ALTEC®

pH/ORP CONTROLLER
PH/ORP800

INSTRUCTION MANUAL

Table of Contents

1 Introduction

The PH/ORP800 pH/ORP controller is used for measuring and controlling either pH or ORP parameters.

The controller is ideal for applications such as water treatment and monitoring, electroplating, chemical processing, food processing, wastewater treatment, etc...

The controller is waterproof and acid/alkali resistant designed.

2 Order Code

PH/ORP800/ □ / □

Comms

0	None
232	RS232, 3 wires, Optical Isolation, Comms distance:15m
485	RS485, 2 wires, Optical Isolation, Comms distance:1.2km
BS	Process Value(PV) Transmission

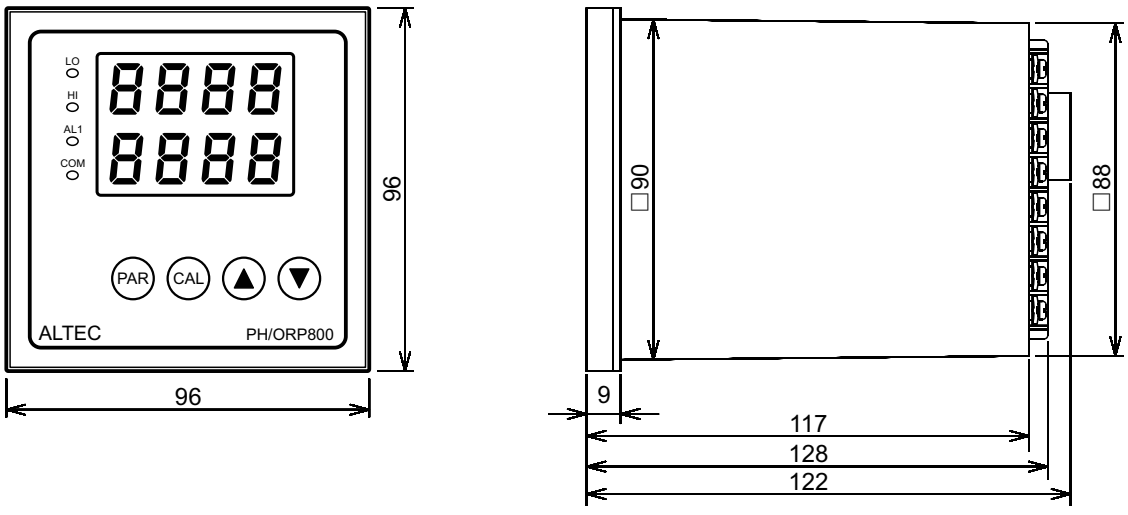
Display

LCD	LCD display
LED	7-segment LED display

e.g. PH/ORP800/LED/485 with LED display and RS485 communication function.

3 Mounting

3.1 Outline Dimensions

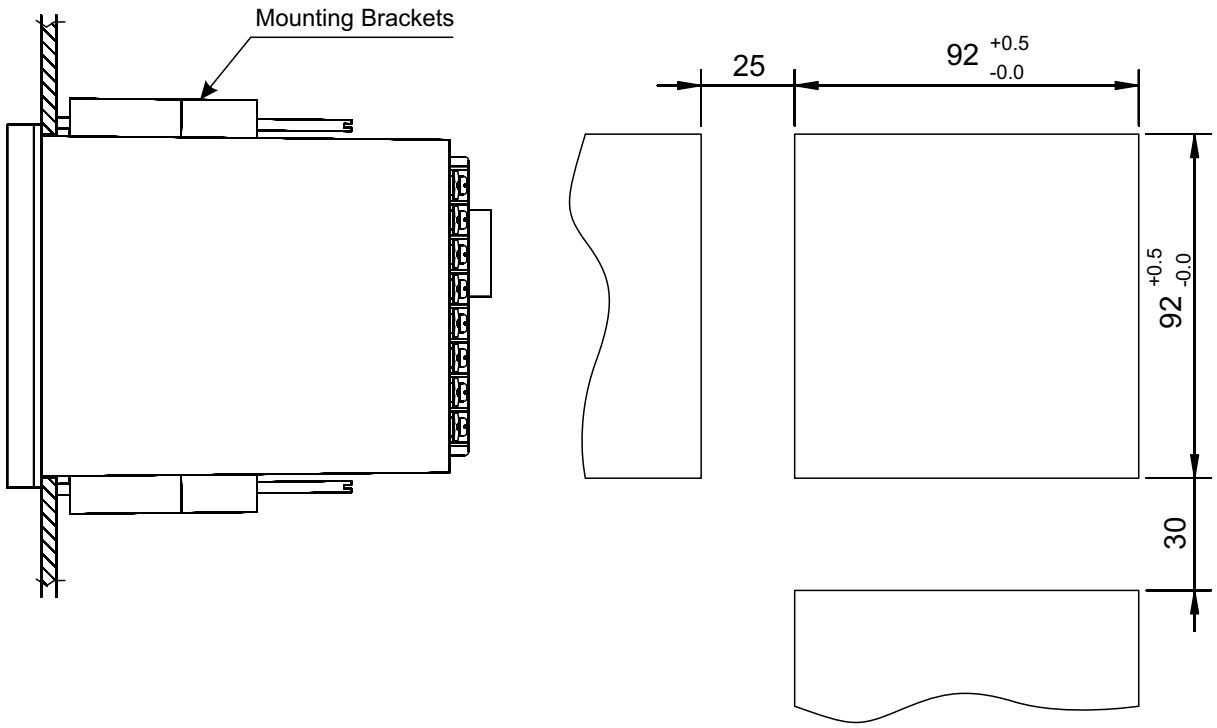


3.2 Mounting

1). Prepare a square cut-out in the mounting panel to the size shown below. If a number of controllers are to be mounted in the same panel they should be spaced as shown.

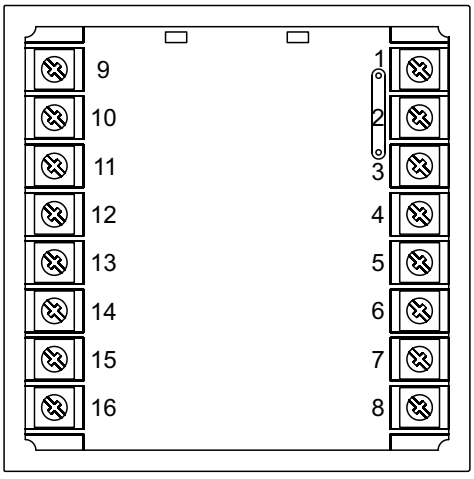
2). Insert the controller through the cut-out.

3). Catch the mounting brackets to the holes top and bottom of the case, and screw to fix.



4 Electrical Connections

4.1 Rear Terminals Layout

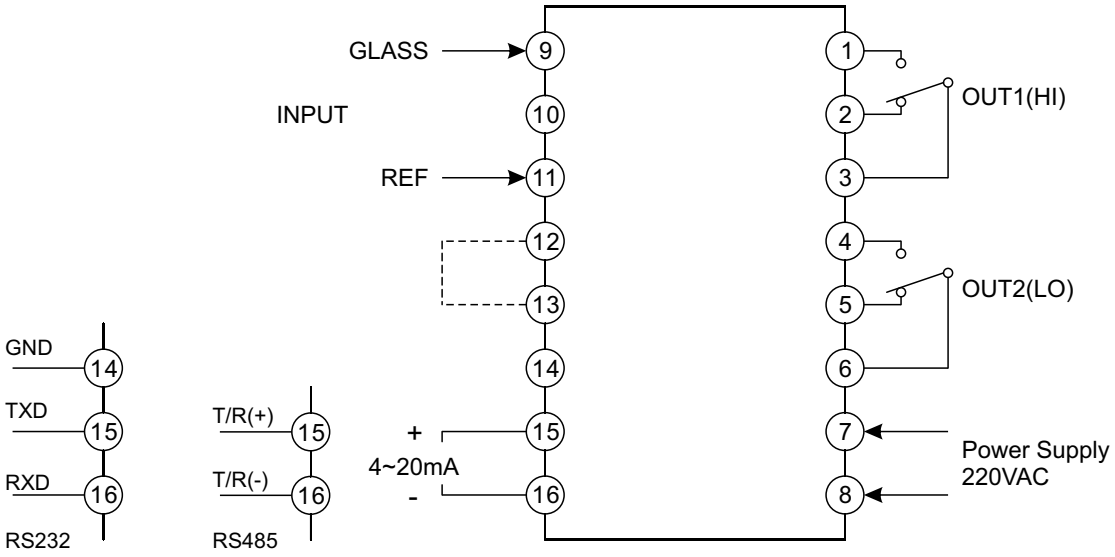


Notice

● In order to avoid electrical noise to the input signal, the signal line should be separated from the power and load lines.

● The electrode signal transmission to be used specific cables, can not be replaced arbitrarily.

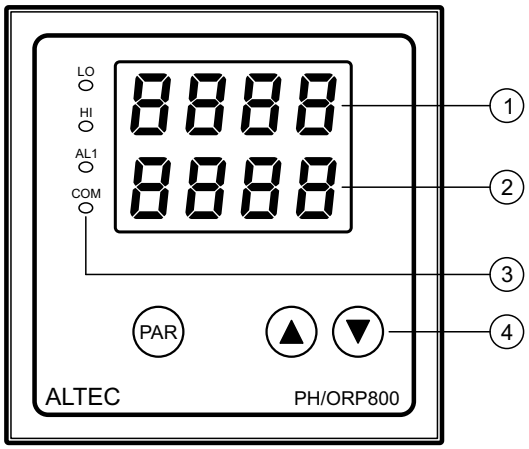
4.2 Wiring



4.3 Comments on Terminals

Terminal #	Comments
9	GLASS, connect the central line of the PH/ORP electrode
11	REF, connect the shield line of the pH/ORP electrode
14, 15, 16	4~20mA output, PV transmission, recorder connection, digital communication
1, 2, 3	OUT1(HI), pH high action relay
4, 5, 6	OUT2(LO), pH low action relay
7, 8	Power supply, 200~240V AC

5 Operator Interface



SN	Item	Description
①	PV Display	Indicates the Process Value and parameter mnemonic
②	SV Display	Indicates the setpoint, parameter values, alarm codes
③	LO	pH Low indicator
	HI	pH High indicator
	AL1	Alarm 1 indicator(red)
	COM	Communication indicator(red)
④	PAR	Parameter setting key
	▲	Raise key
	▼	Lower key

6 Operation

6.1 Overview

There are two LED displays indicate the operating parameters.
The **upper display** indicates the Process Value(PV) when in base condition. On selecting a parameter, the appropriate parameter abbreviation appears.

The **lower display** indicates the Setting Value(SV), and alarm codes, on selecting a parameter, the appropriate parameter value appears here.

When the controller is powered on, the upper display indicates the model code of the controller, and the lower display indicates the software version.

The LED indicators indicate the current status of the controller.
LO : lit when relay OUT1 activates. (adding acid)
HI : lit when relay OUT2 activates. (adding alkali)
AL1 : When the alarm is active, the indicator will be lit.
COM: This indicator will flash when the controller is in active communication with a host computer.

6.2 Low Alarm Value(LoAL) Adjusting

During the basic functioning, the upper display indicates the Process Value(PV), the lower display indicates the “Low Alarm value”.

Press keys ▲ or ▼ to increase or decrease the “low alarm value”(LoAL). Keeping it pressed results in a progressively faster variation.

6.3 Modifying the Operation Parameter

When the controller is in the PV/SV displaying status, press PAR key and hold for 3 seconds reveals the first parameter. The parameter value can either be modified with the ▲ or ▼ key, or left unmodified. Press PAR key again, the next parameter and its current value appears, the modified data has been saved in the memory.

If the last parameter is displayed or there’s no key operation within 16 seconds, the menu times out automatically.

Operation Parameter List

S.N.	Mnemonic	Parameter	Adjustable Range		Comments
			PH	ORP(mV)	
1	HiAL	Full-scale High Alarm	0.00~14.00	-999~1000	
2	Hb	High Alarm Hysteresis	0.01~4.50	1~999	
3	LoAL	Full-scale Low Alarm	0.00~14.00	-999~1000	
4	Lb	Low Alarm Hysteresis	0.01~4.50	1~999	
5	Addr	Instrument Address	0.0~9.9		Appears if digital comms function is available
6	bAud	Baud Rate	1200 2400 4800 9600 19.2		
7	Sn	Input Signal	PH orP		
8	CAL	Input Signal Calibration	P1 P2		

Notes on Parameters

1). Input Signal – Sn

The parameter Sn should be set to the correct sensor type the controller connected, otherwise the measured value will be incorrect.
For pH measurement, set Sn to value PH.
For ORP measurement, set Sn to value orP.

2). High & Low Alarm – HiAL, LoAL

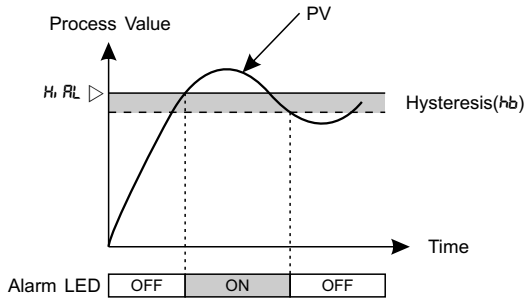
● When PV > HiAL, relay **OUT1** activates, indicator **HI** will be lit. In pH value control applications, **OUT1** should be used to control the acid adding devices.

● When PV < LoAL, relay **OUT2** activates, indicator **LO** will be lit. In pH value control applications, **OUT2** should be used to control the alkali adding devices.

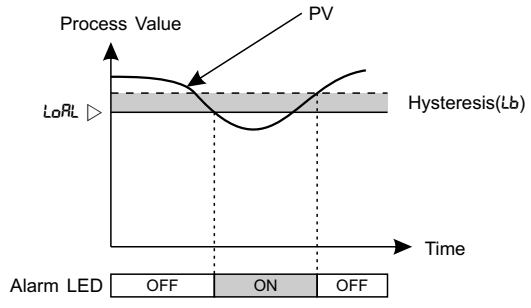
3). Alarm Hysteresis – Hb, Lb

The hysteresis prevents relay rapid contact switching(chatter) if the Process Value is fluctuating near the setpoint. See the figure below.

Full-scale High Alarm(HiAL)



Full-scale Low Alarm(LoAL)



7 Calibration

7.1 pH Calibration

The PH/ORP800 pH/ORP controller uses two-points calibration.

Before calibration:
1). Set parameter Sn to PH.

2). Prepare two preset standard buffers with pH value 4.00 and 9.18.

2). Prepare 3 to 4 beakers, wash with distilled water and dry with filter paper.

3). Wash and dry the electrode.

4). Pour the prepared buffer in the clean beakers respectively.

1). P1 Calibration

Step	Button Operation	Display
1	Immerse the pH electrode in the buffer solution with pH value 4.00. Wait until the display stabilizes.	
2	Press PAR key until CAL appears in the upper display	CAL ----
3	Press ▲ key, P1 appears in the lower display	CAL P1
4	Press PAR key, the number in the lower display will be the value after adjustment assigned to the injected input signal	P1 3.00
5	Press ▲ and ▼ key to adjust the number in the lower display until it corresponds to the pH value of the buffer solution.(here is 4.00)	P1 4.00
6	Press PAR key	4.00 no
7	Press ▲ key to affirm	4.00 YES
8	Press PAR key, P1 appears in the upper and lower display at the same time	P1 P1
9	5 seconds later, the scaling of the 1st point is completed	CAL ----

2). P2 Calibration

Step	Button Operation	Display
1	Remove the electrode from the first buffer, wash and then immerse into the buffer with pH value 9.18.	
2	Press PAR key until CAL appears in the upper display	CAL ----
3	Press ▲ key until P2 appears in the lower display	CAL P2
4	Press PAR key, the number in the lower display will be the value after adjustment assigned to injected input signal	P2 4.00
5	Press ▲ and ▼ key to adjust the number in the lower display until it corresponds to the pH value of the buffer solution (here is 9.18)	P2 9.18
6	Press PAR key	9.18 no
7	Press ▲ key to affirm	9.18 YES
8	Press PAR key, P2 appears in the upper and lower display at the same time	P2 P2
9	5 seconds later, the scaling of the 2nd point is completed	CAL ----

7.2 ORP-mV Calibration

Before the calibration, prepare a standard mV signal generator and set the parameter Sn to orP.

1). P1 Calibration

Step	Button Operation	Display
1	Connect source.(form signal generator or sensor to input terminals) Apply a signal equal to 0.0mV.	
2	Press PAR key until CAL appears in the upper display	CAL ----
3	Press ▲ key, P1 appears in the lower display	CAL P1
4	Press PAR key, the number in the lower display will be the value after adjustment assigned to the injected input signal	P1 30
5	Press ▲ and ▼ key to adjust the number in the lower display until it equals 0	P1 0
6	Press PAR key	0 no
7	Press ▲ key to affirm	0 YES
8	Press PAR key, P1 appears in the upper and lower display at the same time	P1 P1
9	5 seconds later, the scaling of the 1st point is completed	CAL ----

2). P2 Calibration

Step	Button Operation	Display
1	Apply a signal equals to 500.0mV for the second setup point(P2)	
2	Press PAR key until CAL appears in the upper display	CAL ----
3	Press ▲ key until P2 appears in the lower display	CAL P2
4	Press PAR key, the number in the lower display will be the value after adjustment assigned to injected input signal	P2 30
5	Press ▲ and ▼ key to adjust the number in the lower display until it equals 500	P2 500
6	Press PAR key	500 no
7	Press ▲ key to affirm	500 YES
8	Press PAR key, P2 appears in the upper and lower display at the same time	P2 P2
9	5 seconds later, the scaling of the 2nd point is completed	CAL ----

8 Digital Communication

8.1 Overview

Digital Communication allows the controller to communicate with a PC or a networked computer system.

The RS232 standard allows a single instrument to be connected to a PC, a Programmable Logic Controller, or a similar devices using a cable length of less than 15m.

The RS485 standard allows one or more instruments to be connected(multi-dropped) using a two wire connection, with cable length of less than 1200m. 31 Instruments and one "Master" may be connected in this way.

RS485 is recommended for plant installation.

8.2 Data Format

1 start bit
7 data bits
even parity
1 stop bit

8.3 Baud Rate(bps)

300, 600, 1200, 2400, 4800, 9600, and 19.2k.

8.4 Control Characters

ASCII-HEX	Control Sign	Comments	ASCII-HEX	Control sign	Comments
02	<STX>	Start of text	30	0	
03	<ETX>	End of text	31	1	
04	<EOT>	End of transmission	32	2	
05	<ENQ>	Enquiry	33	3	
06	<ACK>	Positive acknowledge	34	4	
15	<NAK>	Negative acknowledge	35	5	
20		Space	36	6	
2D	-	Minus sign	37	7	
2E	.	Decimal point	38	8	
3E	>	Greater than	39	9	

8.5 Reading Data from the Controller

To read data, a 'poll' message is issued to the instrument. This message takes the following format:

[EOT](ADR_H)(ADR_H)(ADR_L)(ADR_L)(C1)(C2)**[ENQ]**

Each item in the above description represents a single ASCII character. The items in bold type and square brackets are control characters used to frame the message, whose values may be determined by reference to the table on the previous page. The bracketed item in normal type have the following significance:

ADR_H The first digit of the instrument address, the ADR_H is sent twice, as a validation mechanism.
e.g. '1'(31 HEX) for instrument address 12.
'0'(30 HEX) for instrument address 01.

ADR_L The second digit of the instrument address, the ADR_L is sent twice, as a validation mechanism.
e.g. '2'(32 HEX) for instrument address 12.
'1'(31 HEX) for instrument address 01.

C1 The first character of the mnemonic for the parameter being accessed, e.g. 'P' for Process Variable.

C2 The second character of the mnemonic for the parameter being accessed, e.g. 'V' for Process Variable.

If the instrument receives the message correctly and the mnemonic is valid it will reply with:

[STX](C1)(C2)<DATA>**[EXT]**(BCC)

C1, C2 Echo of the mnemonic from the poll message.

DATA The value of the parameter in a given display format.
e.g. 99.9, 7.2, -999, >1234 etc.

BCC This is a block checksum that is generated for data validation. It is computed by XORing(exclusive or) all the characters after and excluding the STX, and including the ETX. Note that it may take the value of 'EOT' and care must be take when writing a protocol driver to ensure that this is not seen as an 'End of Transmission' sequence.

Example of a Parameter Read

For example, when reading PV(i.e. measured tension) from instrument at address 01, the following sequence of character will be sent and received:

Master:

ASCII:	EOT	0	0	1	1	P	V	ENQ
HEX:	04	30	30	31	31	50	56	05

If the measured value is 6.89 at address 01, the instrument returns:

Instrument:

ASCII:	STX	P	V		6	.	8	9	ETX	BCC
HEX:	02	50	56	20	36	2E	38	39	03	3C

8.6 Writing Data to the Controller

To write data, a 'select' message is issued to the instrument. This message takes the following format:

[EOT](ADR_H)(ADR_H)(ADR_L)(ADR_L)**[STX]**(C1) (C2)<DATA>**[ETX]**(BCC)

Each item in the above description represents a single ASCII character. The items in bold type and square brackets are control characters used to frame the message, whose values may be determined by reference to the table on Page 1. The bracketed item in normal type have the following significance:

ADR_H The first digit of the instrument address, the ADR_H is sent twice, as a validation mechanism.
e.g. '1'(31 HEX) for instrument address 12.
'0'(30 HEX) for instrument address 01.

ADR_L The second digit of the instrument address, the ADR_L is sent twice, as a validation mechanism.
e.g. '2'(32 HEX) for instrument address 12.
'1'(31 HEX) for instrument address 01.

C1 The first character of the mnemonic for the parameter being accessed, e.g. 'P' for Process Variable.

C2 The second character of the mnemonic for the parameter being accessed, e.g. 'V' for Process Variable.

DATA The value of the parameter in a given display format. e.g. 99.9,1.2, -999, >1234 etc.

BCC This is a block checksum that is generated for data validation. It is computed by XORing(exclusive or) all the characters after and excluding the STX, and including the ETX.

If a parity or a address format error is detected, the instrument will not reply. Otherwise, the instrument will reply with either:

[NAK] Failed to write:BCC is incorrect, or Parameter not available or not configured, or Parameter is read only, or attempt has been made to read a parameter that is outside limits.

OR

[ACK] Parameter write was successful.

Example of a Parameter Write

For example, when writing a value of 7.50 to the SV(Setting Value) to an instrument at address 01, the following sequence of character will be sent and received:

Master:

ASCII:	EOT	0	0	1	1	STX	S	L		7	.	5	0	ETX	BCC
HEX:	04	30	30	31	31	02	53	4C	20	37	2E	35	30	03	20

If the modification of SV was successful, the instrument returns:

Instrument:

ASCII:	ACK
HEX:	06

8.7 Communication Parameters List

SN	Order	ASCII/HEX	Mnemonic	Parameter	Adjustable Range
1	PV	50 56		Process Value(Read only)	
2	OP	4F 50		Output Power(Read only)	0~100.0%
3	SL	53 4C		Setting Value	0.01~14. 00
4	Hi	48 69	HI, RL	High Alarm Value	0.01~14. 00
5	Hb	48 62	hb	High Alarm Hysteresis	0.01~14. 00
6	Lo	4C 6F	LoRL	Low Alarm Value	0.01~14. 00
7	Lb	4C 62	Lb	Low Alarm Hysteresis	0.01~14. 00

9 Maintenance

In general applications, there is nearly no needs of maintenance for the PH/ORP800 controller.

The measure and control accuracy always depend on the accuracy of the pH electrodes. About the maintenance of the pH electrode, please refer to its instruction manual for details.

Appendix A: ASCII Table

MSD / LSD	0	1	2	3	4	5	6	7
0	NUL	DLE	SPACE	0	@	P	`	p
1	SOH	XON	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	XOFF	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	S1	US	/	?	O	_	o	DEL

Technical Data

Input	PH/ORP Probe	
Measurement Range	PH	0.0~14.00pH
	ORP(mV)	-1999~1999mV
Resolution	PH	±0.01pH(±1digit)
	ORP(mV)	±0.2%(±1digit)
Sample Rate	125ms	
Calibration	2 Points	
Control Algorithm	Hi/Lo control, (Relay, NO, max.250VAC/3A)	
Communications	RS-232, RS485	
Transmission	Isolated 4~20mA, corresponding PV range programmable, max load 500Ω	
Display	LCD, 7-seg LED	
Power Supply	85~264VAC; 45/60Hz	
Environmental	Temperature: 0~50°C, Rel. Humidity: ≤85%	
Dimensions	96×96×125mm(W×H×D)	
Panel cut-out	92×92mm(W×H)	