ZC Sensor

ZCT2xxM-LBS-Ax-H5-460x

Tiltmeter Specifications

www.inclinesensor.com

+86 21 6490 8096

sales@zc-sensor.com

ZCT2xxM-LBS-Ax-H5-460x Tiltmeter Datasheet

1. Overview

Developed by Shanghai Zhichuan Electronic Tech Co., Ltd., ZCT2xxM-LBS-Ax-H5-460x is a dual-axis digital tiltmeter of high accuracy. With RS485 interface and Aluminum alloy housing, the product is in compliance with Modbus communication protocol, IP67 and EMC standards of CE.

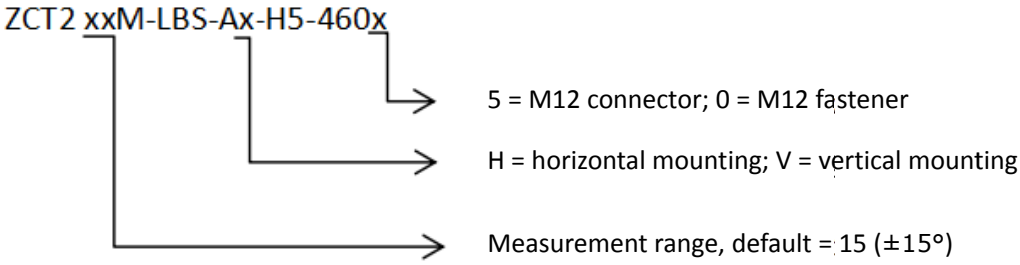
2. Technical parameters

(Unless otherwise noted, the following parameters are typical values at 25℃)

	Parameters	Conditions		Min	Typical	Max	Unit
Electrical parameters	Voltage			8		36	VDC
	Static working current	DC24V power supply			15	20	mA
	Operating temperature			-40		85	℃
Performance parameters	Measuring range				±15	±30	°
	Resolution	9600bps, polling mode			0.001		°
	Accuracy		0～±15°		±0.005	±0.01	°
	Cross axis error					±1	%
	Zero temperature drift	-40～+85℃	Without compensation		±0.002		°/℃
						±0.13	°
			With compensation		±0.001		°/℃
						±0.065	°
	Update time [1]	9600bps, polling mode			40		ms
	Power-on start time					0.5	s
	Zero deviation				±0.05		°
Others	Dimensions	Without mounting bracket			87*59*28		mm
		With mounting bracket			115*87*34.5		mm

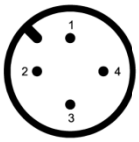
Note: 1. Update time refers to the time interval to refresh tilt angle value of both axes. Therefore, in the polling mode, there should be at least 40ms interval between completing time of an angle query command and starting time of the next angle query command.

3. Model naming



4. Wiring definition

M12 connector (4-pin male):



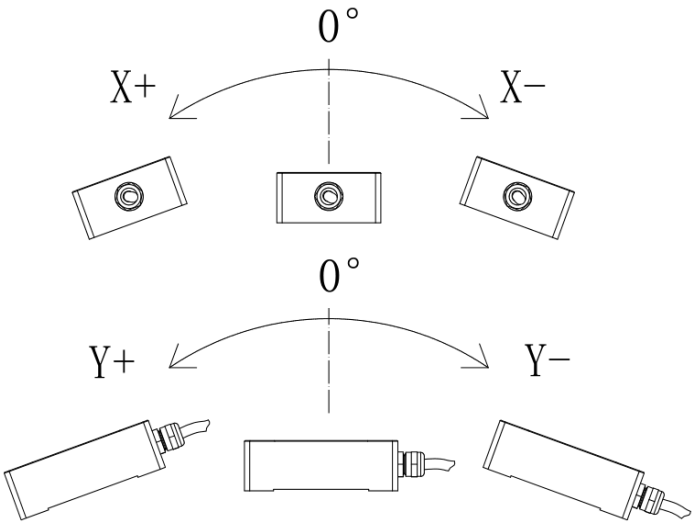
Pin	ZCT2xxM-LBS-Ax-H5-4605
1	Power positive
2	485B
3	485A
4	Power negative

M12 fastener:

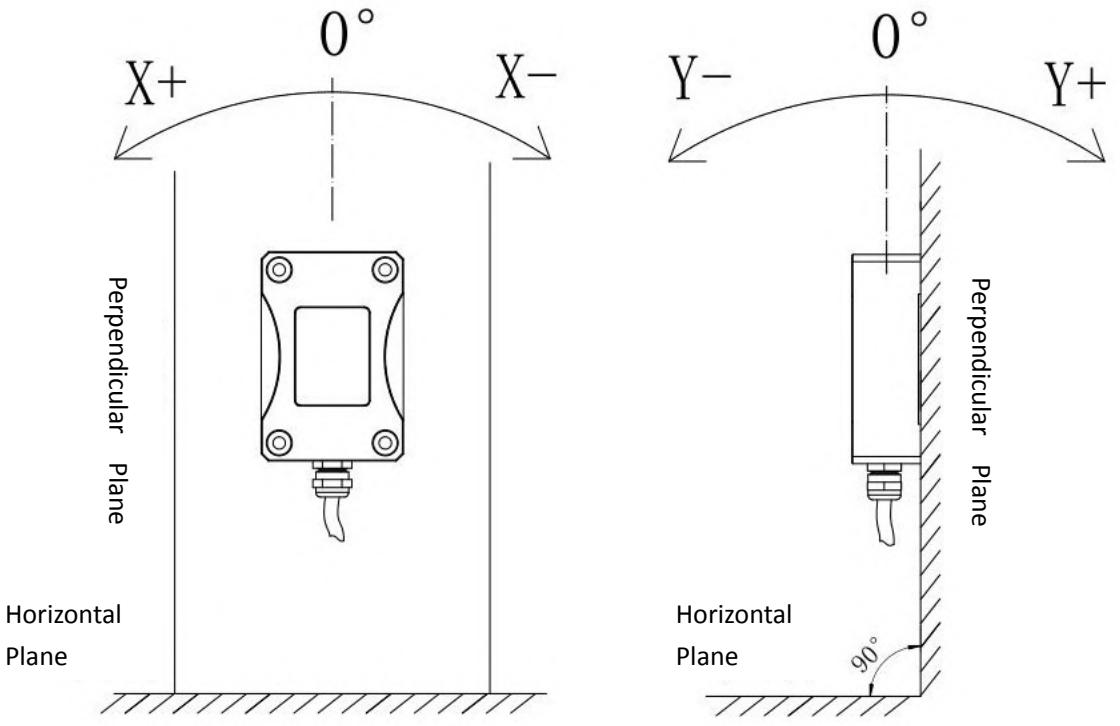
Thread color	ZCT2xxM-LBS-Ax-H5-4600
Red	Power positive
Yellow	485B
Blue	485A
Black	Power negative

5. Tilt directions

ZCT2xxM-LBS-A**H**-H5-460x should be installed horizontally:

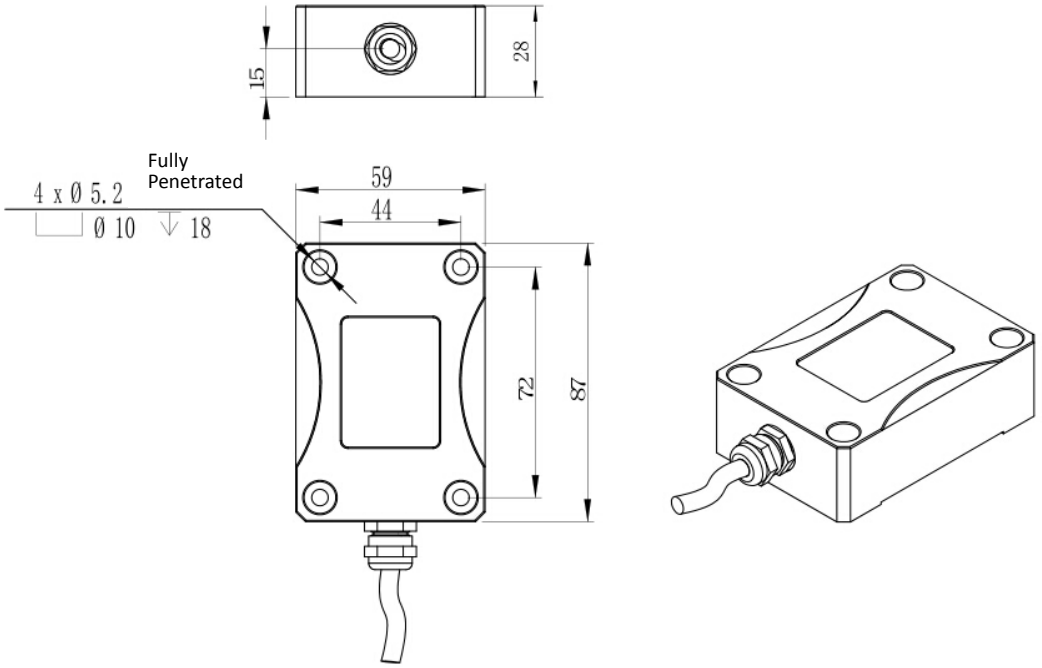


ZCT2xxM-LBS-A**V**-H5-460x should be installed vertically:

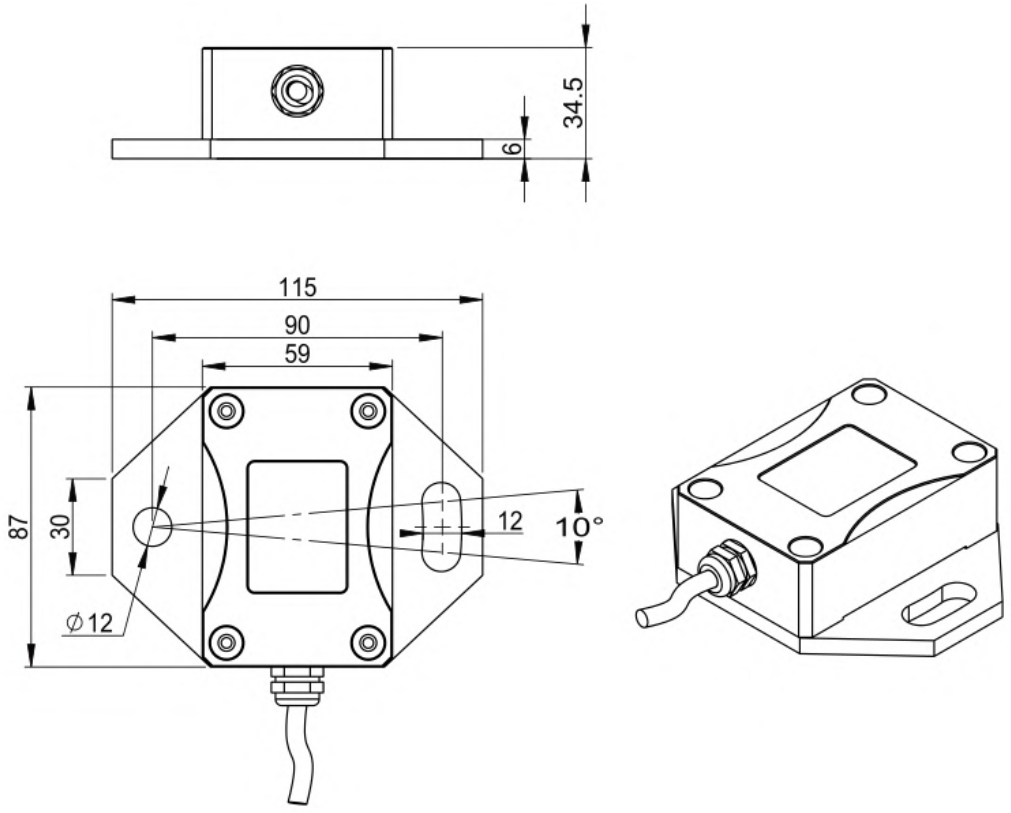


6. Housing size (unit: mm)

Without mounting plate:



With mounting plate:



7. Communication protocol

7.1 The communication protocol is in compliance with Modbus RTU protocol.
Default baud rate: 9600bps; parity bit: no parity; data bit: 8; stop bit: 1;
default address: 01H.

Register address	Data value name	Data type	Data range	Read/ write	Default value
0002H	X-axis angle value - high position	Int16	0000H~FFFFH	R	-
0003H	X-axis angle value - low position	Int16	0000H~FFFFH	R	-
0004H	Y-axis angle value - high position	Int16	0000H~FFFFH	R	-
0005H	Y-axis angle value - low position	Int16	0000H~FFFFH	R	-
0006H	X-axis temperature value	Int16	0000H~FFFFH	R	-
0007H	Y-axis temperature value	Int16	0000H~FFFFH	R	-
0008H	Reserved	Int16	0000H~FFFFH	R	0000H
0009H	Reserved	Int16	0000H~FFFFH	R	0000H
0010H	Set absolute/relative zero point	Int16U	0000H~00FFH	R/W	0000H
0011H	Local address	Int16U	0001H~00FFH	R/W	0001H
0012H	Baud rate	Int16U	0000H~0004H	R/W	0002H
0013H	Restore factory settings	Int16U	0000H~FFFFH	R/W	FFFFH

Remarks:

1. R is read only; R/W is both readable and writable.
2. The function code for reading registers is 03H, and the function code for writing registers is 06H.
3. Other register addresses that are not listed above are invalid for reading or writing.
4. Address, absolute/relative zero point, baud rate and default factory settings can be set in batches using the broadcast command (broadcast address: 00). There will be no return value in this case. Reboot the products and read each individually to confirm if the setting is successful.
5. X- and Y-axis temperature should be the same.

7.2 **Function code 03, read register value:**

request:

Device address	Function code	Register start address HI	Register start address LO	Register number HI	Register number LO	CRC check
1 byte	0x03	1 byte	1 byte	1 byte	1 byte	2 bytes

response:

Device address	Function code	Number of bytes	Register value	CRC check
1 byte	0x03	1 byte	N*2 bytes	2 bytes

Example (1) read X- and Y-axis angle:

Send: 01 03 00 02 00 04 E5 C9
Reply: 01 03 08 **00 00 CD CC FF FF CE E7** 81 D4

Angle calculation: angle = reply value/10000
X-axis angle: 0x0000CDCC/10000= +5.2684°; Y-axis angle: 0xFFFFCEE7/10000= -1.2569°

Note: The angle data is a 32-bit signed number. When it is less than 0x80000000, it is a positive angle, which is equal to data/10000. When the angle data is greater than or equal to 0x80000000, it is a negative angle, which is equal to (data -2^{32})/10000 (unsigned operation).

Example (2) read X- and Y-axis temperature:

Send: 01 03 00 06 00 02 24 0A
Reply: 01 03 04 **F4 10 08 6C** CE 2B

Temperature calculation: temperature = reply value/100
X-axis temperature: 0xF410/100= -30.56 ℃; Y-axis temperature: 0x086C/100= +21.56 ℃

Note: The temperature data is a 16-bit signed number. When it is less than 0x8000, it is a positive temperature, which is equal to data/100. When the temperature data is greater than or equal to 0x8000, it is a negative temperature, which is equal to (data -2^{16})/100 (unsigned operation).

7.3 Function code 06, write a single register:

request:

Device address	Function code	Register start address HI	Register start address LO	Register value HI	Register value LO	CRC check
1 byte	0x06	1 byte	1 byte	1 byte	1 byte	2 bytes

response:

Device address	Function code	Register start address HI	Register start address LO	Register value HI	Register value LO	CRC check
1 byte	0x06	1 byte	1 byte	1 byte	1 byte	2 bytes

Example (1) set relative zero point:

Send: 01 06 00 10 **00 FF** C8 4F
Reply: 01 06 00 10 **00 FF** C8 4F

Note: 00 = absolute zero degree; non-zero = relative zero degree; value range = 0000~00FFH

Example (2) set sensor address

Send: 01 06 00 11 **00 05** 19 CC
Reply: 01 06 00 11 **00 05** 19 CC

The command sets the address of the tiltmeter to **0x05**.

Note: value range = 0001~00FFH

Example (3) set baud rate:

Send: 01 06 00 12 **00 02** A8 0E
Reply: 01 06 00 12 **00 02** A8 0E

The command sets the baud rate of the tiltmeter to **9600bps**.

Baud rate definition:

Register value	0000H	0001H	0002H	0003H	0004H
Baud rate (bps)	2400	4800	9600	19200	115200

Note: value range = 0000~0004H

Example (4) restore factory settings

Send: 01 06 00 13 **FF FF** 79 BF
Reply: 01 06 00 13 **FF FF** 79 BF

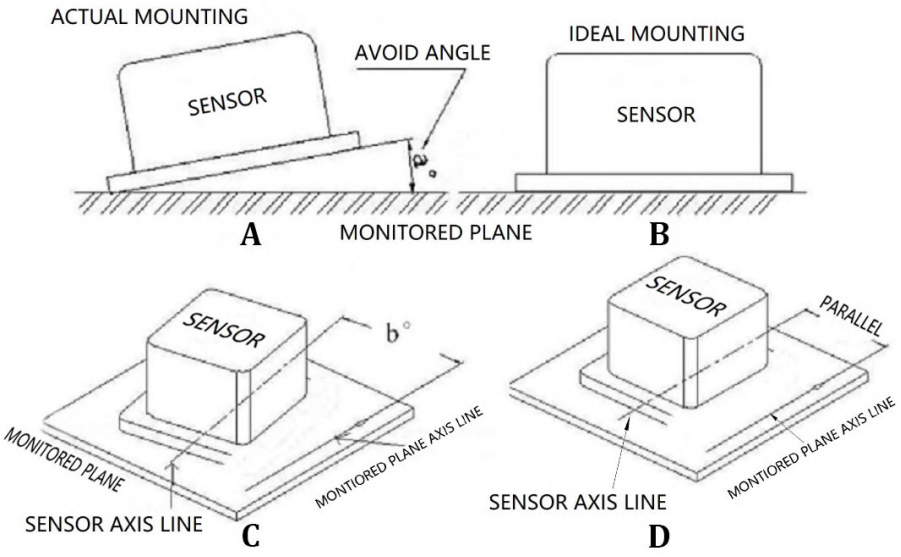
Note: any non-zero value is effective; value range = 0000H-FFFFH

8. Notice on Installation (horizontal mounting for example)

Improper installation may lead to large measurement angle error. Please pay attention to the following two points during installation:

① Two planes: The installation plane of the sensor and that of the object to be measured should be against each other tightly and the installation plane of the object should be as horizontal as possible. There should not be an angle in between the two planes, such as angle a in Diagram A. Diagram B shows the correct installation.

② Two lines: the axis of the sensor and that of the measured surface should be parallel. There should not be an angle between them, such as angle b in Diagram C. Diagram D shows the correct installation.



9. Notice on placing orders

1. cable length: 1 meter by default
2. mounting bracket: with mounting bracket by default
   (4 * black round-headed M4*16 hexagon socket S304 screw for each bracket)