

Pure Water Heating Unit

Operation Manual

Model PWH-144i

(Series common manual)

KELK Ltd.

No. K30008210000

Revision history

Rev	Date	Contents	Approval	Examination	Making

Introduction

Thank you very much that you have purchased this pure water heating unit.

The unit is a heating machine dedicated for pure water. To prevent a malfunction from occurring, do not use any other liquid.

Manuals for the pure water heating unit include:

- ① Operation manual---Describes operating procedures and precautions on operation.
- ② Maintenance manual---Describes operation of the maintenance screen, cautions on corrective measures for maintenance errors and initial setting. This manual shall be safely stored by the maintenance manager.
- ③ Installation manual---Describes precautions on installation.
- ④ Appendix--- sketch drawing, wiring diagram, and replacement part list have been described.

Be sure to read the manuals thoroughly in order to obtain maximum performance of this product and assure effective operation. This manual describes how to operate the pure water heating unit and operating precautions. Always keep this manual at a place near the product and consult whenever you have a question while using this product.

Descriptions in this document are subject to change without notice.

Copying, quotation, or alteration of any part of the descriptions in the document without permission is prohibited. Be sure to contact us before copying any part of the document.

About preconditions for operating the unit

⚠ DANGER

- **This unit has been designed and tested according to the safety standard to confirm safety before shipping.**
- **This unit uses high temperature pure water. Also, installation work includes handling of high voltage wires.**
- **Incorrect piping or wiring may cause personal injury or malfunction of the unit. Be sure to thoroughly read and understand the operating instructions before operating the product. Otherwise, KELK Ltd. shall assume no responsibility for an accident caused by any reason other than our product.**

Environmental preconditions

Location of operation	The product is designed to be operated in a clean room.
Altitude	Operate the unit only at 2000m or lower sea level.
Environmental temperature/humidity	Operate the unit at 15~30°C, 35~85%RH (no condensation).
Rated voltage	The rated voltage is different depending on the specification. Refer to "1. specification" of the separate volume manual "Appendix" . Avoid operating the unit at a voltage other than the rated voltage, which may cause a malfunction. Also, install a power shut-off unit meeting the relevant laws in the country where this unit is installed on the power supply side.
Over voltage category contamination level	The unit has been evaluated according to the over voltage category II and the contamination level II.

Introduction

About warranty

Application of Warranty Provisions

The warranty provisions described below refer to the warranty which applies to product delivered through a supplier, or delivered by KELK Ltd., directly to the system manufacturer or to the end user. They do not necessarily include the system manufacturer's or the supplier's warranty provisions which apply to the end user.

There may be occasions wherein certain provision in this warranty are precluded by a separate contract concluded between KELK Ltd., and either the system manufacturer or the end user to whom the product is delivered which warrant product quality, or by the application of prescribed provisions which are different from those given herein.

Warranty Provisions

1) Term of warranty

Warranty period for this product shall be 18 months from the date of delivery or 12 months after starting operation of the product, whichever comes earlier.

2) Content of the guarantees

In case of failure of the product under normal operating conditions within the guarantee period and when the claim is presented in the written form to us, this product shall be returned. According to our own judgment, we will provide repair service or replacement part on the basis of delivery place for users in Japan or on the basis of FOB shipment place for users outside Japan.

If there is a separate agreement concerning the operation of the content of guarantees in the above quality assurance agreement, which contains stipulation different from this Clause, such stipulation will be preferred.

3) Warranty coverage

Coverage is limited to warranty for this product. KELK Ltd. is not responsible for damage to other equipment, damage resulting from process stoppages or for compensation for personal casualty.

Cases which relate to any of the following are exempt from warranty.

- (a) Claim is not filed during the term of warranty.
- (b) The product's consumable parts, whose warranty period has expired before the end of the product's warranty period.
- (c) Improper handling, installation or operation performed by a party other than KELK Ltd., owing to failure to heed warnings and precautions given in this instruction manual.
- (d) Repair or modification performed by an agency not authorized by KELK Ltd.
- (e) Damage resulting from a natural disaster or unavoidable accident.
- (f) Malfunction or damage in the course of transportation under the authority of a third party other than KELK Ltd.
- (g) Burning of the halogen lamp after 5,000 hours or one year or more of use.

Except for the foregoing warranties, all other warranties are excluded.

Contact when a trouble occurs

When any abnormality occurs to the unit, its safety protection function will be activated to automatically perform processes necessary for the safety side. When you notice an error indication, confirm the error number and perform the appropriate counter measures in the “Troubleshooting” or contact your dealer or us. The list of sales offices and representative stores is shown below.

<Domestic sales office>

Tokyo sales office, overseas group:

3-25-1 Shinomiya, Hiratsuka-shi, Kanagawa
 Tokyo sales office (Tel) 0463-22-8276 (Fax) 0463-22-8277
 Overseas group (Tel) 0463-23-8241 (Fax) 0463-22-8277

Kansai sales office:

17 Takada, Morimoto cho, Muko-shi, Kyoto-Fu
 (Tel) 050-3369-1066 (Fax) 075-922-2106

Kyusyu sales office:

1421-1 Muro, Ozu-machi, Kikuchi-gun, Kumamoto
 (Tel) 050-3797-7180 (Fax) 096-273-9778

<Overseas sales>

KOREA	High Integrated Technology Inc.	72, Segyosandan-ro, Pyeongtaek-si, Gyeonggi-do 17843, Korea Tel: +82(0) 31 650 7000 Fax: +82(0) 31 650 7007
CHINA	King Virtue Electron Co., Ltd.	30F, King Tower, No.28 Xinjinqiao Road, Pudong Shanghai, 201206, China Tel: +86(0) 21 5834 0610 Fax: +86(0) 21 5834 0645
TAIWAN	Pinpointek Corporation	11F-5, No.295, Sec.2, Guangfu Road, East District. Hsinchu City 300, Taiwan, R.O.C. Tel: +886(0) 3 574 4555 Fax: +886(0) 3 574 4550
SOUTH-EAST ASIA	Pinpointek Corporation Pte Ltd.	66 Tannery Lane #01-03G, Shindo Building, Singapore 347805 Tel: +65 6749 3050 Fax: +65 6743 7791
U.S.A	Daitron Incorporated	9720 SW Hilman Court, Suite 805, Wilsonville, Oregon 97070, U.S.A. Tel: +1 503 682 7560 Fax: +1 503 682 2861
EUROPE	METRONICS Semiconductor Equipment GmbH	Gewerbering 8 D-85258 Weichs Germany Tel: +49(0) 8136 8088 66 Fax: +49(0) 8136 8088 65

Although we have a minimum number of spare parts for this product for regular services, which is also available for emergency repair, note that some time may be necessary if spare parts have been run out.

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1 Foreword

1.1 How to use the manual

The document is an operation manual for the users to describe the pure water heating unit and to assure safe and correct operation. Use the manual according to your specific application.

When the unit is delivered, first read the document and fully understand its contents before operating the unit.

1.2 Definition of terms

Refer to the terms used throughout the document before using it.

Table 1-1 Terms and their meanings

Terms	Meanings of the terms
Heater	This means a halogen lamp heater.
Power module	This means a power control unit for the heater (Abbreviation : PM) .
PV	This means the present temperature value.
SV	This means the set temperature value.
PID value	This means a calculation constant used for temperature control.
PLC	This means the Programmable Controller (sequencer).
Control panel	This is a touch panel display used for various settings and indication.
Control board	This is the board used to control the temperature control system.
PM_I/F board	These are the interface boards for power modules.
Sensor board	This is the board that relays various signals from the heating unit to the controller.
Interlock board	This is the board used for hardware interlock.
UNIT#	This is a name for unit with an output of 144kW or more. This name is not applicable to 96kW or less units.
NFB	This is the abbreviation of a No Fuse Breaker.
ELB	This is the abbreviation of This is the abbreviation of an Electrical Leakage Breaker.
ΔT	This means a difference between the set temperature (SV) and the inlet temperature.
Function key	These are hard switches on the control panel. There are F1 to F5 keys.
LOCAL	This is the mode when the user can operate the unit from the control panel.
REMOTE	This is the mode when the user can operate the unit with I/O signals from the wet station.
SERIAL	This is the mode when the user can operate the unit using the communication function from the wet station. Note that this function is optional.

Foreword

1.3 Conforming standards

Refer to individual specifications for the standard.

1.4 Features

Table 1-2 Features

Item	Features
Heating	The halogen lamp heater heating system is employed and heating capacity is 95% or more.
Rise time	Temperature will be stable within three minutes. (30LPM, $\Delta T = 55^{\circ}\text{C}$ or less)
Liquid contact part material	Fluorine resin and highly pure silica glass are used.
Operability	The optimal value can be set with automatic PID setting based on the operating conditions. Separate setting or auto tuning is not necessary.
Control	Reviewed control algorithm and improved an agitation suppression characteristic in comparison with the conventional machine (PWH- ## N).
Compatibility	The components of the unit are compatible with those of the existing units (PWH- ##N). Note, however, that the position of the drain pan assembly is slightly different.

1.5 Characteristic

Condition: When the ratings voltage is input and all heaters light

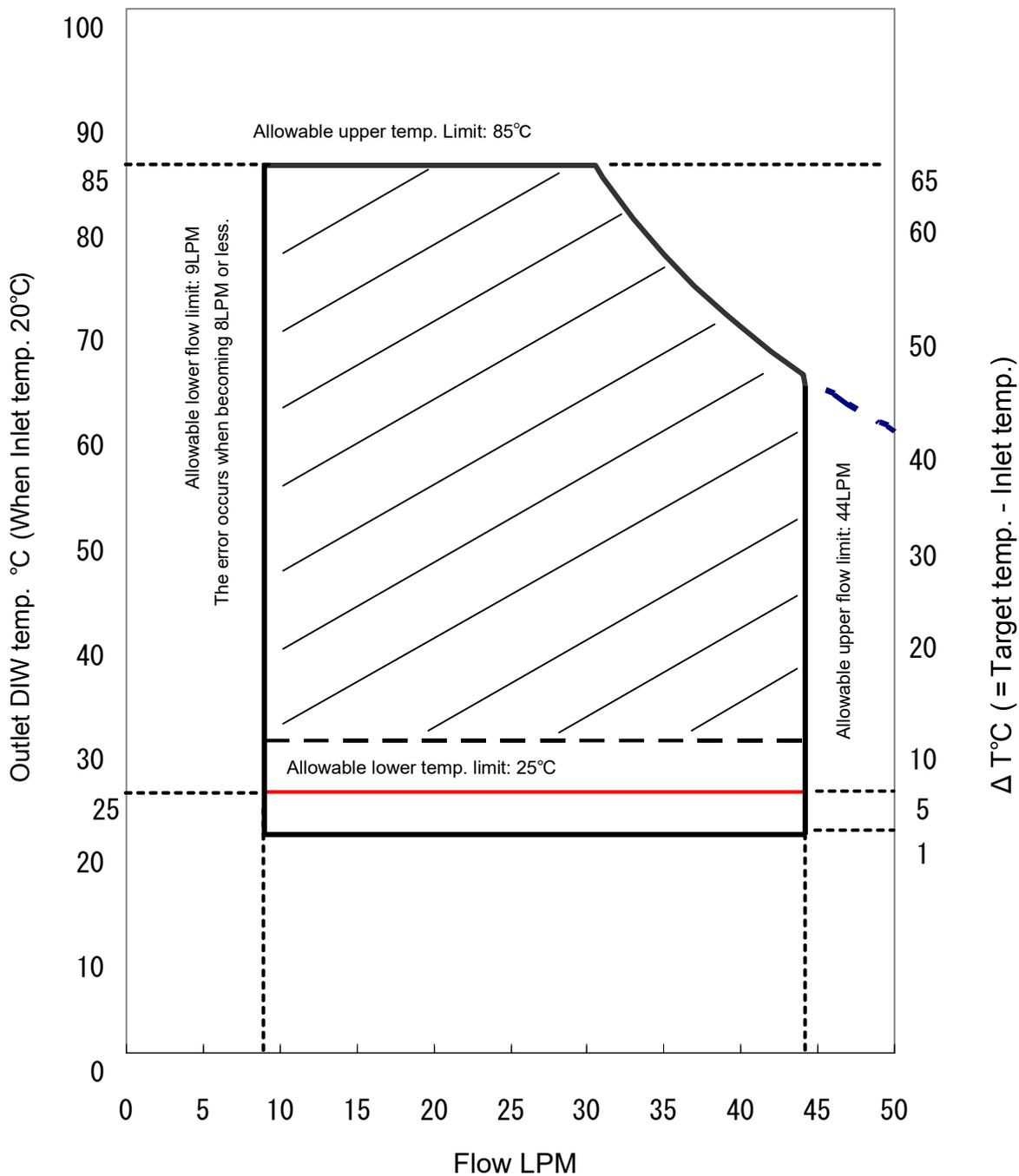


Figure 1-1 Characteristic diagram (144kW)

- ※This figure shows flowing quantity and Δ T (target temp. - 20°C in temperature of the inlet temp.) of the standard 144kW.
- ※Use it within the slash range.
- ※The temperature control accuracy deteriorates on the condition excluding the slash.

Foreword

1.6 Unit overview

1.6.1 Functional block diagram

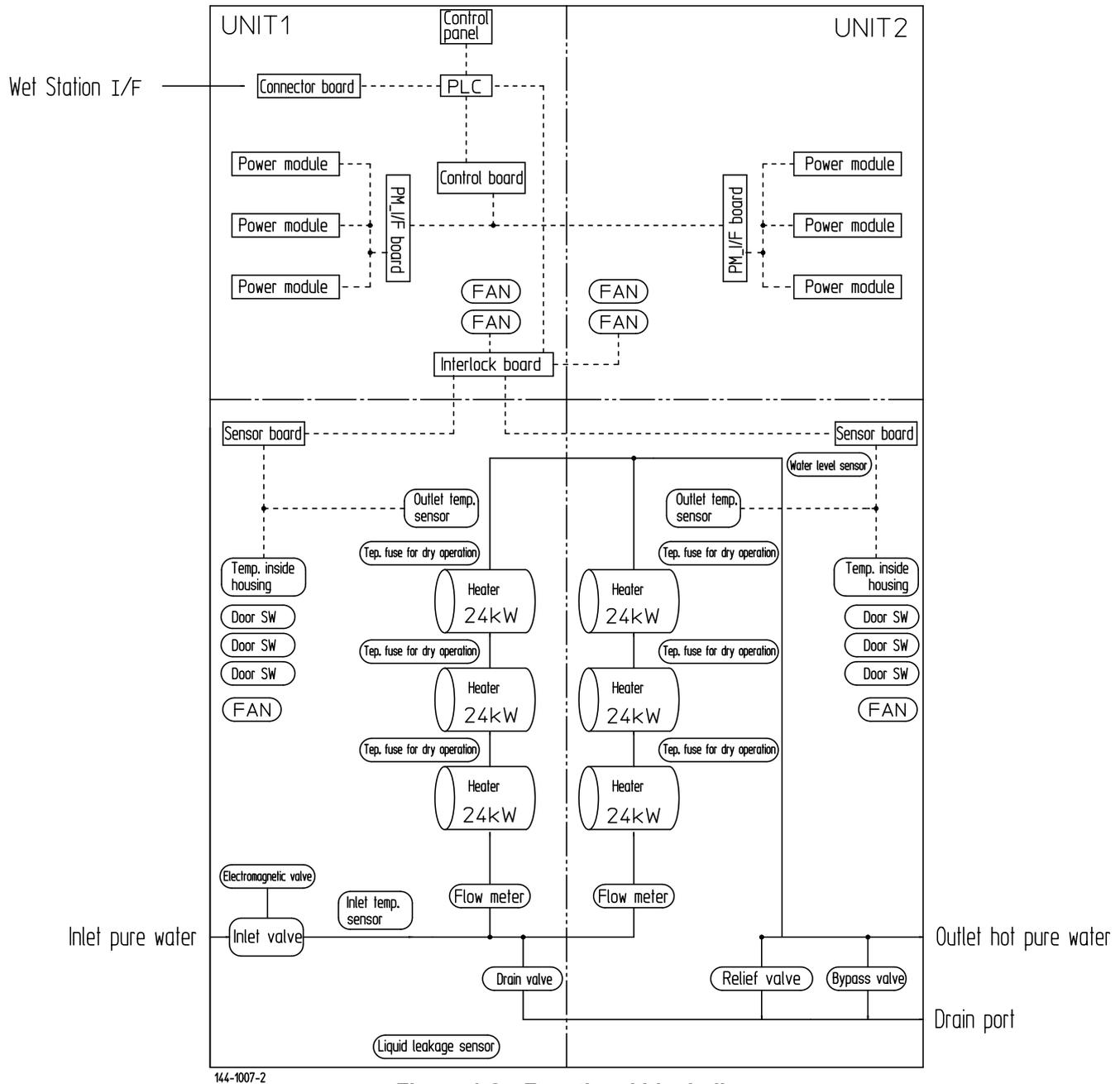


Figure 1-2 Functional block diagram

1.6.2 Basic principle of control

The internal configuration of this unit is as shown in “Figure 1-2 Functional block diagram”. The temperature control board performs PID calculation using temperature information and flow information from sensors and outputs operation commands to the power module so that the operation will always be stable at the SV value.

Each power module supplies power that corresponds to this command to the heater in order to perform feed back control.

2 Safety measures

▲DANGER

- Handling the pure water heating unit without reading the document may cause personal injury or malfunction of the unit.
- Some parts of the unit employ parts that are susceptible to shocks. Handle the unit gently not to give shocks to it.
- Handling of the unit must be performed by a person who is well acquainted with piping works and operation of electrical devices.

2.1 Notations in the operation manual

Definitions of Danger / Warning / Caution / Note.

Danger

▲DANGER

Danger denotes a possibility that may directly result in death.

Warning

▲WARNING

Warning denotes a possibility that may cause injury not fatal to people.

Caution

▲ CAUTION

Caution denotes a possibility of damages to the unit.

Note

NOTE

Note is information that will be helpful to the operator.

Safety measures

2.2 Prediction of danger

2.2.1 Electrical danger

⚠ DANGER

- When operating the unit, do not touch the charging part of electric parts with wet hand. Otherwise, an electrical shock may result.
 - Never fail to connect the earth wire.
 - Connect the power cable correctly and securely.
 - Be sure to use a fuse conforming to the standard and rating for replacement. Use of a non-conforming fuse might cause a fire.
 - Never use the unit in a corrosive gas atmosphere, which will corrode the electrical wires and cause an electrical shock or a fire.
 - The unit is not explosion-proof. Operating the unit in the vicinity of flammable gas may cause an ignition.
-

2.2.2 Thermal danger

⚠ WARNING

- Do not attempt to open the maintenance panel immediately after stopping operation except for an emergency.
 - Do not attempt to touch the internal pipes and parts which are hot immediately after stopping operation.
 - Do not replace heater immediately after stopping operation.
 - Maintenance after at least four hours has passed since termination of operation.
 - The pipe at the pure water outlet may become hot. The user should install a pipe cover to protect people against high temperature.
 - When liquid leakage occurs, hot pure water may splash and therefore you must wear gloves and goggles and carefully open the maintenance panel.
-

2.2.3 Other dangers

▲ DANGER

- Never use this unit as a medical or aircraft transportation unit that is directly connected to human life.
 - KELK Ltd. shall not assume any responsibility for any damages, loss of profits, or claims by a third party arising due to ignoring these warnings.
-

▲ WARNING

- Do not splash water or wash the unit. Otherwise, an electrical shock may result.
 - Do not attempt to modify the unit. Modifying the unit will void the warranty.
-

▲ CAUTION

- The unit is a heating machine dedicated for pure water. To prevent a malfunction from occurring, do not use any other liquid.
-

Safety measures

NOTE

- Although the heater contains an only minimum amount of bromine, even if the heater is broken and bromine leaks into atmosphere, it shall have no harm to human health.
 - Looking heater light directly for a long time may dazzle your eyes.
 - Density of UV radiation at $0.39 \mu\text{m}$ or less is almost zero and the tolerance against UV of parts used is sufficient. Also, it is not harmful to human body.
-

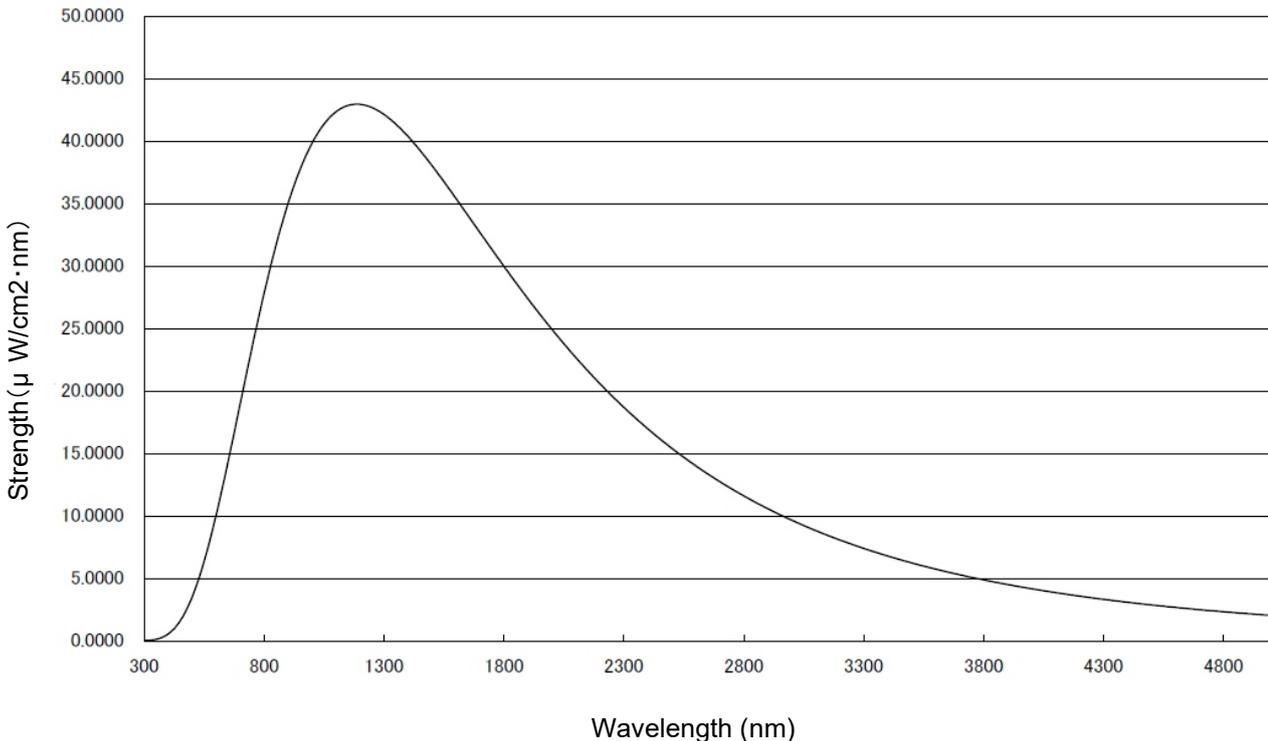


Figure 2-1 Heater spectrum radiation energy (reference data)

2.2.4 Precautions for use

NOTE

- Let the flow amount stable within 10 seconds after starting heating and flowing. Otherwise, the heating speed may be compromised.
 - Take precautions on valve operation timings to avoid any water hammer.
 - Use degassing water by all means. Er408 (water level anomaly) may occur by influence of an air bubble heating with the pure water which is not degassed when it runs.
-

2.3 Warning label

▲ DANGER

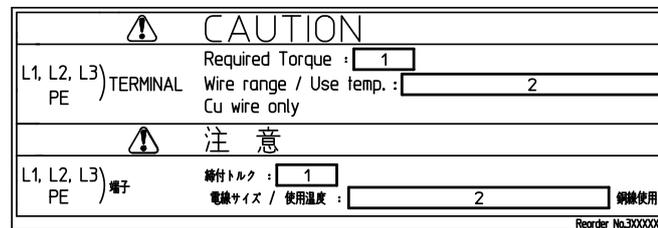
- To avoid danger latent in the system, the following labels are pasted. To safely use the system free of such latent danger, follow the instructions given on these labels.

2.3.1 Meaning of warning label

① CAUTION

The label is placed near the primary side power supply breaker. Take care not to damage the label when connecting a cable. "1" and "2" are different in figure depending on the specification.

Refer to "1. specification" of the separate volume manual "Appendix".



144-1000

② DANGER

The label is placed near the primary side power supply breaker. Check and pay attention to the primary side to which source voltage may always be supplied.



144-1000

③ WARNING

This label is pasted on the controller part maintenance panel. Check and pay attention to this label when conducting wiring work.



144-1000

Type Standard



072-1031

Type ETL-SEMI

Safety measures

④ WARNING-CAUTION

This label is also pasted near the hot water outlet. Since the pressure at the pure water outlet may rise at an abnormal rate when liquid is heated suddenly in the heating bottle, be sure to install a pressure relief valve (relief pressure: 0.4MPa or lower) authorized in ASTM in the outlet side pipe line.



144-1000

Do not attempt to touch the outlet side pipe line with bare hands since it become hot.

We recommend installing a heat insulator cover to prevent a burning.



144-1000

Type Standard, ETL-SEMI



Reorder No.*****
072-1032

Type ETL-SEMI Only

⑤ CAUTION

This label is also pasted inside the heating unit. Note that the heater is hot immediately after finishing operation. To prevent a burning, wait for at least four hours until the unit cools down before maintenance.

Replace with a heater having the specified wattage "1" is different in figure depending on the specification. Refer to "5. Replacement part list" of the separate volume manual "Appendix". Be sure to put on gloves when replacing a heater.



144-1000

⑥ CAUTION

This label is pasted on the maintenance panel of the heating unit. Opening the maintenance panel while trigger the interlock mechanism and stop the unit.



⑦ WARNING

144-1000

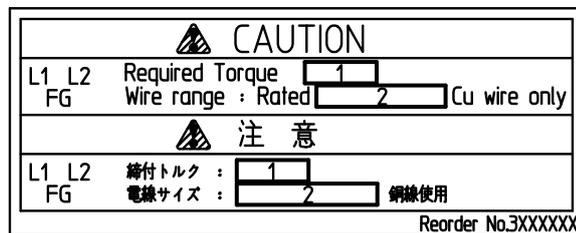
The label is pasted near the fuse inside the controller. Replace with a specified fuse. Refer to the maintenance manual for replacement work.



144-1000

⑧ CAUTION

The label is placed near the terminal block for control power supplies. Take care not to damage the label when connecting a cable.



144-1000

No.	Notation
1	1.4 N·m
2	600V AWG18

⑨ WARNING

The label is pasted near the main breaker handle only the main breaker specification. When operating the handle, wear the protective equipment and take care the arc flash.



072-1033

Type ETL –SEMI Only

Safety measures

2.3.2 Warning label positions

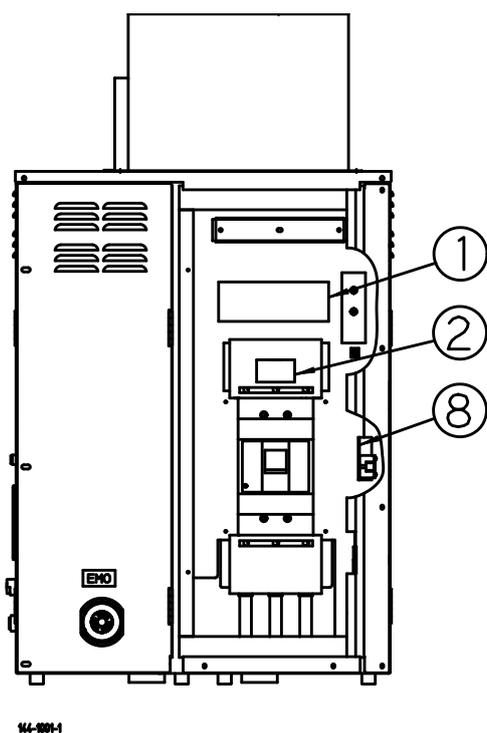


Figure 2-2 Breaker assembly

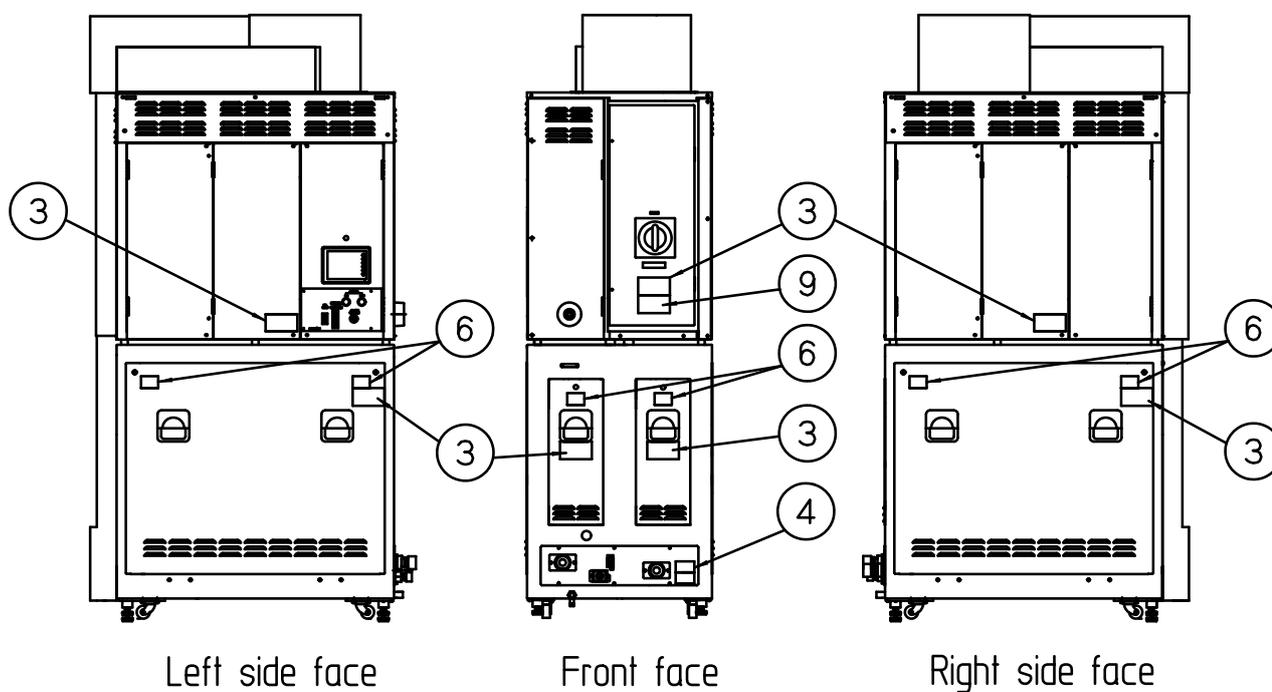
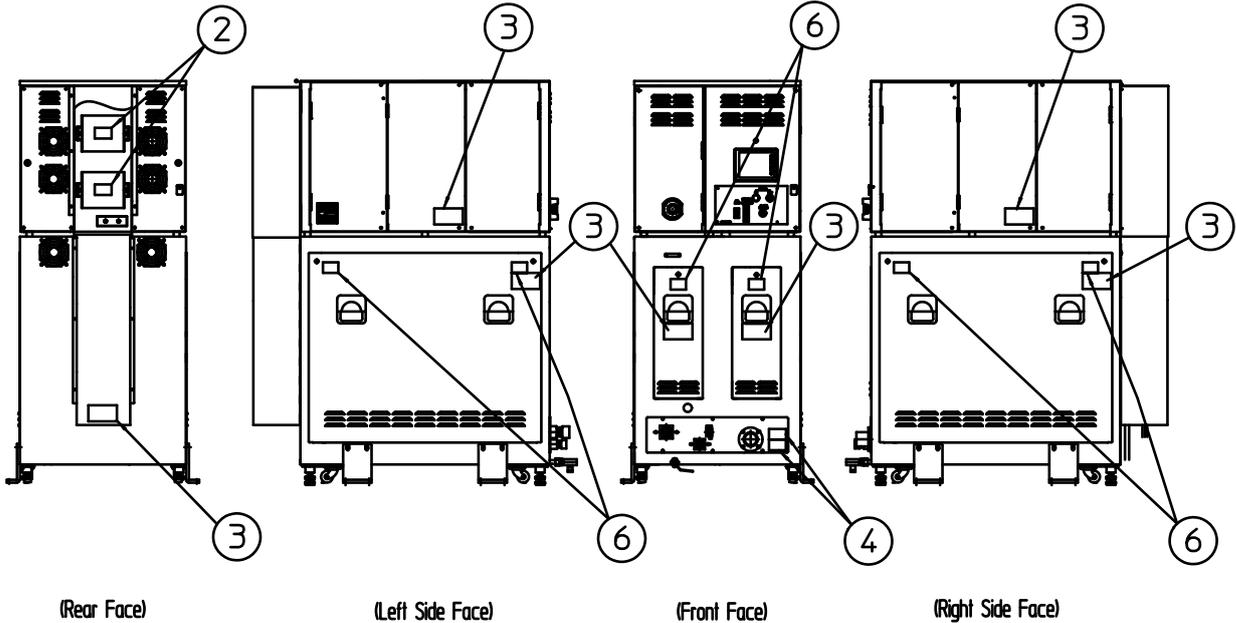
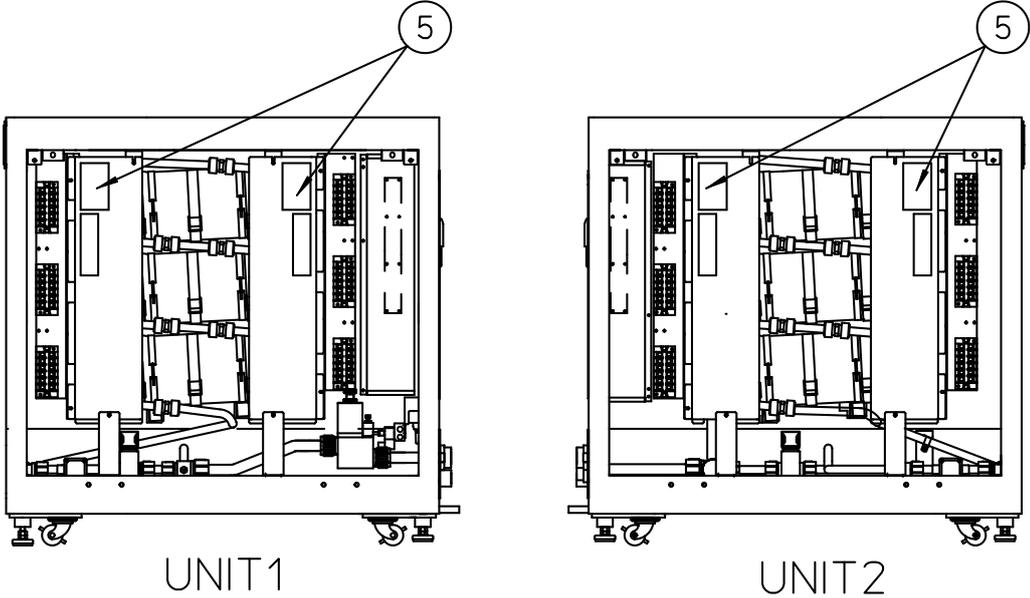


Figure 2-3 Type main breaker (Outer appearance)



144-1067

Figure 2-4 Type Terminal block (Outer appearance)



144-1003

Figure 2-5 Heating unit

Safety measures

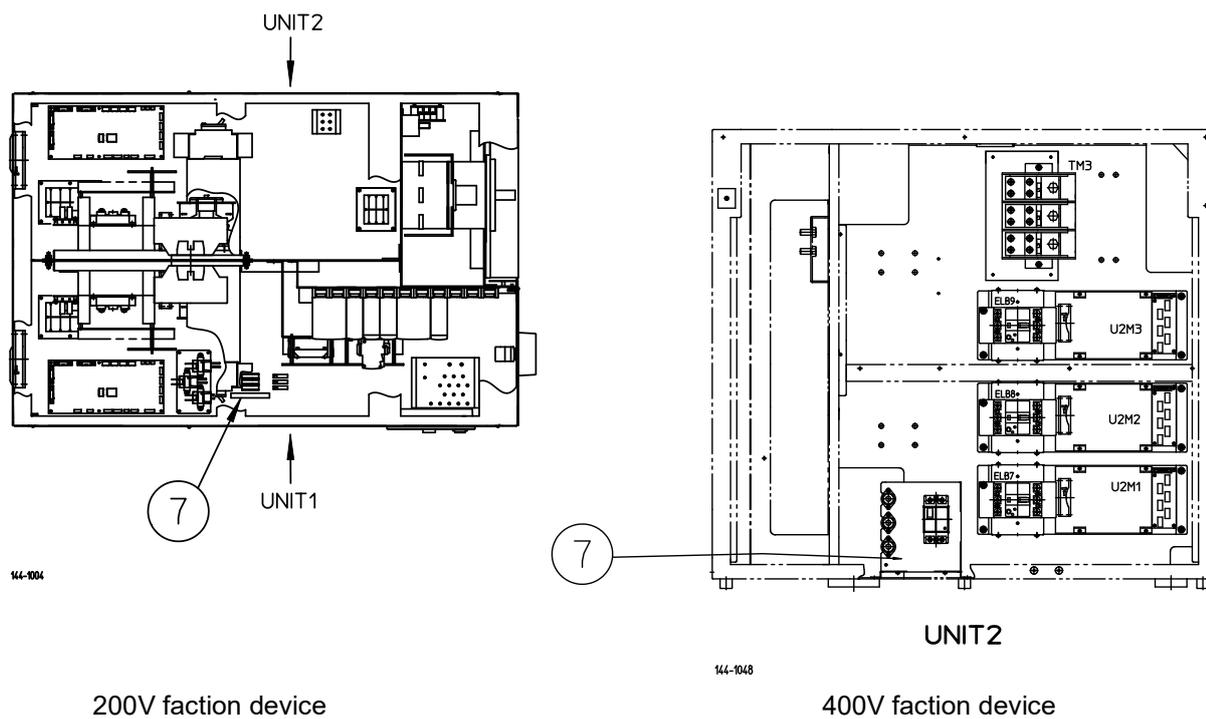


Figure 2-6 Fuse layout

NOTE

- Warning label positions and Language are different depending on the specification.

2.4 Interlock

2.4.1 Hardware interlock

2.4.1.1 System configuration

Both UNIT 1 and 2 consist of various sensors (temperature fuse for dry operation detection, over heat sensor, temperature switch, and door switch), Interlock board, and power module.

2.4.1.2 System operation

- Operation with a sensor

When an abnormality is detected in any one of sensors connected in the unit (temperature fuse for dry operation detection, temperature over-rise sensor, temperature switch, or door switch), the relay in the interlock board is turned "OFF" causing the relay in the power module control board to switch to "OFF". This makes the electromagnetic contactor (M.C) to "OFF" and power supply to the thyristor (SCR) and to the heater is shut off.

- Operation caused by abnormal temperature of the power module

The relay is turned "OFF" when the temperature switch in the power module detects an abnormal temperature. This makes the electromagnetic contactor (M.C) to "OFF" and power supply to the thyristor (SCR) and to the heater is shut off.

Table 2-1 Hardware interlock sensor functions

Name	Function	Operation
temperature fuse for dry operation detection	Detects a bottle temperature of $135\pm 3^{\circ}\text{C}$ or above.	Open when an abnormality occurs
Temperature over-rise sensor	Detects an outlet temperature of $98\pm 2^{\circ}\text{C}$.	
Temperature switch (heating unit)	Detects an internal temperature of the heating unit of $60\pm 5^{\circ}\text{C}$.	
Temperature switch (power module)	Detects a radiator temperature of the heating unit of $90\pm 5^{\circ}\text{C}$.	
Door switch	Detects the open state of the maintenance panel of the heating assy.	
Liquid Leakage sensor	Detects leak of pure water.	

When this function is activated, power reset is necessary for recovery.

Safety measures

2.4.1.3 Hardware interlock block diagram

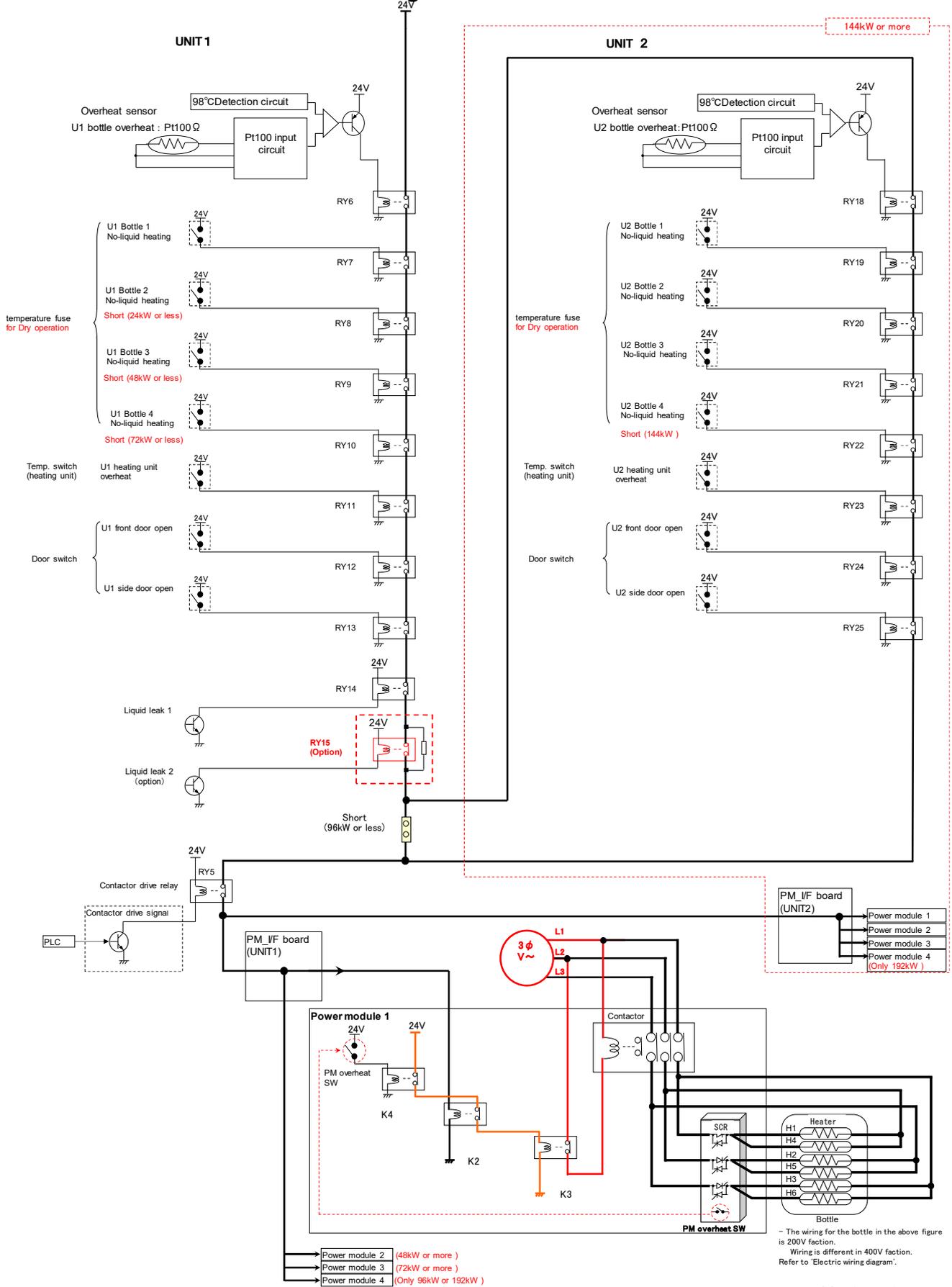
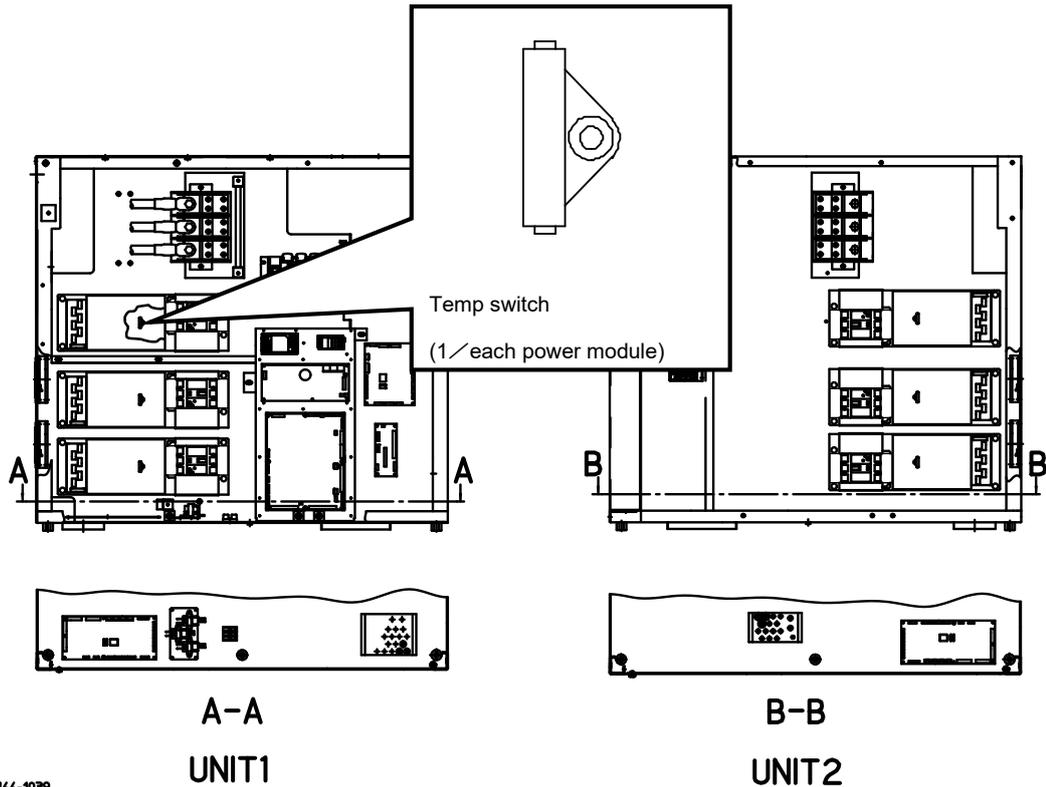
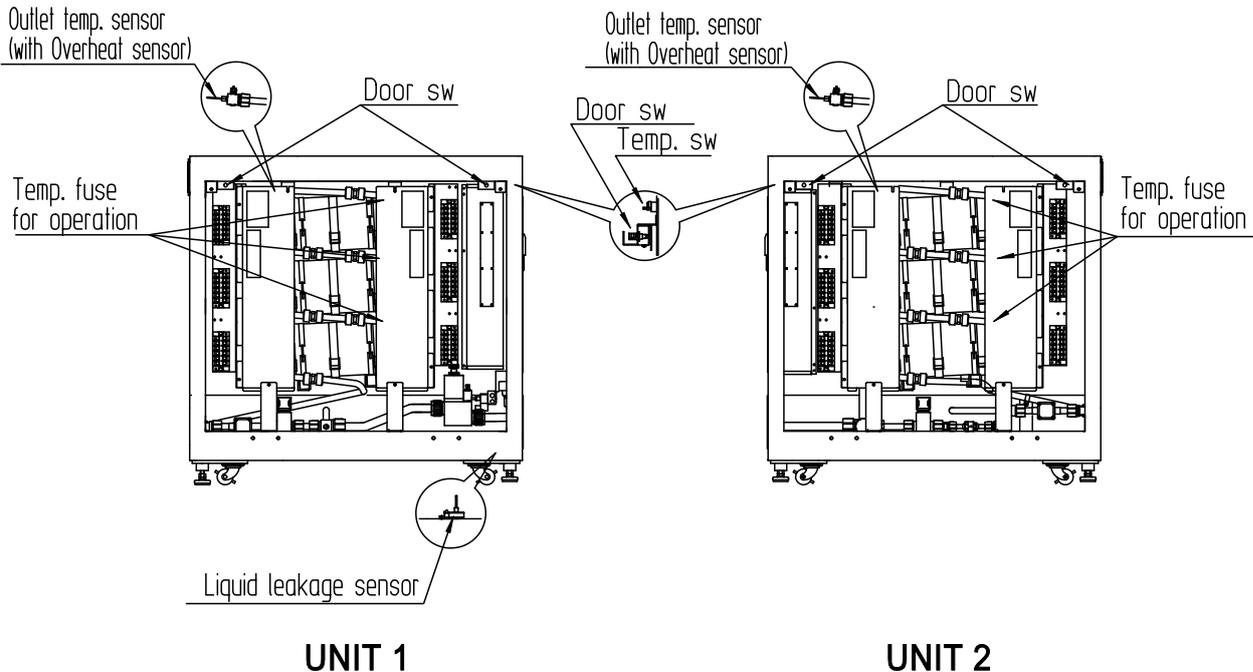


Figure 2-7 Interlock board block diagram



144-1039



144-1044

Figure 2-8 Hardware interlock

Safety measures

2.4.2 Software interlock

2.4.2.1 System operation

· Operation by the abnormal detection

When the software detects an abnormality in the temperature sensor, the flow meter, or the fan sensor, the temperature control board and PLC outputs a heating stop signal to the PM_I/F board via the temperature control board by RS485 communication to. The heating stop signal turns the thyristor (SCR) to “OFF” via the control board in the power module to stop heating of the heater. In addition, PLC outputs an OFF order for contactor of a power line with it and shutdown a heater line.

Table 2-2 Software interlock sensor functions

Name	Function	Operation
Temperature sensor	Detects the outlet water temperature.	Changes in resistance with temperature
Flow meter	Detects the flow amount.	Changes in pulse frequency due to flow amount
Fan sensor	Detects the rotation speed.	Fan stop signal
Water level sensor	Detects whether pure water exists or not.	Capacitance sensor signal
Communication data	Detect communication abnormality such as parity, framing.	Abnormally communication data

2.4.2.2 Software interlock block diagram

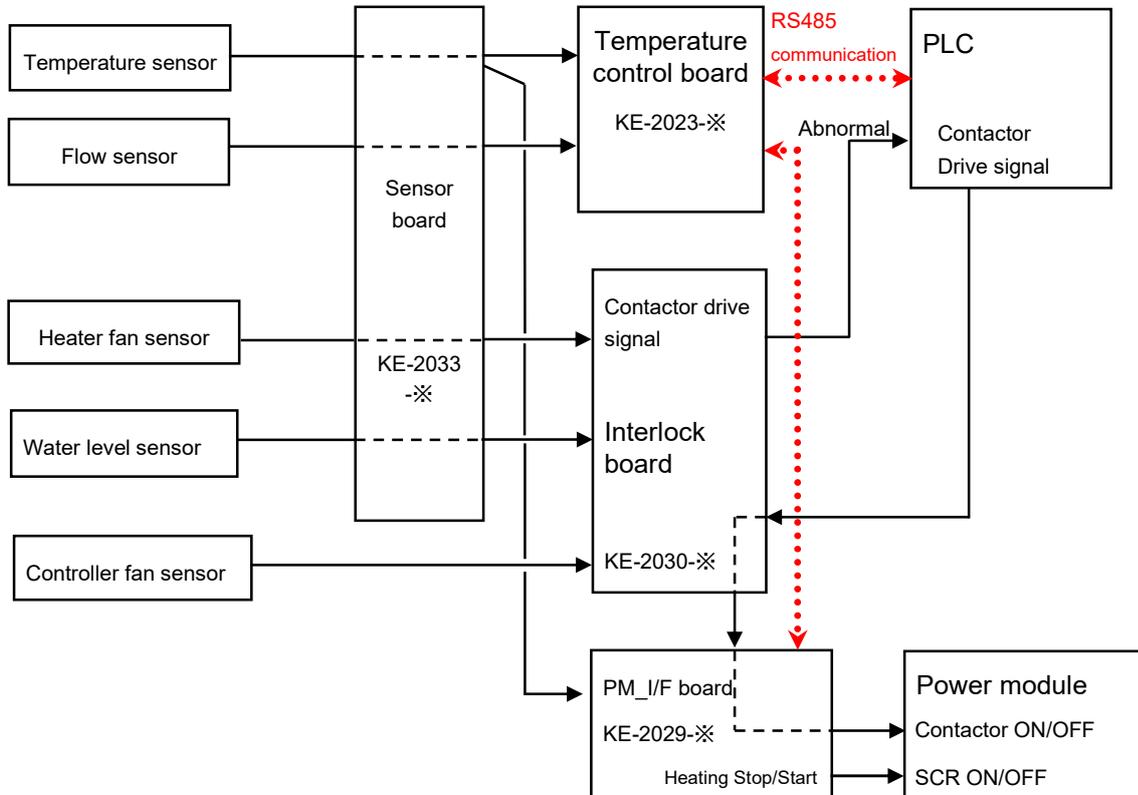


Figure 2-9 Software interlock block diagram

3 Operation and display

Positions of parts required for operation of the unit and how to input settings on the unit front panel are described below.

3.1 Names, positions, and functions

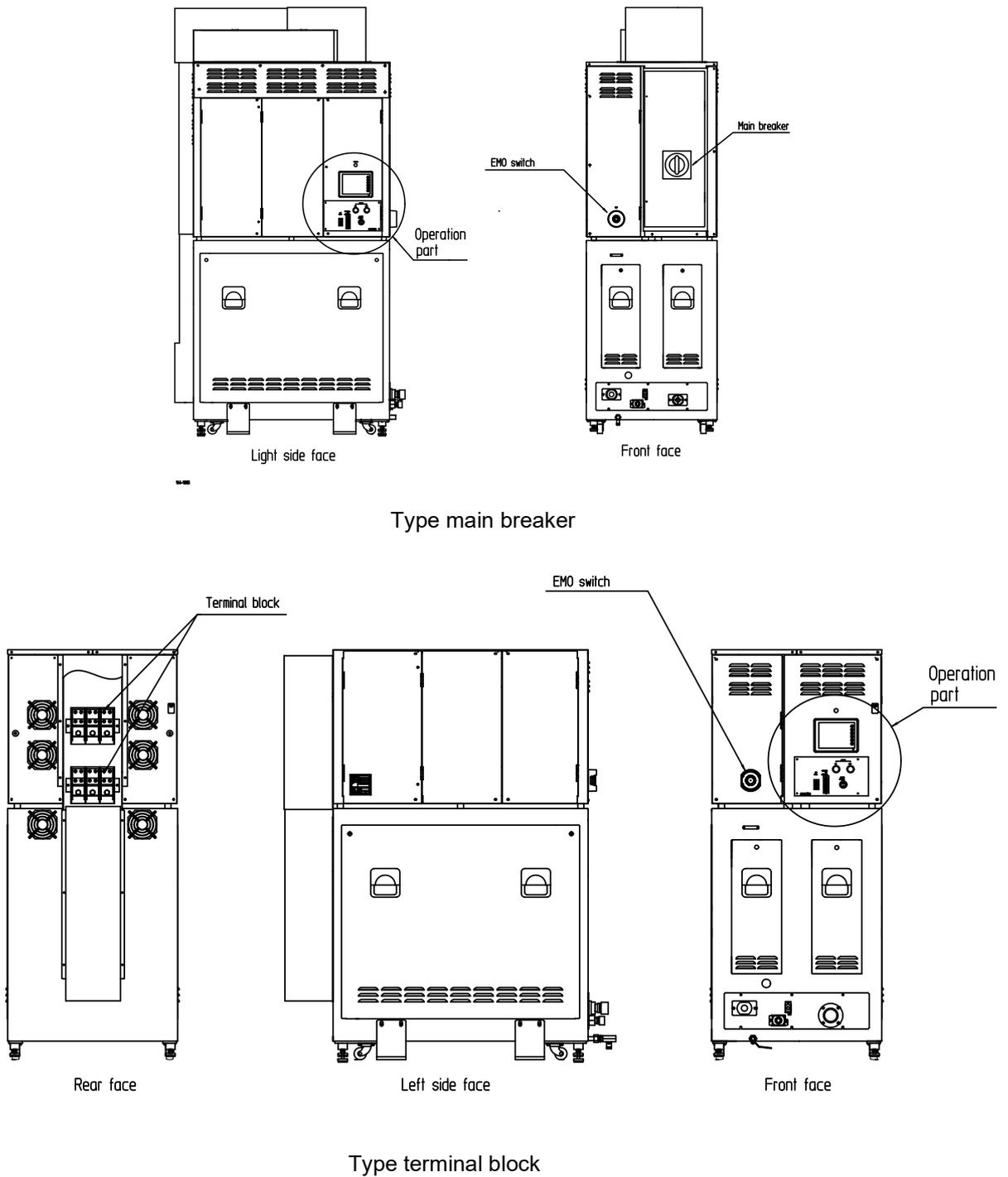
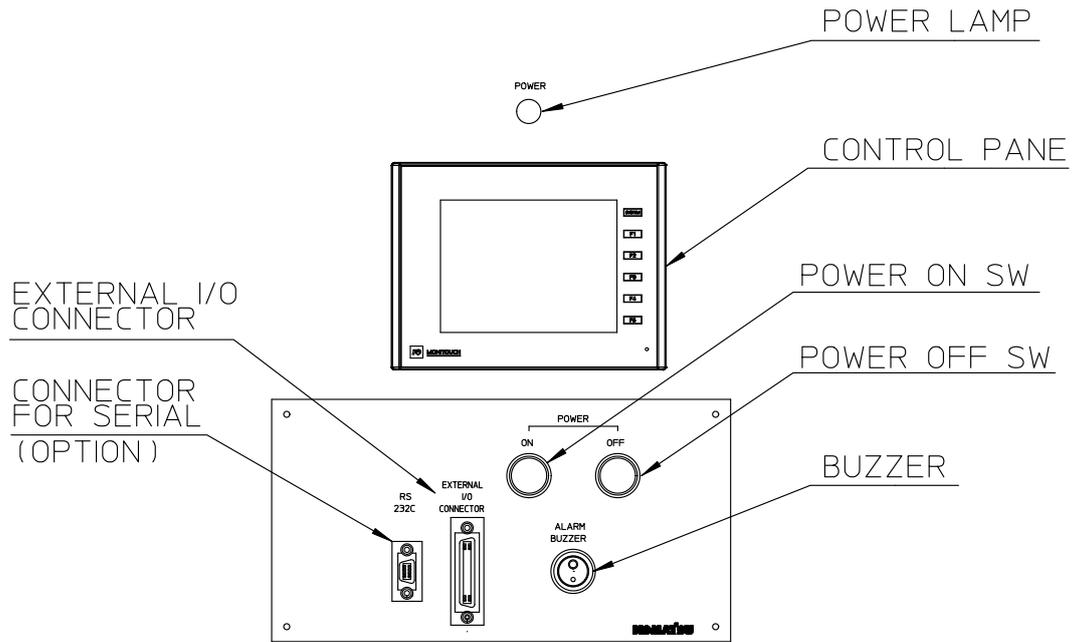


Figure 3-1 Names of the operation part

Operation and display



144-1114

Figure 3-2 Details of the operation part

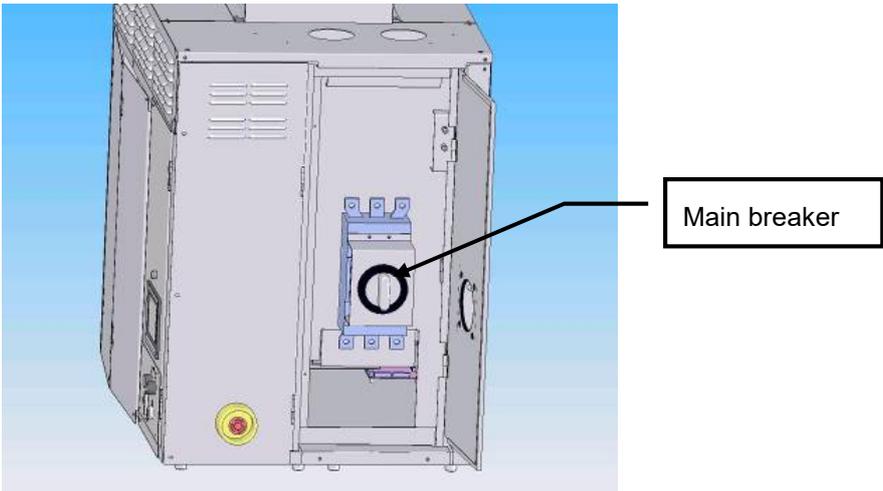


Figure 3-3 Layout of the main breaker (Type main breaker)

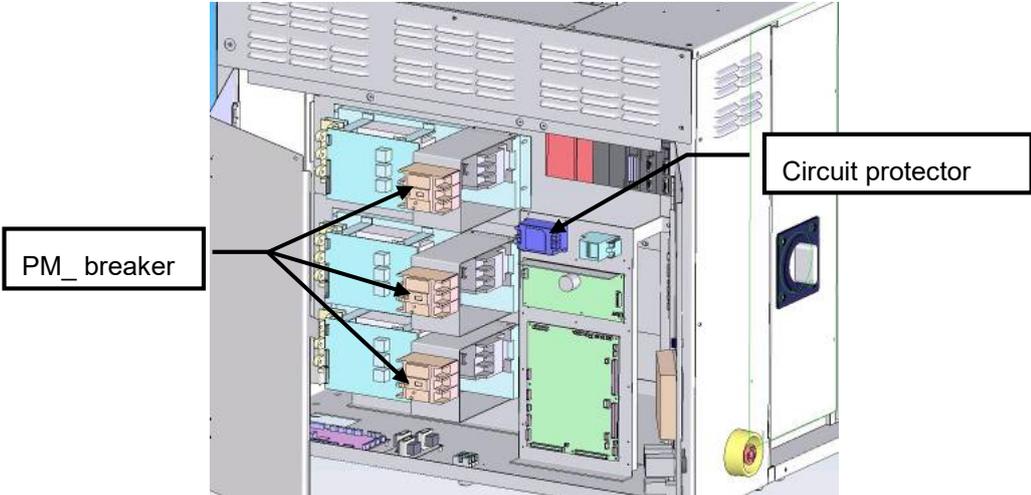


Figure 3-4 UNIT1 breaker layout

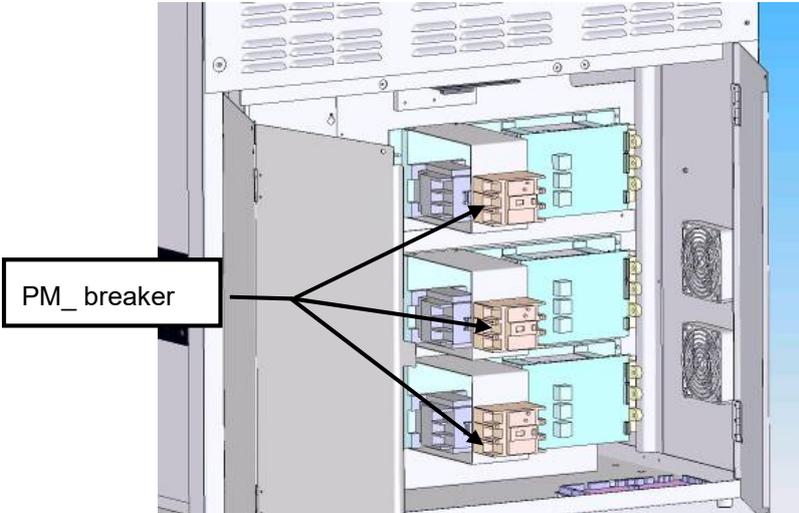
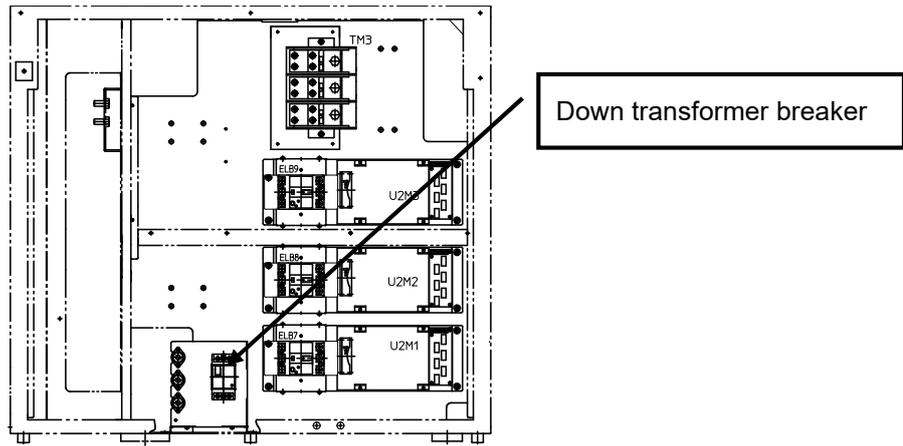


Figure 3-5 UNIT2 breaker layout

Operation and display



UNIT 2

14-1048

Figure 3-6 Down transformer breaker layout (400V faction specification)

Table 3-1 Names of parts

Name	Description
Main breaker	Supplies power to the primary side of the pure water heating unit. It is not setup according to the specification.
EMO switch	Emergency stop of a pure water heating unit. The main breaker is shut off, then the heating unit and the control circuit are shut off immediately and heating and water supply are stopped.
Power lamp	Turns on when standard voltage is supplied to the system.
Power ON switch	Supplies power to the secondary side of the pure water heating unit.
Power OFF switch	Shuts off power to the secondary side of the pure water heating unit.
Control panel	Panel display used for inputting various settings.
Buzzer	Buzzer that beeps when an error or an alarm occurs or is activated.
External I/O connector	Interface I/O connector with the wet station.
Connector for serial	Interface communication connector with the wet station.
PM breaker	Breaker for each power module.
Circuit protector	Overcurrent breaker for the control circuit.
Down transformer breaker	Overcurrent breaker for the down transformer. It is not set up according to the specification.

3.2 Power turning-on and shutting-off

3.2.1 Turning power on

Be sure to confirm the following items before operating the unit for the first time.

- ① Is the power cable securely connected?
- ② Are the cables securely connected to the wet station? (Be short-circuited between 36-18 pins of external I/O connector. Refer to "3. External I/O signals" of the separate volume manual "Appendix")
- ③ Is the lock of EMO switch released ?
- ④ Are pipes securely connected to the pure water inlet/outlet, the drain, and the air system?
- ⑤ Are the power module breaker, the circuit protector and the down trance breaker* turned ON?

After confirming the above, turn the main breaker ON and turn 【POWER ON】 switch ON.

▲WARNING

- **The power module breaker, the circuit protector and the down trance breaker* are ON at the time of shipping. Be sure to confirm that the main breaker* is OFF before turning breakers ON.**

*The down transformer breaker and main breaker are not set up according to the specification.

3.2.2 Shutting power off

Press the 【POWER OFF】 switch to turn power off and turn the main breaker OFF to shut power off. Shut the source power off by shutting the power supply off.

NOTE

- **Drain pure water when you are going not to use the unit for a longer period of time. Otherwise, bacteria or other contaminants may result.**
- **Drain work shall be conducted by the maintenance manager only.**

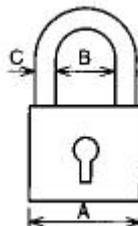
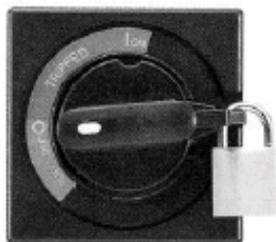
3.2.3 Lock out / Tag out

The main breaker handle can be locked at OFF position with a padlock.

Use a padlock to lock the handle. Padlock shall be prepared by the customer.

- ① Turn the handle to OFF position, pull out the lock plate out of the handle and set the padlock.

Operation and display



The handle is different according to the main breaker.

Use a padlock that is commercially available and has a size close to below.

Unit:mm

A size	B size	C size
35	19	5
40	22 or 23	5.5

- ② Put a tag as shown below to prevent wrong operations. Tag shall be prepared by the customer.



▲WARNING

- During maintenance, never fail to lock the handle and put a tag to prevent any people other than the administrator.

3.2.4 Resuming operation

Be sure to confirm the following items before resuming the operation of the unit.

- ① Confirm the connections of pure water IN/OUT, air, and drain.
- ② Confirm connections of signal connectors such as external I/O connectors.
- ③ Confirm power supply.
- ④ Flow water to the pure water heating unit to fill the bottle with pure water.

Resume operation only after having confirmed the above.

▲CAUTION

- We recommend washing pipes from the pure water to the wet station of the unit which has not been operated for a longer period of time.

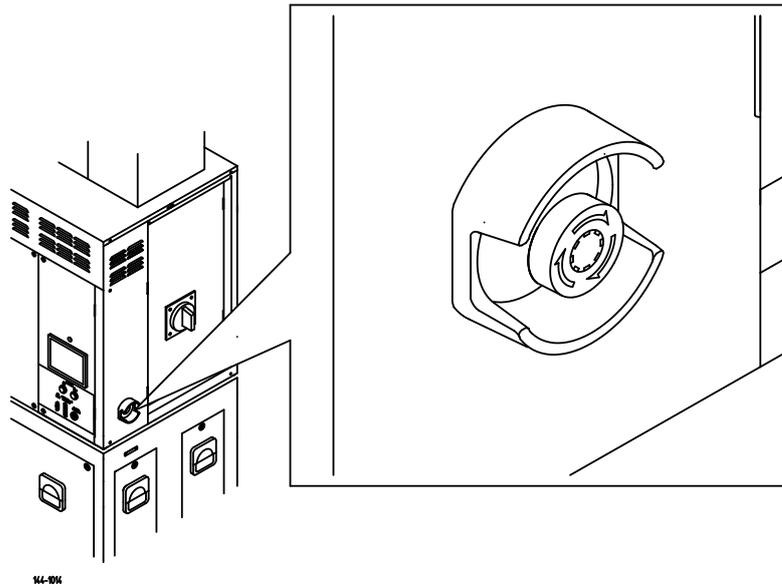
3.2.5 Emergency stop

When an abnormality should occur during operation and the unit must be stopped immediately, you can press the Emergency stop (EMO) switch to emergency stop the unit.

Pressing the emergency stop (EMO) switch will shut power to the control system and the POWER system.

You cannot turn power on until you release the lock of the Emergency stop (EMO) switch.

You can release the lock of emergency stop by turning the head of the switch in the direction of arrow(→).



⚠ WARNING

- Note that the primary side is supplied with power even when the Emergency stop (EMO) switch is pressed and therefore be sure to turn the source power off, carry out lock out /tag out.

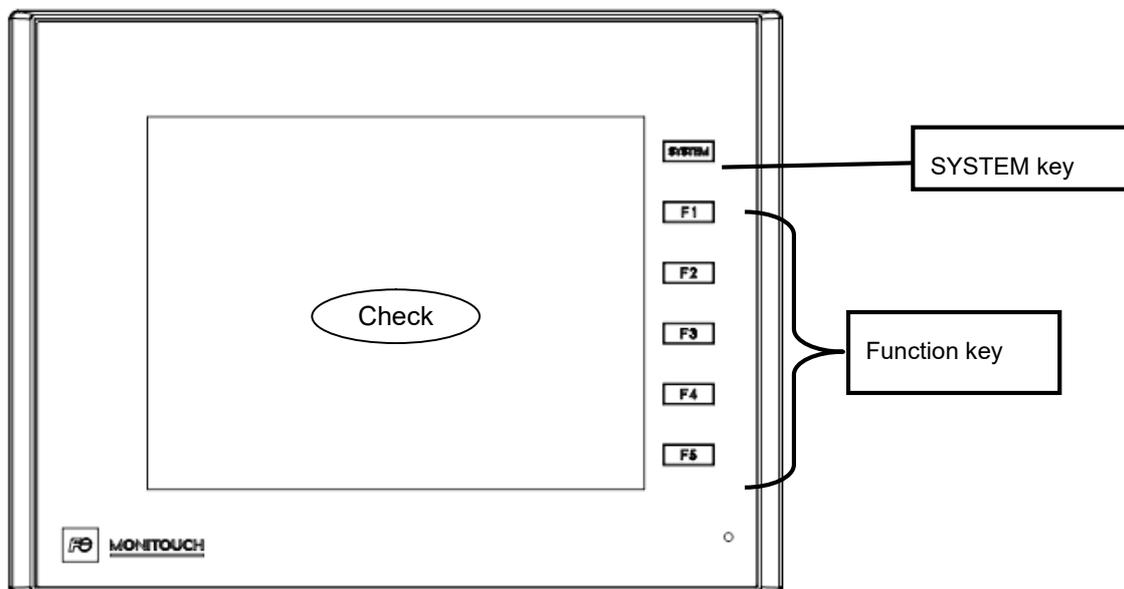
⚠ CAUTION

- Note that emergency stop will stop heating and supply of pure water, which may damage the process in session.
- Shut the valve on the wet station after the valve of the pure water heating unit shuts. Because the inlet valve is when the emergency stops and there is a possibility of the bottle damage by the water hammer generation depending on doing of close all and timing.

Operation and display

3.2.6 Initial display of control panel

Pressing the [POWER ON] switch will display the check screen and it changes to the [MAIN SCREEN] screen after several seconds in the control panel display.



144-1110

Figure 3-7 Initial display

Table 3-2 Main specifications of the operation panel

Display color	TFT color (Black and White setting)
Display size	5.7 inch
Display resolution(horizontal × length dot)	320 × 240
Upper and lower viewing angle(°)	±80
Right and left viewing angle(°)	±80

⚠ CAUTION

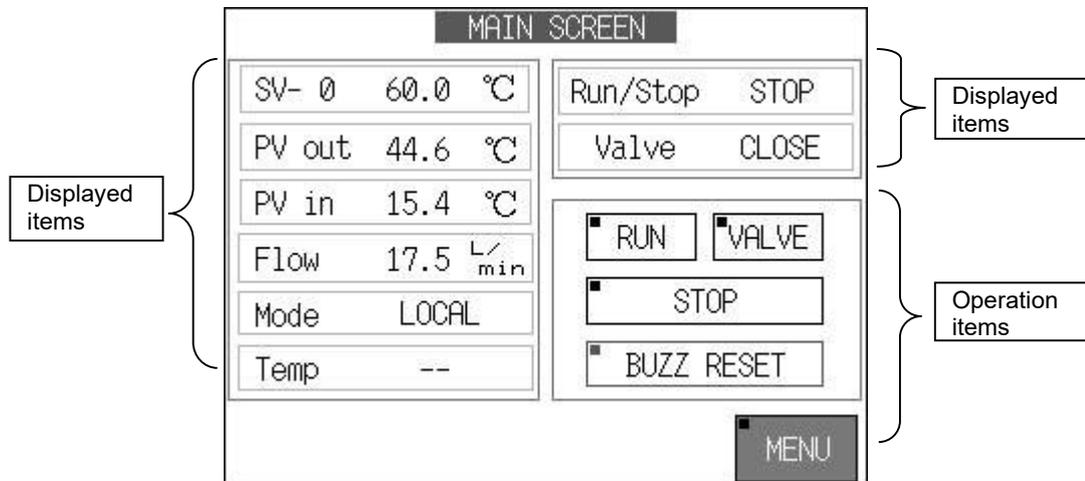
- Do not press the SYSTEM key. Performing a wrong operation will switch the screen to the control panel setting screen (firmware). If the screen should switch to another one, turn power off without doing any other operations.

NOTE

- Do not turn off while any function key and touch panel display being pressed. This will cause Er111 (internal communication error).
- The backlight will go off if you leave the unit for one hour or more without performing any operations. You can resume by touching the control panel.

3.3 Operation

3.3.1 Main screen display



Displayed item	Description
SV-#	Indicates the target temperature setting of pure water. The # part differs depending on the specific SV number selected.
PV out	Indicates the present temperature at the pure water outlet.
PV in	Indicates the present temperature at the pure water inlet.
Flow	Indicates the present flow amount of pure water.
Mode	Indicates the operation mode currently selected. LOCAL: Operated on the control panel. REMOTE: Operated on the wet station and with I/O signals. SERIAL (optional): Operated with serial signals. The initial setting is [REMOTE].
Temp	When stable outlet temperature is detected, [Stability] will be displayed.
Run/Stop	Displays the unit operating status.
Valve	Displays the operation status of the inlet valve (main).

Operation item	Description
RUN	Starts heating operation. When the VALVE is not OPEN, heating operation will start after water starts to flow.
VALVE	Starts water flow.
STOP	Stops heating or water flow.
BUZZ RESET	Stops buzzer alarm triggered when an error occurs (alarm will not be reset).
MENU	Shift to the Menu screen. No operation is allowed on the Menu screen on which the keys are locked at the time of powering on.

Operation and display

3.3.2 Supplying and stopping pure water

When operating the unit for the first time or resume operation after draining, be sure to flow water to fill the bottle with pure water before starting temperature control operation.

- LOCAL mode

Pressing the 【VALVE】 key opens the inlet valve and supplies pure water; pressing the 【STOP】 key closes the inlet valve and stops supply of pure water.

- REMOTE mode

Input the water supply signal to the unit from the wet station (Refer to “3. External I/O signal” of the separate volume manual “Appendix”).

- SERIAL mode(optional)

Input the water supply signal to the unit from the wet station.

▲ CAUTION

- **Performing heating operation 【RUN】 when pure water is not filled will activate the water level sensor causing an Er 408 (Water level anomaly) .**

3.3.3 About set temperature (SV)

- LOCAL mode

Specifying the LOCAL mode will display SV-0 and the set value on the screen. Pressing the 【RUN】 switch will start heating to obtain that temperature.

- REMOTE mode

Specifying the REMOTE mode enables external temperature command. SV-# display and setting may appear on the screen depending on the status of contact input from the wet station. Since each initial SV value is set at 60°C, input appropriate temperature conditions referring to “3.4.5 SV Set” . Input the operation signal after confirming the temperature.

- SERIAL mode

Operation is made by communication with the wet station only. Refer to the separate communication specifications.

The number of SV-# is different depending on the specification.

3.3.4 Starting and stopping heating operation

Start heating operation after filling the bottle with pure water.

- LOCAL mode

Press the **【RUN】** switch when you want to start heating operation. If [Valve] is set at [CLOSE], it is automatically switched to [OPEN] and heating starts. If [Valve] is set at [OPEN], heating starts immediately. When **【STOP】** key is pressed, the heating stops, and pure water supply stops, too. When **【Valve】** key is pressed, the pure water is supplied.

- REMOTE mode

Input the water supply signal to the unit from the wet station (Refer to "3. External I/O signal" of the separate volume manual "Appendix"). Heating starts immediately when the water flow signal has already been input in the unit.

- SERIAL mode (optional)

Input the water supply signal to the unit from the wet station.

▲ CAUTION

- **Performing heating operation when pure water is not filled will activate the no pure water sensor causing an error.**
 - **Start running only after having made various settings.**
-
-

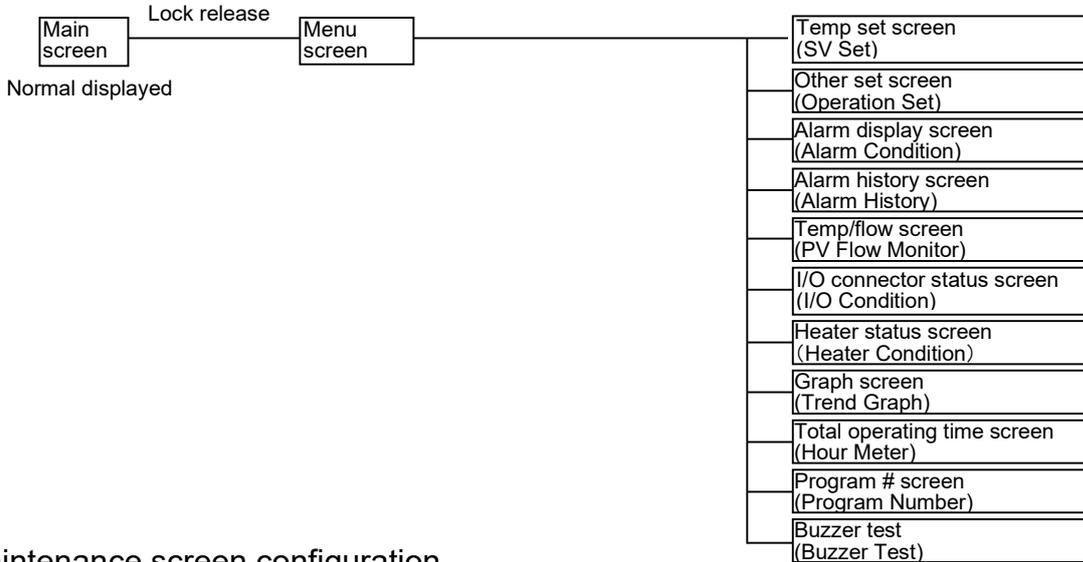
Operation and display

3.4 Setting

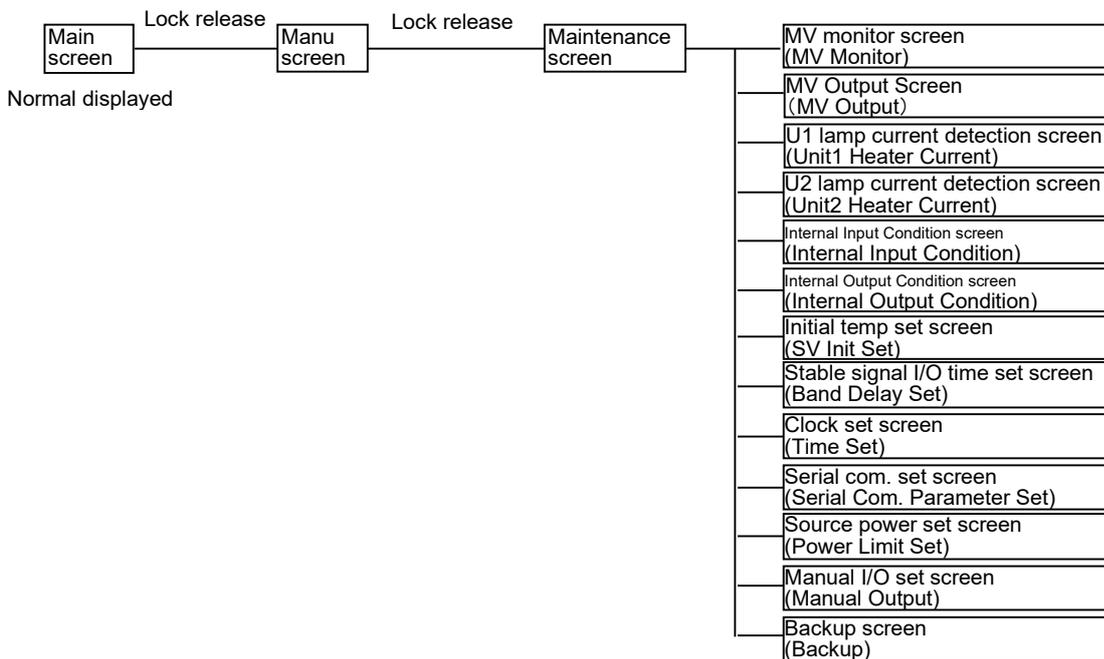
3.4.1 Screen configuration

The control panel has two screens: the operator screen and the maintenance screen. Refer to the maintenance manual for settings on the maintenance screen.

Operator screen configuration



Maintenance screen configuration



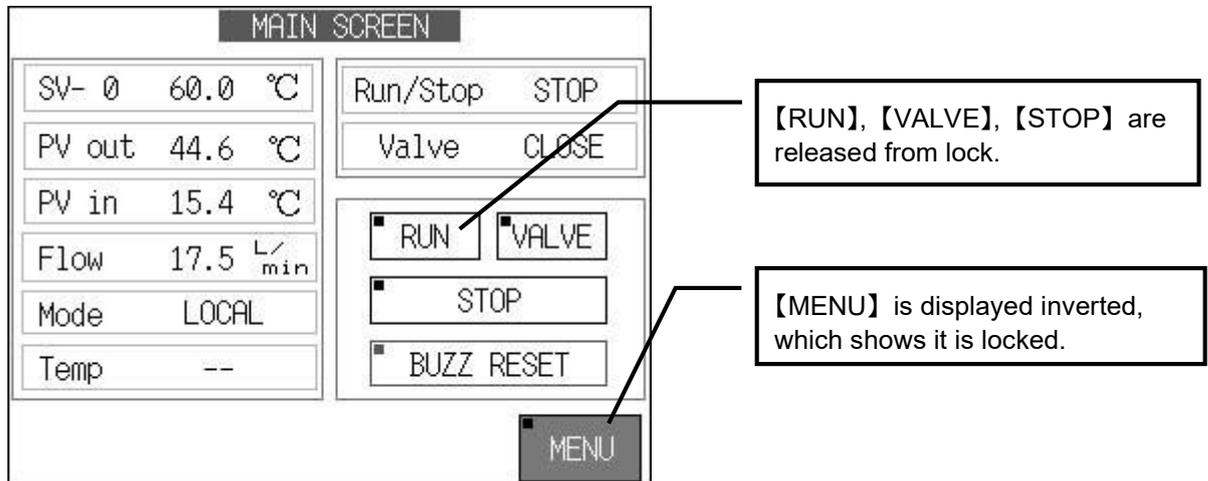
NOTE

- Indications in () are those displayed on the control panel screen.
- Releasing lock is necessary to move to this screen from the main screen.

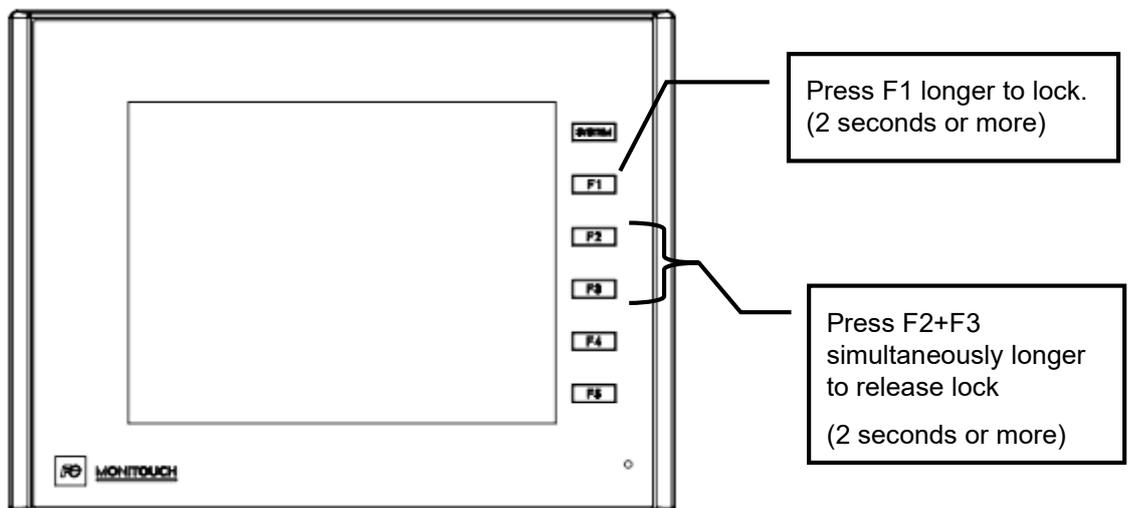
3.4.2 Locking and releasing lock of the control panel

The control panel has a "Panel lock" function in order to prevent erroneous operations.

Reversed keys (outline characters) indicate they are locked and any key operations are not accepted. In the following diagram, the【MENU】key is locked.



Press the functions keys 【F2】 and 【F3】 simultaneously longer to release lock of the 【MENU】key (2 seconds or more). When the 【MENU】 key will reverse and the color of characters turn black, lock is released. To lock it again, press the【F1】 key longer (2 seconds or more).



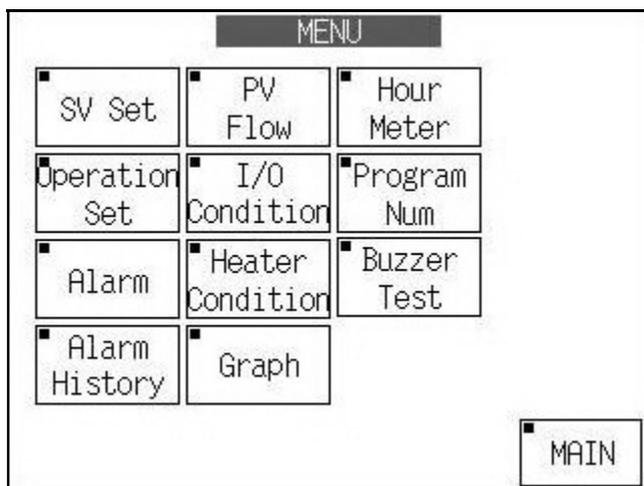
NOTE

- When turning power ON, the 【MENU】 switch will always be subject to panel lock.
- 【RUN】 , 【VALVE】 , and 【STOP】 keys are released from lock in the LOCAL mode while locked in the REMOTE · SERIAL modes.
- The 【BUZZ RESET】 key is always available for operation.

Operation and display

3.4.3 Setting on the operator screen

Release lock of 【MENU】 and press 【MENU】 to switch to the screen below.



Item	Description
SV Set	Switches to the set temperature input screen.
Operation Set	Switches to the setting screen for parameters.
Alarm	Switches to the alarm display screen.
Alarm History	Switches to the alarm history screen.
PV Flow	Switches to the temperature & flow display screen.
I/O Condition	Switches to the external I/O connector I/O status check screen.
Heater Condition	Switches to the heater disconnection display screen.
Graph	Switches to the temperature, flow & graph display screen.
Hour Meter	Switches to the operating hour display screen.
Program Num	Switches to the software program # check screen.
Buzzer Test	Switches to the buzzer test screen.
MAIN	Returns to the [MAIN SCREEN] .

Each screen is common to the following keys.

MENU	Returns to the [MENU] screen.
◀ ▶	Moves to one of the screens within the [MENU] screen.

3.4.4 Numeric keypad

The numeric keypad is used for inputting numerals on the setting screen. Pressing the keys of the numeric keypad automatically displays the required numerals.

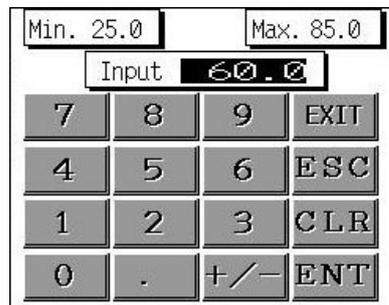


Figure 3-8 [Numeric keypad] input screen

Item	Description	Item	Description
Min.	Indication of the minimum value within the input range.	ESC	Returns to the value before the input data is determined.
Max.	Indication of the maximum value within the input range.	CLR	Clears the current input value.
Input	Indication of the current input value.	ENT	Determines the setting that has been input. When the input value is out of the minimum or maximum range, only beep is heard and the value is not determined.
EXIT	Cancels the input data and returns to the former screen.		

3.4.5 SV Set

Pressing the **[SV Set]** in the[MENU]screen will switch to the setting screen below.

Pressing **[SV-#]** displays the Numeric keypad, with which you can input a temperature setting. Fix it with the **[ENT]** key after inputting a set value.

The number of **[SV-#]** is different depending on the specification. The display of the external temperature instruction of not being possible to use it by the specification is [0.0].

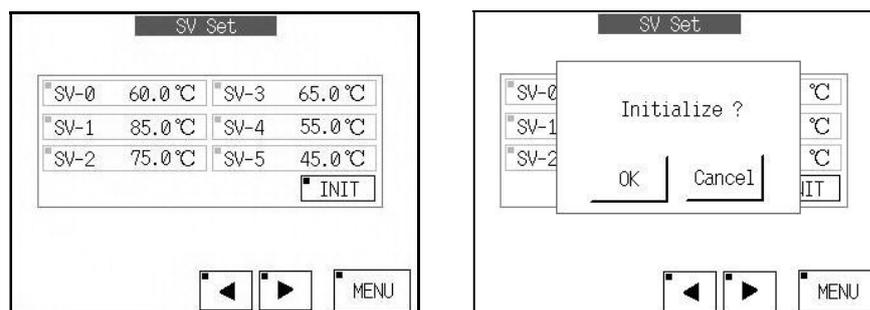


Figure 3-9 Example of[SV SET] screen

Item	Description
SV-0	Set temperature in the LOCAL and the SERIAL modes. The value here will be the setting when there is not external temperature command is input in the REMOTE mode. However, there is a device that cannot be set according to the specification, too.
SV-#	Set temperature in the external temperature command input in the REMOTE mode.
INIT	When the [INIT] key is pushed, the initialization confirmation screen is displayed. When the [OK] key is pushed, SV-# is initialized. When the [CANCEL] key is pushed, it doesn't initialize it.

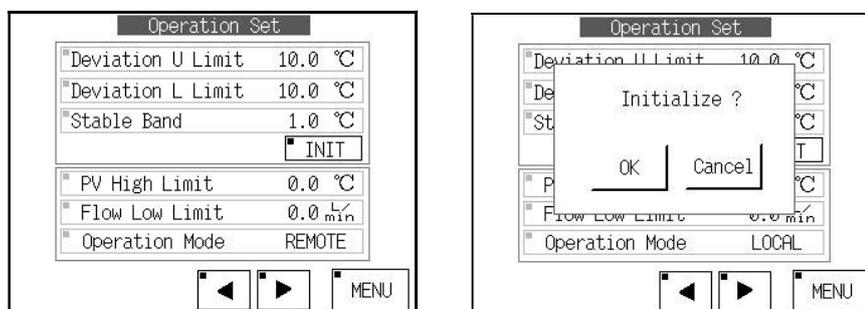
Operation and display

3.4.6 Operation Set

Pressing the **[Operation Set]** key in the [MENU] screen will switch to the [Operation Set] screen.

This screen is used to set the upper/lower band alarm, stable width and other parameters.

Pressing each key displays the Numeric keypad, with which you can input a temperature setting. Fix it with the **[ENT]** key after inputting a set value.



Item	Description
Deviation U Limit	When coming off from "SV + (set value)" after the output temperature stability is recognized, upper limit band alarm (the stop alarm) will be triggered.
Deviation L Limit	When coming off from "SV - (set value)" after the output temperature stability is recognized, upper limit band alarm (the continue alarm) will be triggered.
Stable Band	Sets the temperature range used to judge <Stable> status. The value will be $SV \pm (\text{input value})$.
INIT	When the [INIT] key is pushed, the initialization confirmation screen is displayed. When the [OK] key is pushed, [Deviation U Limit], [Deviation L Limit], [Stable Band] are initialized. When the [CANCEL] key is pushed, it doesn't initialize it.
PV High Limit	The upper bound value of the outlet temperature (PV) is set. When a set value is exceeded, the exit upper bound alarm (stop warning) is generated.
Flow Low Limit	When flow amount drops below the input setting, you can issue the continue alarm. Enter [0.0] when you are not going to use this function. This is effective when you want to manage flow amount to prevent the flow lower limit (stop alarm) alarm from being issued.
Operation Mode	This mode is used to set the following. LOCAL : Operated on the control panel. REMOTE : Operate the unit with I/O signals from the wet station. SERIAL (optional) : Operate the unit with serial signals from the wet station.

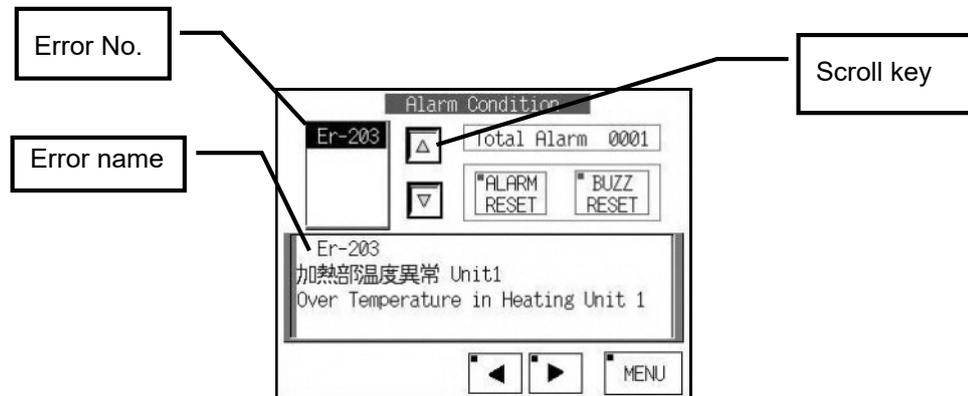
NOTE

- You can disable a function by entering [0.0] for each setting. We recommend disabling a function when it is not used.

3.4.7 Alarm Condition

Pressing the **[Alarm]** key in the [MENU] screen will switch to the [Alarm Condition] screen.

When an abnormality occurs to the unit, an error number (Er-#) is displayed for identification.

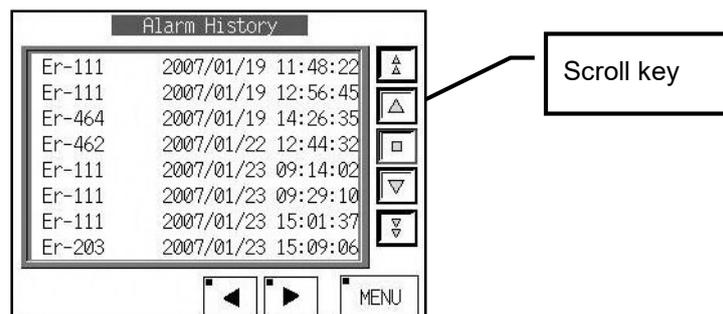


Item	Description
Total Alarm	Displays the number of alarms that occurred at the same time.
ALARM RESET	Press this key after removing the cause of the alarm. Note, however, that some alarms may require power reset.
BUZZ RESET	Stops buzzer alarm triggered when an alarm occurs (alarm will not be reset).
Scroll key	The key is used to scroll when all Error numbers of errors that occurred at the same time cannot be displayed within one screen.

3.4.8 Alarm History

Pressing the **[Alarm History]** key in the [MENU] screen will switch to the [Alarm History] screen.

History of alarms so far occurred will remain.



NOTE

- Up to about 100 alarms can be displayed in alarm history. When the number of alarms exceeds about 100, the oldest alarm history will be deleted automatically.

Operation and display

3.4.9 PV · Flow Monitor

Pressing the [PV Flow] key in the[MENU]screen will switch to the [PV·Flow Monitor] screen.

The current values of temperature, flow amount and the PV Offset value set on the [Band Delay Set] screen of the maintenance screen are displayed together.

Temperature [°C]		Flow [L/min]	
PV out	44.6	Total	17.5
PV Unit1	45.6	Unit1	8.9
PV Unit2	43.7	Unit2	8.6
PV in	15.4		
PV Offset	1.0		

◀ ▶ MENU

3.4.10 I/O Condition

Pressing the [I/O Condition] key in the[MENU]screen will switch to the [I/O Condition] screen.

I/O status of the I/O connector can be confirmed on this screen.

[○] indicates contact open and [●] indicates contact closed.

[Analog Input] indicates the current value and the temperature reduced value of an analog input. There is no display depending on specification.

I/O Condition							
Output			Input				
1	○	19	○	10	○	28	○
2	○	20	○	11	○	29	○
3	○	21	○	12	○	30	○
4	○	22	○	13	○	31	○
5	○	23	○	14	○	32	○
6	○	24	○	15	○		
7	○	25	○	Analog	12.3	°C	
8	○	26	○	Input	12.34	mA	

○ OPEN
● CLOSE

◀ ▶ MENU

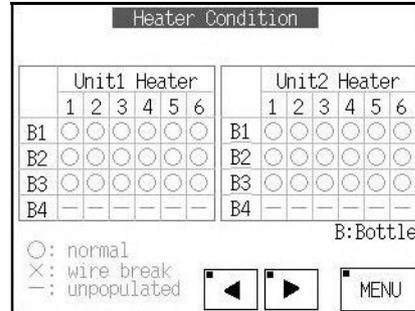
NOTE

- This screen display indicates the recognition status of PLC.
- The number means a pin number.

3.4.11 Heater Condition

Pressing the [Heater Condition] key in the [MENU] screen will switch to the [Heater Condition] screen.

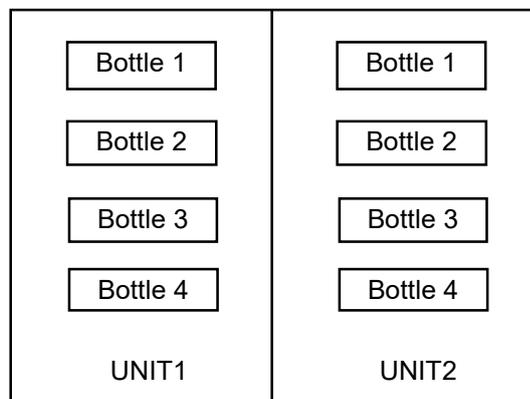
When heater disconnection occurs, [O] changes to [X] on the display screen to allow the user to isolate the disconnecting heater.



NOTE

- Depending on the model, [-] may be displayed for a heater that is not used.
- When an alarm is triggered, the heater disconnection Er380(heater disconnection) will be displayed on the [Alarm Condition] screen. Press the [Heater Condition] key on the [MENU] screen to move to this screen.
- When heater disconnection occurs, immediately contact the maintenance manager to ask for replacement of the heater.
- Two heaters are detected with one sensor in three phases three wires 400V system device. Therefore, when one of two is disconnected, both become the disconnection displays. The combination of the heater as follows.
 - Heater1-Heater4 ▪ Heater2-Heater5 ▪ Heater3-Heater6

The bottle number is the following. The number is allotted from the upper part of each UNIT.

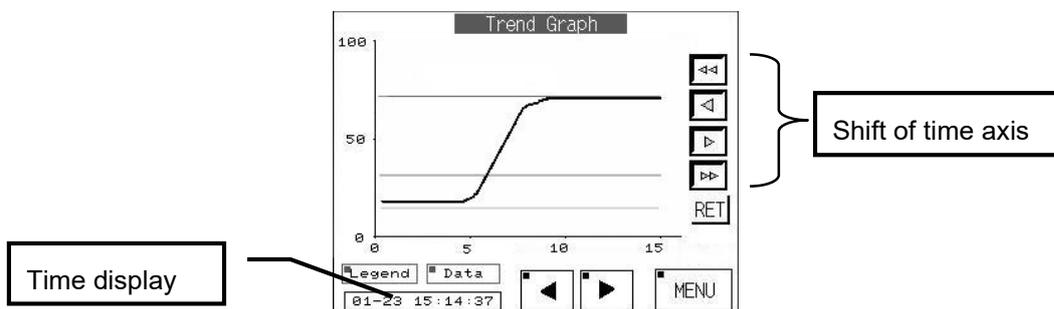


Operation and display

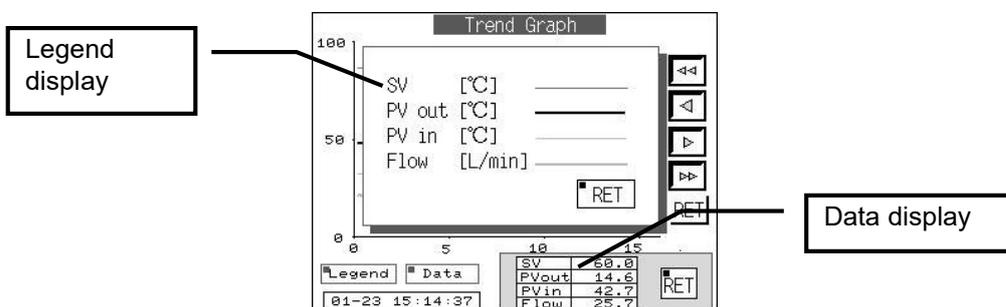
3.4.12 Trend Graph

Pressing the [Graph] key in the [MENU] screen will switch to the [Trend Graph] screen.

Changes in temperature and flow can be viewed as a graph.



Item	Description
Legend	Indicates the displayed items on the graph. Pressing the [ESC] key returns you to the previous status.
data	Displays the current numeric value. Pressing the [ESC] key returns you to the previous status.
Shift of time axis	Press the [◀] key for the time shift if you want to view older data. [◀◀] is for fast forward. [▶] and [▶▶] keys can be used to move the time forward. Pressing the [RET] returns to the current value.



NOTE

- The retained data is for about one hour only and data prior to it will be cleared.

3.4.13 Hour Meter

Pressing the **[Hour Meter]** key in the[MENU]screen will switch to the [Hour Meter] screen.
Indicates the operating hours of the pure water heating unit.



Item	Description
Operating Time	Displays the total unit power on time.
Heating Time	Displays the heating time.

3.4.14 Program Number

Pressing the **[Program Num]** key in the[MENU]screen will switch to the [Program Number] screen.
The number is the program number of the software used in the pure water heating unit.

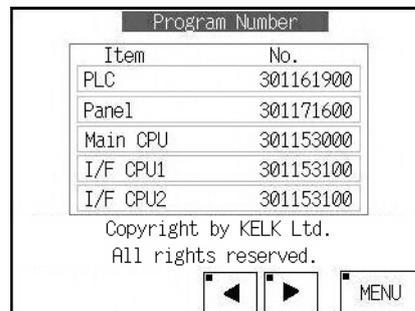


Figure 3-10 Example of[Program Number]screen

NOTE

- **[I/F CPU2]** will be displayed only for models of 144kW or more.

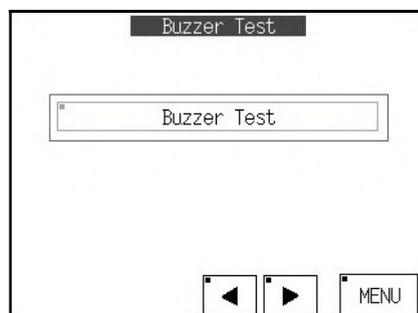
Operation and display

3.4.15 Buzzer Test

Pressing the **[Buzzer Test]** key in the **[MENU]** screen will switch to the **[Buzzer Test]** screen.

The screen is used to test sounding of the buzzer.

While the **[Buzzer Test]** key is pressed, the character color is inverted and the buzzer sounds.



3.4.16 Initial value · Setting range

Screen	Item	Initial value	Setting range	Remarks
SV Set	SV-0	60.0	25.0~85.0	By Specifications "SV-#" number of different. [INIT] key and SV Init Set Value.
	SV-1	60.0	25.0~85.0	
	SV-2	60.0	25.0~85.0	
	SV-3	60.0	25.0~85.0	
	SV-4	60.0	25.0~85.0	
	SV-5	60.0	25.0~85.0	
Operation Set	Deviation U Limit	10.0	0.0~30.0	
	Deviation L Limit	10.0	0.0~30.0	
	Stable Band	1.0	0.0~10.0	
	PV High Limit	0.0	0.0~100.0	
	Flow Low Limit	0.0	0.0~99.9	
	Operation Mode	REMOTE	LOCAL · REMOTE · SERIAL	SERIAL is Optional.

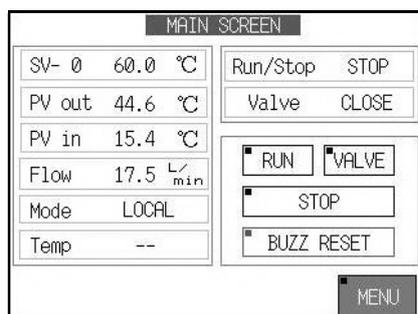
3.5 Measures to be taken when an alarm occurred

NOTE

- When an alarm occurs, immediately contact the maintenance manager to ask for replacement of the heater.

3.5.1 Stopping the alarm buzzer

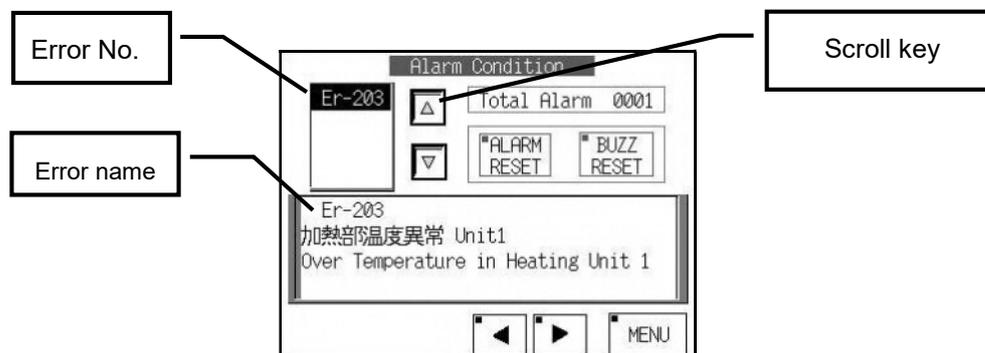
Press the **【BUZZ RESET】** key on the [MAIN SCREEN] screen or the [Alarm Condition] screen to stop the buzzer.



Operation and display

3.5.2 Alarm display

To confirm the details of an alarm, release panel lock (pressing **[F2]+[F3]** keys, 2 seconds or more), then press the **[ALARM]** key on the **[MENU]** screen to move to the screen below.



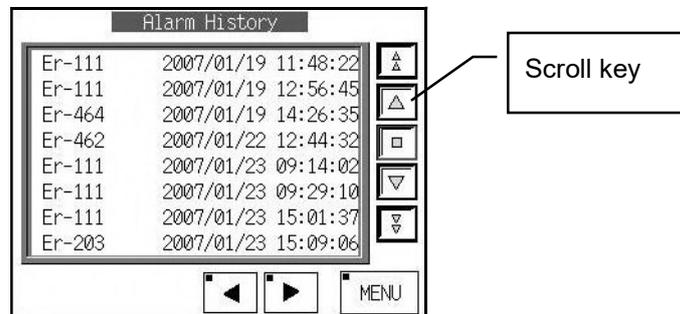
Item	Description
Total Alarm	Displays the number of alarms that occurred at the same time.
ALARM RESET	Press this key after removing the cause of the alarm. Note, however, that some alarms may require power reset.
BUZZ RESET	Stops the buzzer when an alarm occurs. Alarm is not reset.
Scroll key	The key is used to scroll when all Error numbers of errors that occurred at the same time cannot be displayed within one screen.

NOTE

- **More than one alarm might occur simultaneously and we recommend to note Error numbers before resetting.**

3.5.3 Alarm history display

To confirm the details of an alarm history, release panel lock, then press the [ALARM History] key on the [MENU] screen to move to the screen below.

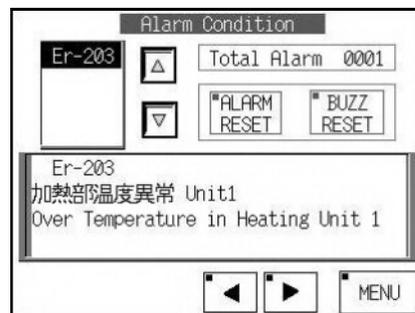


NOTE

- Up to about 100 alarms can be displayed in alarm history. When the number of alarms exceeds about 100, the oldest alarm history will be deleted automatically.

3.5.4 Releasing the alarm

To release the alarm, first remove the cause of it and press the [ALARM RESET] key on the [Alarm Condition] screen.



NOTE

- The internal contactor may turn OFF depending on some types of alarms. In this case, the contactor ON operation sound will be heard when resetting the alarm.
- Note that some alarms may require power reset. Refer to "2. Alarm code list" of the separate volume manual "Appendix". Such an alarm cannot be reset by pressing the [ALARM RESET] key.

