
using the instrument

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1、Product Description

YTS-61 oil property sensor uses the world's advanced piezoelectric resonant MEMS components, through the integrated high-precision signal sampling and processing unit, combined with advanced algorithms, can automatically detect the moisture, density, viscosity, dielectric constant, water activity and temperature. At the same time, 20 ° C density, kinematic viscosity, viscosity index; 40 ° C viscosity, 100 ° C viscosity and other indicators can also be achieved through a powerful internal calculation program.

2、Specifications

1. Measurement index accuracy: See <七. Test items and accuracy> for details.
2. Response time: less than 30 seconds (first time), data refreshed once per second.
3. Signal output:
Digital signal – RS485 MODBUS RTU. (RS232 optional);
Analog signal – 4~20 mA, resistive load <500Ω. (optional)
4. Alarm node: 2 channels 250VAC/3A or 30VDC/3A (optional DDU350).
5. Supply voltage: DC 9V–32V@RS485, DC20V–32V@4–20mA.
6. Machine power consumption: < 20mA@24Vdc RS485.
7. Probe withstand voltage: max 10bar.
8. Flow rate: ≤ 0.3 m/s.
9. Working temperature: - 40°C~ 85°C.
10. Flow liquid temperature: - 40°C~ 120°C.



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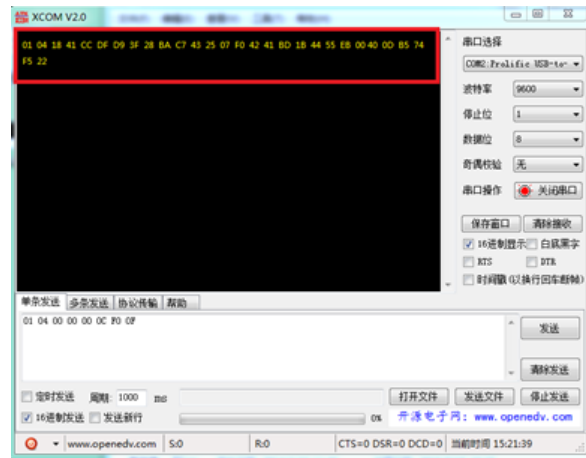
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42 41 BD 1B 44 55 EB 00 40 0D B5 74 F5 22 (As shown below) .



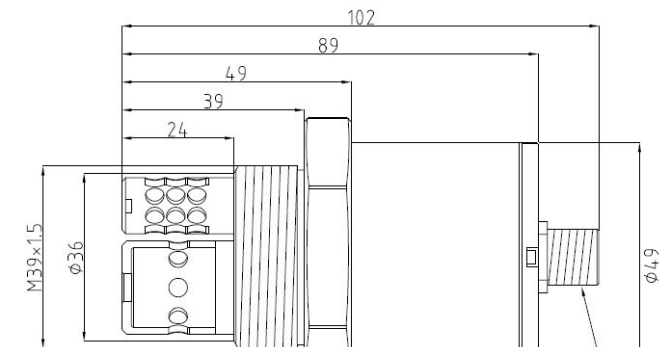
Then analyze the data:

Transfer these received 16 band data transfer to Float Inverse.

Parameter	Hexadecimal	Decimal (Floating point number)	Unit
Temperature	41 CC DF D9	25.6093	°C
Water activity	3F 28 BA C7	0.6591	aw
Moisture	43 25 07 F0	165.0310	ppm
Dynamic viscosity	42 41 BD 1B	48.3878	mPa · s
Density	44 55 EB 00	855.6719	kg/m ³
Dielectric constant	40 0D B5 74	2.2142	

- Shell material: 316/304 stainless steel Hastelloy.
- Structure size: $\phi 49 \times 102$ mm.
- Mechanical interface: G 1-1/2" .
- Weight: 550g.
- IP Rating: IP65.
- Connecting cable: 2 meters, M12, 8 pin (customizable).
- Meet the standards: CE certification, ASTM1657, ASTM1657, EN61326 - 1 、EN61326 - 2 - 3, ICES - 003 B.

3、Product Structure



Unit: mm

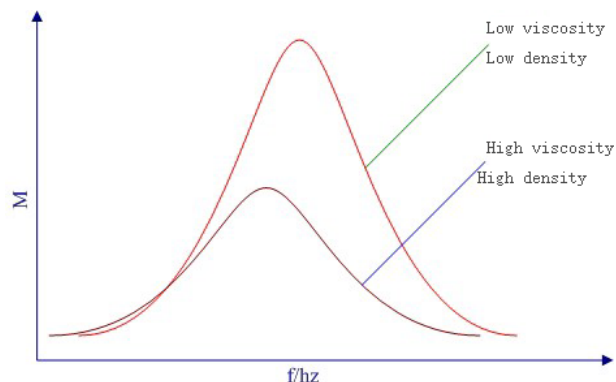
4、Features

- Imported probes, accurate measurement of viscosity, density and temperature up to eight parameters output online monitoring sensor;
- Fast response, the data refresh frequency every second;
- The outer casing is made of stainless steel and has excellent

chemical and pressure resistance. The measurement is not affected by external vibration and is suitable for on-line monitoring of robustness requirements;

4. No moving parts, no consumable parts, effective service life up to more than 10 years;
5. Compact structure, easy system integration, on-site calibration of integrated modules;
6. CE, ASTM1657 and other certification and testing standards.

5、Measuring principle



YTS-61 adopts piezoelectric resonance mode, and controls the vibrator components to work in the resonance state to obtain relevant parameters.

Its vibration period T is related to the liquid density:

$$\rho = K_0 + K_1 \cdot T + K_2 \cdot T^2 \quad (K_0 \ K_1 \ K_2 \text{ is the instrument calibration parameters})$$

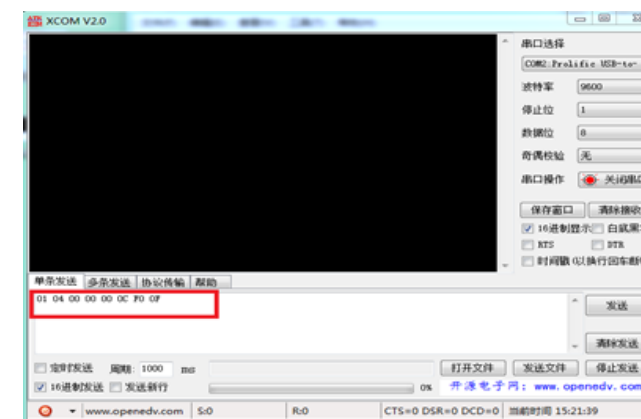
Its vibration quality factor Q is related to viscosity

$$\eta = C_0 + C_1 \cdot Q + C_2 \cdot Q^2 \quad (C_0 \ C_1 \ C_2 \text{ is the instrument calibration parameters})$$

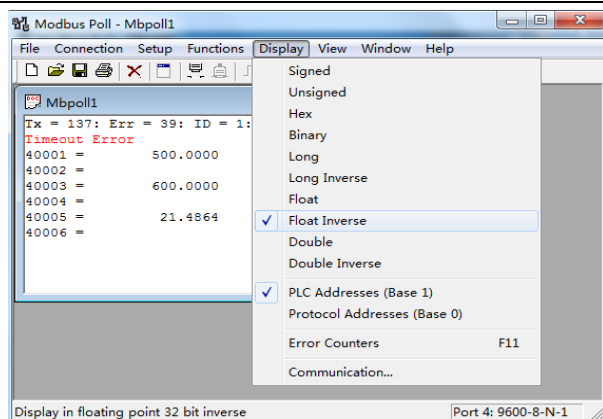
Output parameter	Send Command							
	address	Function code	Data address high byte	Data address lower byte	Data quantity high byte	Data quantity low byte	CRC Verifying high bytes	CRC16 Verifying low bytes
Viscosity、Density、Temperature	01	04	00	00	00	0C	F0	0F

In the serial assistant tool, both “send and receive” are set to hexadecimal.

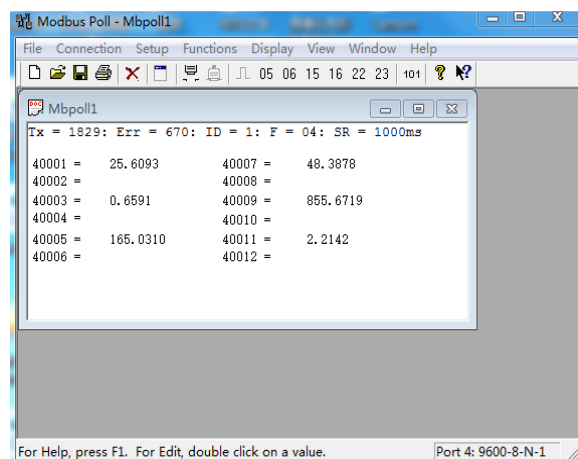
Example: Use serial port assistant send to the sensor: 01 04 00 00 00 0C F0 0F.



Receive the signal 01 04 18 41 CC DF D9 3F 28 BA C7 43 25 07 F0



(7) Normal communication interface as following picture. The graph shows a temperature of 25.61 ° C, a moisture of 0.659aw, a moisture content of 165.03 ppm, a viscosity of 48.38 mPa · s, a density of 855.67 kg/m³ and a dielectric constant of 2.21.



9.4 Serial Port assistant communication test

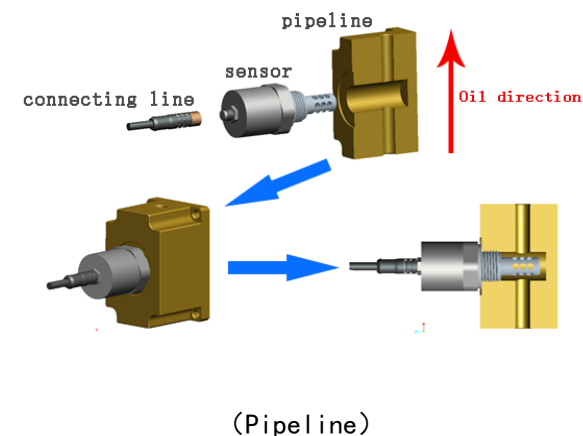
Users can use serial port assistant to do communication test, the related test command as following

parameters)

Kinematic viscosity can also be converted according to the following formula:

$\mu = \eta / \rho$ (μ -Kinematic viscosity mm²/s=cst, η -Dynamic viscosity mPa · s=mPa · s, ρ - Density g · cm³)

6、Installation method



Installation steps (pictured above):

Step1: Insert the connecting wire into the terminal of the sensor, turn the threaded part of the connecting wire and tighten it;

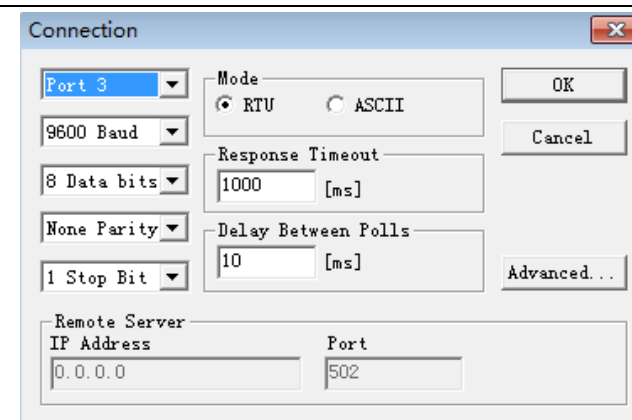
Step2: Connect the sensor to the pipe, and the connection method is thread rotation. ·

Note: Ensure that the oil path is from bottom to top during installation.

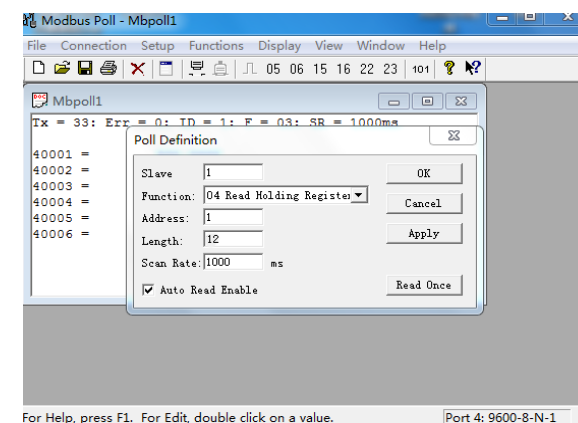
7、Test items and accuracy

Measurement Indicators	Moisture(ppm), Density(kg · m ⁻³), Dynamic Viscosity(cP), Dielectric Constant, Water Activity(AW), Temperature(°C)
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Optional indicator	Kinematic viscosity, 40°C viscosity, 100°C viscosity, viscosity index, 20°C density
Measurement Range	Density: 0.6 g.cm ³ ~1.25 g.cm ³ or 600 kg. m ³ ~1250 kg. m ³
	Viscosity:1~400mPa · s (500mm ² /s)
	Dielectric Constant: 1~6
	Water Contant: 0~30000ppm(Calibration according to different oils)
	Water Activity: 0~1aw
	Temperature: - 40°C~120°C
Measurement Accuracy (typical @25°C)	Density: 2% or 5kg.m ³
	Viscosity: 5%or 1mPa · s (Take a big value)
	Dielectric Constant: 5%
	Water Contant: 10% or 10ppm (Take a big value)
	Water Activity: 3%
	Temperature:0.3°C
Resolution	Density: 0.0001g. cm ³ or 0.1 kg. m ³
	Viscosity: 0.1mPa · s
	Dielectric Constant: 0.01
	Water Contant: 1ppm
	Water Activity: 0.001
	Temperature: 0.1°C



(4) Click “OK” , then click “Setup” in the menu. Choosing “Poll Definition” in the drop down list. It will show following dialog box, please setup the parameter as following:

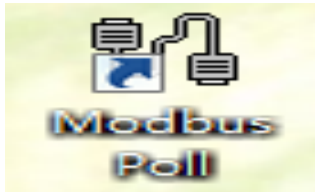


(5) Click “OK” to finish setting.

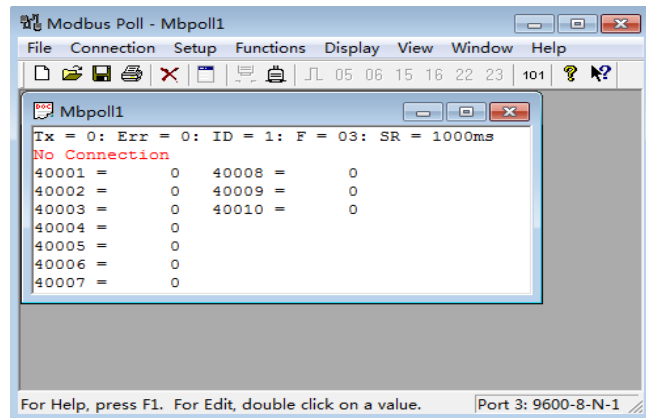
(6) To change the data display type , click “Display” and setup to “ Float Inverse”

Modbus Poll software communication setting process:

(1) Install Modbus Poll software and RS485 device driver to PC.



(2) Open Modbus Poll software, the interface as follow:



(3) Click "Connect" in the menu, set up the parameter as following. Port number is determined by the port actually used by the user.

8、Precautions for use

1. When moving the sensor, hold the back cover and do not touch the sensor element at the top of the probe to avoid damage to the sensor probe.
2. The installation must be mechanically fixed to prevent loosening, stretching, vibration, etc.
3. Choose a place where there are no air bubbles, no fluid dead spots, and no eddy currents.
4. The probe must be completely immersed in the liquid during the measurement to ensure optimum repeatability.
5. Try to keep the liquid flow rate gentle, avoid water hammer impact, and install a surge suppressor if necessary.
6. The liquid at the probe site should be kept flowing while preventing the fluid from sticking to the probe.
7. The probe should be installed in the center of the fluid as much as possible, and the flow rate of the measured liquid should be kept as constant as possible to prevent material from being deposited and coked on the probe. In some special cases, the probe needs to be cleaned regularly.
8. The position where the probe is installed cannot be strong electromagnetic field, so as to avoid affecting the measurement accuracy.
9. Connect the existing cable to ensure that the working power supply DC24V (100mA max) is normal.
10. 4-20mA resistive load is recommended to use high precision, low

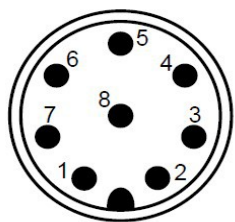
temperature drift 250 Ω or 500 Ω resistor.

11. Do not exceed the system specified range, especially the specified temperature and pressure.
12. It is forbidden to apply in hazardous situations that are flammable or explosive or require explosion protection.

9、Communication Protocol

9.1 Cable Connection

YTS61 oil property sensor adopts RS485 Serial port, please refer to following direction of communication cable electrical connection.



Interface definition:

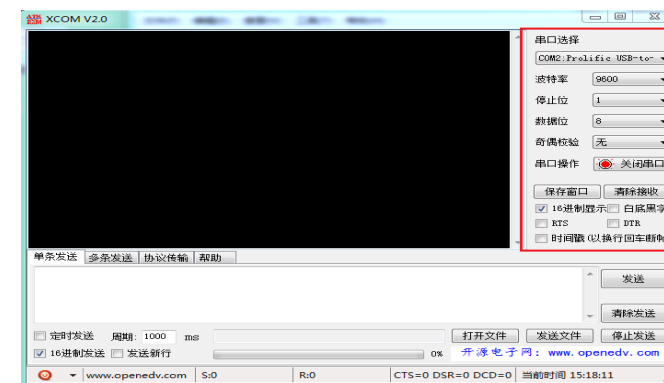
- 1 \longrightarrow RS485+/A
- 3 \longrightarrow RS485-/B
- 5 \longrightarrow GND
- 8 \longrightarrow +24V DC

9.2 Serial port setting

YTS61 oil property sensor works under Modbus RTU communication type default setting as following:

Specification	Property
Address	1
Baud rate	9600
Data Bit	8
Stop bit	1
Check bit	None

As shown below:



9.3 Modbus Poll communication testing

Users can communicate with sensors via Modbus Poll software. The sensor can output six parameters of temperature, water activity, moisture, viscosity, density and dielectric constant. The data length of the parameters is two words, and its register settings are as follows:

Start	End	Length(digital)	Parameter
1	2	2	temperature
3	4	2	Water activity
5	6	2	Moisture
7	8	2	Viscosity
9	10	2	Density
11	12	2	Dielectric constant