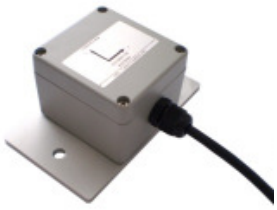
PEI-Z290-LCS-CAN-3 CANopen 2-axis Inclinometer



General description:

- two-axis inclinometer sensor with high precision and stability.
- Total range is from +/-30° up to +/-90°
- CANopen communication.
- IP66 protection
- Wide DC supply, reverse voltage protection

Specifications

unless special remark, following datas are typical value in room environment (25℃).

	Parameter	Test condition	Min value	Typical value	Max value	Unit
Operating	Supply voltage		8	12	30	VDC
	Quiescent current	VCC=12.00V		90	120	mA
	Operating temperature		-40		+85	℃
Performance	Total range	Two-axis			±90	º
	Resolution	Total range≤±60 º		0.01		º
	Accuracy	Total range≤±30 º		±0.05		º
		Total range≤±45 º		±0.1		º
		Total range≤±60 º		±0.15		º
		Total range≤±75 º		±0.3		º
		Total range≤±90 º		±0.4		º
	Repeatability	Total range≤±60 º		±0.03		º
	Zero temperature drift[1)]	-40… +85℃		0.5	0.86	º
	Sensitivity temperature drift[2)]	-40…+85℃		0.014		%/℃
	Response time[3)]			300		ms
Environment	Storage temperature		－45		+125	℃
	Protection grade			IP66		

Note 1: zero temperature drift means when the output is 0º under the room environment, the offset of the angle when change temperature.

Note 2: Sensitivity temperature drift means the sensitivity changes with the change of environment temperature. The tolerance on the measuring results is as follow:

arcsin (sinθ/(1±Δ%))–θ [θ is actual angle,Δ is the offset of the sensitivity]

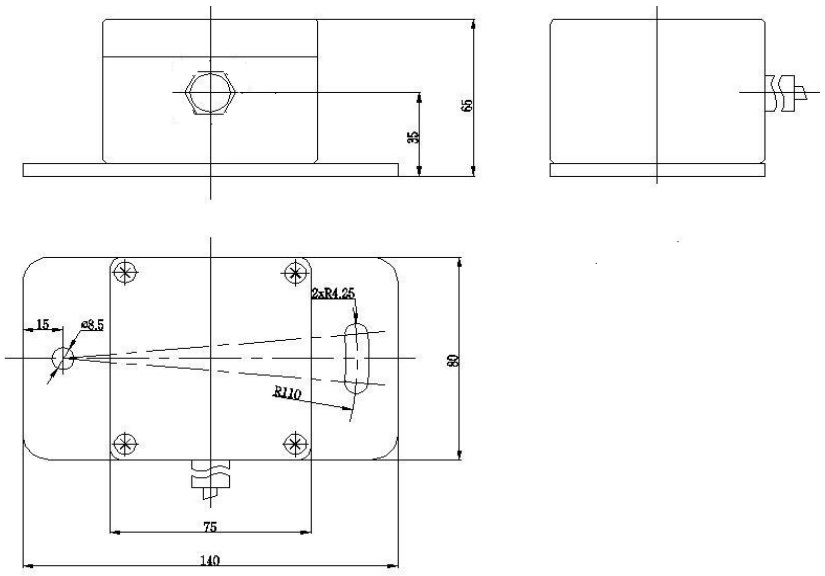
Note 3: response time means the needed time of sensor output reaching 85% of the final output, resulted by the step change of measured tilt.

Ordering Code

PEI-Z2xx-LCS-CAN-3 total range= +/-xx° xx=30, 45, 60, 75, 90

Installation size and wire connection definition:

In order to obtain the largest variable range of tilt, when the delivery tools and platform are in a normal position, the module should be installed in horizontal.



Wire connection definition：

Red ———— VCC	Black ———— GND
Yellow ———— CANH	Blue ———— CANL

Installation:

Incorrect mounting will cause large angle error.

CAN-open communication protocol：

1. **The sensor automatically sends the message 'BOOT-UP' after power on. (defaulted Node_ID=0x20)**

CAN-ID	First byte
0x700+Node_ID	0x00

2. **SDO message：8 bytes for both request and answer message. If the data byte is too short, the rest is filled with zeros.**

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x22	Index_LSB	Index_MSB	Sub_index	×	×	×	×

Diagram 1-1 SDO request message format (Master sends)

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	Index_LSB	Index_MSB	Sub_index	0x00	0x00	0x00	0x00

Diagram 1-2 SDO answer message format (transmitter answers)

1) Modify the Node_ID（Node_ID=1～127）：defaulted Node_ID is 0x20

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x22	0x20	0x23	0x00	Node_ID	0x00	0x00	0x00

Diagram 1-3 SDO send message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	0x20	0x23	0x00	0x00	0x00	0x00	0x00

Diagram 1-4 SDO answer message format

Example： if the previous Node_ID=0x20，now modify it to Node_ID=0x05，then SDO receive CAN-ID=0x605, send CAN-ID=0x585, PDO send CAN-ID=0x185,BOOT-UP message CAN-ID=0x705.

2) Modify the output cycle of PDO：

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x22	0x00	0x18	0x05	VL	VH	0x00	0x00

Diagram 1-5 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	0x00	0x18	0x05	0x00	0x00	0x00	0x00

Diagram 1-6 SDO answer message format

The 5th byte（VL）modifies low byte of the output cycle, the 6th byte（VH) modifies high byte of the output cycle.

VL=0X2C, VH=0X01, means output cycle is 300mS.

VL=0X58, VH=0X02, means output cycle is 600mS.

VL=0XDC, VH=0X05, means output cycle is 1500mS. The defaulted cycle is 300mS.

3) Save the above parameter setting：

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x22	0x10	0x10	0x01	0x73	0x61	0x76	0x65

Diagram 1-7 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	0x10	0x10	0x01	0x00	0x00	0x00	0x00

Diagram 1-8 SDO answer message format

This command stores the set Node_ID and output cycle in the MCU-EEPROM.

4) Restore the defaulted parameter:

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x22	0x11	0x10	0x01	0x6C	0x6F	0x61	0x64

Diagram 1-9 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	0x11	0x10	0x01	0x00	0x00	0x00	0x00

Diagram 1-10 SDO answer message format

The command restore set Node_ID and output cycle as factory setting. Node_Id is 0x20,output cycle is 300mS.

5) Set zero position

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x22	0x25	0x61	SZ	0x7A	0x65	0x72	0x6F

Diagram 1-11 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	0x25	0x61	SZ	0x00	0x00	0x00	0x00

Diagram 1-12 SDO answer message format

Note: the value of SZ can be 0x01、0x02、0x03 and 0x04. 01 means setting the current angle of X axis as zero. 02 means setting the current angle of Y axis as zero.

Eg : if the current angle of X axis is +2º, when send a 01 command, the value of the angle becomes 0º; previous +4 ºbecomes +2º. 03 means cancelling the zero set of X axis. 04 means cancelling the zero set of Y axis. This command can be saved after power off.

6) set resolution

CAN-ID	First	Second	Third	Fourth	5th	6th	Seventh	Eighth

	Byte	Byte	Byte	Byte	Byte	Byte	Byte	byte
0x600+ Node_ID	0x22	0x00	0x60	0x00	SR	0x00	0x00	0x00

Diagram 1-13 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x60	0x00	0x60	0x00	0x00	0x00	0x00	0x00

Diagram 1-14 SDO answer message format

Note: SR can be 0x01 and 0x0a. 0x01 means the resolution is 0.01º，0x0a means the resolution is 0.1º，and the faulted resolution is 0.01. the command can be stored after power off. That is , if the current resolution is 0.1º, and the resolution will be 0.1º next time when power on.

7) Set CAN baud rate

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eightth byte
0x600+ Node_ID	0x22	0x21	0x23	0x00	Baud	0x00	0x00	0x00

Diagram M1-15 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eightth byte
0x580+ Node_ID	0x60	0x21	0x23	0x00	0x00	0x00	0x00	0x00

Diagram 1-16 SDO answer message format

Note: the 5th byte(Baud) can be 0x00、 0x01、0x02、0x03、0x04、0x05 and 0x06. 0x00 means setting baud rate at 1000K，0x01 means setting baud rate at 800K，0x02 means setting baud rate at 500K，0x03 means setting baud rate at 250K，0x04 means setting baude rate at 125K，0x05 means setting baud rate at 100K，0x06 means setting baud rate at 50K. The defaulted baud rate is 250K. The command can be saved after power off, that is if the current baud rate is 800K，the baud rate is still at 800K when next time power on.

Read Object ,the format of request message and answer message is as the diagram 1-15 and 1-16, the first byte 40H means reading command.

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x40	Index_LSB	Index_MSB	Sub_index	0x00	0x00	0x00	0x00

diagram1-17 SDO request message format (Master sends)

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x42	Index_LSB	Index_MSB	Sub_index	×	×	×	×

diagram1-18 SDO answer message format (transmitter answers)

1)、read Node_ID（Node_ID=1～127）：

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x40	0x20	0x23	0x00	0x00	0x00	0x00	0x00

Diagram 1-19 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x42	0x20	0x23	0x00	Node_ID	0x00	0x00	0x00

Diagram 1-20 SDO answer message format

2)、read output cycle of PDO:

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x40	0x00	0x18	0x05	0x00	0x00	0x00	0x00

Diagram 1-21 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x42	0x00	0x18	0x05	CL	CH	0x00	0x00

Diagram 1-22 SDO answer message format

The 5th byte （CL）is the Low byte of output cycle, the 6th byte （CH）is high byte of the output cycle .CL=0X2C, CH=0X01，means the cycle is 300mS.CL=0X58, CH=0X02，means the cycle is 600mS.CL=0XDC, CH=0X05，means the cycle is 1500mS. The defaulted output cycle is 300mS.

3)、read CAN baud rate:

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x40	0x21	0x23	0x00	0x00	0x00	0x00	0x00

Diagram 1-23 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x42	0x21	0x23	0x00	BL	BH	0x00	0x00

Diagram 1-24 SDO answer message format

The 5th byte (BL) is low byte of output cycle, the 6th byte(BH) is high byte of the cycle. BL=0XE8, BH=0X03，means the baud rate is 1000K bps. BL=0X20, BH=0X03，means the baud rate is 800K bps. BL=0XF4, BH=0X01，means the baud rate is 500K bps. BL=0XFA, BH=0X00，means the baud rate is 250K bps. BL=0X7D, BH=0X00，means the baud rate is 125K bps. BL=0X64, BH=0X00，means the baud rate is 100K bps. BL=0X32, BH=0X00，means baud rate is 50K bps.

4)、read resolution:

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x600+ Node_ID	0x40	0x00	0x60	0x00	0x00	0x00	0x00	0x00

Diagram 1-25 SDO request message format

CAN-ID	First Byte	Second Byte	Third Byte	Fourth Byte	5th Byte	6th Byte	Seventh Byte	Eighth byte
0x580+ Node_ID	0x42	0x00	0x60	0x00	SR	0x00	0x00	0x00

Diagram 1-26 SDOanswer message format

The 5th byte（SR）is the angle resolution，SR=0x01 means the resolution is 0.01º；SR=0x0a means the resolution is 0.1º；

3、PDO of the tilt sensor (Process Data Object)：

1、start PDO and send the data：

CAN-ID	First Byte	Second byte
0x000	01	00

Diagram 1-27 PDO send message format

CAN-ID	First byte	Second byte	Third Byte	Fourth byte
0x180+ Node_ID	XL	XH	YL	YH

Diagram 1-28 PDO answer message format

There are four parameter . the first byte means the output low byte of X axis angle, the second byte means high byte of X axis angle, the third byte means the output low byte of Y axis angle, the fourth byte means high byte of Y axis angle.

Angle conversion:

1) When the resolution is 0.01º: 0 = 0º, 2328(hex) = +90º, DCD8 = -90º.
2) When the resolution is 0.1º：0 = 0º，384（hex）= +90º,FC7C = -90º.

Note: If the angle is positive, angle display as in hex.eg: if angle is +20º, it will display as 7D0(when resolution is 0.01). If the angle is negative, it display with complement number,eg: if angle is -20º, it will display as F830 (when resolution is 0.01). That is, 0x10000-0x7D0=0x F830.

2、Stop PDO sending data：

CAN-ID	First Byte	Second byte
0x000	02	00

Diagram 1-29 PDO send message format

Note 1: There is a high-speed optical isolation built in the CAN module, so connection with ground is not required.

Note 2: The send and receive CAN frames are all standard frames.

Note 3: The defaulted baud rate of CAN is 250K.

Specifications are subject to change without notice!

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