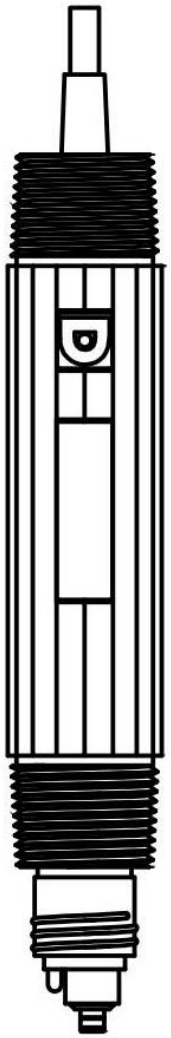
Daruifuno

Digital ORP Sensor
User Manual



Model: DRH7

Version 1.0

Contents

Chapter 1 Specification

Product specifications are subject to change without notice.

Measuring range	-2000 ~ +2000 mV 0.0~50.0 °C
Resolution	1 mV 0.1 °C
Accuracy	±2 mV
Calibration method	Zero calibration, slope calibration, deviation calibration
Operating temperature	0 to 50°C
Work pressure	≤2Bar
Waterproof level	IP68
Power requirements	9~36VDC
Power consumption	About 0.2W
Electrical isolation	Power and communication are isolated inside the sensor
Communication Interface	RS485 MODBUS
Shell material	ABS
Shell size	Diameter 35mm, total length about 260mm (including cleaning protective cover)
Installation size	One imperial 1" NPT thread on each end Insertion depth 100mm (including cleaning connector 115mm)
weight	About 150 grams (without cable)
Cable	PUR (polyurethane) sheath, standard 10 meters, custom lengths available
Connection method	Bare wire, M12 plug or waterproof aviation plug

Chapter 2 Basic Information

2.1 Security Information

Please read this manual completely before unpacking, installing and operating this equipment. Pay special attention to all precautions. Otherwise, it may cause serious personal injury to the operator or damage the equipment.

2.2 Overview

The digital ORP sensor adopts the classic electrochemical principle, which is reliable in measurement and stable in performance. Widely used in environmental protection water treatment, surface water, purified water, circulating water and other systems, as well as electroplating, electronics, printing and dyeing, chemical, food, pharmaceutical and other

2.3 Dimensions

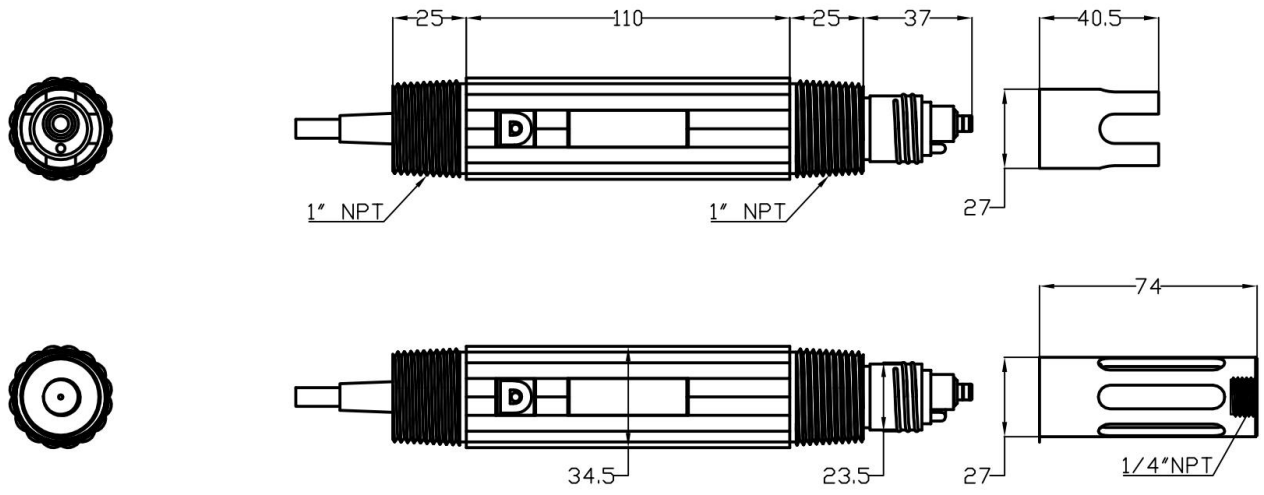


Figure 1 Dimensions of the sensor

Chapter 3 Installation

3.1 Sensor Installation

Refer to the pictures in this section to install and fix the sensor. To ensure that the sensor can measure safely and accurately, the following conditions must be met during installation:

- Choose a location that is convenient for operation and maintenance to install the sensor. The ORP sensor needs regular maintenance;
- The electrode installation angle is within ±30°, and the electrode cannot be installed horizontally or upside down;
- Do not remove the protective cap when installing the electrode on site, and then remove the protective cap after the installation is over.

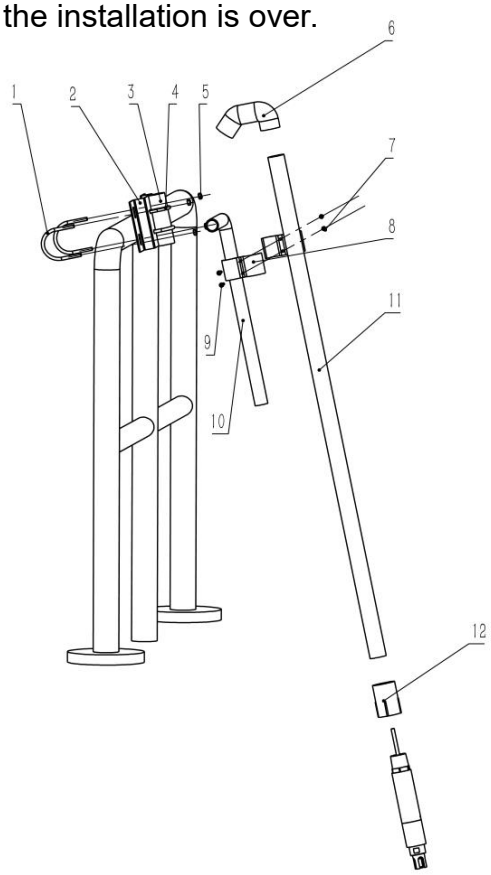


Figure 2 Schematic diagram of railing installation

1-DN60 U-shaped card	7-M4 screw nut 8*4
2-U-shaped board	8-“8”shaped clip 25&32
3-Handle sleeve	9-M4 screw*25*2
4-DN40 U-shaped card	10-handle
5-M6 screw nut*8	11-DN32PVC Bracket
6-Rainproof elbow	12-1 inch inner wire straight pipe joint

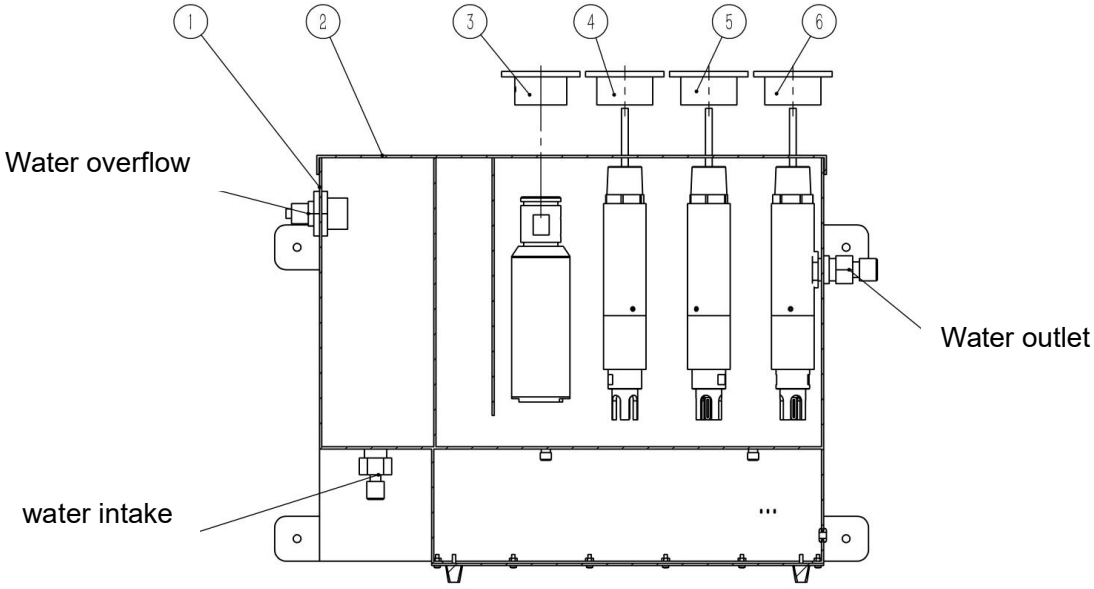


Figure 3 Schematic diagram of five-parameter flow cell installation

1-Flow cell	4-pH sensor fixed connection cover
2-Flow cell cover	5-dissolved oxygen sensor fixed connection cover
3-Turbidity sensor fixed connection cover	6-conductivity sensor fixed connection cover

3.2 Sensor Wiring

The sensors are connected correctly as defined in the table below.
Note: Aviation plug version does not require user to connect wires.

Wire Color	red	black	white	green
Terminal Definition	Power positive	Power negative	RS485 data A (+)	RS485 data B (-)
Instrument Terminal Symbols	V+	V-	AS	BS

Chapter 4 Communication

4.1 About Modbus RTU Overview

About Modbus RTU overview:

The electrode acts as a slave on the network and supports the Modbus RTU communication protocol.

Data communication is initiated by the host, and the first byte of the transmitted message is the target slave address. After the first byte is received by all the slaves on the network, each slave will decode it to determine whether the message is sent to itself.

The transmission of the RTU message frame shall start with a pause interval of at least 3.5 character time. After the transmission of the last character, a pause of at least 3.5 characters time marks the end of the message frame. A new message can start after this pause. During transmission, the entire message frame must be transmitted in a continuous stream. If there is a pause interval of more than 1.5 character time before the transmission of the message frame is completed, the receiving device will flush the incomplete message and assume that the next byte is the start of a new message. Likewise, if a new message begins with the previous frame within less than 3.5 characters, the receiving device will consider it a continuation of the previous frame, and this will result in an error because the final CRC The value cannot be correct.

The host can send command frames to read individual or all data results.

The data frame format is as follows (all data are in Hex format)

Host sends:

1	2	3	4	5	6	7	8
slave address	function code	Register start address upper 8 bits	Register start address lower 8 bits	The upper 8 bits of the number of registers	The lower 8 bits of the number of registers	CRC lower 8 bits	CRC high 8 bits

The slave responds:

1	2	3	4	5	5+n	5+n+1	5+n+2	5+n+3
slave address	function code	Data bytes	Data 1 high 8 bits	Data 1 lower 8 bits	Data n high 8 bits	Data n lower 8 bits	CRC lower 8 bits	CRC high 8 bits

Example:

Send frame: [01 04 00 02 00 02 D0 0B], meaning as follows:

[01]: slave address

[04]: function code

[00 02]: The starting address of the register is 0x02

[00 02]: Read 2 registers from the starting address (ie, read 1 single-precision floating-point data result)

[D0 0B]: CRC check data

Return frame: [01 04 04 00 00 41 C8 CA 42], meaning as follows:

[01]: slave address

[04]: function code

[04]: The number of bytes returned is 4

[00 00 41 C8]: 41 C8 00 00 (that is, the floating-point value is 25, the specific value meaning is to find the corresponding address)

(Note: Combine two 16-bit integer registers to form a single-precision floating-point number, pay attention to the order of the data)

4.2 Corresponding parameter table of communication address

Main measurement (read with function code 04)					
Parameter	**Address**	**Data Format**	**Value Range**	**Initial Value**	**Illustrate**
Main measured value	2	32 Bit Float	-2000～+2000	-	Unit: mV
Temp. measurement	4	32 Bit Float	0～50	-	Unit: Celsius

Communication parameters (read with function code 03, write with function code 06)					
Parameter	**Address**	**Data Format**	**Value range**	**Initial Value**	**Illustrate**
Address	0	Unsigned	1～254	9	-
Baud rate	1	Unsigned	0～3	1	0：4800 1：9600 2：19200 3：38400
Check Digit	2	Unsigned	0～2	0	0: no verification 1: Even parity 2: odd parity
Stop bit	3	Unsigned	1～2	1	1:1 bit 2: 2 bits

System setting parameters (read with function code 03, write with function code 06)					
Parameter	**Address**	**Data Format**	**Value range**	**Initial Value**	**Illustrate**
Sample rate	4	Unsigned	0～4	2	0: Level 2 buffering 1: Level 4 buffering 2: 8-level buffer 3: 16-level buffer 4: 32-level buffer
Temperature mode	5	Unsigned	0～1	0	0: Automatic 1: Manual

User setting parameters (use function code 03 to read, function code 16 to write)					
Parameter	**Address**	**Data Format**	**Value range**	**Initial Value**	**Illustrate**
Slope calibration point calibration value	100	32 Bit Float	-	256	The calibration point value can be changed, the default is 256mV
Zero calibration point standard liquid value	102	32 Bit Float	-	86	The calibration point value can be changed, the default is 86mV
zero	106	32 Bit Float	-	0	The value is generated according to the user calibration, the zero value can be changed
Slope	108	32 Bit Float	-	1	The value is generated according to the user calibration, the slope value can be changed
Main measurement offset	112	32 Bit Float	-2000～+2000	0	The main measurement offset value can be changed, the setting range is between -2000 and +2000
Temperature offset	114	32 Bit Float	-100～100	0	The temperature offset value can be changed, the setting range is between -100 and 100
Manual temperature value	116	32 Bit Float	0～100	25	Manual temperature value can be changed, the setting range is between 0 and 100

User calibration parameters (read with function code 03, write with function code 16)					
Parameter	**Address**	**Data Format**	**Value range**	**Initial Value**	**Illustrate**
Slope calibration	200	32 Bit Float	-	-	Write the value 256 for slope calibration
Zero calibration	206	32 Bit Float	-	-	Write the value 86 for zero calibration

Recovery (Write with function code 06)					
Parameter	**Address**	**Data Format**	**Value range**	**Initial Value**	**Illustrate**
Restore settings	400	Unsigned	-	-	Write the value of 99 to restore the setting parameters, but the communication settings will not be restored

4.3 How to use common functions

4.3.1 Reading electrode measurements

Read the ORP value and temperature value measured by the electrode (assuming the electrode address is 1)

Host sends **[01 04 00 02 00 04 50 09]**

[01] Indicates the electrode address, where the electrode address is 1

[04] Indicates the function code, here use the function code 04 to read the measured value

[00 02] represents the starting register address, where the starting register address is 2

[00 04] indicates the number of registers to be read, here 4 registers are read

[50 09] Indicates CRC check code

Electrode return data **[01 04 08 00 00 40 E0 00 00 41 C8 9A DD]**

[01] Indicates the electrode address, where the electrode address is 1

[04] Indicates the function code, here use the function code 04 to read the measured value

[08] Indicates the number of data bytes, there are 8 bytes here

[00 00 40 E0] These 4 bytes represent the ORP value, the value is represented by a floating point number, **[00 00]** is the lower 16 bits, **[40 E0]** is the upper 16 bits, that is, the 32-bit floating point number is **[40 E0 00 00]**, after converting to decimal, it is 7, and the mV value is 7

[00 00 41 C8] These 4 bytes represent the temperature value, the value is represented by a floating point number, **[00 00]** is the lower 16 bits, **[41 C8]** is the upper 16 bits, that is, the 32-bit floating point number is **[41 C8 00 00]**, converted to decimal number is 25, the temperature value is 25 degrees Celsius

[9A DD] means CRC check code

4.3.2 Modify electrode address

Modify the electrode address, change the electrode address from 1 to 2

Host sends **[01 06 00 00 00 02 08 0B]**

4.3.3 Electrode Calibration

Electrode calibration (assuming the electrode address is 1)

Zero calibration:

The calibration value is the value set by the zero calibration point, the default is 86

Use function code 16 to write value 86 to register address 206 to perform calibration

Host send **[01 10 00 CE 00 02 04 00 00 42 AC 4E AE]**

Slope calibration:

The calibration value is the value set by the slope point, the default is 256

Use function code 16 to write value 256 to register address 200 to perform calibration

Host send **[01 10 00 C8 00 02 04 00 00 43 80 CE C9]**

4.3.4 Factory reset

Factory reset (communication parameters are not restored) (assuming the electrode address is 1)
Use function code 06 to write the value 99 to the register address 400 to perform recovery
Host sends **[01 06 01 90 00 63 C8 32]**

Chapter 5 Maintenance

In order to obtain the best measurement results, regular maintenance and maintenance are required. Maintenance and maintenance include cleaning of electrodes, checking for damage, etc.

5.1 Maintenance Period

Maintenance work	Maintenance frequency
Visual inspection	per month
Check Calibration	Monthly (depending on usage environment conditions)
Replace electrodes	Yearly (according to usage environment conditions)

5.2 Common problems and solutions

Phenomenon	Approach
Electrodes cannot communicate	1. Check whether the electrode wiring is correct
	2. Check the communication setting parameters (address, baud rate, parity bit, stop bit)
The measured value is not normal	1. Check whether the electrode platinum ring is clean and whether the sensor is damaged
	2. Restore the electrode to the factory calibration value, clean and re-calibrate with standard buffer
	3. Check the service life of the electrode

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