

ZCT215M-LBS-ABUS-E3-4505 Tilt sensor



I.General Description:

ZCT215M-LBS-ABUS-E3-4505 is 2 axis high accuracy digital inclinometer (RS485) which is researched and developed by Shanghai Zhichuan .Measuring range is $\pm 15^\circ$, with IP67 aluminum casing.

II.Technical Parameter: (all the below parameter are effective under room temperature (25°C)if no special circumstances)

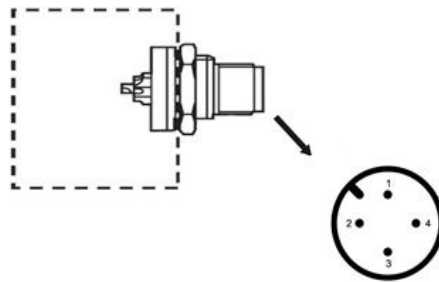
	Parameter	Condition	Min	Typ	Max	Unit	
Electronic Parameter	Power Supply		8		36	V (DC)	
	Quiescent working current	Power supply 24V		18		mA	
	Working tempt		-40		85	°C	
Performance Parameter	Measuring range			$\pm 15^\circ$		°	
	Resolution	Room tempt		0.001		°	
	Accuracy	9600baud、3Hz ASK-REPLY MODE	$0 \sim \pm 3^\circ$		± 0.005	± 0.01	°
			$\pm 3 \sim \pm 6^\circ$		± 0.01	± 0.02	°
			$\pm 6 \sim \pm 15^\circ$		± 0.02	± 0.03	
	Cross axis error				± 1	%	
	Zero temperature drift	$-40 \sim +85^\circ\text{C}$			± 0.002		°/°C
						± 0.2	°
	Refresh time ¹				30		ms
Power-on time					0.5	s	
	Zero offset			± 0.05		°	
Others	Housing			85*70*40		mm	

Reamrk:Refresh time means the minimun renew time of the sensor's 2 axis value .Thus in ask-Answer command, it needs at least 30s after last output demand till next demand.

III. EMC

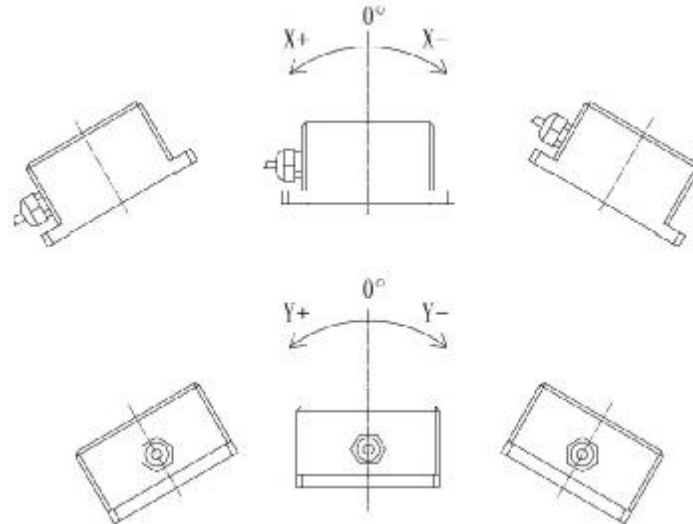
EMC item	Test level	Unit	Test standard	Result
Static electricity	±6 (contact discharge)	KV	GB/T 17626.2 / IEC 61000-4-2	At least B level
	±8 (air discharge)			
Electrical fast transient pulse	±2(power) ±1(IO)	KV	GB/T 17626.4 / IEC 61000-4-4	At least B level
Surge	±4 (differential mode)	KV	GB/T 17626.5 / IEC 61000-4-5	At least B level
	±4 (common mode)			

IV.Connection Definition:

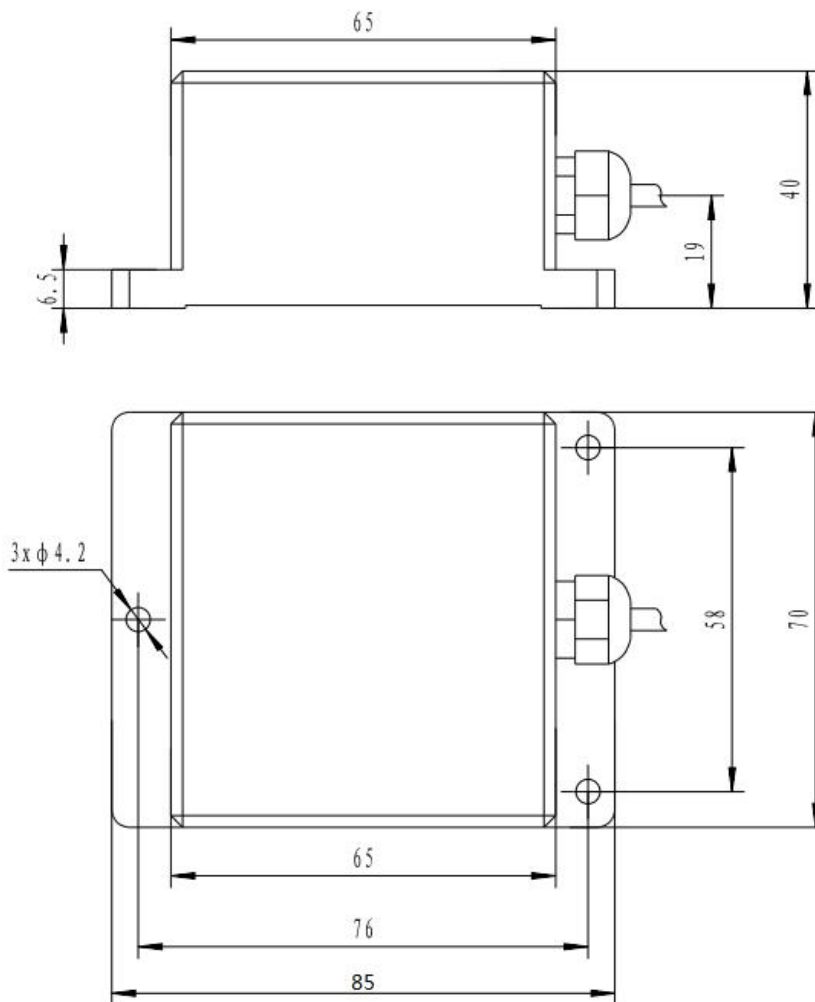


Wire color	Red	Black	Yellow	Blue
Function	Power +	GND	RS485-A	RS485-B

V.Working Diagram:



VI.Product size: (unit: mm)



VII.Communication Protocol:
1、 Data Frame Format: (8-bit data bits, 1-bit stop bit, non parity, the default rate 9600)

Identification (1byte)	Data Length (1byte)	Address Code (1byte)	Command Word (1byte)	Data Field	Check Sum (1byte)
0x77					

Data format: 16 binary

Identifier: fixed as 0x77

Data length:the length from data length to check sum(including check sum)

Address code: Sensor address, default 0x00

Data field: when different command words, there would be different content and length .

Check Sum: the sum of data length,address code,command word and data field . (take no account of carry bit) .

2、 Command format
2.1 Read X axis angle

Send Command: 77 04 00 01 05

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	Check sum (1byte)
0x77			0x01		

Answer Command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (4byte)	Check sum (1byte)
0x77			0x81	SSXX.YYYY	

Remark: Data field is 4 bytes return angle value ,is compress BCD Code ,SS is sign bit(00 +,10-),XX is 2 bit integer,YYYY is 4 bit decimal. The other axis data will be alike .eg.10 26 87 62 means -26.8762°.

2.2 Read Y axis angle value.

Send command: 77 04 00 02 06

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	check sum (1byte)

0x77			0x02		
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Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (4byte)	check sum (1byte)
0x77			0x82	SSXX.YYYY	

2.3 Read X.Y axis angle value

Send command: 77 04 00 04 08

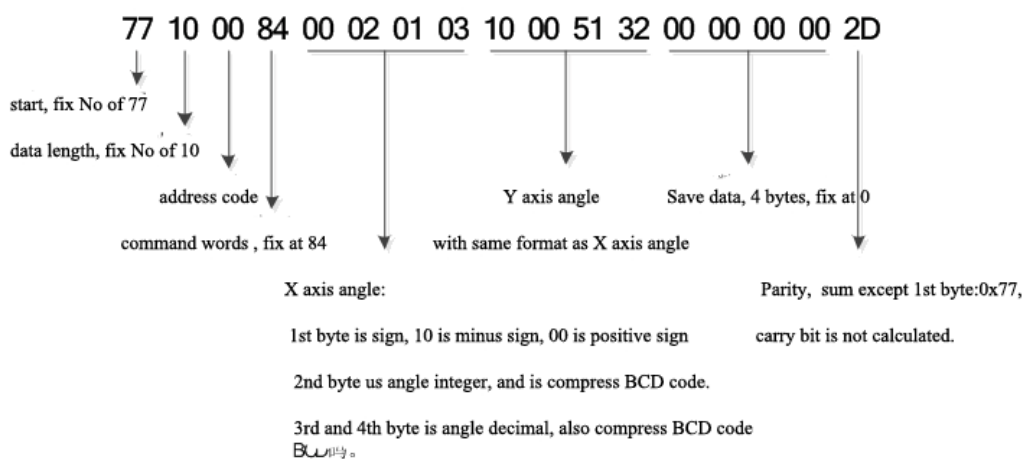
Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	check sum (1byte)
0x77			0x04		

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (12byte)	check sum (1byte)
0x77			0x84		

Remark:Data field is 12 bytes return angle value,divided into 3 groups each group is made of 1 sign bit and 3 compress BCD code .they are respectively as X axis ,Y axis and zero .

For example :



Remark :X Axis means + 2.0103°, Y axis means -0.5132°

2.4 Set/relatively/absolutely zero point

Send Command: 77 05 00 05 00 0A

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x05	0x00: Absolute zero 0x01: relative zero	

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x85	0x00: Succeed set 0xFF: Failed set	

Remark:If set absolute zero ,take the factory default zero as the measurement basis .

If set the relative zero,take the current position as the zero point to take the measurement .

2.5 Check relative/absolute zero point.

Send command: 77 04 00 0D 11

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	check sum (1byte)
0x77			0x0D		

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x8D	0x00: Absolute zero 0xFF: Relative zero	

2.6 Set communication rate

Send Command: 77 05 00 0B 03 13

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x0B	0x00:2400 0x01:4800 0x02:9600 0x03:19200 0x04:115200	

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x8B	0x00: Succeed set 0xFF: Failed set	

Remark:default value is 0x02:9600 .After successfully re-set the communication rate each time ,the sensors will answer with the original baud rate ,and then change the device communication rate immediately .If want high baud rate output , need set the baud rate as 115200 .

2.7 Set sensor's address.

Send Command: 77 05 00 0F 01 15

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x0F	Sensor's address	

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x8F	0x00: Succeed set 0xFF: Failed set	

Remark:if the sensors used under networking condition,node address cannot be 0 ,and the node should be less than 32.

2.8 Check sensor's address

Send Command: 77 04 00 1F 23

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	check sum (1byte)
0x77			0x1F		

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x1F		

2.9 Set output angle format.

Send Command: 77 05 00 0C 00 11

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x0C	0x00:Ask-answer format 0x01:5Hz 0x02:10Hz 0x03:15Hz 0x04:25Hz	

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x8C	0x00: Succeed set 0xFF: Failed set	

Remark:

- ① Default output format is Ask-Answer format
- ② 5Hz means automatically output 5 data each second, and so with others.
- ③ Because RS485 IS half duplex,when the the sensor automatically export the data ,maybe it cannot receive command in valid,you may need to send command in repeatedly for many times ,in this way,the product can receive the signal.So if you want to send command and receive the command correctly , we recommend you set the sensor in Ask-Answer model. Besides ,when the sensor set in automatic output model , the sensor will not output anything within 10s after power on,and then the sensor can receive the outside command in valid .
- ④ No matter in which mode ,the faster output frequency the more noise .if want to get less noise ,high accurate output ,please set the baud rate as high as possible ,output frequency as low as possible .

2.10 Save setting*

Send Command: 77 04 00 0A 0E

Identification	Data length (1byte)	Address code (1byte)	Command word	Data field (0byte)	check sum (1byte)

(1byte)			(1byte)		
0x77			0x0A		

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x8A	0x00: Succeed set 0xFF: Failed set	

Remark: For all parameter settings, if finish the setting but without sending "Save setting" Command, these settings will disappear after power off.

2.11 Factory Reset

Send Command: 77 04 00 0E 12

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	check sum (1byte)
0x77			0x0E		

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (1byte)	check sum (1byte)
0x77			0x8E	0x00: Succeed Set 0xFF: Failed Set	

2.12 Check temperature command

Send Command: 68 04 00 23 27

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (0byte)	check sum (1byte)
0x68	04	00	0x23		27

Answer command:

Identification (1byte)	Data length (1byte)	Address code (1byte)	Command word (1byte)	Data field (8byte)	check sum (1byte)
0x68			0x23		

Remark: Data field 8 bytes, they are respectively 2 float, the front 4 bytes is the X axis' temperature, the

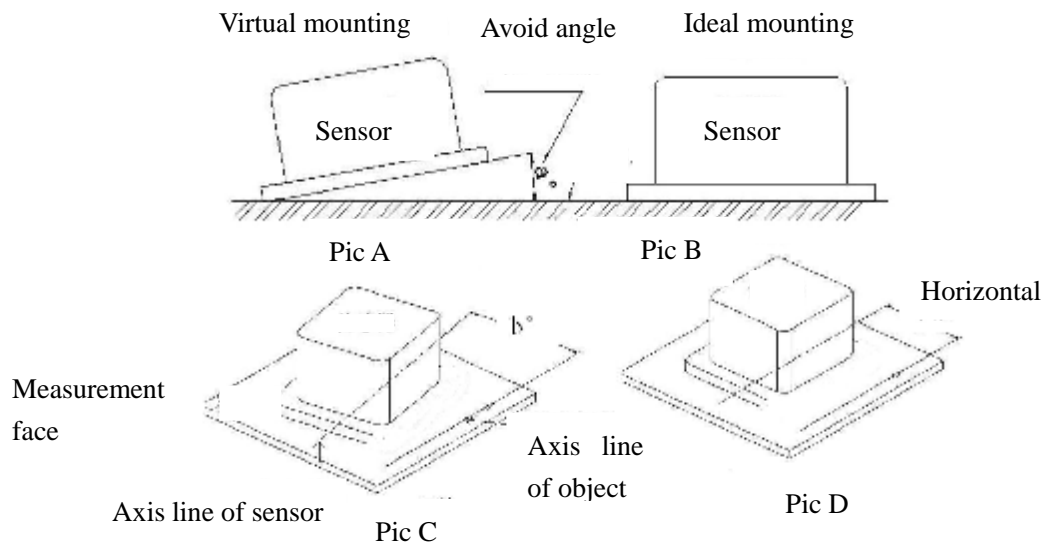
behind 4 bytes is Y axis' temperature.

VII.Installation attentions:

When install the sensors ,wrong action will cause big measurement error,please pay attention to the below:

① :“2 faces”means the mounting faces of the sensors and the measured objects should completely cling to each other (the measured objects' mounting face should be as horizontal as possible), no angle allowed (for example angle “a” in Pic A .the right installation please refer to Pic B .

② : “2 lines” means the Axis Line of sensor and the measured object should be horizontal,no angle allowed of the 2 lines (for example ,b°in Pic ,the correct installation please refer to Pic D.



Specification subject to change without notice!