SPECIFICATIONS

Item No.：ACA2200-CANopen

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.09
- Date:2014.11.10

ACA2200-CANopen -High Accuracy Digital Type Dual-Axis Inclinometer with Full Temperature Compensation

General Description

ACA2200-CANopen 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 0.0001 ° ,precision 0.001 ° ,temperature drift: 0.0008 ° C / ° ,it is a highly competitive industry product nowadays .Non-contact installation features make ACA2200-CANopen 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.

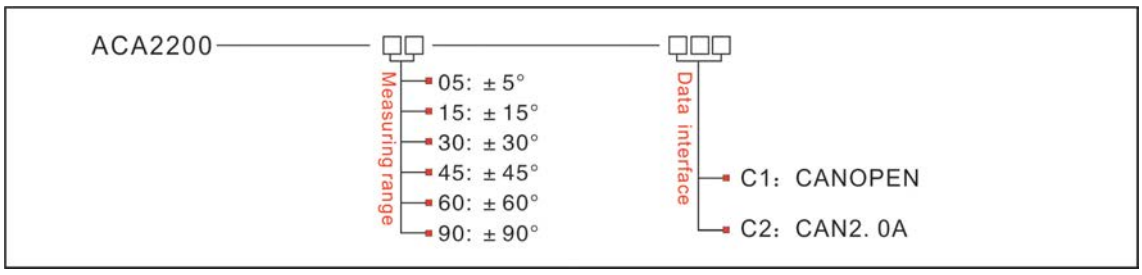
Features

- ●Dual-Axis Inclinometer
- ●Wide voltage input: 9～36V
- ●Wide temperature working: -40～+85℃
- ● Size:93.8×55.5×20.5mm(customized)
- ●Measuring Range :±1～±90° optional
- ●Water-proof air-plug
- ● Resolution: 0.0001°
- ●IP67 protection class
- ●Output mode RS232、RS485、TTL、PWM、CANopen、CAN2.0 are optional

Application:

- ●Engineering vehicles automatic leveling
- ●Precise equipment level control
- ●Underground drill posture navigation
- ●Based on the angle direction measurement
- ●Bridge & dam detection
- ●Medical facilities angle control
- ● Railway gauging rule , gauge equipment leveling
- ●Geological equipment inclined monitoring
- ●Directional satellite communications antenna pitching angle measurement

Ordering information:



E.g：ACA2200--05-C1：Dual-axis/±5°Measuring range/CANopen output

Technical Data

Parameters	Conditions				Unit
Measuring range		±05	±10	±15	°
Measuring axis		X, Y	X Y	X Y	
Resoluition		0.0001	0.0001	0.0001	°
Absolute accuracy		0.001	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		0.3	0.3	0.3	S
Response time		0.05	0.05	0.05	S
Output rate	5Hz、15Hz、35Hz、50Hz can be set				
Out signal	RS232/RS485/RS422/TTL/CANopen/CAN2.0A				
Electromagnetic compatibility	According to EN61000 and GBT17626				
MTBF	≥50000hours / times				
Insulation Resistance	≥100M				
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)				

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	℃
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 cable with air-plug connector（customized）

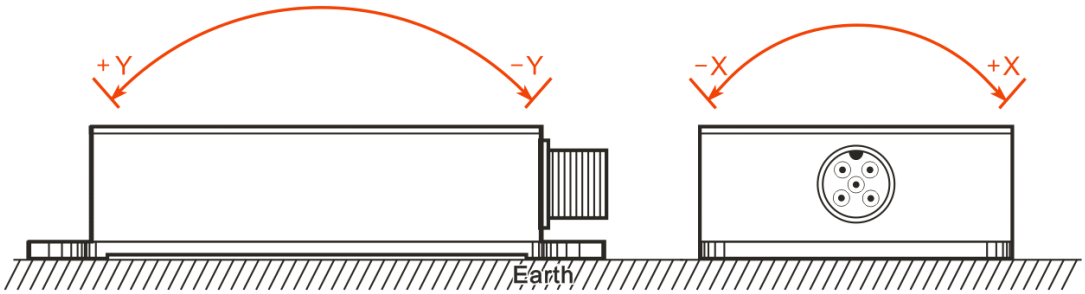
○ Protection glass：IP67(air plug connector)

○ Enclosure material ：Aluminum Shield Oxide

○ Installation ：4*M5 screws

Measuring Directions&Fix

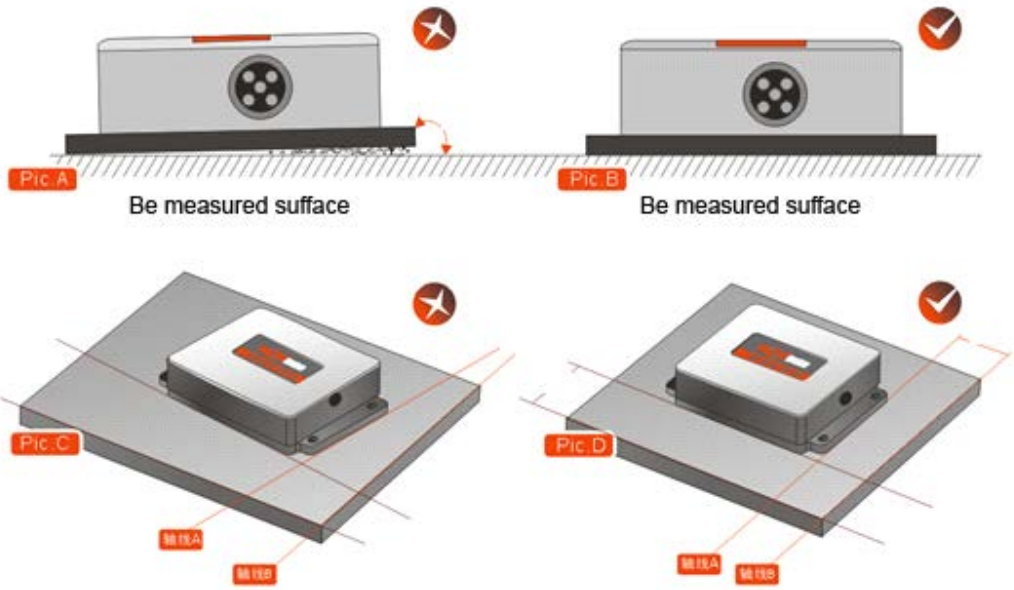
The installation must guarantee the product bottom is parallel to measured face，and reduce the influence of dynamic and acceleration to the sensor. This product can be installed horizontally or mounted vertically (mounted vertically selection is only applicable to the single axis), for installation please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



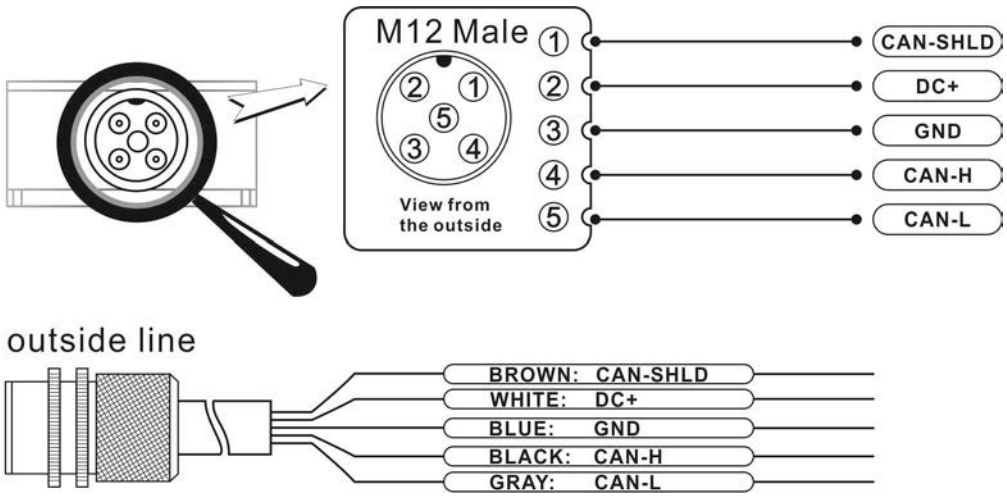
Production installation notes :

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

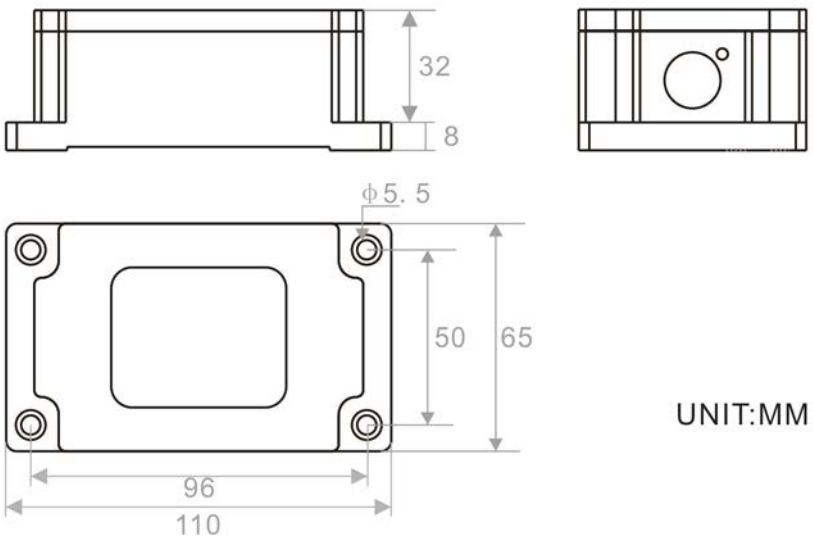
2) The sensor axis and the measured axis must be parallel ,the two axes do not produce the angle as much as possible. See Figure Pic.CD



Electrical Connection



Dimension



Size:110×65×40mm(customized)

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, 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), defualt 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)，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	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	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）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:

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: 0XFFFFFF1D

FFFFFFFF–0XFFFFFF1D=226/10000 = – 0.0226 degree

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