MITSUBISHI ELECTRIC

Numerical Protection Relay

MELPRO™-D Series

GENERATOR PROTECTION RELAY

MODEL

CGP1-A41D1/CGP1-A42D1

INSTRUCTION MANUAL

■For the latest version of this instruction manual, please download from the URL below.

http://www.mitsubishielectric.co.jp/fa/download/search.do?mode=manual&kisyu=/pror

― Safety precautions ―

Before installation, operation, maintenance, and inspection, please be sure to read this instruction manual and all other attached documents thoroughly in order to work safely with the equipment. Please ensure that you fully understand the equipment, safety information, and precautions that need to be taken before working with the equipment.

Safety precautions are classified as “Danger” and “Caution.”

 Danger	The case where a dangerous situation can arise and there is the possibility that death or seriously injury can occur if the equipment is handled incorrectly.
 Caution	The case where a dangerous situation can arise and there is the possibility that moderate or minor injuries canl occur, or property damage can take place if the equipment is handled incorrectly.

Furthermore, even with items described as ⚠Caution, there is the possibility of serious consequences depending on the situation. All of the described contents are important. Therefore, be sure to comply with them.

[Transportation]

 Caution

- ●Transport the equipment in the correct orientation.
- ●Do not apply excessive shock and/or vibration as this could affect the performance and life of the product.

[Storage]

 Caution

- ●The storage environment shall comply with the following conditions (compliant with JEC2500-2010). Otherwise, there is a risk of reducing the performance and life of the product.
  - Ambient temperature –20 to +60 °C
    The state where dew condensation or freezing does not occur.
  - Relative humidity 30 to 80 % on daily average
  - Altitude 2000 m or lower
  - The equipment must not be exposed to abnormal vibration, shock, inclination, or magnetic fields.
  - The equipment must not be exposed to harmful smoke/gas, saline gas, water droplets or vapour, excessive dust or fine powder, explosive gas or fine powder, wind & rain.

[Installation, wiring work]

 Danger

- ●The equipment must be correctly grounded using the designated grounding terminals where they exist. Failure to do so may lead to the risk of electric shock, equipment failure, malfunction or failure to operate.
- ●Be sure to return all terminal covers, protection covers to their original positions once any work is complete. If they remain uncovered there is a risk of electrical shock.

Caution

- Ensure that the equipment is mounted and connected correctly. Otherwise, there are risks of failure, burning, or maloperation..
- Securely tighten the terminal connection screws. Otherwise, there are risks of failure and burning.
- For tightening torque of screws, refer to the following Table.

Place of use	Nominal dia.	Standard value of torque (steel screw)	Allowable range
Terminal block	M3.5	1.10 N•m (11.2 kgf•cm)	0.932 to 1.27 N•m (9.5 to 12.9 kgf•cm)
Panel mounting	M5.0	3.24 N•m (33 kgf•cm)	2.75 to 3.63 N•m (28 to 37 kgf•cm)

- Ensure that the equipment is connected correctly in accordance with the details shown on the connection terminals. Otherwise, there is the risk of failure, burning, malfunction, or maloperation.
- Ensure that the equipment is connected correctly in accordance with thephase sequence details shown on the connection terminals. Otherwise, there is the risk of failure, burning, malfunction, or maloperation.
- All power supplies to the equipment must be of suitable capacity and rated load to avoid the risk of malfunction and maloperation.
- The appropriate connectors must be used to ensure compatibility with the connector terminals to avoid the risks of failure or fire.

[Operating and Setting the equipment]

Danger

- The equipment must only be operated and handled by qualified personnel. Otherwise, there are risks of electric shock, injury, failure, malfunction, and maloperation.
- Handling and maintenance of the equipment must only be carried out after gaining a thorough understanding of the instruction manual. Otherwise, there is the risk of electric shock, injury, failure, malfunction, or maloperation.

Caution

- The equipment must be used within the following range limits (compliant with JEC2500-2010). Otherwise, there is a risk of reducing the performance and life of the product.
  - Variation range of control power supply voltage: Within –15% to +10% of the rated voltage
  - Frequency variation: Within ±5% of the rated frequency
  - Ambient temperature: 0 to +40°C (-10 to 50°C is allowable temporarily within few hours a day, but use under the state where dew condensation or freezing does not occur.)
  - Relative humidity: 30 to 80% on daily average
  - Altitude: 2000 m or lower
  - The state where abnormal vibration, shock, inclination, magnetic field are not applied
  - The state where it is not exposed to harmful smoke/gas, saline gas, water droplet or vapor, excessive dust or fine powder, explosive gas or fine powder, wind & rain
- While energized, do not tamper with or remove any components other than those which have been designated. Otherwise, there is a risk of failure, malfunction, or maloperation.
- While energized, do not draw out the internal unit (subunit). Otherwise, there is a risk of electric shock, injury, failure, malfunction, or maloperation.
- When changing the setting value during the energized state, ensure that all trip circuits are locked in order not to operate. Otherwise, there is a risk of malfunction.

[Maintenance and Inspection]

Danger

- The equipment must only be operated and handled by qualified personnel. Otherwise, there are risks of electric shock, injury, failure, malfunction, and maloperation.
- Handling and maintenance of the equipment must only be carried out after gaining a thorough understanding of the instruction manual. Otherwise, there is the risk of electric shock, injury, failure, malfunction, or maloperation.
- Do not touch any live parts, such as terminals, etc. Otherwise, there is a risk of electric shock.

Caution

- When replacing the equipment, use a product of same model, rating, and specifications. Otherwise, there is the risk of failure or fire.. If any other product is to be used, the manufacturer must be consulted.
- We recommend that any tests or inspections are carried out under the following conditions, as well as any additional conditions described in the instruction manual.

• Ambient temperature	20 ± 10°C
• Relative humidity	90% or less
• External magnetic field	80 A/m or less
• Atmospheric pressure	86 to 106 × 10^3 Pa
• Mounting angle	Regular direction ±2°
• Frequency	Rated frequency ±1%
• Waveform (in the case of AC)	Distortion factor 2% or less

$$\text{Distortion factor} = \frac{\text{Effective value of higher harmonics only}}{\text{Effective value of fundamental wave}} \times 100\ (\%)$$

• AC component (in the case of DC)	Ripple factor 3% or less

$$\text{Ripple factor} = \frac{\text{Max. value} - \text{Min. value}}{\text{Average value of DC}} \times 100\ (\%)$$

• Control power supply voltage	Rated voltage ±2%

- Do not exceed the overload capacity for voltage and current. Otherwise,equipment failure or fire could occur.
- Do not clean the equipment while energised. When the cover needs to be cleaned, make use of a damp cloth.

[Repair and modification]

Caution

- When carrying out repair and/or modification, please consult with the manufacturer in advance.of carrying out the work. We will not take any responsibility for any repair and/or modification (including software) which has been carried out without prior consent.

[Disposal]

Caution

- Disposal must take place in accordance with the applicable legislation

Guarantee

1. Guarantee period

The guarantee period of this product should be one year after delivery, unless otherwise specified by both parties.

2. Scope of guarantee

When any fault or defect is detected during the period of guarantee and such fault or defect is proved to be caused apparently at the responsibility of MITSUBISHI ELECTRIC CORPORATION, the defective unit concerned will be repaired or replaced with substitute with free of charge.

However, the fee for our engineer dispatching to site has to be covered by the user.

Also, site retesting or trial operation caused along with replacing the defect units should be out of scope of our responsibilities.

It is to be acknowledged that the following faults and defects should be out of this guarantee.

(1) When the faults or defects are resulted from the use of the equipment at the range exceeding the condition/environment requirements stated in the catalogue and manual.

(2) When the faults or defects are resulted from the reason concerning without our products.

(3) When the faults or defects are resulted from the modification or repair carried out by any other entity than MITSUBISHI ELECTRIC CORPORATION.

(4) When the faults or defects are resulted from a phenomenon which cannot be predicted with the science and technology put into practical use at the time of purchase or contract

(5) In case of integrating our products into your equipment, when damages can be hedged by the proper function or structure in the possession of your equipment which should be completed according to the concept of the de fact standard of industry.

(6) In case of that the faults or defects are resulted from un-proper application being out of instruction of MITSUBISHI ELECTRIC CORPORATION.

(7) In case that the faults or defects are resulted from force majeure such a fire or abnormal voltage and as an act of God such as natural calamity or disaster.

3. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, MITSUBISHI ELECTRIC CORPORATION shall not be liable for compensation of damages caused by any cause found not be the responsibility of MITSUBISHI ELECTRIC CORPORATION, loss in opportunity, lost profits incurred to the user by failures of MITSUBISHI ELECTRIC CORPORATION products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than MITSUBISHI ELECTRIC CORPORATION products and other tasks.

4. Applications of products

(1) The user is requested to confirm the standards, the regulations and the restrictions which should be applied, in case of utilizing products described in this catalogue and another one in combination.

Also, the user is requested to confirm the suitability of our products to your applied system or equipment or apparatus by yourself.

MITSUBISHI ELECTRIC CORPORATION shall not be liable for any suitability of our products to your utilization.

(2) This MITSUBISHI ELECTRIC CORPORATION products described in the catalogue have been designed and manufactured for application in general industries, etc. Thus, application in which the life or an asset could be affected by special application such as medical system for life-sustaining, in nuclear power plants, power plants, aerospace, transportation devices(automobile, train, ship, etc.) shall be excluded from the application. In addition to above, application in which the life or an asset could be affected by potentially chemical contamination or electrical interference and also in which the circumstances and condition are not mentioned in this catalogue shall be excluded from the application.

Note even if the user wants to use for these applications with user's responsibility, the user to be requested to approve the specification of MITSUBISHI ELECTRIC CORPORATION products and to contact to the technical section of MITSUBISHI ELECTRIC CORPORATION prior to such applications.
If the user applies MITSUBISHI ELECTRIC CORPORATION products to such applications without any contact to our technical section, MITSUBISHI ELECTRIC CORPORATION shall not be liable for any items and not be insured, independently from mentioned in this clause.
(3) In using MITSUBISHI ELECTRIC CORPORATION product, the working conditions shall be that the application will not lead to a major accident even if any problem or fault occur, and that backup or duplicate system built in externally which should be decided depend on the importance of facility, is recommended.
(4) The application examples given in this catalogue are reference only and you are requested to confirm function and precaution for equipment and apparatus and then, use our products.
(5) The user is requested to understand and to respect completely all warning and caution items so that unexpected damages of the user or the third party arising out of un-correct application of our products would not be resulted.

5. Onerous repair term after discontinuation of product
(1) MITSUBISHI ELECTRIC CORPORATION shall accept onerous product repairs for 7(seven) years after production of the product is discontinued. (However, please consider the replacement of products after 15 years have been passed from ex-work of products.)
(2)Product supply (including repair parts) is not available after production is discontinued.

6. Changes in product specification
The specification given in the catalogue, manuals or technical documents are subject to change without prior to notice.

7. Scope of service
The technical service fee such as engineer dispatching fee is excluded in the price of our products.
Please contact to our agents if you have such a requirement.

Improvement on the reliability of protection function

Any parts and materials applied to the protection relay have limited life time which will bring the degradation to the relay.
The degree of degradation will be variable and depend on the purpose, period in use, applied circumstance and unevenness on the performance of each part.
MITSUBISHI ELECTRIC CORPORATION design the relay so as to realize that the recommended replaced duration is more than 15 years.
However, there may be some possibilities to occur some defects before reaching 15 years due to above mentioned the degree of degradation of parts and materials being depended on the condition in use.
To prevent unwanted operation or no operation of relay due to above reasons, it is recommended to apply the relay with self-diagnosis function and/or multiplexing relay system such as dual or duplex scheme.

Introduction

Thank for your purchasing MITSUBISHI ELECTRIC ***MELPRO***™ – D Series Digital Protection Relay.
Please read this instruction manual carefully to be familiar with the functions and performances enough to use the product properly.
It is necessary to forward this instruction manual to end users and a person in charge of maintenance.

In regard to the instruction manual for PC software, read the following document.

Title of document	Document No.
MELPRO-D Series Protection Relay PC-HMI Instruction Manual	JEP0-IL9504

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1. General description

Mitsubishi Electric ***MELPRO***™ – D Series is a digital protection relay product with a microprocessor for protection of high/extra-high voltage electric power systems.
With its improved functions, such as PLC (Programmable Logic Controller), data saving at the time when relay elements are operated, and measurement of input value, this series of protection relay allows stable and effective control and monitoring of electric power systems as well as high-reliable protection.

High accurate digital computation
The digital computation with high-speed sampling minimizes the effect of higher harmonics, etc., which enables high accurate protections. As this computation is implemented in software, stable operation without aging is obtained.

Advanced self-diagnosis function improves reliability
The relay continuously monitors electronic circuits from input to output so that it can detect internal component failure, which enables to improve reliability.

Measurement functions
The input values of the relay (e.g. current, voltage, phase and frequency) can be measured at a steady state, which is useful for energy-saving management. Measurement items differ depending on the types of the relay units.

Data saving functions
Various record functions as shown below are useful for fault investigations.
(1) The data savings of input value at the time when relay element are operated.
(2) The operation logs of the relay.

Programmable output contacts with PLC provide flexibility
The operation of output contacts can be set by combining the detection or definitive signals of the protection elements with PLC which incorporates logic circuit (e.g. OR, AND, NOT, and flip-flop) and timer (e.g. on-delay, off-delay, and one-shot). This is useful for easy designing of sequential circuits and reducing labor-hours of wiring.

Forced contact test enables checking of relay sequence
The output contacts can be forced to operate in the test menu, which enables checking of relay sequence easily.

Easy replacement
The cut-out dimensions of panel are the same as MULTICAP-C series or the old model of MELPRO-DASH series. Replacing an existing relay with this new type is easy. (There are some exceptions.)

Easy maintenance
The relay adopts draw-out unit mechanisms with automatic CT shorting at drawing, thereby making it easy to maintain the relay.

Diverse operation and reset characteristics
The relay incorporates various operation and reset characteristics including the standards of IEC 60255-3, which can be adopted to the protection of various types of electric systems.

Communication network (will be supported in the future)
The relay can build a network system which allows monitoring and control of measurement values, operation status, and setting changes, etc., from a remote location. This leads to labor-saving of maintenance.

2. Structure

2.1. Front view of relay

For the details about front panel, refer to Section 5.1.

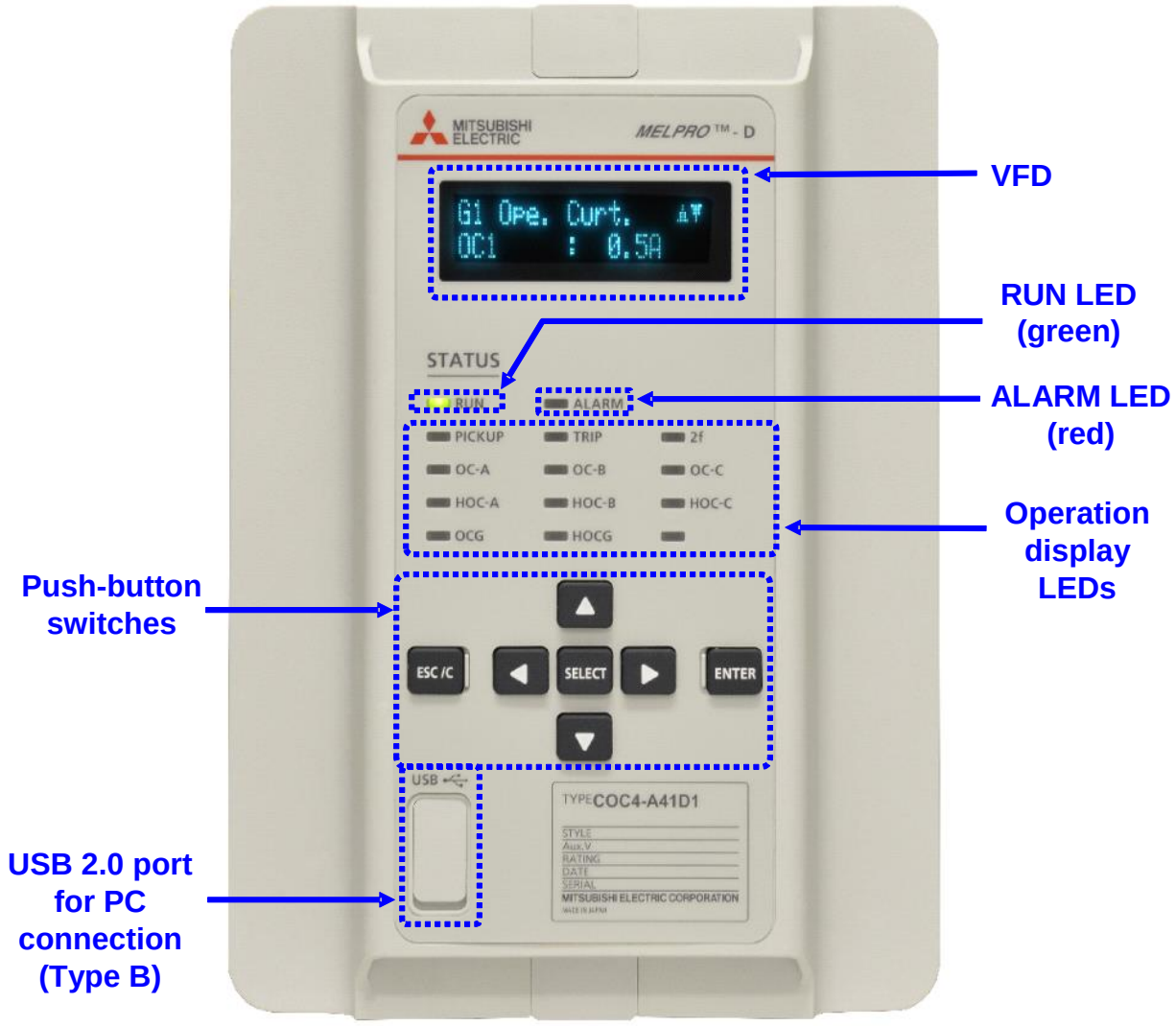


Fig. 2-1 Front view of relay

2.2. Terminal layout on the back of relay

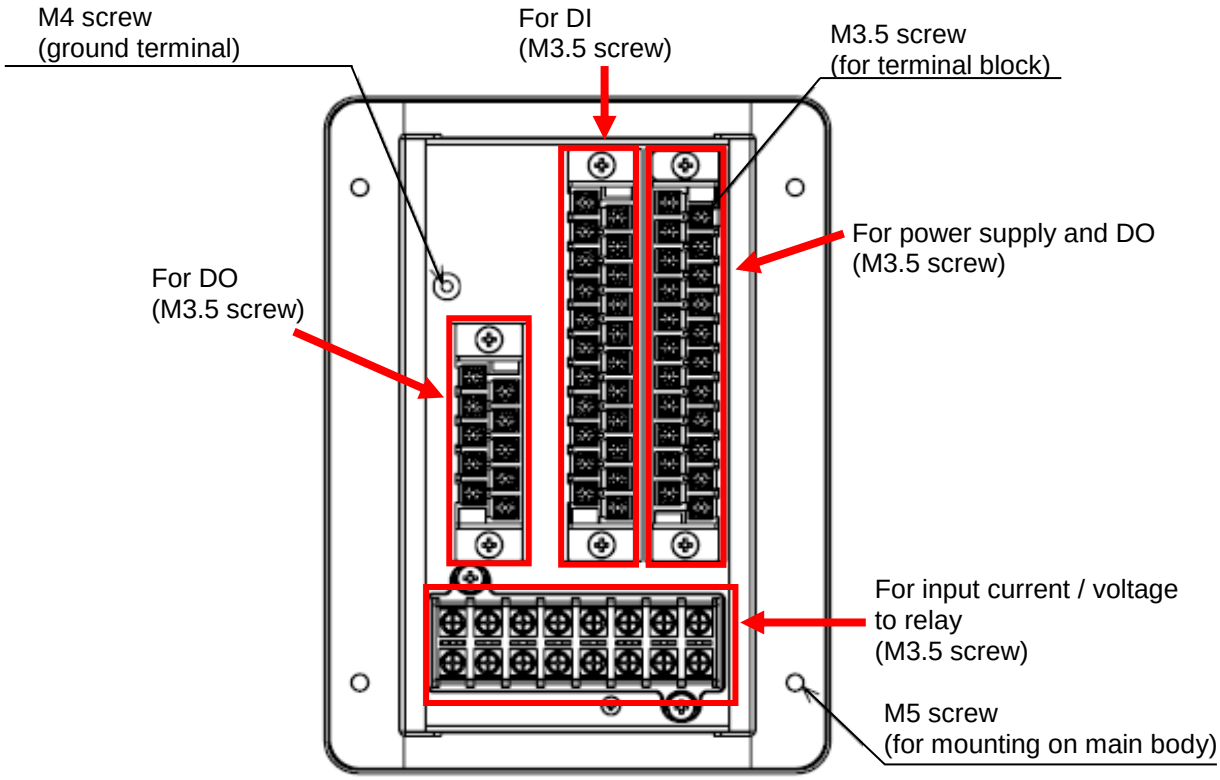


Fig. 2-2 Terminal layout on the back of relay

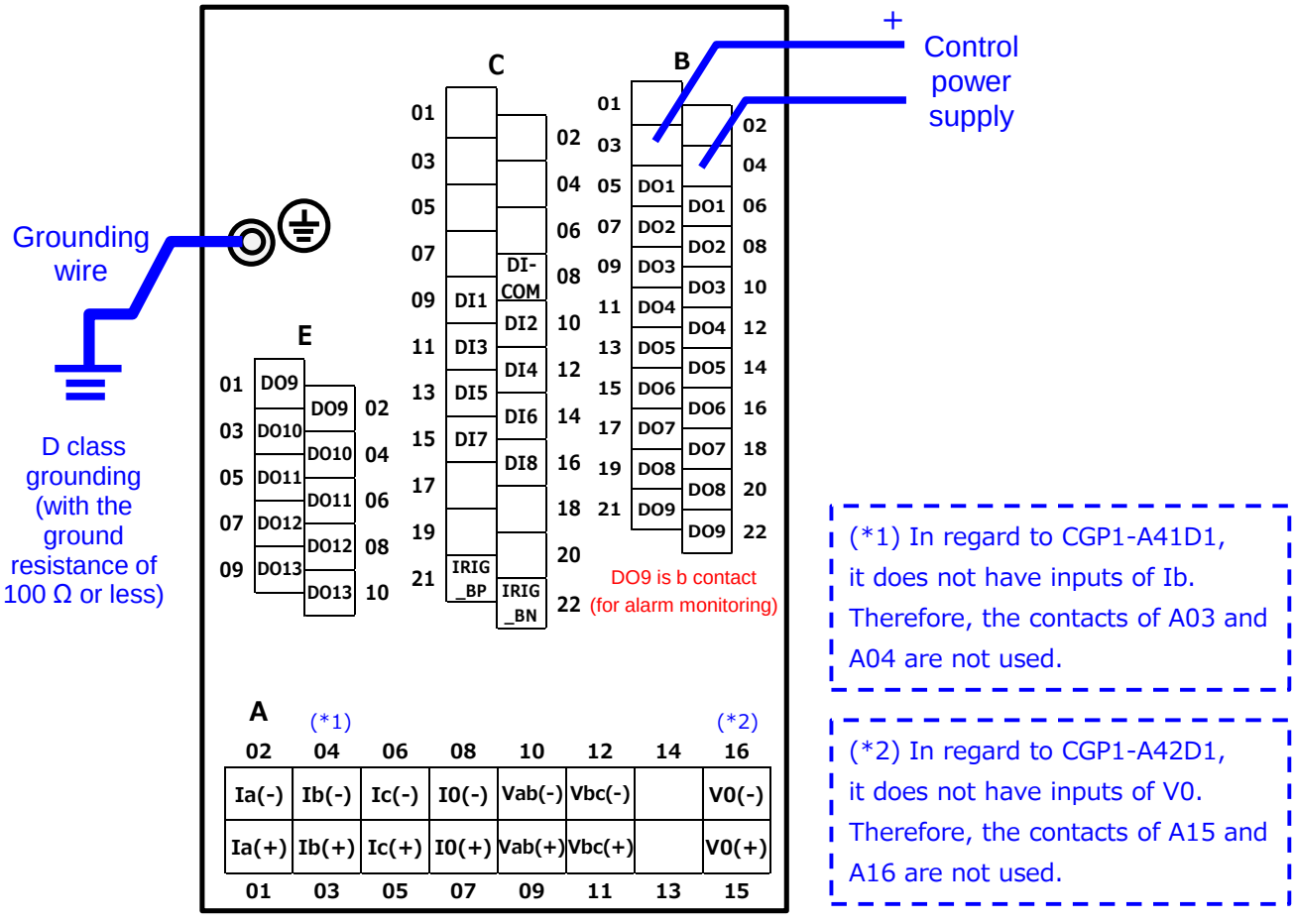


Fig. 2-3 Terminal number on the back of relay

2.3. Dimensions of relay and Cut-Out dimensions of panel

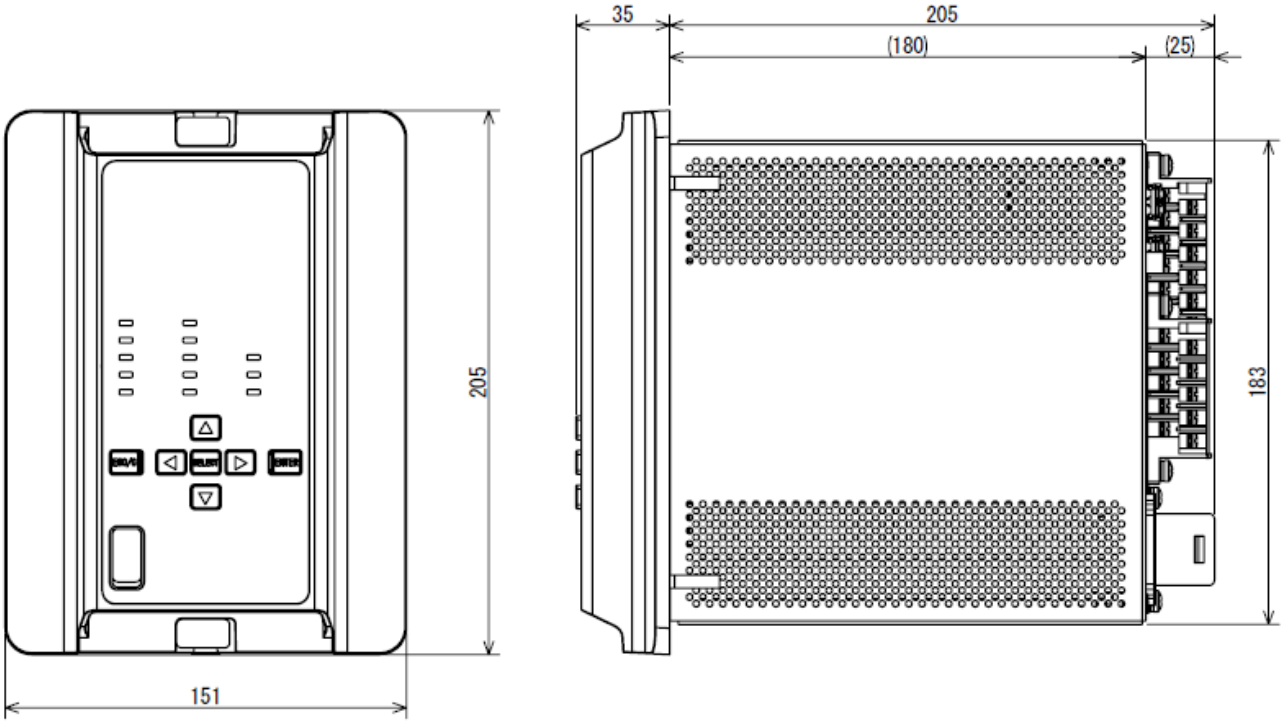


Fig. 2-4 Dimensions of relay

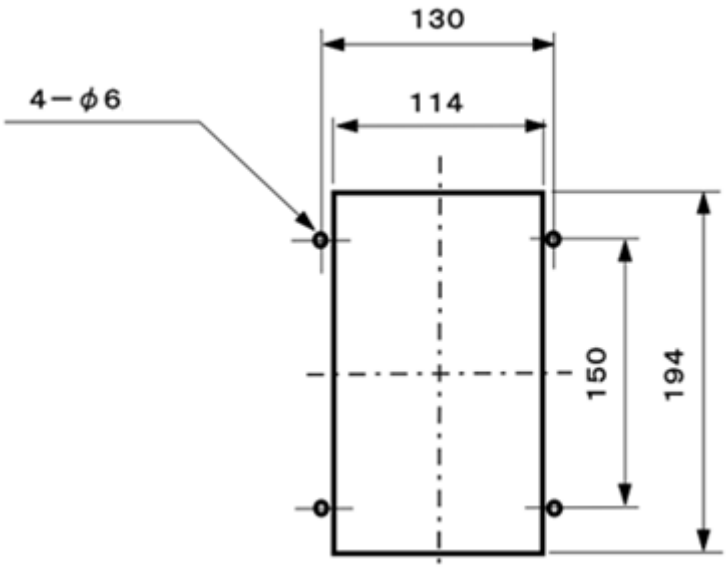


Fig. 2-5 Cut-Out dimensions of panel

2.4. External view of relay

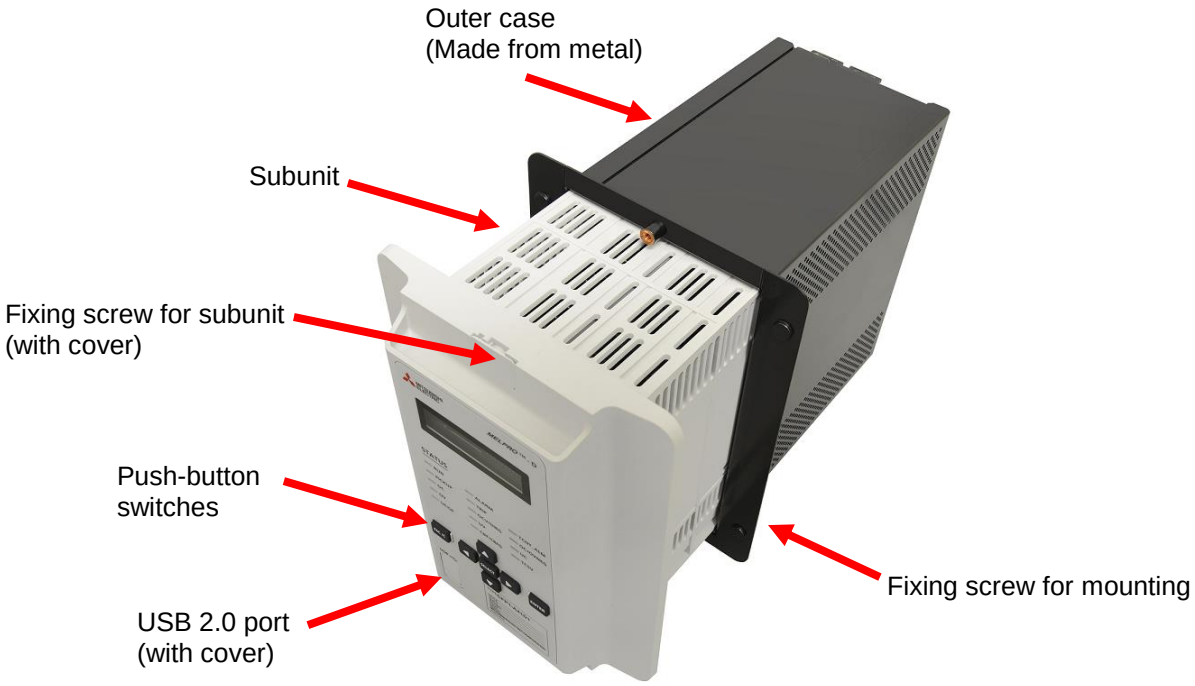


Fig. 2-6 External view of relay

3. Handling, Mounting

3.1. Unpacking

Usually this relay is packed in a case for transportation. However, it may occur that only the sub-unit is transported independently for the convenience at repair. In such a case, fully brush off the dust, dirt, etc. adhered to the sub unit after completion of unpacking, and further visually check that the parts mounted on the front panel or built in the sub unit are not damaged.

3.2. Transportation and storage

To carry the equipment within the place of use, handle it carefully so that the parts installed on the front panel of the sub-unit or built-in parts cannot be deformed or broken.

3.3. How to draw sub-unit out

The relay has draw-out construction to facilitate inspection and testing. Therefore, it is possible to draw out the sub-unit without disconnecting the external wiring

When drawing out the subunit, be sure to take the following steps to avoid the unwanted operation of primary equipment:

- Open control power supply of the relay (Note: Take care that the appropriate circuit is opened.)
- Shunt / Isolate the CT circuit
- Lock out the tripping circuit including breakers etc.
- Disconnect the main control circuits

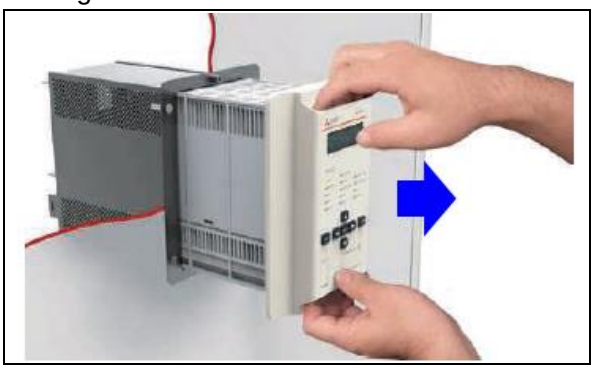
As an additional precaution, the CT circuit is provided with an automatic short-circuiting mechanism. This will ensure that the CT secondary circuit is not opened when the sub-unit is removed even if the CT circuits have not been shunted.

3.3.1. Procedures for drawing out subunit

(1) Removing screws

When drawing out the subunit from the outer case, open upper & lower screw covers at the front side of the subunit and detach both screws.

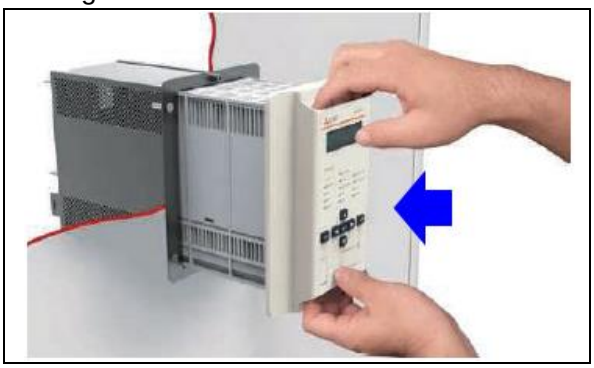
(2) Drawing out the subunit



Draw out subunit horizontally by using fingers on the upper & lower grooves of it.

3.3.2. Procedures for housing subunit

(1) Inserting the subunit

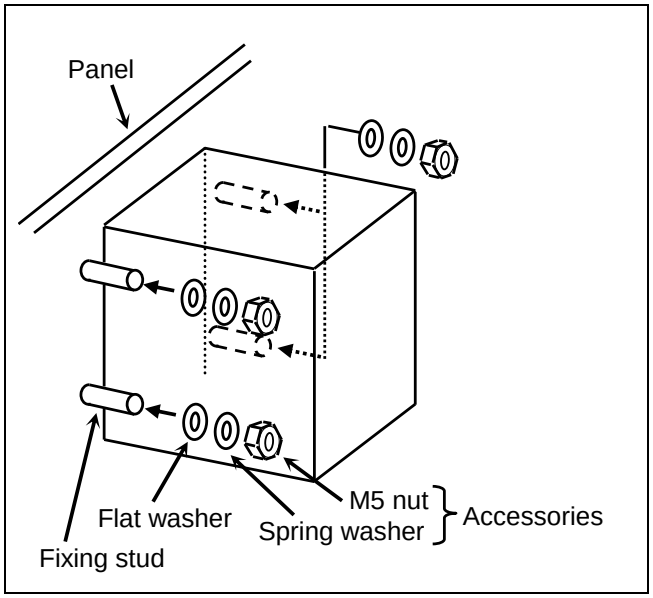


Insert subunit into the outer case horizontally by using fingers on the upper & lower grooves of it. Ensure that there is no gap between front side of the subunit and outer case.

(2) Fixing the screws

Tighten upper & lower screws and fix the subunit to the outer case.
After that, close screw covers.

3.4. Mounting

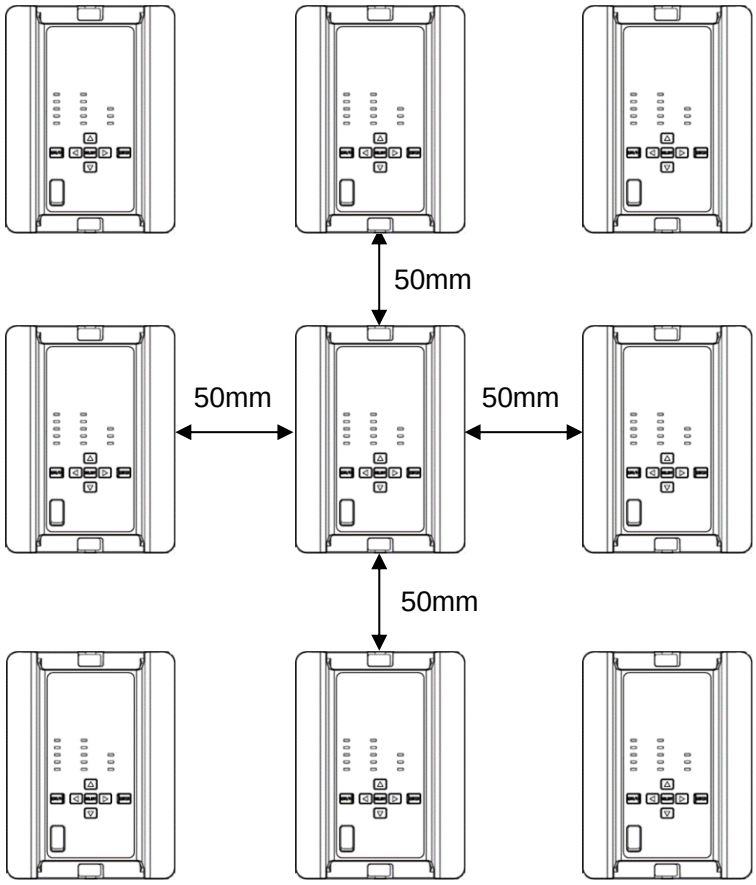


When inserting this relay into control panel, take care in order not to damage it.
After inserting, fix this relay with washers and nuts which are supplied with the product.

Section 2.3 explains Cut-Out dimensions of panel.

3.5. Distance between two devices

If you install more than one relay devices in a control panel, please leave 50 mm between one device and another.



4. Connection

4.1. Precautions for wiring work

(1) Multiplexing

Important facilities should be provided with fail-safe measures such as dual or duplex system in order to improve reliability of the facilities.

(2) Effects of external surge

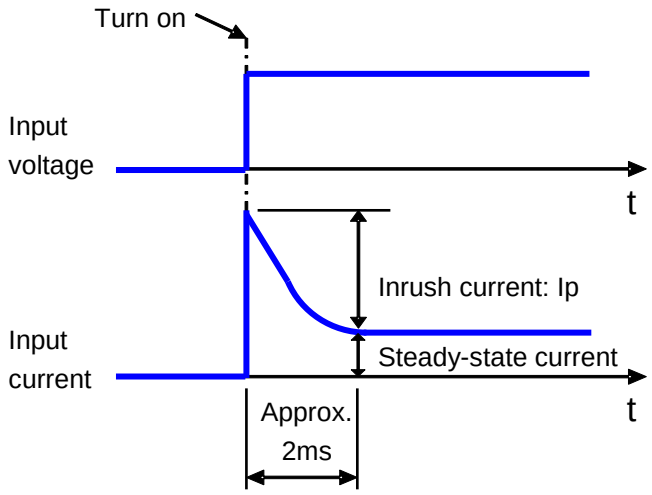
Some types of surge with a certain condition may negatively affect the relay. If so, take it into account to install surge absorbers. (MF type surge absorbers made by Mitsubishi Electric, for example.)

(3) Guarantee of control power supply against power interruption

The control power supply of the relay is not guaranteed against power interruption. When you do not have an uninterruptible power supply (UPS), please purchase it that is made by Mitsubishi Electric or commercially available. When you select UPS, please confirm rated values, ambient temperature, and other service conditions.

(4) Inrush current of control power supply

Since inrush current may flow in the relay when the control power supply is turned on as shown in the figure below, make consideration of this point when selecting the breaker for the control power supply circuit.



Input voltage	Inrush current: Ip
DC100V	Approx. 20A or less
DC220V	Approx. 55A or less
AC100V	Approx. 25A or less
AC220V	Approx. 65A or less

Fig. 4-1 Inrush current of control power supply

(5) Self-diagnosis output circuit

In order to be able to continue monitoring even if the built-in power fuse is blown, the self-diagnosis output circuit adopts normally-closed contact which is excited (opened) at the time of normal condition of monitoring. Therefore, connect the timer to the external wiring. For details, refer to Fig. 4-2.

(6) Trip circuit

There are two kinds of output contacts for the trip circuits and the control circuits. Please keep in mind that the output contacts for control circuits cannot be used for the trip circuit. (If used, the contact may burn.)

Connect the pallet contact (52a) of the circuit breaker to the trip circuit.

(7) Ground circuit

Be sure to earth the ground terminal located on the back of the relay with D class grounding method whose ground resistance is 100 Ω or less.

(8) ZCT circuit

It is necessary to reduce surge or noise which is entered into the relay as much as possible, thus the connection from ZCT to the relay should be done with 2 core shielded cable whose cross-sectional area is 0.75 ~ 1 mm^2. The shield of the cable should be connected to the ground terminal of the relay or that of the cubicle.

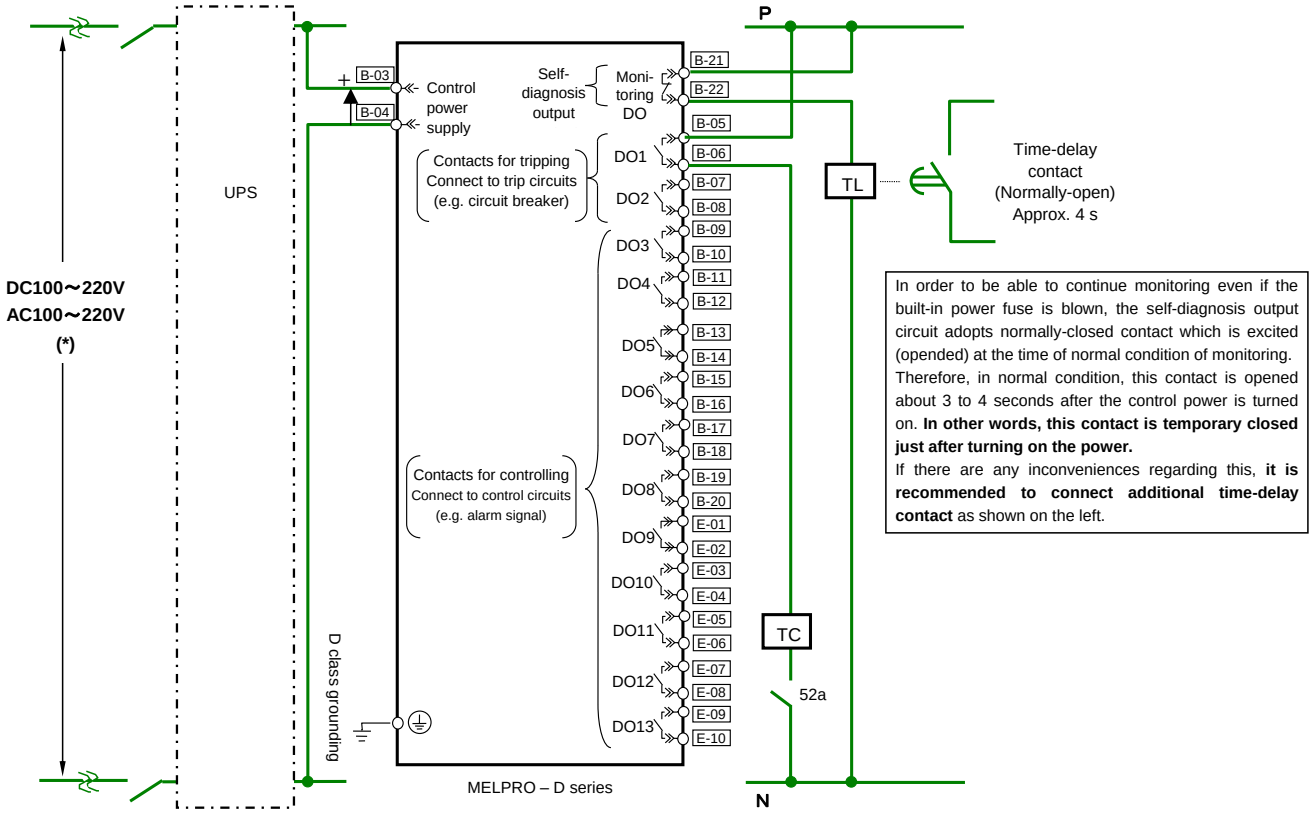
The burden should be less than 5Ω as a round-trip (e.g. about 100 meters one way for 0.75 mm^2 cable).

4.2. Terminal layout

Regarding to the terminal layout, refer to Section 2.2. The screw size of each terminal is M3.5. Recommended wire size is 2mm^2 or less.

4.3. External connection

4.3.1. Connection example of control circuit



(*) Refer to Section 4.1-(3) "Guarantee of control power supply against power interruption".

Fig. 4-2 Connection example of control power supply and self-diagnosis output circuit.

4.3.2. Connection example of input circuit

This figure shows concept of the connection to the relay. Therefore, the position or condition of CT, VT, and other devices sometimes differs from the actual state.

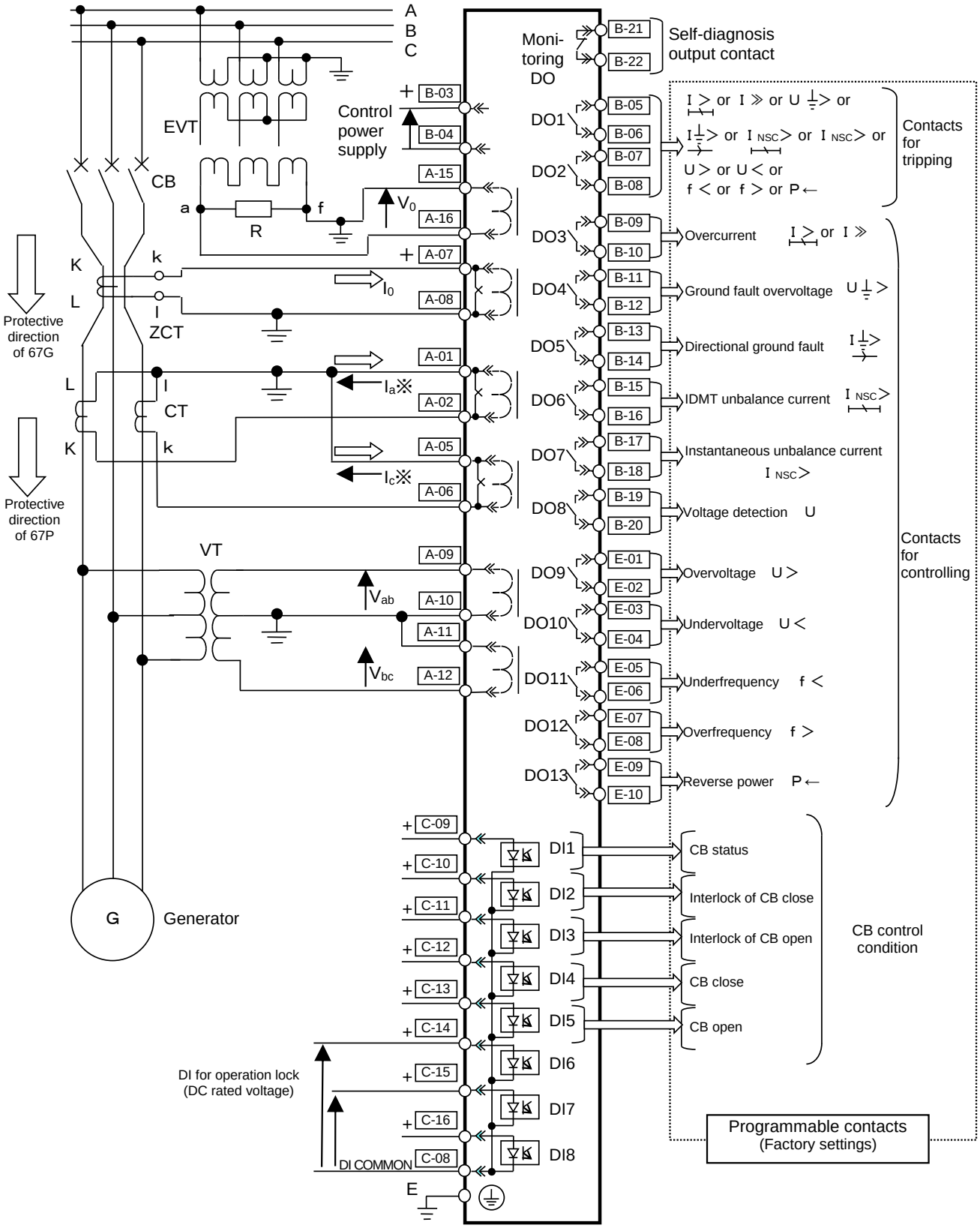


Fig. 4-3 CGP1-A41D1 Example of AC input circuit

※ ⇨ This symbol shows the direction of the current that flows into the generator side in the case of 67P operational condition.

← This symbol shows the direction of the current that flows form the generator side in the case of normal condition.

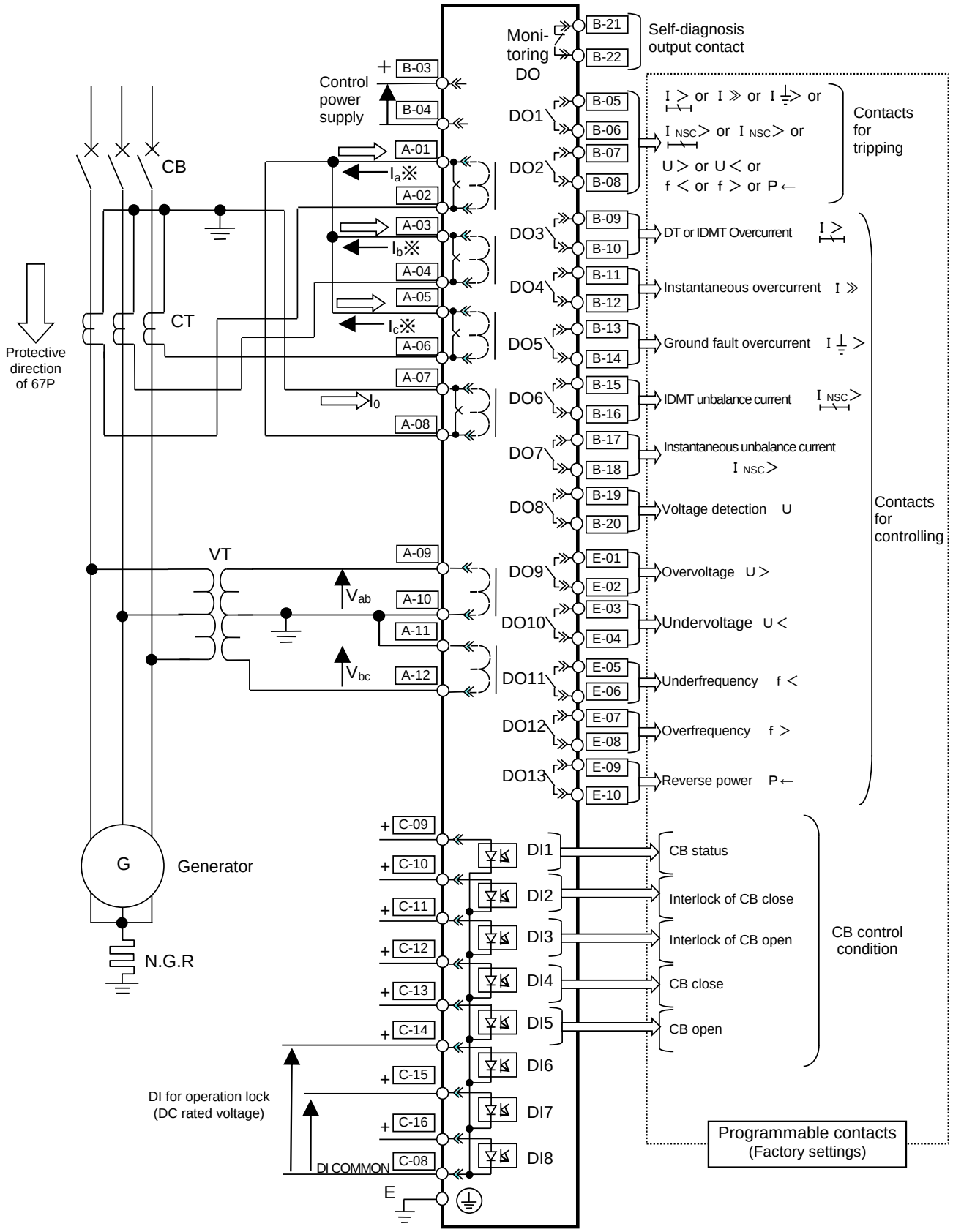


Fig. 4-4 CGP1-A42D1 Example of AC input circuit

※ ⇨ This symbol shows the direction of the current that flows into the generator side in the case of 67P operational condition.

← This symbol shows the direction of the current that flows form the generator side in the case of normal condition.

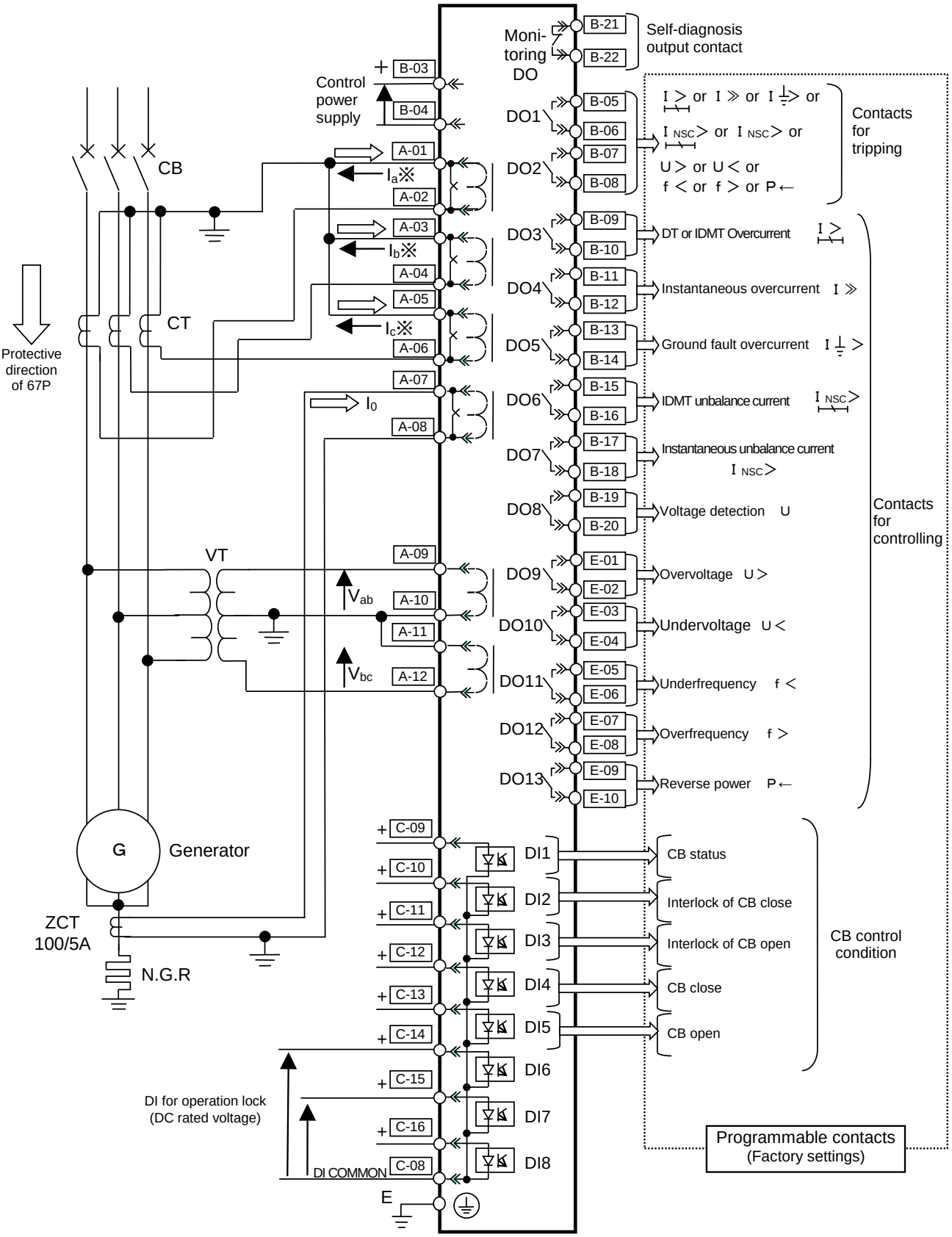


Fig. 4-5 CGP1-A42D1 Example of AC input circuit

※ ⇨ This symbol shows the direction of the current that flows into the generator side in the case of 67P operational condition.

← This symbol shows the direction of the current that flows form the generator side in the case of normal condition.

5. Human machine interface

There are three ways to set and operate the relay:

(1) Operation from the front panel

(2) Operation from a locally connected PC

This chapter describes about “(1) Operation from the front panel” by pushbuttons and the indication display. The operation method (2) is described in a separate volume. Please refer to the following document.

Title of document	Document No.
MELPRO-D Series Protection Relay PC-HMI Instruction Manual	JEP0-IL9504

5.1. Pushbutton switches and indication display

This section describes the pushbuttons and indication display on the front panel.

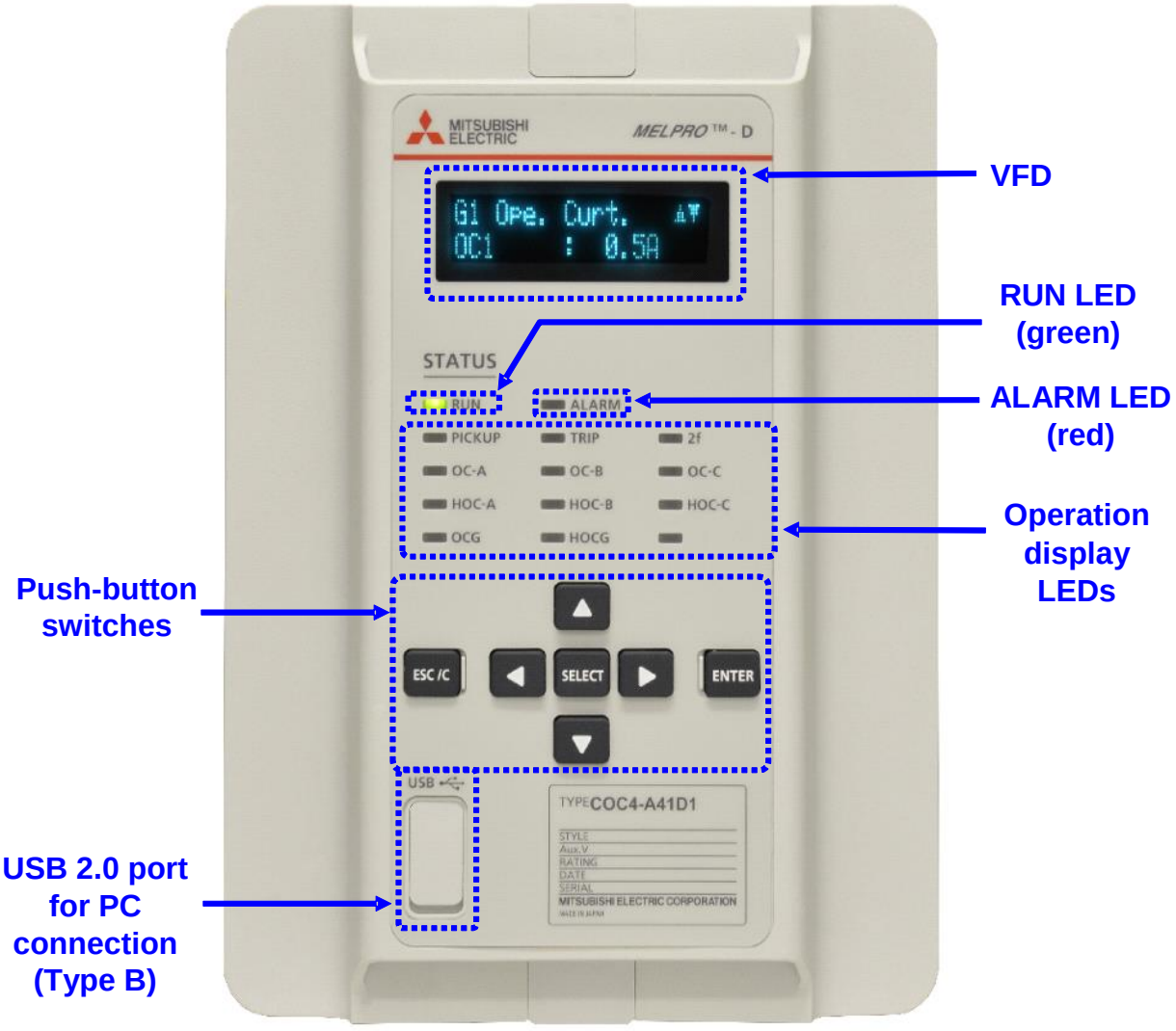


Fig. 5-1 Front view of relay

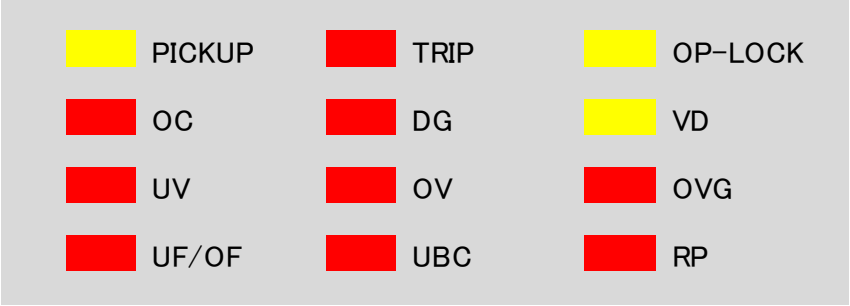


Fig. 5-2 Operation display LEDs of CGP1-A41D1

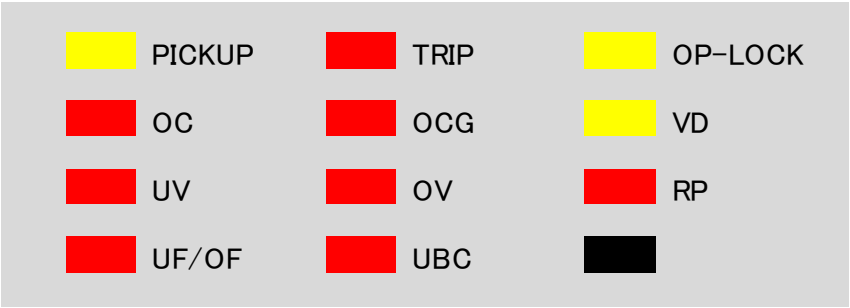


Fig. 5-3 Operation display LEDs of CGP1-A42D1

Table 5-1 Description of front panel

Name				Description
VFD (Vacuum Fluorescent Display) (18 characters x 2 lines)				Shows various menus and values of the DISPLAY/SETTING mode. If you has not operated any push buttons for more than 30 minutes, the VFD is automatically turned off. In the METERING menu, you can expand the character size.
RUN LED			Green	Shows the result of constant supervision. Illuminated for a normal condition. When this LED light is turned off, the relay functions are not working.
ALARM LED			Red	Shows the result of constant supervision. Illuminated for an abnormal condition.
Operation display LED		PICKUP	Yellow	Illuminated for detection of protection element (OR of all elements except for VD element). This LED will be turned off after resetting.
		TRIP	Red	Illuminated when the definitive signal (TRIP signal) of protection element is issued (OR of all elements except for VD element). (*)
		OP-LOCK	Yellow	Illuminated when the operation lock function is operated. This LED will be turned off after resetting.
	CGP1-A41D1	OC	Red	Illuminated when the definitive signal of overcurrent element is issued. (*)
		DG	Red	Illuminated when the definitive signal of directional ground fault element is issued. (*)
		VD	Yellow	Illuminated when the voltage detection element is operated. This LED will be turned off after resetting.
		UV	Red	Illuminated when the definitive signal of undervoltage element is issued. (*)
		OV	Red	Illuminated when the definitive signal of overvoltage element is issued. (*)
		OVG	Red	Illuminated when the definitive signal of ground fault overvoltage element is issued. (*)
		UF/OF	Red	Illuminated when the definitive signal of underfrequency element or overfrequency element is issued. (*)
		UBC	Red	Illuminated when the definitive signal of unbalance current element is issued. (*)
		RP	Red	Illuminated when the definitive signal of reverse power element is issued. (*)
	CGP1-A42D1	OC	Red	Illuminated when the definitive signal of overcurrent element is issued. (*)
		OCG	Red	Illuminated when the definitive signal of ground fault overcurrent element is issued. (*)
		VD	Yellow	Illuminated when the voltage detection element is operated. This LED will be turned off after resetting.
		UV	Red	Illuminated when the definitive signal of undervoltage element is issued. (*)
		OV	Red	Illuminated when the definitive signal of overvoltage element is issued. (*)
		RP	Red	Illuminated when the definitive signal of reverse power element is issued. (*)
		UF/OF	Red	Illuminated when the definitive signal of underfrequency element or overfrequency element is issued. (*)
		UBC	Red	Illuminated when the definitive signal of unbalance current element is issued. (*)

(*) The LED continues lighting after resetting the protection element. You can turn the LED off by pushing ESC/C button if the trouble has been resolved.

Pushbutton switch	SELECT	• Moves to the menu one level lower • Confirms selection of input item • Confirms input value • Reconfirms after pressing ENTER in SETTING mode
	ENTER	• Starts operation in SETTING mode
	ESC/C	• Turns off VFD • Turns off operation indicator LEDs by holding down (for 3s or longer)
	◀	• Moves to the menu one level higher • Moves to digit on the left in the value input screen • Discards the input value in the input screen and moves to the menu one level higher
	▶	• Moves to digit on the right in the value input screen
	▼ ▲	• Moves to the menu above/below • Increments/decrements the input value in the value input screen
USB2.0 port		For PC connection (Commercial USB cable is available)

(*) The LED continues lighting after resetting the protection element. You can turn the LED off by pushing ESC/C button if the trouble has been resolved.

5.2. List of menus

The operation mode includes the DISPLAY and SETTING modes, which respectively have different menus. Table 5-2 lists the menus available in the respective modes.

Table 5-2 List of menu

○: DISPLAY only Θ: DISPLAY and SETTING -: Not shown

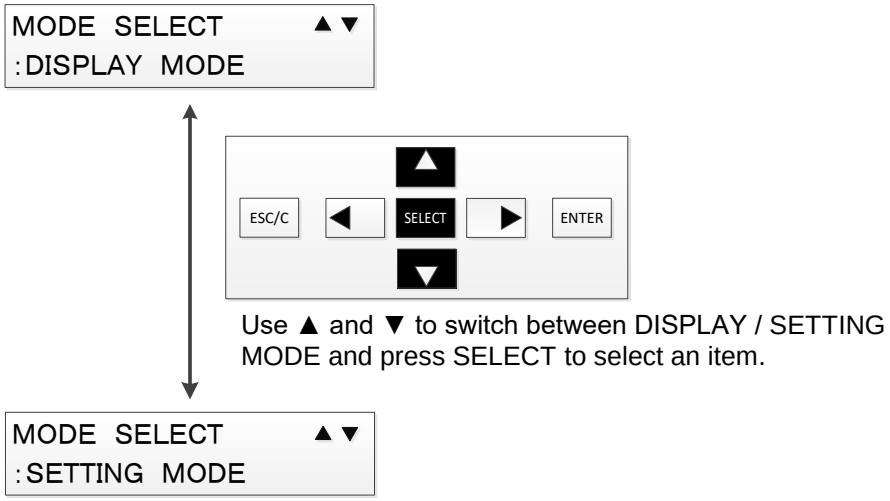
Menu		Operation mode	
		DISPLAY	SETTING
Status (STATUS)	Clock (CLOCK)	○	-
	Measured analog value (METERING)	○	-
	DI/DO status (DIGITAL I/O)	○	-
	Trip counter (TRIP COUNTER)	○	-
	Device name (DEVICE NAME)	○	-
Record (RECORD)	Fault record (FAULT RECORD)	○	-
	Event record (EVENT RECORD)	○	-
	Access record (ACCESS RECORD)	○	-
	Alarm record (ALARM RECORD)	○	-
Setting (SETTING)	Active group (ACTIVE WG)	○	Θ
	Group 1 setting (G1)	○	Θ
	Group 2 setting (G2)	○	Θ
Control (CONTROL)	Control mode (CTRL MODE)	○	Θ
	CB control (CB CONTROL)	-	Θ
Configuration (CONFIG)	Communication setting (COMMUNICATION)	○	Θ
	Clock adjustment (CLOCK ADJUST)	-	Θ
	Analog value display switching (METERING)	○	Θ
	Electric energy (ENERGY)	○	Θ
	Trip counter (TRIP COUNTER)	○	Θ
	Disturbance record (DISTURBANCE)	○	Θ
	DI voltage (DI VOLTAGE)	○	Θ
	Password use/unuse (PASSWORD USE)	-	Θ
	Password registration (PASSWORD REGIST)	-	Θ
Test (TEST)	DO contact test (CONTACT TEST)	-	Θ
	Test mode (MODE)	-	Θ
	LED/VFD lighting test (LED/VFD TEST)	-	Θ
Clear record (RECORD-CLR)	Clear fault record (FAULT REC CLEAR)	-	Θ
	Clear alarm record (ALARM REC CLEAR)	-	Θ
	Clear event record (EVENT REC CLEAR)	-	Θ

5.3. Operation method

This section describes the operations for mode selection and various menus.

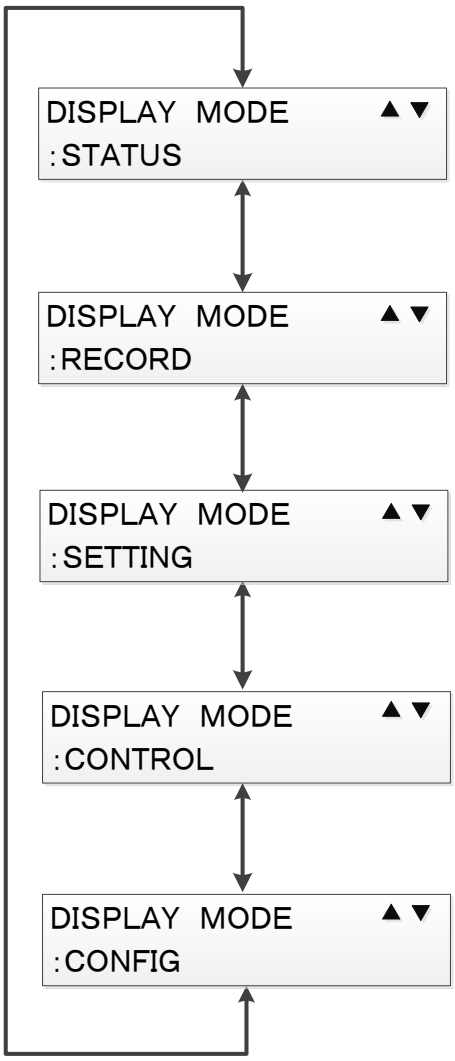
5.3.1. DISPLAY/SETTING mode selection

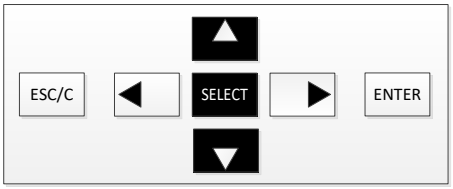
Press a key except for ESC/C when VFD is OFF to show the DISPLAY/SETTING mode selection screen. The DISPLAY and SETTING modes offer different sets of menus available.
For the details about the menus in the respective modes, see Table 5-2.



5.3.2. DISPLAY mode menu operations

This subsection describes the menu operations in the DISPLAY mode.
The menu screen has five selectable items. Use the Up and Down keys to select the item and press SELECT. For the details about the menus available in the DISPLAY mode, see Table 5-2.

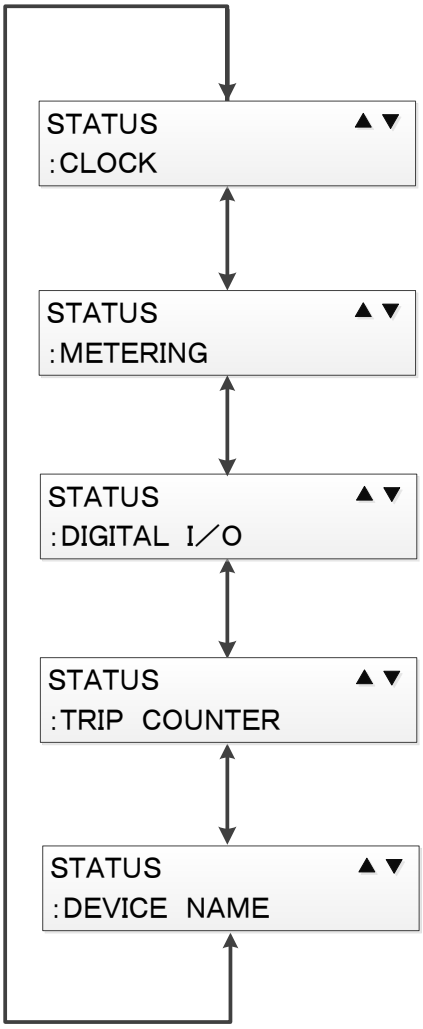


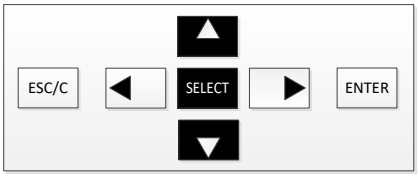


Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.2.1. Status (STATUS) menu

This subsection describes the Status (STATUS) menu.
The Status menu shows the current time, measured value, DI/DO status, trip counter, device name and Software version.





Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.2.1.1. Clock (CLOCK) menu

[Operation path] DISPLAY MODE > STATUS > CLOCK

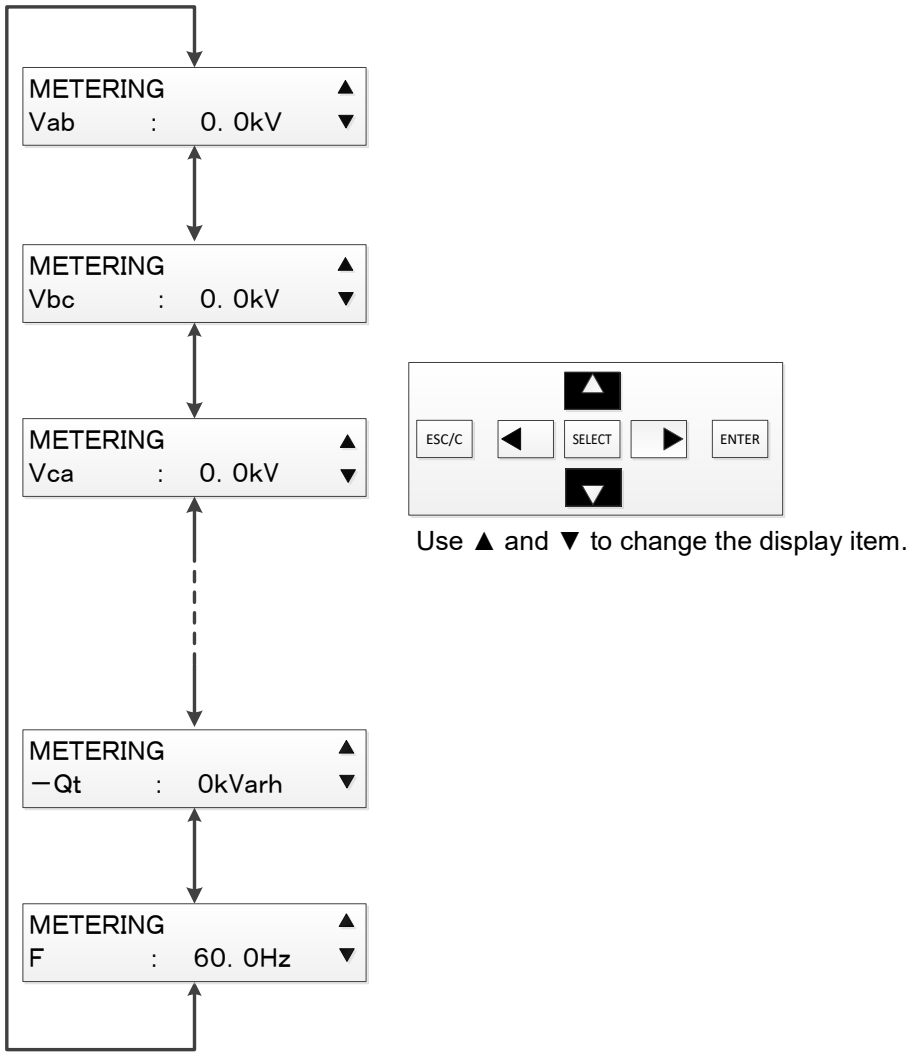
The clock (CLOCK) menu allows viewing of the current time and synchronization type.

The text in the upper right part of the screen indicates the synchronization type for the time shown.
(Part showing “LOCAL” in figure above)

5.3.2.1.2. Measured analog value (METERING) menu

[Operation path] DISPLAY MODE > STATUS > METERING

The Measured analog value (METERING) menu allows viewing of the current measured value.
The Configuration menu can specify the measured value of the primary or secondary value of CT/VT.
For the setting procedure, see 5.3.4.3.3.



Note: This is an example.

By pressing SELECT, you can expand the character size of the measured value.
Pressing SELECT again goes back to the original state.

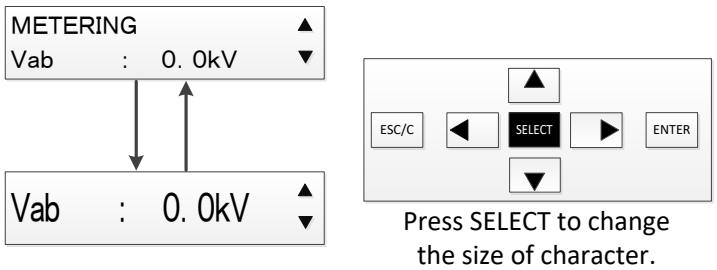


Table 5-3 Measured value display items

・CGP1-A41D1

No.	Signal name	Unit (primary/secondary)	No.	Signal name	Unit (primary/secondary)
1	Vab	kV / V	16	Ia-ph	°LAG / °LAG
2	Vbc	kV / V	17	Ic-ph	°LAG / °LAG
3	Vca	kV / V	18	IG-ph	°LAG / °LAG
4	VG	kV / V	19	+P	MW / - (*1)
5	V1	kV / V	20	-P	MW / - (*1)
6	V2	kV / V	21	+Q	MVar / - (*1)
7	Ia	A / A	22	-Q	MVar / - (*1)
8	Ic	A / A	23	S	MVA / - (*1)
9	IG	A / mA	24	PF	- / - (*1)
10	I1	A / A	25	+Pt	kWh / - (*1)
11	I2	A / A	26	-Pt	kWh / - (*1)
12	Vab-ph	°LAG / °LAG	27	+Qt	kVarh / - (*1)
13	Vbc-ph	°LAG / °LAG	28	-Qt	kVarh / - (*1)
14	Vca-ph	°LAG / °LAG	29	F	Hz / Hz
15	VG-ph	°LAG / °LAG			

・CGP1-A42D1

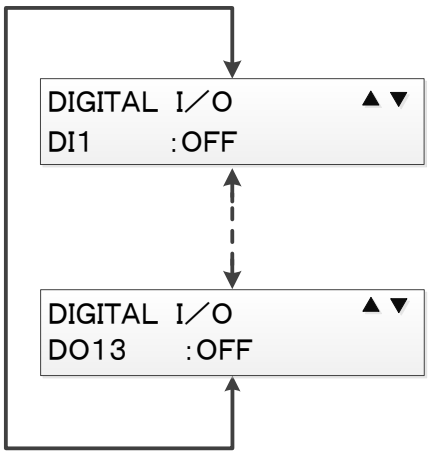
No.	Signal name	Unit (primary/secondary)	No.	Signal name	Unit (primary/secondary)
1	Vab	kV / V	16	Ib-ph	°LAG / °LAG
2	Vbc	kV / V	17	Ic-ph	°LAG / °LAG
3	Vca	kV / V	18	IG-ph	°LAG / °LAG
4	V1	kV / V	19	+P	MW / - (*1)
5	V2	kV / V	20	-P	MW / - (*1)
6	Ia	A / A	21	+Q	MVar / - (*1)
7	Ib	A / A	22	-Q	MVar / - (*1)
8	Ic	A / A	23	S	MVA / - (*1)
9	IG	A / A	24	PF	- / - (*1)
10	I1	A / A	25	+Pt	kWh / - (*1)
11	I2	A / A	26	-Pt	kWh / - (*1)
12	Vab-ph	°LAG / °LAG	27	+Qt	kVarh / - (*1)
13	Vbc-ph	°LAG / °LAG	28	-Qt	kVarh / - (*1)
14	Vca-ph	°LAG / °LAG	29	F	Hz / Hz
15	Ia-ph	°LAG / °LAG			

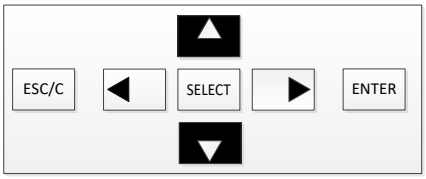
(*1) This value can be shown only when PRIMARY value is selected in METERING setting menu shown in 5.3.4.3.3.

5.3.2.1.3. DI/DO status (DIGITAL I/O) menu

[Operation path] DISPLAY MODE > STATUS > DIGITAL I/O

The DI/DO status (DIGITAL I/O) menu allows viewing of the current DI/DO.





Use ▲ and ▼ to change the display item

Table 5-4 DI/DO status display items

No.	Signal name	No.	Signal name
1	DI1	9	DO1
2	DI2	10	DO2
3	DI3	11	DO3
4	DI4	12	DO4
5	DI5	13	DO5
6	DI6	14	DO6
7	DI7	15	DO7
8	DI8	16	DO8
		17	DO9
		18	DO10
		19	DO11
		20	DO12
		21	DO13

5.3.2.1.4. Trip counter (TRIP COUNTER) menu

[Operation path] DISPLAY MODE > STATUS > TRIP COUNTER

The Trip counter (TRIP COUNTER) menu allows viewing of the number of trips.

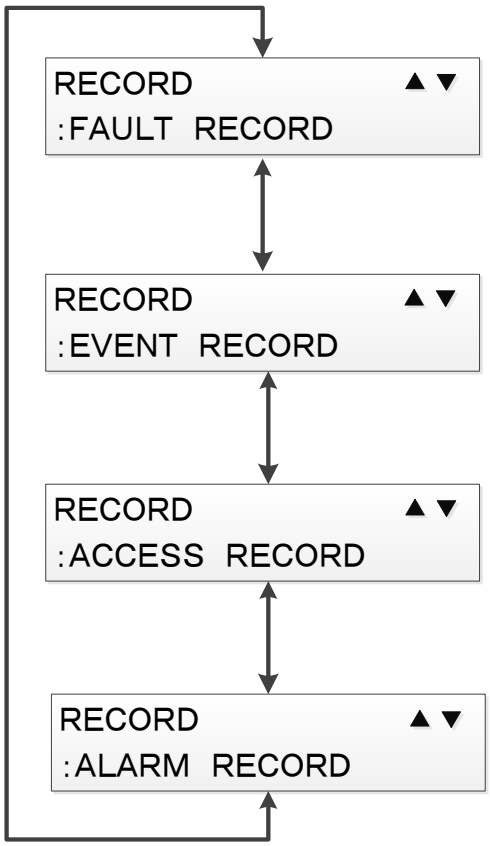
5.3.2.1.5. Device name (DEVICE NAME) menu

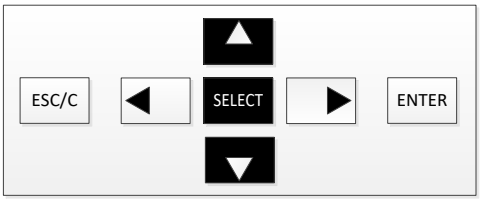
[Operation path] DISPLAY MODE > STATUS > DEVICE NAME

The Device name (DEVICE NAME) menu allows viewing of the device name.

5.3.2.2. Record (RECORD) menu

This subsection describes the operation logs in the Record (RECORD) menu.
The Record menu allows viewing four types of log data.
(Fault record, Event record, Access record and Alarm record)



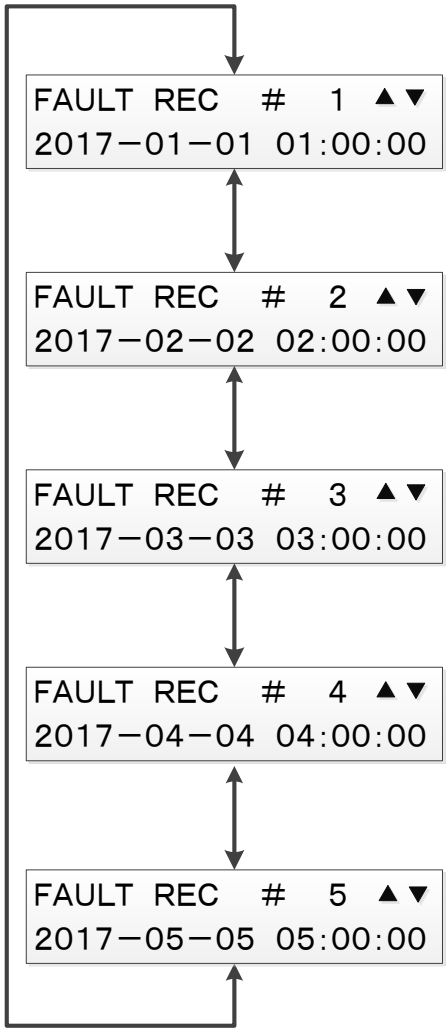


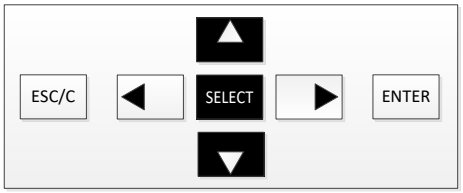
Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.2.2.1. Fault record (FAULT RECORD) menu

[Operation path] DISPLAY MODE > RECORD > FAULT RECORD

The Fault record (FAULT RECORD) menu allows viewing of the time, operating values and operating elements when the fault is detected. Fault records of up to five phenomena are stored and the respective fault record can be viewed. For selecting record for display, use the Up and Down keys to select the date of the fault record and press SELECT.

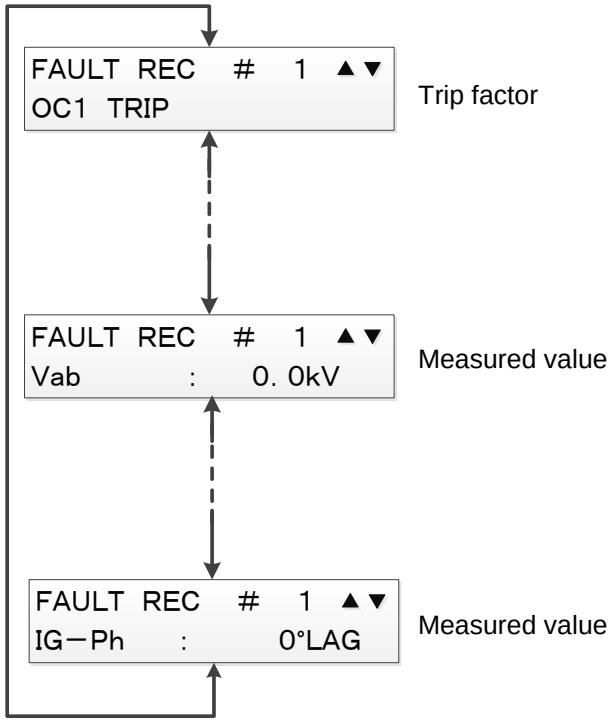




Use ▲ and ▼ to switch between items and press SELECT to select an item.

Note: This is an example.

After a fault record is selected, use the Up and Down keys to view the trip factors and measured values.



Note: This is an example.

Table 5-5 Elements of fault records (CGP1-A41D1)

Element name displayed	Element name displayed
OC1-A Trip	RP1 Trip
OC1-C Trip	RP2 Trip
DIRG1 Trip	UV1-AB Trip
OC2-A Trip	UV1-BC Trip
OC2-C Trip	UV1-CA Trip
DIRG2 Trip	UV2-AB Trip
OC3-A Trip	UV2-BC Trip
OC3-C Trip	UV2-CA Trip
OVG1 Trip	OV1 Trip
OC4-A Trip	OV2 Trip
OC4-C Trip	UF1 Trip
OVG2 Trip	UF2 Trip
UBC1 Trip	OF1 Trip
UBC2 Trip	OF2 Trip

Table 5-6 Elements of fault records (CGP1-A42D1)

Element name displayed	Element name displayed
OC1-A Trip	UBC2 Trip
OC1-B Trip	RP1 Trip
OC1-C Trip	RP2 Trip
OCG1 Trip	UV1-AB Trip
OC2-A Trip	UV1-BC Trip
OC2-B Trip	UV1-CA Trip
OC2-C Trip	UV2-AB Trip
OCG2 Trip	UV2-BC Trip
OC3-A Trip	UV2-CA Trip
OC3-B Trip	OV1 Trip
OC3-C Trip	OV2 Trip
OC4-A Trip	UF1 Trip
OC4-B Trip	UF2 Trip
OC4-C Trip	OF1 Trip
UBC1 Trip	OF2 Trip

Table 5-7 Measured values of fault records (CGP1-A41D1)

No.	Signal name	Unit
1	Vab	kV
2	Vbc	kV
3	Vca	kV
4	VG	kV
5	V1	kV
6	V2	kV
7	Ia	A
8	Ic	A
9	IG	A
10	I1	A
11	I2	A
12	Vab-ph	°LAG
13	Vbc-ph	°LAG
14	Vca-ph	°LAG
15	VG-ph	°LAG
16	Ia-ph	°LAG
17	Ic-ph	°LAG
18	IG-ph	°LAG

Table 5-8 Measured values of fault records (CGP1-A42D1)

No.	Signal name	Unit
1	Vab	kV
2	Vbc	kV
3	Vca	kV
4	V1	kV
5	V2	kV
6	Ia	kV
7	Ib	A
8	Ic	A
9	IG	A
10	I1	A
11	I2	A
12	Vab-ph	°LAG
13	Vbc-ph	°LAG
14	Vca-ph	°LAG
15	Ia-ph	°LAG
16	Ib-ph	°LAG
17	Ic-ph	°LAG
18	IG-ph	°LAG

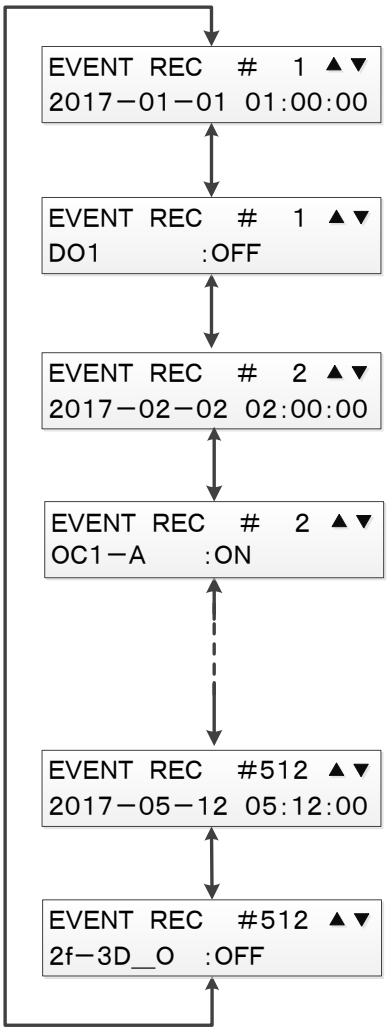
5.3.2.2.2. Event record (EVENT RECORD) menu

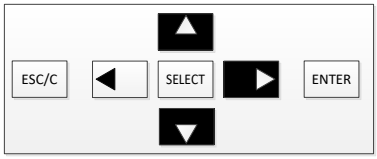
[Operation path] DISPLAY MODE > RECORD > EVENT RECORD

The Event record (EVENT RECORD) menu allows viewing of event records saved.
Event records of up to 512 events are stored and the respective event record can be viewed.
Press the Up and Down keys to switch the indication on the screen as below.

Date of occurrence > Record description > Date of occurrence...

Press the Right key to display from the current event record to the past 10th record.





Use ▲ and ▼ to change the display item.
Use ► to move from the record currently shown to the date of the tenth record into past.

Note: This is an example.

Table 5-9 List of event record (CGP1-A41D1)

Event name	
OC1-A	Definitive signal of OC1 A-phase or forced operation from PC-HMI
OC1-C	Definitive signal of OC1 C-phase or forced operation from PC-HMI
OC2-A	Definitive signal of OC2 A-phase or forced operation from PC-HMI
OC2-C	Definitive signal of OC2 C-phase or forced operation from PC-HMI
OC3-A	Definitive signal of OC3 A-phase or forced operation from PC-HMI
OC3-C	Definitive signal of OC3 C-phase or forced operation from PC-HMI
OC4-A	Definitive signal of OC4 A-phase or forced operation from PC-HMI
OC4-C	Definitive signal of OC4 C-phase or forced operation from PC-HMI
UBC1	Definitive signal of UBC1 or forced operation from PC-HMI
UBC2	Definitive signal of UBC2 or forced operation from PC-HMI
DIRG1	Definitive signal of DIRG1 or forced operation from PC-HMI
DIRG2	Definitive signal of DIRG2 or forced operation from PC-HMI
RP1	Definitive signal of RP1 or forced operation from PC-HMI
RP2	Definitive signal of RP2 or forced operation from PC-HMI
UV1-AB	Definitive signal of UV1 AB-phase or forced operation from PC-HMI
UV1-BC	Definitive signal of UV1 BC-phase or forced operation from PC-HMI
UV1-CA	Definitive signal of UV1 CA-phase or forced operation from PC-HMI
UV2-AB	Definitive signal of UV2 AB-phase or forced operation from PC-HMI
UV2-BC	Definitive signal of UV2 BC-phase or forced operation from PC-HMI
UV2-CA	Definitive signal of UV2 CA-phase or forced operation from PC-HMI
OV1	Definitive signal of OV1 or forced operation from PC-HMI
OV2	Definitive signal of OV2 or forced operation from PC-HMI
TCNT_ALM	Alarm of trip counter
DO1	Status of DO1
DO2	Status of DO2
DO3	Status of DO3
DO4	Status of DO4
DO5	Status of DO5
DO6	Status of DO6
DO7	Status of DO7
DO8	Status of DO8
DO9	Status of DO9
DO10	Status of DO10
DO11	Status of DO11
DO12	Status of DO12
DO13	Status of DO13
DI1	Status of DI1
DI2	Status of DI2
DI3	Status of DI3
DI4	Status of DI4
DI5	Status of DI5
DI6	Status of DI6
DI7	Status of DI7
DI8	Status of DI8
CBa1	Status of CB

INT_LK_OP	Interlock signal (OPEN)
INT_LK_CL	Interlock signal (CLOSE)
CTL_OP_OK	Possible to CB open control
CTL_CL_OK	Possible to CB close control
CB_CTL_OK	Success of CB control
CB_CTL_NG	Failure of CB control
OP_TS	CB open control (local)
CL_TS	CB close control (local)
MANU_CLS	Command of CB close
MANU_OPN	Command of CB open
CB_LR	Local or Remote
CL_DI	DI command of close
OP_DI	DI command of open
P_INT_LK1	Interlock of close-side
P_INT_LK2	Interlock of open-side
CB_DI_CTL	Active status of DI for CB control
ALARM	Abnormal condition of constant supervision (serious failure)
ALARM-L	Abnormal condition of constant supervision (minor failure)
RY-LOCK	Locking of relay
UV-AB-LK	Locking of UV AB-phase
UV-BC-LK	Locking of UV BC-phase
UV-CA-LK	Locking of UV CA-phase
TCNT-LK	Locking of trip counter
OVG1	Definitive signal of OVG1 or forced operation from PC-HMI
OVG2	Definitive signal of OVG2 or forced operation from PC-HMI
VD	Definitive signal of VD or forced operation from PC-HMI
UF1	Definitive signal of UF1 or forced operation from PC-HMI
UF2	Definitive signal of UF2 or forced operation from PC-HMI
OF1	Definitive signal of OF1 or forced operation from PC-HMI
OF2	Definitive signal of OF2 or forced operation from PC-HMI
CTL_BLOP1	Prohibition of open
CTL_BLCL1	Prohibition of close
43INT_FLG	Use / Non-use setting of interlock
VL4000000	Choice failure
RES_STS00	Success of control
RES_STS02	Lack of control / Prohibition of operation
RES_STS05	Control of the same direction
RES_STS0A	Failure of interlock condition
RES_STS10	Time out
ALLEL-O	OR of all “definitive signal AND operation lock signal”
DS_TRIG	Pulse signal from start-up until the end of data saving (Except for pre-fault time)
SV-LK	Locking of supervision

Table 5-10 List of event record (CGP1-A42D1)

Event name	
OC1-A	Definitive signal of OC1 A-phase or forced operation from PC-HMI
OC1-B	Definitive signal of OC1 B-phase or forced operation from PC-HMI
OC1-C	Definitive signal of OC1 C-phase or forced operation from PC-HMI
OC1-G	Definitive signal of OC1 zero-phase or forced operation from PC-HMI
OC2-A	Definitive signal of OC2 A-phase or forced operation from PC-HMI
OC2-B	Definitive signal of OC2 B-phase or forced operation from PC-HMI
OC2-C	Definitive signal of OC2 C-phase or forced operation from PC-HMI
OC2-G	Definitive signal of OC2 zero-phase or forced operation from PC-HMI
OC3-A	Definitive signal of OC3 A-phase or forced operation from PC-HMI
OC3-B	Definitive signal of OC3 B-phase or forced operation from PC-HMI
OC3-C	Definitive signal of OC3 C-phase or forced operation from PC-HMI
OC4-A	Definitive signal of OC4 A-phase or forced operation from PC-HMI
OC4-B	Definitive signal of OC4 B-phase or forced operation from PC-HMI
OC4-C	Definitive signal of OC4 C-phase or forced operation from PC-HMI
UBC1	Definitive signal of UBC1 or forced operation from PC-HMI
UBC2	Definitive signal of UBC2 or forced operation from PC-HMI
RP1	Definitive signal of RP1 or forced operation from PC-HMI
RP2	Definitive signal of RP2 or forced operation from PC-HMI
UV1-AB	Definitive signal of UV1 AB-phase or forced operation from PC-HMI
UV1-BC	Definitive signal of UV1 BC-phase or forced operation from PC-HMI
UV1-CA	Definitive signal of UV1 CA-phase or forced operation from PC-HMI
UV2-AB	Definitive signal of UV2 AB-phase or forced operation from PC-HMI
UV2-BC	Definitive signal of UV2 BC-phase or forced operation from PC-HMI
UV2-CA	Definitive signal of UV2 CA-phase or forced operation from PC-HMI
OV1	Definitive signal of OV1 or forced operation from PC-HMI
OV2	Definitive signal of OV2 or forced operation from PC-HMI
TCNT_ALM	Alarm of trip counter
DO1	Status of DO1
DO2	Status of DO2
DO3	Status of DO3
DO4	Status of DO4
DO5	Status of DO5
DO6	Status of DO6
DO7	Status of DO7
DO8	Status of DO8
DO9	Status of DO9
DO10	Status of DO10
DO11	Status of DO11
DO12	Status of DO12
DO13	Status of DO13
DI1	Status of DI1
DI2	Status of DI2
DI3	Status of DI3
DI4	Status of DI4
DI5	Status of DI5

DI6	Status of DI6
DI7	Status of DI7
DI8	Status of DI8
CBa1	Status of CB
INT_LK_OP	Interlock signal (OPEN)
INT_LK_CL	Interlock signal (CLOSE)
CTL_OP_OK	Possible to CB open control
CTL_CL_OK	Possible to CB close control
CB_CTL_OK	Success of CB control
CB_CTL_NG	Failure of CB control
OP_TS	CB open control (local)
CL_TS	CB close control (local)
MANU_CLS	Command of CB close
MANU_OPN	Command of CB open
CB_LR	Local or Remote
CL_DI	DI command of close
OP_DI	DI command of open
P_INT_LK1	Interlock of close-side
P_INT_LK2	Interlock of open-side
CB_DI_CTL	Active status of DI for CB control
ALARM	Abnormal condition of constant supervision (serious failure)
ALARM-L	Abnormal condition of constant supervision (minor failure)
RY-LOCK	Locking of relay
UV-AB-LK	Locking of UV AB-phase
UV-BC-LK	Locking of UV BC-phase
UV-CA-LK	Locking of UV CA-phase
TCNT-LK	Locking of trip counter
VD	Definitive signal of VD or forced operation from PC-HMI
UF1	Definitive signal of UF1 or forced operation from PC-HMI
UF2	Definitive signal of UF2 or forced operation from PC-HMI
OF1	Definitive signal of OF1 or forced operation from PC-HMI
OF2	Definitive signal of OF2 or forced operation from PC-HMI
CTL_BLOP1	Prohibition of open
CTL_BLCL1	Prohibition of close
43INT_FLG	Use / Non-use setting of interlock
VL4000000	Choice failure
RES_STS00	Success of control
RES_STS02	Lack of control / Prohibition of operation
RES_STS05	Control of the same direction
RES_STS0A	Failure of interlock condition
RES_STS10	Time out
ALLEL-O	OR of all “definitive signal AND operation lock signal”
DS_TRIG	Pulse signal from start-up until the end of data saving (Except for pre-fault time)
SV-LK	Locking of supervision

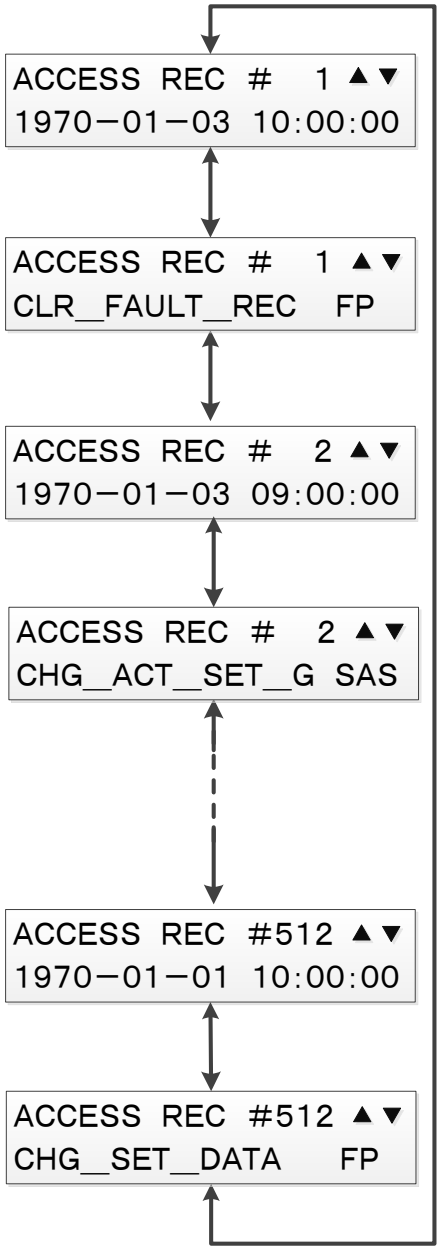
5.3.2.2.3. Access record (ACCESS RECORD) menu

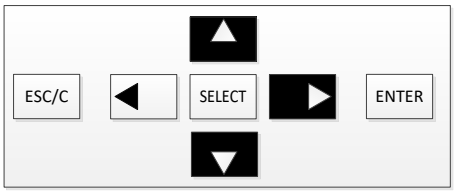
[Operation path] DISPLAY MODE > RECORD > ACCESS RECORD

The Access record (ACCESS RECORD) menu allows viewing of the saved access records.
Access records of up to 512 accesses are stored and the records for the respective accesses can be viewed.
Press the Up and Down keys to switch the indication on the screen as below.

Date of occurrence > Record description > Date of occurrence...

Press the Right key to display from the current access record to the past 10th record.





Use ▲ and ▼ to change the display item.
Use ► to move from the record currently shown to the date of the tenth record into past.

Note: This is an example.

Access record description registered (operator)

Display item	Operation description
RY	Front panel
PC	PC-HMI
AUT	Automatic cancelation on device

Access record description registered (operation description)

Display item	Operation description
CHG_ACT_SET_G	Change of active setting group
CHG_DI_VOLTAGE	Change of configuration of DI voltage
CHG_DIST_REC_T	Change of configuration of disturbance record
CHG_USE_PASSWD	Change of password use setting
CHG_PASSWD	Change of password
CHG_USB_CONN	Change of USB connection channel
CHG_TRIP_CNTR	Change of trip counter
CHG_DEV_NAME	Change of device name
CHG_CFG_METER	Change of configuration of analog measurement status display
CHG_CFG_ENERGY	Change of configuration of electric energy
CHG_TIMEMANAGE	Change of configuration of time management
CHG_CTRL_MODE	Change of CB control mode
CHG_CONTACT_T	Change of configuration of DO contact test
CHG_PLC_DATA	Change of PLC data
CHG_SET_DATA	Change of relay setting
CLR_FAULT_REC	Clearing of fault/disturbance record
CLR_ALARM_REC	Clearing of alarm record
CLR_EVENT_REC	Clearing of event record
ADJ_CLOCK	Adjustment of system clock
ACT_TST_MODE	Activation of test mode
DEACT_TST_MODE	Deactivation of test mode
RESET_LED	LED reset
STA_CONTACTTST	Start of DO contact test
STP_CONTACTTST	Stop of DO contact test
LOCK_SV	Lock of self-diagnosis
UNLOCK_SV	Unlock of self-diagnosis
STA_I/F_TST	Start of forced operation
STP_I/F_TST	Stop of forced operation
OPERATE_CB	Operation of CB control (open / close)

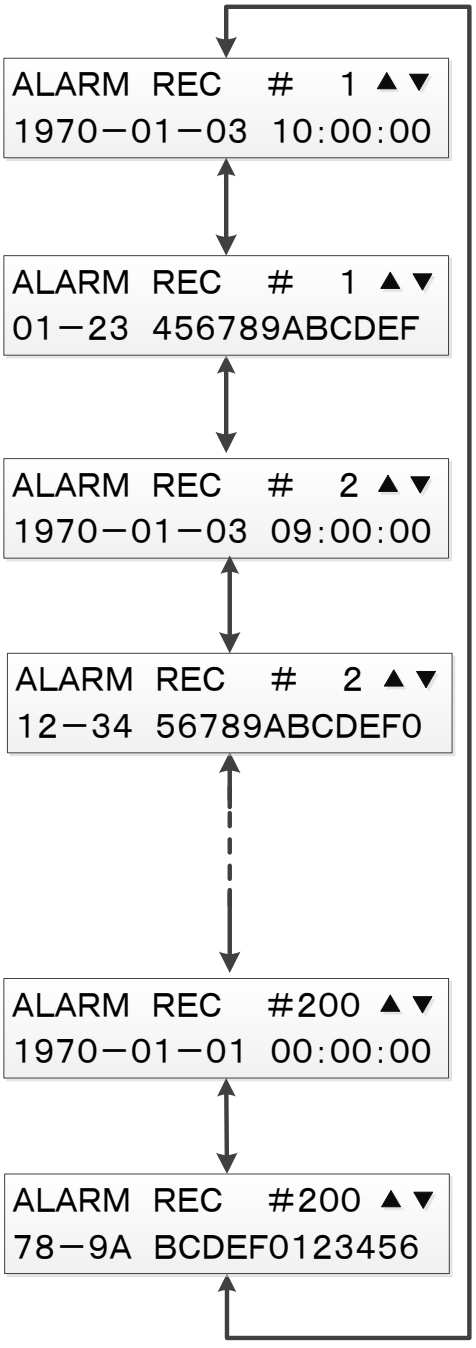
5.3.2.2.4. Alarm record (ALARM RECORD) menu

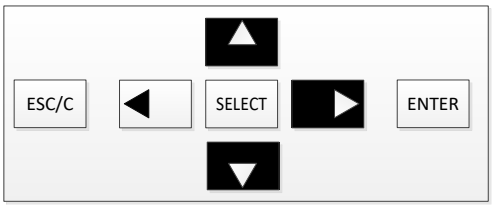
[Operation path] DISPLAY MODE > RECORD > ALARM RECORD

The Alarm record (ALARM RECORD) menu allows viewing of the saved alarm records.
Alarm records of up to 200 alarms are stored and the records for the respective alarms can be viewed.
Press the Up and Down keys to switch the indication on the screen as below.

Date of occurrence > Record description > Date of occurrence...

Press the Right key to display from the current alarm record to the past 10th record.





Use ▲ and ▼ to change the display item.
Use ► to move from the record currently shown to the date of the tenth record into past.

Note: This is an example.

5.3.2.3. Setting (SETTING) menu

The Setting menu can be selected in either DISPLAY or SETTING mode but the DISPLAY mode only allows viewing of the setting values.
The setting values can be changed only in the SETTING mode.

For operations for the Setting menu, see 5.3.4.1.

5.3.2.4. Control (CONTROL) menu

The Control menu can be selected in either DISPLAY or SETTING mode but the DISPLAY mode only allows viewing of the setting of Control mode.
In the SETTING mode, both Control mode and CB control can be shown and set.

For operations for the Control menu, see 5.3.4.2.

5.3.2.5. Configuration (CONFIG) menu

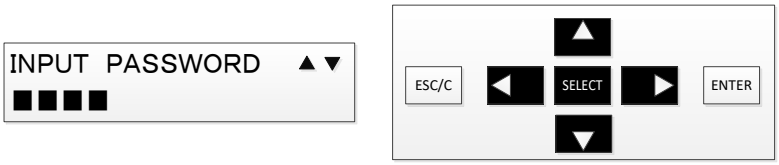
The Configuration menu can be selected in either DISPLAY or SETTING mode. Clock adjustment (CLOCK ADJUST), Password use/unuse (PASSWORD USE) and Password registration (PASSWORD REGIST) can be selected only in the SETTING mode.
For other settings, the DISPLAY mode allows only viewing of the setting values.
The setting values can be changed only in the SETTING mode.

For operations for the Configuration menu, see 5.3.4.3.

5.3.3. Password input screen

If the password use/unuse setting is “USE,” a four-digit password is requested when the SETTING mode is selected.

* For the password use/unuse setting, see 5.3.4.3.8.
For how to set the password input, see 5.3.4.3.9.



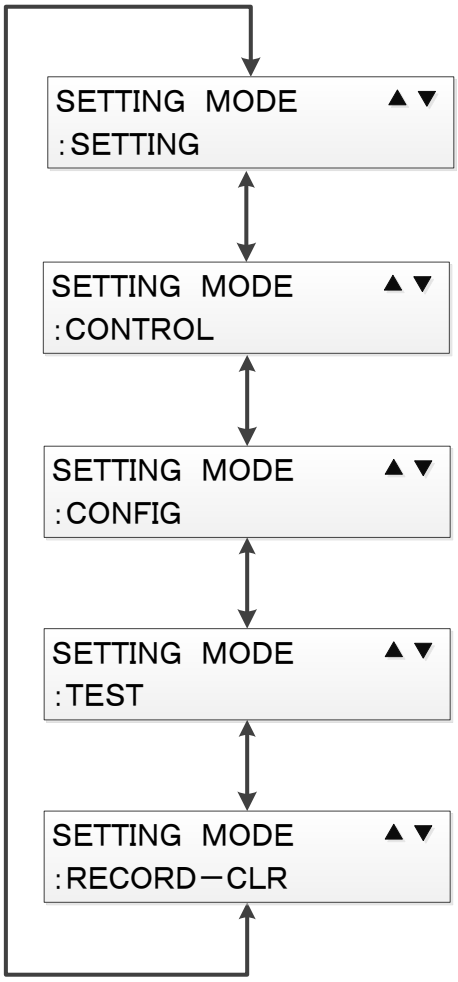
Use ▲ and ▼ to change the value of the each digit selected.
Pressing SELECT confirms the value for the digit entered and moves the cursor to the next digit on the right.

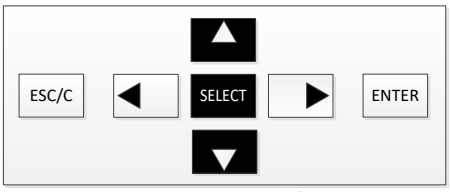
If the password input is wrong, a screen as shown below appears.

The main menu appears when the correct password has been input.

5.3.4. SETTING mode menu operations

This subsection describes the SETTING mode menu.
The menu screen has five selectable items. Use the Up and Down keys to select the item and press SELECT.
For the details about the menus available in the SETTING mode, see Table 5-2.

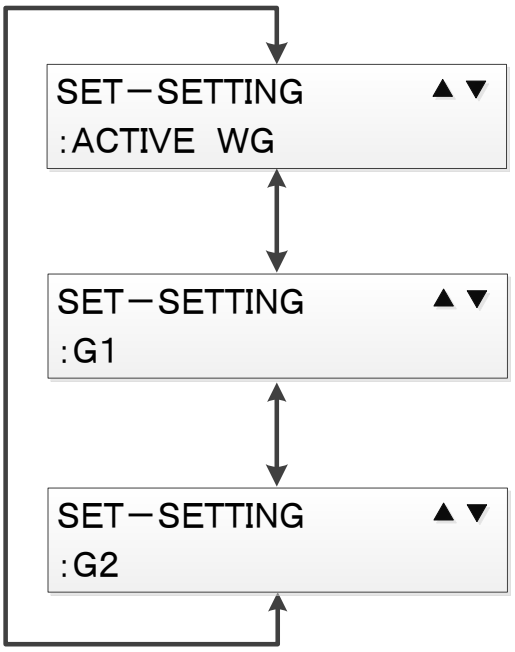


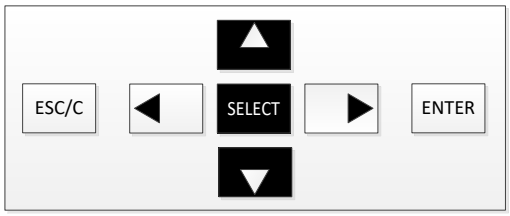


Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.4.1. Setting (SETTING) menu

The Setting (SETTING) menu allows viewing/changing of the active setting group and viewing/changing of the group setting values.
The Setting menu can be selected in either DISPLAY or SETTING mode but the setting values can be changed only in the SETTING mode.
(The DISPLAY mode allows only viewing of the setting values.)





Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.4.1.1. Active group (ACTIVE WG) menu

[Operation path] SETTING MODE > SETTING > ACTIVE WG

The Active group (ACTIVE WG) menu allows changing of the active group numbers setting.
(Active group numbers can be changed only in the SETTING mode.
The DISPLAY mode allows only viewing of the current group numbers.)

```
ACTIVE WG
          :G1
```

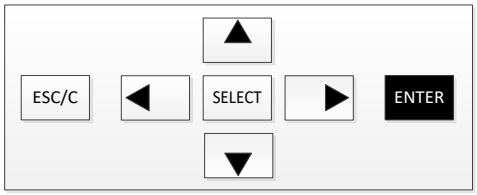
To change the active group number, in the Active group menu, press SELECT.
A cursor appears, which allows the selection of a group number with the Up and Down keys.
Select the group number to change and press SELECT to confirm the change.

```
ACTIVE WG
          :■1
```

Use ▲ and ▼ to switch between group Nos. and press SELECT to confirm the change

Press ENTER to show the confirmation screen below. Press SELECT to initiate the change to the group number selected.
When the new active group setting is not required, press the Left key to return the display back.

```
CHANGE ACTIVE WG?
YES=SELECT  NO=◀
```



Press ENTER to show the screen on the left.

The next message shows the Successful or Unsuccessful change of active group number.
Pressing SELECT brings the display back to the Setting menu.

```
SETTING
HAVE CHANGED
```

Message for a successful change of the active group

```
SETTING
FAILED TO CHANGE
```

Message for an unsuccessful change of the active group

The cancel message will appear by pressing the Left key in the Active group menu.
Pressing SELECT exits the Active group menu without changing the active group and brings the display back to the Setting menu.
Pressing the Left key brings the display back to the Active group menu.

```
CANCEL ACTIVE WG?
YES=SELECT  NO=◀
```

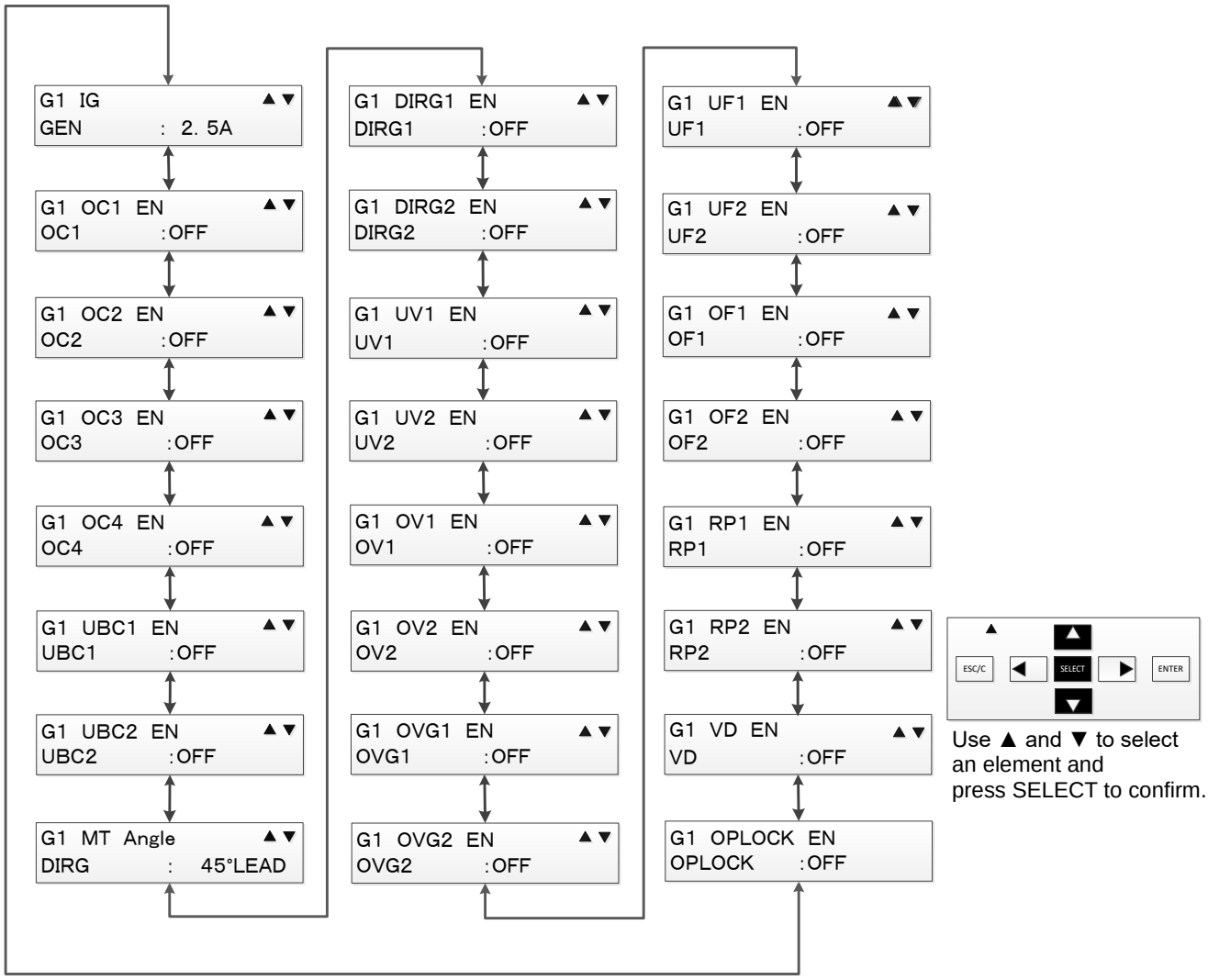
5.3.4.1.2. Group 1 setting (G1) and Group 2 setting (G2) menus

[Operation path] SETTING MODE > SETTING > G1(G2)

The Group 1 setting (G1) and Group 2 setting (G2) menus allow viewing and changing of the setting values for the respective group settings.
(Setting values can be changed only in the SETTING mode. The DISPLAY mode allows only viewing of the setting values)
The operation procedure for changing group settings is explained by changing G1 (for example).

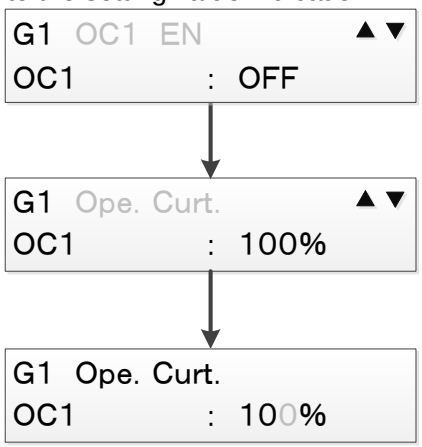
1. First, select the setting value group in the Setting menu to change and press SELECT.

2. The Group setting menu appears.
Select the protective element to change with pressing the Up and Down key, and press SELECT.



Note: This is an example.

3. The cursor moves to the setting parameter indication.
Use the Up and Down keys to select the setting parameter to be changed and press SELECT. The cursor moves to the setting value indication.



Cursor moves to the setting parameter indication.

Select the setting parameter to change and press SELECT.

Cursor moves to the setting value indication.

4. Use the Left and Right keys to select the digit to change and use the Up and Down keys to set the value.

For setting a value as shown on the left,
use ◄ and ► to select the digit to change,
and ▲ and ▼ to set the value.
Press SELECT to confirm the change.

5. When the value has been changed, press SELECT to move the cursor to the setting parameter indication.

Cursor moves to the setting parameter indication.

6. Complete setting of all parameters in the element to change by repeating steps 2 to 5 above.

7. Press the Left key to return the cursor back to the protective element indication.
Complete setting of any other protective elements to change by repeating steps 1 to 6 above.

8. When the all necessary change of the setting values has been completed, press ENTER.
A confirmation message of the setting value changes appears as shown in the figure below. After confirmation of correct settings, press SELECT. If discarding the setting value changes, press the Left key.

Press SELECT to change the setting.
Press ◄ to discard the change.

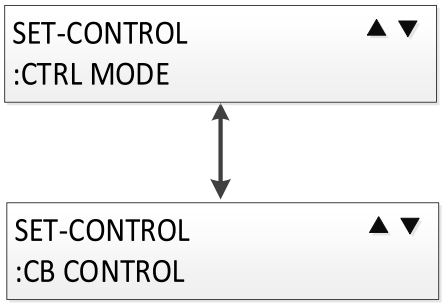
The following messages are shown respectively to check the successful or unsuccessful setting change, The display returns back to the Setting menu by pressing SELECT while either of the messages below.

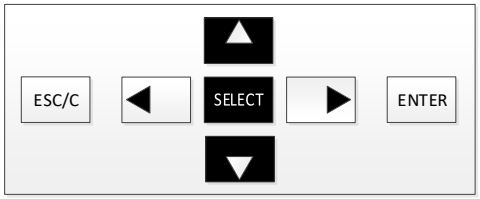
Message for successful changes of setting value

Message for unsuccessful changes of setting value

5.3.4.2. Control (CONTROL) menu

The Control (CONTROL) menu allows viewing/changing of Control mode and CB control.
The Control menu can be selected in either DISPLAY or SETTING mode but the DISPLAY mode only allows viewing of the setting of Control mode.
In the SETTING mode, both Control mode and CB control can be shown and set.





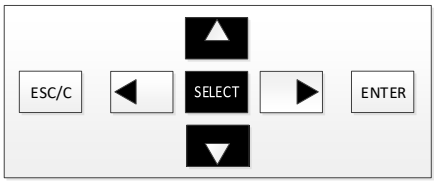
Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.4.2.1. Control mode (CTRL MODE) menu

[Operation path] SETTING MODE > CONTROL > CTRL MODE

The Control mode (CTRL MODE) menu allows setting of the Local/remote control, Interlock selection and Circuit breaker operation blocking.
(Note that they can be set only in the SETTING mode. The DISPLAY mode only allows viewing of the settings.)

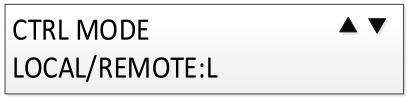
1. Use the Up and Down keys to show the control mode item to change and press the SELECT key for selection.



Use▲ and▼ keys to switch between items and press the SELECT key to select an item.

2. The cursor moves to the setting value. Use the Up and Down keys to change the setting value.
(The setting value below shows a selection setting. For a numeric value setting, use the Left and Right keys to change the digit for setting.)

3. Press the SELECT key to change the setting value.



4. Repeat steps 1 to 3 until there are no more items you want to change.

5. Press the ENTER key, and a message appears to confirm application of the control mode settings that were just changed as shown in the figure below.
Press the SELECT key to apply the control mode settings that were just changed by steps 1 to 4 and complete the control mode setting.

Press the Left key to go back to the Control mode menu without applying the settings that were just changed.

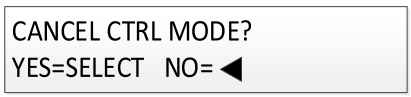


Table 5-11 Setting items of Control mode

NO.	Item	Description	Setting range	Unit
1	REMOTE/LOCAL	Remote / Local setting	R / L	-
2	INTERLOCK	Interlock unuse/use selection setting	UNUSE / USE	-
3	CB OPEN	CB open control operation block setting	UNBLK / BLK	-
4	CB CLOSE	CB close control operation block setting	UNBLK / BLK	-
5	ON TIMER	Control waiting time	0 - 60	s

5.3.4.2.2. CB Control (CB CONTROL) menu

[Operation path] SETTING MODE > CONTROL > CB CONTROL

The CB control (CB CONTROL) menu allows CB open control/CB close control.
This item can be selected for implementing CB control only in the SETTING mode.

For CB control, the control mode settings must be as shown in the table below.
For details about control mode operation, refer to 5.3.4.2.1.
For details about the CB control functions including other conditions required for CB control, refer to Chapter 9.

Table 5-12 Control mode settings when CB Control is executed

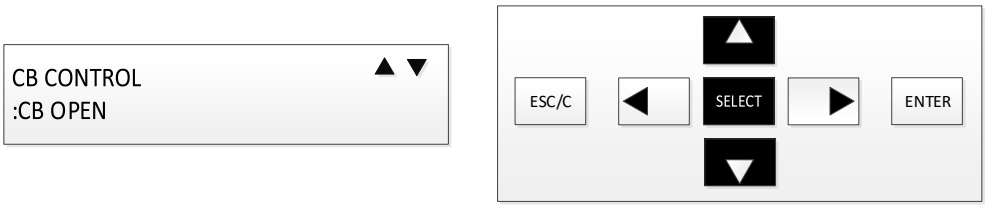
・CB open control

Item	Setting value	Description of the setting value
REMOTE/LOCAL	L	Set to the local state.
INTERLOCK	UNUSE	Set to the interlock unuse state.
CB OPEN	UNBLK	Set to the CB open control operation block resetting state. Set to UNBLK to enable CB open control.

・CB close control

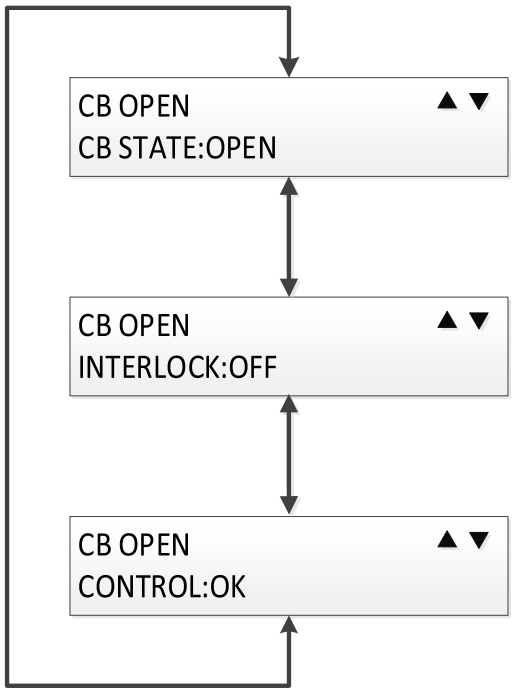
Item	Setting value	Description of the setting value
REMOTE/LOCAL	L	Set to the local state.
INTERLOCK	UNUSE	Set to the interlock unuse state.
CB CLOSE	UNBLK	Set to the CB close control operation block resetting state. Set to UNBLK to enable CB close control.

1. Use the Up and Down keys to show the CB control setting item to change and press the SELECT key.
   * Select CB OPEN for CB open control and CB CLOSE for CB close control.
   (The figure below shows an example of a screen that appears when CB OPEN is selected.)



Use ▲ and ▼ keys to switch between items and press the SELECT key to select an item.

2. The display switches to the CB status indication screen.
   Press the Up and Down keys to cycle through items of CB status indication.



3. After confirming the CB status, press the ENTER key while the CB status indication screen is shown.
   The following screen appears to confirm whether to execute CB control. Press the SELECT key to execute the control and press the Left key not to execute the control.

   If CB control has been successful, a control success message is displayed.

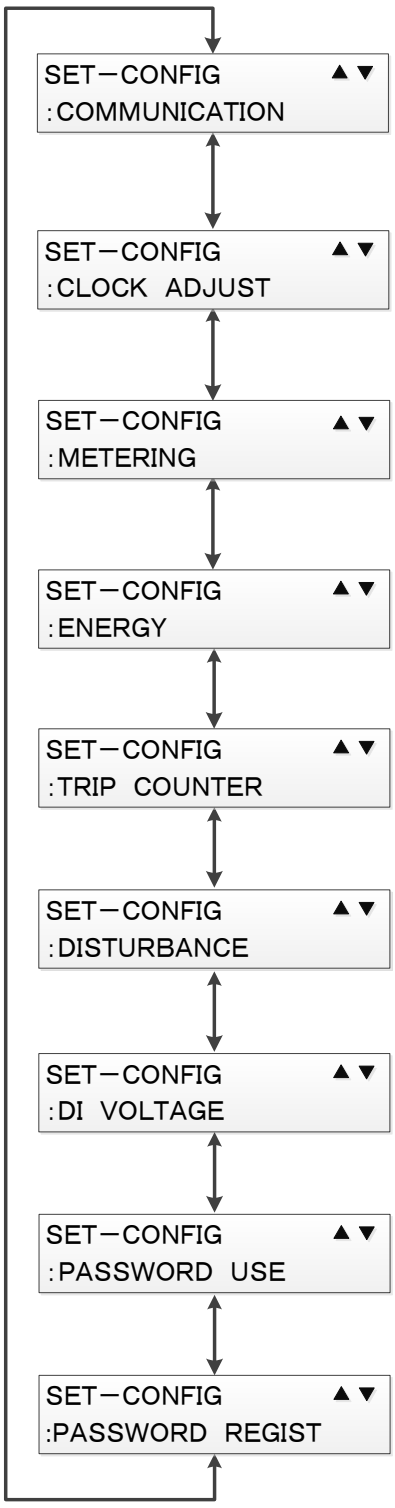
   If CB control has been unsuccessful, a control failure message is displayed.

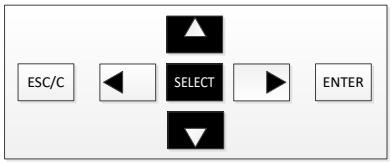
   If the control mode is not set as specified in Table 5-12 or if control condition is not satisfied, an error message as shown below is displayed.

   Pressing the SELECT key while the above control success message, control failure message, or error message is shown brings the display back to the CB control menu.

5.3.4.3. Configuration (CONFIG) menu

This subsection describes the operations for the Configuration (CONFIG) menu.
The Configuration menu can be selected in either DISPLAY or SETTING mode. Clock adjustment (CLOCK ADJUST), Password use/unuse (PASSWORD USE) and Password registration (PASSWORD REGIST) can be selected only in the SETTING mode.
The other settings can be changed in the SETTING mode only.
(The DISPLAY mode only allows viewing of the setting values)





Use ▲ and ▼ to switch between items and press SELECT to select an item.

5.3.4.3.1. Communication setting (COMMUNICATION) menu

[Operation path] SETTING MODE > CONFIG > COMMUNICATION

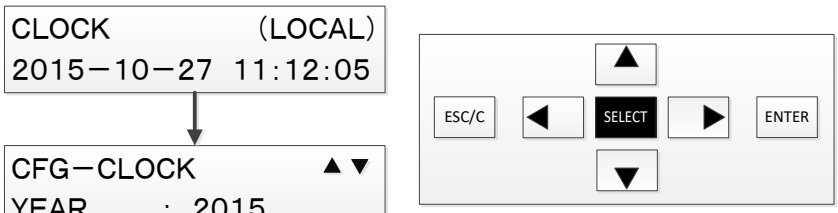
In regard to the standard products, there is no communication function.
In this menu, the message "NONE" appears on the display.

5.3.4.3.2. Clock adjustment (CLOCK ADJUST) menu

[Operation path] SETTING MODE > CONFIG > CLOCK ADJUST

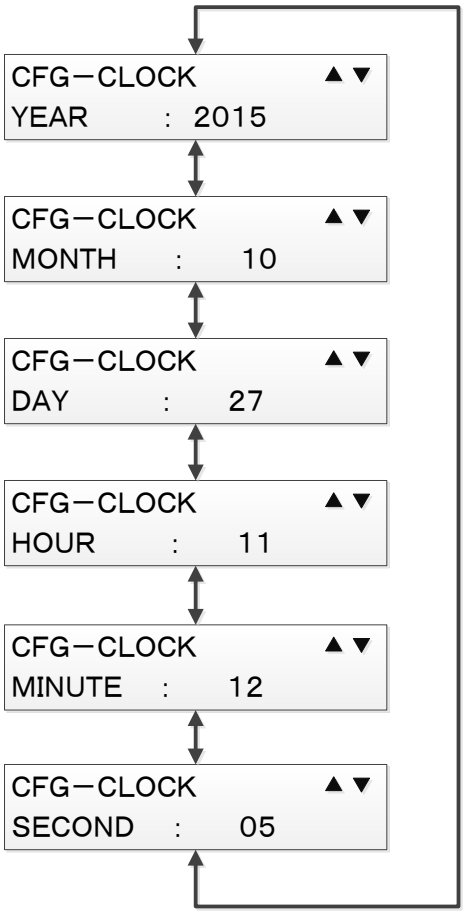
The Clock adjustment (CLOCK ADJUST) menu allows time setting.
This item can be selected only in the SETTING mode.

1. When the Clock adjustment menu is selected, the current time is indicated as shown below.
   Pressing SELECT while this screen is shown allows changing of the year, month, day, hour, minute and second settings.



Press SELECT to select an item

2. Pressing the Up and Down keys cycles through the year, month, day, hour, minute and second selection items. Select the item to change and press SELECT.



3. The cursor moves to the setting value. Use the Up and Down keys to select the value and the Left and Right keys to select the digit to make the change.

4. Press SELECT to change the setting value.

5. Complete setting of all other items to change by repeating steps 1. to 3..

6. Press ENTER and the confirmation message of the time setting appears.
   Press SELECT to apply the time setting changed by steps 1. to 4. and complete the Clock adjustment setting.
   Press the Left key to go back to the Clock adjustment menu without applying the setting changes.

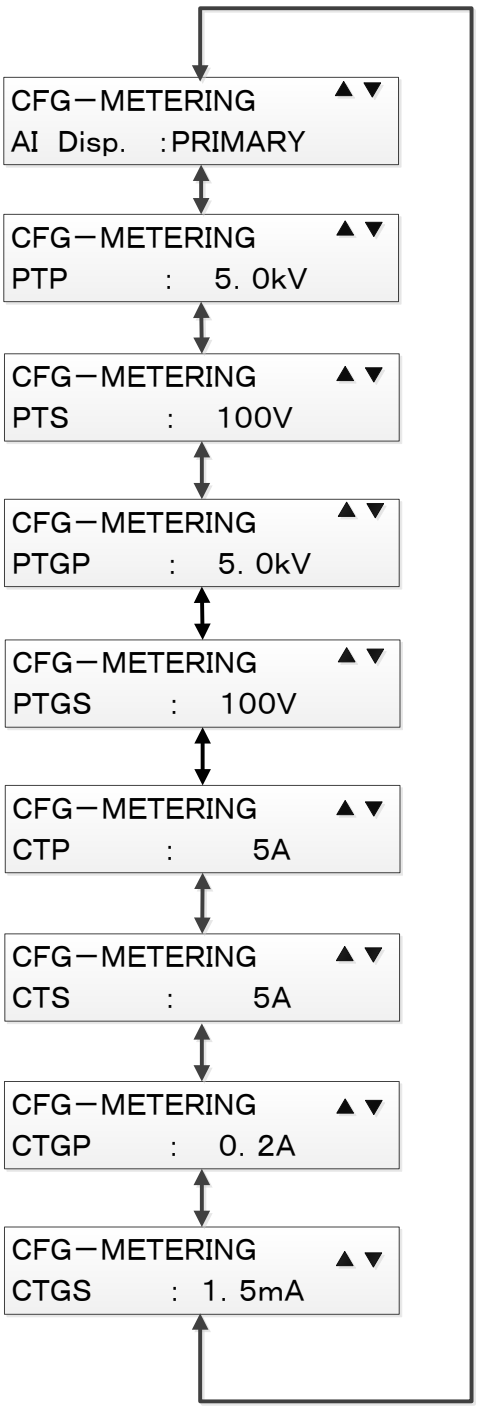
5.3.4.3.3. Analog value display switching (METERING) menu

[Operation path] SETTING MODE > CONFIG > METERING

The Analog value display switching (METERING) menu allows configuration of the following settings.

(1) Set the indication type from the primary or secondary side of CT/VT
(2) Set the rating of CT/VT.
(The DISPLAY mode only allows viewing of the setting values)

The following describes the operation procedure for viewing and changing the settings for the Measurement value display switching menu.



Note: This is an example.

1. Use the Up and Down keys to select the item to change and press SELECT for selection.

2. The cursor moves to the setting value. Use the Up and Down keys to select the value and the Left and Right keys to select the digit to make the change.

3. Press SELECT to change the setting value.

4. Complete setting of all other items to change by repeating steps 1. to 3..

5. Press ENTER and the confirmation message of the new measurement settings appears as shown in the figure below.
   Press SELECT to apply the measurement value settings changed by steps 1. to 4. and complete the setting.
   Press the Left key to go back to the Analog value display switching menu without applying the setting changes.

Table 5-13 Setting items of analog value display

- CGP1-A41D1

No.	Item	Setting description	Setting range	Unit
1	AI Disp	AI display primary value / secondary value selection	PRIMARY / SECONDARY	―
2	PTP	VT primary side rating	0.1 ~ 500.0	kV
3	PTS	VT secondary side rating	100 ~ 125	V
4	PTGP	EVT primary side rating	0.1 ~ 500.0	kV
5	PTGS	EVT tertiary side rating	100 ~ 220	V
6	CTP	CT primary side rating	5 ~ 30000	A
7	CTS	CT secondary side rating	5 (fixed value)	A
8	CTGP	Zero-sequence current primary side rating	0.1 ~ 100.0	A
9	CTGS	Zero-sequence current secondary side rating	1.5 (fixed value)	mA

- CGP1-A42D1

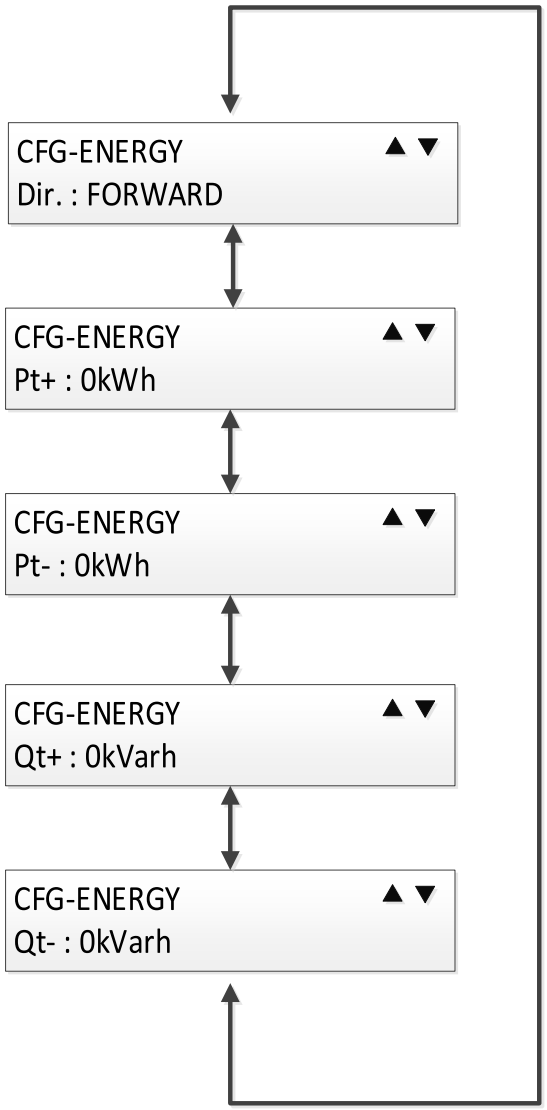
No.	Item	Setting description	Setting range	Unit
1	AI Disp	AI display primary value / secondary value selection	PRIMARY / SECONDARY	―
2	PTP	VT primary side rating	0.1 ~ 500.0	kV
3	PTS	VT secondary side rating	100 ~ 125	V
4	CTP	CT primary side rating	5 ~ 30000	A
5	CTS	CT secondary side rating	5 (fixed value)	A
6	CTGP	Zero-sequence current primary side rating	5 ~ 30000	A
7	CTGS	Zero-sequence current secondary side rating	5 (fixed value)	A

5.3.4.3.4. Electric energy (ENERGY) menu

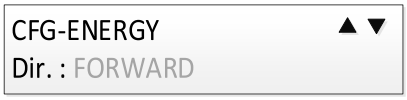
[Operation path] SETTING MODE > CONFIG > ENERGY

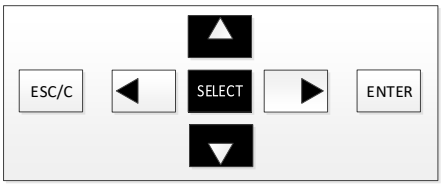
The Electric energy (ENERGY) menu allows configuration of the following settings.

(1) Setting of the power flow direction in electric energy indication
(2) Setting of the respective electric energy initial values to the desired ones
(The DISPLAY mode only allows viewing of the setting values)



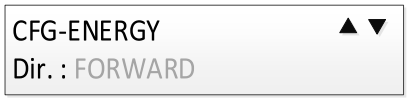
1. Use the Up and Down keys to show the item to change and press the SELECT key.





Use ▲ and ▼ keys to switch between items and press the SELECT key to select an item.

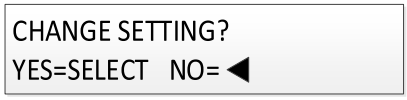
2. The cursor moves to the setting value.
   For a numeric value setting, use the Up and Down keys to change the value and the Left and Right keys to select the digit to change.
   For selection setting, use the Up and Down keys to select the setting.



3. Press the SELECT key to change the setting value.

4. Repeat steps 1 to 3 until there are no more items you want to change.

5. Press the ENTER key, and a message as shown in the figure below appears to confirm application of the electric energy settings that were just changed.
   Press the SELECT key to apply the electric energy settings that were just changed by steps 1 to 4 and complete the electric energy setting.



   Press the Left key to go back to the Electric energy menu without applying the settings that were just changed.

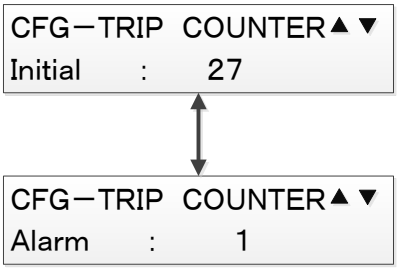
Table 5-14 Setting Items of Electric energy

No.	Item	Setting description	Setting range	Unit
1	Dir.	Electric energy power flow direction	FORWARD / REVERSE	-
2	Pt+	+PT initial value	0 ~ 999999999	kWh
3	Pt-	-Pt initial value	0 ~ 999999999	kWh
4	Qt+	+Qt initial value	0 ~ 999999999	kVarh
5	Qt-	-Qt initial value	0 ~ 999999999	kVarh

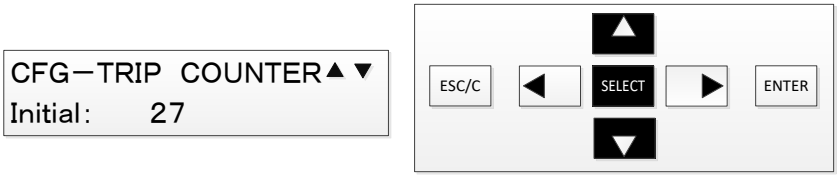
5.3.4.3.5. Trip counter (TRIP COUNTER) menu

[Operation path] SETTING MODE > CONFIG > TRIP COUNTER

The Trip counter (TRIP COUNTER) menu allows setting of the initial counter and alarm counter values. The trip counter will count the number of trip times.
(The DISPLAY mode only allows viewing of the setting values)

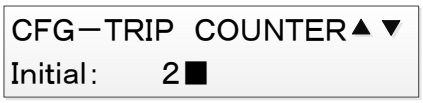


1. The trip counter setting menu appears. Use the Up and Down keys to select the item to change and press SELECT.



Use ▲ and ▼ to switch between items and press SELECT to select an item.

2. The cursor moves to the setting value. Use the Up and Down keys to select the value and the Left and Right keys to select the digit to make the change.



3. Press SELECT to change the setting value.

4. Complete setting of all other items to change by repeating steps 1. to 3..

5. Press ENTER and the confirmation message of the trip counter settings appears.
Press SELECT to apply the trip counter settings changed by steps 1. to 4. and complete the setting.
Press the Left key to go back to the setting menu in step 1. above without applying the setting changes.

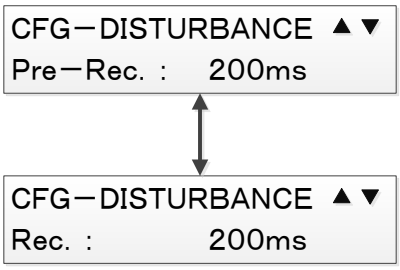
Table 5-15 Setting items of trip counter

No.	Item	Setting description	Setting range	Unit
1	Initial	Initial value of trip counter	0~10000	Times
2	Alarm	Alarm value of trip counter	1~10000	Times

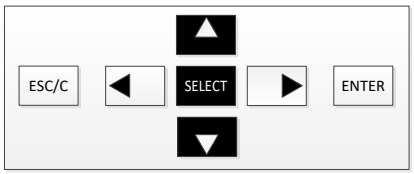
5.3.4.3.6. Disturbance record (DISTURBANCE) menu

[Operation path] SETTING MODE > CONFIG > DISTURBANCE

The Disturbance record (DISTURBANCE) menu allows setting of maximum recording time and pre-fault recording time of each disturbance (fault) record.
(The DISPLAY mode only allows viewing of the setting values)



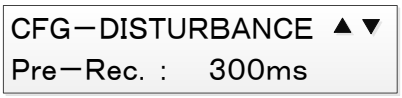
1. Use the Up and Down keys to select the item to change and press SELECT.



Use ▲ and ▼ to switch between items and press SELECT to select an item.

2. The cursor moves to the setting value. Use the Up and Down keys to select the value and the Left and Right keys to select the digit to make the change.

3. Press SELECT to change the setting value.



4. Complete setting of all other items to change by repeating steps 1. to 3..

5. Press ENTER and the message to confirm application of the disturbance record time settings appears. Press SELECT to apply the disturbance record time settings changed by steps 1. to 4. and complete the setting.
Press the Left key to go back to the setting menu in step 1. above without applying the setting changes.

Table 5-16 Setting items of disturbance record time

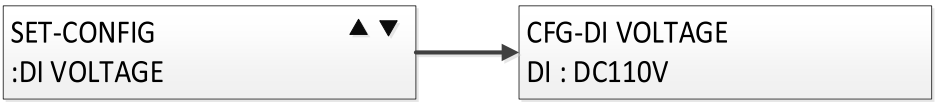
No.	Item	Setting description	Setting range	Unit
1	Pre-Rec.	Save time of pre-fault waveform data	100 ~ 4500	ms
2	Rec.	Save time of waveform data	200 ~ 5000	ms

Note: The save time of “Pre-Rec.” is included in that of “Rec.”.
In other words, the setting value of “Rec.” must be larger than that of “Pre-Rec.”.

5.3.4.3.7. DI voltage (DI VOLTAGE) menu

[Operation path] SETTING MODE > CONFIG > DI VOLTAGE

The DI voltage (DI VOLTAGE) menu allows setting of the DI rated voltage.
(The DISPLAY mode only allows viewing of the setting values)



1. In the DI voltage setting menu, display the item “DI” and press the SELECT key.
   * The DI voltage setting menu has one item: “DI”

Press the SELECT key to select an item.

2. The cursor moves to the setting value. Use the Up and Down keys to select the setting to make the change.

3. Press the SELECT key to change the setting value.

4. Press the ENTER key, and a message appears to confirm application of the DI voltage setting value that was just changed.
   Press the SELECT key to apply the DI voltage setting value and complete the setting.

Press the Left key to go back to the DI voltage setting menu without applying the setting that was just changed.

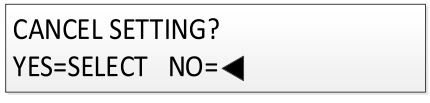


Table 5-17 Setting item of DI voltage

No.	Item	Setting description	Setting
1	DI	DI voltage setting	DC 110 / 220V

5.3.4.3.8. Password use/unuse (PASSWORD USE) menu

[Operation path] SETTING MODE > CONFIG > PASSWORD USE

The Password use/unuse (PASSWORD USE) menu specifies whether to use or not use a password input when the SETTING mode is selected.
(This item is not shown in the DISPLAY mode)

1. In the Password use/unuse menu, press SELECT.

Press SELECT to select an item

2. The cursor moves to the setting value. Use the Up and Down keys to select the setting to be changed.

3. Press SELECT to change the setting value.

4. Press ENTER and the confirmation message of the password use/unuse setting changed appears as shown in the figure below.
   Press SELECT to apply the password use/unuse setting and complete the setting.
   Press the Left key to go back to the setting menu in step 1. above without applying the setting changes.

Table 5-18 Setting item of Password use/unuse

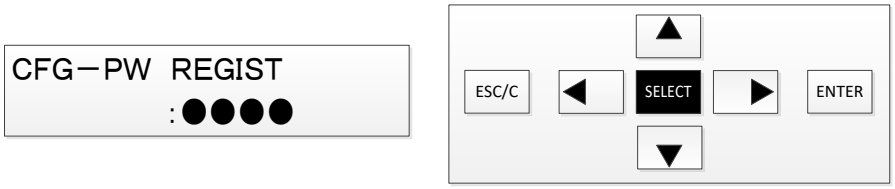
No.	Item	Setting description	Setting
1	PASSWORD	Password use/unuse setting	USE / UNUSE

5.3.4.3.9. Password registration (PASSWORD REGIST) menu

[Operation path] SETTING MODE > CONFIG > PASSWORD REGIST

The Password registration (PASSWORD REGIST) menu allows the setting of the password input when the SETTING mode is selected.
(This item is not shown in the DISPLAY mode)

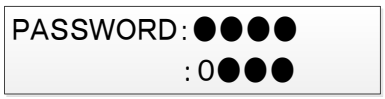
1. In the Password registration menu, press SELECT.



Press SELECT to select an item

2. The Password registration screen appears.
   For registering a password, press SELECT after each digit is entered.
   Pressing SELECT confirms the value for the digit entered and moves the cursor to the digit on the right.
   It is not possible to return to the previous digit by using the Left key.
   Use the Up and Down keys to select a value out of 0 to 9 for each digit.

3. When the four digits have been entered, password input is requested again.
   Enter the same password as that registered in step 2 above.

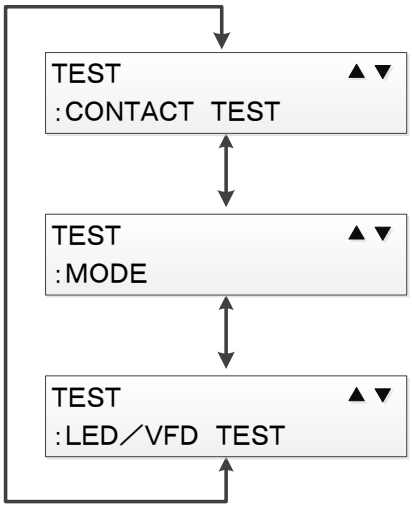


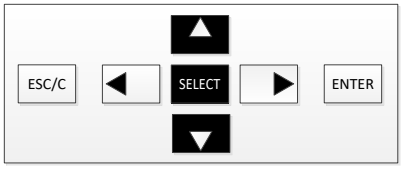
4. If the above two password-inputs in steps 2 and 3 are same, the screen shown in step 1 appears.
   Press ENTER and the confirmation message of the password registration appears.
   Press SELECT to apply the password registration and complete the setting.
   Press the Left key to go back to the setting menu in step 1. above without applying the setting changes.

If the two password-inputs in steps 2 and 3 are not same, an error message as shown below appears.

5.3.4.4. TEST menu

This subsection describes the operations for the Test menu.
The Test menu can be selected only in the SETTING mode.





Use ▲ and ▼ to switch between items
and press SELECT to select an item

5.3.4.4.1. DO contact test (CONTACT TEST) menu

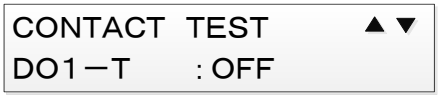
[Operation path] SETTING MODE > TEST > CONTACT TEST

The DO contact test (CONTACT TEST) menu allows contact testing of DO signals (DO1 to DO13).

1. When the DO contact test menu has been selected, the caution message appears.

When pressing SELECT, the next message appears. Then, press “SELECT” again.

2. The setting screen for the DO contact test appears.
Use the Up and Down keys to select the item to set and press SELECT.



3. The cursor moves to the setting of the selected item.
   Use the Up and Down keys to switch the setting.
   Select ON to conduct a contact test on the selected DO. If not, select OFF.

4. Press SELECT to change the setting and bring the cursor back to the item name.

5. Complete settings of all the items to change by repeating steps 2. to 4. above.

6. After the settings are completed, press ENTER while the setting item selection screen in step 4 is shown in order to operate DO contact test.
   *The selected DO contact(s) is(are) operated while ENTER is held down. The operation of the respective DO contact corresponds to the settings in steps (2) to (5) above.

   To exit the DO contact test setting screen, press the Left key.

Table 5-19 Setting items of DO contact test

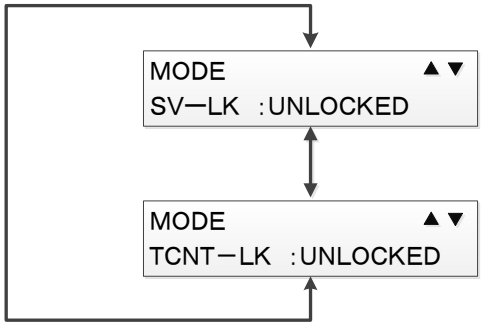
No.	Item
1	DO1-T
2	DO2-T
3	DO3-T
4	DO4-T
5	DO5-T
6	DO6-T
7	DO7-T
8	DO8-T
9	DO9-T
10	DO10-T
11	DO11-T
12	DO12-T
13	DO13-T

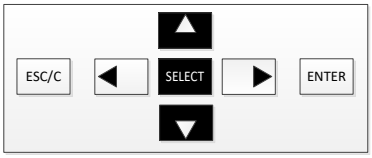
5.3.4.4.2. Test mode (MODE) menu

[Operation path] SETTING MODE > TEST > MODE

The Test mode (MODE) menu allows setting of the test mode.

1. Use the Up and Down keys to select the item to set and press SELECT.





Use ▲ and ▼ to switch between items and press SELECT to select an item.

2. The cursor moves to the setting of the selected item. Use the Up and Down keys to switch the setting.

3. Press SELECT to change the setting.

4. Complete setting of all other items to change by repeating steps 1. to 3. above.

5. Press ENTER to be enable the test mode as set in steps 1. to 4. above.
The RUN LED flashes during the test mode.

Caution

During the test mode, use of the Left or ESC key to exit the SETTING mode is disabled.
(Operations implemented in the SETTING mode are enabled)
When turning off the VFD screen or moving to the DISPLAY mode, it exits the test mode.

5.3.4.4.3. LED/VFD lighting test (LED/VFD TEST) menu

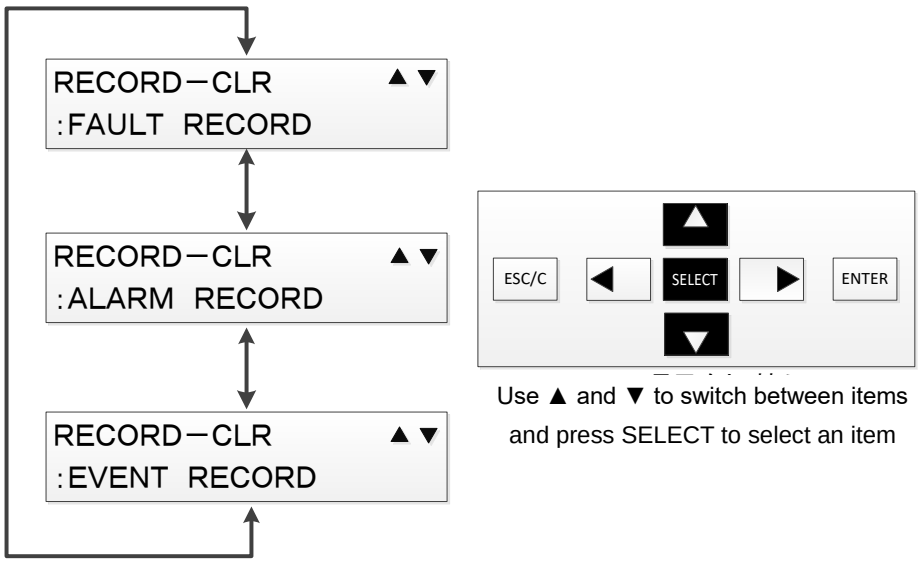
[Operation path] SETTING MODE > TEST > LED/VFD TEST

The LED/VFD lighting test (LED/VFD TEST) menu allows lighting of all LEDs/VFDs.

When LED/VFD TEST is selected in the Test menu, a screen as shown below appears.
Pressing ENTER and all LEDs and VFDs are lighting while the key is held down.
It can be checked the LED/VFD indication visually.

5.3.4.5. Clear record (RECORD-CLR) menu

The Clear record (RECORD-CLR) menu allows clearing three types of log data: fault, event and alarm records.
*Access record log data cannot be cleared.



5.3.4.5.1. Clear fault record (FAULT REC CLEAR) menu

[Operation path] SETTING MODE > RECORD-CLR > FAULT RECORD

The Clear fault record (FAULT REC CLEAR) menu allows clearing of fault records.
In the Clear record menu, select FAULT RECORD and press ENTER. Then, the next screen appears.
Press SELECT to clear the fault records.
When pressing the Left key, the display returns to the selection screen of Clear record menu without clearing the fault records.

When clearing of the fault records are completed, the display returns to the Clear record menu.
If the clearing is unsuccessful, a message screen as shown below appears.
Pressing SELECT while the message below is shown brings the display back to the Clear record menu selection screen.

5.3.4.5.2. Clear alarm record (ALARM REC CLEAR) menu

[Operation path] SETTING MODE > RECORD-CLR > ALARM RECORD

The Clear alarm record (ALARM REC CLEAR) menu allows clearing of alarm records.
In the Clear record menu, select ALARM RECORD and press ENTER. Then, the next screen appears.
Press SELECT to clear the alarm records.
When pressing the Left key, the display returns to the selection screen of Clear record menu without clearing the alarm records.

When clearing of the alarm records are completed, the display returns to the Clear record menu.
If the clearing is unsuccessful, a message screen as shown below appears.
Pressing SELECT while the message below is shown brings the display back to the Clear record menu selection screen.

5.3.4.5.3. Clear event record (EVENT REC CLEAR) menu

[Operation path] SETTING MODE > RECORD-CLR > EVENT RECORD

The Clear event record (EVENT REC CLEAR) menu allows clearing of event records.
In the Clear record menu, select EVENT RECORD and press ENTER. Then, the next screen appears.
Press SELECT to clear the event records.
When pressing the Left key, the display returns to the selection screen of Clear record menu without clearing the event records.

When clearing of the event records are completed, the display returns to the Clear record menu.
If the clearing is unsuccessful, a message screen as shown below appears.
Pressing SELECT while the message below is shown brings the display back to the Clear record menu selection screen.

6. PC-HMI

PC-HMI is a software for setting, configuration, and supervision of this relay.
The software can be downloaded on the web site of Mitsubishi Electric FA (Factory Automation).
The operation method is described in a separate volume. Please refer to the following document.

Title of document	Document No.
MELPRO-D Series Protection Relay PC-HMI Instruction Manual	JEP0-IL9504

In regard to PLC signals, refer to Table 6-1 and Table 6-2.

Table 6-1 PLC signals of CGP1-A41D1

Signal name	Description
DI1	Status of DI1
DI2	Status of DI2
DI3	Status of DI3
DI4	Status of DI4
DI5	Status of DI5
DI6	Status of DI6
DI7	Status of DI7
DI8	Status of DI8
VD/	Definitive signal of voltage detection (84) element
F_UV	Undervoltage for locking of underfrequency / overfrequency (95L/H) element
TCNT_ALM	Alarm of trip counter
MANU_CLS	Command of CB close
MANU_OPN	Command of CB open
OC1-AD	Detection signal of 1st instantaneous overcurrent (50) element on A phase
OC1-CD	Detection signal of 1st instantaneous overcurrent (50) element on C phase
OC2-AD	Detection signal of 2nd instantaneous overcurrent (50) element on A phase
OC2-CD	Detection signal of 2nd instantaneous overcurrent (50) element on C phase
OC3-AD	Detection signal of 3rd instantaneous overcurrent (50) element on A phase
OC3-CD	Detection signal of 3rd instantaneous overcurrent (50) element on C phase
OC4-AD	Detection signal of definite time or IDMT overcurrent (51) element on A phase
OC4-CD	Detection signal of definite time or IDMT overcurrent (51) element on C phase
UBC1-D	Detection signal of 1st unbalance current (46) element
UBC2-D	Detection signal of 2nd unbalance current (46) element
DIRG1-D	Detection signal of 1st directional ground fault (67G) element
DIRG2-D	Detection signal of 2nd directional ground fault (67G) element
RP1-D	Detection signal of 1st reverse power (67P) element
RP2-D	Detection signal of 2nd reverse power (67P) element
UV1-ABD	Detection signal of 1st undervoltage (27) element on AB phase
UV1-BCD	Detection signal of 1st undervoltage (27) element on BC phase
UV1-CAD	Detection signal of 1st undervoltage (27) element on CA phase
UV2-ABD	Detection signal of 2nd undervoltage (27) element on AB phase
UV2-BCD	Detection signal of 2nd undervoltage (27) element on BC phase
UV2-CAD	Detection signal of 2nd undervoltage (27) element on CA phase
OV1-D	Detection signal of 1st overvoltage (59) element
OV2-D	Detection signal of 2nd overvoltage (59) element
OVG1-D	Detection signal of 1st ground fault overvoltage (64) element
OVG2-D	Detection signal of 2nd ground fault overvoltage (64) element
VD-D	Detection signal of voltage detection (84) element
UF1-D	Detection signal of 1st underfrequency (95L) element
UF2-D	Detection signal of 2nd underfrequency (95L) element
OF1-D	Detection signal of 1st overfrequency (95H) element
OF2-D	Detection signal of 2nd overfrequency (95H) element
ALARM	Abnormal condition of constant supervision (serious failure)
ALARM-L	Abnormal condition of constant supervision (minor failure)
RY-LOCK	Locking of relay
RESET	Reset signal (activated by pushing ESC/C button for more than 3 seconds)
INTER1	1st intermediate output signal of PLC

INTER2	2nd intermediate output signal of PLC
INTER3	3rd intermediate output signal of PLC
INTER4	4th intermediate output signal of PLC
INTER5	5th intermediate output signal of PLC
INTER6	6th intermediate output signal of PLC
INTER7	7th intermediate output signal of PLC
INTER8	8th intermediate output signal of PLC
OC1-3D_O	Detection signal of any OC1 of A and C phase
OC2-3D_O	Detection signal of any OC2 of A and C phase
OC3-3D_O	Detection signal of any OC3 of A and C phase
OC4-3D_O	Detection signal of any OC4 of A and C phase
UV1-3D_O	Detection signal of any UV1 of AB, BC, and CA phase
UV2-3D_O	Detection signal of any UV2 of AB, BC, and CA phase
HOC-AD_O	Detection signal of any of OC1, OC2, and OC3 on A phase
HOC-CD_O	Detection signal of any of OC1, OC2, and OC3 on C phase
HOC-3D_O	Detection signal of any of OC1, OC2, and OC3 on all phase (OR of all instantaneous overcurrent elements)
OC-3D_O	Detection signal of any of overcurrent elements on A and C phase
UBC-D_O	Detection signal of UBC1 or UBC2 elements
UV-3D_O	Detection signal of any of undervoltage elements on AB, BC, and CA phase
OV-D_O	Detection signal of OV1 or OV2 elements
OVG-D_O	Detection signal of OVG1 or OVG2 elements
UF-D_O	Detection signal of UF1 or UF2 elements
OF-D_O	Detection signal of OF1 or OF2 elements
RP-D_O	Detection signal of RP1 or RP2 elements
ALLEL-D_O	Detection signal of any of all elements except for VD element (OR of all detection signals except for VD element)
OC1-3T_O	“OC1_A-T” OR “OC1_C-T”
OC2-3T_O	“OC2_A-T” OR “OC2_C-T”
OC3-3T_O	“OC3_A-T” OR “OC3_C-T”
OC4-3T_O	“OC4_A-T” OR “OC4_C-T”
UV1-3T_O	“UV1_AB-T” OR “UV1_BC-T” OR “UV1_CA-T”
UV2-3T_O	“UV2_AB-T” OR “UV2_BC-T” OR “UV2_CA-T”
HOC-AT_O	“OC1_A-T” OR “OC2_A-T” OR “OC3_A-T”
HOC-CT_O	“OC1_C-T” OR “OC2_C-T” OR “OC3_C-T”
HOC-3T_O	“HOC-AT_O” OR “HOC-CT_O”
OC-3T_O	“OC1-3T_O” OR “OC2-3T_O” OR “OC3-3T_O” OR “OC4-3T_O”
UBC-T_O	“UBC1-T” OR “UBC2-T”
DIRG-T_O	“DIRG1-T” OR “DIRG2-T”
UV-3T_O	“UV1-3T_O” OR “UV2-3T_O”
OV-T_O	“OV1-T” OR “OV2-T”
OVG-T_O	“OVG1-T” OR “OVG2-T”
UF-T_O	“UF1-T” OR “UF2-T”
OF-T_O	“OF1-T” OR “OF2-T”
RP-T_O	“RP1-T” OR “RP2-T”
OC/UB/DG/P	“OC-3T_O” OR “UBC-T_O” OR “DIRG-T_O” OR “RP-T_O”
UV/OV/OVG	“UV-3T_O” OR “OV-T_O” OR “OVG-T_O”
UF/OF	“UF-T_O” OR “OF-T_O”
ALLEL-O	OR of all “Definitive signal AND Operation lock signal” except for VD element

UV1-3D_A	Detection signal of all UV1 of AB, BC, and CA phase (AND of all UV1 detection signals)
UV2-3D_A	Detection signal of all UV2 of AB, BC, and CA phase (AND of all UV2 detection signals)
UV1-3T_A	“UV1_AB-T” AND “UV1_BC-T” AND “UV1_CA-T”
UV2-3T_A	“UV2_AB-T” AND “UV2_BC-T” AND “UV2_CA-T”
OC1-A	“OC1_A-T” or forced operation from PC-HMI
OC1-C	“OC1_C-T” or forced operation from PC-HMI
OC2-A	“OC2_A-T” or forced operation from PC-HMI
OC2-C	“OC2_C-T” or forced operation from PC-HMI
OC3-A	“OC3_A-T” or forced operation from PC-HMI
OC3-C	“OC3_C-T” or forced operation from PC-HMI
OC4-A	“OC4_A-T” or forced operation from PC-HMI
OC4-C	“OC4_C-T” or forced operation from PC-HMI
OC4-3_O	“OC4-3T_O” or forced operation from PC-HMI
UBC1	“UBC1-T” or forced operation from PC-HMI
UBC2	“UBC2-T” or forced operation from PC-HMI
DIRG1	“DIRG1-T” or forced operation from PC-HMI
DIRG2	“DIRG2-T” or forced operation from PC-HMI
RP1	“RP1-T” or forced operation from PC-HMI
RP2	“RP2-T” or forced operation from PC-HMI
UV1-AB	“UV1_AB-T” or forced operation from PC-HMI
UV1-BC	“UV1_BC-T” or forced operation from PC-HMI
UV1-CA	“UV1_CA-T” or forced operation from PC-HMI
UV2-AB	“UV2_AB-T” or forced operation from PC-HMI
UV2-BC	“UV2_BC-T” or forced operation from PC-HMI
UV2-CA	“UV2_CA-T” or forced operation from PC-HMI
OV1	“OV1-T” or forced operation from PC-HMI
OV2	“OV2-T” or forced operation from PC-HMI
OVG1	“OVG1-T” or forced operation from PC-HMI
OVG2	“OVG2-T” or forced operation from PC-HMI
VD	“VD/” or forced operation from PC-HMI
UF1	“UF1-T” or forced operation from PC-HMI
UF2	“UF2-T” or forced operation from PC-HMI
OF1	“OF1-T” or forced operation from PC-HMI
OF2	“OF2-T” or forced operation from PC-HMI
HOC-A_O	“HOC-AT_O” or forced operation from PC-HMI
HOC-C_O	“HOC-CT_O” or forced operation from PC-HMI
HOC-3_O	“HOC-3T_O” or forced operation from PC-HMI
OPLK-OC1	Operation lock on OC1 element
OPLK-OC2	Operation lock on OC2 element
OPLK-OC3	Operation lock on OC3 element
OPLK-OC4	Operation lock on OC4 element
OPLK-UBC1	Operation lock on UBC1 element
OPLK-UBC2	Operation lock on UBC2 element
OPLK-DG1	Operation lock on DIRG1 element
OPLK-DG2	Operation lock on DIRG2 element
OPLK-UV1	Operation lock on UV1 element
OPLK-UV2	Operation lock on UV2 element
OPLK-OV1	Operation lock on OV1 element

OPLK-OV2	Operation lock on OV2 element
OPLK-OVG1	Operation lock on OVG1 element
OPLK-OVG2	Operation lock on OVG2 element
OPLK-UF1	Operation lock on UF1 element
OPLK-UF2	Operation lock on UF2 element
OPLK-OF1	Operation lock on OF1 element
OPLK-OF2	Operation lock on OF2 element
OPLK-RP1	Operation lock on RP1 element
OPLK-RP2	Operation lock on RP2 element
OC1_A-T	“Definitive signal of OC1 on A phase” AND “Operation lock signal”
OC1_C-T	“Definitive signal of OC1 on C phase” AND “Operation lock signal”
OC2_A-T	“Definitive signal of OC2 on A phase” AND “Operation lock signal”
OC2_C-T	“Definitive signal of OC2 on C phase” AND “Operation lock signal”
OC3_A-T	“Definitive signal of OC3 on A phase” AND “Operation lock signal”
OC3_C-T	“Definitive signal of OC3 on C phase” AND “Operation lock signal”
OC4_A-T	“Definitive signal of OC4 on A phase” AND “Operation lock signal”
OC4_C-T	“Definitive signal of OC4 on C phase” AND “Operation lock signal”
UBC1-T	“Definitive signal of UBC1” AND “Operation lock signal”
UBC2-T	“Definitive signal of UBC2” AND “Operation lock signal”
DIRG1-T	“Definitive signal of DIRG1” AND “Operation lock signal”
DIRG2-T	“Definitive signal of DIRG2” AND “Operation lock signal”
RP1-T	“Definitive signal of RP1” AND “Operation lock signal”
RP2-T	“Definitive signal of RP2” AND “Operation lock signal”
UV1_AB-T	“Definitive signal of UV1 on AB phase” AND “Operation lock signal”
UV1_BC-T	“Definitive signal of UV1 on BC phase” AND “Operation lock signal”
UV1_CA-T	“Definitive signal of UV1 on CA phase” AND “Operation lock signal”
UV2_AB-T	“Definitive signal of UV2 on AB phase” AND “Operation lock signal”
UV2_BC-T	“Definitive signal of UV2 on BC phase” AND “Operation lock signal”
UV2_CA-T	“Definitive signal of UV2 on CA phase” AND “Operation lock signal”
OV1-T	“Definitive signal of OV1” AND “Operation lock signal”
OV2-T	“Definitive signal of OV2” AND “Operation lock signal”
OVG1-T	“Definitive signal of OVG1” AND “Operation lock signal”
OVG2-T	“Definitive signal of OVG2” AND “Operation lock signal”
UF1-T	“Definitive signal of UF1” AND “Operation lock signal”
UF2-T	“Definitive signal of UF2” AND “Operation lock signal”
OF1-T	“Definitive signal of OF1” AND “Operation lock signal”
OF2-T	“Definitive signal of OF2” AND “Operation lock signal”
OC1_A-TL	Latch signal of OC1_A-T (*)
OC1_C-TL	Latch signal of OC1_C-T (*)
OC2_A-TL	Latch signal of OC2_A-T (*)
OC2_C-TL	Latch signal of OC2_C-T (*)
OC3_A-TL	Latch signal of OC3_A-T (*)
OC3_C-TL	Latch signal of OC3_C-T (*)
OC4_A-TL	Latch signal of OC4_A-T (*)
OC4_C-TL	Latch signal of OC4_C-T (*)
UBC1-TL	Latch signal of UBC1-T (*)
UBC2-TL	Latch signal of UBC2-T (*)
DIRG1-TL	Latch signal of DIRG1-T (*)
DIRG2-TL	Latch signal of DIRG2-T (*)
RP1-TL	Latch signal of RP1-T (*)

RP2-TL	Latch signal of RP2-T (*)
UV1_AB-TL	Latch signal of UV1_AB-T (*)
UV1_BC-TL	Latch signal of UV1_BC-T (*)
UV1_CA-TL	Latch signal of UV1_CA-T (*)
UV2_AB-TL	Latch signal of UV2_AB-T (*)
UV2_BC-TL	Latch signal of UV2_BC-T (*)
UV2_CA-TL	Latch signal of UV2_CA-T (*)
OV1-TL	Latch signal of OV1-T (*)
OV2-TL	Latch signal of OV2-T (*)
OVG1-TL	Latch signal of OVG1-T (*)
OVG2-TL	Latch signal of OVG2-T (*)
UF1-TL	Latch signal of UF1-T (*)
UF2-TL	Latch signal of UF2-T (*)
OF1-TL	Latch signal of OF1-T (*)
OF2-TL	Latch signal of OF2-T (*)

(*) Note: The latch signal can be reset by pushing ESC/C button for more than 3 seconds.

Table 6-2 PLC signals of CGP1-A42D1

Signal name	Description
DI1	Status of DI1
DI2	Status of DI2
DI3	Status of DI3
DI4	Status of DI4
DI5	Status of DI5
DI6	Status of DI6
DI7	Status of DI7
DI8	Status of DI8
VD/	Definitive signal of voltage detection (84) element
F_UV	Undervoltage for locking of underfrequency / overfrequency (95L/H) element
TCNT_ALM	Alarm of trip counter
MANU_CLS	Command of CB close
MANU_OPN	Command of CB open
OC1-AD	Detection signal of 1st instantaneous overcurrent (50) element on A phase
OC1-BD	Detection signal of 1st instantaneous overcurrent (50) element on B phase
OC1-CD	Detection signal of 1st instantaneous overcurrent (50) element on C phase
OC1-GD	Detection signal of 1st instantaneous overcurrent (50) element on zero phase
OC2-AD	Detection signal of 2nd instantaneous overcurrent (50) element on A phase
OC2-BD	Detection signal of 2nd instantaneous overcurrent (50) element on B phase
OC2-CD	Detection signal of 2nd instantaneous overcurrent (50) element on C phase
OC2-GD	Detection signal of 2nd instantaneous overcurrent (50) element on zero phase
OC3-AD	Detection signal of 3rd instantaneous overcurrent (50) element on A phase
OC3-BD	Detection signal of 3rd instantaneous overcurrent (50) element on B phase
OC3-CD	Detection signal of 3rd instantaneous overcurrent (50) element on C phase
OC4-AD	Detection signal of definite time or IDMT overcurrent (51) element on A phase
OC4-BD	Detection signal of definite time or IDMT overcurrent (51) element on B phase
OC4-CD	Detection signal of definite time or IDMT overcurrent (51) element on C phase
UBC1-D	Detection signal of 1st unbalance current (46) element
UBC2-D	Detection signal of 2nd unbalance current (46) element
RP1-D	Detection signal of 1st reverse power (67P) element
RP2-D	Detection signal of 2nd reverse power (67P) element
UV1-ABD	Detection signal of 1st undervoltage (27) element on AB phase
UV1-BCD	Detection signal of 1st undervoltage (27) element on BC phase
UV1-CAD	Detection signal of 1st undervoltage (27) element on CA phase
UV2-ABD	Detection signal of 2nd undervoltage (27) element on AB phase
UV2-BCD	Detection signal of 2nd undervoltage (27) element on BC phase
UV2-CAD	Detection signal of 2nd undervoltage (27) element on CA phase
OV1-D	Detection signal of 1st overvoltage (59) element
OV2-D	Detection signal of 2nd overvoltage (59) element
VD-D	Detection signal of voltage detection (84) element
UF1-D	Detection signal of 1st underfrequency (95L) element
UF2-D	Detection signal of 2nd underfrequency (95L) element
OF1-D	Detection signal of 1st overfrequency (95H) element
OF2-D	Detection signal of 2nd overfrequency (95H) element
ALARM	Abnormal condition of constant supervision (serious failure)
ALARM-L	Abnormal condition of constant supervision (minor failure)
RY-LOCK	Locking of relay

RESET	Reset signal (activated by pushing ESC/C button for more than 3 seconds)
INTER1	1st intermediate output signal of PLC
INTER2	2nd intermediate output signal of PLC
INTER3	3rd intermediate output signal of PLC
INTER4	4th intermediate output signal of PLC
INTER5	5th intermediate output signal of PLC
INTER6	6th intermediate output signal of PLC
INTER7	7th intermediate output signal of PLC
INTER8	8th intermediate output signal of PLC
OC1-3D_O	Detection signal of any OC1 of A, B, and C phase
OC2-3D_O	Detection signal of any OC2 of A, B, and C phase
OC3-3D_O	Detection signal of any OC3 of A, B, and C phase
OC4-3D_O	Detection signal of any OC4 of A, B, and C phase
UV1-3D_O	Detection signal of any UV1 of AB, BC, and CA phase
UV2-3D_O	Detection signal of any UV2 of AB, BC, and CA phase
HOC-AD_O	Detection signal of any of OC1, OC2, and OC3 on A phase
HOC-BD_O	Detection signal of any of OC1, OC2, and OC3 on B phase
HOC-CD_O	Detection signal of any of OC1, OC2, and OC3 on C phase
HOC-3D_O	Detection signal of any of OC1, OC2, and OC3 on all phase (OR of all instantaneous overcurrent elements)
OC-3D_O	Detection signal of any of overcurrent elements on A, B, and C phase
OCG-D_O	Detection signal of OCG1 or OCG2 elements
UBC-D_O	Detection signal of UBC1 or UBC2 elements
UV-3D_O	Detection signal of any of undervoltage elements on AB, BC, and CA phase
OV-D_O	Detection signal of OV1 or OV2 elements
UF-D_O	Detection signal of UF1 or UF2 elements
OF-D_O	Detection signal of OF1 or OF2 elements
RP-D_O	Detection signal of RP1 or RP2 elements
ALLEL-D_O	Detection signal of any of all elements except for VD element (OR of all detection signals except for VD element)
OC1-3T_O	“OC1_A-T” OR “OC1_B-T” OR “OC1_C-T”
OC2-3T_O	“OC2_A-T” OR “OC2_B-T” OR “OC2_C-T”
OC3-3T_O	“OC3_A-T” OR “OC3_B-T” OR “OC3_C-T”
OC4-3T_O	“OC4_A-T” OR “OC4_B-T” OR “OC4_C-T”
UV1-3T_O	“UV1_AB-T” OR “UV1_BC-T” OR “UV1_CA-T”
UV2-3T_O	“UV2_AB-T” OR “UV2_BC-T” OR “UV2_CA-T”
HOC-AT_O	“OC1_A-T” OR “OC2_A-T” OR “OC3_A-T”
HOC-BT_O	“OC1_B-T” OR “OC2_B-T” OR “OC3_B-T”
HOC-CT_O	“OC1_C-T” OR “OC2_C-T” OR “OC3_C-T”
HOC-3T_O	“HOC-AT_O” OR “HOC-BT_O” OR “HOC-CT_O”
OC-3T_O	“OC1-3T_O” OR “OC2-3T_O” OR “OC3-3T_O” OR “OC4-3T_O”
OCG-T_O	“OC1_G-T” OR “OC2_G-T”
UBC-T_O	“UBC1-T” OR “UBC2-T”
UV-3T_O	“UV1-3T_O” OR “UV2-3T_O”
OV-T_O	“OV1-T” OR “OV2-T”
UF-T_O	“UF1-T” OR “UF2-T”
OF-T_O	“OF1-T” OR “OF2-T”
RP-T_O	“RP1-T” OR “RP2-T”
OC/UB/P	“OC-3T_O” OR “OCG-T_O” OR “UBC-T_O” OR “RP-T_O”
UV/OV	“UV-3T_O” OR “OV-T_O”

UF/OF	“UF-T_O” OR “OF-T_O”
ALLEL-O	OR of all “Definitive signal AND Operation lock signal” except for VD element
UV1-3D_A	Detection signal of all UV1 of AB, BC, and CA phase (AND of all UV1 detection signals)
UV2-3D_A	Detection signal of all UV2 of AB, BC, and CA phase (AND of all UV2 detection signals)
UV1-3T_A	“UV1_AB-T” AND “UV1_BC-T” AND “UV1_CA-T”
UV2-3T_A	“UV2_AB-T” AND “UV2_BC-T” AND “UV2_CA-T”
OC1-A	“OC1_A-T” or forced operation from PC-HMI
OC1-B	“OC1_B-T” or forced operation from PC-HMI
OC1-C	“OC1_C-T” or forced operation from PC-HMI
OC1-G	“OC1_G-T” or forced operation from PC-HMI
OC2-A	“OC2_A-T” or forced operation from PC-HMI
OC2-B	“OC2_B-T” or forced operation from PC-HMI
OC2-C	“OC2_C-T” or forced operation from PC-HMI
OC2-G	“OC2_G-T” or forced operation from PC-HMI
OC3-A	“OC3_A-T” or forced operation from PC-HMI
OC3-B	“OC3_B-T” or forced operation from PC-HMI
OC3-C	“OC3_C-T” or forced operation from PC-HMI
OC4-A	“OC4_A-T” or forced operation from PC-HMI
OC4-B	“OC4_B-T” or forced operation from PC-HMI
OC4-C	“OC4_C-T” or forced operation from PC-HMI
OC4-3_O	“OC4-3T_O” or forced operation from PC-HMI
UBC1	“UBC1-T” or forced operation from PC-HMI
UBC2	“UBC2-T” or forced operation from PC-HMI
RP1	“RP1-T” or forced operation from PC-HMI
RP2	“RP2-T” or forced operation from PC-HMI
UV1-AB	“UV1_AB-T” or forced operation from PC-HMI
UV1-BC	“UV1_BC-T” or forced operation from PC-HMI
UV1-CA	“UV1_CA-T” or forced operation from PC-HMI
UV2-AB	“UV2_AB-T” or forced operation from PC-HMI
UV2-BC	“UV2_BC-T” or forced operation from PC-HMI
UV2-CA	“UV2_CA-T” or forced operation from PC-HMI
OV1	“OV1-T” or forced operation from PC-HMI
OV2	“OV2-T” or forced operation from PC-HMI
VD	“VD/” or forced operation from PC-HMI
UF1	“UF1-T” or forced operation from PC-HMI
UF2	“UF2-T” or forced operation from PC-HMI
OF1	“OF1-T” or forced operation from PC-HMI
OF2	“OF2-T” or forced operation from PC-HMI
HOC-A_O	“HOC-AT_O” or forced operation from PC-HMI
HOC-B_O	“HOC-BT_O” or forced operation from PC-HMI
HOC-C_O	“HOC-CT_O” or forced operation from PC-HMI
HOC-3_O	“HOC-3T_O” or forced operation from PC-HMI
OPLK-OC1	Operation lock on OC1 element
OPLK-OC2	Operation lock on OC2 element
OPLK-OC3	Operation lock on OC3 element
OPLK-OC4	Operation lock on OC4 element
OPLK-OCG1	Operation lock on OCG1 element
OPLK-OCG2	Operation lock on OCG2 element

OPLK-UBC1	Operation lock on UBC1 element
OPLK-UBC2	Operation lock on UBC2 element
OPLK-UV1	Operation lock on UV1 element
OPLK-UV2	Operation lock on UV2 element
OPLK-OV1	Operation lock on OV1 element
OPLK-OV2	Operation lock on OV2 element
OPLK-UF1	Operation lock on UF1 element
OPLK-UF2	Operation lock on UF2 element
OPLK-OF1	Operation lock on OF1 element
OPLK-OF2	Operation lock on OF2 element
OPLK-RP1	Operation lock on RP1 element
OPLK-RP2	Operation lock on RP2 element
OC1_A-T	“Definitive signal of OC1 on A phase” AND “Operation lock signal”
OC1_B-T	“Definitive signal of OC1 on B phase” AND “Operation lock signal”
OC1_C-T	“Definitive signal of OC1 on C phase” AND “Operation lock signal”
OC1_G-T	“Definitive signal of OC1 on zero phase” AND “Operation lock signal”
OC2_A-T	“Definitive signal of OC2 on A phase” AND “Operation lock signal”
OC2_B-T	“Definitive signal of OC2 on B phase” AND “Operation lock signal”
OC2_C-T	“Definitive signal of OC2 on C phase” AND “Operation lock signal”
OC2_G-T	“Definitive signal of OC2 on zero phase” AND “Operation lock signal”
OC3_A-T	“Definitive signal of OC3 on A phase” AND “Operation lock signal”
OC3_B-T	“Definitive signal of OC3 on B phase” AND “Operation lock signal”
OC3_C-T	“Definitive signal of OC3 on C phase” AND “Operation lock signal”
OC4_A-T	“Definitive signal of OC4 on A phase” AND “Operation lock signal”
OC4_B-T	“Definitive signal of OC4 on B phase” AND “Operation lock signal”
OC4_C-T	“Definitive signal of OC4 on C phase” AND “Operation lock signal”
UBC1-T	“Definitive signal of UBC1” AND “Operation lock signal”
UBC2-T	“Definitive signal of UBC2” AND “Operation lock signal”
RP1-T	“Definitive signal of RP1” AND “Operation lock signal”
RP2-T	“Definitive signal of RP2” AND “Operation lock signal”
UV1_AB-T	“Definitive signal of UV1 on AB phase” AND “Operation lock signal”
UV1_BC-T	“Definitive signal of UV1 on BC phase” AND “Operation lock signal”
UV1_CA-T	“Definitive signal of UV1 on CA phase” AND “Operation lock signal”
UV2_AB-T	“Definitive signal of UV2 on AB phase” AND “Operation lock signal”
UV2_BC-T	“Definitive signal of UV2 on BC phase” AND “Operation lock signal”
UV2_CA-T	“Definitive signal of UV2 on CA phase” AND “Operation lock signal”
OV1-T	“Definitive signal of OV1” AND “Operation lock signal”
OV2-T	“Definitive signal of OV2” AND “Operation lock signal”
UF1-T	“Definitive signal of UF1” AND “Operation lock signal”
UF2-T	“Definitive signal of UF2” AND “Operation lock signal”
OF1-T	“Definitive signal of OF1” AND “Operation lock signal”
OF2-T	“Definitive signal of OF2” AND “Operation lock signal”
OC1_A-TL	Latch signal of OC1_A-T (*)
OC1_B-TL	Latch signal of OC1_B-T (*)
OC1_C-TL	Latch signal of OC1_C-T (*)
OC1_G-TL	Latch signal of OC1_G-T (*)
OC2_A-TL	Latch signal of OC2_A-T (*)
OC2_B-TL	Latch signal of OC2_B-T (*)
OC2_C-TL	Latch signal of OC2_C-T (*)
OC2_G-TL	Latch signal of OC2_G-T (*)

OC3_A-TL	Latch signal of OC3_A-T (*)
OC3_B-TL	Latch signal of OC3_B-T (*)
OC3_C-TL	Latch signal of OC3_C-T (*)
OC4_A-TL	Latch signal of OC4_A-T (*)
OC4_B-TL	Latch signal of OC4_B-T (*)
OC4_C-TL	Latch signal of OC4_C-T (*)
UBC1-TL	Latch signal of UBC1-T (*)
UBC2-TL	Latch signal of UBC2-T (*)
RP1-TL	Latch signal of RP1-T (*)
RP2-TL	Latch signal of RP2-T (*)
UV1_AB-TL	Latch signal of UV1_AB-T (*)
UV1_BC-TL	Latch signal of UV1_BC-T (*)
UV1_CA-TL	Latch signal of UV1_CA-T (*)
UV2_AB-TL	Latch signal of UV2_AB-T (*)
UV2_BC-TL	Latch signal of UV2_BC-T (*)
UV2_CA-TL	Latch signal of UV2_CA-T (*)
OV1-TL	Latch signal of OV1-T (*)
OV2-TL	Latch signal of OV2-T (*)
UF1-TL	Latch signal of UF1-T (*)
UF2-TL	Latch signal of UF2-T (*)
OF1-TL	Latch signal of OF1-T (*)
OF2-TL	Latch signal of OF2-T (*)

(*) Note: The latch signal can be reset by pushing ESC/C button for 3 seconds or longer.

7. Rating, Specification

7.1. Features

(1) Multi-function

- The relay incorporates a variety of protection functions which are required for generator protection.
- The relay has two Group settings sets. Therefore, it can be used for different purposes, such as operation/test, or quickly adapted to meet load conditions.
- Control of a circuit breaker is possible via the font panel, PC-HMI, or DI terminal.

(2) High-precision measuring functions

- Measurement functions are enhanced.
  Measurement values (e.g. current, voltage, electric power, and frequency) can be viewed via the front panel display on the relay or using interface software on a PC.
  In addition, you can expand the character size of the measured values on the front panel display, which enables to check values easily.
- Fault / Disturbance Recording
  The relay stores up to 5 fault / disturbance records which can be used for fault investigations. Fault record function is the record of analog input values (as RMS) at the time when relay elements are operated. Disturbance record function is the record of waveform data for the prescribed period before and after occurrence of fault at sampling rate of 24 samples/cycle.

(3) Diverse operation time characteristics

The relay incorporates various operation time characteristics, which enables suitable protection coordination.

(4) Programmable Output Contacts provide flexibility

The configuration of output contact is possible by PLC (Programmable Logic Controller), which enables to apply the relay to various systems.

(5) Advanced constant monitoring function improves reliability

The relay continuously monitors the electronic circuits and can detect internal component failure, which enables to improve reliability.

The relay's behavior is as follows:

- In normal conditions: RUN LED lights.
- In abnormal conditions: ALARM LED lights.
  During serious abnormal conditions, the protection elements are locked to prevent an unnecessary output, and the relay fail alarm is issued.

(6) The draw-out Subunit improves maintainability

The provision of an automatic CT shorting mechanism at the time of drawing out the unit makes it very easy to maintain the relay.

Remarks: This mechanism is installed only in relay devices with current protection element.

7.2. Standard Ratings

Item			Contents
Rating	Current		5 A
	Line voltage		57 ~ 120 V
	Zero-sequence current		CGP1-A41D1: 1 A (JEC1201 standardized ZCT 200/1.5 mA) CGP1-A42D1: 5 A
	Zero-sequence voltage (CGP1-A41D1 only)		100 ~ 208 V (JEC1201 standardized EVT)
	Frequency		50 Hz / 60 Hz
	DI input voltage		DC 110 V (Variation range: 88 ~ 150 V) DC 220 V (Variation range: 176 ~ 300 V)
	Power Supply	Voltage	DC: 100 ~ 220 V AC: 100 ~ 220 V
		Variation range	DC: 85 ~ 242 V (Range of 80 ~ 286 V is allowable temporarily.) AC: 85 ~ 242 V (Range of 85 ~ 253 V is allowable temporarily.)
Communication function	CC-LINK		Option

7.3. Protection elements

Protection element		Operating value	Operating time	Other setting
50	Instantaneous overcurrent (OC1, OC2, OC3)	100 ~ 1200 % (1 % step) (multiplier applied to generator's rated current)	0.00 ~ 10.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 40 ms.	
51	DT or IDMT overcurrent	100 ~ 120 % (1 % step) (multiplier applied to generator's rated current)	—	3 kinds of operating time characteristics
51G (*)	Ground fault overcurrent	0.1 ~ 2.5 A (0.1 A step)	0.00 ~ 10.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 40 ms.	
46-1	Instantaneous unbalance current	5 ~ 30 % (1 % step) (multiplier applied to generator's rated current)	0.1 ~ 10.0 s (0.1 s step)	
46-2	IDMT unbalance current	5 ~ 30 % (1 % step) (multiplier applied to generator's rated current)	—	1 kind of operating time characteristics
67G (*)	Directional ground fault (DIRG1, DIRG2)	V0: 2.0 ~ 100.0 V (0.1 V step) I0: 1.0 ~ 100.0 mA (0.5 mA step) Phase: Lead angle 0° ~ 90° (1° step)	0.00 ~ 10.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 50 ms.	
27	Undervoltage (UV1, UV2)	20.0 ~ 120.0 V (0.1 V step)	0.00 ~ 15.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 50 ms.	
59	Overvoltage (OV1, OV2)	20.0 ~ 200.0 V (0.1 V step)	0.00 ~ 15.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 50 ms.	
64 (*)	Ground fault overvoltage (OVG1, OVG2)	2.0 ~ 100.0 V (0.1 V step)	0.00 ~ 20.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 50 ms.	
95L	Underfrequency (UF1, UF2)	-0.5 ~ -6.0 Hz (0.1 Hz step) (difference from rated frequency)	0.1 ~ 15.0 s (0.1 s step)	
95H	Overfrequency (OF1, OF2)	+0.5 ~ +6.0 Hz (0.1 Hz step) (difference from rated frequency)	0.1 ~ 15.0 s (0.1 s step)	
67P	Reverse power (RP1, RP2)	0.5 ~ 30.0 % (0.1 % step) (multiplier applied to generator's rated current)	0.10 ~ 20.00 s (0.01 s step)	

84	Voltage detection (VD)	80 ~ 110 V (1 V step)	0.00 ~ 10.00 s (0.01 s step) In setting 0.00 s, instantaneous operating time is less than 50 ms.	
OP LOCK	Operation lock function (OPLOCK)	—	0.0 ~ 10.0 s (0.1 s step) In setting 0.0 s, instantaneous operating time is less than 50 ms.	

* In CGP1-A41D1, there are no 51G (Ground fault overcurrent) elements.
* In CGP1-A42D1, there are no 67G (Directional ground fault) and 64 (Ground fault overvoltage) elements.
* Factory settings are set to a default of “OFF (Non-use)” for the items with setting of Use/Non-use. In regard to other default settings, refer to Chapter 13.
* For details about protective function, refer to Chapter 8.

7.4. Measuring element

・CGP1-A41D1

Contents displayed		Range	Measured value		Accident record	Waveform record
Name of signal	Item	(Secondary value / Primary value)	Primary	Secondary	Primary only	Common
Vab	AB-phase voltage	0.0 ~ 260.0 V (0.1 V step) / 0.0 ~ 750.0 kV (0.1 kV step)	○	○	○	○
Vbc	BC-phase voltage		○	○	○	○
Vca	CA-phase voltage		○	○	○	○
VG	Zero-phase voltage	0.0 ~ 247.0 V (0.1 V step) / 0.0 ~ 750.0 kV (0.1 kV step)	○	○	○	○
V1	Positive-sequence voltage (Calculated by software)	0.0 ~ 150.0 V (0.1 V step) / 0.0 ~ 750.0 kV (0.1 kV step)	○	○	○	×
V2	Negative-sequence voltage (Calculated by software)		○	○	○	×
Ia	A-phase current	0.00 ~ 10.00 A (0.01 A step) / 0 ~ 60000 A (1 A step)	○	○	○	○
Ic	C-phase current		○	○	○	○
IG	Zero-sequence current	0.0 ~ 999.9 mA (0.1 mA step) / 0.0 ~ 999.9 A (0.1A step)	○	○	○	○
I1	Positive-sequence current (Calculated by software)	0.00 ~ 10.00 A (0.01 A step) / 0 ~ 60000 A (1 A step)	○	○	○	×
I2	Negative-sequence current (Calculated by software)		○	○	○	×
Vab-phase	Phase angle of Vab	0.0 ~ 359.9 ° (0.1 ° step) On the basis of Vab (Lag angle)	○	○	○	×
Vbc-phase	Phase angle of Vbc		○	○	○	×
Vca-phase	Phase angle of Vca		○	○	○	×
VG-phase	Phase angle of VG		○	○	○	×
Ia-phase	Phase angle of Ia		○	○	○	×
Ic-phase	Phase angle of Ic		○	○	○	×
IG-phase	Phase angle of IG		○	○	○	×
+P	Positive 3-phase active power	0.0 ~ 999.9 MW (0.1 MW step)	○	×	×	×
-P	Negative 3-phase active power		○	×	×	×
+Q	Positive 3-phase reactive power	0.0 ~ 999.9 MVar (0.1 MVar step)	○	×	×	×
-Q	Negative 3-phase reactive power		○	×	×	×
S	3-phase apparent power	0.0 ~ 999.9 MVA (0.1 MVA step)	○	×	×	×
PF	3-phase power factor	-1.00 ~ 1.00 (0.01 step)	○	×	×	×
F	Power system frequency	44.0 ~ 66.0 Hz (0.1 Hz step)	○	○	×	×
+Pt	Positive 3-phase active electric energy	0 ~ 999999999 kWh (1 kWh step)	○	×	×	×
-Pt	Negative 3-phase active electric energy		○	×	×	×
+Qt	Positive 3-phase reactive electric energy	0 ~ 999999999 kVarh (1 kVarh step)	○	×	×	×
-Qt	Negative 3-phase reactive electric energy		○	×	×	×

・CGP1-A42D1

Contents displayed		Range	Measured value		Accident record	Waveform record
Name of signal	Item	(Secondary value / Primary value)	Primary	Secondary	Primary only	Common
Vab	AB-phase voltage	0.0 ~ 260.0 V (0.1 V step) / 0.0 ~ 750.0 kV (0.1 kV step)	○	○	○	○
Vbc	BC-phase voltage		○	○	○	○
Vca	CA-phase voltage		○	○	○	○
V1	Positive-sequence voltage (Calculated by software)	0.0 ~ 150.0 V (0.1 V step) / 0.0 ~ 750.0 kV (0.1 kV step)	○	○	○	×
V2	Negative-sequence voltage (Calculated by software)		○	○	○	×
Ia	A-phase current	0.00 ~ 10.00 A (0.01 A step) / 0 ~ 60000 A (1 A step)	○	○	○	○
Ib	B-phase current		○	○	○	○
Ic	C-phase current		○	○	○	○
IG	Zero-sequence current	0.00 ~ 10.00 A (0.01 A step) / 0 ~ 60000 A (1 A step)	○	○	○	○
I1	Positive-sequence current (Calculated by software)	0.00 ~ 10.00 A (0.01 A step) / 0 ~ 60000 A (1 A step)	○	○	○	×
I2	Negative-sequence current (Calculated by software)		○	○	○	×
Vab-phase	Phase angle of Vab	0.0 ~ 359.9 ° (0.1 ° step) On the basis of Vab (Lag angle)	○	○	○	×
Vbc-phase	Phase angle of Vbc		○	○	○	×
Vca-phase	Phase angle of Vca		○	○	○	×
Ia-phase	Phase angle of Ia		○	○	○	×
Ib-phase	Phase angle of Ib		○	○	○	×
Ic-phase	Phase angle of Ic		○	○	○	×
IG-phase	Phase angle of IG		○	○	○	×
+P	Positive 3-phase active power	0.0 ~ 999.9 MW (0.1 MW step)	○	×	×	×
-P	Negative 3-phase active power		○	×	×	×
+Q	Positive 3-phase reactive power	0.0 ~ 999.9 MVar (0.1 MVar step)	○	×	×	×
-Q	Negative 3-phase reactive power		○	×	×	×
S	3-phase apparent power	0.0 ~ 999.9 MVA (0.1 MVA step)	○	×	×	×
PF	3-phase power factor	-1.00 ~ 1.00 (0.01 step)	○	×	×	×
F	Power system frequency	44.0 ~ 66.0 Hz (0.1 Hz step)	○	○	×	×
+Pt	Positive 3-phase active electric energy	0 ~ 999999999 kWh (1 kWh step)	○	×	×	×
-Pt	Negative 3-phase active electric energy		○	×	×	×
+Qt	Positive 3-phase reactive electric energy	0 ~ 999999999 kVarh (1 kVarh step)	○	×	×	×
-Qt	Negative 3-phase reactive electric energy		○	×	×	×

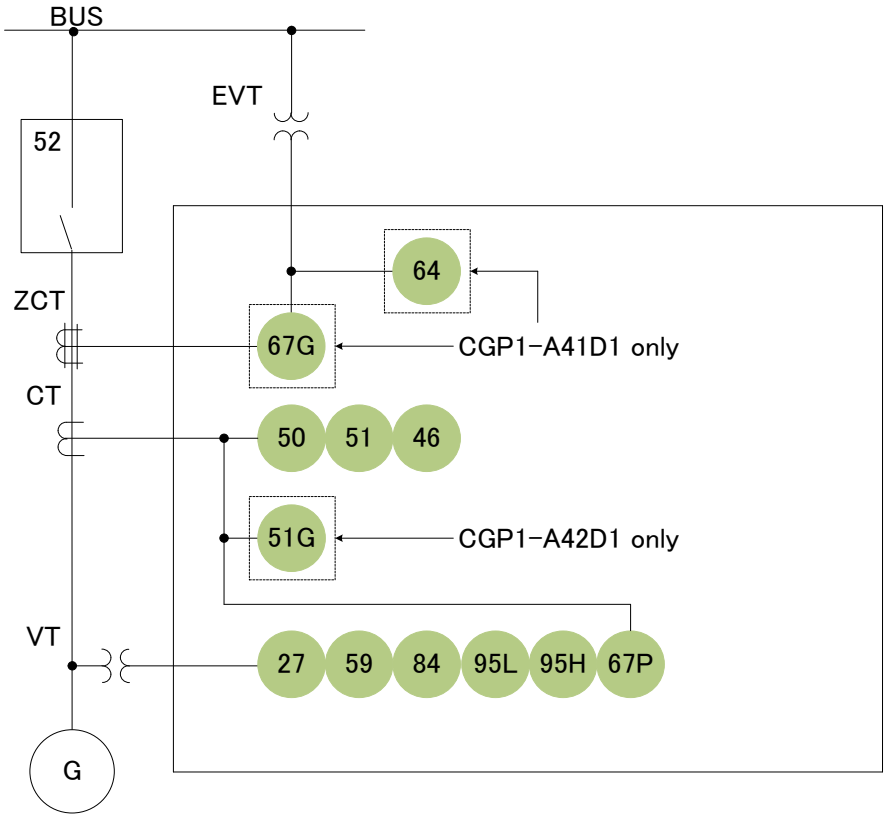
7.5. List of functions

Menu	Item	Operation system	
		PC-HMI	Front panel
Status (STATUS)	Clock (CLOCK)	○	○
	Measured analog value (METERING)	○	○
	DI/DO status (DIGITAL I/O)	○	○
	Trip counter (TRIP COUNTER)	○	○
	Device name (DEVICE NAME)	○	○
	Monitoring	○	×
	LED reset	○	×
Record (RECORD)	Waveform analysis	○	×
	Disturbance record	○	×
	Fault record (FAULT RECORD)	○ (*)	○
	Event record (EVENT RECORD)	○	○
	Access record (ACCESS RECORD)	○	○
	Alarm record (ALARM RECORD)	○	○
Setting (SETTING)	Active group (ACTIVE WG)	○	○
	Group 1 setting (G1)	○	○
	Group 2 setting (G2)	○	○
	PLC	○	×
Control (CONTROL)	Control mode (CTRL MODE)	○	○
	CB control (CB CONTROL)	○	○
Configuration (CONFIG)	Communication setting (COMMUNICATION)	×	○
	Clock adjustment (CLOCK ADJUST)	○	○
	Analog value display switching (METERING)	○	○
	Electric energy (ENERGY)	○	○
	Trip counter (TRIP COUNTER)	○	○
	Disturbance record (DISTURBANCE)	○	○
	DI voltage (DI VOLTAGE)	○	○
	Password use/unuse (PASSWORD USE)	×	○
	Password registration (PASSWORD REGIST)	×	○
	Device name setting	○	×
	Time management setting	○	×
	DO contact test setting	○	×
Test (TEST)	DO contact test (CONTACT TEST)	○	○
	Test mode (MODE)	○	○
	LED/VFD lighting test (LED/VFD TEST)	×	○
	Forced operation of relay	○	×
Clear record (RECORD-CLR)	Clear fault record (FAULT REC CLEAR)	○	○
	Clear alarm record (ALARM REC CLEAR)	○	○
	Clear event record (EVENT REC CLEAR)	○	○

(*) In PC-HMI, the item of Fault record is included in Disturbance record.

8. Protective function

In the relay, following protection elements are provided for the purposes of generator protection.
In this chapter, the protection elements incorporated in the relay are described.



Model	Protection elements	Input	Purpose
CGP1-A41D1	50, 51, 67P, 46-1, 46-2, 27, 59, 95L, 95H, 84, 67G, 64	Ia, Ic (2 phase) I0 : JEC1201 standardized ZCT Vab, Vbc (2 phase) V0 : EVT	For high-resistance grounding system I0 from ZCT and V0 from EVT detects 67G.
CGP1-A42D1	50, 51, 67P, 46-1, 46-2, 27, 59, 95L, 95H, 84, 51G	Ia, Ib, Ic (3 phase) I0 : 3CT residual circuit Vab, Vbc (2 phase)	For resistance grounding system. I0 from 3CT residual circuit detects 51G.

8.1. Overcurrent element

Four stages of overcurrent elements are incorporated in CGP1-A41D1 and CGP1-A42D1 relay, and this enables rapid detection of faults. Furthermore, a variety of operation characteristics are provided which enable effective time coordination as shown in Fig. 8-1.

Apparatus No.	Display name	Protective function
50	OC1, OC2, OC3	Instantaneous overcurrent element
51	OC4	Definite time or IDMT overcurrent element

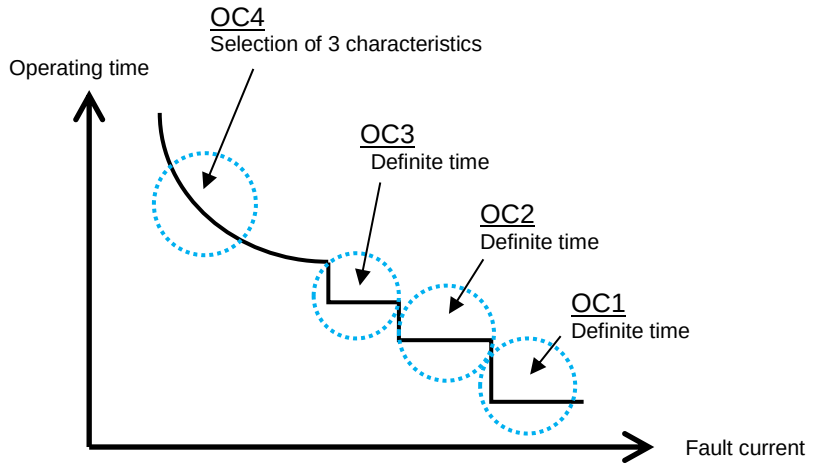


Fig. 8-1 Example of a time coordination curve for overcurrent element

8.1.1. OC1 element

Fig. 8-2 shows the internal function blocks of OC1 element.

OC1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when input current is greater than or equal to the operation setting value (Ope. Curt.).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of OC1 element (OC1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OC1 element.
This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

As the operating current setting value is the ratio (multiplier) of the generator's rated current, obtain the operating value from the following:

Generator's rated current IG (A) × Operating current setting value (Ope. Curt.) (%)

(Example) When the generator's rated current is IG = 3.0 (A) and
the operating current setting value is Ope. Curt. = 110 (%),
the operating value of the element can be obtained as follow: 3.0 A × 110 % = 3.3 A

The generator's rated current IG can be set within the range of 2.5 to 5.0 A (in increments of 0.1 A).

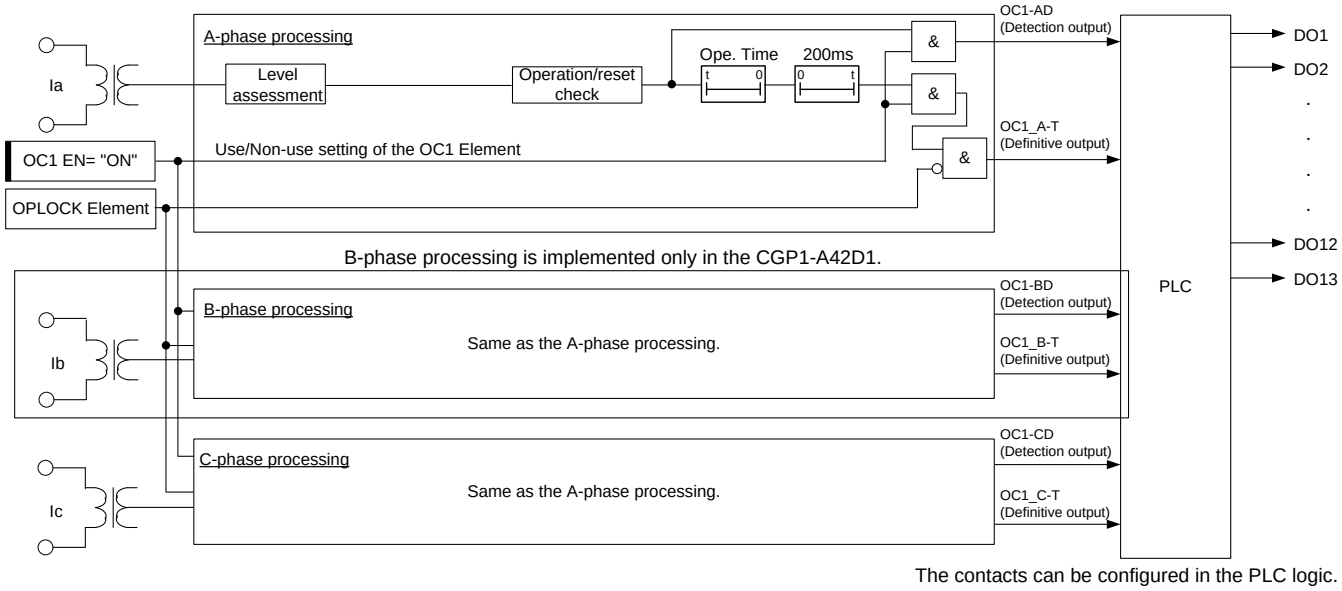


Fig. 8-2 Internal function block diagram of OC1 element

Table 8-1 Setting items of OC1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OC1	OC1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	100 ~ 1200 %	1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 40 ms

8.1.2. OC2 element

The OC2 element has the same characteristics as the OC1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.1.1.

Table 8-2 Setting items of OC2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OC2	OC2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	100 ~ 1200 %	1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 40 ms

8.1.3. OC3 element

The OC3 element has the same characteristics as the OC1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.1.1.

Table 8-3 Setting items of OC3 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OC3	OC3 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	100 ~ 1200 %	1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 40 ms

8.1.4. OC4 element

Fig. 8-3 shows the internal function blocks of OC4 element.

The OC4 element outputs a definitive signal when a detection signal operates for longer than a time setting.
The detection signal is issued when input current is greater than or equal to the operation setting value (Ope. Curt.).
The DT or IDMT timer counts up in accordance with the operating time characteristic (Ope. Chr.) and the operating time multiplier (Ope. TM).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of OC4 element (OC4 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OC4 element.
This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

As the operating current setting value is the ratio (multiplier) of the generator's rated current, obtain the operating value from the following:

Generator's rated current IG (A) × Operating current setting value (Ope. Curt.) (%)

(Example) When the generator's rated current is IG = 3.0 (A) and
the operating current setting value is Ope. Curt. = 110 (%),
the operating value of the element can be obtained as follow: 3.0 A × 110 % = 3.3 A

The generator's rated current IG can be set within the range of 2.5 to 5.0 A (in increments of 0.1 A).

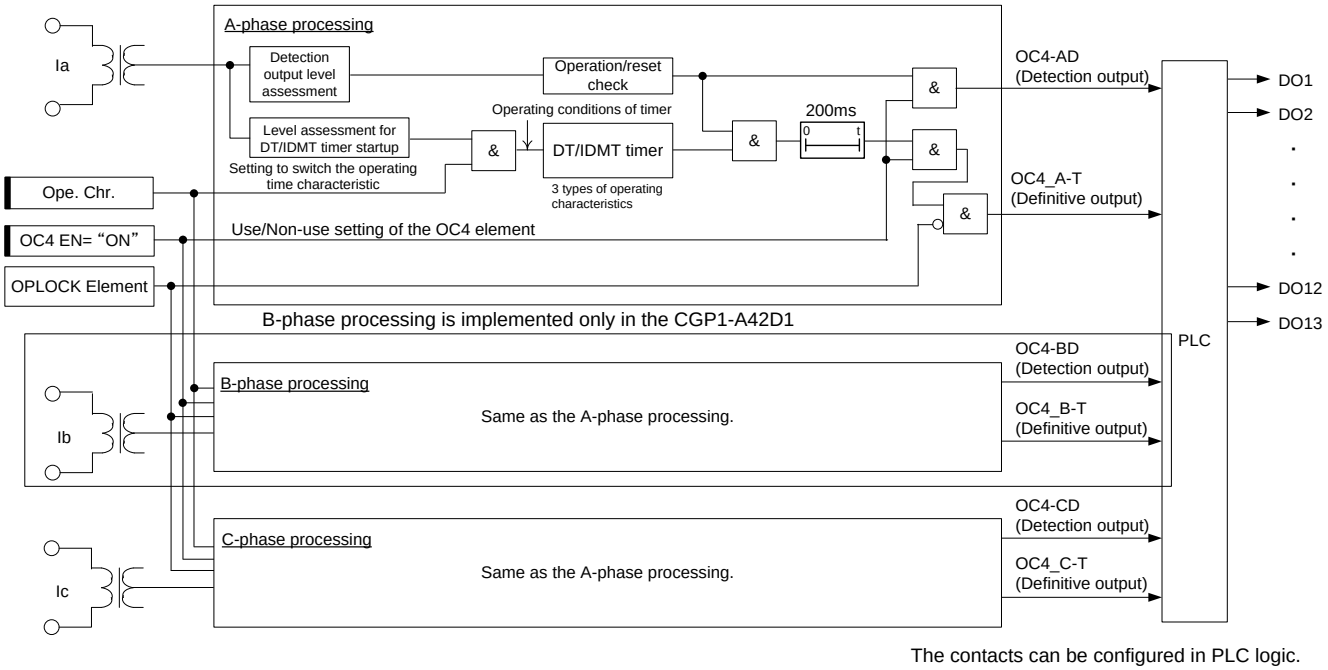


Fig. 8-3 Internal function block diagram of OC4 element

Table 8-4 Setting items of OC4 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OC4	OC4 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	100 ~ 120 %	1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. TM	0.25 ~ 10.00	0.01	Operating time multiplier. This is indicated as "M" in the characteristic formula shown in sub-clause 8.1.4.3.
	Ope. Chr.	NI, EI, DT	-	Choice of DT or IDMT operating characteristics. (Refer to IDMT characteristic formula in sub-clause 8.1.4.3.)

8.1.4.1.Operating time characteristic

Fig. 8-4 shows the time chart of operating time characteristic of OC4 element.

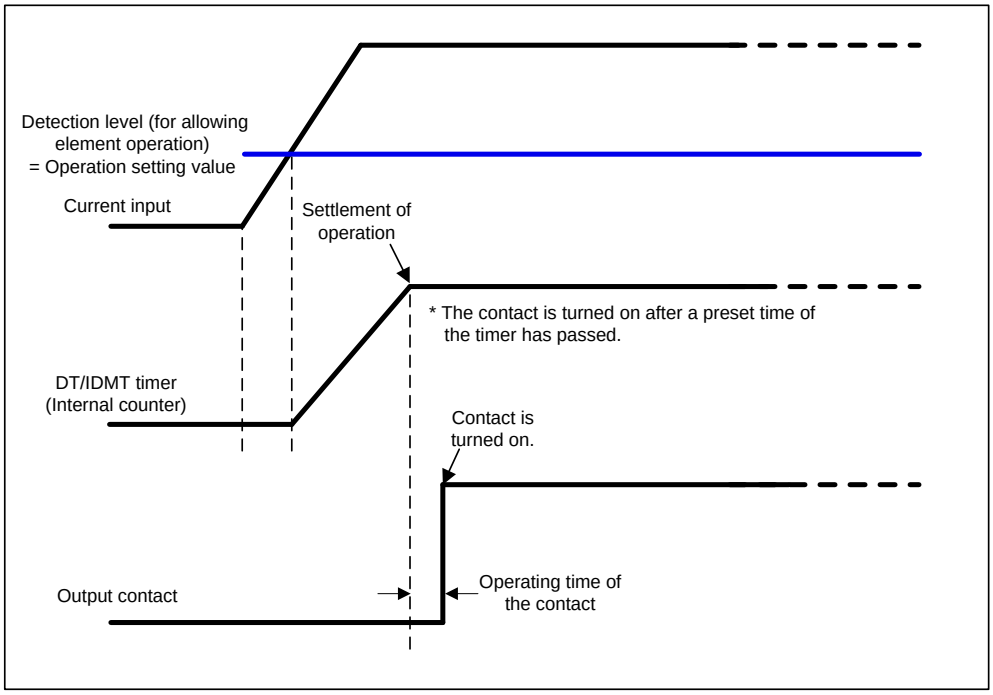


Fig. 8-4 Time chart of operating time characteristic of OC4 element

8.1.4.2.Resetting time characteristic

Fig. 8-5 shows the time chart of resetting time characteristic of OC4 element.

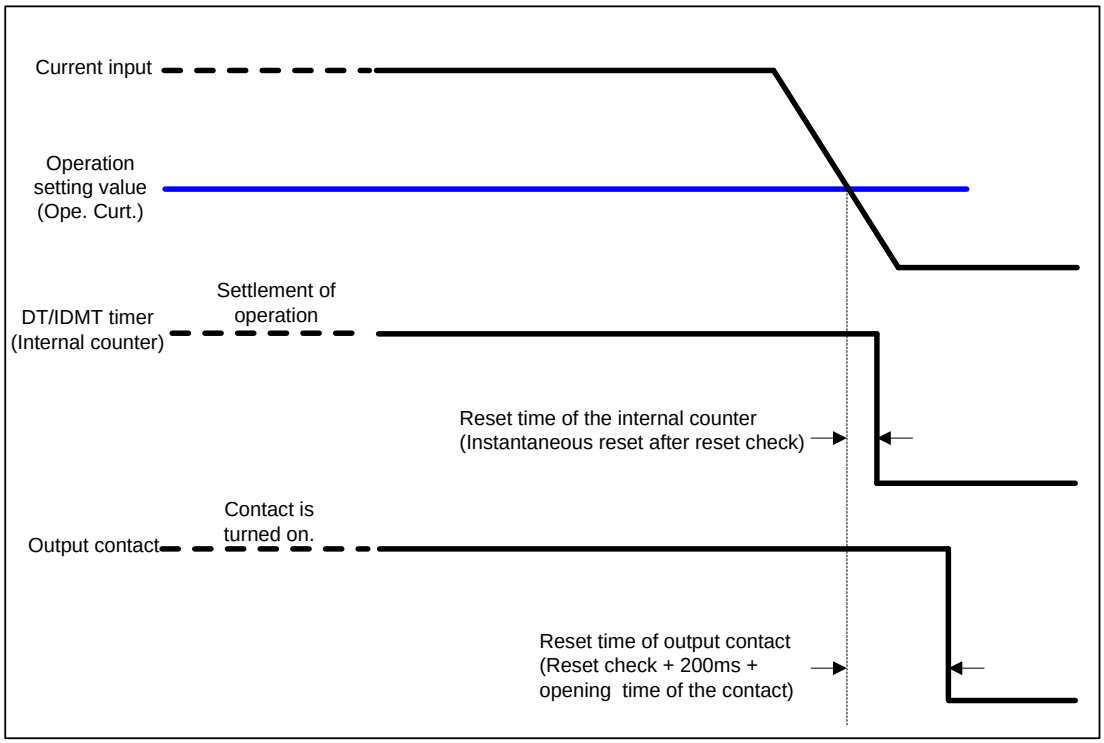
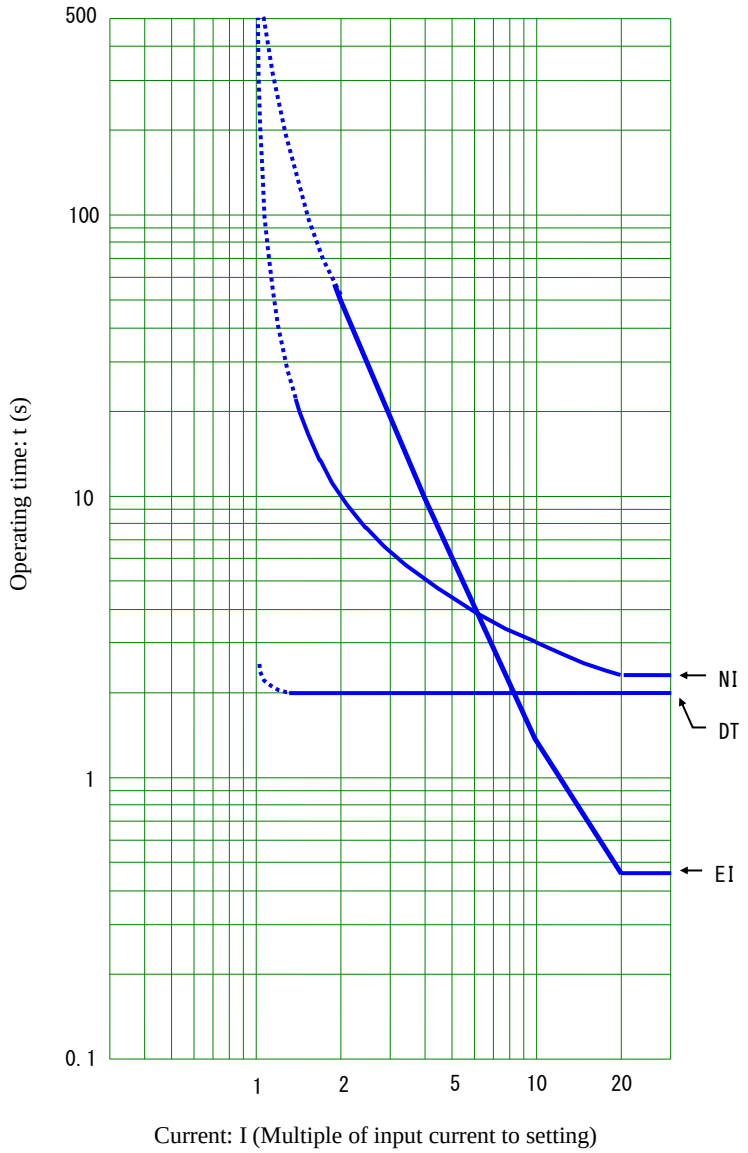


Fig. 8-5 Time chart of resetting time characteristic of OC4 element

8.1.4.3.IDMT characteristic

3 types of operating time characteristics are provided in the OC4 element.



NI: Normal Inverse characteristic

$$t = \frac{0.14}{I^{0.02} - 1} \times \frac{M}{10}(s)$$

EI: Extremely Inverse characteristic

$$t = \frac{150}{I^{2} - 1} \times \frac{M}{10}(s)$$

DT: Definite Time characteristic

$$t = 2 \times \frac{M}{10}(s)$$

t: Operating time (s)
I: Multiple of input current value to the setting value (times)
M: Operating time multiplier (times)

This graph is an example of M = 10.

Fig. 8-6 Operating time characteristic

Table 8-5 Normal Inverse (NI) Operating time accuracy table

Unit: s

Multiple of input	300%		500%		1000%	
Operating time Multiplier (M)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)
0.25	±0.100 (sec)	0.158 0.058 ~ 0.258	±0.100 (sec)	0.107 * 0.040 ~ 0.207	±0.100 (sec)	0.074 * 0.040 ~ 0.174
0.5	±0.100 (sec)	0.315 0.215 ~ 0.415	±0.100 (sec)	0.214 0.114 ~ 0.314	±0.100 (sec)	0.149 0.049 ~ 0.249
1	±0.100 (sec)	0.630 0.530 ~ 0.730	±0.100 (sec)	0.428 0.328 ~ 0.528	±0.100 (sec)	0.297 0.197 ~ 0.397
1.5	±12.00	0.945 0.832 ~ 1.059	±0.100 (sec)	0.642 0.542 ~ 0.742	±0.100 (sec)	0.446 0.346 ~ 0.546
2	±12.00	1.260 1.109 ~ 1.412	±0.100 (sec)	0.856 0.756 ~ 0.956	±0.100 (sec)	0.594 0.494 ~ 0.694
2.5	±12.00	1.575 1.386 ~ 1.765	±0.100 (sec)	1.070 0.970 ~ 1.170	±0.100 (sec)	0.743 0.643 ~ 0.843
3	±12.00	1.891 1.664 ~ 2.117	±0.100 (sec)	1.284 1.184 ~ 1.384	±0.100 (sec)	0.891 0.791 ~ 0.991
3.5	±12.00	2.206 1.941 ~ 2.470	±7.00	1.498 1.393 ~ 1.603	±0.100 (sec)	1.040 0.940 ~ 1.140
4	±12.00	2.521 2.218 ~ 2.823	±7.00	1.712 1.592 ~ 1.832	±0.100 (sec)	1.188 1.088 ~ 1.288
4.5	±12.00	2.836 2.496 ~ 3.176	±7.00	1.926 1.791 ~ 2.061	±0.100 (sec)	1.337 1.237 ~ 1.437
5	±12.00	3.151 2.773 ~ 3.529	±7.00	2.140 1.990 ~ 2.290	±0.100 (sec)	1.485 1.385 ~ 1.585
6	±12.00	3.781 3.327 ~ 4.235	±7.00	2.568 2.388 ~ 2.748	±0.100 (sec)	1.782 1.682 ~ 1.882
7	±12.00	4.411 3.882 ~ 4.941	±7.00	2.996 2.786 ~ 3.206	±5.00	2.079 1.975 ~ 2.183
8	±12.00	5.042 4.437 ~ 5.647	±7.00	3.424 3.184 ~ 3.663	±5.00	2.376 2.258 ~ 2.495
9	±12.00	5.672 4.991 ~ 6.352	±7.00	3.852 3.582 ~ 4.121	±5.00	2.674 2.540 ~ 2.807
10	±12.00	6.302 5.546 ~ 7.058	±7.00	4.280 3.980 ~ 4.579	±5.00	2.971 2.822 ~ 3.119

Table 8-6 Extremely Inverse (EI) Operating time accuracy table

Unit: s

Multiple of input	300%		500%		1000%	
Operating time Multiplier (M)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)
0.25	±0.100 (sec)	0.469 0.369 ~ 0.569	±0.100 (sec)	0.156 0.056 ~ 0.256	±0.100 (sec)	0.038 * 0.040 ~ 0.138
0.5	±12.00	0.938 0.825 ~ 1.050	±0.100 (sec)	0.313 0.213 ~ 0.413	±0.100 (sec)	0.076 * 0.040 ~ 0.176
1	±12.00	1.875 1.650 ~ 2.100	±0.100 (sec)	0.625 0.525 ~ 0.725	±0.100 (sec)	0.152 0.052 ~ 0.252
1.5	±12.00	2.813 2.475 ~ 3.150	±0.100 (sec)	0.938 0.838 ~ 1.038	±0.100 (sec)	0.227 0.127 ~ 0.327
2	±12.00	3.750 3.300 ~ 4.200	±0.100 (sec)	1.250 1.150 ~ 1.350	±0.100 (sec)	0.303 0.203 ~ 0.403
2.5	±12.00	4.688 4.125 ~ 5.250	±7.00	1.563 1.453 ~ 1.672	±0.100 (sec)	0.379 0.279 ~ 0.479
3	±12.00	5.625 4.950 ~ 6.300	±7.00	1.875 1.744 ~ 2.006	±0.100 (sec)	0.455 0.355 ~ 0.555
3.5	±12.00	6.563 5.775 ~ 7.350	±7.00	2.188 2.034 ~ 2.341	±0.100 (sec)	0.530 0.430 ~ 0.630
4	±12.00	7.500 6.600 ~ 8.400	±7.00	2.500 2.325 ~ 2.675	±0.100 (sec)	0.606 0.506 ~ 0.706
4.5	±12.00	8.438 7.425 ~ 9.450	±7.00	2.813 2.616 ~ 3.009	±0.100 (sec)	0.682 0.582 ~ 0.782
5	±12.00	9.375 8.250 ~ 10.500	±7.00	3.125 2.906 ~ 3.344	±0.100 (sec)	0.758 0.658 ~ 0.858
6	±12.00	11.250 9.900 ~ 12.600	±7.00	3.750 3.488 ~ 4.013	±0.100 (sec)	0.909 0.809 ~ 1.009
7	±12.00	13.125 11.550 ~ 14.700	±7.00	4.375 4.069 ~ 4.681	±0.100 (sec)	1.061 0.961 ~ 1.161
8	±12.00	15.000 13.200 ~ 16.800	±7.00	5.000 4.650 ~ 5.350	±0.100 (sec)	1.212 1.112 ~ 1.312
9	±12.00	16.875 14.850 ~ 18.900	±7.00	5.625 5.231 ~ 6.019	±0.100 (sec)	1.364 1.264 ~ 1.464
10	±12.00	18.750 16.500 ~ 21.000	±7.00	6.250 5.813 ~ 6.688	±0.100 (sec)	1.515 1.415 ~ 1.615

Table 8-7 Definite Time (DT) Operating time accuracy table

Unit: s

Multiple of input	300%		500%		1000%	
Operating time Multiplier (M)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)
0.25	±0.050 (sec)	0.050 * 0.040 ~ 0.100	±0.050 (sec)	0.050 * 0.040 ~ 0.100	±0.050 (sec)	0.050 * 0.040 ~ 0.100
0.5	±0.050 (sec)	0.100 0.050 ~ 0.150	±0.050 (sec)	0.100 0.050 ~ 0.150	±0.050 (sec)	0.100 0.050 ~ 0.150
1	±0.050 (sec)	0.200 0.150 ~ 0.250	±0.050 (sec)	0.200 0.150 ~ 0.250	±0.050 (sec)	0.200 0.150 ~ 0.250
1.5	±0.050 (sec)	0.300 0.250 ~ 0.350	±0.050 (sec)	0.300 0.250 ~ 0.350	±0.050 (sec)	0.300 0.250 ~ 0.350
2	±0.050 (sec)	0.400 0.350 ~ 0.450	±0.050 (sec)	0.400 0.350 ~ 0.450	±0.050 (sec)	0.400 0.350 ~ 0.450
2.5	±0.050 (sec)	0.500 0.450 ~ 0.550	±0.050 (sec)	0.500 0.450 ~ 0.550	±0.050 (sec)	0.500 0.450 ~ 0.550
3	±0.050 (sec)	0.600 0.550 ~ 0.650	±0.050 (sec)	0.600 0.550 ~ 0.650	±0.050 (sec)	0.600 0.550 ~ 0.650
3.5	±0.050 (sec)	0.700 0.650 ~ 0.750	±0.050 (sec)	0.700 0.650 ~ 0.750	±0.050 (sec)	0.700 0.650 ~ 0.750
4	±0.050 (sec)	0.800 0.750 ~ 0.850	±0.050 (sec)	0.800 0.750 ~ 0.850	±0.050 (sec)	0.800 0.750 ~ 0.850
4.5	±0.050 (sec)	0.900 0.850 ~ 0.950	±0.050 (sec)	0.900 0.850 ~ 0.950	±0.050 (sec)	0.900 0.850 ~ 0.950
5	±5.00	1.000 0.950 ~ 1.050	±5.00	1.000 0.950 ~ 1.050	±5.00	1.000 0.950 ~ 1.050
6	±5.00	1.200 1.140 ~ 1.260	±5.00	1.200 1.140 ~ 1.260	±5.00	1.200 1.140 ~ 1.260
7	±5.00	1.400 1.330 ~ 1.470	±5.00	1.400 1.330 ~ 1.470	±5.00	1.400 1.330 ~ 1.470
8	±5.00	1.600 1.520 ~ 1.680	±5.00	1.600 1.520 ~ 1.680	±5.00	1.600 1.520 ~ 1.680
9	±5.00	1.800 1.710 ~ 1.890	±5.00	1.800 1.710 ~ 1.890	±5.00	1.800 1.710 ~ 1.890
10	±5.00	2.000 1.900 ~ 2.100	±5.00	2.000 1.900 ~ 2.100	±5.00	2.000 1.900 ~ 2.100

◆How to read the operating time accuracy table

* “300%”, “500%”, and “1000%” which are listed in the table are multiples to be applied to the current setting value, respectively.
* The allowable operating time T_k shown in the table were obtained by substituting values for ε_{tm}, T_{base}, and k in the following equation.

$$\varepsilon_{tm} = \frac{T_k - k \times T_{base}}{k \times T_{base}}$$

ε_{tm} : Operating time error (%)

T_{base} : Nominal operating time (seconds) at the base operating time multiplier setting $(= 10)$

T_k : Operating time (seconds) at the operating time multiplier setting k

k : $\dfrac{\text{Operating time multiplier setting } (=\ \text{M})}{\text{Base operating time multiplier setting } (=\ 10)}$ (times)

If the error range calculated according to the above equation is smaller than the error lower limit of ±100 ms, this error lower limit is defined as the allowable error range. Note that the error lower limit is ±50 ms for the Definite Time (DT) characteristic.

* The time of 40 ms in the underlined part for the asterisk in the table is the time set as the minimum operating time.

8.2. Ground fault overcurrent element

Two stages of ground fault overcurrent elements are incorporated in CGP1-A42D1, and rapid detection of ground fault is possible.

Apparatus No.	Display name	Protective function
51G	OCG1, OCG2	Ground fault overcurrent element

8.2.1. OCG1 element

Fig. 8-7 shows the internal function blocks of OCG1 element.

OCG1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when zero-sequence current is greater than or equal to the operation setting value (Ope. Curt.).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of OCG1 element (OCG1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OCG1 element.
This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

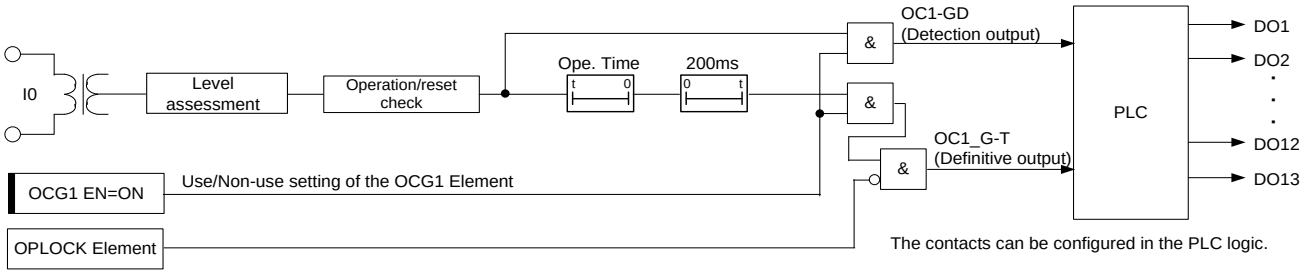


Fig. 8-7 Internal function block diagram of OCG1 element

Table 8-8 Setting items of OCG1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OCG1	OCG1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	0.1 ~ 2.5 A	0.1 A	Operating current
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 40 ms

8.2.2. OCG2 element

The OCG2 element has the same characteristics as the OCG1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.2.1.

Table 8-9 Setting items of OCG2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OCG2	OCG2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	0.1 ~ 2.5 A	0.1 A	Operating current
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 40 ms

8.3. Unbalance current element

Two types of unbalance current elements are incorporated in CGP1-A41D1 and CGP1-A42D1.

These elements are used to detect the unbalanced current caused by a two-phase short-circuit accident or two-phase ground fault of the three-phase circuit and are applied to the unbalanced current protection for a generator.

Apparatus No.	Display name	Protective function
46	UBC1	Instantaneous unbalance current
	UBC2	IDMT unbalance current

8.3.1. UBC1 element

Fig. 8-8 shows the internal function blocks of UBC1 element.

UBC1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when negative sequence current calculated from 2-phase current (Ia and Ic) is greater than or equal to the operation setting value (Ope. Curt.).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of UBC1 element (UBC1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to UBC1 element.
This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

As the operating current setting value is the ratio of the generator's rated current, obtain the operating value from the following:

Generator's rated current IG (A) × Operating current setting value (Ope. Curt.) (%)

(Example) When the generator's rated current is IG = 3.0 (A) and
the operating current setting value is Ope. Curt. = 10 (%),
the operating value of the element can be obtained as follow: 3.0 A × 10 % = 0.3 A

The generator's rated current IG can be set within the range of 2.5 to 5.0 A (in increments of 0.1 A).

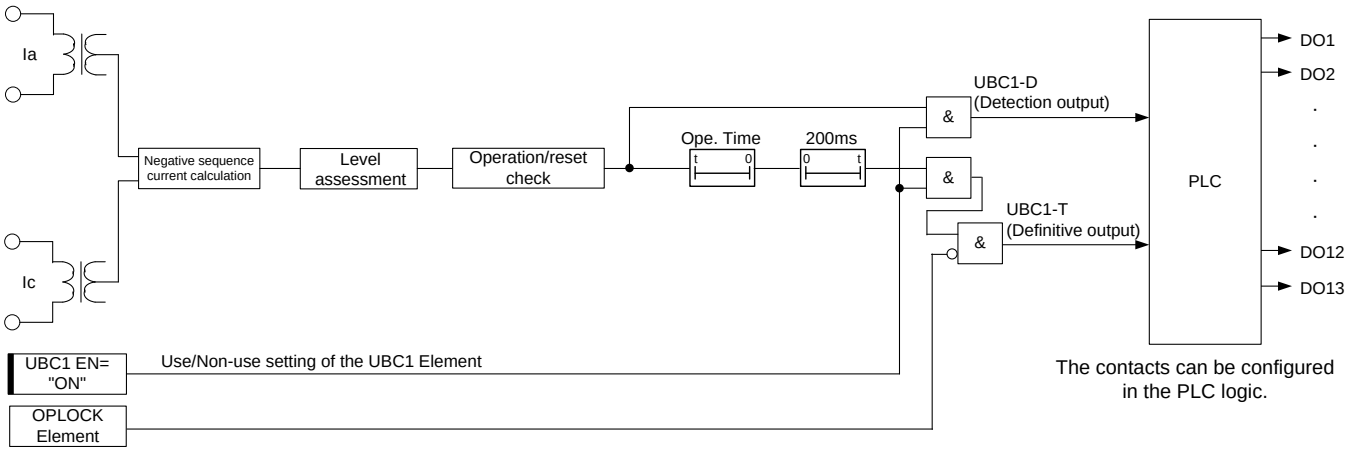


Fig. 8-8 Internal function block diagram of UBC1 element

Table 8-10 Setting items of UBC1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
UBC1	UBC1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	5 ~ 30 %	1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. Time	0.1 ~ 10.0 s	0.1 s	Operating time

8.3.2. UBC2 element

Fig. 8-9 shows the internal function blocks of UBC1 element.

UBC2 element outputs a definitive signal when a detection signal operates for longer than a time setting. The detection signal is issued when negative sequence current calculated from 2-phase current (Ia and Ic) is greater than or equal to the operation setting value (Ope. Curt.).
The IDMT timer counts up in accordance with the operating time multiplier (Ope. TM).
The operating time characteristic is parallel to the negative sequence current versus allowable limit time characteristic of the generator operating at following formula : $I_2^2 \cdot t = M$.
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of UBC2 element (UBC2 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to UBC2 element.
This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

As the operating current setting value is the ratio of the generator's rated current, obtain the operating value from the following:

Generator's rated current IG (A) × Operating current setting value (Ope. Curt.) (%)

(Example) When the generator's rated current is IG = 3.0 (A) and
the operating current setting value is Ope. Curt. = 10 (%),
the operating value of the element can be obtained as follow: 3.0 A × 10 % = 0.3 A

The generator's rated current IG can be set within the range of 2.5 to 5.0 A (in increments of 0.1 A).

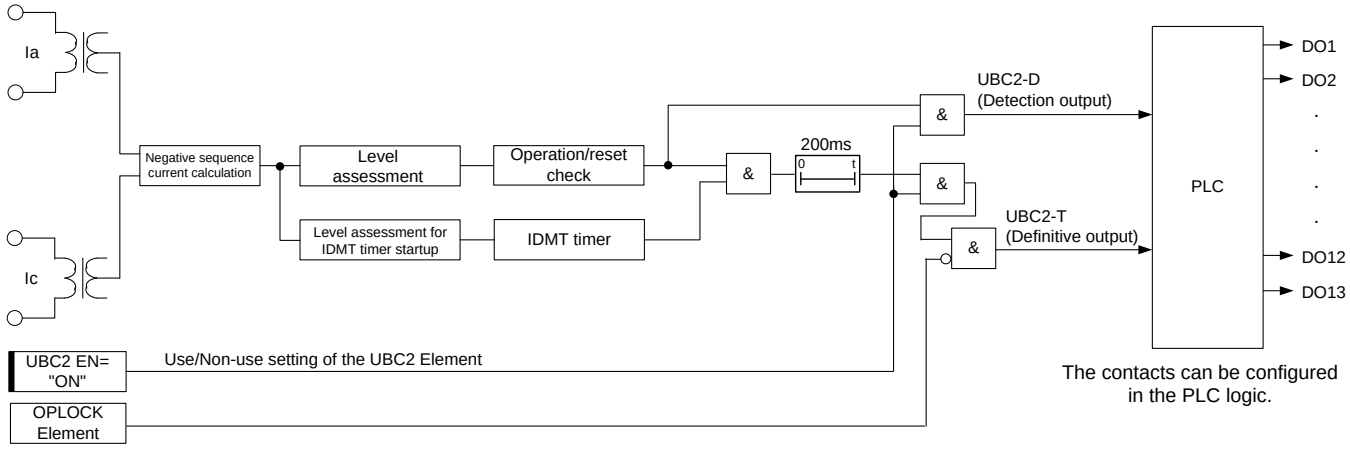


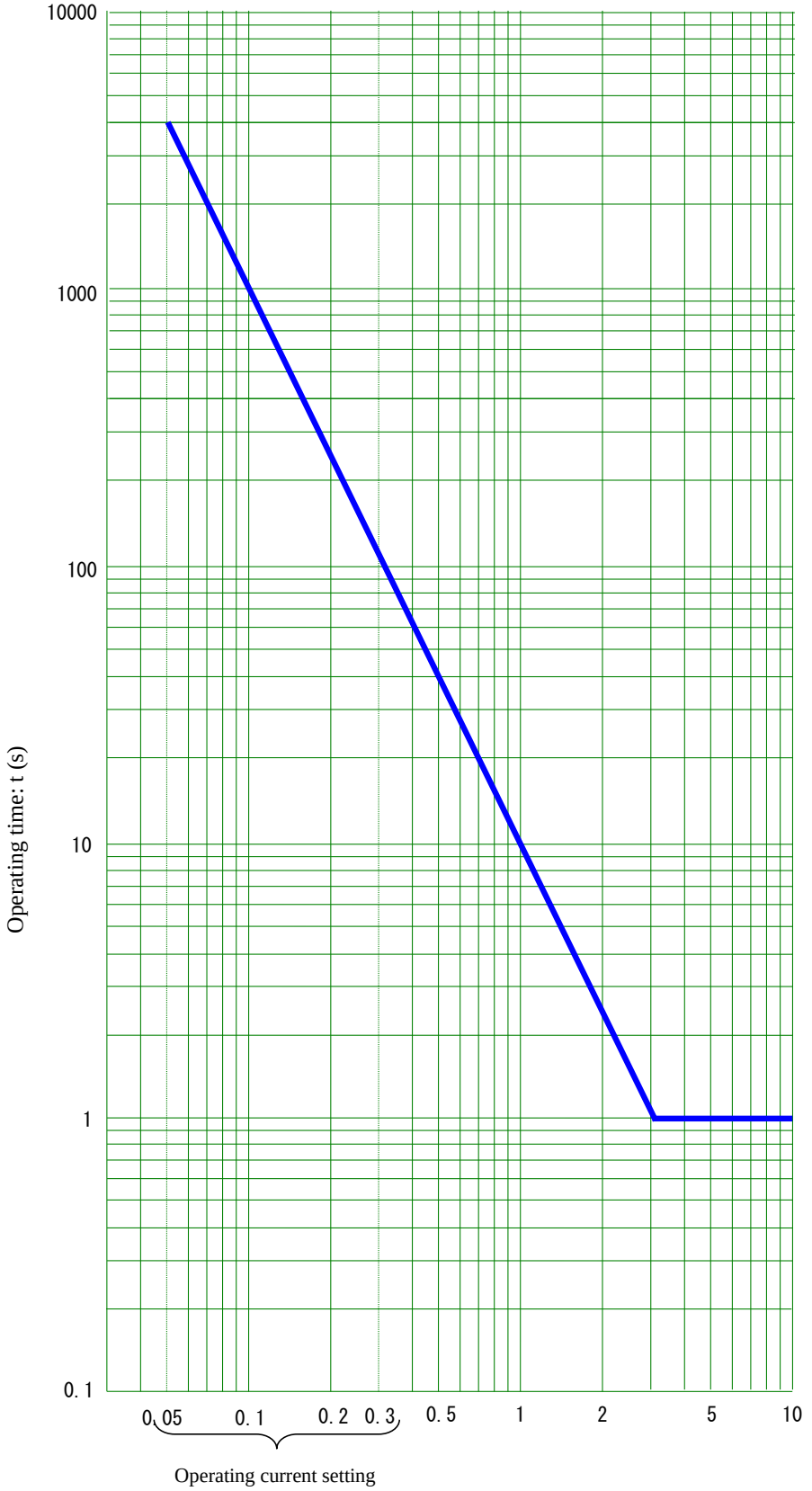
Fig. 8-9 Internal function block diagram of UBC2 element

Table 8-11 Setting items of UBC2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
UBC2	UBC2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	5 ~ 30 %	1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. TM	5 ~ 50	1	Operating time multiplier. This is indicated as "M" in the characteristic formula shown in sub-clause 8.1.4.3.

8.3.2.1.IDMT characteristic

Following operating time characteristics are provided in the UBC2 element.



$$t = \frac{M}{I_2^2}$$

t : Operating time (s)

I_2 : Multiple of input negative sequence current to generator's rated current IG (times)

M : Operating time multiplier (times)

This graph is an example of M = 10

Fig. 8-10 Operating time characteristic

Table 8-12 UBC2 element Operating time accuracy table

Unit: s

Multiple of input	30%		50%		100%	
Operating time Multiplier (M)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)	Error (ε_{tm}) %	Standard time Allowable time (T_k)
5	±10.00	55.6 50.0 ～ 61.1	±10.00	20.0 18.0 ～ 22.0	±10.00	5.0 4.5 ～ 5.5
10	±10.00	111.1 100.0 ～ 122.2	±10.00	40.0 36.0 ～ 44.0	±10.00	10.0 9.0 ～ 11.0
15	±10.00	166.7 150.0 ～ 183.3	±10.00	60.0 54.0 ～ 66.0	±10.00	15.0 13.5 ～ 16.5
20	±10.00	222.2 200.0 ～ 244.4	±10.00	80.0 72.0 ～ 88.0	±10.00	20.0 18.0 ～ 22.0
25	±10.00	277.8 250.0 ～ 305.6	±10.00	100.0 90.0 ～ 110.0	±10.00	25.0 22.5 ～ 27.5
30	±10.00	333.3 300.0 ～ 366.7	±10.00	120.0 108.0 ～ 132.0	±10.00	30.0 27.0 ～ 33.0
35	±10.00	388.9 350.0 ～ 427.8	±10.00	140.0 126.0 ～ 154.0	±10.00	35.0 31.5 ～ 38.5
40	±10.00	444.4 400.0 ～ 488.9	±10.00	160.0 144.0 ～ 176.0	±10.00	40.0 36.0 ～ 44.0
45	±10.00	500.0 450.0 ～ 550.0	±10.00	180.0 162.0 ～ 198.0	±10.00	45.0 40.5 ～ 49.5
50	±10.00	555.6 500.0 ～ 611.1	±10.00	200.0 180.0 ～ 220.0	±10.00	50.0 45.0 ～ 55.0

8.4. Directional ground fault element

Two stages of directional ground fault elements are incorporated in CGP1-A41D1, and rapid detection of ground fault within the protected section is possible.

Apparatus No.	Display name	Protective function
67G	DIRG1, DIRG2	Directional ground fault element

8.4.1. DIRG1 element

Fig. 8-11 shows the internal function blocks of DIRG1 element.

The DIRG1 element outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when

a) the zero sequence current is greater than or equal to the setting value (Ope. Curt.) , AND

b) the zero sequence voltage is greater than or equal to the setting value (Ope. Volt.), AND

c) the phase difference between the zero-seq. current and zero-seq. voltage is within the operating area.

An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of DIRG1 element (DIRG1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to DIRG1 element.
This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

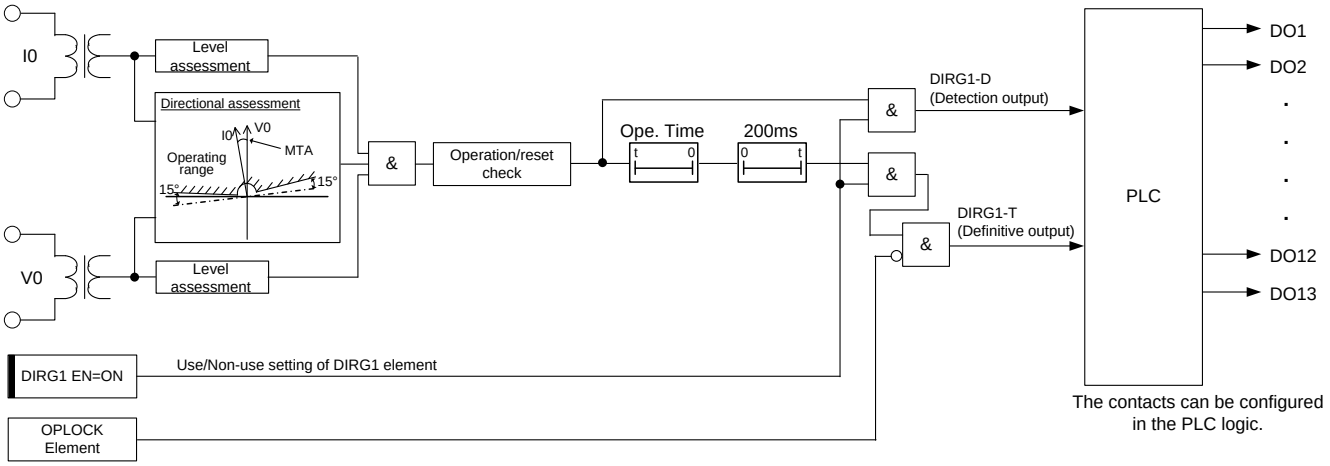


Fig. 8-11 Internal function block diagram of DIRG1 element

Table 8-13 Setting items of DIRG1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
DIRG	MT Angle	0° ~ 90° (Lead angle)	1°	Setting the maximum sensitivity angle common to DIRG1 and DIRG2
DIRG1	DIRG1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt	2.0 ~ 100.0 V	0.1 V	Operating voltage
	Ope. Curt.	1.0 ~ 100.0 mA	0.5 mA	Operating current
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.4.2. DIRG2 element

The DIRG2 element has the same characteristics as the DIRG1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.4.1.

Table 8-14 Setting items of DIRG2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
DIRG	MT Angle	0° ~ 90° (Lead angle)	1°	Setting the maximum sensitivity angle common to DIRG1 and DIRG2
DIRG2	DIRG2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt	2.0 ~ 100.0 V	0.1 V	Operating voltage
	Ope. Curt.	1.0 ~ 100.0 mA	0.5 mA	Operating current
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.5. Undervoltage element

Two stages of undervoltage elements are incorporated in CGP1-A41D1 and CGP1-A42D1.

As a countermeasure against accidents on the premises of users installing non-utility generation facilities, these elements detect a voltage drop that occurs due to an abnormality in the system such as the voltage control system of the non-utility generation facilities and shut off the circuit with a time delay.

Apparatus No.	Display name	Protective function
27	UV1, UV2	Undervoltage element

8.5.1. UV1 element

Fig. 8-12 shows the internal function blocks of UV1 element.

UV1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when input voltage is less than or equal to the operation setting value (Ope. Volt.).
However, the voltage of Vca is calculated by software which synthesizes Vab and Vbc.
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

To facilitate testing of the single phase operation, a lock function is provided for the UV1 element of each phase. The lock function can be set from the front panel or PC-HMI.
Furthermore, this element is enabled only when the setting of Use/Non-use of UV1 element (UV1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to UV1 element.

This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

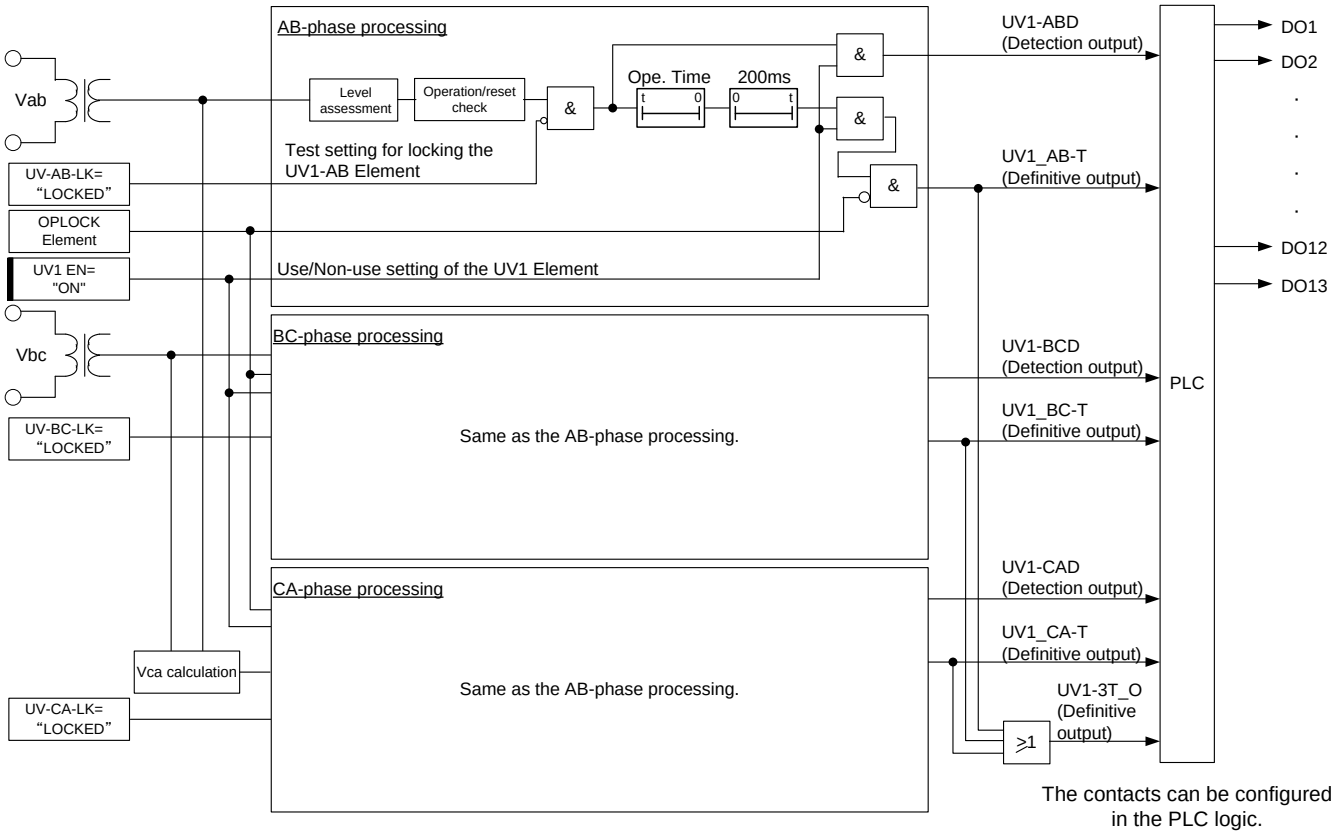


Fig. 8-12 Internal function block diagram of UV1 element

Table 8-15 Setting items of UV1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
UV1	UV1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	20.0 ~ 120.0 V	0.1 V	Operating voltage
	Ope. Time	0.00 ~ 15.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.5.2. UV2 element

The UV2 element has the same characteristics as the UV1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.5.1.

Table 8-16 Setting items of UV2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
UV2	UV2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	20.0 ~ 120.0 V	0.1 V	Operating voltage
	Ope. Time	0.00 ~ 15.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.6. Overvoltage element

Two stages of overvoltage elements are incorporated in CGP1-A41D1 and CGP1-A42D1.

Apparatus No.	Display name	Protective function
59	OV1, OV2	Overvoltage element

8.6.1. OV1 element

Fig. 8-13 shows the internal function blocks of OV1 element.

OV1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when input voltage is greater than or equal to the operation setting value (Ope. Volt.).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of OV1 element (OV1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OV1 element.

This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

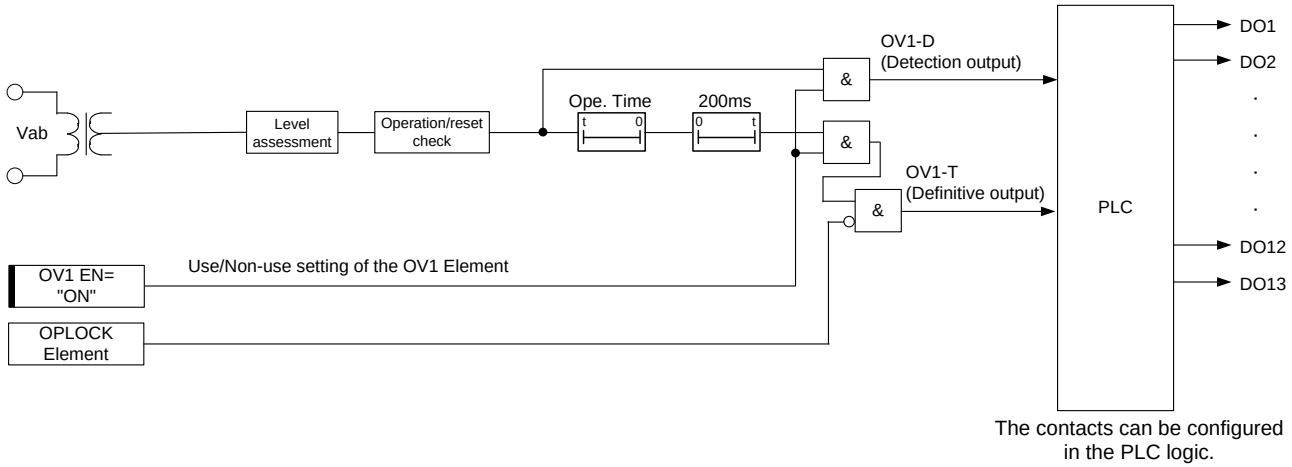


Fig. 8-13 Internal function block diagram of OV1 element

Table 8-17 Setting items of OV1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OV1	OV1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	20.0 ~ 200.0 V	0.1 V	Operating voltage
	Ope. Time	0.00 ~ 15.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.6.2. OV2 element

The OV2 element has the same characteristics as the OV1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.6.1.

Table 8-18 Setting items of OV2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OV2	OV2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	20.0 ~ 200.0 V	0.1 V	Operating voltage
	Ope. Time	0.00 ~ 15.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.7. Ground fault overvoltage element

Two stages of ground fault overvoltage elements are incorporated in CGP1-A41D1.

Apparatus No.	Display name	Protective function
64	OVG1, OVG2	Ground fault overvoltage element

8.7.1. OVG1 element

Fig. 8-14 shows the internal function blocks of OVG1 element.

OVG1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when input voltage is greater than or equal to the operation setting value (Ope. Volt.).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of OVG1 element (OVG1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OVG1 element.

This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

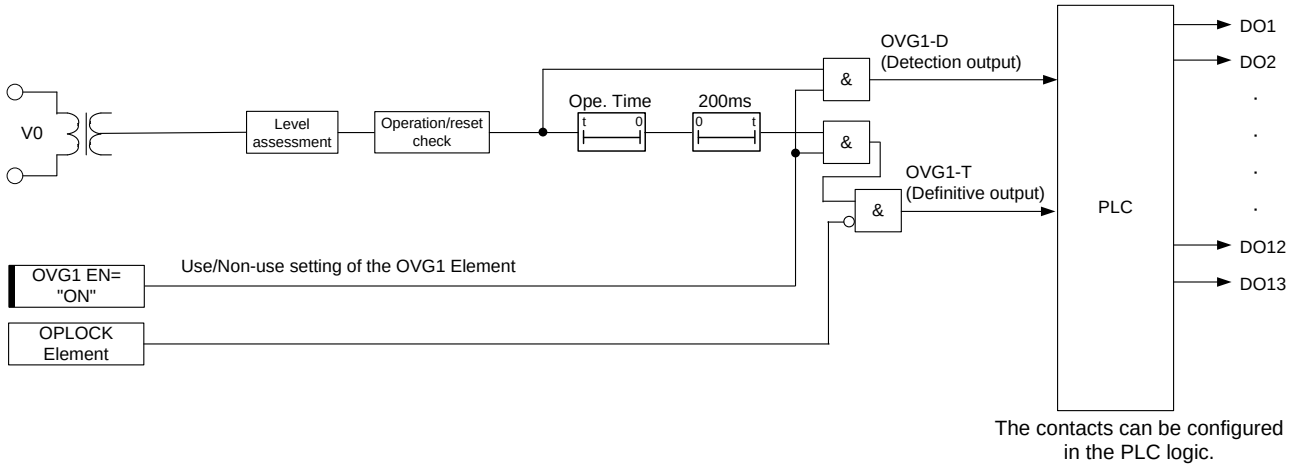


Fig. 8-14 Internal function block diagram of OVG1 element

Table 8-19 Setting items of OVG1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OVG1	OVG1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	2.0 ~ 100.0 V	0.1 V	Operating voltage
	Ope. Time	0.00 ~ 20.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.7.2. OVG2 element

The OVG2 element has the same characteristics as the OVG1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.7.1.

Table 8-20 Setting items of OVG2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OVG2	OVG2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	2.0 ~ 100.0 V	0.1 V	Operating voltage
	Ope. Time	0.00 ~ 20.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.8. Underfrequency element

Two stages of underfrequency elements are incorporated in CGP1-A41D1 and CGP1-A42D1.

Apparatus No.	Display name	Protective function
95L	UF1, UF2	Underfrequency element

8.8.1. UF1 element

Fig. 8-15 shows the internal function blocks of UF1 element.

UF1 element calculates a frequency from Vab phase.
UF1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when calculated frequency is less than or equal to the operation setting value (Ope. Freq.), AND when Vab-phase voltage is greater than or equal to 35V (*1).
(*1) This condition is imposed because a voltage greater than a certain level is necessary to permit a correct calculation of frequency.

An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of UF1 element (UF1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to UF1 element.

This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

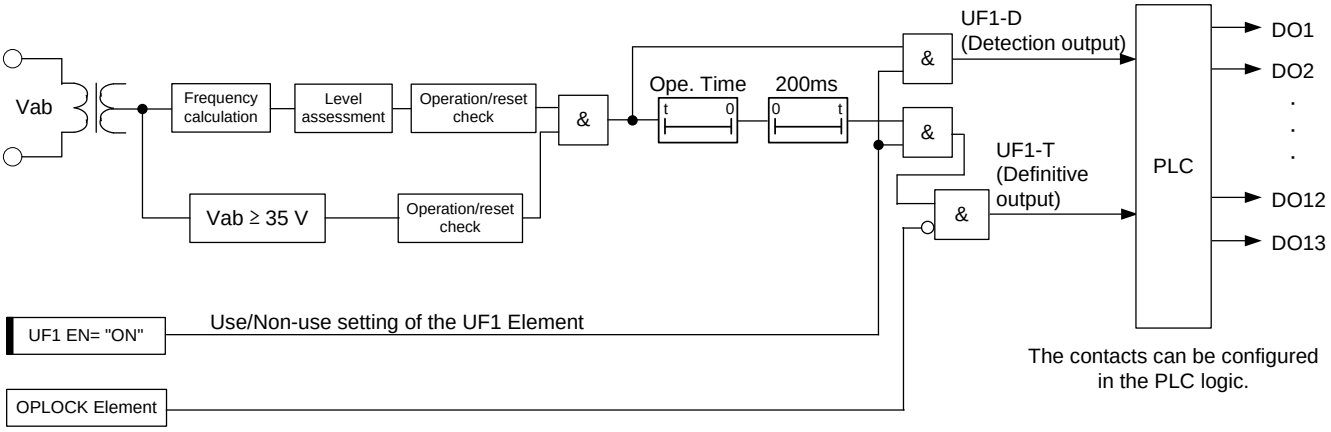


Fig. 8-15 Internal function block diagram of UF1 element

Table 8-21 Setting items of UF1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
UF1	UF1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Freq.	-0.5 ~ -6.0 Hz	0.1 Hz	Operating frequency (Difference from rated frequency)
	Ope. Time	0.1 ~ 15.0 s	0.1 s	Operating time

8.8.2. UF2 element

The UF2 element has the same characteristics as the UF1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.8.1.

Table 8-22 Setting items of UF2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
UF2	UF2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Freq.	-0.5 ~ -6.0 Hz	0.1 Hz	Operating frequency (Difference from rated frequency)
	Ope. Time	0.1 ~ 15.0 s	0.1 s	Operating time

8.9. Overfrequency element

Two stages of Overfrequency elements are incorporated in CGP1-A41D1 and CGP1-A42D1.

Apparatus No.	Display name	Protective function
95H	OF1, OF2	Overfrequency element

8.9.1. OF1 element

Fig. 8-16 shows the internal function blocks of OF1 element.

OF1 element calculates a frequency from Vab phase.
OF1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when calculated frequency is greater than or equal to the operation setting value (Ope. Freq.), AND when Vab-phase voltage is greater than or equal to 35V (*1).
(*1) This condition is imposed because a voltage greater than a certain level is necessary to permit a correct calculation of frequency.

An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of OF1 element (OF1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OF1 element.

This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

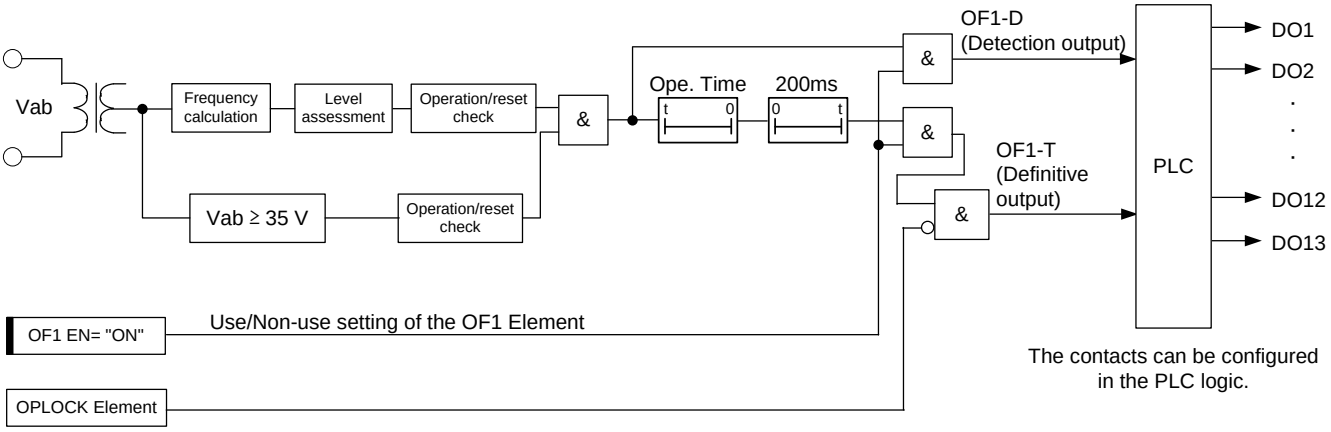


Fig. 8-16 Internal function block diagram of OF1 element

Table 8-23 Setting items of OF1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OF1	OF1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Freq.	+0.5 ~ +6.0 Hz	0.1 Hz	Operating frequency (Difference from rated frequency)
	Ope. Time	0.1 ~ 15.0 s	0.1 s	Operating time

8.9.2. OF2 element

The OF2 element has the same characteristics as the OF1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.9.1.

Table 8-24 Setting items of OF2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OF2	OF2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Freq.	+0.5 ~ +6.0 Hz	0.1 Hz	Operating frequency (Difference from rated frequency)
	Ope. Time	0.1 ~ 15.0 s	0.1 s	Operating time

8.10. Reverse power element

Two stages of reverse power elements are incorporated in CGP1-A41D1 and CGP1-A42D1.

Apparatus No.	Display name	Protective function
67P	RP1, RP2	Reverse power element

8.10.1. RP1 element

Fig. 8-17 shows the internal function blocks of RP1 element.

RP1 element calculates the 3-phase combined power by using the two-wattmeter method.
RP1 outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when calculated power is greater than or equal to the operation setting value based on current (Ope. Curt.) and rated voltage.
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of RP1 element (RP1 EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to RP1 element.

This element is provided with two DI circuits for interlocking the operation (OPLOCK element).
For the operations of the OPLOCK element, refer to 8.12.1.

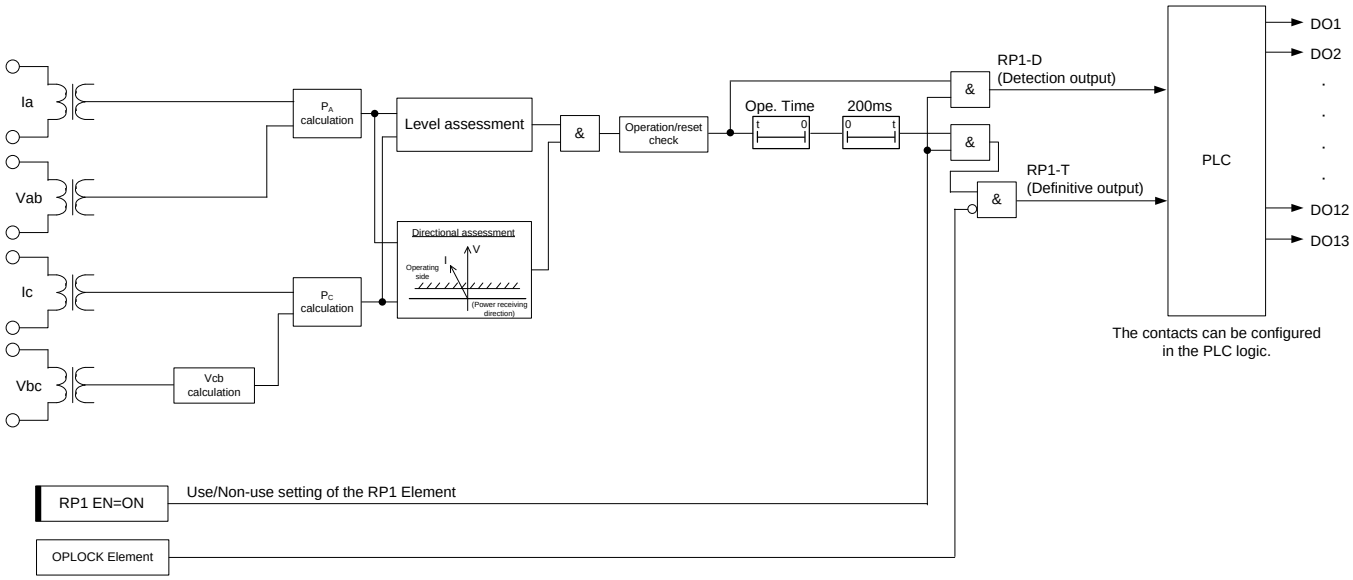


Fig. 8-17 Internal function block diagram of RP1 element

Table 8-25 Setting items of RP1 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
RP1	RP1 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	0.5 ~ 30.0 %	0.1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. Time	0.10 ~ 20.00 s	0.01 s	Operating time

8.10.2. RP2 element

The RP2 element has the same characteristics as the RP1 element.
Regarding the internal function block diagram and its operation, refer to sub-clause 8.10.1.

Table 8-26 Setting items of RP2 element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
RP2	RP2 EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Curt.	0.5 ~ 30.0 %	0.1 %	Operating current (Multiplier applied to generator's rated current)
	Ope. Time	0.10 ~ 20.00 s	0.01 s	Operating time

8.11. Voltage detection element

A voltage detection element is incorporated in CGP1-A41D1 and CGP1-A42D1.

Apparatus No.	Display name	Protective function
84	VD	Voltage detection element

8.11.1. VD element

Fig. 8-18 shows the internal function blocks of VD element.

VD element outputs a definitive signal after a preset time of the operation timer (Ope. Time) has passed, when input voltage is greater than or equal to the operation setting value (Ope. Volt.).
An off-delay timer of 200 ms is added in order to prevent chattering of the output contacts.

Furthermore, this element is enabled only when the setting of Use/Non-use of VD element (VD EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to VD element.

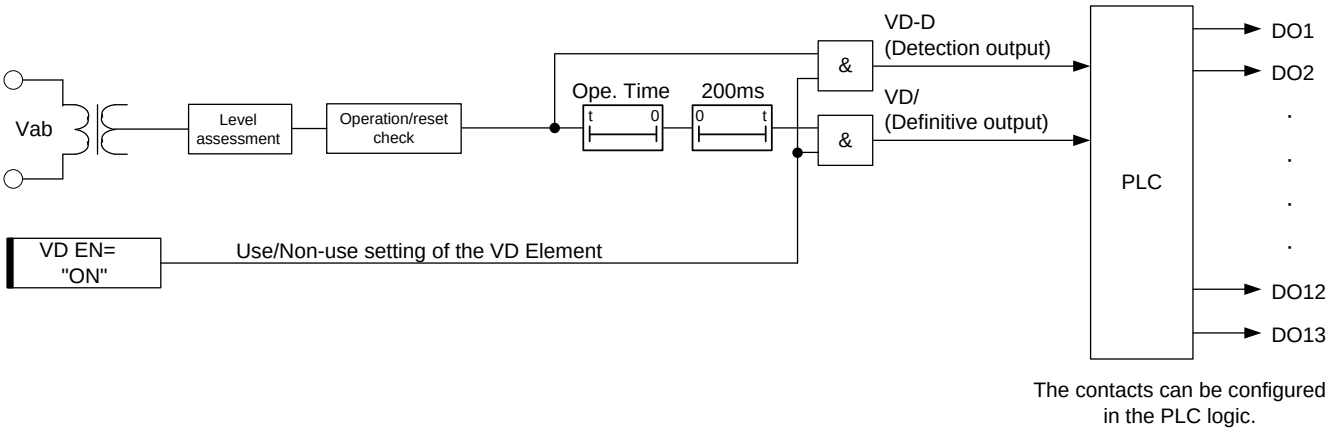


Fig. 8-18 Internal function block diagram of VD element

Table 8-27 Setting items of VD element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
VD	VD EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Ope. Volt.	80 ~ 110 V	1 V	Operating voltage
	Ope. Time	0.00 ~ 10.00 s	0.01 s	Operating time INST: ≤ 50 ms

8.12. Operation lock function

An operation lock function is incorporated in CGP1-A41D1 and CGP1-A42D1.

Apparatus No.	Display name	Protective function
OPLOCK	OPLOCK	Operation lock function

8.12.1. OPLOCK element

OPLOCK element is provided with two DI circuits for interlocking the operation of protection elements. This element remains in the operation lock state while voltage is applied to DI6 or DI7, and the lock is reset without the voltage after a preset time of the resetting timer (Rst. Time) has passed.
The protection elements subject to operation lock can be switched to one of the four patterns (OFF: Not used, DI6: Locked by DI6 input, DI7: Locked by DI7 input, DI67: Locked by either DI6 or DI7 input) depending on the lock element setting (○○ Lock EN*) for each element.
*○○ represents each element name.

Furthermore, this element is enabled only when the setting of Use/Non-use of OPLOCK element (OPLOCK EN) is set to ON. Therefore, when this element is not used, unnecessary operation can be prevented by setting to OFF. It is not necessary to set other setting items with regard to OPLOCK element.

Table 8-28 Setting items of OPLOCK element

Display name	Setting parameter	Setting		Description
		Range of setting	step	
OPLOCK	OPLOCK EN	OFF, ON	-	OFF: Non-use, ON: Use When this element is used, set to ON.
	Rst. Time	0.0 ~ 10.0 s	0.1 s	Resetting time for unlocking INST: ≤ 50 ms
	OC1 Lock EN	OFF, DI6, DI7, DI67	-	OC1 Lock
	OC2 Lock EN	OFF, DI6, DI7, DI67	-	OC2 Lock
	OC3 Lock EN	OFF, DI6, DI7, DI67	-	OC3 Lock
	OC4 Lock EN	OFF, DI6, DI7, DI67	-	OC4 Lock
	OCG1 Lock EN	OFF, DI6, DI7, DI67	-	OCG1 Lock (CGP1-A42D1 only)
	OCG2 Lock EN	OFF, DI6, DI7, DI67	-	OCG2 Lock (CGP1-A42D1 only)
	UBC1 Lock EN	OFF, DI6, DI7, DI67	-	UBC1 Lock
	UBC2 Lock EN	OFF, DI6, DI7, DI67	-	UBC2 Lock
	DIRG1 Lock EN	OFF, DI6, DI7, DI67	-	DIRG1 Lock (CGP1-A41D1 only)
	DIRG2 Lock EN	OFF, DI6, DI7, DI67	-	DIRG2 Lock (CGP1-A41D1 only)
	UV1 Lock EN	OFF, DI6, DI7, DI67	-	UV1 Lock
	UV2 Lock EN	OFF, DI6, DI7, DI67	-	UV2 Lock
	OV1 Lock EN	OFF, DI6, DI7, DI67	-	OV1 Lock
	OV2 Lock EN	OFF, DI6, DI7, DI67	-	OV2 Lock
	OVG1 Lock EN	OFF, DI6, DI7, DI67	-	OVG1 Lock (CGP1-A41D1 only)
	OVG2 Lock EN	OFF, DI6, DI7, DI67	-	OVG2 Lock (CGP1-A41D1 only)
	UF1 Lock EN	OFF, DI6, DI7, DI67	-	UF1 Lock
	UF2 Lock EN	OFF, DI6, DI7, DI67	-	UF2 Lock
	OF1 Lock EN	OFF, DI6, DI7, DI67	-	OF1 Lock
	OF2 Lock EN	OFF, DI6, DI7, DI67	-	OF2 Lock
	RP1 Lock EN	OFF, DI6, DI7, DI67	-	RP1 Lock
	RP2 Lock EN	OFF, DI6, DI7, DI67	-	RP2 Lock

OFF: Non-use
DI6: DI6 is activated.
DI7: DI7 is activated.
DI67: Both DI6 and DI7 are activated.

9. CB control function

In the relay, following CB control function is provided.
In this chapter, the CB control function incorporated in the relay are described.

CB control can be performed in the following three ways.
(1) Operation from the front panel (Refer to 5.3.4.2.)
(2) Operation from a locally attached PC (PC-HMI)
(3) Operation from the DI control instructions

9.1. CB open control

Fig. 9-1 shows the internal function blocks of CB open control.
Table 9-1 shows the control conditions.

The CB open control provides control output by receiving control instructions.
To output the control signal, check the presence or absence of interlock condition and the presence or absence of operation block setting (CB OPEN), and then output the control instruction.

When the Remote/Local setting (REMOTE/LOCAL) is set to REMOTE, the control output is performed after a preset time set on the operation timer (ON TIMER). When the Remote/Local setting (REMOTE/LOCAL) is set to LOCAL, the control output is performed instantaneously after the operation. At this time, the control state is held by the flip-flop, but it is reset when the control result becomes clear. When the Remote/Local setting (REMOTE/LOCAL) is set to REMOTE, the DI control signal must be continuously input so as to exceed the set time of the operation timer (ON TIMER). If you want to stop the control for some reason, it is possible to stop the control by stopping the DI input during the timer count.

An one-shot timer of 200 ms is added to the control output for performing open control to maintain the output until the CB is fully opened. This is because, if the breaking current that flows when the CB is opened is released by relay's own contact, the contact will be welded.

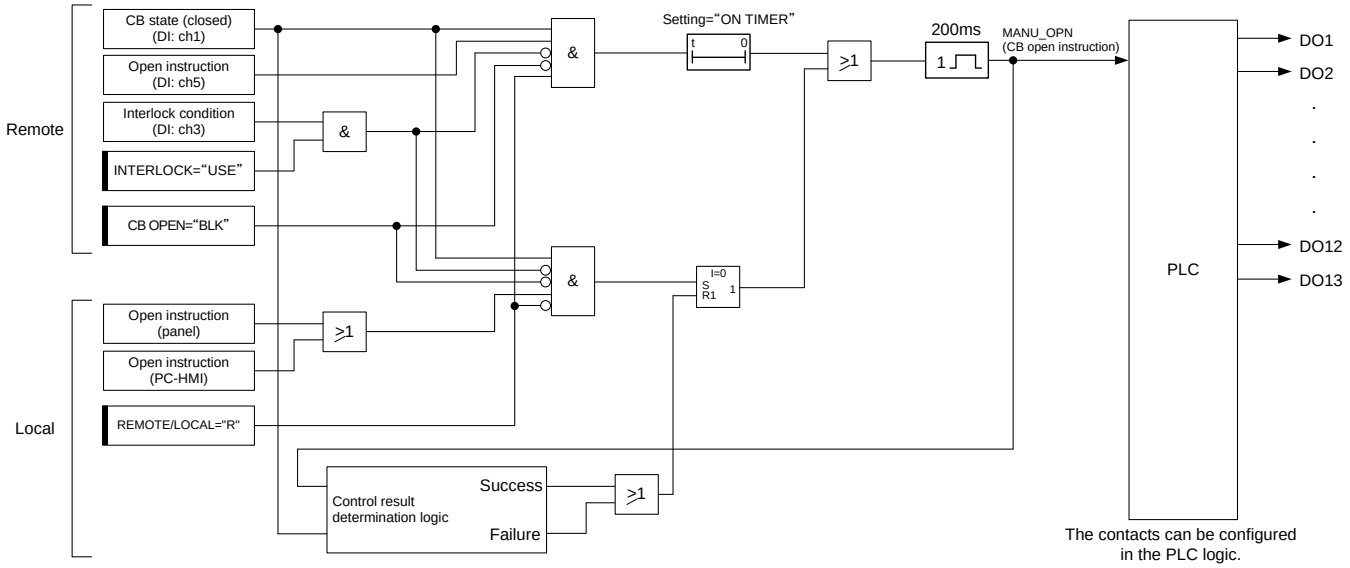


Fig. 9-1 Internal function block diagram of CB open control

As shown in Table 9-1, when "CB control: DI input" and "CB control: Setting" are both established, it is possible to execute the CB open instruction.
Note that the open instruction method that can be used in Local mode is different from that used in Remote mode.

Local: Open instruction is executed by panel operation or PC-HMI operation.
Remote: Open instruction is executed by the input to DI (ch5).

Table 9-1 Control conditions of CB open

	CB control: DI input		CB control: Setting (Refer to 5.3.4.2)			CB open instruction	
	CB State (Closed) (DI:ch1)	Interlock condition (DI:ch3)	Interlock	CB OPEN	LOCAL/ REMOTE	Open instruction (Panel or PC-HMI)	Open instruction (DI:ch5)
Local	○		UNUSE	UNBLK	L	Possible	
	○	○	UNUSE	UNBLK	L	Possible	
	○		USE	UNBLK	L	Possible	
Remote	○		UNUSE	UNBLK	R		Possible
	○	○	UNUSE	UNBLK	R		Possible
	○		USE	UNBLK	R		Possible

* The cell with a circle "○" under the "DI:ch*" column means that "the DI input is on".

9.2. CB close control

Fig. 9-2 shows the internal function blocks of CB close control.
Table 9-2 shows the control conditions.

The CB close control provides control output by receiving control instructions.
To output the control signal, check the presence or absence of interlock condition and the presence or absence of operation block setting (CB CLOSE), and then output the control instruction.

When the Remote/Local setting (REMOTE/LOCAL) is set to REMOTE, the control output is performed after a preset time set on the operation timer (ON TIMER). When the Remote/Local setting (REMOTE/LOCAL) is set to LOCAL, the control output is performed instantaneously after the operation. At this time, the control state is held by the flip-flop, but it is reset when the control result becomes clear. When the Remote/Local setting (REMOTE/LOCAL) is set to REMOTE, the DI control signal must be continuously input so as to exceed the set time of the operation timer (ON TIMER). If you want to stop the control for some reason, it is possible to stop the control by stopping the DI input during the timer count.

An one-shot timer of 200 ms is added to the control output for performing close control to maintain the output until the CB is fully closed. This is because, if the making current that flows when the CB is closed is released by relay's own contact, the contact will be welded.

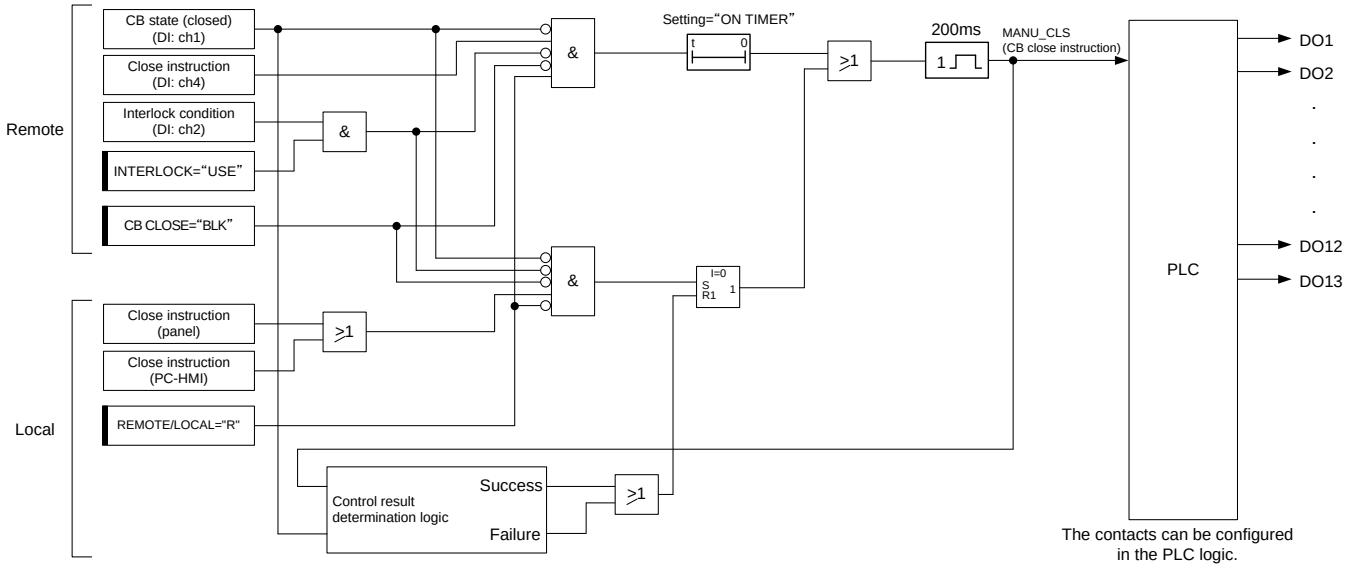


Fig. 9-2 Internal function block diagram of CB close control

As shown in Table 9-2, when "CB control: DI input" and "CB control: Setting" are both established, it is possible to execute the CB close instruction.
Note that the close instruction method that can be used in Local mode is different from that used in Remote mode.

Local: Close instruction is executed by panel operation or PC-HMI operation.
Remote: Close instruction is executed by the input to DI (ch5).

Table 9-2 Control conditions of CB close

	CB control: DI input		CB control: Setting (Refer to 5.3.4.2)			CB close instruction	
	CB State (Closed) (DI:ch1)	Interlock condition (DI:ch2)	Interlock	CB CLOSE	LOCAL/ REMOTE	Close instruction (Panel or PC-HMI)	Close instruction (DI:ch4)
Local			UNUSE	UNBLK	L	Possible	
		○	UNUSE	UNBLK	L	Possible	
			USE	UNBLK	L	Possible	
Remote			UNUSE	UNBLK	R		Possible
		○	UNUSE	UNBLK	R		Possible
			USE	UNBLK	R		Possible

* The cell with a circle “○” under the “DI:ch*” column means that “the DI input is on”.

10. Standard (Technical data)

Compliance standards: Standard of the Japanese Electrotechnical Committee (JEC)

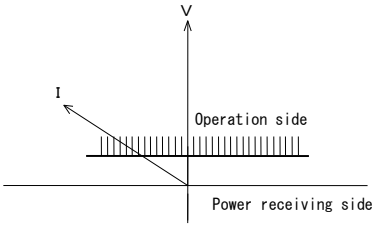
JEC2500 (2010) Protection relays for electric power systems
JEC2501 (2010) Electromagnetic compatibility tests for protection relays
JEC2511 (1995) Voltage relays
JEC2512 (2002) Directional earth fault relays
JEC2518 (2015) Digital type overcurrent relays

Guaranteed performance

Common conditions	Frequency: Rated frequency Control power supply voltage: Rated voltage Ambient temperature: 20°C Relative humidity: 30 to 80 % on daily average	Unless otherwise indicated, the common conditions shall be as described in the left column.

10.1. Relay characteristic data

Item	Test condition		Standard
Operating value	Overcurrent element (50, 51)	Current setting	Setting ± 5%
	Ground fault overcurrent element (51G)	Current setting (a) 0.1A ≤ Ope.Curt. < 0.5A (b) 0.5A ≤ Ope.Curt	(a) Setting ± 10% (b) Setting ± 5%
	Directional ground fault element (67G)	Voltage setting Current setting (a) Ope.Curt. < 10.0mA (b) 10.0mA ≤ Ope.Curt.	Setting ± 5% (a) Setting ±10% (b) Setting ±5%
	Unbalance current (46-1, 46-2)	Negative sequence current setting	Setting ± 5%
	Undervoltage element (27) Overvoltage element (59) Ground fault overvoltage element (64) Voltage detection element (84)	Voltage setting	Setting ± 5%
	Underfrequency element (95L) Overfrequency element (95H)	Frequency element: Voltage input: Rated voltage Undervoltage lock element (35V fixed): Rated frequency + Ope. Freq. – 1Hz (95L) Rated frequency + Ope. Freq. + 1Hz (95H)	Frequency element: Setting ± 0.02Hz Undervoltage lock element: 35V ± 5%
	Reverse power element (67P)	Current setting (a) Ope.Curt. < 2.0% (b) 2.0% ≤ Ope.Curt. Voltage input: Rated voltage Current phase: Maximum sensitivity angle	(a) Setting ± 7% (b) Setting ± 5%
Resetting value	Overcurrent element (50, 51) Ground fault overcurrent element (51G)	Current setting	Operating value × 95% or more
	Directional ground fault element (67G)	Voltage setting Current setting	
	Unbalance current (46-1, 46-2)	Negative sequence current setting	
	Overvoltage element (59) Ground fault overvoltage element (64) Voltage detection element (84)	Voltage setting	

Resetting value	Undervoltage element (27)	Voltage setting	Operating value × 105% or less
	Underfrequency element (95L) Overfrequency element (95H)	Frequency element: Voltage input: Rated voltage Undervoltage lock element (35V fixed): Rated frequency + Ope. Freq. – 1Hz (95L) Rated frequency + Ope. Freq. + 1Hz (95H)	Frequency element: Setting ± 0.02Hz Undervoltage lock element: Operating value × 105% or less
	Reverse power element (67P)	Current setting (a) Ope.Curt. < 2.0% (b) 2.0% ≤ Ope.Curt. Voltage input: Rated voltage Current phase: Maximum sensitivity angle	(a) Operating value × 90% or more (b) Operating value × 95% or more
Overshoot time characteristics	Instantaneous overcurrent element (50) Ground fault overcurrent element (51G)	Setting : Current setting = Minimum Operating time = Maximum Current input: Current = 0 → Setting value × 1000% Applied time: Theoretical operating time × 90%	The relay shall not operate.
	DT or IDMT overcurrent element (51)	Setting : Current setting = Minimum Operating time multiplier = 10.00 Ope. Chr. = EI Current input: Current = 0 → Setting value × 1000% Applied time: Theoretical operating time × 90%	
	Instantaneous unbalance current (46-1)	Setting : Current setting = Minimum Operating time = 1.0s Current input: Current = 0 → Setting value × 1000% Applied time: Theoretical operating time × 90%	
	IDMT unbalance current (46-2)	Setting : Current setting = Minimum Operating time multiplier = 10 Current input: Current = 0 → Setting value × 1000% Applied time: Theoretical operating time × 90%	
Phase characteristics	Directional ground fault element (67G)	Setting : Voltage setting = Minimum Current setting (a) Ope.Curt. < 10.0mA (b) 10.0mA ≤ Ope.Curt. Voltage input: Rated voltage Rated voltage × 30% Current input: Current setting × 200% Current setting × 1000% Current setting × 4000%	(a) Setting ±10° (b) Setting ±5°
	Reverse power element (67P)	Setting: Current setting = Minimum Input: Voltage = Rated voltage Current = Setting value × 200%	 Maximum sensitivity angle = 0°±5°

Operating time	Instantaneous overcurrent element (50) Ground fault overcurrent element (51G)	Setting : Current setting = Minimum (a) Ope.Time : 0.00 s Input: Current = 0 → Setting value × 200% (b) Ope.Time : 0.01s ≤ Ope.Time < 1.00s Input: Current = 0 → Setting value × 300, 500, 1000% (c) Ope.Time : 1.00s ≤ Ope.Time ≤ 10.00s Input: Current = 0 → Setting value × 300, 500, 1000%	(a) Within 40 ms (b) Ope.time setting ± 50 ms (c) Ope.time setting ± 5%
	DT or IDMT overcurrent element (51)	Setting : Current setting = Minimum ・Except for DT Input: Current = (a) 0 → Setting value ×300% (b) 0 → Setting value ×500% (c) 0 → Setting value ×1000% ・DT (d) Ope.TM < 5.00 Input: Current = 0 → Setting value ×300, 500, 1000% (e) 5.00 ≤ Ope.TM ≤ 10.00 Input: Current = 0 → Setting value ×300, 500, 1000%	・Except for DT (a) Ope.time setting ± 12% or Ope.time setting ± 100 ms (b) Ope.time setting ± 7% or Ope.time setting ± 100 ms (c) Ope.time setting ± 5% or Ope.time setting ± 100 ms ・DT (d) Ope.time setting ± 50 ms (e) Ope.time setting ± 5%
	Directional ground fault element (67G)	Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Input: Current = 0 → Ope.Curt. × 150, 300, 500, 1000, 2000, 4000% Voltage = 0 → Rated voltage, Rated voltage × 30% Phase difference between voltage and current = 0° (a) Ope.Time : 0.00 s (b) Ope.Time : 0.01s ≤ Ope.Time < 1.00s (c) Ope.Time : 1.00s ≤ Ope.Time ≤ 10.00s	(a) Within 50 ms (b) Ope.time setting ± 50 ms (c) Ope.time setting ± 5%
	Instantaneous unbalance current (46-1)	Setting : Current setting = Minimum Input: Negative sequence current = 0 → IG × Setting value × 300% (a) Ope.Time : 0.1s ≤ Ope.Time < 1.0s (b) Ope.Time : 1.0s ≤ Ope.Time ≤ 10.0s	(a) Ope.time setting ± 50 ms (b) Ope.time setting ± 5%
	IDMT unbalance current (46-2)	Setting : Current setting = Minimum Operating time multiplier = Minimum Input: Negative sequence current = 0 → IG	Ope.time setting ± 10% or Ope.time setting ± 100 ms
	Overvoltage element (59)	Setting: Voltage setting Input: Voltage = 0 → Setting value × 120, 130, 150% (a) Ope.Time : 0.00 s (b) Ope.Time : 0.01s ≤ Ope.Time < 1.00s (c) Ope.Time : 1.00s ≤ Ope.Time ≤ 15.00s	(a) Within 50 ms (b) Ope.time setting ± 50 ms (c) Ope.time setting ± 5%
	Voltage detection element (84)	Setting: Voltage setting Input: Voltage = 0 → Setting value × 120% (a) Ope.Time : 0.00 s (b) Ope.Time : 0.01s ≤ Ope.Time < 1.00s (c) Ope.Time : 1.00s ≤ Ope.Time ≤ 10.00s	

Operating time	Undervoltage element (27)	Setting: Voltage setting Input: Voltage = 125V → Setting value × 70, 0% (a) Ope.Time : 0.00 s (b) Ope.Time : 0.01s ≤ Ope.Time < 1.00s (c) Ope.Time : 1.00s ≤ Ope.Time ≤ 15.00s	(a) Within 50 ms (b) Ope.time setting ± 50 ms (c) Ope.time setting ± 5%
	Ground fault overvoltage element (64)	Setting: Voltage setting Input: Voltage = 0 → Setting value × 120, 150, 200% (a) Ope.Time : 0.00 s (b) Ope.Time : 0.01s ≤ Ope.Time < 1.00s (c) Ope.Time : 1.00s ≤ Ope.Time ≤ 20.00s	
	Underfrequency element (95L)	Frequency element: Setting: -6.0Hz Input: Voltage = Rated voltage Rated frequency → Rated frequency + Ope. Freq. – 0.5Hz df/dt = 3Hz/s (a) Ope.Time : 0.1s ≤ Ope.Time < 1.0s (b) Ope.Time : 1.0s ≤ Ope.Time ≤ 15.0s Undervoltage lock element (35V fixed): Input: Rated frequency + Ope. Freq. – 0.5Hz Rated voltage → 35V × 90%	Frequency element: (a) Ope.time setting ± 50 ms (b) Ope.time setting ± 5% Undervoltage lock element: Within 50 ms
	Overfrequency element (95H)	Frequency element: Setting: 6.0Hz Input: Voltage = Rated voltage Rated frequency → Rated frequency + Ope. Freq. + 0.5Hz df/dt = 3Hz/s (a) Ope.Time : 0.1s ≤ Ope.Time < 1.0s (b) Ope.Time : 1.0s ≤ Ope.Time ≤ 15.0s Undervoltage lock element (35V fixed): Input: Rated frequency + Ope. Freq. + 0.5Hz Rated voltage → 35V × 90%	
	Reverse power element (67P)	Setting: Current setting = Minimum Input: Voltage = Rated voltage Current = 0 → Setting value × 200% Current phase: Maximum sensitivity angle (a) Ope.Time : 0.10s ≤ Ope.Time < 1.00s (b) Ope.Time : 1.00s ≤ Ope.Time ≤ 20.00s	(a) Ope.time setting ± 50 ms (b) Ope.time setting ± 5%
Resetting time for unlocking	Operation lock function (OPLOCK)	DI input voltage: Rated voltage → 0 (a) Ope.Time : 0.0 s (b) Ope.Time : 0.1s ≤ Ope.Time < 1.0s (c) Ope.Time : 1.0s ≤ Ope.Time ≤ 10.0s	Operation time of relay element (a) Within 50 ms (b) Ope.time setting ± 50 ms (c) Ope.time setting ± 5%
Resetting time	Overcurrent element (50, 51) Ground fault overcurrent element (51G)	Setting : Current setting = Minimum Input: Current = Setting value × 300% → 0	200ms ± 50ms
	Directional ground fault element (67G)	Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Input: Current = Ope.Curt. × 1000, 2000% → 0 Voltage = Rated voltage, Rated voltage × 30% → 0 Phase difference between voltage and current = 0°	

Resetting time	Unbalance current (46-1, 46-2)	Setting : Current setting = Minimum Input: Negative sequence current = Setting value × 300% → 0	200ms ± 50ms
	Overvoltage element (59) Voltage detection element (84)	Setting: Voltage setting = Minimum Input: Voltage = Setting value × 120% → 0	
	Ground fault overvoltage element (64)	Setting: Voltage setting = Minimum Input: Voltage = Setting value × 150% → 0	
	Undervoltage element (27)	Setting: Voltage setting = Maximum Input: Voltage = Setting value × 70% → 125V	
	Underfrequency element (95L)	Frequency element: Setting: -6.0Hz Input: Voltage = Rated voltage Rated frequency + Ope. Freq. – 0.5Hz → Rated frequency df/dt = 3Hz/s Undervoltage lock element (35V fixed): Input: Rated frequency + Ope. Freq. – 0.5Hz 35V × 90% → Rated voltage	Frequency element: 200ms ± 50ms Undervoltage lock element: Within 50 ms
	Overfrequency element (95H)	Frequency element: Setting: 6.0Hz Input: Voltage = Rated voltage Rated frequency + Ope. Freq. + 0.5Hz → Rated frequency df/dt = 3Hz/s Undervoltage lock element (35V fixed): Input: Rated frequency + Ope. Freq. + 0.5Hz 35V × 90% → Rated voltage	
	Reverse power element (67P)	Setting: Current setting = Minimum Input: Voltage = Rated voltage Current = Setting value × 200% → 0 Current phase: Maximum sensitivity angle	200ms ± 50ms
Temperature characteristics	Instantaneous overcurrent element (50) Ground fault overcurrent element (51G) Undervoltage element (27) Overvoltage element (59) Ground fault overvoltage element (64) Voltage detection element (84) Directional ground fault element (67G) Reverse power element (67P) Unbalance current (46-1, 46-2) Underfrequency element (95L) Overfrequency element (95H)	Variation range: 20°C ± 20°C Setting: Operation setting value = Minimum (UV, OF = Maximum) Ope. Time. = Minimum	Operating value: ・OC, OCG, DIRG, OVG, OV, UV, VD, RP, UBC Ope.value at 20°C ± 5% ・UF, OF Ope.value at 20°C ± 0.02Hz
			Operating time: ・OC, OCG Within 40 ms ・OVG, OV, UV, VD Within 50 ms ・RP, UBC-1 Ope. time at 20°C ± 50ms ・UBC-2 Ope. time at 20°C ± 10%
			Phase characteristics: ・RP, DIRG Ope.value at 20°C ± 5°

Temperature characteristics	Instantaneous overcurrent element (50) Ground fault overcurrent element (51G) Undervoltage element (27) Overvoltage element (59) Ground fault overvoltage element (64) Voltage detection element (84) Directional ground fault element (67G) Reverse power element (67P) Unbalance current (46-1, 46-2) Underfrequency element (95L) Overfrequency element (95H)	Variation range: 20°C ± 30°C Setting: Operation setting value = Minimum (UV, OF = Maximum) Ope. Time. = Minimum	Operating value: ・OC, OCG, DIRG, OVG, OV, UV, VD, RP, UBC Ope.value at 20°C ± 10% ・UF, OF Ope.value at 20°C ± 0.04Hz
			Operating time: ・OC, OCG Within 40 ms ・OVG, OV, UV, VD Within 50 ms ・RP, UBC-1 Ope. time at 20°C ± 100ms ・UBC-2 Ope. time at 20°C ± 20%
			Phase characteristics: ・RP, DIRG Ope.value at 20°C ± 10°
	DT or IDMT overcurrent element (51)	(a) Variation range: 20°C ± 20°C (b) Variation range: 20°C ± 30°C Ope. value Setting : Current setting = Minimum Operating time multiplier = Minimum Ope. Chr. = DT Ope. time Setting : Current setting = Minimum Operating time multiplier = 10.00 Ope. Chr. = EI	Ope. value (a) Ope.value at 20°C ± 5% (b) Ope.value at 20°C ± 10% Ope. time (a)Ope. time at 20°C ± 10% (b)Ope. time at 20°C ± 20%
Power supply voltage characteristics	All elements	Variation range of control power supply =DC 88V, DC 300V, AC 85V, AC 264V	Operating value: ・Except for UF, OF Ope.value at rated voltage ± 5% ・UF, OF Ope.value at rated voltage ± 0.02Hz
Distorted wave characteristics	Ground fault overvoltage element (64) Overvoltage element (59) Undervoltage element (27) Voltage detection element (84)	3rd harmonic content: 90% of distortion factor 5th harmonic content: 90% of distortion factor 7th harmonic content: 90% of distortion factor	Operating value at 1f ± 10%
	Instantaneous overcurrent element (50) Ground fault overcurrent element (51G) Reverse power element (67P) Unbalance current (46-1, 46-2)	3rd harmonic content: 30% of distortion factor 5th harmonic content: 30% of distortion factor 7th harmonic content: 30% of distortion factor	Operating current at 1f ± 15%
	Underfrequency element (95L) Overfrequency element (95H)	Constant distorted wave: Superimpose 5% of 3rd harmonic Superimpose 5% of 5th harmonic Superimpose 5% of 7th harmonic	Operating value at 1f ± 0.05Hz
		Accident distorted wave: Superimpose 90% of 3rd harmonic Superimpose 90% of 5th harmonic Superimpose 90% of 7th harmonic	The relay shall not operate at rated frequency.

Distorted wave characteristics	Directional ground fault element (67G)	Third harmonic content: 30% of current distortion factor and 90% of voltage distortion factor Fifth harmonic content: 30% of current distortion factor and 90% of voltage distortion factor Seventh harmonic content: 30% of current distortion factor and 90% of voltage distortion factor Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0°	Current Ope. value at 1f ± 15% Voltage Ope. value at 1f ± 10% Phase Ope. value at 1f ± 10°
Frequency characteristics	Instantaneous overcurrent element (50) Ground fault overcurrent element (51G)	Frequency: Rated frequency ± 5% Setting : Current setting = Minimum Ope. Time. = 0.00s	Ope.value at rated freq. ± 5% Within 40 ms when inputting 200% of current setting
	Instantaneous unbalance current (46-1)	Frequency: Rated frequency ± 5% Setting : Current setting = Minimum	Ope.value at rated freq. ± 5%
	DT or IDMT overcurrent element (51)	Frequency: Rated frequency ± 5% Ope. value Setting : Current setting = Minimum Operating time multiplier = Minimum Ope. Chr. = DT01 Ope. time Setting : Current setting = Minimum Operating time multiplier = 10.00 Ope. Chr. = EI01 (a) Input: Current = 0 → Ope.Curt.×300% (b) Input: Current = 0 → Ope.Curt.×500% (c) Input: Current = 0 → Ope.Curt.×1000%	Ope.value at rated freq. ± 5% Ope. time: (a)Ope. time at rated freq. ± 12% (b)Ope. time at rated freq. ± 7% (c)Ope. time at rated freq. ± 5%
	Directional ground fault element (67G)	Frequency: Rated frequency ± 5% Ope. value Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Phase characteristics Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Input: Current = 0 → Ope.Curt. × 200, 1000, 4000% Voltage = Rated voltage	Current Ope.value at rated freq. ± 5% Voltage Ope.value at rated freq. ± 5% Phase characteristics Ope.value at rated freq. ± 5%

Frequency characteristics	IDMT unbalance current (46-2)	Frequency: Rated frequency ± 5% Ope. value Setting : Current setting = Minimum Operating time multiplier = Minimum Ope. time Setting : Current setting = Minimum Operating time multiplier = 10.00 Ope. Chr. = EI01 (a) Input: Current = 0 → Ope.Curt.×30% (b) Input: Current = 0 → Ope.Curt.×50% (c) Input: Current = 0 → Ope.Curt.×100%	Ope.value at rated freq. ± 5% Ope. time: (a)Ope. time at rated freq. ± 20% (b)Ope. time at rated freq. ± 15% (c)Ope. time at rated freq. ± 10%
	Ground fault overvoltage element (64) Overvoltage element (59) Undervoltage element (27) Voltage detection element (84) Reverse power element (67P)	Variation range: Rated frequency ± 5% Setting: Operation setting value = Minimum (UV = Maximum) Ope. Time. = Minimum	Operating value: ・OVG, OV, UV, DS Ope.value at rated frequency ± 5% ・RP, UP Ope.value at rated frequency ± 10%
			Operating time: ・OVG, OV, UV, RP, UP Within 50 ms ・DS Ope. time at rated frequency ± 5%
			Phase characteristics: ・DS, RP, UP Ope.value at rated frequency ± 5°
	Underfrequency element (95L)	Undervoltage lock element (35V fixed): Frequency setting: -6.0Hz Input: Rated frequency – 10Hz Voltage: variable	Undervoltage lock element: Ope.value at rated frequency ± 15%
	Overfrequency element (95H)	Undervoltage lock element (35V fixed): Frequency setting: 6.0Hz Input: Rated frequency + 10Hz Voltage: variable	Undervoltage lock element: Ope.value at rated frequency ± 15%
System disturbance	Underfrequency element (95L) Overfrequency element (95H)	(1) Voltage sudden change: Rated voltage ⇔ 35V × 110, 90, 0% (2) Phase sudden change: Phase change: ± 30° (Rated voltage) (3) Voltage and phase sudden change: (1) and (2) simultaneously Setting: Ope. Freq. = -0.5Hz (UF), 0.5Hz (OF) Ope. Time = Minimum	The relay shall not operate.
Over full scale	Underfrequency element (95L) Overfrequency element (95H)	Input: (for 300ms, twice, at intervals of 1min) Voltage = Full scale × 110% (= 330V) Rated frequency Setting: Ope. Freq. = -0.5Hz (UF), 0.5Hz (OF) Ope. Time = Minimum	The relay shall not operate.

Maximum current in guaranteed operating range	Overcurrent element (50/51) Ground fault overcurrent element (51G)	Input current : 200A, for 300 ms, twice, at intervals of 1 min Instantaneous overcurrent element (50) Ground fault overcurrent element (51G) Setting : Current setting = Maximum Ope. Time. = Minimum DT or IDMT overcurrent element (51) Setting : Current setting = Maximum Operating time multiplier = Minimum Ope. Chr. = DT	The relay shall operate.
Overload characteristics	Directional ground fault element (67G)	Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Input current : Ope. Curt. × 4000% Input voltage : Rated voltage × 150%	The relay shall operate and reset for sure.
Creeping	Directional ground fault element (67G)	Open / short current circuit while applying voltage. Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Input voltage : Rated voltage × 150% Input current : Open or Short	The relay shall not operate.
Overload capability	Directional ground fault element (67G)	Setting : Voltage setting = Minimum Current setting = Minimum Maximum sensitivity angle = 0° Input : For 1 s, twice, at intervals of 1 min Current : 0 → Rated current × 4000% Voltage : Rated voltage × 150%	The relay shall operate.

10.2. General specification data

<table>
<tr><th>Item</th><th colspan="4">Test condition</th><th>Standard</th></tr>
<tr><td rowspan="3">Contact capacity</td><td colspan="3" rowspan="2">Contact for tripping</td><td>Closed circuit capacity</td><td>DC 110 V : 15 A
DC 220 V : 10 A
0.5s L/R = 0</td></tr>
<tr><td>Open-circuit capacity</td><td>DC 110 V : 0.3 A
DC 220 V : 0.15 A
L/R = 40 ms</td></tr>
<tr><td colspan="4">Contact for annunciator</td><td>Open- / Closed circuit capacity :
500VA (cosφ = 0.4),
60W (L/R = 7ms)

Max. current : 5 A
Max. voltage : AC 380 V
DC 125 V</td></tr>
<tr><td rowspan="3">Overload capacity</td><td>Current circuit</td><td colspan="3">Rated current × 40 times,
for 2 s, twice, at intervals of 1 min</td><td rowspan="3">No malfunction,
no unnecessary operation,
no abnormal indication,
and etc.</td></tr>
<tr><td rowspan="2">Voltage circuit</td><td colspan="3">Rated voltage × 1.15 times, 3 hr</td></tr>
<tr><td colspan="3">Positive-phase-sequence voltage :
Rated voltage × 2.17 times, for 10 s, once

Zero-phase-sequence voltage :
Rated voltage × 1.5 times, for 5 s, once</td></tr>
<tr><td>Insulation resistance</td><td colspan="4">DC500 V meg-ohm-meter is used.
(1) Between collective electric circuit and ground
(However, the serial communication circuit is excluded.)
(2) Between mutual circuits, between contact poles
(However, the serial communication circuit is excluded.)</td><td>(1) 10 MΩ or more

(2) 5 MΩ or more</td></tr>
<tr><td>Withstand voltage at commercial frequency</td><td colspan="4">(1) Between collective electric circuit and ground :
AC2000 V, 1 min
(2) Between mutual circuits, between contact poles :
AC2000 V, 1 min
(However, the serial communication circuit is excluded.)
(3) Between contact terminals (between poles) :
AC1000 V, 1 min</td><td>No malfunction,
no unnecessary operation,
no abnormal indication,
and etc.</td></tr>
<tr><td rowspan="2">Withstand voltage against lightning impulse</td><td rowspan="2">Standard shock voltage waveform (1.2/50 μs)

Application to each of positive and negative pole for 3 times</td><td>4.5 kV</td><td colspan="2">▪ Between collective electric circuit and ground
▪ Between mutual transformer circuits for measuring instruments
▪ Between the transformer circuit for measuring instrument and the control circuit
(However, the serial communication circuit is excluded.)</td><td rowspan="2">No malfunction,
no unnecessary operation,
no abnormal indication,
and etc.</td></tr>
<tr><td>3 kV</td><td colspan="2">▪ Between mutual control circuits
▪ Between terminals of transformer circuit for measuring instrument
▪ Between contact circuit terminals (between poles)
▪ Between terminals of control power supply circuit
(However, the serial communication circuit is excluded.)</td></tr>
</table>

Item	Test condition	Standard
Trouble of control power supply	・ Turning on/off control power supply ・ Instantaneous interruption of control power supply ・ Slow variation of control power supply	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Immunity against electrostatic discharge	8 kV: Contact discharge 15 kV: Aerial discharge 10 times of each of positive and negative pole at intervals of more than 1s	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Immunity against commercial frequency	Applied point: Between line and ground Test voltage: 300 V, Test time: 10 s Applied point: Between lines Test voltage: 150 V, Test time: 10 s	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Immunity against damped oscillatory wave	・ Peak value of 1st wave: 2.5 kV ・ Vibration frequency: 1 MHz ± 10% ・ Damping time to 1/2: 3 ~ 6 cycles ・ Frequency of repetition: 6 ~ 10 times/ 1 cycle of commercial frequency (asynchronous) ・ Output impedance of test circuit: 200 Ω ± 10% Applied point: ・ Between collective transformer circuit and ground ・ Between collective control power supply circuit and ground ・ Between terminals of control power supply circuit	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Electric fast transient/Burst immunity	Applied voltage: ±2.0 kV Repetition frequency: 5.0 kHz Port for applied: Between collective control power supply circuit and ground Applied voltage: ±1.0 kV Repetition frequency: 5.0 kHz Port for applied: ・ Between collective transformer circuit for measuring instruments and ground ・ Between collective binary input/output (DI/DO) circuit and ground	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Immunity to square wave impulse	Applied voltage: 1.0 kV ±10% Test time : 2s Each of positive and negative pole Output impedance : 50 Ω Pulse duration : 100 ns ±30% Pulse rise time : 1 ns or less Port for applied: ・ Between collective transformer circuit and ground ・ Between collective control power supply circuit and ground ・ Between collective binary input/output (DI/DO) circuit and ground ・ Between terminals of control power supply circuit	No malfunction, no unnecessary operation, no abnormal indication, and etc.

Item	Test condition	Standard
Surge immunity	Applied time : 1.2/50 μs at open circuit condition 8/20 μs at short circuit condition Effective output impedance : 2 Ω 5 times of each of positive and negative pole at intervals 1min Port for applied and applied voltage: ・ Between control power supply terminals: Applied voltage : 0.5, 1 kV (0 Ω, 18 μF, 1.5 mH) ・ Between collective control power supply and ground: Applied voltage : 0.5, 1, 2 kV (10 Ω, 9 μF, 1.5 mH) ・ Between binary input/output circuit terminals: Applied voltage : 0.5, 1 kV (40 Ω, 0.5 μF, 20 mH) ・ Between collective binary input/output circuit and ground: Applied voltage : 0.5, 1, 2 kV (40 Ω, 0.5 μF, 20 mH) ・ Between transformer circuits for measuring instruments: Applied voltage : 0.5, 1 kV (40 Ω, 0.5 μF, 20 mH) ・ Between collective transformer circuit for measuring instruments and ground: Applied voltage : 0.5, 1, 2 kV (40 Ω, 0.5 μF, 20mH)	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Commercial frequency magnetic field immunity	Magnetic field intensity : 30 A/m, for 60 s (continuous), at once 300 A/m, for 2s, three times at intervals of 1 min * Setting value of the I0 circuit for ZCT input shall be 5 mA or more.	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Immunity to conducted disturbances, induced by radio- frequency fields	Voltage level : 10 V Amplitude modulation : 1 kHz, ±80% Frequency range : (a) Sweep test : 150 kHz ~ 80 MHz (b) Spot test : 27, 68 MHz Test time : (a) Sweep test : 0.5 s or more at each step of frequency (b) Spot test : 10 s or more at each frequency Port for applied : ・Between collective control power supply and ground ・Between collective binary input/output circuit and ground ・Between collective transformer circuit for measuring instruments and ground	No malfunction, no unnecessary operation, no abnormal indication, and etc.
Radiated, radio-frequency, electromagnetic field immunity	Voltage level : 10 V/m Amplitude modulation : 1 kHz, ±80% Frequency range : (a) Sweep test : 80 MHz ~ 1.0 GHz, 1.4 GHz ~ 2.7 GHz (b) Spot test : 80, 160, 380, 450, 900, 1850, 2150 MHz Test time : (a) Sweep test : 0.5 s or more at each step of frequency (b) Spot test : 10 s or more at each frequency Number of test time : Twice at each frequency for each direction of back and forth, right and left (4 directions) ; In total, 8 times at each frequency	No malfunction, no unnecessary operation, no abnormal indication, and etc.

<table>
<tr><th>Item</th><th colspan="8">Test condition</th><th>Standard</th></tr>
<tr><td rowspan="4">Vibration</td><td rowspan="2">Frequency
(Hz)</td><td colspan="3">Amplitude
(mm)</td><td rowspan="2">Time
(s)</td><td colspan="3">Acceleration
(m/s^2)</td><td rowspan="4">No malfunction,
no unnecessary operation,
no abnormal indication,
and etc.</td></tr>
<tr><td>Back and forth</td><td>Right and left</td><td>Up and down</td><td>Back and forth</td><td>Right and left</td><td>Up and down</td></tr>
<tr><td>10</td><td colspan="2">5</td><td>2.5</td><td>30</td><td colspan="2">10</td><td>5</td></tr>
<tr><td>16.7</td><td colspan="3">0.4</td><td>600</td><td colspan="3">2</td></tr>
<tr><td>Shock</td><td colspan="8">・Shock acceleration : 300 m/s^2
・Duration of pulse : 11 ms
・Direction of pulses : Respective 3 directions in back and forth, right and left, up and down (6 directions)
・ Number of pulses : 3 times for 6 directions (In total : 18 times)</td><td>No malfunction,
no unnecessary operation,
no abnormal indication,
and etc.</td></tr>
<tr><td>Load</td><td colspan="8">(1) Current circuit
(2) Voltage circuit
(3) Control power supply</td><td>(1) At the rating of 5 A: 0.6 VA or less
At the rating of 1 A: 0.1 VA or less
(2) 0.1 VA or less
(3) 10 W or less</td></tr>
<tr><td>Mass</td><td colspan="8">(1) Subunit
(2) Subunit and outer case</td><td>(1) About 2.3 kg
(2) About 3.7 kg</td></tr>
</table>

11. Test

Although all necessary functional tests are implemented for this relay before shipment from the factory, it is recommendable to perform the tests with reference to the following items, before use.

11.1. Visual inspection

Perform the visual inspection check with reference to the following items.

Inspection item	Contents of inspection
Unit (working part)	(1) No deformation (2) Operational check of the operation key switches (3) Neither discoloration nor deformation of the front name plate (4) No damage at the terminal connectors
Case	No damage including the terminal connectors
Others	No foreign substances, such as dust, iron pieces, etc.

11.2. Characteristic test

11.2.1. Notes related to the tests

(1) Recommended test condition

Regarding the ambient conditions, following conditions shall be complied with, as far as possible. If the test is performed at the condition which is significantly different from the next condition, the correct test results may not be obtained.

- Ambient temperature: 20°C ± 10°C
- Rated frequency: ±1%
- Waveform (AC): Distortion factor 2% or less
- Control voltage: Rated voltage ±2%

(2) Functional control points

Refer to Chapter 10.

The functional control point (standard point) of each relay's element shall be checked by the relay alone. Therefore, when the combined test with external devices such as CT, ZCT, etc. is performed, it shall be considered the error factor of external devices.

Furthermore, if user-defined control point is specified (e.g. accracy of relay characteristic is controlled at service conditions), execute the test at the manufacturer-defined control point (mentioned in Section 10.1) before in-service operation and then check accuracy of the relay. After that, execute the test at the user-defined control point, and set this data to the subsequent standards.

(3) Setting change

Refer to 5.3.4.1 for the setting change.

(4) Judgment of operation

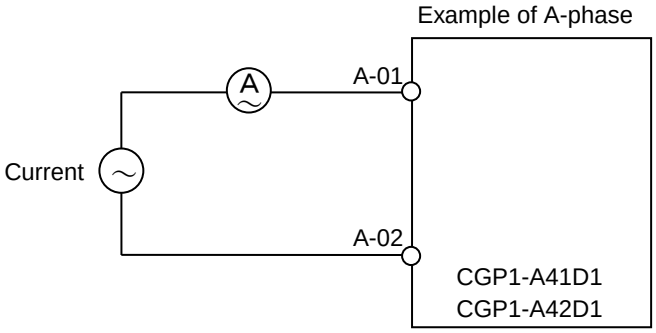
Basically, the measurement of the operating value, operating time, etc. shall be done by open/close of the output relay contact of each element.

11.2.2. Characteristic test

(1) Test circuit

The external connection of AC input circuit is as shown below as a reference.
Refer to Fig. 2-3 for the terminal arrangement.

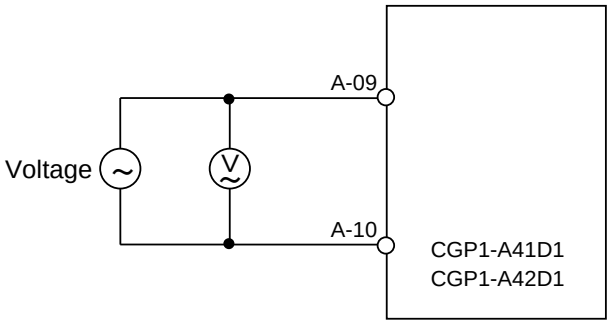
[1] Overvcurrent element



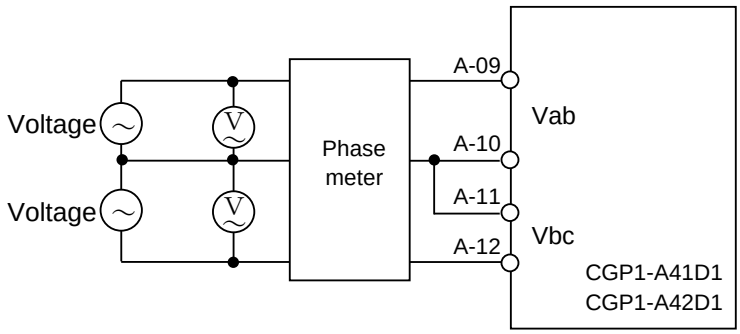
Test phase	Terminal No.
A-phase	A-01 ~ A-02
B-phase (*)	A-03 ~ A-04
C-phase	A-05 ~ A-06

(*) CGP1-A42D1 only

[2] Overvoltage element, Voltage detection element



[3] Undervoltage element (Single-phase or All-phase)

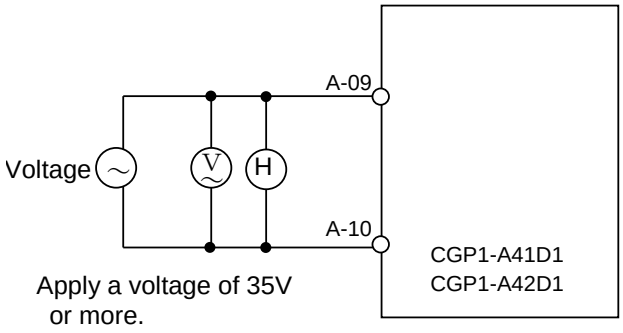


Test phase	Terminal No.
ab phase	A-09 - A-10
bc phase	A-11 - A-12
ca phase (*)	A-09 - A-10, A-11 - A-12

(*) Vector composition from the input values of the ab phase and bc phase)

Undervoltage element is designed to operate with the OR condition for three phases.
However, single-phase test can also be performed by locking phases other than the phase to be tested in the test settings.
Reset the test settings after the test.

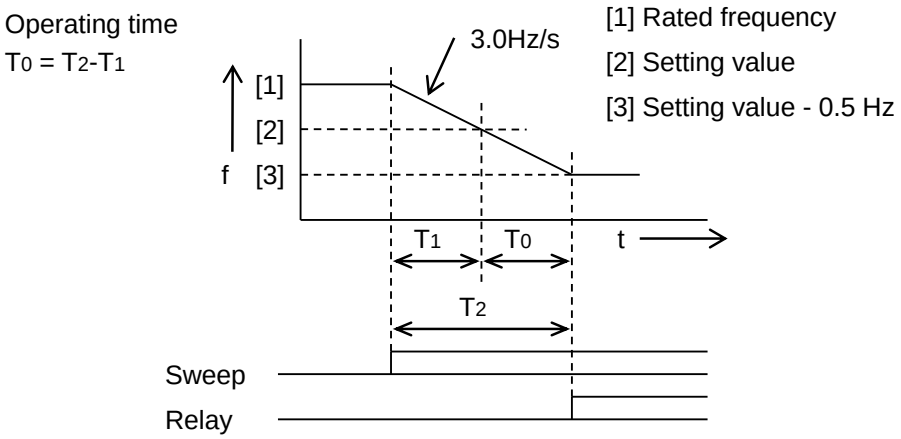
[4] Underfrequency element, Overfrequency element



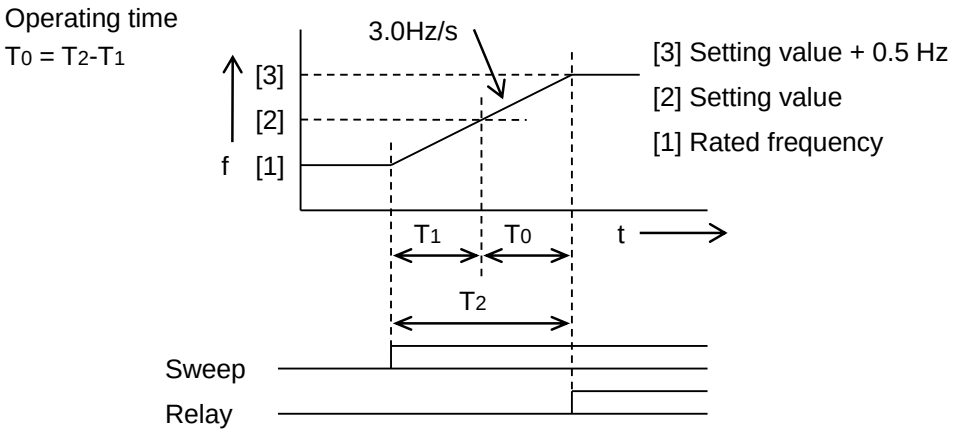
When measuring the operating time of the Underfrequency element and the Overfrequency element, change the frequency at a rate of 3.0 Hz/s from the non-operating frequency to the operating frequency with respect to the setting value, and calculate the operating time as follows.
You can also simply change the voltage from zero to the operating frequency or change the frequency suddenly.

Operating time calculation method

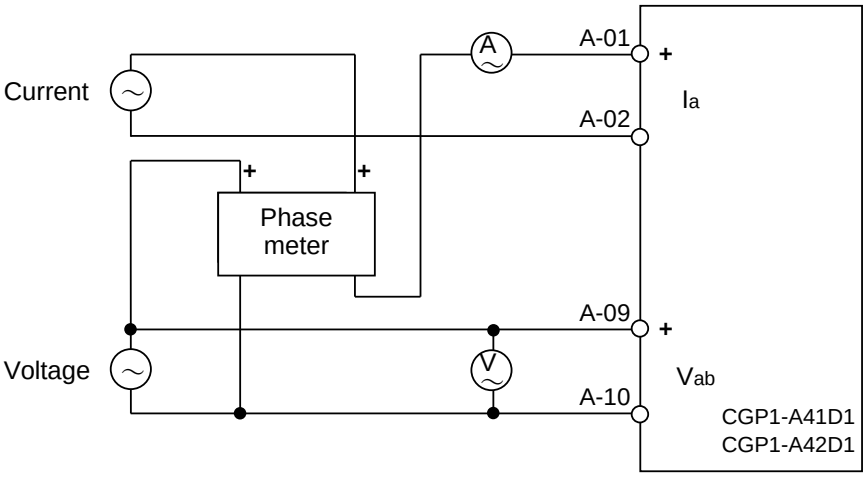
(a) Underfrequency element



(b) Overfrequency element

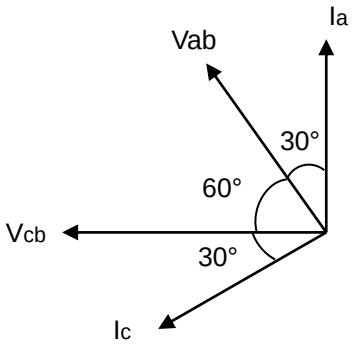


[5] Reverse power element, Underpower element (Single-phase or Two-phase)



Test phase	Current terminal	Voltage terminal
I_a-V_{ab}	A-01 - A-02	A-09 - A-10
I_c-V_{cb}	A-05 - A-06	A-12 - A-11

When a single-phase test is performed, the operating value is $\sqrt{3}$ times the setting value.
When a three-phase test is performed, use as reference the phase relationship when the power factor is 1 as the following vector.
When changing the phase, do not change the phase between the two currents or the two voltages (Ia and Ic, Vab and Vcb), but change the phase between the current and the voltage.



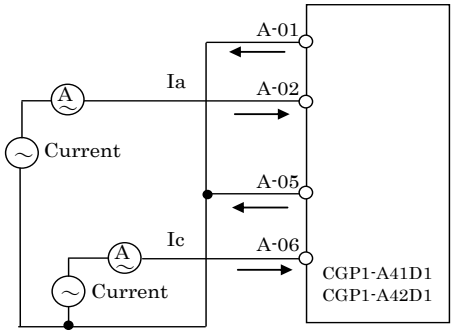
Caution

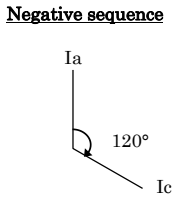
When testing the Underpower element, if there is no current input applied to one or more phases, the disconnection detection function will output the operating signal.
Therefore, test with the setting of "disconnection detection function" (UP-UC EN) turned OFF.
Do not forget to reset the setting after the test.

[6] Unbalance current element (Single-phase or All-phase)

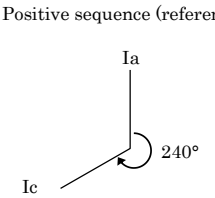
■ All-phase test

Apply a balanced **negative sequence current**.





Ic lags behind Ia by 120°

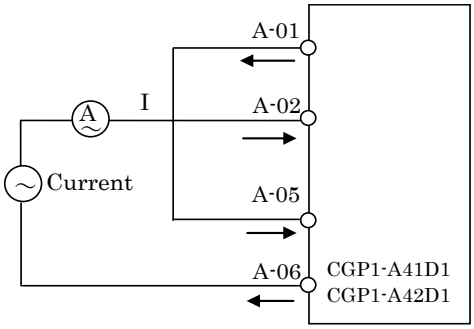


Ic lags behind Ia by 240°

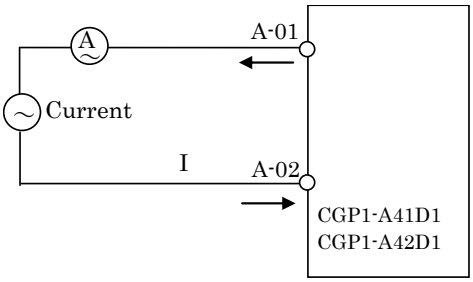
* Ia (Input value) = Ic (Input value) = Setting value

■ Single-phase test

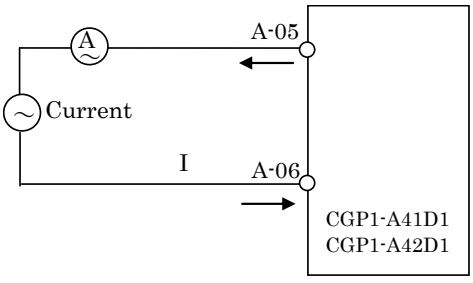
(1) Ia-Ic



(2) Ia-Ib (composition)

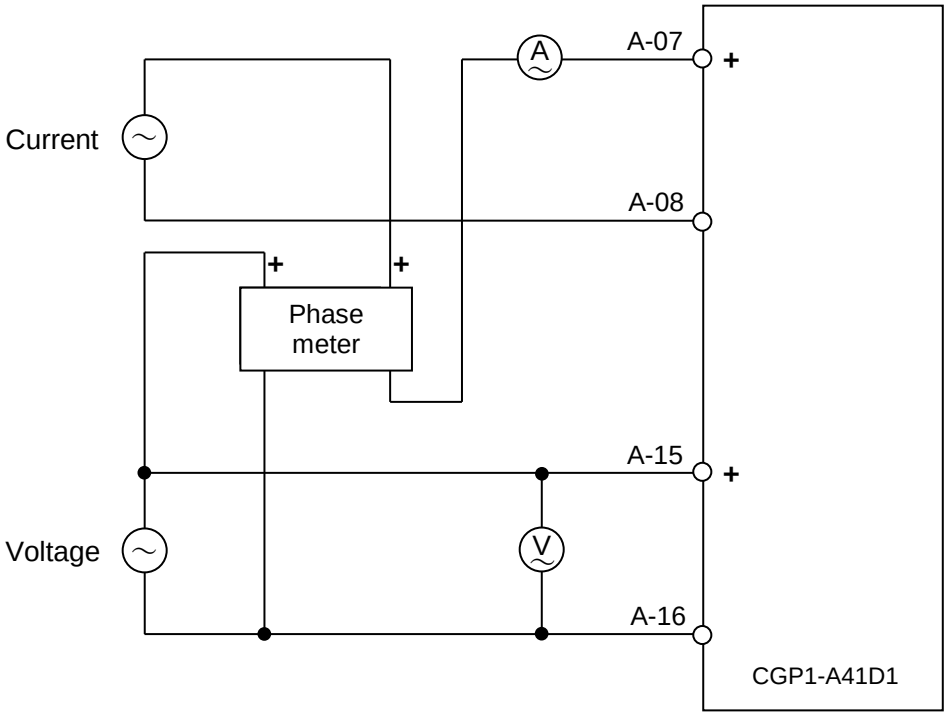


(3) Ic-Ib (composition)

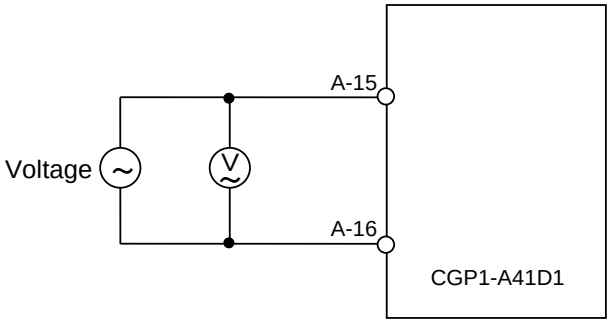


* I (Input value) = √3 × Setting value

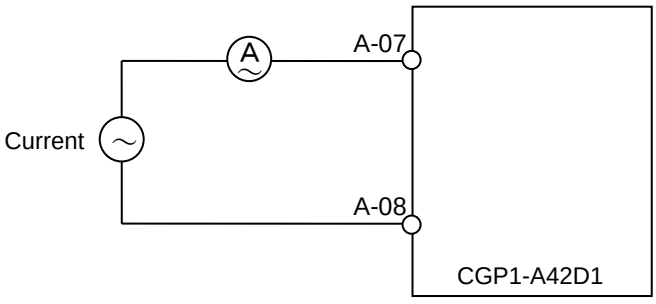
[7] Directional ground fault element



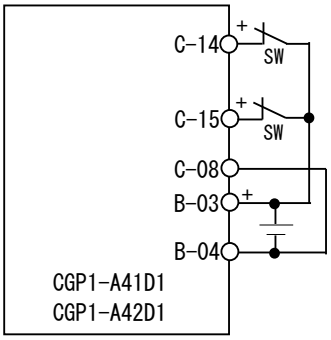
[8] Ground fault overvoltage element



[9] Ground fault overcurrent element



[10] Operation lock function



When the above switch (SW) is changed from closed to open on the conditions of operation of protection elements, the relay is locked up until the setting value of the unlocking time, and then the relay operates.
(When the SW is closed, "OP-LOCK" on the front panel lights up and the relay is locked.)

(2) Test items

[1] Test setting

Before staring test, it is recommended to to use ‘Test setting’ function in order to lock the operation of un-tested phases and elements.

As for the method of test setting, refer to 5.3.4.4.2 in Chapter 5.
As for the list of test setting items, refer to the table shown below.

List of test setting items

No.	Name of items	Contents of setting	Setting
1	SV-LK	Locking of alarm function	UNLOCKED / LOCKED
2	UV-AB-LK	Locking of UV-AB phase	UNLOCKED / LOCKED
3	UV-BC-LK	Locking of UV-BC phase	UNLOCKED / LOCKED
4	UV-CA-LK	Locking of UV-CA phase	UNLOCKED / LOCKED
5	TCNT-LK	Locking of trip counter	UNLOCKED / LOCKED

[2] Forced operation test (DO contact test)

Refer to 5.3.4.4.1 in Chapter 5.

[3] Operating value test

Refer to the “Operating value” and “Resetting value” in Chapter 10.

[4] Operating time test

Refer to the “Operating time” in Chapter 10.

[5] Reset time test

Refer to the “Reset time” in Chapter 10.

[6] Phase characteristics test

Refer to the “Phase characteristics” in Chapter 10.

[7] LED/VFD full lighting test

Refer to 5.3.4.4.3 in Chapter 5.

12. Maintenance and self diagnosis

12.1. Maintenance

12.1.1. Daily inspection

It is recommended to check the following items daily;

- No dust (such as iron powder, etc) is in/on the relay case
- No abnormal noise is generated
- ‘RUN’ LED is lighting

12.1.2. Periodic inspection

It is recommended to test the following items periodically.

- Visual inspection, referring to Section 11.1.
- Characteristic test, referring to Section 11.2.

12.2. Self diagnosis

Monitoring of the electronic circuit as well as the incorporated power supply is performed. If any trouble is generated, fault display by LED and output by alarm DO (b contact) are executed.

1. Alarm indication

The relay alarm, which would be appeared at relay failure, is divided two types, minor failure and serious failure.

Minor failure ------ This alarm may appear by detecting the abnormal current or voltage input, or abnormality of the circuits which would not affect the relay's trip operation directly.

Serious failure --- This alarm may appear by detecting abnormality of the important circuits which would affect the relay's trip operation directly.

The operation of LED display and alarm DO output are shown in next table.

Table 12-1 LED display, Alarm DO

Status of the relay	Alarm DO	RUN LED	ALARM LED
Minor failure	OFF	ON	ON
Serious failure	ON	OFF	ON

Since the indication of 'ALARM LED' at fault detection is latched, it is necessary to press 'ESC/C' key for 3 sec or more after removing the cause of trouble.

2. Handling of Alarm indication

When any trouble is generated, please collect the necessary information as shown below which would be useful for finding the cause of trouble.

[1] Confirm the state of LED display and the contact of alarm DO.
Refer to Fig. 12-1, Fig. 12-2 for LED display and alarm DO.

[2] Confirm the error code in monitoring
Refer to 5.3.2.2.4 in Chapter 5 for the confirmation method of the error code,

[3] Please contact your service provider.

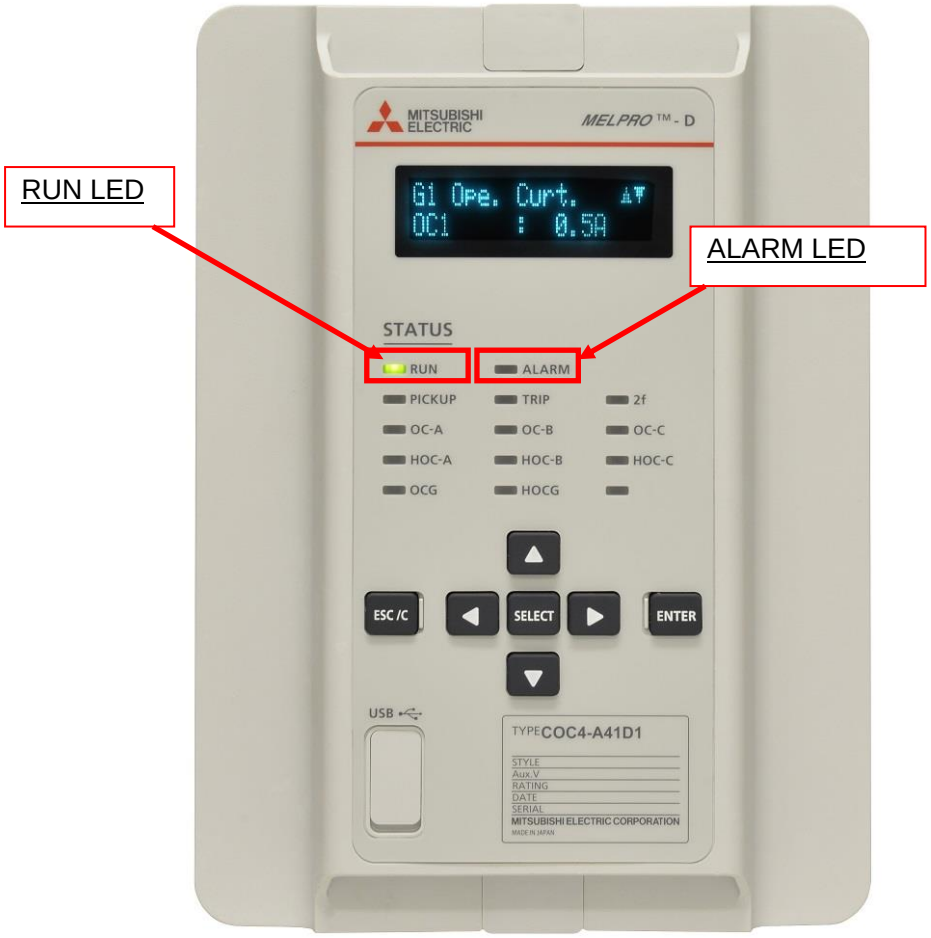


Fig. 12-1 Position of RUN LED, ALARM LED

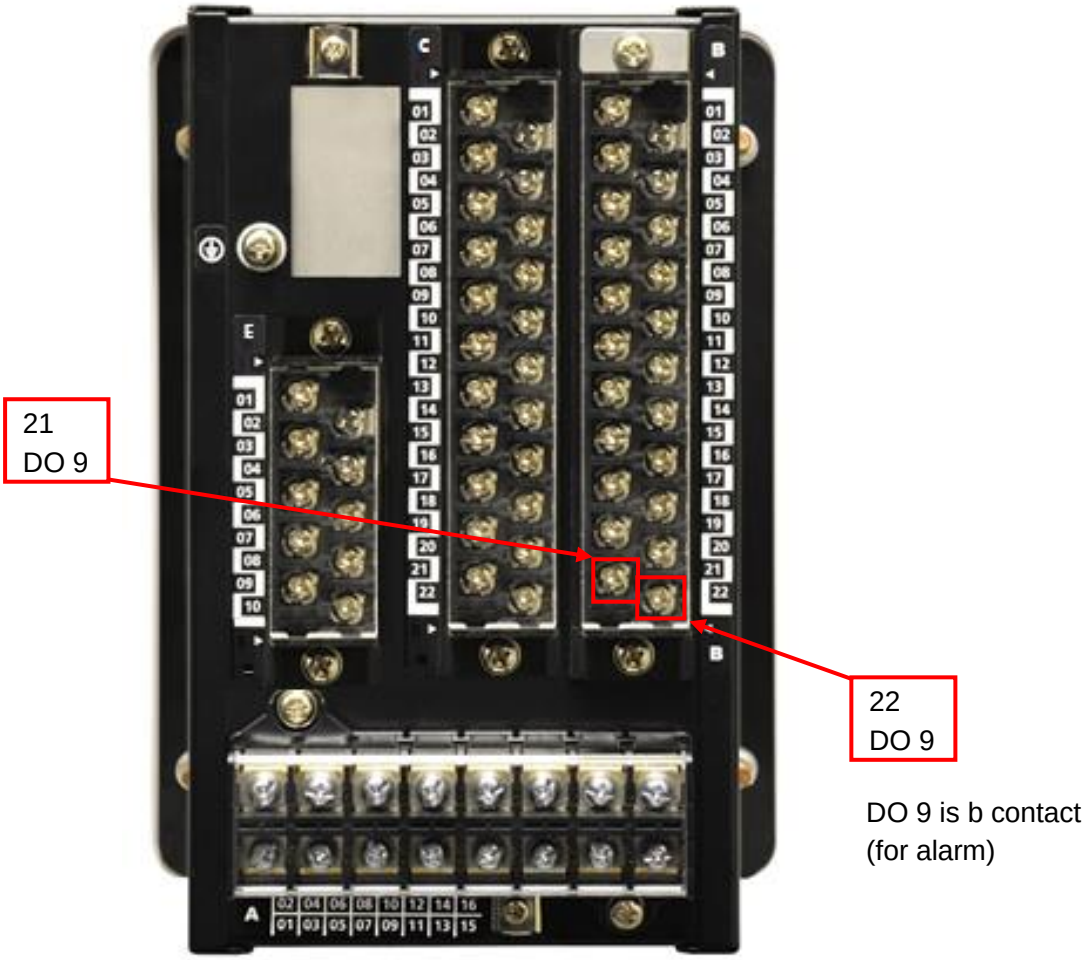


Fig. 12-2 Position of alarm DO

13. Default setting or configuration value

13.1. Setting

- CGP1-A41D1

Category	Element	Setting								
		Item name or Setting parameter		Range		Step	Default value		Please make a note about setting.	
		VFD	PC-HMI	VFD	PC-HMI		VFD	PC-HMI	Group 1 (G1)	Group 2 (G2)
GENERATOR	GEN	IG	Rated GEN Curt.	2.5 ~ 5.0A		0.1A	2.5A	2.5A		
OC/UBC	OC1	OC1 EN	OC1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	OC1 Ope. Curt.	100 ~ 1200%		1%	100%	100%		
		Ope. Time	OC1 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OC2	OC2 EN	OC2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	OC2 Ope. Curt.	100 ~ 1200%		1%	100%	100%		
		Ope. Time	OC2 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OC3	OC3 EN	OC3 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	OC3 Ope. Curt.	100 ~ 1200%		1%	100%	100%		
		Ope. Time	OC3 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OC4	OC4 EN	OC4 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	OC4 Ope. Curt.	100 ~ 120%		1%	100%	100%		
		Ope. TM	OC4 Ope. TM	0.25 ~ 10.00		0.01	10.00	10.00		
		Ope. Chr.	OC4 Ope. Chr.	NI EI DT		–	NI	NI		
	UBC1	UBC1 EN	UBC1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	UBC1 Ope. Curt.	5 ~ 30%		1%	5%	5%		
		Ope. Time	UBC1 Ope. Time	0.1 ~ 10.0s		0.1s	0.1s	0.1s		
	UBC2	UBC2 EN	UBC2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	UBC2 Ope. Curt.	5 ~ 30%		1%	5%	5%		
		Ope. TM	UBC2 Ope. TM	5 ~ 50		1	5	5		
DIRG	DIRG	MT Angle	DIRG MT Angle	0 ~ 90°LEAD		1°LEAD	0°LEAD	0°LEAD		
	DIRG1	DIRG1 EN	DIRG1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	DIRG1 Ope. Volt.	2.0 ~ 100.0V		0.1V	2.0V	2.0V		
		Ope. Curt.	DIRG1 Ope. Curt.	1.0 ~ 100.0mA		0.5mA	1.0mA	1.0mA		
		Ope. Time	DIRG1 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	DIRG2	DIRG2 EN	DIRG2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	DIRG2 Ope. Volt.	2.0 ~ 100.0V		0.1V	2.0V	2.0V		
		Ope. Curt.	DIRG2 Ope. Curt.	1.0 ~ 100.0mA		0.5mA	1.0mA	1.0mA		
		Ope. Time	DIRG2 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
UV/OV/OVG	UV1	UV1 EN	UV1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	UV1 Ope. Volt.	20.0 ~ 120.0V		0.1V	20.0V	20.0V		
		Ope. Time	UV1 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	UV2	UV2 EN	UV2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	UV2 Ope. Volt.	20.0 ~ 120.0V		0.1V	20.0V	20.0V		
		Ope. Time	UV2 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	OV1	OV1 EN	OV1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	OV1 Ope. Volt.	20.0 ~ 200.0V		0.1V	20.0V	20.0V		
		Ope. Time	OV1 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	OV2	OV2 EN	OV2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	OV2 Ope. Volt.	20.0 ~ 200.0V		0.1V	20.0V	20.0V		
		Ope. Time	OV2 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	OVG1	OVG1 EN	OVG1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	OVG1 Ope. Volt.	2.0 ~ 100.0V		0.1V	2.0V	2.0V		
		Ope. Time	OVG1 Ope. Time	0.00 ~ 20.00s		0.01s	0.00s	0.00s		
	OVG2	OVG2 EN	OVG2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	OVG2 Ope. Volt.	2.0 ~ 100.0V		0.1V	2.0V	2.0V		
		Ope. Time	OVG2 Ope. Time	0.00 ~ 20.00s		0.01s	0.00s	0.00s		
F	UF1	UF1 EN	UF1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Freq.	UF1 Ope. Freq.	- 6.0 ~ -0.5Hz		0.1Hz	-0.5Hz	-0.5Hz		
		Ope. Time	UF1 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		
	UF2	UF2 EN	UF2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Freq.	UF2 Ope. Freq.	- 6.0 ~ -0.5Hz		0.1Hz	-0.5Hz	-0.5Hz		
		Ope. Time	UF2 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		
	OF1	OF1 EN	OF1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Freq.	OF1 Ope. Freq.	0.5 ~ 6.0Hz		0.1Hz	0.5Hz	0.5Hz		
		Ope. Time	OF1 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		
	OF2	OF2 EN	OF2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Freq.	OF2 Ope. Freq.	0.5 ~ 6.0Hz		0.1Hz	0.5Hz	0.5Hz		
		Ope. Time	OF2 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		

Category	Element	Setting							
		Item name or Setting parameter		Range		Step	Default value		Please make a note about setting.
		VFD	PC-HMI	VFD	PC-HMI		VFD	PC-HMI	Group 1 (G1)	Group 2 (G2)
RP	RP1	RP1 EN	RP1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	RP1 Ope. Curt.	0.5 ~ 30.0%		0.1%	0.5%	0.5%		
		Ope. Time	RP1 Ope. Time	0.10 ~ 20.00s		0.01s	0.10s	0.10s		
	RP2	RP2 EN	RP2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	RP2 Ope. Curt.	0.5 ~ 30.0%		0.1%	0.5%	0.5%		
		Ope. Time	RP2 Ope. Time	0.10 ~ 20.00s		0.01s	0.10s	0.10s		
VD	VD	VD EN	VD EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	VD Ope. Volt.	80 ~ 110V		1V	110V	110V		
		Ope. Time	VD Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
OPLOCK	OPLOCK	OPLOCK EN	OPLOCK EN	OFF ON	Off On	–	OFF	Off		
		Rst. Time	OPLOCK Rst. Time	0.0 ~ 10.0s		0.1s	0.0s	0.0s		
		OC1 Lock EN	OC1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OC2 Lock EN	OC2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OC3 Lock EN	OC3 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OC4 Lock EN	OC4 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UBC1 Lock EN	UBC1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UBC2 Lock EN	UBC2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		DIRG1 Lock EN	DIRG1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		DIRG2 Lock EN	DIRG2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UV1 Lock EN	UV1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UV2 Lock EN	UV2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OV1 Lock EN	OV1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OV2 Lock EN	OV2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OVG1 Lock EN	OVG1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OVG2 Lock EN	OVG2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UF1 Lock EN	UF1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UF2 Lock EN	UF2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OF1 Lock EN	OF1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OF2 Lock EN	OF2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		RP1 Lock EN	RP1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		RP2 Lock EN	RP2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
System setting	–	DI VOLTAGE	DI Voltage Level	DC110V DC220V		–	DC110V	DC110V		
	–	Pre-Rec.	Pre-Rec. Time	100 ~ 4500ms		10ms	100ms	100ms		
	–	Rec.	Max. Rec. Time	200 ~ 5000ms		10ms	200ms	200ms		
	–	PASSWORD	–	UNUSE USE	–	–	UNUSE			
	–	PASS	–	0000 ~ 9999		1	0000			
Trip counter	–	Initial	Initial Value	0 ~ 10000		1	0	0		
	–	Alarm	Alarm Value	1 ~ 10000		1	1	1		
Analog value display	–	AI Disp.	AI Display Style	PRIMARY SECONDARY	Primary Secondary	–	PRIMARY	Primary		
	–	PTP	PTP	0.1 ~ 500.0kV		0.1kV	5.0kV	5.0kV		
	–	PTS	PTS	100 ~ 125V		1V	100V	100V		
	–	PTGP	PTGP	0.1 ~ 500.0kV		0.1kV	5.0kV	5.0kV		
	–	PTGS	PTGS	100 ~ 220V		1V	100V	100V		
	–	CTP	CTP	5 ~ 30000A		1A	5A	5A		
	–	CTS	CTS	5A		–	5A	5A		
	–	CTGP	CTGP	0.1 ~ 100.0A		0.1A	0.2A	0.2A		
	–	CTGS	CTGS	1.5mA		–	1.5m	1.5mA		
Electric energy	–	Dir.	Current Direction	FORWARD REVERSE	Forward Reverse	–	FORWARD	Forward		
	–	Pt+	Initial kWh	0 ~ 999999999kWh		1kWh	0kWh	0kWh		
	–	Pt-	Initial RP kWh	0 ~ 999999999kWh		1kWh	0kWh	0kWh		
	–	Qt+	Initial kVarh	0 ~ 999999999kVarh		1kVarh	0kVarh	0kVarh		
	–	Qt-	Initial RP kVarh	0 ~ 999999999kVarh		1kVarh	0kVarh	0kVarh		
CB control	–	REMOTE/LOCAL	Remote/Local	R L	Remote Local	–	R	Remote		
	–	INTERLOCK	Interlock Use	UNUSE USE	Non-Use Use	–	USE	Use		
	–	CB OPEN	CB Open Block	UNBLK BLK	Unblocked Blocked	–	UNBLK	Unblocked		
	–	CB CLOSE	CB Close Block	UNBLK BLK	Unblocked Blocked	–	UNBLK	Unblocked		
	–	ON TIMER	CB On-Delay Timer	0 ~ 60s		1s	0s	0s		
DO contact test setting	–	–	One-Shot Time	–	1 ~ 20s	1s		1s		

- CGP1-A42D1

Category	Element	Setting								
		Item name or Setting parameter		Range		Step	Default value		Please make a note about setting.	
		VFD	PC-HMI	VFD	PC-HMI		VFD	PC-HMI	Group 1 (G1)	Group 2 (G2)
GENERATOR	GEN	IG	Rated GEN Curt.	2.5 ~ 5.0A		0.1A	2.5A	2.5A		
OC/OCG/UBC	OC1	OC1 EN	OC1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	OC1 Ope. Curt.	100 ~ 1200%		1%	100%	100%		
		Ope. Time	OC1 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OCG1	OCG1 EN	OCG1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	OCG1 Ope. Curt.	0.1 ~ 2.5A		0.1A	0.1A	0.1A		
		Ope. Time	OCG1 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OC2	OC2 EN	OC2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	OC2 Ope. Curt.	100 ~ 1200%		1%	100%	100%		
		Ope. Time	OC2 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OCG2	OCG2 EN	OCG2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	OCG2 Ope. Curt.	0.1 ~ 2.5A		0.1A	0.1A	0.1A		
		Ope. Time	OCG2 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OC3	OC3 EN	OC3 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	OC3 Ope. Curt.	100 ~ 1200%		1%	100%	100%		
		Ope. Time	OC3 Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
	OC4	OC4 EN	OC4 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	OC4 Ope. Curt.	100 ~ 120%		1%	100%	100%		
		Ope. TM	OC4 Ope. TM	0.25 ~ 10.00		0.01	10.00	10.00		
		Ope. Chr.	OC4 Ope. Chr.	NI EI DT		—	NI	NI		
	UBC1	UBC1 EN	UBC1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	UBC1 Ope. Curt.	5 ~ 30%		1%	5%	5%		
		Ope. Time	UBC1 Ope. Time	0.1 ~ 10.0s		0.1s	0.1s	0.1s		
	UBC2	UBC2 EN	UBC2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Curt.	UBC2 Ope. Curt.	5 ~ 30%		1%	5%	5%		
		Ope. TM	UBC2 Ope. TM	5 ~ 50		1	5	5		
UV/OV	UV1	UV1 EN	UV1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Volt.	UV1 Ope. Volt.	20.0 ~ 120.0V		0.1V	20.0V	20.0V		
		Ope. Time	UV1 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	UV2	UV2 EN	UV2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Volt.	UV2 Ope. Volt.	20.0 ~ 120.0V		0.1V	20.0V	20.0V		
		Ope. Time	UV2 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	OV1	OV1 EN	OV1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Volt.	OV1 Ope. Volt.	20.0 ~ 200.0V		0.1V	20.0V	20.0V		
		Ope. Time	OV1 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
	OV2	OV2 EN	OV2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Volt.	OV2 Ope. Volt.	20.0 ~ 200.0V		0.1V	20.0V	20.0V		
		Ope. Time	OV2 Ope. Time	0.00 ~ 15.00s		0.01s	0.00s	0.00s		
F	UF1	UF1 EN	UF1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Freq.	UF1 Ope. Freq.	- 6.0 ~ -0.5Hz		0.1Hz	-0.5Hz	-0.5Hz		
		Ope. Time	UF1 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		
	UF2	UF2 EN	UF2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Freq.	UF2 Ope. Freq.	- 6.0 ~ -0.5Hz		0.1Hz	-0.5Hz	-0.5Hz		
		Ope. Time	UF2 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		
	OF1	OF1 EN	OF1 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Freq.	OF1 Ope. Freq.	0.5 ~ 6.0Hz		0.1Hz	0.5Hz	0.5Hz		
		Ope. Time	OF1 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		
	OF2	OF2 EN	OF2 EN	OFF ON	Off On	—	OFF	Off		
		Ope. Freq.	OF2 Ope. Freq.	0.5 ~ 6.0Hz		0.1Hz	0.5Hz	0.5Hz		
		Ope. Time	OF2 Ope. Time	0.1 ~ 15.0s		0.1s	0.1s	0.1s		

Category	Element	Setting								
		Item name or Setting parameter		Range		Step	Default value		Please make a note about setting.	
		VFD	PC-HMI	VFD	PC-HMI		VFD	PC-HMI	Group 1 (G1)	Group 2 (G2)
RP	RP1	RP1 EN	RP1 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	RP1 Ope. Curt.	0.5 ~ 30.0%		0.1%	0.5%	0.5%		
		Ope. Time	RP1 Ope. Time	0.10 ~ 20.00s		0.01s	0.10s	0.10s		
	RP2	RP2 EN	RP2 EN	OFF ON	Off On	–	OFF	Off		
		Ope. Curt.	RP2 Ope. Curt.	0.5 ~ 30.0%		0.1%	0.5%	0.5%		
		Ope. Time	RP2 Ope. Time	0.10 ~ 20.00s		0.01s	0.10s	0.10s		
VD	VD	VD EN	VD EN	OFF ON	Off On	–	OFF	Off		
		Ope. Volt.	VD Ope. Volt.	80 ~ 110V		1V	110V	110V		
		Ope. Time	VD Ope. Time	0.00 ~ 10.00s		0.01s	0.00s	0.00s		
OPLOCK	OPLOCK	OPLOCK EN	OPLOCK EN	OFF ON	Off On	–	OFF	Off		
		Rst. Time	OPLOCK Rst. Time	0.0 ~ 10.0s		0.1s	0.0s	0.0s		
		OC1 Lock EN	OC1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OC2 Lock EN	OC2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OC3 Lock EN	OC3 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OC4 Lock EN	OC4 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OCG1 Lock EN	OCG1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OCG2 Lock EN	OCG2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UBC1 Lock EN	UBC1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UBC2 Lock EN	UBC2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UV1 Lock EN	UV1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UV2 Lock EN	UV2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OV1 Lock EN	OV1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OV2 Lock EN	OV2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UF1 Lock EN	UF1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		UF2 Lock EN	UF2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OF1 Lock EN	OF1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		OF2 Lock EN	OF2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		RP1 Lock EN	RP1 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
		RP2 Lock EN	RP2 Lock EN	OFF DI6 DI7 DI67	Off DI6 DI7 DI67	–	OFF	Off		
System setting	–	DI VOLTAGE	DI Voltage Level	DC110V DC220V		–	DC110V	DC110V		
	–	Pre-Rec.	Pre-Rec. Time	100 ~ 4500ms		10ms	100ms	100ms		
	–	Rec.	Max. Rec. Time	200 ~ 5000ms		10ms	200ms	200ms		
	–	PASSWORD	–	UNUSE USE	–	–	UNUSE			
	–	PASS	–	0000 ~ 9999		1	0000			
Trip counter	–	Initial	Initial Value	0 ~ 10000		1	0	0		
	–	Alarm	Alarm Value	1 ~ 10000		1	1	1		
Analog value display	–	AI Disp.	AI Display Style	PRIMARY SECONDARY	Primary Secondary	–	PRIMARY	Primary		
	–	PTP	PTP	0.1 ~ 500.0kV		0.1kV	5.0kV	5.0kV		
	–	PTS	PTS	100 ~ 125V		1V	100V	100V		
	–	CTP	CTP	5 ~ 30000A		1A	5A	5A		
	–	CTS	CTS	5A		–	5A	5A		
	–	CTGP	CTGP	5 ~ 30000A		1A	5A	5A		
	–	CTGS	CTGS	5A		–	5A	5A		
Electric energy	–	Dir.	Current Direction	FORWARD REVERSE	Forward Reverse	–	FORWARD	Forward		
	–	Pt+	Initial kWh	0 ~ 999999999kWh		1kWh	0kWh	0kWh		
	–	Pt-	Initial RP kWh	0 ~ 999999999kWh		1kWh	0kWh	0kWh		
	–	Qt+	Initial kVarh	0 ~ 999999999kVarh		1kVarh	0kVarh	0kVarh		
	–	Qt-	Initial RP kVarh	0 ~ 999999999kVarh		1kVarh	0kVarh	0kVarh		
CB control	–	REMOTE/LOCAL	Remote/Local	R L	Remote Local	–	R	Remote		
	–	INTERLOCK	Interlock Use	UNUSE USE	Non-Use Use	–	USE	Use		
	–	CB OPEN	CB Open Block	UNBLK BLK	Unblocked Blocked	–	UNBLK	Unblocked		
	–	CB CLOSE	CB Close Block	UNBLK BLK	Unblocked Blocked	–	UNBLK	Unblocked		
	–	ON TIMER	CB On-Delay Timer	0 ~ 60s		1s	0s	0s		
DO contact test setting	–	–	One-Shot Time	–	1 ~ 20s	1s		1s		

13.2. Output contacts

- CGP1-A41D1

	Item name (PC-HMI)	Default value (PLC signal)	Please make a note about setting.
CB control Condition (DI)	CB status	DI1	
	Interlock of CB close	DI2	
	Interlock of CB open	DI3	
	CB close	DI4	
	CB open	DI5	
Operation lock (DI)	-	DI6	
	-	DI7	
Contacts for tripping (DO)	DO1	ALLEL-O	
	DO2	ALLEL-O	
Contacts for annunciator (DO)	DO3	OC-3T_O	
	DO4	OVG-T_O	
	DO5	DIRG-T_O	
	DO6	UBC2-T	
	DO7	UBC1-T	
	DO8	VD/	
	DO9	OV-T_O	
	DO10	UV-3T_O	
	DO11	UF-T_O	
	DO12	OF-T_O	
	DO13	RP-T_O	

- CGP1-A42D1

	Item name (PC-HMI)	Default value (PLC signal)	Please make a note about setting.
CB control Condition (DI)	CB status	DI1	
	Interlock of CB close	DI2	
	Interlock of CB open	DI3	
	CB close	DI4	
	CB open	DI5	
Operation lock (DI)	-	DI6	
	-	DI7	
Contacts for tripping (DO)	DO1	ALLEL-O	
	DO2	ALLEL-O	
Contacts for annunciator (DO)	DO3	OC4-3T_O	
	DO4	HOC-3T_O	
	DO5	OCG-T_O	
	DO6	UBC2-T	
	DO7	UBC1-T	
	DO8	VD/	
	DO9	OV-T_O	
	DO10	UV-3T_O	
	DO11	UF-T_O	
	DO12	OF-T_O	
	DO13	RP-T_O	

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