

YM1160

Exquisite and High-precision Directional Illuminance Sensor

User Manual



YM1160 using the standard ,easy access to PLC, DCS and other instruments or systems for monitoring illuminance state quantities. The internal use of high-precision sensing core and related devices to ensure high reliability and excellent long-term stability,can be customized RS232,RS485,CAN,4-20mA,DC0~5V\10V,ZIGBEE,Lora,WIFI,GPRS and other output methods.

Technical parameter	Parameter value
Illuminance measuring range	0~65535Lux
Illuminance allow deviation	± 7%
Repeatability test	± 5%
Illuminance detection chip	Import digital
Wavelength range	380nm~730nm
Interface	RS485/4-20mA/DC0-5V
Power	DC12~24V 1A
Running temperature	-30~80℃
Working humidity	5%RH~90%RH

Product Selection

Product DesignRS485,4-20mA,DC0-5VMultiple output methods, the products are divided into the following models depending on the output method.

Product model	output method
YM1160B	RS485 bus
YM1160M	4-20mA
YM1160V5	DC0-5V

Product Size



Note: Manual measurement, please refer to the actual product

Read the data function code 03

All operation commands are hexadecimal data, and the default communication baud rate: 9600,8,N,1

Query frame (hexadecimal), send example: query 1# device 1 data,

The host computer sends the command: 01 03 00 00 00 01 84 0A

CMD	ADD	MOD	SA	LEN	CAPTCHA
CMD	01	03	00 00	00 01	84 0A

Response frame (hexadecimal): 01 03 02 02 18 b9 2E

CMD	ADD	MOD	LEN	DATA	CAPTCHA
CMD	01	03	02	02 18	B9 2E

In the response data of the above example, since the length of the measurement point data accounts for two bytes, for example, the photometric data is 0218. Folded into decimal system, it is: 536, THE RESOLUTION IS 1, AND WHEN THE VALUE IS 536, THE ACTUAL LIGHTING IS: $536 \times 1 = 536 \text{LUX}$.

For 65535 range, the sensor resolution is 1, and the value needs to be divided by 1, that is, the actual value is 536LUX;

For a large range sensor of more than 100,000, its resolution is 10, and it uses 20,000 to express 200,000,

When the value is 536, the actual illumination is $536 \times 10 = 5360 \text{LUX}$;

How to use software?

Use of Software

STATUS QUANTITY DATA REGISTER

ADDR.	REG	TITLE	R/W	NOTE
40001	00 00	ILLUMINANCE REGISTERS	R	0~65535

PARAMETER REGISTERS

ADDR.	REG	TITLE	R/W	NOTE
40101	00 65	TYPE ID	R	0~59999
40102	00 65	POINTS	R	1~20
40103	00 66	ADDRESS	R/W	1~249
40104	00 67	BAUD RATE	R/W	0~6
40105	00 68	MODE	R/W	1. QUERY 2. UPLOAD
40106	00 69	PROTOCOL	R/W	1 MODBUS-RTU
40107	00 6A	INTERVAL	R/W	1~36000
40108	00 6B	VALUE	R/W	SOME PRODUCTS ARE AVAILABLE

In the case of broken wires, wire the wires as shown in the figure. If the product itself has no leads, the core color is for reference.

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Product List

Illuminance sensors can be widely used in laboratory, agricultural greenhouse, warehouse storage, production workshop, indoor lighting and other measurement fields.





Certificate

The number of illuminance sensors is 1
(The actual delivery is subject to the user's selection)

Communication Protocol

The product uses the RS485 MODBUS-RTU standard protocol format, and all operation or reply commands are in hexadecimal data. When the device leaves the factory, the default device address is 1, and the default baud rate is: for modules and non-recording instruments: 9600, 8, n, 1 (for the recorder series products, the default is: 115200, 8, n, 1).

1. Read data (Function code 0x03)

The inquiry frame (in hexadecimal). Example of sending: To query 1 piece of data of device No. 1, the host computer sends the command: 01 03 00 00 00 01 84 0A .

Address	Function code	Starting address	Data length	Checksum
01	03	00 00	00 01	84 0A

For a correct inquiry frame, the device will respond with data: 01 03 02 02 18 B9 2E , and the response format is:

Address	Function code	Length	Data 1	Checksum
01	03	02	02 18	B9 2E

Data description: The data in the command is in hexadecimal. Taking Data 1 as an example, 02 18 converted to decimal value is 536. Assuming the data magnification factor is 100, then the true value is $536/100 = 5.36$, and the others can be deduced by analogy.

2. Common Data Address Table

Configuration Address	Register Address	Register Description	Data Type	Value Range
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40001	00 00	illuminance	Read Only	0~65535
40101	00 64	Model Code	Read-only	0~59999
40102	00 65	Total Number of Measuring Points	Read-only	1~1600
40103	00 66	Device Address	Read/Write	1~249
40104	00 67	Baud Rate	Read/Write	0~6
40105	00 68	Communication Mode	Read/Write	1 Query
40106	00 69	Protocol Type	Read/Write	1 MODBUS-RTU

3. Read and modify the device address

(1) Read or query the device address

If you don't know the current device address and there is only one device on the bus, you can query the device address through the command FA 03 00 66 00 01 71 9E .

Device address	Function code	Starting address	Data length	Checksum
FA	03	00 66	00 01	71 9E

FA, which is 250, is the universal address. When you don't know the address, you can use 250 to obtain the real device address. 00 66 is the register of the device address.

For a correct query command, the device will respond. For example, the response data is: 01 03 02 00 01 79 84. The format analysis is shown in the following table:

Device address	Function code	Starting address	Address ID	Checksum
01	03	02	00 01	79 84

In the response data, the first byte 01 represents the real address of the current device.

(2) Change the device address

For example, if the current device address is 1 and you want to change it to 02, the command is: 01 06 00 66 00 02 E8 14 .

Device address	Function code	Register address	Target address	Checksum
01	06	00 66	00 02	E8 14

After the change is successful, the device will return the information: 02 06 00 66 00 02 E8 27. The format analysis is shown in the following table:

Device address	Function code	Register address	Target address	Checksum
02	06	00 66	00 02	E8 27

In the response data, after the modification is successful, the first byte is the new device address. Generally, after the device address is changed, it takes effect immediately. At this time, users need to modify the query commands in their own software accordingly.

4. Read and modify the baud rate

(1) Read the baud rate

The default factory baud rate of the device is 9600. If you need to change it, you can perform the change operation according to the following table and the corresponding communication protocol. For example, to read the baud rate ID of the current device, the command is: 01 03 00 67 00 01 35 D5 . The format analysis is as follows.

Device address	Function code	Starting address	Data length	Checksum
01	03	00 67	00 01	35 D5

Read the baud rate code of the current device. Baud rate codes: 1 for 2400; 2 for 4800; 3 for 9600; 4

for 19200; 5 for 38400; 6 for 115200.

For a correct query command, the device will respond. For example, the response data is: 01 03 02 00 03 F8 45. The format analysis is shown in the following table:

Device address	Function code	Data length	Baud rate code	Checksum
01	03	02	00 03	F8 45

According to the baud rate code, 03 represents 9600, which means the current baud rate of the device is 9600.

(2) Change the baud rate

For example, to change the baud rate from 9600 to 38400, that is, change the code from 3 to 5, the command is: 01 06 00 67 00 05 F8 16 .

Device address	Function code	Register address	Target baud rate	Checksum
01	06	00 67	00 05	F8 16

Change the baud rate from 9600 to 38400, that is, change the code from 3 to 5. The new baud rate will take effect immediately. At this time, the device will stop responding, and the query command for the device's baud rate needs to be modified accordingly.

5. Read and modify the correction value (valid for some products)

(1) Read the correction value

When there is an error between the data and the reference standard, we can reduce the display error by adjusting the "correction value". The adjustable range of the correction difference is plus or minus 1000, that is, the value range is 0 - 1000 or 64535 - 65535. For example, when the displayed value is 100 less than the actual value, we can correct it by adding 100. The command is: 01 03 00 6B 00 01 F5 D6 . In the command, 100 is the hexadecimal value 0x64. If you need to decrease the value, you can set a negative value. For example, - 100 corresponds to the hexadecimal value FF 9C. The calculation method is 100 - 65535 = 65435, and then convert it to hexadecimal, which is 0x FF 9C. The device correction value starts from 00 6B. We take the first parameter as an example for illustration. When there are multiple parameters, the methods for reading and modifying the correction value are the same.

Device address	Function code	Starting address	Data length	Checksum
01	03	00 6B	00 01	F5 D6

For a correct query command, the device will respond. For example, the response data is: 01 03 02 00 64 B9 AF. The format analysis is shown in the following table:

Device address	Function code	Data length	Correction value	Checksum
01	03	02	00 64	B9 AF

In the response data, the first byte 01 represents the real address of the current device, and 00 6B is the register for the correction value of the first state variable. If the device has multiple parameters, the operation methods for other parameters are the same. Generally, temperature and humidity sensors have this parameter, while light sensors usually do not.

(2) Change the correction value

For example, if the current state variable value is too small and we want to increase its real - value by 1, the command to correct the current value by adding 100 is: 01 06 00 6B 00 64 F9 FD .

Device address	Function code	Register address	Target address	Checksum
01	06	00 6B	00 64	F9 FD

After the operation is successful, the device will return the information: 01 06 00 6B 00 64 F9 FD. After the change is successful, the parameter takes effect immediately.

For example, the range is 0~65535Lux, the analog output is 4~20mA current signal, Illuminance and current The calculation relationship is as shown in the formula: $C = (A2-A1) * (X-B1) / (B2-B1) + A1$, where A2 is Illuminance range upper limit, A1 is the lower limit of the range, B2 is current output range upper limit, B1 is the lower limit, X is the currently read Illuminance value, and C is the calculated current value. The list of commonly used values is as follows:

current(mA)	IlluminanceValue (Lux)	Calculation Process
4	0.0	$(65535-0)*(4-4)\div(20-4)+0$
5	4095.9	$(65535-0)*(5-4)\div(20-4)+0$
6	8191.9	$(65535-0)*(6-4)\div(20-4)+0$
7	12287.8	$(65535-0)*(7-4)\div(20-4)+0$
8	16383.8	$(65535-0)*(8-4)\div(20-4)+0$
9	20479.7	$(65535-0)*(9-4)\div(20-4)+0$
10	24575.6	$(65535-0)*(10-4)\div(20-4)+0$
11	28671.6	$(65535-0)*(11-4)\div(20-4)+0$
12	32767.5	$(65535-0)*(12-4)\div(20-4)+0$
13	36863.4	$(65535-0)*(13-4)\div(20-4)+0$
14	40959.4	$(65535-0)*(14-4)\div(20-4)+0$
15	45055.3	$(65535-0)*(15-4)\div(20-4)+0$
16	49151.3	$(65535-0)*(16-4)\div(20-4)+0$
17	53247.2	$(65535-0)*(17-4)\div(20-4)+0$
18	57343.1	$(65535-0)*(18-4)\div(20-4)+0$
19	61439.1	$(65535-0)*(19-4)\div(20-4)+0$
20	65535.0	$(65535-0)*(20-4)\div(20-4)+0$

As shown in the above formula, when measuring 8mA, current current is 16387.75Lux.

For example, the range is 0~65535Lux, the analog output is 0~5V DC0-5Vvoltage signal, Illuminance and DC0-5Vvoltage The calculation relationship is as shown in the formula: $C = (A2-A1) * (X-B1) / (B2-B1) + A1$, where A2 is Illuminance range upper limit, A1 is the lower limit of the range, B2 is DC0-5Vvoltage output range upper limit, B1 is the lower limit, X is the currently read Illuminance value, and C is the calculated DC0-5Vvoltage value. The list of commonly used values is as follows:

DC0-5Vvoltage(V)	IlluminanceValue (Lux)	Calculation Process
0	0.0	$(65535-0)*(0-0)\div(5-0)+0$
1	13107.0	$(65535-0)*(1-0)\div(5-0)+0$
2	26214.0	$(65535-0)*(2-0)\div(5-0)+0$
3	39321.0	$(65535-0)*(3-0)\div(5-0)+0$
4	52428.0	$(65535-0)*(4-0)\div(5-0)+0$
5	65535.0	$(65535-0)*(5-0)\div(5-0)+0$

As shown in the above formula, when measuring 2.5V, current DC0-5Vvoltage is 32767.5Lux.