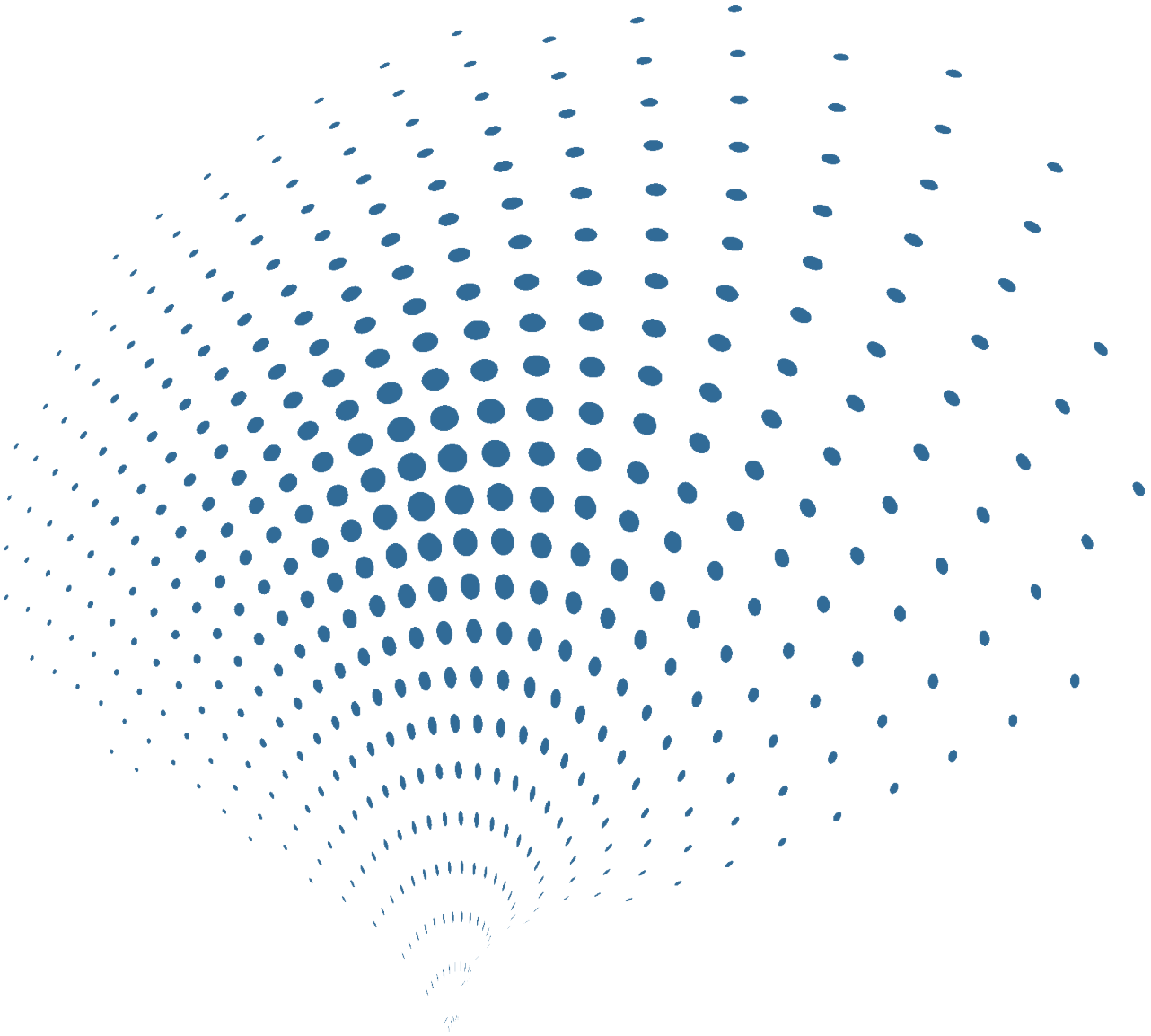
Vigor Technology



SST2202 Tilt Beam Sensor

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Features

- High resolution, accuracy & stability
- Reliable long distance transmission, easy to set up measurement network on site
- U-Shaped openings in both ending, easy to connect sensors
- IP67 protection
- Alloyed & anodized aluminum shell, corrosion-resistant, wear-resistant, artistic

Descriptions

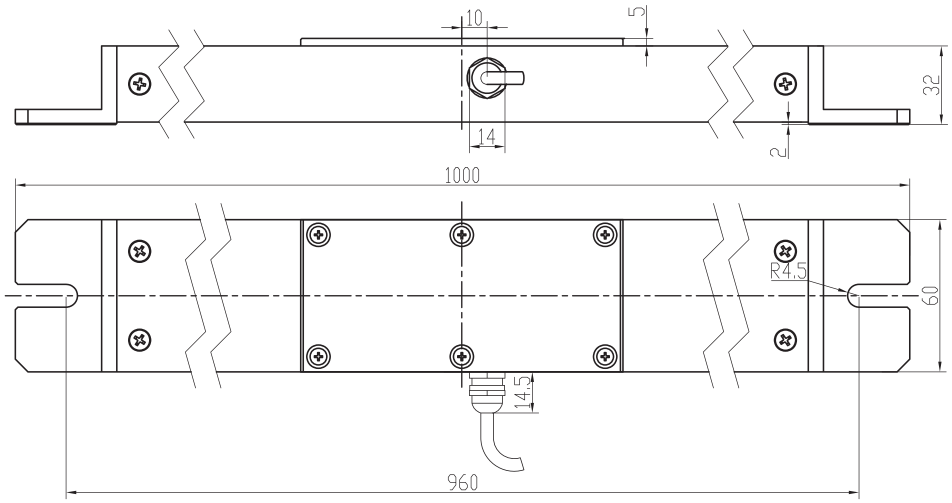
SST2202 tilt beam sensor is developed by Vigor Company based on patent inclination measurement technology for civil industry application, and it is specially designed for linear measurement.
SST2202 is used to detect the angle change between two fixed points. The inclination sensor is installed in a rigid beam with a standard length of 1m (2m, 3M optional). When the beam is installed on the structure to be monitored, the angle change can be measured and converted into the displacement relative to the length of the beam. Many such beams can be connected in series for long distance and accurate monitoring of the linear changes of the dam, tunnel and excavation wall.

Picture 1 Level bending diagram

Applications

- Buildings and structures adjacent to deep excavation and series walls.
- Buildings and structures impacted by tunneling and mining.
- Subgrade treating, grouting & supporting structure.
- Oil tank monitoring
- Retaining wall monitoring
- Subside and collapse monitoring
- Rail subsidence monitoring, etc.

Dimensions (mm)



Performances

Table 1 Specifications

Measurement range		±5°	±10°	±15°
Combined absolute accuracy①(@25℃)		±0.01°（0.17mm/m）	±0.015°(0.26mm/m)	±0.02°(0.35mm/m)
Accuracy subroutine parameter	Absolute linearity (LSF,%FS)	±0.06	±0.03	±0.03
	Cross-axis sensitivity②	±0.1%FS		
	Offset③	±0.005°(0.1mm/m)		
	Repeatability	±0.0025°(0.05mm/m)		
	Hysteresis	±0.0025°(0.05mm/m)		
Allowed installation misalignment④		±4.0°	±3.0°	±2.5°
Input-axis mislignment		≤±0.1°		
Sensitivity temperature drift coefficient (max.)		≤100ppm/ ℃		
Offset temperature drift coefficient (max.)		≤0.003° (0.06mm/m)/ ℃		
Offset turn on repeatability⑤		±0.008°(0.15mm/m)		
Resolution		0.0025°(0.05mm/m)		
Long-term stability(1 year)⑥		≤0.02°(0.4mm/m)		
Measurement axis		1 axis		
Temperature sensor		Range: -50~125℃, Accuracy:±1℃		
Output		RS232(standard) , Optional RS485, CAN2.0, Ethernet, Wi-Fi, 4~20mA, -5~5VDC		
RS232 output format		115200 baud, 8 data bits, 1 start bit, 1 stop bit, none parity		
Cold start warming time		60s		
Response time⑦		0.3s(@t_{90})		
Refresh rate		5Hz, optional 10Hz or 20Hz		
Response frequency⑧		3Hz @-3dB		
Power supply		9~36VDC		
Power consumption		Average working current≤50mA, average power≤1.5W (25℃&24VDC)		
Operation temperature range		-40~85℃		
Storage temperature range		-60~100℃		
EMC		According to EN 61000		
Insulation resistance		100MΩ		
MTBF		≥25000 hours		
Shock		100g@11ms, three-axis, half sine		
Vibration		8grms, 20~2000Hz		
Protection		IP67		
Connecting		Pigtail, 2m cable, other length available		
Weight		1.3Kg(without connector and cable)		

① Combined absolute accuracy means the compositive value of sensor's absolute linearity, repeatability, hysteresis, offset and cross-axis sensitivity error. (in room temperature condition) as

$\Delta=\pm\sqrt{\text{absolute linearity}^2+\text{repeatability}^2+\text{hysteresis}^2+\text{offset}^2+\text{cross-axis sensitivity}^2\ \text{error}^2}$

② The cross-axis sensitivity means the angle that the tilt sensor may be banked to the normal tilt direction of sensor. The cross-axis sensitivity (±0.1%FS) shows how much perpendicular acceleration or inclination is coupled to the inclinometer output signal. For example, for the single-axis inclinometer with range ±30°(assuming the X-axis as measured tilt direction), when there is a 10° tilt angle perpendicular to the X-axis direction(the actual measuring angle is no change, example as +8.505°), the output signal will generate additional error for this 10° tilt angle, this error is called as cross-axis sensitivity error. SST300`s cross-axis sensitivity is 0.1%FS, the extra error is 0.1%×30°=0.03°(max), then real output angle should be +(8.505°±0.03°). In SST300 series, this error has been combined into the absolute accuracy

③ Offset means that when no angle input (such as the inclinometer is placed on an absolute level platform), output of sensor is not equal to zero,the actual output value is zero offset value.

④ Allowed installation misalignment means during the installation, the allowable installation angle deviation between actual tilt direction and sensor's nature measurement direction. In general, when installed,SST300 sensor is required that the measured tilt direction keep parallel or coincident with sensor designated edge, this parameter can be allowed a certain deviation when sensor is installed and does not affect the measurement accuracy.

⑤ Offset turn on repeatability means the repeatability of the sensor in repeated by supply power on-off-on many times.

⑥ Long-term stability means the deviation between the statistics of the maximum and the minimum output value after a year of continuous power supply when the sensor is at 20℃.

⑦ The response time refers to the angle sensor in a step change (such as the angle changes from -10 ° to +10 °within 5ms), the time required that output of the sensor achieved to the standard value of 90%. The index is different from the sensor set-up time

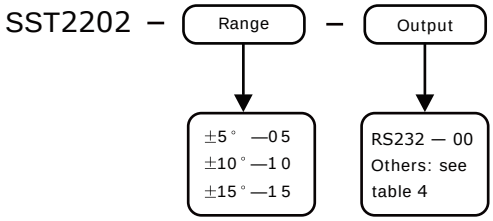
⑧ Response frequency is for the limitation of the dynamic measurement range, when the dynamic measurement exceeds 3 Hz, because of centripetal force, the output occupied additional random error,this error is difficult to define.

Wiring

Table2 Cable definition

Wire color	RS232	RS485	CAN	Ethernet	Wi-Fi	4~20mA	-5~+5VDC
Red	Power+	Power+	Power+	Power+	Power+	Power+	Power+
Black	Power GND	Power GND	Power GND	Power GND	Power GND	Power GND	Power GND
Green	Signal GND	Signal GND	Signal GND	Signal GND	NC	Signal GND	Signal GND
Yellow	NC	NC	NC	E-RXD+	NC	Iout	Vout
White	NC	NC	NC	E-RXD-	NC	NC	NC
Blue	RS232—TXD	RS485—A	CAN-H	E-TXD+	NC	NC	NC
Brown	RS232—RXD	RS485—B	CAN-L	E-TXD-	NC	NC	NC

Ordering



Angle conversion

Table3 Angle conversion table

	degrees	arc minutes	arc seconds	μradians	mm/meter	inches/ft.
1 degree=	1	60	3600	17453	17.453	0.2094
1 arc minute=	0.01667	1	60	290.9	0.2909	$3.49x10^{-3}$
1 arc second=	$2.78x10^{-4}$	0.01667	1	4.848	$4.85x10^{-3}$	$5.82x10^{-5}$
1 μradian=	$5.73x10^{-5}$	$3.44x10^{-3}$	0.2063	1	0.001	$1.20x10^{-5}$
1 mm/meter=	0.0573	3.436	206.3	1000	1	0.0120
1 inches/ft.=	4.775	286.5	17189	83333	83.33	1

Accessories & Options

Table 4 Accessories

Item	Order Code	Accessories name	Function
Output interface	00	RS232 output	Standard industrial interface
	G1	RS485 output	Standard industrial ModBus protocol
	G3	CAN output	Standard industrial interface
	G9	Ethernet interface	Standard industrial TCP/IP interface
	G12	Wi-Fi interface	Standard industrial interface
	G19	4~20mA output	Standard industrial level
	G21	-5~+5VDC output	Standard industrial level

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