KH.WQX Bubble Pressure Water Level Meter Product Introduction

Shenzhen KEHAO Information Technology Co., LTD

I Product Overview

i Summary

KH.WQX bubble pressure water level meter is a high-precision water level sensor independently researched, developed and produced by KEHAO. It adopts micro-piston pump as blowing and pressure-inducing device, which converts the hydrostatic pressure at the underwater measuring point into the pressure value of gas and leads it above the water surface through the measuring tube, and then senses and processes it with the pressure sensor, so as to realize the measurement of water level. Since the pressure sensor measures the pressure of compressed air without contacting the measured liquid, the long-term stability is extremely high.

KH.WQX bubble pressure water level meter with high accuracy, high reliability, high intelligence, free of gas cylinders, free of logging, maintenance-free, vibration resistance, long service life, especially suitable for flowing water, large, medium and small rivers, reservoirs, or water pollution and corrosive industrial wastewater and other water bodies, such as serious pollution and corrosive industrial wastewater and other occasions inconvenient to build logging wells or build wells are expensive, such as: water conservancy and hydrology, upstream and downstream of dams, the ocean, groundwater levels, petroleum,

Chemical industry, sewage treatment plants, urban drainage pumping stations and other monitoring.

ii Functional Features

- Non-contact measurement, high precision, good stability, easy maintenance;
- Easy to install, no need to build a logging well, and unaffected by floating objects on the water surface;
- With zero auto-calibration function, zero drift error can be completely eliminated;
- The influence of liquid specific gravity by temperature change can be effectively compensated by an external temperature sensor;
- With analog output and digital communication interface for user convenience;
- Wide voltage design with reverse connection protection, over-voltage and over-current protection and lightning surge absorption;
- Equipped with LCD display and input keyboard, visualizing the instant water level, flexible operation;
- The automatic cleaning function ensures that the air guide tube is free of obstruction;
- Cyclic storage of 10,000 measurement records;
- Adopting Modbus communication protocol, it is convenient to

interface with various data collection devices.

iii Technical Parameters

Supply voltage: 10～ 30VDC.

Standby current: ≤3.5mA

Average current: ≤10mA (measurement interval 1 minute, RS485 or SDI-12 output)

Range: 20m/30m/40m/50m/60m optional

Resolution: 1mm

Measurement accuracy: ±0.03% F.S.

Long-term stability: ≤±0.1% F.S. per year

Maximum water level change rate: 1m/min

Measurement interval: 1 minute to 24 hours can be set, default 5 minutes

Communication interface: RS 485 or SDI-12

Analog output: 4～ 20mA

Measuring tube specification: Inner φ3/outer φ8

Temperature sensor: NTC 103 (optional)

Measuring medium: water (rivers, streams, lakes, groundwater, etc.), special liquids can be customized

Operating temperature: -20～ 80℃

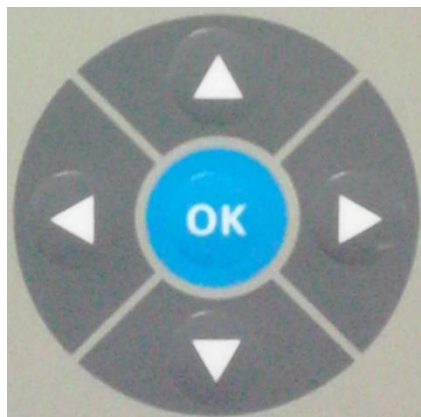Storage temperature: -40～ 80℃

Ambient humidity: less than 95%

II Features

i.Exterior Condition

a Keypads

b Keypad Interface

ii Key Function

● **OK** button: Setting function buttons

Default display state:

    Short press - display historical data

    Long press - parameter setting menu selection (long press time needs more than 3s)

Parameter menu selection and parameter setting status:

    Short press - to enter the corresponding setting items, confirm the validity of the input data, and return to the unset state.

●▲Key: Up Selection Key

Historical data is displayed in the state:

    Short press - page up to show earlier historical data

Parameter menu selection state:

    Short press - to select a menu item upwards

parameter selection state:

    Short press - to select an option upwards

parameter input state:

    Short press - increase value by 1

●▼Key: Down selection key

Historical data is displayed in the state:

    Short press - page down to display the most recent

historical data

Parameter menu selection state:

    Short press - to select a menu item downwards

parameter selection state:

    Short press - to select an option down

parameter input state:

    Short press - the value decreases by 1

●◄Key: Left button

In the operating parameter display state:

    Short press - return to default display state

parameter input state:

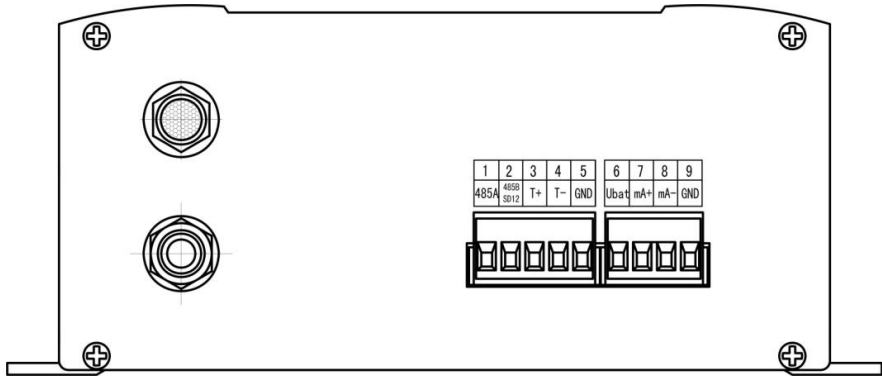   Short press - move one place to the left

●►Key: Right button

Default display state:

    Short press - display working parameters

parameter input state:

    Short press - move one place to the right

iii Terminal Block Description

485A -- RS485 A terminal, connects to RS485 A of the RTU.

485B/SD12 -- RS485 B terminal, connect to RS485 B on RTU, or SD12 port on other data collectors.

T+   -- Temperature sensor signal input, connected to the positive terminal of the temperature sensor.

T -   - temperature sensor signal input, connected to the negative pole of the temperature sensor.

Ubat - connects to the positive terminal of the 12V external power supply or battery.

mA+ --4~ 20mA analog positive to 12V external power supply or battery positive.

mA - - 4~ 20mA analog negative to RTU 4~ 20mA input port.

GND - connects to the negative, reference ground of the 12V external power supply or battery.

III Parameterization

> ➢ Description: Enter the "Parameter Setting" interface as follows:

> ➢ On the KH.WQX-1 panel, press any key to light the LCD lamp.

> ➢ Press and hold the "OK" button to enter the password input interface.

> ➢ Enter the password, the default is "111111", press "OK" to enter the "Parameter Setting" interface.

> ➢ Press "▲ ", "▼ " key, select "address, work interval" and other options that need to be set, press "OK" key. Press "OK" to enter the modification state.

> ➢ Press "◄ ", " ► " to select the number of digits, press "▲ ", "▼ " key to modify the value, press the Press "OK" to exit the modification state.

> ➢ After parameter modification, press "▼ " to turn the page, select "Save", and press "OK" for success to take effect.

> ➢ Press "▼ " to turn the page, select "Exit", press "OK" to exit, the water level meter enters the measurement mode.

i Range (of scales or measuring equipment)

- ➤ The factory water level meter range is a fixed value, the user can only view, not modify.

a Address

- ➤ This address is the RS485 address in the range 000～255.
- ➤ Factory default address: 01.

b Working Interval

- ➤ The operating interval is the time interval between each water level collection.
- ➤ Optional values are: 1min, 2min, 5min, 10min, 15min, 30min, 60min.
- ➤ The factory setting is set to: 1min.

c Baud

- ➤ Selectable baud rates are: 300bps, 600bps, 1200bps, 2400bps, 9600bps, 19200bps.
- ➤ The factory set baud rate is: 9600bps.

d Bathymetry

- ➤ The range is: 00.000 to 99.000m.
- ➤ Factory setting: 0.000m.

e Base Elevation

> The range is: 0000.000 to 9999.000m.

> Factory setting: 0.000m.

f 4mA Base Value

> This parameter is for factory debugging and cannot be modified by the user.

g 20mA base value

> This parameter is for factory debugging and cannot be modified by the user.

h Accelerations

> The acceleration range is: 9.700 to 9.900.

> The factory setting is: 9.788 (the value of gravity acceleration corresponding to the dimension of Shenzhen city).

i Temperature of Water

> The water temperature range is: 0.0 to 50.0℃.

> Factory setting: 25.0°C.

> When a temperature sensor is connected externally, the LCD screen automatically displays the actual measured value.

j Water Temperature Compensation

> - Automatic water temperature compensation switch.
> - When set to On and connected to a temperature sensor, compensation is automatic.
> - When set to On, compensates with manually entered water temperature.

k Calibration Value

> - This parameter is for factory debugging and cannot be modified by the user.

l Number of Rings

> - This parameter sets the minimum number of motor pumping turns.
> - Minimum number of pumping rings setting range: 1~3.

m External command

> - Whether to accept user extended command switch
> - If set to On, the water level meter can accept external extended commands from the user (see Appendix A)
> - If set to Off, the water level meter does not accept commands other than data acquisition
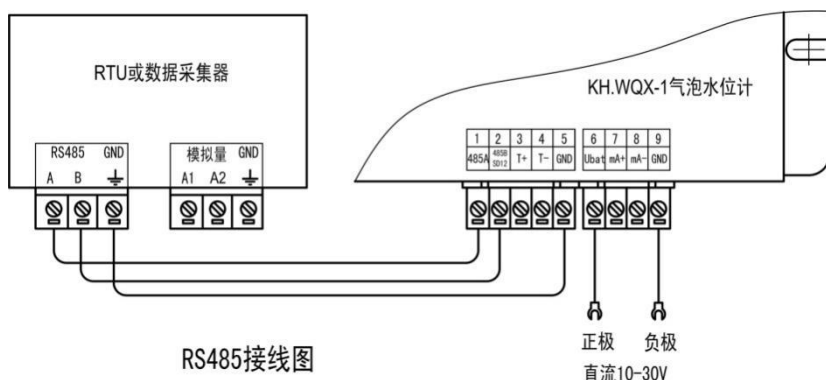
n Cryptographic

> - The password is a 6-digit string of numbers.

- ➢ The factory default password is: "111111".
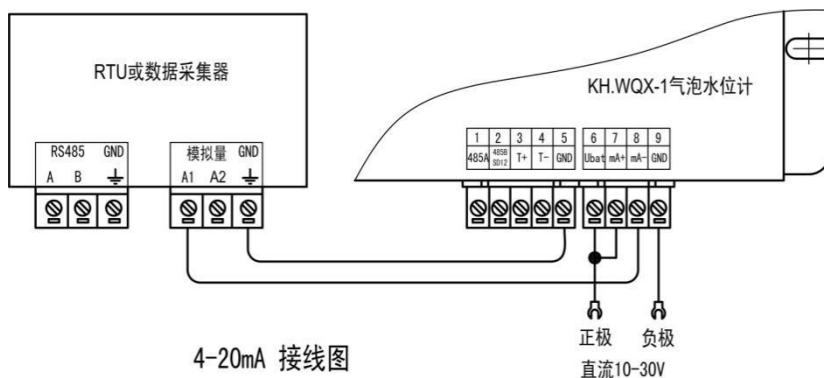
- ➢ Users can set their own passwords as needed.

IV Installation Steps

i Connect a Wire

1. Fix the water level meter in a suitable position inside the data box, and see "7.Dimensions" for specific installation dimensions.

2. Connect the water level meter to the RTU as described below:

3. KH.WQX-1 bubble water level meter supports two kinds of data interfaces, RS485 interface and 4～20mA analog output interface.

4. Due to the influence of RTU analog acquisition accuracy, in order to ensure the accuracy of the reported data of the water level meter and power saving, it is recommended that the user adopts RS485 interface.

5. RS485 wiring method, as shown below:

> The 4 to 20mA wiring method is shown below:

RTU或数据采集器　　　　　　　KH.WQX-1气泡水位计

| RS485 | GND | 模拟量 | GND |
| A | B | ⏚ | A1 | A2 | ⏚ |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 485A | 485B SDI2 | T+ | T- | GND | Ubat | mA+ | mA- | GND |

正极　　负极
直流10-30V

4-20mA 接线图

6. Connect the power supply, paying attention to the positive and negative terminals.

7. Note: When the power is turned on, the water level meter starts to run, the LCD display lights up, the air pump starts to pump, because the measuring air tube is not yet installed, it can't measure the actual water level yet, the air pump stops automatically after pumping for about 7 minutes.

ii Installation of Underwater Air Chambers

Install the air hose on the fitting of the underwater air chamber, paying attention to the front and back order of the internal
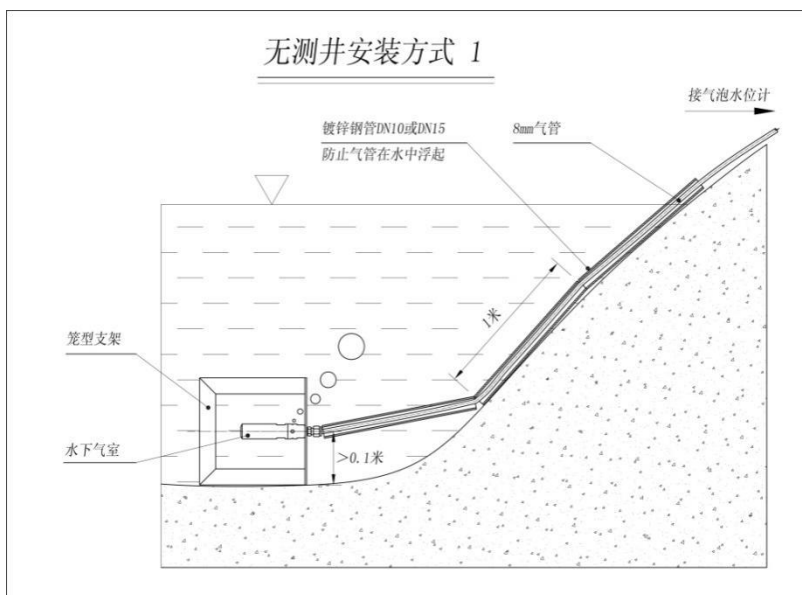

ferrules, which must not be installed in reverse, as shown in the following figure:

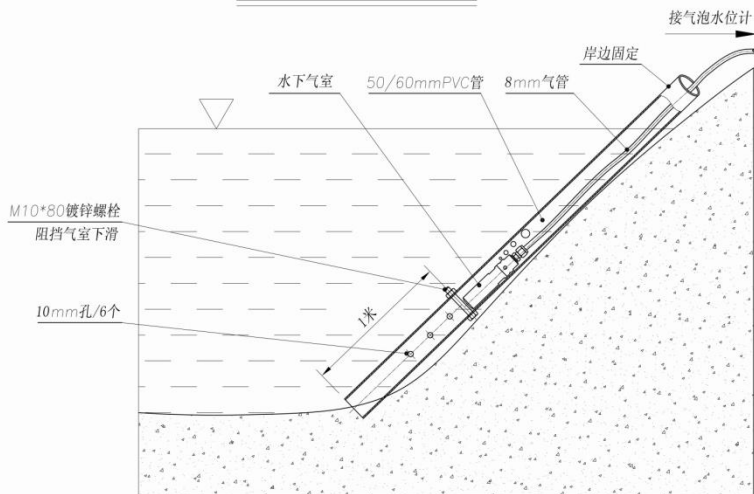1. Insert the air hose inside the fitting and tighten the nut with a

wrench, when you feel the beginning of the force, just turn it about 3/4 turn (two wrenches are needed).

2. Installation of underwater gas chambers is carried out in accordance with the two "no logging installation methods" recommended by our company according to the actual needs.

3. **For both types of installation, the air pipe must not have a "negative slope", otherwise the water level will not be measured correctly.**

无测井安装方式 1

接气(泡水位计
镀锌钢管DN10或DN15   8mm气管
防止气管在水中浮起
笼型支架
水下气室
1米
>0.1米

无测井安装方式 2

接气泡水位计
岸边固定
水下气室 50/60mmPVC管 8mm气管
M10*80镀锌螺栓
阻挡气室下滑
10mm孔/6个
1米

iii Installation of Air Tubes

1. Lay out the air tube into the control box of the water level meter, reserve a suitable length, cut off the excess air tube, and repair the air tube section neatly, with the following requirements:

2. **There must be no sharp-edged burrs, etc.; the outer circle of the trachea must not be oval-shaped.**

3. Insert the air hose into the water level gauge fitting by pinching the air hose with your hand and applying about 3-5kg of thrust, when there is a "thumping" sensation, the air hose is installed in place, as shown in the figure below:

Measuring tube fitting inserted

> **Remarks:**

1、 The Bubble Level Gauge in shipped condition comes with an underwater air chamber.

2、 Measuring air tubes are supplied separately.

3、 Cage brackets are supplied separately.

iv Adjust Components during Testing

1. After confirming that the wiring is correct and that the underwater air chamber and air tubing are in place, first unplug the 4PIN phoenix terminal of the water level gauge and reinsert it back into place after 5 seconds.

2. When the water level meter is powered on, the LCD screen lights up and displays the version information, the air pump starts to pump after about 5 seconds, and the air pump stops and enters the measurement state after 7 minutes. During

the pumping process, there should be even bubbles coming out of the water surface.

3. When the water level meter enters the normal measurement mode, there should be "water depth" and "water level" values displayed on the LCD screen.

4. Note the current measured "depth" as the "base depth".

5. Calculate the "base elevation" based on the current known water level elevation value (which can be read from the reservoir's water scale) as follows:

6. "Base elevation" = "Current water level elevation value" - "Base water depth"

7. Enter the "Base elevation" as described in "3.6 Base elevation" parameterization.

➢ **Description:**

If the base elevation is not set, then the measured water level is only the depth of the water, not the elevation.

V Common Troubleshooting

i The power-on Display Does Not Light up:

1. Use a multimeter to measure whether the power supply from the water level meter's power port "Ubat" to "GND" is between 10-30V.
2. Is the power supply positive and negative polarity correct.

ii The RTU does not Capture the Field Water Level:

1. For the RS485 wiring method, make sure that the following items are correct:
2. Are the RS485 terminals "A" and "B" of the water level meter and RTU correctly connected?
3. Whether the RTU's sensor configuration type is an RS485 sensor.
4. Whether the communication baud rate of RTU and water level meter is the same, the default of water level meter is "9600".
5. Is the RS485 address of the RTU the same as the water level meter, the default address of the water level meter is "1".
6. Is the "Base elevation" or "Reference value" of the RTU or host computer set?
7. For the 4～ 20mA wiring method, verify that the following

items are correct:

8. Is the 4~ 20mA wiring of the RTU and water level gauge correct.

9. Whether the sensor configuration type of the RTU or host computer is an analog sensor.

10. Is the sensor resolution setting of the RTU or host computer correct.

11. Is the water level "base elevation" or "reference value" of the RTU or host computer set?

iii The "water level" and "water depth" values on the LCD display are the same:

1. If "Base elevation" is not entered, calculate and set "Base elevation" according to "4.4 Commissioning".

VI Attachment (email)

- 1 copy of the instruction manual.

- 1 copy of the warranty certificate.

- Certificate of Product Conformity.

- 1 underwater air chamber.

VII External Dimensions
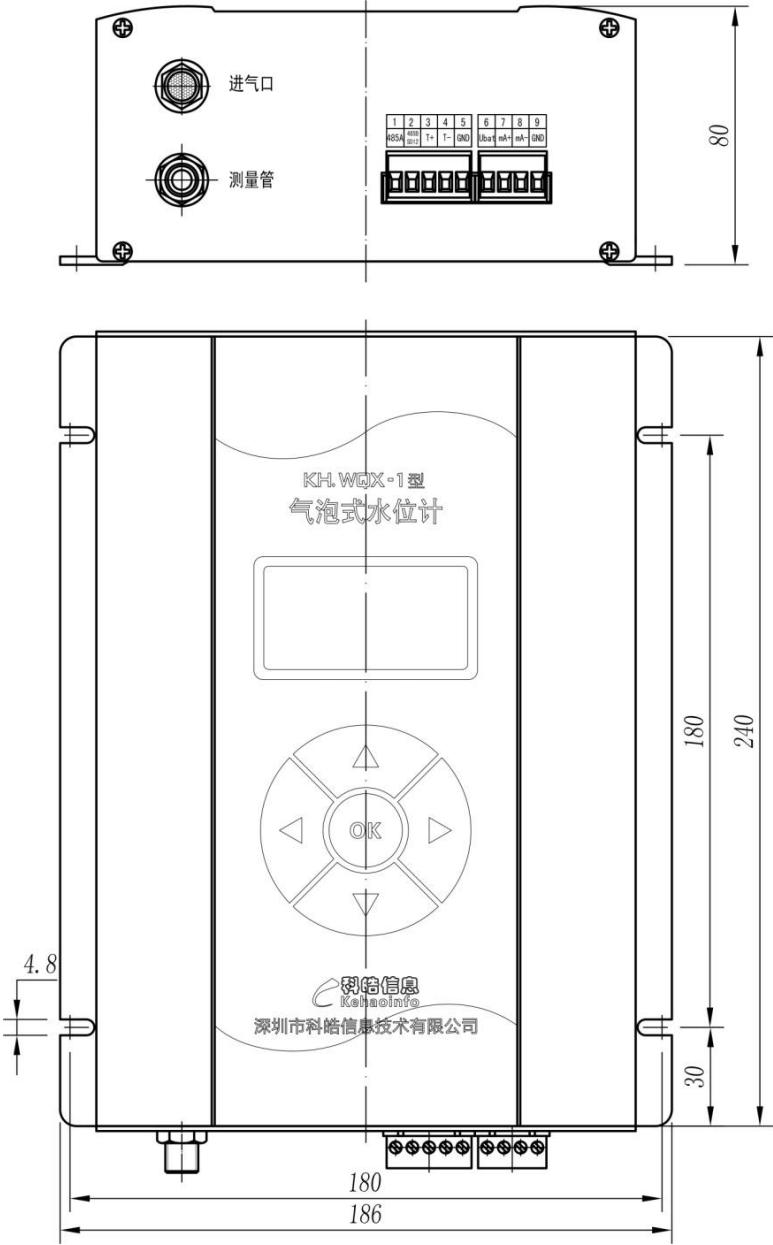
Appendix A. RS485 Communication Protocols

i Description of the Agreement

KH.WQX-1 Bubble Water Level Meter RS485 adopts Modbus communication protocol, and the water level meter acts as a slave. Baud rate can be 300bps, 1200bps, 2400bps, 9600bps and 19200bps, the default is 9600bsp. The data byte format is 1 start bit, 8 data bits, 1 stop bit, no parity bit; the low bit is in the front, the high bit is in the back.

a Data byte format:

Start Bit Data Bit Stop Bit

1bit 8bit 1bit

b Data frame format:

Address Function code Data content Checksum

1 byte 1 byte Indefinite length 2 bytes

c Function code 0x03:

Using the 0x03 function code of the Modbus communication protocol, the value of the water level meter is read (1 value).

d Function code 0x41:

Function code 0x41 is a Modbus user extension command, here used to externally control the water level meter motor operation.

The format of the host's commands is from the machine address, function

code, start address, number of bytes, and CRC code.

The slave responds with a command format of slave address, function code, data area, and CRC code. The data in the data area is a binary code, two bytes, with the high bit first.

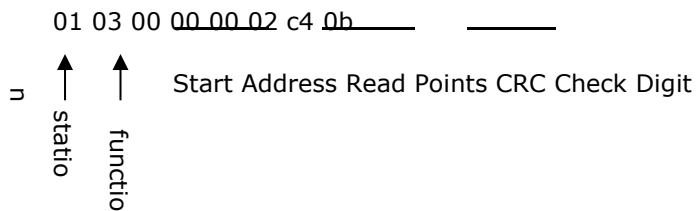CRC codes are all two bytes, with the low bit coming first.

ii Example of message frame format (slave address 0x01 for example).
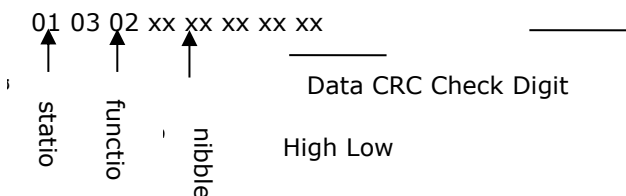
a   Function code 0x03

Host paging:

(01) 84 0A

(04) 44 09

01 03 00 00 00 02 c4 0b

Start Address Read Points CRC Check Digit

statio ↑   functio ↑

n

Answer from the machine:

01 03 02 xx xx xx xx xx

Data CRC Check Digit

statio ↑   functio ↑   nibble ↑

High Low

Starting address and read points description:

The starting address in the host format takes values in the range 00 00 - 00 03, with the following meanings:

00 00: Reading water level (in mm)

00 01: Read water depth in mm.

00 02: Reading of water pressure (in kPa)

00 03: Read water temperature (°C)

The number of read points in the host format can be 0x02, as well as 0x01 and 0x04. The function code (0x03) in the slave answer frame remains unchanged. The number of read unit bytes can be 0x02 and 0x04 depending on the size of the data, 0x02 when the value is less than or equal to 65535, and 0x04 when it is greater than 65535, and the number of data bytes is 2 or 4 bytes accordingly.

b Function code 0x41

Host paging:

01 41 00 00 00 00 00 3D C5 ———

Address Function Code Reserved (all zeros) CRC Check Digit

Answer from the machine:

01 83 00 41 30 ———

Address Function Code Result Code CRC Check Digit

Result Code Description:

The result code is used to indicate the processing result of the command received by the water level meter and has the following types:

0x00 -- Response successful

0x01 -- Invalid function code

0x02 -- Invalid register address

0x03 -- Invalid register data

0x04 -- Error during operation

Note: Function code 0x03 also responds to the corresponding error answer if the last four errors occur.

c CRC calculation steps

1. Preset the 16-bit register to hexadecimal FFFF (i.e., all 1s), call this register the CRC register.

2. Isolate the first 8-bit data with the lower bit of the 16-bit CRC register and put the result in the CRC register.

3. Shift the contents of the register one bit to the right (toward the lower bit), fill the highest bit with a 0, and check the lowest bit.

4. If the lowest bit is 0: repeat step 3 (shift again).

5. If the lowest bit is 1: The CRC register is differentiated from the polynomial A001 (1010 0000 0000 0001).

6. Repeat steps 3 and 4 until it is shifted right 8 times so that the entire 8-bit data is processed in its entirety.

7. Repeat steps 2 through 5 for the next 8-bit data.

8. The last CRC register obtained is the CRC code.

9. When putting the CRC result into the message frame, the high and low bits will be exchanged, with the low bit coming first.

Contact Us

Should you have any questions or require technical support, please do not hesitate to contact us.

Shenzhen KEHAO Information Technology Co., LTD

Address: Software Industry Base, Haitian 2nd Road, Yuehai Sub-district, Nanshan District, Shenzhen, China

Email: export@kehaoinfo.com

Website: www.kehaoinfo.net

WhatsApp: +1 (213) 246-7245