Digital RC Controller

MESTAR+ Series

Instruction Manual

Thank you very much for purchasing cheonsei RC 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.

※Please refer to the website (www.cheonsei.co.kr) as we always register the latest instruction manual.

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

• The 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℃ / Relative humidity : below 80%

  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 RC controller : 1Set
  • Bracket(SPC-1 M4 x 52) : 2EA
  • User 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.
Electrode cable is a shielded cable with high insulation. Other cables and connections will cause performance degradation.

4 Model Code

MESTAR⁺ R ▢▢ – ▢
   ① ② ③   ④

① Controller	② Controller Option	③ Output	④ Electrode
R : RC (Residual Chlorine)	B : Standard C : Communication(RS-485)	0 : Standard	0 : None 1 : CPR11(Constant Voltage)

5 Specification

5-1 Controller

Specificatioin		Performance
Measuring range		0.00 ~ 2.00ppm(Display Range: 0.00 ~ 4.00ppm)
Resolution / Accuracy		0.01ppm / ±5% of Full Scale(0.1ppm)
Ambient Temp. & Humidity		-5℃ ~ 45℃ / Relative humidity : Below 80% (Muse be free from condensation and dew)
Calibration method		2Point Calibration(Zero, Span)
Display		3" LCD Segment Display (LED Back Light : White)
Alarm output	Setting	High, Low
	Output	Dry Contact 1a1b, Contact capacity : 3A 250VAC / 3A 28VDC
	Deadband	Setting Range: 0.00 ~ 1.00ppm
Analog output		0.00 ~ 4.00ppm : 4~20mA isolated output (Load resistance 1,000Ω)
pH Compensation Rage		4.0 ~ 8.5pH (Analog input : Approx 8.5 ~ 13.7mA)
Memory		EEPROM
Communication		RS-485 2Wire Half-Duplex(Option)
Power		AC85 ~ 245V, 50/60Hz (Power consumption: 3W)
Case		Anti-Static ABS
Size & Weight		96mm * 96mm * 115mm / Approx.450g
Installation place		Indoor, inside electric panel

5-2 Electrode

	Specification	Remark
Model	CPR11	
Use	Free Residual Cholrine	
Electrode type	Constant Voltage	
Measuring range	0.00 ~ 2.00ppm	
pH condition for mesurement	4.00 ~ 8.50 pH	Recommendation : 6.5~7.5pH
Flow condition for mesurement	500 ~ 1000mL/min	
Workable temp.	2 ~ 45℃	
Workable pressure	Max. 1bar	
Reply time	95% in 2minutes	Base on 25℃
Cable length	Approx. 5m	
Meterial	Glass	

6 SET Components

6-1 Standard SET Components

SET Model	Conponents		Specification	Quantity
MESETAR+ RB0-1	Controller		Digital RC Controller	1SET
	Panel bracket		SPC-1 M4 x 52mm	2EA
	User manual		34Page	1Copy
	Electrode		CPR11	1SET
	Sampling holder	Probe housing	Meterial: PC	1SET
		Sampling valve	Meterial: PVC	1SET
		Filter	Meterial: Nylon + PC	1SET
		Plate	Meterial: Nylon	1SET

6-2 Sampling holder optional item

① Variable-area Flowmeter

# 7 Name & Function of Each Part

7-1 Screen Layout

① Setup mode
② Measurement mode
③ Calibration mode
④ Zero calibration
⑤ Span calibration
⑥ Main display
⑦ Main display unit

⑧ Sub display unit
⑨ Temp. compensation
   setting status
⑩ Sub display
⑪ Low alarm status
⑫ High alarm status
⑬ Hold setting status

7-2 Key Fuction

Key	Setup mode	Measurement mode	Calibration mode
(CAL)	-	Enter calibration mode (5seconds)	Exit
(MENU)	Return	Enter setup mode	-
(▲)	Increase	High alarm set value display (3seconds)	Increase
(▼)	Decrease	Low alarm set value display (3seconds)	Decrease
(ENTER)	Select	Select	Select

7-3 Rear
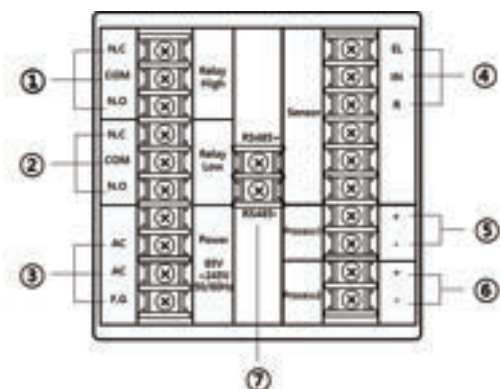
① Relay High : High alarm output
② Relay Low : Low alarm output
③ Power : Power Supply
④ Sensor : Electrode connection
⑤ Process1 : 4~20mA Analog output
          for 0.00~4.00ppm
⑥ Process2 : 4~20mA Analog input
          for 4.0~8.5pH
⑦ Communication
   : RS-485 Communication output (Option)

8 Calibration

8-1 Calibration

This controller is Two-Point Calibration type and supports Zero calibration and Span calibration.

Get a comparator ready for the conduct of calibrations (DPD colorimeter is recommended).

8-2 Cautions for calibratioin

①It does not change to measurement mode after several minutes in calibration mode.

To exit the Calibration Mode, should stop calibration by pressing the CAL Key or complete calibration by pressing the ENTER Key.

②During 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.

③Clean the electrodes with clean or distilled water before submerging it.

④The residual chlorine is much influenced by the rate of liquid flow. Calibrate the rate with the same flow rate obtained at the time of measurement. The reliability of the measure value is reduced, if the flow rate at the time of calibration is different from that at the time of measurement.

⑤Calibrate in the manner that the range to be measured falls within the Zero and Span range; otherwise, its accuracy drops. (Ex. Meas: 0.5ppm Zero: 0ppm, Span: 0.8ppm)

⑥Zero calibration is more accurate when performed when the measured water is free of chlorine than when the electrode is exposed to air.

⑦Span correction should be set more than 0.2ppm higher than the measurement range to increase measurement accuracy.

※There can be a considerable difference between analysis by an instrument and analysis by a reagent. Analysis by a reagent is advised to adopt to have precise measurements

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⚠ **Warning**

· Calibration powder or solution used for product calibration can be harmful to the human body when drunk, so be careful not to drink it. When drinking, be sure to receive a doctor's prescription.

· If the glass electrode is broken, it may cause harm to the human body. Careful handling is required and the surface of the electrode is visually inspected.

Do not use and discard if damage is confirmed or it is judged to be abnormal.

· Be sure to wear protective equipment when measuring water is harmful to the human body.

8-2 How to calibrate
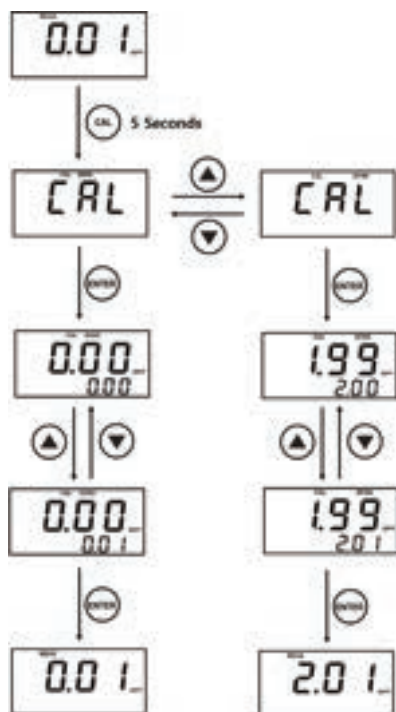
① Check the chlorine concentration of the water to be measured through a comparator.
   (DPD colorimeter recommended)
② Clean the electrode with distilled water.
③ Immerse the electrode in the water to be measured
④ Wait until the controller has stabilized.(It may take up to 5 minutes)
⑤ In the measurement mode, press the CAL key for 5 seconds to enter the calibration mode.
⑥ If the measured chlorine concentration is below the usage range, select ZERO.
⑦ If the measured chlorine concentration is above the usage range, select span.
⑧ The concentration currently being measured is displayed on the main screen and the concentration
    to be calibrated is displayed on the sub screen.
⑨ You can adjust the concentration to be corrected with the ▲, ▼ keys.
   (Change to the concentration measured with the comparator.)
⑩ Press ENTER to complete the calibration.

※If the concentration to perform ZERO correction is higher than the SPAN concentration at the time of the
   last calibration, or if the concentration to perform the SPAN correction is lower than the ZERO concentration
   at the time of the last calibration, an error (E.02) occurs. In this case, change the calibration sequence or
   press the ENTER key in measurement mode. Press for 5 seconds to initialize and proceed with calibration.
  (Be careful because all setting values are initialized during initialization.)

9 Setting & Function
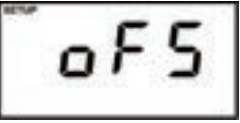
9-1 Menu setting

You can enter setup mode by pressing the MENU key in measurement mode, and can cancel the setting or return to measurement mode by pressing MENU key in setup mode. In setup mode, if there is no an keystroke for 20 seconds, return to measurement mode without any storage of the value that is being set.
ENTER key must be pressed to save the setting value. The controller supports the following 9 setting functions.

9-2 Menu components

※Some functions are not supported depending on the specifications or settings of the controller.
  For detailed setting of each menu item, please refer to the detailed explanation page of 9-3 ~ 9-9.

rEL	9-3 Alarm setting(Relay) It sets the operation value of High, Low alarm. After setting the high alarm, you can set the low alarm. Default: high 2.00ppm, low 0.00ppm ※If Low setting is 0, alarm setting is Off.
d.bnd	9-4 Deadband setting It sets the range when alarm output turns OFF when ON. System errors caused by frequent ON/OFF operation of alarm output can be pevented. Default : 0.00ppm
dAmP	9-5 Damping setting Ignores small changes in the controller readings. If there is a problem in the output signal of the electrode under certain circumstances, only the amount of change over the set value is detected. Default : 0.00ppm
oFS	9-6 Offset setting Increases or decreases the measured value by the set value. It is used temporarily when the measured values show a certain difference or when it is difficult to immediately proceed with the calibration. Default : 0.00ppm
hold	9-7 Measurement value fixed setting(hold) The measured value is fixed at the set value. System errors can be prevented by fixing the measured values when cleaning or replacing electrodes. Default : Off

|	
SETUP **Adr**	9-8 Communication address setting Set the address of the controller for RS-485 communication. Default : 01 ※A controller without communication specification is not supported.
SETUP **bAud**	9-9 Baudrate setting Set the communication Baudrate. Default : 9.6(9600bps) ※A controller without communication specification is not supported.

9-3 Alarm setting(Relay)
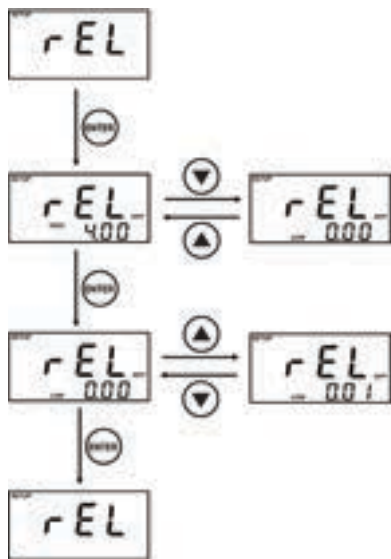
① rEL in setup mode is the alarm setting menu.

② When entering the setting screen, the currently set alarm value is displayed.

③ You can change the alarm setting value with the ▲,▼ keys.

   (Unit: 0.01ppm, Range : 0.00 ~ 4.00ppm)

④ After setting the high alarm, you can set the lo alarm.

⑤ The high alarm value cannot be set lower than the low alarm value.

⑥ The low alarm value cannot be set higher than the high alarm value.

⑦ The deadband setting value is reflected in the alarm setting value. (Refer to 9-4 Deadband setting)

   ex) When the deadband is set at 0.30ppm and high alarm is set at 2.00ppm,

   low alarm cannot be set above 1.70ppm.

⑧ Alarm ON condition

   • High alarm : High alarm setting value ≤ Measured value

   • Low alarm : Low alarm setting value ≥ Measured value

⑨ Alarm OFF condition

   • High alarm : High alarm setting value > Measured value

   • Low alarm : Low alarm setting value < Measured value

※For Deadband setting and its operation, please refer to "9-4 Deadband setting".

9-4 Deadband setting
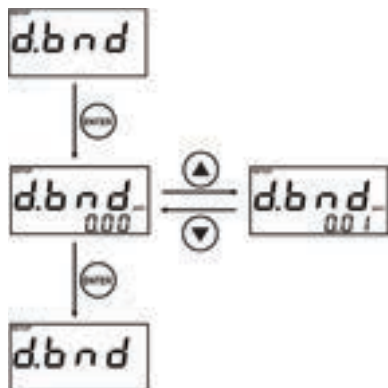
① d.bnd in setup mode is the deadband setting menu.

② When entering the setting screen, the currently set alarm value is displayed.

③ You can change the deadband setting value with the ▲,▼ keys.

  (Unit: 0.01ppm, Max: 1.00ppm)

④ Finish the setting by pressing ENTER key.

⑤ The alarm will occur as shown below example.

ex) When setting of 0.10ppm

 • When setting value of high alarm is 1.00ppm

  : If measured value is 1.00ppm or over, High alarm will occur,

   and if measured value become less than 0.90ppm, High alarm will be off.

 • When setting value of low alarm is 0.50ppm

  : If measured value is less than 0.50ppm, Low alarm will occur,

   and if measured value become 0.60ppm or over, Low alarm will be off.

※Deadband setting value can not be set within the difference range of high alarm and low alarm.

  (Refer to "9-3 Alarm setting")

ex) When 1.00ppm of high alarm and 0.80ppm of low alarm are set,

   0.20ppm or higher can not be set as deadband.

9-5 Damping setting
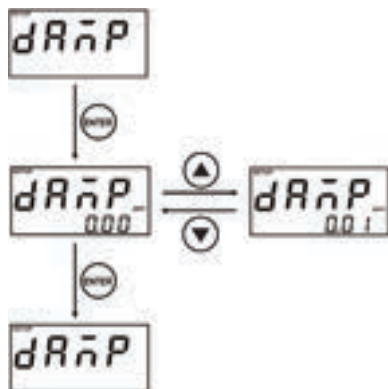
① dAnp in setup mode is the damping setting menu.
② When entering the setting screen, the currently set damping value is displayed.
③ You can change the damping setting value with the ▲,▼ keys.
   (Unit: 0.01ppm, Max: 1.00ppm)
④ Finish the setting by pressing ENTER key.

9-6 Offset setting
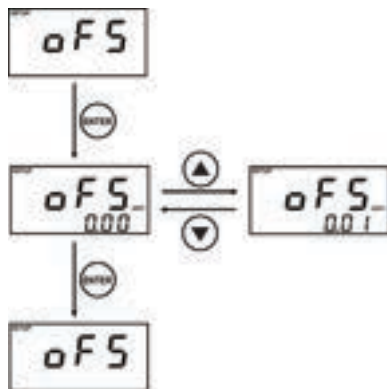
① oFS in setup mode is the offset setting menu.
② When entering the setting screen, the currently set offset value is displayed.
③ You can change the offset setting value with the ▲,▼ keys.
   (Unit: 0.01ppm, Range: -1.00 ~ 1.00ppm)
④ Finish the setting by pressing ENTER key.

9-7 Mesured value fixed setting

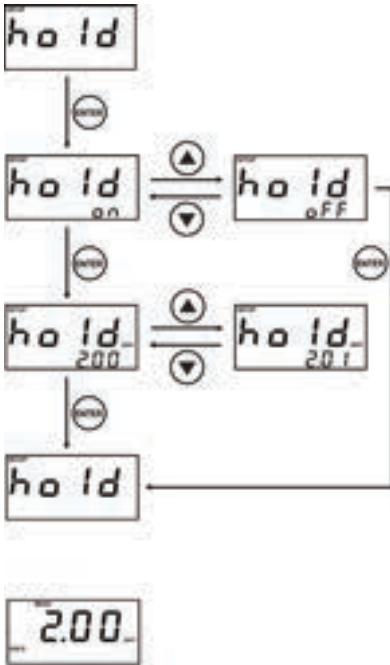① Hold in setup mode is the measurement value fixed setting menu.
② Enter the setting screen and select whether to set the measurement value fixed.
③ You can change ON/OFF with ▲,▼ keys
④ When selecting off, the setting is immediately completed.
⑤ When selecting on, the value to set is displayed.
⑥ You can change the hold setting value with the ▲,▼ keys.
　(Unit: 0.01ppm, Range: 0.00~4.00ppm)
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 or lower than the setting value
　of LOW Alarm, alarm will occur, but it will be not effected by Deadband.
※It is impossible to enter the calibration mode, when the measured value is hold state.

9-8 Communication address setting
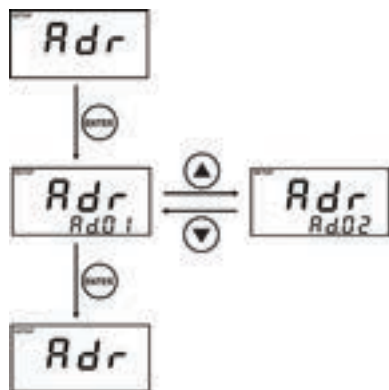
① Adr in setup mode is the Communication(RS-485) address setting menu.

② When entering the setting screen, the currently set address is displayed.

③ You can change the address with the ▲,▼ keys.

   (Range: 1 ~ 32)

④ Finish the setting by pressing ENTER key.

※A controller without communication specification is not supported.
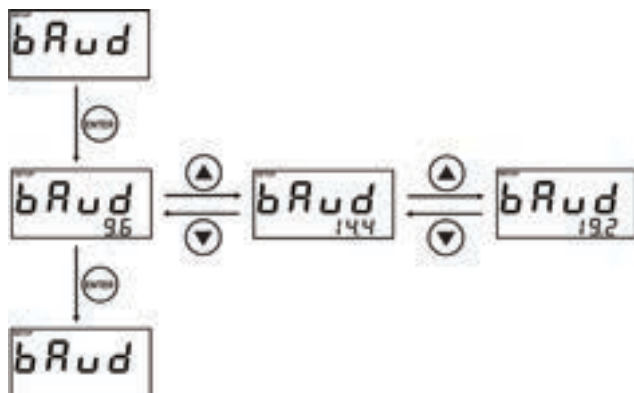
9-9 Baudrate Setting

① bAud in setup mode is the communcation(RS-485) baudrate setting menu.

② When entering the setting screen, the currently set baudrate is displayed.

③ You can change the baudrate with the ▲,▼ keys.

   (9.6: 9600bps, 14.4: 14400bps, 19.2: 19200bps)

④ Finish the setting by pressing ENTER key.

※A controller without communication specification is not supported.

10 How to use the pH Compensation Fuction

10-1 pH input
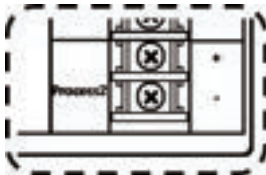
①Connect the 4-20mA analog output signal for pH concentration 0 ~ 14pH to the Process2 terminal at the back of the controller.
　※Compensation function is activated only in the range of 4.0 ~ 8.5pH.
　　(Analog signal input range: about 8.5 ~ 13.7mA)
② Refer to '8-2 Calibration method' to perform SPAN calibration.
③ If SPAN calibration is completed normally, the pH concentration at the time of calibration is saved, and au-tomatically according to the changing pH concentration.
　Residual chlorine readings are compensated and displayed.

10-2 Confirmation and error of pH compensation

① pH compensation function operation status
　: On the measurement screen, the pH display lights up as above.
② Non-operating state (when pH analog signal is not input)
　: The pH display does not light up on the measurement screen.
　※When the span calibration is in progress, even if the pH concentration is out of the compensation range,
　　it will not light up.
③ Error occurrence status
　: The pH display blinks on the measurement screen.
　　(After the pH compensation function is ON, when the pH compensation range is out of range or an
　　analog input signal problem occurs)

11 Communication Protocol

11-1 Communication Type

1)Channel : RS-485(Multi Drop)

2)Baudrate : 9,600bps(Default), 14,400bps, 19,200bps

3)Transmission : Half-Duplex

4)Protocol : Modbus RTU

11-2 Character Form

1)Character composition

• 0 Start bit

• 8 Data bit (LSB First)

• No Parity bit

• 1 Stop bit

2)Bit Sequence

Start	Data (8bit)								Stop
Bit	D0	D1	D2	D3	D4	D5	D6	D7	Bit
0	x	x	x	x	x	x	x	x	1

11-3 Frame

1)Frame construction

• Each area of the message is called a Field and consists of four fields.

①Address field : 8bit

②Function Code field : 8bit

③Data field : N x 8bit

④CRC(Error Check)field : 16bit

Message				
Slave Address	Function Code	Data	CRC Low	CRC High
8bit	8bit	N x 8bit	8bit	8bit

2)Frame division
  • Frames are classified by a waiting time of at least 3.5 character time after transmission of the last
    character of the frame, and if a new character is received within 3.5 character time, it is judged
    as a continuation of the frame being transmitted.
  • The frame string must be transmitted continuously, and if a waiting time of 1.5 Character time or more
    occurs between each character, it is judged as an incomplete message and the receive buffer is initialized.

3)Character time (Baud Rate : 9600bps)
    • 1Character : 1.04ms
    • 3.5Character : 3.64ms

11-4 Field

1)Address field
  • In the frame sent by the Master (PC), it is the address of the Slave (controller) to communicate with,
    The frame sent by the Slave is its own address.
  • The address setting of the controller can be set in the Adr item of the menu function.
    When entering the menu, Ad.01 (initial value) is displayed on the controller screen,
    and addresses 1 to 31 can be changed with the ▲ and ▼ keys.
    ※It must be saved with the ENTER key, and if there is no key operation for 20 seconds,
       the setting is terminated without saving.
  • The address cannot be changed by any method other than controller operation.

2)Functioin Code field
  • Select the type of function to request from the Slave. (Only two functions are supported.)
    ①Register read : 0x03
    ②Register write : 0x06
  • If the Master's request is normal, the same function code as the requested function code is returned.
  • If the master's request is abnormal, an error response is made by setting the first bit of the requested
    function code to 1.
     ex) Error respond to 0x03 : 0x83
         Error respond to 0x06 : 0x86

3)Data field
  • It consists of the address, number, and data of the register, and the composition of the data field varies
    depending on the requested function code and response type.
    ①Register read request : Register address to start reading, number of registers to read
    ②Register read respond : Number of byte, data
    ③Register write request, respond : Register address to write, data value to write
    ④Error respond : Exception Code
  • All data is composed of 2Byte (16bit) signed Integer type and has a value of '-32768 ~ 32767'.

• In case of negative number, it is treated as a complement and displayed.
 (Refer to "7.Data Conversion".)
• All data are processed as integers without distinction of decimal point and transmitted.
 For information on decimal point, refer to "10-7. Data conversion" to convert data.
 (Data of 50 and 5.0 are treated as 50 and transmitted in the form of 0x0032.)

 • Example of data construction
  ① 14.00(Decimal)   ② -20(Decimal)

Data (High)	Data (Low)
0x05	0x78

Data (High)	Data (Low)
0xFF	0xEC

4)CRC(Error Check) field
 • The CRC field consists of 2 bytes, and the transmission order is the lower 1 byte and the upper 1 byte.
 • CRC check method is CRC16 (Modbus).
 • For how to create CRC16, refer to "10-10.CRC16 creation method".

11-5 Register Map

Register Address	Contents	Write / Read	Value		Report
0x0001	Controller Status	Read	0x0101		pH measurement mode
			0x0102		ORP measurement mode
			0x0103		RC measurement mode
			0x0104		DO measurement mode
			0x0105		EC measurement mode
			0x0110		Calibration mode entry state
			0x0120		Setup mode entry state
			0x0191		ERROR1 occur
			0x0192		ERROR2 occur
			0x0193		ERROR3 occur
0x0002	Alarm Status	Read	0x0200		No alarms occurred
			0x0201		High alarm occur
			0x0202		Low alarm occur
0x0003	Meas Data	Read			Measured concentration value
0x0004	Temp Meas Data	Read			Measured temp. value
0x0005	High Alarm Data	Write / Read			High alarm set value
0x0006	Low Alarm Data	Write / Read			Low alarm set value
0x0007	Unit	Read	High Byte	0x80	Main unit mV
				0x40	Main unit pH
				0x20	Main unit %
				0x10	Main unit mg/L
				0x08	Main unit ppm
				0x04	Main unit mS
			Low Byte	0x80	Sub unit ℃
				0x40	Sub unit ℉
				0x20	Sub unit %
0x0008	Dead Band	Write / Read			Dead Band set value
0x0009	Offset	Write / Read			Offset set value
0x000A	Damping	Write / Read			Damping set value

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11-6 Write data input range

1)pH

High Alarm (0x0005)	Low Alarm (0x0006)	Dead Band (0x0008)	Offset (0x0009)	Damping (0x000A)
0 ~ 14.00	0 ~ 14.00	0 ~ 1.00	-1.00 ~ 1.00	1 ~ 1.00
0x0000 ~ 0x0578	0x0000 ~ 0x0578	0x0000 ~ 0x0064	0xFF9C ~ 0x0064	0x0001 ~ 0x0064

2)ORP

High Alarm (0x0005)	Low Alarm (0x0006)	Dead Band (0x0008)	Offset (0x0009)	Damping (0x000A)
-1999 ~ 1999	-1999 ~ 1999	0 ~ 100	-100 ~ 100	1 ~ 100
0xF831 ~ 0x07CF	0xF831 ~ 0x07CF	0x0000 ~ 0x0064	0xFF9C ~ 0x0064	0x0001 ~ 0x0064

3)RC

High Alarm (0x0005)	Low Alarm (0x0006)	Dead Band (0x0008)	Offset (0x0009)	Damping (0x000A)
0 ~ 4.00	0 ~ 4.00	0 ~ 1.00	-1.00 ~ 1.00	0 ~ 1.00
0x0000 ~ 0x0190	0x0000 ~ 0x0190	0x0000 ~ 0x0064	0xFF9C ~ 0x0064	0x0000 ~ 0x0064

4)DO

High Alarm (0x0005)	Low Alarm (0x0006)	Dead Band (0x0008)	Offset (0x0009)	Damping (0x000A)
0 ~ 20.00	0 ~ 20.00	0 ~ 1.00	-1.00 ~ 1.00	0 ~ 1.00
0x0000 ~ 0x07D0	0x0000 ~ 0x07D0	0x0000 ~ 0x0064	0xFF9C ~ 0x0064	0x0000 ~ 0x0064

5)EC

High Alarm (0x0005)	Low Alarm (0x0006)	Dead Band (0x0008)	Offset (0x0009)	Damping (0x000A)
0 ~ 20.00	0 ~ 20.00	0 ~ 1.00	-1.00 ~ 1.00	0 ~ 1.00
0x0000 ~ 0x07D0	0x0000 ~ 0x07D0	0x0000 ~ 0x0064	0xFF9C ~ 0x0064	0x0000 ~ 0x0064

11-7 Data transfomation

1)Dot Position

	pH	ORP	RC	DO		EC
				ppm	%	
Meas Data (0x0003)	2	0	2	2	1	2
Temp Meas Data (0x0004)	1	None	None	1		1
High Alarm Data (0x0005)	2	0	2	2	1	2
Low Alarm Data (0x0006)	2	0	2	2	1	2
Dead Band (0x0007)	1	0	1	1		1
Offset (0x0008)	1	0	1	1		1
Damping (0x0009)	1	0	1	1		1
Temp Offset (0x000A)	1	0	None	1		1

2)Negative Number
• 65536 + Negative Number = Data
  ex) -50
      65536 + (-50) = 65486 (0xFFCE)

11-8 Request and response format

1)Read request
 • Read consecutive registers of the requested quantity
 • Fuction code 0x03
 • Start address of register to read -1
 • The number of registers to read
 • Ex) Request the register value of 0x0003 ~ 0x0007 of Controller 1

Slave Address	Function Code	Starting Address (High)	Starting Address (Low)	No. Of Register (High)	No. Of Register (Low)	CRC (Low)	CRC (High)
0x01	0x03	0x00	0x02	0x00	0x05	0x24	0x09

2)Read response (normal response)
 • Number of data bytes
 • Data in the requested register
 • Ex) Response to the above read request example
   ppm: 0.50, Temp:25.0(not suported), High Alarm: 1.00, Low Alarm: 0.30, Main unit: ppm, Sub unit: None

Slave Address	Function Code	Byte Count	Value (High)	Value (Low)	Value (High)	Value (Low)	Value (High)
0x01	0x03	0x0A	0x00	0x32	0x00	0xFA	0x00

Value (Low)	Value (High)	Value (Low)	Value (High)	Value (Low)	CRC (Low)	CRC (High)
0x64	0x00	0x1E	0x04	0x00	0x20	0xD6

3)Write request
 • Write a value to one register
 • Function code 0x06
 • Address of register to be written -1
 • Ex) Write the value of 0x0320 (Relay High: 1.00) to the register of 0x0005 of controller address 1.

Slave Address	Function Code	Starting Address (High)	Starting Address (Low)	Value (High)	Value (Low)	CRC (Low)	CRC (High)
0x01	0x06	0x00	0x06	0x00	0x64	0x68	0x20

4)Write respond
 • Respond with the same data as the write request

11-9 Error respond

  1)Function Code

    • Response by setting the first bit of the requested function code to 1

    • Read error 0x83

    • Write error 0x86

  2)Exception Code

    • Information on what kind of error occurred

    • 0x01 : Use of unsupported function code

    • 0x02 : Register address is invalid

    • 0x03 : Invalid data entry

11-10 How to create CRC16

  1)Load 0xFFFF into 16Bit register (CRC register).

  2)XOR the lower byte and data (8Bit) of CRC register and save the result in CRC register.

  3)Shift the CRC register to the right (LSB direction) by 1 bit and check the LSB.

  4)If LSB is 0, repeat step 3.

    If LSB is 1, XOR the CRC register and 0xA001 and store the result in the CRC register.

  5)Repeat steps 3 and 4 8 times.

  6)Repeat items 1 to 5 as many as the number of bytes in the frame except for CRC 2Byte.

11-11 CRC16 Program example

```
crc16_check(num)
{
      int I, j;
      uint crc_sum=0xffff, carry=0;
      for(i=0; i<num; i++)
      {
           crc_sum = plc_rbuffer[i] ^ crc_sum;
           for( j=0; j<8; j++)
           {
                carry = crc_sum & 0x01;
                crc_sum = crc_sum >> 1;
                if(carry == 1) crc_sum = crc_sum ^ 0xA001;
           }
      }
      sum[0] = crc_sum & 0xff;
      sum[1] = crc_sum >> 8;
      if(sum[0] == plc_rbuffer[num]) return(true);
      else return(false);
}
```

12 System Diagram & Precautions Measuring

12-1 System Diagram(Sampling holder)
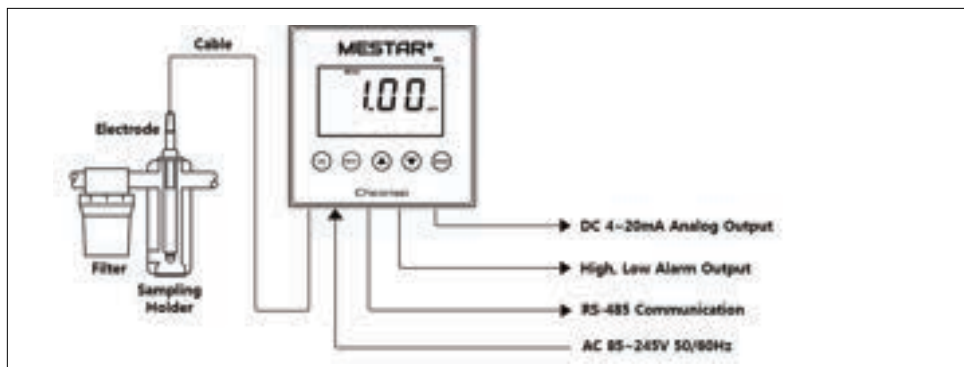
※ The sampling holder has a mounting structure for the probe housing to which electrodes can be connected. Various water quality measurements such as pH and conductivity can be processed in one sampling line.

12-2 Precautions measuring

1) Measuring methods other than sampling are not recommended for the residual chlorine meter.
2) Keep the flow rate in the sampling holder constant. (Recommended: 500 to 1,000 mL/min)
3) Prevent air bubbles from entering the sampling holder. may affect measurements.
4) The filter strainer provided as a basic component of the sampling holder serves to prevent clogging of the flow path in the sampling holder. If the measurement water contains impurities, attach an additional external filter. Measurements can be affected by impurities and the lifetime of the electrode is reduced.
5) Since the electrode cable is a special cable that can minimize the influence of external noise, do not connect it with other cables to extend the cable.

13 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
C	E.03 on screen (Electrode signal error)	3, 4, 5
D	Reading on screen is not changed	3, 4, 5, 6, 7
E	Measuring is difficult reading is not steady	3, 5, 6, 7

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 electorde
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	Temperature sensor calibration required	Performs temperature measurement value correction function of set item

14 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 The warranty period of the product is 1 year from the date of sale.

② During the warranty period, we can repair or replace free of charge in case of failure or damage due to
   problems in our design and manufacturing.

③Repair or replacement in the event of failure or damage due to the following causes will be charged
   regardless of the warranty period.

   1)Failure and damage after the warranty period has expired

   2)Problems in use due to careless handling

   3)Failure and damage caused by using parts other than those specified by our company or by arbitrarily
      remodeling

   4)Failure and damage caused by repairs or remodeling other than our company or our designated contractor

   5)Failure and damage due to force majeure such as fire or natural disaster

15 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.

   1) Model Name & manufacture number written in name plate

   2) Used 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.

16 Controller Wiring
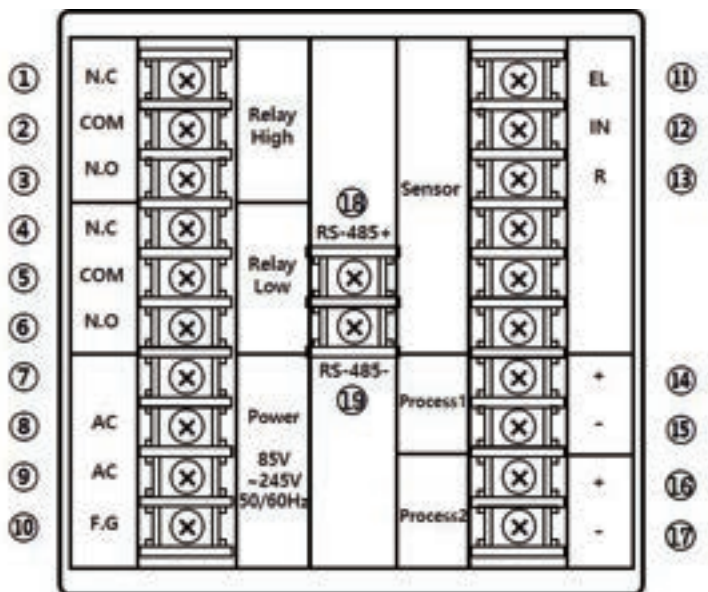
1)HIGH Alarm Normal Close	11)Electrode EL
2)HIGH Alarm Common	12)Electrode IN
3)HIGH Alarm Normal Open	13)Electrode R
4)LOW Alarm Normal Close	14)ppm Analog Output +
5)LOW Alarm Common	15)ppm Analog Output -
6)LOW Alarm Normal Open	16)pH Analog Input +
7)None	17)pH Analog Input -
8)AC input	18)RS-485 Communication +
9)AC input	19)RS-485 Communication -
10)F.G(Frame Ground)	

17 Controller Dimension
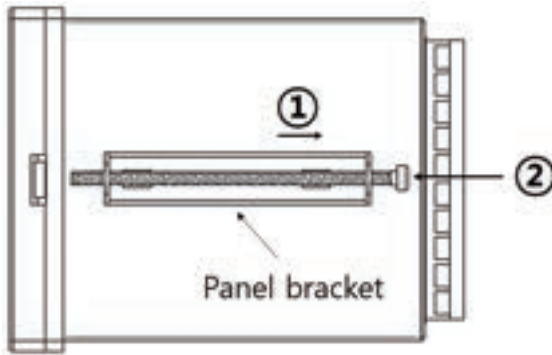
Front view
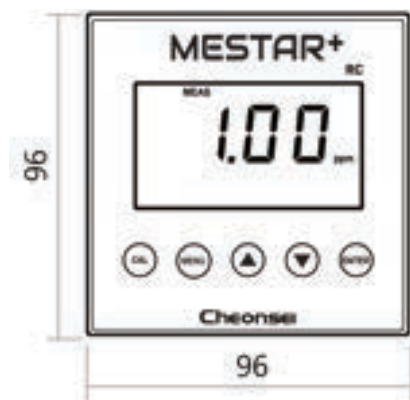
Side view
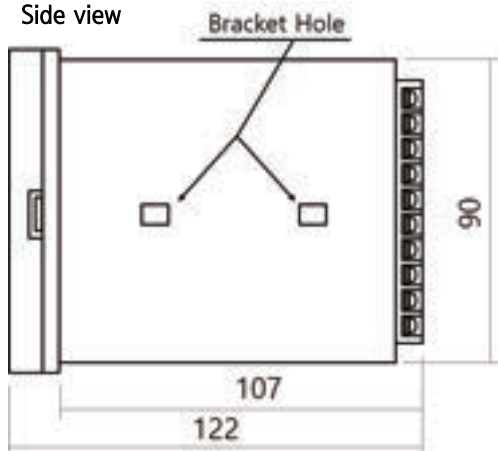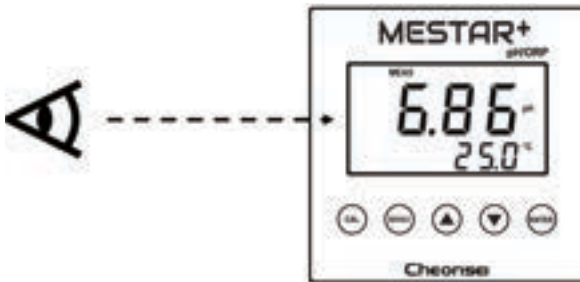

Rear view
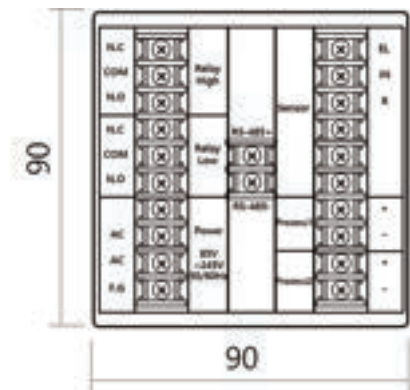
Panel Cutout
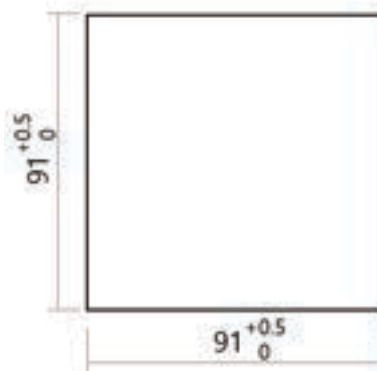
18 Controller Installation

18-1 Panel bracket fixed

1) Insert the panel bracket into the panel bracket mounting holes on both sides of the controller and insert in the direction of ①.
2) Tighten the support bolt in the direction of ② to fix it.

18-2 Installation height

> **⚠ Caution**
> • Install the controller screen so that it is level with the eye level.
> • The controller screen is an LCD type, so if you do not look directly at the screen, visibility is reduced.