



SPECIFICATIONS

Item No.: HCA526T-CAN open

Description: High Accuracy Digital 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
- 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: 2014.4.17

HCA526T-CAN open-High Accuracy Digital Dual-axis Inclinometer



General Description

HCA526T-CAN open is a high accuracy dual -axis inclinometer launched by RION company, inherit the stability of the SCA series, while the accuracy be effectively improved, and the temperature drift performance with much more excellence , in addition the system with built-in high-precision 16bit A / D differential converter, meanwhile through 5 filtering algorithm, which can measure the angle of sensor output relative to the horizontal tilt and pitch tilt. The output interface RS485, RS232, RS422, TTL, or CAN 2.0B are optional.

Because of Built in ADI company's high precision digital temperature sensor that can correct the sensor temperature drift in accordance with the changes of the built-in temperature sensor(temperature output are optional), to ensure high repeatability of the product in the low-temperature and high-temperature environment. The output frequency response most up to 100Hz, for higher response frequency Division we can customize according to the user requests. The products are truly industrial-grade products, reliable performance, scalability. Suitable for a variety of harsh industrial control environment.

Features:

- Dual-Axis Inclinometer
- Accuracy refer to the technical data
- Wide temperature working: -40~+85℃
- IP67 protection class
- Small size :90×50×33mm (customized)
- Measuring Range :±1~±90° optional
- Wide voltage input: 9~36V
- Resolution: 0.001°
- Highly anti-vibration performance >2000g
- Water-proof air-plug connector

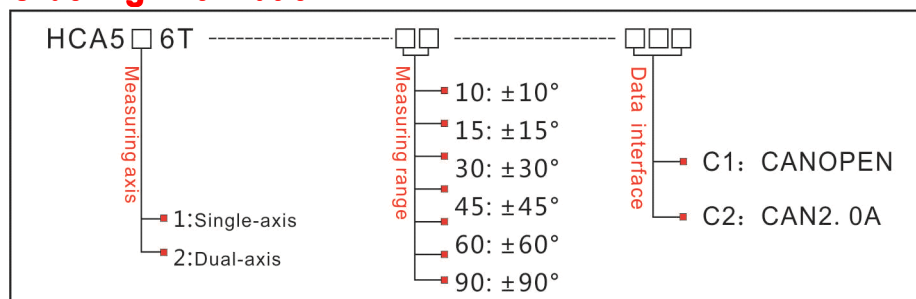
Application:

- Satellite positioning Search
- engineering mechanical measurement of dip angle
- Radar detection of vehicle platform
- Gun Barrel angle measurement in early shooting
- Satellite communications vehicle posture detection
- Ship's navigation posture measurement
- Rail-mobile monitoring
- oil-well drilling equipment
- Underground drill posture navigation
- Based on the angle direction measurement
- Shield pipe jacking application
- Geological equipment inclined monitoring



HCA526T-CAN open-High Accuracy Digital Dual-axis Inclinator

Ordering information:



E.g: HCA526T-10-C1: Dual axis /Standard/ $\pm 10^\circ$ Measuring range/CANOPEN output

Technical Data

Parameters	Conditions	HCA526T-10	HCA526T-30	HCA526T-60	HCA526T-90	Unit
Measuring rang		± 10	± 30	± 60	± 90	$^\circ$
Measuring axis		X,Y	X,Y	X,Y	X,Y	
Resolution		0.001	0.001	0.001	0.001	$^\circ$
Absolute accuracy		0.005	0.01	0.02	0.05	$^\circ$
Long term stability		0.01	0.02	0.05	0.08	
Zero temperature coefficient	$-40 \sim 85^\circ$	± 0.002	± 0.002	± 0.002	± 0.002	$^\circ/\text{C}$
Sensitivity temperature coefficient	$-40 \sim 85^\circ$	≤ 50	≤ 50	≤ 50	≤ 100	ppm/ $^\circ\text{C}$
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	CANOPEN					
EMC	According to EN61000 and GBT17626					
MTBF	≥ 50000 hours/times					
Insulation Resistance	$\geq 100\text{M}$					
Shockproof	100g@11ms、3Times/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)					

* This Technical data only list $\pm 10^\circ$, $\pm 30^\circ$, $\pm 60^\circ$, $\pm 90^\circ$ series for reference, other measuring range please refer to the adjacent parameters

Electronic Characteristics

Parameters	Conditions	Min	Standard	Max	Unit
Power supply	Standard	9	12、24	36	V
	customized		Other voltage		V
Working current	non-loaded		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.

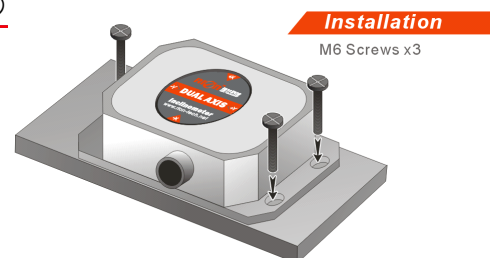
Absolute accuracy: Refers to in the normal temperature circumstances, the sensor absolute linearity, repeatability, hysteresis, zero deviation, and transverse error comprehensive error.

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.

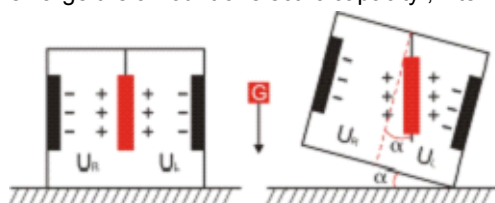
Mechanical Parameters

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



Working Principle

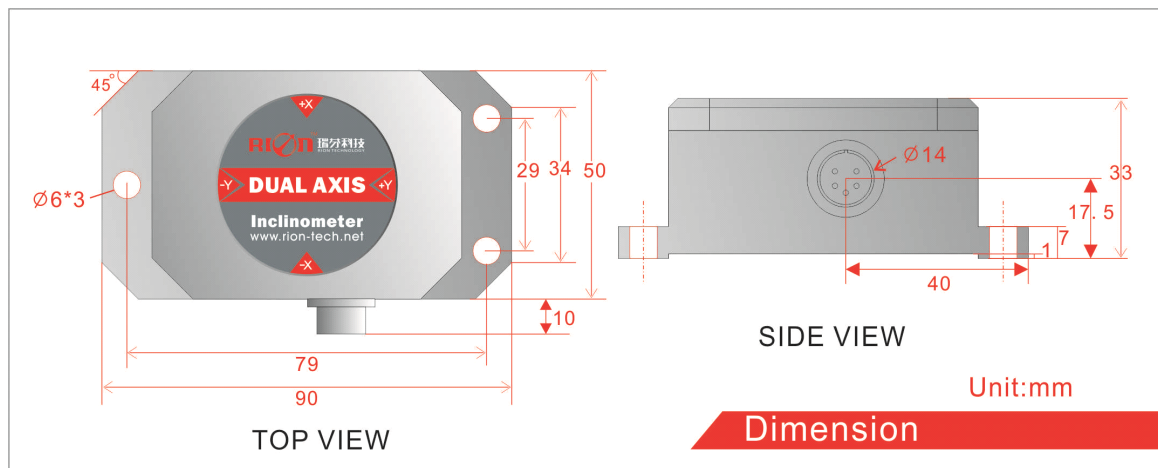
Adopt the European import of core control unit, using the capacitive micro pendulum principle and the earth gravity principle, when the the inclination unit is tilted, the Earth's gravity on the corresponding pendulum will produce a component of gravity, corresponding to the electric capacity will change, 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:

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

Dimension

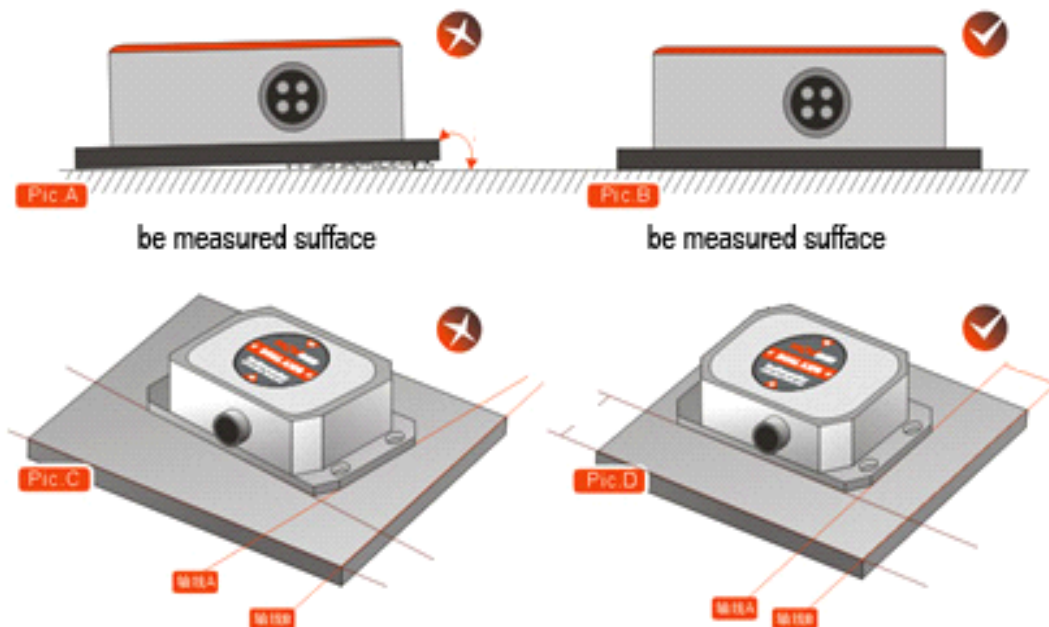


Size: L90×W50×H33mm

Production installation notes :

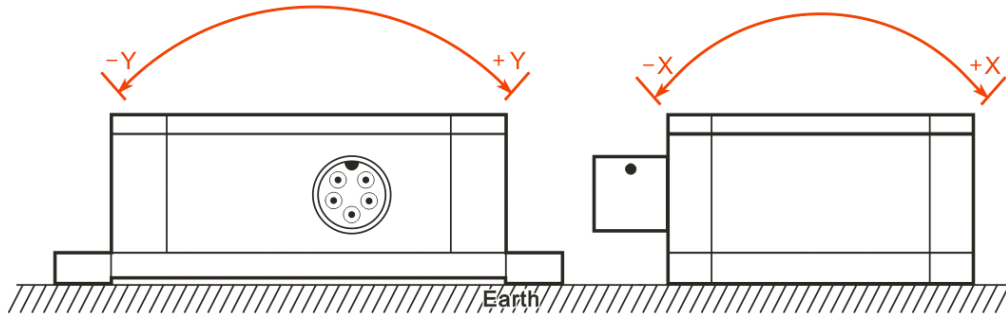
Please follow the correct way to install tilt sensor, incorrect installation can cause measurement errors, with particular attention to the "surface", "line"::

- 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



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.



Electrical Connection

Line color function	BLACK	WHITE	BLUE	BROWN	GRAY
	GND Power Negative	CANL	CANH	VCC 9-36V	FACTORY Use only

Rion products' communication protocol

Communication protocol:

1. SDO message: SDO request, response message include 8 bytes, if not enough, add 0 to make it 8 bytes.

Write Object format and content of request and response message showed as table 1-1 and 1-2: Node_ID is CAN communication node number, Index_LSB is dictionary index low byte, Index_MSB is dictionary index high byte, Sub_index is sub-index.

1) BOOT UP

It send message automatically after inclinometer initialization accomplished, length of the message is 1 byte, default node number(node_ID) is 0 x 05

CAN-ID	First byte
0x700+ 0x05	0x00

2) start, stop, host node sending

CAN-ID	First byte	Second byte	function
00	01	00	start
00	80	00	stop

3):modify node number (Node_ID=0x01 ~ 0x7F), default node number (Node_ID) is 0x05

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x600+ Node_ID	0x22	0x00	0x30	0x00	New Node_ID	0x00	0x00	0x00

Table 1-3 SDO request message format

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x580+ Node_ID	0x60	0x00	0x30	0x00	0x00	0x00	0x00	0x00

Table 1-4 SDO response message format

remark: if controller send CAN-ID=0x600+0x05(default), send data: 22 00 30 00 10 00 00 00, Transducer return CAN-ID=0x580+0x05 (default), returned data: 60 00 30 00 00 00 00 00, received frame after restarting ID is 0x590(0x580+0x10), the data represent successful modification of frame ID.

4) CAN baud rate setting factory default baud rate is 125K, default node number is (Node_ID) 0x05

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x600+ Node_ID	0x22	0x01	0x30	0x00	Baud	0x00	0x00	0x00

Table 1-5 SDO request message format

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x580+ Node_ID	0x60	0x01	0x30	0x00	00	0x00	0x00	0x00

Table 1-6 SDO response message format

remark: Fifth byte(Baud) is 0x01、0x02、0x03、0x04、0x05、0x06、0x07、0x08。

Send above direct, restart the sensor after receiving returned data, then modification of baud rate is finished.

Corresponding baud rate

catalog	Baud rate	catalog	Baud rate
00	1M	05	100k
01	800K	06	50k
02	500k	07	20k
03	250k	08	10k
04	125k		

5) time setting of cyclic sending PDO

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x600+ Node_ID	0x22	0x00	0x22	0x00	TIME	0x00	0x00	0x00

Table 1-7 SDO request message format

The fifth byte time support only 0X32h: 50ms 0X64:100ms factory default is 0X64:100MS

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x580+ Node_ID	0x60	0x00	0x22	0x00	00	0x00	0x00	0x00

Table 1-8 SDO response message format

6) relative zero setting

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x600+ Node_ID	0x22	0x03	0x21	0x00	0x01	0x00	0x00	0x00

Table 1-9 SDO request message format

Set current angle to be zero. If current angle is 0.12 degree, then the actual angle should be subtracted 0.12 degree.

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x580+ Node_ID	0x60	0x03	0x21	0x00	0x00	0x00	0x00	0x00

Table 1-10 SDO response message format

7) cancel relative zero

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x600+ Node_ID	0x22	0x03	0x21	0x01	0x01	0x00	0x00	0x00

Table 1-11 SDO request message format

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Seventh byte	Eighth byte
0x580+ Node_ID	0x60	0x03	0x21	0x01	0x00	0x00	0x00	0x00

Table 1-12 SDO response message format

8) PDO protocol format

ID	LEN	D0	D1	D2	D3	D4	D5	D6	D7
0x280+ NoID	8	XL	XM1	XM	XH	YL	YM	YM	YH

It send below message periodically after start:

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D0,D1,D2,D3 is X axis angle D4,D5,D6,D7 is Y axis angle

low bytes at the front, high ones at the behind, then divided by 10000

0~ 0X 0D BB A0 signify :+0~+90

FFFFFFFF~FFF2445F signify:-0~ -90

eg: X: 0X 00 00 35 13=13587/10000=1.3587

Y: 0XFFFFFFFF1D

FFFFFFFF-0XFFFFFFFF1D=226/10000 = - 0.0226 degree



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



深圳市瑞芬科技有限公司
CHINA SHENZHEN RION TECHNOLOGY CO.,LTD.

✓ 倾角传感器 ✓ 倾角（调平）开关 ✓ 数显水平仪 ✓ 陀螺仪
✓ 三维电子罗盘 ✓ 加速度计 ✓ 航姿参考系统 ✓ 寻北仪

T: 0755-29657137 / 29761269 F: 0755-29123494
W: www.rion-tech.net E: sales@rion-tech.net
A: 中国·深圳市宝安区82区华丰科技园 五期3F

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