



## Product introduction

NBL-W-SDS Sunshine Duration Sensor is used for continuous measurement of sunshine hours. It accumulates time when the radiation voltage value incident on the instrument exceeds a preset threshold (200mV). The accumulation is reset at midnight each day, and the data is automatically recorded by the data collector as sunshine hours. The instrument has no moving parts, consumes low power, and is suitable for long-term outdoor observations.

The core component of the NBL-W-SDS Sunshine Duration Sensor is a high-precision light-sensitive element, offering good stability and high accuracy. Additionally, a quartz glass cover, precisely machined through optical cold processing, is installed over the sensing element to effectively prevent environmental factors from affecting its performance. This product can be widely applied in fields such as meteorology, energy, agriculture, and construction.

## Technical Parameters

### Radiation sensor indicator:

Counting the presence or absence of sunshine per minute and zeroing the zero point every day.

Resolution: 0.1h

Spectral range: 0.3 ~ 3 $\mu$ m

Response time: <5s

Temperature correlation: < $\pm$ 0.08% $^{\circ}$ C

Cosine response: < $\pm$ 10% (at 10 $^{\circ}$  sun altitude

angle)

Non-linearity : < $\pm$ 2%

Annual variation rate: < $\pm$ 2

Transmitter indicators

Measuring range: 0~24h

Power supply mode:

DC 12-24V

Other

Output:

Current: 4~20mA

Voltage: 0~2.5V

Voltage: 0 to 5V

RS485

Other

Instrument cable length:

Standard: 2.5 meters

Others

Load capacity:

Current type:  $R_L \leq 250\Omega$

Voltage type:  $R_L \geq 1K\Omega$

Working Environment:

Temperature -50 $^{\circ}$ C~80

Humidity  $\leq 100\%$ RH

Product weight: sensor 420 g, with transmitter 760 g

Product power consumption: 0.15W

## Calculation formula

Current type (4~20mA)

$T = (I - 4) / 16 * 24$

T: sunshine hours value, unit: hour;

I: output current value, unit: mA, range 0~24h;

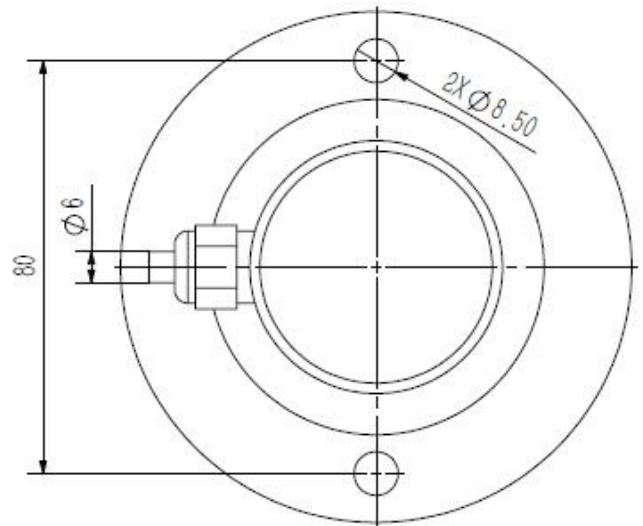
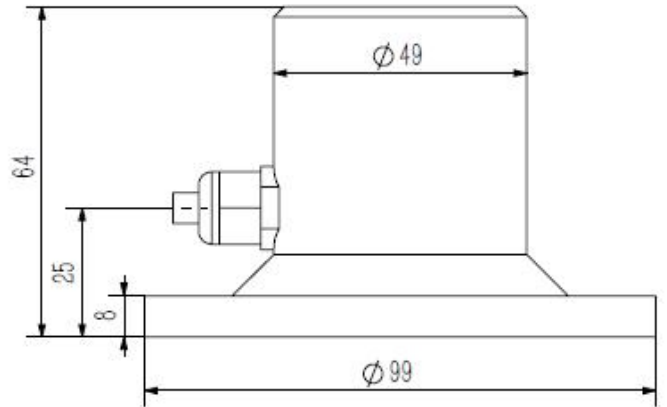
## Connection method

(1) If equipped with the collector produced by our company, directly connect the sensor to the corresponding interface on the collector using the sensor cable.

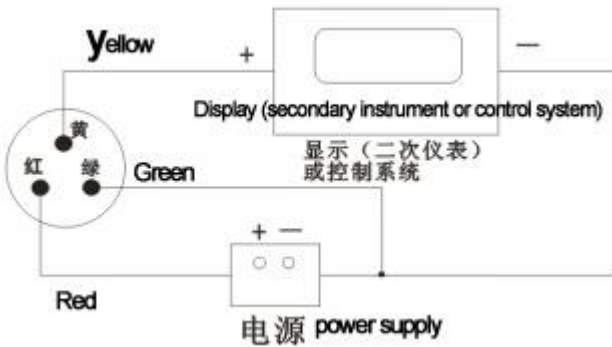
(2) If the transmitter is purchased separately, the corresponding line sequences are:

Line color	Output signal		
	Voltage	Current	RS485 Communications
Red	+	+	+
Black (Green)	-	-	-
Yellow	Voltage signal	Current Signal	A
Blue			B

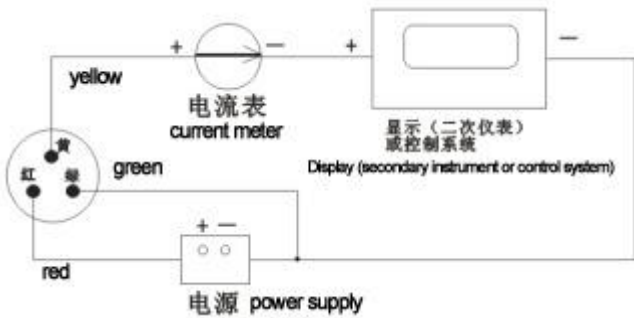
### Structural Dimensions



(3) There are two output wiring methods for transmitter voltage and Current:



(Wiring diagram of voltage output mode)



(Wiring diagram of current output mode)

### MODBUS-RTU Communication protocol

#### I. Serial Port Format

Data bits 8 bits

Stop bit 1 or 2 bits

Check digit None

Baud rate 9600 two communication interval of at least 1000ms or more

Communication Format

[1] Write device address

Send: 00 10 Adress CRC (5 bytes)

Return: 00 10 CRC (4 bytes)

#### Note:

1. The address bit of the read/write address command must be 00.
2. Adress is 1 byte, the range is 0-255.

**Example:**

Send 00 10 01 BD C0  
 Return 00 10 00 7C

**[2] Read device address**

Send: 00 20 CRC (4 bytes)  
 Return: 00 20 Adress CRC (5 bytes)  
 Explanation: Adress is 1 byte, the range is 0-255.  
 Example: Send 00 20 00 68  
 Return: 00 20 01 A9 C0

**[3] Reading real-time data**

Send: Adress 03 00 00 00 01 XX XX

Explanation: As shown in the figure below:

Code	Feature Definition	Remark
Adress	Address	
03	Function code	
00 00	Start Address	
00 01	Reading points	
XX XX	CRC Check code, low front and high back	

Return: Address 03 02 XX XX XX XX

Description:

Code	Feature Definition	Remark
Adress	Address	
03	Function code	
02	Read unit bytes	
XX XX	Data (front high and back low)	Hex
XX XX	CRC check code	

**Example:**

Send: 01 03 00 00 00 01 84 0A

Return: 01 03 02 00 05 78 47

**Note:** 00 05 converted to hexadecimal is 5, after data parsing, with a decimal point need to be divided by ten, the actual value of sunshine hours for 0.5h.

**Steps to calculate the CRC code:**

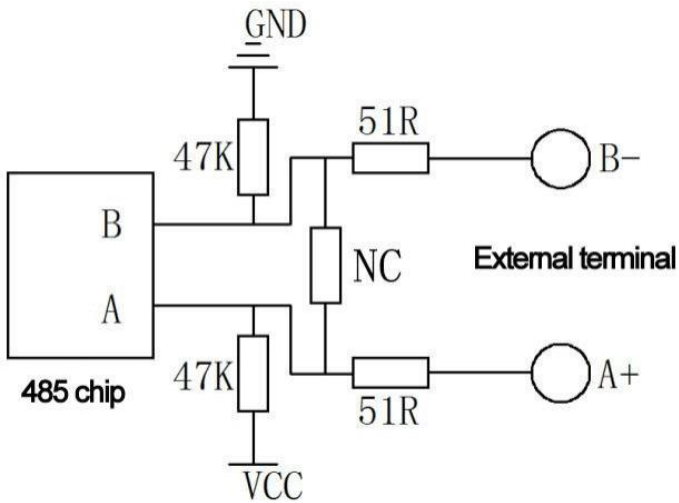
**P.S. Steps to calculate CRC code:**

1. Preset the 16-bit register to hex FFFF (i.e., all 1s). Call this register the CRC register;
- 2, the first 8-bit data with the low bit of the 16-bit CRC register is different or, put the result in the CRC register;
- 3, shift the contents of the register right one bit (towards the low bit), fill the highest bit with 0, and check the shifted out bit after the right shift;
4. If the shifted-out bit is 0: repeat step 3 (right-shift one bit again)

If the shifted out bit is 1: the CRC register is iso-or with the polynomial A001 (1010 0000 0000 0001);

5. Repeat steps 3 and 4 until it is shifted right 8 times so that the entire 8-bit data is all processed;
- 6, Repeat steps 2 through 5 for the next 8-bit data processing;
- 7, the final CRC register obtained is the CRC code;
8. When putting the CRC result into the information frame, the high and low bits will be exchanged, with the low bit coming first.

### RS485 circuit

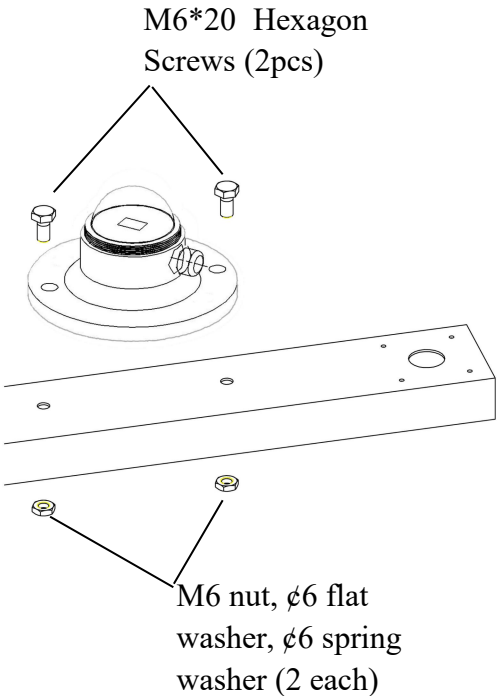


### Precautions

- 1、 Please check whether the package is intact, and check whether the product model number is consistent with the selection;
- 2, do not be wired with electricity, wiring is completed to check for errors before energizing;
- 3, the sensor line length will affect the product output signal, do not change the use of the product has been welded at the factory components or wires, if there is a need to change, please contact the manufacturer;
- 4, the sensor is a precision device, the user in the use of the user should not disassemble, with pointed objects or corrosive liquids in contact with the sensor surface, in order to avoid damage to the product;
- 5、 Please keep the calibration certificate and certificate of conformity, and return with the product when repairing.

### Instruction manual

1. Make sure the mounting bracket is parallel to the ground;
- 2, Use M6 screw nuts to secure the sensor to the mounting bracket through the 2 mounting holes on the sensor as shown in the figure; Avoid disassembling the sensor during installation.



### Troubleshooting

- 1、 Display value is obviously big/small when analog output. Please check whether there is oil and other dirt on the glass cover and wipe it off with a clean rag;
- 2、 Analog output, the display meter indicates that the value is 0 or not within the range. It is possible that the collector cannot get the information correctly due to the wiring problem. Please check whether the wiring is correct and firm;
- 3、 If it is not the above reasons, please contact the manufacturer.

## Selection table

No.	Power supply	output signal	explanation
NBL-W-SDS-			Sunshine Hour Sensor
	5V-		5V Power Supply
	12V-		12V Power Supply
	24V-		24V power supply
		V	0-5V
		V2	0-2.5V
		A1	4-20mA
		W2	RS485
Example: NBL-W-SDS -12V-A1: Sunshine hour sensor 12V power supply, 4-20mA current signal output			

## Contact us

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