_R, U_L,)$ On the inclination of α function:

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

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.
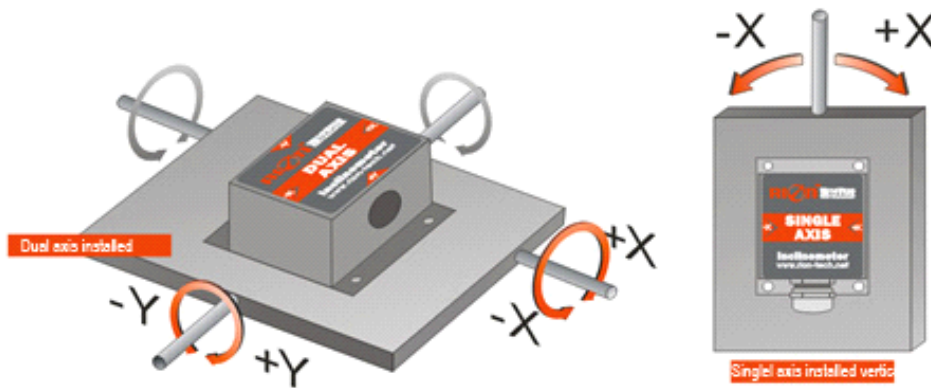
Production installation notes:

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
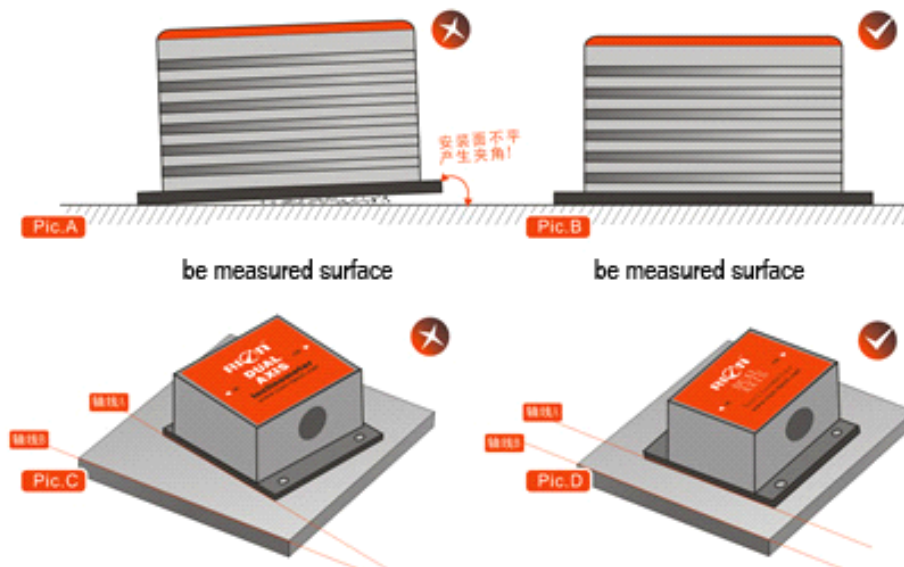
Dimension
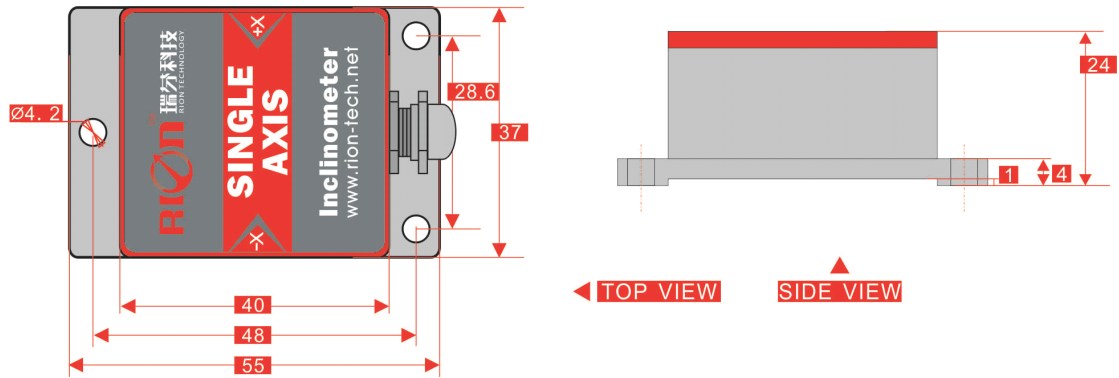
Size：L55mm×W37mm×H24mm

Electrical Connection

Line color function	BLACK	YELLOW	GREEN	RED
	GND	RS232(RXD)	RS232(TXD)	DC 5V
	Power Negative	RS485(D+)	RS485(D-)	Power positive
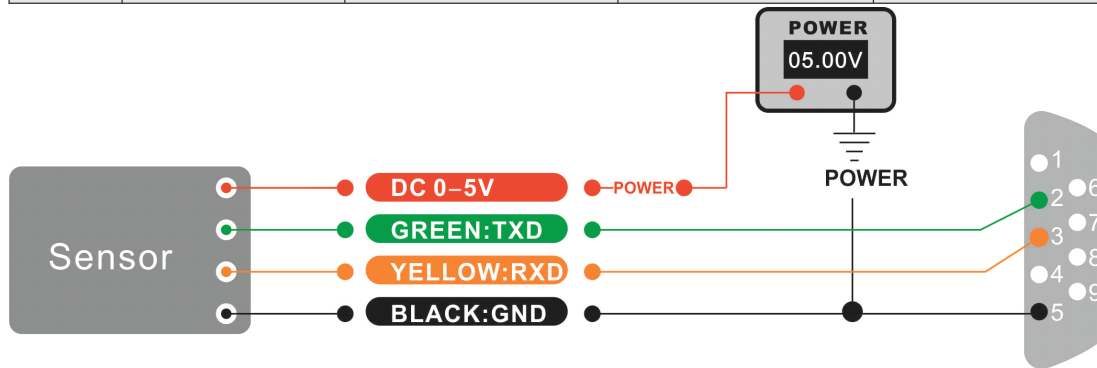
RION serial port tester software

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 comassistant software on line for using .
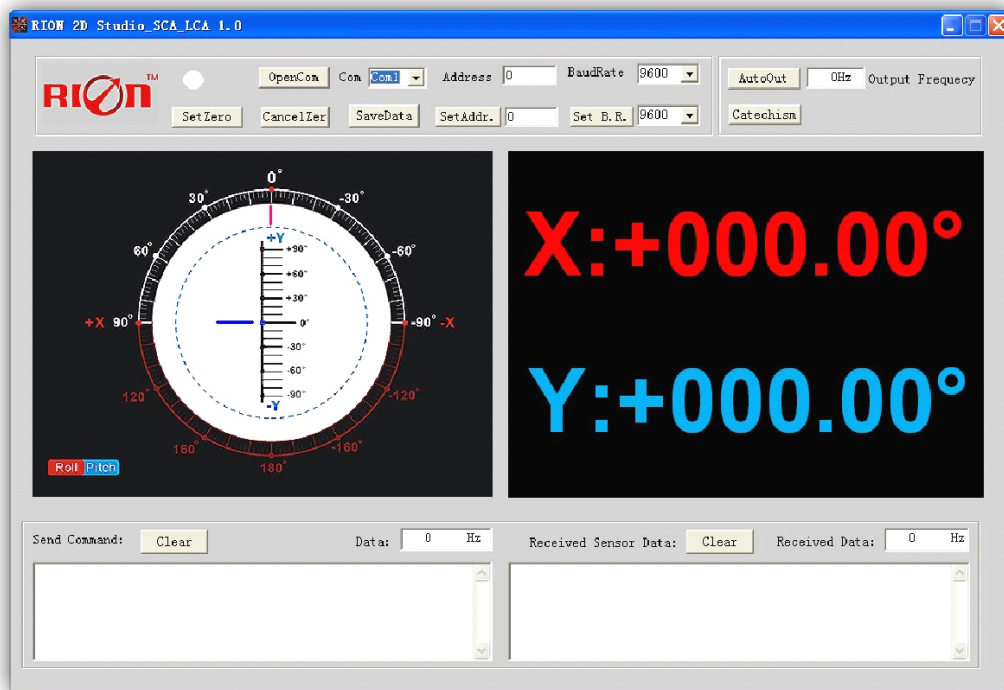
Open/Close：Open and close COM port;

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

一、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
0X04	**Meanwhile reading angle commands** E.g: *68 04 00 04 08*	Data domain(0byte) No Data domain command
0X84	Sensor answer reply E.g **68 0D 00 84 00 20 10 10 05 25 00 00 00 FB**	Data domain（9byte） AA AB BB CC CD DD EE EE EE AA AB BB: 3 bytes means X axis CC CD DD: 3 bytes means Y axis EE EE EE : 3 bytes resovation keep data , fixed to be 000000 Angle format X axis or Y axis with same analytic method The angle in left example is : X axis 020.10deg, Y axis -05.25deg
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 results 00 Setting successfully FF Setting failure
0X0B	**Setting communication rate** E.g：*68 05 00 0B 03 13* The command setting is effective after power off then restart , meanwhile power off with save function	Data domain（1byte） Baud rate：Default value is :9600 00 means 2400 01 means 4800 02 means 9600 03 means 19200 04 means 38400

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		05 means 115200
0X8B	Sensor answer reply command E.g: **68 05 00 8B 90**	Data domain（1byte） Data domain in the number means the sensor response results 00 Success FF　Failure
0X0C	**Setting sensor output mode** Response rule; Need upper computer send reading angle command , the sensor answer the corresponding angle Automatic output rule: The sensor with power on can Automatically output X, Y angle , output frequency is 20HZ (Power off with save function) E.g: **68 05 00 0C 00 11**	Data domain （1byte）Factory default is : 00 00　Response rule 01　5Hz　Automatic output mode 02　15Hz　Automatic output mode 03　25Hz　Automatic output mode 04　35Hz　Automatic output mode 05　50Hz　Automatic output mode 06　100Hz　Automatic output mode
0X8C	Sensor answer reply command E.g: **68 05 00 8C 00 91**	Data domain（1byte） Data domain in the number means the sensor response results 00 Setting successfully FF Setting failure
0X0F	**Setting module address command** 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 . 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) 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	Data domain （1byte）XX Module address Address from 00 to EF range 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

0X8F	The sensor answer reply command E.g: 68 05 00 8F 94	Data domain（1byte）, Data domain in the number means the sensor response results 00　Success　FF　Failure
0X0D	**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**	Data domain（0byte） No data domain commands
0X8D	The sensor answer reply command E.g:**68 05 00 8D 00 92**	Data domain（1byte）, Data domain in the number means the sensor response results 00　Absolute ZERO 01　Relative ZERO
0x17	**Set the sensor filter coefficients** Set to a different filter coefficient to adjust the angle acquisition rate, in order that there is a steady angle output in working with different type devices(This function with memory after power off) *E.g: 68 05 00 17 01 1D*	Data domain （1byte）Factory default : 02 01　1 Filtering Fast response, no delay, the output of the last one data beat (100 sampling) 02　2　Filtering For the periodic peak value filtering, faster response, and the short delay (30 sampling) 03　3 Filtering After periodic filtering then large range of smoothing filtering, biggest delay, only suitable for static measurements (5 sampling)
0X97	The sensor answer reply command E.g: **68 05 00 97 00 02**	Data domain（1byte） Data domain in the number means the sensor response results 00 success FF failure

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