MITSUBISHI ELECTRIC

MDU Breaker

Instruction Manual

Applicable Models **NF250-SEV with MDU, NF250-HEV with MDU for BREAKER MOUNTING TYPE**

- Be sure to fully understand this Instruction Manual before using the product.
- After reading the manual, keep it at hand for your future reference.
- Deliver this Instruction Manual to the end user.

- In the case of MDU with CC-Link transmission, read the following related manual in addition to this manual.
  [1] CC-Link System Master –Local Module User's Manual.
  [2] MDU Breaker Programming Manual(CC-Link).
  * The CC-Link version is "CC-Link Ver.1.10."

The marks used respectively mean the following.

⚠ **Danger**	Wrong handling can cause dangerous situation in which possibility of fatal accidents or serious injuries assumed.
⚠ **Caution**	Wrong handling can cause dangerous situation in which possibility of significant or minor injuries or only impersonal damages assumed.

⚠	Using this under certain conditions could cause electrical shock.

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1. Safety Precautions

This instruction manual is intended mainly for those who have technical knowledge of electricity, such as manufacturers of assembly products using this product, electricians, and servicepersons. This manual is also for operators (end users) of this product.

⚠ Caution

- For correct and safe usage, be sure to carefully read and fully understand the "Handling and Maintenance of Mitsubishi Molded Case Circuit Breaker/Earth Leakage Circuit Breaker" and this instruction manual before use.
- Before installing or removing the MDU breaker, cut off the upper circuit breaker and make sure that no electricity is supplied.
- This product shall be handled by a person having technical knowledge.

2. Precautions for Use

Unless otherwise noted, the following terms used this instruction manual indicate the models shown below.

	Model name
Molded Case Circuit Breaker (MCCB)	NF250-SEV with MDU, NF250-HEV with MDU

2.1 Standard operating conditions

⚠ Caution

- Use the MDU breaker within the standard operation conditions described below.
  - [1] Operating ambient temperature: -10°C to 40°C (However, the average temperature for 24 hours shall not exceed 35°C.)
  - [2] Storage ambient temperature: -25°C to +55°C (No condensation/freezing)
  - [3] Relative humidity: 85% or less without dew condensation.
  - [4] Altitude: 2000 m or less
  - [5] Atmosphere: There shall not be much dust, smoke, corrosive gas, flammable gas, water, and salt.
- Lowering ratio of operational current in special ambient temperature over 40℃.
  - 50℃…..0.9 times 60℃…..0.7 times
- Do not wipe the MDU breaker off with a cloth soaked with thinner, detergent, or other chemicals.
  Doing so may fade characters on the name plate, reduce insulation performance, or deform the mold.
  When cleaning the product, use air cleaner or wipe it off with a dry cloth.
- There is no influence in the performance though the MDU case might discolor by the environment.
- The LCD may have bright (always on) or dark (always off) pixeis due to the characteristics of LCDs.
  Because LCDs contain many display elements, there is no way to ensure that bright or dark pixels will never occur. Bright or dark pixels are not defects in the product itself.

2.2 Dielectric strength test

⚠ Caution

- Be sure to connect the circuit breaker and the MDU unit before starting the test.
- A transformer for measurement has been connected between the load side poles of the circuit breaker.
  At the areas marked with "X" in the table below, do not perform the withstand voltage test between the load side poles. Doing so causes a failure.
  At the areas marked with "△" in the table below, the 500 V DC insulation resistance test does not cause breakdown. However, a low insulation resistance value is shown.
  The withstand voltage test and insulation resistance test can be performed without problems between the bundled line and load terminal of the circuit breaker and the earth.
- The voltage between each terminal must not become DC5V or more when you do the cable check etc. of DA,DB,DG,SLD,and the terminal FG for the CC-Link. It is likely to break down.

Measurement point/test			Insulation resistance test		Withstand voltage test		
Status of handle			ON	OFF	ON	OFF	Test condition
Between live part and earth			○	○	○	○	2500 V AC 1 min.
Between different poles	Line side	Between left and middle poles	△	○	x	○	
		Between middle and right poles	△	○	x	○	
		Between left and right poles	△	○	x	○	
		Between middle and neutral poles (for 4-pole breaker)	△	○	x	○	
	Load side	Between left and middle poles	△	△	x	x	
		Between middle and right poles	△	△	x	x	
		Between left and right poles	△	△	x	x	
		Between middle and neutral poles (for 4-pole breaker)	△	△	x	x	
Between line and load terminal			-	○	-	○	
Between main circuit and MDU unit terminal (L1, L2)			○	○	○	○	2500 V AC 1 min. (Note 1)
Between main circuit and MDU unit terminal (113, 114) (with electric energy pulse output (option))			○	○	○	○	
Between main circuit and MDU unit terminal (DA, DB, DG, SLD, FG) (with CC-Link communication (option)) (Note 3) (Note 4)			○	○	○	○	
Between MDU unit terminal (L1, L2) and MDU terminal (113, 114) (with electric energy pulse output (option))			○	○	○	○	1500 V AC 1 min. (Note 2)
Between MDU unit terminal (L1, L2) and MDU unit terminal (DA, DB, DG, SLD, FG) (with CC-Link communication (option)) (Note 3) (Note 4)			○	○	○	○	

Note 1. When testing, connect the MDU unit terminal (L1, L2, 113, 114, DA, DB, DG, SLD, FG) to the earth side.
Note 2. When testing, connect the MDU unit terminal (113, 114, DA, DB, DG, SLD, FG) to the earth side.
Note 3. Do not test between the MDU unit terminal (DA, DB, DG, SLD) and the MDU terminal (FG).
Note 4. When testing, be sure to handle the MDU unit terminals (DA, DB, DG, SLD, and FG) collectively.

2.3 Connection and installation

⚠ Caution

- When using the MDU breaker, the line side and load side cannot be reversed.
- When installing the MDU breaker of breaker mounting type, do not remove the cable connecting the MDU unit and the circuit breaker. Doing so causes a failure.
- When the MDU breaker of breaker mounting type with SLT (accessory device) on the right pole side, the MDU unit is placed separately. In this case, a breaker-side connection cable is attached to the circuit breaker. For details, refer to Chapter 5 "Procedure for Installing and Setting MDU Breaker".
- The connector of the breaker-side connection cable is insulated from the inside of the circuit breaker.
- Even if the power is supplied to the MDU breaker while the connector is open (not connected), the circuit breaker is designed not to break down but to operate properly.
- If a MDU will be installed later, do so within 1.5 years from installing the MDU Breaker main unit.
- Since some space is required to install the connection cable, assure such space before installing the MDU breaker.
- Do not pull the connection cable and the breaker-side connection cable forcibly (15 N or less). Doing so may disconnect or break the cables.
- The connection cable and breaker-side connection cable forms a small signal circuit. Install them 10 cm or more away from power electric circuits.
  Also secure the cables near their connectors to prevent any external force applied to the connection sections when the front door is opened or closed. When bending the cable, keep the radius 20 mm or more.
- The connectors between the MDU unit and the connection cable and between the connection cable and the breaker-side connection cable should not be connected and disconnected exceeding 20 times.
- Supply the control power to L1 and L2 terminal of the MDU unit.
  When control power is cut off, measurement, display, electric energy pulse output, and CC-Link communication cannot be performed. In this control circuit, install MCCB or Fuses as a short-circuit protection device.
- When using the MDU breaker in a 1φ2W (single-phase 2-wire system), make the connections as shown in Figure 1. Since the load side of Phase 1 is a live part, ensure insulation.
  As the measurement data, use the current of phase 2 or phase 3 and the voltage between phase 2 and phase 3. For the phase wire system setting, select the 1φ2W.
- When using the MDU breaker in a 1φ3W (single-phase 3-wire system), connect the neutral line to phase 2 as shown in Figure 2. For the phase wire system setting, select the 1φ3W.
  Note that when the neutral line is connected to phase 1 or phase 3, the MDU cannot make measurement.

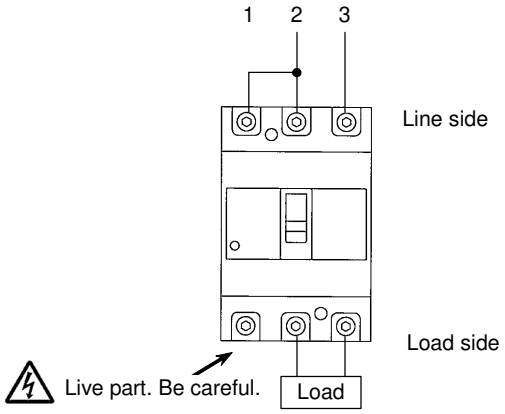


Figure 1. Connection method in a 1φ2W

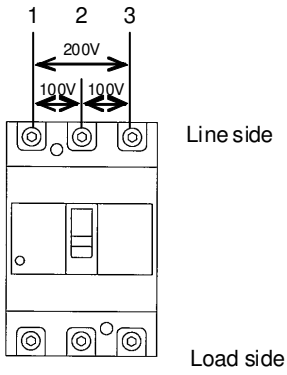


Figure 2. Connection method in a 1φ3W

- Note that a 3-pole MDU breaker is not usable in the 3φ4W (3-phase 4-wire system).
  The table below shows a case where a 3-pole MDU breaker is used in the 3φ4W.

Measurement item	Status	Reason
Load current	O: Voltage phase **x**: Phase N	Measurements cannot be made because CT does not exist in Phase N.
Line voltage	O: Between voltage phases **x**: Voltage phase - Phase N	Measurements cannot be made because VT does not exist between Phase N.
Harmonic current	O: Voltage phase **x**: Phase N	Measurements cannot be made because CT does not exist in Phase N.
Electric power/ reactive power	**x**	Since CT does not exist in Phase N and VT does not exist between Phase N, the value for Phase N cannot be added.
Electric energy/ reactive energy	**x**	
Power factor	**x**	

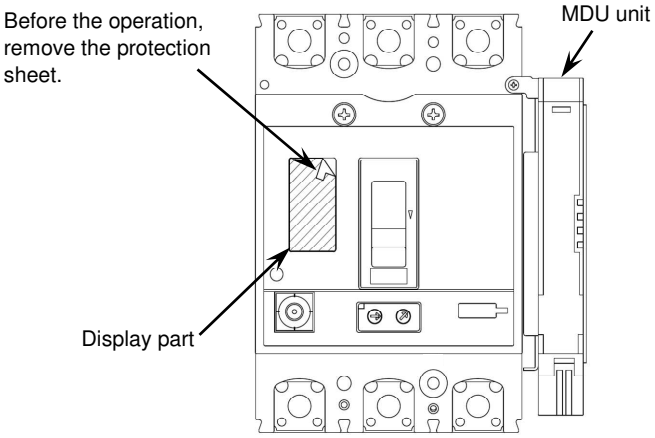
Note: "O" indicates that the measurement is possible. "X" indicates that the measurement is impossible.

2.4 Preparation before use

The LCD of display part is covered with a protection sheet to prevent flaws and scratches. Remove it before starting the use.

When the sheet is removed, the LCD display part may light up because of generation of static electricity, which is not a malfunction. After a while, it goes out due to self-discharge.

In addition, it may flicker during the internal process for display update.



Breaker mounting type

2.5 Requests

- The free warranty period and warranty scope for this product are as follows.
- Free warranty period

The free warranty period lasts for one year from the time of purchase.

- Warranty scope

(1) Any failures that occur during the warranty period will be repaired free of charge, assuming that the usage status, usage method, usage environment, etc. are as described in the product's catalog, User's Manual, warning labels, etc., and that the product was used under standard conditions as described in the precautions, etc.

However, the free warranty period shall last a maximum of 18 months after manufacture, with a maximum of six months for the distribution period after the product is shipped from Mitsubishi Electric.

(2) A fee will be charged for repairs under the following circumstances, even if the product is still within the free warranty period.

- Failures resulting from inappropriate storage/handling, carelessness, error, etc. on the customer's part.
- Failures resulting from installation mistakes.
- Failures resulting from misuse or unreasonable modification.
- Failures resulting from fires, abnormal voltage, or other external events beyond human control, or from earthquakes, wind disasters, or other natural disasters.
- Failures resulting from phenomena that could not be foreseen using the scientific technology standards at the time the product was shipped by Mitsubishi Electric.

The free warranty described here applies only to the delivered product, and does not apply to any damage or the like caused by failures in the delivered product.

- This free warranty does not apply to any damage or the like caused due to reprinting or reproducing the information included in this document in whole or in part in any form without the consent of Mitsubishi Electric.
- All efforts have been made to keep the information in this document current as software and hardware is revised. However, there may be cases where inconsistencies arise.

2.6 Notes on usage

(1) The products described in this Instruction Manual were designed and manufactured as general-purpose items meant for general industrial use, etc. Please contact Mitsubishi Electric sales to discuss use for special purposes including atomic energy, electric power, aerospace, medical, or passenger transport devices or systems.

(2) Mitsubishi Electric shall not be held responsible for damage caused for reasons not attributable to Mitsubishi Electric; opportunities or profit lost by customers caused by Mitsubishi Electric product failure; damage caused from extraordinary circumstances, secondary damage, accident compensation, damage to anything other than Mitsubishi Electric products, or compensation for any other work, whether foreseen or not by Mitsubishi Electric.

3. Cautionary instructions for Handling MDU Breaker

3.1 Cautionary instructions for using MCCB

⚠ Caution

- Electric work shall be conducted by a qualified person (electrical worker).
- The circuit breaker shall be maintained or inspected by a person having technical knowledge.
  Cut off the upper circuit breaker and make sure that no electricity is being supplied. If electricity is being supplied, an electric shock may be resulted.
- Correctly connect the line side and the load side. When connecting electric wires, securely tighten the terminal screws to the torque specified on their container bag that comes with the product. Otherwise, a fire may be resulted.
- During installation, do not allow foreign materials, such as dust, concrete powder, and iron powder, or rain water to enter inside. Doing so may result in a fire or operation failure.
- Ensure the protective earth of the loading equipment.
- When the 1φ3W or 3φ4W is used, be sure to connect the neutral line to the neutral pole.
- When the circuit breaker has automatically tripped, remove the cause and then turn on the handle. Otherwise, an electric shock or a fire may be resulted.
- Retighten the terminal screws regularly. Otherwise, a fire may be resulted.

3.2 Periodic inspections

To prevent trouble and to maintain the performance of the breaker, inspect the breaker one month after starting use and periodically thereafter according to the operation environment.

⚠ Caution

- Make sure that the product is not energized prior to performing periodic inspections. Otherwise, an electrical shock, a device failure, or a fire may be resulted.
- Periodically tighten terminal screws. Otherwise, a fire may be resulted.

Inspection Interval Guide

1	Clean environment where the air is dry	Once every 2 or 3 years
2	Environment with low levels of dust, corrosive gas, vapor, and salinity	Once a year
3	Environment other than that described in the above 1 and 2	Once every 6 months

Check contents	Criteria
1. Check whether the conductors are loose.	They must not be loose. Otherwise, retighten screws at the specified torque.
2. Check whether the cover and the base cracks and whether the handle breaks.	The cover and the base must not crack, or the handle must not break.
3. Check whether the breaker has been infiltrated by water and is heavily dirtied by mud or dust.	The breaker must not be infiltrated by water or be heavily dirtied by mud, or dust.
4. Check whether the temperature has abnormally risen.	By visual inspection, the rear studs of terminals, the tightening area of the main body, and the molded area must not discolor from burning.
5. Check whether the ON/OFF operation is performed smoothly with the handle.	The operation must be performed smoothly.
6. Check whether the breaker trips with the trip button.	The trip operation must be reset.

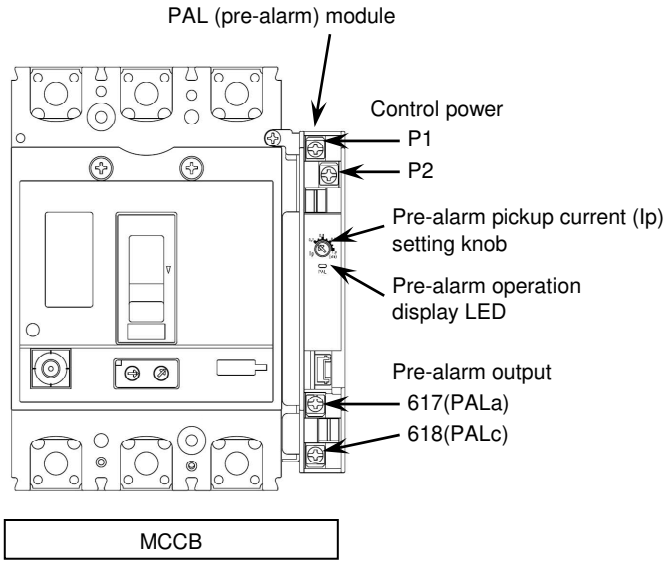
3.3 Cautionary instructions for using MDU breaker with PAL module (option)

⚠ Caution

●Cut OFF the control power before setting the pre-alarm pickup current.

● For the control power to the PAL module, refer to the table below.During the operation, set the voltage distortion to 10% or less.

Control power supply	Allowable voltage range	Control VA
00-240 V AC, 50/60 Hz	80 to 264 V AC	5 VA or less
00-240 V DC	80 to 264 V DC	

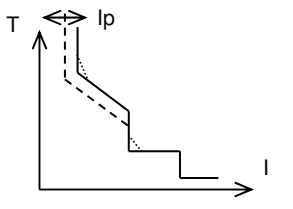


(1) PAL function

- When the load current exceeded the pre-alarm pickup current (Ip), the pre-alarm operation display LED starts blinking every second. When the load current stays over the pre-alarm pickup current for the pre-alarm operating time, a contact output occurs, the pre-alarm operation display LED stays lit, and the MDU breaker's display shows the PAL alarm.
  For the information displayed by the MDU breaker's display, refer to "9.4 Method of display of fault/alarm and contents of the displayed".
- The method of resetting the pre-alarm output is selectable between electric self-retention and automatic reset. Select the method using the operation switch part or via transmission.
  Refer to "9.6.2 (5) Alarm reset method setting".
  For reset, use the operation switch part.
  For the procedure, refer to "(1) PAL in Section 7.2.1 Breaker alarms" and "9.5 Method of reset".
- The method of setting of the pre-alarm current value
  Set the value by rotating the pre-alarm setting knob. As in the case of setting the rated current or the instantaneous tripping current, use a flathead screwdriver.
  The appropriate driver is 3 mm in tip width and 0.5 mm in thickness.
  Do not apply excessive force more than necessary. Doing so may cause breakdown. (The appropriate operation torque is 0.05 N•m or less.)

Pre-alarm current Ip	0.7-0.75-0.8-0.85-0.9-0.95-1.0 x Ir

Underlined: Standard default value (unless otherwise specified)



PAL operating characteristics

(2) Terminal markings and functions of PAL

- Pre-alarm output terminal (617(PALa), 618(PALc)): Alarm output terminal for pre-alarm
- Control power terminal (P1, P2): Control power supply terminal for PAL module

⚠ Caution

- Do not remove the connectors that connect between the circuit breaker and the PAL module and between the circuit breaker and the MDU unit. If they are disconnected, reconnect them securely.
- Other internal accessory devices cannot be installed on the right pole side of the circuit breaker.
- The length of the wire to the side terminal block should be within 100 m. Wiring exceeding 100 m may cause malfunctions.

- For the contact capacity of Pre-alarm output, refer to the table below.

Voltage	COSφ = 1	COSφ = 0.4 L/R = 0.007
125 V AC	3 A	2 A
250 V AC	3 A	2 A
30 V DC	2 A	2 A
100 V DC	0.4 A	0.3 A

(3) Appropriate tightening torque of the PAL module terminal

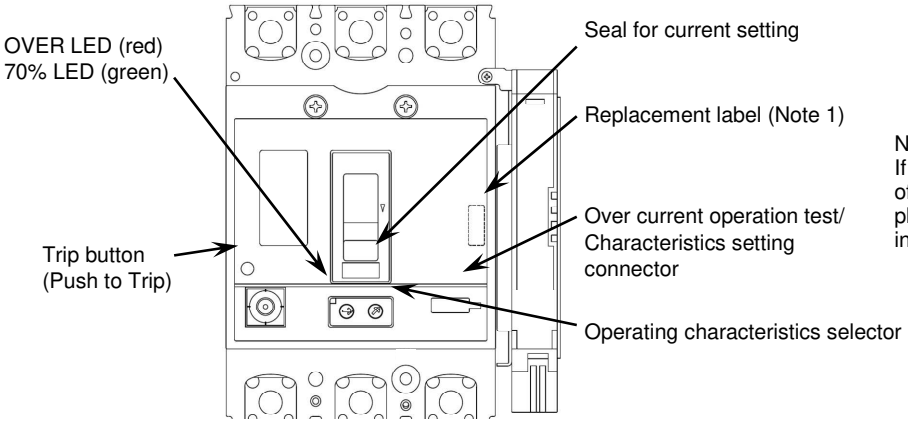
⚠ Caution

- Securely connect the terminals by tightening them to the appropriate torque of 0.9 to 1.2 N•m.

3.4 Setting method of the operating characteristics

⚠ Caution

● Before setting the characteristics, cut off the upper circuit breaker or put the circuit breaker you want to set in the OFF or TRIP mode.

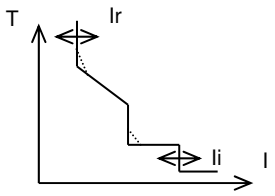


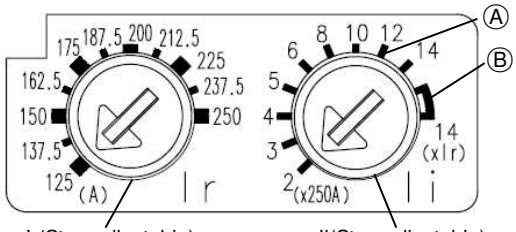
Note 1)
If the current setting Ir or characteristics of over current operation is changed, please use the replacement label for indicate.

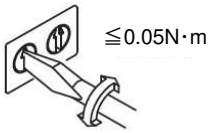
● Setting of current setting(Ir), instantaneous pickup current(Ii)

(1) Change the value with turning the operating characteristics selector.
Please use a flathead screwdriver show in the figure of lower right.
The appropriate a flathead is 3 mm in tip width and 0.5 mm in thickness.
Do not apply excessive force more than necessary. Doing so may cause breakdown.
(The appropriate operation torque is 0.05 N•m or less.)

(2) Take out the label for current setting from the inside of the right side of circuit breaker.
And stick the label to the position under the handle.







Model name	NF250-SEV with MDU, NF250-HEV with MDU
Rated current In (A)	250
Current setting Ir (A)	Variable from 125 to <u>250</u> (variable in 12.5-A steps)
Instantaneous pickup current Ii (A)	Ⓐ 2-3-4-5-6-8-10-12-<u>14</u> x Rated current In Ⓑ 14 x Current setting Ir

Underlined: Setting for shipment.

● Setting method except current setting and instantaneous pickup current

In the case of change the characteristics except current setting and instantaneous pickup current, change the setting with the operation check and setup unit "Y-360" (option) or display unit of MDU breaker.

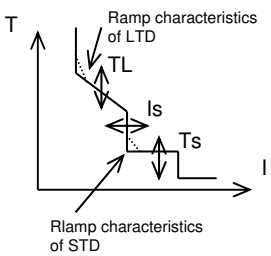
For setting using "Y-360", refer to the instruction manual for "Y-360".

For settings using the MDU breaker, refer to "9.3 Method of check/setting of the operating characteristics".

LTD time: TL	12-60-80-<u>100</u> s (at 200% Ir)
STD pickup current: Is	2-2.5-3-3.5-4-5-6-7-8-9-<u>10</u> x Ir
STD time: Ts	0.1-0.2-<u>0.3</u> s
Ramp characteristics of LTD	ON (I^6t) – <u>OFF (I^2t)</u>
Ramp characteristics of STD	ON (I^2t) – <u>OFF (FLAT)</u>
Neutral pole protection: NP (Note 2)	<u>ON (function)</u> – OFF (none)

Underlined: Setting for shipment.

Note 2)It can set only 4-pole circuit breaker.



3.5 Testing method

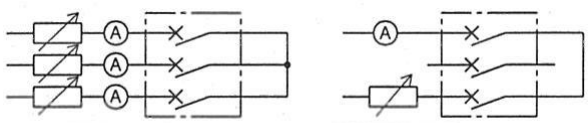
Check operation with load current or using the operation check and setup unit "Y-360" (option).
If the unit "Y-360" is used execute the test according to its manual.

⚠ Caution

- You cannot test the measurement functions, alarm functions, display of fault cause/current, electric energy pulse output, and CC-Link communication using the operation check and setup unit "Y-360".
  However, overcurrent alarm OVER is transmit to the MDU breaker. When a trip occurs, the display unit enters the fault current display mode. In this case, the fault current is 0 A.

This section describes the procedure for the test by supplying the power to the circuit breaker.

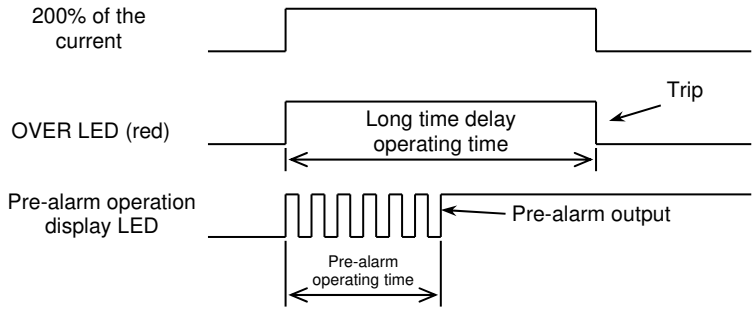
(1) Supply AC current to the circuit breaker from a 3-phase power supply or single-phase power supply.
When using a single-phase power supply, supply the power via any two poles in series.



Current adjustable resistor Current adjustable resistor

(2) You can check the status of each operating current with the LEDs on the front of the circuit breaker.
70% LED (green) --- Favorable when the LED lights up and stays illuminating within the range of 60% to 80% of the current setting Ir.
OVER LED (red) --- Favorable when the LED lights up and stays illuminating within the range of 105% to 125% of the current setting Ir.
Pre-alarm operation display LED --- Favorable when the LED starts blinking within ±10% of the setting value.
(When Ip is 0.7, the result is favorable when the LED starts blinking within the range of 60% to 80% of the current setting Ir.)

(3) You can check the long time delay/pre-alarm operating time by supplying the current equivalent to 200% of the current setting Ir.
However, if a current exceeding the current setting Ir is supplied before this test, the operating time is reduced and the first measurement is invalid.
When the circuit breaker trips, the tripping circuit is reset and the operating time can be measured correctly next time.



The result is favorable when the operating time measurement is within the range below.

Measurement item	TL = 12 s	TL = 60 s	TL = 80 s	TL = 100 s
Long time delay operating time	9.6 to 14.4 s.	48 to 72 s.	64 to 96 s.	80 to 120 s.
Pre-alarm operating time	4.8 to 7.2 s.	24 to 36 s.	32 to 48 s.	40 to 60 s.

3.6 Cautionary instructions for using the operation check and setup unit "Y-360"

- Connect “Y-360” to the test connector of the circuit breaker and then turn ON the POWER switch of “Y-360”.
  The alarm (OVER) may be output wrongly when “Y-360” is connected or disconnected while the control power is being supplied to the MDU unit.
- When “Y-360” is connected while the control power is supplied to the MDU unit, the electric energy and the reactive energy may decrease. (They return to the values of 30 minutes ago at the maximum.)
  Before connecting “Y-360”, turned off the control power of the MDU unit or set them by the energy amount setting.
  The electric energy when the control power is turned off is stored when the control power of the MDU unit is turned off.
  For setting the electric energy, refer to "9.6.5 Method of setting of electric energy/reactive energy".

4. Specifications of MDU breaker

4.1 Features of MDU breaker

- The MDU breaker measures and displays the load current, line voltage, electric power, reactive power, electric energy, reactive energy, harmonic current (fundamental wave, 3rd, 5th, 7th, 9th, 11th, 13th, 15th, 17th, and 19th-order, and total), power factor, frequency.
- The MDU with electric energy pulse output (option) is able to output the electric energy as a pulse wave.
  The MDU with CC-Link communication (option) is able to transmit the data of measurement.
- When the circuit breaker trips, the fault cause and the fault current are stored in nonvolatile memory (EEPROM).
  This is helpful for investigation of the fault cause and recovery.(When the AL switch for transmission with MDU breaker (option) is installed)
  The maximum values of the load current (demand value), line voltage (present value), total harmonic current (demand value), electric power (demand value), reactive power (demand value), electric energy (amount for 1 hours), and reactive energy (amount for 1 hours), are stored in nonvolatile memory (EEPROM).
  In addition, since the time of their occurrence is stored, it is helpful to grasp the peak time of the use of electricity.
- Some items/functions are not measured or displayed (transmitted) by certain models or according to certain specifications. In such cases, those items/functions are skipped.

4.2 Functions of MDU breaker

Applicable model			MCCB
Frame A			250
Model			NF250-SEV/HEV with MDU
Item (Note 1) (Note 2) \ Current setting (A)			Adjustable: 125 to 250 (in 12.5-A steps)
Measurement function	Load current		○
	Line voltage		○
	Harmonic current		○
	Electric power		○
	Reactive power		○
	Electric energy		○
	Reactive energy		○
	Power factor		○
	Frequency		○
	Fault cause Fault current (Note 3)	LTD	○
		STD	○
		INST	○
Phase wire system			For 3-pole: 3φ3W, 1φ3W, For 4-pole: 3φ4W (3-pole product is usable for 1φ2W.)
Installation method of MDU unit (Note 4)			Breaker mounting type
Electric energy pulse output (Option) (Note 5)			○
CC-Link communication (Option) (Note 5)			○
MDU control power supply (Allowable voltage range: 85% to 110%)			100 - 240 V AC/DC shared, 12 VA (Note 6)

Note 1. For details on the measurement function, refer to "Measurement Functions".

Note 2. For the load current, line voltage, harmonic current, fault current, power factor, and frequency, their maximum measurement value blinks when they are equal to or larger than their maximum measurement value.
(When a fault occurs, however, the fault cause and the fault current measurement value blink even if the value is less than the maximum measurement value.)
When the electric power/reactive power is equal to or larger than the maximum measurement value, or when either load current or line voltage is equal to or larger than the maximum measurement value, the value blinks.
The transmission data showing the maximum measurement value during CC-Link communication indicates that the input value is equal to or larger than the maximum measurement value.

Note 3. Display and measurement of fault cause and fault current of INST trip are enabled when the AL switch for transmission with MDU breaker (option) is installed.
Either of the latest fault cause or the latest fault current is displayed. They are not displayed simultaneously.

Note 4. When the MDU breaker of breaker mounting type with SLT (accessory device) on the right side, the MDU unit is placed separately.
The circuit breaker and the MDU unit are connected with a connection cable.
A 2-meter (standard) connection cable is included. (The connection cable length can be selected from 0.5 m, 3 m, 5m, and 10 m.)

Note 5. Simultaneous installation for the electric energy pulse output and CC-Link communication is not allowed.

Note 6. When the MDU unit control power is turned on, a rush current transitionally flows (maximum rush current: 2 A, energizing time: 1 ms (240 V AC)).

4.3 Specifications of electric energy pulse output, and CC-Link communication

4.3.1 Electric energy pulse output

Item	Specification
Output element	Solid state relay (SSR) No-voltage a-contact (113, 114 terminal: no polarity)
Contact capacity	Compatible with 24 V DC and 100-200 V AC, 20 mA
Output pulse unit	1, 10, 100, 1000, and 10000 kWh/pulse (selectable)
Output pulse width	0.35 to 0.45 s
Maximum wiring length	100 m (Note)

Note: Refer to the specifications of the combined electric operating device.

4.3.2 CC-Link communication

Item	Specification
Transmission method	Broadcast polling method
Transmission speed	10 M, 5 M, 2.5 M, 625 k, 156 kbps
Configuration of transmission path	Bus type (T-junction not allowed. However, 156 kbps and 625 kbps of CC-Link ver 1.10 are allowed.)
Number of occupied stations	Remote device occupying 1 station
Max. total extension cable length	CC-Link ver.1.10 supported Max. 1200 m (156 kbps), max. 900 m (625 kbps), max. 400 m (2.5 Mbps), max. 160 m (5 Mbps), max. 100 m (10 Mbps)
Number of connected units	Max. 42 units
Connecting cable	Cables applicable to CC-Link Ver.1.10 (shielded 3-core twisted pair cables)

Note: For more information, visit the website of CC-Link Partner Association (http://www.cc-Link.org/).

4.4 Name and function of each part of MDU breaker

This section describes the names and functions of parts. For details on the displayed items and setting procedures, refer to "9. Procedures for Display, Operation, and Setting".

4.4.1 Display, operation switch, and display unit

These parts display and set measurement values, alarms, setting values, etc.

(1) Display

Displays measurement values, alarms, setting values, etc.

For breaker mounting type, the display direction of the display part is in accordance with the installation direction. Refer to "9.6.3 Method of setting for LCD".

(2) Operation switch

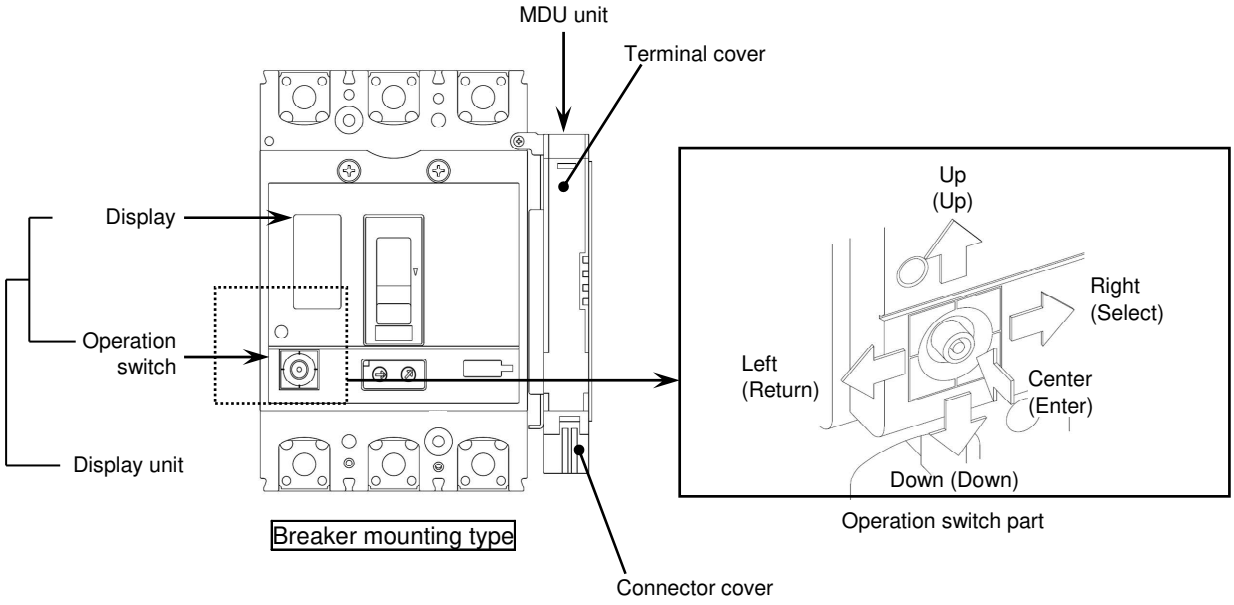
Measurement values can be changed or set.

You can switch or operate the screen by moving the switch to the Up (Up), Down (Down), Left (Return), Right (Select), and Center (Enter) positions.

For breaker mounting type, the switch is a four-direction + center-push switch.

(3) Display unit

“Display unit” is the general term for “Display part” and “Operation switch part”.



4.4.2 Terminal unit

(1) Control power terminals L1 and L2

These terminals connect the control power for the MDU unit. They have no polarity.

(2) Ground terminal FG

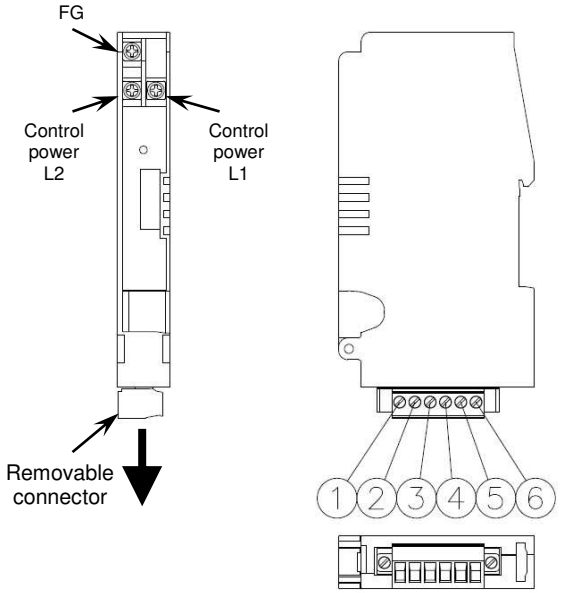
Perform D class grounding of terminal FG of the MDU unit.

(3) Pulse output terminals 113 and 114 (with electric energy pulse output (option))

These terminals are for electric energy pulse output. They have no polarity.

(4) CC-Link communication terminals DA, DB, DG, and SLD (with CC-Link communication (option))

These terminals connect CC-Link communication signals DA, DB, DG, and SLD.



MDU specification	①	②	③	④	⑤	⑥
Pulse	-	-	-	-	113	114
CC-Link	-	SLD	-	DG	DB	DA

Terminal assignment: Breaker mounting type

Note : In the case of No transmission type, the MDU unit does not have the removable connector.

⚠ Caution

- Nothing should be connected to unused terminals. Do not use them for transition wiring purpose.
  Connecting unused terminals may cause a failure in the MDU unit.

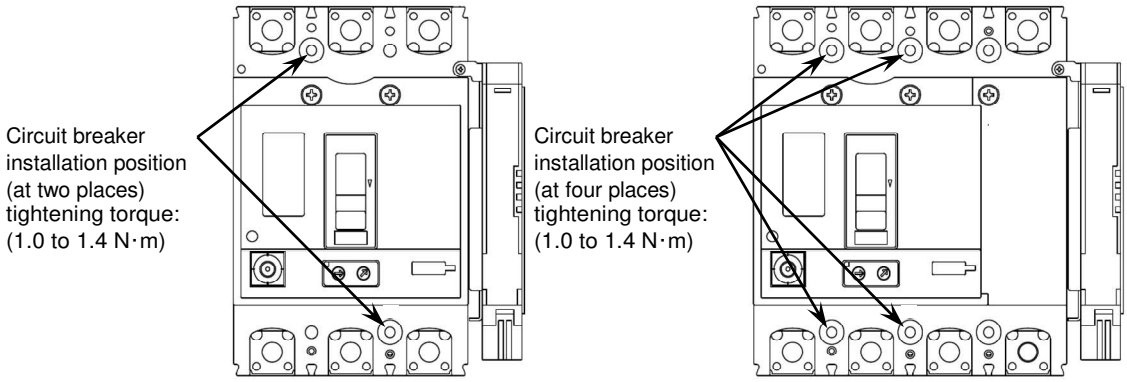
5. Procedure for Installing and Setting MDU Breaker

5.1 Installing the circuit breaker

- Install the MDU breaker with the "circuit breaker fixing screws" that come with the circuit breaker.

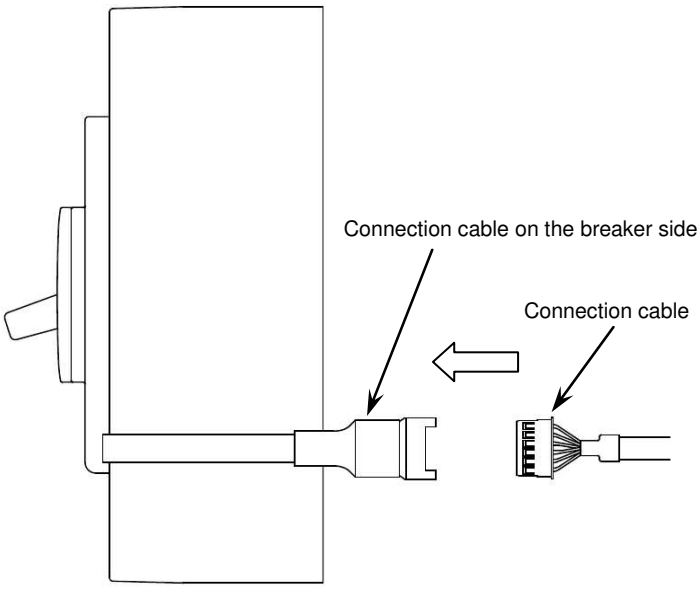
⚠ Caution

- Cut off the upper circuit breaker and make sure that no electricity is being supplied.
- Put the circuit breaker in the OFF or TRIP mode.
- When the connection cable is connected to the MDU breaker, take care so that the connection cable and the connector are not caught in.
- The connector of the connection cable is a precision component. During wiring, protect it adequately and take great care to prevent breakage.
- The connection cable is an exclusive part. If it is processed or a non-exclusive cable is used, correct measurement cannot be made.
- When installing the MDU breaker, leave at least 40 mm of space at both sides of the MDU breaker for wiring to the MDU unit.



5.2 Installing the connection cable to the circuit breaker - MDU unit separate installation type (with SLT (accessory device) on the right side)

(1) Connect the connector of the connection cable to the connector of breaker-side connection cable. Insert the connector until it clicks into place.



⚠ Caution

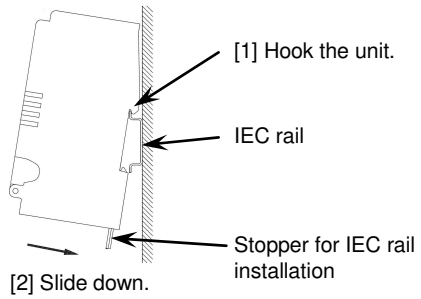
- Secure the connection cable with a clamp or other tool to prevent it from being exposed to excessive force.

5.3 Installing MDU unit - For MDU unit separate installation type (with SLT (accessory device) on the right side)

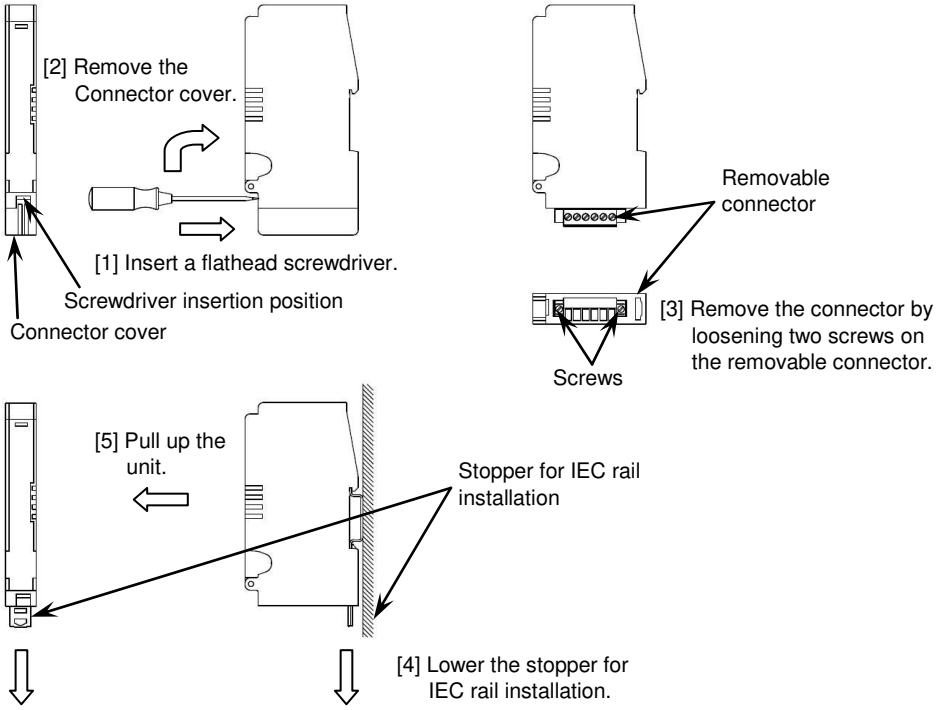
⚠ Caution

- The MDU unit contains a reset switch, a station No. setting switch (with CC-Link communication (option)), and a baud rate setting switch (with CC-Link communication (option)).
  After the installation, position the MDU unit at a place where you can access it easily to reset or change the settings.

(1) Installation on the IEC rail (35 mm)



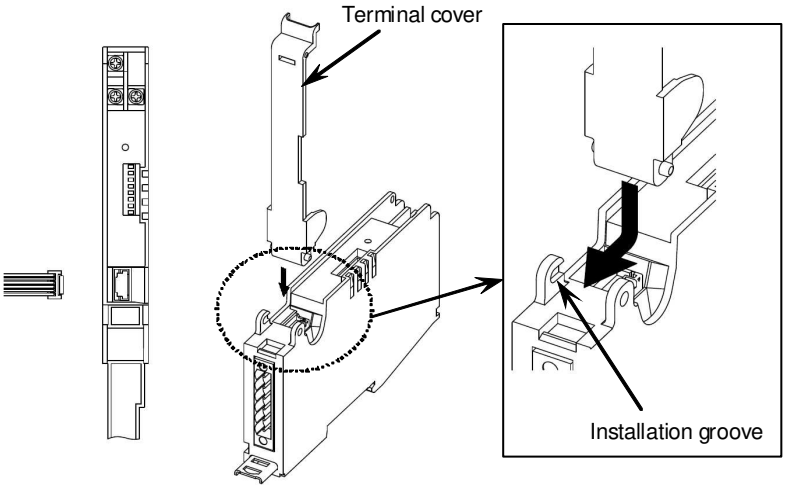
(2) Removal from the IEC rail (35 mm)



(3) Installation of the connection cable

Open the terminal cover of the MDU unit to connect the connection cable to the connector.

When the terminal cover is removed, attach it along the installation groove by referring to the illustration on the right.

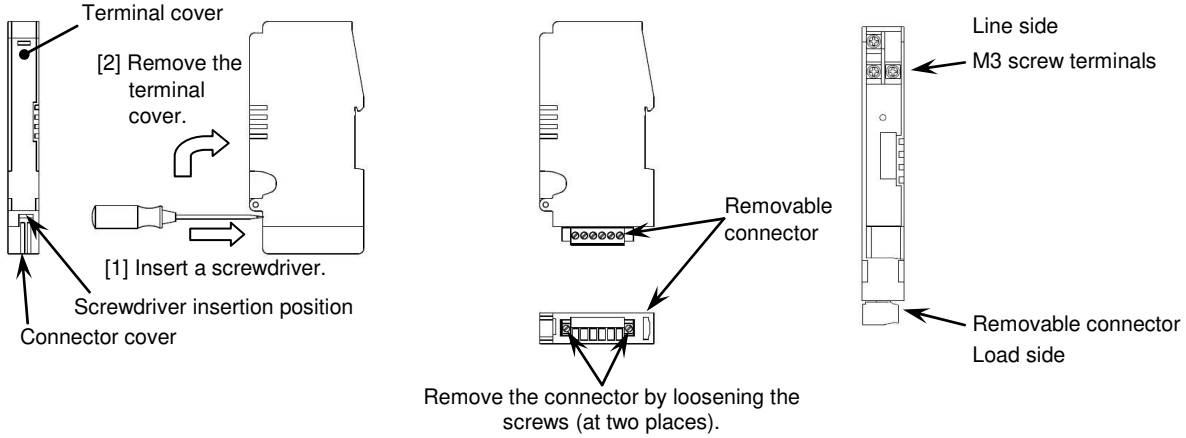


5.4 Connecting electric wire to the MDU unit

[Separate installation type]

⚠ Caution

- M3 screw is used as the terminal on the line side of the MDU unit.
  Tighten the screw to the appropriate torque (0.5 to 0.7 N•m).
- When two crimped terminals are used for transition wiring of the terminals on the line side of the MDU unit or other purpose, it may be difficult to close the terminal cover depending on the type of the electric wire size or crimped terminals to be used.
  When installing the terminal cover, fold the crimped terminals or take other means.
- To connect a wire to the terminal on the load side of the MDU unit, remove the connector cover and the removable connector.
  Note : In the case of No transmission type, the MDU unit does not have the removable connector.



- The applicable wire sizes for the removable connector are as follows.

Applicable wire size	1-line connection	2-line connection
Single wire	0.2 to 2.5 mm^2	0.2 to 1.0 mm^2
Twisted wire	0.2 to 2.5 mm^2	0.2 to 1.5 mm^2
Twisted wire with rod terminal (without insulation sleeve)	0.25 to 2.5 mm^2 (note 1)	0.25 to 1.0 mm^2 (note 1)
Twisted wire with rod terminal (with insulation sleeve)	0.25 to 2.5 mm^2 (note 2)	0.5 to 1.5 mm^2 (note 3)

Note 1. The A series to show as follows applies.
Note 2. The AI series to show on the following page applies.
Note 3. The AI-TWIN series to show on the following page applies.
Note 4. When polyethylene insulation vinyl sheath cables (equivalent to those with a CPEV shield) are used, the connection of two wires, up to 1.2 mm^2 as solid wires, is possible.

- Insert an electric wire to the terminal and tighten it to the appropriate torque.
  Keep the screw straight and tighten it slowly at first.

  Appropriate tightening torque 0.5 to 0.6 N•m

  Tool: flat-blade screwdriver Tip thickness: 0.6 mm, overall width: 3.5 mm

  [Recommended screwdriver: Screwdriver manufactured by Phoenix Contact, Model: SZS 0.6 x 3.5]

  Wire strip length 7 mm

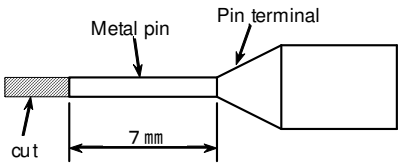
- For treatment of the end of the single wire, just strip it and connect it as it is.
  For the twisted wire, strip the wire shield, twist the cores, and then insert it into the connected part.
  Carefully prevent the barbed wire from short-circuiting an adjacent pole. Do not solder the core wires.
  Following compression pin terminal is recommended.

  Manufacturer : Phoenix contact
  A series (without insulation sleeve)
  Cross section of wiring 0.25mm^2 : A 0.25-7 (Catalog No.3202478) (note 5)
  Cross section of wiring 0.5mm^2 : A 0.5-8 (Catalog No.3202481) (note 5)
  Cross section of wiring 0.75mm^2 : A 0.75-8 (Catalog No.3202504) (note 5)
  Cross section of wiring 1mm^2 : A 1-8 (Catalog No.3202517) (note 5)
  Cross section of wiring 1.5mm^2 : A 1.5-7 (Catalog No.3200263)
  Cross section of wiring 2.5mm^2 : A 2.5-7 (Catalog No.3200289)
  Note 5. A 0.25-7/ A 0.5-8/ A 0.75-8/ A 1-8 A can insert two of them in a connector.

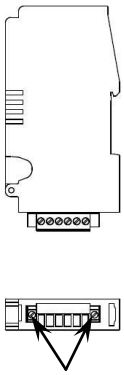
  AI series (with insulation sleeve)
  Cross section of wiring 0.25mm^2 : AI 0.25-8 YE(Catalog No.3200852)
  Cross section of wiring 0.5mm^2 : AI 0.5-8 WH(Catalog No.3200014)
  Cross section of wiring 0.75mm^2 : AI 0.75-8 GY(Catalog No.3200519)
  Cross section of wiring 1mm^2 : AI 1-8 RD(Catalog No.3200030)
  Cross section of wiring 1.5mm^2 : AI 1.5-8 BK(Catalog No.3200043)
  Cross section of wiring 2.5mm^2 : AI 2.5-8 BU(Catalog No.3200522)

  AI-TWIN series (with insulation sleeve)
  Terminal for 2wires 0.5mm^2 × 2 : AI-TWIN 2 × 0.5-8 WH(Catalog No.3200933)
  Terminal for 2wires 0.75mm^2 × 2 : AI-TWIN 2 × 0.75-8 GY(Catalog No.3200807)
  Terminal for 2wires 1mm^2 × 2 : AI-TWIN 2 × 1-8 RD(Catalog No.3200810)
  Terminal for 2wires 1.5mm^2 × 2 : AI-TWIN 2 × 1.5-8 BK(Catalog No.3200823)

Please contact to the manufacturer as for further details.
However the length of pin terminal (compression) is longer than 7mm cut the metal pin as follows.



● After connecting the wires, attach the removable connector and tighten it with screws. The appropriate tightening torque is 0.2 to 0.3 N•m.



Tighten the screws (at two places)
(Tightening torque: 0.2 to 0.3 N•m)

[Connection of electric wire to the MDU unit with electric energy pulse output]

⚠ Caution

- The MDU unit with electric energy pulse output has terminals 113 and 114 for pulse output.
- The pulse output line forms a small signal circuit. Install it at least 10 cm away from power electric circuits. The wire length is determined depending on conditions such as noise resistant performance of pulse receiver. However, the maximum wire length should be 100 m.
- When AC is used for pulse output power supply, be careful to prevent the pulse receiver from malfunctioning due to leakage current caused by electrostatic capacitance between electric wires.

[Connection of electric wire to the MDU unit with CC-Link communication function]

⚠ Caution

- The MDU unit with CC-Link communication has terminals DA, DB, DG, and SLD.
  Connect them to the CC-Link transmission line. Take great care not to connect any other terminals than those for transmission line such as L1 and L2 terminals for the control power supply.
  Since the CC-Link transmission line forms a small signal circuit, wrong connection is very dangerous.

⚠ Caution

- The CC-Link transmission line forms a small signal circuit. Install it at least 10 cm away from power electric circuits.
  When long lines are laid in parallel to each other, they should be at least 30 cm away from each other.

5.5 CC-Link setting (for MDU with CC-Link communication (option))

The MDU is a remote device station and number of occupied stations is one station.

In case of a sequencer CPU error or a data link error, the input data of the MDU breaker is retained.

(1) Station No. setting switch

Open the terminal cover , and then set the station number for CC-Link communication with the BCD code using the station No. setting switch. (Setting range: 1 to 64) (Default = 1)

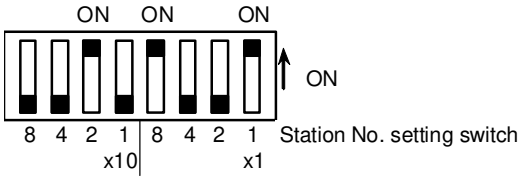
Setting example: The value of the switch turned ON:

Tenths digit --- 2 x 10 = 20

Units digit --- 8 x 1 + 1 x 1 = 9

The total is as follows: 20 + 9 = 29

Station No.: 29



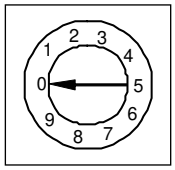
Ensure that more than one same station number exists in one transmission path.

For the number of connected units and combinations with other equipment, refer to "6.8 Number of connected MDU units with CC-Link communication function and precautions".

(2) Baud rate setting switch

The baud rate setting switch is used to set the transmission speed.

Switch setting	Transmission speed
0	156 kbps (Default)
1	625 kbps
2	2.5 Mbps
3	5 Mbps
4	10 Mbps
5 to 9	Setting error (L ERR.LED lights up.)



Baud rate setting switch

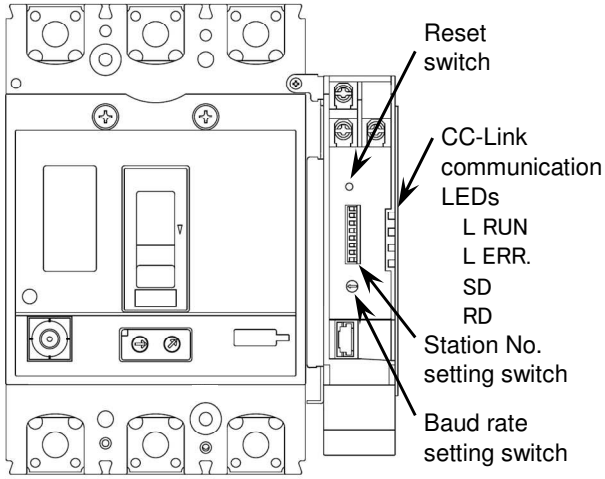
(3) Reset switch

Press the reset switch to accept the setting made by the station No. setting switch or the baud rate setting switch. After operating the Station No. setting switch or the baud rate setting switch after the control power is supplied, be sure to press the reset switch.

(4) CC-Link communication LEDs

The CC-Link communication LEDs show the transmission signal line status.

LED name	Description
L RUN LED (Green)	ON: Communication is normal. OFF: Communication is disconnected.
L ERR. LED (red)	ON: Communication data error Blink: Communication data error OFF: Communication is normal.
SD LED (Green)	ON during data transmission
RD LED (Green)	ON during data reception



⚠ Caution

- View the CC-Link communication LEDs from the front of the circuit breaker. They may appear illuminating depending on the illumination status of adjacent LEDs when viewed from some directions.

(5) Precautions for CC-Link operation

[1] For CC-Link communication, pay attention to the number of occupied stations of each device to set the station number before energizing the transmission line.
Because CC-Link devices use station numbers to carry out communication with each other, setting the station numbers is very important.

[2] Operate the station No. setting switch with a thin rod and make sure that the setting has been certainly switched.
In addition, operate the station No. setting switch at 10 N or less.

[3] If the station No. setting switch is operated after the control power is supplied, the newly selected station number is not accepted unless the reset switch is pressed.

[4] Securely press the reset switch with a thin rod.

[5] Do not use a mechanical pencil to operate the switch.
Broken lead of a pencil may enter a clearance of the switch, causing malfunction or failure.

5.6 Number of connected MDU units with CC-Link communication function and precautions

The MDU breaker is a remote device station and number of occupied stations is one station. The number of units connected and combinations with other equipment must satisfy both of the following conditions 1 and 2 for the number of units connected.

Condition 1 for the number of units connected

$\{(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d)\} \leq 64$

a: Number of units occupying one station (MDU falls under this category.)

b: Number of units occupying two stations

c: Number of units occupying three stations

d: Number of units occupying four stations

Condition 2 for the number of units connected

$\{(16 \times A) + (54 \times B) + (88 \times C)\} \leq 2304$

A: Number of remote I/O stations ≤ 64

B: Number of remote device stations ≤ 42 (MDU falls under this category.)

C: Number of local stations ≤ 26

Up to 42 units can be connected when MDU units only are connected.

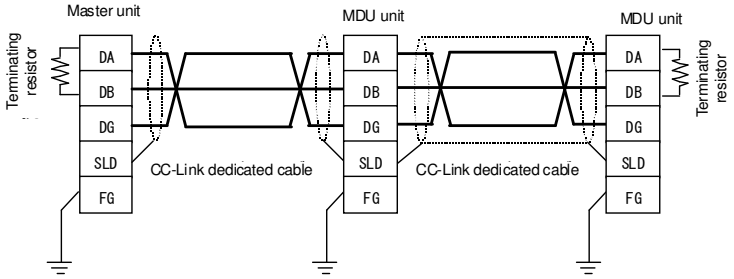
Condition 1 for the number of units connected --- $\{(1 \times 42) + (2 \times 0) + (3 \times 0) + (4 \times 0)\} = 42 \leq 64$

Condition 2 for the number of units connected --- $\{(16 \times 0) + (54 \times 42) + (88 \times 0)\} = 2268 \leq 2304$

5.7 Installing and wiring the MDU with CC-Link communication

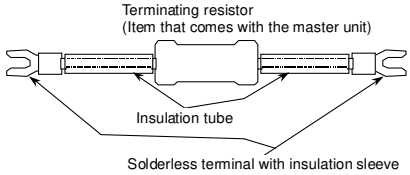
5.7.1 Installing the terminating resistors

The terminating resistors included in the master unit must be installed at both ends of the CC-Link transmission line.



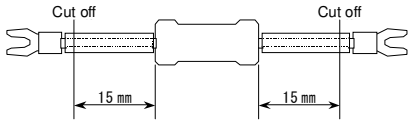
When the MDU breaker is located at the end of the CC-Link transmission line, connect the terminating resistors between DA and DB of the MDU unit.

In this case, the terminating resistors that come with the master unit should be processed and connected as shown below.

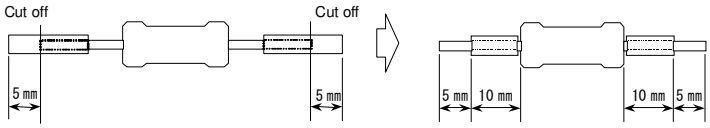


[Processing method]

(1) Cut off the leg to leave 15 mm from each end of the terminating resistor.



(2) Cut the insulation tube 5 mm from each end.



⚠ Caution

- No terminating resistor comes with this product. Use the terminating resistors that come with the master unit.
- For details on the terminating resistors, refer to the description of the terminating resistors that come with the master unit.

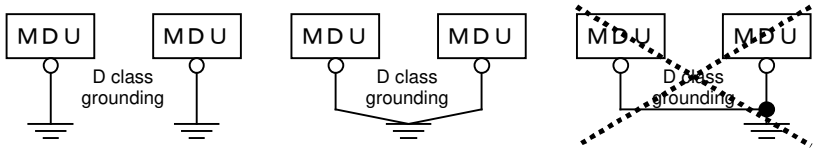
5.7.2 Grounding the shielded wire

Connect each end of the shielded wire of CC-Link dedicated cable to "SLD" of each unit.

Use "FG" of each unit for grounding only.

Perform D class grounding.

Perform shared grounding shown below when dedicated grounding cannot be done.



Dedicated grounding --- Best Shared grounding --- Favorable Shared grounding --- Not allowed

6. Measurement Functions

6.1 List of measurement functions

Measurement item		Transmission	Display
Load current	Present value of each phase	●	●
	Present value of Average	●	-
	Maximum value in all phases	●	-
	Present demand value of each phase	●	●
	Maximum demand value in all phases	●	●
	Maximum demand value in all phases	●	●
	Time of occurrence of maximum demand value in all phases	●	●
Line voltage	Present value of each line	●	●
	Present value of average	●	●
	Maximum value in all lines	●	●
	Time of occurrence of maximum value in all lines	●	●
Electric power	Present value	●	●
	Present demand value	●	●
	Maximum demand value	●	●
	Time of occurrence of maximum demand value	●	●
Reactive power	Present value	●	●
	Present demand value	●	●
	Maximum demand value	●	●
	Time of occurrence of maximum demand value	●	●
Electric energy	Integrated value	●	●
	Amount of last 1 hour	●	●
	Maximum value of amount for 1 hours	●	●
	Time of occurrence of maximum value of amount for 1 hours	●	●
Reactive energy	Integrated value	●	●
	Amount for last 1 hour	●	●
	Maximum value of amount for 1 hours	●	●
	Time of occurrence of maximum value of amount for 1 hours	●	●
Power factor	Present value	●	●
	Maximum present value	●	●
	Time of occurrence of maximum present value	-	●
Frequency	Present value	●	●
Harmonic current	Present value of fundamental wave of each phase	●	●
	Present value of each order of each phase	●	●
	Present value of total of each phase	●	●
	Maximum value of fundamental wave in all phases	●	●
	Time of occurrence of maximum present value of fundamental wave in all phases	-	●
	Maximum value in each order of each phase	●	●
	Time of occurrence of maximum present value in each order of each phase	●	●
	Synthesized demand value of each phase	●	●
	Maximum synthesized demand value in all phases	●	●
	Time of occurrence of maximum demand synthesized value in all phases	●	●
	Distortion factor of each phase	-	●
	Content rate in each order of each phase	-	●
Fault current		● (note 2)	● (note 2)

Note 1. When the demand time is set to 0 second, the demand value is equivalent to the present value.

Note 2. When the AL switch for transmission with MDU breaker (option) is installed.

6.2 Measurement rating, measurement range, and accuracy

6.2.1 Load current

- The present value is a RMS value for one cycle.
- Phases include phases 1, 2, 3, and N. (Phase N is used for 4-pole circuit breaker.)
- The average is calculated as shown below when the phase wire system is set. (Setting for shipment is 3φ3W.)
  For the maximum present value in all phases and the maximum present demand value in all phases, the maximum value among the following phases are shown according to the selected phase wire system.

Phase wire system	Average	Target phase
1φ2W	I_3	I_3
1φ3W	$(I_1 + I_3)/2$	I_1, I_3
3φ3W	$(I_1 + I_2 + I_3)/3$	I_1, I_2, I_3
3φ4W		I_1, I_2, I_3, I_N

- The demand value is an approximate average value in a demand time duration. A current demand time can be set as follows.
  Demand time is a collective setting value including other measurement items. (Setting for shipment is 2 minutes.)

Item	Setting value
Demand time	0 to 15 minutes (in 1-minute steps)

- The maximum demand value in all phases means the maximum value of the maximum present demand value in all phases from the start of use (after the last reset) until the present time.
- The rated current measurement, measurement range, and measurement accuracy are shown below.

Rated current measurement	250 A
Measurement allowable tolerance (accuracy) (Note)	±2.5 A (±1.0% of measurement rated current)
Lower limit of current measurement	2.5 A (1% of measurement rated current)
Upper limit of current measurement	500 A (two times the measurement rated current)
● When the current measurement value is less than the lower limit of current measurement: The current measurement value is considered to be 0 A. ● When the current measurement value exceeds the upper limit of current measurement: The current measurement value is considered to be equal to the upper limit of current measurement.	

(Note) The measurement accuracy is independent of the current setting and is a ratio to the measurement rated current.

6.2.2 Line voltage

- The present value is a RMS value for one cycle.
- Lines include 1 and 2, 2 and 3, 3 and 1, 1 and N, 2 and N, or 3 and N. (1 and N, 2 and N, 3 and N is used for 4-pole circuit breaker.)
- The average is calculated as shown below when the phase wire system is set. (Setting for shipment is 3φ3W.)
  For the maximum present value in all lines, the maximum value among the following lines are shown according to the selected phase wire system.

Phase wire system	Average	Target phase
1φ2W	$V_{2\text{-}3}$	$V_{2\text{-}3}$
1φ3W	$(V_{1\text{-}2} + V_{2\text{-}3})/2$	$V_{1\text{-}2}$, $V_{2\text{-}3}$
3φ3W	$(V_{1\text{-}2} + V_{2\text{-}3} + V_{3\text{-}1})/3$	$V_{1\text{-}2}$, $V_{2\text{-}3}$, $V_{3\text{-}1}$
3φ4W		

- The maximum present value in all lines means the maximum value of the maximum present value in all lines from the start of use (after the last reset) until the present time.
- The rated voltage measurement, measurement range, and measurement accuracy are shown below.

Rated voltage measurement	440 V
Measurement allowable tolerance (accuracy)	±4.4 V (±1.0% of the rated voltage measurement)
Lower limit of voltage measurement	80 V (Although the value displayed is up to 22 V, values of less than 80 V are handled as reference values.)
Upper limit of voltage measurement	759 V
● When the voltage measurement value is less than 22 V: The voltage measurement value is considered to be 0 V. ● When the voltage measurement value exceeds the upper limit of voltage measurement: The voltage measurement value is considered to be equal to the upper limit of voltage measurement.	

6.2.3 Electric power/reactive power

- The present value is a RMS value for one cycle. (The electric power at the time of reverse power flow is also measured.)
- Demand time is a collective setting value including other measurement items. (Setting for shipment is 2 minutes.)

Item	Setting value
Demand time	0 to 15 minutes (in 1-minute steps)

- The rated electric power/reactive power measurement, measurement range, and measurement accuracy are shown below.

Rated electric power measurement and rated reactive power measurement	√3 x rated current measurement x 440 V
Power measurement accuracy	±1.5% of the rated power measurement
Reactive power measurement accuracy	±2.5% of the rated reactive power measurement
Lower limit of electric power/reactive power measurement	- (Two times the rated electric power measurement, or value exceeding the upper limit of current measurement or the upper limit of voltage measurement)
Upper limit of electric power/reactive power measurement	Two times the rated electric power measurement, or value exceeding the upper limit of current measurement or the upper limit of voltage measurement
● When the current measurement value is less than 0.4% of the rated current measurement, or the voltage measurement value is 0 V (less than 22 V): The electric power measurement value is considered to be 0 kW, and the reactive power measurement value is considered to be 0 kvar. ● When the power measurement value exceeds the lower limit/upper limit of power measurement: The power measurement value is considered to be the lower limit/upper limit of power measurement. ● When the reactive power measurement value exceeds the lower limit/upper limit of reactive power measurement: The reactive power measurement value is considered to be the lower limit/upper limit of reactive power measurement.	

6.2.4 Electric energy/reactive energy

- The integrated value is a cumulative total value from the start of use (after the last reset) until the present time. (At time of reverse power flow, electric energy is not integrated.)
- Arbitrary values of electric energy and reactive electric values can be set.
- The value of amount of last 1 hour is an amount for an hour from the hour of the built-in clock to the next hour. (The latest one-hour amount only.)
- The maximum value of amount for 1 hours is the maximum value of the value of amount of last 1 hour from the start of use (after the last reset) until the present time.
- The measurement range and measurement accuracy of electric energy and reactive energy are shown below.

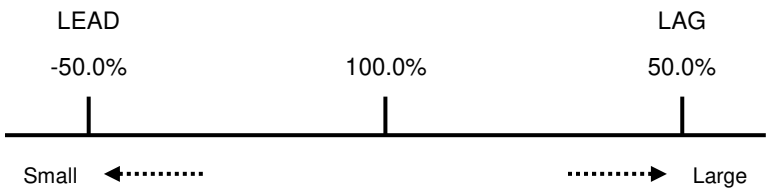
Measurement accuracy of electric energy	±2.0% of the true value obtained by voltage (100 to 440 V) x current (5% to 100% of the rated current measurement) (power factor = 1)
Measurement accuracy of reactive energy	±3.0% of the true value obtained by voltage (100 to 440 V) x current (10% to 100% of the rated current measurement) (power factor = 0)
Measurement range of electric energy/reactive energy	0.0 to 99999.9 kWh/kvarh
● The electric energy and reactive energy are measured when the current measurement value is approximately 0.4% or more. ● When the integrated value exceeds 99999.9 kWh/kvarh, the value returns to 0 kWh/kvarh and the integration is continued.	

6.2.5 Power factor

- The measurement accuracy and measurement range of power factor are shown below.

Power factor measurement accuracy	±5% to electrical angle of 90°
Power factor measurement range	Transmission: LEAD (lead): 0% to 100% to 0%, LAG (lag), LEAD is set to a negative value. (A value of less than 50% is a reference value.) Display: LEAD (lead): 50% to 100% to 50%, LAG (lag), "LEAD" is displayed for lead, and "LAG", for lag.
● When the current measurement value is less than 1.0% of the rated current measurement, or the voltage measurement value is 0 V (less than 22 V) or the electric power is 0 kW: The power factor measurement value is 100%. ● Power factor is measured by combining phases. When the current measurement value of a phase is displayed to be 0 A in the load current near cutoff, an error may become large. ● In case of display, when the power factor measurement value exceeds the measurement range: The power factor measurement value is considered to be the upper limit/lower limit of factor measurement (50%).	

- Large and small power factors are as shown below.



6.2.6 Frequency

● The measurement accuracy and measurement range of frequency are as shown below.

Frequency measurement accuracy	±2.5% of true value
Frequency measurement range	0,45 to 65 Hz
● When the voltage measurement value is less than the lower limit of voltage measurement(less than 22v); The frequency measurement value is displayed to 50 Hz. ● When the frequency measurement value is less than 45 Hz: The frequency measurement value is considered to be 45 Hz. ● When the frequency measurement value exceeds 65 Hz: The frequency measurement value is considered to be 65 Hz.	

6.2.7 Harmonic current

● The present value is a RMS value for one cycle.

● The present value of harmonic current is used to measure the fundamental wave, 3rd, 5th, 7th, 9th, 11th, 13th, 15th, 17th, and 19th -order at each phase (phases 1, 2, 3, and N).(Phase N is used for 4-pole circuit breaker.)

● The present value of total of each phase is a value totaling the 3rd, 5th, 7th, 9th, 11th, 13th, 15th, 17th, and 19th -order harmonic components, except for fundamental wave components.

The calculation formula is shown below.

$$I_{AH}=\sqrt{I_3^2+I_5^2+I_7^2\cdots+I_{17}^2+I_{19}^2}$$ (In: n is a harmonic order)

● The maximum present value in each order of each phase means the maximum value of present value of each order of each phase from the start of use (after the last reset) until the present time.

● Demand time is a collective setting value including other measurement items. (Default is 2 minutes.)

Item	Setting value
Demand time	0 to 15 minutes (in 1-minute steps)

● The distortion factor of each phase and content rate in each order of each phase are values calculated below.

Distortion factor of each phase (%)	$\frac{\text{Present value of total of each phase}}{\text{Present value of fundamental wave of each phase}} \times 100$
Content rate in each order of each phase (%)	$\frac{\text{Present value of each order of each phase}}{\text{Present value of fundamental wave of each phase}} \times 100$

● The rated harmonic current measurement, measurement range, and measurement accuracy are shown below.

Rated current measurement	250 A
Measurement allowable tolerance (accuracy)	±6.2 A (±2.5% of the rated measurement)
Lower limit of current measurement	5 A (2% of the rated measurement)
Upper limit of current measurement	250 A (one time the rated measurement)
● When the measurement value of harmonic current is less than the lower limit of current measurement: The measurement value of harmonic current is considered to be 0 A. ● When the measurement value of harmonic current exceeds the upper limit of current measurement: The measurement value of harmonic current is considered to be equal to the upper limit of current measurement.	

6.2.8 Fault current

● Display of the cause of fault current and measurement of fault current by INST trip are enabled when "alarm switch for MDU transmission (option)" is installed.

● The measurement accuracy and measurement range of overload and short-circuit current are as shown below.

Measurement accuracy of fault current	±15% of true value
Upper limit of fault current measurement (A)	4000
● When the fault current measurement value exceeds the upper limit of fault current measurement: The fault current measurement value is considered to be equal to the upper limit of fault current measurement. ● In an energizing area where the flowing current exceeds the setting value of the instantaneous tripping current, errors may be large.	

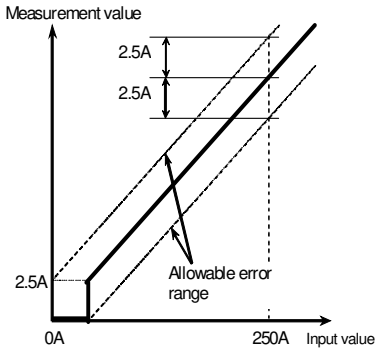
6.3 Display range/display status of measurement values

	Applicable breaker	Rated current	Display range	Display status	Remarks
Load current	NF250-SEV NF250-HEV	125 to 250 A	0.0 to 499.9 A 500 A or more	0.0 to 499.9 A Blinking at 500.0 A	0.0 A is displayed for less than 2.5 A.
Line voltage			0.0 to 99.9 V 100 to 689 V 690 or more	0.0 to 99.9 V 100 to 689 V Blinking at 690 V	0.0 V is displayed for less than 22 V.
Harmonic current			0.0 to 99.9 A 100 to 249 A 250 A or more	0.0 to 99.9 A 100 to 249 A Blinking at 250 A	0.0 A is displayed for less than 5.0 A.
Electric power			-657.3 kW or less -657.2 to 0.0 kW 0.0 to 657.2 kW 657.3 kW or more	Blinking at -657.3 kW -657.2 to 0.0 kW 0.0 to 657.2 kW Blinking at 657.3 kW	The value blinks also when the current or voltage is equal to or larger than the maximum measurement value.
Reactive power			-657.3 kvar or less -657.2 to 0.0 kvar 0.0 to 657.2 kvar 657.3 kvar or more	Blinking at -657.3 kvar -657.2 to 0.0 kvar 0.0 to 657.2 kvar Blinking at 657.3 kvar	The value blinks also when the current or voltage is equal to or larger than the maximum measurement value.
Electric energy			0.0 to 99999.9 kW	0.0 to 99999.9 kW	When the value exceeds 99999.9 kWh, it returns to 0.0 kWh and integration is continued.
Reactive energy			0.0 to 99999.9 kvarh	0.0 to 99999.9 kvarh	When the value exceeds 99999.9 kvarh, it returns to 0.0 kvarh and integration is continued.
Electric energy amount for last 1 hour			0.0 to 657.3 kWh	0.0 to 657.3 kWh	
Reactive energy amount for last 1 hour			0.0 to 657.3 kvarh	0.0 to 657.3 kvarh	
Power factor			Lag of 50 to 100 to 50% of lead	50.0 to 100.0 to -50.0%	
Fault current Long time delay Short time delay Instantaneous			0 to 3999 A 4000 A or more	0 to 3999 A Blinking at 4000 A	Note: If a fault occurs, the fault cause and the fault current measurement value are displayed. (Display of backlight in red)
Frequency			45 Hz or less	Blinking at 45.0 Hz	
			45 to 65 Hz	45.0 to 65.0 Hz	
			65 Hz or more	Blinking at 65.0 Hz	
			0 Hz	0.0 Hz	Measurement values for voltage between 1-phase and 2-phase and voltage between 3-phase and 2-phase are both 0 V (less than 22 V)

6.4 Cautionary instructions for using the MDU breaker

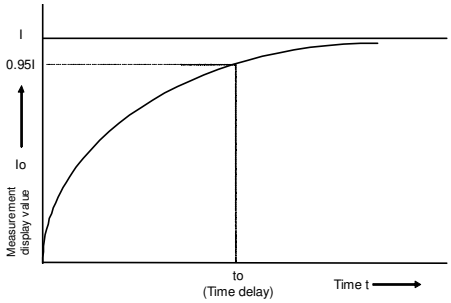
6.4.1 Current measurement accuracy

● The current measurement accuracy of the MDU breaker is ±1.0% of the rated current measurement of the applicable circuit breaker.
For example, when NF250-SEV (125-250 A) is used, the allowable tolerance is 250 A x 1.0% = 2.5 A. In the field ranging from the current of 0 A to 250 A, the allowable tolerance is then ±2.5 A.
This concept related to the allowable tolerance conforms to "JIS C 1111".
When the measurement value is less than 1% (250 A x 1% = less than 2.5 A), it is cut off to be 0 A. However, when the measurement value is approximately 0.4% or more, the electric power and the electric energy are measured.



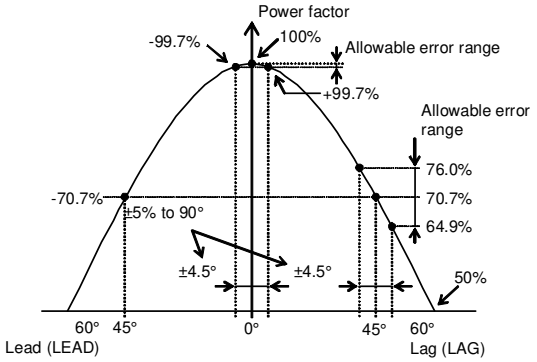
6.4.2 Demand

● The demand value is an approximate average value in a demand time duration.
The demand time (to) means the time to be taken for the measurement display value (Io) to display 95% of a certain input (I) when such input is continuously supplied.
The time required to display 100% of the input (I) is approximately three times the demand time (to).



6.4.3 Power factor measurement accuracy

● The power factor measurement accuracy of the MDU breaker is 5% to the electrical angle of 90 degrees.
This is 4.5° in phase angle, meaning that the power factor of 100% allows approximately up to 0.3% (LEAD of 99.7 to LAG of 99.7), and LEAD or LAG of 70.7% allows approximately up to 6% (64.9 to 76.0).



6.4.4 Measurement of intermittent load (welder, etc.)

● For the load current, line voltage, electric power, and other items, measurement (sampling) is performed once every 250 ms to obtain the present values and other values to update the measured values. The shortest update cycle to display the results of measurements by the display unit and that of the transmission data to be output are 500 ms.
Therefore, errors become large when this product is used for measurement of intermittent load as in the case of a resistance welding machine.
If a lower circuit breaker trips due to short-circuit, a low operating current may be measured in some cases. Though fault current is continuously monitored, the MDU breaker measures its own operating current and it cannot measure the operating current of a lower circuit breaker.

6.4.5 Operation at the time of recovery from power outage

- Electric energy (integrated value) and reactive energy (integrated value) are stored in nonvolatile memory (EEPROM) at the time of power outage or every 30 minutes. If a power outage occurs, measurements are continuously made at the time of recovery from power outage by using the data stored before the power outage.
- Since setting values are stored in nonvolatile memory (EEPROM) when they are configured, they do not have to be set again at the time of recovery from power outage.
  (The setting values include the demand time setting, current demand alarm pickup current/demand time setting, current open-phase alarm setting, current unbalance alarm setting, pulse unit setting, phase wire system, breaker alarm reset method, phase switching setting, and display direction setting.)
- When the measurement display screen is being displayed at the time of power outage, the screen at that time is stored. Therefore, after the recovery from power outage, the screen is displayed as it was before the power outage.
  When other screen is being displayed at the time of power outage, the main menu screen appears.
- The clock setting is not recovered. Clock setting should be made at the time of power recovery. It is necessary for measurement of the time of occurrence of the maximum value or the electric energy and reactive energy of amount of last 1 hour (one-hour amount of the built-in clock from the hour and the next hour).
- The maximum value and the time of occurrence are stored every 30 minutes. Therefore, in case of a power outage, data for maximum. 30 minutes from 30 minutes before the power outage to its occurrence may not be stored.

7. Monitoring Functions

7.1 List of monitoring functions

● The table below shows monitor items and items that can be displayed by the display unit or are available for transmission.
The Display column shows whether the item can be displayed by the display unit and the Transmission column shows whether the item can be transmitted via CC-Link communication.

Monitor item			MCCB	
			Transmission	Display
Breaker alarm	Pre-alarm	PAL(Note 1)	●	●
	Overcurrent alarm	OVER	●	●
	Current demand alarm	IDM_AL	●	●
	Current open-phase alarm	ILA_AL	●	●
	Current unbalance alarm	IUB_AL	●	●
Breaker status (Note 2)	Trip count		●	-
	Open/close count		●	-
Fault cause (Note 3)	LTD		●	●
	STD		●	●
	INST		●	●
Current demand upper/lower limit alarm			●	-
Neutral line open-phase alarm NLA(Note 4)			-	●

Note 1. The PAL functions are enabled when the MDU breaker with PAL module (option) is used.

Note 2. The trip count and the open/close count are enabled when "AL switch for transmission with MDU breaker (option)" and "AX switch for transmission with MDU breaker (option)" are installed, respectively.

Note 3. The fault cause by INST trip is enabled when "AL switch for transmission with MDU breaker (option)" is installed.

Note 4. When the 1φ3W is selected, the function is turned ON. (When other system is selected, the function is turned OFF.)

7.2 Method of using monitoring functions

7.2.1 Breaker alarms

(1) PAL (pre-alarm): (The PAL functions are enabled when the MDU breaker with PAL module (option) is used.)

Description of alarm	When an alarm signal (PAL) is output from the circuit breaker, an alarm is output to the display/transmission.		
Setting procedure	Setting via transmission or by the display unit is not required. Settings are configured within the range from 70% to 100% of the rated current in steps of 5% by the PAL module. (Setting for shipment is 70%.)		
Reset method	Selectable from self-retention and automatic reset via transmission or by the display unit.		
	Reset procedure	Self-retention	The user resets the alarm via transmission or by the display unit.
		Automatic reset	Alarm is automatically reset when the alarm cause is removed.

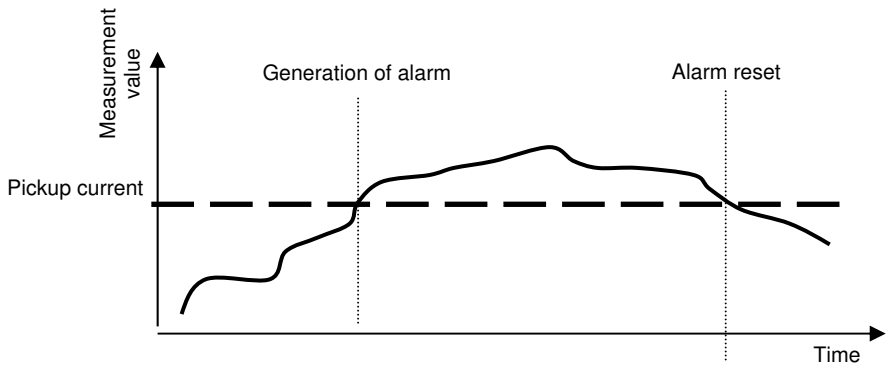
(2) OVER (overcurrent alarm)

Description of alarm	When the load current exceeds 105% to 125% of the rated current of the breaker, an alarm is output to the display/transmission.
Setting procedure	No setting is required.
Reset method	Alarm is automatically reset. (No setting is required.) Alarm is automatically reset when the alarm cause is removed.

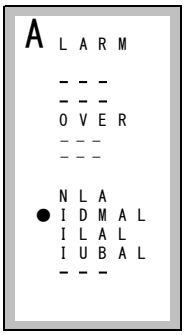
(3) IDM_AL (current demand alarm)

Description of alarm	When the current demand value of the load current exceeds the pickup current, an alarm is output to the display/transmission.		
Setting procedure	Through transmission or by the display unit, configure the following settings. Function: ON/OFF Pickup current: 50% to 100% (in 1% steps) Demand time delay: 1 to 10 minutes (in 1-minute steps), 15, 20, 25, and 30 minutes (Setting for shipment is OFF.)		
Reset method	Selectable from self-retention and automatic reset via transmission or by the display unit.		
	Reset procedure	Self-retention	The user resets the alarm via transmission or by the display unit.
		Automatic reset	Alarm is automatically reset when the alarm cause is removed.

Note. This differs from the demand time limit for each measurement value.



Display example on the MDU breaker

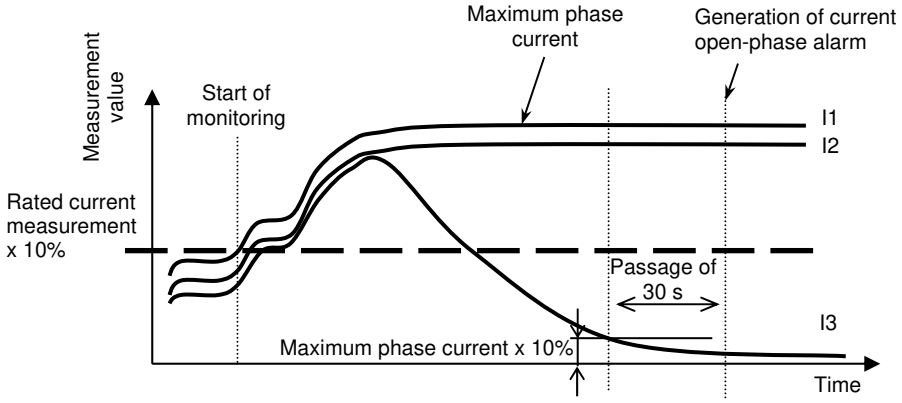


For automatic reset, the alarm is reset when the current drops lower than the pickup current.
For self-retention, reset it because the alarm is retained.

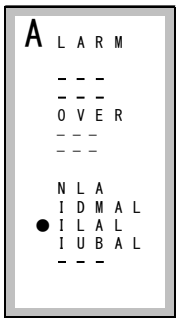
(4) ILA_AL (current open-phase alarm)

Description of alarm	Monitoring starts when the flowing current in any phase is 10% or more of the rated current measurement. When 30 seconds passes after the generation of a current flowing phase of maximum phase current x 10% or less, an alarm is output to the display/transmission.		
Setting procedure	Through transmission or by the display unit, configure the following settings. Function: ON/OFF (Setting for shipment is OFF.) Pickup current: Fixed to 10% (No setting is required.) Operating time: Fixed to 30 seconds (No setting is required.)		
Reset method	Selectable from self-retention and automatic reset via transmission or by the display unit.		
	Reset procedure	Self-retention	The user resets the alarm via transmission or by the display unit.
		Automatic reset	Alarm is automatically reset when the alarm cause is removed.

The rated current measurement is 250 A.



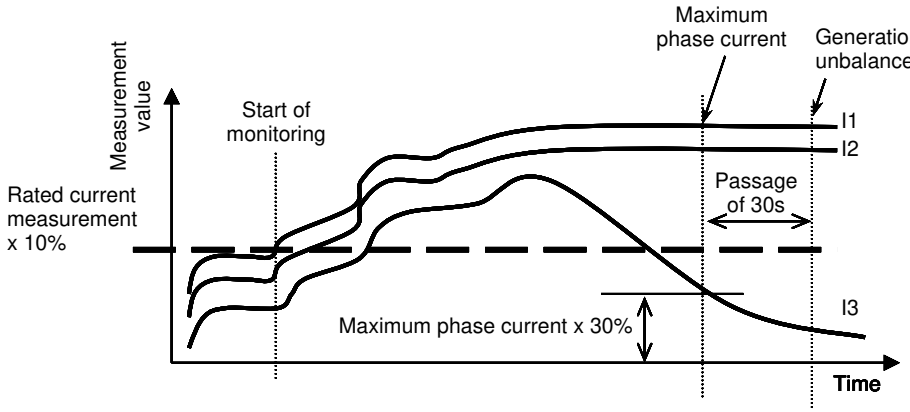
Display example on the MDU breaker



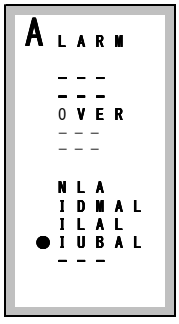
(5) IUB_AL (current unbalance alarm)

Description of alarm	Monitoring starts when the flowing current in any phase is 10% or more of the rated current measurement. When 30 seconds passes after the generation of a current flowing phase of maximum phase current x 30% or less, an alarm is output to the display/transmission.		
Setting procedure	Through transmission or by the display unit, configure the following settings. Function: ON/OFF (Setting for shipment is OFF.) Pickup current: Fixed to 30% (No setting is required.) Operating time: Fixed to 30 seconds (No setting is required.)		
Reset method	Selectable from self-retention and automatic reset via transmission or by the display unit.		
	Reset procedure	Self-retention	The user resets the alarm via transmission or by the display unit.
		Automatic reset	Alarm is automatically reset when the alarm cause is removed.

The rated current measurement is 250 A.



Display example on the MDU breaker



7.2.2 Breaker status

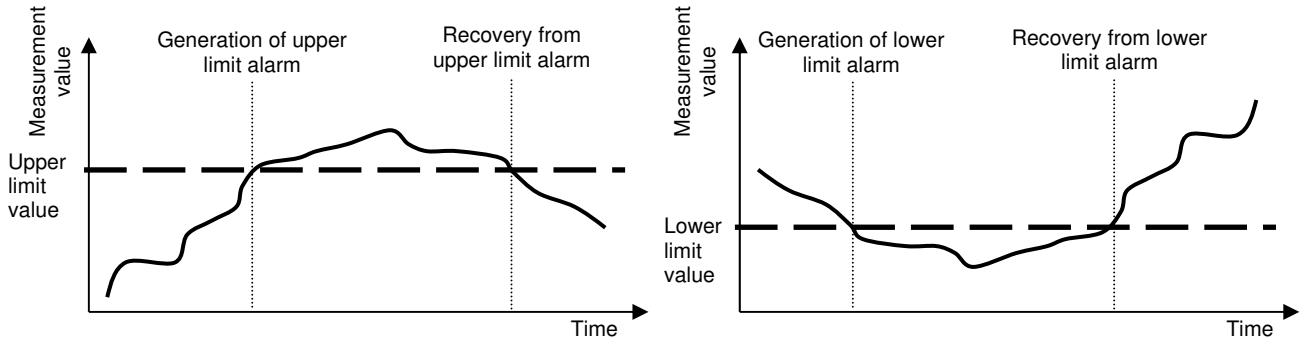
Description of circuit breaker status	Trip count	The total trip count of the circuit breaker from the start of use till the present time is output to the transmission.
	Open/close count	The total open/close count of the circuit breaker from the start of use till the present time is output to the transmission.
Remark	● To measure the trip count and the open/close count of the circuit breaker, the following devices mounted inside the breaker are required. "AL switch for transmission with MDU breaker (option)" to measure the trip count of the circuit breaker "AX switch for transmission with MDU breaker (option)" to measure the open/close count of the circuit breaker. "AL/AX switch for transmission with MDU breaker (option)" to measure both the trip count and the open/close count of the circuit breaker	

7.2.3 Fault cause

Description of circuit breaker status	If the circuit breaker trips, the fault cause is output to the display/transmission.
	One of LTD (long time delay), STD (short time delay), and INST (instantaneous trip) is output via transmission or displayed.

7.2.4 Upper/lower limit alarm

Description of upper/lower limit alarm	When an upper/lower limit value is set in the current demand (present value of max. demand value among all phases) and the measurement value exceeds the upper/lower limit value, the status of alarm generation is output to the transmission. (It is not output to the display unit.)		
	Status of alarm generation	Whether an alarm has been generated or recovered.	
Setting procedure	The upper and lower limit setting values are set via transmission. (They cannot be set by the display unit.)		
	Upper limit setting value		Sets the upper limit in the measurement value.
	Lower limit setting value		Sets the lower limit in the measurement value.
Alarm generation condition	Monitor	Type	Alarm generation condition
	Upper limit monitor	Generation	Measurement value > Upper limit setting value
		Recovery	Measurement value ≤ Upper limit setting value
	Lower limit monitor	Generation	Measurement value < Lower limit setting value
		Recovery	Measurement value ≥ Lower limit setting value
Reset method	Automatic reset. (No settings.) Automatically resets when the cause of alarm is removed.		



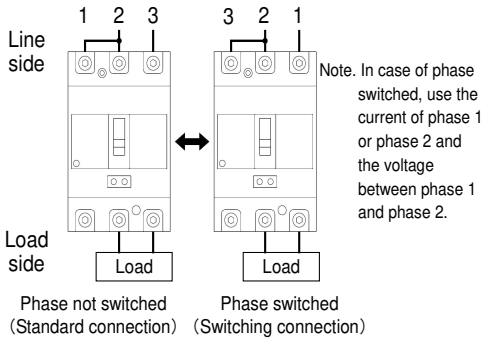
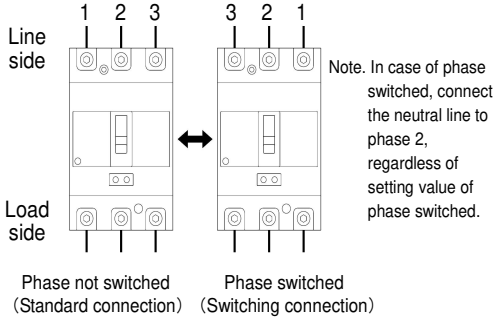
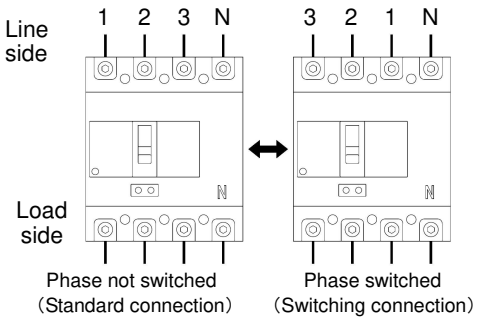
7.2.5 Neutral line open-phase alarm (NLA)

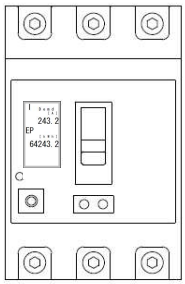
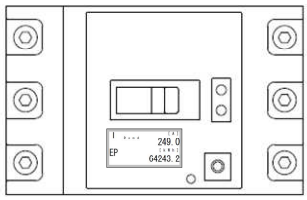
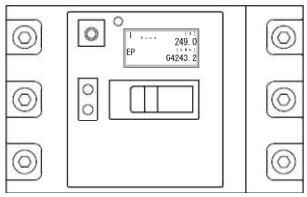
Alarm details	When the present value of line voltage exceeds the rated operating overvoltage, the status of alarm generation is output to the display. (It is not output to the transmission.)		
Setting procedure	Set via communication or on the display. This function is turned ON when the phase wire type is set to single-phase three-wire system. (The function is turned OFF when set to any other phase and wire type.)1		
	Rated operation overvoltage:	135 VAC fixed (no settings)	
	Operating time:	1 s fixed (no settings)	
	Rated inoperative overvoltage:	120 VAC	
	Overvoltage inertia inoperative time:	0.1 s or more	
Reset method	Selectable from self-retention and automatic reset via transmission or by the display unit.		
	Reset procedure	Self-retention	The user resets the alarm via transmission or by the display unit.
		Automatic reset	Alarm is automatically reset when the alarm cause is removed.

8. Setting Functions

8.1 Setting functions

The Transmission column shows whether the setting can be made via CC-Link communication, and the Display column shows whether the setting can be made by the display unit. The "●" marking shows that the setting can be made.

Setting item	Setting range	Setting for shipment	Remark	Transmission	Display
Date/time	Year: 2000 to 2099 Month: 1 to 12 Day: 1 to 31 Hour: 00 to 23 Minute: 00 to 59 Second: 00 to 59	2010 1 1 00 00 00	● To store the time of occurrence, setting the date and time is required.	●	●
Phase wire system	1φ2W (Single-phase 2-wire), 1φ3W (single-phase 3-wire), 3φ3W (3-phase 3-wire), 3φ4W (3-phase 4 wire)	3φ3W	● To monitor the average value, maximum value, minimum value, and upper/lower limit, setting the phase system is required.	●	●
Demand time	0 to 15 minutes (at 1-minute steps)	2 minutes	● Demand time settings are configured collectively.	●	●
Circuit breaker alarm reset method	Self-retention or automatic reset	Automatic reset	●PAL, IDM_AL, ILA_AL, IUB_AL, and NLA are "set collectively".	●	●
Phase switching (Phase 1-3 connection)	Phase not switched (standard connection) or phase switched (switching connection)	Phase not switched (standard connection)	● Select the phase switching according to the installation/wiring method. Phase not switched: Phases 1, 2, and 3 from the left Phase switched: Phases 3, 2, and 1 from the left ・1φ2W  ・1φ3W, 3φ3W  ・3φ4W  Note. Connect the neutral line to phase N, regardless of setting value of phase switched.	●	●

Electric energy Reactive energy	0.0 to 99999.9 kWh/kvarh	0.0	● Electric energy/reactive energy can be set to any value.	●	●
Display direction	Portrait display Landscape display - 1 Landscape display - 2	Portrait display	● When the circuit breaker is installed horizontally with the MDU breaker installed, the MDU display unit can be positioned according to the installation direction for easy view. - Portrait display Line side  Load side - Landscape display - 1  Line side Load side - Landscape display - 2  Load side Line side	-	●

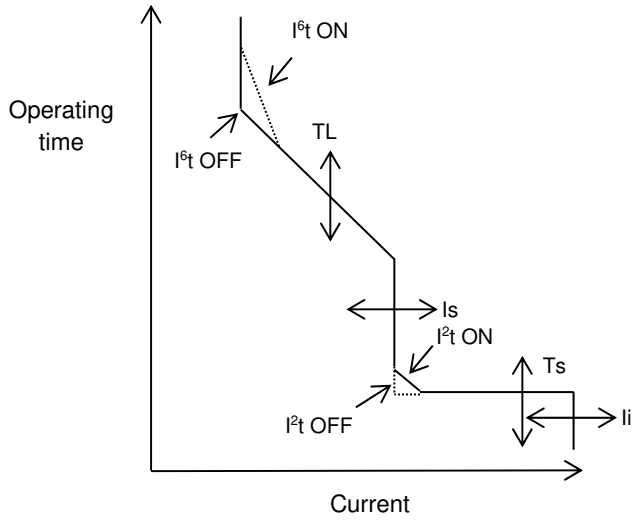
8.2 Characteristics settings

The Circuit breaker, “Y-360”, and Display columns show whether the setting can be made by the setting knob on the breaker, the separately sold the operation check and setup unit "Y-360", and the display unit of MDU breaker, respectively. The "●" marking shows that the setting can be made.

For the setting procedure using "Y-360", refer to the instruction manual for "Y-360".

Item	Setting range	Default (Following settings are applied unless otherwise specified.)	Circuit breaker	Y-360	Display
Current setting (Ir)	125 to 250 A in 12.5-A steps (adjustable)	250 A	●	-	-
INST pickup current (Ii)	Rated current In x 2, 3, 4, 5, 6, 8, 10, 12, or 14,or Current setting Ir x 14	Rated current In x 14	●	-	-
LTD operating time (TL)	12, 60, 80, or 100 s	100 s	-	●	●
STD pickup current (Is)	In x 2, 2.5, 3, 3.5, 4, 5, 6, 7, 8, 9, or 10	x 10	-	●	●
STD operating time (Ts)	0.1, 0.2, or 0.3 s	0.3 s	-	●	●
LTD I^6t characteristics ON/OFF	ON or OFF	OFF	-	●	●
STD I^2t characteristics ON/OFF	ON or OFF	ON	-	●	●
N-pole protection (NP) ON/OFF (note 1)	ON or OFF	ON	-	●	●

Note 1. For 4-pole circuit breaker only.

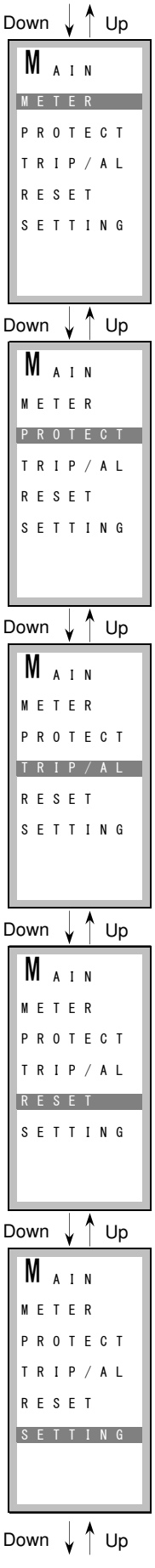


9. Procedures for Display, Operation, and Setting

9.1 Main menu screen

You can move to various display screens from the main menu screen. Using Up/Down of the operation switch, select a desired screen and press Enter to move to the selected screen.

[Main menu screen]

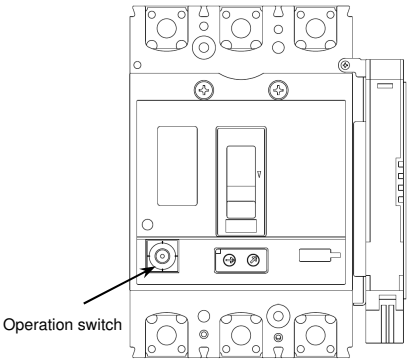


When displaying measurement values, select this.

Refer to Section 9.2.

[Measurement value display screen]
This screen displays
- Electric energy/combined (current)
- Load current
- Line voltage
- Electric power
- Reactive power
- Power factor
- Frequency
- Harmonic current (present value)
- Harmonic current (content rate)
- Harmonic current (maximum value)
- Harmonic current (demand value)
- Reactive energy

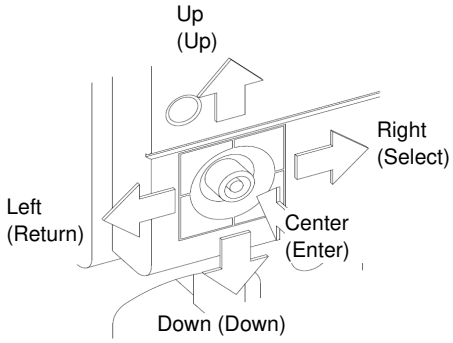
* When you move from the measurement value display screen to the main menu screen and then move back to the measurement value display screen, the screen before you move to the main menu screen is displayed.



When displaying or setting the operating characteristics, select this.

Refer to Section 9.3.

[Protection characteristics display screen]
This screen displays
- Current setting Ir check
- LTD operating time TL setting
- Neutral protection NP setting
- STD pickup current Is setting
- STD operating time Ts setting
- INST pickup current Ii check



When displaying the fault/alarm status, select this.

Refer to Section 9.4.

[Fault/alarm display screen]
This screen displays the fault cause, fault current, and the alarm status.

When resetting the values, select this.

Refer to Section 9.5.

[Reset screen]
This screen is used to clear the fault cause and fault current and to reset the alarm, maximum value, electric energy, and reactive energy.

When making various settings, select this.

Refer to Section 9.6.

[Setting menu screen]
This screen is used to set
- Relations of measurement
- Relations of alarm
- Setting for LCD
- Clock setting

9.2 Measurement value display and displayed information

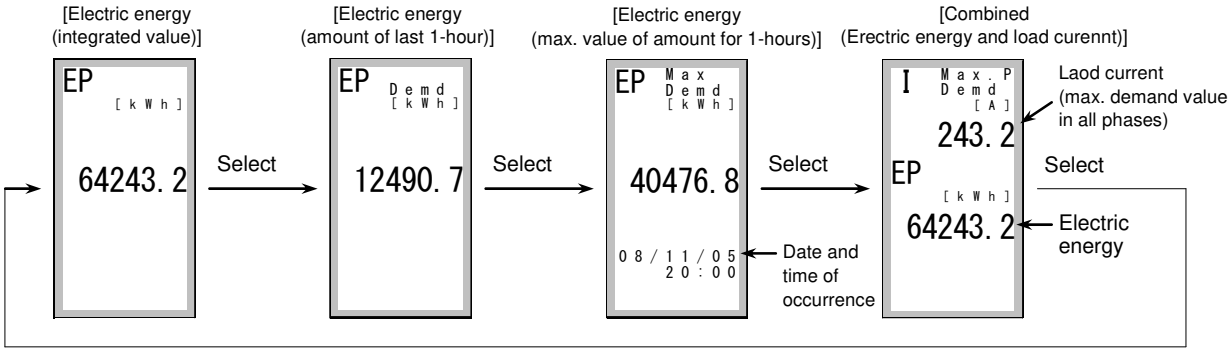
- Select METER on the main menu screen and press Enter to move to the measurement value display screen. Select a measurement item you want to view by Up/Down.

  Screens are switched as shown below:

  [1] Electric energy/combined (current) <=> [2] Load current <=> [3] Line voltage <=> [4] Electric power <=>
  [5] Reactive power <=> [6] Power factor <=> [7] Frequency <=> [8] Harmonic current (present value) <=>
  [9] Harmonic current (content rate) <=> [10] Harmonic current (maximum value) <=> [11] Harmonic current (demand value) <=>
  [12] Reactive energy <=> [1] Electric energy/combined (current) <=> ...
- You can go back to the main menu screen by Return.
- When you move from the measurement value display screen to the main menu screen and then move back to the measurement value display screen, the screen before you move to the main menu screen is displayed.

[1] Electric energy/combined (load current)

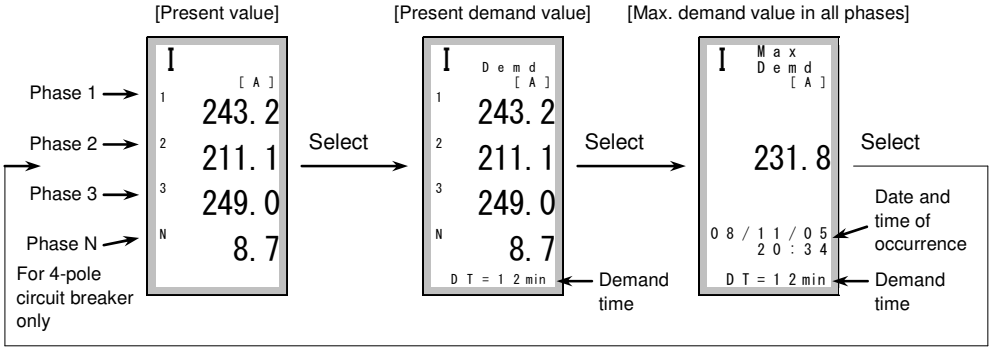
- The screen displays the measurement values of the electric energy and combined values (electric energy and load current). You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [12] Reactive energy by Up or [2] Load current by Down.

[2] Load current

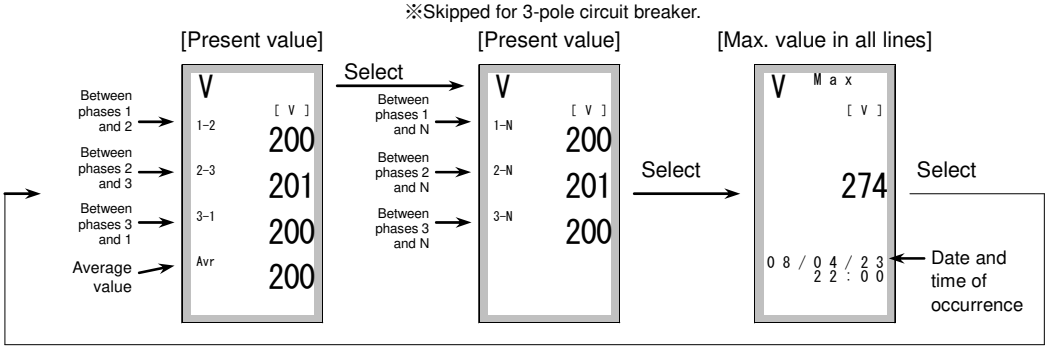
- The screen displays the measurement value of the load current. You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [1] Electric energy/combined (load current) by Up or [3] Line voltage by Down.

[3] Line voltage

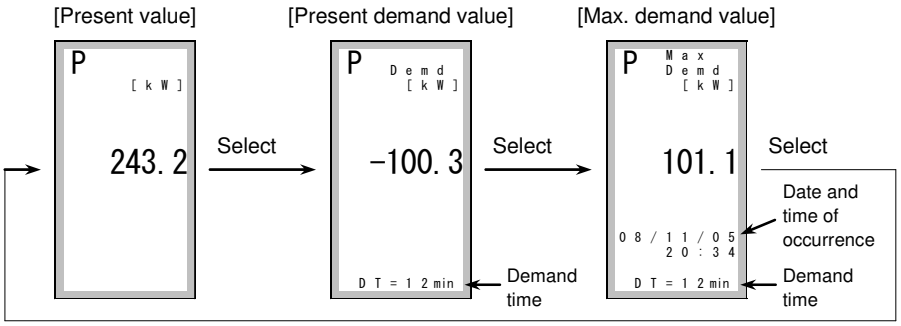
- The screen displays the measurement values of the line voltage. You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [2] Load current by Up or [4] Electric power by Down.

[4] Electric power

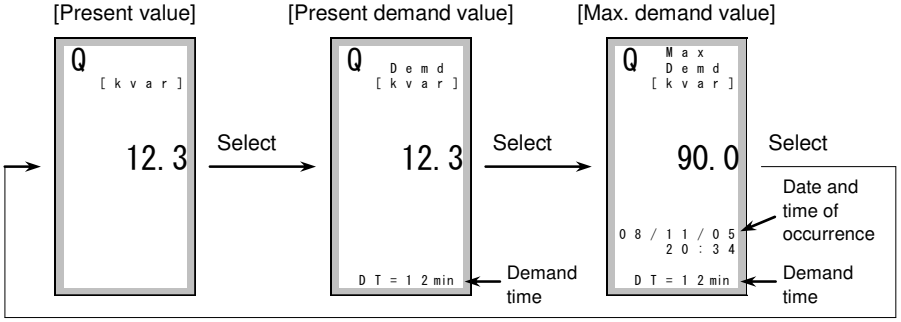
- This screen displays the measurement values of the electric power. You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [3] Line voltage by Up or [5] Reactive power by Down.

[5] Reactive power

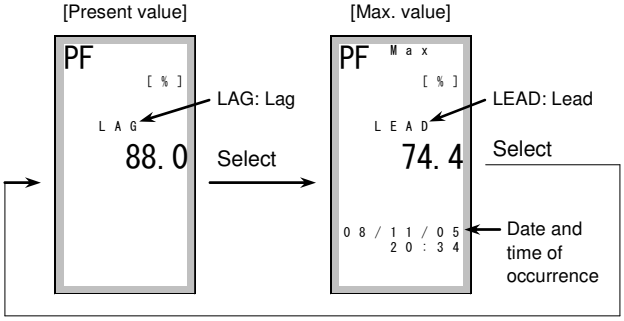
- The screen displays the measurement values of the reactive power. You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [4] Electric power by Up or [6] Power factor by Down.

[6] Power factor

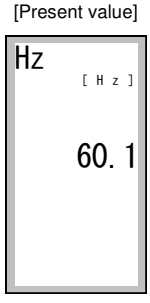
- This screen displays the measurement values of the power factor. You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [5] Reactive power by Up or [7] Frequency by Down.

[7] Frequency

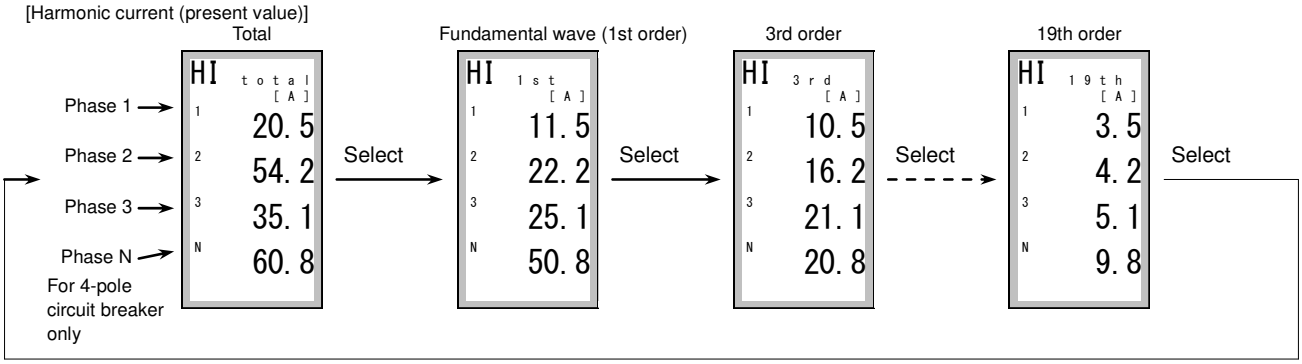
- The screen displays the present value of the frequency.



- You can go back to the main menu screen by Return.
- You can move to [6] Power factor by Up or [8] Harmonic current (present value) by Down.

[8] Harmonic current (present value)

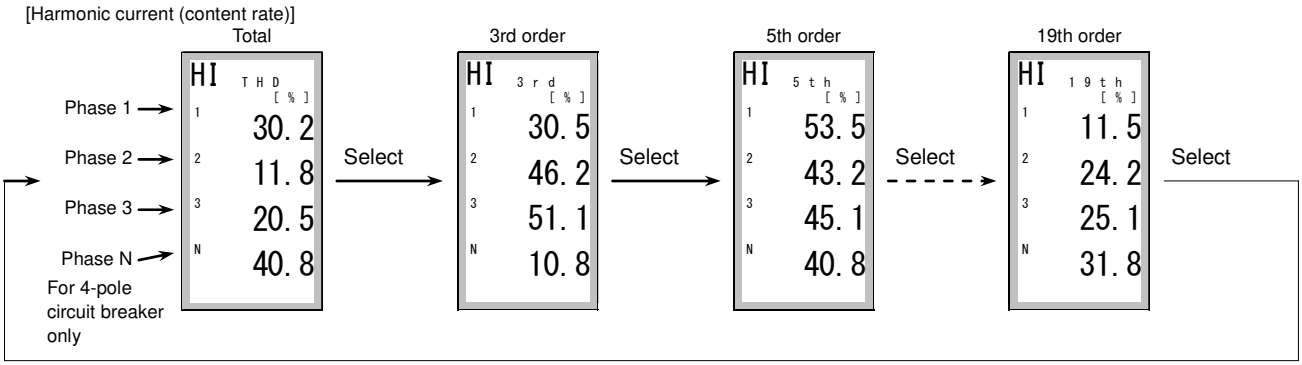
- This screen displays the measurement values of harmonic current (present value). You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [7] Frequency by Up or [9] Harmonic current (content rate) by Down.

[9] Harmonic current (content rate)

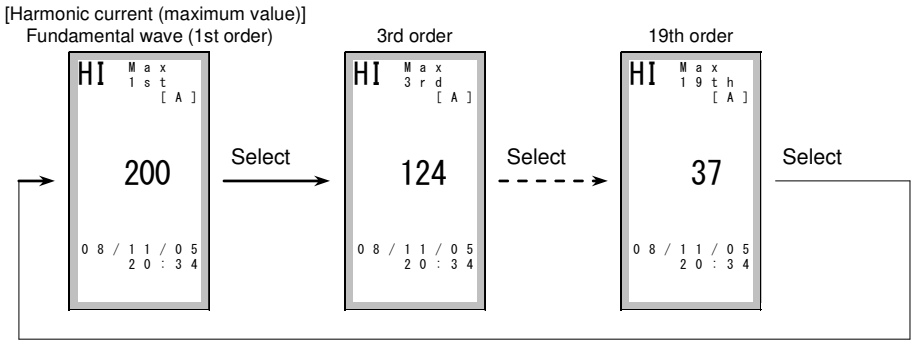
- This screen displays the measurement values of harmonic current (content rate). You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [8] Harmonic current (present value) by Up or [10] Harmonic current (maximum value) by Down.

[10] Harmonic current (maximum value)

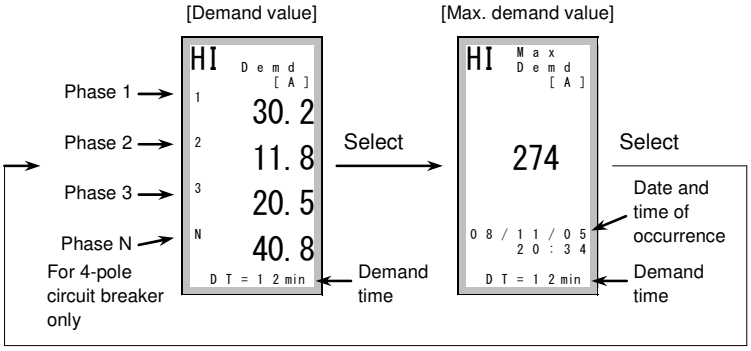
- This screen displays the measurement values of harmonic current (maximum value). You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [9] Harmonic current (content rate) by Up or [11] Harmonic current (demand value) by Down.

[11] Harmonic current (demand value)

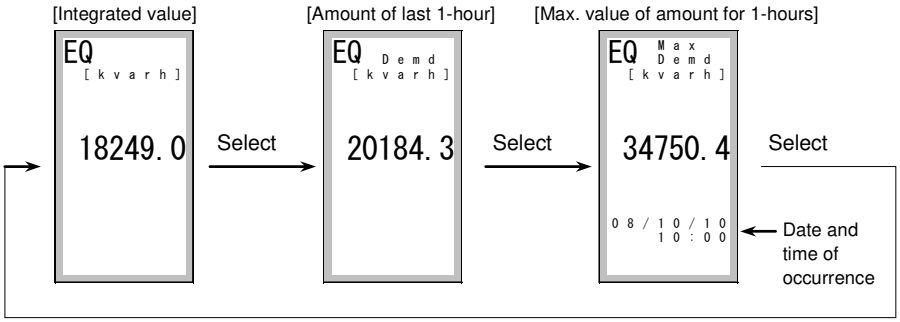
- This screen displays the measurement values of harmonic current (demand value). You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [10] Harmonic current (maximum value) by Up or [12] Reactive energy by Down.

[12] Reactive energy

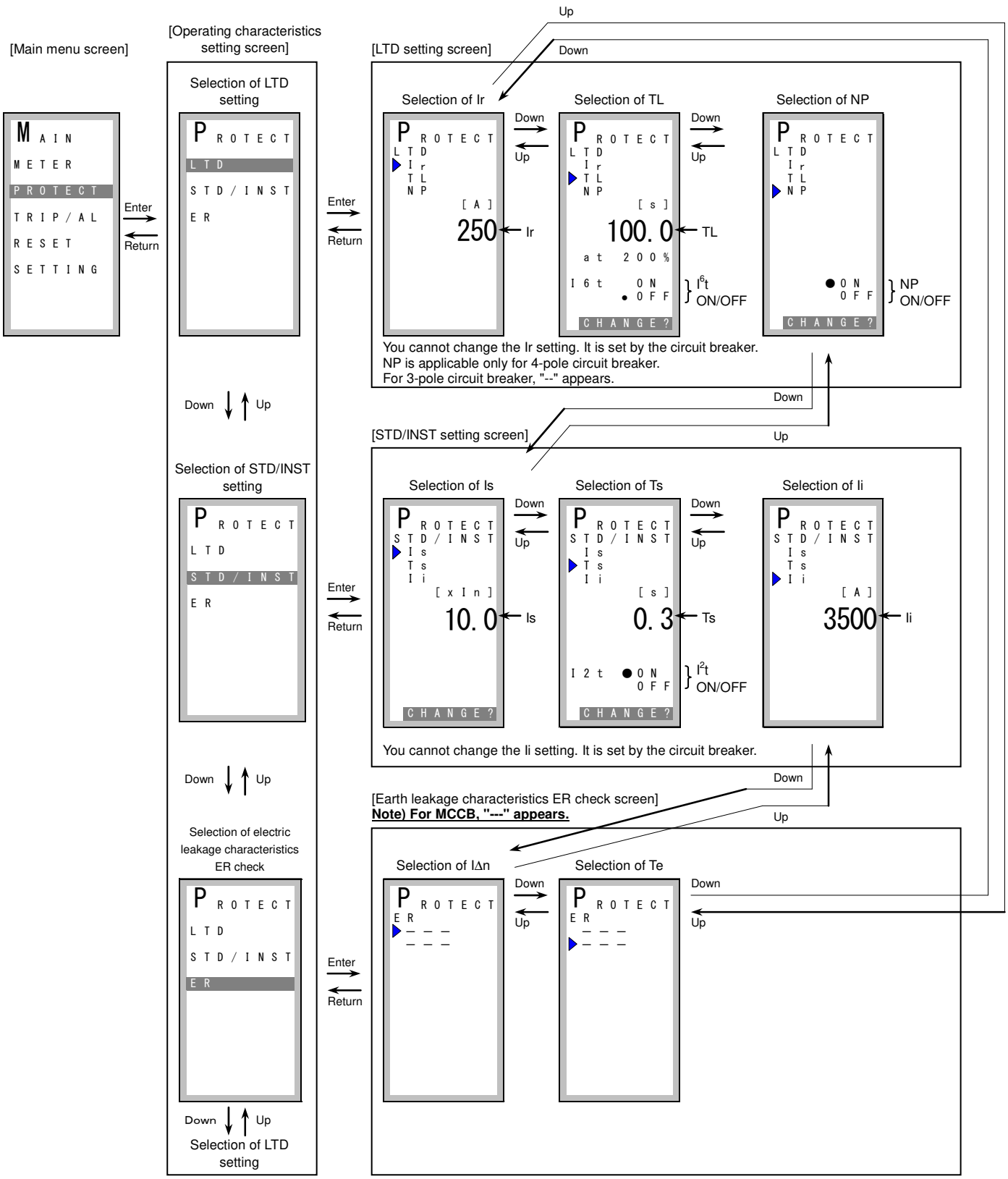
- This screen displays the measurement values of the reactive energy. You can switch the screens by Select.



- You can go back to the main menu screen by Return.
- You can move to [11] Harmonic current (demand value) by Up or [1] Electric energy/combined by Down.

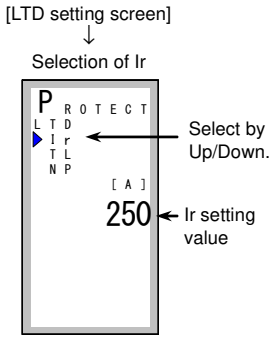
9.3 Method of check/setting of the operating characteristics

- Select PROTECT on the main menu screen and press Enter to display the operating characteristics setting screen.
- You can switch the screen using Up/Down: LTD <=> STD/INST <=> ER <=> LTD.



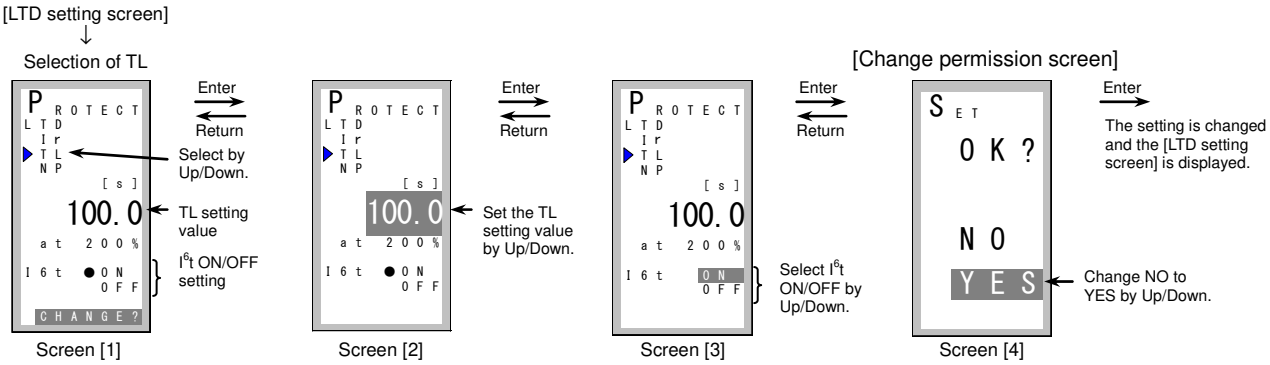
(1) Current setting Ir check

- On the LTD setting screen, select Ir by Up/Down. The Ir setting value of the circuit breaker is displayed.



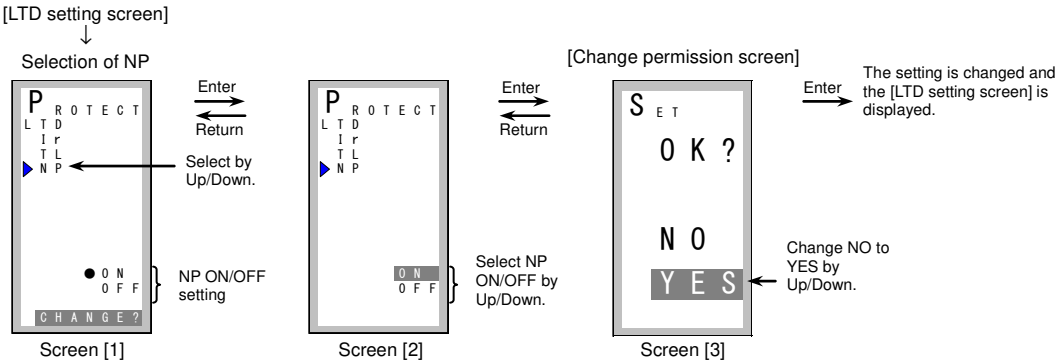
(2) LTD operating time TL setting

- On the LTD setting screen, select TL by Up/Down. (Screen [1])
- Pressing Enter can change the TL setting value. (Screen [2])
  Use Up/Down to change the setting value as follows: 12.0 <=> 60.0 <=> 80.0 <=> 100.0.
  Determine the setting value by pressing Enter.
- Then, ON/OFF of the I^6t characteristics can be changed. (Screen [3])
  Select ON or OFF by Up/Down and press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the LTD setting screen is displayed again.



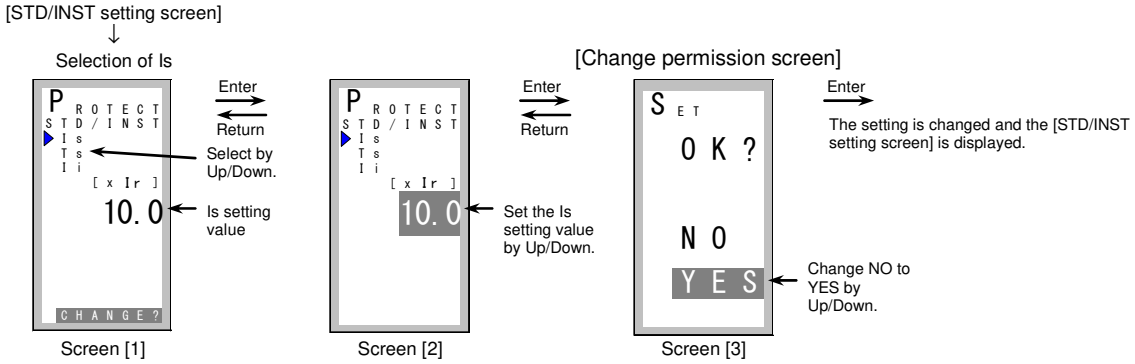
(3) Neutral protection NP setting (only for 4-pole circuit breaker)

- On the LTD characteristics setting screen, select NP by Up/Down. (Screen [1])
- Pressing Enter can change ON/OFF of NP characteristics. (Screen [2])
  Select ON or OFF by Up/Down and press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [3])
  When you press Enter, the LTD setting screen is displayed again.



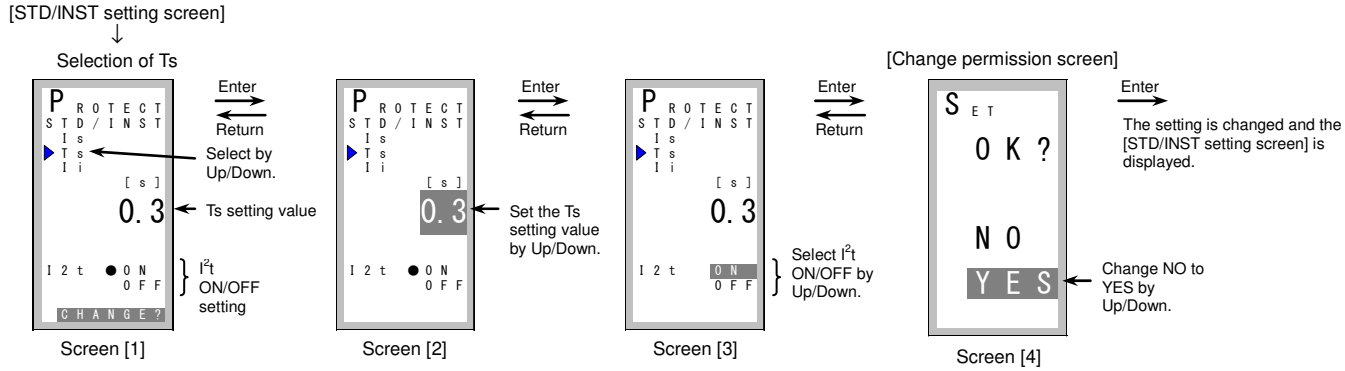
(4) STD pickup current Is setting

- On the STD/INST setting screen, select Is by Up/Down. (Screen [1])
- Pressing Enter can change the Is setting value. (Screen [2])
  You can change the setting value by UP/Down as follows: 2.0 <=> 2.5 <=> 3.0 <=> 3.5 <=> 4.0 <=> 5.0 <=> 6.0 <=> 7.0 <=> 8.0 <=> 9.0 <=> 10.0.
  Determine the setting value by pressing Enter.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [3])
- When you press Enter, the STD/INST setting screen is displayed again.



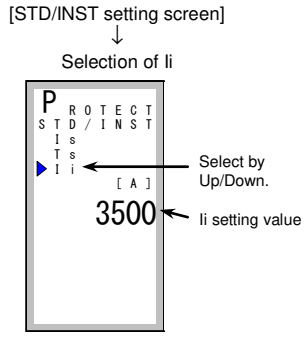
(5) STD operating time Ts setting

- On the STD/INST setting screen, select Ts by Up/Down. (Screen [1])
- Pressing Enter can change the Ts setting value. (Screen [2])
  You can change the setting value by Up/Down as follows: 0.1 <=> 0.2 <=> 0.3.
  Determine the setting value by pressing Enter.
- Then ON/OFF of the I^2t characteristics can be changed. (Screen [3])
  Select ON or OFF by Up/Down and press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
- When you press Enter, the STD/INST setting screen is displayed again.



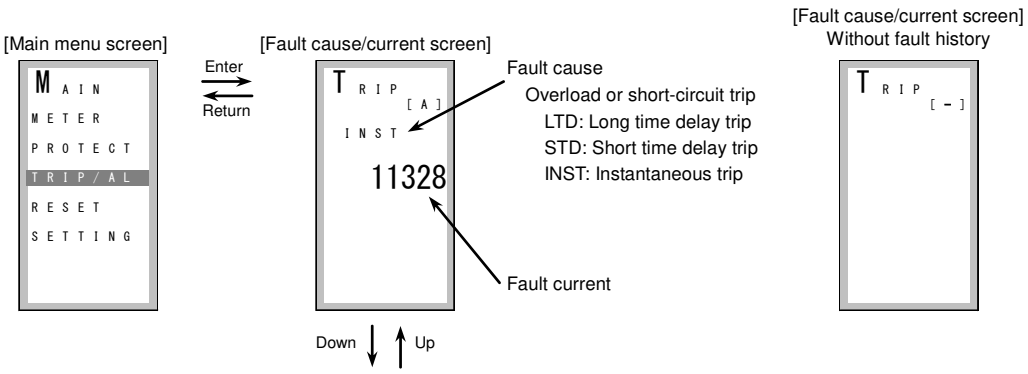
(6) INST pickup current Ii check

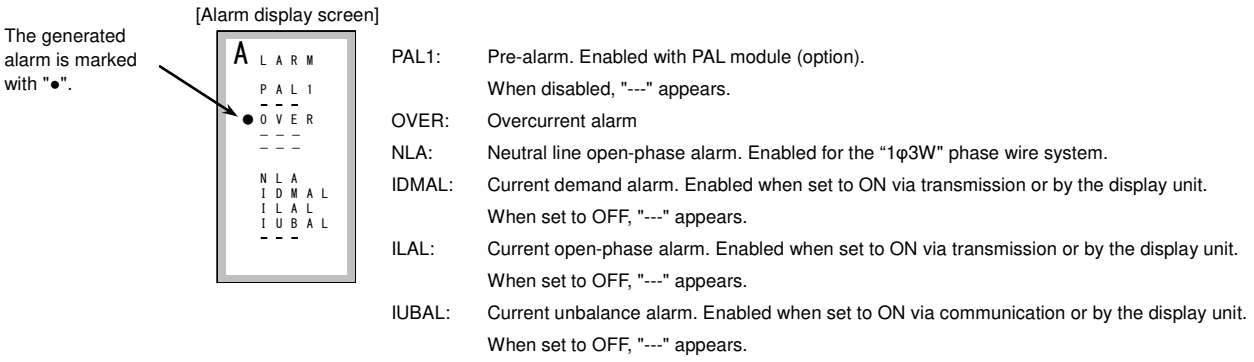
- On the STD/INST setting screen, select Ii by Up/Down. The Ii setting value of the circuit breaker is displayed.



9.4 Method of display of fault/alarm and contents of the displayed

- Select TRIP/AL on the main menu screen and press Enter to display the fault/alarm display screen.
- You can switch the fault cause/current display screen and the alarm display screen by Up/Down.

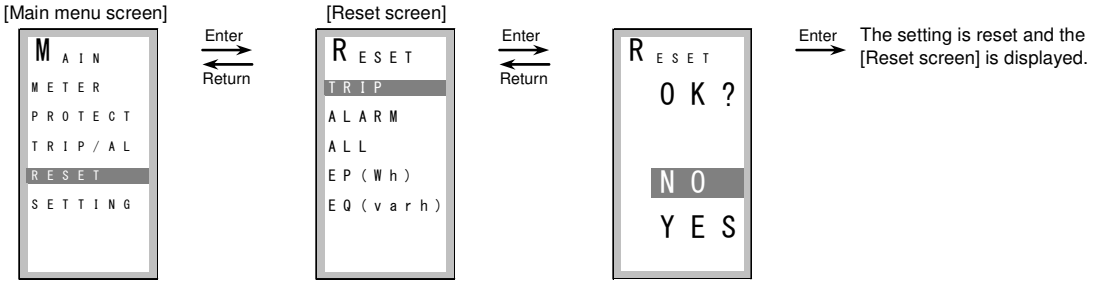




- The fault cause/current display screen is automatically displayed in case of a fault, and the alarm display screen is automatically displayed in case of an alarm. In such cases, the backlight turns red.
- When you press any of the operation buttons, the backlight turns back white and the screen that was being displayed before the alarm display screen is displayed.
  (The alarm is kept output until it is reset.)
- When the alarm reset method is automatic reset and the alarm cause is removed, the backlight turns back white and the screen that was being displayed before the alarm display screen is displayed. (The output alarm is also reset.)

9.5 Method of reset

- Select RESET on the main menu screen and press Enter to display the reset screen.
- Select an item you want to reset by Up/Down (TRIP <=> ALARM <=> ALL <=> EP (WH) <=> EQ (varh) <=> TRIP <=> ---) and press Enter to display the reset permission screen.

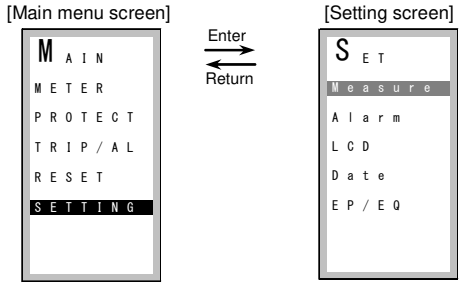


TRIP:	Resets the fault cause/current.
ALARM:	Resets the alarm.
ALL:	Resets the maximum value and time of occurrence of maximum value. Excepting fault cause/current, alarm,electric energy and reactive energy.
Ep (Wh):	Resets the electric energy. (The value is set to 0 kwh.)
EQ (varh):	Resets the reactive energy. (The value is set to 0 kvarh)

- Select an item you want to reset and press Enter to display the reset permission screen. Select YES and press Enter to reset the selected item.

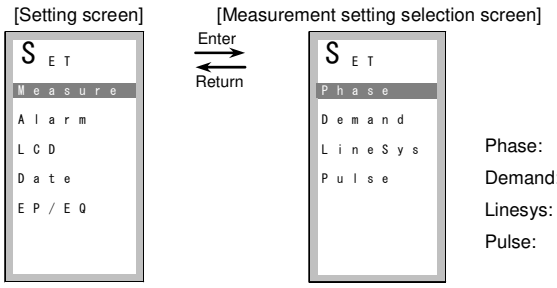
9.6 Method of various settings

- Select SETTING on the main menu screen and press Enter to display the setting screen.
- You can switch the screen by Up/Down as follows: Measure <=> Alarm <=> LCD <=> Date <=> EP/EQ <=> Measure ---.



9.6.1 Method of various settings for relations of the measurement

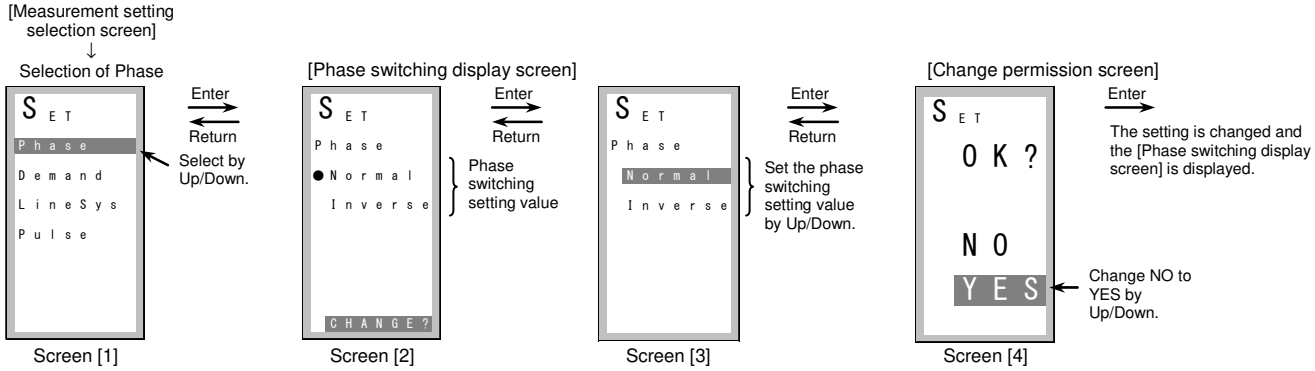
- Select Measure on the setting screen and press Enter to display the measurement setting selection screen.
- You can switch the setting item Up/Down as follows: Phase <=> Demand <=> LineSys <=> Pulse <=> Phase ---.



Phase:	Sets the phase switching.
Demand:	Sets the demand time.
Linesys:	Sets the phase wire system.
Pulse:	Sets the pulse unit. (With electric energy pulse output (option))

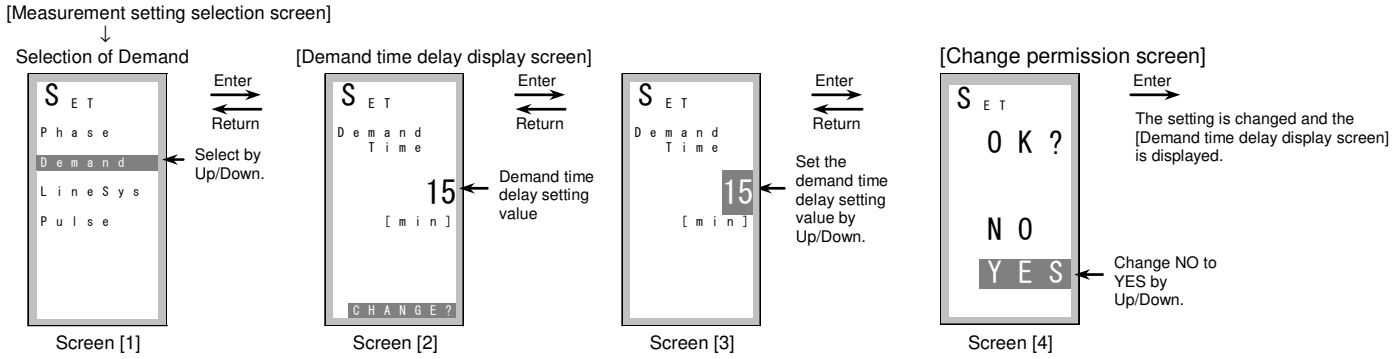
(1) Phase switching setting

- On the measurement setting selection screen, select Phase by Up/Down. (Screen [1])
- Pressing Enter displays the phase switching display screen. (Screen [2])
- Then pressing Enter can change the phase switching setting value. (Screen [3])
  Select Normal (phase not switched) or Inverse (phase switched) by Up/Down and press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the phase switching display screen is displayed again.



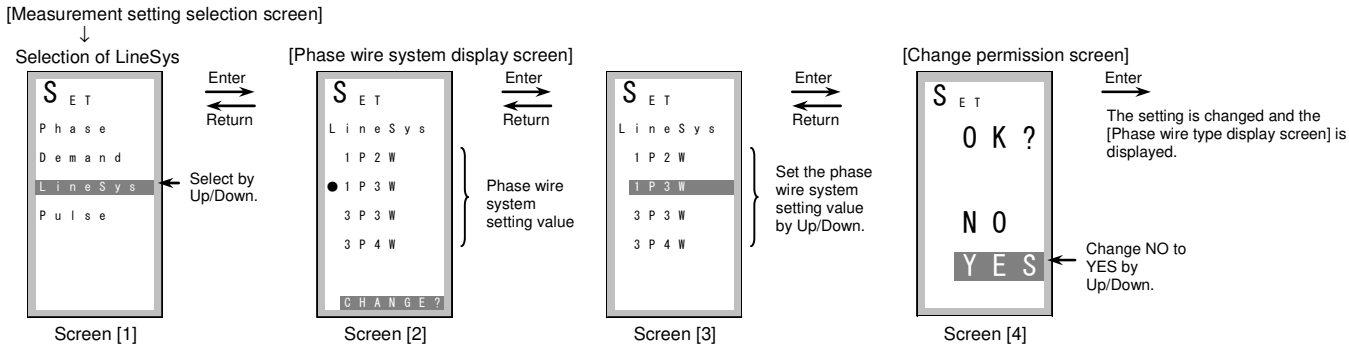
(2) Demand time setting

- On the measurement setting selection screen, select Demand by Up/Down. (Screen [1])
- Pressing Enter displays the demand time display screen. (Screen [2])
- Then pressing Enter can change the demand time setting value. (Screen [3])
  You can change the setting value by Up/Down as follows: 0 <=> 1 <=> 2 <=> --- <=> 14 <=> 15 <=> 0 --- (in 1-minute steps).
  Determine the setting value by pressing Enter.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the demand time delay display screen is displayed again.



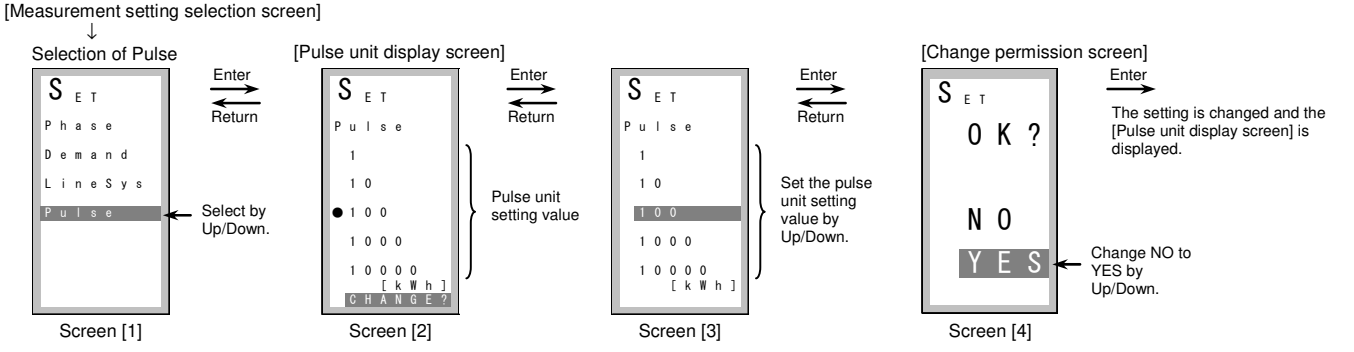
(3) Phase wire system setting

- On the measurement setting selection screen, select LineSys by Up/Down. (Screen [1])
- Pressing Enter displays the phase wire system display screen. (Screen [2])
- Then pressing Enter can change the phase wire system setting value. (Screen [3])
  You can change the setting value by Up/Down as follows:
  1P2W (1φ2W : Single-phase 2-wire)
  1P3W (1φ3W : Single-phase 3-wire)
  3P3W (3φ3W : 3-phase 3-wire)
  3P4W (3φ4W :3-phase 4 wire) (for 4-pole circuit breaker)
  Determine the setting value by pressing Enter.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the phase wire system display screen is displayed again.



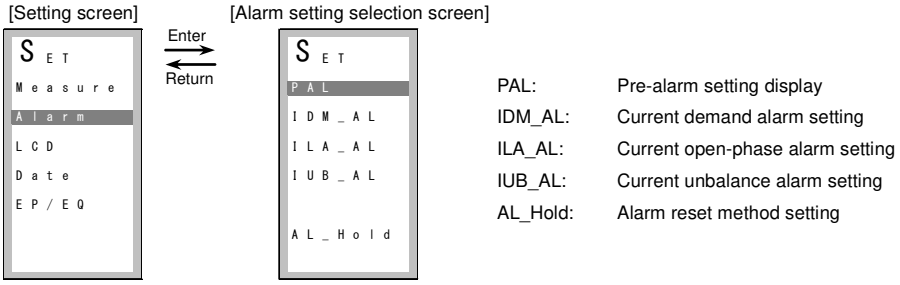
(4) Pulse unit setting

- On the measurement setting selection screen, select Pulse by Up/Down. (Screen [1])
- Pressing Enter displays the pulse unit display screen. (Screen [2])
- Then pressing Enter can change the pulse unit setting value. (Screen [3])
- You can change the setting value by Up/Down as follows: 1 <=> 10<=> 100 <=> 1000 <=> 10000 <=> 1 --- (kwh/pulse).
  Determine the setting value by pressing Enter.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the pulse unit display screen is displayed again.



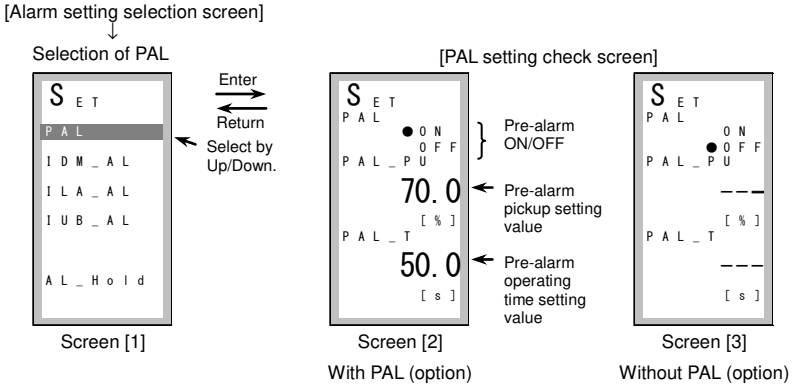
9.6.2 Method of various settings for relations of the alarm

- Select Alarm on the setting screen and then press Enter to display the alarm setting selection screen.
- You can change the setting item by Up/Down as follows: PAL <=> IDM_AL <=> ILA_AL <=> IUB_AL <=> AL_Hold <=> PAL --- .



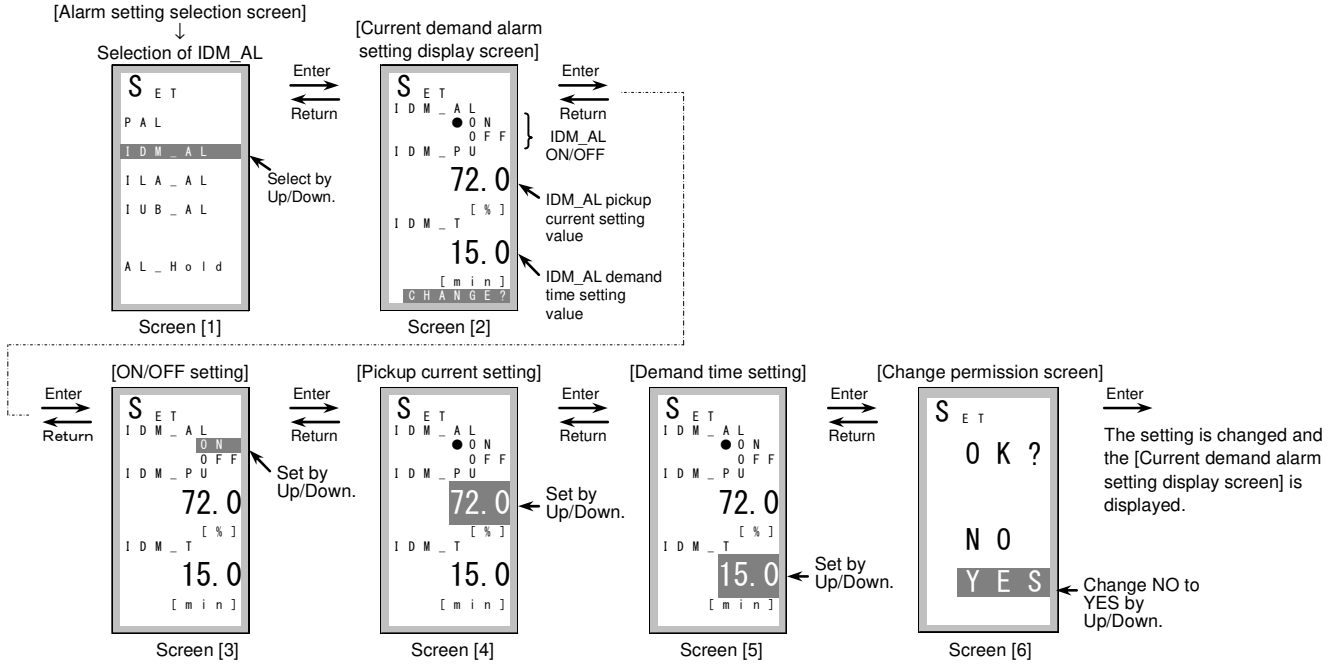
(1) Pre-alarm (PAL) setting display (No setting is configured by the display unit.)

- On the alarm setting selection screen, select PAL by Up/Down. (Screen [1])
- Pressing Enter displays the PAL setting check screen. (Screen [2], screen [3])
  With PAL module (option), the function is turned ON.
- The setting is made by the circuit breaker and the PAL module.



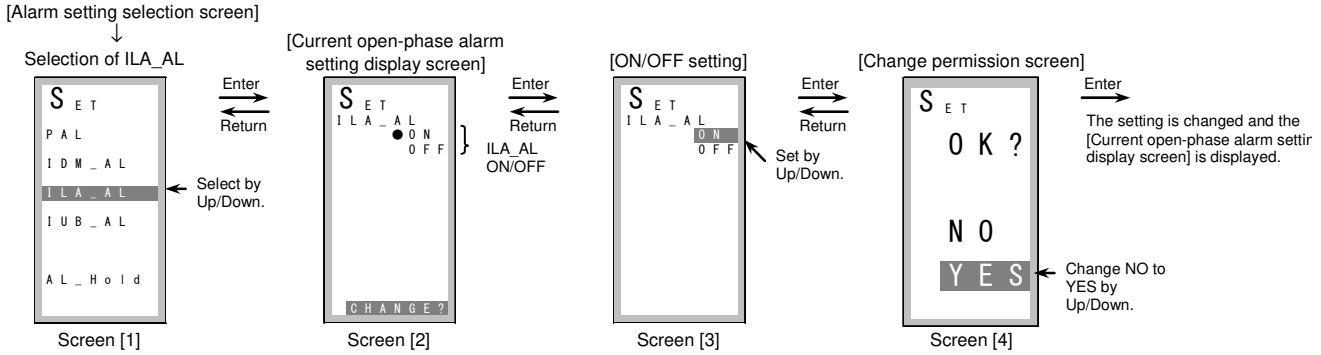
(2) Current demand alarm setting (IDM_AL)

- Select IDM_AL by Up/Down on the alarm setting selection screen. (Screen [1])
- Pressing Enter displays the current demand alarm setting display screen. (Screen [2])
- Then pressing Enter can change ON/OFF of IDM_AL. (Screen [3])
  Select ON (function enabled) or OFF (function disabled) by Up/Down and press Enter to determine the selection.
- Then pressing Enter can change the pickup current setting value.
  You can change the setting value between 50.0 and 100.0 (in 1.0% steps) by Up/Down.
  Determine the setting value by pressing Enter. (Screen [4])
- Then pressing Enter can change the demand time setting value.
  You can change the setting value by Up/Down as follows: 1.0-10.0 (in 1.0-minute steps) <=> 15.0 <=> 20.0 <=> 25.0 <=> 30.0.
  Determine the setting value by pressing Enter. (Screen [5])
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [6])
  When you press Enter, the current demand alarm setting display screen is displayed again.



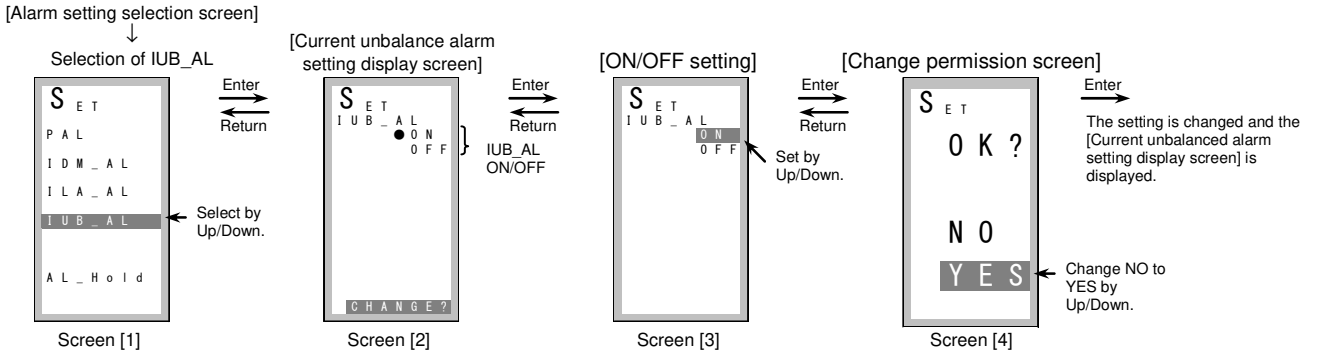
(3) Current open-phase alarm setting (ILA_AL)

- Select ILA_AL by Up/Down on the alarm setting selection screen. (Screen [1])
- Pressing Enter displays the current open-phase alarm setting display screen. (Screen [2])
- Then pressing Enter can change ON/OFF of ILA_AL. (Screen [3])
  Select ON (function enabled) or OFF (function disabled) by Up/Down and then press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the current one-phase alarm setting display screen is displayed again.



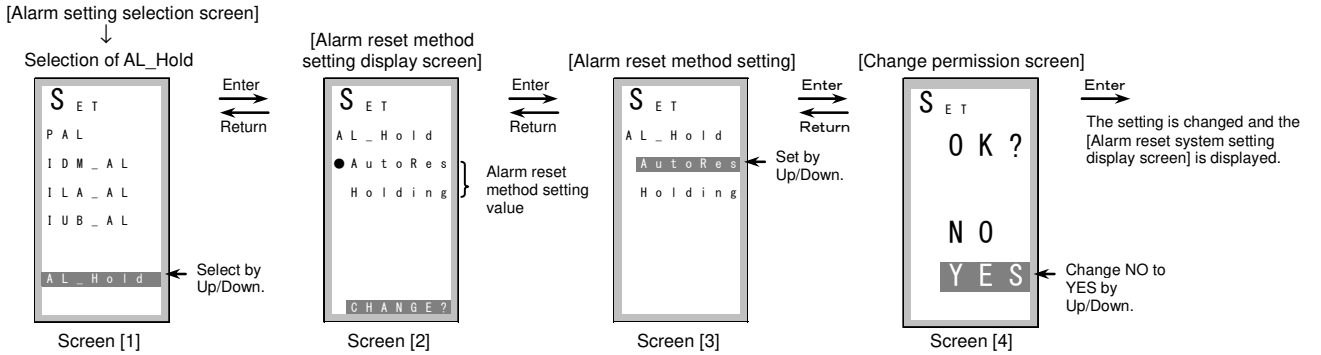
(4) Current unbalance alarm setting (IUB_AL)

- Select IUB_AL by Up/Down on the alarm setting selection screen. (Screen [1])
- Pressing Enter displays the current unbalance alarm setting display screen. (Screen [2])
- Then pressing Enter can change ON/OFF of IUB_AL. (Screen [3])
  Select ON (function enabled) or OFF (function disabled) by Up/Down and press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the current unbalance alarm setting display screen is displayed again.



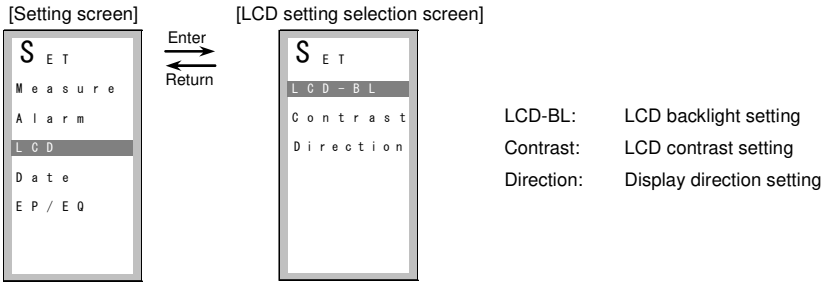
(5) Alarm reset method setting

- Select AL_Hold by Up/Down on the alarm setting selection screen. (Screen [1])
- Pressing Enter displays the alarm reset method setting display screen. (Screen [2])
- Then pressing Enter can change the alarm reset method. (Screen [3])
  Select AutoRes (automatic reset) or Holding (self-retention) by Up/Down and press Enter to determine the selection.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the alarm reset setting display screen is displayed again.



9.6.3 Method of setting for LCD (backlight setting, contrast, display direction)

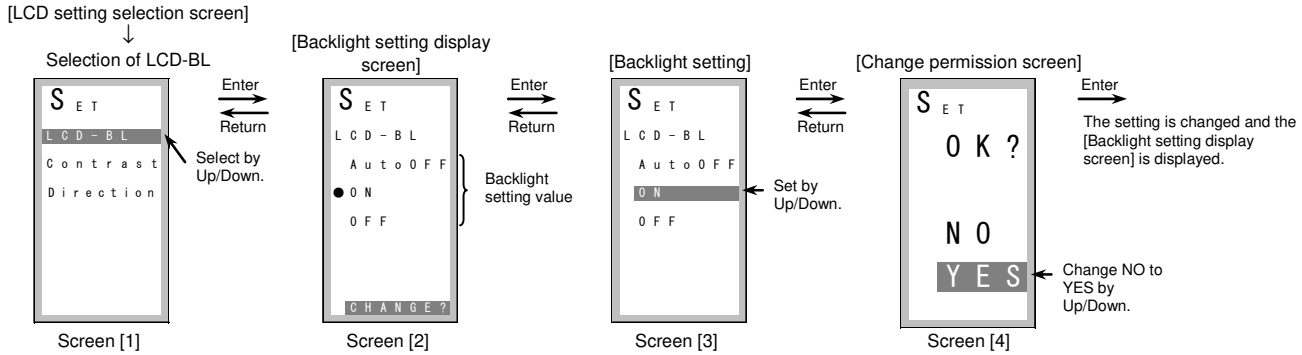
- Select LCD on the setting screen and press Enter to display the LCD setting selection screen.
- You can select the setting item by Up/Down as follows: LCD-BL <=> Contrast <=> Direction <=> LCD-BL --- .



LCD-BL: LCD backlight setting
Contrast: LCD contrast setting
Direction: Display direction setting

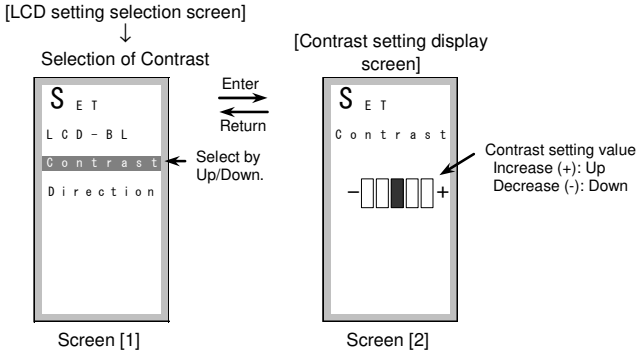
(1) Backlight setting

- On the LCD setting selection screen, select LCD-BL by Up/Down. (Screen [1])
- Pressing Enter displays the backlight setting display screen. (Screen [2])
- Then pressing Enter can change the backlight setting. (Screen [3])
  By Up/Down, select one of the following settings and press Enter to determine the selection.
  AutoOFF (Automatically turned OFF when no operation is done for about 5 minutes. Turned ON again when the switch is operated.)
  ON (Always ON)
  OFF (Always OFF)
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the backlight setting display screen is displayed again.



(2) Contrast setting

- On the LCD setting selection screen, select Contrast by Up/Down. (Screen [1])
- Pressing Enter displays the contrast setting display screen. (Screen [2])
  While viewing the screen, change the contrast by Up/Down. (The setting applies to the screen accordingly.)
- When you press Enter or Return, the contrast selection screen is displayed again.



(3) Display direction setting (only for breaker mounting type)

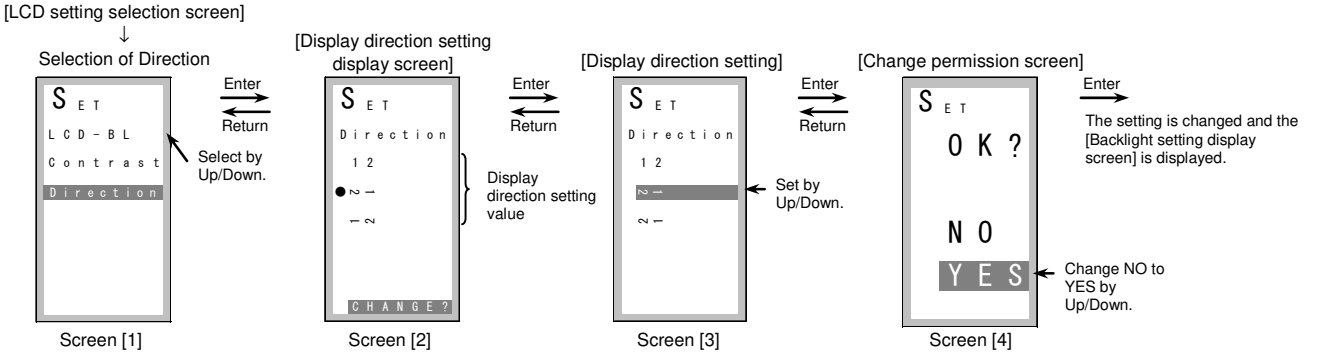
- On the LCD setting selection screen, select Direction by Up/Down. (Screen [1])
- Pressing Enter displays the display direction setting display screen. (Screen [2])
- Then pressing Enter can change the display direction setting value. (Screen [3])
  You can change the setting value by Up/Down as follows:

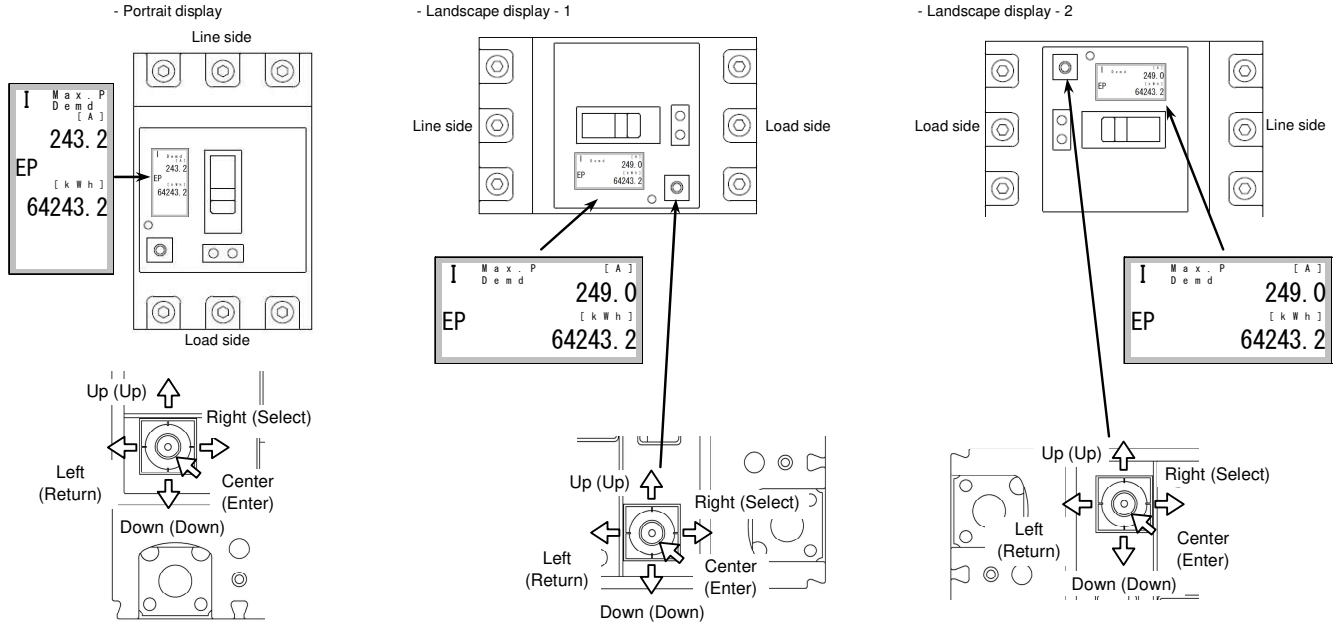
  1 2 : Portrait display
  2 1 : Landscape display - 1
  1 2 : Landscape display - 2

  Determine the setting value by pressing Enter.
- On the change permission screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [4])
  When you press Enter, the display direction setting display screen is displayed again.

* The screen is displayed according to the selected direction.

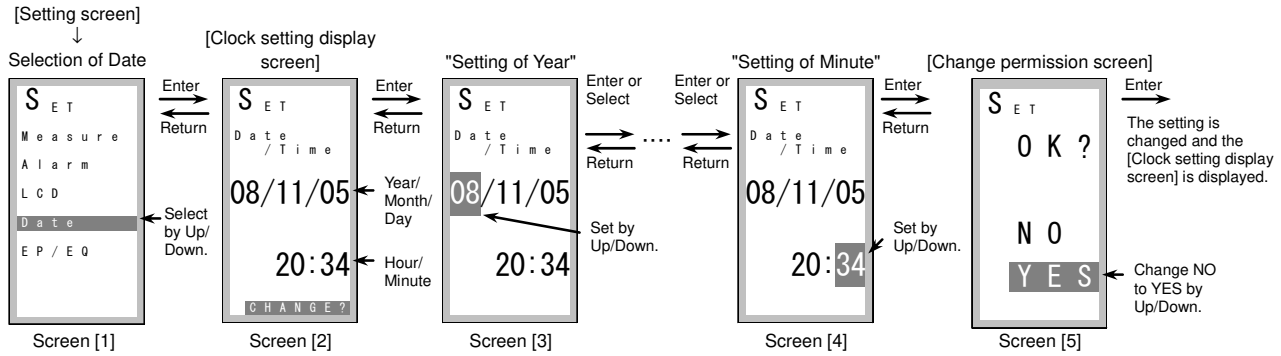
* The direction of the operation switch is changed according to the installation direction of the breaker.





9.6.4 Method of clock setting

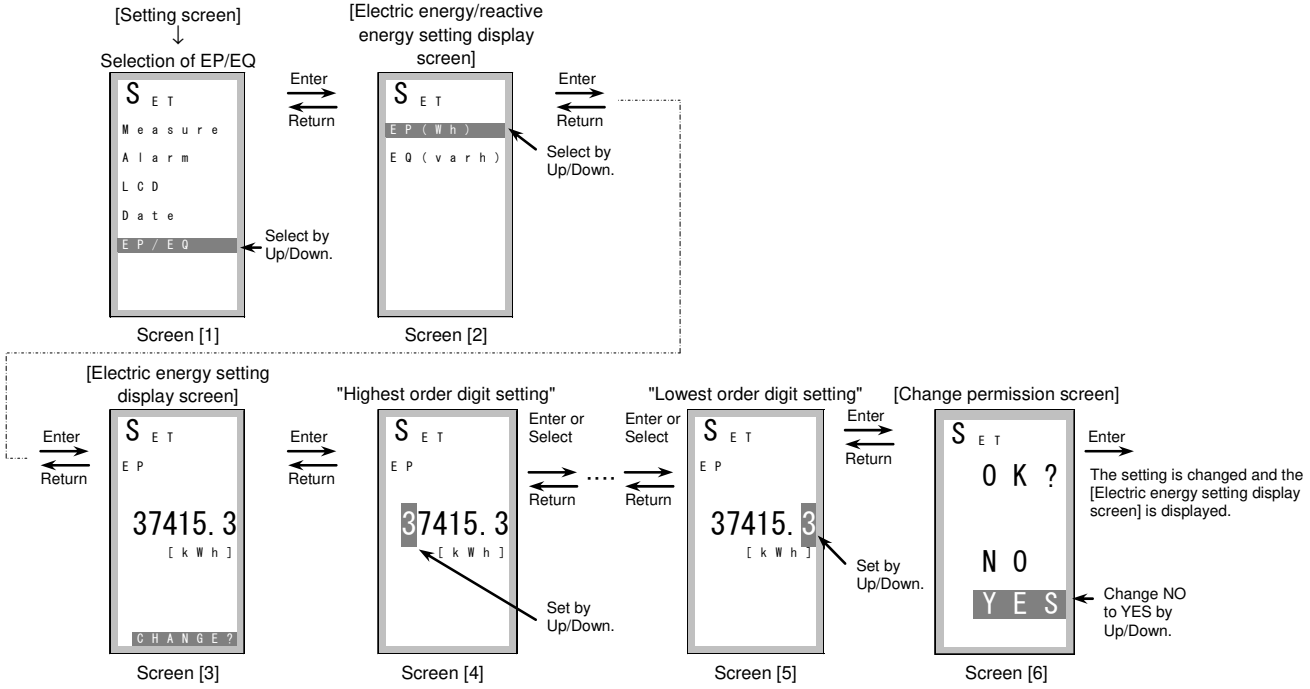
- On the setting screen, select Date by Up/Down. (Screen [1])
- Pressing Enter displays the clock setting display screen. (Screen [2])
- Then pressing Enter can change the clock setting. (Screens [3] and [4])
- You can select the setting item by Enter or Select as follows: "Year" → "Month" → "Day" → "Hour" → "Minute"
  You can select the setting item by Return as follows: "Year" ← "Month" ← "Day" ← "Hour" ← "Minute"
  Select an item you want to change and set it by Up/Down.
- After "Minute" is set, pressing Enter displays the change permission screen. On the screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [5])
  When you press Enter, the clock setting display screen is displayed again.
  * Year is set in two digits. Year 20XX is displayed as 00 to 99.



9.6.5 Method of setting of electric energy/reactive energy

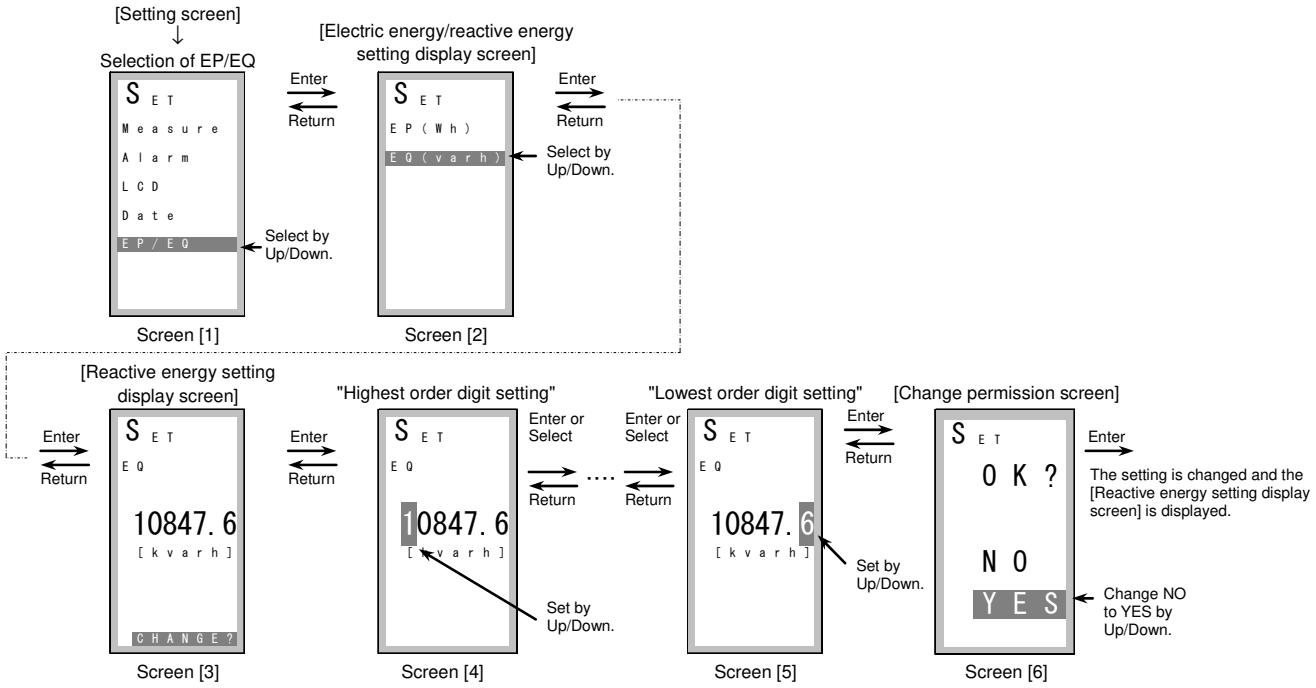
(1) Electric energy setting

- On the setting screen, select EP/EQ by Up/Down. (Screen [1])
- Pressing Enter displays the electric energy/reactive energy setting display screen. (Screen [2])
  Select EP (Wh) by Up/Down and press Enter to display the electric energy setting screen. (Screen [3])
- Then pressing Enter can set the electric energy. (Screens [4] and [5])
  You can move the cursor from "the highest order digit" to "the lowest order digit" by Enter or Select.
  You can move the cursor from "the lowest order digit" to "the highest order digit" by Return.
- Select a digit you want to change and set it by Up/Down.
- After "the lowest order digit" is set, pressing Enter displays the change permission screen. On the screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [6])
  When you press Enter, the electric energy setting display screen is displayed again.



(2) Reactive energy setting

- On the setting screen, select EP/EQ by Up/Down. (Screen [1])
- Pressing Enter displays the electric energy/reactive energy setting display screen. (Screen [2])
  Select EQ (varh) by Up/Down and press Enter to display the reactive energy setting screen. (Screen [3])
- Then pressing Enter can set the reactive energy. (Screens [4] and [5])
  You can move the cursor from "the highest order digit" to "the lowest order digit" by Enter or Select.
  You can move the cursor from "the lowest order digit" to "the highest order digit" by Return.
- Select a digit you want to change and set it by Up/Down.
- After "the lowest order digit" is set, pressing Enter displays the change permission screen. On the screen, change NO to YES by Up/Down and press Enter to change the setting. (Screen [6])
  When you press Enter, the reactive energy setting display screen is displayed again.

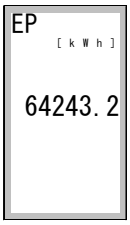


9.7 List of measurement screens

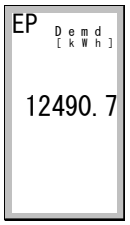
Portrait display

[1] Electric energy/combined

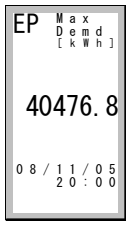
[Electric energy] (Integrated value)



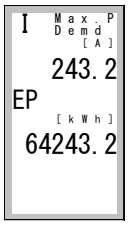
[Electric energy] (amount of last 1-hour)



[Electric energy] (max. value of amount for 1-hours)

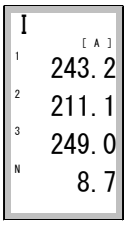


[Combined] (Electric energy and load current)

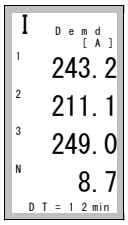


[2] Laod Current

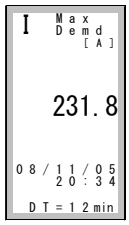
[Present value]



[Present demand value]

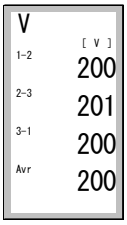


[Max. demand value in all phases]

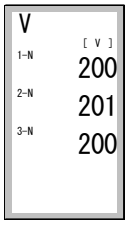


[3] Line voltage

[Present value]



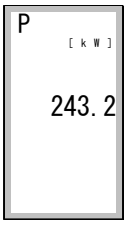
[Present value]



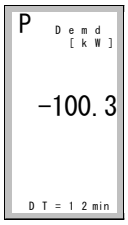
[Max. value in all lines]

[4] Electric power

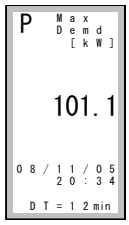
[Present value]



[Present demand value]

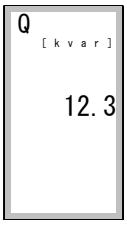


[Max. demand value]

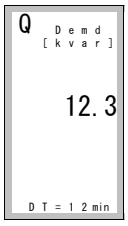


[5] Reactive power

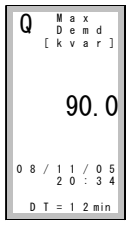
[Present value]



[Present demand value]

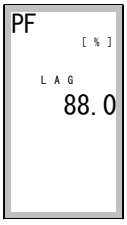


[Max. demand value]



[6] Power factor

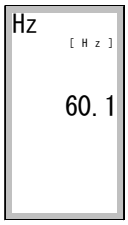
[Present value]



[Max. value]

[7] Frequency

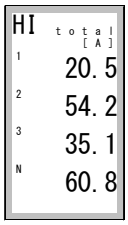
[Present value]



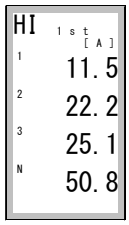
[8] Harmonic current(present value)

[Harmonic current (present value)]

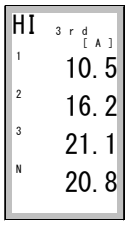
Total



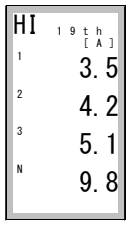
Fundamental wave



3rd order



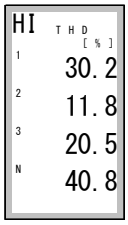
..... 19th order



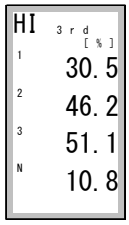
[9] Harmonic current (content rate)

[Harmonic current (content rate)]

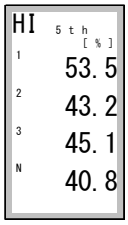
Total



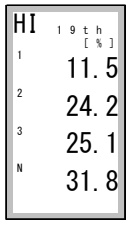
3rd order



5th order



..... 19th order



[10] Harmonic current (max. value)

[Harmonic current (max. value)]

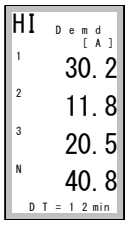
Fundamental

3rd order

..... 19th order

[11] Harmonic current (demand value)

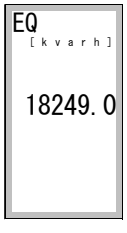
[Demand value]



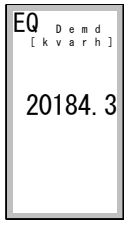
[Max. demand value]

[12] Reactive energy

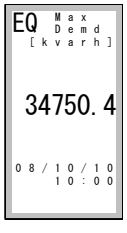
[Integrated value]



[Amount of last 1-hour]



[Max. value of amount for 1-hours]

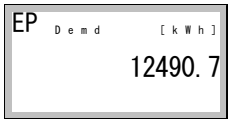


Landscape display

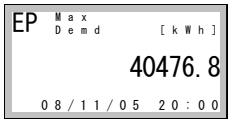
[1] Electric energy/ combined

[Electric energy (Integrated value)]

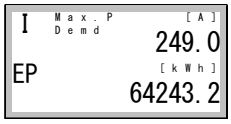
[Electric energy] (Amount of last 1-hour)



[Electric energy] (Max. value of amount for 1-hours)

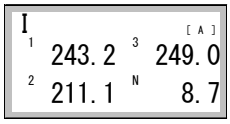


[Combined] (Electric energy and load current)

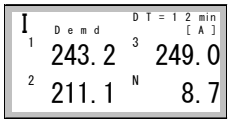


[2] Load current

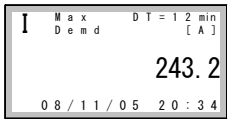
[Present value]



[Present demand value]

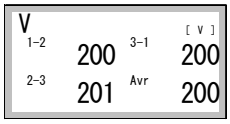


[Max. demand value in all phases]

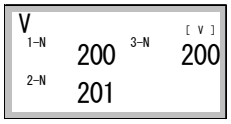


[3] Line voltage

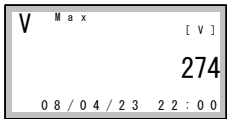
[Present value]



[Present value]



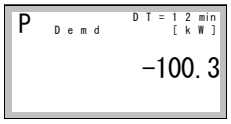
[Max. value in all lines]



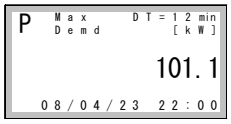
[4] Electric power

[Present value]

[Present demand value]



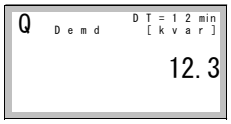
[Max. demand value]



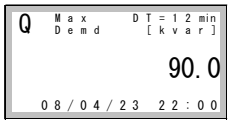
[5] Reactive power

[Present value]

[Present demand value]

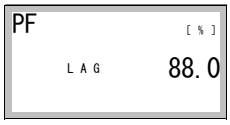


[Max. demand value]

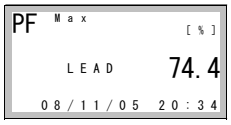


[6] Power factor

[Present value]

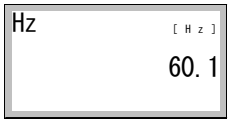


[Max. value]



[7] Frequency

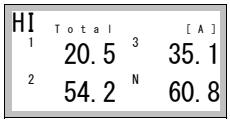
[Present value]



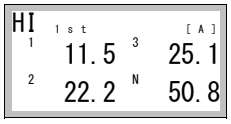
[8] Harmonic current (present value)

[Harmonic current (present value)]

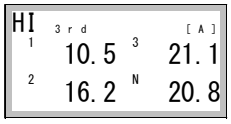
Total



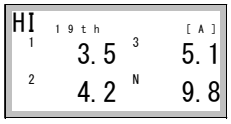
Fundamental wave



3rd order



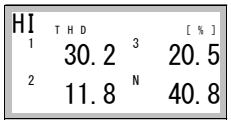
..... 19th order



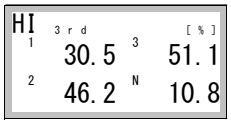
[9] Harmonic current (content rate)

[Harmonic current (content rate)]

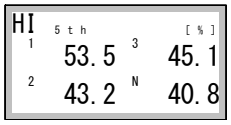
Total



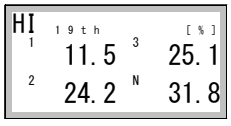
3rd order



5th order



..... 19th order

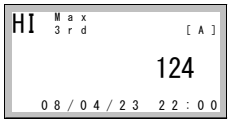


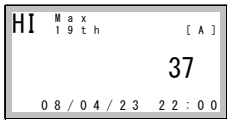
[10] Harmonic current (max. value)

[Harmonic current (max. value)]

Fundamental

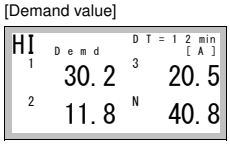
3rd order ..... 19th order



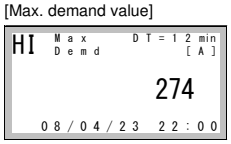


[11] Harmonic current (demand value)

[Demand value]

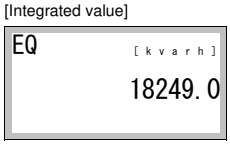


[Max. demand value]

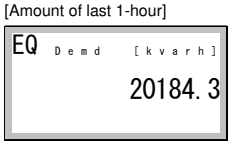


[12] Reactive energy

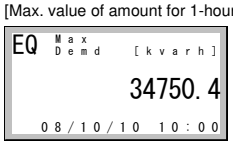
[Integrated value]



[Amount of last 1-hour]



[Max. value of amount for 1-hours]



10. Appendix

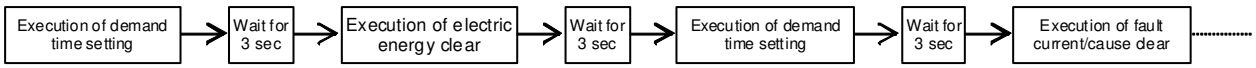
10.1 Precautions for configuring settings

Using the display unit, you can configure or clear the settings described in "7. Monitoring Functions", "8. Setting Functions", and "9 Procedures for Display, Operation, and Setting".

For the items except for those in "9.6.4 Method of clock setting", their values stored in the nonvolatile memory (EEPROM) are rewritten according to the configuration or clearing of the settings.

Rewriting the data stored in the nonvolatile memory (EEPROM) requires some time. Therefore, if you configure or clear these settings successively without pause, data in the nonvolatile memory are not rewritten properly. To prevent this, configure or clear the settings at intervals of about 3 seconds regardless of whether the settings are in the same or different categories as shown below.

< Successive setting example>



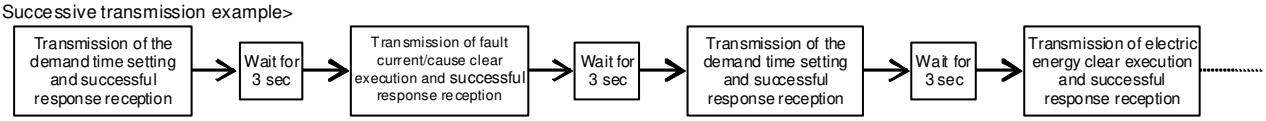
10.2 Precautions for configuring settings via CC-Link communication

In the case of the MDU breaker with CC-Link communication function, you can configure or clear the settings via CC-Link communication as in the case of the display unit described above, by transmitting the predefined commands and setting values to the MDU unit.

(For details about configuration and clearing of the settings, refer to "Programming Manual for MDU Breaker".)

When the settings are configured or cleared via CC-Link communication, data stored in the nonvolatile memory are rewritten accordingly. Therefore, if you configure or clear these settings successively without pause, the data in the nonvolatile memory may not be rewritten properly. To prevent this, configure or clear the settings at intervals of about 3 seconds regardless of whether the settings are in the same or different categories as shown below.

< Successive transmission example>



10.3 Communication error codes and measures against errors

For MDU with CC-Link communication option

Error code Note: Values in parentheses are hexadecimal numbers.		Error description	Measure
For standard command between devices	For digital command, analog command, and pulse command		
1 (01h)		The command has not been defined.	Correct the command.
16 (10h)	192 (C0h)	A hardware error has occurred.	Turn OFF the control power supply to the MDU unit and turn it back ON, or press the reset switch. Before pressing the reset switch, save the electric energy/reactive energy according to "9.6.5 Method of setting of electric energy/reactive energy".
65 (41h)	-	The group number is out of the range.	Correct the group number to an appropriate value.
66 (42h)	193 (C1h)	The channel number is out of the range.	Correct the channel number to an appropriate value.
81 (51h)	194 (C2h)	The setting value is out of the setting range.	Correct the setting value to an appropriate value.
83 (53h)	209 (D1h)	The upper limit value and lower limit value are crossed.	Correct the upper limit value and lower limit value so that they are not crossed.

Note. Errors except for the above are detected by the command sender device. For such errors, refer to the instruction manual for the device.

Note. Once the error flag (RX (n+1) A) becomes "1" (ON), it does not return to "0" (OFF) even when the CPU of the sequencer is reset. To set the error flag to "0" (OFF), set the error reset flag (RY (n+1) A) to "1" (ON). However, even when you clear the error by setting the error reset flag to "1" (ON), if the data to be retransmitted has still an error, the error flag will become "1" (ON) again. In such a case, remove the error cause referring to the error code and then restart the transmission.

10.4 Troubleshooting

When you think the product is in failure, check the following.

(1) ERROR appears on the display unit. Nothing appears on the display unit.
Check whether the connector of connection cable is loose or disconnected.

(2) The current is displayed 0 A even while the power is supplied.
When the current measurement value is lower than the lower limit of the current measurement (lower than ±1.0% of the rated current measurement), the displayed value is cut off to 0 A.

(3) Although the display unit shows a value, it cannot be monitored via transmission.
- Check for an error in the connection of the transmission line or check for breaks in the electric wires.
- Check whether there is more than one same station number in one transmission path. If yes, set the station numbers correctly and press the reset switch.
- Check whether the transmission speed is the same as that of the master device. If not, correct the transmission speed correctly and press the reset switch.

(4) The current value measured by this device is different from the value measured by other measuring instrument (exceeding the allowable tolerance).
- Check that the measuring instrument used for comparison indicates the correct effective value. This product shows an effective value.
- When the compared measuring instrument uses the average value instead of the effective value, the resulted value may largely differ when there is current distortion in the measurement circuit.

■Sales Network

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	ELECTRO MECH AUTOMATION& ENGINEERING LTD.	SHATABDI CENTER, 12TH FLOOR, SUITES : 12-B, 292, INNER CIRCULAR ROAD,	+88-02-7192826
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Central America	Automation International LLC	7050 W. Palmetto Park Road Suite #15 PMB #555, Boca Raton, FL 33433	+1-561-237-5228
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	Mitsubishi Electric Automation (China) Ltd. ShenZhen Branch	Room 2512--2516, Great China International Exchange Square, Jintian Rd.S., Futian District, Shenzhen, 518034	+86-755-2399-8272
	Mitsubishi Electric Automation (China) Ltd. GuangZhou Branch	Room 1609, North Tower, The Hub Center, No.1068, Xing Gang East Road, Haizhu District, Guang Zhou, China 510335	+86-20-8923-6730
	Mitsubishi Electric Automation (China) Ltd. ChengDu Branch	Block B, Room 407-408, Shangri-La Center Offeice Builiding, No.9 BinJiang East Road, Chengdu, China 610021	+86-28-8446-8030
	Mitsubishi Electric Automation (Hong Kong) Ltd.	20/F., Cityplaza One, 111 king's Road, Taikoo shing, Hong Kong	+852-2510-0555
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Hungary	Meltrade Ltd.	Fertõ utca 14. HU-1107 Budapest, Hungary	+36(0)1-431-9726
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	Mitsubishi Electric India Private Limited Pune Sales	ICC-Devi Gaurav Technology Park, Unit no. 402, Fourth Floor, Survey no. 191-192 (P), Opp.	+91-20-68192100
	Mitsubishi Electric India Private Limited FA Center	204-209, 2nd Floor, 31FIVE, Corporate Road, Prahladnagar,	+91-79677-77888
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MDU Breaker

For Safety : Please read the instruction manual carefully before using this product.
Wiring and connection must be done by the person have a specialized knowledge of electric construction and wiring.

MITSUBISHI ELECTRIC CORPORATION

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