

KWS-910 Online TSS Sensor

Introduction

Kacise KWS-910 self-cleaning suspended solids (sludge concentration) sensor is based on the principle of scattering method. It uses near-infrared LED light source and our unique adaptive software algorithm to effectively remove interference from external light. The sapphire light guide structure has excellent repeatability and stability. The sensor does not require reagents, is pollution-free, and is more economical and environmentally friendly; it is equipped with an automatic cleaning brush to eliminate bubbles and reduce the impact of contamination on measurement, making the maintenance cycle longer and maintaining excellent stability for long-term online use.



Feature

- Digital sensor, RS-485 output, support MODBUS
- With automatic cleaning brush to prevent contamination and eliminate air bubbles
- Compensate the color of the water to eliminate the interference of color on the measurement
- Fiber-optic structure, not affected by ambient light

Technical Specifications

Item	Self-cleaning Sludge Concentration Sensor
Principle	Infrared scattering method
Measuring Range	0.5-4000 mg/L (0-15000mg/L optional)
Accuracy	± 5%
Resolution	0.1mg/L
Protection Rate	IP68
Max. Pressure	3 bar
Temperature Range	0 ~ 50℃
Output	support RS-485, MODBUS protocol
Power Consumption	0.2W (not wiping), 0.6W (wiping) DC 9~24V, >500mA
Installation	NPT3/4, Input type
Size	Φ 36mm*198.2mm
Self-Cleaning System	Yes
Casing Material	Titanium
Calibration	1 point or 2 points

Wiring

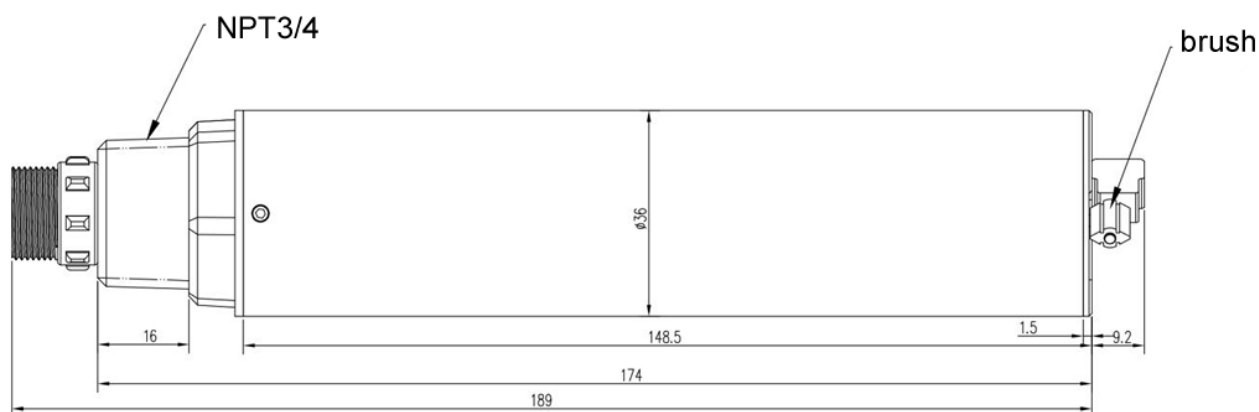
Red—Power (VCC)

White—485B

Green—485A

Black—Ground (GND)

Dimension



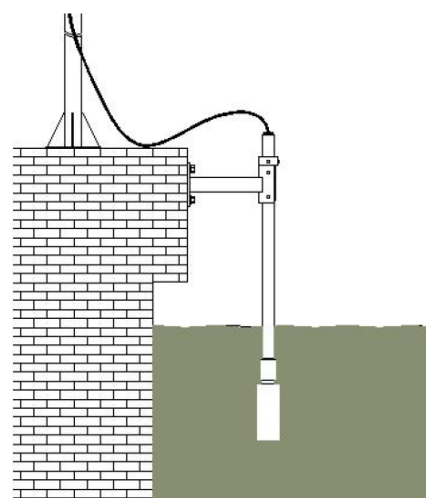
Installation

Wiring and power supply

1. Do not use the sensor cable to pull the sensor! It is required to install sensor in a secure and stable mounting bracket.
2. The female and male connector of sensor cable should be screwed tightly to avoid moisture incursion.
3. Make sure power supply voltage is correct before power on.

Sensor installation

1. It is recommended to install the sensor vertically with electrodes facing down.
2. In consideration of the fluctuation of water level, install the sensor below water level of 30cm, and try to install it in the position where there are no bubbles in the water.
3. Considering the basic principles of optics, please keep the end of the light window no less than 10cm from the bottom of the container/related device.
4. It is recommended to install the sensor in a location without bubbles in the water, as far away from the aeration port as possible.



Calibration

Calibration Solution Preparation

- (1) Diatomite, median particle size 36.8 μm (CAS: 68855-54-9)
- (2) Weigh 4 g of diatomite, dissolve in deionized water, and dilute to a final volume of 1 L to obtain a sludge standard solution with a concentration of 4000 mg/L.
- (3) Dilute the solution from step (1) to the desired concentration. For example: Take 500 mL of the 4000 mg/L sludge standard solution, dissolve in deionized water, and dilute to 1 L to obtain a 2000 mg/L sludge standard solution.

Calibration Precautions

- (1) As diatomite is insoluble in water, the standard solution must be continuously stirred with a magnetic stirrer during use to maintain a uniform suspension.
- (2) To minimize interference from sedimentation, it is recommended that the probe be placed horizontally, with the measurement window facing vertically downward into the standard solution during calibration. Therefore, a wide-mouth container (inner diameter > 30 cm) is recommended, and the volume of the standard solution should preferably exceed 5 L (a 1 L light-proof bottle can be used for testing purposes).
- (3) All testing instruments should be thoroughly cleaned and wiped dry before use to avoid contaminating the standard solution.
- (4) The standard solution should be freshly prepared and used immediately.

Communication Protocols

The RS485 communication protocol uses MODBUS communication protocol, and the sensors are used as slaves.

Baud rate	9600
Starting position	1
Data bits	8
Stop bit	1
Check digit	N

Read and write data (standard MODBUS protocol).

The default address is 0x01, the address can be modified by register

Reading data

Host call (hexadecimal)

01 03 00 00 00 01 84 0A

Code	Function Definition	Remarks
01	Device Address	
03	Function Code	
00 00	Start Address	See register table for
00 01	Number of registers	Length of registers (2 bytes)
84 0A	CRC checksum, front low and back high	

Slave answer (hexadecimal)

01 03 02 00 xx xx xx xx

Code	Function Definition	Remarks
01	Device Address	
03	Function Code	
02	Number of bytes read	
XX XX	Data (front low and back high DCBA)	See register table for details
XX XX	CRC checksum, front low and back high	

Writing data

Host call (hexadecimal)

01 10 1B 00 00 01 02 01 00 0C C1

Code	Function Definition	Remarks
01	Device Address	
10	Function Code	
1B 00	Register Address	See register table for details
00 01	Number of registers	Number of read registers
02	Number of bytes	Number of read registersx2
01 00	Data (front low and back high DCBA)	
0C C1	CRC checksum, front low and back high	

Slave answer (hexadecimal)

01 10 1B 00 00 01 07 2D

Code	Function Definition	Remarks
01	Device Address	
10	Function Code	
1B 00	Register Address	See register table for details
00 01	Returns the number of	
7D 2D	CRC checksum	

Calculating CRC Checksum

- (1) Preset one 16-bit register as hexadecimal FFFF (i.e., all 1s) and call this register the CRC register.
- (2) Iso-oring the first 8-bit binary data (both the first byte of the communication information frame) with the lower 8 bits of the 16-bit CRC register and placing the result in the CRC register, leaving the upper 8 bits of data unchanged.
- (3) Shift the contents of the CRC register one bit to the right (toward the low side) to fill the highest bit with a 0, and check the shifted-out bit after the right shift.
- (4) If the shifted out bit is 0: repeat step 3 (shift right one bit again); if the shifted out bit is 1, CRC register and polynomial A001 (1010 0000 0000 0001) for the iso-or.
- (5) Repeat steps 3 and 4 until the right shift is made 8 times so that the entire 8-bit data is processed in its entirety.
- (6) Repeat steps 2 through 5 for the next byte of the communication information frame.
- (7) Exchange the high and low bytes of the 16-bit CRC register obtained after all bytes of this communication information frame have been calculated according to the above steps.
- (8) The final CRC register content is obtained as follows: CRC code.

Register Table

Start address	Command Description	Number of registers	Data format (hexadecimal)
0x1100H	User calibration K/B (read/write)	4	Total 8 bytes 00~03: K 04~07: B To read K for example, read out as 4 bytes of data (low bit in front, DCBA format, need to convert this data to floating point, see below for conversion method) To write k, for example, we need to convert k to 32-bit floating point and write it in (DCBA format)
0x1B00H	Brush power-on startup settings	1	2 bytes in total 00~01: 0x0000 does not start on power 0x0100 Power on and self-start
0x2600H	Temperature value/TSS value acquisition	4	8 bytes in total 00~03: Temperature value 04~07: TSS value The reading temperature value/water TSS value is 4 bytes of data. (The low position is in the front, DCBA format, and this data needs to be converted to a change floating point number.)
0x3000H	Device address (read and write)	1	2 bytes in total 00~01: Device address The range can be set from 1~254 For example, the data obtained is 02 00 (If the low position is in the front, it means that the address is 2) Take address 15 as an example, then 0F 00 Write the corresponding address (low in front) When the current device address is unknown, you can use FF as a common device address to ask for the current
0x3100H	Brush startup (write only)	0	Send a write command with a write length of 0
0x3200H	Brush repeated start time setting (read and write)	1	2 bytes in total 00~01: Time Take the reading value 1E 00 (default) as an example, the actual value is 0x001E, that is, 30 minutes. For example, if you need to write for 60 minutes, convert it to 3C 00 for writing.