

Spectron Ceramic Tilt Sensors

Spectron 公司陶瓷倾角传感器

Sensors
(Scale 1/1)SH50054-
A-003SH50055-
A-009SH50056-
A-003

	TECHNICAL CHARACTERISTICS	TYPES	SH50054-A-003	SH 50055-A-009	SH 50056-A-003
1	Total tilt angle range	(degree)	± 6	± 1	± 80
2	Linear range	(degree)	± 3	± 0.5	± 60
3	Output(MUPI-2)	(mv/arc second)	0.4	1.0	
4	Output(MUPI-2)	(MV/arc degree)			160
5	Resolution	(arc degrees)	< .0003	< .0001	< .001
6	Null repeatability	(arc degrees)	< .0008	< .0008	< .02
7	Symmetry at half linear scale	(%)	< 2	< 2	< 2
8	Accuracy at half linear scale	(%)	< 2FS	NA	< 8FS
9	Accuracy at full linear scale	(%)	< 8FS	NA	< 3FS
10	Null impedance ± 20%	(Kohm)	12	1	8
11	Operating temperature	()	-54/+125	-54/+125	-54/+125
12	Storage temperature	()	-76/+150	-76/+150	-76/+150
13	Null stability typical (12 hrs @ 25)	(arc degrees)	< .0005	< .0005	< .005
14	Scale factor temp.coefficient typical	(%/)	0.6	0.6	0.1
15	Electrolyte Conductivity and viscosity can be custom designed		S6a	C6	C1
16	Wires # 30 teflon * SH50058 wires are # 26 teflon (purple neutral)	(black neutral)	8	18	6
			red	blue	green
			yellow	yellow	red

Spectron reserves the right to make changes without further notice to any products herein to improve reliability, function or design.

TEST CIRCUIT

Measured using a MUPI-2 signal conditioner calibrated in the following way: A 4 Kohm 0.01% resistor (two 2 Kohm resistors tied together) bridge is wired to the MUPI-2. The null potentiometer is adjusted to read zero volt ± 3mv. A 2 Kohm, 5% resistor is mounted parallel to one leg of the bridge, and the output voltage is adjusted to 2.6V ± 3mV, and then the other side is adjusted to -2.6V.

LONG TERM STABILITY

Sensor is in a stationary position and output is measured every 15 minutes over a 12 hour period.

SCALE FACTOR

Measured at 1/2" the linear range of the sensor, as measured in the test circuit.

RESOLUTION

The smallest incremental angle that results in a monotonic output.

REPEATABILITY

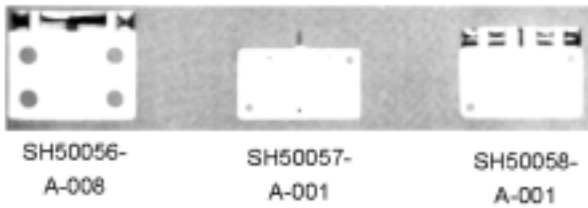
The maximum difference detected when returning a set angle from opposite directions. In general, it is the maximum hysteresis observed at any angle setting.

LINEARITY

The maximum deviation of the output voltage from a best fit straight line calculated using the sum of least squares method.

SYMMETRY

$$\text{Equals} = \frac{(100) \times 2 \times (\text{positive output} - \text{negative output})}{(\text{positive output} + \text{negative output})}$$



SH 50056-A-008	SH50057-A-001	SH 50058-A-001
± 80	± 15	± 15
± 60	± 10	± 10
160	420	420
< .001	< .0005	< .0005
< .02	< .001	< .001
< 2	< 2	< 2
< 8FS	< 2FS	< 2FS
< 3FS	< 5FS	< 5FS
8	40	40
-54/+125	-54/+125	-54/+125
-76/+150	-76/+150	-76/+150
< .005	< .001	< .001
0.1	0.1	0.1
S6f	C1	C1
6	11	*18
green	orange	orange
blue	yellow	gray

SETTLING TIME

The time it takes for the output to stabilize to within 1% of its quiescent value.

NULL IMPEDANCE

Measured using a 1 KHz impedance meter as the lowest impedance when measured between the two active electrodes.

CROSS COUPLING

The maximum deviation of the sensitive axis output as the sensor is tilted in its orthogonal axis.

ELECTROLYTE

Alcohol based fluid, containing no heavy metals, non-corrosive, that can be custom tailored for conductivity and viscosity.

CERAMIC TILT SENSORS

The SH50050 family of sensors utilizes advanced

ceramic materials bonded together with glass resulting in a hermetically sealed package without any mechanically moving parts. This results in a robust sensor that can withstand shocks >100 Gs. The 96% alumina can be molded or machined into intricate body shapes that determine range, sensitivity (subarc second), and dynamic response characteristics. The sensors are constructed with flat outside surfaces that facilitate mounting to a vertical surface which, when combined with symmetrical geometry, result in uniform thermal propagation. These high accuracy, low cost angle sensors are fabricated using automated sealing techniques that allow for high volume production with consistent uniformity. To further assure that only the highest quality sensors reach our customers, every sensor is tested on our state of the art automatic testing equipment.

CERAMIC SENSOR APPLICATION

AEROSPACE

Strap Down Attitude Reference
Compass Compensation
Antenna Alignment
Wind Tunnel Alignment

AUTOMOTIVE

Machine Alignment

CONSTRUCTION

Lasers
Road Graders
Trenching Machines
Paving Machines
Total Station Compensator

GEOTECHNICAL

Soil Subsidence
Structural Monitoring
Tilt Meters

INDUSTRIAL

Camera Alignment
Range Finder
Fork Lift
Machine Tool Leveling
Automatic Inspection Equipment
Robotic Positioning

MDICAL

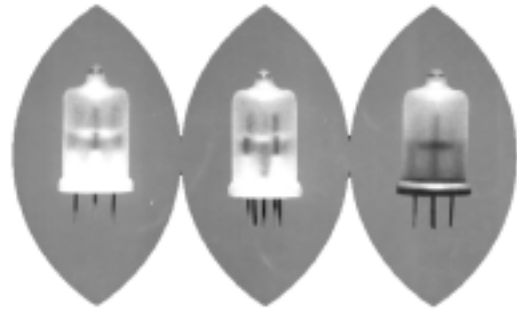
Scanner Alignment

OCEANOGRAPHIC

Antenna Stabilization
ROV

Spectron Two-Axis-and**Single-Axis Tilt Sensors**

单/双轴倾斜传感器

Sensors
(Scale 1/1)

TECHNICAL CHARACTERISTICS	TYPES	SP 5000 -A-000	SP 5010 -A-000	SP 5020 -A-000
1 Total range	(degree)	± 45	± 45	± 60
2 Scale factor	(volts/degree)	0.13	0.12	0.10
3 Resolution	(degree)	0.02	0.02	0.01
4 Stability at 25 12 hours	(degree)	0.04	0.04	0.04
5 Repeatability	(degree)	0.04	0.03	0.03
6 Linearity(%)	at 50% range	3	3	4
	at 25% range	0.8	0.5	0.6
7 Bore sight	(degree)	3	3	3
8 Symmetry at half range	(%)	5	5	5
9 Settling time (ms)	at+25	160	160	240
	at+80	160	160	240
	at-40	250	240	270
10 Null Impedance(K ohms)	at+25	3.4	3.4	2.2
	at+80	1.7	1.7	5.1
	at-40	13	13	7.8
11 Null shift vs temperature	(arc seconds/)	0.1	0.1	0.06
12 Scale factortemperature coefficient	(%/)	0.1	0.1	0.06
13 Cross coupling at null tilt	(degree)			
	at 15 degree cross tilt	0.7	1.0	1.3
	at 30 degree cross tilt	1.6	3.0	2.7
	at 45 degree cross tilt	2.9	5.0	4.5
14 Operating temperature	()	+80/-40	+80/-40	+80/-40
15 Storage temperature	()	+125/-55	+125/-55	+125/-55
16 Electrolyte		C1	C1	C1

TEST CIRCUIT

Measured using a MUPI-2 signal conditioner calibrated in the following way: A 4 Kohm 0.01% resistor (two 2 Kohm resistors tied together) bridge is wired to the MUPI-2. The null potentiometer is adjusted to read zero volt ± 3mv. A 2 Kohm, 5% resistor is mounted parallel to one leg of the bridge, and the output voltage is adjusted to 8.0v ± 3mv, and then the other side is adjusted to - 8.0v.

LONG TERM STABILITY

Sensor is in a stationary position and output is measured every 15 minutes over a 12 hour period.

SCALE FACTOR

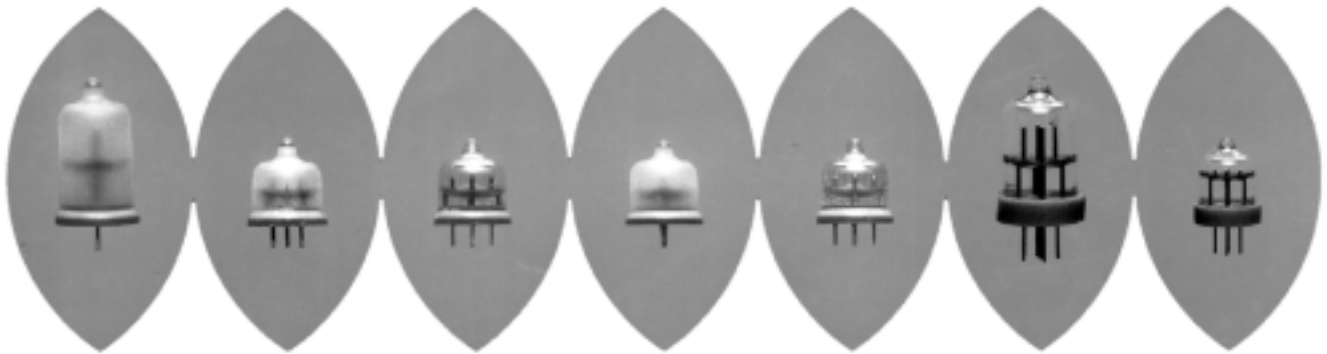
Measured at 1/2 the linear range of the sensor, as measured in the test circuit.

RESOLUTION

The smallest incremental angle that results in a monotonic output.

REPEATABILITY

The maximum difference detected when returning a set angle from opposite directions. In general, it is the maximum hysteresis observed at any angle setting.



SP 5030 -A-001	SP 5003 -A-000	SP 5004 -A-000	SP 5005 -A-000	SP 5006 -A-000	AU 6000 -A-006	AU 6004 -A-001
± 60	± 20	± 20	± 20	± 20	± 60	± 70
0.15	0.26	0.26	0.37	0.28	0.11	0.11
0.03	0.005	0.005	0.005	0.02	0.02	0.05
0.07	0.03	0.04	0.03	0.02	0.4	0.1
0.15	0.02	0.01	0.03	0.1	0.3	0.2
2	1	1	1	4	14	15
0.5	0.2	0.2	0.2	0.2	10	5
3	3	3	3	3	NA	NA
5	5	5	5	5	25	50
220	270	360	380	200	610	2300
220	350	540	570	560	375	100
250	210	240	260	230	1107	4000
4.8	3.1	3.2	6.8	3.5	4.1	3.0
2.5	1.6	1.6	3.5	2.0	2.0	5.1
17	11	11	25	13	17	50
20	10	10	10	10	20	20
0.04	0.1	0.1	0.1	0.1	0.1	0.05
1.0	1.3	0.6	0.7	1.6	0.8	1.3
2.0	3.1	1.4	1.5	4.0	1.8	3.0
3.6	5.9	2.8	3.3	7.0	3.0	6.0
+80/-40	+80/-40	+80/-40	+80/-40	+80/-40	+50/-20	+50/-20
+125/-55	+125/-55	+125/-55	+125/-55	+125/-55	+90/-40	+90/-40
C1	C4	C4	C4	C4	MU11	MU12

LINEARITY

Tge naxunyn devuatuib if tge iytoyt viktage frin a best fut strauggt kube cakcykated ysubg tge syn if kesat sqyares netjid,

BIRE SUGGT

The deviation of the electrical null when the mechanical base of the sensor is perpendicular to the gravity vector.

SYMMETRY

Equals= $\frac{(100) \times 2 \times (\text{positive output} - \text{negative output})}{(\text{positive output} + \text{negative output})}$

SETTLING TIME

The time it takes for the output to stabilize to within 1% of its quiescent value.

NULL IMPEDANCE

Measured using a 1KHz impedance meter as the lowest impedance when measured between any two outer electrodes directly opposite each other.

CROSS COUPLING

The maximum deviation of the sensitive axis output as the sensor is tilted in its orthogonal axis.

ELECTROLYTE

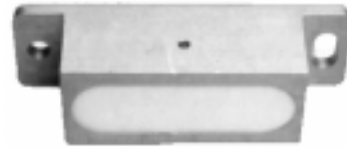
Alcohol based fluid, containing no heavy metals, non-corrosive, that can be custom tailored for conductivity and viscosity.

Spectron Electrolytic Tilt Sensor 电解质倾斜传感器

* Standard signal conditioner

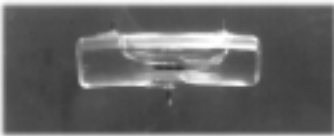
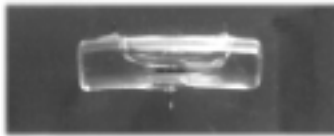
available from stock
(data sheet on request)

** Electrolyte: Conductivity and viscosity can be custom designed



Type 501

2.55 (65) × .78 (20) × .70 (18)

Types		RG-33A...		RG-33T...	
SENSORS(Scale 1/1)					
TECHNICAL CHARACTERISTICS		STANDARD	AVAILABLE	STANDARD	AVAILABLE
1	Tilt Angle Range(degrees)	± 0.25	± 0.25	± 0.5	± 0.5
2	Test Circuit*	MUPI3	MUPI3	MUPI3	MUPI3
3	Output(V/degrees)				
4	Output(mV/arc seconds)	6	6	3	3
5	Resolution(arcseconds)	0.1	0.1	0.2	0.2
6	Null Repeatability(degrees)	0.0008	0.0002	0.0008	0.0002
7	Symmetry(1/2scale)	5	5	5	5
8	Linearity full scale(degrees)	.04	.04	.05	.05
9	Linearity half scale(degrees)	.01	.01	.02	.02
10	Electrolyte**	C6	C6	C6	C6
11	Time constantVs. Temperature				
	Temp.()+20(Time ConstantmS.)	200	200	200	200
	Temp.()+80(Time ConstantmS.)	100	100	100	100
	Temp.()-54(Time ConstantmS.)	1600	1600	1600	1600
12	Null Impedance(Kohms) ± 20%	1.5	1.5	1.5	1.5
13	Null Shift(degrees)				
	(Cross Coupling at 30 °)				
14	Null Shift(degrees)	NA	NA	NA	NA
	(Vibration)4.2g(RMS)5 to 150Hz				
	3.0g(RMS)150 to 500Hz				

SPECTRON

Since our first tilt sensor was produced in 1948, more than 2'000'000 have been supplied to thousands of customers world wide.

From outer space to undersea, our sensors have provided the solutions for the most demanding applications. Imagine how we can help you with your angle measurement requirements.

SENSOR APPLICATIONS

The RG series is recommended for use in static environments (laser leveling, tilt monitors etc.)

The CG series is used in high vibration applications (helicopters, construction equipment etc.)

The L series can be altered by varying viscosity and dampening orifice for usage in almost any application.

All 554 housings are applicable to single axis horizontal mounting of all RG or CG sensor types.

Material: AL 6061 / Finish: Anodize



Type 554M
2.0 (50.8) x 625 (15.9) x 94 (23.9)



Type 554
2.0 (50.8) x 625 (15.9) x 625 (15.9)



Type 554CE
2.0 (50.8) x 625 (15.9) x 1.02 (26.1)

RG-33N....		RG-37S....		CG-10N....		CG-57S....	
STANDARD	AVAILABLE	STANDARD	AVAILABLE	STANDARD	AVAILABLE	STANDARD	AVAILABLE
± 1.0	± 1.0	± 10	± 10	± 4.0	± 4.0	± 12.0	± 12.0
MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	
				1	1	0.5	0.5
1.5	1.5	0.5	0.5	1	1		
0.4	0.4	1.0	1.0	1.0	1.0	3.0	3.0
0.0008	0.0002	0.0005	0.0002	0.002	0.001	0.002	
5	5	5	5	5	5	5	5
.19	.19	0.4	0.4	0.16	0.16	0.5	0.5
.05	.05	0.06	0.06	0.05	0.05	0.1	0.1
C6	C6	C8	C8	C1	C1	C1	C1
200	200	200	200	200	200	400	400
100	100	100	100	100	100	200	200
1600	1600	1600	1600	1600	1600	3200	3200
1.0	1.0	2.6	2.6	9.6	9.6	6.0	6.0
NA	NA	NA	NA	0.008	0.008	0.16	0.16

Wire Options:

Standard leads=10"(254mm)long 30 awg Teflon Insulation

Standard cable=36"(914mm)long WEICO W330TCB 554M:

Cover plate (+gasket) with feed thru terminals

Optional Lemo Connector (554 only) on request:

Internal for Lseries only

External for all other sensors

SPECTRON tilt sensor assemblies are completely aligned, sealed and inspected before delivery. With prealigned tilt sensor assemblies, installation and alignment become one operation. It no longer requires energizing the instrument or use of electrical measurement devices. This service is intended to provide an economical alternative to performing time consuming precision operations at customer facilities or field sites. In addition to our standard holders, sensors can be mounted into customer supplied and/or designed holders.

Spectron Electrolytic Tilt Sensor

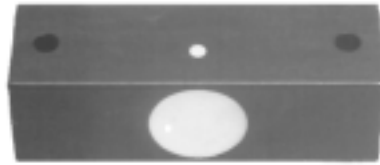
电解质倾斜传感器

The housing types 555 and 556A are horizontal mounting. The 557 can be used for either horizontal or vertical mounting as requested. Material: AL 6061 Finish: Anodize



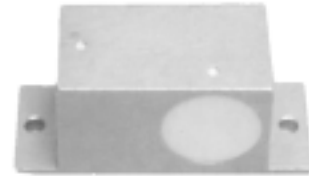
Type 557 single axis

. 104 (26.5) x . 665 (16.7) x . 39 (10)



Type 555 single axis

2.0(50.8) x . 625 (15.9) x . 625 (15.9)



Type 556 A two axis

1.62 (41) x . 725 (18.4) x . 480 (12.2)

L-210....		L-211U....		L-211ND....		L-212....		L-212T....	
STANDARD	AVAILABLE	STANDARD	AVAILABLE	STANDARD	AVAILABLE	STANDARD	AVAILABLE	STANDARD	AVAILABLE
± 80	± 80	± 60	± 60	± 80	± 80	± 60	± 60	± 45	± 45
MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3	MUPI3
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.15	0.15
30	30	30	30	30	30	30	30	20	20
.01	.005	.01	.005	.01	.005	.01	.005	.01	.005
5	5	5	5	5	5	5	5	5	5
1	0.3	2	0.3	2	0.3	1.0	0.3	1.0	0.3
0.4	0.2	0.3	0.1	0.3	0.1	0.4	0.2	0.4	0.2
C5	C5	C4	C4	C5	C5	U42	U42	C5	C5
20	20	40	40	20	20	100	100	40	40
10	10	20	20	10	10	50	50	20	20
160	160	320	320	160	160	800	800	320	320
22	22	6.0	6.0	4.7	4.7	3.2	3.2	3.0	3.0
0.8	0.8	.2	.2	.2	.2	.08	.08	.08	.08
0.1	0.1	.1	.1	0.1	0.1	.08	.08	.08	.08

Resolution:The smallest consistent change in output

Time constant: The time it takes to reach 62.5% of the settled output voltage when the sensor is subjected to a step input equal to 50% of its total range.

Operating temperature (Sensor):

-54 to +125 (Standard)

-30 to +190 (Available)

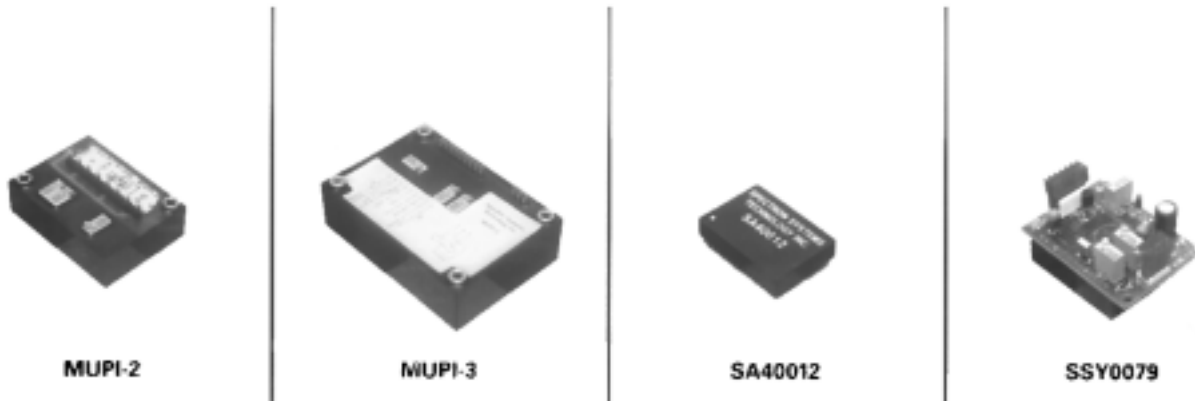
Storage temperature (Sensor):-75 to + 125

Temperature Compensation:

By introducing a temperature sensor located as close as possible to the tilt sensor and connected to terminals 10 and 11 of the MUPI-3, it is possible to efficiently compensate the shift of the tilt sensor's scale factor. Reduction of the shift from 0.15% to 0.02% or even 0.01% per degree Celsius is possible, provided that the resistor R1 has the optimal value which can be slightly different from sensor to sensor.

Spectron Signal Conditioners and Singal Conditioning Modules

信号调节器及模块



Available Signal Conditioners(SC)and Signal Conditioning Modules (SCM)for easy and fast use together with single axis Spectron Tilt Sensors:		
	MUPI-2 Standard SC	MUPI-3 Standard SC
Supply Voltage bipolar	$\pm 10\text{VDC}$ to $\pm 16\text{VDC}$	$\pm 11\text{VDC}$ to $\pm 16\text{VDC}$
Supply Current	20mA max.	20mA at $\pm 12\text{VDC}$ max.
Output Signal	$\pm 7.0\text{VDC}$ max.	$\pm 7.0\text{VDC}$ max.
Pots for adjustment	Null, +Gain and -Gain	Null, +and -Gain
Connections	Soldering Pins	Soldering Pins
Dimension L/W/H	max. 51 x 39 x 20mm	max. 70 x 50 x 21.5mm
Advantages	Plus and Minus Gain	Plus and Minus Gain
		separately adjustable
		Temperature compensation
	SA40012 SC Module	SSY0079SC Assembly
Supply Voltage unipolar	5VDC to 15VDC	5VDC to 15VDC
Supply Current no(load)	0.5 to 0.9mA at 5 to 15VDC	0.5 to 0.9mA at 5 to 15 VDC
Output Signal	$\pm 1.5\text{VDC}$ at 6VDC supply	$\pm 1.5\text{VDC}$ at 6VDC supply
Pots for adjustment	to be mounted on customer's PCB	mounted on PCB
	NULL, SYMMETRY and GAIN	NULL, SYMMETRY and GAIN
Connections	28Pin (Dual in Line) for PCB	1 Connector 4PIN, 1 Connector 6PIN
Dimensions L/W/H	max. 41.3 x 28.6 x 10.2mm	max. 53.4 x 39.4 x 27.7mm
	max. 1.625 x 1.125 x 0.400 inches	max. 2.100 x 1.550 x 1.09 inches
Advantages	unipolar supply, Null, Symmetry and Gain separately adjustable.	unipolar supply, Null, Symmetry and Gain separately adjustable.
	Temperature Compensation	Temperature Compensation; Low
	Low power consumption	Power consumption/ <i>Optional</i> : Single axis sensor mounted on board.

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更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/>

传感器销售热线：

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电话：0755-83370250 83376489 83376549 83607652 83370251 82500323

传真：0755-83376182 (0) 13902971329 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:szss20@163.com QQ: 195847376

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