# Instructions of Remote Display Meter

GP-2000

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# **1. Product Introduction**

The remote display meter working data of the connected instrument through three signal input modes: HART, RS485, and HART+RS485. During use, the basic parameters of the connected instrument can also be viewed or modified through four programming buttons.

Advantages:

1. Convenient remote operation to ensure the personal safety of operators.

2. Easy and convenient installation.

Widely used in on-site display of radar level gauges, pressure transmitters, temperature transmitters, etc., the meter head can be set in multiple units: meters (m), centimeters (cm), millimeters (mm), feet (ft), inches (in), temperature (°C), pressure (KPa, MPa), etc

# 2. Product Parameters

Power supply	DC 24V		
Input signal	HART 、RS485、HART+RS485		
Output signal	4-20mA 、RS485、4-20mA+RS485		
Working temperature	-20-70°C		
Field operations	The 4 buttons on the display screen		
Cable inlet	M20*1.5		
Housing material	Engineering plastic		
Protection level	IP68		
Install	Screw fixing		
Alarm output	Relay output mode, default without		

# 3. Dimension



# 4. Wiring

## 4.1 Port introduction

Remove the screen display component of the meter LCD. It can be seen that the device has a total of 5 sets of wiring terminals. Among them, IN represents the 24V DC input terminal, OUT represents the 4-20mA current output terminal, terminals 1 and 2 are alarm terminals, terminals 3 and 4 are RS485 terminals, and terminals 5 and 6 are HART terminals.

# 4.2. Connect the HART instrument



# 4.3 Connect the RS485 instrument



## 4.4. Connect the HART + RS485 instrument



# 5. Main Interface Display Description

## 5.1 HART interface

When the input signal is set as HART signal and the measured instrument equipment with HART communication mode is connected with terminal 5/6, the main interface will be displayed as the HART device reading interface, as shown in the figure below. See item 6.1 for the parameters of the configured HART.



#### HART display interface

The HART display interface is: the output current of the HART meter is 18.886mA, the measured value is 0.836, unit is meter.

## 5.2 RS485 interface

When the input signal is set to the RS485 signal, and the measured instrument equipment is connected with the RS485 communication mode using the terminal 3 / 4, the main interface will be displayed as the RS485 interface. The interface can be divided into dual-channel display and single-channel display according to the currently configured parameters. The two channels are shown in the figure below. See item 6.2 for the parameters of the configured RS485.



RS485 dual-channel display interface is: the first channel value is 1.223 m. The value of the second channel is 4.815 m.



The RS485 single-channel display interface

RS485 single channel display interface is: currently select the first display channel, the value is 0.385, unit :meter.

## 5.3 HART + RS485 interface

When the input signal is set to HART + RS485 signal, connect the HART device with terminal 5 / 6 and the RS485 device with terminal 3 / 4, the HART + RS485 interface will be displayed on the main interface. The interface display is shown in the following figure. For HART + RS485 parameter set, see item 6.3.



The HART + RS485 display interface

The HART + RS485 display interface is: the currently connected HART meter measurement

value is 0.655 m. RS485 has a value of 3.321 in meters. On the right, R1 indicates RS485 primary channel, R2 indicates RS485 secondary channel, and H indicates HART.

## 5.4 Backlight display

The default is green backlight under normal condition and red backlight if alarm occurs.

# 6. Operation Settings

## 6.1. Connect the HART instrument

## 6.1.1. [Basic]

6.1.1.1[Input Signal]

Input signal: press [OK] to enter the setting interface, press [OK] to enter the [Basic], then press the [OK] key to enter the [Input Signal] project, select the required input signal through the [+] key and [▶] key, and then press the [OK] key to confirm.

(1) Set the [Input Signal] to HART



## 6.1.1.2[Output Signal]

Output signal: press [OK] to enter the setting interface, press [OK] key to enter the [Basic], select the output signal item through the [ $\triangleright$ ] key, press [OK] key to enter, select one of the "4-20 mA, RS485,4-20 mA + RS485" items, and press the [OK] key to confirm.

(1) Set the [Output Signal] to 4-20mA





## 6.1.1.3[Range Set]

Range Set: press [OK] to enter the setting interface, press [OK] to enter the [Basic], select the range setting project through the [ $\triangleright$ ] key, press [OK] to enter, modify the "High Calibration, Low Calibration" and select the editing parameter bit through the [+] key, and press the [OK] key to confirm.

(1) Set the URV and LRV (example set the LRV of 30m, the URV is 0m, actually set according to the connected HART instrument)



## 6.1.1.4[Damp Set]

Damp Set: press [OK] to enter the setting interface, press [OK] to enter the [Basic], select the damp set item through [ $\triangleright$ ] key, press [OK] to enter, press [ $\triangleright$ ] key to select the edit parameter bit, press [+] to modify the parameter value, and press [OK] to confirm.

(1) Set the damp (for example, set the damp of the HART meter to 0S, and actually set the corresponding HART meter damping time as needed)



6.1.1.5[Volume Set]

Volume set: press the [OK] to enter the setting interface, press the [OK] key to enter the [Basic], select the volume set item through the [ $\blacktriangleright$ ] key, press the [OK] key to enter, press the [OK] key again, and select "Enable, Disable" through the [+] key and [ $\blacktriangleright$ ] key.

Select the Vessel type project by [+] key,  $[\triangleright]$  key, press the [OK] key to enter, through the [+] key,  $[\triangleright]$  key select "rectangular vessel, columniform vessel, conical vessel, horizontal tank vessel" one of them, press the [OK] key to confirm to enter the setting parameters, such as: "rectangular container, set the corresponding length, width, (high: the height of the default liquid level)", the remaining three container parameters set the same operation.

Through  $[\triangleright]$  key select the quality measurement project, press [OK] to enter, press [OK] key again, through the [+] key,  $[\triangleright]$  key select "enable, stop", through the [+] key,  $[\triangleright]$  key select the density set the project, through the [+] key,  $[\triangleright]$  key input the density of the measured object, press [OK] key to confirm, note: quality measurement need to set the volume of the tank.

(1) Set, volume displayed as enabled (set to disabled. If you do not want to open the volume measurement, please select deactivate)



(2) Select the Vessel type as a rectangular Vessel, and set its parameters (the same goes for other containers. This parameter is not valid when the volume is disabled)





## 4.1.1.6[4mA CAL]

4mA Calibration: press the [OK] key to enter the setting interface, then press [OK] key to enter the [Basic] interface, find the 4mA calibration project through the  $[\bullet]$  key, and press the [OK] key to enter. Connect the two ends of the OUT through the external current measuring instrument, input the actual measurement value of the current measuring instrument to the equipment, and then press the [OK] key to complete the calibration.

Note: To make the data as accurate as possible, please calibrate it multiple times. (1) The current measured current is 4.3 mA and calibrated.



## 4.1.1.7[20mA CAL]

20mA Calibration: press [OK] to enter the setting interface, then press [OK] to enter the [Basic] interface, find the 20mA calibration project through [ $\triangleright$ ] key, and press the [OK] key to enter. Connect the two ends of the OUT through the external current measuring instrument, input the actual measurement value of the current measuring instrument to the equipment, and then press the [OK] key to complete the calibration.

Note: To make the data as accurate as possible, please calibrate it multiple times.

(1) The current measured current is 20.1mA and calibrated



## 4.1.1.8[Cur Sim]

Current simulation: press the [OK] key to enter the setting interface, then press the [OK] key to enter the [Basic] interface, find the current simulation project through the [**>**] key, and press the [OK] key to enter. At this time, the instrument will output

the current value displayed by the display screen and output it to the two ends of the OUT, which can be used to connect the OUT ends of the instrument. After the measurement, press [ESC] to exit.

Note: To ensure the accuracy of the current simulation, please conduct 4mA and 20mA calibration first.

## (1) Output simulation current is 4mA



## 6.1.2. [Advanced]

The following parameters are set only when the input signal is "RS485,4-20 mA + RS485" in these two modes (i. e., RS485 host mode).

Modbus Parameters: press [OK] to enter the setting interface, press  $[ \triangleright ] / [+]$  to select the professional setting item, and press [OK] to enter the Advanced setting interface. Then press [OK] to select the Modbus parameter item, reach the channel selection interface, select the channel to be set through  $[ \triangleright ] / [+]$ , and then press [OK] to enter the setting interface of the corresponding channel. Then the Modbus parameter is set according to the required parameters.

(1) In host mode, the slave address of 1 channel is 0x01, the function code is 0x03, the register address is 0x2040, the data type is FLOAT, and the byte order is MSB-> LSB. At this point, the device cycles the data of 01 03 20 40 00 02 CE 1F (Hex) to the RS485 slave before and after.



## 6.1.3 [Display Set]

## 6.1.3.1 [Language Set]

Language Set: press the [OK] key to enter the setting interface, select the display set item through the  $[\blacktriangleright]$  key, press the [OK] key twice to enter, select one of the "Chinese and English" through the [+] keys and  $[\blacktriangleright]$  keys, and press the [OK] key to confirm.

(1) Set the language to Chinese (set the same as English)



6.1.3.2 [Display Unit Set]

Display Unit Set: Press the [OK] key to enter the setting interface, select the display set item through the  $[\triangleright]$  key, select the display unit item through the  $[\triangleright]$  key, press the [OK] key to enter, select the unit corresponding to the connected HART instrument through the [+] key,  $[\triangleright]$  key, and press the [OK] key to confirm.

(1) The HART table or HART is not connected and cannot be recognized



(2) Identifiable HART instrument is connected (and set in m [ranging type HART Table])





## 6.1.4. [Info]

The customer of this project cannot modify it. If you need to modify it, please contact the manufacturer in advance.

# 6.2 Connect the RS485 instrument

## .6.2.1 [Basic]

6.2.1.1 [Input Signal]

Input signal: press [OK] to enter the setting interface, Press [OK] to enter the Basic settings, Press [OK] to select input signal items, Select the RS485 programming project through the [+] keys, [ $\checkmark$ ] keys, Press the [OK] key to confirm, Press [OK] again to confirm the entry, Set the corresponding Data ratio by the [+], [ $\checkmark$ ] keys, Select select unit items through [+] and [ $\checkmark$ ] keys, Press the [OK] key to enter, Select the required units "m, In, cm, mm, PSI, bar, Kba, Pa, KPa, atm, MPa, mA, °C, °F, °R, K, Ft" through the [+] key, [ $\checkmark$ ] key.

Note: The Data ratio and units are set to ensure that the data displayed is consistent with the external 485 instrument display.

(1) The input signal is set to RS485, and the Data Ratio is 1 in a unit of m (if this setting is made, it is set to the RS485 host mode, which only allows the local machine to send read or write access 485 devices, and will not respond to the active request of the 485 device)





#### 6.2.1.2 [Output Signal]

Output signal: press [OK] to enter the setting interface, press [OK] to enter the Basic, select the output signal item through [▶] key, press [OK] to enter, and press [OK] again to confirm.

Note: When the input signal is set to a signal containing RS485, the output signal under RS485 connection can only be set to 4-20mA.

(1) When the input signal is without RS485 signal (i. e. device slave mode), set the output signal to RS485 signal (set the same for other signals)



6.2.1.3 [Range Set]:operate as Range Set under "6.1.1, Basic"

6.2.1.4 [Damp Set]: operate as Damp Set under "6.1.1, Basic"

6.2.1.5 [Volume Set]: operate as Volume Set under "6.1.1, Basic"

6.2.1.6 [4mA CAL]: operate as 4mA CAL under "6.1.1, Basic"

6.2.1.7 [20mA CAL]: operate as 20mA CAL under "6.1.1, Basic".

6.2.1.8 [Cur Sim]: operate as Cur Sim under "6.1.1, Basic".

#### 6.2.2 [Advanced]

[Modbus Par]: operate as Modbus Par under "6.1.2, Advanced" Note: This is set under input signal only select RS485 or HART + RS485 mode (i. e. RS485 host mode).

#### 6.2.3 [Display Set]

[Language Set]: operate as language Set under 6.1.3, Display Settings.

[Display Unit Set]: For the HART instrument only, connect to the RS485 instrument only without modification.

#### 6.2.4 [Info]

The customer of this project cannot modify it. If you need to modify it, please contact the manufacturer in advance.

## 6.3 Connect HART+RS485 instrument

## 6.3.1 [Basic]

[Input Signal]: press [OK] key to enter the setting interface, press [OK] key to enter the Basic, then press [OK] key to select the input signal project, select HART + RS485 programming project through [+] key, the key of [ $\triangleright$ ] key, and press [OK] key to confirm. The setting of RS485 is the same as the setting of RS485 in the input signal under "6.2.1, Basic". **Note**: the unit set here refers to the unit connected to the RS485 instrument.

[Output Signal]: The output signal in this mode is only 4-20mA, so you do not need to set this item.

[Range Set]: only for the setting items of the connected HART instrument, the setting operation is the same as the Range Set under "6.1.1, Basic".

[Damp Set]: only for the setting items of the connected HART instrument, the setting operation is the same as the Damp Set under "6.1.1, Basic".

[Volume Set]: only for the setting items of the connected HART instrument, the setting operation is the same as the Volume set under "6.1.1, Basic".

[Alarm Set]: only for the setting items of the connected HART instrument, the setting operation is the same as the Alarm Set under "8, Alarm".

[4mA CAL]: the setting operation is the same as the 4mA CAL setting under "6.1.1 Basic".

[20mA CAL]: The setting operation is the same as the 20mA CAL setting under "6.1.1, Basic".

[Cur Sim]: the setting operation is the same as the Current Simulation setting

under "6.1.1, Basic".

#### 6.3.2. [Advanced]

[Modbus Par]: only for the connected RS485 instrument, press the [OK] key to enter the setting interface, select the Advanced setting project through the [ $\triangleright$ ] key, press the [OK] key twice to enter, modify the parameter value and select the parameter bit through the [+] key, and press the [OK] key to confirm. The specific setting method and the flow chart are consistent with the Modbus Par item setting method under 6.2.2 Advanced.

#### 6.3.3. [Display Set]

[Language Set]: the same as the language Settings under "6.1.3, Display Settings".

[Display Unit Set]: the same operation setting as the Display Unit Set under "6.1.3, Display Set". Note: for HART instrument only.

## 6.3.4. [Info]

The customer of this project cannot modify it. If you need to modify it, please contact the manufacturer in advance.

## 7. RS485 Setting Instruction

## 7.1 RS485 slave mode setting instruction

If the Output Signal is "RS485,4-20 mA + RS485", this product can be used as a slave, and the Modbus parameter shall be set.

Instrument address	0-255		
	Low 16 in the front high 16 in		
Byte order	the posterior		
	MSB →LSB		
	$LSB \rightarrow MSB$		

Note: The instrument address and byte order of the connected host shall correspond to the byte order of the instrument address of the product. The meaning of byte order is as follows: the lower 16 bits in the top 16 bits in the back indicates the 4 bytes of data, the lower 16 bits in the top 16 bits in the back, the MSBLSB indicates that the transmitted data high is in the front and back, and the LSBMSB indicates that

the transmitted data low is in the front and back.

## 7.2 RS485 host mode setting instruction

When the Input Signal is RS485, HART + RS485 mode, the product can be used as a host , and Modbus par and Modbus set shall be set.

#### 7.2.1. Host mode parameter setting:

Up to a 2-way read of the RS485 instrument data.

Slave address	Function Code	Register	Data type	Byte order
		address		
0xXX 0xXX 0xXX				Low 16 in the
				anterior high
	0VVVV		16 in the	
	UXAA	ΟΧΑΛΑΑ		posterior
				MSB→LSB
			$LSB \rightarrow MSB$	

Slave address: the instrument address you connected, check on site or according to the supporting instructions.

Function code: optional 03 or 04, according to the supporting instructions of the connected instrument.

Register address: query according to the supporting instructions of the connected instrument.

Data type: When the read data is 2 registers, Float and 1 register are selected for INT, which needs to be checked according to the supporting instructions of the connected instrument.

Byte order: MSBLSB is selected by default, according to the supporting instructions of the connected instrument.

For example:

The host machine sends the following data: 01 03 00 00 00 01 84 0A

01-The slave address, i. e., the address of the connection instrument.

03-function code, 03 means to read a register value, that is, the data of the instrument.

00 00-Start register address, read the register value starting from 0x00 00.

00 01-Number of registers, read 0x00 01 registers

84 0A-16-bit check code, the check mode is ModbusCRC16.

Machine-slave response data like: 01 03 02 19 98 B2 7E

01-The slave address of the data.

03-Function code, this data is consistent with the sent function code.

02-Number of bytes read. Represents a read up to 2 bytes.19 98-Register value, indicating that the value of the 1 register read is 0x 1998.B2 7E-16-bit check code, the check mode is ModbusCRC16.Note: The answered data will be displayed after host data processing.

#### 7.2.2 Actively issue data setting slave

This machine actively issues commands and changes the instrument data of the corresponding address connection.

Slave address	Function	Register	Number of	The written
Code		address	registers	data
0xXX	0xXX	0xXXXX	0xXX	0xXXXX

Slave address: the instrument address you need to set, check on site or check according to the supporting instructions.

Function code: optional 06 or 10, 06 is to write a single register, 10 is to write multiple registers (this product Up to 2 registers are allowed).

Register address: The register address that you need to modify. Check according to the supporting instructions.

Number of registers: when the function code is 06, only one register cannot be modified. When the function code is 10, two registers select the number to be modified.

Written data: the parameter values you want to change (hexadecimal number).

For example:

(1) 0x06 function code

Sent: 01 06 00 00 00 01 48 0A

01-The slave address, where the address of the written device is 0x01.

06-Functional code, indicating the modification of a single register.

00 00-Start address, indicating write to 0x00 00 starting address.

00 01-written data, indicating that the value of the write register is 0x00 01.

48 0A-16-bit check code, the check mode is ModbusCRC16.

Reply: 01 06 00 00 00 01 48 0A

01-The slave address, and the data is consistent with the sent slave address. 06-Function code, this data is consistent with the sent function code.

00 00-Starting address, the data is consistent with the sent starting address.

00 01-Data written to it. This data is consistent with the written data sent.

48 0A-16-bit check code, the check mode is ModbusCRC16.

(2) 0x10 function code

Sent: 01 10 00 00 00 01 02 1A 0A 2D 37

01-The slave address, indicating the address of the written device, 0x01.

10-Function code, indicating that multiple registers are written.

00 00-Start address, indicating that the start register address being written is  $0x00\ 00$ .

00 01-Number of registers, indicating that the number of registers being written is  $0x00\ 01$ .

02-Data size, where the total number of bytes written is 0x02.

1A 0A-Data written, indicating that the data to be written to the specified register is 0x1A0A.

2D 37-16-bit check code, the check mode is ModbusCRC16.

Reply: 01 10 00 00 00 01 01 C9

01-The slave address, the data is sent to the same slave address.

10-function code, the data sent by the same function code

00 00-Start address, the data is consistent with the sent starting address

00 01-Number of registers, the data is consistent with the sent slave address

01 C9-16-bit check code, the check mode is ModbusCRC16.

## 8. Alarm

## 8.1. Setting of the alarm parameters

Press [OK] to enter the setting interface, press [OK] to enter the Basic, select the alarm setting item through the [ $\blacktriangleright$ ] key, and press [OK] to enter. Press the [OK] key again and select the Up Limit Alarm programming item through the [+] key and [ $\blacktriangleright$ ] key. The Down Limit Alarm setting operation is the same as the Up Limit Alarm. Select the Alarm Value programming project through the [+] key and [ $\blacktriangleright$ ] key, press the [OK] key to enter, modify the parameter value and select the parameter bit, and press the [OK] key to confirm. The operation of setting the parameter is the same as the alarm value. For example, if the alarm value is set to 2m, the margin value is set to 2.5m, the alarm range is 2±0.5m. When the alarm value is set to 2m, the up limit alarm is higher than 2m, the alarm is the same.

(1) Set the alarm mode as the Up Limit Alarm (so too. If the alarm is not enabled, please set the alarm mode to the up limit alarm, the alarm value is 999.999)





## 8.2. Alarm instructions

Description: There are two alarm modes, namely Up Limit Alarm and Down Limit Alarm. When the alarm mode Up Limit Alarm is selected, if the trigger value exceeds the alarm value and the display displays a red backlight. Then, when the trigger value is less than the alarm value, the alarm will be lifted and the backlight will switch to green. When the alarm mode is selected as the Down Limit Alarm, if the trigger value is lower than the alarm value, the alarm will be triggered and the display screen shows red backlight. Then, when the trigger value exceeds the alarm value + Margin Value, the alarm will be lifted and the backlight will switch to green.

Trigger value: When the selected input signal contains HART (HART or HART + RS485), the trigger value corresponds to the HART data. If the selected input signal is RS485 only, the trigger value corresponds to the RS485 data.

# 9. 4-20 mA Output Description

When the input signal is selected to contain HART (HART or HART + RS485), the device will output the read current value as the 4-20mA current value. When the input signal is selected as RS485 only, 4-20mA will be divided into two conditions, namely, when only 1 or 2 channel is valid, the data of the corresponding channel will be taken as the reference value; when the double channel is valid, 1 channel data is taken as the reference value. Output current value calculation formula is: output value = (base value / | URV-LRV|) \* 16 + 4.

## 10. Example

#### **Example 1: Connect only the HART meter**

wiring:



#### **Operating process:**

(1) Press the [OK] key to enter the setting interface, press the [OK] key to enter the Basic, then press the [OK] key to enter the Input Signal project, select the required input signal through the [+] key and [ $\triangleright$ ] key, and then press the [OK] key to confirm. Set the input signal to HART completed. Then press two [ $\triangleright$ ] keys to select the range set item, press the [OK] key to enter the range set interface, set the range according to the known conditions and press the [OK] key to save. After quitting, select the damp set item through [ $\triangleright$ ], and then press [OK] to enter the damp set interface. After the setting according to the conditions. Press the [OK] key to save the data.

Note: If you do not want to change the data of the HART instrument under test, you only need the equipment to set the input signal to HART.





## Example 2. Connect the RS485 instrument

wiring:



#### **Operating process:**

After connecting the tested RS485 instrument, press [OK] to enter the setting interface, select the input signal item and press [OK] to enter the input signal setting interface. Pressing [ $\triangleright$ ] to select RS485 and pressing [OK]. Then you need to set the Data Ratio and units. Press [OK] to set the corresponding parameters and press [OK] to confirm and save the parameters. Adjust the Data Ratio and unit to ensure that the data displayed by the equipment is consistent with the data of the measured instrument, and then it is set.





## 11. Menu tree





