SH5800R Type
pH (ORP) analyzer
Instruction Manual

Ohkura

WXPSH5800R01E
1st Edition
Sep. 2007

For safety using

Thank you for purchasing our type SH5800R pH (ORP) Analyzer.
In order to this analyzer to exhibit all of its functions effectively and correctly, read and understand this instruction manual thoroughly before using the analyzer.

BE SURE TO OBSERVE THE FOLLOWING WARNINGS/CAUTIONS AND THOSE PROVIDED IN THE TEXT IN ORDER TO SECURE SAFETY IN HANDLING THE ANALYZER.

⚠ WARNING

General	Be sure to disconnect this analyzer from the main power source in order to prevent an electric shock.
Protective Grounding	(1) In order to prevent an electric shock; be sure to provide protective grounding prior to turning on this analyzer. (2) Do not cut a protective grounding conductor or disconnect protective grounding.
Power Source	(1) Make sure that the supply voltage for this analyzer conforms to the voltage of the supply source. (2) Attach a protective cover prior to turning on this analyzer.
Working Environment	Do not operate this analyzer in the environment where it is exposed to a combustible/explosive/corrosive gas or water/steam.
Input and Output Wiring	Provide input and output wiring after turning off the power.

⚠ CAUTION

Input and Output Wiring	Do not use empty terminals for other purposes such as relaying, etc.
Inside of Instrument	Do not touch inside this analyzer. Also, do not replace the main unit or printed circuit boards. When this is neglected, we cannot guarantee functioning of the analyzer. Contact our dealer where you purchased the analyzer, or our sales representative.
Transportation	Take precautions when transporting or moving the analyzer or the equipment with this analyzer installed.

[Note]

Instruction Manual

(1) Deliver this instruction manual to an end user.

(2) Prior to handling this analyzer, be sure to read this manual.

(3) If you have any questions on this manual or find any errors or omissions in this manual, contact our sales representative.

(4) After reading this manual, keep it carefully by the analyzer.

(5) When the manual is lost or stained, contact our sales representative.

(6) It is prohibited to copy or reproduce this manual without our permission.

Installation

(1) When installing this analyzer, put on a protective gear such as safety shoes, helmet, etc. for your safety.

(2) Do not put your foot on the installed analyzer or get on it, because it is dangerous.

Maintenance

Only our serviceman or persons authorized by OHKURA are allowed to remove and take the inner module, the main unit and printed circuit boards apart.

Disposal

Do not incinerate plastics of maintenance parts and replacement parts. A harmful gas may be produced.

Cleaning

(1) Use dry cloth to clean the surface of this analyzer.

(2) Do not use any organic solvent.

(3) Cleaning the analyzer after turning off the power.

Revisions

This instruction manual is subject to change without prior notice.

How to use this instruction manual

This instruction manual consists of “For safety using”, “Table of Contents,” and “Chapters 1 to 11” as follows. Read the applicable pages to suit your purpose:

Chapter and title	At purchase and installation	In daily operation	In maintenance and troubleshooting
For safety using (pages 1 and 2)	◎	◎	◎
Chapter 1 Receipt to product	◎		
Chapter 2 Installation	◎		○
Chapter 3 Wiring	◎		○
Chapter 4 Display and keys	○	○	
Chapter 5 Basic Operation and Setting	○	○	
Chapter 6 Display and function		○	○
Chapter 7 Before starting measurement	◎	○	
Chapter 8 Buffer calibration	◎	○	◎
Chapter 9 Maintenance		○	◎
Chapter 10 Troubleshooting		○	◎
Chapter 11 Specifications	○		

◎ : Be sure to read the chapter
○ : Read if necessary.

Caution/reference mark

This instruction manual describes the cautioning and reference information with the following marks:

Caution/reference mark	
⚠ **WARNING**	Failure to observe this information could result in death or injury. Be absolutely certain to read this.
⚠ **CAUTION**	Failure to observe this information could damage the analyzer. Be certain to read it.
[Note]	This is cautionary information for correct use of the analyzer. Be certain to read.
[Reference]	This is information to help you use the functions of this analyzer more effectively.

How to read display symbols

Segment 7 LED is used in the indicator.

The alphabet is displayed as symbols shown below. (Capital letters and lower case letters are not differentiated in usage.)

The blinking part is described in reversed character in this manual.

Example)  → ALarm 1

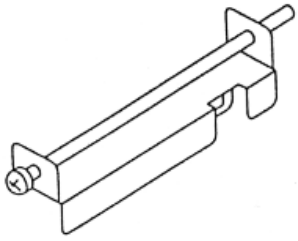
Table of contents

Chapter 1 Receipt to product

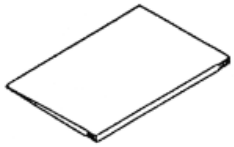
1.1 Checking the accessories

When this analyzer arrives, please check on the accessories and appearance and check that there is no lacking parts or damages. If you find any inappropriate parts, inform our dealer where you purchased the analyzer or our sales representative.

This analyzer has the following accessories:



Mounting fixture (2 pieces)



Instruction manual (this manual)

1.2 Checking the specifications

Confirm that the model code (MODEL) indicated on the nameplate on the top of the case matches the specifications of your order.

Option

① ② ③ ④ ⑤

SH58□□R □ □ □ □

①Input

01	Glass electrode
02	ORP electrode
03	Antimony electrode

②Communication module（*2）

0	None
1	RS-232C
2	RS-422A

③Interrupter

0	No interrupter
1	Installed(*1)

④Solution temperature compensation

0	None
1	Installed(*3)

⑤Others

0	None
1	Dust case
9	Special

*1 All alarms are interrupter

*2 Optional modules are necessary for communication

*3 Only use for pure water (combined with SA1001B)

Install this analyzer by establishing holes according to the panel cutout drawing and fixing it with the mounting fixtures.

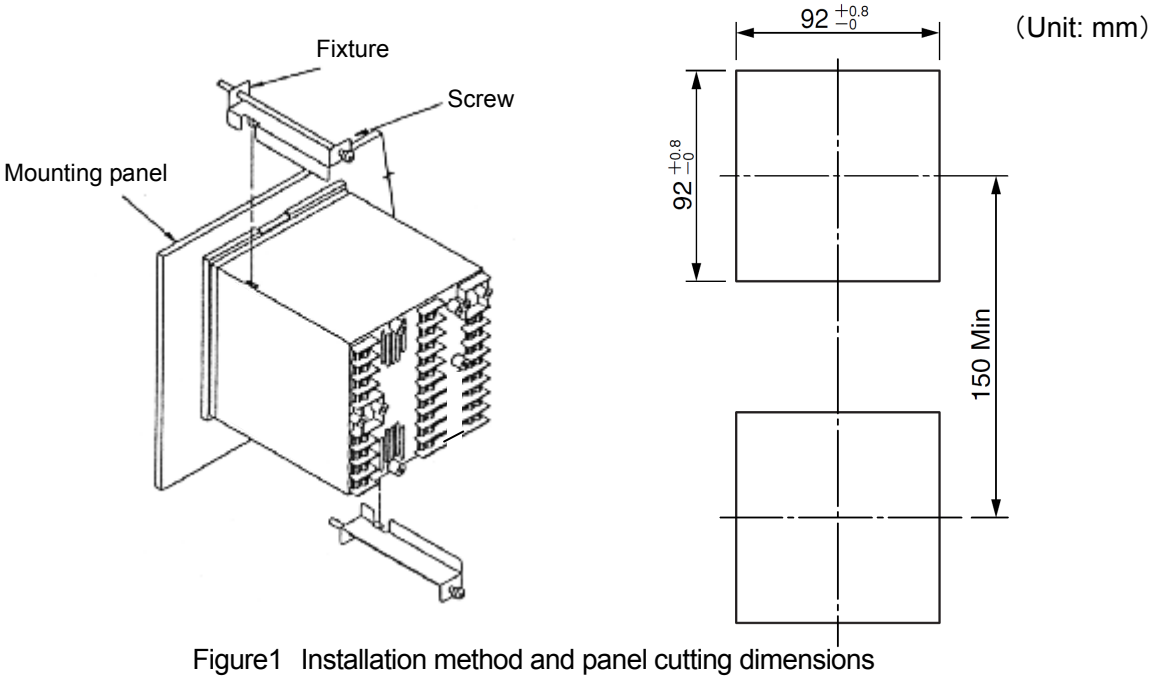


Figure1 Installation method and panel cutting dimensions

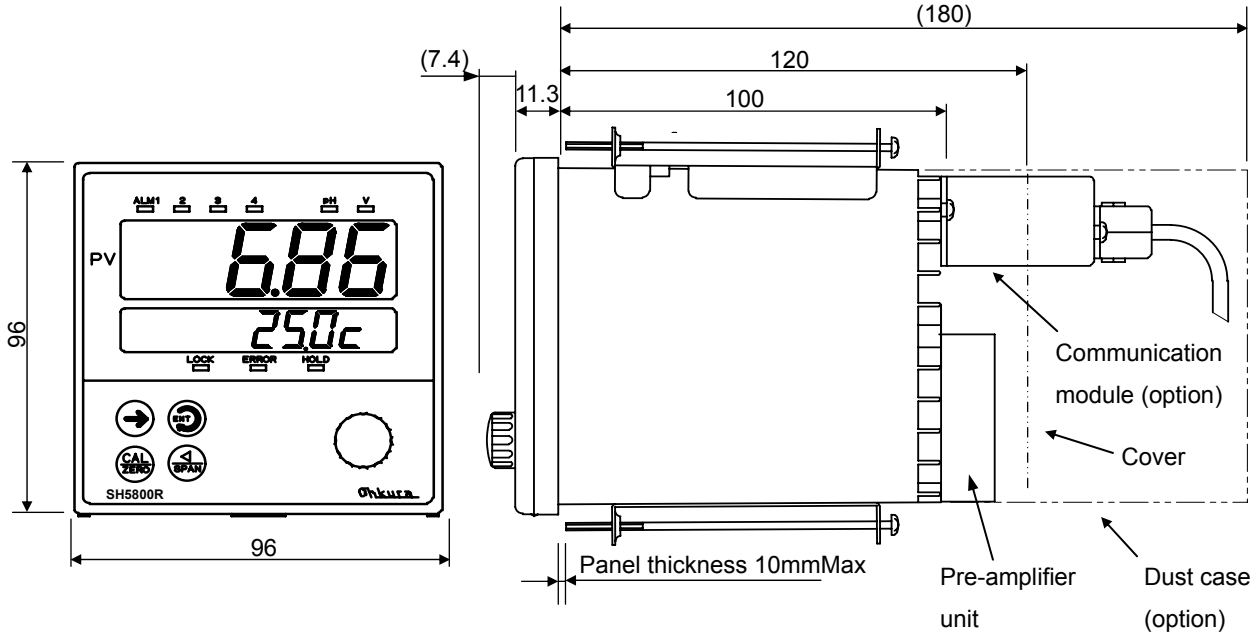


Figure 2 Outside dimensions

CAUTION

・Install at locations with stable peripheral temperature in the range of -10 to 55℃. Avoid the following location:

- ○ Locations where people can touch the terminal easily
- ○ Locations with dusts in the air, with corrosive gas
- ○ Locations with vibration or impact or strong noise
- ○ Locations with direct sunlight or wind and rain (water is splashed)
- ○ Locations with direct wind on the back terminal
- ○ Locations near flammable objects

・Fix with the fixture tightening torque of 15N・cm or smaller.

Chapter 3 Wiring

3.1 Terminal connection

Wire the cables, as shown in Figure 3, Terminal configuration diagram.

The method of how to connect the detectors, see the next page.

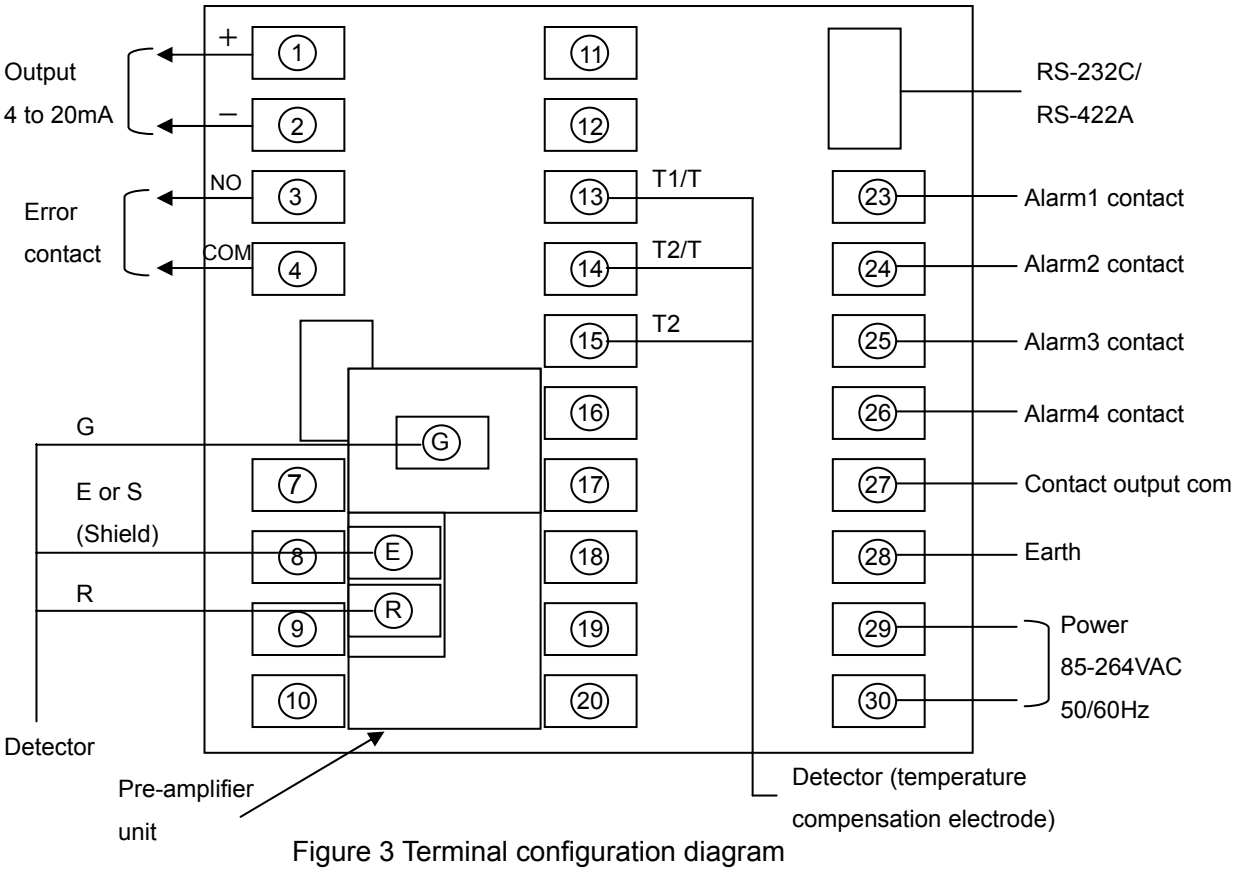


Figure 3 Terminal configuration diagram

⚠ WARNING

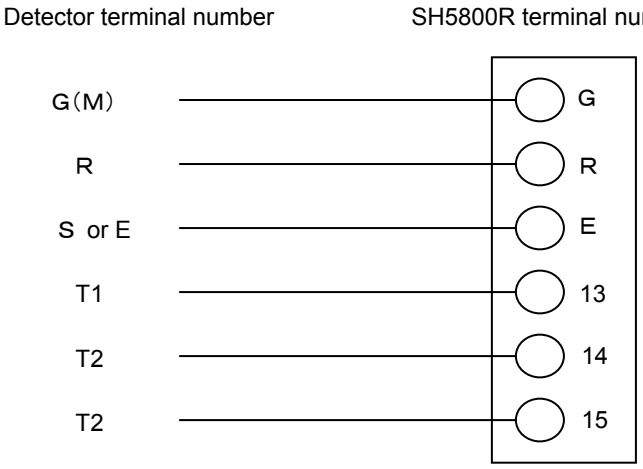
- Never touch the power supply terminal while the power is supplied. When the power supply terminal is touched, it gets an electric shock.
- Never touch relay output terminal and alarm output terminal when they are connected with power supply.

⚠ CAUTION

- To connect the detector to the SH5800R analyzer, use a recommended extension cable (OHKURA model P301/2). The maximum cable length is 100 m.
- If you plan to use an already extension cable, contact our dealer where you purchased the analyzer or our sales representative.
- Use shielded cable and set the signal line (input, AO, communication, etc.) as far away as possible from the power line.
- Use a M3.5 press-fitting terminal.
- Attach circuit breaker, switch, etc. on power supply wiring for safety and specify that this is a switch for turning off the power for this analyzer.
- Don't use unusing terminals for a relay terminal.
- Wiring of a temperature compensation electrode changes with sensors, and for an ORP or antimony analyzer, do not connect wiring to the temperature compensation electrode terminal(13, 14, and 15)
- The pre-amplifier unit is installed by terminal 7, 10, 16 to 20.

3.2 Connection with the detector

1) Connection with the cable type detector（SP3201、SP3311 etc.）



[Note]

・In the case of an ORP detector, wire G terminal of SH5800R in a detector M terminal, and wire R terminal of SH5800R in a detector R terminal.

・Since there is no polarity in two T2 terminals, you may wire whichever.

・When two T terminals type detector, wire 13 and 14 number terminal in T terminal, and connect a jumper between terminals 14 and 15.

Figure 4　Connection with the cable type detector

2) Connection with the cable type detector, use the extension cable and the junction box

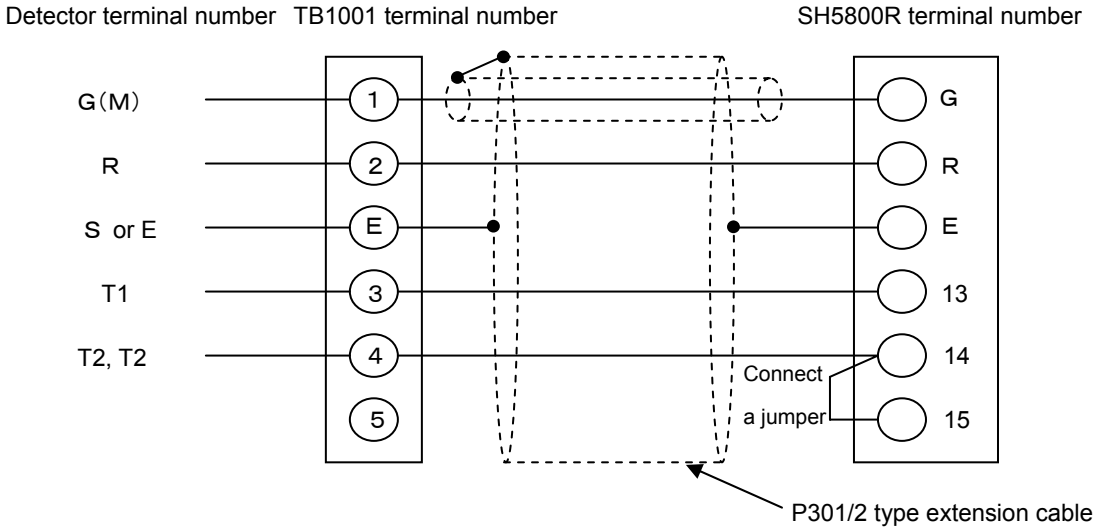


Figure 5 Connection with the cable type detector (2)

CAUTION

・Please perform terminal treatment of the extension cable according to figure 7. The conductive coat (black coat) for static frees occurs in shielding of a G line. Turn to this coat certainly.

・The junction box should use a supply chiefly(OHKURA model TB1001).

[Note]

・The maximum extension cable length is 100 m.

・When two T terminals type detector, wire 3 and 4 number terminal of TB1001 in T terminal, and connect a jumper between terminals 14 and 15.

・In the case of an ORP detector, wire G terminal of SH5800R in a detector M terminal, and wire R terminal of SH5800R in a detector R terminal.

・Wire 4 terminal of TB1001 in two T2 terminals .

3) Connection with the terminal box type detector (SP3101、SP3301 etc.)

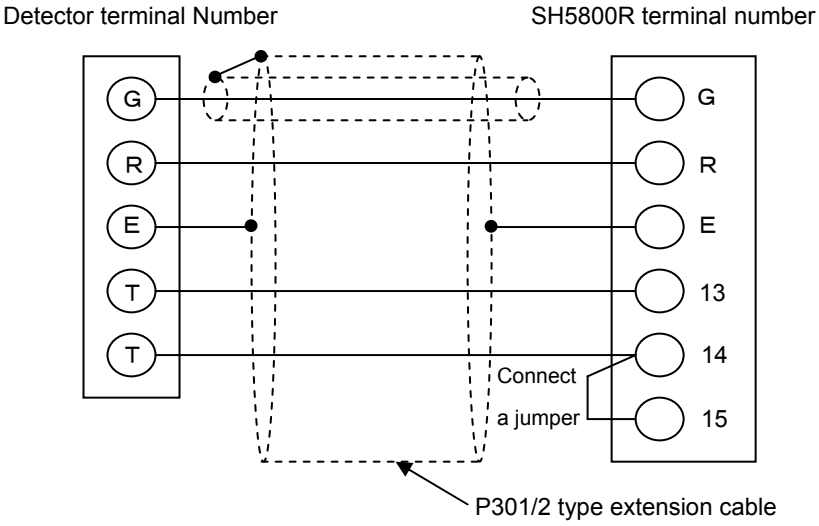


Figure 6 Connection with the terminal box type detector

CAUTION

・Please perform terminal treatment of the extension cable according to figure 7. The conductive coat(black coat) for static frees occurs in shielding of a G line. Turn to this coat certainly.

［Note］

・The maximum extension cable length is 100 m.

・Connect a jumper between terminals 14 and 15.

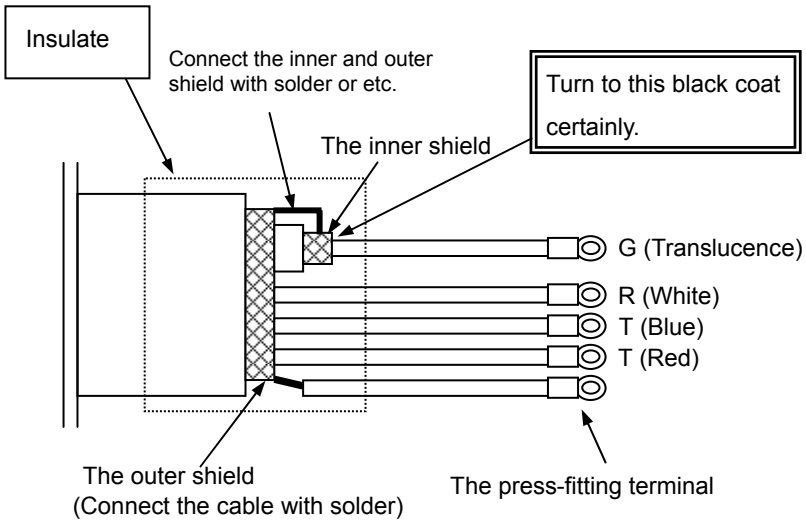


Figure 7 Terminal treatment of the extension cable

CAUTION

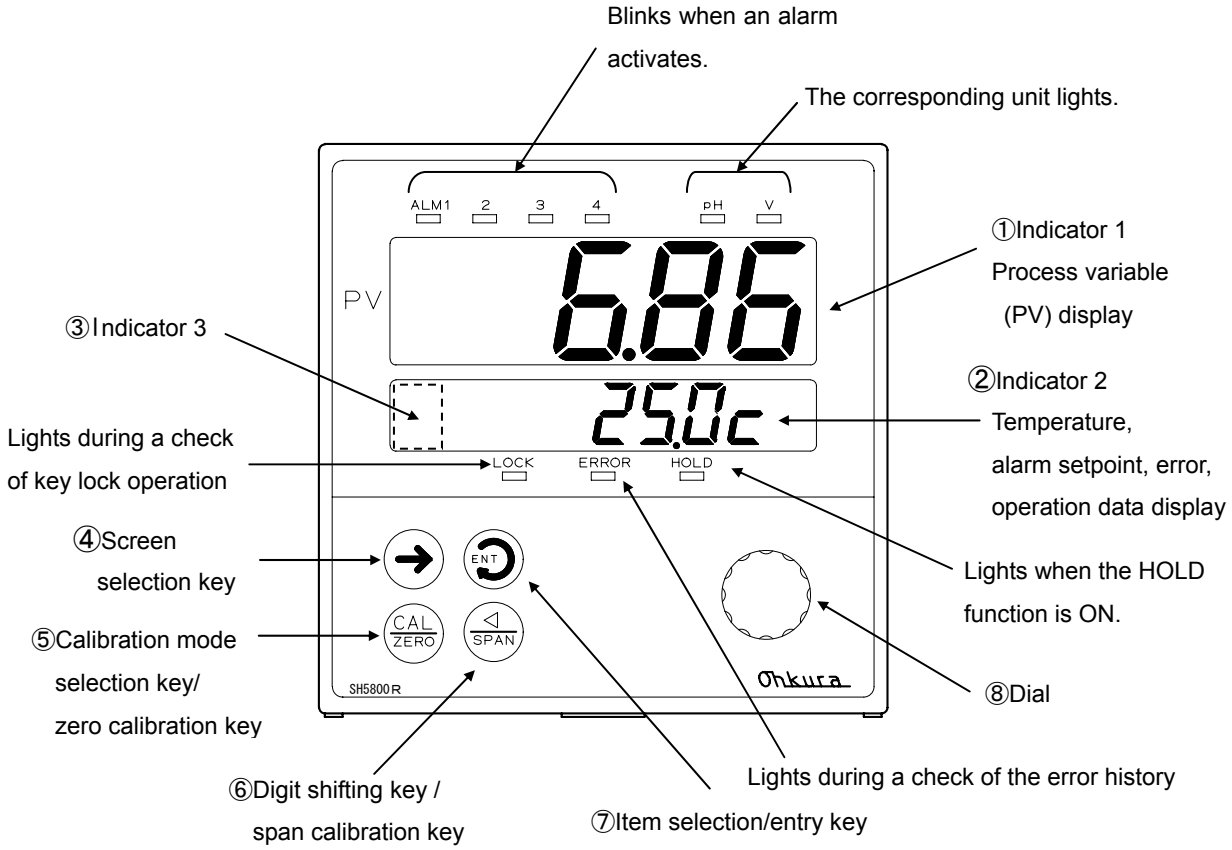
The conductive coat (black coat) should not make core wire contact absolutely. This coat has conductivity. When this is not removed, right measurement cannot be performed for the following reasons.

・The high insulation between core wires is not maintained.

・When a coat contacts other terminals or the printed circuit board, between terminals will be in a short condition

Chapter 4 Display and keys

The name and function of a display and a key are shown below.



No.	Name	Function
①	Indicator 1 Process variable display	Displays a process variable in the operation mode. Displays each item in the parameter mode or setup mode.
②	Indicator 2 Temperature, alarm setpoint, error, operation data display	Normally, it displays a temperature (glass electrode) or nothing (ORP and antimony electrode). However, it may also display an alarm setpoint, operation data, an error and other information according to the key operation.
③	Indicator 3	The zero (1st) calibration and the span (2nd) calibration are shown at the time of buffer calibration.
④	Screen selection key 「→」	Selects the screen to be displayed. Carries out mode transition by continuing pressing this key.
⑤	Calibration mode selection/zero calibration key 「CAL/ZERO」	Carries out to the buffer calibration mode by continuing pressing this key. In the buffer calibration mode, calibrate zero point.
⑥	Display switching /span calibration key 「◁/SPAN」	Allows the previous setting to be changed. Selects the digit where a value is input. In the calibration mode, calibrate span point.
⑦	Item selection/ entry key 「ENT」	Selects various items for setting. Asserts the selected data.
⑧	Dial for setting values and items	A set value is selected with this dial.

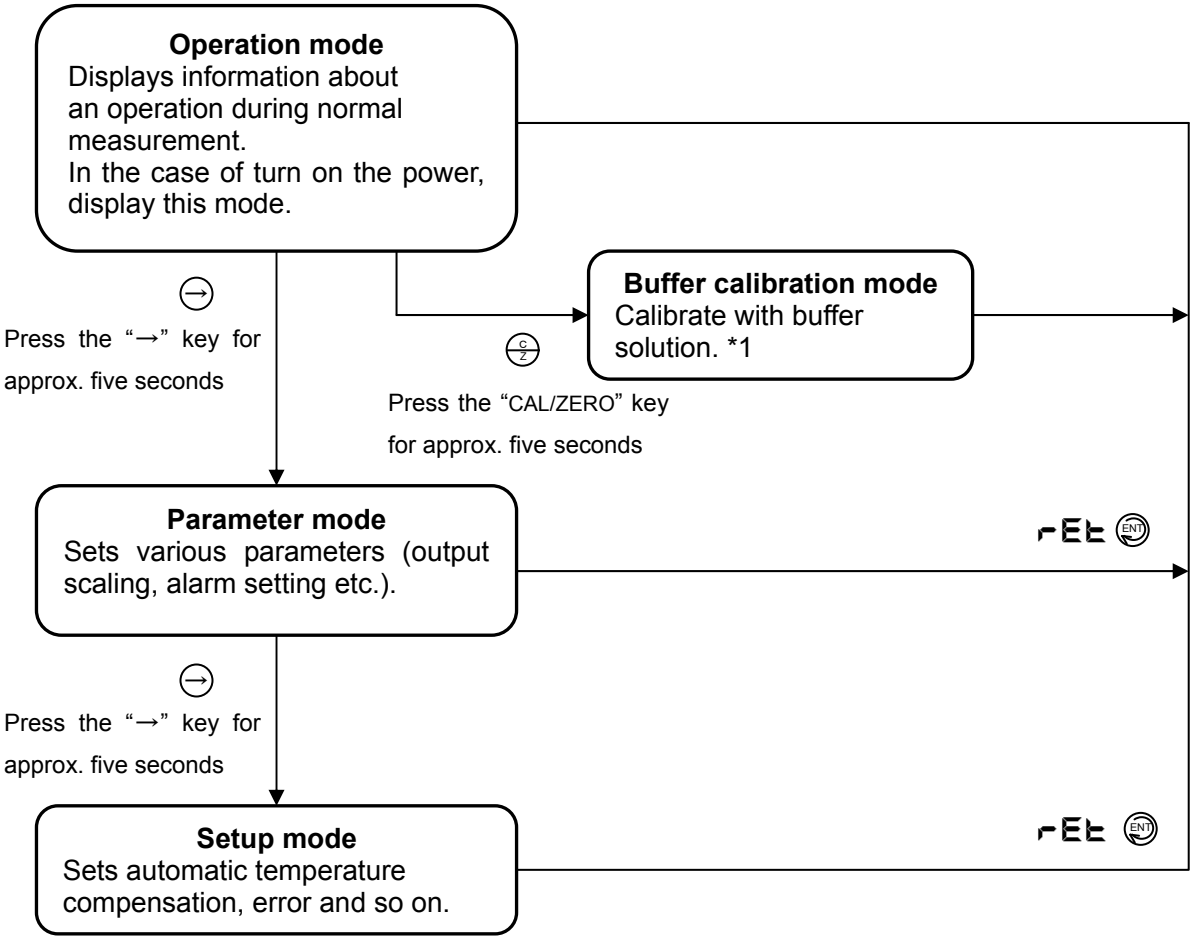
*1 The symbols of Name (“ENT” and etc.) are shows the sign in this manual.

Chapter 5 Basic operation and setting

5.1 Mode configuration

The display consists of the following four modes.

Changing mode method is shown bellow. For details of each mode, see chapter 6.

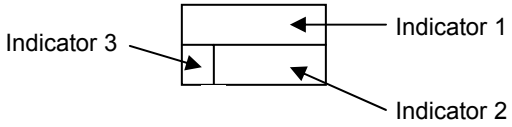


*1 The ORP analyzer does not display the buffer calibration mode.

5.2 Data setting procedure

Data is classified as “numerical data” and “character data.” Numeric value blinks when change is enabled for numerical data, and the decimal point blinks for character data. It is set up by the following procedure:

[Reference] In this manual shows display as follows.



1) Numerical data changing

a) The lowest numeric value blinks when the “◁/SPAN” key is pressed, indicating that change is enabled.

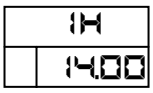
[Reference] In this manual reverse symbol means blinking.

b) The digit to be changed is selected by pressing the “◁/SPAN” key. Every time the “◁/SPAN” key is pressed, blinking value moves in order indicated by the arrow in figure on the left. The blinking digit is subject for change.

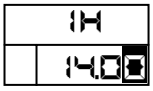
c) The value of the subject digit to be changed is changed by turning the dial.

d) The value is registered by pressing the “ENT” key. The value blinking stops.

Example) Procedure of changing the alarm1 setpoint from 14.00pH to 12.50pH

① 

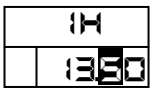
Move to display of alarm1 setpoint setting. (For details of moving method, see chapter 6)

② 

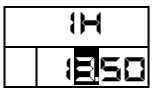
Press the “◁/SPAN” key. The lowest numeric value “0” blinks.

③ 

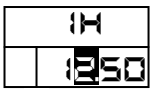
Press the “◁/SPAN” key. The blinking digit move to left.

④ 

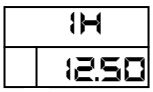
Turn the dial to left and exchange number from “0” to “5”.

⑤ 

Press the “◁/SPAN” key. The blinking digit move to left.

⑥ 

Turn the dial to right and exchange number from “3” to “2”.

⑦ 

Press the “ENT” key. The value blinking stops.

2) Character data changing

a) The decimal point on the 4th digit blinks when the "◁/SPAN" key is pressed.

[Reference] In this manual reverse symbol means blinking.

b) Desired data (character) is selected by turning the dial.

c) The data (character) is registered by pressing the "ENT" key. Blinking of the decimal point stops.

Example) Procedure of changing the HOLD setting from OFF to ON.

① 

Move to display of HOLD setting. (For details of moving method, see chapter 6)

② 

Press the "◁/SPAN" key. The decimal point on the 4th digit blinks.

③ 

Turn the dial and exchange character from "oFF" to "on".

④ 

Press the "ENT" key. The decimal point blinking stops.

3)When a preset value cannot be changed

With this analyzer, when press the "◁/SPAN" key to change the data, to prevent the miss-operation.

"----" is displayed and it may not shift to a setting enabled status. The reasons are shown bellow:

①Key lock

With this analyzer, there is a key lock function which cannot change the data. A setting cannot be changed when "LoC" is chosen. Please change again after canceling a key lock. （Refer to chapter 6 for the details of a key lock）

②It is not an item which can be change

When the "◁/SPAN" key is pressed on the display for which a setting is improper, it is not permitted and "----" is displayed. Please check the item can be change.

Chapter 6 Display and function

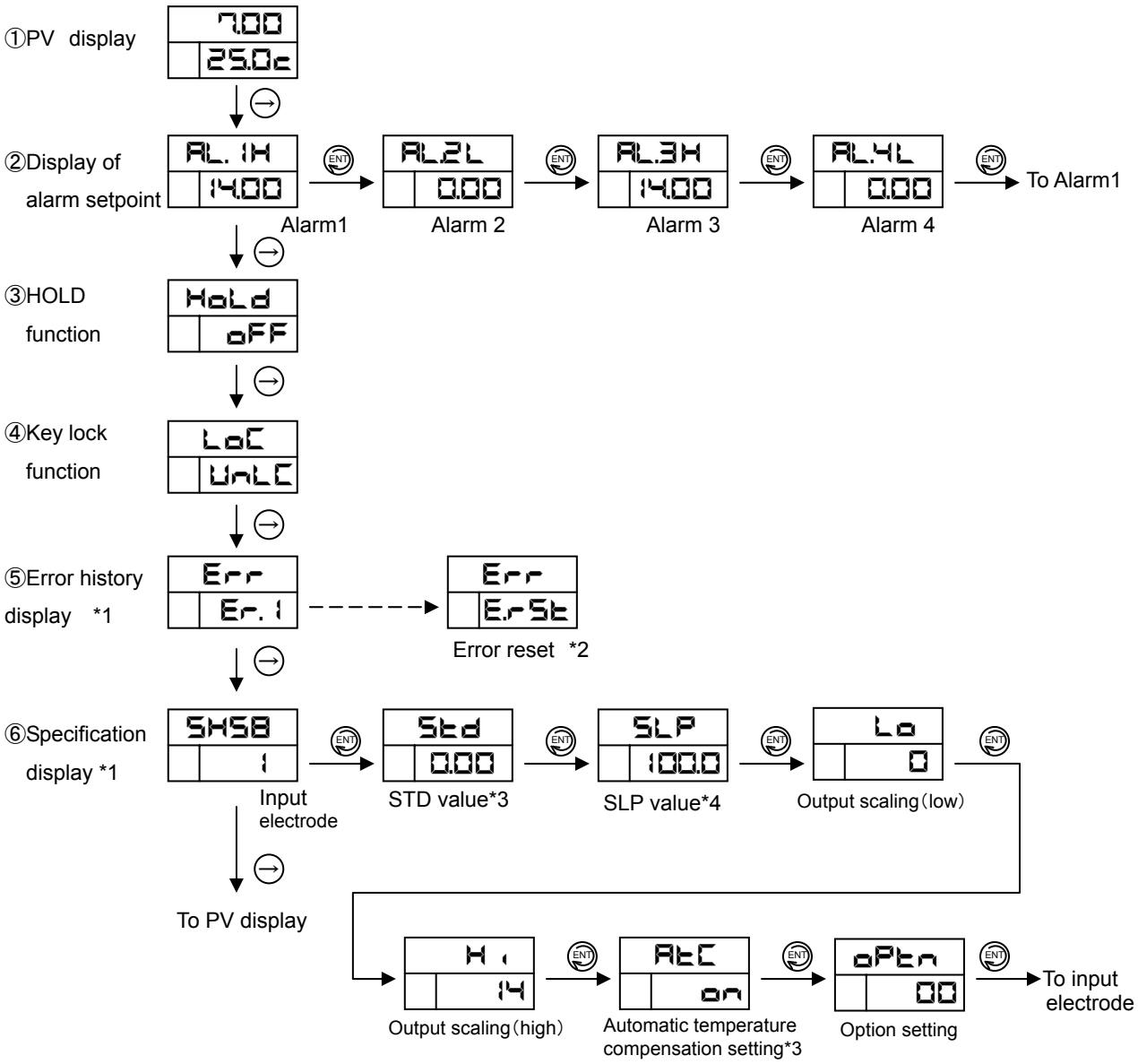
As Chapter 5 showed, this analyzer is divided into four modes.
This chapter explains a display and a function for every mode. (For the buffer calibration mode, see chapter 8)

If you are lost on which mode it is, press the "→" key several times. The mode can be distinguished by the information on the indicator 1.

PA n（n is a numeric value）… Parameter mode
SU n（n is a numeric value）… Setup mode

6.1 Operation mode

6.1.1 Display configuration



*1 Nothing is displayed if no errors have occurred.

*2 An error history is eliminated when it presses with the "◁/SPAN" key and the "ENT" key on this screen.

*3 These items are displayed only when the glass electrode is selected.

*4 This item is undisplayed only when the ORP electrode is selected.

*5 The functions that can be set are HOLD function, key lock function and error reset.

6.1.2 Function

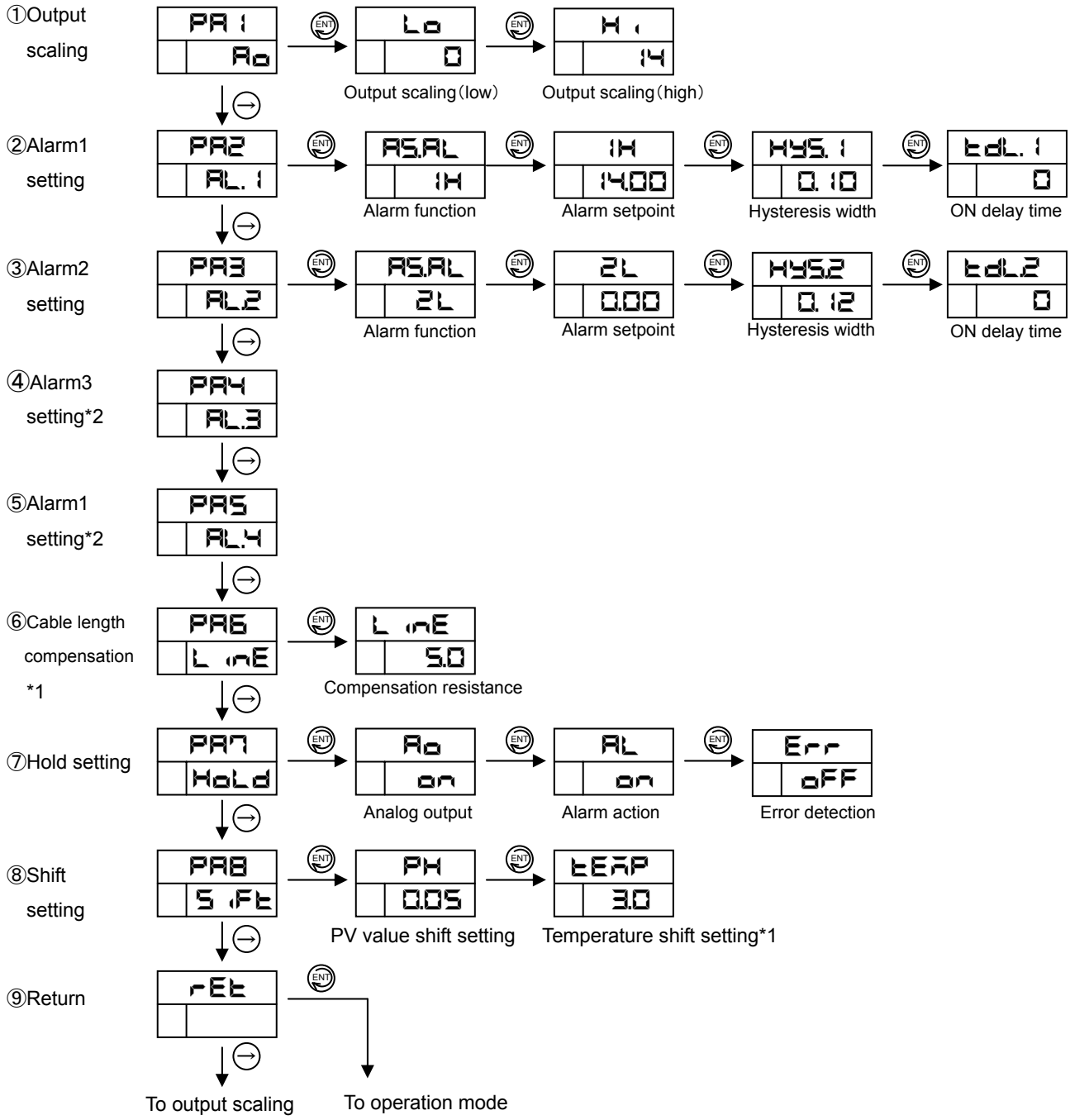
No.	Function	display example	Explanation
①	PV display	indicator 1: PV indicator 2 : Temperature	Measuring PV and temperature is displayed. Return to this display when no key and dial operation is made for more than one minute. * Temperature is displayed only when the glass electrode is selected.
②	Alarm setpoint	AL. 1H 14.00	The alarm setpoint set in parameter mode is checked. A number and function are displayed at the right of AL. which shows an alarm on indicator 1, and a alarm setpoint is displayed on an indicator 2. A display switches to alarms 1, 2, 3 and 4 by pressing the "ENT" key. Refer to parameter mode for the details of an alarm action.
③	HOLD function	HoLd oFF	If the HOLD function is turned ON, the outputs are held according to the setting made in the parameter mode(PAT) and the HOLD lamp lights. The PV of displayed is not held.
④	Key lock function	LoC UnLC	No change can be made to various settings. Select lock(LoC) or unlock(UnLC). In the case of LoC is selected, other settings can not change and LOCK lamp lights.
⑤	Error history display	Err Er. 1	It is a function which displays the occurred error number. Whenever it presses the “ENT” key, it is displayed sequentially from the error history of a small number. This display is not displayed when there is no error occurrence.
	Reset the error history	Err E.rSt	An error history is eliminated by pressing the “◁/SPAN” key and pressing the “ENT” key continuously.
⑥	Specification display		The present contents of settings and buffer calibration data are displayed.
	Input electrode display	SHSB 1	The input electrode type is displayed. 1: glass electrode 2: ORP electrode 3: antimony electrode
	STD value display *1	Std 0.00	The STD value which means a buffer calibration data is displayed. Refer to chapter 8 for the details of the STD value.
	SLP value display *2	SLP 100.0	The SLP value which means a buffer calibration data is displayed. Refer to chapter 8 for the details of the SLP value.
	Output scaling display(low)	Lo 0	The pH or ORP value of 4mA (low) output which selected in parameter mode is displayed.
	Output scaling display(high)	H . 14	The pH or ORP value of 20mA (high) output which selected in parameter mode is displayed.
	automatic temperature compensation function *1	AtC on	The setting of automatic temperature compensation function selected in the setup mode is displayed. on: performed, oFF: unperformed
	Option setting	oPtn 00	The option specified at the time of an order is shown. right: solution temperature compensation left: Interrupter

*1: These items are displayed only when the glass electrode is selected.

*2: This item is undisplayed only when ORP electrode is selected.

6.2 Parameter mode

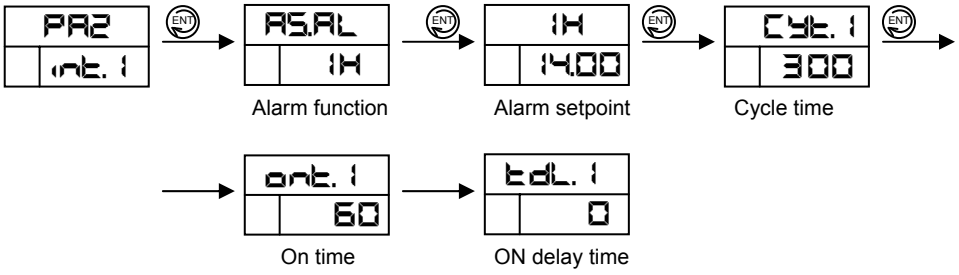
6.2.1 Display configuration



*1 These items are displayed only when the glass electrode is selected.

*2 The display of alarm 3 and 4 is the same as alarm 1 and 2.

*3 When interrupter of an option is chosen, the following screen is displayed instead of an alarm-setting screen. The display of alarm 2 to 4 is the same as alarm 1.



6.2.2 Function

No.	Function	display example	Explanation	Setting range	Factory setting
①	Output scaling setting	PA 1 Ao	It is a function which carries out scaling of the output range. The pH (ORP) corresponding to 4mA and 20mA is set up above 4pH (0.5V) width.		
	Output scaling (low) position	Lo	The pH (ORP) value of 4mA is set up per 1 pH (0.1V).	0～10pH (-1.5～1.0V)	0(-1.5)
	Output scaling (high) position	H 1	The pH (ORP) value of 20mA is set up per 1 pH (0.1V).	4～14pH (-1.0～1.5V)	14(1.5)
②	Alarm1 setting	PA2 AL. 1 (int. 1)	Sets the items related to an alarm action. In addition, it is also possible to set up the function independently with four points and to make both points into high or low alarm. The alarm lamp which corresponds at the same time an ALM contact output is carried out blinks at the time of an alarm action. When interrupter of an option is chosen, interrupter setting. In the case of an interrupter, instead of a hysteresis, it sets up a cycle time and an on time. Refer to the section 6.2.3 for the detail of an interrupter action.		
	Function setting	AS.AL	Alarm function is chosen from high alarm (1H) and low alarm (1L).	1H or 1L	1H
	Setpoint of alarm	1H 14.00	Sets the value at which the alarm occurs. In case high, an alarm occurs when PV is alarm setpoint or more. In case low, an alarm occurs when PV is alarm setpoint or less.	0.00～14.00pH (-1.500～ 1.500V)	14.00 (1.500)
	Hysteresis width *1	HYS. 1 0.10	Sets the hysteresis width of an alarm. (Example: When high alarm setpoint is 10.00pH, and a hysteresis width is 0.10pH, if PV becomes less than 9.90pH, an alarm will cancel.)	0.00～14.00pH (-1.500～ 1.500V)	0.00 (-1.500)
	ON delay time	tdL. 1 0	Sets the ON delay time (alarm occurrence delay time) of an alarm.	0～300sec	0
	Cycle time *2	CYt. 1 300	Set the cycle time of an interrupter.	0～600sec	600
	On time *2	ont. 1 60	Set the on time of an interrupter.	0～600sec	600
③	Alarm2 setting	PA3 AL2	Sets the items of alarm2. The only difference from an alarm1 is that in factory setting, the alarm function is low alarm and alarm setpoint is 0.00pH (-1.500V).		
④	Alarm3 setting	PA4 AL3	Sets the items of alarm3. The items are same as alarm1.		
⑤	Alarm4 setting	PA5 AL4	Sets the items of alarm4. The items are same as alarm2.		

*1: This item is undisplayed when interrupter is selected.

*2: These items are displayed only when interrupter is selected.

No.	Function	display example	Explanation	Setting range	Factory setting
⑥	Cable length compensation *1	PAb L inE	Although measurement of temperature is performed by resistance, when the extension cable is long, cable resistance serves as an error. Therefore, it is a function which compensates cable resistance. Refer to the section 6.2.3 for details.		
	Compensation resistance	L inE 5.0	The resistance for compensation of an extension cable is set up per 0.1Ω.	0.0～100.0Ω	0.0
⑦	HOLD setting	PA7 HoLd	Selects the items to be held if the HOLD function is set to ON in the operation mode. It is not held only by choosing ON by this item.		
	Analog output selection	Ao on	on: HOLD enabled oFF: HOLD disabled	on or oFF	oFF
	Alarm output selection	AL on	on: HOLD enabled oFF: HOLD disabled	on or oFF	oFF
	Error detection selection	Err oFF	on: HOLD enabled oFF: HOLD disabled	on or oFF	oFF
⑧	Shift setting	PAb S iFt	It is the function to shift PV and temperature value, when an error is occurred in comparison with other analyzers etc.		
	pH (ORP) value shift setting	PH 0.05	The pH (ORP) value is shifted by the setting shift value. Moreover, an analog output also changes according to pH (ORP) value after a shift. In the buffer calibration mode, shift setting is unperformed.	±2.00pH （±0.300V）	0.00 （0.000）
	Temperature shift setting*1	tEMP 3.0	The temperature is shifted by the temperature shift value.	±5.0℃	0.0
⑨	Return	rEt	It is a display for returning to the operation mode. If the “ENT” key is pressed on this display, it will return to the operation mode.		

*1: These items are displayed only when the glass electrode is selected.

6.2.3 Details

The details of the main functions are shown below.

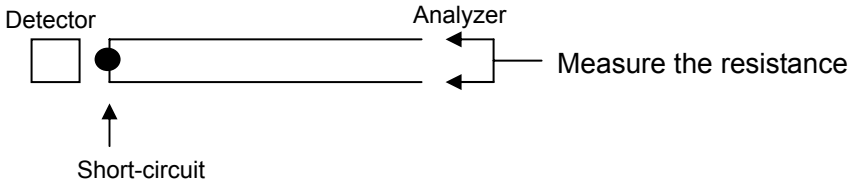
1) Cable length compensation

By this analyzer, temperature input is a platinum resistor Pt1000 or other resistors. Therefore, the resistance of the extension cable serves as causes of error.

When you use the extension cable, please check the resistance by one of the following methods, and set up this value as cable length compensation value.

①Measure the resistance

Measure the resistance of the extension cable, and set up the measured value.



②Calculate the resistance

The outline resistance formula of the extension cable (P301/2) is shown below. When the resistance cannot be measured, calculate the resistance with following formula, and set up this resistance.

Resistance（Ω）＝0.07×A（m）

2) Interrupter function

An interrupter function is a kind of an alarm action. pH control may be unable to control by the usual alarm action well cause of reaction lag time etc. In this case, if an interrupter function is used, an alarm action turns into a sampling action and suitable control can be performed from the usual alarm action.

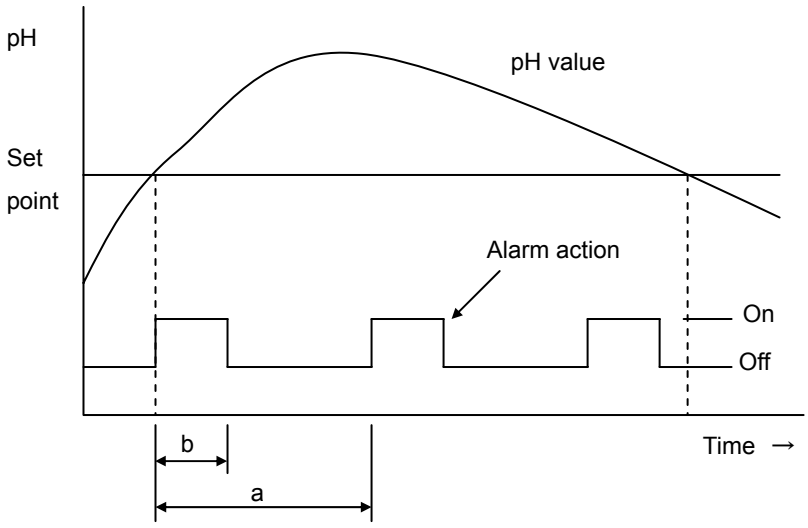
In addition to the usual alarm setting, setup the following two parameters

Cycle time: Set up the time of one cycle of an interrupter action.

On time: Set up time to carry out an alarm action during cycle time.

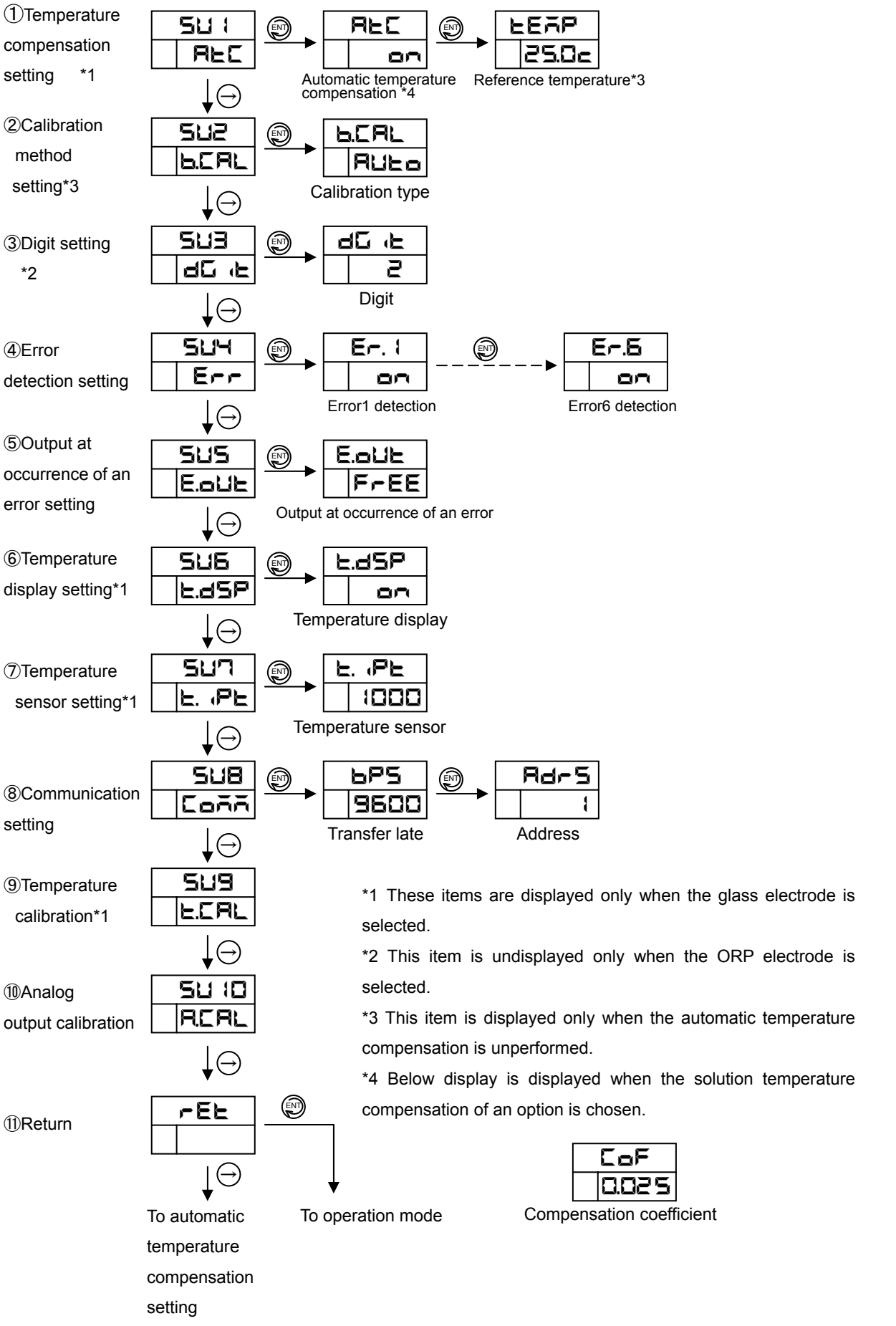
Example）Cycle time; a　On time;b　　Alarm function; High alarm

Repeat the action for which only interrupter time turns on an alarm among cycle time.



6.3 Setup mode

6.3.1 Display configuration



*1 These items are displayed only when the glass electrode is selected.

*2 This item is undisplayed only when the ORP electrode is selected.

*3 This item is displayed only when the automatic temperature compensation is unperformed.

*4 Below display is displayed when the solution temperature compensation of an option is chosen.

6.3.2 Function

No.	Function	display example	Explanation	Setting range	Factory setting
①	Temperature compensation setting*1	SU 1 AtC	In the case of the glass electrode, select the automatic temperature compensation and the reference temperature. Refer to the section 6.3.3 for details.		
	Automatic temperature compensation	AtC on	on: with the automatic temperature compensation oFF: without the automatic temperature compensation(manual compensation)	on or oFF	on
	Reference temperature	tEAP 25.0c	When a without automatic temperature compensation is selected, set up the reference temperature. A setting unit is ℃ and this analyzer compensates for temperature with this value. In the case of automatic temperature compensation, this display is not displayed.	0.0～100.0℃	25.0
	Temperature compensation coefficient	CoF 0.025	In the case of the solution temperature compensation of an option is chosen, set the temperature compensation coefficient.	0.000～0.050 pH/℃	0.000
②	Buffer calibration method*2	SU2 b.CAL	In the case of pH analyzer, select the buffer calibration method. Refer to the chapter 8 for difference between the automatic buffer calibration and the manual buffer calibration.		
		b.CAL AUto	AUto: Automatic buffer calibration MAn: Manual calibration	AUto or MAn	AUto
③	Digit setting*2	SU3 dG it	It is a function to change the display digit after the decimal point.		
		dG it 2	2: two digit 1: one digit	1 or 2	2
④	Error detection setting	SU4 Err	This analyzer detects the errors as a self-diagnostics. It is chosen whether it detects about errors 1 to 6. Refer to the section 6.3.3 for the details of an error.		
		Er. 1 on	on: with detect an error oFF: without detect an error Selects ON or OFF at each error.	on or oFF	All errors oFF
⑤	Output at occurrence of an error setting	SU5 E.oUt	Selects the analog output value at occurrence of an error.		
		E.oUt FrEE	Selects the analog output value at occurrence of an error from the following. FrEE: output displayed value Lo : output 4mA Hi : output 20mA	FrEE or Lo or Hi	FrEE

*1: This item is displayed only when the glass electrode is selected.

*2: These items are undisplayed only when the ORP electrode is selected.

No.	Function	display example	Explanation	Setting range	Factory setting
⑥	Temperature display setting*1	SU6 t.dSP	In the case of the glass electrode, select display of temperature or nothing. The temperature compensation is performed also when the temperature display is nothing.		
		t.dSP on	on: display temperature oFF: nothing	onまたは oFF	on
⑦	Temperature sensor setting*1	SU7 t. iPt	Select the temperature sensor for bellows. NOTE: The standard temperature sensor is Pt1000.		
		t. iPt 1000	1000: Pt1000, 20k: 20kΩ, 10k: 10kΩ 6.8k: 6.8kΩ, 500: 500Ω	20k／10k／ 6.8k／1000 ／500	1000
⑧	Communication setting	SU8 Conn	Selects the transfer rate and address.		
	Transfer rate setting	bPS 9600	Selects the transfer rate from 9600, 4800, 2400, 1200, and 600 or 300bps.	9600/4800 2400/1200 600/300	9600
	Address setting	Adr S 1	Selects the address of an analyzer from 0 to 31.	0～31	0
⑨	Temperature calibration*1	SU9 t.CAL	Calibrates temperature display. Refer to Chapter 8 for details.		
⑩	Analog output calibration	SU 10 A.CAL	Calibrates the analog output. Refer to Chapter 8 for details.		
⑪	Return	rEt	It is a display for returning to the operation mode. If the "ENT" key is pressed on this display, it will return to the operation mode.		

*1: These items are displayed only when the glass electrode is selected.

6.3.3 Details

The details of the main functions are shown below.

1) Temperature compensation

When the glass electrode is used, the pH analyzer measures the electromotive force generated on the glass electrode and converts the pH value.

However, the electromotive force generated on the glass electrode varies with the temperature. The relation of the electromotive force (V: mV) and the temperature (T: ℃) is below.

$$V = 59.16 \times \frac{T + 273.16}{298.16}$$

Because of this, even when water solutions having the same pH (hydrogen ion concentration) are measured, the electromotive force will differ if their temperatures are different.

Accordingly, it is necessary to compensate for the temperature characteristic of the electromotive force.

This applies temperature compensation to the electromotive force generated on the glass electrode, using temperature data obtained from the temperature sensor.

In the case of the automatic temperature compensation, this analyzer compensate from measuring temperature.

In the case of the manual compensation, this analyzer compensate from setting reference temperature.

2) Solution temperature compensation

Normal temperature compensation is applied to only the electromotive force of the glass electrode.

In the range of pure water, it is necessary to apply additional compensation to the measured value, depending upon the degree of dissociation of the water.

Solution temperature compensation is provided for this purpose.

Compensation is applied to the measured value according to a preset variation per 1℃ (pH/℃), represented by CoF. (temperature compensation coefficient). When the coefficient is set to 0.01 pH/℃, a compensation of 0.01 pH is applied to the measured value for every 1℃ change in temperature. When using this option, temperature compensation for the glass electrode the electromotive force of the glass electrode is set to automatic mode.

The coefficient value is about 0.020pH/℃, but it is different by using process. Compute by the following method or use the data at the time of construction.

①Changing the temperature compensation coefficient into 0.

②Measure two pH values by two points from which temperature differs.

[Note] Please measure at the activity maximum temperature and 25℃ as much as possible.

③Compute the solution temperature compensation (α) by the following formula from measured value.

$$\alpha = \frac{pH_{min} - pH_{max}}{t_{max} - t_{min}} \quad (pH/℃)$$

pH_{min}: pH value of lower temperature
pH_{max}: pH value of higher temperature
t_{min}: lower temperature
t_{max}: higher temperature

3) Error content

The error used by this analyzer is shown in Table 3. All errors are set as OFF at factory setting. In addition, since the internal circuitry of errors 9 to 11 is unusual, there is no setup. These errors are unconditionally effective.

Table 3 Error number table

Error	Error content	Error detection condition	Input
Er.1	pH(ORP)value high	An indicator 1 is - - - - display (more than 14.5pH(1.6V)).	All input
Er.2	pH(ORP)value low	An indicator 1 is. . . display(less than -0.5pH(-1.6V))	All input
Er.3	Temperature high	An indicator 2 is - - - - display (more than 150℃).	Glass electrode
Er.4	Temperature low	An indicator 1 is. . . display(less than -30℃)	Glass electrode
Er.5	STD error	When the STD data is unusual.	Glass electrode
Er.6	SLP error	When the SLP data is unusual.	Glass/Antimony electrode
Er.9	Memory error	When the non-volatile memory data is unusual.	All input
Er.10	ADC error	When the ADC (analog to digital converter) operation is unusual.	All input
Er.11	CPU error	When the watchdog timer operates.	All input

Chapter 7 Before starting measurement

In order to measure, exact installation, wiring, and setting, and buffer calibration are required. Check the following points before measurement.

1) The checking of installation

Check whether the installation is performed correctly according to Chapter 2.

2) The checking of wiring

Check whether the wiring is performed correctly according to Chapter 3. When especially the extension cable is used, check that terminal treatment is exact.

3) The checking of a setting

Although it differs according specifications and operating conditions, please check the items, which is the following is set as the specification of hope.

Checked the following items are set up in the parameter mode.

・Output scaling
・Alarm1 to 4
・Cable length compensation
・HOLD items

Refer to the section 6.2 for operating procedure and an initial value.
Refer to the section 5.2 for the setting method.

Checked the following items are set up in the setup mode.

・Automatic temperature compensation
・Buffer calibration method
・Display digit
・Error detection and output setting
・Temperature display setting
・Communication setting

Refer to the section 6.3 for operating procedure and an initial value.
Refer to the section 5.2 for the setting method.

4) Buffer calibration

The buffer calibration is necessary for the glass electrode and antimony electrode analyzer. Calibrate refer to chapter 8.

Chapter8 Buffer calibration

In below case, the buffer calibration is necessary for the glass electrode and antimony electrode analyzer.

①After installation and wiring
②After changing the electrode
③Measurement reopens
④Periodical buffer calibration (about once a week)

Perform buffer calibration refer to below.

［Note］

・The buffer calibration method is differ from the detector. Refer to the detector's instruction manual.

・The ORP electrode dose not require buffer calibration. Check the electrode characteristic, refer to section 9.1.

8.1 Before buffer calibration

1) Items

Some items are necessary to buffer calibration.

①Two standard buffer solution(specified in JIS(Japanese Industrial Standard))
pH7 and pH4 or pH9（glass electrode）, pH7 and pH4 or pH10（antimony electrode）
②Three 500ml beakers(two beakers: for buffer solution, one beaker: for cleaning）
③Pure water
④The temperature meter（In the case of the antimony electrode）

The buffer solution differs depending on the electrode and measuring solution.

・The pH measurement range is acid to neutral: pH4 and pH7
・The pH measurement range is alkaline: pH7and pH9（antimony electrode: pH10）

Standard buffer solution use Ohkura model P504（pH4）, P507（pH7）, P509(pH9), P510（pH10）.
There standard buffer solutions are made by one bag dissolves in 500ml pure water.

［Note］

・A standard buffer solution should use what was dissolved on the day. The pH value changes (especially pH9 and pH10 buffer solution) with carbon dioxide gas in the air.

・There is no temperature compensation by an antimony electrode. Such exact measurement can be performed that the temperature of a standard buffer solution and measurement liquid is near.

2) Difference of between the automatic buffer calibration to the manual buffer calibration

This analyzer has two method of the buffer calibration. Perform the buffer calibration by a method suitable for an operating condition in consideration of the merit of two methods.

①Automatic buffer calibration

Immerse the detector in a standard buffer solution and press the key. This analyzer automatically distinguishes the type of standard buffer solution and the electrode output stability.

②Manual buffer calibration

Immerse the detector in a standard buffer solution or the solution of pH value known and setting the pH value. A standard solution can be used if there is two or more pHs of differences of two pH values.

Method	Automatic buffer calibration	Manual buffer calibration
Merit	Do not require pH value setting and the electrode output stability decision.	It is possible to calibrate by except the standard solution of JIS.
Demerit	When an electrode characteristic deteriorates, a calibration may require time.	When using a JIS standard solution, it is necessary to consider pH value computation as thermometry. It may calibrate, before an electrode characteristic is stabilized.

8.2 Buffer calibration method

Buffer calibration method shows below. Refer to the section 8.4 for details of procedure and display.

①Press the “CAL/ZERO” key for approximately five seconds in the operation mode then the display moves to the buffer calibration mode.

②Take out of the detector to process and clean up the detector.

③Immerse the detector in pH7 standard buffer solution(manual calibration: 1st calibration solution). After pH value is stabilized, press the “CAL/ZERO” key.

④Calibrate zero point(1st). In the case of the automatic calibration, this analyzer calibrates automatically. In the case of the manual calibration, set the pH value of calibration solution.

⑤After calibration of zero point finished, indicator 1 displays pH value it is calculated by a new calibration data, and indicator 2 displays End(End). Refer to the section 8.3 when Err is displayed.

⑥Clean up the detector and Immerse the detector in other standard buffer solution. After pH value is stabilized press the “◁/SPAN” key.

⑦Calibrate span point(2nd). In the case of the automatic calibration, this analyzer calibrates automatically. In the case of the manual calibration, set the pH value of calibration solution.

⑧After calibration of span point finished, indicator 1 displays pH value it is calculated by a new calibration data, and indicator 2 displays End(End). Refer to the section 8.3 when Err is displayed.

⑨Press the “ENT” key to check the buffer calibration data.

⑩In the case of indicator 2 displays Good(Good), the buffer calibration data is good. Press the “ENT” key to return the operation mode. Refer to the section 8.3 when Err is displayed.

[Reference]

・In the buffer calibration mode, hold function automatically perform.

・Refer to the table 2 about pH value of JIS standard buffer solution.

・The zero and span point calibration are possible multiple times. In the zero or span calibration end display, in the case of the “CAL/ZERO” key is pressed, perform zero point calibration and in the case of the “◁/SPAN” key is pressed, perform span point calibration. In addition, the calibration data check is performed by the zero and span calibration data which performed at the end.

[Note]

・If the “→” key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

・In order to calculate the pH value of a standard solution, temperature setting is required of the automatic calibration of an antimony electrode. Set up in 0 to 60℃. In addition, as for pH10 standard buffer solution, characteristics change above 35℃. An error is produced although a calibration can be performed. In the case of alkaline measurement solution, perform a manual calibration using the solution of pH value known at an elevated temperature.

Table 2 Relation between pH value of JIS standard buffer solution and temperature

(℃)	pH value			
	pH4	pH7	pH9	pH10
0	4.01	6.98	9.46	10.32
5	4.01	6.95	9.39	(10.25)
10	4.00	6.92	9.33	10.18
15	4.00	6.90	9.27	(10.12)
20	4.00	6.88	9.22	(10.07)
25	4.01	6.86	9.18	10.02
30	4.01	6.85	9.14	(9.97)
35	4.02	6.84	9.10	(9.93)
40	4.03	6.84	9.07	-
45	4.04	6.83	9.04	-
50	4.06	6.83	9.01	-
55	4.08	6.84	8.99	-
60	4.10	6.84	8.96	-
70	4.12	6.85	8.93	-
80	4.16	6.86	8.89	-
90	4.20	6.88	8.85	-
100	4.23	6.89	8.83	-

8.3 In case of a calibration error (Err is displayed)

This analyzer checks the buffer calibration data and when the buffer calibration data is unusual, displays Err. In the case of Err is displayed, calibrate again refer to below.

1) In the case of Err is displayed by the zero point calibration（1st）

The reason of the automatic buffer calibration

・Using the buffer solution is not pH7 buffer solution

→Zero point calibration is possible to use pH7 buffer solution. Check the buffer solution.

・The electromotive force generated on the electrode is unusual

→Check the buffer solution and the electrode.

The reason of the manual buffer calibration

In the manual buffer calibration, it is ending with the span point (2nd) calibration, and when the difference of setting of two points is two or less pH, an error occurs. Check the set-up pH value.

2) In the case of Err is displayed by the span point calibration（2nd）

The reason of the automatic buffer calibration

・The electromotive force generated on the electrode is unusual

→Check the buffer solution and the electrode.

The reason of the manual buffer calibration

In the manual buffer calibration, it is ending with the zero point (1st) calibration, and when the difference of setting of two points is two or less pHs, an error occurs. Please reconfirm the set-up pH value.

3) In the case of Err is displayed by the calibration data check

This analyzer checks the calibration data. When the calibration data is normal, this analyzer displays Good and when the calibration data is unusual, this analyzer displays Err.

At the time of calibration data check, to check an electrode characteristic. Err is displayed by an electrode characteristic deteriorates and dirt adheres to the electrode.

In addition, even when Err is displayed by calibration data check, the calibration is performed according to the present electrode characteristic. Therefore, the present electrode can be used if it is a short period of time in the present situation.

①In the case of Err 1 is displayed（only the glass electrode）

The “electromotive force in pH7 solution” is one of the characteristics of a pH electrode. This is called STD (STANDARD) and a characteristics judgment is made by error from the theoretical value.

The theoretical value of STD is 0.00pH and in the case of an electrode characteristic deteriorates, STD value increase or decrease. Err 1 is displayed when this value separates from the range of ±1.00pH.

In addition, an actual STD value can be checked by the specification display of the operation mode.

Occurrence factors are mainly deterioration of a reference electrode, a stick of liquid junction, etc.

②In the case of Err2 is displayed

The “electromotive force per 1pH” is one of the characteristics of pH electrode. This is called SLP (SLOPE) and a characteristics judgment is made by percentage of a theoretical value.

The theoretical value of SLP is 100.0%, and SLP will decrease fundamentally, if an electrode characteristic deteriorates (in the case of an antimony electrode, since dispersion in each electromotive force is large, the SLP value may separate from 100% in the state of the initial state).

When this value is the following, Err2 is displayed.

Glass electrode: SLP value is separated from 80 to 110%

Antimony electrode: SLP value is separated from 70 to 130%

In addition, an actual STD value can be checked by the specification display of an operation mode. Occurrence factors are mainly deterioration of a glass electrode, dirt adheres to the electrode, a stick of liquid junction, lowering of internal insulation, etc.

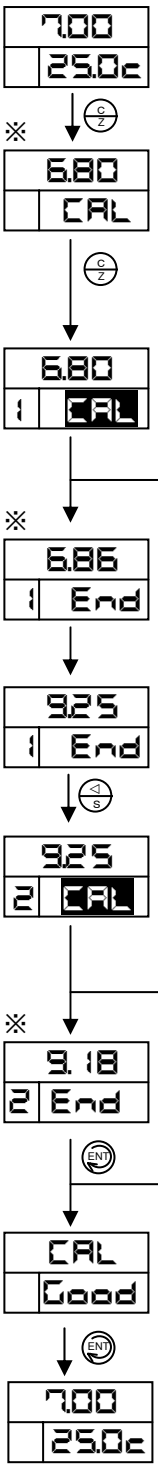
③In the case of Err3 is displayed（only glass electrode）

Err3 is displayed, when Err 1 and Err2 occur simultaneously.

④In the case of ---- is displayed

---- is displayed when it is going to end a calibration, without only one point calibration.

8.4 Buffer calibration method: glass electrode automatic calibration



Press the “CAL/ZERO” key for approximately five seconds in the operation mode then the display moves to the buffer calibration mode.

Immerse the detector in pH7 standard buffer solution. Indicator1 displays the pH value it is calculated by the before calibration data, and indicator2 displays CAL. After the pH value is stabilized, press the “CAL/ZERO” key. Zero point calibration starts.

Zero point calibration is progressing. In calibration, CAL blinking and indicator 3 displays 1 which means zero point calibration.
It shifts to an end screen automatically after the end of calibration.

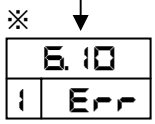
Zero point calibration is finished.
Indicator1 displays the pH value it is calculated by the new calibration data. Clean up the detector and immerse the detector in other standard buffer solution.

After pH value is stabilized, press the “◁/SPAN” key.
Starts span point calibration.

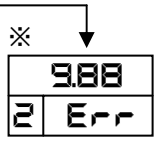
Span point calibration is progressing. In calibration, CAL blinking and indicator 3 displays 2 which means span point calibration.
It shifts to an end screen automatically after the end of calibration.

Span point calibration is finished.
Indicator 1 displays the pH value it is calculated by the new calibration data.
Press the “ENT” key to check the calibration data.

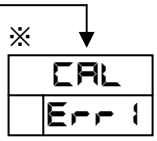
Calibration data is good.
Press the “ENT” key and return to the operation mode.



Zero point calibration is unusual.
Press the “CAL/ZERO” key to retry zero point calibration or press the “→” key to finish the buffer calibration.



Span point calibration is unusual.
Press the “◁/ SPAN” key to retry zero point calibration or press the “→” key to finish the buffer calibration.

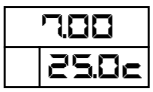


Calibration data is error.
Press the “ENT” key when updating calibration data, and press the “→” key when not updating calibration data.

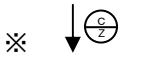
[Note]
If the “→” key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

[Reference]
・Displayed pH value is reference value. A value changes with conditions at the time of an actual calibration.
・In the buffer calibration mode, hold function automatically perform and shift setting is canceled.
・Zero and span point calibration are possible multiple times. In zero or span calibration end display (the display of ※ is marked) , in the case of the “CAL/ZERO” key is pressed, perform zero point calibration and in the case of the “◁/SPAN” key is pressed, perform span point calibration.

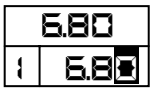
8.5 Buffer calibration method: glass electrode manual calibration



Press the “CAL/ZERO” key for approximately five seconds in the operation mode then the display moves to buffer calibration mode.

※ 

Immerse the detector in pH7 standard buffer solution. Indicator1 displays the pH value it is calculated by the before calibration data, and indicator2 displays CAL. After the pH value is stabilized, press the “CAL/ZERO” key. Zero point calibration starts.



Indicator 2 displays pH value and lowest numeric value of pH value blinks. Set the calibration pH value using the “SPAN” key and a dial.

Indicator 3 displays 1 which means zero point calibration.

After set the calibration pH value, press the “ENT” key and finish the setting.

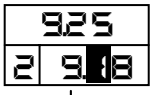
※ 

Zero point calibration is finished.

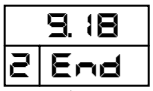
Indicator1 displays the pH value it is calculated by the new calibration data. Clean up the detector and immerse the detector in other standard buffer solution.

After the pH value is stabilized, press the “◁/SPAN” key. Starts span point calibration.

Indicator2 displays the pH value and lowest numeric value of the pH value blinks. Set the calibration pH value refer to zero point calibration. Indicator3 displays 2 which means span point calibration.



After set the calibration pH value, press the “ENT” key and finish the setting.

※ 

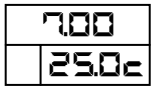
Span point calibration is finished.

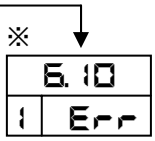
Indicator1 displays the pH value it is calculated by the new calibration data.

Press the “ENT” key to check the calibration data.

Calibration data is good.

Press the “ENT” key and return to the operation mode.



※ 

Zero point calibration is unusual.

Press the ”CAL/ZERO” to retry zero point calibration or press the “→” key to finish the buffer calibration.

※ 

Span point calibration is unusual.

Press the “◁/SPAN” to retry zero point calibration or press the “→” key to finish the buffer calibration.

※ 

Calibration data is error.

Press the “ENT” key when updating calibration data, and press the “→” key when not updating calibration data.

［Reference］

・Displayed pH value is reference value. A value changes with conditions at the time of an actual calibration.

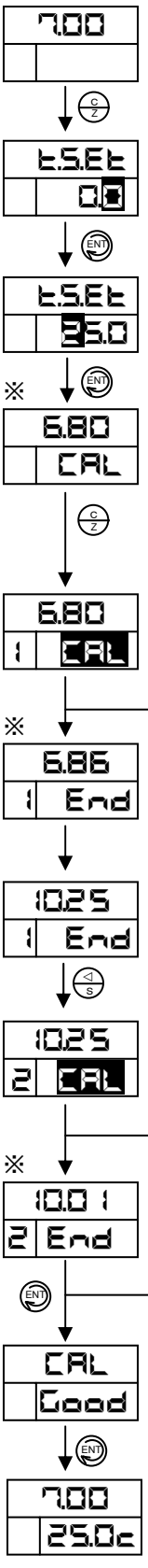
・In the buffer calibration mode, hold function automatically perform and shift setting is canceled.

・Zero and span point calibration are possible multiple times. In zero or span calibration end display (the display of ※ is marked) , in the case of the “CAL/ZERO” key is pressed, perform zero point calibration and in the case of the “◁/SPAN” key is pressed, perform span point calibration.

［Note］

If the “→” key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

8.6 Buffer calibration method: antimony electrode automatic calibration



Press the “CAL/ZERO” key for approximately five seconds in the operation mode then the display moves to buffer calibration mode.

Set the temperature of the standard buffer solution using the “SPAN” key and a dial. A setting unit is ℃ and setting range is 0 to 80 ℃.

After temperature setting, press the “ENT” key to decide temperature and repress the “ENT” key to move zero point calibration.

Immerse the detector in pH7 standard buffer solution. Indicator1 displays pH value it is calculated by the before calibration data, and indicator2 displays CAL. After the pH value is stabilized, press the “CAL/ZERO” key. Zero point calibration starts.

Zero point calibration is progressing. In calibration, CAL blinking and indicator3 displays 1 which means the zero point calibration. It shifts to an end screen automatically after the end of calibration.

Zero point calibration is finished.

Indicator1 displays the pH value it is calculated by the new calibration data. Clean up the detector and immerse the detector in other standard buffer solution.

After the pH value is stabilized, press the “◁/SPAN” key. Starts span point calibration.

Span point calibration is progressing. In calibration, CAL blinking and indicator3 displays 2 which means span point calibration. It shifts to an end screen automatically after the end of calibration.

Span point calibration is finished.

Indicator1 displays the pH value it is calculated by the new calibration data.

Press the “ENT” key to check the calibration data.

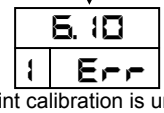
Calibration data is good.

Press the “ENT” key and return to the operation mode.

［Reference］

Antimony electrode is necessary to set temperature for calculates the standard buffer solution pH value.

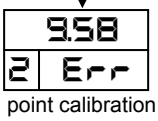
※



Zero point calibration is unusual.

Press the “CAL/ZERO” key to retry zero point calibration or press the “→” key to finish the buffer calibration.

※



Span point calibration is unusual.

Press the “◁/SPAN” key to retry zero point calibration or press the “→” key to finish the buffer calibration.

※

Calibration data is error. Press the “ENT” key when updating calibration data, and press the “→” key when not updating calibration data.

［Note］

If the “→” key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

［Reference］

・Displayed pH value is reference value. A value changes with conditions at the time of an actual calibration.

・In the buffer calibration mode, hold function automatically perform and shift setting is canceled.

・Zero and span point calibration are possible multiple times. In zero or span calibration end display (the display of ※ is marked) , in the case of the “CAL/ZERO” key is pressed, perform zero point calibration and in the case of the “◁/SPAN” key is pressed, perform span point calibration.

8.7 Buffer calibration method: antimony electrode manual calibration

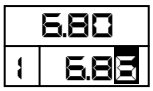
Press the “CAL/ZERO” key for approximately five seconds in the operation mode then the display moves to buffer calibration mode.

※

Immerse the detector in pH7 standard buffer solution. Iindicator1 displays pH value it is calculated by the before calibration data, and indicator2 displays CAL. After the pH value is stabilized, press the “CAL/ZERO” key. Zero point calibration starts.

Indicator2 displays the pH value and lowest numeric value of pH value blinks. Set the calibration pH value using the “◁/SPAN” key and a dial.

Indicator3 displays 1 which means zero point calibration.

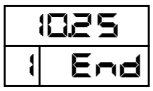


After set the calibration pH value, press the “ENT” key and finish the setting.

※

Zero point calibration is finished.

Indicator1 displays the pH value it is calculated by the new calibration data. Clean up the detector and immerse the detector in other standard buffer solution.

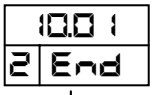


After the pH value is stabilized, press the “◁/SPAN” key. Starts span point calibration.

Indicator2 displays the pH value and lowest numeric value of pH value blinks. Set the calibration pH value refer to zero point calibration. Indicator3 displays 2 which means span point calibration.

After set the calibration pH value, press the “ENT” key and finish the setting.

※



Span point calibration is finished.

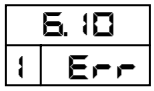
Indicator1 displays the pH value it is calculated by the new calibration data.

Press the “ENT” key to check the calibration data.

Calibration data is good.

Press the “ENT” key and return to the operation mode.

※



Zero point calibration is unusual.

Press the ”CAL/ZERO” key to retry zero point calibration or press the “→” key to finish the buffer calibration.

※

Span point calibration is unusual.

Press the “◁/SPAN” key to retry zero point calibration or press the “→” key to finish the buffer calibration.

※

Calibration data is error. Press the “ENT” key when updating calibration data, and press the “→” key when not updating calibration data.

[Reference]

・Displayed pH value is reference value. A value changes with conditions at the time of an actual calibration.

・In the buffer calibration mode, hold function automatically perform and shift setting is canceled.

・Zero and span point calibration are possible multiple times. In zero or span calibration end display (the display of ※ is marked) , in the case of the “CAL/ZERO” key is pressed, perform zero point calibration and in the case of the “◁/SPAN” key is pressed, perform span point calibration.

[Note]

If the “→” key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

Chapter 9 Maintenance

9.1 Maintenance of detector

It is necessary cleaning of the electrode and the buffer calibration. The cycle of cleaning and buffer calibration is difference from measuring condition. In addition, a recommendation buffer calibration cycle is once a week.

[Note] Refer to the instruction manual of detector for details of detector's treatment.

1) Cleaning of the electrode

When dirt adheres to the electrode, malfunctions such as slow response and calibration data unusual etc. will occur. In this case, it is necessary to clean the electrode.

Select the proper cleaning method according to the type of the dirt from table 3 and clean the electrode.

Table 3 Cleaning method

Type of the dirt	Cleaning method
Calcareous scale or heavy metal hydroxide	Dissolve the dirt with diluted hydrochloric acid (2 to 3% HCl) for approximately thirty seconds. ⚠ Do not immerse electrode for a long time.
Suspended material, adhesive material and micro-organism	Wipe it with soft paper or a cloth containing water.
Oily material	Wipe it with a cloth containing neutral detergent or organic solvent such alcohol. Wash it well with water after the cleaning. ⚠ Do not clean the plastic part with organic solvent.

⚠ WARNING

When the case of hydrochloric acid is used for cleaning, and measurement liquid are chemicals, be careful a chemical not to go into eyes and a mouth. When chemicals should go into eyes or a mouth or it is attached to a hand, please wash promptly and when after cleaning senses abnormalities, please receive diagnosis of a medical practitioner.

[Reference]

When electrode washes with hydrochloric acid, the effect of hydrochloric acid, the pH value may be changed for a while.

2) Buffer calibration

Perform buffer calibration refer to chapter 8.

3) Check the ORP detector

The ORP detector is not necessary to calibrate with the standard buffer solution. Check the measurement loop with a quinhydrone standard solution. Dissolve the quinhydrone standard powder (OHKURA model code P541) to the 500ml pure water. Immerse the ORP detector in the quinhydrone solution at 10 to 30℃. Check the ORP value is between 240mV to 280mV.

If the displayed ORP value is no good, clean the electrode. If after cleaning the displayed ORP value is no good, polish the metal (gold or platinum) at the sand paper.

9.2 Maintenance of pH（ORP）analyzer

There is no everyday maintenance item in this analyzer. At the time of routine inspection, and when it seems that it is unusual, please perform a check and calibration of a display and an output.

9.2.1 Wiring

Wiring at the terminal according to figure 8.

[Note] In case of the ORP and antimony electrode, it is not necessary to wiring between 13 to 15 terminals.

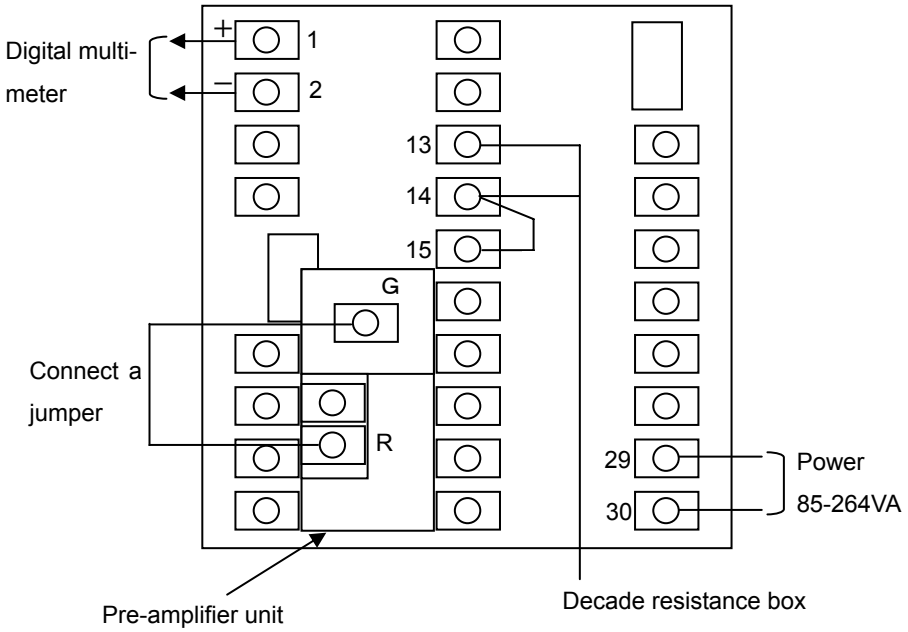


Figure 8 Wiring for maintenance

CAUTION

- Turn off the power, and don't turn on the power supply until wiring is completed thoroughly.
- Connect a jumper between 14 to 15 terminals.

9.2.2 Exchange setting

Change a cable length compensation value and a shift value into 0. It is resetting after maintenance, record setting value.

9.2.3 Confirm the display value and the analog output

1) Confirm the pH（ORP）value

In the case of glass electrode, 1097.3 Ω (an equivalent for 25℃) is inputted with a decade resistance box.

Connect a jumper between G to R terminal and check the display value is into below range.

Glass electrode: within 7pH±1pH

ORP electrode: within 0.000V±0.003V

Antimony electrode: within 0.5 to 2.5pH

2) Confirm the temperature value

The resistance of Table 4 is inputted with a decade resistance box after changing a cable length compensation value and a temperature shift value into 0. It is normal if an error is less than ±0.3 ℃ between displayed value and standard value. If an error is greater than ±0.3 ℃, calibrate the temperature display value. Refer to Section 9.3.

Table 4 Relation of Input resistance and standard temperature

Input resistance（Ω）	1000.0	1097.3	1194.0	1289.8	1385.1
Standard temperature（℃）	0.0	25.0	50.0	75.0	100.0

3) Confirm the analog output

Check the analog output corresponds to the display. The analog output corresponding to an indicated value is computed by the following formula. If an error is more than ±0.064mA between measuring output value and standard value, calibrate analog output refer to section 9.4.

$$\text{Analog output} = \frac{\text{PV}-\text{AOLO}}{\text{AOHI}-\text{AOLO}} \times 16 + 4\,(\text{mA})$$

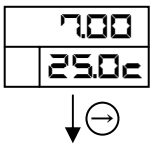
PV: displayed pH（ORP）value

AOLO: The pH value which is set by output scaling （low） position

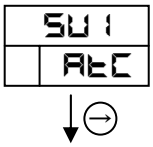
AOHI: The pH value which is set by output scaling （high） position

9.3 Temperature display calibration

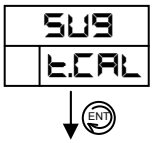
Calibrate the temperature display when an error is occurred in a temperature display. Wiring is performed according to the section 9.2.1.



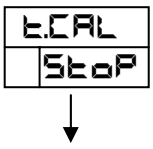
Press the "→" key for approximately ten seconds in the operation mode then the display moves to the setup mode.



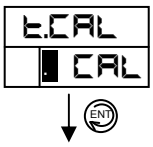
Press the "→" key several time. The display moves SU9(t.CAL).



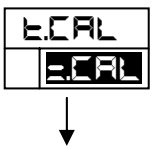
Press the "ENT" key to start the temperature display calibration.



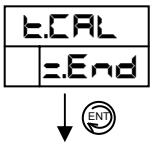
Calibrate zero point. Input the 1000Ω between terminal 13 and 14,and wait approximately fifteen seconds. Press the "◁/SPAN" key to change the data. A dial is turned and StoP is changed into CAL.



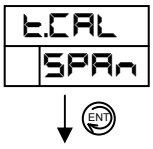
Press the "ENT" key to calibrate zero point.



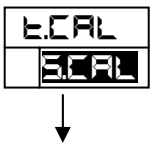
Calibration zero point is progressing. It shifts to an end screen automatically after the end of calibration.



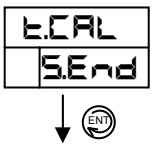
Calibration of zero point finished. Press the "ENT" key to move span point calibration.



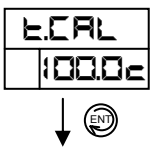
Calibrate span point. Input the 1385.1Ω between terminal 13 and 14, and wait approximately fifteen seconds.



Calibration span point is progressing. It shifts to an end screen automatically after the end of calibration.



Calibration of span point finished. Press the "ENT" key to move the display of calibration data check.



The temperature after calibration is displayed, and checks that it is 100.0.

Temperature display calibration is finished.
Press the "→" key twice to move rEt display. Press "ENT" key and return to the operation mode.

[Note]

If the "→" key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

[Reference]

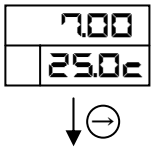
is displayed

When Err is displayed instead of End, the abnormalities of wiring or resistance can be considered. Please calibrate again after a check.

9.4 Analog output calibration

Calibrate the analog output when an error is occurred.

Wiring is performed according to section 9.2.1.



Press the "→" key for approximately ten seconds in the operation mode then the display moves to the setup mode.

Press the "→" key several time. Display moves SU10(A.CAL).

Press the "ENT" key to start analog output calibration.

Press the "◁/SPAN" key to change the data.

A dial is turned and StoP is changed into CAL.

Press the "ENT" key to start calibration.

Calibrate zero point. Press the "◁/SPAN" key to change the data.

Press the "◁/SPAN" key and turn dial to change the zero output adjustment value so that the output is 4.00±0.01mA.

*Setting value of 4mA is about 15.50.

After completing change of the adjustment value, press the "ENT" key to memory the adjustment value.

Press the "ENT" key to move span point calibration.

to A

A

Press the "ENT" key.

Press the "◁/SPAN" key to change the data.

Press the "◁/SPAN" key and turn dial to change the span output adjustment value so that the output is 20.00±0.01mA.

*Setting value of 20mA is about 79.50.

After completing change of the adjustment value, press the "ENT" key to memory the adjustment value.

Press the "ENT" key to finish analog output calibration.

Press the "→" key several times to move rEt display. Press the "ENT" key and return to the operation mode.

[Note]

If the "→" key is pressed in the middle of calibration, calibration will be ended without updating calibration data. Be careful not to push accidentally at the time of the usual calibration.

Chapter 10 Trouble shooting

When this analyzer does not operate normally, please cope with it according to the table below.

In addition, if the problem appears in initial measurement, the abnormalities of wiring and a detector installation condition can be considered.

Please reconfirm with reference to section 3 and the instruction manual of the detector.

When especially the extension cable is used, check that terminal treatment is exact.

If the problem appears to be serious, please contact our dealer where you purchased the analyzer or our sales representative.

In that case, please inform us of the model number and manufacture number on the nameplate.

Problem	Cause	Corrective action
Error 1 does not disappear. The indicator1 displays ----.	The detector is not immersed in measuring solution	Install the detector correctly.
	Wiring error	Check the wiring.
	Detector failure	Refer to the instruction manual of the detector.
Error 2 does not disappear. The indicator1 displays	The detector is not immersed in measuring solution	Install the detector correctly.
	Wiring error	Check the wiring.
	Detector failure	Refer to the instruction manual of the detector.
Error 3 does not disappear. The indicator2 displays ----.	Wiring error	Check the wiring.
	Temperature sensor setting is mismatching	Resetting the temperature sensor.
	Detector failure	Refer to the instruction manual of the detector.
	The abnormalities in calibration data	Recalibrate.
Error 4 does not disappear. The indicator2 displays	Wiring error	Check the wiring.
	Temperature sensor setting is mismatching	Resetting the temperature sensor.
	Detector failure	Refer to the instruction manual of the detector.
	The abnormalities in calibration data	Recalibrate.
Error 5 does not disappear.	The abnormalities in buffer calibration data	Refer to section 8.3.
Error 6 does not disappear.	The abnormalities in buffer calibration data	Refer to section 8.3.
Errors 9 to 11 do not disappear.	CPU overrun	Reswitch on an analyzer power supply.
	Analyzer failure	Contact our dealer where you purchased the analyzer or our sales representative.

Problem	Cause	Corrective action
A setting cannot be performed. （The indicator2 displays ----）	The keylock function is set to LoC	Release the key lock UnLC in the operation mode.
The PV is incorrect	The electrode characteristic changed	Clean the detector and perform calibration with buffer solutions.
	The abnormalities in buffer calibration data	Perform calibration with buffer solutions.
	Wiring error	Check the wiring.
	Detector failure	Refer to the instruction manual of the detector.
	The pre-amplifier unit is faulty	Replace the pre-amplifier unit.
The PV is not constant	The electrode is dirty	Clean the detector.
	There are air bubbles around the electrode	Remove air bubbles.
	Wiring error	Check the wiring.
	Insulation is falling	Check terminals there are no dirt and moistures. Refer to the instruction manual of the detector.
	Effect of noise	Check whether there is any noise source.
	Ground potential is abnormal	Check process grounding.
Do not perform buffer calibration （Err is displayed）	Detector failure The electrode is dirty Insulation is falling Wiring error Buffer solution error Pre-amplifier unit failure	Refer to chapter 8 and the instruction manual of the detector.

Input number	:	1point
Input type	:	Glass electrode ORPelectrode Antimony electorode
Input range	:	0.00 to 14.00pH （-1.500 to 1.500V）
Output	:	4 to 20mADC isolated 600Ω max.
Output range	:	Programmable, 4pH(0.5V) in span minimum 1pH(0.1V) increment
Display	:	4 digits, 7 segments LED, dual
Linearity	:	±0.03pH（±3mV）
Repeatability	:	±0.01pH（±1mV）
Alarm	:	Up to 4 high or low alarm number of set point ; 4 point setpoint range; 0.00 to 14.00pH （-1.500 to 1.500V） Output relay; From-A 0.5A/250VAC Hysterisis adjustment; 0 to 14pH(-1.5 to 1.5V) On delay timer; 0 to 300s
Self diagnostics (Error detection)	:	Low pH 0.00pH and below, high pH 14.00pH and above, low temp. -25℃ and below, high temp. 150℃ and above, buffer standard and compensation curve
Diagnostics output	:	1 From-A 0.5A/250VAC
Buffer calibration	:	JIS pH standard solution, automatic calibration or manual calibration
Temperature compensation	:	0 to 100℃ Temp.sensor:Pt1000(standard) 500Ω,6.8kΩ,10kΩ, 20kΩ
Case structure	:	IP65(only front panel)
Case material	:	Polycarbonate
Operating condition	:	-10 to 50℃, 90%RH max
Power supply voltage	:	85 to 264VAC 45 to 65Hz
Power supply	:	85 to 264VAC
Power consumption	:	6VA／100VAC
Weight	:	Approx.500g

●Option

Solution temperature compensation:
0.000 to 0.050pH/℃ for high purity water.
Interrupter: 0 to 600 sec. replaces alarm 1 to 4
Operation: High or Low
Cycle time: 0 to 600 sec.
On time: 0 to 600 sec.
On delay timer: 0 to 300 sec.
Communication interface module:
RS-232C or RS-422A
Rate: 9600, 4800, 2400 1200, 600 or 300bps
Dust protection cover: Installed on rear terminal panel