Quick Start Manual

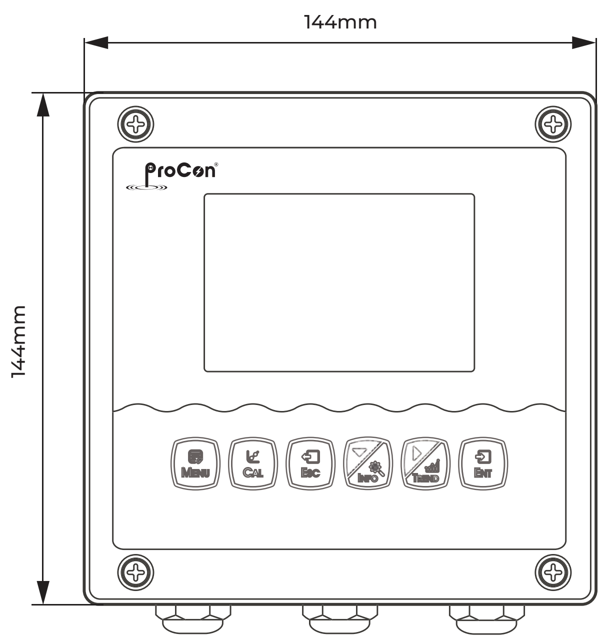
ICON™ PROCESS CONTROLS Corrosion-Free Instrumentation Equipment

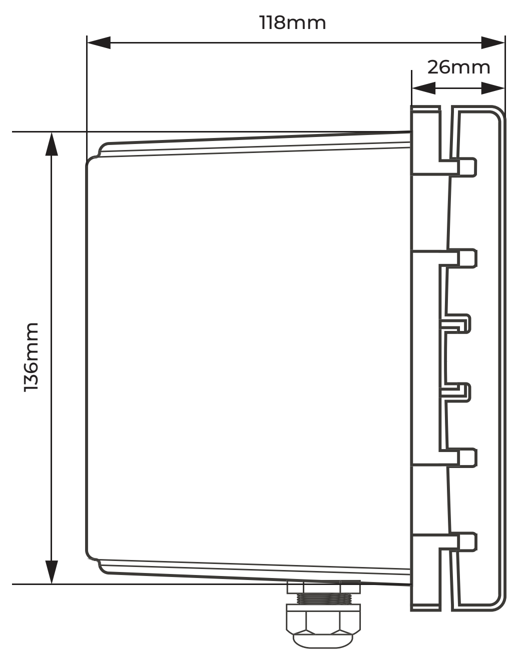
Read the user's manual carefully before starting to use the unit.
Producer reserves the right to implement changes without prior notice.

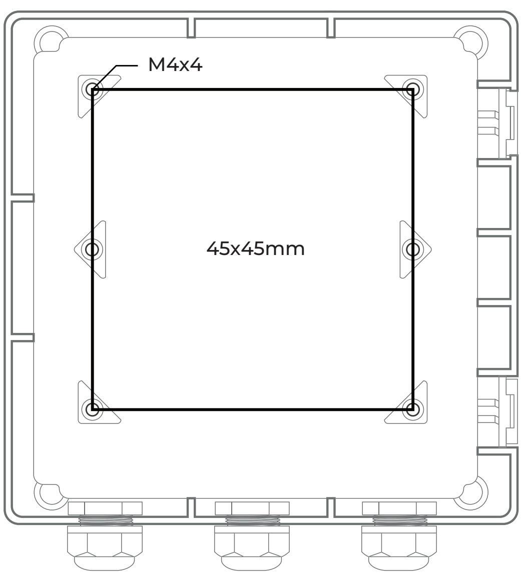
Technical Specifications

Measurement Range	0~2000ms/cm
Measurement Unit	ms/cm
Resolution	0.01ms/cm
Basic Error	±3%
Temperature	14 ~ 302°F | -10 ~ 150.0°C (Depends on the Sensor)
Temperature Resolution	0.1°C
Temperature Accuracy	±0.3°C
Temperature Compensation	Manual | Automatic
Stability	pH: ≤0.01pH/24h ; ORP: ≤1mV/24h
Current Output	Line 2: 4~20mA, 20~4mA, 0~20mA
Communication Output	RS485 MODBUS RTU
Three Relay Control Contacts	5A 250VAC, 5A 30VDC
Power Supply	9~36VDC | 85~265VAC | Power Consumption ≤ 3W
Working Conditions	No strong magnetic field interference around except the geomagnetic field
Working Temperature	14 ~ 140°F | -10~60°C
Relative Humidity	≤90%
Waterproof Rating	IP65
Dimensions	144 x 114 x 118mm
Mounting	Panel | Wall Mount

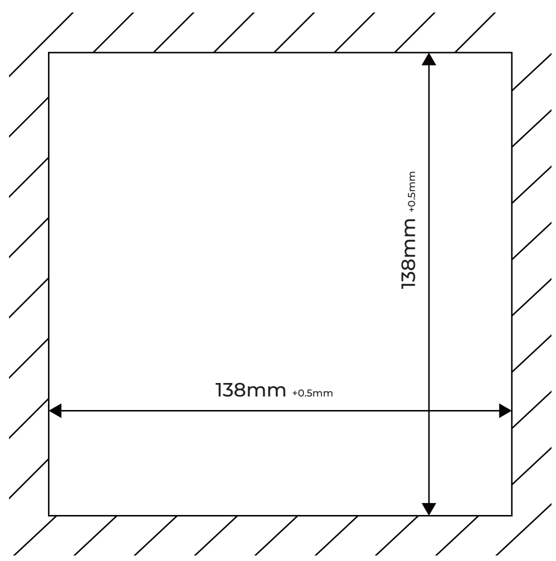
Dimensions





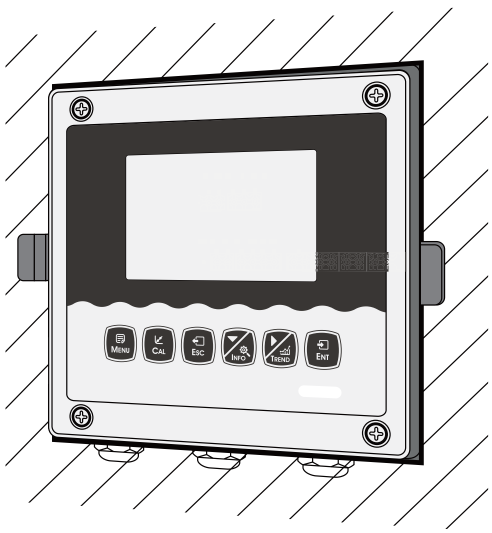


Back Fixed Hole Size

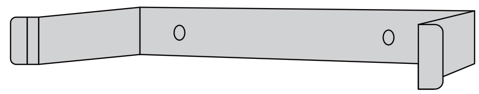


Embedded Mounting Cut-out Size

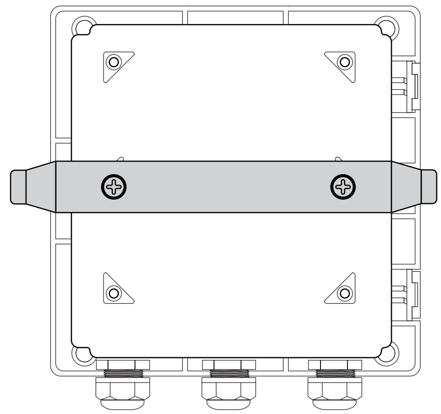
Embedded Installation



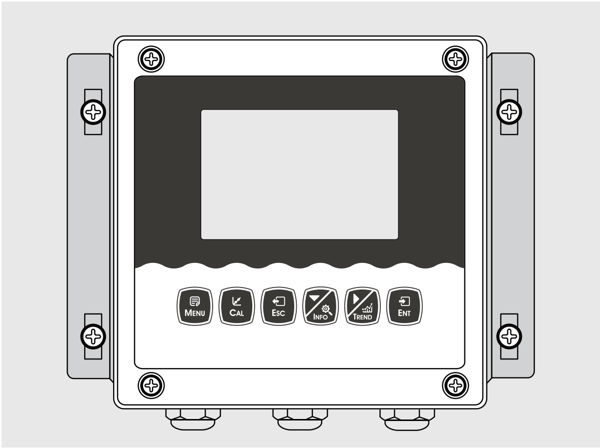
Schematic of Completion of Installation



a) Embedded in an open hole
b) Fix the instrument

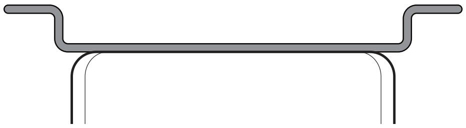


Wall Mount Installation

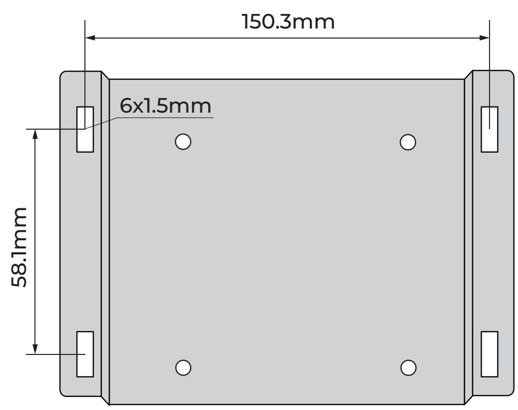


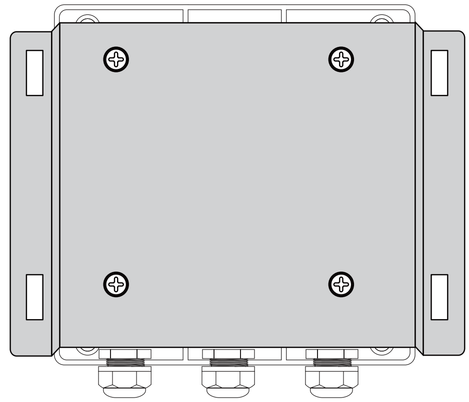
Schematic of Completion of Installation

a) Install a mounting bracket for the instrument
b) Wall screw fixation

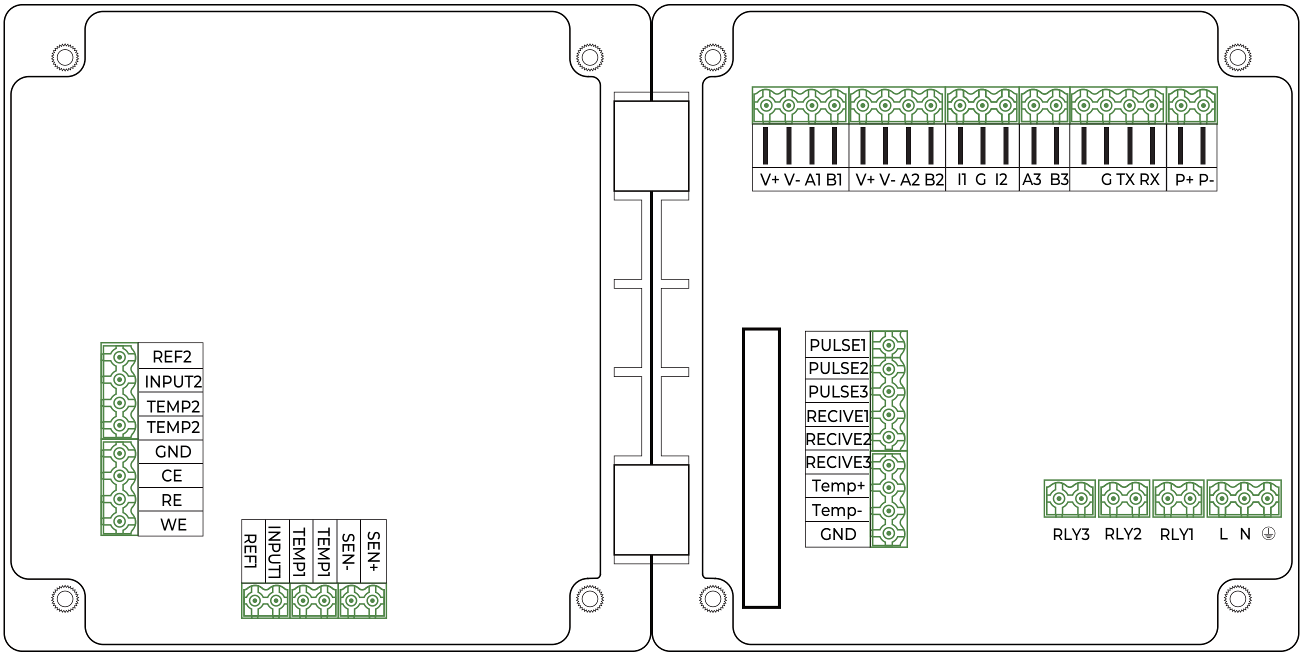


Top view of mounting bracket
Pay attention of installation direction





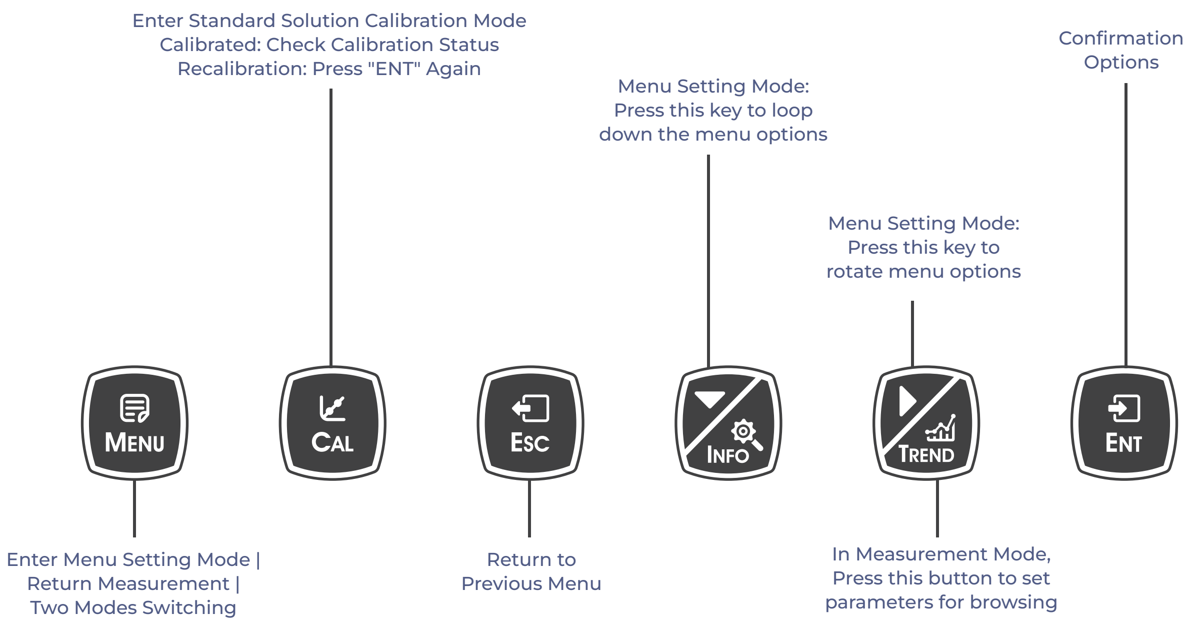
Wiring



Terminal	Description	Terminal	Description
V+, V-, A1, B1	Digital Input Channel 1	REF1	Digital Input Channel 1
V+, V-, A2, B2	Digital Input Channel 2	INPUT1	Digital Input Channel 2
I1, G, I2	Output Current	TEMP1	Output Current
A3, B3	RS485 Communication Output	SEN-,SEN+	RS485 Communication Output
G, TX, RX	RS232 Communication Output	REF2	RS232 Communication Output
P+, P-	VDC Power Supply	INPUT2	VDC Power Supply
EC1,EC2,EC3,EC4	Conductivity/Resistivity Wiring	TEMP2	Conductivity/Resistivity Wiring
RLY3,RLY2,RLY1	Group 3 Relays	GND	Group 3 Relays
L,N,⏚	L- Live Wire | N- Neutral | ⏚ Ground	CE,RE,WE	Constant Voltage for FCL/CLO2/O

The connection between the instrument and the sensor: the power supply, output signal, relay alarm contact and the connection between the sensor and the instrument are all inside the instrument, and the wiring is as shown above. The length of the cable lead fixed by the electrode is usually 5-10 Meters, insert the line with corresponding label or color wire on the sensor into the corresponding terminal inside the instrument and tighten it.

Keypad Description

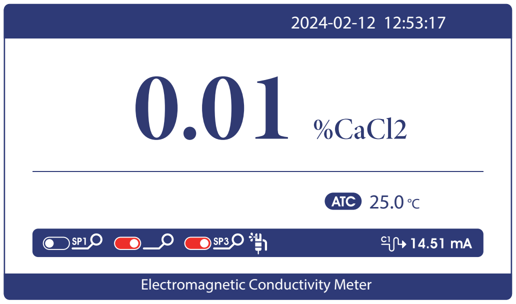


Short Press: Short Press means to release the key immediately after pressing. (Default to short presses if not included below)
Long Press: Long Press is to press the button for 3 seconds and then release it.
Press & Hold: Press and hold means to press the button, and accelerate after a certain time until the data is adjusted to the user's required value before releasing the button

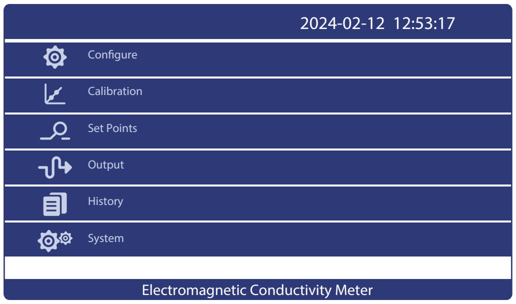
Display Descriptions

All pipe connections and electrical connections should be checked before use. After the power is switched on, the meter will display as follows.

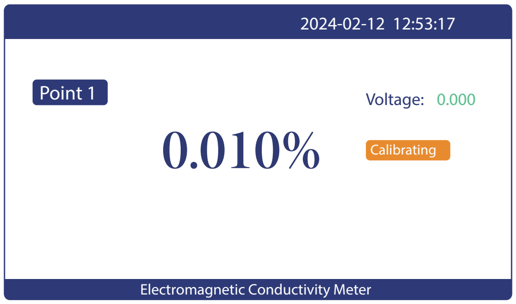
Measurement Mode



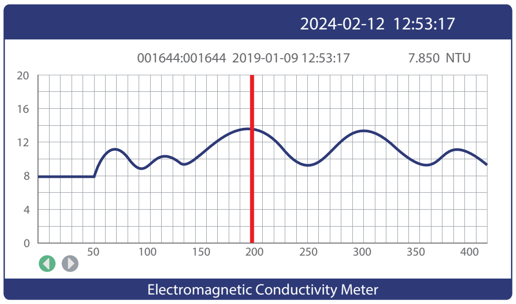
Setting Mode



Calibration Mode



Trend Chart Display



Menu Structure

The following is the menu structure of this instrument

Setting	Electrode Set	Electrode Type Setting	ms/cm
			NaOH
			NaCl
			CaCl2
			HCl
		Units Setup	%
			ms/cm
		Electrode Constant	2.7 (Default, can be modified)
		Temperature Coefficient	2.0 (Default, can be modified)
	Temperature	Temperature Sensor	PT1000
		Temperature Offset	0.0000
		Temperature Input	Automatic
			Manual
		Temperature Unit	°C
			°F
Calibration	Standard Solution Calibration	Point 1	0.01 (Default, can be modified)
		Point 2	1.0 (Default, can be modified)
		Point 3	5.0 (Default, can be modified)
		Point 4	10.0 (Default, can be modified)
		Point 5	20.0 (Default, can be modified)
		Calibration Adjustment	Voltage 1
			Voltage 2
			Voltage 3
			Voltage 4
			Voltage 5
	Field Calibration	Field Calibration	
		Offset Adjustment	
		Slope Adjustment	

Alarm	Relay 1	On-Off State	ON
			OFF
		Specify the type	High Alarm
			Low Alarm
			Clean
		Limit Setting (Open Time - Cleaning State)	Continuous Opening Time
		Lag (Off Time - In Cleaning State)	The interval between the last opening and closing and the next opening
	Relay 2	On-Off State	ON
			OFF
		Specify the type	High Alarm
			Low Alarm
			Clean
		Limit Setting (Open Time - Cleaning State)	Continuous Opening Time
		Lag (Off Time - In Cleaning State)	The interval between the last opening and closing and the next opening
	Relay 3	On-Off State	ON
			OFF
		Specify the type	High Alarm
			Low Alarm
			Clean
		Limit Setting (Open Time - Cleaning State)	Continuous Opening Time
		Lag (Off Time - In Cleaning State)	The interval between the last opening and closing and the next opening
Output	Current 1	Channel	Main
			Temperature
		Output Option	4-20mA
			0-20mA
			20-4mA
		Upper Limit	
		Lower Limit	
	Current 2	Channel	Main
			Temperature
		Output Option	4-20mA
			0-20mA
			20-4mA
		Upper Limit	
		Lower Limit	

Output	RS485	Baud Rate	4800BPS
			9600BPS
			19200BPS
		Parity Check	None
			Odd
			Even
		Stop Bit	1 Bit
			2 Bit
		Network Node	001 +
Data Log	Graphic Trend (Trend Chart)	Interval/Point	Display according to interval settings 480 points/ screen
		1h/Point	
		12h/Point	
		24h/Point	
	Data Query	Query by number of data	Year/Month/Day, Time:Minutes:Seconds Value Unit
	Record Interval	7.5s	
		90s	
		180s	
	Memory Information	101600 Point	
	Data Output		
System	Language	English	
	Date/Time	Year-Month-Day	
		Hour-Minute-Second	
	Display	Display Speed	Low
			Standard
			Medium
			High
		Backlight	Saving
			Bright
		Range Set	1
			2
			3
			Automatic
	Software version	Software Version	1.9-1.0
		Password Settings	0000
		Serial number	

System	Factory Default	No	
		Yes	
	Terminal Current Tuning	Current 1 | 4mA	The positive and negative ends of the ammeter are connected to the current 1 or current 2 output terminals of the instrument respectively, press [▼] key to adjust the current to 4 mA or 20mA , press [ENT] key to confirm.
		Current 1 | 20mA	
		Current 2 | 4mA	
		Current 2 | 20mA	
	Relay Test	Relay 1	Select three groups of relays and hear the sound of two switches ,the relay is normal.
		Relay 2	
		Relay 3	

Calibration

Press [MENU] to enter the setting mode and select the calibration

Calibration	Standard Solution Calibration	Point 1	Enter given standard liquid value(Example:0.01)
		Point 2	Enter given standard liquid value(Example:1.0)
		Point 3	Enter given standard liquid value(Example:5.0)
		Point 4	Enter given standard liquid value(Example:10.0)
		Point 5	Enter given standard liquid value(Example:20.0)
		Field Calibration	
		Offset Adjustment	
		Slope Adjustment	

Standard Solution Calibration

This function is used to calibrate the five calibration points of the sensor. It has been calibrated before delivery and users can use it directly. If calibration is required, prepare 5 suitable standard liquids with known value, press **[MENU]** to enter the setting mode and select the calibration point.Modify or enter the corresponding calibration value.

After setting the calibration value, press **[MENU]** key returns to the measurement screen, and press **[CAL]** key to enter the standard solution calibration mode. Standard solution calibration has five points, and can be calibrated at any point (at least one point)..

If the instrument has been calibrated, press the **[CAL]** key to check the calibration state, press the [▼] key to switch the calibration state of the calibration point, and if the point shall be re-calibrated in this state, press **[ENT]** key to enter re-calibration.

If the monitor prompts you to enter the calibration safety password, press [▼] or [▶] key to set the calibration safety password, then press **[ENT]** to confirm the calibration safety password.

Point 1 Calibration

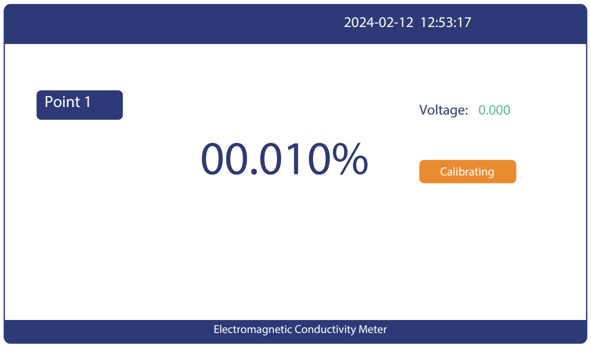
After entering the calibration mode, the instrument displays as shown in the figure. The main value of the instrument displays the known standard liquid value of point

1.Place the electrode into the standard solution of the corresponding value, and the corresponding voltage mV value and calibration state will be displayed on the left side of the screen.

After completion of calibration, (**Done**) will be displayed on the right side of the screen.

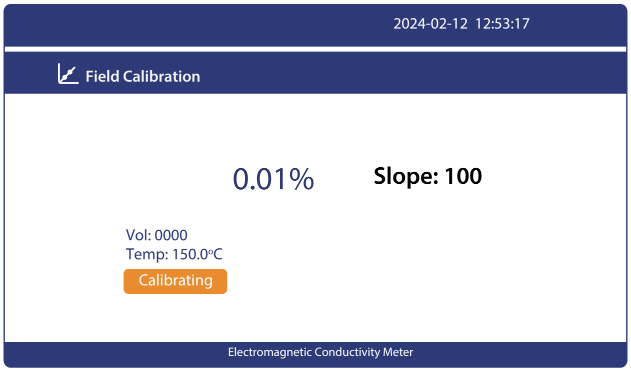
If the next point is calibrated, press [▼] to switch the calibration point.
If only one point calibration is needed, after the calibration is completed, press [**MENU**] to exit.

During the calibration process, when the standard solution is wrong, the screen will show Error.



Field Calibration

Select field calibration methods: [Field calibration], [Offset adjustment], [linear adjustment].



Offset Adjustment

Compare the data from portable instrument with the data measured by isntrument. if there is any error, the error data can be modified by this function.

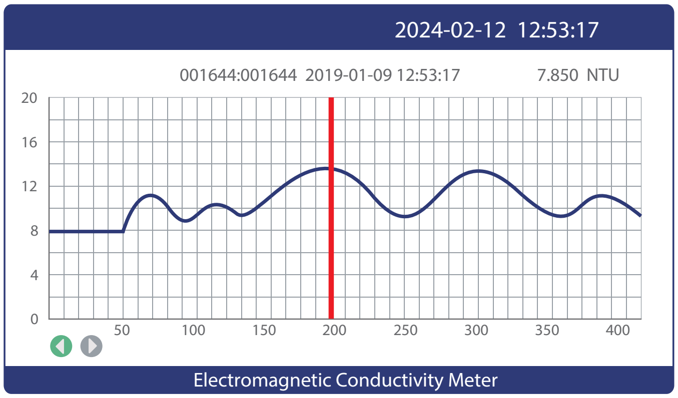
Linear adjustment

Linear values after "field calibration" will be saved in this term and the factory data is 1.00.

Graphic Trend (Trend Chart)

Data Log	Curve Query (Trend Chart)	Interval/Point	400 points per screen, displays the most recent data trend graph according to interval settings
		1h/point	400 points per screen, display trend chart of the last 16 days of data
		12h/point	400 points per screen, display trend chart of the last 200 days of data
		24h/point	400 points per screen, display trend chart of the last 400 days of data
	Data Query	Year/Month/Day	Year/Month/day Time: Minute: Second Value Unit
	Interval	7.5s	Store Data Every 7.5 Seconds
		90s	Store Data Every 90 Seconds
		180s	Store Data Every 180 Seconds

Press the [**MENU**] button returns to the measurement screen. Press the [▶**/TREND**] button in the measurement mode to view the trend chart of the saved data directly. There are 480 sets of data record per screen, and the interval time of each record can be selected [7.5s, 90s, 180s), corresponding to the data displayed in [1h, 12h, 24h] per screen.



In the current mode, press the [**ENT**] key to move the data display line to the left and right (green) and display the data in left and right circles. Long pressing of the [**ENT**] key can accelerates displacement. (When the bottom Icons is green. [**ENT**] key is displacement direction, press [▶ **/TREND**] key to switch the direction of displacement)

MODBUS RTU

The hardware version number of this document is V2.0; the software version number is V5.9 and above. This document describes the MODBUS RTU interface in details and the target object is a software programmer.

MODBUS Command Structure

Data format description in this document;
Binary display, suffix B, for example: 10001B - decimal display, without any prefix or suffix, for example: 256
Hexadecimal display, prefix 0x, for example: 0x2A
ASCII character or ASCII string display, for example: "YL0114010022"

Command Structure

The MODBUS application protocol defines the Simple Protocol Data Unit (PDU), which is independent of the underlying communication layer.

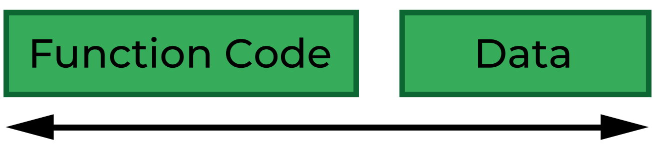


Fig.1 : MODBUS Protocol Data Unit

MODBUS protocol mapping on a specific bus or network introduces additional fields of protocol data units. The client that initiates the MODBUS exchange creates the MODBUS PDU, and then adds the domain to establish the correct communication PDU.

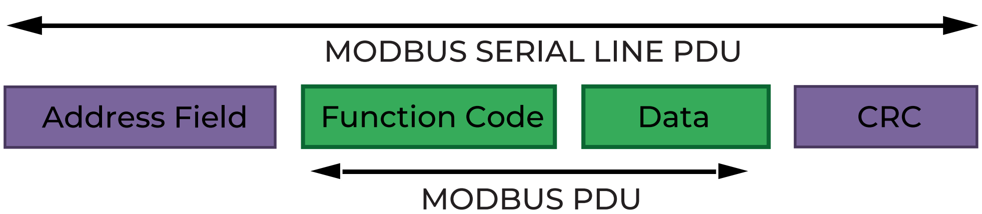


Fig.2 : MODBUS Architecture for Serial Communication

On the MODBUS serial line, the address domain contains only the slave instrument address. Tips: The device address range is 1...247
Set the device address of the slave in the address field of the request frame sent by the host. When the slave instrument responds, it places its instrument address in the address area of the response frame so that the master station knows which slave is responding.

Function codes indicate the type of operation performed by the server.
CRC domain is the result of the " redundancy check" calculation, which is executed according to the information content.

MODBUS RTU Transmission Mode

When the instrument uses RTU (Remote Terminal Unit) mode for MODBUS serial communication, each 8-bit byte of information contains two 4-bit hexadecimal characters. The main advantages of this mode are greater character density and better data throughput than the ASCII mode with the same baud rate. Each message must be transmitted as a continuous string.

The format of each byte in RTU mode (11 bits):

Coding system: 8-bit binary

Each 8-bit byte in a message contains two 4-bit hexadecimal characters (0-9, A-F)

Bits in each byte: 1 starting bit

8 data bits, the first minimum valid bits without parity check bits

2 stop bits

Baud rate: 9600 BPS

How characters are transmitted serially:

Each character or byte is sent in this order (from left to right) the least significant bit (LSB)... Maximum Significant Bit (MSB)

Start bit	1	2	3	4	5	6	7	8	Stop bit	Stop bit

Fig.3 : RTU Pattern Bit Sequence

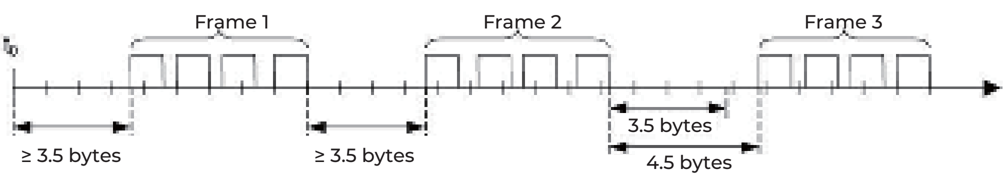
Check Domain Structure: Cyclic Redundancy Check (CRC16)

Structure description:

Slave Instrument	Address	Data	CRC
1 byte	1 byte	0...252 byte	2 byte
			CRC Low byte | CRC High byte

Fig.4 : RTU Information Structure

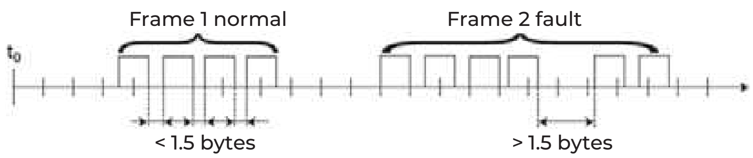
The maximum frame size of MODBUS is 256 bytes
MODBUS RTU Information Frame
In RTU mode, message frames are distinguished by idle intervals of at least 3.5 character times, which are called t3.5 in subsequent sections.



Starting	Address	Function code	Data	CRC	End
≥ 3.5 bytes	8	8	Nx8	16 bit	≥ 3.5 bytes

Fig.5 : RTU Message Frame

The entire message frame must be sent in a continuous character stream. When the pause time interval between two characters exceeds 1.5 characters, the information frame is considered incomplete and the receiver does not receive the information frame.



MODBUS RTU CRC Check

The RTU mode contains an error-detection domain based on a cyclic redundancy check (CRC) algorithm that performs on all message contents. The CRC domain checks the contents of the entire message and performs this check regardless of whether the message has a random parity check. The CRC domain contains a 16-bit value consisting of two 8-bit bytes. CRC16 check is adopted. Low bytes precede, high bytes precede.

Implementation of MODBUS RTU in Instrument

According to the official MODBUS definition, the command starts with a 3.5 character interval triggering command, and the end of the command is also represented by a 3.5 character interval. The device address and MODBUS function code have 8 bits. The data string contains n*8 bits, and the data string contains the starting address of the register and the number of read/write registers. CRC check is 16 bits.

Value	Start	Device Address	Function	Data	Summary Check		End
	No Signal bytes during 3.5 Characters	1-247 1	Function Codes Confirming to MODBUS Specification	Data Confirming to MODBUS Specification	CRCL	CRCL	No Signal bytes during 3.5 characters
Byte	3.5		1	N	1	1	3.5

Fig.7 : MODBUS definition of Data Transmission

Instrument MODBU RTU Function Code

The instrument only uses two MODBUS function codes:
0x03: Read-and-hold register
0x10: Write multiple registers

MODBUS Function Code 0x03: Read-and-hold Register
This function code is used to read the continuous block content of the holding register of the remote device. Request the PDU to specify the start register address and the number of registers. Address registers from zero. Therefore, the addressing register 1-16 is 0-15. The register data in the response information is packaged in two bytes per register. For each register, the first byte contains high bits and the second byte contains low bits.

Request:

Function Code	1 byte	0x03
Start Address	2 byte	0x0000....0xfffff
Read Register Number	2 byte	1...125

Fig.8 : Read and hold register request frame

Response:

Function Code	1 byte	0x03
Number of bytes	2 bytes	0x0000....0xfffff
Read Register Number	2 bytes	1...125

N = Register Number

Figure 9 : Read and hold register response frame

The following illustrates the request frame and response frame with the read and hold register 108-110 as an example. (The contents of register 108 are read-only, with two byte values of 0X022B, and the contents of register 109-110 are 0X0000 and 0X0064)

Request Frame		Response Frame	
Number Systems	(Hexadecimal)	Function Code	(Hexadecimal)
Function Code	0x03	Byte Count	0x03
Start Address (High byte)	0x00	Register Value (High Bytes) (108)	0x06
Start Address (Low byte)	0x6B	Register Value (Low Bytes) (108)	0x02
Number of Read Registers (High Bytes)	0x00	Register Value (High Bytes) (109)	0x2B
Number of Read Registers (Low Bytes)	0x00	Register Value (Low Bytes) (109)	0x00
		Register Value (High Bytes) (110)	0x00
		Register Value (Low Bytes) (110)	0x00
		Function Code	0x64

Figure 10 : Examples of read and hold register request and response frames

MODBUS Function Code 0x10 : Write Multiple Registers

This function code is used to write continuous registers to remote devices (1... 123 registers) block that specifies the value of the registers written in the request data frame. Data is packaged in two bytes per register. Response frame return function code, start address and number of registers written.

Request:

Function Code	1 byte	0x10
Start Address	2 byte	0x0000....0xfffff
Number of input registers	2 byte	0x0001....0x0078
Number of bytes	1 byte	Nx2
Register Values	N x 2 bytes	Value

Fig.11 : Write Multiple Register Request Frames

*N = Register Number

Response:

Function Code	1 byte	0x10
Start Address	2 byte	0x0000....0xffff
Register Number	2 byte	1...123(0x7B)

N = Register Number

Figure 12 : Write Multiple Register Response Frames

The request frame and response frame are illustrated below in two registers that write the values 0x000A and 0x0102 to the start address of 2.

Response Frame	(Hexadecimal)	Response Frame	(Hexadecimal)
Number Systems	0x10	Number Systems	0x10
Function Code	0x00	Function Code	0x00
Start Address (High byte)	0x01	Start Address (High byte)	0x01
Start Address (Low byte)	0x00	Start Address (Low byte)	0x00
Input Register Number (High bytes)	0x02	Input Register Number (High bytes)	0x02
Input Register Number (Low bytes)	0x04	Input Register Number (Low bytes)	
Number of bytes	0x00		
Register Value (High byte)	0x0A		
Register Value (Low byte)	0x01		
Register Value (High byte)	0x02		
Register Value (Low byte)			

Figure 13 : Examples of writing multiple register request and response frames

Data Format in Instrument

Floating Point

Definition: Floating point, conforming to IEEE 754 (single precision)

Description	Symbol	Index	Mantissa	SUM
Bit	31	30...23	22...0	22...0
Index Deviation	127			

Figure 14 : Floating Point Single Precision Definition (4 bytes, 2 MODBUS Registers)

Example: Compile decimal 17.625 to binary

Step 1:

Converting 17.625 in decimal form to a floating-point number in binary form, first finding the binary representation of the integer part

17decimal= $16 + 1 = 1\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$

The binary representation of integer part 17 is 10001B

then the binary representation of decimal part is obtained

$0.625 = 0.5 + 0.125 = 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3}$

The binary representation of decimal part 0.625 is 0.101B.

So the binary floating point number of 17.625 in decimal form is 10001.101B

Step 2:

Shift to find the exponent.

Move 10001.101B to the left until there is only one decimal point, resulting in 1.0001101B, and

10001.101B = 1.0001101 B× 24 . So the exponential part is 4, plus 127, it becomes 131, and its binary representation is 10000011B.

Step 3:

Calculate the tail number

After removing 1 before the decimal point of 1.0001101B, the final number is 0001101B (because before the decimal point must be 1, so IEEE stipulates that only the decimal point behind can be recorded). For the important explanation of 23-bit mantissa, the first (i.e. hidden bit) is not compiled. Hidden bits are bits on the left side of the separator, which are usually set to 1 and suppressed.

Step 4:

Symbol bit definition

The sign bit of positive number is 0, and the sign bit of negative number is 1, so the sign bit of 17.625 is 0.

Step 5:

Convert to floating point number

1 bit symbol + 8 bit index + 23-bit mantissa

0 10000011 00011010000000000000000B (the hexadecimal system is shown as 0 x418d0000)

Reference code:

1. If the compiler used by the user has a library function that implements this function, the library function can be called directly, for example, using C language, then you can directly call the C library function memcpy to obtain an integer representation of the floating-point storage format in memory.

For example: float floatdata; // converted floating point number

void* outdata; memcpy(outdata,&floatdata,4);

Suppose floatdata = 17.625

If it is a small-end storage mode, after executing the above statement, the data stored in the address unit outdata is 0x00.

address unit (outdata + 1) stores data as 0x00

address unit (outdata + 2) stores data as 0x8D

address unit (outdata + 3) stores data as 0x41

If it is large-end storage mode, after executing the above statement, the data stored in outdata of address unit is 0x41

address unit (outdata + 1) stores data as 0x8D

address unit (outdata + 2) stores data as 0x00

address unit (outdata + 3) stores data as 0x00

2. If the compiler used by the user does not implement the library function of this function, the following functions can be used to achieve this function:

```
void memcpy(void *dest,void *src,int n)
{
char *pd = (char *)dest; char *ps = (char *)src;
for(int i=0;i<n;i++) *pd++ = *ps++;
}
```

And then make a call to the above memcpy(outdata,&floatdata,4);

Example: Compile binary floating-point number 0100 0010 0111 1011 0110 0110 0110 10B to decimal number

Step 1: Divide the binary floating-point number 0100 0010 0111 1011 0110 0110 0110B into symbol bit, exponential bit and mantissa bit.

0 10000100 11110110110011001100110B

1-bit sign + 8-bit index + 23-bit tail sign bit S: 0 denotes positive number

Index position E: 10000100B $=1\times2^7+0\times2^6+0\times2^5+0\times2^4+0\times2^3+1\times2^2+0\times2^1+0\times2^0$

=128+0+0+0+0+4+0+0=132

Mantissa bits M: 11110110110011001100110B =8087142

Step 2: Calculate the decimal number

D = (−1)×(1.0 + M/223)×2E−127

= (−1)0×(1.0 + 8087142/223)×2132−127

= 1×1.964062452316284×32

= 62.85

Reference Code:

```
float floatTOdecimal(long int byte0, long int byte1, long int byte2, long int byte3)
{
long int realbyte0,realbyte1,realbyte2,realbyte3; char S;
long int E,M;
float D; realbyte0 = byte3; realbyte1 = byte2; realbyte2 = byte1; realbyte3 = byte0;
```

```
if((realbyte0&0x80)==0)
{
S = 0;//positive number
}
else
{
 S = 1;//negative number
 }
E = ((realbyte0<<1)|(realbyte1&0x80)>>7)-127;
M = ((realbyte1&0x7f) << 16) | (realbyte2<< 8)| realbyte3;
D = pow(-1,S)*(1.0 + M/pow(2,23))* pow(2,E);
return D;
 }
```

Function description: parameters byte0, byte1, byte2, byte3 represent 4 bytes of binary floating point number.

The decimal number converted from the return value.

For example, the user sends the command to get the temperature value and dissolved oxygen value to the probe. The4 bytes representing the temperature value in the received response frame are 0x00, 0x00, 0x8d and 0x41. Then the user can get the decimal number of the corresponding temperature value through the following call statement.

That is temperature = 17.625.

float temperature = floatTOdecimal(0x00, 0x00, 0x8d, 0x41)

Read Instruction Mode

The communication protocol adopts MODBUS (RTU) protocol. The content and address of the communication can be changed according to the needs of customers. The default configuration is network address 01, baud rate 9600, even check, one stop bit, users can set their own changes;

Function code 0x04: This function enables the host to obtain real-time measurements from slaves, which are specified as single-precision floating-point type (i.e. occupying two consecutive register addresses), and to mark the corresponding parameters with different register addresses. Communication address is as follows:

0000-0001: Temperature value | 0002-0003: Main Measured Value | 0004-0005: Temperature and Voltage Value |

0006-0007: Main Voltage Value

Communication examples:

Examples of function code 04 instructions:

Communication address = 1, temperature = 20.0, ion value = 10.0, temperature voltage = 100.0, ion voltage = 200.0

Host Send: 01 04 00 00 08 F1 CC | Slave Response: 01 04 10 00 41 A0 00 41 20 00 42 C8 00 43 48 81 E8

Note:

[01] Represents the instrument communication address;

[04] Represents function code 04;

[10] represents 10H (16) byte data;

[00 00 00 41 A0] = 20.0; / temperature value

[00 00 4120]= 10.0; // Main Measured Value

[00 00 42 C8] = 100.0; / / Temperature and Voltage Value

[00 00 43 48] = 200.0; / / Main measured voltage value

[81 E8] represents CRC16 check code;

Maintenance

According to the requirements of use, the installation position and working condition of the instrument are relatively complex. In order to ensure that the instrument is working normally, maintenance personnel should carry out regular maintenance on the instrument. Please pay attention to the following matters during maintenance:

- Check the working environment of the instrument. If the temperature exceeds the rated range of the instrument, please take appropriate measures; otherwise, the instrument may be damaged or its service life may be reduced;
- When cleaning the plastic shell of the instrument, please use a soft cloth and a soft cleaner to clean the shell.
- Check whether the wiring on the terminal of the instrument is firm. Pay attention to disconnect the AC or DC power before removing the wiring cover.

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