CHINO

IM series

Infrared multiple-constituents analyzer

Operator interface/display unit

Model : IRGMEG2□□
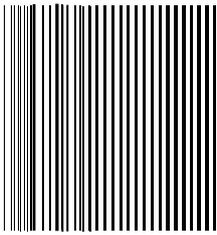
INSTRUCTIONS

Store this manual in a readily accessible location for future reference.

This manual should be provided to the end user.

CHINO

■ Preface

Thank you for purchasing the IM series infrared multiple-constituents analyzer operator interface/display unit IRGMEG2□□ series.
Read this manual carefully to ensure that you use this product correctly and safely.

◆ Regarding this manual

(1) This manual should be provided to the end user.

(2) Read this manual carefully to gain a thorough understanding of how to operate this product before starting operation.

(3) This manual describes the functions and maintenance of this product. Store it in a readily accessible location for future reference.

(4) If you have unclear points or need technical assistance, please contact your sales agent of CHINO Corporation.

── Notices ──

1. The contents of this manual are subject to change without notice.

2. Every effort has been made to ensure that the details of this manual are accurate. However, should any errors be found or importance information be omitted, please contact your nearest agent of CHINO Corporation.

3. Under absolutely no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without permission.
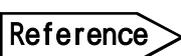
■Important Operational Instructions ⚠

Be sure to read the following safety instructions before attempting to install, operate or store this product.

1. Working conditions and environment

1) This product is designed to be installed on a panel (instrumentation panel). Refer to [3.2 Installation] and fix it securely.
2) Do not install this product in the following locations.
   Locations filled with dusts or corrosive gas.
   Locations where the ambient temperature is higher than 50℃ or lower than 0 ℃, or widely changing.
   Very humid locations
   Close to power lines or locations disturbed by strong magnetic induction
   Locations subjected to vibrations or shocks
3) Do not use this product in locations where volatile, corrosive or flammable gas is present, or in a location where moisture, chemical or salt water is sprayed.

2. Symbols used in this manual

The following symbols are used depending on important degrees of warnings/cautions to operate this product safely and to avoid malfunctions or unexpected situation.

Important degree	Symbols	Contents
1	⚠	This symbol is indicated with a title for an explanation with **Warning**
2	**Warning**	Indicates important information that must be observed to avoid the risk of fire or electric shock or other dangers that may result in serious personal injury or death, or damage to this product.
3	Caution	Indicates important information that must be observed to avoid the risk of personal injury or malfunctions of this product.
4	Remarks	Indicates supplementary information that the operator is recommended to understand.
5	Reference	Indicates supplementary information or a reference to an operation.

■Warnings and Cautions ⚠

Please observe the following safety precautions fully to use this product correctly. In addition, please read this manual carefully and store it in a readily accessible location for future reference. The ⊘ mark indicates actions that are prohibited during an operation.

⚠	**Warning** (**May cause death or serious personal injury**)	
⚠	**Do not operate this product in a location where flammable or volatile gas is present.** The use of this product in such environment may result in the risk of explosion.	⊘
⚠	**If this product emits any smoke, abnormal noise or unusual odor, immediately turn off power.** Do not continue to use this product as it may result in the risk of fire or electric shock. Turn off the power source to this product and contact your nearest sales agent of CHINO Corporation. Do not repair this product yourself as it may be dangerous.	⊘
⚠	**Never touch the internal parts of this product.** If you touch the inside of this product, it may result in personal injury by electric circuits or a moving part Even when you open the case of this product for maintenance works, never touch the internal parts.	⊘
⚠	**Do not attempt to repair or modify this product.** Repairing or modification must be carried out by service personnel authorized by CHINO Corporation. If you repair or modify this product yourself, it may not fulfill this product's functions, or it may result in the risk of electric shock or damage to this product.	⊘
⚠	**Do not touch, with wet hands, the power terminals or plugs of the power cord.** If you touch, with wet hands, the power terminals or plugs of the power cord, it may result in the risk of electric shock.	⊘
⚠	**If you notice something suspicious, immediately turn off power.** If the temperature of the power cord or other cable is high abnormally, turn off the power source to this product immediately and contact your nearest sales agent of CHINO Corporation.	⊘
⚠	**Confirm the grounding.** To avoid the risk of electric shock, before supplying the power to this product, make sure that the power terminals and the protective ground terminal have been wired correctly and reliably.	

⚠	**Caution** (**May cause personal injury or property damage**	
⚠	**Confirm the specifications (Model code) of this product.** Before using this product, check that the model code shown in the serial number plate matches your order.	
⚠	**Separate precautionary safety measures should be provided before using this product.** When this product is used in equipment that needs security measures, provide separate safety measures with the equipment before using this product, responding to phenomena resulting from erroneous operations or malfunctions of this product or malfunctions of related instruments.	
⚠	**Use crimp type lugs for termination of wires.** To avoid dropping-out or short-circuit of wires, use crimp type lugs for their termination.	
⚠	**Confirm the power to this product.** Before supplying the power to this product, make sure that the power voltage matches the rated voltage to this product and that the power terminals and the protective ground terminal have been wired correctly and reliably.	
⚠	**Do not continue to use this product remaining malfunctioned.** Do not continue to use this product remaining malfunctioned as it may result in the risk of fire or electric shock. Contact your nearest sales agent of CHINO Corporation for repairing.	⊘
⚠	**Comply with the descriptions in this manual.** Comply with the descriptions and handling instructions in this manual to ensure that you use this product correctly and safely. Failure to comply with the descriptions and instructions may result in damage to or functional decline of this product or damage to the equipment.	

Contents

Contents

1. Introduction

1.1 General

The infrared multiple-constituents analyzer (hereinafter called "constituent meter") operator interface/display unit IR-GMEG2□□ is used in combination with IRMA□□□□□ series constituent meter detector units and can communicate with up to nine (9) detector units.

The operator interface/display unit digitally displays constituent values including moisture content and thickness, as well as accessing to parameters of a detector unit. It also provides various functions including communication and calibration curve switching by a contact signal.

This manual describes about the operator interface/display unit only. In addition to this manual, refer to a separate instruction manual of [Infrared multiple-constituents analyzer detector unit IRMA□□□□□], too.

1.2 Configuration (**Configuration example in combination with IRMA1□□□□□**)

Detector unit
IRMA11□□□□, 12□□□□, 13□□□□

Analog output

Power unit IR-WEP
(Supplied as an
    attachment)

24V DC

Connection cable
IR-WERP□□□

Air-purge hood
IR-WEA

Operator   interface
/display unit
IRGMEG2□□

RS-485

Output checker plate
IR-WEB

Communication output (Note)
Analog output
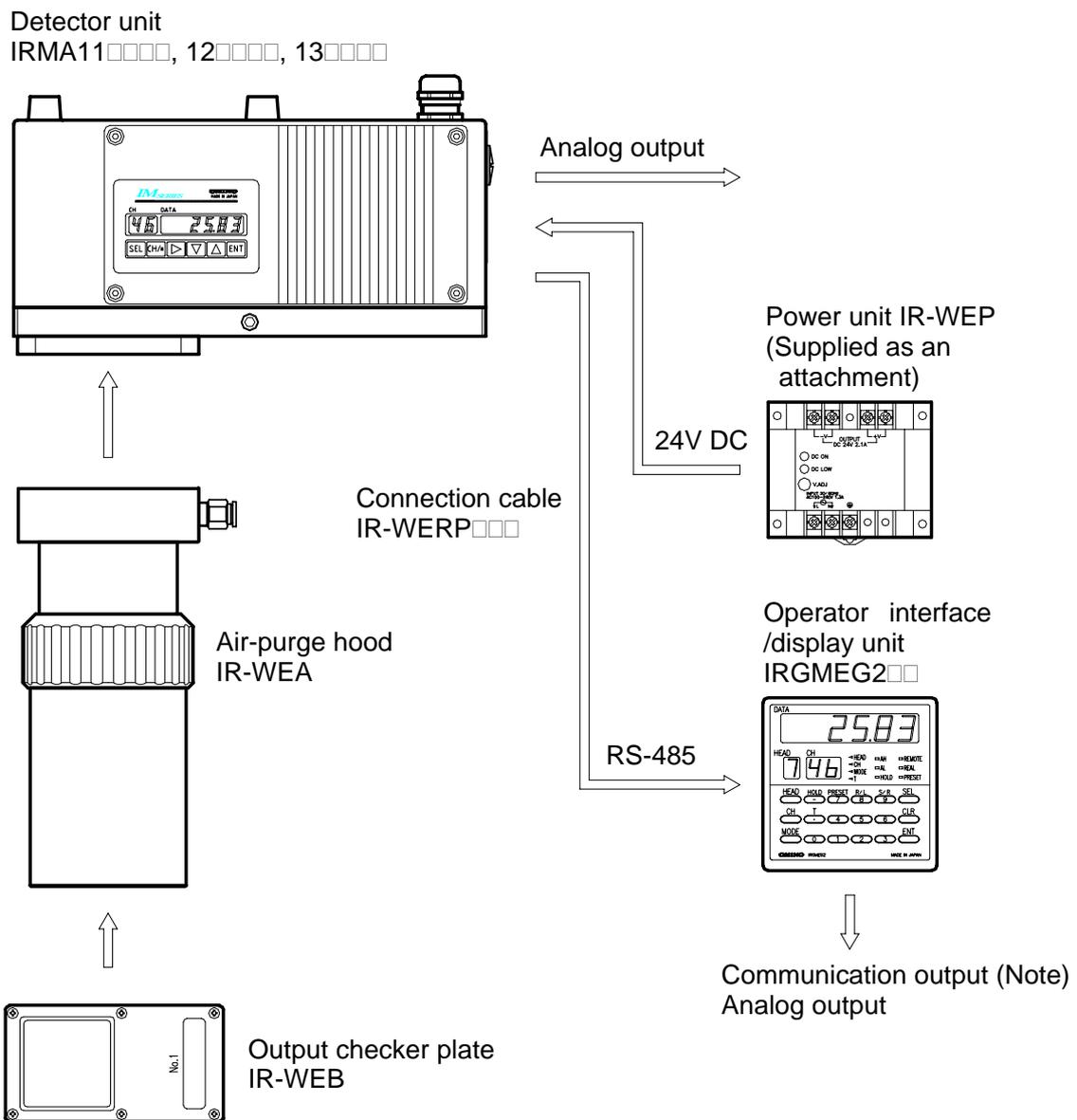
(Note) In case of using IRMA data logging software Model for IM-VXA□□□□, the personal computer and detector unit are a direct communication.

2. Models and accessories

2.1 Models

IRGMEG2□□

Operator interface/display unit for
constituent meters Output
   2: 4 to 20mA

Communication interface
   R: RS-232C (standard)
   A: RS-422A
   S: RS-485
   *In case of connecting with
      IM-VXA□□□□ it is RS-232C.

Special specifications
   Blank: Standard
      V : Complying with CE

CE
(Standards)
• EN55011 Group 1 Class A
• EN50082-2 (Industrial environment)
(Directives)
89/366/EEC, 92/31/EEC (amendment)
93/68/EEC (amendment)

2.2 Attachments

Name	Quantity	Remarks
Mounting brackets	1 set	
Internal unit pulling-out tool	1 piece	
Ferrite core	3 pieces	Attached only for complying with CE 1 piece for the cable IR-WERP 1 piece for a power cable 1 piece for a signal cable (Refer to [3.3 Connections] and [3.3.1 Enlarge view of the terminal board]) Remarks> When 4 pieces of ferrite cores or more are required, order them separately.
Instruction manual	1 copy	This document
Instruction manual for communications	1 copy	Separate manual " IM series IRMA/IRGMEG2 Communications"

3. Installation and connections

3.1 Setting dipswitches ▲

Set internal dispswitches before installing this unit.

3.1.1 How to pull out the internal unit.

| **Warning** | For avoiding the risk of electric shock, make sure to turn off the power source to this unit before pulling out the internal unit. |

3.1.1-1) For this unit not installed on a panel

(1) Remove the water-proof gaskets fitted in the locking portions of the internal unit. Hold this unit and then insert the L-shaped part of the supplied pulling-out tool into the lower locking portion of this unit.

(2) In this state, press the other side of the tool down to slide the front panel forward 2 to 3mm and then remove the internal unit. (*)

(3) After setting the dipswitches, position the printed circuit boards of the internal unit with the guide rails on the inside of the case and push the internal unit slowly along the guides until it is locked. Make sure to press the water-proof gaskets in the locking portions securely. (Note)

3.1.1-2) For this unit being installed on a panel

(1) Remove the water-proof gaskets fitted in the locking portions of the internal unit. Insert the L-shaped part of the supplied pulling-out tool for the internal unit into the locking portion on the lower side of this unit.

(2) In this state, press the other side of the tool down to slide the front panel forward 2 to 3mm and then remove the internal unit. (*)

(3) After setting the dipswitches, position the printed circuit boards of the internal unit with the guide rails on the inside of the case and push the internal unit slowly along the guides until the locking portion is activated. Make sure to press the water-proof gaskets in the locking portions securely. (Note)

The front panel of this unit complies with IP65 (IEC529). For this compliance, it may be hard to pull out the internal unit.

Panel

Internal unit pulling-out tool

Internal unit locking portion
(The water-proof gasket is fitted in.)

(Note)
When this unit is used in the state that the locking portion is not activated, it may cause display fluctuation by contact failure of terminal metals. In addition, the effectiveness of water-proofing may become impaired.

| **Remarks** | (*): Ordinarily the internal unit can be pulled out by only loosening the lower locking portion of this unit. However, if it is hard to remove it, loosen the upper locking portion, too. |

3. Installation and connections

3.1.2 Setting dipswitches

Set the dipswitches depending on the quantity of the detector units to be connected.

Dipswitch No.	Function	Position of dipswiches		Default settings
		OFF	ON	
1	Quantity of the detector unit to be connected	1 set (Single-detector-unit connection)	2 sets or more (Multiple-detector-units connection)	OFF
2	Not used	Not used (remaining at OFF)		OFF
3	Not used	Not used (remaining at OFF)		OFF
4	Not used	Not used (remaining at OFF)		OFF

[Internal unit pulled out]
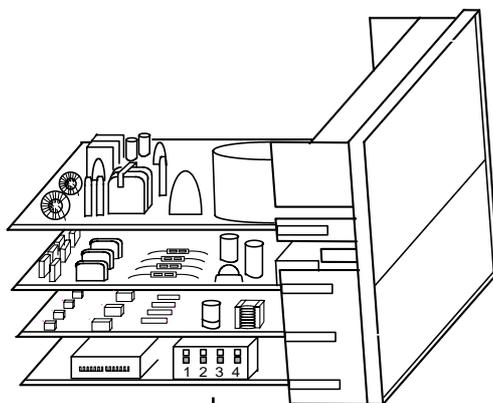
[Enlarged view of dipswitches]

3. Installation and connections

3.2 Installation

This unit is designed to be installed on a panel (instrumentation panel).
Set the supplied mounting brackets (2 pieces) in place on the top and bottom of this unit, and then tighten the screws of the brackets until they turn free.

3.2.1 Dimensions and panel cutout

Unit : mm

3.2.2 How to install

Caution⟩ Do not install this product in the following locations.
• Locations filled with dusts or corrosive gas.
• Locations where the ambient temperature is higher than 50 ℃ or lower than 0 ℃, or widely changing.
• Very humid locations
• Close to power lines or locations disturbed by strong magnetic induction
• Locations subjected to vibrations or shocks

3. Installation and connections

3.3 Connections ▲

Wire to the terminals on the rear of this unit as shown in the following terminal wiring diagrams. Before carrying out wiring, turn off the power source to this unit.

Warning	For avoiding the risk of electric shock, make sure to turn off the power source to this unit before wiring to the power terminals.

For complying with CE (IRGMEG2□V)
1) Attach the supplied ferrite cores (3 pieces attached as standard), at a place as close as the terminal board (within 10cm), to bind up each cable to be connected. (→For the details of attaching ferrite cores, refer to [3.3.1 Enlarge view of the terminal board].)
2) The connection cable should be used indoors and its length should be up to 30m.

[IRGMEG2□]
Contact rating
Resistive load
  100V AC 0.5A
  200V AC 0.2A
Inductive load
  100V AC 0.2A
  200V AC 0.1A
Minimum load
  5V DC 10mA

[IRGMEG2□V]
Contact rating
Resistive load
  30V AC 0.5A
  24V DC 0.2A
Inductive load
  30V AC 0.2A
  24V DC 0.1A
Minimum load
  5V DC 10mA

Cable
IR-WERP

Operator interface/display unit
[IRGMEG2□]　(Note)

Detector unit
IRMA□□□□

IM SERIES
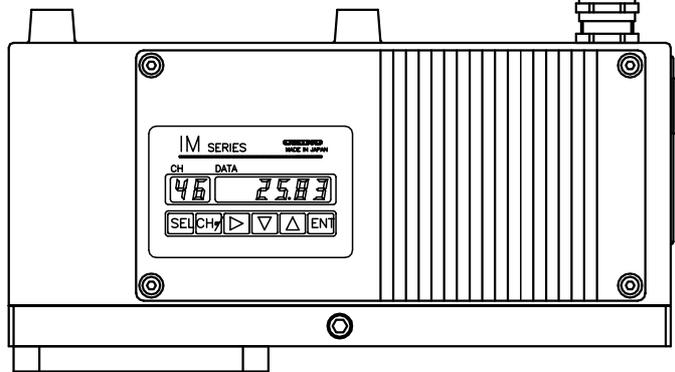
[IRGMEG2□V]　(Note)

Power 24V DC

P- (Blue)

P+ (Red)

G (Green)

Power unit
IR-WEP
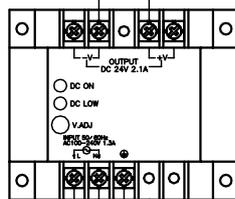
100-120V AC
200-240V AC

Protective ground
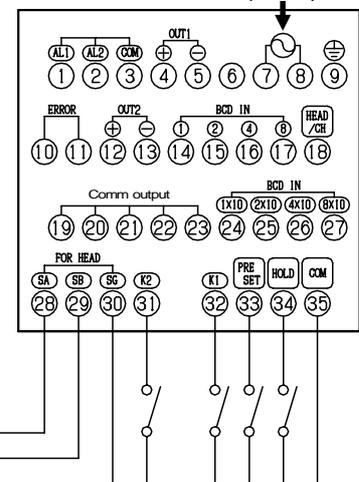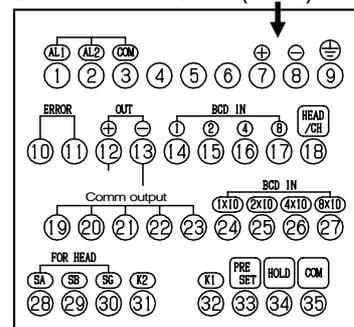
(Note) 100-240V AC for IRGMEG2□
　　　 24V DC for IRGMEG2□V (complying with CE)

3. Installation and connections

3.3.1 Enlarge view of the terminal board

*1 : Refer to [3.4 Cautions on connections] (3) Power
*2 : Refer to [3.5 Analog output and alarm output]

Example of attaching places of ferrite cores
(3 pieces attached as standard)
▭ : To be attached absolutely
┈ : At any place (Note)
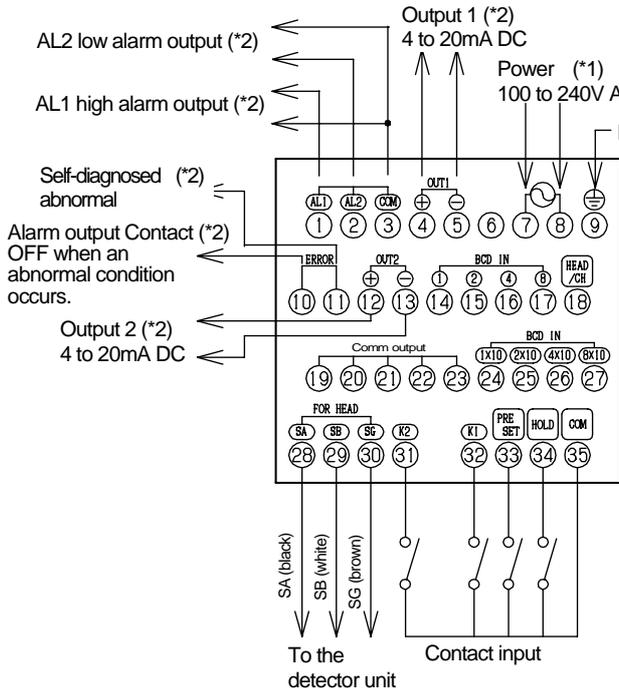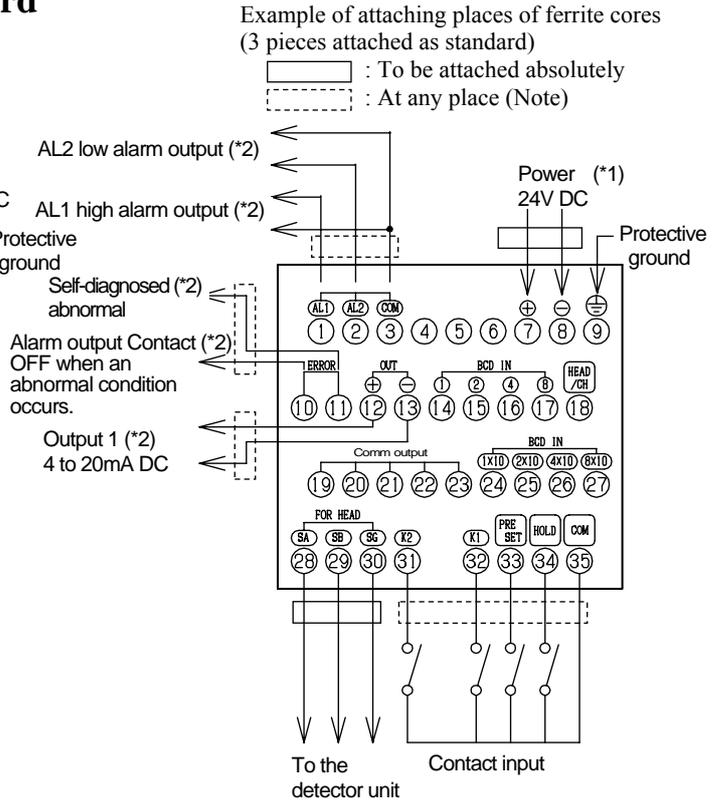
IRGMEG2□

(Note) If 4 pieces or more are required, order them separately.
IRGMEG2□V (complying with CE)

3.3.2 Communication output terminals

Terminal No.	IRGMEG2R RS-232C communication	IRGMEG2A RS-422A communication	IRGMEG2S RS-485 communication
⑲	SD	SDA	SA
⑳	--	SDB	SB
㉑	RD	RDA	--
㉒	--	RDB	--
㉓	SG	SG	SG

3.3.3 Contact input terminals

Terminal No.	Item	Explanation
⑭	BCD IN 1	Detector unit No./Calibration curve No./Constituent No. 1-input
⑮	BCD IN 2	Detector unit No./Calibration curve No./Constituent No. 2-input
⑯	BCD IN 4	Detector unit No./Calibration curve No./Constituent No. 4-input
⑰	BCD IN 8	Detector unit No./Calibration curve No./Constituent No. 8-input
⑱	HEAD/CH	Switching of the detector unit No. and the calibration curve No.
㉔	BCD IN 1 x 10	Detector unit No./Calibration curve No. 1 x 10-input
㉕	BCD IN 2 x 10	Detector unit No./Calibration curve No. 2 x 10-input
㉖	BCD IN 4 x 10	Detector unit No./Calibration curve No. 4 x 10-input
㉗	BCD IN 8 x 10	Detector unit No./Calibration curve No. 8 x 10-input
㉛	K2	Constituent No. input command
㉜	K1	No. 1 side calibration with the contact ON
㉝	PRESET	Preset output with the contact ON
㉞	HOLD	Hold with the contact ON
㉟	COM	Common contact terminal

3. Installation and connections

3.4 Cautions on connections ▲

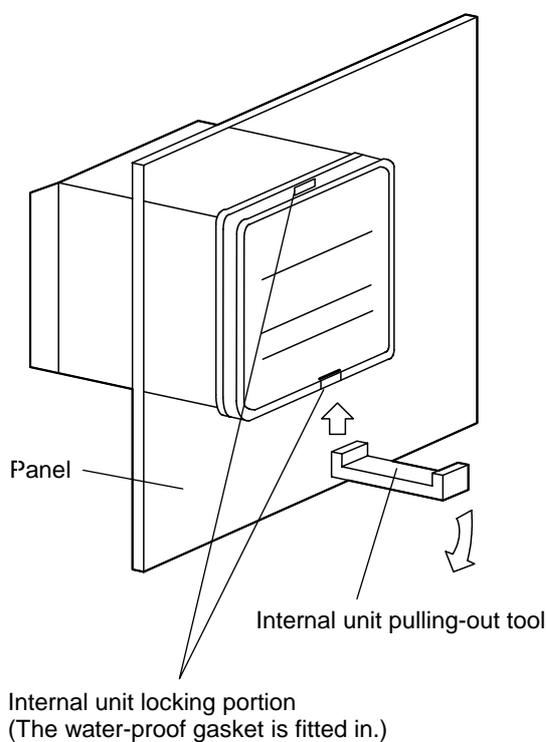| Warning	For avoiding the risk of electric shock, make sure to turn off the power source to this unit before wiring to the power terminals.

Before carrying out wiring, observe the following precautions.

(1) Terminating wires
Use crimp type lugs covered with the insulation sleeve to prevent wires from dropping off or contacts of wires. (The terminal screws are M3.5.)

(2) Mounting a power switch and a fuse
Neither power supply nor fuse is built in this unit. You are required to prepare them separately.

(3) Power
[IRGMEG2□]
- The power to IRGMEG2□ is universal from 100 to 240V AC but avoid the following powers;
    (1) Powers whose voltage fluctuates greatly.
    (2) Powers whose waveform distortion is big.

[IRGMEG2□V (complying with CE)]
- The power to IRGMEG2□ V (complying with CE) is 24V DC (within ±10%).
    Ordinarily supply the power to this unit from the power unit IR-WEP.

Caution	The power to IRGMEG2□ V (complying with CE) is DC. Observe the following cautions. 1) Ensure correct polarity. 2) The connection with reverse polarity may cause a failure of this unit. 3) Make sure not to supply AC power to this unit. If AC power is supplied by mistake, this unit will be damaged.

(4) Noise source
Separate this unit from strong power circuits or powerful noise sources as far as possible.

3. Installation and connections

3.5 Analog output and alarm output

This unit is designed for use with multiple-constituents analyzer detector units connection and can connect plural constituent meter detector units.

However, the analog outputs and alarm outputs are configured by setting the dipswitches as shown below. (Refer to [3.1 Setting dipswitches].)

Item	Position of the dipswitch No. 1: OFF		Position of the dipswitch No. 1: ON
	Detector unit: 1 set(Single-detector-unit connection)		Detector unit: 2 sets or more (Multiple-detector-units connection)
Connected detector	IRMA1000,2000, 7000,8000 series 1 constituent specification of IRMA5000,6000 series	2 or more constituents specification of IRMA5000,6000 series	IRMA1000,2000,7000,8000 series IRMA5000,6000 series
OUT1	Analog output from the constituents No. 1 of detector unit No. 1	Analog output from the constituents No. 1 of detector unit No. 1	Analog output from the constituents No. 1 of detector unit No. 1
OUT2 (*)	Analog output from the constituents No. 1 of detector unit No. 1	Analog output from the constituents No. 2 of detector unit No. 1	Analog output from the constituents No. 1 of detector unit No. 2
AL1	High limit alarm signal from the detector unit No. 1	High limit alarm signal from the detector unit No. 1	High limit alarm signal from the detector unit No. 1
AL2	Low limit alarm signal from the detector unit No. 1	Low limit alarm signal from the detector unit No. 1	Low limit alarm signal from the detector unit No. 1
ERROR	Self-diagnosed abnormal condition signal from the detector unit No. 1	Self-diagnosed abnormal condition signal from the detector unit No. 1	Self-diagnosed abnormal condition signal from all detector units connected

(*) Available in IRGMEG2□ only [OUT 2 is not available in IRGMEG2□V (complying with CE).]

3. Installation and connections

3.6 Multiple-detector-units connection

In the multiple-detector-units connection, the following two connection systems are available. For either connection system, before turning on the power to this unit, set detector unit numbers not to overlap them each other.

For the settings of detector unit numbers, refer to the separate manual for a detector unit.

3.6.1 Relaying boxes used
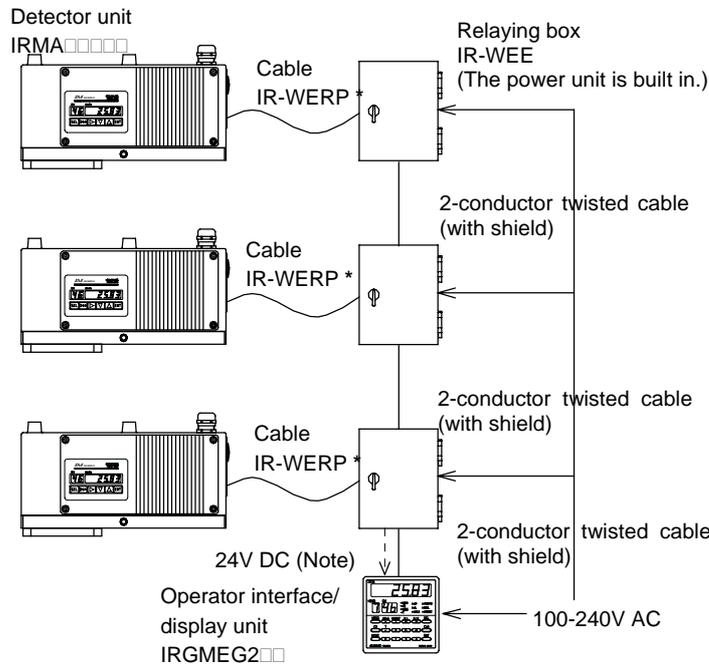
Detector unit
IRMA□□□□□

Cable
IR-WERP *

Relaying box
IR-WEE
(The power unit is built in.)

Cable
IR-WERP *

2-conductor twisted cable
(with shield)

Cable
IR-WERP *

2-conductor twisted cable
(with shield)

24V DC (Note)

2-conductor twisted cable
(with shield)

Operator interface/
display unit
IRGMEG2□□

100-240V AC

Remarks
(Note): 24V DC at CE marking (In case of using IRGMEG2□V)
(*): The connection cable should be indoors and its length should be up to 30m.

Caution
For wiring to the relaying box, refer to the separate manual for the relaying box.

3.6.2 Relaying boxes not used
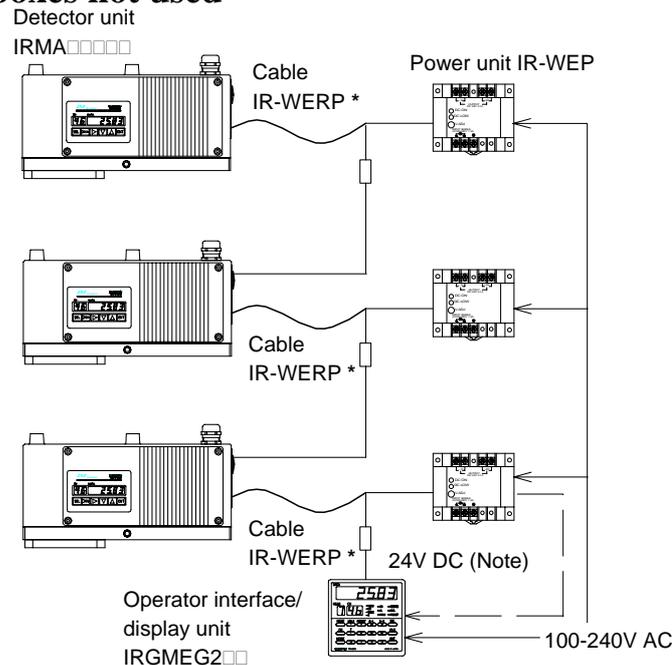
Detector unit
IRMA□□□□□

Cable
IR-WERP *

Power unit IR-WEP

Cable
IR-WERP *

Cable
IR-WERP *

24V DC (Note)

Operator interface/
display unit
IRGMEG2□□

100-240V AC

Remarks
(Note): 24V DC at CE marking (In case of using IRGMEG2□V)
(*): The connection cable should be indoors and its length should be up to 30m.

4. Names and Functions

4.1 Names and functions of displays, lamps and keys

Name	Function
(1) Data display	Displays a constituent value in the measurement mode and a parameter data in the setting mode. When a self-diagnosed abnormal condition is occurred, an error number corresponding to an abnormal condition is displayed.
(2) Detector unit number display	Displays a detector unit number of the constituent meter currently indicating a constituent value in the data display. When the detector unit number is changed, a constituent value being measured by the detector unit with the changed number will be displayed.
(3) Calibration curve display	Displays a calibration curve number in the measurement mode, the calibration curve setting mode, a mode number during the mode setting, and a time constant during the time constant setting. The first-digit decimal point indicates the key-lock activated.
(4) Setting status lamps	HEAD: Lights during the detector unit number setting. CH: Lights during the calibration curve number setting. MODE: Lights during the mode number setting. For IRMA5000 or 6000 series detector units being connected, this lamp lights during the setting of the constituent number whose calibration curve or time constant is set. T: Lights during the time constant setting.
(5) Measurement status lamps	AH: Lights when a high limit alarm is activated. AL: Lights when a low limit alarm is activated. HOLD: Lights in the hold mode. REMOTE: Lights during the remote setting of a calibration curve number. REAL: Lights during the real (without smoothing) measurement mode. PRESET: Lights during the preset output.
(6) Key-lock indicator	The first-digit decimal point indicates the key-lock activated.

4. Names and Functions

4.1 Names and functions of displays, lamps and keys

(7) Function keys

Name		Function
(7) Function keys	HEAD	Is used to set a detector unit number.
	CH	Is used to set a calibration curve number.
	MODE	Is used to set a mode number.
	HOLD —	Switches the HOLD to ON or OFF in the measurement mode. Is used to enter (—) in the setting mode.
	PRESET **7**	Switches the PRESET to ON or OFF in the measurement mode. Is used to enter the numeric of 7 in the setting mode.
	R/L **8**	Switches the calibration curve setting to REMOTE or LOCAL in the measurement mode. Is used to enter the numeric of 8 in the setting mode.
	S/R **9**	Switches the measurement mode to REAL or SMOOTHING in the measurement mode. Is used to enter the numeric of 9 in the setting mode.
	T •	Is used to set the time constant in the measurement mode. Is used to enter the decimal point in the setting mode.
	0 **6**	Is used to enter the numeric from 0 to 6 in the setting mode.
	SEL	Is used to enter into the setting mode or switch setting screens.
	CLR	Is used to clear a data being set. A data is cleared from the least significant digit, each time this key is pressed once.
	ENT	Is used to store a parameter data.
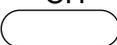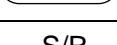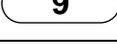
5. Operation

5.1 Confirmation before operation

Check the following three points before turning on the power.
1) Have the dipswitches been set? (Refer to [3.1 Setting dipswitches].)
2) Are all of connections correct? (Refer to [3.3 Connections])
3) In the multiple-detector-units connection, have detector unit numbers been set?
   (Refer to the separate instruction manual for [Infrared multiple-constituents analyzer detector unit
      IRMA□□□□□□].)

Caution Turn on the power to this unit concurrently with or after turning on the power to detector units.
If the power to this unit is turned on before turning on detector units, this unit can not recognize the detector units and will display the error code Er18 (detector unit number error).

5.2 Setting detector unit numbers

When the power to this unit is turned on, data measured by the constituent meter with the detector unit number being indicated in "HEAD" will be displayed.
The following procedure is for changing a detector unit number.

(1) Press HEAD key to enter into the detector unit number setting mode with the setting lamp "HEAD" lit.
(2) Press the numeric keys 1 to 9 to enter a detector unit number.
(3) By pressing ENT key, the data measured by the constituent meter with the changed detector unit number will be displayed. The calibration curve number and the constituent value displayed this time are under the conditions set in the changed constituent meter. (Time constant, decimal places of constituent values displayed, etc.)

HEAD	CH	DATA
1	1	12.3

Detector unit No.   Calibration curve No.   Constituent value

HEAD	CH	DATA
2	12	54.32

Detector unit No.   The calibration curve No. changes, too.   The constituent value changes, too.
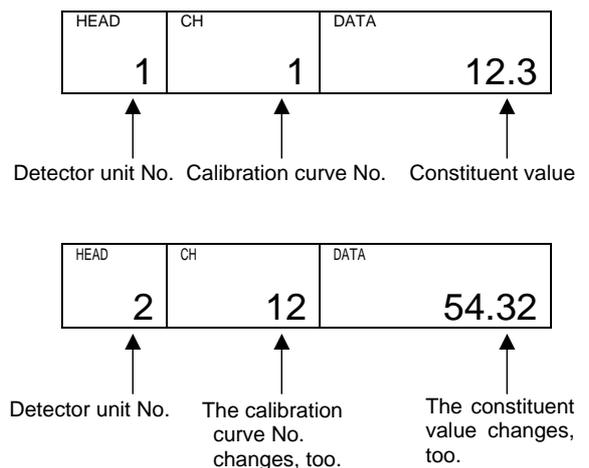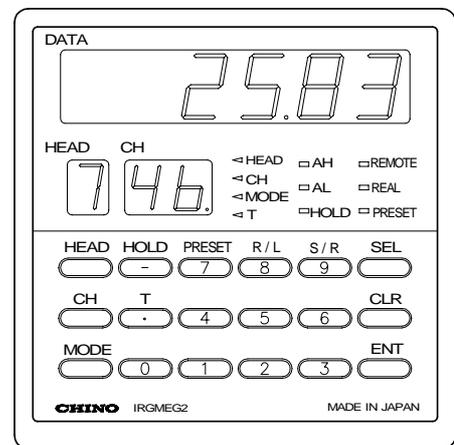
5. *Operation*

5.3 Setting calibration curves

Output characteristics of detector units depend upon measuring objects. It may also change according to process conditions or constituent measuring conditions of samples.

Accordingly, for accurate measurements, it is required to perform beforehand sample tests of each object and obtain, for moisture measurements, a relationship (This is called as a calibration curve.) between moisture contents (%H_2O) obtained by a drying method or other measuring methods and absorbance "x" measured by a detector unit] or, for thickness measurements, a relationship (This is called as a calibration curve.) between thickness (μm) obtained by a micrometer or other measuring methods and absorbance "x" measured by a detector unit].

Reference> This paragraph describes the setting method of calibration curve data, assuming that calibration curves have been already created. When the calibration curves have not been created yet, refer to the paragraph [Sample preparation] in the separate instruction manual of the detector unit IRMA□□□□□ being connected.

5.3.1 Data for setting

5.3.1-1) List of data for setting calibration curves

The followings are data for setting calibration curves.

Setting items available differ depending on specifications (number of wavelengths and number of constituents) of a detector unit being connected.

	Setting data name	Display	Setting range of data	Default value	Remarks
(1)	Calibration curve No.	CH	1 to 99	1	
(2)	Computing mode	Md	1 to 4	1	(*1)
(3)	Calibration curve coefficient a_0	A0	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_1	A1	0 to ±9999.9	1.0000	Effective numeric: 5 digits
	Calibration curve coefficient a_2	A2	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_3	A3	0 to ±9999.9	0.0000	
	The followings are used in the mode 4 only. The numeric from 4 to 10 indicates the number of wavelengths. (*1)				
	Calibration curve coefficient a_4	A4	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_5	A5	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_6	A6	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_7	A7	0 to ±9999.9	0.0000	Effective numeric: 5 digits
	Calibration curve coefficient a_8	A8	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_9	A9	0 to ±9999.9	0.0000	
	Calibration curve coefficient a_{10}	AA	0 to ±9999.9	0.0000	
(4)	Correction expression coefficient b_0	b0	0 to ±9999.9	0.0000	
	Correction expression coefficient b_1	b1	0 to ±9999.9	1.0000	Effective numeric: 5 digits
	Correction expression coefficient b_2	b2	0 to ±9999.9	0.0000	
(5)	Low limit output	Lo	0 to 9999.9	0.0000	For IRMA1000,2000,7000,8000 -Specify the number of decimal places.
	High limit output	Hi	0 to 9999.9	100.00	
(6)	Low limit alarm	AL	0 to 9999.9	0.0000	
	High limit alarm	AH	0 to 9999.9	100.00	For IRMA5000,6000 -Effective numeric : 5 digits
(7)	Preset value	PS	0 to 9999.9	0.0000	
(8)	Water absorbance	Ab	0 to ±9999.9	0.0000	Effective numeric: 5 digits (*2)

*1: Displays and settings of these items are only available for IRMA5000 or 6000 series detector units being connected.

*2: For measuring the moisture content of sands, etc., the water absorbance is required to be set. The display and the setting of this water absorbance are only enable when the surface water ratio computation shown in [5.7.12 Computing surface water ratio] is set to ON.

5. Operation

5.3.1-2) Descriptions of the setting data for calibration curves

	Setting data name	Function
(1)	Calibration curve number	An optional number from 1 to 99 can be designated as a calibration curve. Ordinarily it is designated sequentially from "1".
(2)	Computing mode (*)	The computing modes selectable differ depending on specifications (number of wavelengths and number of constituents) of a detector unit being connected. The computing modes 1 to 3 are 3-wavelength ratio processing (R1, S1 and R2) in each group in the table shown below. • Computing mode 1: 3-wavelength ratio processing (λ1, 2, 3) in Group 1 • Computing mode 2: 3-wavelength ratio processing (λ4, 5, 6) in Group 2 • Computing mode 3: 3-wavelength ratio processing (λ7, 8, 9) in Group 3 • Computing mode 4 is multiple regression computation using each wavelength. The number of the wavelengths differs depending on specifications of the detector unit and up to 10 wavelengths are available. Each computing expression of the calibration curve is shown in the next column.

Wavelength	λ1	λ2	λ3	λ4	λ5	λ6	λ7	λ8	λ9	λ10
	GROUP 1			GROUP 2			GROUP 3			
Computing mode 1	R1	S1	R2							
Computing mode 2				R1	S1	R2				
Computing mode 3							R1	S1	R2	
Computing mode 4	λ1	λ2	λ3	λ4	λ5	λ6	λ7	λ8	λ9	λ10

	Setting data name	Function
(3)	Calibration curve coefficient a_0 to a_{10} (*)	These coefficients are provided for the following computing expressions to compute a calibration curve. 1) Computing mode 1, 2, 3 A calibration curve is computed by the cubic or lower-degree polynomial. $y = a_3x^3 + a_2x^2 + a_1x + a_0$, where, "y" is a measured value and "x" is an absorbance (data of constituent 0). 2) Computing mode 4 A calibration curve is computed by the multiple regression computation at each wavelength. $y = a_0 + a_1 LOG(\lambda1) + a_2 LOG(\lambda2) + \ldots\ldots + a_{10} LOG(\lambda10)$ Note that settable coefficients differ depending on number of wavelengths being used.
(4)	Correction expression coefficient b_0 to b_2	These coefficients are provided for the quadratic expression correction against a measured value "y". Assuming that a measured value after the correction be "Y", we obtain "$Y = b_2y^2 + b_1y + b_0$".
(5)	Low limit output High limit output	These specify measured values at a low limit output and a high limit output on the analog output scaling. The output is scaled to 4mA at the low limit measured value and 20mA at the high limit measured value.
(6)	Low limit alarm High limit alarm	A low limit alarm is activated when a measured value is lower than a low limit alarm setpoint. A high limit alarm is activated when a measured value is higher than a high limit alarm setpoint.
(7)	Preset value	By setting the preset output to ON by key operations or through communications, the value being set as a preset value is displayed and outputted, regardless of measured values.
(8)	Water absorbance	Decide a water absorbance to compute a surface water ratio for measuring moisture contents of sands, etc. The relation between a measured moisture content (%: mass basis moisture content), a surface water ratio (%) and a water absorbance (%) is; • Surface water ratio = (Moisture content − Water absorbance) / (1 + (Water absorbance / 100)

(*): Selectable computing modes differ depending on models of the constituent meter detector units.

Refer to the table shown below for your selection of a computing mode.

	IRMA1□□□	IRMA2□□□	IRMA5□□□	IRMA6□□□	IRMA7□□□	IRMA8□□□
Computing mode 1	○	○	○	○	○	○
Computing mode 2	—	—	□ (2 constituents or more)	□ (2 constituents or more)	—	—
Computing mode 3	—	—	□ (3 constituents or more)	□ (3 constituents or more)	—	—
Computing mode 4	—	—	□ (2 constituents or more)	□ (2 constituents or more)	—	—

5. Operation

5.3.2 Setting procedure

The setting procedures for (1) calibration curve numbers, (2) computing modes and (3) calibration curve coefficients a_0 to a_{10} shown in [5.3.1-1] List of the setting data for calibration curves differ depending on specifications (number of wavelengths and number of constituents) of a detector unit being connected.
The followings are these setting procedures.

5.3.2-1) Setting detector unit numbers and (1) calibration curve numbers to (3) calibration curve coefficients for IRMA1000, 2000, 7000 or 8000 series detector units

1) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a detector unit number.

    $\boxed{\text{HEAD}}$ $\boxed{}$ $\boxed{\text{ENT}}$

HEAD	CH	DATA
1	1	1

2) Press $\boxed{\text{SEL}}$ key for 2 seconds to display "CH" in the CH display for entering into the calibration curve number setting mode.

HEAD	CH	DATA
1	CH	1

Calibration curve number setting mode   Calibration curve number

3) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a calibration curve number.

    $\boxed{}$ $\boxed{}$ $\boxed{\text{ENT}}$

4) Press $\boxed{\text{SEL}}$ key to display "A0" in the CH display for entering into the calibration curve coefficient a_0 setting mode.

HEAD	CH	DATA
1	A0	0.0000

Setting data name   Setting data

5) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a calibration curve coefficient a_0.

    $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{\text{ENT}}$
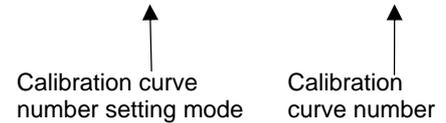
$\boxed{\text{Reference}}$ Press $\boxed{\text{T/•}}$ key to enter a decimal point.

6) Press $\boxed{\text{SEL}}$ key to display "A1" in the CH display for entering into the calibration curve coefficient a_1 setting mode.

HEAD	CH	DATA
1	A3	0.0000

Setting data name   Setting data
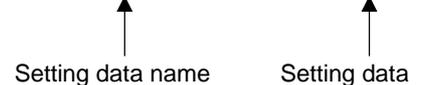
7) Set a calibration curve coefficient a_1 with the same key operation.

8) Repeat 6) and 7) to set calibration curve coefficients a_2 to a_3.

5. Operation

5.3.2-2) Setting detector unit numbers and (1) calibration curve numbers ~ (3) calibration curve coefficients for IRMA5000 or 6000 series detector units being connected

1) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a detector unit number.
    $\boxed{\text{HEAD}}$ $\boxed{}$ $\boxed{\text{ENT}}$

HEAD	CH	DATA
1	1	1

2) Press $\boxed{\text{SEL}}$ key for 2 seconds to display "CH" in the CH display for entering into the calibration curve number setting mode.

HEAD	CH	DATA
1	CH	1

Calibration curve number setting mode   Calibration curve number

3) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a calibration curve number.
    $\boxed{}$ $\boxed{}$ $\boxed{\text{ENT}}$

4) Press $\boxed{\text{SEL}}$ key to display "Md" in the CH display for entering into the computing mode selection.

HEAD	CH	DATA
1	Md	1

Setting data name   Setting data

5) Use the numeric keys $\boxed{1}$ to $\boxed{4}$ to set a computing mode.
    $\boxed{}$ $\boxed{\text{ENT}}$

6) Press $\boxed{\text{SEL}}$ key to display "A0" in the CH display for entering into the calibration curve coefficient a_0 setting mode.

HEAD	CH	DATA
1	A0	0.0000

Setting data name   Setting data

7) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a calibration curve coefficient a_0.
    $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{\text{ENT}}$

> **Reference** > Press $\boxed{\text{T/•}}$ key to enter a decimal point.

8) Press $\boxed{\text{SEL}}$ key to display "A1" in the CH display for entering into the calibration curve coefficient a_1 setting mode.

HEAD	CH	DATA
1	AA	0.0000

Setting data name   Setting data

9) Set a calibration curve coefficient a_1 with the same key operation. (Refer to. 7))

10) Repeat 8) and 9) to set calibration curve coefficients a_2 to a_{10}. (A2 to AA in the CH display)

5. Operation

5.3.2-3) Setting from (4) correction coefficients b_0 ~ b_2 to (8) water absorbance

1) Press SEL to enter into the next data setting mode.

2) Set from (4) correction coefficients b_0 ~ b_2 to (4) water absorbance with the same key operation as the above [5.3.2.-2].

5.3.3 Correcting calibration curves

If an actual constituent value (moisture content or thickness) does not correspond with a constituent value (moisture content or thickness) on a calibration curve being preset due to the difference of one-line and off-line measurements, or other causes, correct it with correction coefficients b_0, b_1 and b_2. These coefficients are provided for the quadratic expression correction against a measured value "y". Assuming that a measured value after correction be "Y", we obtain,

$$Y = b_2y^2 + b_1y + b_0$$

Usually, a shift correction is done with b_0 only. ($b_1 = 1$, $b_2 = 0$)

Remarks

[Example 1]
> When a measured moisture content before correction is 15 (%H_2O) and an actual moisture content is 13 (%H_2O), "-2%H_2O should be set.
> ($b_2 = 0$, $b_1 = 1$, $b_0 = -2$)

[Example 2]
> When a measured thickness before correction is 25 (μm) and an actual thickness is 23.5 (μm), "-1.5μm should be set.
> ($b_2 = 0$, $b_1 = 1$, $b_0 = -1.5$)

5. Operation

5.4 Setting output limit values of calibration curves

A measured value can be fixed by low limit and high limit absorbance values.

When an absorbance becomes less than a low limit absorbance value, a measured value is fixed to YL as shown right.
Also, when an absorbance becomes more than a high limit absorbance value, a measured value is fixed to YH.
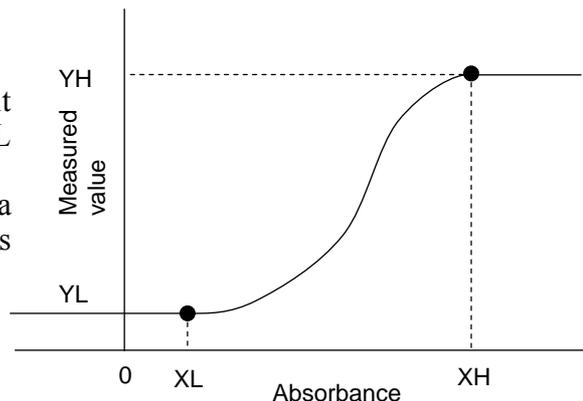
5.4.1 Data for setting limit values of calibration curves

The followings are data for setting calibration curve output limit values.

	Setting data name	Display	Setting range of data	Default value	Remarks
(1)	Calibration curve number	CH	1 to 99	1	
(2)	Output limit processing enabled/disabled	LM	OFF (disabled), ON (enabled)	OFF	0: OFF, 1: ON
(3)	Low limit absorbance value	XL	0 to ±9999.9	0.0000	Effective numeric: 5 digits
	Low limit measured value	YL	0 to ±9999.9	0.0000	Effective numeric: 5 digits
(4)	High limit absorbance value	XH	0 to ±9999.9	9.9999	Effective numeric: 5 digits
	High limit measured value	YH	0 to ±9999.9	9999.9	Effective numeric: 5 digits

	Setting data name	Description
(1)	Calibration curve number	Any calibration curve number in 1 to 99 can be specified, but it is normally specified from 1 sequentially.
(2)	Output limit processing enabled/disabled	Set the output limit processing enabled or disabled. When ON (enabled) is set, a measured value is outputted corresponding to limit values being set. When OFF (disabled) is set, a measured value is outputted corresponding to data of a calibration curve.
(3)	Low limit absorbance value XL Low limit measured value YL	Enter data to fix a measured value at a low limit side.
(4)	High limit absorbance value XH High limit measured value YH	Enter data to fix a measured value at a high limit side.

5. Operation

5.4.2 Procedure for setting the data for output limit values of calibration curves

5.4.2-1) Setting calibration curve numbers (CH)

1) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a detector unit number.

$\boxed{\text{HEAD}}$ $\boxed{}$ $\boxed{\text{ENT}}$

2) Press $\boxed{\text{SEL}}$ key and $\boxed{\text{CH}}$ key simultaneously for 2 seconds to display "CH" in the CH display for entering into the calibration curve number setting mode for the calibration curve output limit values.
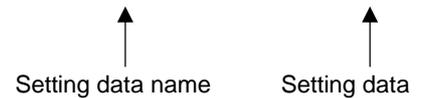
3) Use the numeric keys $\boxed{1}$ to $\boxed{9}$ to set a calibration curve number.

$\boxed{}$ $\boxed{}$ $\boxed{\text{ENT}}$

HEAD	CH	DATA
1	CH	1

Calibration curve number setting mode   Calibration curve number

5.4.2-2) Enabling/disabling the output limit processing (LM)

1) Press $\boxed{\text{SEL}}$ key to display "LM" in the CH display for entering into the output limit processing enabled/disabled setting mode. Use the numeric key $\boxed{0}$ or $\boxed{1}$ to set the processing enabled or disabled.

Enter 0 for OFF (disabled) and 1 for ON (enabled).

$\boxed{}$ $\boxed{\text{ENT}}$

HEAD	CH	DATA
1	LM	OFF

Setting data name   Setting data

HEAD	CH	DATA
1	LM	ON

Setting data name   Setting data
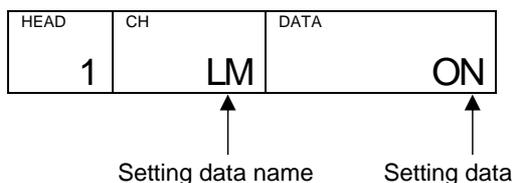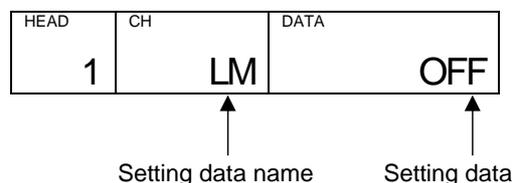
5.4.2-3) Setting a low limit absorbance value (XL) and a low limit measured value (YL)

1) Press $\boxed{\text{SEL}}$ key to display "XL" in the CH display for entering into the low limit absorbance value XL setting mode. Use the numeric keys $\boxed{0}$ to $\boxed{9}$ to set a low limit absorbance value XL.

HEAD	CH	DATA
1	XL	0.0

Setting data name   Setting data

▷ Reference ▷ | Press $\boxed{\text{T/•}}$ key to enter a decimal point.
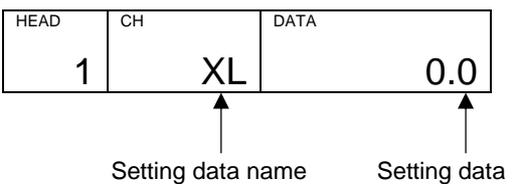
2) Press $\boxed{\text{SEL}}$ key to display "YL" in the CH display for entering into the low limit measured value YL setting mode. Use the numeric keys $\boxed{0}$ to $\boxed{9}$ to set a low limit measured value YL.

HEAD	CH	DATA
1	YL	0.0

Setting data name   Setting data

▷ Reference ▷ | Press $\boxed{\text{T/•}}$ key to enter a decimal point.
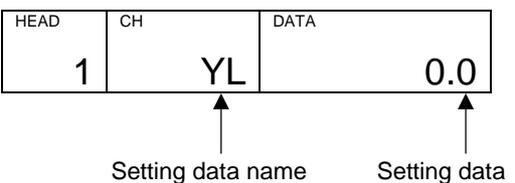
5. Operation

5.4.2-4) Setting a high limit absorbance value (XH) and a high limit measured value (YH)

1) After the above settings [5.4.2-1)] to 5.4.2-3)], press SEL key to display "XH" in the CH display for entering into the high limit absorbance value XH setting mode. Use the numeric keys 0 to 9 to set a high limit absorbance value XH.

HEAD	CH	DATA
1	XH	1.000

Setting data name   Setting data
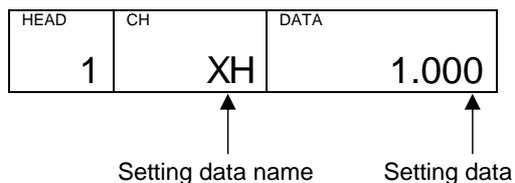
Reference > Press T/• key to enter a decimal point.

2) After the above setting, press SEL key to display "YH" in the CH display for entering into the high limit measured value YH setting mode. Use the numeric keys 0 to 9 to set a high limit measured value YH.

HEAD	CH	DATA
1	YH	50.0

Setting data name   Setting data
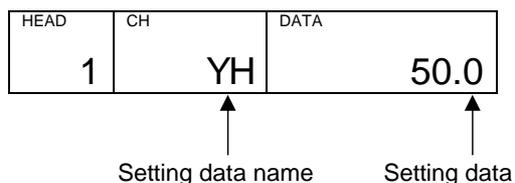
Reference > Press T/• key to enter a decimal point.

5.4.2-5) Setting output limit values to other calibration curve numbers

1　After the above settings [5.4.2-1)] to 5.4.2-4)], press SEL key to display "CH" in the CH display for returning to the calibration curve number setting mode.

2　Enter other calibration curve number for setting output limit values.

3) Repeat the above procedure [5.4.2-1)] to 5.4.2-4)] to set output limit values to other calibration curve numbers.

HEAD	CH	DATA
1	CH	1

Calibration curve   Calibration
number setting mode   curve number
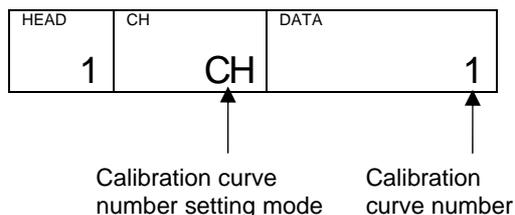
Remarks > After the above setting procedure is completed, return to the measurement mode by pressing SEL key for two seconds, or the automatic return is made if no key is pressed for one minute.

5. Operation

5.5 Selecting calibration curve numbers

This is for selecting a calibration curve number whose data for computing moisture contents, thickness or constituent values have been set in [5.3 Setting calibration curves].
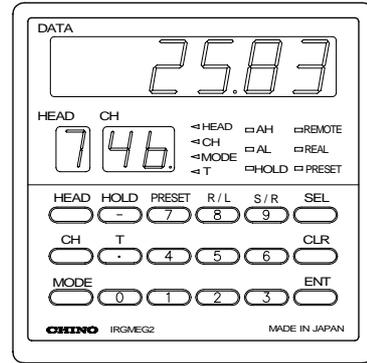
5.5.1 Selecting calibration curve numbers for IRMA1000, 2000, 7000 or 8000 series detector units

1) Press CH key to light the setting status lamp "CH".
2) Enter a calibration curve number by using the numeric keys 1 to 9. After entering it, the setting status lamp "CH" will go off and the mode will go to the measurement mode.
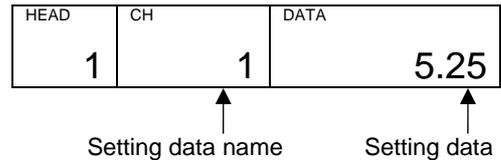
[Going to the absorbance display mode]

By entering 0 in the calibration curve number selection and pressing ENT key, the setting status lamp "CH" will go off and the mode will go to the absorbance display mode.

HEAD	CH	DATA
1	1	5.25

Setting data name   Setting data

HEAD	CH	DATA
1	2	7.12

HEAD	CH	DATA
1	0	0.0123
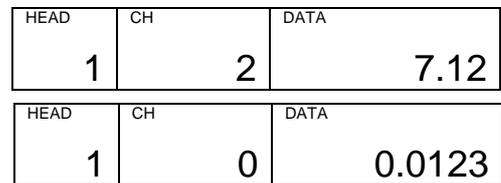
5.5.2 Selecting calibration curve numbers for IRMA5000 or 6000 series detector units

After selecting a constituent number you want to set, set a calibration curve number.
Settable constituent numbers differ depending on constituent specifications of a detector unit being connected.

Data name	Display	Setting range	Default value	Remarks
Constituent number	C0	0 to 4	1	0: Absorbance display mode
Calibration curve number	CH	1 to 99	1	

[Changing constituent numbers]

1) Press CH key to light the setting status lamps "CH" and "MODE".
2) By entering a constituent number 1 to 4 by using the numeric keys 1 to 4, "C1" to "C4" corresponding to the constituent number entered will be displayed in the CH display.
3) Press ENT key. The calibration curve number being currently set will be displayed in the CH display and the setting status lamp "MODE" will go off.

HEAD	CH	DATA
1	C1	10.25

Setting data name   Setting data

HEAD	CH	DATA
1	1	10.25
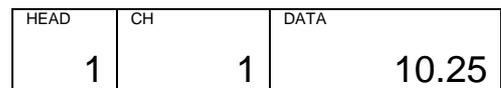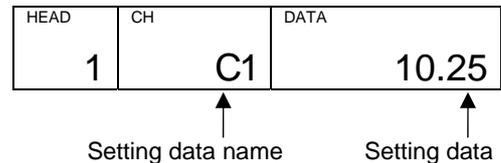
[Changing calibration curve numbers]

4) After the above settings, enter a calibration curve number by using 1 to 9. After entering it, the setting status lamp "CH" will go off and the mode will go to the measurement mode.
5) For setting a calibration curve number for each constituent number, repeat the above procedure.

HEAD	CH	DATA
1	2	5.25

[Going to the absorbance display mode]

When 0 is entered by using the numeric key 0 in the above 2) for entering a constituent number, "C0" is displayed in the CH display. Then, by pressing ENT key, the setting status lamps "MODE" and "CH" will go off and the mode will go to the absorbance display mode.

HEAD	CH	DATA
1	C0	5.25

5. Operation

5.6 Setting operation conditions I (display/output)

This is for setting display/output conditions of a detector unit by this unit.

5.6.1 List of setting data

	Setting data name	Lamp	Setting range of data	Default value
(1)	Time constant	T lights.	0.1 to 9.9 (less than 10 sec) 1 to 99 (10 sec or more)	0.2 (T goes off.)
(2)	Smoothing/real	REAL lights.	Smoothing/real switching	Smoothing (REAL goes off.)
(3)	Hold	HOLD lights.	HOLD activated/released	HOLD released (HOLD goes off.)
(4)	Preset output ON/OFF	PRESET lights.	ON/OFF	OFF (PRESET goes off.)

5.6.2 Setting operation conditions

5.6.2-1) Time constant

When a measured value fluctuates quickly, the signal can be dulled by delaying a response time of a constituent meter detector unit. A smoothing time (equivalent to a time constant of analog instruments) can be set with 0.1-second increment for shorter than 10 seconds and 1-second increment for 10 seconds or longer.

<For IRMA1000, 2000, 7000 or 8000 series detector units being connected>

1) Press T/• key to display the setting status lamp "T".
2) Enter a time constant by using the numeric keys 0 to 9 and press ENT key. The setting status lamp "T" will go off and the mode will return to the measurement mode.

<For IRMA5000 or 6000 series detector units being connecte

1) Press T/• key to display the setting status lamp "MODE".
2) Enter a constituent number for setting a time constant by using the numeric keys 1 to 4 and press ENT key. The setting status lamp "MODE" will go off and the time constant being currently set will be displayed in the CH display.
3) Enter a time constant by using the numeric keys 0 to 9 and press ENT key. The setting status lamp "T" will go off and the mode will return to the measurement mode.

HEAD	CH	DATA
1	0.2	10.25

Setting data name   Setting data

HEAD	CH	DATA
1	1	10.25

HEAD	CH	DATA
1	C1	10.25

HEAD	CH	DATA
1	0.2	10.25

HEAD	CH	DATA
1	1	10.25

5.6.2-2 Smoothing/real

This is for switching the smoothing processing (The setting of time constant is effective.) of measured values or the real processing (Time constant = 0.0 second) of them. The setting status lamp "REAL" turns on to indicate the real processing. By pressing S/R/9 key, the processing becomes the smoothing processing and the setting status lamp "REAL" will go off.

This setting will be reflected in analog outputs and displays.

5.6.2-3) Hold

This is used to hold a measured value.

1) By pressing HOLD/— key, a measured value will be held and an analog output will be held, too.
2) By pressing HOLD/— key again, the holding condition will be released.

In the holding condition, the setting status lamp "HOLD" will light.

5.6.2-4) Preset output

This is used to display the constituent value being set as a preset value. With the display of the preset constituent value, an analog output corresponding to the preset constituent value will be outputted.

1) By pressing PRESET/7 key, the preset output will be activated.
2) By pressing PRESET/7 key again, the preset output will be released.

In the preset output condition, the setting status lamp "PRESET" will light.

5. Operation

5.7 Setting operation conditions II (MODE setting)

For setting various operation conditions of this unit and a detector unit, use the MODE setting.
The MODE setting is only available in the absorbance display mode.

Remarks For exiting the MODE setting, press SEL key for 2 seconds or the automatic return to the measurement mode is made if no key is pressed for one minute.

Caution If an invalid MODE number is entered, "Er" will be displayed in the CH display.
After one second, the automatic return to the measurement mode is made if no key is pressed for one minute.

5.7.1 List of data for setting operation conditions II

The followings are data for setting operation conditions II.
Setting items available differ depending on number of constituents.

MODE No.	Setting data name		Disp.	Setting range of data	Default value	Remarks	Para.
6	Weight α, Calibration constant						
	Computation mode 1	Weight α1	1A[*1]	0 to 1.000	0.500	0.5: 3-wavelength processing 0 or 1: 2-wavelength processing	5.7.2
		Calibration constant K1	1K[*1]	0 to ±9.9999	1.0000		
	Computation mode 2	Weight α2	2A[*2]	0 to 1.000	0.500	0.5: 3-wavelength processing 0 or 1: 2-wavelength processing	
		Calibration constant K2	2K[*2]	0 to ±9.9999	1.0000		
	Computation mode 3	Weight α3	3A[*3]	0 to 1.000	0.500	0.5: 3-wavelength processing 0 or 1: 2-wavelength processing	
		Calibration constant K3	3K[*3]	0 to ±9.9999	1.0000		
14	Decimal place displaying measured values		d□	0 to 4	1	0: Not displays after the decimal point 1: Displays 1 decimal place 2: Displays 2 decimal places 3: Displays 3 decimal places 4: Displays 4 decimal places	5.7.3
17	Calibration curve remote inputs with Binary or BCD			0, 1	0	0: Binary 1: BCD	5.7.4
19	Sample temperature correction enabled or disabled (For detector units for 1 constituent in IRMA□□□ series)			0, 1	0	0: Disable 1: Enable	5.7.5
20	Sample temperature displaying					When 1(enable) is selected in Mode 19, this mode is effective	5.7.6
21	Sample temperature input scaling			Lo, Hi	Lo	Lo: Analog input scaling low limit value Hi: Analog input scaling high limit value	5.7.7

*1: (1) **Weight α1:** The 3-wavelength processing and the 2-wavelength processing can be changed by setting the weight α1.
When α1 is set to 0.5, the processing becomes the 3-wavelength processing that is the ratio processing of three wavelengths.
When α1 is set to 0 or 1, the processing becomes the 2-wavelength processing.
(α1: 1 - the ratio processing of λ1 and λ2, α1: 0 - the ratio processing of λ2 and λ3)
  (2) **Calibration constant k1:** This constant is automatically obtained in [5.10 Calibration].

*2: (1) **Weight α2:** The 3-wavelength processing and the 2-wavelength processing can be changed by setting the weight α2.
When α1 is set to 0.5, the processing becomes the 3-wavelength processing that is the ratio processing of three wavelengths.
When α1 is set to 0 or 1, the processing becomes the 2-wavelength processing.
(α1: 1 - the ratio processing of λ1 and λ2, α1: 0 - the ratio processing of λ2 and λ3)
  (2) **Calibration constant k2:** This constant is automatically obtained in [5.10 Calibration].

*3: (1) **Weight α3:** The 3-wavelength processing and the 2-wavelength processing can be changed by setting the weight α1.
When α1 is set to 0.5, the processing becomes the 3-wavelength processing that is the ratio processing of three wavelengths.
When α1 is set to 0 or 1, the processing becomes the 2-wavelength processing.
(α1: 1 - the ratio processing of λ1 and λ2, α1: 0 - the ratio processing of λ2 and λ3)
  (2) **Calibration constant k3:** This constant is automatically obtained in [5.10 Calibration].

5. Operation

MODE No.	Setting data name	Disp.	Setting range of data	Default value	Remarks	Para.
30	Displaying a constituent number (For IRMA5000 or 6000 series detector units only)		0 to 4	1	0: Cycle (Circulating display) 1: C1 (Constitute number 1) 2: C2 (Constitute number 2) 3: C3 (Constitute number 3) 4: C4 (Constitute number 4)	5.7.8
31	Selecting a constituent number for an analog output and a contact output from a detector unit (For detector units for 2 or more constituents in IRMA5000 or 6000 series only)		1 to 4	1	1: C1 (Constitute number 1) 2: C2 (Constitute number 2) 3: C3 (Constitute number 3) 4: C4 (Constitute number 4)	5.7.9
32	Selecting of a contact output from a detector unit enabled or disabled and an output item		0 to 2	0	0: none (disabled) 1: ALARM 2: ERRoR	5.7.10
33	Selecting of a contact input from a detector unit enabled/disabled and an input item		0 to 3	0	0: none (disabled) 1: HoLd 2: PrSEt 3: SMt.rL	5.7.11
35	Displaying a calibration curve number (For detector units for 2 or more constituents in IRMA5000 or 6000 series only)		0, 1	0	0: OFF 1: ON	5.7.12
40	Computing surface water ratio		0, 1	0	0: OFF 1: ON	5.7.13
80	Setting communication conditions					5.7.14
	(1) Protocol	Pr	1, 2	1	1: rtU 2: PriV	
	(2) Communication speed	SP	1, 2	1	1: 9600 2: 19200	
	(3) Parity	P	1 to 3	2	1: nonE 2: EVEn 3: odd	
	(4) Data length	d	7, 8	8	7: 7 bits 8: 8 bits	
	(5) Stop bit length	Sb	1, 2	1	1: 1 bit 2: 2 bits	
	(6) BCC use/no use	BC	0, 1	0	0: no 1: YES	

5. Operation

5.7.2 Weight α, calibration constant

The weights "α" are values to decide a ratio of 2 wavelengths in 3-wavelength processing.
The calibration constants are values obtained in [5.10 Calibration] which have been automatically stored.

For setting, press MODE, 6 and then ENT.
"1A" will be displayed in the CH display and its setting data will be displayed in the DATA display.

The following items will be displayed in circle by pressing SEL key.

    1A: Computing mode 1 weight α1
    1K: Computing mode 1 calibration constant K1
    2A: Computing mode 2 weight α2
    2K: Computing mode 2 calibration constant K2
    3A: Computing mode 3 weight α3
    3K: Computing mode 3 calibration constant K3

HEAD	CH	DATA
1	1A	0.5

Setting data name   Setting data

Reference > For the details of the weight α1 to α3, refer to *1 to *3 on the margin of [5.7.1 List of data for setting operation conditions II]

HEAD	CH	DATA
1	3K	0.0009

5.7.3 Decimal place displaying measured values

The decimal place of a measured value can be set for better viewing of the data displayed.

For setting, press MODE, 1, 4 and then SEL.
"d1" will be displayed in the CH display and its setting data will be displayed in the DATA display.

    d1: Decimal place displaying a measured value of the constituent 1.
    (Decimal place displaying a measured value of the constituent 1 for IRMA5000 or 6000 series detector units

HEAD	CH	DATA
1	d1	25.83

Setting data name   Setting data

For IRMA5000 or 6000 series detector unit, the following items will be displayed in circle by pressing SEL.

    d2: Decimal place displaying a measured value of the constituent 2.
    (This will be displayed for the number of constituents is 2 or more and settable.)
    d3: Decimal place displaying a measured value of the constituent 3.
    (This will be displayed for the number of constituents is 3 or more and settable.)
    d4: Decimal place displaying a measured value of the constituent 4.
    (This will be displayed for the number of constituents is 4 and settable.)

Setting range: 0 to 4
For storing, press ☐ and then ENT.

5.7.4 Calibration curve remote contact inputs with Binary or BCD

This is for setting the processing of calibration curve remote contact inputs to this unit.
Processing with the binary code or the BCD code of remote contact input data can be selected.

For setting, press MODE, 1, 7 and then ENT.

Setting range: 0 to 1 (0: Binary, 1: BCD)
For storing, press ☐ and then ENT.

5. Operation

5.7.5 Sample temperature correction enabled or disabled

(This is effective for IRMA1000, 2000, 7000 or 8000 series detector units, or for detector units for 1 constituent in IRMA5000 or 6000 series.)

Select the sample temperature correction by a detector unit is enabled or disabled.

For setting, press MODE, 1, 9 and then ENT.

Setting range: 0 or 1 (0: disabled, 1: enabled)

For storing, press ☐ and then ENT.

5.7.6 Sample temperature displaying

When 1 (Enabled) in selected in [5.7.5 Sample temperature correction enabled or disabled], sample temperature is displayed in this unit.

MODE, 2, 0 and then ENT .

5.7.7 Sample temperature input scaling

Set a scaling of an analog input to a detector unit for the sample temperature correction.

For setting, press MODE, 2, 1 and then ENT.

"Lo" will be displayed in the CH display and its setting data will be displayed in the DATA display.

The following items will be displayed in circle by pressing SEL.

Use the number keys 0 to 9 the set a low limit value for an analog input scaling and high limit value for an analog scaling.

HEAD	CH	DATA
1	Lo	-10

Setting data name   Setting data
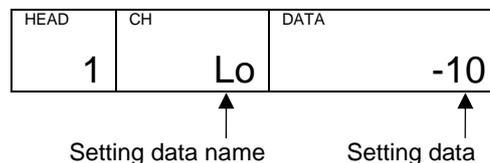
Reference > │ Press HOLD/ - key to enter a minus (-) │

   Lo: Low limit value for an analog input scaling
   Hi: High limit value for an analog input scaling

Setting range: -999 to 999

5.7.8 Displaying constituent numbers

(For IRMA5000 or 6000 series detector units)

Select a constituent number to be displayed on a detector unit and this unit.

For setting, press MODE, 3, 0 and then ENT.

Setting range: 0 to 4
        [0: CYCLE (circulating display), 1: C1, 2: C2, 3: C3, 4: C4]

For storing, press ☐ and then ENT.

Remarks > │ This setting is invalid [Er] for IRMA1000, 2000, 7000 or 8000 series detector units, or detector units for 1 constituent in IRMA5000 or 6000 series detector units. │

5. Operation

5.7.9 Selecting a constituent number for an analog output and a contact output from a detector unit
(For detector units for 2 or more constituents in IRMA5000 or 6000 series only)

Select a constituent number for an analog output and a contact output from a detector unit.

For setting, press MODE, 3, 1 and then ENT.

Setting range: 1 to 4
         (1: C1, 2: C2, 3: C3, 4: C4)

For storing, press ☐ and then ENT.

Remarks
> This setting is invalid [Er] for IRMA1000, 2000, 7000 or 8000 series detector units, or detector units for 1 constituent in IRMA5000 or 6000 series detector units.

5.7.10 Selecting a contact output from a detector unit enabled or disabled and an output item

Select a kind of a contact output from a detector unit.

For setting, press MODE, 3, 2 and then ENT.

Setting range: 0 to 2 (0: none, 1: ALARM, 2: ERROR)
For storing, press ☐ and then ENT.

5.7.11 Selecting a contact input to a detector unit enabled/disabled and an input item

Select a kind of a contact input to a detector unit.

For setting, press MODE, 3, 3 and then ENT.

Setting range: 0 to 3 (0: none, 1: HoLd, 2: PrSEt, 3: SMr.rL)
For storing, press ☐ and then ENT.

5.7.12 Displaying a calibration curve number
(For detector units for 2 more constituents in IRMA5000 or 6000 series only)

This is to select ON or OFF for displaying a calibration curve number.

Select ON when you want to change the CH display in the measurement mode from a constituent number to a calibration curve number.

For setting, press MODE, 3, 5 and then ENT.

Setting range: 0 to 1 (0: OFF, 1: ON)
For storing, press ☐ and then ENT.

Remarks
> This setting is invalid [Er] for IRMA1000, 2000, 7000 or 8000 series detector units, or detector units for 1 constituent in IRMA5000 or 6000 series detector units.

5.7.13 Computing surface water ratio

Select the surface water ratio computation for computing moisture contents of sands, etc. enabled or disabled.

Select ON when you want to use the computation.
For setting, press MODE, 4, 0 and then ENT.
Setting range: 0 to 1 (0: OFF, 1: ON)
For storing, press ☐ and then ENT.

5. Operation

5.7.14 Setting communication conditions

The followings are data for setting communication conditions between this unit and a personal computer, a PLC or other equipment.

For setting, press MODE, 8, 0 and then ENT.
"Pr" will be displayed in the CH display and its setting value will be displayed in the DATA display.

HEAD	CH	DATA
1	Pr	rtU

Setting data name   Setting data
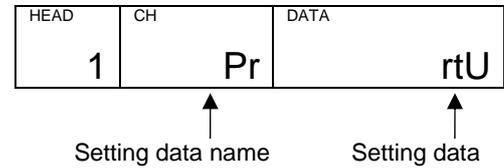
The following items (1) to (6) will be displayed in circle by pressing SEL.

After selecting a condition, press ENT to store it.

	Data name	Display	Setting rage	Default value
(1)	Protocol	Pr	1: rtU, 2:PriV	1: rtU
(2)	Communication speed	SP	1: 9600, 2:19200	1: 9600
(3)	Parity	P	1: nonE, 2: EVEn, 3: odd	2: EVEn
(4)	Data length	d	7, 8	8
(5)	Stop bit length	Sb	1, 2	1
(6)	BCC enabled/disabled	BC	0: no, 1: YES	0: no

(1) Protocol
Select MODBUS mode (rtU) or CHINO's private protocol (PriV).

(2) Communication speed
Select 9600 or 19200bps.

(3) Parity
Select no-parity (none), even parity (even) or odd parity (odd).

(4) Data length
Select 7 or 8 bits.

Remarks> When MODBUS "rtU" mode protocol is selected, the data length is fixed to 8 bits and this item will be skipped.

(5) Stop bit length
Select 1 or 2 bits.

Remarks> When MODBUS "rtU" mode protocol is selected, the stop bit length is fixed as shown below and this item will be skipped.
• Even parity or odd parity: 1 bit
• No parity: 2 bits

(6) BCC enabled/disabled
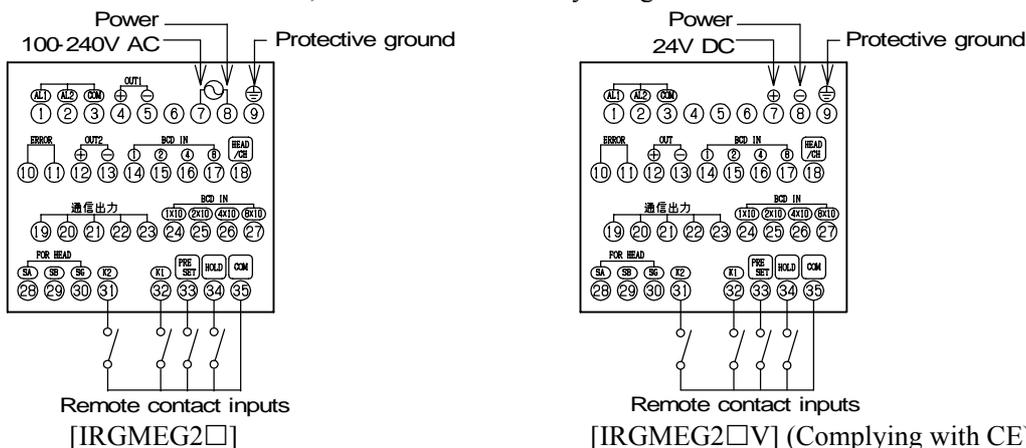When CHINO's private protocol (PriV) is selected, set BCC enabled or disabled.

Remarks> When MODBUS "rtU" mode protocol is selected, this item will be skipped.

5. Operation

5.8 Remote contact inputs

The setting of a calibration curve number, etc. can be executed by using remote contacts.

[IRGMEG2□]

[IRGMEG2□V] (Complying with CE)

5.8.1 Setting detector unit numbers, constituent numbers and calibration curve numbers

For activating this function, press R/L/9 to go to the remote mode (The measurement status lamp "REMOTE" will light.).

By setting a numeric with the BCD code or the binary code at BCD IN terminals, detector unit numbers, constituent numbers and calibration curve numbers can be set.

When the HEAD/CH terminal is switched from OFF to ON, the numeric at BCD IN terminals is set as a detector unit number.

When the K2 terminal is switched from OFF to ON, the numeric of BCD IN terminals is set as a constituent number.

When the HEAD/CH terminal is switched from ON to OFF, the numeric at BCD IN terminals is set as a calibration curve number.

> **Remarks** The default setting is the BCD code. For using the binary code, change the code in the MODE setting. (Refer to [5.7 Setting operation conditions II (MODE setting)].)

HEAD/CH terminal

Detector unit number setting   Calibration curve number setting

K2 terminal

Constituent number setting
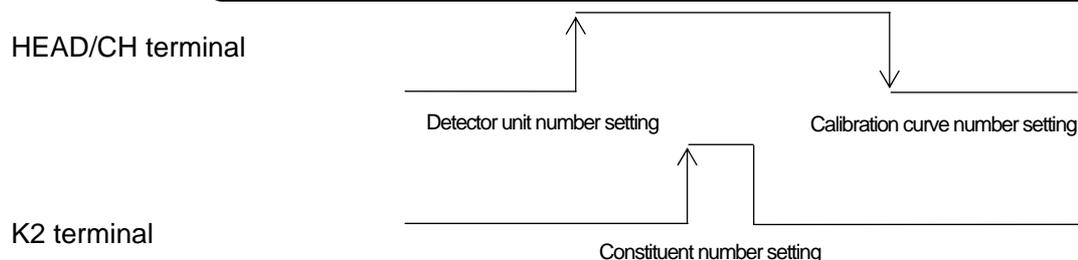
> **Remarks** The setting of a constituent number is not required for IRMA1000, 2000, 7000 or 8000 series detector units, or detector units for 1 constituent in IRMA5000 or 6000 series detector units.

5.8.2 Calibration

When the K1 terminal is ON, a calibration with No. 1 side of the output checker plate will be executed.

5.8.3 Preset

1) When the PRESET terminal is ON, the preset output will be activated.
2) When the PRESET terminal is switched to OFF, the preset output will be released.

5.8.4 Hold

1) When the HOLD terminal is ON, the HOLD will be activated.
2) When the HOLD terminal is switched to OFF, the HOLD will be released.

5.9 Key lock

1) By pressing MODE and SEL simultaneously for 2 seconds except the absorbance display mode, the key lock will be activated and the first-digit decimal point will light.

> **Remarks** With this key lock, settings cannot be changed by key operations, but various data can be confirmed.

2) For releasing the key lock, press MODE and SEL simultaneously for 2 seconds.

5. *Operation*

5.10 Calibration (For performing a calibration, read the paragraph [Calibration] in a separate instruction manual for a detector unit being connected, too.)

For using this detector unit accurately, the periodical calibration (once in three months) is recommended.

Supply the power a detector unit for one hour or longer before calibration.

5.10.1 Calibration for IRMA1000, 2000, 7000 or 8000 series detector units

1) Mount the output checker plate and measure the No. 1 side of the output checker plate.

[Setting the absorbance display mode]

With the key operations shown below, set the calibration curve number to 0 for entering into the absorbance display mode.

2) Press CH key to light the setting status lamp "CH".

3) Press 0 and then ENT.

HEAD	CH	DATA
1	0	0.0123

[Calibration]

4) Press MODE, 1 and then ENT. When the absorbance "x" is within value on the following table, the calibration is completed.

HEAD	CH	DATA
1	0	0.0000

Series model	Absorbance "x"
IRMA1100□□,1200□□, 7100□□,2100□□,2200□□	Within 0.0000±0.0010
IRMA1300□□,7200□□, 8100□□	Within 0.0000±0.0050

Remarks > If the absorbance "x" is not included in range within value of the above table the malfunction of this unit is conceivable.
Please contact your nearest agent of CHINO corporation.

[Releasing the absorbance display mode setting]

6) After the calibration is completed, press CH, enter a calibration curve number and then press ENT key.

5. Operation

5.10.2 Calibration for IRMA5000 or 6000 series detector units

1) Mount the output checker plate and measure the No. 1 side of the output checker plate.

[Setting the absorbance display mode]

With the key operations shown below, set the constituent number to 0 for entering into the absorbance display mode.

2) Press CH key to light the setting status lamps "CH" and "MODE".

3) Press 0 and then ENT.

[Calibration]

4) Press MODE, 1 and then ENT. When the absorbance "x" of the computing mode 1 (M1) is within value on the following table, the calibration is completed.

Series model	Absorbance "x"
IRMA51□□□□,61□□□□	Within 0.0000±0.0050
IRMA52□□□□	Within 0.0000±0.0100

HEAD	CH	DATA
1	M1	0.0123

HEAD	CH	DATA
1	M1	0.0000

HEAD	CH	DATA
1	M4	1.000

5) For your confirmation, change the computing modes by pressing SEL.
The CH display will change M1→M2→M3→M4→M1 by pressing SEL. When the absorbance "x" of the computing modes 1 to 3 is within value on the following table and the absorbance "x" of the computing mode 4 is within 1.000±0.0100, the calibration is completed.

Remarks ⟩ If the absorbance "x" is not included in range within value of the above table the malfunction of this unit is conceivable.
Please contact your nearest agent of CHINO corporation.

[Setting the absorbance display mode]

6) After the calibration is completed, press CH in any computing mode, enter a constituent number and then press ENT.

7) In the CH display, a calibration curve number will be displayed. If it is not need to change it, press ENT.
If you want to change it, enter a number you want and then press ENT.

6. Creating calibration curves

Output characteristics of detector units depend upon measuring objects. It may also change according to process conditions or constituent measuring conditions of samples.

Accordingly, for accurate measurements, it is required to perform beforehand sample tests of each object and obtain, for moisture measurements, a relationship (This is called as a calibration curve.) between moisture contents (%H$_2$O) obtained by a drying method or other measuring methods and absorbance "x" measured by a detector unit] or, for thickness measurements, a relationship (This is called as a calibration curve.) between thickness (μm) obtained by a micrometer or other measuring methods and absorbance "x" measured by a detector unit].

6.1 Sample preparation

Refer to the paragraph of [Sample preparation] in the separate instruction manual for instruction manual for [Infrared multiple-constituents analyzer detector unit IRMA□□□□□].

6.2 Sample measurement

Refer to the paragraph of [Sample measurement] in the separate instruction manual for instruction manual for [Infrared multiple-constituents analyzer detector unit IRMA□□□□□].

6.3 Creating calibration curves

Refer to the paragraph of [Procedure for creating calibration curves] in the separate instruction manual for instruction manual for [Infrared multiple-constituents analyzer detector unit IRMA□□□□].

7. *Inspection and maintenance*

7.1 Periodical inspection

The following inspections are required periodically.
1) Connections
   Check the connections to all terminals of a detector unit, this operator interface/display unit, a receiving instrument or other instruments are fixed securely.

2) Calibration
   The calibration once in 3 months is recommended. (Refer to [5.10 Calibration].)

7.2 Self-diagnosis function

The self-diagnosis function is built in this detector unit. When an abnormal condition occurs, the corresponding error number is displayed.
All error numbers are common to a detector unit and this operator interface/display unit.

Error No.	Item	Contents	Measures	Diagnosed abnormal condition*
-----	High limit over range	Measured value is higher than the displaying range.	Check the calibration curve data. Check the output by the output checker plate.	×
-----	Low limit over range	Measured value is lower than the displaying range.	Check the calibration curve data. Check the output by the output checker plate.	×
Er01	Nonvolatile memory abnormal	Writing to or reading from the nonvolatile memory is disabled.	Return this detector unit to CHINO.	○
Er03	Motor rotation abnormal	The motor stops or rotates abnormally.	Replace the motor.	○
Er06	Computation error	Overflow happed in computation	Check the output by the output checker plate.	○
Er07	Element temperature abnormal	The element temperature is abnormal.	Return this detector unit to CHINO.	○
Er08	Communication abnormal	Abnormal communication between a detector unit and this operator interface/display unit	Separate from a noise source causing abnormal communication	○
Er12	Ambient temperature too high	The ambient temperature of the detector unit is high	Lower the ambient temperature.	×
Er13	Ambient temperature too low	The ambient temperature of the detector unit is low	Raise the ambient temperature.	×
Er14	Sample temperature too high	The sample temperature is higher than the correction range	Widen the correction range.	×
Er15	Sample temperature too low	The sample temperature is lower than the correction range	Widen the correction range.	×
Er16	Sample low reflection	The reflection rate of the sample is low or the lamp is burned out.	Close the distance to the sample. If the lamp is burned out, replace it.	×
Er17	Sample high reflection	The reflection rate of the sample is high.	Incline or extend the distance to the sample.	×
Er18	Detector unit number error	A detector unit number not connected is set.	Set a detector unit number again.	×
Er20	Number of calibration curves insufficient for sample temperature correction	The number of calibration curves is insufficient for the sample temperature correction..	Set two calibration curves setting sample temperature or more.	×
Er99	RAM error	Data destroy of the RAM in this operator interface/display unit	Initialize the RAM.	○

(Note) For the items filled with ○ in the self-diagnosed abnormal condition, a self-diagnosed abnormal condition alarm is outputted from a detector unit and this operator interface/display unit.

7. Inspection and maintenance

7.3 Measures against troubles not included with self-diagnosis

If a trouble occurred, take remedial measures referring to the corresponding items of this manual after checking the following points. For the troubles of a detector unit, refer to the separate instruction manual for [Infrared multiple-constituents analyzer detector unit IRMA□□□□□].

7.3.1 Measured value remains unchanged.

(1) Is HOLD set to ON?
(2) Is PRESET set to ON?
(3) Are the calibration curve data correct?
(4) Turn off the power once and then turn on it.
(5) By using the output checker plate, check if the data displayed in the absorbance display mode change?
(6) When the data remains unchanged, initialize the RAM. If this phenomenon is not still recovered, return this unit to CHINO.

7.3.2 Measured value fluctuates.

(1) Is the measuring surface flat?
(2) Is the measuring position correct? Make sure that a detector unit does not measure such bottom face as a conveyor belt, etc.
(3) Make sure that any disturbance light is not irradiated onto a measuring surface.
(4) Is the smoothing time proper? Certain smoothing time is necessary in stable measurements.
(5) Make sure that any noise source does not exist around a detector unit or connection cables.
(6) By using the output checker plate change, check if the data displayed in the absorbance display mode fluctuate?
(7) When the data fluctuates, initialize the RAM. If this phenomenon is not still recovered, return this unit to CHINO.

7.3.3 Measured value is higher or lower than an actual value.

(1) Is the calibration curve number correct?
(2) Are the calibration curve data correct?
(3) Is HOLD or PRESET set to ON?
(4) Is the measuring position by a detector unit correct?
(5) Is a cover glass surface face of a detector unit clean?

7.4 Maintenance parts

Article name	Quantity	Replacing interval	Remarks
Lithium battery	1	3 to 10 years	10 years for normal operation, 3 years for a nonenergized period

7.5 Ram clearing

If an abnormal condition of this unit is not recovered by all means, initialization of the RAM is required.

Caution | For initializing the RAM, make sure to turn off the power source to this unit.
The stored contents of the RAM in this unit are initialized.
The stored contents (calibration curve data, etc.) of the RAM in a detector unit are not initialized.

(1) Turn on the power by pressing MODE key and CLR key simultaneously.
(2) The contents of the RAM are initialized. Set the calibration curve data, etc. again.
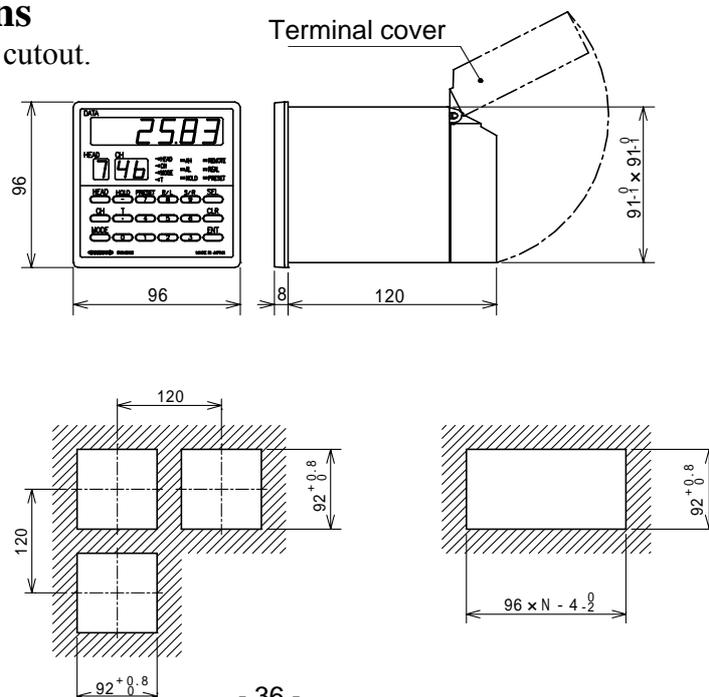
8. Specifications

8.1 Operator interface/display unit IRGMEG2□□

Model	IRGMEG2□□	IRGMEG2□V (complying with CE)
Detector unit input	RS-485, Up to 9 sets connectable	
Analog output	4 to 20mA DC (Load resistance: 500Ω or less) 2 outputs	4 to 20mA DC (Load resistance: 500Ω or less) 1 output
Output accuracy	±0.5%/FS	
Stability under EMC test environment	———————	±3%/FS
Communication output	RS-232C (RS-485 or RS-422A is available on request.)	
Output renewable cycle	28ms × quantity of detector units connected	
Display	Data : LED 5 digits, Calibration curve number : LED 2 digits, Detector unit number : LED 1 digit	
Remote setting	Settings of detector unit numbers, constituent numbers, calibration curve numbers, calibration, a PRESET output, a HOLD by remote contact signal	
Alarm	High-limit and low-limit alarms, 2 contact outputs (1 common terminal)	
Self-diagnosis	1 contact output	
Working temperature range	0 to 50°C	
Power	100 to 240V AC 50/60Hz	24V DC
Allowable voltage fluctuation	85 to 264V AC	±10% of rated value
Power consumption	Maximum about 15VA	Maximum about 10VA
Case	ABS resin, splash-proof front panel (IP65)	
Installation	Panel-mounting	
Weight	About 600g	
Attachment	Mounting brackets 1 set, internal unit pulling-out tool 1 piece	Mounting brackets 1 set, internal unit pulling-out tool 1 piece, ferrite cores 3 pieces (*)
CE	———————	EN55011 Group1 Class1, EN50082-2 (Industrial environment)
Conditions for CE conformance	———————	1. The connection cable should be indoors and its length should be up to 30m. 2. One(1) set of DC power source unit should be individually connected to one(1) set of this unit.

(*) When 4 pieces or more are required, order them separately.

8.2 Outside dimensions
Outside dimensions and panel cutout.

Terminal cover

CHINO