Cheonsei

KEMPION DIGITAL CONTROLLER

MESTAR+

Digital pH/ORP Controller

Instruction Manual

www.cheonsei.co.kr

Thank you very much for purchasing Cheonsei pH/ORP Controller.

Before beginning operation, please read this instruction manual carefully.

Correct handling, repair, & maintenance are described easily.

Please keep this instruction manual at the place where you can see it easily.

※ The specification of products can be changed for improvement without prior notice.

CONTENTS

1 Notice for Safety

1-1 Introduction

• To use the products safely, the signs are showed on the manual like below.

• As it is a matter of safety, please be sure to keep the directions in manual.

• he signs and indication are as follows.

⚠ Warning

Person death or serious injury will be occurred, if warning is not kept by wrong handling.

⚠ Caution

Person injury or property damage will be occurred, if caution is not kept by wrong handling.

1-2 Cautions for Operation Condition

⚠ Caution

• Do not use this Controller and its components for other purposes.
  Otherwise it may cause trouble.
• Please keep the followings, otherwise it may cause trouble.
  Ambient temperature : -5 ~ 45°C
  Relative humidity : below 90%
  Install location : Indoor and inside of electrical panel
  Temperature of the handling liquid : below the working temperature described in the electrode specification
• Gas or moisture, which occur in jobsite, can lead to the internal corrosion of the controller and it may cause reduction of service life and trouble.

1-3 Warning for Handling Condition

⚠ Warning

• Install this controller beyond the reach of children and/or unauthorized person.
• Turn off the power and stop the controller & other equipments when repairing or disassembling the controller.
  If power is on during work, it may cause electric shock.
• Controller should be properly grounded and install ELCB(Earth Leakage Circuit Breaker) in order to prevent electric shock.
• In case of installation in the electric panel, install the controller after securing sufficient space in order not to contact with the components inside electric panel.
• Do not touch with wet hands. Electric shock may occur.
• Use only designated parts. If undesignated parts are used to the controller, it may cause accident & trouble.
• Do not arbitrarily reconstruct the controller. If the controller is arbitrarily reconstructed, it may cause accident & trouble.

> ⚠ Caution
>
> - Do not use the controller of which case was damaged. If the controller is used, it may cause trouble to equipment connected with the controller.
> - Do not install controller in the heavy moist or dusty place. Electric shock and trouble may occur.
> - Do not use power other than that specified in controller. Otherwise, it may cause malfunction or fire.
> - Refrain from voltage withstand test in order to prevent damage of internal parts.
> - Dispose of waste controller in accordance with related national law.

2 Product Confirmation

2-1 Check Point When Unpacking

Please check following points immediately after receiving the product.
If the defect is found from the product, please request it to local agent or CHEONSEI.
1 Is specification correct as ordered?
2 Is there any missing parts ?
3 Is there any visible damage caused by vibration or shock during transport?
4 Is there any loosened bolt or nut?

2-2 Components

1 Controller
   • Digital pH/ORP Controller : 1 SET
   • Bracket(SPC-1 M4 × 52) : 2 EA
   • Instruction Manual : 1 COPY
2 SET Components
   • Refer to section 6.

3 General

This controller is a digital controller built-in micro processor. It can be used by composing circuit with the external devices through dry contact of analog Input & output and, as option, it can be composed according to wanted using condition by installing Communication card.
This controller is designed only for a high insulation shielded cable.
If you need to extend the electrode cable, refrain from using the general cable in market and use our high insulation shielded cable.

4 Model Code

MESTAR⁺ P [①] [②] [③] — [④]

① Controller	② Controller Option	③ Output Option	④ Electrode	
P : pH/ORP	B : Standard T : Temp. Compensation	0 : Standard 1 : Temp.(4~20mA)	1 : GS-5 2 : GSH-5 3 : MS-5 4 : GST-5	5 : GSTH-5 6 : CPP11 7 : CPP12

5 Specifications

5-1 Controller

Specification		Performance	
Display & Measuring Range	pH	0.00 ~ 14.00pH	
	ORP	-1999 ~ +1999mV	
	Temp	-10.0°C ~ 100°C	
Resolution/ Accuracy	pH	0.01 pH / 0.01pH	
	ORP	1mV / 1mV	
	Temp	0.1°C / 0.5°C	
Ambient Temp. & humidity		-10°C ~ 40°C / Relative Humidity : below 80%RH (Must be free from condensation and dew)	
Range of temp. compensation		AUTO/MANUAL 0~100°C	
Calibration Method		2 Points Calibration(Zero : pH7, Span : pH4 or pH9)	
Display		3" LCD Segment Display (LED Back Light : White)	
Alarm Output	Setting	HIGH, LOW	
	Output	Dry Contact 1a 1b Contact capacity : 0.5A, 125VAC / 1A, 24VDC	
	Dead Band	0.00 ~ 1.00pH / 0~100mV	
Analog output	pH	0.00 ~ 14.00pH	4~20mA Isolated output (Load resistance 500Ω)
	ORP	-1999 ~ +1999mV	
	Temp	-10°C ~ 100°C (Option)	
Memory		EEPROM	
Communication		RS-485 (Option)	
Power		AC85~245V, 50/60Hz (Power Consumption : 3W)	
Case		Anti-static ABS	
Size		96mm * 96mm * 115mm	
Weight		Approx. 400g	
Installation Place		Indoor, inside electric panel	

5-2 Electrode

Code	Model	Use	Internal Liquid	Measuring Range	Cable effective Length	Using Temp.	Body Material
1	GS-5	pH	3.3Mol KCl	0~14pH	4m	0~40°C	Glass
2	GSH-5	pH	3.3Mol KCl	0~14pH	4m	0~80°C	Glass
3	MS-5	ORP	3.3Mol KCl	0~±1999mV	4m	0~40°C	Glass
4	GST-5	pH Temp. Compensation	3.3Mol KCl	0~14pH	4m	0~40°C	Glass
5	GSTH-5	pH Temp. Compensation	3.3Mol KCl	0~14pH	4m	0~80°C	Glass
6	CPP11	pH Supplement-free	3.3Mol KCl	0~14pH	4m	0~80°C	PC
7	CPP12	pH Temp. Compensation & Supplement-free	3.3Mol KCl	0~14pH	4m	0~80°C	PC

6 Set Components

6-1 Standard Components

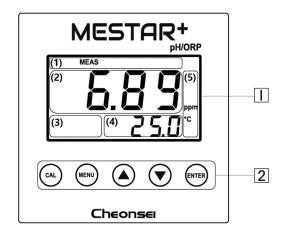| Set Model	Components	Specification	Quantity
MESTAR+ PB0-1	Controller	Digital pH/ORP Controller	1 Set
	Panel Bracket	SPC-1 M4 x 52mm	2 EA
	Instruction Manual	24Page	1 Copy
	Electrode	GS-5	1 Set
	Electrode Holder	Standard : ∅34×1m, Material : PE	1 Set
	Bracket for Holder	Material : PVC	1 Set
	Connection Box	Coated with Anti-static film	1 Set
	Connection Cable	High isolated special shield cable	20 m
	KCl Solution	3.3Mol/123g	1 EA
	KCl Bottle	500cc, Material : PE	1 EA
	Buffer Powder	pH4, pH7Each	2 EA
	Standard Liquid Battle	500cc, Material : PE	2 EA
	Beaker	500cc, Material : PE	1 EA

※ Some components may vary depending on the SET model.

6-2 Optional Items

① Connection Cable (up to 100m)
② Quinhydrone Powder (for ORP)
③ Sampling Holder

7 Name & Function of Each Part

7-1 Front

Ⅰ Display : 3" LCD Segment
    ① Status
      • SETUP : Display in setup mode
      • MEAS : Display in measurement mode
      • CAL : Display in calibration mode
      • ZERO : Display in ZERO calibration
      • SPAN : Display in SPAN calibration
    ② Main Display
     : Measured value or setting screen is
      displayed according to Mode.
    ③ Alarm
      • HOLD : Display in setting of measurement
           value fixed
      • HIGH : Display in HIGH alarm
      • LOW : Display in LOW alarm
    ④ Sub Display : Display Temp. or display setting value when enter in setting mode or calibration mode.
    ⑤ Unit : Display the unit which is set.

Ⅱ Key

(CAL) : Enter Calibration Mode, if press the button for 5 seconds in Measuring Mode.
Exit the Calibration Mode, if press the button in Calibration Mode.
(Can not enter Calibration Mode when Setting Mode, displaying Error, & Setting to hold the measured value)

(MENU) : Enter the Setting Mode, if press the button in Measuring Mode.
Return to previous Mode, if press the button in Setting Mode.

(▲) : Menu is changed or Setting Value is increased, if press the button in Setting Mode or Calibration Mode.
Setting value is fast increased, if press the button continuously.
High Alarm Setting Value is displayed for 3 seconds, if press the button for 3 seconds in Measuring Mode.

(▼) : Menu is changed or Setting Value is decreased, if press the button in Setting Mode or Calibration Mode.
Setting value is fast decreased, if press the button continuously.
Low Alarm Setting Value is displayed for 3 seconds, if press the button for 3 seconds in Measuring Mode.
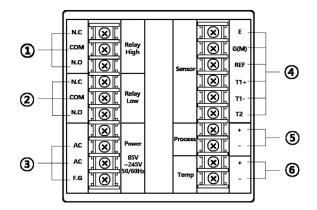
(ENTER) : Save the setting value in Setting Mode or Calibration Mode.
The buzzer will sound and all setting values will be initialized, if press the button for 5 seconds in Measuring Mode.
(Unable to initialize when Setting Mode, Calibration Mode, & displaying Error)
   ※ When initialization, all calibration values and setting values will be changed to the initial setting values before delivery from factory.

7-2 Rear

① Relay High : HIGH Alarm Output Terminal
② Relay Low : LOW Alarm Output Terminal
③ Power : Power Supply Terminal
④ Sensor : Electrode Connection Terminal
⑤ Process : Analog output terminal of 4~20mA
　　for 0 ~ 14pH(ORP : -1999~1999mV)
⑥ Temp : Analog output terminal of 4~20mA
　　for –10 ~ 100°C(Option)

8 Calibration

8-1 Calibration

This controller is Two-Point Calibration type and supports Automatic Calibration and Manual Calibration.
After Zero Calibration(pH7), perform Span Calibration(pH4 or pH9).
Perform calibration by using the standard solution of pH4, pH7, & pH9 and take a note that the controller does not support calibration for other standard solutions.
Refer to the below table for the Standard Solutions which enables Automatic Calibration and temperature characteristics according to the standard solutions.

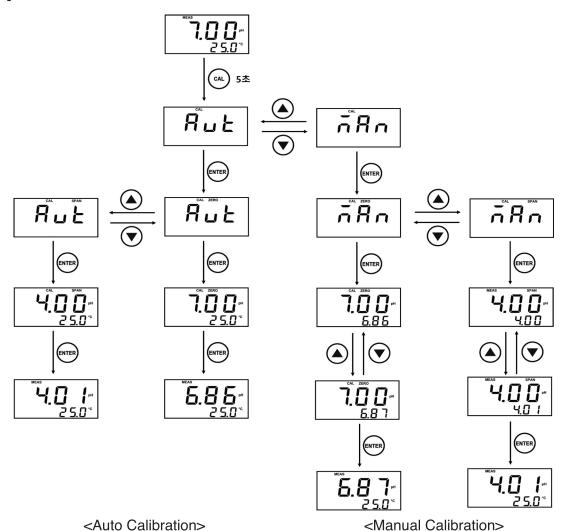|	pH4 Potassium Phthalate	pH7 Neutral Phosphate	pH9 Borate
0	4.01	6.98	9.46
5	4.01	6.95	9.39
10	4.00	6.92	9.33
15	4.00	6.90	9.27
20	4.00	6.88	9.22
25	4.01	6.86	9.18
30	4.01	6.85	9.14
35	4.02	6.84	9.10
40	4.03	6.84	9.07
45	4.04	6.83	9.04
50	4.06	6.83	9.01
55	4.08	6.84	8.99
60	4.10	6.84	8.96
70	4.12	6.85	8.93
80	4.16	6.86	8.89
90	4.20	6.88	8.85
95	4.23	6.89	8.83

8-2 Cautions for calibration

1 In calibration mode, do not be changed to Measuring Mode even after several minutes.
  To exit the Calibration Mode, should stop calibration by pressing the CAL Key or complete calibration by pressing the ENTER Key.
2 During calibration, if press CAL key to exit Calibration Mode or the Calibration Mode is exited in an unusual manner, such as power off, Calibration Values are not stored.
3 Clean the electrode with clean or distilled water before submerging it or transferring it to a different standard solution.
4 For correct calibration, use it after stirring the standard solution sufficiently.

> ⚠ Warning
>
> • Do not handle calibration powder or solution used for product calibration by children or the elderly & the infirm, since it may be harmful to the human body.
>   Be sure to follow the doctor's prescription when drinking it.
> • When the glass electrode is broken, it may cause serious damage to the human body.
>   Be careful in handling the glass electrode and check the surface of electrode by naked eye and, if there is a crack or an damage in the electrode, do not use it and discard it.
> • Be sure to wear protective gear, if the measuring liquid is harmful to the human body.

8-3 pH Calibration

<Auto Calibration>   <Manual Calibration>
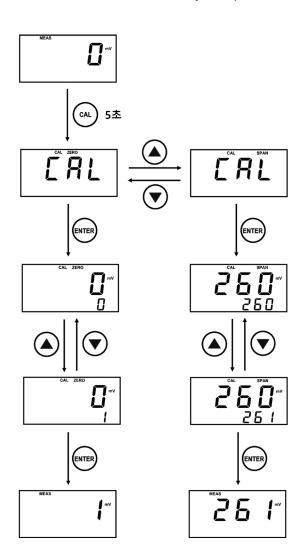
1 Clean the electrode with distilled water.
2 Immerse the electrode in the standard solution(Zero Calibration: pH7, Span Calibration: pH4 or pH9).
Wait until the Controller has stabilized.(It may take up to 5 minutes)
3 Make sure that the setting temperature matches the temperature of the standard solution.
If it is not matched, change the setting temperature.(Refer to 9-11 The setting of Automatic Temperature Compensation)
※When using automatic temperature compensation, separate settings are not required.
4 In the Measuring Mode, press the CAL key for 5 seconds to enter the Calibration Mode.
5 Press ENTER key, after selecting the Calibration Method(Automatic: Aut, Manual: ñAn) with ▲ and ▼ key.
6 Press ENTER key, after selecting the Calibration Type(ZERO, SPAN) with ▲ and ▼ key.
7 The measured pH value is displayed.
8 In case of Manual Calibration, can change the Calibration Value with ▲ and ▼ key.
If you are using a standard solution not specified in 8-1 the temperature characteristic table, change it to pH value that corresponds to that standard solution.
9 Press ENTER key to complete the calibration.

8-4 ORP Calibration

※ In case of ORP calibration, it will be not necessary to set any calibration because ORP Calibration of the controller was already completed before delivery from factory.

■ Zero Calibration
①Disconnect the electrode wire from the rear terminal of the Controller.
②Short circuit between G(M) and R terminals.

■ Span Calibration
① Clear the electrode with distilled water and submerge it in Quinhydrone solution.
② Wait until the Controller's concentration has stabilized.
③ In the Measuring Mode, press the CAL key for 5 seconds to enter the Calibration Mode.
④ Press ENTER key, after selecting the Calibration Type(ZERO, SPAN) with ▲ and ▼ key.
⑤ The measured ORP value is displayed.
⑥ Can change the Calibration Value with ▲ and ▼ key.
※ Change the Calibration Value only if it is needed.
⑦ Press ENTER key to complete the calibration.
※ In case of Zero Calibration, connect the electrode wire.

9 Setting & Function

9-1 Menu Setting

You can enter Menu mode by pressing the Menu key in Measuring mode, and can cancel the setting or return to Measuring mode by pressing Menu key in Menu mode.

In Menu mode, if there is no any keystroke for 20 seconds, return to Measuring mode without any storage of the value that is being set.

Enter key must be pressed to save the setting value.
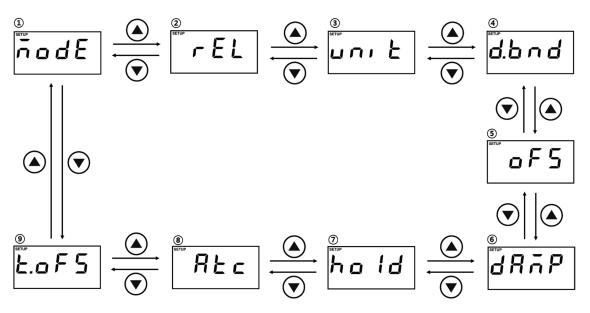
9-2 Standard setting value

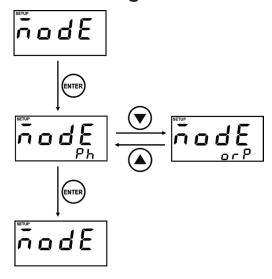| Menu		Standard setting value(pH/ORP)	
Mode(ñodE)		pH	
Alarm(rEL)	High	9.00pH	400mV
	Low	4.00pH	-400mV
Unit(unit)	Meas	pH	mV
	Temp	°C	do not support
Dead Band(d.bnd)		0.00pH	0mV
Offset(oFS)		0.00pH	0mV
Damping(dAñP)		0.00pH	0mV
Hold on measured value(hold)		OFF	OFF
Auto temp. compensation(Atc)		OFF	do not support
Temp. offset(t.oFS)		0.0°C	do not support

9-3 Menu configurations

Menu configurations support 9 setup menus as shown below. Can change the menu by ▲ & ▼ key after entering the Menu mode and can enter the setting display by ENTER key.

In case of each setting method, refer to the setting page(9-4 ~ 9-12) of the corresponding menu.

※ORP Mode do not support Setting of Unit(unit), Auto temp. compensation(Atc), & Temp. offset(t.oFS)

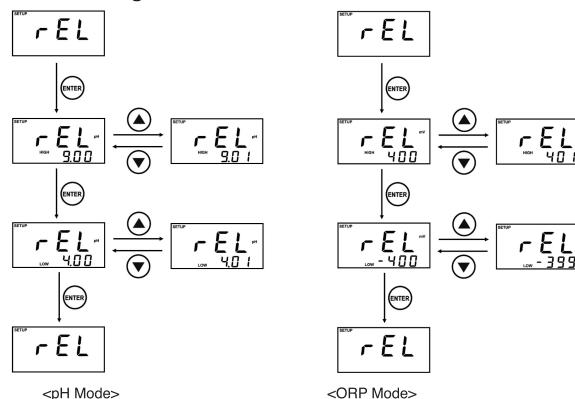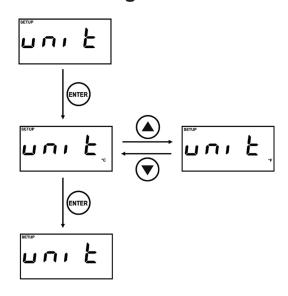## 9-4 Mode Setting

1. ñodE is Mode setting menu.
2. The Mode you want to change is displayed, while you enter the Setting display.
3. The Mode you want to select can be changed by ▲,▼key. (pH or ORP)
4. Mode is changed to the selected mode by pressing ENTER Key.
   ※ If you change mode, all setting values will be initialized.

9-5 Alarm Setting

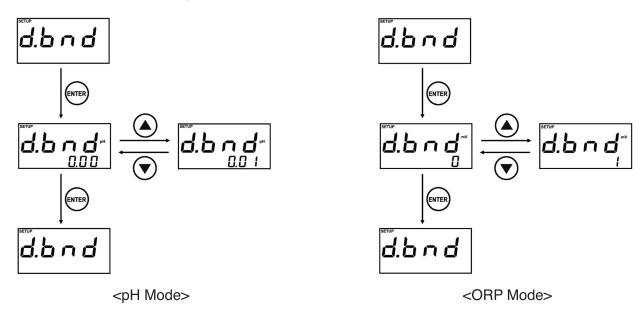<pH Mode>   <ORP Mode>

1. rEL is Alarm setting menu.
2. Present Alarm setting value is displayed, while you enter the Setting display.
3. Alarm setting value can be changed by ▲,▼ Keys
   (Unit: 0.01pH / 1mV, Range: -0.00~14.00pH / -1999mV~1999mV)
4. Set the HIGH Alarm setting and then the LOW Alarm setting.
5. The HIGH Alarm value cannot be set lower than the LOW Alarm value, and the LOW Alarm value cannot be set higher than the HIGH Alarm value.
6. Dead band setting value is reflected to Alarm setting value.
   (Refer to 9-7 Dead band setting).
   Ex.) When 0.30pH of Dead band & 2.00pH of HIGH Alarm are set, 1.70pH or higher cannot be set as LOW Alarm.
7. Generating condition of alarm
   • HIGH Alarm : HIGH Alarm setting value – Measured value ≤ 0
   • LOW Alarm : LOW Alarm setting value – Measured value ≥ 0
※ In case of Dead band setting and its corresponding operation, refer to "9-7 Dead Band Setting".

9-6 Unit Setting

1 unit is Unit setting menu.
2 Present set unit is displayed, while you enter the Setting display.
3 Finish the setting by ENTER Key, after changing setting unit by ▲,▼ Key.(Two type of unit(°C & °F) is supported)
　※Unit setting is not supported in ORP Mode.
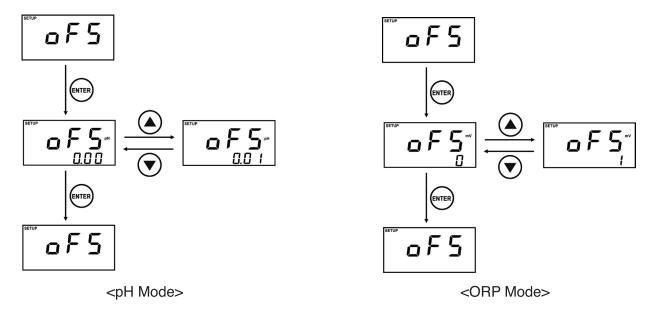
9-7 Dead band Setting

<pH Mode>　　　　　　　　　　　　　　　　　　<ORP Mode>

1 d.bnd is Dead band setting menu.
2 Present set value is displayed, while you enter the Setting display.
3 Dead band value can be changed by ▲,▼ Key(Unit: 0.01pH / 1mV, Max.: 1.00pH / 100mV)
4 Finish the setting by pressing ENTER Key.
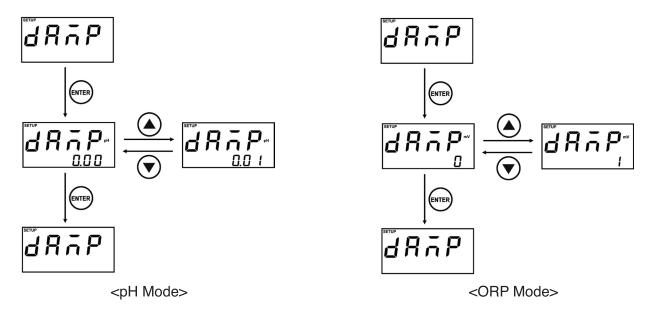5 The alarm will occur as shown below example.
　Ex.) When setting of 0.10pH
　　• When Setting value of HIGH Alarm is 3.00pH
　　: If measured value is 3.10pH or over, HIGH Alarm will occur, and, if measured value become less than 2.90pH, HIGH Alarm will be off.
　　• When Setting value of LOW Alarm is 1.00pH
　　: If measured value is less than 0.90pH, LOW Alarm will occur, if measured value become 1.10pH or over, LOW Alarm will be off.
　※Dead band setting value can not be set within the difference range of HIGH Alarm and LOW Alarm. (Refer to " 9-5 Alarm Setting")
　Ex.) When 1.20pH of HIGH Alarm and 1.00 pH of LOW Alarm are set, 0.20pH or higher can not be set as Dead band.

13

9-8 Offset Setting

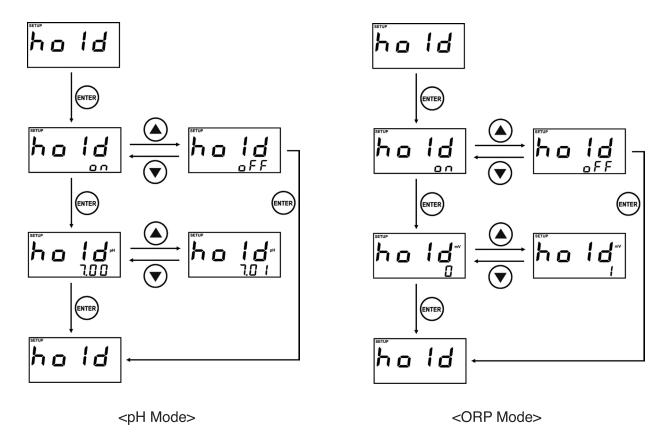<pH Mode>   <ORP Mode>

① oFS is Offset setting menu.
② Present set value is displayed, while you enter the Setting display.
③ Offsetting value can be changed by ▲,▼ Key.
　　(Unit: 0.01pH / 1mV, Range: -1.00~1.00pH / -100mV~100mV)
④ Finish the setting by pressing ENTER Key.
⑤ The measured value is displayed after offsetting it as much as setting value.

9-9 Damping Setting

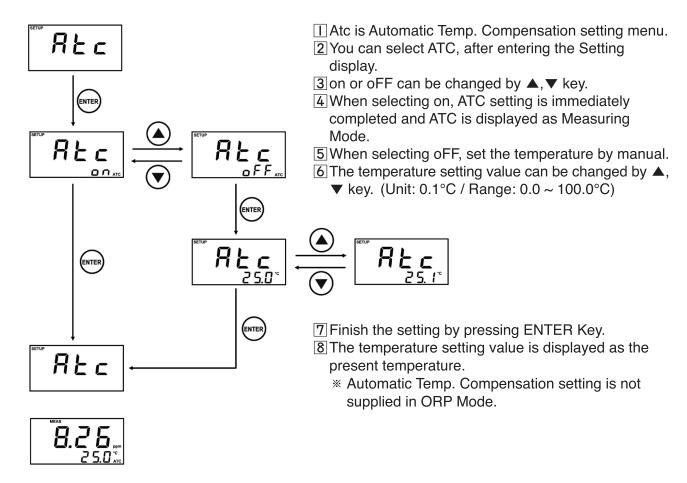<pH Mode>   <ORP Mode>

① dAn̄P is Damping setting menu.
② Present setting value is displayed, while you enter the Setting display.
③ Damping value can be changed by ▲,▼ Key.
　　(Unit: 0.01pH / 1mV, Max.: 1.00pH / 100mV)
④ Finish the setting by pressing ENTER Key.
⑤ The measured value is displayed after damping it as much as setting value.

9-10 Hold Setting

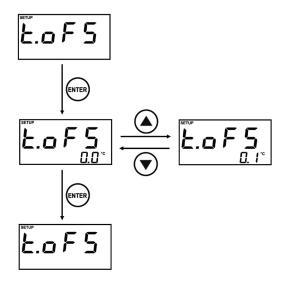
<pH Mode>   <ORP Mode>

1 hold is menu for fixing the measured value.
2 You can select whether to hold the measured value or not, after entering the Setting display,
3 on or oFF can be changed by ▲,▼ key.
4 When selecting oFF, setting is immediately completed.
5 When selecting on, the value to set is displayed.
6 The setting value can be changed by ▲,▼ key.
   (Unit : 0.01pH / 1mV, Range : 0.00~14.00pH / -1999~1999mV)
7 Finish the setting by pressing ENTER Key.
8 The measured value is displayed as the setting value and HOLD status is displayed.
   ※ If the hold setting value is higher than the setting value of HIGH Alarm and lower than the
      setting value of LOW Alarm, alarm will occur, but it will be not effected by Dead band.
   ※ It is impossible to enter the calibration mode, when the measured value is hold state.
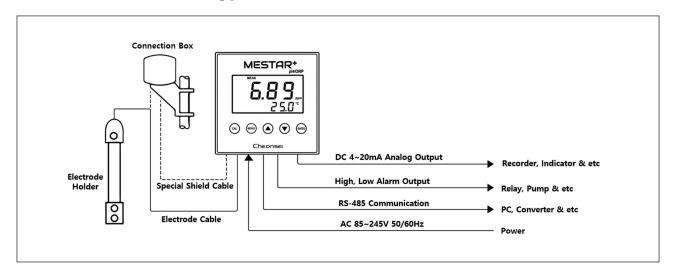
9-11 ATC Setting

[1] Atc is Automatic Temp. Compensation setting menu.
[2] You can select ATC, after entering the Setting display.
[3] on or oFF can be changed by ▲,▼ key.
[4] When selecting on, ATC setting is immediately completed and ATC is displayed as Measuring Mode.
[5] When selecting oFF, set the temperature by manual.
[6] The temperature setting value can be changed by ▲, ▼ key. (Unit: 0.1°C / Range: 0.0 ~ 100.0°C)

[7] Finish the setting by pressing ENTER Key.
[8] The temperature setting value is displayed as the present temperature.
 ※ Automatic Temp. Compensation setting is not supplied in ORP Mode.

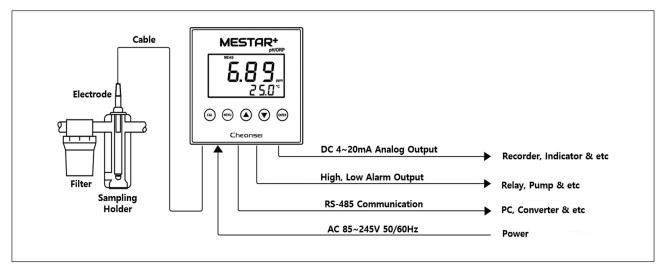## 9-12 Temp. Offset setting

[1] t.oFS is Temp. Offset setting menu.
[2] Present setting value is displayed, while you enter the Setting display.
[3] Temp. Offset value can be changed by ▲,▼ key. (Unit: 0.1°C / 0.1°F, Range: -5.0~5.0°C / -9.0~9.0°F)
[4] Finish the setting by pressing ENTER Key.
[5] The present temperature is displayed after offsetting it as much as setting value.
 ※ It is only operated when Automatic Compensation is on.
 ※ If temperature sensor is not connected, it will be not operated.
 ※ Unit setting is not supplied in ORP Mode

10 System Diagram

10-1 Electrode Holder Type
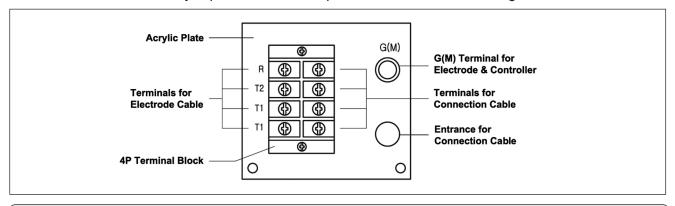

10-2 Sampling Holder Type

11 Handling of Components

※This manual describes only the handling for the standard set components.

11-1 Wiring of Connection Box(for Temp. Compensation)

☐ Be careful not to change wiring, since the color of the electrode & the connection cable should be matched with the terminals in the connection box each other.

② General Standard Connection Box has only G(M) & R terminals, so connect G(M) & R terminal on both sides of the acrylic plate to the same poles each other when wiring.
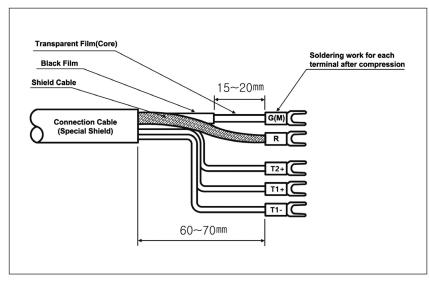

⚠ Caution

• Do not install controller in the heavy moist, dusty, or vibration place. Bad connection at the terminal may occur.
• Do not install this connection box at the place where corrosive gas is generated.
• Turn off power before repair & maintenance.
  It may cause a damage of controller by static electricity.

11-2 Termination Method of Connection Cable (for Temp. Compensation)

Ⅰ Remove the external film & the internal Black film as beside figure and solder the Y terminal after compressing the Y terminal(1.5-3Y) to the cable.

② Wrap it with tube or tape after soldering. Specially, wrap Shield cable of R terminal with shrink tube(Φ2.0) or tape in order to prevent its exposure.

③ When moving external film & internal black film, be careful that transparent film (G(M)) don't be damaged and, if the transparent film is damaged, rework after cutting the damaged part.
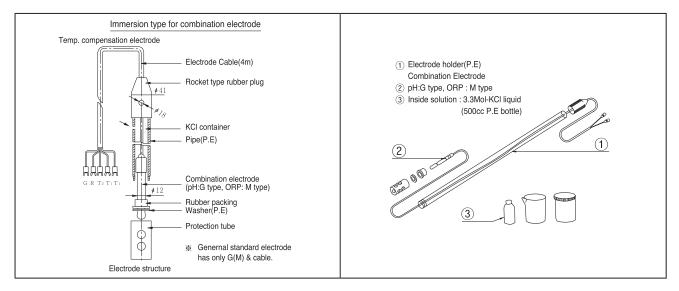

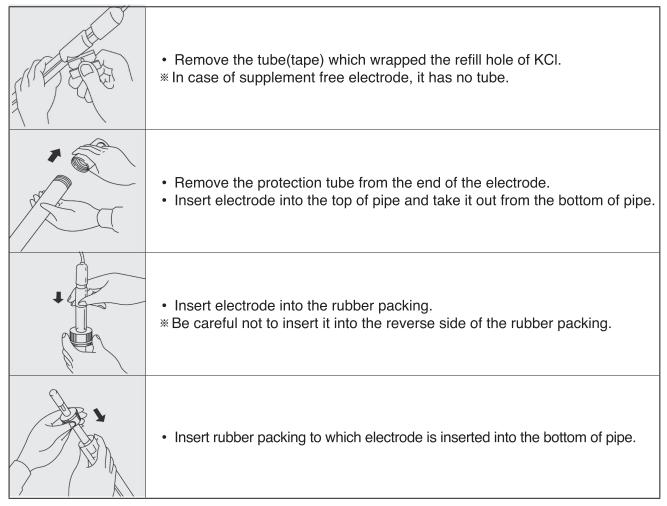| Terminal	G(M)	R	T2	T1	T1
Cable Color	Transparent Film(Core)	Shield Cable	White	Red	Yellow

⚠ Caution

• Remove black film as above figure certainly.
  If not removed, G(M) terminal and R terminal will be short state, can not measure it since the measured value will be fixed around pH7 in pH measuring and the measured value will be fixed around 0mV in ORP measuring.

11-3 Handing method of Electrode Holder

☐ The electrode holder is used for measuring pH value of liquid in the open tank. Electrode holder is plastic pipe and functions as container which can fill in KCl liquid.
KCl liquid can be easily filled from top of electrode holder and sufficient KCl liquid can be stored inside because whole pipe functions as container.

② In case of supplement free electrode, there is no need to refill KCl liquid and handling method is similar to other electrodes.

Immersion type for combination electrode

Temp. compensation electrode

- Electrode Cable(4m)
- Rocket type rubber plug
- $\phi 41$
- $\phi 18$
- KCl container
- Pipe(P.E)

G R T₂ T₁ T₁

- Combination electrode (pH:G type, ORP: M type)
- $\phi 12$
- Rubber packing
- Washer(P.E)
- Protection tube

※ Gennral standard electrode has only G(M) & cable.

Electrode structure

① Electrode holder(P.E) Combination Electrode
② pH:G type, ORP : M type
③ Inside solution : 3.3Mol-KCl liquid (500cc P.E bottle)

11-4 Installation method of electrode & electrode holder

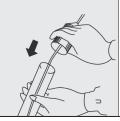|	
	• Remove the tube(tape) which wrapped the refill hole of KCl. ※ In case of supplement free electrode, it has no tube.
	• Remove the protection tube from the end of the electrode. • Insert electrode into the top of pipe and take it out from the bottom of pipe.
	• Insert electrode into the rubber packing. ※ Be careful not to insert it into the reverse side of the rubber packing.
	• Insert rubber packing to which electrode is inserted into the bottom of pipe.

	• Put the Washer(P.E) on top of the rubber packing and fix the rubber packing by inserting the protection tube. ※ When inserting protection tube, tighten it in order to prevent leakage of internal solution. ※ When inserting electrode cable into electrode holder, don't make it tight but rather loose. It is more convenient when refilling internal solution & replacing electrode.
	• Dissolve KCl powder in distilled water of 500cc and put it in beaker. Take the rocket type rubber plug off and fill it into the top of electrode holder. ※ In case of supplement free electrode, there is no need to refill KCl liquid.
	• After refilling KCl liquid, insert the rocket type rubber plug into electrode holder by aligning the air vent of the electrode holder & the air vent of the rocket type rubber plug. ※ In case of supplement free electrode, special rubber plug is included.

⚠ Caution

• Be careful not to apply excessive force when handling the electrode. If the glass electrode is broken by excessive force, it may cause injury.

12 Cause & Solution of Problem

Item	Problem	Number of Cause & Solution
A	E.01 on screen (Electronic circuit board is not connected)	1, 2
B	E.02 on screen (Electrode is not calibrated)	3, 4, 9
C	E.03 on screen (Electrode signal Error)	3, 4, 5
D	Reading on screen is not changed	3, 4, 5, 6, 7, 9
E	Measuring is difficult because reading is not steady	3, 5, 6, 7, 9
F	The displayed temp. is far different from the actual temperature. (over ±5°C)	8

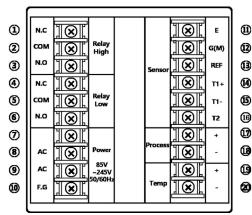| No.	Cause	Solution
1	Faulty circuit board connection	Repair the controller
2	Damaged circuit board	Repair the controller
3	Damaged electrodes & Electrode's aging	Exchange electrode
4	Shortage of Electrode solution	Supplement of internal liquid
5	Fault of liquid to be measured	Connecting terminal after removing obstacle
6	Poor quality of the measuring liquid	Exchange the measuring liquid
7	The fluid velocity of liquid to be measured is not steady	Makes the fluid velocity steady
8	Fault of temp. compensation circuit	Exchange temp. compensation PCB

13 Warranty

> ⚠ Caution
>
> • If the product is reconstructed arbitrarily or the undesignated parts are used into the product, CHEONSEI will not warrant and CHEONSEI is not responsible for any expense caused by accident or trouble.

1 Warranty period is one year from purchase date.
2 During warranty period, repair or change of pump is free of charge, if trouble or damage of pump due to design or manufacturing of CHEONSEI.(Consumable parts are excluded)
3 Repair or change product due to following reasons will be charged regardless the warranty period.
　① Trouble or damage of pump expired warranty period.
　② Trouble of using by careless handling.
　③ Trouble or damage due to using non-designated part & reconstructing the products arbitrarily.
　④ Trouble or damage due to reconstructing the products by other than CHEONSEI and our authorized company.
　⑤ Trouble by fire or natural disaster

14 Repair Service

> ⚠ Caution
>
> • When the product is sent to factory for repair service, do not damage during transport.
> Also, please make sure that bolts and other components are securely fastened in order not to loss it.

1 Contact to CHEONSEI or local agent as shown on back of the manual, if you have any problem or questions.
2 If you want to repair, please inform the following.
　①Model Name & manufacture number written in name plate
　②Used period, using condition & state
3 If warranty period is over, it may charge according to repair part. Please contact with sales agent for more information.
4 Minimum retention period of parts for repair is 5 years from the date of production.
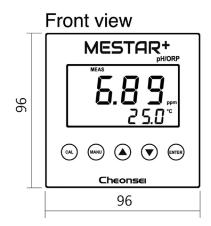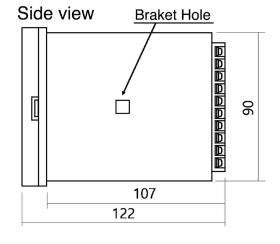
15 Controller Wiring

① HIGH Alarm N.C(Normal Close)
② HIGH Alarm COM(Common)
③ HIGH Alarm N.O(Normal Open)
④ LOW Alarm N.C(Normal Close)
⑤ LOW Alarm COM(Common)
⑥ LOW Alarm N.O(Normal Open)
⑦ None(Don't use)
⑧ AC Power Input
⑨ AC Power Input
⑩ F.G(Frame Ground)

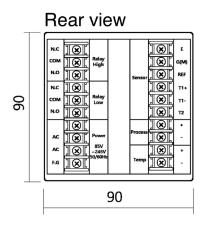⑪ Earth to measured liquid
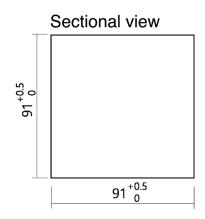⑫ Electrode G(M)
⑬ Electrode REF
⑭ Electrode T1+
⑮ Electrode T1-
⑯ Electrode T2+
⑰ pH/ORP Analog Output +
⑱ pH/ORP Analog Output -
⑲ Temp. Analog Output +
⑳ Temp. Analog Output -

16 Controller Dimension

Front view

MESTAR+
pH/ORP
MEAS
6.89 ppm
25.0 ℃
CAL MANU ▲ ▼ ENTER
Cheonsei

96
96

Side view

Braket Hole

90
107
122

Rear view

90
90

Sectional view

$91^{+0.5}_{0}$
$91^{+0.5}_{0}$

22