KWS-960C Online Turbidity Sensor

Introduction

The KWS-960C online turbidity sensor is designed and manufactured based on the principle of scattered light turbidity measurement. When a beam of light is projected into a water sample, the light is scattered due to the turbidity substances in the water sample. The turbidity in the water sample is calculated by measuring the intensity of the scattered light in the direction perpendicular to the incident light and comparing it with the internal calibration value. The final value is output after linearization processing.

Feature

- 90° angle scattered light principle, built-in temperature sensor
- Support RS-485, Modbus/RTU protocol
- Optical fiber structure, strong resistance to external light interference
- Infrared LED light source with high stability
- IP68 protection, water depth within 20 meters
- Convenient, fast, stable and easy to maintain

Technical Specifications

Model	KWS-960	
Principle	Light scattering method	
Range/Resolution	0～20.00NTU	0.01NTU/0.1℃
	0～200.0NTU	0.01NTU/0.1℃
	0～1000.0NTU	0.1NTU/0.1℃
Precision	±3% or ±1.5NTU(0～20.00NTU) ±3% or ±2NTU(0～200.0NTU) ±5% or ±3NTU(0～1000.0NTU)	
Response Time (T90)	＜60s	
Lowest Detection Limit	0.01 (0-20NTU)	
	0.3NTU	
Calibration Mode	Two-point calibration	
Temperature Compensation	Automatic temperature compensation (Pt1000)	
Output	RS-485(Modbus/RTU)	
Working Conditions	0～50℃，<0.2MPa	
Storage Temperature	-5～65℃	
Installation	Immersion mount with 3/4NPT pipe thread	
Cable Length	5 meters, other lengths can be customized	
Power Consumption	0.2W@12V	
Power Supply	12～24VDC	
Protection Grade	IP68	

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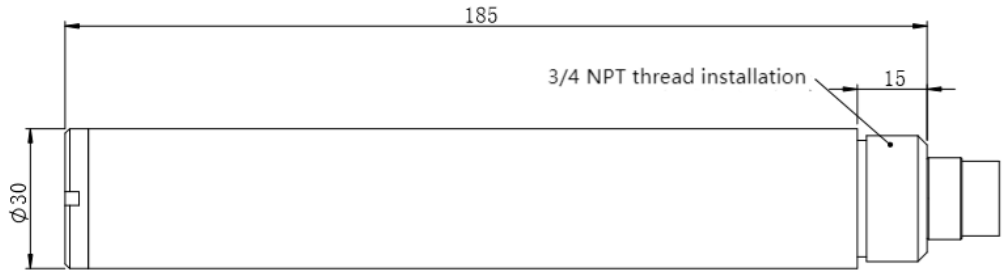
Dimension



Note: The sensor joint is M16-5 core waterproof joint male head

Installation and Electrical Connection

Installation

Installation distance requirements: keep above 5cm with side wall and above 10cm with bottom.

Wiring

a) Red- power (12 ~ 24V)
b) Black- ground (GND)
c) Blue- 485A
d) White- 485B

After wiring completed, it should be carefully checked to avoid incorrect connections before powering up.

Cable specification: Considering that the cable is immersed in water (including sea water) for a long time or exposed to the air, the cable has certain corrosion resistance. The outer diameter of the cable is Φ6 mm and all interfaces are waterproof.

Maintenance

1. Use and maintenance

1.1 Maintenance schedule

The cleanliness of the measuring window is very important for maintaining accurate readings.

Maintenance task	Recommended maintenance frequency
Calibrate sensors (if required by the competent authority)	According to the maintenance schedule required by the competent department

1.2 Maintenance method

- Sensor outer surface: clean the outer surface of the sensor with tap water, if there is still debris residue, wipe with wet soft cloth, for some stubborn dirt, you can add some household washing liquid to tap water to clean.
- Check the cable of the sensor: the cable should not be tightened when it is working properly, otherwise it is easy to break the wire inside the cable and make the sensor unable to work properly.

1.3 Matters need attention

The probe contains sensitive optical and electronic components. Make sure the probe is not subjected to severe mechanical impact. There are no components inside the probe that need to be maintained by the user.

2. Calibration of sensors

- Zero calibration: take proper amount of zero turbidity solution with large beaker, put the sensor vertically in the solution, the front end of the sensor is at least 10 cm from the bottom of the beaker, and the zero calibration will be carried out after the value is stabilized for 3-5 minutes. The instructions refer to the appendix.
- Slope calibration: the sensor probe is placed in the standard solution, the front end of the sensor is at least 10 cm from the bottom of the beaker, and the slope calibration is carried out after 3-5 minutes of numerical stability. The instructions refer to the appendix.

3. Frequently asked questions

Wrong	Probable cause	Resolvent
The operating interface cannot connect or does not display the measurement results	The measured value is too high, too low, or the numerical value remains unstable.	Reconnect the controller and cable
	Cable failure	Please contact us.
The measured value is too high, too low, or the numerical value remains unstable.	The sensor window is attached to the external object	Clean the window surface of the sensor

Quality and Service

Quality assurance

- The quality inspection department has standardized inspection procedures, equipped with advanced and complete testing equipment and methods, and strictly inspects according to the procedures, conducts 72-hour aging tests and stability tests on products, and does not allow any unqualified products to leave the factory.

- The receiving party directly returns the product batch with a failure rate of 2%, and all the costs incurred are borne by the supplier. The reference standard refers to the product description provided by the supplier.

- Guarantee the quantity of goods and the speed of shipment.

Service commitment

The company provides local after-sales service within one year from the date of sale, but does not include damage caused by improper use. If repair or adjustment is required, please return it, but the shipping cost must be conceited. Damaged on the way, the company will repair the damage of the instrument for free.

Appendix data communication

1. Data Format

The default data format for Modbus communication is: 9600, n, 8, 1 (baud rate 9600bps, 1 start bit, 8 data bits, no parity, 1 stop bit).

2. Information Frame Format (xx for one byte).

a) Read data instruction frame

07	03	xx xx	xx xx	xx xx
address	FC	Register start address	Number of registers	CRC check code (low bytes in front)

b) Read data response frame

07	03	xx	xx …xx	xx xx
address	FC	Bytes	Response data	CRC check code (low bytes in front)

c) Write data instruction frame

07	06	xx xx	xx xx	xx xx
address	FC	Register address	read-in data	CRC check code (low bytes in front)

d) Write data response frame (co-write data instruction frame)

07	06	xx xx	xx xx	xx xx
address	FC	Register address	read-in data	CRC check code (low bytes before）

3. Register address

Register address	Designation	Explain	Number of registers	Access mode
40001 (0x0000)	Measured value + temperature	4 double-byte integers, namely, the measured value, the number of decimal places of the measured value, the temperature value, and the number of decimal places of the temperature value.	4 (8 bytes)	Read
44097 (0x1000)	Zero calibration	The 0-20NTU range is calibrated in 0-10NTU turbidity solution, and the written data is the actual value of the standard solution × 100; the 0-100NTU range is calibrated in 0-20NTU turbidity solution, and the written data is the actual value of	1(2 bytes)	Write/ Read

		the standard solution × 10; the 0-1000NTU range is calibrated in 0-200NTU turbidity solution, and the written data is the actual value of the standard solution × 10; the read data is the zero point offset.		
44101 (0x1004)	Slope calibration	The 0-20NTU range is calibrated in 10-20NTU turbidity solution, and the written data is the actual value of the standard solution × 100; the 0-100NTU range is calibrated in 20-100NTU turbidity solution, and the written data is the actual value of the standard solution × 10; the 0-1000NTU range is calibrated in 200-1000NTU turbidity solution, and the written data is the actual value of the standard solution × 10; the read data is the slope value × 1000.	1 (2 bytes)	Write/ Read
44113 (0x1010)	Temperature correction	When calibrated in solution, the written data is the actual temperature value × 10; the read data is the temperature calibration offset × 10.	1(2 bytes)	Write/ Read
48195 (0x2002)	Sensor address	The default is 7, and the write data range is 1-255.	1(2 bytes)	Write/ Read
48196 (0x2003)	Baud rate	Default is 9600. 0-9600, 1-19200.	1 (2 bytes)	Write/ Read
48225 (0x2020)	Reset sensor	The calibration value is restored to the default value, and the written data is 0. Note that the sensor needs to be calibrated again after being reset before it can be used.	1 (2 bytes)	Write

4. Command example

a) Start measurement instructions

Function: Obtain the turbidity value and temperature of the measuring probe; the unit of temperature is Celsius, and the unit of turbidity is NTU.

Request frame: 07 03 00 00 00 04 44 6F

Response frame: 07 03 08 01 02 00 01 00 B0 00 01 94 B4

Example of reading:

Turbidity value	Temperature scale
01 02 00 01	00 B0 00 01

For example: turbidity value 01 02 means hexadecimal reading turbidity value, 00 01 means turbidity value with 1 decimal point, converted to decimal value 25.8.

The temperature value 00 B0 represents the hexadecimal reading temperature value, and 00 01 represents the temperature value with a decimal point converted to a decimal value of 17.6.

b) Calibration instructions

Zero calibration

Function: Set the zero calibration value of the turbidity of the sensor; here the zero calibration is performed in zero turbidity water;

Request frame: 07 06 10 00 00 00 8C 6E

Response frame: 07 06 10 00 00 00 8C 6E

Slope calibration

Function: Set the slope calibration value of the sensor turbidity.

For sensor with a range of 0 to 1000 NTU and 0 to 100 NTU, the slope calibration example is as follows (calibrated in 1000 NTU standard solution, the written value is 1000x10, i.e. 0x2710):

Request frame: 07 06 10 04 27 10 D6 91

Response frame: 07 06 10 04 27 10 D6 91

For sensor with a range of 0 to 20 NTU, the slope calibration example is as follows (calibrated in 20 NTU standard solution, the written value is 20x100, i.e. 0x07D0):

Request frame: 07 06 10 04 07 D0 CF 01

Response frame: 07 06 10 04 07 D0 CF 01

c) Set the device ID address:

Role: set the MODBUS device address of the electrode;

Change the device address 06 to 01. The example is as follows

Request frame: 07 06 20 02 00 01 E2 6C

Response frame: 07 06 20 02 00 01 E3 6C

5. Error response

If the sensor does not execute the upper computer command correctly, the following format information is returned:

definition	address	FC	CODE	CRC check
data	ADDR	COM+80H	xx	CRC 16
Bytes	1	1	1	2

a) CODE：01 – Functional code error
03 – Data error

b) COM：Received function code