

ZC Sensor

ZCT230L-LCT-AH-E5-37B Tilt Sensor Datasheet



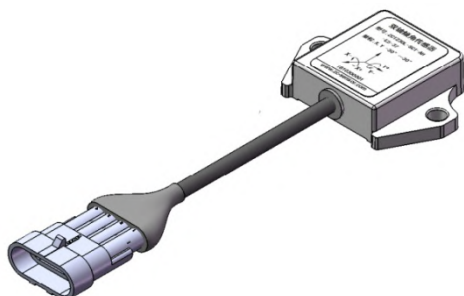
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ZCT230L-LCT-AH-E5-37B

Tilt Sensor Datasheet



1. Overview

Designed and manufactured by Shanghai Zhichuan Electronic Tech Co., Ltd., ZCT230L-LCT-AH-E5-37B is a dual axis tilt sensor with ± 30 degree measurement range and CAN J1939 interface. The product can be used on various engineering vehicles with controller working on CAN J1939 protocol.

2. Advantages

- Industrial grade components used
- Stable and reliable
- Excellent shock and vibration resistance capability
- With reverse polarity protection
- Strong and water-tight Aluminum alloy housing

3. Application

- Engineering vehicles
- Mining machinery

4. Technical parameters

(Unless otherwise specified, the following parameters are typical values at 25°C)

4_1. Working parameters

Parameters	Conditions	Min	Typical	Max	Unit
Power supply		8	12	40	VDC
Static working current	Vcc = 12V	15	20	25	mA
Working temperature range		-40		85	°C
Storage temperature range		-40		85	°C

4_2. Performance parameters

Parameters	Conditions	Min	Typical	Max	Unit
Measurement range	Biaxial	-30		+30	°
Resolution ¹	25°C		0.01		°
Repeatability ²	25°C		0.25		°
Accuracy ³	Range < ±8°		±0.25		°
	Range < ± 15°		±0.5		°
	Range < ± 30°		±0.8		°
Output frequency		1	25	100	Hz
CAN baud rate			250		Kbps
Zero point temperature drift	-40 ~ +85°C		0.008	0.01	°/°C
Zero point error	With housing		0.5		°

Note 1: Resolution refers to the minimum variation in input angle that the device is able to detect (default filter level = 5).

Note 2: Default filter level = 5.

Note 3: Default filter level = 5.

5. Communication protocol

※ The protocol is in compliance with SAE J1939 of CAN 2.0B. See below the protocol details.

5_1. Definition of J1939 ID format

29 bit extended frame (ID mode) is used for data transmission in J1939. See below definition of bits.

Position	Function
28:26	Priority (6 (highest), 0 (lowest))
25:24	Always specified as 0:0
23:16	PF (format A (range 0x00 ~ 0xEF) and format B (range: 0xF0 ~ 0xFF))
15:8	PS
7:0	SA (range: 0x80 ~ 0xF7, default: 0xC1)

5_2. Sensor address format

Priority: 6		Source address: SA
PF: 0xEE		Sending rate: 0.5s after power on
PS: 0xFF		
Data	Byte	Function
X	0	S/N, Bits 0-7
X	1	S/N, Bits 8-15
X	2	Byte 2, Bits 0 ~ 4 = S/N, Bits 16 ~ 20; Byte 2, Bits 5 ~ 7 = MC, Bits 0 ~ 2
X	3	MC, Bits 3 ~ 10(MSB)
0x00	4	Fixed
0x88	5	Fixed
0x00	6	Fixed
0x30	7	Fixed

Remarks:

- S/N is the serial number of the sensor, which is 1825293 by default.
- MC is the supplier code, which is 255 by default.

5_3. Angle output format

Priority: 4		Source address: SA
PF:0xFF		Sending rate: 10 ~ 1000ms (40ms by default)
PS:0x53		
Data	Byte	Function
X	0	X-axis angle (LSB)
X	1	X-axis angle (MSB)
X	2	Y-axis angle (LSB)
X	3	Y-axis angle (MSB)
X	4	Temperature
X	5	Software version code (0x20 by default)
X	6	Byte 6, Bits 0 ~ 3 = data status; Byte 6, Bits 4 ~ 7 = timestamp (range: 0x00-0x0F)
X	7	Error code

Remarks:

- a) Angle calculation: in the front is the lower byte, followed by the higher byte. Output angle = 100 x actual angle. For example,
+20 deg → 2000 (0.01deg) → 0x07D0 → D0 07 (LSB MSB).
- b) Data status:
- 0x00: status within 1s after power on, indicating initialization; data can't be used
- 0x01: valid data that can be used

0x03: error in data; error code defined in Byte 7 (see table below)

Error description	Position	=0	=1
Undefined	0	Undefined	Undefined
X-axis angle out of range	1	Normal	In case of exceeding $\pm 90^\circ$, the X-axis angle will be set to 0xFFFF
Y axis angle out of range	2	Normal	In case of exceeding $\pm 90^\circ$, the Y-axis angle will be set to 0xFFFF
Supply voltage detection	3	Power supply voltage $\geq 8V$	Power supply voltage $< 8V$
Supply voltage detection	4	Power supply voltage $\leq 28V$	Power supply voltage $> 28V$
High temperature error	5	PCBA temperature $\leq 90^\circ C$	PCBA temperature $> 90^\circ C$
Undefined	6	Undefined	Undefined
Undefined	7	Undefined	Undefined

5_4. Sensor serial number and version code output format

Priority: 4		Source address: SA
PF: 0xFF		Sending rate: upon request of the master computer
PS: 0x52		
Data	Byte	Function
X	0	0x00
X	1	Byte 1, Bits 4 ~ 7 = 0x00; Byte 1, Bits 0 ~ 3 = decimal tens of Year in the S/N (BCD format)
X	2	Byte 2, Bits 4 ~ 7 = decimal ones of Year in the S/N (BCD format); Byte 2, Bits 0 ~ 3 = decimal tens of Week in the S/N (BCD format)
X	3	Byte 3, Bits 4 ~ 7 = decimal ones of Week in the S/N (BCD format); Byte 3, Bits 0 ~ 3 = 0x00
X	4	Byte 4, Bits 4 ~ 7 = 0x00; Byte 4, Bits 0 ~ 3 = decimal hundreds of No. in the S/N (BCD format)
X	5	Byte 5, Bits 4 ~ 7 = decimal tens of No. in the S/N (BCD format); Byte 5, Bits 0 ~ 3 = decimal ones of No. in the S/N (BCD format)
X	6	Byte 6, Bits 4 ~ 7 = decimal tens of Primary Version Code (BCD format); Byte 6, Bits 0 ~ 3 = decimal ones of Primary Version Code (BCD format)
X	7	Byte 7, Bits 4 ~ 7 = decimal tens of Secondary Version Code in (BCD format); Byte 7, Bits 0 ~ 3 = decimal ones of Secondary Version Code (BCD format)

Remarks:

The sensor serial number (S/N) and version code in this command are output in BCD format, where S/N and version code are defined as follows:

- S/N is in decimal 7-digit format. Example: 1840001, here 18 is Year, 40 is Week and 001 is No..
- The version code is in decimal 4-digit format. Example: 0100, here 01 is Primary version code and 00 is Secondary version code.

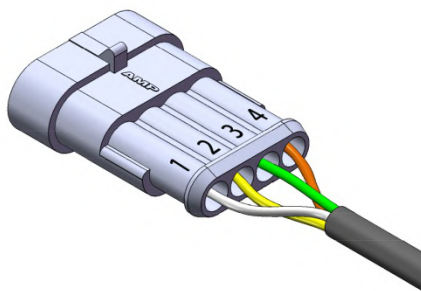
5_5. Parameter modification command format

Priority: 4		Source address: MA (0xD4 by default)
PF: 0xFF		Sending rate: upon request of the master computer
PS: 0x54		
Byte	Function	
0	Command code	
1	Undefined	
2	Undefined	
3	Undefined	
4	Undefined	
5	Undefined	
6	Undefined	
7	Undefined	

Note: command codes are defined as follows:

Command function	Command code	Byte 1 ~ 7 format
Read S/N	0x00	---
Modify SA	0x01	Byte 1: new SA, range (0x80 ~ 0xF7); Byte 2 ~ 7: Byte 0 ~ 5 in the sensor serial number command returned
Pause output	0x02	---
Start output	0x03	---
Modify sending rate	0x04	Byte 1: new sending interval, unit: ms, range (10 ~ 1000); Byte 2 ~ 7: Byte 0 ~ 5 in the sensor serial number command returned
Restore default SA	0x09	Byte 1: current SA; Byte 2 ~ 7: Byte 0 ~ 5 in the sensor serial number command returned
Modify filter level	0x10	Byte 1: new filter level, range (0 ~ 5), default: 5; Byte 2 ~ 7: Byte 0 ~ 5 in the sensor serial number command returned

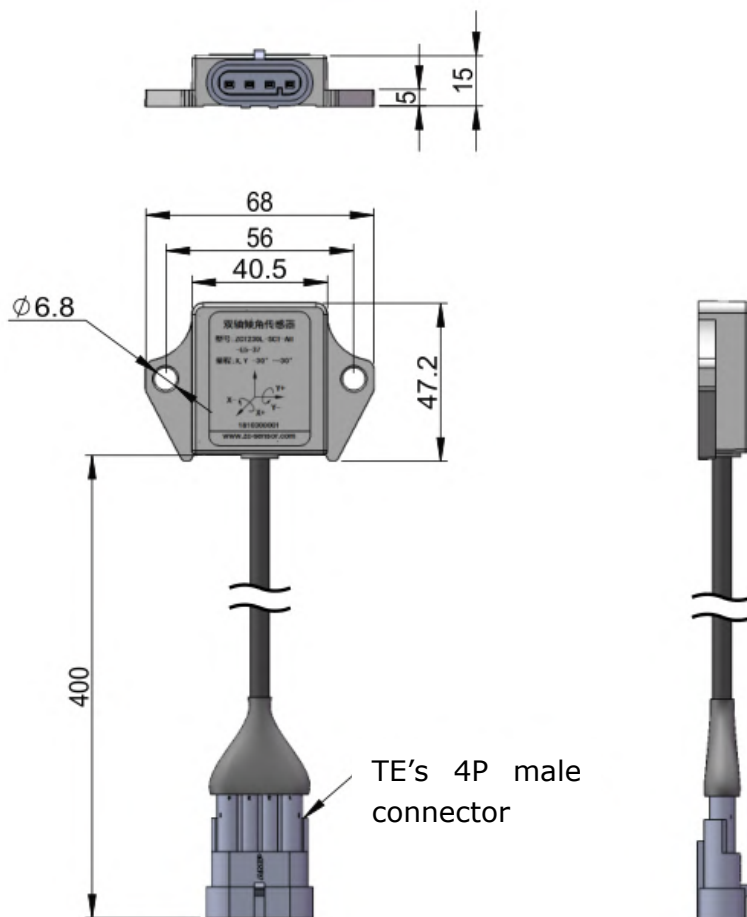
6. Wiring definition



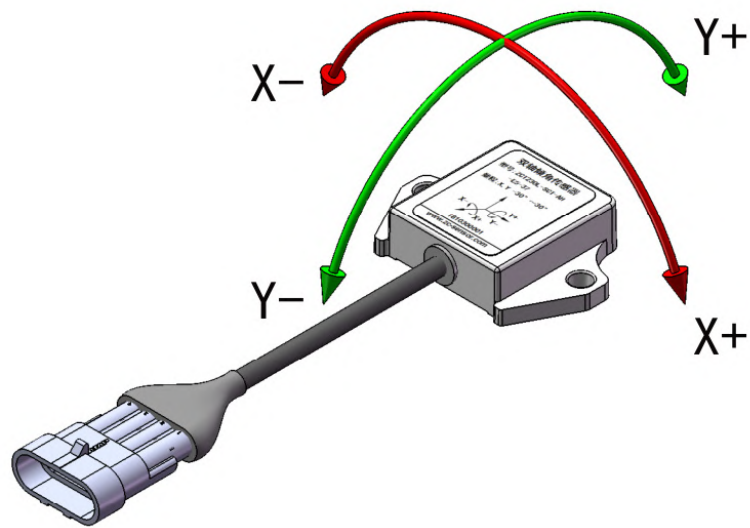
1	2	3	4
white	yellow	green	brown
VCC	GND	CAN-H	CAN-L

7. Size and directions

7_1. Product size (unit: mm)



7_2. Measurement directions



8. Ordering instructions

Model: ZCT230L-LCT-AH-E5-37B

Default cable length (including the connector): $400 \pm 50\text{mm}$

The information in this datasheet is for reference only. Shanghai Zhichuan Electronic Tech Co., Ltd. has the right to modify it without notice.