PHG-2091 Pro

pH ORP Analyzer

Operation Manual

SHANGHAI BOQU INSTRUMENT CO.,LTD

Address:No. 118 Xiuyan Road,Pudong New Area,Shanghai,
zip code:201315,China
Web:www.boquinstruments.com

Product description

The PHG-2091 Pro type pH online automatic analyzer is a brand new online intelligent analog meter independently developed and manufactured by Shanghai BOQU Instrument Co., Ltd. It has a built-in A/D conversion module and is compatible with a variety of analog signal electrodes. Complete functions, stable performance, easy operation, low power consumption, safety and reliability are the outstanding advantages of this instrument. This instrument is equipped with RS485 transmission interface, which can be connected to the upper computer through Modbus RTU protocol to realize monitoring and recording.
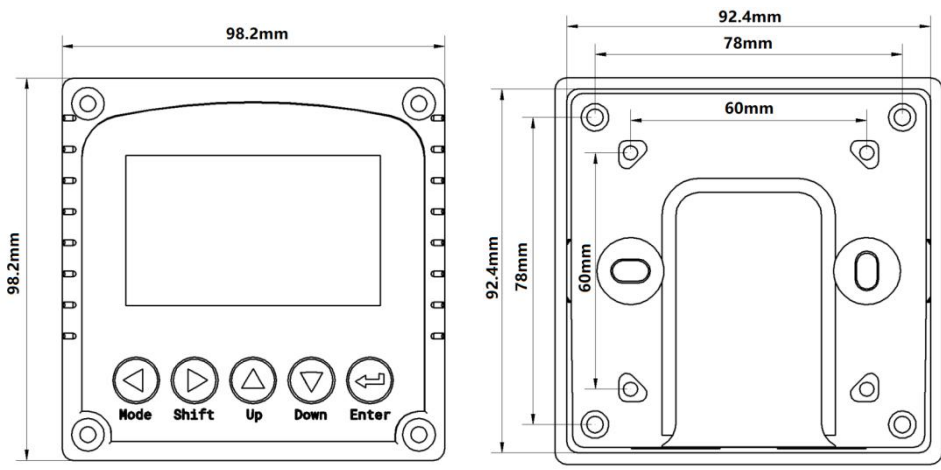
This meter uses a matching analog signal pH electrode (see appendix 2 for details), which can be widely used in solutions, wastewater pH or ORP values and temperatures in industrial occasions such as thermal power generation, chemical industry, metallurgy, environmental protection, pharmaceuticals, biochemical, food, and tap water. Continuous monitoring.
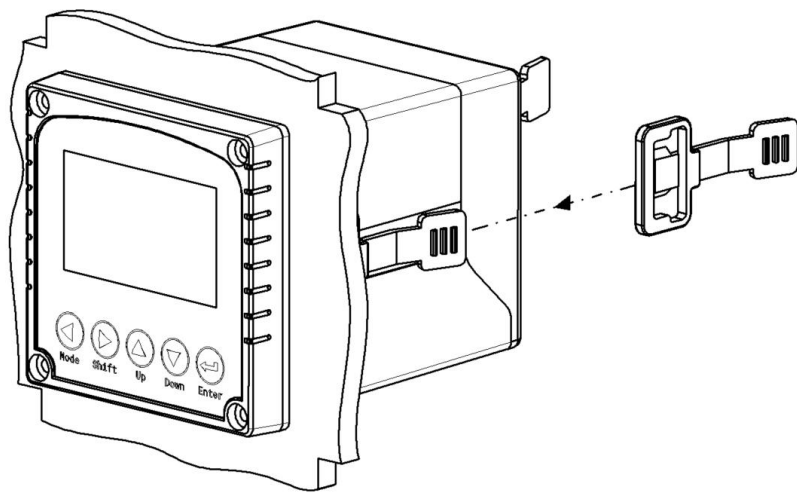
Product Specification Sheet

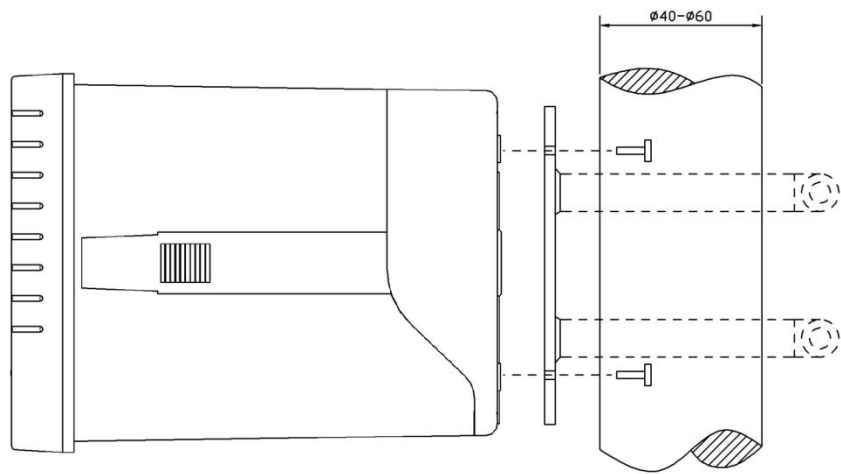| Specification	details
Name	pH meter
Shell material	ABS plastic
Power Supply	90 – 260V AC 50/60Hz
Power consumption	4W
Output method	Two 4-20mA outputs, RS485
Relay	5A/250V AC 5A/30V DC
Size	98.2×98.2×128.3mm
Weight	0.9kg
Communication	Modbus RTU
Measuring range	-2 ~16 pH -2000 ~2000 mV -30 ~130 ℃
Measurement accuracy	±1%FS ±0.5℃
Waterproof level	IP65

Installation and wiring

Instrument size chart

Embedded installation diagram

Pipeline installation diagram

Wiring diagram

01	AC_L	GND	11
		CL2+	12
02	AC_N	GND	13
		CL1+	14
03	GND	RS485_A	15
		RS485_B	16
04	NC	NC	17
05	S1_COM	TEMP2	18
06	S1_C	TEMP1	19
07	S1_O		
		REF	20
08	S2_COM	NC	21
09	S2_C	NC	22
		NC	23
10	S2_O	pH	24

POWER:90-260VAC 50/60Hz
4-20mA:Isolation MAX.Load 500Ω
Relay:5A/250VAC 5A/30VDC
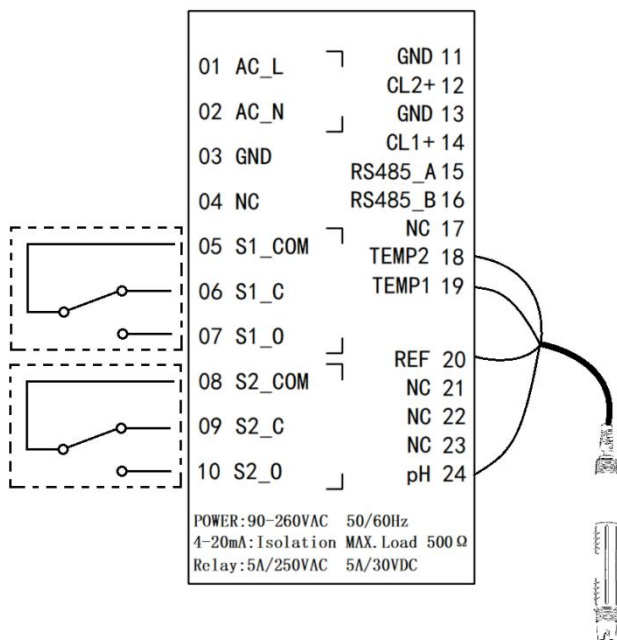
1. Operation panel

The main panel of the pH controller has 2 modules, the LED LCD display module and the button module.

The user can set and adjust the parameters of the instrument through the 5 keys on the panel.
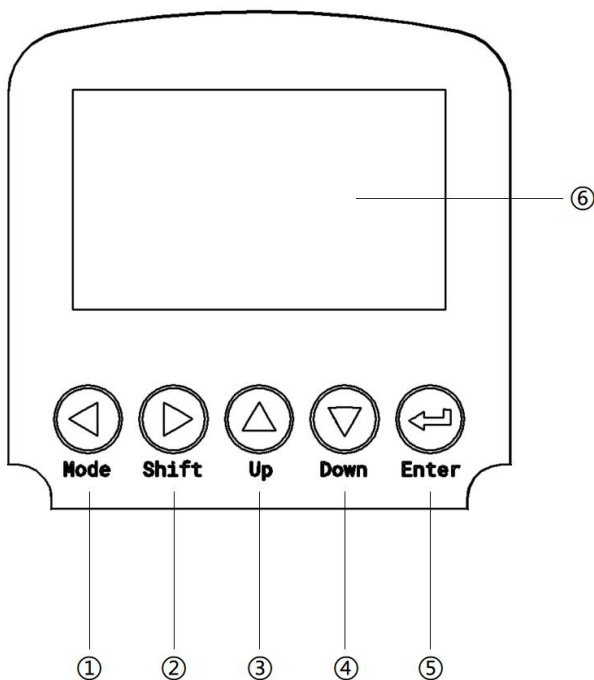

Figure 1 Measuring instrument operation panel

①   Set/Exit button

②   Select/change button

③   Up selection button

④   Down selection button

⑤   Confirm button

⑥   Instrument display

1. Measurement interface

After the start-up animation ends, enter the main measurement interface.

When the meter is working normally, the LED display shows the following contents.
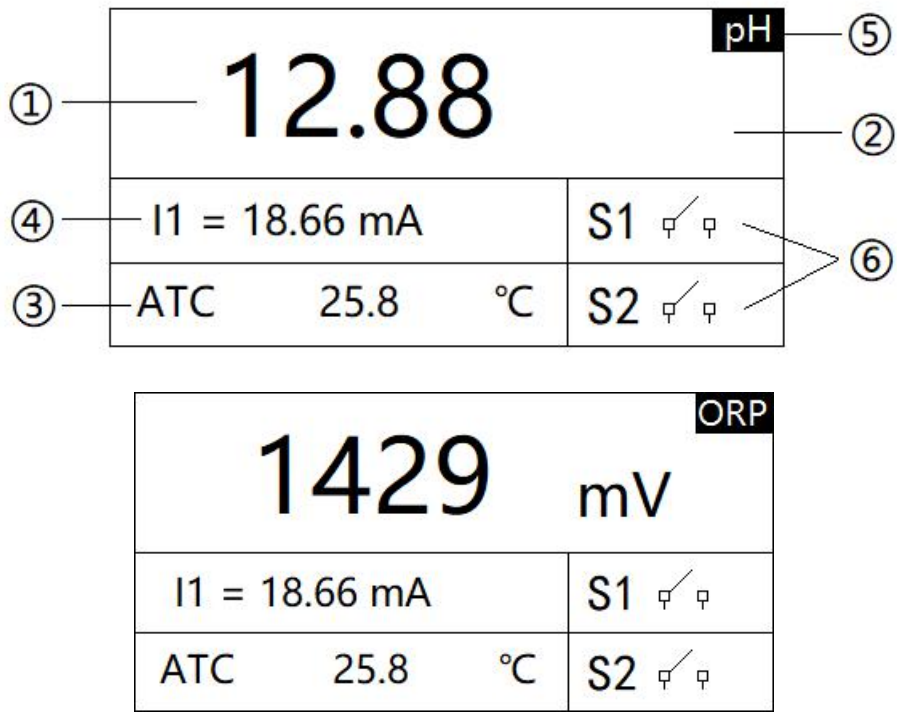

Figure 2 The main interface of measurement display

① Measurement reading
② Measurement unit
③ Measure temperature
④ pH/ORP The corresponding value of 4-20mA
⑤ Measurement mode
⑥ Over/low limit alarm prompt

Three, settings

Press the "Set/Exit button" to enter the password input interface.

PASSWORD

0000
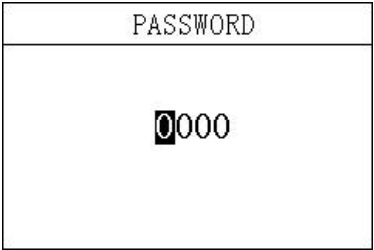
Figure 3 Enter the password

Enter settings:

Enter the password "3700" to enter the setup menu.


```
        SETUP                    SETUP
  1. Measure              7. Relay2
  2. 4-20mA               8. Language

  3. RS485                9. Backlight
  4. Temp                 10. Factory

        SETUP
  5. Relay1 Func.
  6. Relay1
```

Figure 4 Setting menu

3.1 Measurement settings

Under this menu, the user can change the measurement method pH / ORP.


```
          Measure
  Mode:  ▶ pH
              ORP
```

Figure 3.1 Measurement settings

3.2 4-20mA setting

In this menu, the user can change the corresponding value of 4-20mA and set the corresponding effective range.

4-20mA	Measure Value	Temp
▶ Measure Value	4mA : 00.00 mg/L	4mA : ⊞ 000 ℃
Temp	20mA : ▮4.00 mg/L	20mA : + 100 ℃

Figure 3.2 4-20mA setting

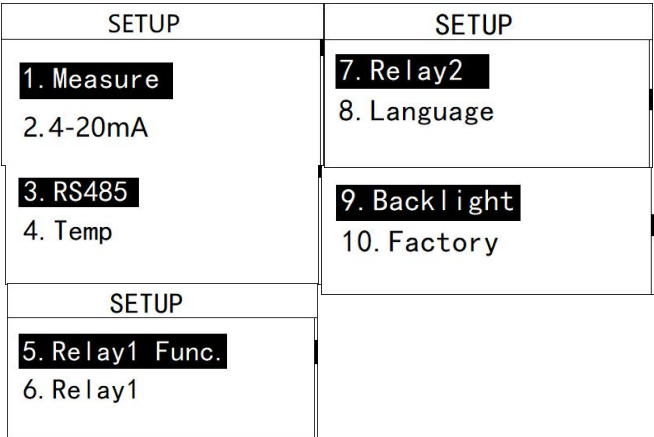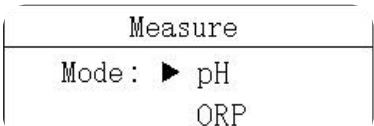## 3.3 Communication settings

In this menu, the user can change the communication address and communication speed.

Modbus RTU	Address	
▶ Address	▯01	▶ 4800 bps
B. R.		9600 bps
		19200 bps

Figure 3.3 Communication settings

3.4 Temperature setting

In this menu, the user can change the temperature compensation type and set the temperature manually.

Temp	Sensor	MTC
▶ Sensor	▶ NTC22k Pt1000	⊞025.0℃
MTC	NTC10k	

Figure 3.4 Temperature setting

3.5 Relay 1 setting

In this menu, the user can switch the relay 1 function, set the parameter alarm upper limit, alarm return difference, and alarm delay time.

```
           Relay1
   Func. :     ON
            ▶ OFF
   High : 10. 00 pH
   Hyst : 1. 00  pH
   Delay : 030 S
```

Figure 3.6 Relay 1 setting

3.6 Relay 2 setting

In this menu, the user can switch the relay 2 function, set the parameter alarm lower limit, alarm return difference, and alarm delay time.

Figure 3.7 Relay 2 setting

3.7 Language setting

In this menu, users can change the language of the system interface. Simplified Chinese and English are built-in.

Figure 3.11 Language setting

3.8 Backlight setting

In this menu, the user can change the backlight mode of the LCD screen, choose whether the backlight is always on or delay off (the default is delayed off), change the backlight brightness (brightness level 1-5, brightness increase), and change the contrast.

Figure 3.12 Backlight setting

3.9 Restore factory settings

In this menu, users can restore all current output and relay parameters to factory parameters.

Figure 3.13 Restore factory settings

Four, calibration

Press the "Set/Exit button" to enter the password input interface.

Figure 5 Enter the password

Enter calibration:

Enter the password "3900" to enter the calibration menu.

Figure 6 Calibration menu

4.1 Automatic calibration

In this menu, users can use standard solutions to calibrate the instrument at two points.

Figure 4.1 Automatic calibration

4.2 Manual input calibration

In this menu, users can calibrate the pH of the known solution by themselves.

```
┌─────────────────────────────┐
│        Manual Cal           │
├───────────────┬─────────────┤
│   7. 16 pH    │             │
│   -9.6  mV    │   0█. 00    │
│   25. 7 ℃     │             │
├───────────────┴─────────────┤
│     Please Press Enter      │
└─────────────────────────────┘
```

Figure 4.2 Manual calibration

4.3 Three-point calibration

Put the electrodes into the standard solution of the specified concentration in order, and press the confirm key after the data is stable.

```
┌──────────────────────┬───┐
│   Three Point Cal    │ 1 │
├──────────────┬───────┴───┤
│   7. 16 pH   │           │
│   -9.6  mV   │  0█. 00   │
│   25. 7 ℃    │           │
├──────────────┴───────────┤
│        Press Enter       │
└──────────────────────────┘
┌──────────────────────┬───┐
│   Three Point Cal    │ 2 │
├──────────────┬───────┴───┤
│   7. 16 pH   │           │
│   -9.6  mV   │  0█. 00   │
│   25. 7 ℃    │           │
├──────────────┴───────────┤
│        Press Enter       │
└──────────────────────────┘
┌──────────────────────┬───┐
│   Three Point Cal    │ 3 │
├──────────────┬───────┴───┤
│   7. 16 pH   │           │
│   -9.6  mV   │  0█. 00   │
│   25. 7 ℃    │           │
├──────────────┴───────────┤
│        Press Enter       │
└──────────────────────────┘
```

Figure 4.3 Three-point calibration

4.4 Buffer group

It is possible to modify the buffer standard set used in electrode calibration.

```
┌─────────────────────────────┐
│      Buffer Group           │
├─────────────────────────────┤
│  ▶ JJG  Buffer              │
│    NIST Buffer              │
│                             │
│                             │
├─────────────────────────────┤
│   4.00  6.86  9.18          │
└─────────────────────────────┘
```

Figure 4.4 Buffer group

4.5 Electrode status

You can view the current zero potential millivolt value and slope of the electrode.

```
┌─────────────────────────────┐
│      Electrode State        │
├─────────────────────────────┤
│    Offset : -2.6 mV         │
│    Slope :   98 %           │
│                             │
│                             │
│                             │
└─────────────────────────────┘
```

Figure 4.5 Electrode status

4.5 Restore factory settings,

The calibration parameters can be initialized to factory parameters.

```
┌─────────────────────────────┐
│                             │
├─────────────────────────────┤
│      Factory Reset          │
│         ▶ YES               │
│           NO                │
│                             │
│                             │
└─────────────────────────────┘
```

Figure 4.5 Restore factory settings

Appendix

1. Communication protocol

Communication parameters:

Baud rate: 4800, 9600, 19200 (default is 9600)

      Serial data format: 8N1 (8 data bits, no parity, 1 stop bit)

Function code: 03

Device address: pH/ORP controller defaults to 1

Register definition:

Register address	Register definition	R/W	illustrate
0,1	Temp	R	℃，Float CDAB
2,3	pH	R	Float CDAB
4,5	mV	R	mV，Float CDAB
7	Temperature mode	R/W	1:ATC 2:MTC
12	RTU Address	R/W	Modbus mailing address，pH/ORP Default is 1
11	Baud rate	R/W	4800，9600，19200，The default is 9600

Detailed example of communication format:

Data read instruction:

Address + function code + register start address + register read number + CRC check code (hexadecimal)

For example Tx: 02 03 00 02 00 02 65 F8

address	function code	Register start address	Number of read registers	CRC Check code
02	03	0002	0002	65F8

Data return instruction:

Address + function code + data length + data + CRC check code (hexadecimal)

For example, Rx: 02 03 04 40 0E B8 52 4E CD

address	function code	Data length	Measured value	CRC Check code
02	03	04	400EB852	4ECD

Convert the hexadecimal number 400EB852 (note the data format) to decimal by a floating-point number converter, and get the value 2.23

Hexadecimal number transfer decimal floating point number

Hexadecimal number: 400EB852

$40 $0E $B8 $52

decimal floating point number: 2.23000001907349

2. Electrode parameter table for industrial online pH controller

Electrode type	pH/ORP				ORP
Model	pH8012	pH8012F	pH8010	pH8010F	ORP8083
Range	0.00~14.00pH		-1000~1000mV		-1000~1000mV
Temp	0.0~80.0°C				
Accuracy	2%，±0.5°C		2%		2%
Pressure	0.06MPa				
IP	IP68/NEMA6P				
Theoretical slope	≥95%				