RUICOM

HTS6 High-Precision CAN Open Output Tilt Sensor

Product manual

V1.8-20230918

Technical Highlights

- ❖ Measuring range selectable from ±1° to ±35°;
- ❖ Small measuring range accuracy 0.001°;
- ❖ Resolution 0.001°;
- ❖ High vibration resistance >2000g;
- ❖ Wide voltage input DC 9~36V;
- ❖ CAN Open signal output.

Product Introduction

RUICOM Technology's independently developed HTS6-CANopen tilt meter, while maintaining the excellent stability of the STS series, further optimizes measurement accuracy and temperature drift performance, ensuring more precise and reliable attitude detection. This product integrates a high-precision 16-bit A/D differential converter, combined with a fifth-order digital filtering algorithm, to accurately measure the tilt and pitch angles of the sensor relative to the horizontal plane.

The CANopen communication interface supports industrial standard protocols for easy system integration; the built-in high-precision digital temperature sensor supports real-time temperature drift compensation (temperature output optional), ensuring excellent repeatability under wide temperature environments; a 50Hz high response frequency (higher frequencies can be customized) meets dynamic measurement needs; industrial-grade design provides strong anti-interference capabilities, adapting to harsh industrial environments; high reliability and strong scalability make it suitable for high-precision applications such as engineering machinery, automation control, and platform calibration.

RUICOM Technology can provide customized solutions based on customer needs to facilitate precise measurement and intelligent control.

Application Scope

Typical applications of this product series include: industrial automation, engineering machinery platform leveling systems, photovoltaic tracking bracket control systems, aerospace attitude reference systems, precision instrument leveling devices, and high-precision tilt measurement fields such as platform leveling.

Performance Parameters

HTS6	Condition	Parameter	
Measurement Range	-	±10°	±35°
Measurement Axis	-	Single/ Dual-axis	Single/ Dual-axis
Resolution[1)]	-	0.001°	0.001°
Measurement Accuracy[2)]	@25℃	0.005°(RMS)	0.01°(RMS)
Long-Term Stability	-	0.01°	0.02°
Zero-Point Temp Coefficient[3)]	-40~85℃	±0.002°/℃	±0.002°/℃
Sensitivity Temp Coefficient[4)]	-40~85℃	≤50ppm/℃	≤50ppm/℃
Power-On Startup Time	-	0.5s	0.5s
Response Frequency	-	20Hz	20Hz
Output Rate	5Hz / 15Hz / 35Hz / 50Hz configurable		
Output Signal	CANopen		
EMC	According to EN61000 and GBT17626		
Insulation Resistance	≥100 MΩ		
Shock Resistance	100g@11ms, 3 Axial Direction (Half Sinusoid)		
Vibration Resistance	10grms/10~1000Hz		
Protection Class	IP67		
Cables	Standard 2m cable, wire diameter 6.0mm, wire weight ＜ 155g		
Weight	≤200g (excluding cable)		

1)Resolution: The smallest angular change that can be detected within the effective measurement range, reflecting its ability to monitor minute tilt fluctuations.
2)Measurement Accuracy: A comprehensive evaluation of the sensor's performance indicators under standard ambient temperature, including the overall performance of linearity error, repeatability error, hysteresis error, zero-point offset error, and cross-axis sensitivity error.
3)Zero-Point Temperature Coefficient: The ratio of the sensor's output value to temperature when the sensor is in a zero-input state, defined as the ratio of the zero-point offset within the rated operating temperature range to the room temperature reference value.
4)Sensitivity Temperature Coefficient: A stability index of the sensor's full-scale output value with temperature changes, characterizing the drift rate of sensitivity relative to the room temperature reference value within the rated temperature range.

Electrical Parameters

Parameter	Condition	Min	TYP		Max	Unit
Power supply voltage	Standard	9	12	24	36	V
	Customized		Other voltages			
Operating current	No load		50			mA
Operating temperature		-40			+85	℃
Storage temperature		-40			+85	℃

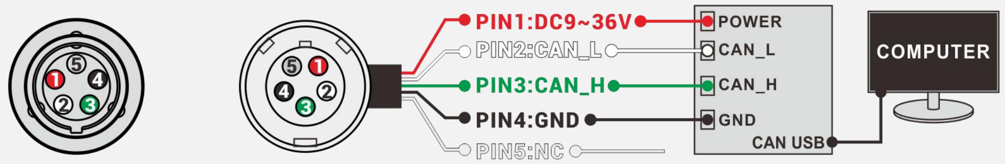
Order selection

Model	Axis	Range		Communication Protocol		Installation Orientation
HTS6	X: X-axis	10: ±10°	-	C1: CAN OPEN protocol	-	H: Horizontal mounting
	Y: Y-axis	15: ±15°				V: Vertical mounting
	D: Dual-axis	35: ±35°				

E.g: HTS6X10-C1-H: Single-axis X-axis / Measurement range ±10° / CAN OPEN protocol / Horizontal mounting.

Interface Definition

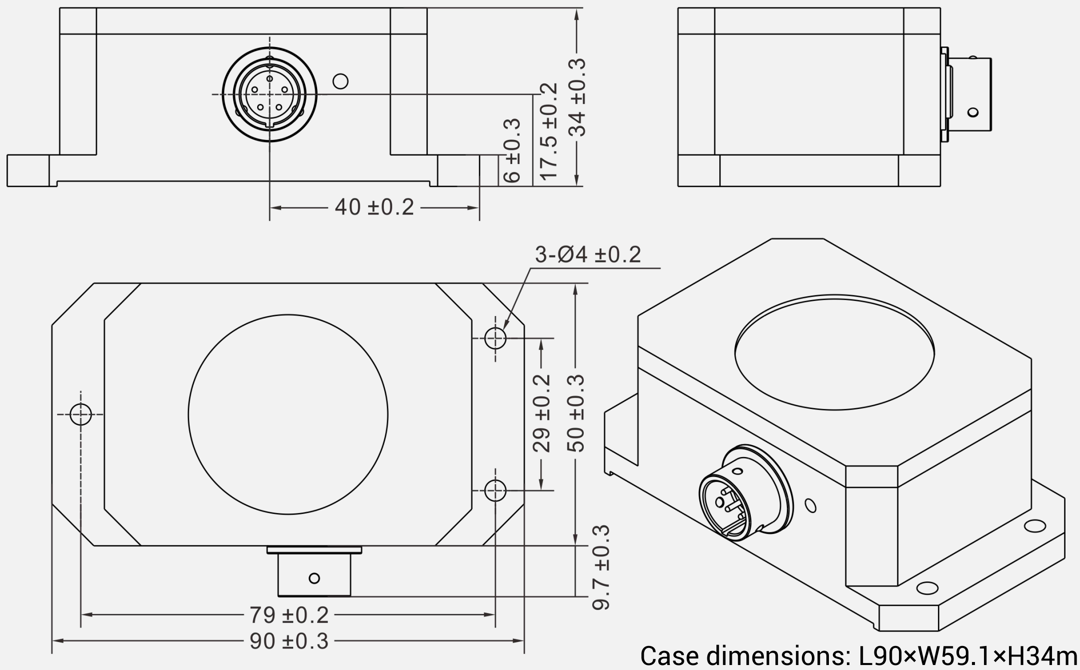
Pin/Thread Color	Definition	Description
PIN1 / Red	DC9~36V	Positive power supply terminal
PIN2 / White	CAN_L	Transmits low-level signal
PIN3 / Green	CAN_H	Transmits high-level signal
PIN4 / Black	GND	Negative power supply terminal
PIN5 / -----	--	--



WEIPU SF1212P-5P Male Connector

WEIPU SF1210S-5P Female Connector

Product Dimensions



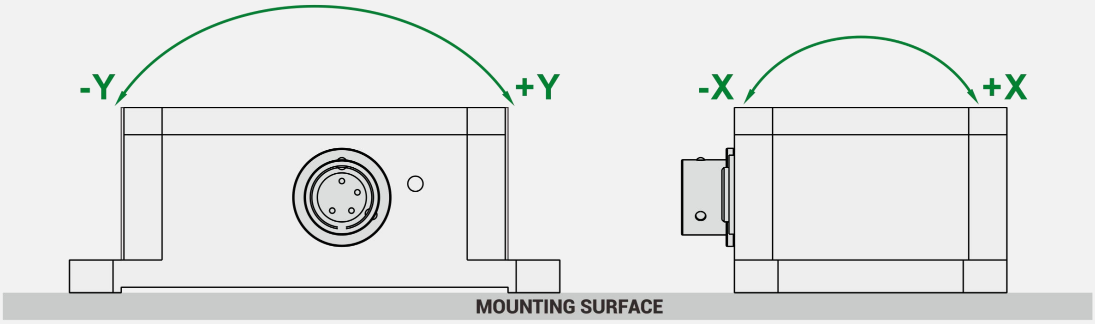
Case dimensions: L90×W59.1×H34mm

Recommended screws: 3 M4 screws

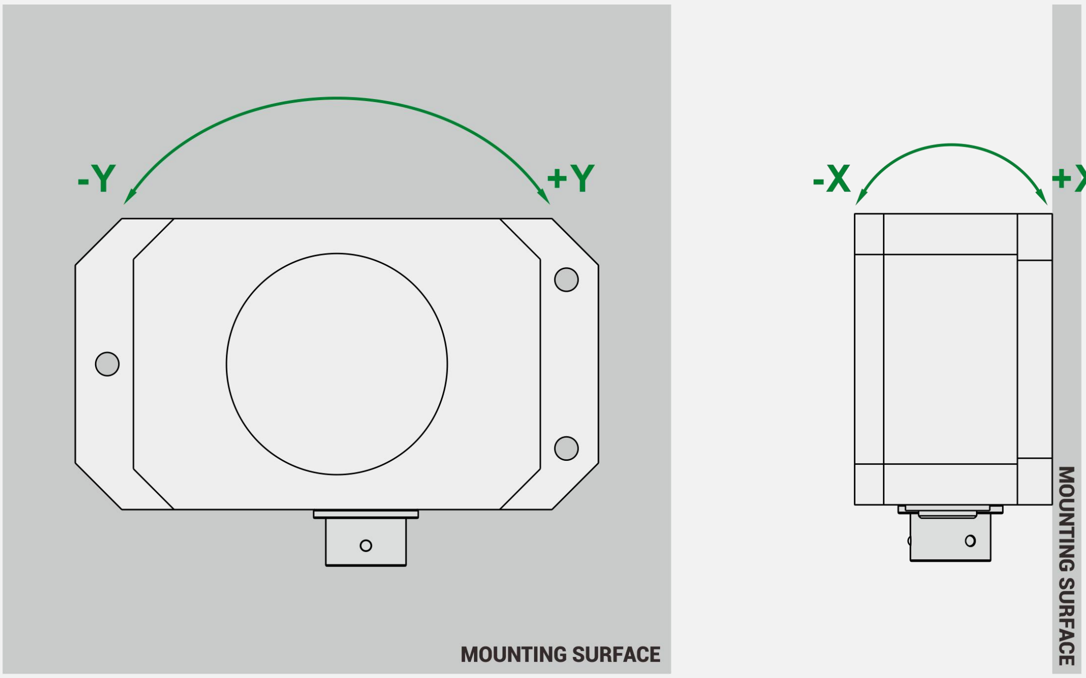
Indicator light operation instructions

The red indicator light remains constantly on after the product is powered on. It will begin flashing when a connection is successfully established and data is being transferred. If the red light remains constantly on during the connection process, it indicates a connection failure, and a reconnection operation is required.

Measurement direction



Horizontal installation



Vertical installation

Communication Protocol

1.SDO messages: SDO request and response messages always consist of 8 bytes, with zeros added at the end if the data bytes are insufficient.
The format and content of Write Object request and response messages are shown in Tables 1-1 and 1-2: Node_ID is the CAN communication node number, Index_LSB is the low byte of the dictionary index, Index_MSB is the high byte of the dictionary index, and Sub_index is the sub-index.

1)This message is automatically sent after the tilt angle power-on initialization is complete. The message length is 1, and the default node number (Node_ID) is 0x05.

CAN-ID	First Byte
0x700+ 0x05	0x00

Table 1-1

2)Start and stop commands are sent by the master node.

CAN-ID	First Byte	Second Byte	Function
00	01	00	**Start**
00	80	00	**Stop**

Table 1-2

3)Modify the node number (Node_ID = 0x01 ~ 0x7F), the default node number (Node_ID) is 0x05.

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+Node_ID	0x22	0x00	0x30	0x00	New Node_ID	0x00	0x00	0x00

Table 1-3 SDO Request Message Format

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+Node_ID	0x60	0x00	0x30	0x00	0x00	0x00	0x00	0x00

Table 1-4 SDO Response Message Format
Note: If the controller sends CAN-ID=0x600+0x05 (default), the data sent is: 22 00 30 00 10 00 00 00
The sensor returns CAN-ID=0x580+0x05 (default), and the data returned is: 60 00 30 00 00 00 00 00. After power-on, the received frame ID is 0x590 (0x580+0x10), indicating that the frame ID was successfully modified.

4)Set the CAN baud rate The factory default baud rate is 125K, and the default node number (Node_ID) is 0x05

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+Node_ID	0x22	0x01	0x30	0x00	Baud	0x00	0x00	0x00

Table 1-5 SDO Request Message Format

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+Node_ID	0x60	0x01	0x30	0x00	00	0x00	0x00	0x00

Table 1-6 SDO Response Message Format
Note: The fifth byte (Baud) is 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, or 0x08.
After sending this command and receiving the returned data, the sensor needs to be powered on again for the baud rate modification to succeed.

Baud Rate Corresponding to Baud

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) Set the PDO sending time in a loop

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+Node_ID	0x22	0x00	0x22	0x00	TIME	0x00	0x00	0x00

Table 1-7 SDO Request Message Format

The fifth byte, TIME **only supports two types: 0X32h: 50ms and 0X64: 100ms. The factory default is 0X64: 100ms**

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+Node_ID	0x60	0x00	0x22	0x00	00	0x00	0x00	0x00

Table 1-8 SDO Response Message Format

6) Set relative zero point

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+Node_ID	0x22	0x03	0x21	0x00	0x01	0x00	0x00	0x00

Table 1-9 SDO Request Message Format

Set the current angle to zero. For example, if the current angle is 0.12 degrees, then all subsequent angles will be absolute angles minus 0.12 degrees

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x580+Node_ID	0x60	0x03	0x21	0x00	0x00	0x00	0x00	0x00

Table 1-10 SDO Response Message Format

7) Cancel Relative Zero Point

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
0x600+ Node_ID	0x22	0x03	0x21	0x01	0x01	0x00	0x00	0x00

Table 1-11 SDO Request Message Format

CAN-ID	1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th 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

After the device starts up, it periodically sends the following messages:
D0, D1, D2, D3 are X-axis angles; D4, D5, D6, D7 are Y-axis angles.
Least significant digit first, most significant digit last, then divide by 10000.
0~0X 0D BB A0 represents: +0~+90°

FFFFFFFF~FFF2445F represents: -0~-90°
For example:
X: 0X 00 00 35 13 = 13587/10000 = 1.3587
Y: 0XFFFFFF1D
FFFFFFFF-0XFFFFFF1D = 226/10000 = -0.0226°