

Electronic Multi-Measuring Instrument

MODEL

ME96SSEA-MB

User's Manual: Detailed Edition

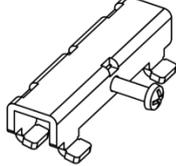


- Before operating the instrument, you should first read thoroughly this operation manual for safe operation and optimized performance of the product.

Deliver this user's manual to the end user.

Check on your delivery

Check the following point as soon as you receive Mitsubishi Electronic Multi-Measuring Instrument

Parts name	Quantity	Specifications
User's Manual (Simplified)	1	 A3 size
Attachment lug (with screw)	2	

About the optional plug-in module sold separately

This product cannot be installed the optional plug-in module.

Please use a combination of other classes (ME96SSHA-MB, ME96SSRA-MB) and the optional plug-in module, if analog output, CC-Link communication, contact input and output, MODBUS@TCP communication or Logging function etc is required.

Features

This instrument measures the load status by inputting the secondary side of the VT and CT, and displays various measurement values.

- This instrument supports active energy: class 0.5S.
- The password protection setting avoids undesired change of settings or deletion of measured data.
- The instruments with transmission function (MODBUS[®]RTU communication) are able to transmit the measured data to superior monitoring devices.
- This instrument complies with the requirements of the CE marking, UL standards, KC mark, and FCC/IC.

MODBUS[®] is a registered trademark of SCHNEIDER ELECTRIC USA, INC in the United States.

Table of Contents

Check on your delivery	1
About the optional plug-in module sold separately.....	1
Features.....	2
Table of Contents.....	3
Safety Precaution	5
EMC Directive Instruction	9
Precautions for KC mark.....	9

Instructions for Handling

1. Display and Button Functions of Each Parts	10
2. Function Modes	13
3. Setting.....	14
3.1. Setting flow.....	14
3.2. Setting Menu 1: Basic Settings (Setting the Phase Wire System, Display Pattern, VT/Direct Voltage, CT Primary Current, etc.)	16
3.3. Setting Menu 2: Communication Settings (Setting the MODBUS®RTU communication).....	20
3.4. Setting Menu 3: Display Settings (Setting Maximum Scale and Harmonic Display)	21
3.5. Setting Menu 4: LCD Settings (Setting Model Display, Version Display, Backlight, and Display Update Time).....	23
3.6. Setting Menu 5: Alarm Settings (Setting Upper/Lower Limit Alarm, Motor Starting Current Mask Function, etc.).....	24
3.7. Setting Menu 6: No Settings	27
3.8. Setting Menu 7: No Settings	27
3.9. Setting Menu 8:Special Settings (Setting Operation Time, Phase Display, IEC Mode).....	28
3.10. Setting Value Confirmation Menus 1-9: Confirming the Settings in the Setting Menus 1-8 and Test Mode in Setting Menu 9.....	30
3.11. Initializing Related Items by Changing Settings	31
3.12. Initializing All Settings.....	31
3.13. Setting the Special Display Pattern P00	32
3.14. Examples of Simple Settings	34
4. Using Test Mode	36
4.1. Test Menu 1: Communication Test	37
5. Operation	38
5.1. Basic Operation.....	38
● Switch display.....	38
● Switch phase	38
● Bar graph display	39
● Switching measurement factors displayed on bar graphs	39
● Cyclic Display	40
● Harmonics display	40
● Maximum value and minimum value display	41
● Display of maximum value and minimum value	41
● Clear the maximum/minimum value	41
● Active Energy Display	42
● How to change the unit of Wh	42
● Wh zero reset	42
● Each measurement item display during power transmission.....	42
● Demand time and demand value of current demand.....	43
5.2. Usage According to Purpose (Alarm, Operating Time, Password, etc.)	44
● Display and operation of the upper/lower limit alarm	44
● Canceling the upper/lower limit alarm	45
● Stopping backlight flickering caused by upper/lower limit alarm generation.....	45
● Display of operation time.....	45
● Resetting the operation time to zero	45
● Preventing maximum value update by motor starting current	46
● Password protection setting	46

Table of Contents

6. Other.....	47
6.1. Display Pattern Contents	47
6.2. Maximum Scale Value.....	49
6.3. Possible Setting Range for Maximum Scale	50
6.4. Measurement Items.....	53
6.5. Measurement Characteristic	54
6.6. Troubleshooting.....	55

Installation

Installation 1. Dimensions.....	56
Installation 2. Mounting.....	57
Installation 3. Wiring	58
Installation 4. Wiring Diagram.....	60

Specifications

Specifications.....	65
1. Specification	65
2. Applicable Standards.....	66
3. Specifications of MODBUS® RTU Communication.....	66
4. Setting Table (Factory Settings and Customer Setting Note).....	67
Appendix.....	68
1. Calculation methods of ME96SS (for 3 phase unbalanced system with neutral)	68

Safety Precaution

(Always read these instructions before using this equipment)

For personnel and product safety please read the contents of these operating instructions carefully before using. Make sure that the end users read this manual and then keep the manual in a safe place for future reference. Make sure to deliver this manual to the end-user.

If you are considering using this instrument for special purpose such as nuclear power plants, aerospace, medical care or passenger vehicles please refer to our sales representative.

HAZARD SYMBOLS



Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. Terminal of control power (MA, MB) and voltage inputs (P1, P2, P3, PN) have hazards of electric shock, explosion, or arc flash. Turn off power supplying this device and the equipment in which it is installed before working on it.

CAUTION

The above indicates that incorrect handling may cause hazardous conditions. Always follow the instructions because they are important to personal safety. Otherwise, it could result in electric shock, fire, erroneous operation, and damage of the instrument. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

■ Normal service conditions

Use the instrument in an environment that meets the Normal service conditions as following points:

- Ambient temperature: -5 to +55°C
- Average day temperature: 35°C or less
- Humidity: 0 to 85%RH, non condensing.
- Altitude: 2000m or less
- Pollution Degree: 2 or less (Note 1)
- Atmosphere without corrosive gas, dust, salt, oil mist.
- Indoor use
- Transient over voltage: 4000V or less (Note 1)
- A place without excessive shocks or vibration.
- Do not expose to rain and water drips.
- Do not expose to direct sunlight.
- An area in where no pieces of metal and an inductive substance disperse.
- Do not expose to strong electromagnetic field and ambient noises.

Note 1. For the definition of the Pollution Degree and the Transient over voltage category, refer to EN61010-1:2010.

■ Installation instructions

Make sure to read this manual carefully before Installation and Wiring.

CAUTION	<ul style="list-style-type: none"> ● This instrument should be installed and used by a qualified electrician. ● The instrument must not be powered and used until its definitive assembly on the cabinet's door. ● The instrument is to be mounted on a panel. All connections must be kept inside the cabinet. ● Verify the following points: <ul style="list-style-type: none"> ■ Auxiliary power supply and measuring ratings. 				
	Auxiliary power supply		AC100-240V(±15%) 50-60Hz 8VA DC100-240V(-30% +15%) 5W		MA,MB terminals
	Ratings	Voltage	3-PHASE 4-WIRE : max AC277/480V 3-PHASE 3-WIRE : (DELTA)max AC220V, (STAR)max AC440V 1-PHASE 3-WIRE : max AC220/440V 1-PHASE 2-WIRE : (DELTA)max AC220V, (STAR)max AC440V	Category III	P1,P2,P3,PN terminals
		Current	5A(via current transformer),maxAC30V	Category III	+C1,C1,+C2,C2,+C3,C3 terminals
	Frequency	50-60Hz			
<p>Provide the basic insulation externally at the current input terminals. Voltage-measuring and current-measuring circuit terminals should be permanently connected.</p>					

Safety Precaution

⚠ CAUTION	■ Others		
	MODBUS®RTU communication	T/R+, T/R-, SG, Ter terminals	maxDC35V

- Do not drop this instrument from high place. If you drop it and the display is cracked, do not touch the liquid crystal or get it in your mouth. If the liquid crystal is touched, wash it away at once.
- Work under the electric outage condition when installing and wiring. It may cause electric shock, electric burn injury or damage of the device.
- When tapping or wiring, take care not to entering any foreign objects such as chips and wire pieces into this instrument.
- If the terminal wiring is pulled with a strong force, the terminals may detach. (Tensile load: 39.2N or less)
- When wiring in this instrument, be sure that it is done correctly by checking the instrument 's wiring diagram. Wrong wiring may cause failure of the instrument, a fire or electric shock.
- Use electrical wire sizes compatible with the rated current. Use of unsuitable sizes may cause heat generation, which may lead to a fire.
- Tighten the terminal screws with the specified torque and use the suitable pressure connectors and suitable wire size. (Refer to page 58)
- In order to prevent invasion of noise, do not bunch the control wires or communication cables with the main circuit or power wire, or install them close to each other. The distance between communicational signal lines, input signal lines and power lines, and high voltage lines when running parallel to each other are shown below.

Conditions	Length
Below 600V, or 600A power lines	30cm or more
Other power lines	60cm or more

- Protective conductor terminals for mains circuits shall be at least equivalent in current-carrying capacity to the mains supply terminals.
- If the protective conductor terminals are also used for other bonding purposes, the protective conductor shall be applied first and secured independently of other connections.

■ Matters concerning the precaution before use

- Use the instrument in the specified usage environment and conditions.
- The setting of this instrument is necessary before use it. Please read this manual carefully to ensure correct setting.
- Confirm the rating of this instrument, and supply power voltage within the specified range.

Safety Precaution

■ Operation instructions

- Before operating the product, check that active bare wire and so on does not exist around the product. If any bare wire exists, stop the operation immediately, and take an appropriate action such as isolation protection.
- In the event of a power outage during the setting, the instrument is not set correctly. Please set again after power recovery.

	<ul style="list-style-type: none">● Do not disassemble or modify this instrument. It may cause failure, malfunction, injury or fire.● Use this instrument within the ratings specified in this manual. If it is used outside the ratings, it may cause not only malfunction or failure but also fire burnout.● Do not open the secondary side of the CT circuit. If the CT is not connected properly or if the secondary side of the CT is open, it may result in high voltage on the secondary side of the CT, the insulation of the secondary winding wire may be damaged, and burnout may be caused.● When the external terminals are connected to the external equipment, the instrument and the external equipment must not be powered and used until its definitive assembly on the cabinet's door.● The rating of the terminal of the external equipment should satisfy the rating of the external terminal of this instrument.
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■ Maintenance instructions

- Wipe dirt off the surface with a soft dry cloth.
- Do not contact a chemical dust cloth to the instrument for a long time, or do not wipe it with benzene, thinner, alcohol.
- Check for the following items to use this instrument properly for long time.
 - (1) Daily maintenance
 - ① No damage on this instrument
 - ② No abnormality with LCD indicators
 - ③ No abnormal noise, smell or heat
 - (2) Periodical maintenance (Once every 6 months to 1 year)
 - No looseness with installation and wire connection

	Do periodical maintenance under the electric outage condition. Failure to do so may cause electric shock, failure of the instrument or a fire. Tighten the terminal regularly to prevent a fire.
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■ Storage conditions

To store this instrument, turn off the power and remove wires, and put it in a plastic bag.

For long-time storage, store at the following places. Failure to follow the instruction may cause a failure and reduced life of the instrument.

- Ambient temperature the: -25 to +75°C
- average day temperature: 35°C or less
- Humidity range 0 to 85%RH, non-condensing.
- Atmosphere without corrosive gas, dust, salt, oil mist.
- A place without excessive shocks or vibration.
- Do not expose to rain and water drips.
- Do not expose to direct sunlight.
- An area in where no pieces of metal and an inductive substance disperse.

Safety Precaution

■ Guarantee

- Gratis warranty is effective until the earlier of 1 year after the date of your purchase or 18 months after manufacturing.
- The gratis warranty shall apply if the product fails even though it is being used properly in the conditions, with the methods and under the environments in accordance with the terms and precautions described in the catalogs, the instruction manual, caution label on the product, etc.
- Repair shall be charged for the following cases even during the gratis warranty period.
 - ① Failures occurring due to your improper storage or handling, carelessness or fault.
 - ② Failures due to faulty workmanship
 - ③ Failures due to faults in use and undue modification
 - ④ Failures due to accidental force such as a fire, abnormal voltage, etc. and force majeure such as an earthquake, wind, flood, etc.
 - ⑤ Failures due to matters unpredictable based on the level of science technology at the time of product.
- Our company shall not be liable to compensate for any loss arising from events not attributable to our company, opportunity loss and lost earning of the customer due to failure of the product, and loss, secondary loss, accident compensation, damage to other products besides our products and other operations caused by a special reason regardless of our company's predictability

■ Replacement Cycle

Although it depends on the status of use, 10 years is the guideline for renewal.

■ Disposal

- When disposing of this product, treat it as industrial waste.
- A battery is not used for this product.

■ About packaging materials and this manual

For reduction of environment load, packaging materials are produced with cardboard, and this manual is printed on recycled paper.

EMC Directive Instruction

This section summarizes the precautions on conformance to the EMC Directive of the cabinet constructed using this instrument.

However, the method of conformance to the EMC Directive and the judgment on whether or not the cabinet conforms to the EMC Directive has to be determined finally by the manufacturer.

This instrument complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This instrument may not cause harmful interference, and (2) this instrument must accept any interference received, including interference that may cause undesired operation.

1. EMC Standards

- EN 61326-1
- EN 61000-3-2
- EN 61000-3-3

2. Installation (EMC directive)

The instrument is to be mounted on panel of a cabinet.

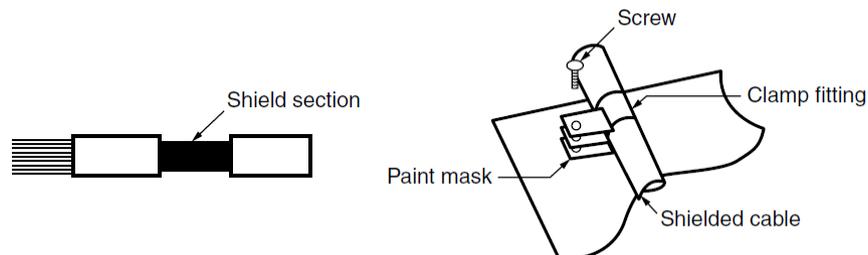
Therefore, the construction of a cabinet is important not only for safety but also for EMC.

The instrument is examined by the following conditions.

- Conductive cabinet is used.
- Six faces of a cabinet have to be ensured conductivity for each other.
- A cabinet has to be connected to earth by a thick wire of low impedance.
- Holes on faces of cabinet have to be 10 cm or less in diameter.
- The terminals for protective earth and functional earth have to be connected to earth by a thick wire of low impedance. (A terminal for protective earth is important not only for safety but also for EMC.)
- All connections must be kept inside the cabinet.
- Wirings outside the cabinet have to be used with the shielded cable.

The following diagram shows how to provide good contact of the shielded cable.

- Remove part of the outer cover.
- Remove part of the paint mask on the cabinet.
- Connect those parts with the clamp.



Precautions for KC mark

사용자안내문

기종별	사용자안내문
A급 기기(업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

■ Precautionary note written in Korean

Distributors and users must understand that this product meets the electromagnetic compatibility requirements and is designed for industrial use (Class A).
Do not use the product in a residential area.

■ Applicant for KC mark : MITSUBISHI ELECTRIC AUTOMATION KOREA CO.,LTD

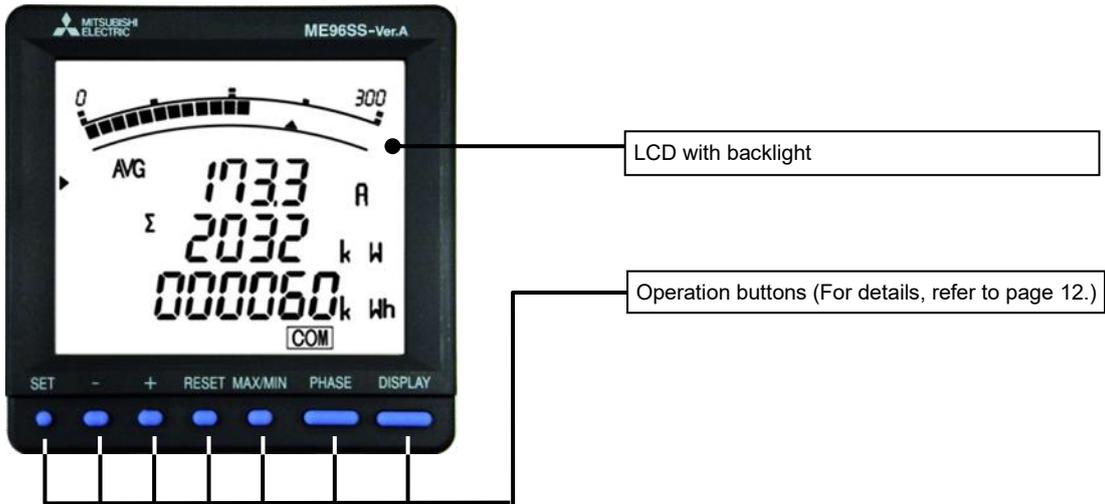
■ Manufacturer : MITSUBISHI ELECTRIC CORPORATION

Note 1: This is the notification for the KC mark (Korea Certification)

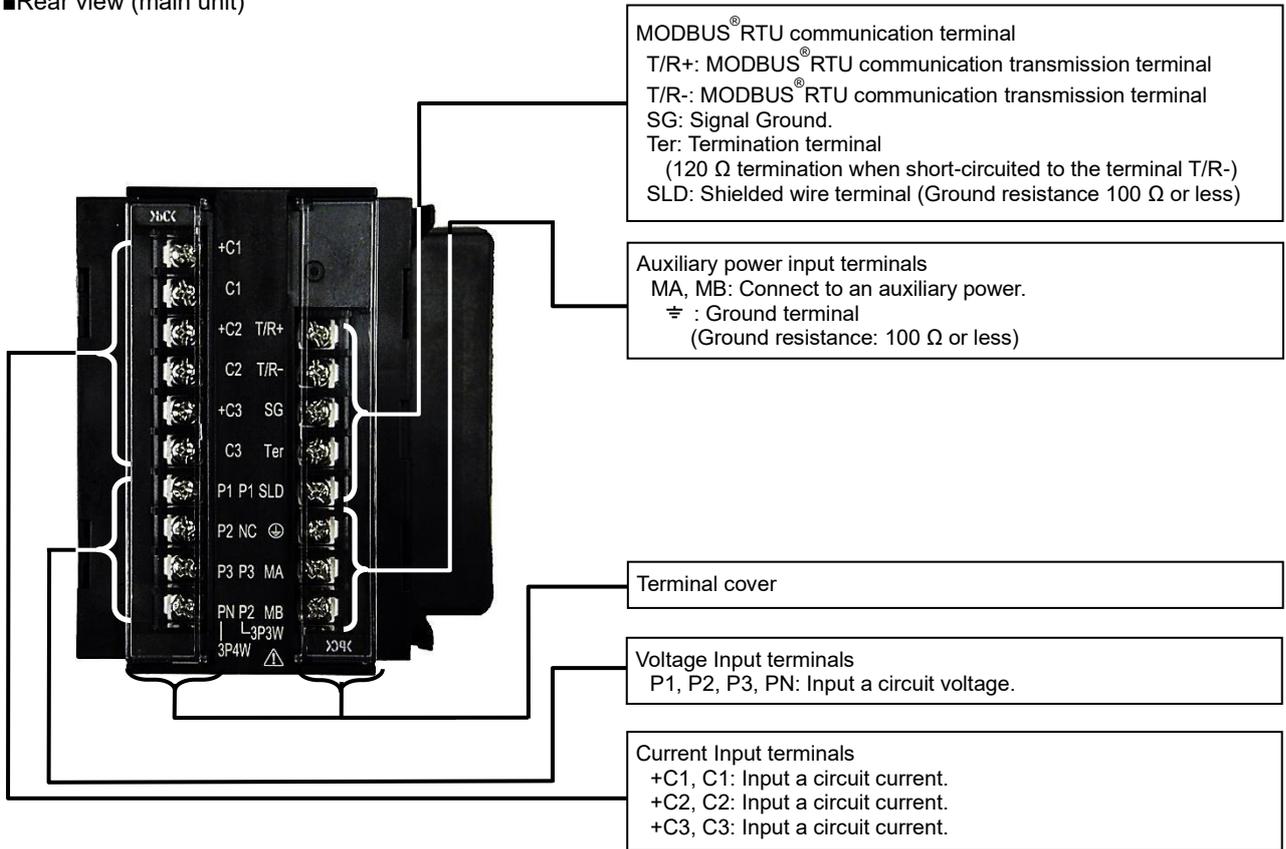
1. Display and Button Functions of Each Parts

Part names

■Front view

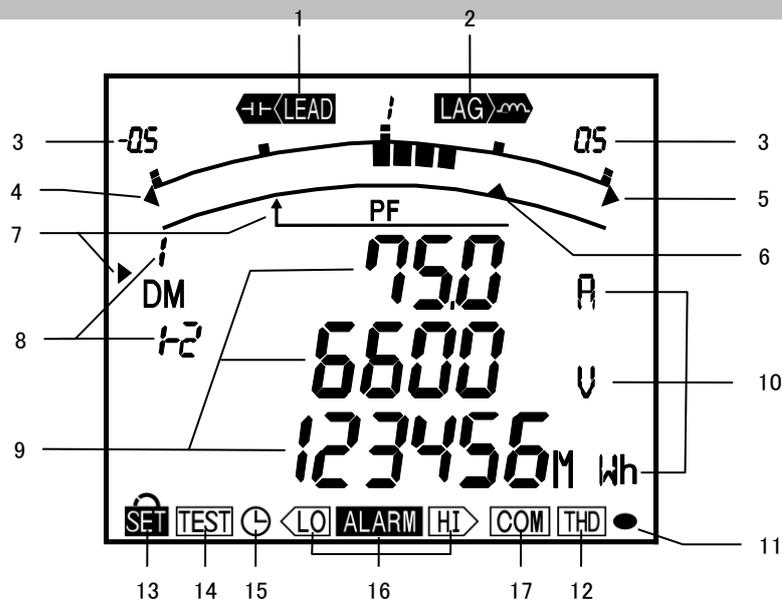


■Rear view (main unit)



1. Display and Button Functions of Each Parts

Display



Note: The above display is an example for explanation.

No.	Segment Name	Description								
1	LEAD status	They show direction of Power Factor on bar graph.								
2	LAG status									
3	Scale of the bar graph	They show the scales of the bar graph.								
4	Under scale input	Turns on when measuring values fall below the minimum scale.								
5	Over scale input	Turns on when measuring values exceed the maximum scale.								
6	Index indicator	When upper/lower limit alarm set, flickers at the limit setting value.								
7	Bar graph status	They show the item expressed with the bar graph. When the item is the same as a digital displayed item, indicated with「▶」, otherwise indicated with「▲」								
8	Phase status	They show the phase for each of the digital displays.								
9	Digital display	Measured values displayed in digital.								
10	Unit	Units of measuring value displayed.								
11	Metering status	Flickers when counting active energy.(Note.1)(only active energy imported display)								
12	Harmonics	Turns on when harmonics displayed.								
13	Setup status	Turns on at setting mode. (SET) Flickers at setting value confirmation mode. (SET)								
14	Test mode status	Turns on at the test mode.								
15	Clock status	Turns on when Operation time displayed.								
16	Upper/lower limit alarm status	Flickers when upper/lower limit alarm is generated.								
17	Communication status	<table border="1"> <thead> <tr> <th>Specification</th> <th>On</th> <th>Blinking</th> <th>Off</th> </tr> </thead> <tbody> <tr> <td>MODBUS®RTU communication</td> <td>Normal</td> <td>Communication error (Such as wrong address)*1</td> <td>Hardware error</td> </tr> </tbody> </table>	Specification	On	Blinking	Off	MODBUS®RTU communication	Normal	Communication error (Such as wrong address)*1	Hardware error
Specification	On	Blinking	Off							
MODBUS®RTU communication	Normal	Communication error (Such as wrong address)*1	Hardware error							

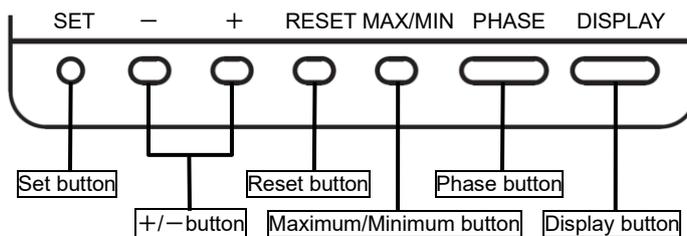
*1. For details, refer to Section 6.6.(page 55).

Note 1. The blinking cycle is constant regardless of the size of the measured input.

1. Display and Button Functions of Each Parts

Functions of operation buttons

The operation buttons have various functions according to how they are pressed down.



Meaning of code: ○(press), □(press on over 1 second), ⊙(press on over 2 seconds), —(press simultaneously)

Operation Mode	Button							Function		
	SET	-	+	RESET	MAX/MIN	PHASE	DISPLAY			
Operation mode	Display changes operation							○	Display changes.	
			○—						○	Display changes.(reverse direction)
								○		Phase changes.
						○				Mode changes to the max./min. display and the instantaneous display
			○	○						The item expressed with the bar graph is changed.
									⊙	Displays change cyclically. (Refer to page 40)
								⊙		Phases change cyclically. (Refer to page 40)
	Measured value is reset / Canceling the alarm, etc		⊙—	⊙						Change the unit of Wh. (Refer to page 42)
						⊙				Maximum values and minimum values on the display are reset to the present value.
						⊙—	⊙			All of the Maximum values and minimum values are reset to the present value.
			⊙—			⊙—	⊙—			Wh is zero reset.
						⊙				The operation time is zero reset (Screen operation time only)
						○				An alarm condition is canceled. (Screen element is canceled)
						⊙				All alarm conditions are canceled. (Element is canceled for all screens)
Mode changes					○				Stopping backlight flickering alarm. (Only effective in setting backlight flicker)	
	⊙—				⊙				The display of Setting mode appears.	
	⊙								The display of Set value confirmation mode appears.	
Setting/ Setting value confirmation mode	Setting operation							⊙—	The display of password protection mode appears.	
		○							The setting items are saved, and setting item is changed to next item.	
								○		Back to the previous item.
			○	○						The values of setting are changed. (If it presses for 1 sec or more fast forward or fast return.)
		□								Back to the setting display.
	○								Save the settings(Only effective in End display)	
	Special operation	○								Cancel the settings(Only effective in CANCEL display)
					□—	□			Meter restart(Only effective in CANCEL display)	
				⊙—		⊙			Returns set contents to the default settings (the default values, Only effective in CANCEL display) (Refer to page 31)	

Note: While the back light is off, if the operation button is pressed, the back light is always lit. If the operation button is pressed once again, the function in the above table appears.

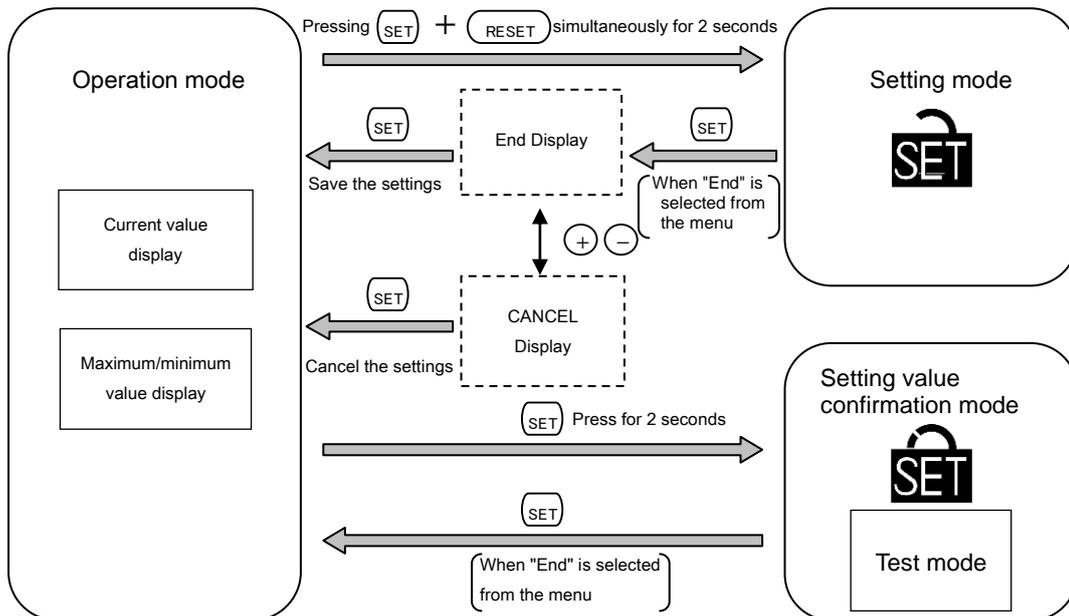
	<ul style="list-style-type: none"> •If the function of “maximum value and minimum value reset” and “Wh zero reset” are done, data will be lost. If this data is needed, please record the data before the reset operation. •If the function of “meter restart” is done, the entire measurement (measurement display, communication) stops.
--	--

2. Function Modes

The following function modes are available for this Multi-Measuring instrument. Operation mode is displayed after auxiliary power turns on. It is then possible to switch to the desired mode.

Mode	Description	Reference Pages
Operation Mode	This mode is for displaying each measured value using digital numerical values and bar graphs. Operation mode contains "Current Value Display" that displays the current value, and "Maximum/Minimum Value Display" that displays old maximum/minimum values. In addition, for each display, the cyclic display function can be used to switch between the screens every 5 seconds.	P.38 to P.46
Setting Mode	This mode is for changing the setting values related to measurement functions. The following special operations can be executed from the "CANCEL Display" for changing/cancelling setting values. <ul style="list-style-type: none"> •The instrument is reset. •Reset the settings to the factory defaults 	P.14 to P.29 P.31 to P.35
Setting Value confirmation mode (Test Mode)	This mode is for confirming the setting values for each setting item.(In this mode, settings cannot be changed in order to prevent accidental changing of settings.) This mode contains test functions that can be used for equipment startup. <ul style="list-style-type: none"> ●Communication Test: Fixed numerical data can be returned without measurement input (voltage/current). 	P.30, P.36 to P.37

■ Diagram of Each Mode



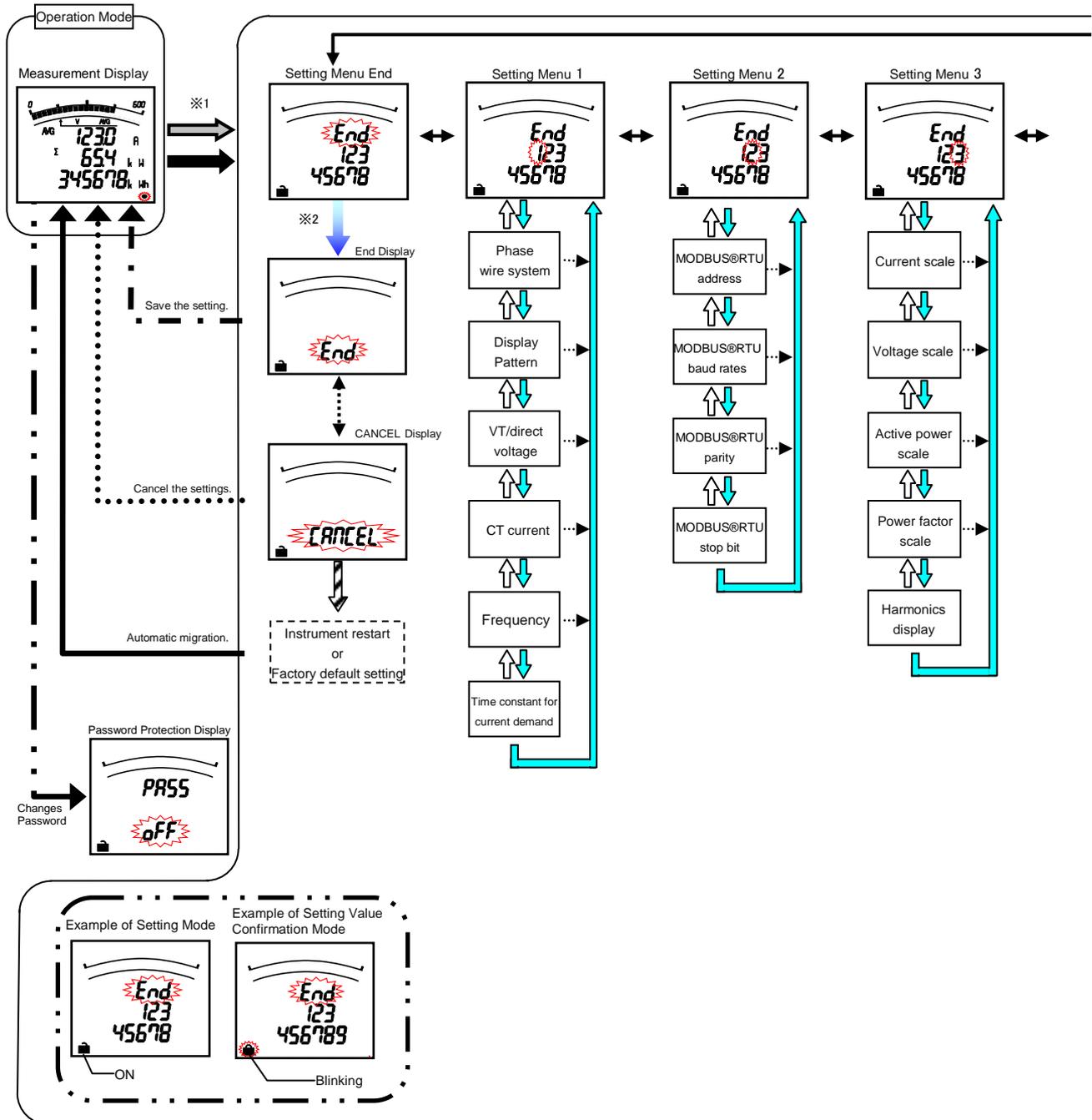
3. Setting

3.1. Setting flow

To measure, it is necessary to use Setting mode to set the phase wire system, VT / direct voltage, and CT primary current. From Operation mode, move to Setting mode and then set necessary items. Factory default settings will be used for items that you do not set.

Only the settings in Setting menu 1 (basic setting) are needed for normal use. For more information about the settings, refer to page 16 and after.

For more information about the factory default settings, refer to the setting table on page 67.



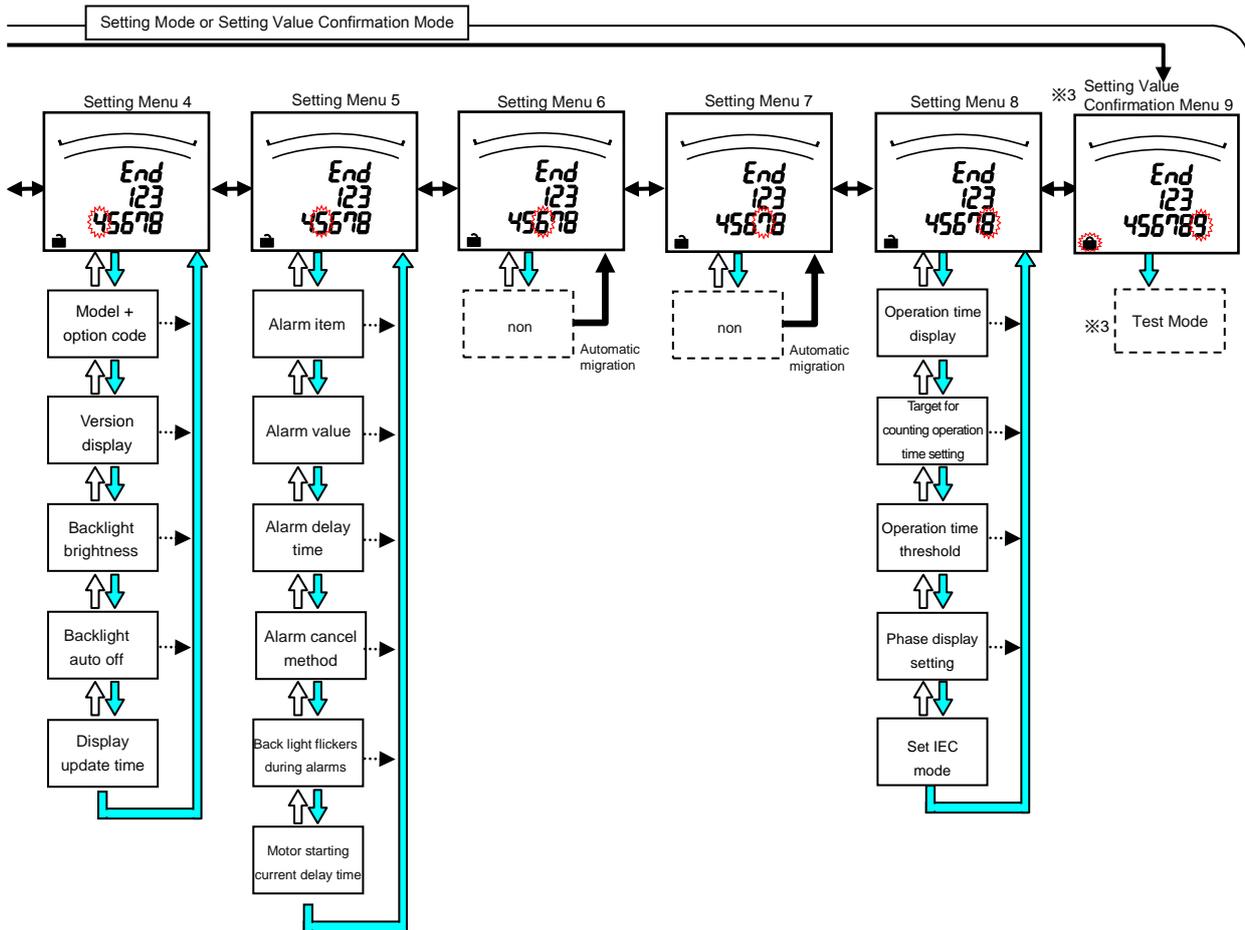
Keep in mind that when a setting is changed, the related setting items and measurement data will be reset to the default settings. (Refer to page 31.)

3. Setting

3.1 Setting flow

<Setting Procedure>

- ① Press (SET) and (RESET) simultaneously for 2 seconds to get in the setting mode.
- ② Select a setting menu number by (+) or (-).
- ③ Use the (SET) button to select a setting menu number.
- ④ Set each setting item. (Refer to page 16 and later pages.)
- ⑤ After completion of setting, select 'End' in the setting menu and press (SET).
- ⑥ When the End display appears, press (SET) once again.



Arrow in Figure	Action	Button operation
	Shift from the operation mode to the setting mode.	(SET) + (RESET) Press them simultaneously
	Shift from the operation mode to the set value confirmation mode.	(SET) Press it for 2 seconds.
	Select the menu number to set or "End".	(+) or (-) Press it several times.
	Get into each setting screen. Shift to the next setting item.	(SET) Press it.
	Go back to the previous setting item.	(DISPLAY) Press it.
Omitted in figure	Select a set value.	(-) or (-) Press it several times.
	Shift to the End screen.	(SET) Press it.
	Memorize the setting contents, and go back to the operation mode.	(SET) Press it.
	Select "CANCEL."	(+) or (-) Press it.
	Cancel the settings.	(SET) Press it.
	Skip remaining setting items during setting.	(SET) Press it for 1 second.
	Set values return to the factory default value.	(RESET) + (PHASE) Press it for 2 seconds.
	Shift from the operation mode to the password protection mode.	(RESET) + (PHASE) Press it for 2 seconds.

※1. If the password protection setting is enabled, it is necessary to enter the password in shift from the operation mode to the setting mode.

※2. For Setting Value Confirmation, it returns to Operation Mode.

※3. This is not display in Setting Mode.

3. Setting

3.1 Setting flow

Basic Operations for setting

Function	Operation	Remarks
Select a set value	Press \oplus or \ominus .	Fast-forward when pressed over 1 sec.
Setting items are saved	Press SET .	Setting item will be saved and shift to the next item.
Go back to the previous setting item	Press DISPLAY .	The set value for the setting item just before Skip removing setting items returning is still available.
Skip removing setting items during setting	Press and hold SET for 1 sec.	

3.2. Setting Menu 1: Basic Settings (Setting the Phase Wire System, Display Pattern, VT/Direct Voltage, CT Primary Current, etc.)

Set the phase wire method, display pattern, VT/direct voltage, CT primary current, etc.

In the operation mode, after pressing SET and RESET simultaneously for 2 seconds or more, the following operation becomes available.

Setting Menu

↑

①Phase Wire system

↑

↓

②Display Pattern

↑

↓

↑

↓

↑

↓

↑

↓

Set the setting menu number to "1".
(as shown in the right figure)

Set the phase wire system.

3P4 : 3-phase 4-wire

3P3. 2CT : 3-phase 3-wire (2CT)

3P3. 3CT : 3-phase 3-wire (3CT)

1P3. 1N2 : 1-phase 3-wire (1N2 display)

1P3. 1N3 : 1-phase 3-wire (1N3 display)

1P2 : 1-phase 2-wire

Supplemental Information:
Underlined portions indicate the default values.
(Same from here.)

Set the display pattern.
The following table shows the measurement elements that can be displayed by each display pattern. (For more details about display patterns, refer to page 47,48.)
In addition, if there is no display pattern that you want from P01 to P09, select the special display pattern P00 to configure the screen freely.
(For more information about setting the special display pattern P00, refer to page32,33)

○ : Displayable at this display setting.
△ : Set at other additional settings.
□ : Select "P00" and set the display order and display position.

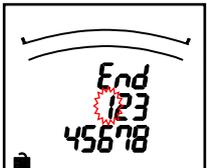
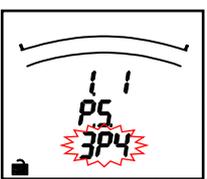
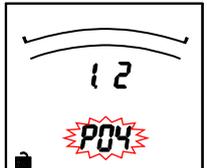
(1)For 3-phase 4-wire

Display Pattern	Current	N Phase Current	Current Demand	N Phase Current Demand	Voltage	Active Power	Power Factor	Frequency	Active Energy (Imported)	Additional display		
										Active Energy (Imported)	Harmonic Current / Voltage	Operation time
P01	○	○			○	○	○				△	△
P02	○	○			○	○	○	○			△	△
P03	○	○			○						△	△
P04	○	○			○	○					△	△
P05	○	○			○	○		○	○		△	△
P06	○	○	○	○	○						△	△
P07	○	○	○	○	○	○					△	△
P08	○	○	○	○	○				○	○	△	△
P09	○	○	○	○	○	○			○	○	△	△
P00	□	□	□	□	□	□	□	□	□	□	△	△

Note: The following settings are required for displaying elements on an additional display.

Measurement element on additional display	Setting item	Reference Pages
Operation time	Setting Menu 8 Operation time display	Page 28

※When display elements does not set active energy, 'P00' of active energy on additional display does not appear.

3. Setting

3.2 Setting menu 1: Basic Settings (Setting the Phase Wire System, Display Pattern, VT/Direct Voltage, CT Primary Current, etc.)

(2) For other phase wire system except 3-phase 4-wire

Display Pattern	Current	Current Demand	Voltage	Active Power	Power Factor	Frequency	Active Energy (Imported)	Additional display		
								Active Energy (Imported)	Harmonic Current/ Voltage	Operation time
P01	○		○	○	○				△	△
P02	○		○	○	○	○	○	○	△	△
P03	○		○						△	△
P04	○		○	○					△	△
P05	○		○	○			○	○	△	△
P06	○	○	○						△	△
P07	○	○	○	○					△	△
P08	○	○	○				○	○	△	△
P09	○	○	○	○			○	○	△	△
P00	□	□	□	□	□	□	□	△	△	△

Note: The following settings are required for displaying elements on an additional display.

Measurement element on additional display	Setting item	Reference Pages
Operation time	Setting Menu 8 Operation time display	Page 28

※When display elements does not set active energy, 'P00' of active energy on additional display does not appear.

Set the VT

When direct input (without VT) ⇒ Select no, and then press **SET**, shift to following (1).

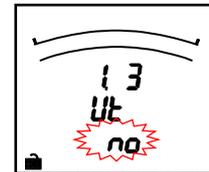
When using VT ⇒ Select yES, and then press **SET**, shift to following (2)

1. For 3-phase 4-wire

no ↔ yES

2. For 3-phase 3-wire or 1-phase 2-wire

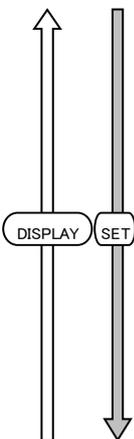
yES ↔ no



<When ① phase wire system is set to 1-phase 3-wire>
Use only for direct input. This setting will be skipped.

Note. VT is voltage transformers.

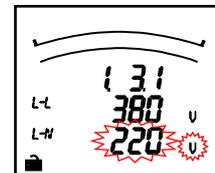
③ VT / direct voltage



(1) For direct input (without VT) Set the direct voltage.

(a) For 3-phase 4-wire

(phase to neutral voltage / phase to phase voltage)



63.5/110V ↔ 100/173V ↔ 110/190V ↔ 220/380V ↔ 230/400V ↔ 240/415V
↕
277/480V ↔ 254/440V

(b) For 3-phase 3-wire (2CT, 3CT) or 1-phase 2-wire

110V ↔ 220V ↔ 440V

(c) For 1-phase 3-wire (1N2, 1N3) (phase to neutral voltage / phase to phase voltage)

110/220V ↔ 220/440V

3. Setting

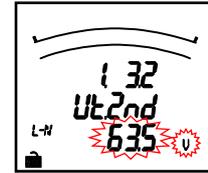
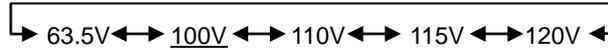
3.2 Setting menu 1: Basic Settings (Setting the Phase Wire System, Display Pattern, VT/Direct Voltage, CT Primary Current, etc.)

Continued from the previous page

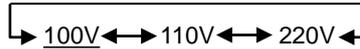
(2) When using VT

<Set the secondary and primary voltages of the VT.>

(a) For 3-phase 4-wire(Phase to phase Voltage)



(b) For 3-phase 3-wire (2CT, 3CT) or 1-phase 2-wire(phase to neutral voltage)

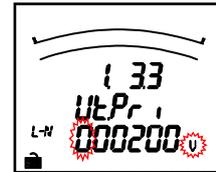


<Primary Voltage Settings>

Default value

For 3-phase 4-wire : 200V(Phase to phase Voltage)

For 3-phase 3-wire or 1-phase 2-wire : 10000V
(phase to neutral voltage)

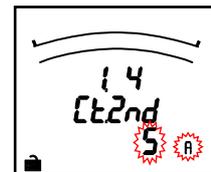


- From top digit, select the value of the flickering digit by (+) and (-)
- The setting digit can be moved to right by (SET)
- The setting digit can be moved to left by (DISPLAY)
- Setting is available in range from 60V to 750000V
 - Less than 100V : Upper 2 digits setting
 - Over 100V : Upper 3 digits setting
- ※Error display (E05) appears when set out of 60V to 750000V range.
After that, please press (SET) review the setting value and set it once Again.
- ※When over 100V set over upper 3 digits setting, the display appear switching upper 3 digits setting.
- Press (SET) at the lowest digit, the setting step will shift to the next one.

Set the CT.

Primary / secondary Current Setting

<Set the secondary current>



Note. CT is current transformers.

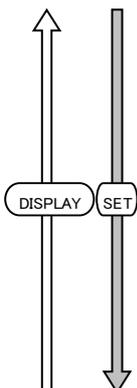
<Set the primary current>

Default Setting : 5.0A



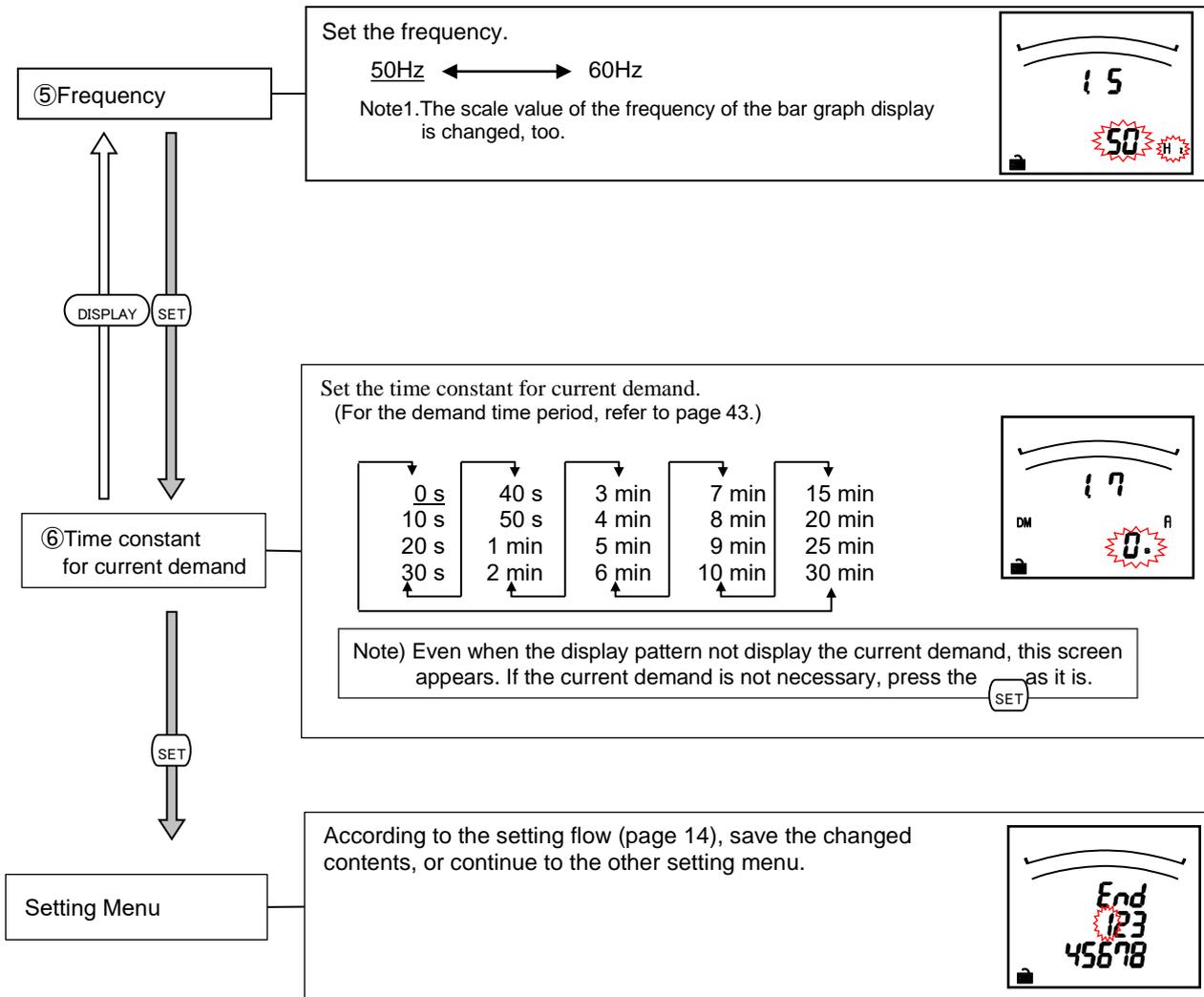
- From top digit, select the value of the flickering digit by (+) and (-)
- The setting digit can be moved to right by the (SET).
- The setting digit can be moved to left by the (DISPLAY).
- Setting is available in range from 1.0A to 30000.0A
 - Less than 10A : Upper 2 digits setting
 - Over 10A : Upper 3 digits setting
- ※Error display (E05) appears when set out of 1.0 to 30000.0A range. After that, please press (SET), review the setting value and set it once again.
- ※When over 10A set over upper 3 digits setting, the display appear switching upper 3 digits setting.
- Press (SET) at the lowest digit, the setting step will shift to the next one.

④CT current



3. Setting

3.2 Setting menu 1: Basic Settings (Setting the Phase Wire System, Display Pattern, VT/Direct Voltage, CT Primary Current, etc.)



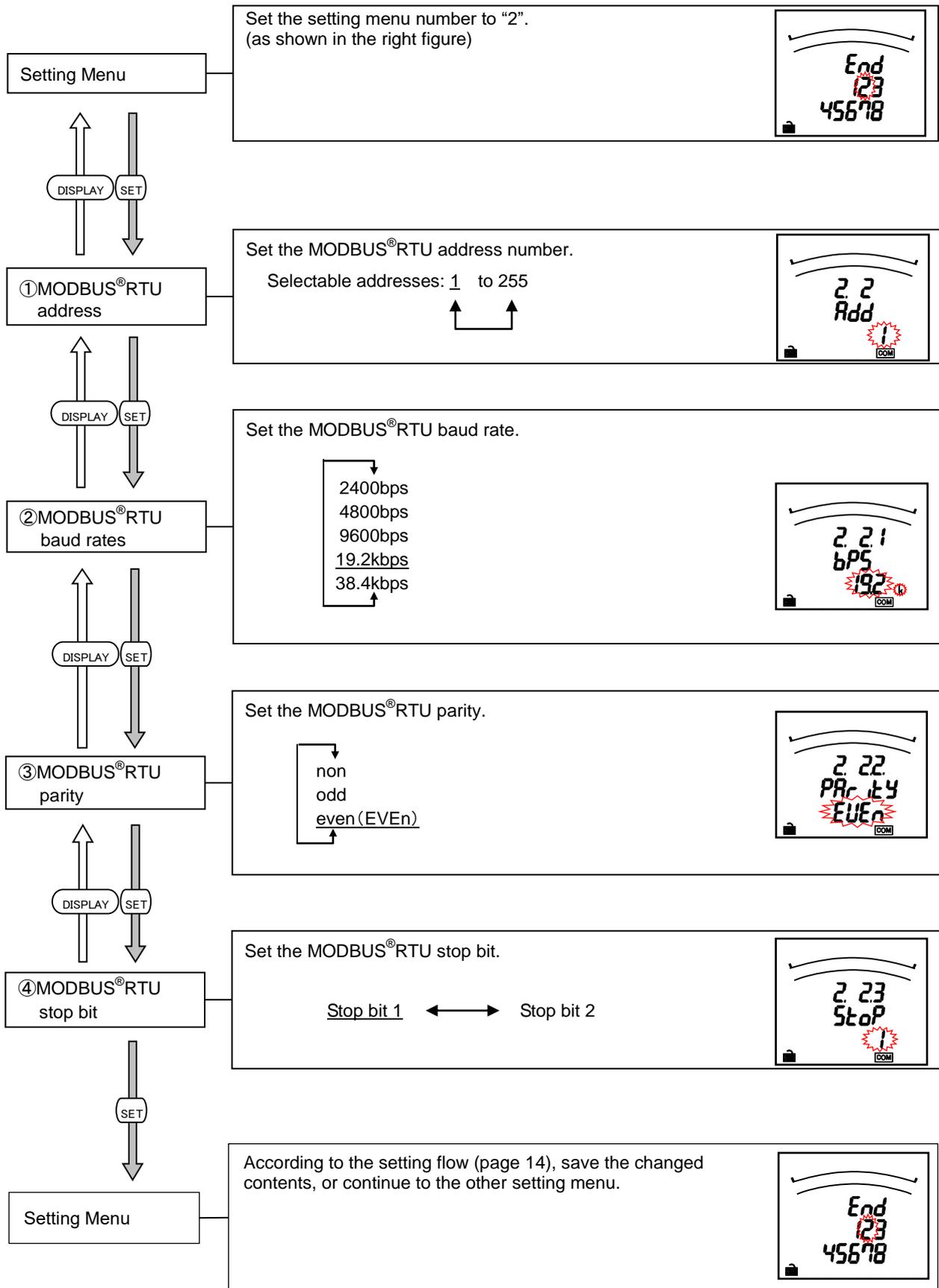
In the case of use only by the Setting menu 1, please go to “5. Operation” (from page 38).
 In the case to use additional functions, please go to “Setting Menus 2 - 8” (from page 20).

Note	<p>If the contents in the setting menu 1 are changed, the maximum value, minimum value, demand value of related measurement items will be reset. (However, active energy will not be reset.) For detail, refer to section 3.11.</p>
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3. Setting

3.3. Setting Menu 2: Communication Settings (Setting the MODBUS®RTU communication)

In the operation mode, press (SET) + (RESET) simultaneously for 2 seconds or more, and the following operation becomes available.

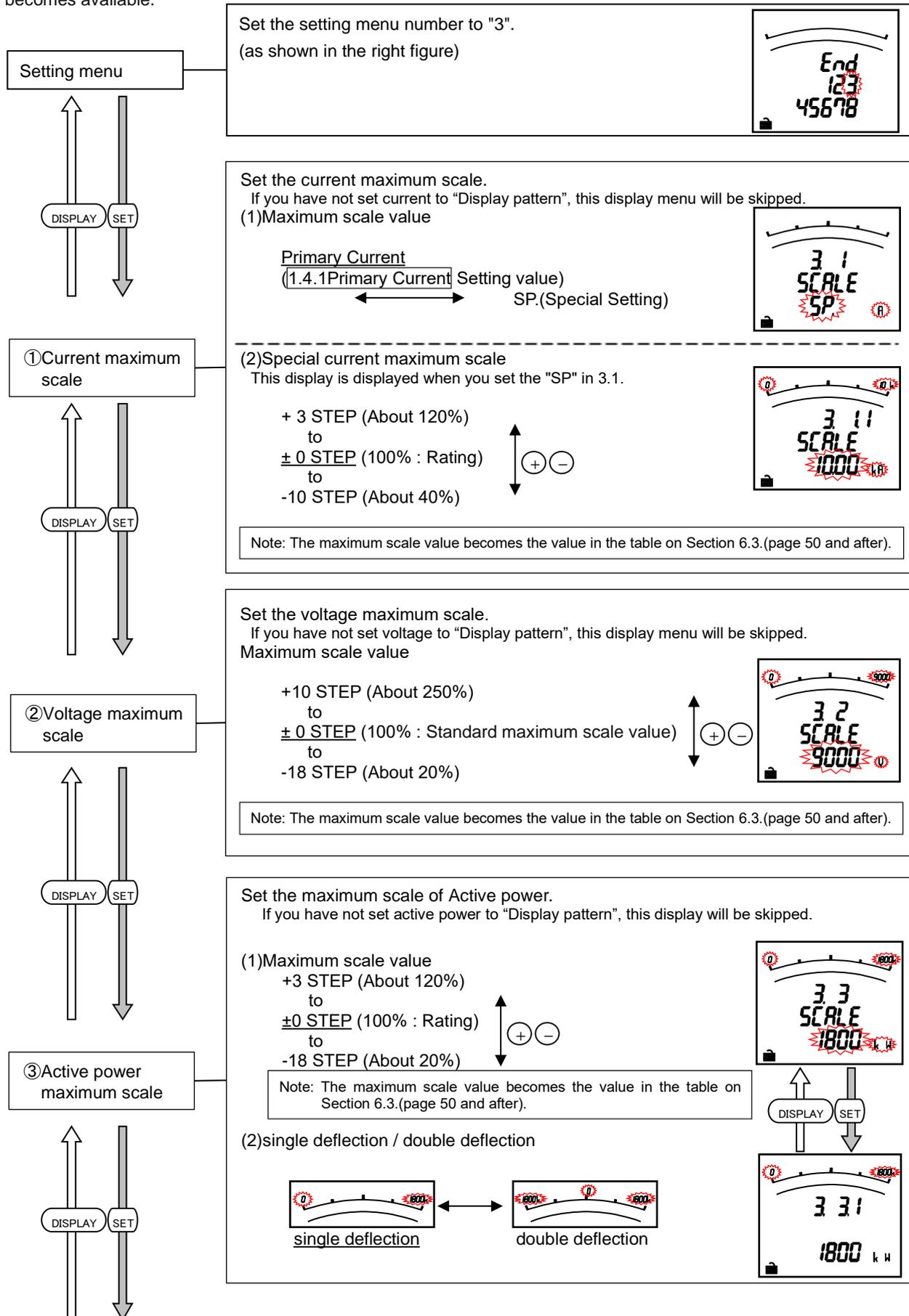


3. Setting

3.4. Setting Menu 3: Display Settings (Setting Maximum Scale and Harmonic Display)

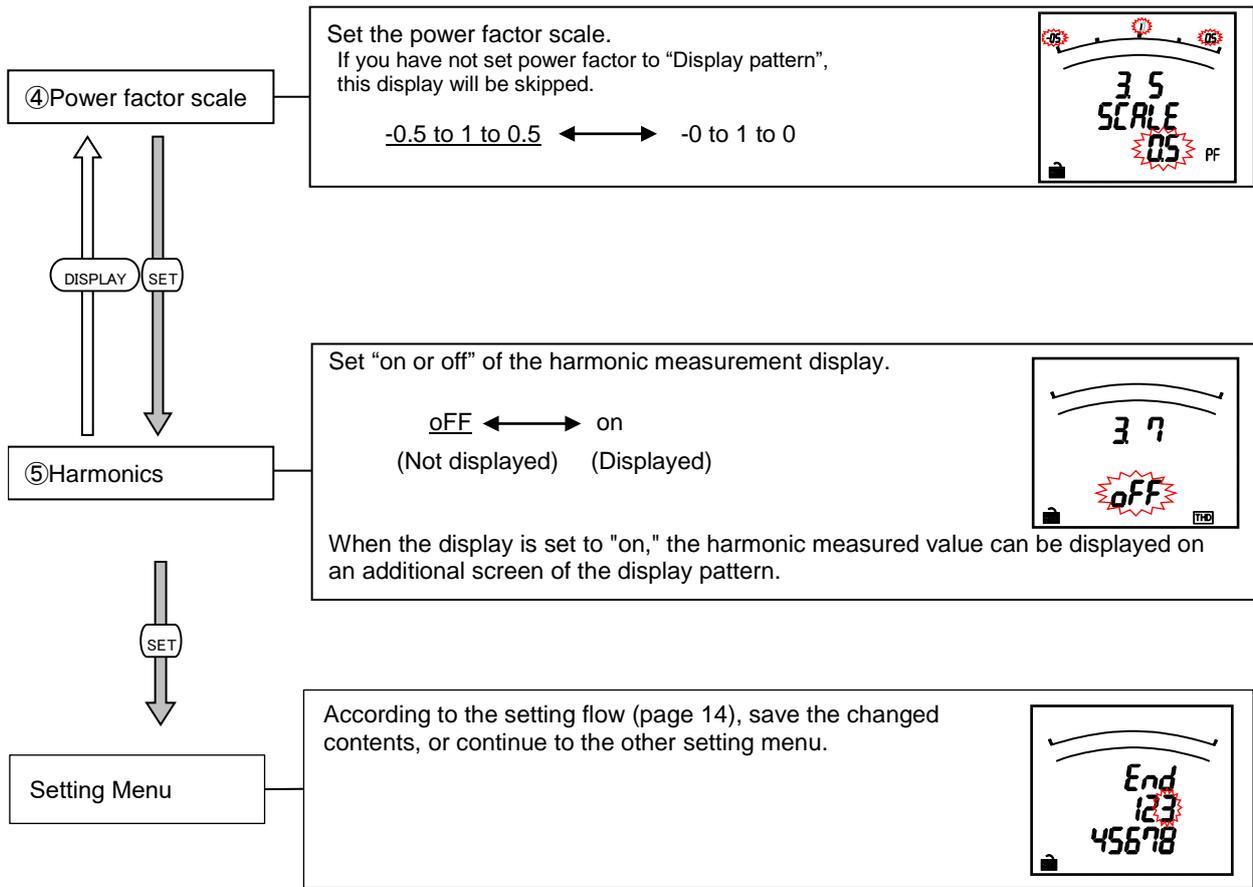
This section shows how to set maximum scale in the bar graph and harmonics display.

In the operation mode, press **(SET)** and **(RESET)** simultaneously for 2 seconds or more, and the following operation becomes available.



3. Setting

3.4 Setting Menu 3: Display Settings (Setting Maximum Scale and Harmonic Display)

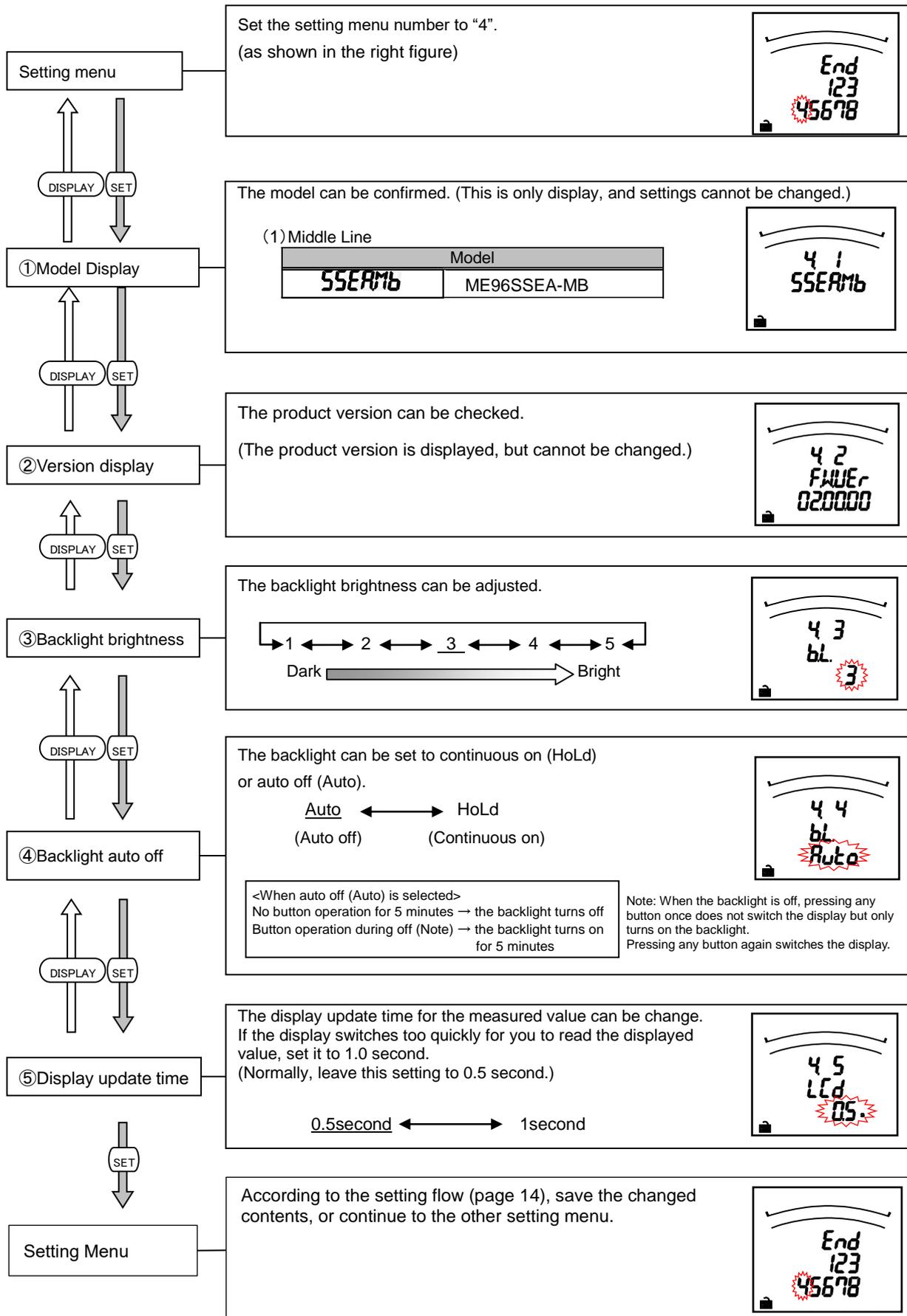


Note	<ul style="list-style-type: none"> ●Accuracy is defined to rated current. Although the maximum scale may display 120% or more of rated current and rated voltage in order to make a scale easy to read depending on the settings of VT/direct voltage and CT primary current, current input is within 100% of rated current.
-------------	---

3. Setting

3.5. Setting Menu 4: LCD Settings (Setting Model Display, Version Display, Backlight, and Display Update Time)

This section is for confirming the model and the product version, and also set the backlight and the display update time. In the operation mode, press (SET)+(RESET) simultaneously for 2 seconds or more, and the following operation becomes available.



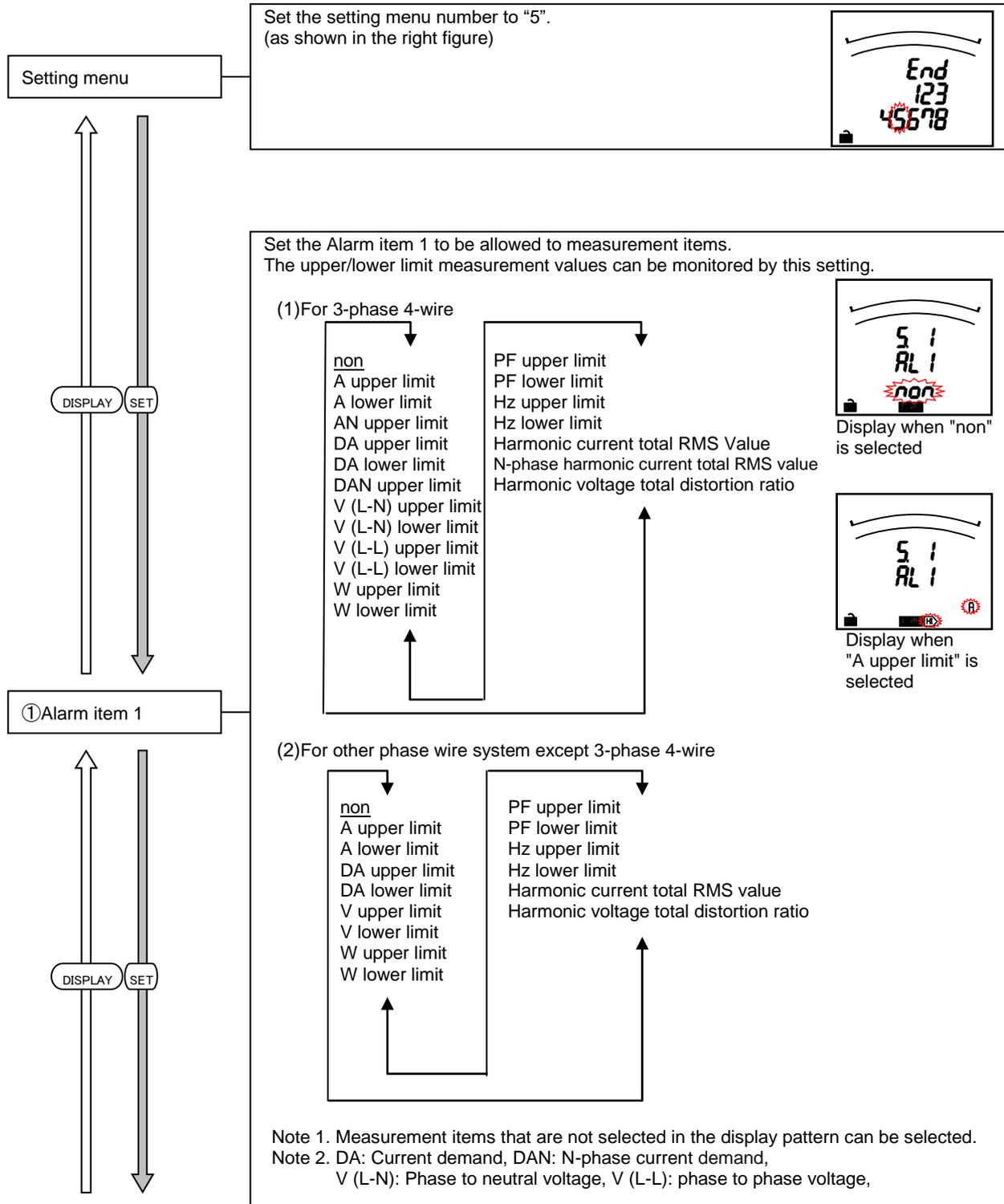
3. Setting

3.6. Setting Menu 5: Alarm Settings (Setting Upper/Lower Limit Alarm, Motor Starting

Current Mask Function, etc.)

This section shows how to set the upper/lower limit alarm, backlight flickering during alarm and, motor starting current delay time. In the operation mode, press **SET** and **RESET** simultaneously for 2 seconds or more, and the following operation becomes available.

For more details about each function, refer to the corresponding pages.
 Upper/lower limit alarm → Pages 44 and 45, Motor startup current → Page 46



3. Setting

3.6 Setting Menu 5: Alarm Settings (Setting Upper/Lower Limit Alarm, Motor Starting

Current Mask Function, etc.)

Set the alarm value for upper/lower limit alarm element 1. The following table shows the setting range.

Measuring element	Setting range	Setting step(Note)
A, AN, DA, DAN upper limit	5 to <u>10</u> to 120(%)	1%
A, DA lower limit	3 to <u>10</u> to 95(%)	1%
V (L-N), V (L-L) upper limit	25 to <u>110</u> to 135(%)	1%
V (L-N), V (L-L) lower limit	20 to <u>70</u> to 95(%)	1%
W upper limit	-95 to <u>100</u> to 120(%)	1%
W lower limit	-120 to <u>3</u> to 95(%)	1%
PF upper limit	-0.05 to <u>1</u> to 0.05	0.05
PF lower limit	-0.05 to <u>-0.5</u> to 0.05	0.05
Hz upper limit	45 to <u>65</u> (Hz)	1Hz
Hz lower limit	<u>45</u> to 65(Hz)	1Hz
Harmonic current total RMS value	1 to <u>35</u> to 120(%)	1%
N-phase harmonic current total RMS value	1 to <u>35</u> to 120(%)	1%
Harmonic voltage total distortion ratio	0.5 to <u>3.5</u> to 20.0(%)	0.5%



Note: W shows the percentage for the maximum scale value (± 0 step).

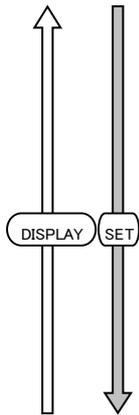
A, AN, DA, DAN, Harmonic current total RMS value, N-phase harmonic current total RMS value shows the percentage for the CT primary current.

"V" shows the percentage for the VT primary voltage (or direct voltage).

(The "V" for 1-phase 3-wire is the percentage for phase to neutral voltage.)

Alarm monitoring is executed using twice the value which set upper/lower limit alarm for the 12-phase and 13-phase.)

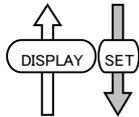
② Alarm value 1



Set the measurement element assigned to the upper/lower limit alarm items 2 to 4. Elements that are set elsewhere cannot be set.

The setting method is the same as ① Alarm item 1.

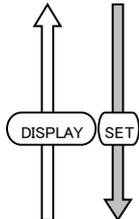
③ Alarm item 2 to 4



Set the alarm value for the upper/lower limit alarm items 2 to 4.

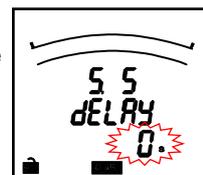
The setting method is the same as ② Alarm value 1.

④ Alarm value 2 to 4

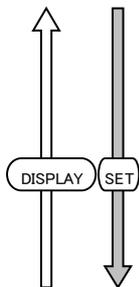


Set the alarm mask time for when you want to prevent a momentary overload or noise alarm.

When this is set, an alarm is generated only when the alarm value over the upper/lower limit alarm value for a longer time than the delay time. On the setting screen, seconds are indicated by "s" and minutes are indicated by "min".



⑤ Alarm delay time



0s	30s	2min
5s	40s	3min
10s	50s	4min
20s	1min	5min

Note:

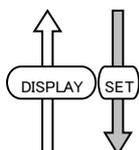
When all settings for ① Alarm item 1 and ③ Alarm item 2 to 4 are set to "non", this setting will be skipped.

Set the alarm cancel method at generation of alarm. (screen, relay)

Reset method (Setting value)	Description (Refer to pages 44 and 45)
Automatic (Auto)	When there is no alarm generation condition, alarm is automatically reset.
Manual (HoLd)	The alarm will continue even when the alarm generated conditions no longer exist. It is necessary to execute button operation to cancel the alarm.



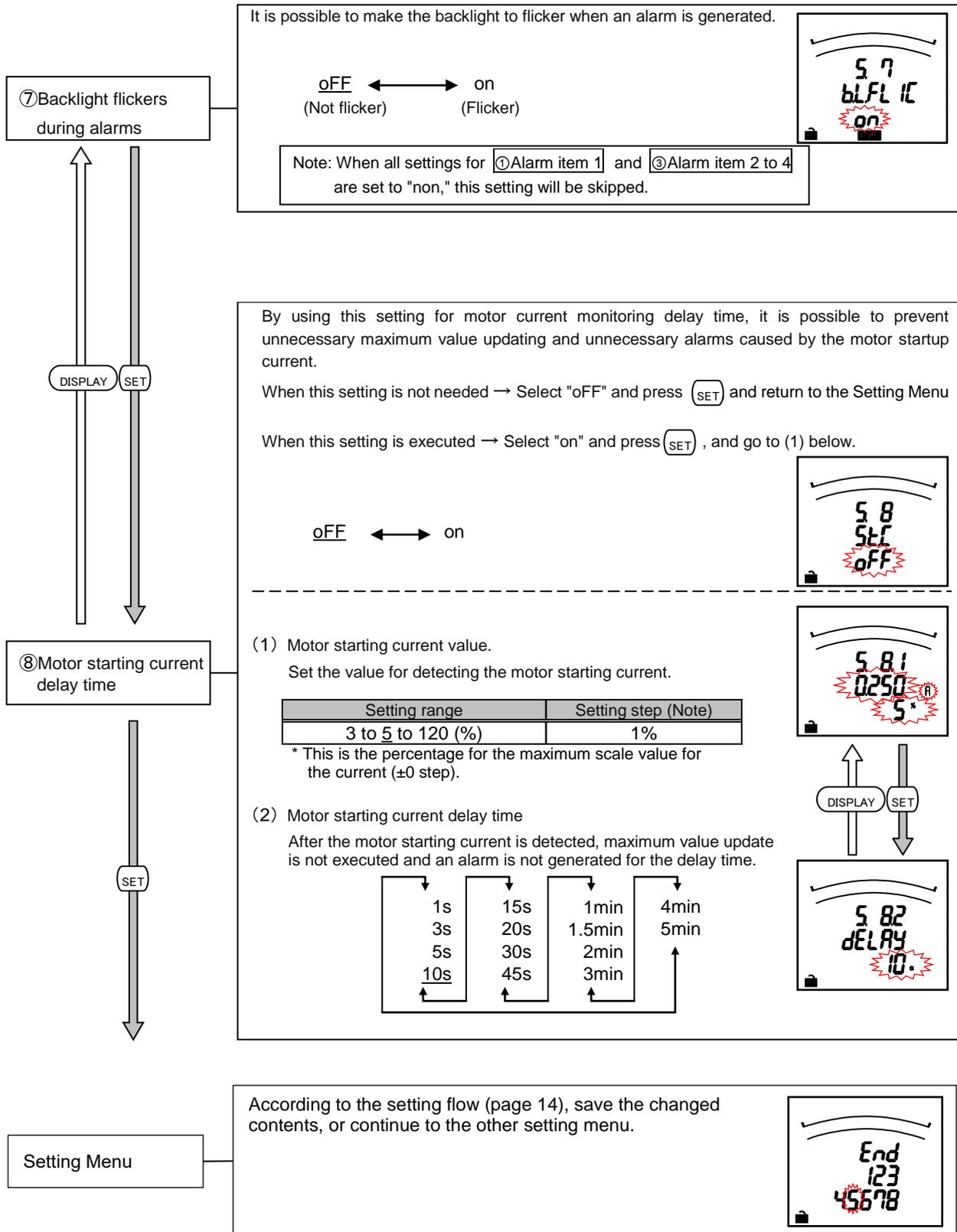
⑥ Alarm cancel method



Note: When all settings for ① Alarm item 1 and ③ Alarm item 2 to 4 are set to "non," this setting will be skipped.

3. Setting

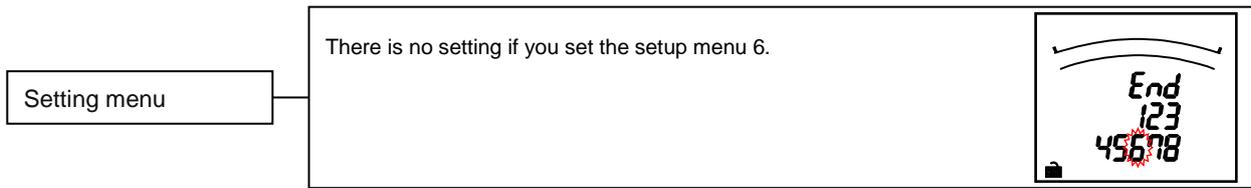
3.6 Setting Menu 5: Alarm Settings (Setting Upper/Lower Limit Alarm, Motor Starting Current Mask Function, etc.)



3. Setting

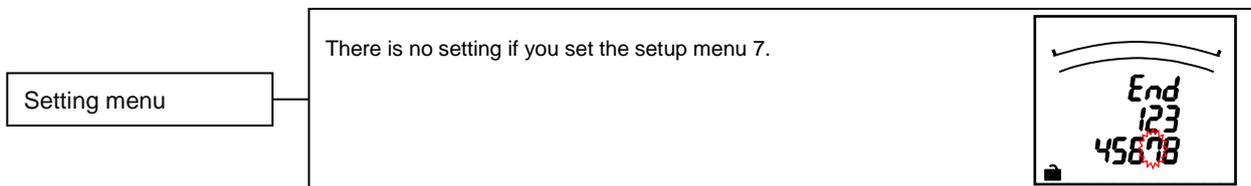
3.7. Setting Menu 6: No Settings

Since there is no corresponding function, this setting item is not displayed.



3.8. Setting Menu 7: No Settings

Since there is no corresponding function, this setting item is not displayed.



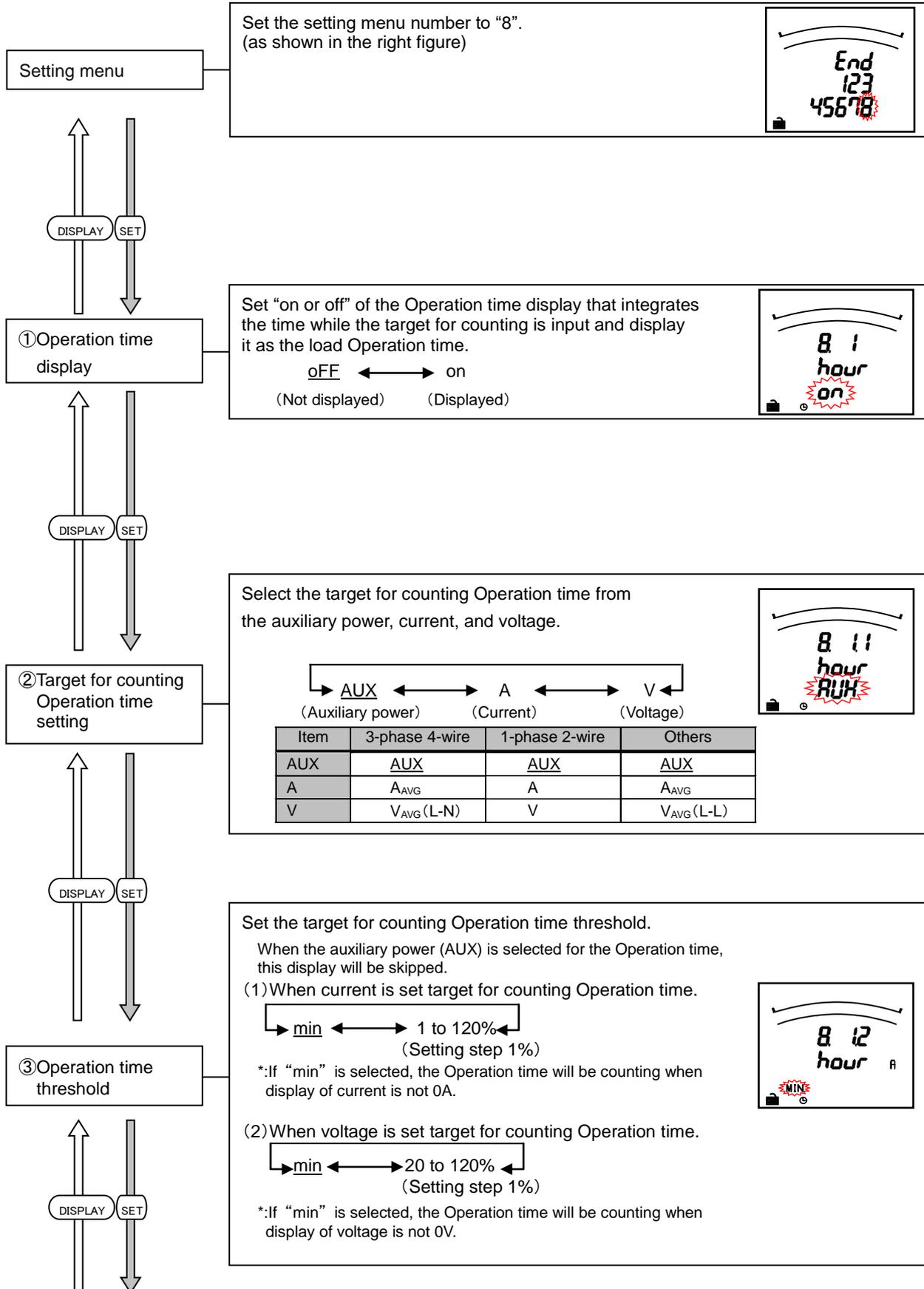
3. Setting

3.9. Setting Menu 8: Special Settings (Setting Operation Time, Phase Display, IEC Mode)

Set the operation time, phase display, IEC mode.

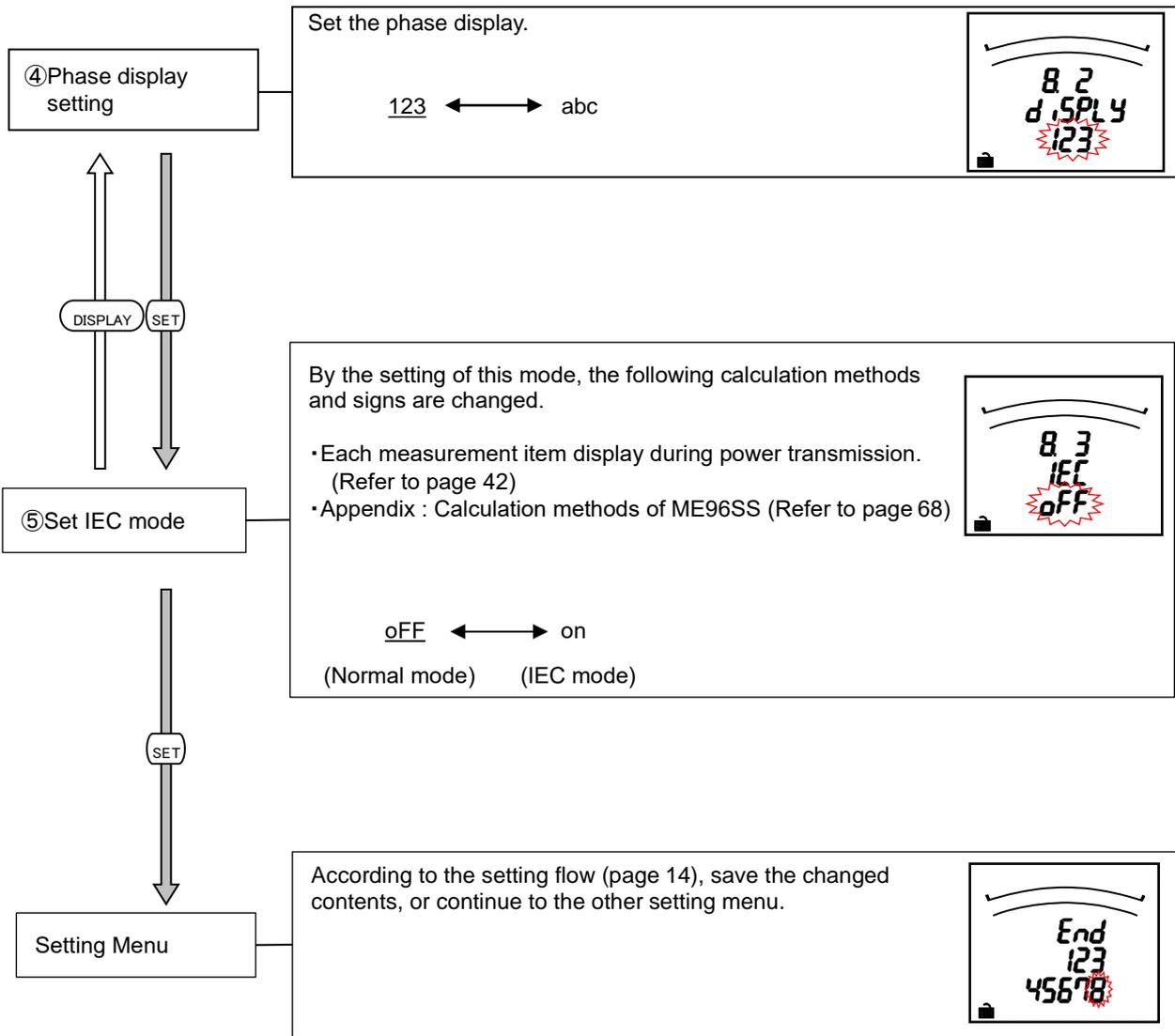
In the operation mode, press **SET** and **RESET** simultaneously for 2 seconds or more, and the following operation becomes available.

(For more details about each function, refer to the corresponding pages.)
 Operation time ⇒ page 45



3. Setting

3.10. Setting Menu 8: Special Settings (Setting Operation Time, Phase Display, IEC Mode)



3. Setting

3.10. Setting Value Confirmation Menus 1-9: Confirming the Settings in the Setting Menus 1-8 and Test Mode in Setting Menu 9

● Setting Value Confirmation

When **(SET)** is pressed for at least 2 seconds in the operation mode, the following operation becomes available.

Setting value confirmation menu	<p>The screen transitions and operations are the same as for Setting Menus 1 to 8 and CL. Refer to Setting Menus 1 to 8 and CL (pages 16 to29). (Note: Settings cannot be changed in the Setting value confirmation mode.)</p>	
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● Test Mode

Press **(SET)** for 2 seconds to move the set values confirmation mode.
Select setting value confirmation menu number "9". Press **(SET)** to move to test mode.
For more information about how to use the Test Mode, refer to page 36 or later.

3. Setting

3.11. Initializing Related Items by Changing Settings

When a setting value is changed, the related setting items and measurement data (maximum/minimum values) will return to the default settings. Refer to the following list.

Setting item to be changed		Menu 1		Menu 5	Menu 8				
		Phase wire system (Note)	VT / direct voltage	CT current		Upper/lower limit alarm item	Target for counting Operation time	Setting of IEC mode	
				CT secondary current	CT primary current				
Initialized item									
Setting item	Menu 1	Phase wire system							
		Display pattern	●						
		VT/direct voltage	○						
	Menu 3	Current scale			●				
		Voltage scale	●	●					
		Power scale	●	●	●				
		Reactive power scale	●	●	●				
	Menu 5	Upper/lower limit alarm item	●						
		Upper/lower limit alarm value	●			●			
Menu 8	Threshold for counting Operation time					●			
Measurement data	Current Maximum/minimum value	●		●	●				
	Current demand Maximum/minimum value	●		●	●				
	Voltage Maximum/minimum value	●	●						
	Active power Maximum/minimum value	●	●	●	●				
	Power factor Maximum/minimum value	●	●	●	●			●	
	Frequency Maximum/minimum value	●							
	Harmonic current Maximum value	●		●	●				
	Harmonic voltage Maximum value	●	●						

● : The setting value will be reset to the default value.

○ : The setting will be reset to the value corresponding to the phase wire system.

Note: The settings will not return to the default values when the setting is switched only between "1N2 display" and "1N3 display" in the 1-phase 3-wire setting.

3.12. Initializing All Settings

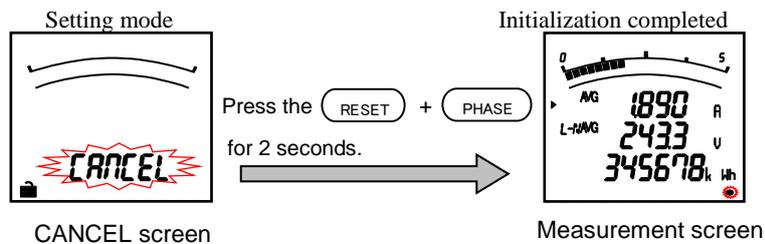
When the following operations are executed, all settings are initialized to the factory defaults. Only the settings are initialized to the defaults. The measured active energy value and operating time etc. are not initialized.

For the initializing of maximum/minimum value, refer to the section 3.11 (page 31).

(For example, if the phase wire system is changed by initializing all settings, all maximum/minimum values will be initialized.)

To initialize all settings to the factory defaults, execute the following operation from the CANCEL screen in the setting mode.

For more information about how to get to the CANCEL screen, refer to 3.1 Setting flow (page 14).



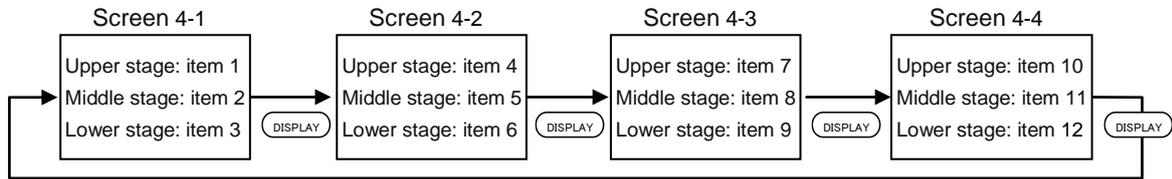
3. Setting

3.13. Setting the Special Display Pattern P00

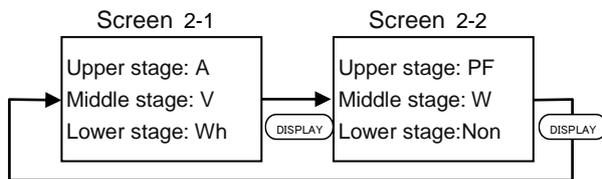
Even if there is no display pattern that you like in the display patterns P01 to P13, individual setting is available by the display pattern P00.

This setting is made in the setting menu 1. Explanation begins with the set "P00" in ②display pattern of the setting menu 1 (page 16). (Others are omitted here, so refer to the setting menu 1.)

- (1) The number of settable display is up to 4. And the number of measurement elements to be displayed is up to 12 items.



- (2) Explanation is made with the example of the following display pattern.



- (3) Setting method

②Display pattern

Set the display pattern.

(1) Select "P00".
Select "P00" by \oplus or \ominus and press SET.

(2) Set the upper stage of the display 4-1 to A.
Select "A" by \oplus or \ominus and press SET.

(3) Set the middle stage of the display 4-1 to V.
Select "V" by \oplus or \ominus and press SET.

(4) Set the lower stage of the display 4-1 to Wh.
Select "Wh" by \oplus or \ominus and press SET.

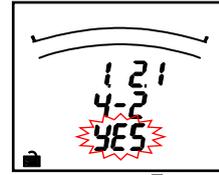
3. Setting

3.13. Setting the Special Display Pattern P00

Continued from the previous page

(5) Set the display of the display 4-2.

Select "yES" by \oplus or \ominus and press SET .

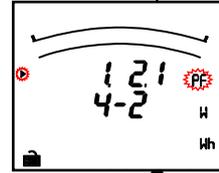


When you do not want to display the display 2, select "no" and press SET .



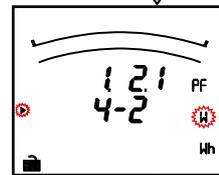
(6) Set the upper stage of the display 4-2 to PF.

Select "PF" by \oplus or \ominus and press SET .



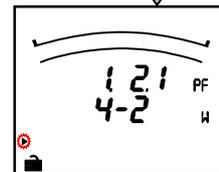
(7) Set the upper stage of the display 4-2 to W.

Select "W" by \oplus or \ominus and press SET .



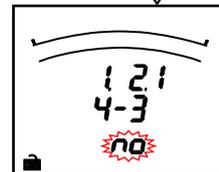
(8) Set the lower stage of the display 4-2 to no display.

Set the unit code of the lower stage to no display by \oplus or \ominus and press SET .



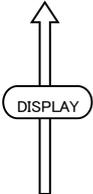
(9) Set the display 4-3 to no display.

Select "no" by \oplus or \ominus and press SET .



Note: When the display 4-3 is set to no display, the display 4-4 is also set to no display automatically.

Returns to the setting for the upper stage of the display 4-1.



③VT / direct voltage

(hereafter same as the setting menu 1)

Note

- The following measurement items cannot be set by the display pattern "P00." Set them separately in the "Setting menu 3" and "Setting menu 8."
 - Harmonic current, Harmonic voltage,
 - Operation time
- The phases of current and voltage cannot be specified. Press the PHASE button in the operation mode for switching phases.
- For the settings other than the 3-phase 4-wire setting, the following measurement items cannot be set.
 - N-phase current, N-phase current demand, apparent power, apparent energy

3. Setting

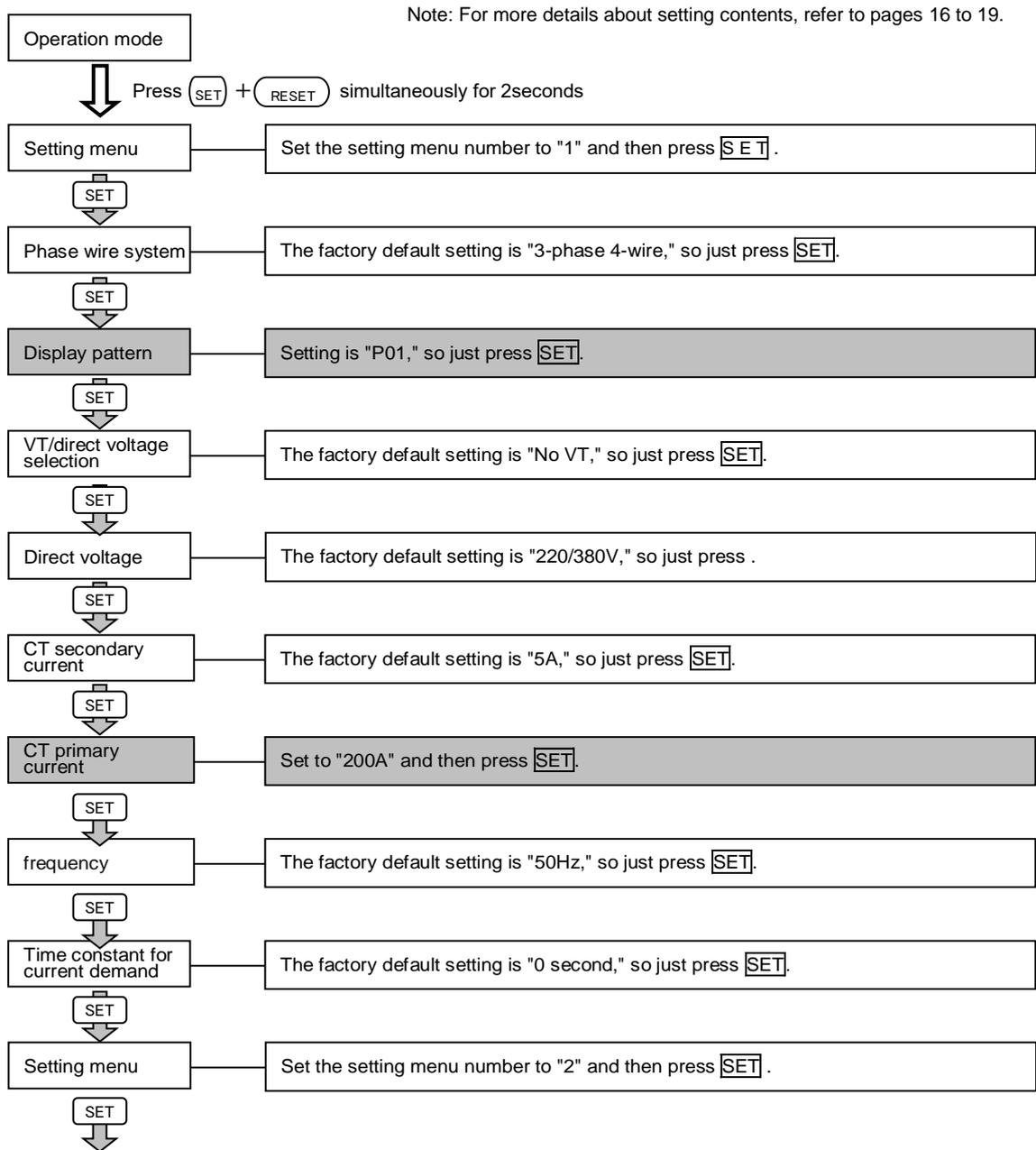
3.14. Examples of Simple Settings

The following shows a simple setting example.

- Setting Example Model: ME96SSEA-MB
- Phase wire system : 3-phase 4-wire
- Measuring element : A, V, W, PF
- Input Voltage :220/380V
- CT primary current : 200A
- CT Secondary current:5A
- frequency :50Hz
- MODBUS®RTU: address 1, baud rates 19.2kbps, parity even, stop bit 1

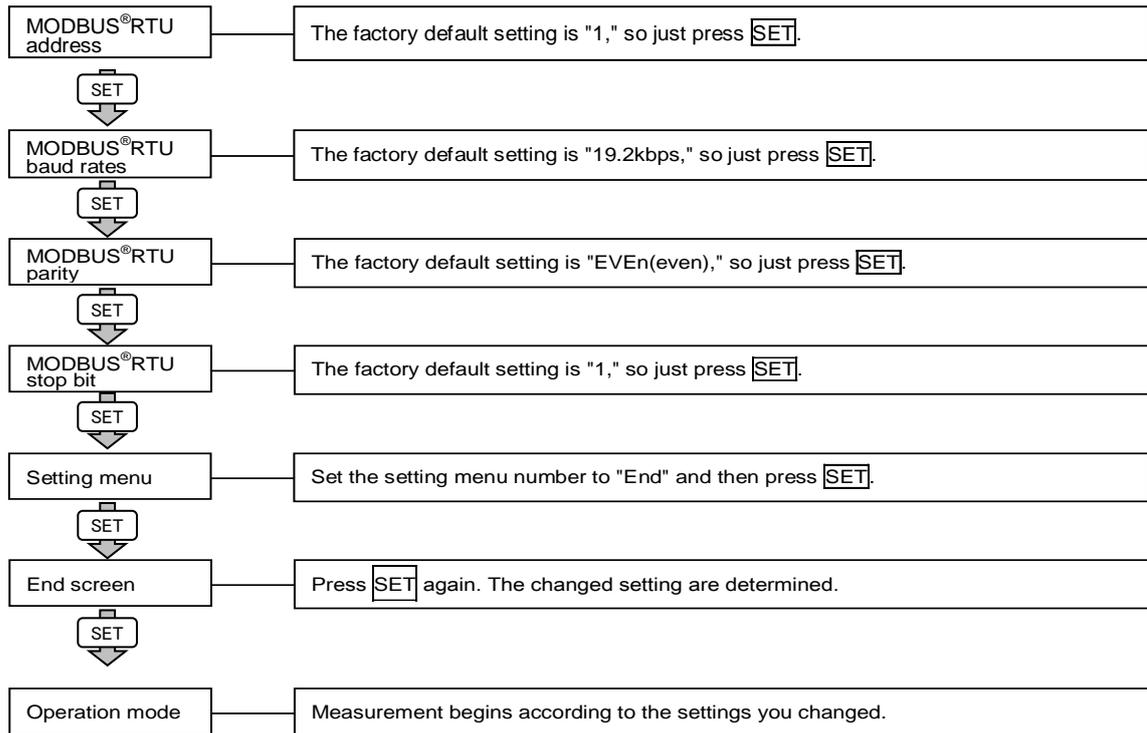
■ Setting Procedure

Items of which setting value need to be changed are indicated by .



3. Setting

3.14. Examples of Simple Settings



4. Using Test Mode

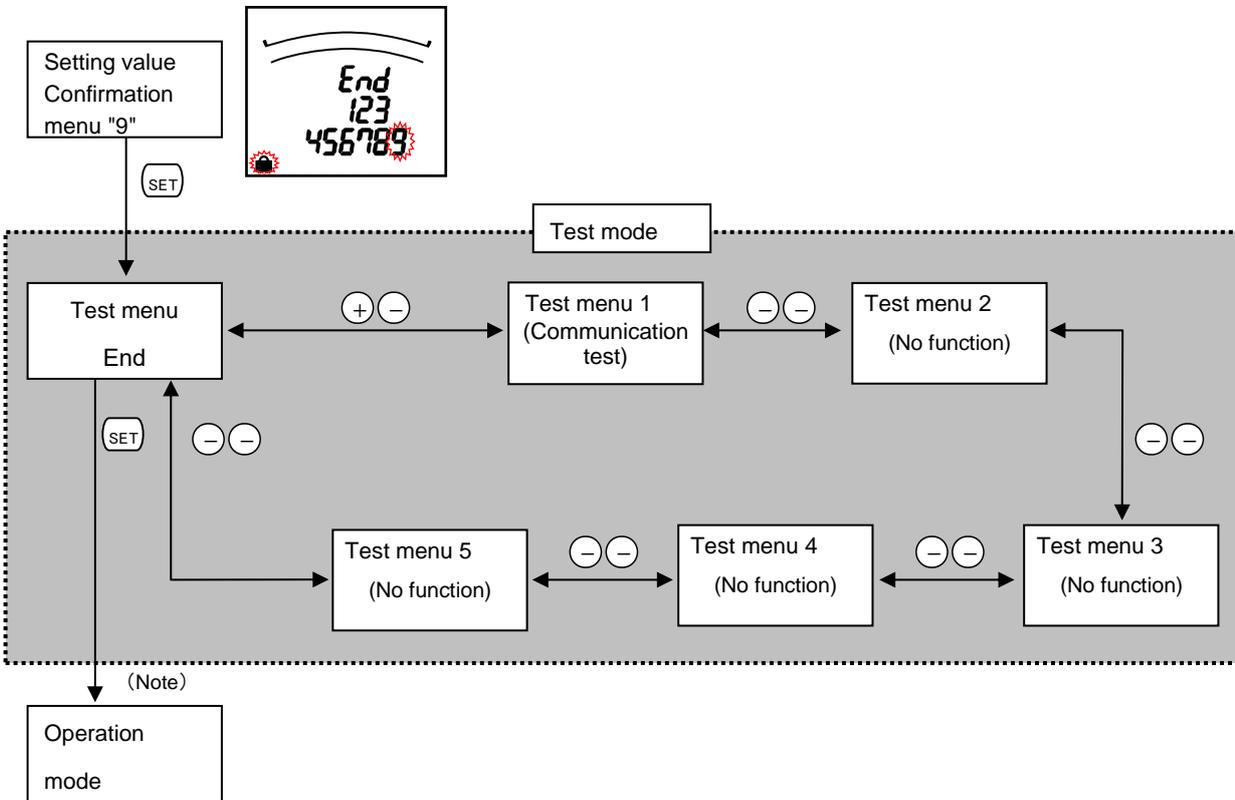
Test mode includes functions that can be used for start-up of equipment.
The following table shows what can be done in the test mode.

Test menu	Description
1. Communication test	For MODBUS@RTU communication function, it is possible to monitor fixed numerical data without measurement (voltage/current) input. Use this for checking with the host system.
2 to 5. No function	—

■ Test Procedure

- ① Press **(SET)** for 2 seconds to move to the set value confirmation mode.
- ② Select setting value confirmation menu number "9" by **(+)** and **(-)**.
- ③ Press **(SET)** to move to test mode.
- ④ Execute tests using test menu 1. (Refer to pages 37)

■ Test Mode Flow

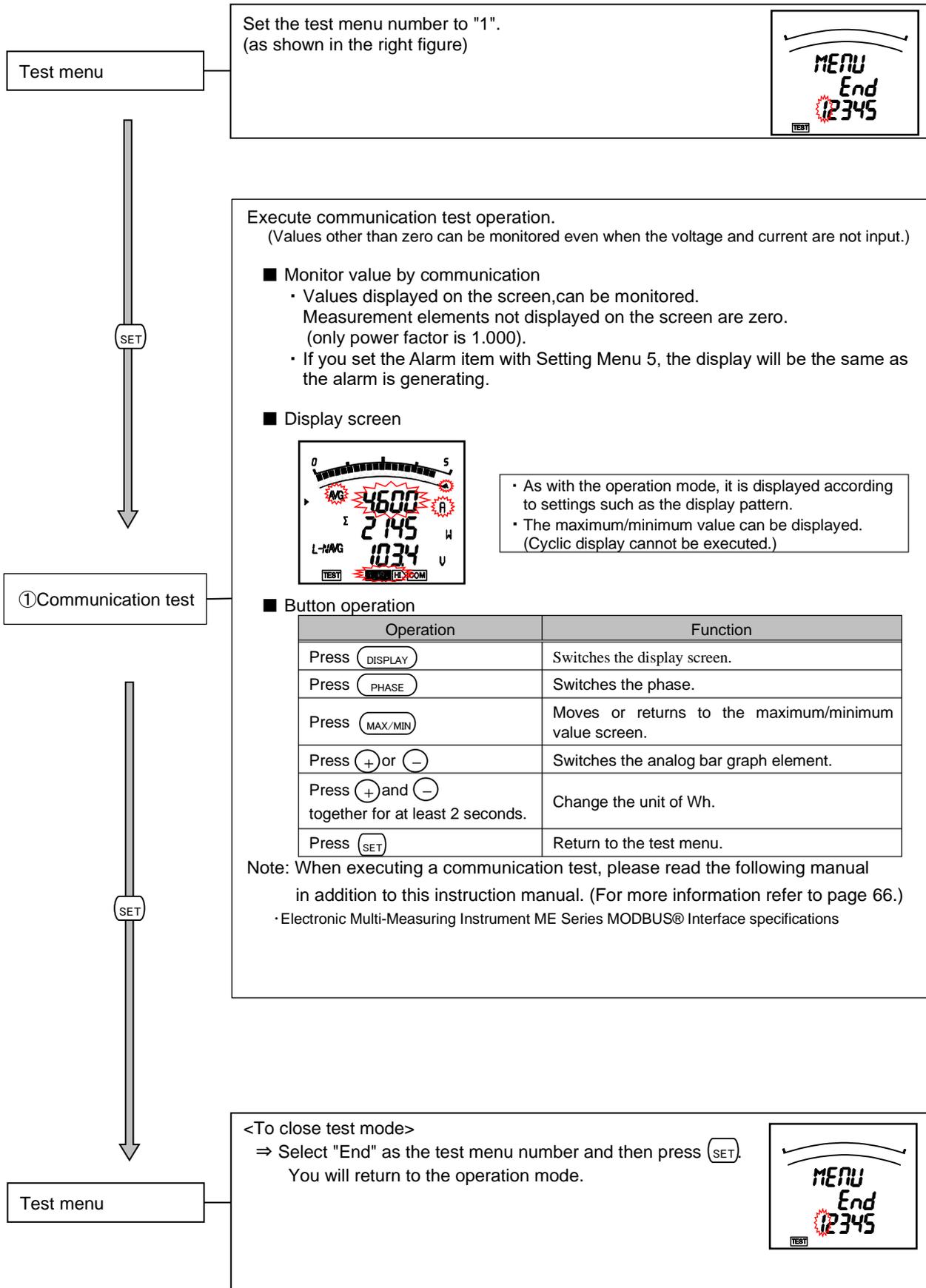


(Note) The screen momentarily turns off.

4. Using Test Mode

4.1. Test Menu 1: Communication Test

In the setting value confirmation mode, when the menu number is set to "9", you will enter the test mode.



5. Operation

5.1. Basic Operation

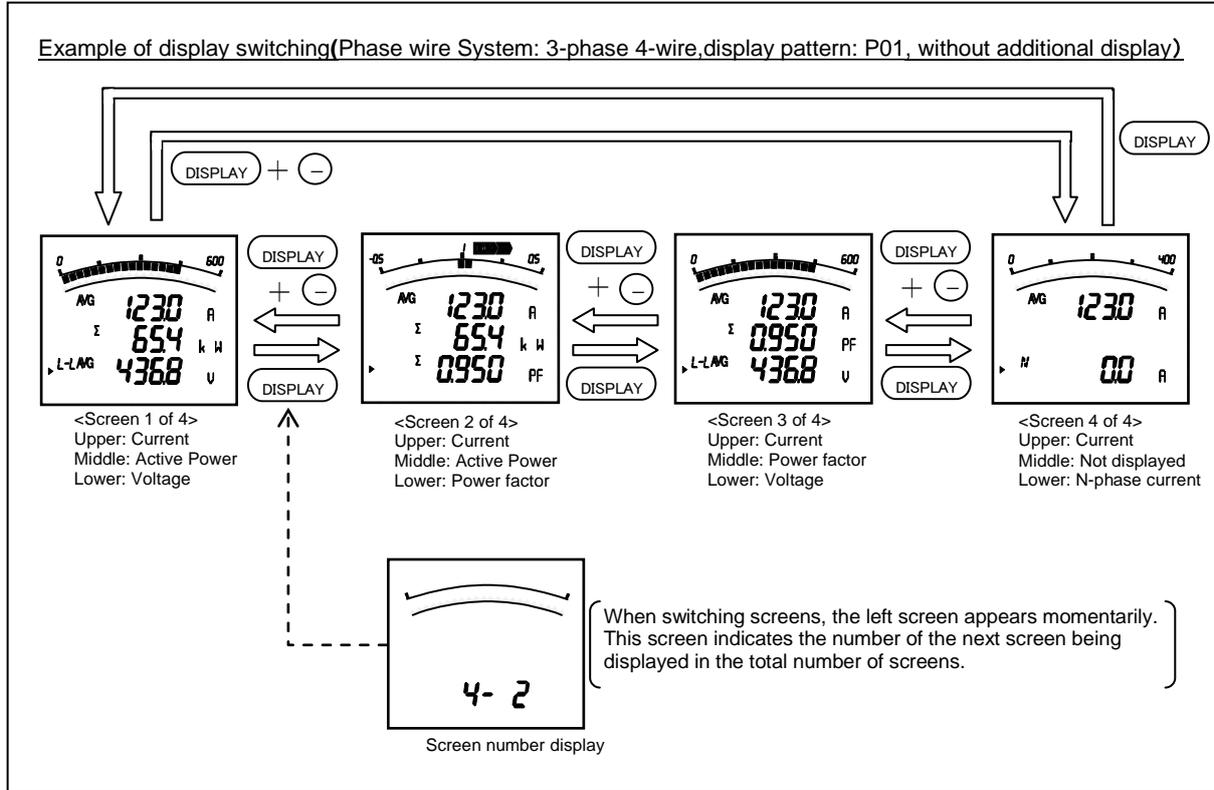
The following explains basic usages during operation.

Display items and the order differ depending on the phase wire method setting display pattern settings and additional screen. For more information about detailed display patterns, refer to pages 47 and 48.

● Switch display

By pressing **DISPLAY**, the measurement display will switch over.

By pressing **DISPLAY** + **-**, the measurement display will switch over in reverse.

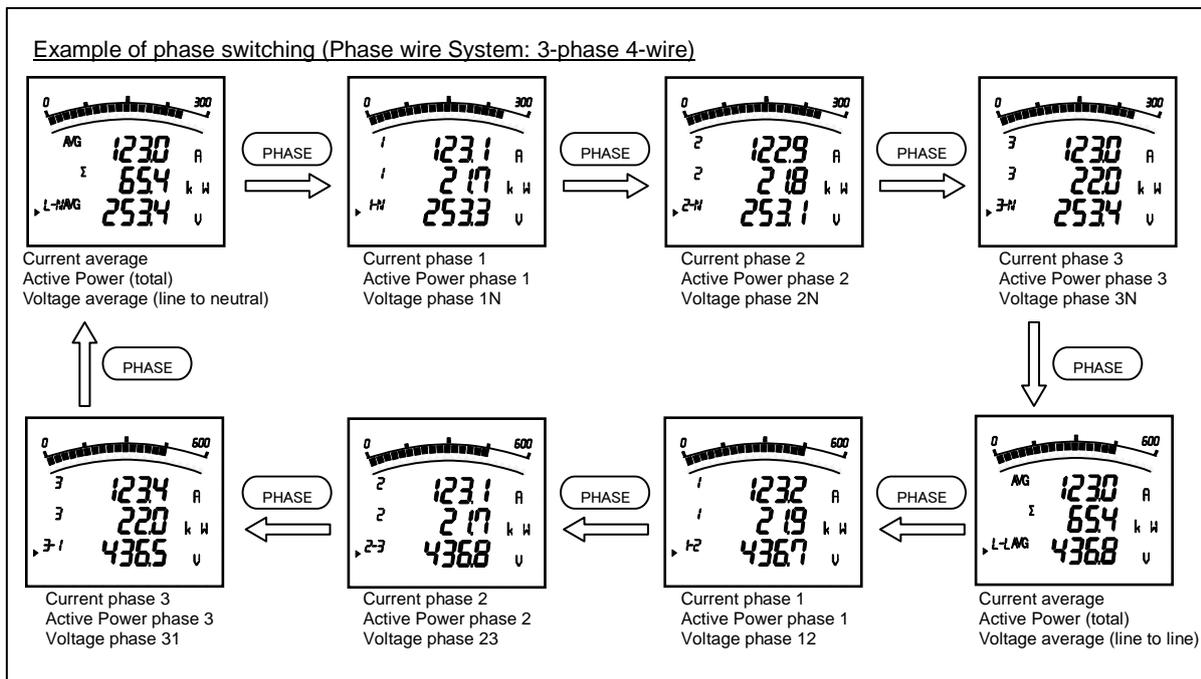


● Switch phase

By pressing **PHASE**, the current phase and the voltage phase will switch over.

The phase cannot be switched in the following cases.

- Measurement elements without phase (Frequency)
- Active power, and power factor for settings other than 3-phase 4-wire
- When the setting is 1-phase 2-wire

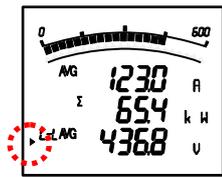


5. Operation

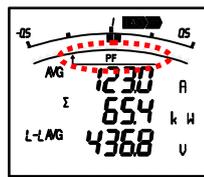
5.1. Basic Operation

● Bar graph display

Bar graph displays the measurement element indicated with “▶” or “▲”.



(Example) Lower element (V) displayed on bar graph



(Example) PF displayed on bar graph

● Switching measurement factors displayed on bar graphs

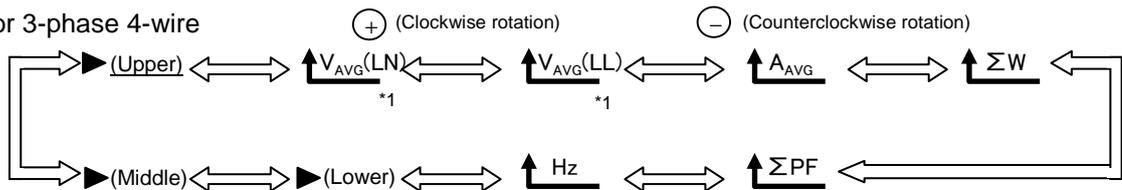
Press the (+) or (-) button to switch.

The following example is the case of “3 measuring items of screen are different” or “2 measuring items of screen are same”. In the case of “3 measuring items of screen are same”, the bar graph of average value or total value appear instead of “▶(Upper)”, “▶(Middle)” and “▶(Lower)”.

(The bar graph cannot be displayed in the following cases.)

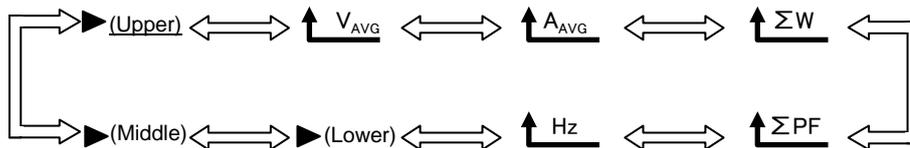
- When active energy is selected
- When a line without measurement display is selected
- Harmonics Display

(1) For 3-phase 4-wire

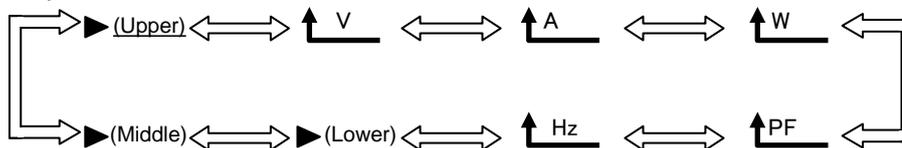


*1: “LN”, “LL” does not appear.

(2) For 3-phase 3-wire, 1-phase 3-wire



(3) For 1-phase 2-wire



5. Operation

5.1. Basic Operation

● Cyclic Display

In cyclic display, display and phases automatically change at every 5 seconds.

When **DISPLAY** is pressed for about 2 seconds, the cyclic display appears.

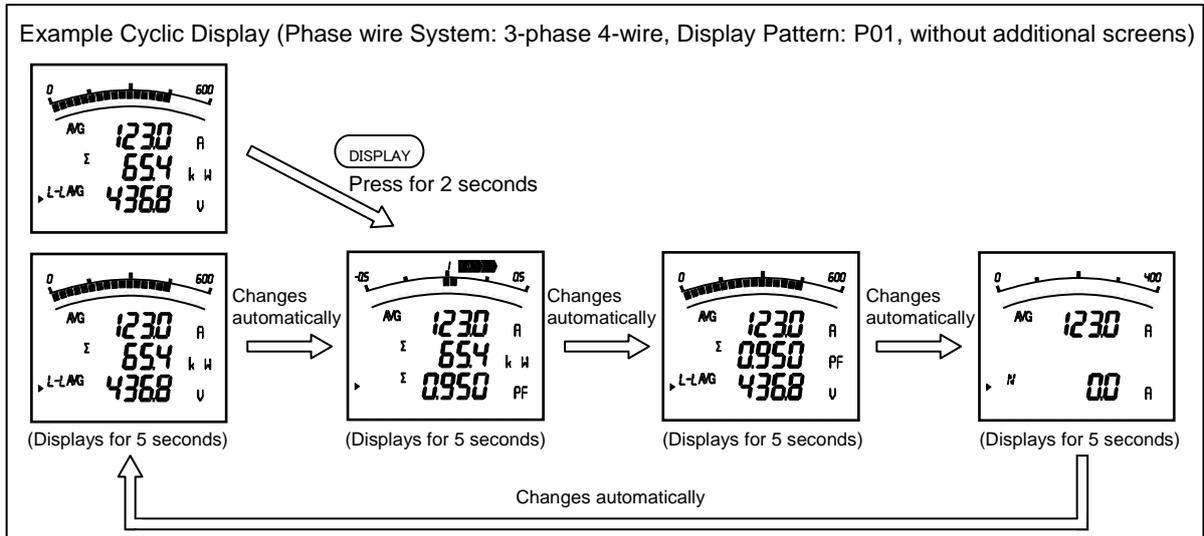
When **PHASE** is pressed for about 2 seconds, the cyclic phase appears.

By pressing any other buttons except **SET**, cyclic display mode ends.

Note 1: Before shifting to the cyclic display change screen, the display flickering 3 times.

Note 2: In the cyclic display, drawing number is not displayed.

Note 3: In the maximum value and the minimum value display, cyclic display is not available.



● Harmonics display

Harmonic RMS value and distortion ratio can be displayed.

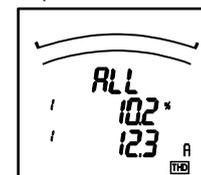
It is necessary to set the harmonics display settings before displaying. (Refer to page 22)

■ Measurement items

Degree	Harmonic current		N-phase harmonic current		Harmonic voltage	
	RMS value	Distortion ratio	RMS value	Distortion ratio	RMS value	Distortion ratio
Harmonic total	○	○	○	—	○	○

■ Example Display

<Example of harmonic current total display>



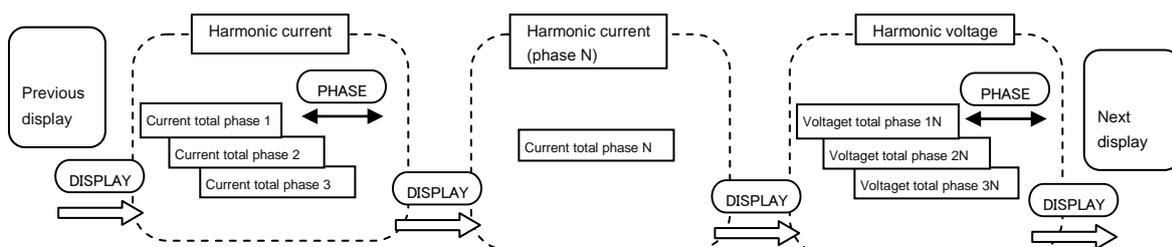
Upper: Degree
Middle: Distortion ratio
Lower: RMS value

Note : Harmonic total is shown by "ALL".

● Harmonics display (Continued from previous page)

■ Switching phase (Phase wire System: 3-phase 4-wire)

Press **PHASE** to switch phases.



Note: For harmonic measurement, the following phases are not displayed.

Phase wire system		Harmonic current	Harmonic voltage
3-phase 3-wire	3CT	—	31-phase
	2CT	2-phase	31-phase
1-phase 3-wire	1N2 display	N-phase	12-phase
	1N3 display	N-phase	13-phase

5. Operation

5.1. Basic Operation

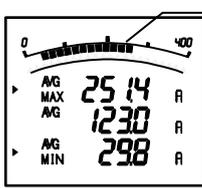
● Maximum value and minimum value display

For the maximum / minimum value display screen, the maximum value, current value, and minimum value for each measurement item are displayed on one screen.

However, for harmonics only the following maximum values are displayed.
 Harmonic current: Total effective values for where the phase was largest for each phase.
 Harmonic voltage: Total distortion factor for where the phase was largest for each phase

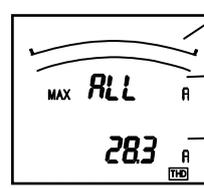
■ Example Display

<Example of current>



The bar graph turns on only between the maximum value and minimum value.
 Upper: Maximum value
 Middle: Current value
 Lower: Minimum value

<Example of current harmonics>

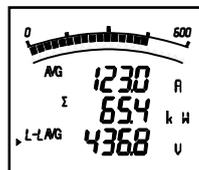


Harmonics won't display as bar graph.
 Harmonic degree
 Maximum value

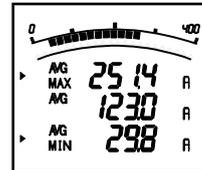
● Display of maximum value and minimum value

When **MAX/MIN** is pressed, the display is changed into the maximum value and minimum value display. And when **MAX/MIN** is pressed, the display changes back to the present value display.

Example of switching between present value display and maximum/minimum value display



Present value display



Maximum value and minimum value display

On maximum/minimum value display, the following operation is also possible as current value display.

Button operation	Function
Press DISPLAY	Measurement items switch according to the following order. However, measurement items that are not included in the phase wire method display pattern setting and additional screens are not displayed. <div style="float: right; border: 1px solid black; padding: 5px; margin-top: 10px;"> AN: N-phase current DA: Current demand DAN: N-phase current demand HI: Harmonic current HIN: N-phase harmonic current HV: Harmonic voltage </div> <div style="text-align: center; margin-top: 10px;"> $\begin{array}{c} \rightarrow A \rightarrow A_N \rightarrow DA \rightarrow DA_N \rightarrow V \rightarrow W \\ HV \leftarrow HIN \leftarrow HI \leftarrow Hz \leftarrow PF \leftarrow \end{array}$ </div>
Press PHASE	3-phase 4-wire: A and DA switch as $\rightarrow \text{Average} \rightarrow 1 \text{ Phase} \rightarrow 2 \text{ Phase} \rightarrow 3 \text{ Phase}$ V switches as $\rightarrow V_{AVG(L-N)} \rightarrow V_{1N} \rightarrow V_{2N} \rightarrow V_{3N} \rightarrow V_{AVG(L-L)} \rightarrow V_{12} \rightarrow V_{23} \rightarrow V_{31}$ W, PF switch as $\rightarrow \text{Total} \rightarrow 1 \text{ Phase} \rightarrow 2 \text{ Phase} \rightarrow 3 \text{ Phase}$ AN, DAN and Hz do not have phase switching. 3-phase 3-wire, 1-phase 3-wire: Phase for A, DA and V switch. 1-phase 2-wire: No phase switch.
Press DISPLAY for 2 seconds	Switches to measurement item cyclic display.
Press PHASE for 2 seconds	Switches to phase cyclic display.

● Clear the maximum/minimum value

On the maximum/minimum value display screen, press the **RESET** for 2 seconds to clear the maximum/minimum value for the displayed measurement item to the present value.

On the maximum/minimum value display screen, press the **+** and **RESET** together for 2 seconds to clear all maximum/minimum values to the present value.

When the password protection setting is enabled, maximum/minimum values are cleared after you enter the password. Also, you can clear all maximum/minimum values by communication function. (In this case, the password is not necessary.)

5. Operation

5.1. Basic Operation

● Active Energy Display

■ Display format

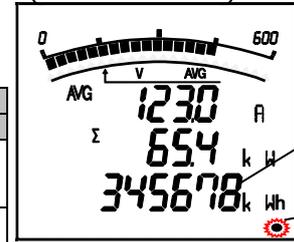
The following table shows the display format of active energy based on the total load.

$$\text{Total load power [kW]} = \frac{\alpha \times (\text{VT primary voltage}) \times (\text{CT primary current})}{1000}$$

- ※1. For the direct voltage setting, the direct voltage is used for calculation instead of the VT primary voltage.
- ※2. For 3-phase 4-wire or 1-phase 3-wire, the VT primary voltage and direct voltage are calculated using the line to phase voltage.

α : 1	1-phase 2-wire
√2	1-phase 3-wire
3	3-phase 3-wire
3	3-phase 4-wire

Total load [kW]	Display type	
	Digital Display	Unit
Less than 10	888888	kWh (Unit can be changed from Wh/kWh/MWh.)
10 or higher and less than 100		MWh (Unit can be changed from Wh/kWh/MWh.)
100 or higher and less than 1000		
1000 or higher and less than 10000		
10000 or higher and less than 100000		
100000 or higher		

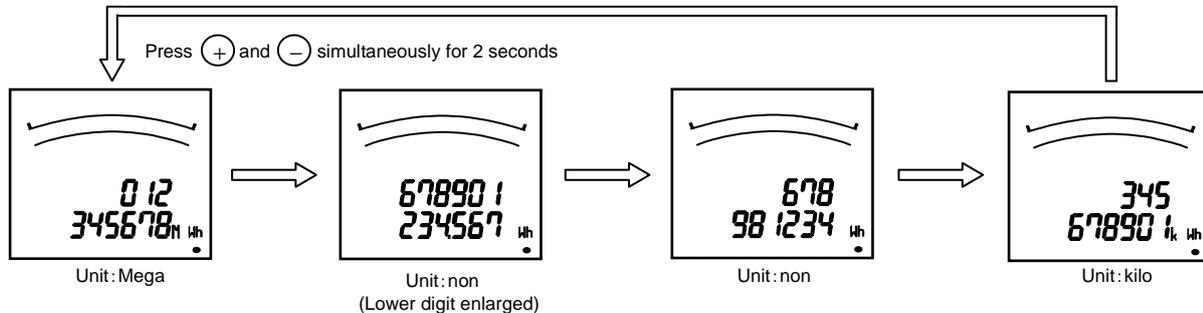


The metering status blinks while the active energy is being counted. When active energy is not counted, turns OFF.

● How to change the unit of Wh

When (+) and (-) are pressed simultaneously for 2 seconds, the unit of Wh will be changed. This will enable to check the upper digits or lower digits of counts.

Example of change: Case of active energy (imported) = 012,345,678,901,234.567Wh



Note1: When the setting value of the VT primary voltage and the CT primary current are large, the lower digits less than a measurement range display "0".

● Wh zero reset

When (SET), (RESET) and (PHASE) are pressed simultaneously for 2 seconds, the measured values of Wh will be reset. When the password protection setting is enabled, Wh will be reset after you enter the password.

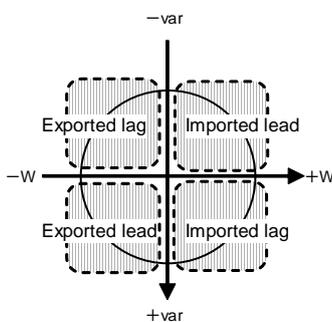
Also, you can clear Wh values by communication function. (In this case, the password is not necessary.)

(Note 1: This is effective only in the instantaneous value display.)

● Each measurement item display during power transmission

The following table shows the symbol display (±) for each measurement value according to the power reception /power sending status.

(Refer to page 29 about "IEC mode" in the Setting Menu 8.)



Measured items		Quadrant			
		Imported Lag	Imported Lead	Exported Lag	Exported Lead
A, DA, N-A, N-DA, V, Hz, HI, N-HI, HV		Unsigned			
W		Unsigned		"-" sign	
PF	Normal mode	Unsigned LAG display※	"-" sign +LEAD display※	"-" sign +LEAD display※	Unsigned LAG display※
	IEC mode	Unsigned LAG display※	"-" sign +LEAD display※	Unsigned LAG display※	"-" sign +LEAD display※

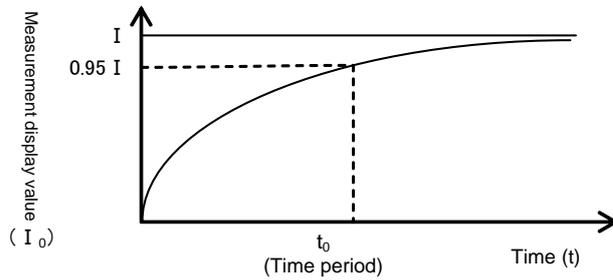
※Turns on when displayed on the bar graph.

5. Operation

5.1. Basic Operation

● Demand time and demand value of current demand

The demand time (t_0) is the time until the measurement display value (I_0) displays 95% of the input (I) when a certain constant input (I) is given. To display 100% of the input (I), about three times more than the time (t_0) is needed.



The demand value is the measurement display value with the above time characteristics, and it shows the overall average within the demand time.

The demand value changes over a relatively long time, so it is not affected by input changes within a short time.

Therefore, this is good for monitoring transformer overload.

5. Operation

5.2. Usage According to Purpose (Alarm, Operating Time, Password, etc.)

The following explains usage according to the purpose during operation.

● Display and operation of the upper/lower limit alarm

When the value exceeds the upper or lower limit setting value set in advance, the display flickers.
(For more information about how to set the upper/lower limit alarm, refer to page 24 and after.)

■ Alarm indicator

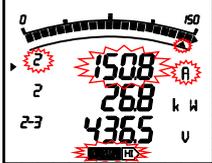
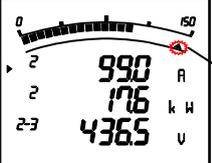
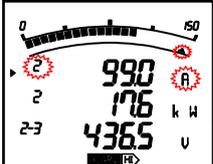
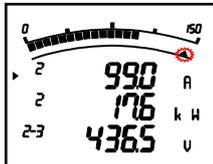
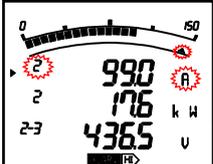
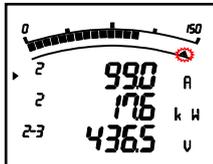
When the measurement element with an upper/lower limit alarm is displayed on the bar graph, "▲" flickers on the bar graph to indicate the upper/lower limit.

■ Behavior During Alarm Generation

Alarm condition: When measurement value exceeds alarm value, display flickers.

Alarm cancel: When alarm is canceled, display flickers normally.

Note: When the alarm delay time is set, an alarm is generated only when the alarm value is continuously beyond the upper/lower limit alarm value for the delay time.

Alarm cancel method		Measurement value \geq Upper limit value (or Measurement value \leq Lower limit value)	Measurement value $<$ Upper limit alarm value (or Measurement value $>$ Lower limit alarm value)
Automatic (Auto)	Display	ALARM , HI or LO flickers 	Normal display  Upper/lower limit indicator
		ALARM , HI or LO flickers  (Alarm generation)	ALARM , HI or LO turns ON  (Alarm retention) RESET  (Alarm cancellation)
Manual (HoLd)	Display	ALARM , HI or LO flickers  (Alarm generation)	ALARM , HI or LO turns ON  (Alarm retention) RESET  (Alarm cancellation)

Note 1: When the measurement element where the alarm generated exists on the display screen, the display for the digital value, unit (A, V, W, PF, Hz, %, DM, THD), and phase (1, 2, 3, N) will be based on the alarm status according to the following table. If it does not exist on the display screen, it does not flicker.

Alarm status	Digital value	Unit	Phase
Alarm generation	Flickering*	Flickering	Flickering*
Alarm retention	On	Flickering	Flickering*
Alarm cancellation	On	On	On

* Does not flicker when displaying phases where no alarm occurred.

Note 2: When the backlight flickering setting is set to ON (flicker) during alarm generation, the backlight also flickers when an alarm is generated.

Note 3: On the maximum/minimum value display screen, the present value (middle of the digital display) and **ALARM**, **HI** or **LO** blinks.

■ Monitoring phase for upper/lower limit alarm element

The phase that monitors the upper/lower limit alarm differs according to the measurement item. For more details, refer to the following table.

Upper/lower limit alarm element	Monitored phase			
	3-phase 4-wire	3-phase 3-wire (3CT, 2CT)	1-phase 3-wire (1N2)	1-phase 3-wire (1N3)
Upper limit current, current demand	1, 2, 3	1, 2, 3	1, N, 2	1, N, 3
Lower limit current, current demand	1, 2, 3	1, 2, 3	1, 2	1, 3
Upper limit N-phase current, N-phase current demand	N	—	—	—
Lower limit N-phase current, N-phase current demand	N	—	—	—
Upper limit voltage (L-L) (Note 1)	12, 23, 31	12, 23, 31	1N, 2N, 12	1N, 3N, 13
Lower limit voltage (L-L) (Note 1)	12, 23, 31	12, 23, 31	1N, 2N, 12	1N, 3N, 13
Upper limit voltage (L-N)	1N, 2N, 3N	—	—	—
Lower limit voltage (L-N)	1N, 2N, 3N	—	—	—
Upper limit active power, power factor	Total	Total	Total	Total
Lower limit active power, power factor	Total	Total	Total	Total
Upper limit frequency	1N	12	1N	1N
Lower limit frequency	1N	12	1N	1N
Harmonic current total RMS value	1, 2, 3	1, 2, 3 (note 2)	1, 2	1, 3
Harmonic current total RMS value N-phase	N	—	—	—
Harmonic voltage total distortion ratio	1N, 2N, 3N	12, 23	1N, 2N	1N, 3N

Note1: For phase 12 (or phase 31) at 1-phase 3-wire, alarm monitoring is executed using a value that is two times the set upper/lower limit alarm value.

Note2: Only 3-phase 3-wire (3CT) is measured for the phase 2 harmonic current.

5. Operation

5.2 Usage According to Purpose (Alarm, Operating Time, Password, etc.)

● Canceling the upper/lower limit alarm

The alarm cancellation method differs depending on the setting for alarm reset. The upper and lower limit alarms can be cancelled also via communication.

Alarm cancel method	Cancellation method
Automatic(Auto)	When the measurement value is below the upper/lower limit set value, the alarm is automatically reset.
Manual(HoLd)	<p>The alarm is maintained even after the measurement value is below the upper/lower limit set value. After the measurement value is below the upper/lower limit alarm value, operate the following alarm cancellation operation. (Note: However, alarms cannot be cancelled from the maximum/minimum value display screen.)</p> <p><Cancelling alarms for selected elements> Display the element where the alarm generated, and then press RESET to cancel the alarm. When an element has a phase such as current and voltage, it is necessary to press RESET for each phase when cancelling an alarm.</p> <p><Cancelling alarms for all elements> At the current value display screen, press RESET for 2 seconds to cancel all alarms.</p>

Note: The difference of 0.8% between the maximum scale and alarm value is used for determining whether the measurement value is below the upper/lower limit alarm value in order to prevent chattering.

● Stopping backlight flickering caused by upper/lower limit alarm generation

Press **RESET** the button to stop the backlight flickering.

● Display of operation time

The measurement time is integrated according to the value set to the target for counting operation time (AUX, A, and V) and displayed as the load operation time.

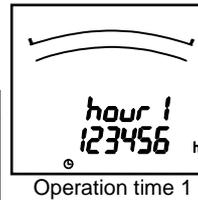
To display the operation time, the operation time display setting should be configured in advance.

The operation time is counting, even if operation time display setting is OFF.

(For setting of the operation time display, refer to page 28.)

When the following set target for counting the operation time exceeds the threshold, the operation time 1 and operation time 2 are integrated.

Item	3-phase 4-wire	1-phase 2-wire	Others
AUX (Auxiliary power)	AUX	AUX	AUX
A (Current)	A _{AVG}	A	A _{AVG}
V (Voltage)	V _{AVG} (L-N)	V	V _{AVG} (L-L)



<Using the operation time 1 and operation time 2 as appropriate>

For example, if you want to check both of the operation time on a monthly basis (the value which is periodically reset) and the cumulative operation time from when the system started to operate (the value which is not periodically reset), use the operation time 1 and operation time 2 accordingly. If it is unnecessary to use the operation time 1 and operation time 2 at the same time, monitor either of them.

This is displayed when the **DISPLAY** button is pressed repeatedly in the operation mode to switch the measurement displays.

● Resetting the operation time to zero

Showing the operation time 1 or the operation time 2 on the display and then holding down the **RESET** button for 2 seconds resets the operation time to zero.

(Only the displayed operation time is reset to zero.)

When the password protection setting is enabled, the operation time is reset to zero after the password is entered.

All the operation times can be reset to zero also via communication. (In this case, the password is not necessary)

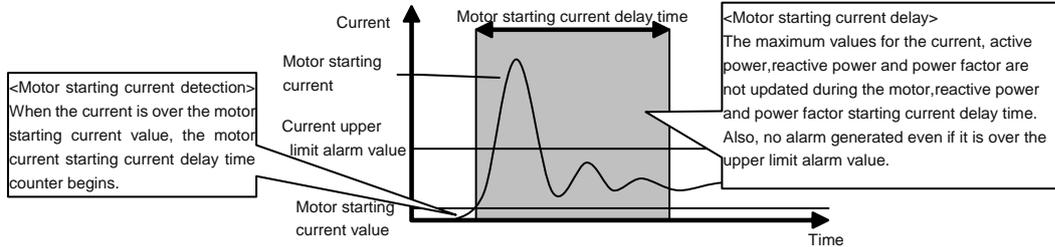
5. Operation

5.2 Usage According to Purpose (Alarm, Operating Time, Password, etc.)

● Preventing maximum value update by motor starting current

When the motor current is monitored, use the motor starting current delay function to prevent maximum value update and alarm generation for the current, active power, reactive power, apparent Power, and power factor due to the motor starting current. It is necessary to set in advance to use the motor starting current delay function. (About settings, refer to page 26.)

■ Movement when the motor starting current delay function is used



Note 1: Set the motor starting current value to a value lower than the lower limit value considering changes in the load current during operation.

Note 2: When the input current is below the motor starting current value, the minimum value update stops.

● Password protection setting

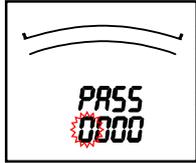
In the operation mode, after pressing **RESET** and **PHASE** simultaneously for 2 seconds or more, the password input display will be displayed. It is possible to set the password protection if you enter the password. Default password is "0000". If you enter the wrong password, to return to the password input display (the highest digit blink).

By pressing **DISPLAY** at the highest digit, to return to the operation mode.

If you enable password protection setting, you need to input password when performing the item of the following table.

■ Password input

Password input display



- Select a value of the blinking digit by pressing the **+** or **-** button from the highest digit.
- Pressing the **SET** button moves the setting digit (blinking digit) to a lower digit.
- Pressing the **DISPLAY** button moves the setting digit (blinking digit) to a higher digit.
- If you enter a correct password and pressing the **SET** in the lowest digit, password protection item IS enabled.
- If you enter an incorrect password and pressing the **SET** in the lowest digit, to return to the highest digit.

■ Password protection item

No.	Item
1	Shift to the setting mode
2	Clear the maximum/minimum value
3	Wh zero reset
4	Clearing the operation time

■ Password protection setting

(1) Set a password protection.

oFF ← → on

(Not protected) (Protected)

(2) Change the password.

no ← → yES

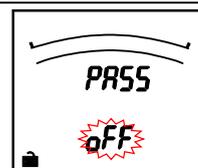
(Not change) (Change)

Note1. Select "no", and go back to the operation mode.

Note2. Select "yES", and the current password is displayed.

(3) Input a new password.

- Select a value of the blinking digit by pressing the **+** or **-** button from the highest digit.
- Pressing the **SET** button moves the setting digit (blinking digit) to a lower digit.
- Pressing the **DISPLAY** button moves the setting digit (blinking digit) to a higher digit.
- Pressing the **SET** button at the lowest digit saves the password.
- Setting is available in range from 0000 to 9999



Important

If You Forget Your Password: It is not possible to cancel the password in the field. Please contact your supplier.

6. Other

6.1. Display Pattern Contents

When the display pattern in the Setting menu 1 and the additional screen in the Setting menus 3 and 8 are set, pressing  changes the screens shown in the table below from the left to the right.

[For 3-phase 4-wire]

Display pattern		Screen set by display pattern							Additional display (Set in the setting menus 3, 8)					
		No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.10	No.11	No.12	No.13
		Wh	Harmonic current	Harmonic current N-phase	Harmonic voltage	Operation time1	Operation time2							
P01	Upper	A	A	A	A					Degree	Degree	Degree	—	—
	Middle	W	W	PF	—					Distortion ratio	-	Distortion ratio	hour1	hour2
	Lower	V	PF	V	AN					RMS value	RMS value	RMS value	Operation time	Operation time
P02	Upper	A	A	A	A	A			—					
	Middle	V	W	PF	—	Hz				ditto	ditto	ditto	ditto	ditto
	Lower	Wh	Wh	Wh	AN	Wh			Wh					
P03	Upper	A1	V1N	A	A									
	Middle	A2	V2N	—	—					ditto	ditto	ditto	ditto	ditto
	Lower	A3	V3N	V	AN									
P04	Upper	A	A1	V1N	A									
	Middle	V	A2	V2N	—					ditto	ditto	ditto	ditto	ditto
	Lower	W	A3	V3N	AN									
P05	Upper	A	A	A1	V1N	A			—					
	Middle	V	W	A2	V2N	—				ditto	ditto	ditto	ditto	ditto
	Lower	Wh	Wh	A3	V3N	AN			Wh					
P06	Upper	A	A1	DA1	V1N	A	DA							
	Middle	DA	A2	DA2	V2N	—	—			ditto	ditto	ditto	ditto	ditto
	Lower	V	A3	DA3	V3N	AN	DAN							
P07	Upper	A	A	A1	DA1	V1N	A	DA						
	Middle	DA	DA	A2	DA2	V2N	—	—		ditto	ditto	ditto	ditto	ditto
	Lower	V	W	A3	DA3	V3N	AN	DAN						
P08	Upper	A	A	DA1	V1N	A	DA		—					
	Middle	DA	V	DA2	V2N	—	—			ditto	ditto	ditto	ditto	ditto
	Lower	Wh	Wh	DA3	V3N	AN	DAN		Wh					
P09	Upper	A	A	A	DA	W	A	DA	—					
	Middle	DA	W	V	V	V	—	—		ditto	ditto	ditto	ditto	ditto
	Lower	Wh	Wh	Wh	Wh	Wh	AN	DAN	Wh					
P00	Upper	Arbitrary	Arbitrary	Arbitrary	Arbitrary				—					
	Middle	Arbitrary	Arbitrary	Arbitrary	Arbitrary					ditto	ditto	ditto	ditto	ditto
	Lower	Arbitrary	Arbitrary	Arbitrary	Arbitrary				Wh					

Note 1: When an additional screen is added, a screen number is added.

Note 2: In the table, "Wh" indicates Imported active energy.

Note 3: When Wh is selected at the screen of from No.1 to No.4, the additional display of Wh appears.

6. Other

6.1 Display Pattern Contents

[For others except 3-phase 4-wire]

Display pattern		Screen set by display pattern					Additional display (Set in the setting menus 3, 8)				
		No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.10
							Wh	Harmonic current	Harmonic voltage	Operation time1	Operation time2
P01	Upper	A	A	A				Degree	Degree	—	—
	Middle	W	W	PF				Distortion ratio	Distortion ratio	hour1	hour2
	Lower	V	PF	V				RMS value	RMS value	Operation time	Operation time
P02	Upper	A	A	A	A		—	ditto	ditto	ditto	ditto
	Middle	V	W	PF	Hz		Wh				
	Lower	Wh	Wh	Wh	Wh						
P03	Upper	A1	V12	A				ditto	ditto	ditto	ditto
	Middle	A2	V23	—							
	Lower	A3	V31	V							
P04	Upper	A	A1	V12				ditto	ditto	ditto	ditto
	Middle	V	A2	V23							
	Lower	W	A3	V31							
P05	Upper	A	A	A1	V12		—	ditto	ditto	ditto	ditto
	Middle	V	W	A2	V23		Wh				
	Lower	Wh	Wh	A3	V31						
P06	Upper	A	A1	DA1	V12			ditto	ditto	ditto	ditto
	Middle	DA	A2	DA2	V23						
	Lower	V	A3	DA3	V31						
P07	Upper	A	A	A1	DA1	V12		ditto	ditto	ditto	ditto
	Middle	DA	DA	A2	DA2	V23					
	Lower	V	W	A3	DA3	V31					
P08	Upper	A	A	DA1	V12		—	ditto	ditto	ditto	ditto
	Middle	DA	V	DA2	V23		Wh				
	Lower	Wh	Wh	DA3	V31						
P09	Upper	A	A	A	DA	W	—	ditto	ditto	ditto	ditto
	Middle	DA	W	V	V	V	Wh				
	Lower	Wh	Wh	Wh	Wh	Wh					
P00	Upper	Arbitrary	Arbitrary	Arbitrary	Arbitrary		—	ditto	ditto	ditto	ditto
	Middle	Arbitrary	Arbitrary	Arbitrary	Arbitrary		Wh				
	Lower	Arbitrary	Arbitrary	Arbitrary	Arbitrary						

Note 1: When an additional screen is added, a screen number is added.

Note 2: When 1-phase 2-wire, only phase1 (A1, DA1) is displayed for current and only phase12 (V12) is displayed for voltage. Other phases are not displayed even when they are set in the display pattern.

Note 3: The phases displayed in the display patterns of the above table are displayed on the screen according to the phase wire system setting shown in the table below.

Phase display in the table above		phase wire		1-phase 2-wire	1-phase 3-wire (1N2)	1-phase 3-wire (1N3)	3-phase 3-wire
		1	2				
Current	1	Phase not displayed		Phase not displayed	1	1	1
	2	Measurement not displayed		Measurement not displayed	N	N	2
	3	Measurement not displayed		Measurement not displayed	2	3	3
Voltage	12	Phase not displayed		Phase not displayed	1N	1N	12
	23	Measurement not displayed		Measurement not displayed	2N	3N	23
	31	Measurement not displayed		Measurement not displayed	12	13	31

Note 4: In the table, "Wh" indicates Imported active energy.

Note 5: When Wh is selected at the screen of from No.1 to No.4, the additional display of Wh appears. (P00)

6. Other

6.2. Maximum Scale Value

Settable primary voltage, primary current, and standard maximum scale value are shown in the tables below.

•Maximum scale value of each item

Measurement element		Maximum scale value	
Current, Current demand		Setting of current maximum scale =SP.	
Voltage	In the case with VT (Note 2)	1-phase 2-wire, 3-phase 3-wire	
		3-phase 4-wire	
		VT Primary current	
		VT Primary voltage (Phase voltage) \times 150/110	
	At direct input	1-phase 2-wire, 3-phase 3-wire	
		110V	150V
		220V	300V
		440V	600V
		1-phase 3-wire (Phase voltage / Line voltage)	
		110/220V	150V/300V
3-phase 4-wire (Phase voltage / Line voltage)			
100/173V, 110/190V	150/300V		
220/380V, 230/400V, 240/415V, 254/440V	300/600V		
277/480V	400/640V		
Active power, (Note 1)		VT ratio \times CT ratio \times specific power(100%)kW	

Note1: At direct voltage setting, VT ratio = 1. The specific power is according to the table on the right.

Note2: For convenience of scale, this is rounded off to the nearest whole number.

•Specific power value for scale calculation

Phase line type	CT Secondary	Rated voltage	Specific power value (100%)			
1-phase 2-wire	5A	At direct input (Line voltage)	110V 0.5kW 220V 1.0kW 440V 2.0kW			
		In the case with VT (Line voltage)	100V, 110V 0.5kW 220V 1.0kW			
		1A	At direct input (Line voltage)	110V 0.1kW 220V 0.2kW 440V 0.4kW		
	1A	In the case with VT (Line voltage)	100V, 110V 0.1kW 220V 0.2kW			
		5A	Without VT (Line voltage)	220V 1.0kW 440V 2.0kW		
				1A	220V 0.2kW 440V 0.4kW	
1-phase 3-wire	5A	At direct input (Line voltage)	110V 1.0kW 220V 2.0kW 440V 4.0kW			
		In the case with VT (Line voltage)	100V, 110V 1.0kW 220V 2.0kW			
		1A	At direct input (Line voltage)	110V 0.2kW 220V 0.4kW 440V 0.8kW		
	3-phase 3-wire	5A	At direct input (Line voltage)	63.5/110V 1.0kW 100/173V 110/190V 2.0kW 220/380V, 230/400V, 240/415V, 254/440V 4.0kW 277/480V 5.0kW		
				1A	In the case with VT (Phase voltage)	63.5V 1.0kW 100V, 110V, 115V, 120V 2.0kW
						At direct input
3-phase 4-wire	5A	At direct input (Line voltage)	63.5/110V 0.2kW 100/173V 110/190V 0.4kW 220/380V, 230/400V, 240/415V, 254/440V 0.8kW 277/480V 1.0kW			
			1A	In the case with VT (Phase voltage)	63.5V 0.2kW 100V, 110V, 115V, 120V 0.4kW	

6. Other

6.3. Possible Setting Range for Maximum Scale

The maximum scale of current can be selected from about 40% to 120% of rating, and maximum scale of voltage can be selected from about 20% to 250% of rating, and maximum scale of active power and reactive power can be selected from about 20% to 120% of rating. But for the convenience of scale conditions, the values in the following tables are applied.

■ Current maximum scale value

Possible setting range:-10 STEP to +3STEP of the rating

Example: When the rating is 100A, the value is from 45A to 160A.

Current maximum scale value (1/3)

STEP	A unit
1	1A
2	1.2A
3	1.5A
4	1.6A
5	1.8A
6	2A
7	2.2A
8	2.4A
9	2.5A
10	3A
11	3.2A
12	3.6A
13	4A
14	4.5A
15	4.8A
16	5A
17	6A
18	6.4A
19	7.2A
20	7.5A
21	8A
22	9A
23	9.6A
24	10A
25	12A
26	15A
27	16A
28	18A
29	20A
30	22A
31	24A
32	25A
33	30A
34	32A
35	36A
36	40A
37	45A
38	48A
39	50A
40	60A
41	64A
42	72A
43	75A
44	80A
45	90A
46	96A
47	100A
48	120A
49	150A
50	160A

Current maximum scale value (2/3)

STEP	A unit	kA unit
51	180A	
52	200A	
53	220A	
54	240A	
55	250A	
56	300A	
57	320A	
58	360A	
59	400A	
60	450A	
61	480A	
62	500A	
63	600A	
64	640A	
65	720A	
66	750A	
67	800A	
68	900A	
69	960A	
70	1000A	
71	1200A	
72	1500A	
73	1600A	
74	1800A	
75	2000A	
76	2200A	
77	2400A	
78	2500A	
79	3000A	
80	3200A	
81	3600A	
82	4000A	
83	4500A	
84	4800A	
85	5000A	
86	6000A	
87	6400A	
88	7200A	
89	7500A	
90	8000A	
91		9kA
92		9.6kA
93		10kA
94		12kA
95		15kA
96		16kA
97		18kA
98		20kA
99		22kA
100		24kA

Current maximum scale value (3/3)

STEP	kA unit
101	25kA
102	30kA
103	32kA
104	36kA
105	40kA

6. Other

6.3 Possible Setting Range for Maximum Scale

■ Voltage maximum scale value

Possible setting range:-18 STEP to +10STEP of the standard maximum scale value.

Example: When the standard maximum scale value is 100V, the value is from 20V to 320V.

Voltage maximum scale value (1/3)

STEP	V unit
1	15V
2	16V
3	18V
4	20V
5	22V
6	24V
7	25V
8	30V
9	32V
10	36V
11	40V
12	45V
13	48V
14	50V
15	60V
16	64V
17	72V
18	75V
19	80V
20	90V
21	96V
22	100V
23	120V
24	150V
25	160V
26	180V
27	200V
28	220V
29	240V
30	250V
31	300V
32	320V
33	360V
34	400V
35	450V
36	480V
37	500V
38	600V
39	640V
40	720V
41	750V
42	800V
43	900V
44	960V
45	1000V
46	1200V
47	1500V
48	1600V
49	1800V
50	2000V

Voltage maximum scale value (2/3)

STEP	V unit	kV unit
51	2200V	
52	2400V	
53	2500V	
54	3000V	
55	3200V	
56	3600V	
57	4000V	
58	4500V	
59	4800V	
60	5000V	
61	6000V	
62	6400V	
63		7.2kV
64		7.5kV
65		8kV
66		9kV
67		9.6kV
68		10kV
69		12kV
70		15kV
71		16kV
72		18kV
73		20kV
74		22kV
75		24kV
76		25kV
77		30kV
78		32kV
79		36kV
80		40kV
81		45kV
82		48kV
83		50kV
84		60kV
85		64kV
86		72kV
87		75kV
88		80kV
89		90kV
90		96kV
91		100kV
92		120kV
93		150kV
94		160kV
95		180kV
96		200kV
97		220kV
98		240kV
99		250kV
100		300kV

Voltage maximum scale value (3/3)

STEP	kV unit
101	320kV
102	360kV
103	400kV
104	450kV
105	480kV
106	500kV
107	600kV
108	640kV
109	720kV
110	750kV
111	800kV
112	900kV
113	960kV
114	1000kV
115	1200kV
116	1500kV
117	1600kV
118	1800kV
119	2000kV
120	2200kV

6. Other

6.3 Possible Setting Range for Maximum Scale

■ Maximum scale value for active power

Possible setting range:-18 STEP to +3STEP of the rating

Example: When the rating is 1000W, the value is from 200W to 1600W.

Maximum scale value of active power (1/5)

STEP	W unit
1	8W
2	9W
3	9.6W
4	10W
5	12W
6	15W
7	16W
8	18W
9	20W
10	22W
11	24W
12	25W
13	30W
14	32W
15	36W
16	40W
17	45W
18	48W
19	50W
20	60W
21	64W
22	72W
23	75W
24	80W
25	90W
26	96W
27	100W
28	120W
29	150W
30	160W
31	180W
32	200W
33	220W
34	240W
35	250W
36	300W
37	320W
38	360W
39	400W
40	450W
41	480W
42	500W
43	600W
44	640W
45	720W
46	750W
47	800W
48	900W
49	960W
50	1000W

Maximum scale value of active power (2/5)

STEP	W unit	kW unit
51	1200W	
52	1500W	
53	1600W	
54	1800W	
55	2000W	
56	2200W	
57	2400W	
58	2500W	
59	3000W	
60	3200W	
61	3600W	
62	4000W	
63	4500W	
64	4800W	
65	5000W	
66	6000W	
67	6400W	
68	7200W	
69	7500W	
70	8000W	
71		9kW
72		9.6kW
73		10kW
74		12kW
75		15kW
76		16kW
77		18kW
78		20kW
79		22kW
80		24kW
81		25kW
82		30kW
83		32kW
84		36kW
85		40kW
86		45kW
87		48kW
88		50kW
89		60kW
90		64kW
91		72kW
92		75kW
93		80kW
94		90kW
95		96kW
96		100kW
97		120kW
98		150kW
99		160kW
100		180kW

Maximum scale value of active power (3/5)

STEP	kW unit	MW unit
101	200kW	
102	220kW	
103	240kW	
104	250kW	
105	300kW	
106	320kW	
107	360kW	
108	400kW	
109	450kW	
110	480kW	
111	500kW	
112	600kW	
113	640kW	
114	720kW	
115	750kW	
116	800kW	
117	900kW	
118	960kW	
119	1000kW	
120	1200kW	
121	1500kW	
122	1600kW	
123	1800kW	
124	2000kW	
125	2200kW	
126	2400kW	
127	2500kW	
128	3000kW	
129	3200kW	
130	3600kW	
131	4000kW	
132	4500kW	
133	4800kW	
134	5000kW	
135	6000kW	
136	6400kW	
137	7200kW	
138	7500kW	
139	8000kW	
140		9MW
141		9.6MW
142		10MW
143		12MW
144		15MW
145		16MW
146		18MW
147		20MW
148		22MW
149		24MW
150		25MW

Maximum scale value of active power (4/5)

STEP	MW unit
151	30MW
152	32MW
153	36MW
154	40MW
155	45MW
156	48MW
157	50MW
158	60MW
159	64MW
160	72MW
161	75MW
162	80MW
163	90MW
164	96MW
165	100MW
166	120MW
167	150MW
168	160MW
169	180MW
170	200MW
171	220MW
172	240MW
173	250MW
174	300MW
175	320MW
176	360MW
177	400MW
178	450MW
179	480MW
180	500MW
181	600MW
182	640MW
183	720MW
184	750MW
185	800MW
186	900MW
187	960MW
188	1000MW
189	1200MW
190	1500MW
191	1600MW
192	1800MW
193	2000MW
194	2200MW
195	2400MW
196	2500MW
197	3000MW
198	3200MW
199	3600MW
200	4000MW

Maximum scale value of active power (5/5)

STEP	MW unit
201	4500MW
202	4800MW
203	5000MW
204	6000MW
205	6400MW
206	7200MW
207	7500MW
208	8000MW

6. Other

6.4. Measurement Items

The table below shows the measurement items.

○ : Data can be measured and displayed - : Data cannot be measured and displayed

Measurement item		Item measurement display												Communication
		3-phase 4-wire			3-phase 3-wire(3CT)			3-phase 3-wire(2CT) 1-phase 3-wire			1-phase 2-wire			
		Inst	Max	Min	Inst	Max	Min	Inst	Max	Min	Inst	Max	Min	
Current	1 phase	○	○	○	○	○	○	○	○	○	○	○	○	○ (Note2)
	2 phase	○	○	○	○	○	○	○	○	○	○	-	-	
	3 phase	○	○	○	○	○	○	○	○	○	○	-	-	
	AVG	○	○	○	○	○	○	○	○	○	○	-	-	
	N phase	○	○	○	-	-	-	-	-	-	-	-	-	
Current demand	1 phase	○	○	○	○	○	○	○	○	○	○	○	○	
	2 phase	○	○	○	○	○	○	○	○	○	-	-	-	
	3 phase	○	○	○	○	○	○	○	○	○	-	-	-	
	AVG	○	○	○	○	○	○	○	○	○	-	-	-	
	N phase	○	○	○	-	-	-	-	-	-	-	-	-	
Voltage	1-N phase	○	○	○	-	-	-	-	-	-	-	-	-	
	2-N phase	○	○	○	-	-	-	-	-	-	-	-	-	
	3-N phase	○	○	○	-	-	-	-	-	-	-	-	-	
	AVG(L-N)	○	○	○	-	-	-	-	-	-	-	-	-	
	1-2 phase	○	○	○	○	○	○	○	○	○	○	○	○	
	2-3 phase	○	○	○	○	○	○	○	○	○	-	-	-	
	3-1 phase	○	○	○	○	○	○	○	○	○	-	-	-	
Active power	AVG(L-L)	○	○	○	○	○	○	○	○	○	-	-	-	
	1 phase	○	○	○	-	-	-	-	-	-	-	-	-	
	2 phase	○	○	○	-	-	-	-	-	-	-	-	-	
	3 phase	○	○	○	-	-	-	-	-	-	-	-	-	
	Σ	○	○	○	○	○	○	○	○	○	○	○	○	
Power factor	1 phase	○	○	○	-	-	-	-	-	-	-	-	-	
	2 phase	○	○	○	-	-	-	-	-	-	-	-	-	
	3 phase	○	○	○	-	-	-	-	-	-	-	-	-	
	Σ	○	○	○	○	○	○	○	○	○	○	○	○	
Frequency		○	○	○	○	○	○	○	○	○	○	○	○	
Harmonic Current (Note 1)	RMS value	1 phase	Max Phase	-	○	Max Phase	-	○	Max Phase	-	○	-		
		2 phase		-	○		-	○		-				
		3 phase		-	○		-	○		-				
		N phase		○	○		-	-		-	-	-	-	-
	Distortion ratio	1 phase	○	-	-	○	-	-	○	-	-	○	-	-
		2 phase	○	-	-	○	-	-	-	-	-	-	-	-
		3 phase	○	-	-	○	-	-	○	-	-	-	-	-
N phase	-	-	-	-	-	-	-	-	-	-	-	-		
Harmonic Voltage (Note 1)	RMS value	1-N phase	○	-	-	-	-	-	-	-	-	-	-	
		2-N phase	○	-	-	-	-	-	-	-	-	-	-	
		3-N phase	○	-	-	-	-	-	-	-	-	-	-	
		1-2 phase	-	-	-	○	-	-	○	-	-	○	-	-
		2-3 phase	-	-	-	○	-	-	○	-	-	-	-	-
	Distortion ratio	3-1 phase	-	-	-	-	-	-	-	-	-	-	-	-
		1-N phase	○	Max Phase	-	-	-	-	-	-	-	-	-	-
		2-N phase	○		-	-	-	-	-	-	-	-	-	-
		3-N phase	○		-	-	-	-	-	-	-	-	-	-
		1-2 phase	-		-	-	○	Max Phase	-	○	Max Phase	-	○	○
2-3 phase	-	-	-		○	Max Phase	-	○	Max Phase	-	-	-	-	
3-1 phase	-	-	-	-	-	-	-	-	-	-	-	-		
Active energy	Imported	○			○			○			○			
Operation time	1	○			○			○			○			
	2	○			○			○			○			

Note 1: RMS values and Distortion ratios of harmonics are total value only.

Note 2: The values which can be monitored by communication are same as the values displayed.

Note 3: When 1-phase 3-wire is selected, read the phase for the measurement item according to the following table.

Phase wire method	1 -phase	2 -phase	3 -phase	12 -phase	23 -phase	31 -phase
1-phase 3-wire (1N2)	1 -phase	N -phase	2 -phase	1N -phase	2N -phase	12-phase
1-phase 3-wire (1N3)	1 -phase	N -phase	3 -phase	1N -phase	3N -phase	13 -phase

6. Other

6.5. Measurement Characteristic

■ Metering actions in other than operation mode

Status	Measurement	Display
Several seconds just after turning on the auxiliary power supply (Backlight is lit, and LCD is not lit.)	No measurement	No display
Setting mode, Set value confirmation mode Password protection mode	Same actions as in operation mode	No display of measured value
During power failure	No measurement	No display

■ Metering actions in input status

Measurement items	Actions	
Current (A) Current demand (DA)	0A when the input current is less than 0.005A	When it is over the upper limit of the possible display range (9999), the upper limit of the possible display range (9999) is displayed.
Voltage (V)	0V when the input voltage (line voltage) is less than 11V. For 3-phase 4-wire, 0V when the line to neutral voltage is less than 11V or the line to line voltage is less than 19V. For 1-phase 3-wire, 0V when the voltage between P1-P3 is less than 22V.	When it is over the upper limit of the possible display range (9999), the upper limit of the possible display range (9999) is displayed. (Note 2)
Active power (W)	0W for total when the current and the voltage are 0A and 0V for all 3 phases. 0W for each phase when the current of phase n is 0A or the voltage of phase n is 0V. (where n = 1,2 or 3)	When it is over the upper limit of the possible display range (9999), the upper limit of the possible display range (9999) is displayed.
Power factor (PF)	1.0 for total when the current and the voltage are 0A and 0V for all 3 phases. 1.0 for each phase when the current of phase n is 0A or the voltage of phase n is 0V. (where n = 1,2 or 3)	
Frequency (Hz)	When the input voltage of phase1 is low voltage, ---- will be displayed. Input 22V or more.	When the frequency is less than 44.5Hz or over 99.9Hz, ---- is displayed.
Harmonic current (HI)	For effective value measurement : When the current is 0A, 0A is displayed. (Each phase) : When the voltage of phase1 is 0V or the frequency is less than 44.5Hz, ---- is displayed for all phases.	For content factor measurement : When the 1st current harmonic is 0A, 0% is displayed. (Each phase) : When the voltage of phase1 is 0V or the frequency is less than 44.5Hz, ---- is displayed for all phases
Harmonic Voltage (HV)	For effective value measurement : When the current is 0V, 0V is displayed. (Each phase) : When the voltage of phase1 is 0V or the frequency is less than 44.5Hz, ---- is displayed for all phases.	For content factor measurement : When the voltage is 0V, 0% is displayed. (Each phase) : When the voltage of phase1 is 0V or the frequency is less than 44.5Hz, ---- is displayed for all phases
Operating Time	999999 hour is displayed if it is over 999999.	

Note1: Input current and input voltage means the input to the instrument. They are not to primary sides of VT, CT.

Note2: For direct measurement, it does not input upper maximum scale value.

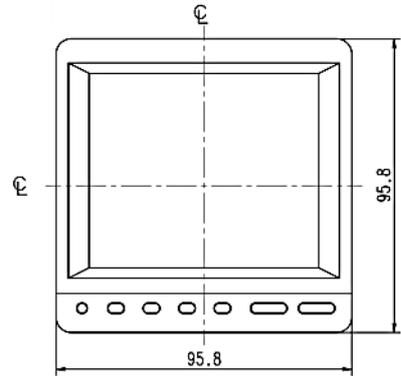
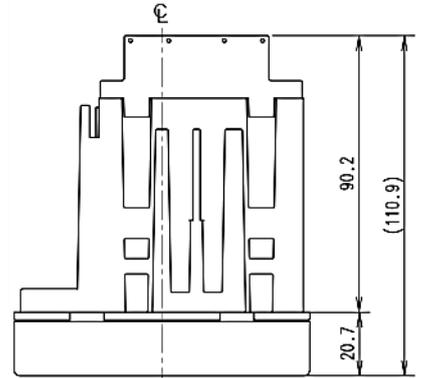
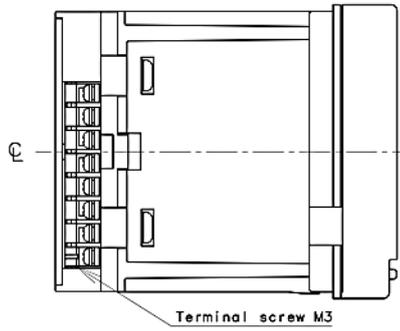
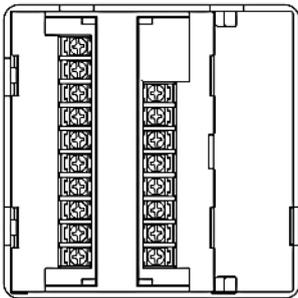
6. Other

6.6. Troubleshooting

In the case of abnormal noise, odor, smoke, or heat generation from this instrument, turn it off at once. Check the followings before you ask for repair.

	Condition	Possible cause	Solution
Display	The display is not lit.	Auxiliary power supply is not impressed on MA and MB terminals.	Impress auxiliary power supply.
	When the auxiliary power supply is impressed, display is not lit soon.	This is not an error. For about a few seconds after auxiliary power source is charged, initialization of internal circuit is carried out.	Use it as it is.
	The back light is not lit.	The back light may be set to auto off (Auto). (If it turns on after you press an operation button, it means the backlight is set to auto off.)	When the auto off is enabled, it automatically turns off in 5 minutes. Continue using it as it is or change the setting to HoLd (it stays on). (Refer to page 23)
	The display becomes black.	It may become black owing to static electricity.	It goes off after a while.
	"End" display remains.	The product is still in the setting mode.	Press (SET) .
Measurement error	The current and voltage have large errors.	The settings for VT / direct voltage and CT primary current may be incorrect.	Please check the set values for VT / direct voltage and CT primary current.
	The current and voltage are correct, but the active power and power factor have large errors.	The wiring for VT/CT or for the measurement instrument may be incorrect.	Please check the wiring for VT/CT and for the measurement instrument.
	Measured values of PF are including large error.	If the input current is smaller than the rating, error becomes large. (about 5% or below of rated current)	This is not an error, or uses it as it is, or if error is troublesome, changes the CT according to the actual current to be used.
	The displayed active power is different from the active power that is calculated by multiplying the displayed current, voltage, and power factor.	If the AC of the current and voltage deteriorate due to harmonics, it will not be the same as the calculated value. (For AC without harmonics, the calculated value will match with the displayed value.)	Please continue using the instrument as it is.
	The total effective harmonics value from the harmonic current is very different from the current value.	The distortion factor (content factor) is way over 100%. (Such as measurement of the inverter secondary side output)	Please check the measured item.
	The current measured by another measurement instrument (such as a clamp meter) is different from the current measured by this instrument. (More than the tolerance)	If another measurement instrument uses the average method for measuring, the measurement instrument used will have a larger error when the AC deteriorates due to harmonics. (This measurement instrument uses the RMS value method.)	Please compare the currents using a measurement instrument that uses the RMS value method.
	On the maximum/minimum value display screen, a present value that is outside of the maximum/minimum range is displayed.	During the starting current delay time, the maximum value is not updated, so the present value that is over the maximum value may be displayed.	Please continue using the instrument as it is.
Operation	Cannot change the settings in the setting mode.	If (SET) at the bottom of the screen is blinking, you are in the set value confirmation mode. Settings cannot be changed in this mode.	Please go to the setting mode to change settings.
	"PASS 0000" appears when trying to change the setting mode.	The password protection setting is turned to valid.	Please enter the set password. Also, the default password is "0000" (Refer to page 46)
Other	Maximum value and minimum value changed.	These are cleared if the settings for the phase wire, VT/direct voltage, and CT primary current are changed.	Make a note of the values before changing the settings
	The values of the setting items that were not supposed to change have changed.	Some setting items return to the default values when settings for the phase wire method, VT/direct voltage, and CT primary current are changed.	Please refer to "Initializing Related Items by Changing Settings" (page 31) and reconfigure the setting items that returned to their default values.
	"PASS 0000" appears when trying to clear the energy or maximum/minimum value.	The password protection setting is turned to valid.	Please enter the set password. Also, the default password is "0000" (Refer to page 46)
Communication	COM in the LCD screen is blinking. (Appears for 0.25sec. / Disappears for 0.25sec.)	MODBUS RTU® communication error as follows was detected. <ul style="list-style-type: none"> • Communication setting (Slave address, baud rate, stop bit and parity) was incorrect. • Function code was incorrect. • Register address was incorrect. etc. 	Review the communication setting, the function code and the register address and so on. If the correct query received, COM is lit.

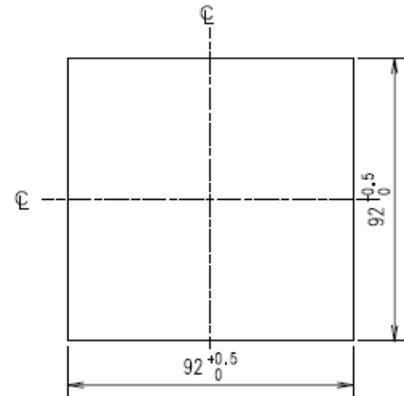
ME96SSEA-MB



Installation 2. Mounting

1 Dimensions of mounting holes

The drilling dimensions of the panel are as shown in the right figure. The product can be installed to a panel having a thickness of 1.6 to 4.0 mm.

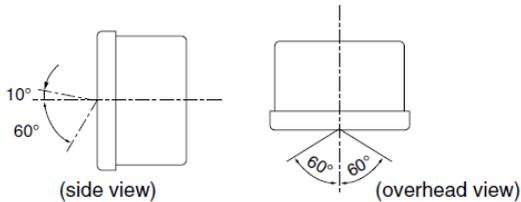


2 Mounting position

The contrast of the LCD changes depending on the angle at which it is viewed.

Mount the product in the easy viewable position.

Viewing angle

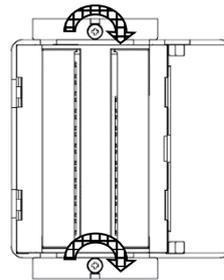
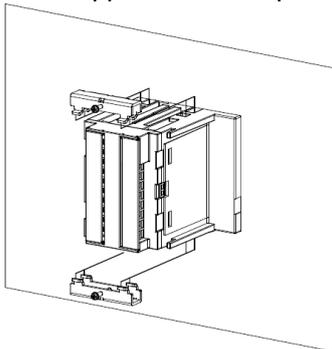


3 Mounting and fixing

Mount the product to the panel of the main unit according to the following procedure.

① Attach the mounting brackets to two areas each in upper and lower parts of the main unit.

② Tighten the screws of the mounting brackets to fix them to the panel.



Note

To avoid damage to the panel and screws, do not overtighten the screws. The recommended torque for this product is 0.3 N•m to 0.5 N•m (about half the normal torque). Tighten the upper and lower screws evenly.

Screw type for mounting to the main unit: M3

Note

Protecting sheet

The LCD part is covered with a protecting sheet to avoid scratches to the LCD during mounting of the panel. Before starting operation, remove the sheet. When removing the sheet, the LCD may illuminate due to static electricity, but this is not a product failure. After a while, the LCD goes off as it naturally discharges electricity.

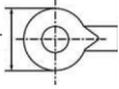
Mounting position

To mount the product to the edge of the panel, check the space for wiring work before determining the mounting position.

Installation 3. Wiring

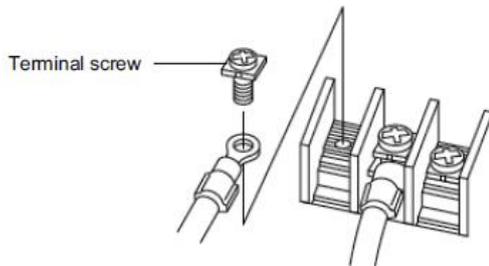
1 Applicable electric wire specifications

The following table shows applicable electric wire sizes.

Section	Screw type	Specification of wire used	Tightening torques
Terminal of main unit. (Auxiliary power, Voltage input, Current input, MODBUS®RTU communication terminal)	M3	<ul style="list-style-type: none"> Use crimping terminals: AWG26 to 14 (Connectable 2 wires) <p>Applicable crimping terminals:</p> <p>Outer Diameter  For M3 screw with an outer diameter of less than 6.0mm.</p>	0.6 to 0.8N·m

2 Wiring of the main unit.

Be sure to securely tighten the terminal screws to the terminal block.



⚠ CAUTION

- Please do not connect three or more electric wires to one terminal. This can cause heat and fire due to imperfect contact.
- If you are using bare crimped terminals, provide the insulation needed to cover exposed live parts and prevent electric shock and short circuits (e.g., use insulated tubing).

3 Checking

Check the following after connection.

- The electric wire is securely connected.
- There is no error in connection.

Installation 3. Wiring

⚠ CAUTION

Do not work with live wires

Do not connect with live wires. It may cause electric shock, burns, device burn out, or fire. It is recommended that a protection fuse be used for VT and the auxiliary power source.

Do not open the secondary side of the CT circuit

Connect the CT secondary side signal correctly to the terminal for CT connection. If the CT is not connected properly or if the secondary side of the CT is open, it may result in high voltage on the secondary side of the CT, the insulation of the secondary winding wire may be damaged, and burnout may be caused.

Do not short the secondary side of the VT circuit

Connect the VT secondary side signal correctly to the terminal for VT connection. If the VT is not connected properly or if the secondary side of the VT shorts, over current may flow to the secondary side of the VT, which can burn out the secondary winding wire. If the secondary winding wire burns out, it can damage the insulation of the primary winding wire, resulting in a short between phases.

Make sure connections to the connection terminals are tight

Electrical wires must be properly tightened to the connection terminal. Otherwise, heat and measurement errors may be caused.

Do not forget wiring of "C₁", "C₂" and "C₃" for pass.

When the L side of CT circuit is common wire, it is necessary to short-circuit "C₁", "C₂", and "C₃" terminal of this device.

Do not use improper electrical wires

Make sure that the electrical wires have the proper rating for current and voltage. If inappropriate electrical wires are used, fire may be caused.

Do not pull the connection wires with force

If the terminal wiring is pulled with a strong force, the input portion may detach. (Tensile load: 39.2N or less)

Do not apply an abnormal voltage.

If a pressure test is given to a high-pressure device, a ground must be used in order to avoid damaging this measurement instrument. If a high voltage of AC2000V is applied for over one minute to the measurement instrument, damage may occur.

Do not connect to Non-Connection (NC) terminal.

Do not connect to Non-Connection (NC) terminals for the purpose of relay etc.

Use the proper voltage for the auxiliary power source.

Use the proper voltage for the auxiliary power source terminal. If an improper voltage is used, the instrument may be damaged or fire may be caused.

Installation 4. Wiring Diagram

Rating voltage for every phase wire system

Phase wire type	Type	Rating voltage	Figure
3-phase 4-wire type	STAR	max AC277V(L-N)/480V(L-L)	Figure 1
3-phase 3-wire type	DELTA	max AC220V(L-L)	Figure 2
	STAR	max AC440V(L-L)	Figure 3
1-phase 3-wire type	—	max AC220V(L-N)/440V(L-L)	Figure 4
1-phase 2-wire type (Note)	DELTA	max AC220V(L-L)	Figure 5
	STAR	max AC440V(L-L)	Figure 6

Note. In case of a circuit which is wired from the delta connection of a 3-phase 3-wire type or a circuit of a transformer of a 1-phase 2-wire type, the maximum rating is "AC220V".
In case of a circuit which is wired from a 3-phase 4-wire type, the star connection of a 3-phase 3-wire type or a 1-phase 3-wire type, the maximum rating is "AC440V".

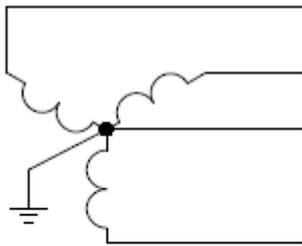


Figure1. 3-PHASE 4-WIRE(STAR)

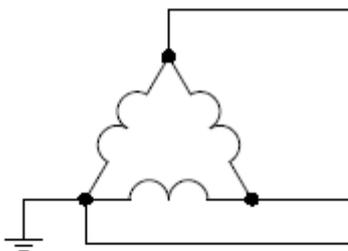


Figure2. 3-PHASE 3-WIRE(DELTA)

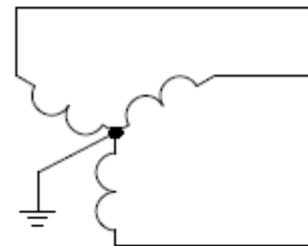


Figure3. 3-PHASE 3-WIRE(STAR)

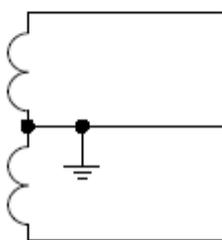


Figure4. 1-PHASE 3-WIRE

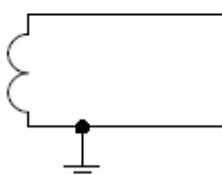


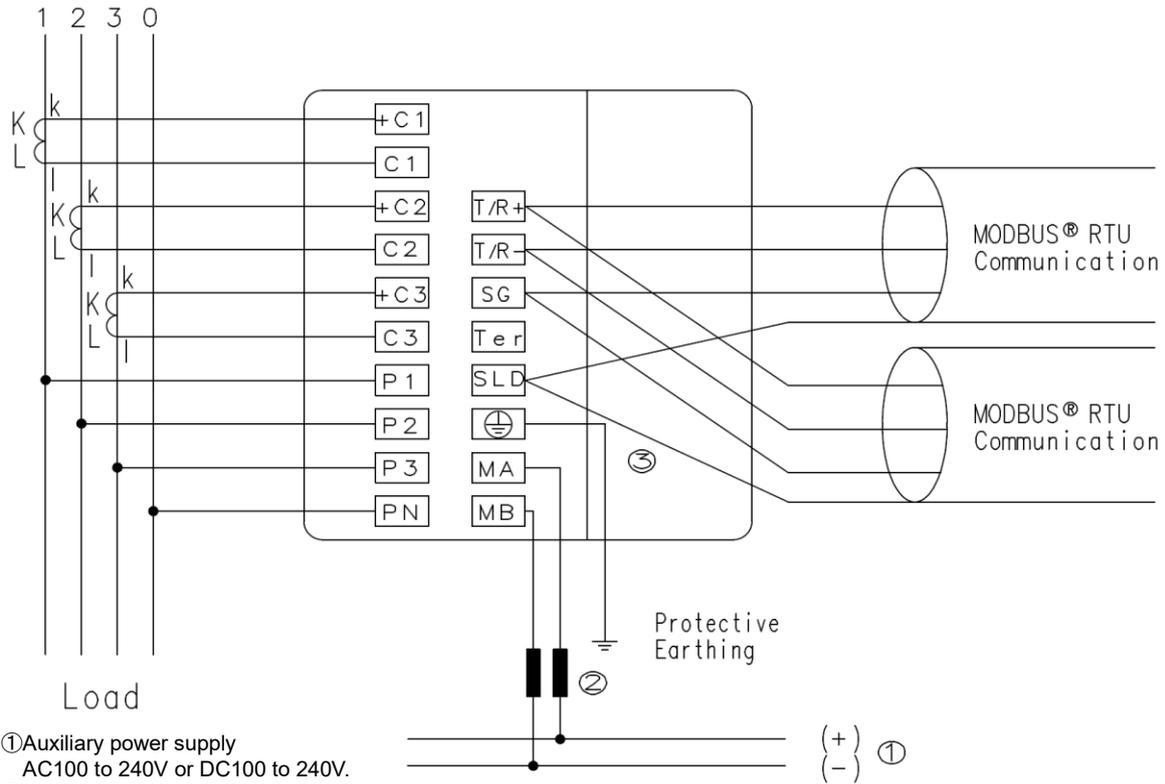
Figure5. 1-PHASE 2-WIRE(DELTA)



Figure6. 1-PHASE 2-WIRE(STAR)

Installation 4. Wiring Diagram

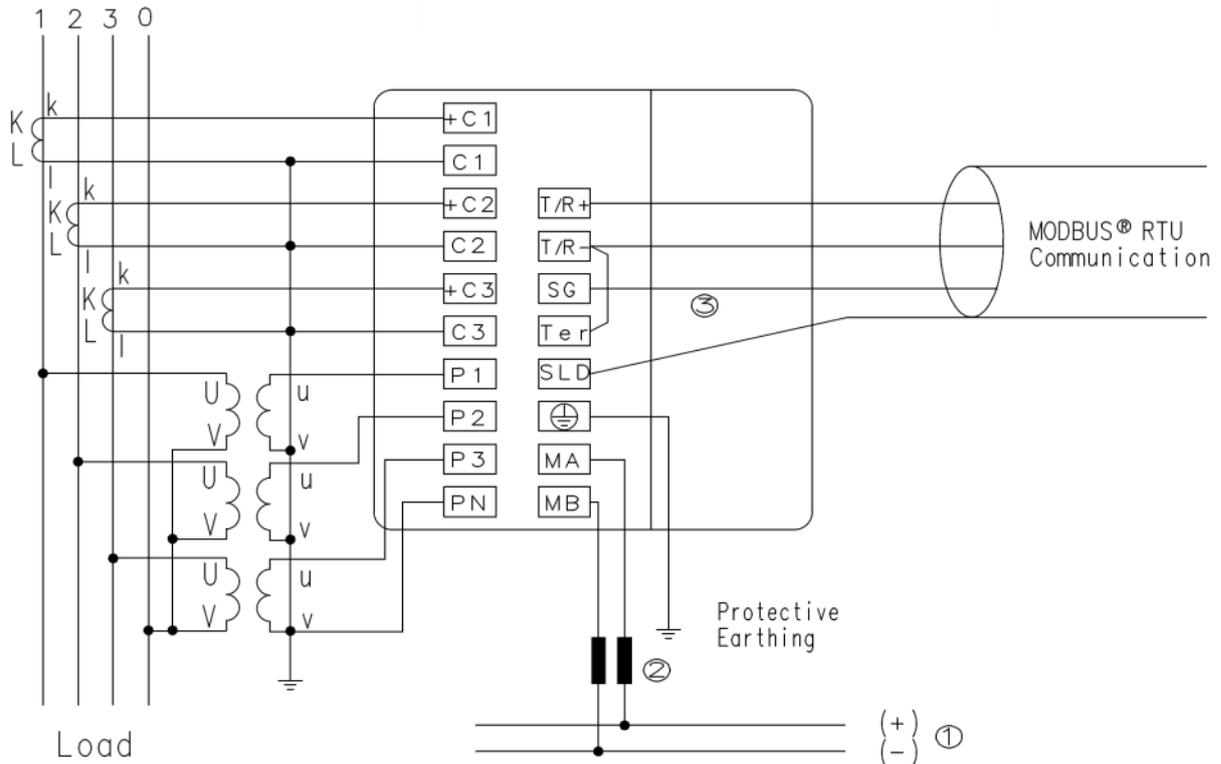
3-phase 4-wire type: Direct input



- ① Auxiliary power supply
AC100 to 240V or DC100 to 240V.
- ② Fuses 0.5A
- ③ Some MODBUS®RTU equipment doesn't have SG. In this case, the wiring between SG is unnecessary.

Note 1: For low voltage circuits, grounding the secondary side of VT and CT is not t necessary.

3-phase 4-wire type: With VT

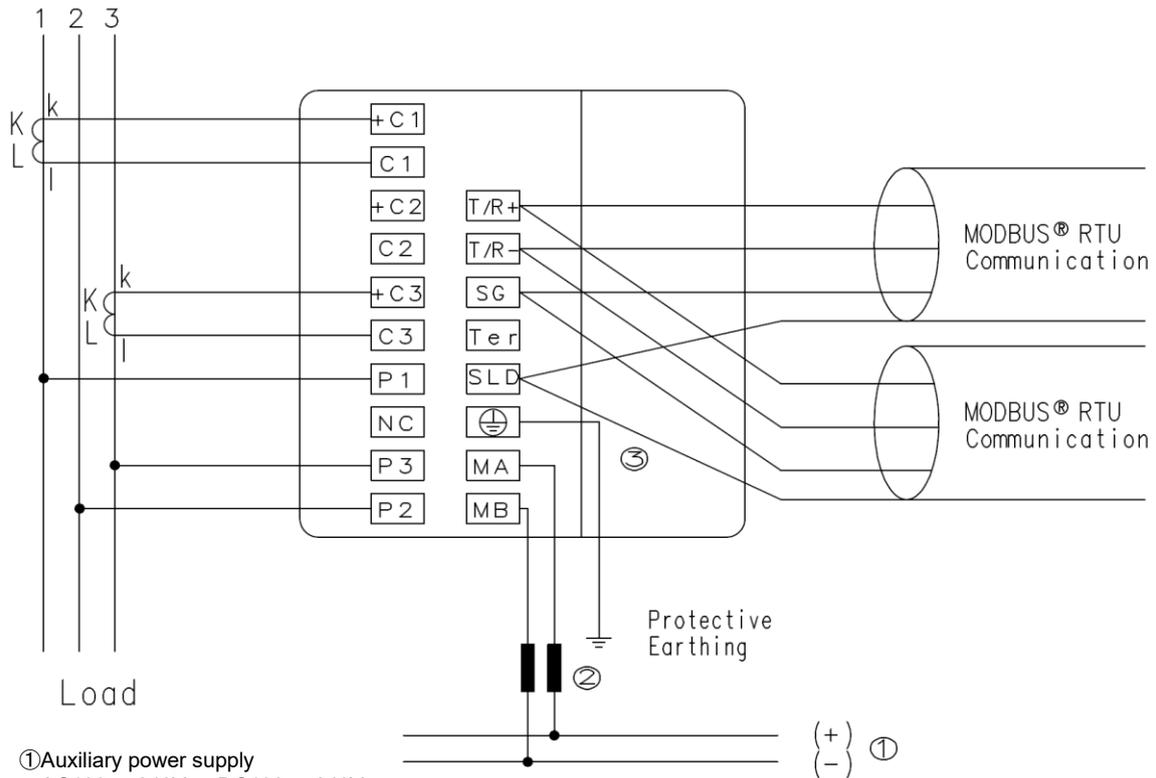


- ① Auxiliary power supply
AC100 to 240V or DC100 to 240V.
- ② Fuses 0.5A
- ③ Some MODBUS®RTU equipment doesn't have SG. In this case, the wiring between SG is unnecessary.

Note 1: For low voltage circuits, grounding the secondary side of VT and CT is not t necessary.

Installation 4. Wiring Diagram

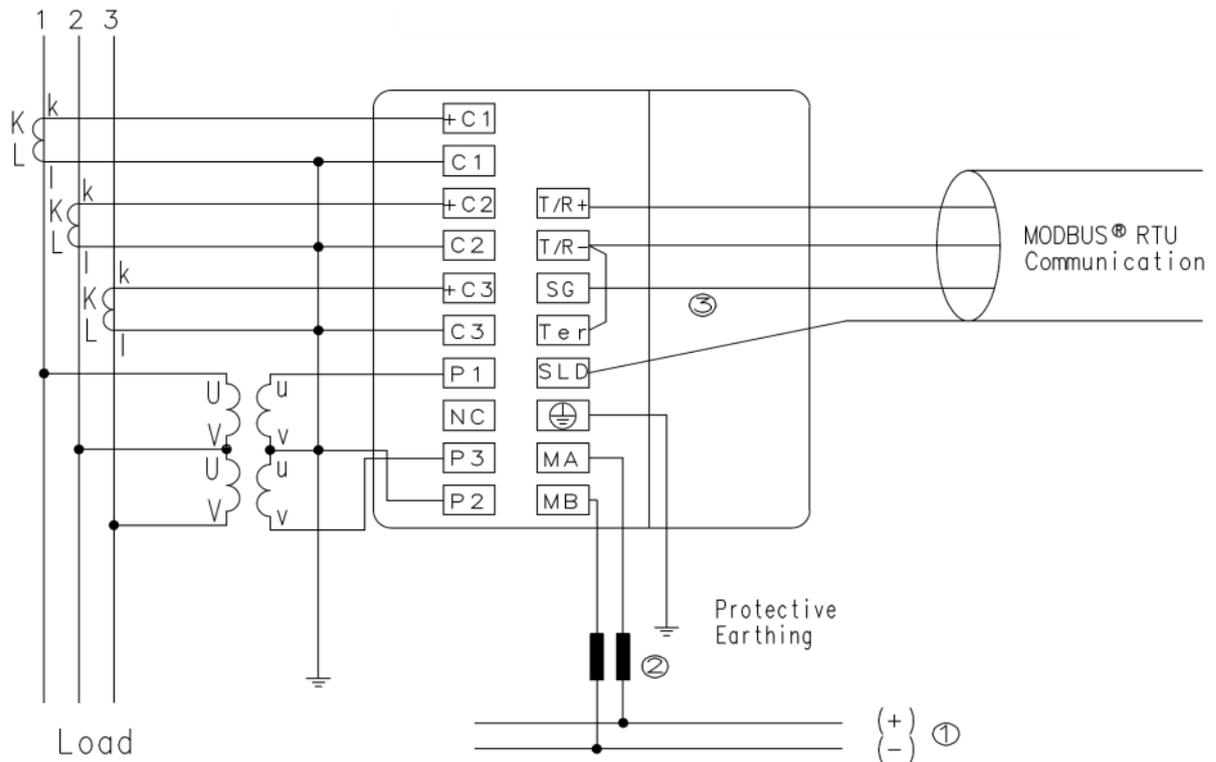
3-phase 3-wire(2CT) type: Direct input



- ①Auxiliary power supply
AC100 to 240V or DC100 to 240V.
- ②Fuses 0.5A
- ③Some MODBUS®RTU equipment doesn't have SG. In this case, the wiring between SG is unnecessary.

Note 1: For low voltage circuits, grounding the secondary side of VT and CT is not t necessary.
 Note 2: Do not connect to NC terminal.

3-phase 3-wire(3CT) type: With VT

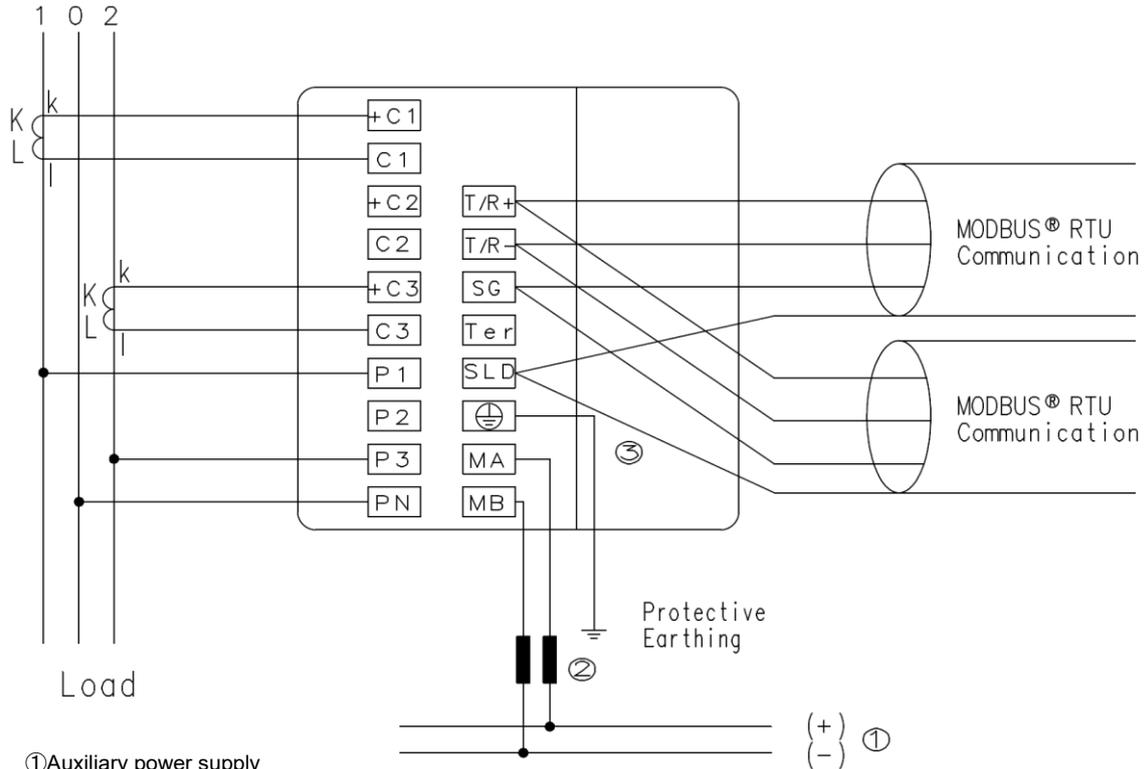


- ①Auxiliary power supply
AC100 to 240V or DC100 to 240V.
- ②Fuses 0.5A
- ③Some MODBUS®RTU equipment doesn't have SG. In this case, the wiring between SG is unnecessary.

Note 1: For low voltage circuits, grounding the secondary side of VT and CT is not t necessary.
 Note 2: Do not connect to NC terminal.

Installation 4. Wiring Diagram

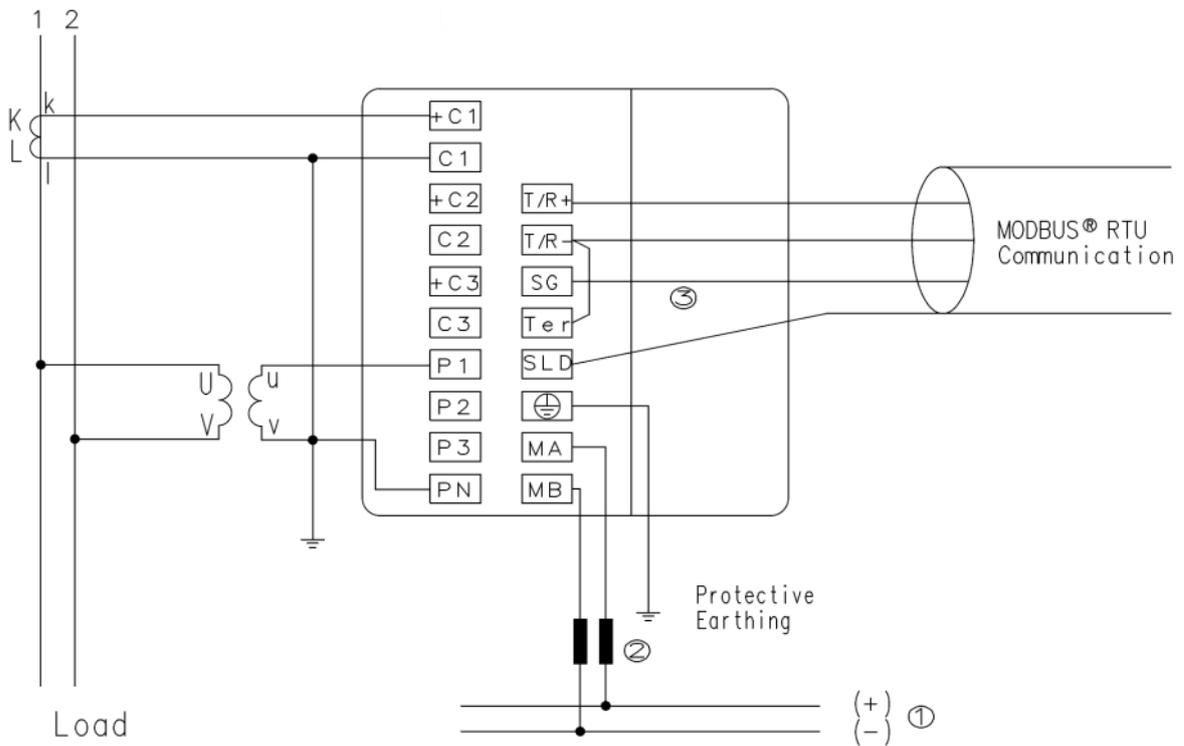
1-phase 3-wire type



- ①Auxiliary power supply
AC100 to 240V or DC100 to 240V.
- ②Fuses 0.5A
- ③Some MODBUS®RTU equipment doesn't have SG. In this case, the wiring between SG is unnecessary.

Note 1: For low voltage circuits, grounding the secondary side of CT is not t necessary.

1-phase 2-wire type: With VT



- ①Auxiliary power supply
AC100 to 240V or DC100 to 240V.
- ②Fuses 0.5A
- ③Some MODBUS®RTU equipment doesn't have SG. In this case, the wiring between SG is unnecessary.

Note 1: For low voltage circuits, grounding the secondary side of VT and CT is not t necessary.

Installation 4. Wiring Diagram

Note for Input

Note	<ol style="list-style-type: none">1. The voltage input terminals for 3-phase 3-wire are different from those for others.2. If the polarity for VT and CT are wrong, the measurement cannot be executed correctly.3. Do not connect wires to the NC terminals.4. In the case of low voltage, there is no need for grounding of the secondary sides of VT and CT.5. Always earth the ⊕ terminal to the protective earth conductor. Earth the terminal with less than 100 ohm of earth resistance. Otherwise there will be a false operation.
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Note for MODBUS[®]RTU

Note	<ol style="list-style-type: none">1. Use the shielded twisted pair cable. (Recommended cables: Refer to page 66.)2. To the units at both ends of the MODBUS[®]RTU link, the 120-ohm resistance has to be attached. This instrument can perform a 120-ohm termination by short-circuiting the terminal of T/R- and Ter.3. The earthing has to be connected to earth by a thick wire of low impedance.4. Keep the distance between MODBUS[®]RTU link to power lines.5. Connect to earth the SLD terminal at one end.
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Specifications

1. Specification

Type		ME96SSEA-MB	
Phase wire system		3-PHASE 4-WIRE, 3-PHASE 3-WIRE(3CT, 2CT), 1-PHASE 3-WIRE, 1-PHASE 2-WIRE (common)	
Rating	Current	AC5A, AC1A (common)	
	Voltage	3-PHASE 4-WIRE : max AC277/480V 3-PHASE 3-WIRE : (DELTA)max AC220V, (STAR)max AC440V 1-PHASE 3-WIRE : max AC220/440V 1-PHASE 2-WIRE : (DELTA)max AC220V, (STAR)max AC440V	
	Frequency	50-60Hz (common)	
Item	Measurement Item	Accuracy	
Measurement elements	Current (A)	A1, A2, A3, AN, A_{AVG}	±0.5%
	Current Demand (DA)	DA1, DA2, DA3, DAN, DA_{AVG}	
	Voltage (V)	V12, V23, V31, $V_{AVG}(L-L)$, V1N, V2N, V3N, $V_{AVG}(L-N)$	
	Active Power (W)	W1, W2, W3, ΣW	
	Power Factor (PF)	PF1, PF2, PF3, ΣPF	
	Frequency (Hz)	Hz	±0.2%
	Active Energy (Wh)	Imported	class0.5S (IEC62053-22)
	Harmonic current (HI)	Total	±2.0%
	Harmonic voltage (HV)	Total	
	Operation time (h)	Operation time 1, Operation time 2	(Reference)
Measuring Method	Instantaneous Value	A·V:RMS calculation, W·Wh: Digital multiplication, PF: Power ratio calculation, Hz: Zero-cross, HI·HV: FFT	
	Demand Value	DA: Thermal type calculation,	
Display	Type	LCD with backlight	
	Maximum Number of Display Digits or Segment Number	Upper stage display : 6 digits, Middle stage display : 6 digits, Lower stage display : 6 digits A, DA, V, W, PF : 4 digits Hz : 3 digits Wh : 9 digits(6 digits or 12 digits possible) Harmonic total distortion ratio : 3 digits Harmonic RMS value : 4 digits Operation time : 6 digits	
	Bar graph	21 Segment-Bar graph, 22 Segment-Indicator	
	Display updating time interval	0.5s, 1s	
Communication Specification	MODBUS®RTU communication		
Power Failure Compensation	Non volatile memory(Items : Setting value, MAX/MIN value, Active energy, Operation time)		
VA Consumption	VT	0.1VA/phase (at 110VAC), 0.2VA/phase(at 220VAC) , 0.4VA/phase(at 440VAC)	
	CT	0.1VA/phase (at 5AAC)	
	Auxiliary power	7VA(AC110V), 8VA(AC220V), 5W(DC100V)	
Auxiliary power	AC100-240V(±15%), DC100-240V(-30% +15%)		
Weight	0.5kg		
Dimension	96(H)×96(W)×90(D)		
Attachment Method	Embedding attachment		
Operating temperature/humidity	-5 to +55°C(average temperature: 35°C or less per day), 0 to 85%RH, non condensing		
Storage temperature/ humidity	-25 to +75°C(average temperature: 35°C or less per day), 0 to 85%RH, non condensing		

Note1: Accuracy is specified according to the maximum scales value of rated value.

Note2: Measurement of harmonics which its distortion ratio is exceeded 100% may exceed the accuracy.

Note3: Harmonics cannot be measured without voltage input.

Specifications

2. Applicable Standards

Electromagnetic Compatibility	
Emissions	
Radiated Emission	EN61326-1/CISPR 11, FCC Part15 Subpart B Class A
Conducted Emission	EN61326-1/CISPR 11, FCC Part15 Subpart B Class A
Harmonics Measurement	EN61000-3-2
Flicker Meter Measurement	EN61000-3-3
Immunity	
Electrostatic discharge Immunity	EN61326-1/EN61000-4-2
Radio Frequency Electromagnetic field Immunity	EN61326-1/EN61000-4-3
Electrical Fast Transient/Burst Immunity	EN61326-1/EN61000-4-4
Surge Immunity	EN61326-1/EN61000-4-5
Conducted Disturbances, Induced By Radio Frequency Fields Immunity	EN61326-1/EN61000-4-6
Power Frequency Magnetic Field Immunity	EN61326-1/EN61000-4-8
Voltage Dips and Short Interruptions	EN61326-1/EN61000-4-11

Safety	
Europe	CE, as per EN61010-1
U.S. and Canada	cRUus as per UL61010-1, IEC61010-1
Installation Category	III
Measuring Category	III
Pollution Degree	2

3. Specifications of MODBUS® RTU Communication

Item	Specifications
Physical interface	RS – 485 2wires half duplex
Protocol	RTU (Binary data)
Synchronization method	Start-stop synchronization
Network topology	Daisy-chain
Baud rate	2400, 4800, 9600, 19200, 38400bps
Data bit	8
Stop bit	1, 2
Parity	Odd, Even, None
Slave address	1 to 255 (0 : For broadcast)
Distance	1200m
Maximum Number	31
Response time	1s or less (time to a response after receiving a query)
Terminate	120Ω 1/2W
Recommended cable	Shielded twisted pair, AWG24 to 14 gauge

■ About Programming

In addition to this manual, read the following documents too.

- Electronic Multi-Measuring Instrument ME Series MODBUS® Interface specifications LSPM-0075

Specifications

4. Setting Table (Factory Settings and Customer Setting Note)

Setting menu No.	Setting items	Initial content	Memo	
1	1.1	Phase wire system	3P4(3-phase 4-wire)	
	1.2	Display pattern	P04	
		1.2.1	Pattern P00	—
	1.3	VT/direct selection	no(No VT)	
		1.3.1	Direct voltage	220/380V
		1.3.2	VT secondary voltage	—
		1.3.3	VT primary voltage	—
	1.4	CT secondary current	5A	
1.4.1		CT primary current	5A	
1.5	Frequency	50Hz		
1.7	Time constant for current demand	0s		
2	2.2	MODBUS [®] RTU address	1	
	2.2.1	MODBUS [®] RTU baud rate	19.2kbps	
		MODBUS [®] RTU parity	EVEn(even)	
		MODBUS [®] RTU stop bit	1	
3	3.1	Current maximum scale	5A(CT primary current)	
	3.1.1	Special current maximum scale	—	
		3.2	Voltage maximum scale	300V(±0 STEP)
	3.3	Power maximum scale	4000W(±0 STEP)	
		3.3.1	Single / Double deflection	Single deflection
	3.5	Power factor scale	0.5(-0.5 to 1 to 0.5)	
3.7	Harmonics display	oFF		
4	4.1	Model name + option code	(Model name)	
	4.2	Version display	(Version)	
	4.3	Back light brightness	3	
	4.4	Back light auto off	Auto(Auto off)	
	4.5	Display update time	0.5s	
5	5.1	Alarm item 1	non	
	5.1.1	Alarm value 1	—	
		5.2	Alarm item 2	non
	5.2.1	Alarm value 2	—	
		5.3	Alarm item 3	non
	5.3.1	Alarm value 3	—	
		5.4	Alarm item 4	non
	5.4.1	Alarm value 4	—	
		5.5	Alarm delay time	—
	5.6	Alarm cancel method	—	
5.7	Back light flickers during alarms	—		
5.8	Motor start-up current masking	oFF		
	5.8.1	Motor start-up current threshold	—	
		5.8.2	Motor start-up current delay time	—
8	8.1	Operating time display	oFF	
	8.1.1	Target for counting Operation time setting	AUX(Auxiliary power)	
		8.1.2	Operating time threshold	—
	8.2	Switch element information	123	
8.3	Set IEC mode	oFF(Normal mode)		

Appendix

1. Calculation methods of ME96SS (for 3 phase unbalanced system with neutral)

Item	Normal mode	IEC mode	Remark
R.m.s current for phase p	$I_p = \sqrt{\frac{\sum_{k=0}^{N-1} i_{p_k}^2}{N}}$		
R.m.s neutral current	$I_N = \sqrt{\frac{\sum_{k=0}^{N-1} (i_{1_k} + i_{2_k} + i_{3_k})^2}{N}}$		
Lp-N r.m.s voltage	$V_{pN} = \sqrt{\frac{\sum_{k=0}^{N-1} v_{pN_k}^2}{N}}$		
Lp-Lg r.m.s voltage	$V_{pg} = \sqrt{\frac{\sum_{k=0}^{N-1} (v_{gN_k} - v_{pN_k})^2}{N}}$		
Active power for phase p	$P_p = \frac{1}{N} \cdot \sum_{k=0}^{N-1} (v_{pN_k} \times i_{p_k})$		
Power factor for phase p	$PF_p = \frac{P_p}{\sqrt{P_p^2 + Q_p^2}}$	$PF_p = \frac{P_p}{S_p}$	Refer to page 42 for the sign.
Total active power	$P = P_1 + P_2 + P_3$		
Total power factor	$PF = \frac{P}{\sqrt{P^2 + Q^2}}$	$PF = \frac{P}{S}$	Refer to page 42 for the sign.

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