SCA126T
Inclinomètre MEMS 2 axes CANopen

General Description

SCA126T is a CANOPEN output dual-axis inclinometer launched to the industrial field control , using industry standard isolated CAN transceiver, built-in high-precision A / D differential converter, by 5 filtering algorithm, which can measure the angle of sensor output relative to the horizontal tilt and pitch tilt.

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, to ensure high repeatability of the product in the low-temperature and high-temperature environment. The output frequency response standards 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, and a variety of output options. 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
- ●Direct lead cable interface
- ●Output mode: CAN OPEN
- ●Measuring Range :±1～±90° optional
- ●Wide voltage input: 9～36V
- ●Resolution: 0.01°
- ●Highly anti-vibration performance >2000g
- ●Small size : 66×44×24mm（customized）

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

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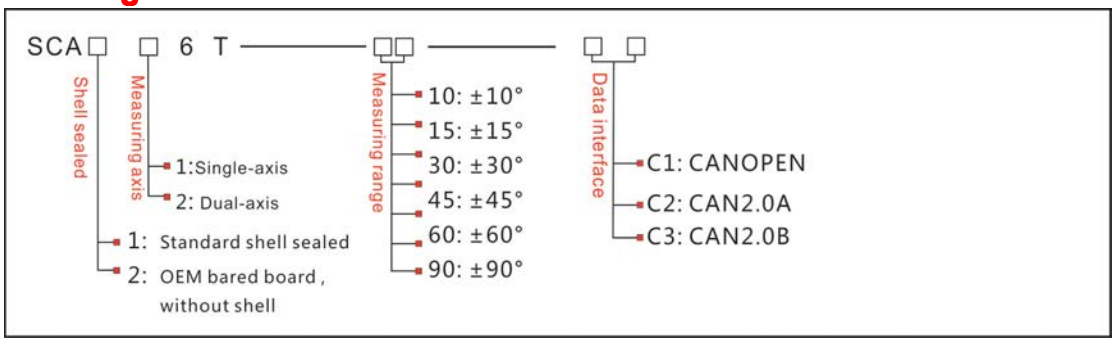
Ordering information:



E.g: SCA126T-10-C1：dual-axis /standard/±10°Measuring range /CANOPEN output

Technical Data

Parameters	Conditions	SCA126T-10	SCA126T-30	SCA126T-60	SCA126T-90	Unit
Measuring range		±10	±30	±60	±90	°
Measuring axis		X,Y	X,Y	X,Y	X,Y	
Resolution		0.01	0.02	0.03	0.04	°
Absolute accuracy		0.02	0.05	0.08	0.1	°
Long term stability		0.05	0.05	0.05	0.05	
Zero temperature coefficient	-40～85°	±0.006	±0.006	±0.006	±0.006	°/℃
Sensitivity temperature coefficient	-40～85°	≤100	≤100	≤100	≤100	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	CAN OPEN					
EMC	According to EN61000 and GBT17626					
MTBF	≥50000hours/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	80g(without cable)					

*This Technical data only list ± 10 °, ± 30 °, ± 60 °, + 90 ° 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		5		V
Working current	non-loaded		30		mA
Working temperature		-40		+85	℃
Store temperature		-55		+125	℃

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.

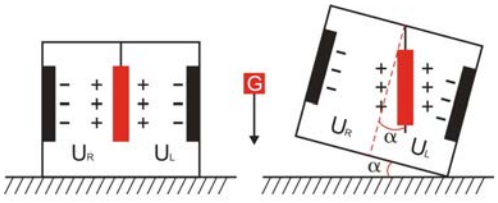
Response time：Refers to the sensor in an angle change, the sensor output value reached the standard time required.

Mechanical Parameters

- Connectors：1m lead cable（customized）
- Protection glass：IP67
- Enclosure material ：Aluminum Oxide
- Installation ：4*M3 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.

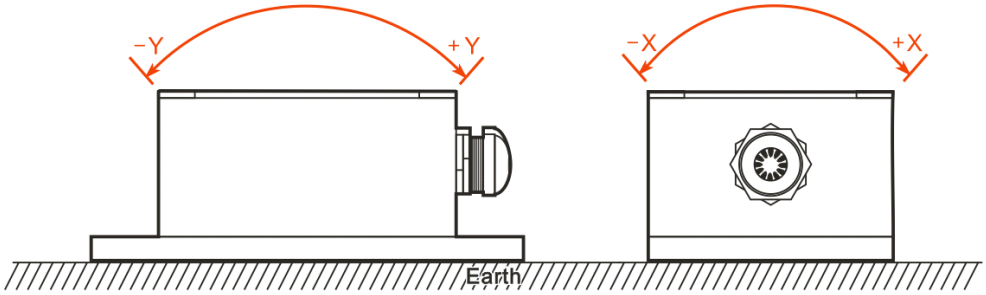


U_R, U_LRespectively is the pendulum left plate and the right plate corresponding to their respective voltage between theelectrodes, when the tilt sensor is tilted, U_R, U_L Will change according to certain rules, so $f(U_R, U_L)$ On the inclination of α function:

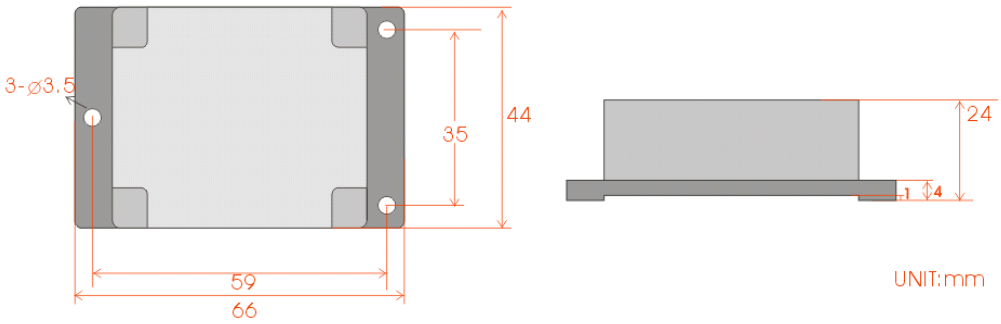
$$\alpha = (U_R, U_L)$$

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.



Dimension



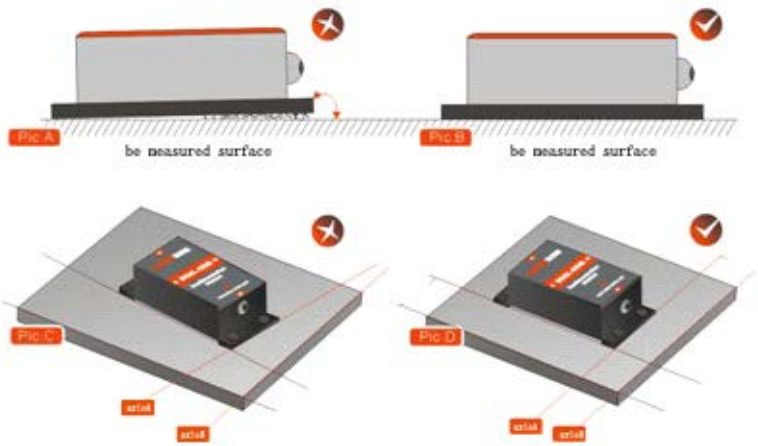
Size：L66×W44×H24mm

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	GREEN	RED
	GND Power Negative	CANL	CANH	Vcc 9～36V Power Positive

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 massage automatically after inclinometer initialization accomplished, lenght of the message is 1 byte, default node number(node_ID) is 0 x 5

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

2）start, stop, host node sending

CAN-ID	First byte	Second byte	functio n
00	01	00	start
00	80	00	stop

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

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Sevent byte	Eighth byte
0x600+ Node_I D	0x22	0x00	0x30	0x00	New Node_I D	0x00	0x00	0x00

Table 1-3 SDO request message format

CAN-ID	First byte	Secon d byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Sevent byte	Eighth byte
0x580+ Node_I D	0x60	0x00	0x30	0x00	0x00	0x00	0x00	0x00

Table 1-4 SDO response message format

remark：if controller send CAN-ID=0x600+0x05(default)，sended 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	Sevent 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	Sevent 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 receiveing 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 PD0

CAN-ID	First byte	Second byte	Third byte	Fourth byte	Fifth byte	Sixth byte	Sevent 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 facotry default is 0X64:100MS

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

Table 1-12 SDO response message format

8)、process data object of inclinometer sensor PDO(Process Data Object)：

1、to output once sensor be started，message format as below：

CAN-ID	First byte	Second byte	Third byte	Fourth byte
0x280+Node_ID	XL	XH	YL	YH

CAN-ID followd by 4 bytes parameter, the former two are for X axis, the later two are for Y axis,low bytes at the front, high ones at the behind.

Example for angle convert：

Angle data of X axis is combined by 16 binary numbers, 8 high numbers are XH, 8 low numbers are XL.

Convert the above 16 binary numbers into decimal numbers and divided by 100, then the result is angle data.

0-0x23328 signify 0~90 degree, positive angle

0XFFFF-0XDCD7 signify 0~-90 degree, negative angle

Eg:

285 13 35 1D FF

Id = 0x285 XL=0X13 XH=0X35 YL=0X1D YH=0XFF

signify X: 0X 3513=13587/100=135.87

Y:FFFF-0XFF1D=226/100 = - 2.26 degree