



Numerical Protection Relay

MELPRO™-A Series
OVERCURRENT RELAY

MODEL

MOC-A1V-R, MOC-A1V-RD
MOC-A1T-R, MOC-A1T-RD

INSTRUCTION MANUAL

Request


Ensure that this Instruction Manual is delivered to
the end users and the maintenance manager.

— Safety section —

This Safety section should be read before starting any work on the relay.

Be sure to read the instruction manuals and other related documents prior to commencing any work on the relay in order to maintain them in a safe condition.

Be sure to be familiar with the knowledge, safety information and all caution items of the product prior to use.

 CAUTION	Caution means that failure to observe safety information, incorrect use, or improper use may endanger personnel and equipment and cause personnel injury or physical damage.
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Items as classified to the caution may become to occur more sever results according to the circumstance. Therefore, all items described in the safety section are important and to be respected without fail.

CAUTION

1. Items concerning transportation
 - (1) Be sure the equipment to be kept in normal direction
 - (2) Avoid the bumps, shock, and vibration, otherwise the product performance /life might be unfavorably affected.
2. Items concerning storage
 - (1) Environment shall be below, otherwise the product performance/life might be unfavorably affected.
 - Ambient temperature: -20°C~+60°C (with no condensation nor freezing)
 - Relative humidity: 30~80% average of a day
 - Altitude: Less than 2000m
 - Avoid applying unusual shock, vibration or leaning or magnetic field
 - Not expose to harmful smoke, gas, salty air, water, vapor, dust, powder, explosive material or wind, rain.
3. Items concerning mounting/wiring work
 - (1) Mounting and wiring work should be done correctly.
Otherwise, damage, burning or erroneous operation might occur.
 - (2) Screw terminal should be tightened securely.
Otherwise, damage and burning might occur.

Tightened torque of screw shall be as below table

Material	Size	Standard torque	Permissible range	Application
Steel	M3.5	1.10N · m (11.2kgf · cm)	0.932~1.27N · m (9.5~12.9kgf · cm)	Terminals of back side

- (3) Grounding should be as done correctly in case it is required.
Otherwise, electric shock, damage, burning or erroneous operation might occur.
 - (4) Wiring should be done without mistake especially observing the correct polarity.
Otherwise, damage, burning or erroneous operation might occur.
 - (5) Wiring should be done without mistake especially observing the phase ordering.
Otherwise, damage, or erroneous operation might occur.
 - (6) Auxiliary power source, measuring transformer and power source which have enough capacity for correct operation of product should be used.
Otherwise, an erroneous operation might occur.
 - (7) Be sure to restore the front cover, terminal cover, protection cover, etc to the original position, which have been removed during the mounting/ wiring work.
Otherwise, electrical shock might occur at the time of checking.
 - (8) Connection should be done correctly using designated and right connectors.
Otherwise, damage or burning might occur.
4. Concerning equipment operation and settings
 - (1) Operational condition should be as below.
Otherwise, the product performance/life might be unfavorably affected.
 - Deviation of auxiliary power: within +10%~-15% of rated voltage
 - Deviation of frequency: within ±5% of rated frequency
 - Ambient temperature: 0°C~+40°C (-20°C~+50°C is permissible during couples of hour per day, with no condensation nor freezing)
 - Relative humidity: 30~80% average of a day
 - Altitude: Less than 2000m

- Avoid to be exposed to unusual shock, vibration, leaning or magnetic field
 - Not expose to harmful smoke, gas, salty air, water, vapor, dust, powder, explosive material, wind or rain.
- (2) Qualified personnel may work on or operate this product, otherwise, the product performance/life might be unfavorably affected and/or burning or erroneous operation might occur.
 - (3) Be sure to read and understand the instruction manuals and other related documents prior to commencing operation and maintenance work on the product. Otherwise, electrical shock, injury, damage, or erroneous operation might occur.
 - (4) While energizing product, be sure not to remove any unit or parts without permissible one. Otherwise, damage, or erroneous operation might occur.
 - (5) While energizing product, be sure to make short circuit of current transformer secondary circuits before setting change or drawing out the sub unit. Otherwise, secondary circuit of live current transformer might be opened and damage or burning might occur due to the high level voltage.
 - (6) While energizing product, be sure to open trip lock terminal before setting change or drawing out the internal unit of product. Otherwise, erroneous operation might occur.
 - (7) Be sure to use the product within rated voltage and current.
Otherwise, damage or erroneous might occur.
5. Items concerning maintenance and checking
- (1) Be sure that only qualified personnel might work on or operate this product.
Otherwise, electrical shock, injury, damage, or erroneous operation might occur.
 - (2) Be sure to read and understand the instruction manuals and other related documents prior to commencing operation and maintenance work on the product. Otherwise, electrical shock, injury, damage, or erroneous operation might occur.
 - (3) In case of replacing the parts, be sure to use the ones of same type, rating and specifications, etc.
If impossible to use above parts, be sure to contact the sales office or distributor nearest you.
Otherwise, damage or burning might occur.
 - (4) Testing shall be done with the following conditions.
 - Ambient temperature: $20^{\circ}\text{C}\pm 10^{\circ}\text{C}$
 - Relative humidity: Less than 90%
 - Magnetic field: Less than 80A/m
 - Atmospheric pressure: $86\sim 106\times 10^3$ Pa
 - Installation angle: Normal direction $\pm 2^{\circ}$
 - Deviation of frequency: within $\pm 1\%$ of nominal frequency
 - Wave form(in case of AC): Distortion factor less than 2%
(Distortion factor= $100\%\times$ effective value of harmonics/effective value of fundamental)
 - Ripple (in case of DC): Ripple factor less than 3%
(Ripple factor= $100\%\times(\text{max}-\text{min})/\text{average of DC}$)
 - (5) Deviation of auxiliary power: within $\pm 2\%$ of nominal voltage
 - (6) Be sure not to inject the voltage or current beyond the overload immunity.
Otherwise, damage or burning might occur.
 - (7) Be careful not to touch the energized parts.
Otherwise, the electric shock might occur.
 - (8) While energizing product, be sure not to clean up the product . Only wiping a stain on the front cover of product with a damp waste might be allowable. (Be sure to wring hardly the water out of the waste.)
6. Items concerning modification and/or repair work
- Be sure to ask any modification and/ or repair work for product to the sales office or distributor nearest you.
Unless otherwise, any incidents occurred with modification or repair works (including software) done by any other entity than MITSUBIHI ELECTRIC CORPORATION shall be out of scope on warranty covered by MITSUBISHI ELECTRIC CORPORATION.
7. Items concerning disposal
- Particular regulations within the country of operation shall be applied to the disposal.

— 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 by a 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 can not 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
 - ①The 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.
 - ②This 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, such as medical system for life-sustaining, in nuclear power plants, power plants, aerospace, and 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. 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.
 - ③In 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, are recommended.
 - ④The 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
 - ⑤The 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
 - ①MITSUBISHI ELECTRIC CORPORATION shall accept onerous product repairs for 7(seven) years after production is terminated. (However, please consider the replacement of products being in operation during 15 years from ex-work.)
 - ②Product 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.

MOC-A1 Series Over Current Relay [Standard: JIS C 4602]

Feature

1. A digital over current relay, which has high accuracy and stable operating characteristics.
2. Contains 2 overcurrent elements in one relay unit.
3. The operating time characteristics which easy to take protection coordination are built in.
 - Time-lag characteristics: EI, VI, NI, DT
 - Instantaneous characteristic: 2 stages
4. Reliable self-diagnostic function.
5. Enriched measurement and display functions.
6. Complete fault display functions.

The fault type (Overload, 2-phase short-circuit, 3-phase short-circuit) and fault phase can be displayed. Strongly support fault analysis.
7. The time-lag current setting can be set “lock”, so easy to carry out the instantaneous element test.

Rating and Specifications

Type Name		MOC-A1V-R	MOC-A1V-RD	MOC-A1T-R	MOC-A1T-RD															
Style No.		090PGA	509PGA	091PGA	510PGA															
Tripping method		Voltage trip		Current trip																
Ratings	Current	5A																		
	Frequency	50/60Hz (Changeover)																		
Settings	Time-lag current	LOCK-3-3.5-4-4.5-5-6A																		
	Dial	0.25-0.5-1-1.5-2-2.5-3-3.5-4-5-6-7-8-9-10-20																		
	Instantaneous current	LOCK-10-15-20-25-30-35-40-50-60A																		
	Using Condition	Frequency	Frequency : 50Hz (SW1-ON) / 60Hz (SW1-OFF) changeover																	
		Operating time characteristic (Time-lag element)	Extremely inverse characteristic (EI): SW3-OFF, SW4-OFF																	
Very inverse characteristic (VI): SW3-OFF, SW4-ON																				
Normal inverse characteristic (NI): SW3-ON, SW4-OFF																				
Definite time characteristic (DT): SW3-ON, SW4-ON																				
Display	Self monitoring	The LED “RUN” (green) lights up in normal condition.																		
	Operation Display	The display target turns from black into orange color when relay operates. Display phase: R-phase, T-phase, instantaneous (Manual resetting type)																		
	Numerical Display	<table border="1"> <thead> <tr> <th>SW No.</th> <th>Indication function</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Input current (A) : 2~30</td> </tr> <tr> <td>1</td> <td>Pickup time lapse : 0~10</td> </tr> <tr> <td>2</td> <td>Time-lag settings (A) : Lo, 3~6</td> </tr> <tr> <td>3</td> <td>Time-lag dial settings : 0.25~20</td> </tr> <tr> <td>4</td> <td>Instantaneous settings (A) : Lo, 10~60</td> </tr> <tr> <td>5</td> <td>Frequency setting (Hz) : 50/60</td> </tr> <tr> <td>6</td> <td>Time-lag characteristic settings: EI, VI, NI, DT</td> </tr> </tbody> </table>				SW No.	Indication function	0	Input current (A) : 2~30	1	Pickup time lapse : 0~10	2	Time-lag settings (A) : Lo, 3~6	3	Time-lag dial settings : 0.25~20	4	Instantaneous settings (A) : Lo, 10~60	5	Frequency setting (Hz) : 50/60	6
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Power Consumption VA (VT)		Normal : 5VA Operating : 6VA																		
Case		Compact cylindrical fixed type	Compact cylindrical draw-out type	Compact cylindrical fixed type	Compact cylindrical draw-out type															
Mass		Approx. 1.1K g	Approx. 1.2K g	Approx. 1.1K g	Approx. 1.2K g															

“LOCK” means that to let this element not to operate.

Characteristics

Item	Characteristics																									
Standard conditions of Use	Ambient temperature : -20~+50°C (in non-freezing state) Relative humidity : 30~80% Altitude : 2000m max. Other conditions : Not to be subject to abnormal vibration, shock or corrosive gases or excessive dust or moisture.																									
Non-operating characteristic	The instantaneous element does not operate when suddenly apply 80% current of setting value at minimum setting.																									
Operating value Characteristics	Time-lag element	Within $\pm 10\%$ of each setting value																								
	Instantaneous element	Within $\pm 15\%$ of each setting value																								
Reset value Characteristics	80% or more of each operating value																									
Operating time Characteristics	Time-lag element (setting: 3A) Refer to fig. 1-1 to 1-4 for characteristic example																									
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Instantaneous element 50ms or less when input = 200% of setting value. Refer to fig. 1-5 for characteristic example																										
Inertia characteristic	Time-lag element	Dial : 10 Input : 1000% of setting value Apply time: 90% of operating time Not operate																								
	Instantaneous element	Input : 180% of setting value Apply time: 22ms Not operate																								
Frequency Characteristics	Operating value: Within $\pm 5\%$ against the operating value at the rated frequency. Test condition: - Rated frequency: $\pm 5\%$ variation																									
Temperature Characteristics	Operating value	Within $\pm 20\%$ against the value at 20°C																								
	Operating time	Within $\pm 20\%$ against the value at 20°C (Input current multiplier = 300%)																								
Wave distortion characteristic	Time-lag element	Setting: Minimum operating value and minimum operating time Input : 80% of operation setting value (5 th harmonic ratio = 30% against fundamental wave) Not operate																								
Overload capacity	Application of "rated current $\times 40$ " two times for 1s at interval of 1min. No abnormality.																									

Vibration	Peak-to-peak amplitude mm (acceleration m/s^2)			Vibration times (s)	When the above vibration is applied with setting of maximum operating value and minimum operating time and applied 90% input voltage (against setting value), it is not abnormal operation and wrong display.
	Frequency (Hz)	Forward/backward	Right/left		
	10	5 (9.8)		2.5 (4.9)	
	16.7	0.4 (1.96)		600	
Shock	When apply a shock to the relay at the maximum acceleration of $300m/s^2$ for 2 times with each forward and backward, right and left, and vertically. No abnormality.				
Insulation Resistance	10M Ω or more between all the electric circuit and the case (E terminal) 10M Ω or more between independent electric circuits 10M Ω or more between contact circuit terminals (between poles) When tested at relative humidity of 80% RH max.				} DC500V megger used
Voltage withstand	2000V AC, for 1 minute between all the electric circuits and the case (E terminal) 2000V AC, for 1 minute between independent electric circuits 1000V AC, for 1 minute between contact circuit terminals (between poles) T ₁ -T ₂ , a ₁ -a ₂				
Lightning impulse withstand voltage	Apply 1.2/50 μ s standard waveform to positive/negative electrodes for 3 times. It is not abnormality. • Between all the electric circuits and the case (E terminal) : 4.5KV • Between independent electric circuits : 4.5KV				
Noise-proof	Apply 80% input current of time-lag element setting value to the relay for 2 seconds with maximum voltage setting. No abnormality. • Between CT secondary and ground (E terminal) • between CT secondary contact terminals (between poles)				
Radio disturbance	Apply 80% input current of time-lag element setting value to the relay with maximum voltage setting. At the same time to put a transceiver antenna (5W output) with 150MHz or 400MHz band closing the relay panel about 0.5m. It is not abnormal operation.				
Contact capacity	Tripping method	Voltage tripping type			Current tripping type
	For circuit breaker trip	Closed circuit	AC110V: 10A (Power factor = 0.5) DC220V: 10A DC110V: 15A (L/R=0s)		Closed circuit: AC110V, 60A [In case of test at parallel connecting 2 Ω (power factor=0.5) impedance with contact]
		Opened circuit	AC110V: 5A (Power factor = 0.5) AC220V: 1A (Power factor = 0.5) DC110V: 0.2A (L/R=40ms)		
For alarm	Rated application current: 0.5A Open-close capacity : 500VA ($\cos\phi=0.4$), 60W (L/R=0.007s) Maximum voltage : AC380V, DC125V				

Time-lag element

EI characteristic

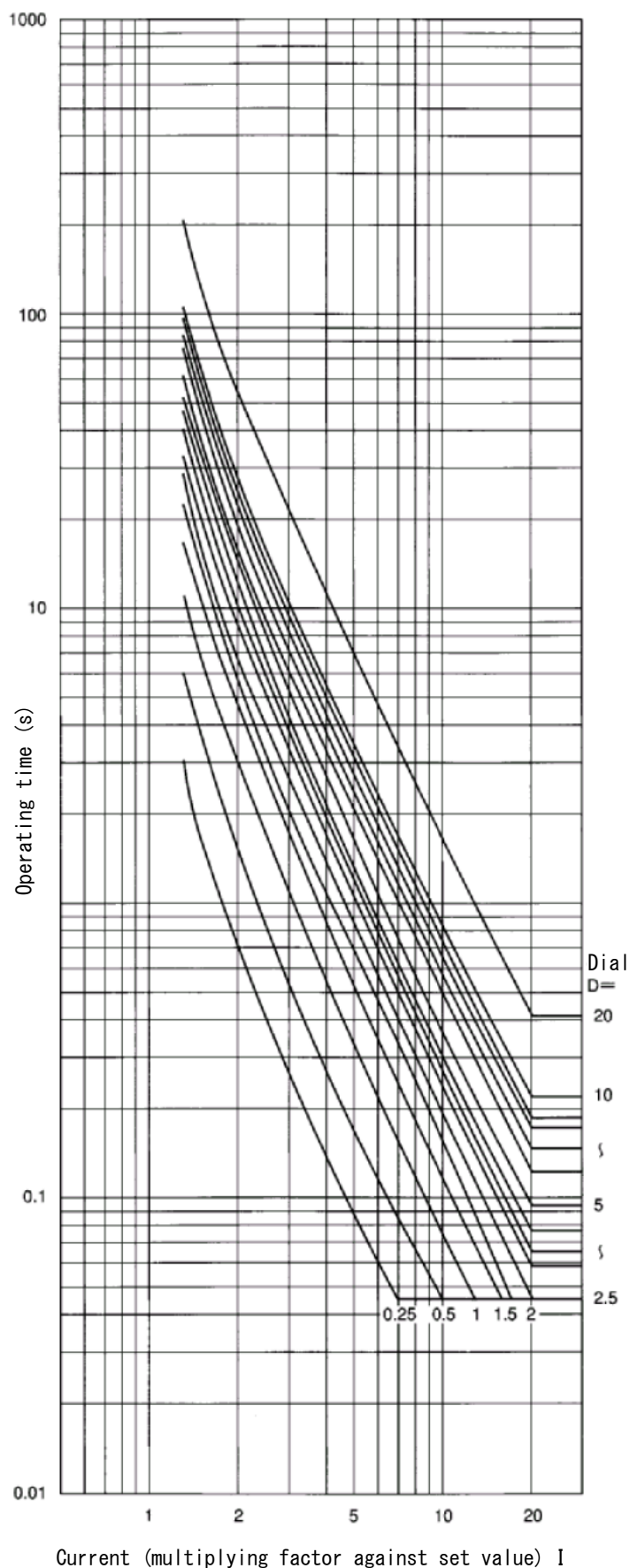


Fig. 1-1 EI: $T = \frac{80}{I^2 - 1} \times \frac{D}{10}$ (s)

VI characteristic

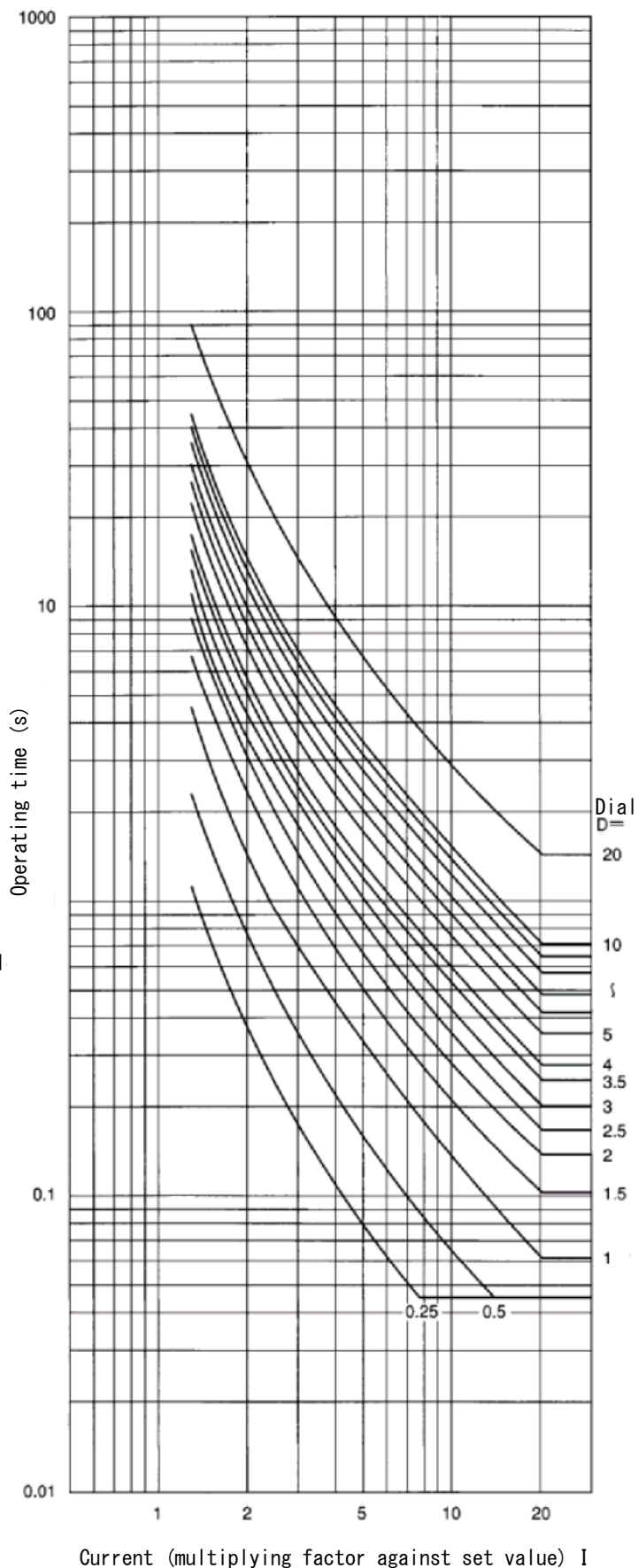
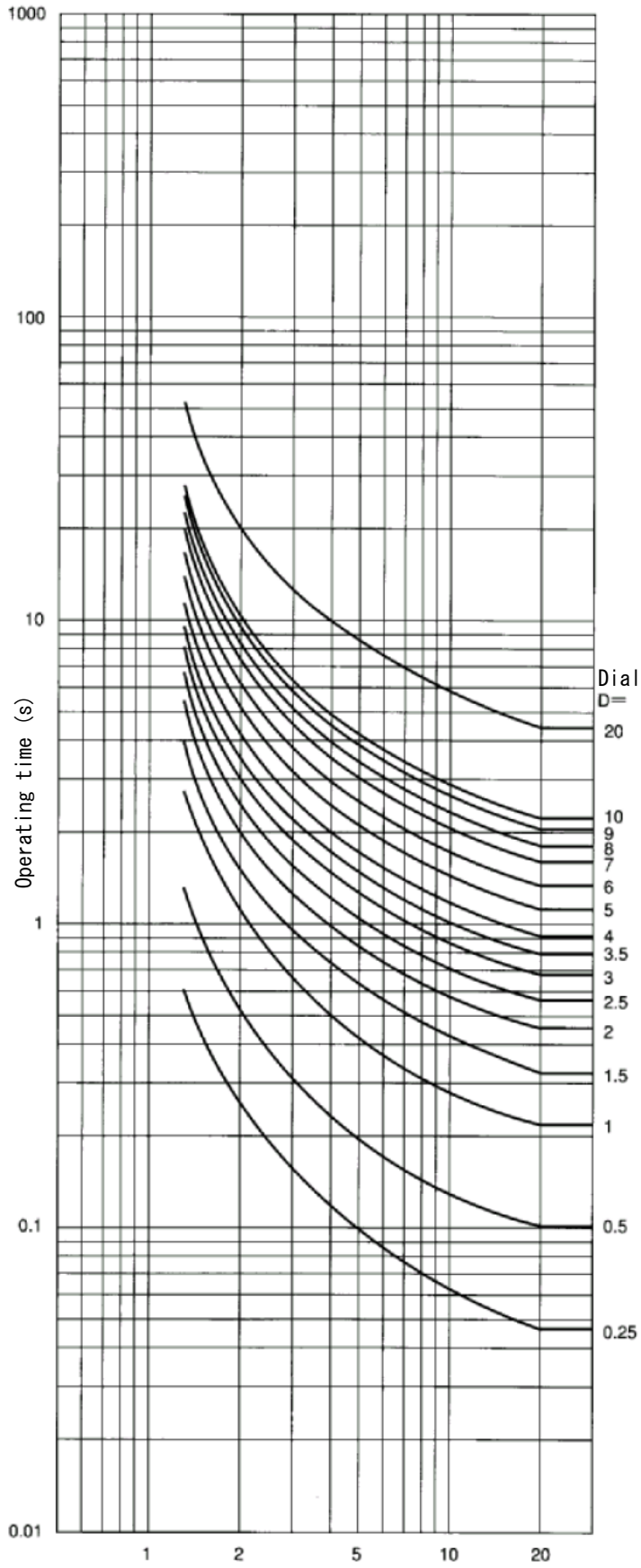


Fig. 1-2 VI: $T = \frac{13.5}{I - 1} \times \frac{D}{10}$ (s)

Time-lag element

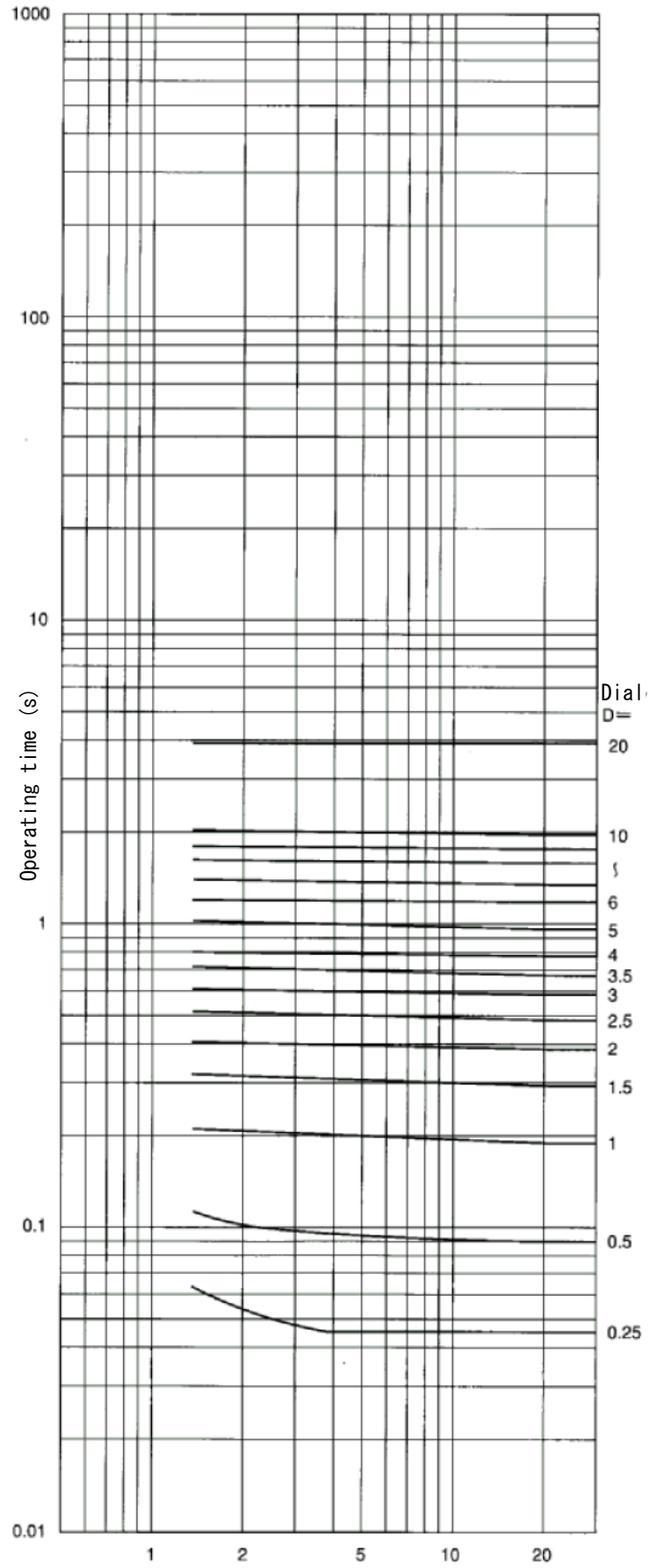
NI characteristic



Current (multiplying factor against set value) I

Fig. 1-3 NI: $T = \frac{0.14}{I^{0.02-1}} \times \frac{D}{10}$ (s)

DT characteristic



Current (multiplying factor against set value) I

Fig. 1-4 DT: $T = 2 \times \frac{D}{10}$ (s)

Instantaneous element

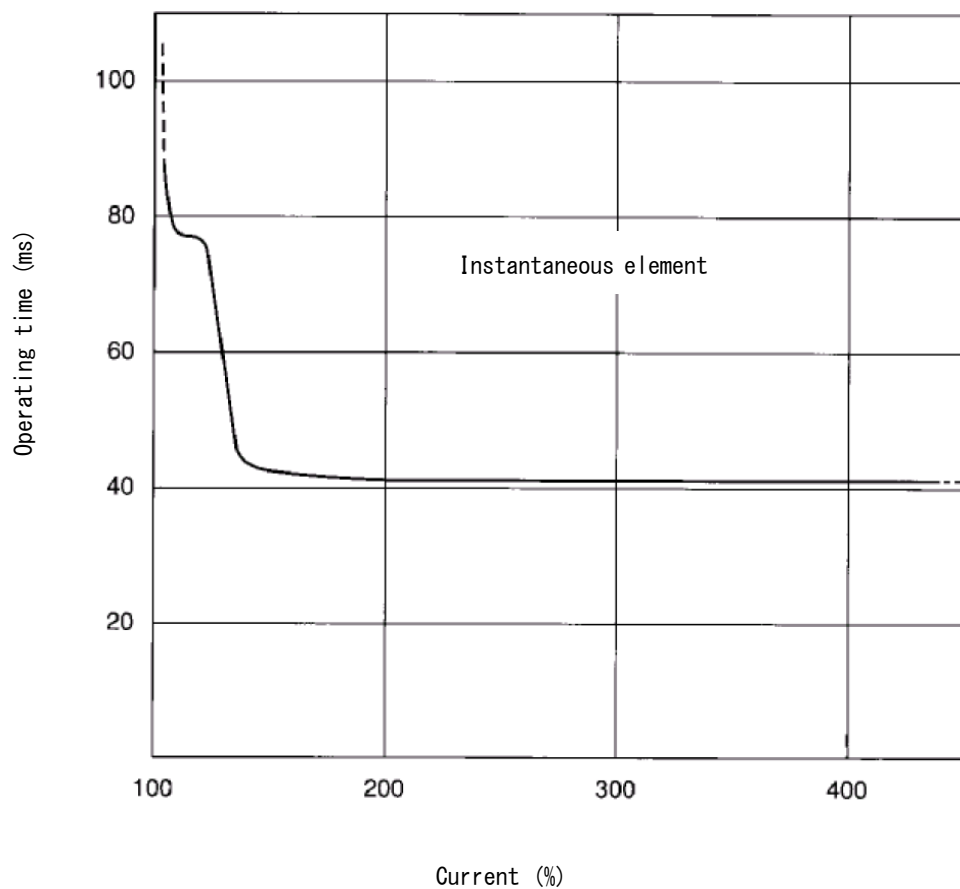


Fig. 1-5 Instantaneous element characteristic

Construction

RUN indicated LED (Green)

Continuously monitor the auxiliary power supply circuit, electric circuit, program date, etc., and the RUN LED lights up in normal condition.

LED for numerical display

The following items can be displayed by switch setting.

- (1) Current measurement...
Input current can be displayed with range of 2.0 to 30A.
- (2) Pickup and lapse display...
0 :0 is displayed when the input achieved pick-up value of time-lag element.
1~10:1 to 10 is displayed according to the time lapse of time-lag element.
- (3) Setting value display...
Each setting value can be displayed.

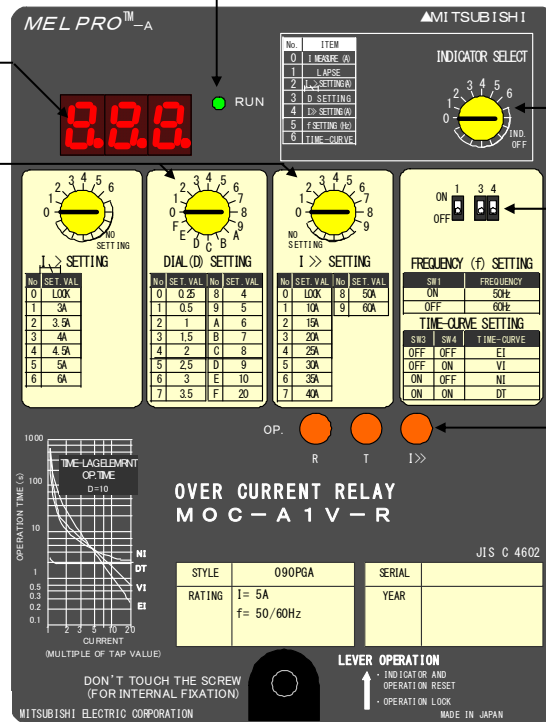
Switches for operating current and dial setting

- Set the setting value
- To change the setting with hand or a small (-) screwdriver.

Display reset lever on the operation flag unit

Pushing reset lever makes it possible to reset the operation display unit.
While the lever is being pushed up, the relay function is locked.

Note) Since the display plug of the operation display unit is of a very precise structure, avoid touching it directly by hand.



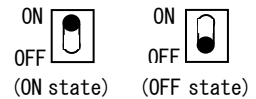
Selector switch for display selection

- Set the display item
- To change the setting with hand or a small (-) screwdriver

Frequency setting switch

The used frequency can be set with ON/OFF switch.

Frequency	SW1
50Hz	ON
60Hz	OFF



(● shows the position of setting)

Time-curve	SW3	SW4
EI	OFF	OFF
VI	OFF	ON
NI	ON	OFF
DT	ON	ON

When the switch is set, do not use any tool with a sharp point. (It may cause damage to the switch lever.)

Operation flag indicator

It is available to display the fault phases (R-phase, T-phase, and instantaneous), so easy to judge the fault phases.

Fig. 1-6 MOC-A1 series construction (panel)

Operating Description

1. Relay function

- ① This relay has a built-in regulated voltage circuit which derives control voltage from the CT secondary current, therefore, particular auxiliary power supply is not required.
- ② The input current is converted into a electronic circuit level signal by a built-in auxiliary CT.
- ③ The input current signal is converted into a digital signal by A/D converter, and as data input microcomputer.

● Level judgment of time-lag and instantaneous element

● Time-lag element characteristic

- EI : $T = \frac{80}{I^2 - 1} \times \frac{D}{10} \text{ (s)}$
- VI : $T = \frac{13.5}{I - 1} \times \frac{D}{10} \text{ (s)}$
- NI : $T = \frac{0.14}{I^{0.02} - 1} \times \frac{D}{10} \text{ (s)}$
- DT : $T = 2 \times \frac{D}{10} \text{ (s)}$

- ④ The microcomputer calculates and compares the level of the input current signal data with the setting value data of each phase. If the current signal is more than the setting value, the timer starts counting. If the counter is more than the operating time setting, the relay and the operating flag unit start to operate and indicate the fault phase. (refer to the following table)

(● : operation indication)

Fault phenomena		Display of operation indicator		
Fault type	Phase	R-phase	T-phase	Inst.
Overload	R-S	●	○	○
	S-T	○	●	○
	T-R	●	●	○
	R-S-T	●	●	○
Short-circuit	R-S	●	○	●
	S-T	○	●	●
	T-R	●	●	●
	R-S-T	●	●	●

- ⑤ About the output contact (including trip contacts and alarm contact) of relay, once it operated, it will reset in 60ms to 120ms after contact holding when the input is less than the setting value.

2. RUN display (Self-monitoring Function)

This relay monitors control voltage, electric circuit and program data at all time. The RUN LED (green) lights up in the normal condition, and goes out in the abnormal condition. Since control voltage is derived from CT secondary current input, the LED goes out when the current input is lower than approx. 0.5A (2-phase input) or approx. 0.7A (single phase input).

3. Numerical Display Function

By changing the position of the selector switch, the following values can be displayed on the numerical display LED.

- ① Current measurement... (switch position : 0) ...

Based on the current signal data of each phase, the current is measured and computed, and then to display the input current value of the biggest one among input phases.

The display range is from 2.0A to 30A.

(When less than 2.0A, nothing be displayed. When more than 30A, "0.F." is displayed.)

- ② Pickup and lapse display... (switch position : 1) ...

The pickup and lapse of time-lag timer is displayed with 0 to 10.

Pickup display: 0 is displayed when the input achieved pick-up value of time-lag element.

Lapse display : 1 to 10 is displayed according to the timer lapse of time-lag element. The output relay and operating indicator operate once 10 is displayed.

- ③ Setting value display... (Switch position : 2~6) ...

This function displays the relay setting condition including the time-lag current setting (A), dial setting, instantaneous current setting (A), frequency setting (Hz) and operation characteristic setting.

Internal Connection diagram

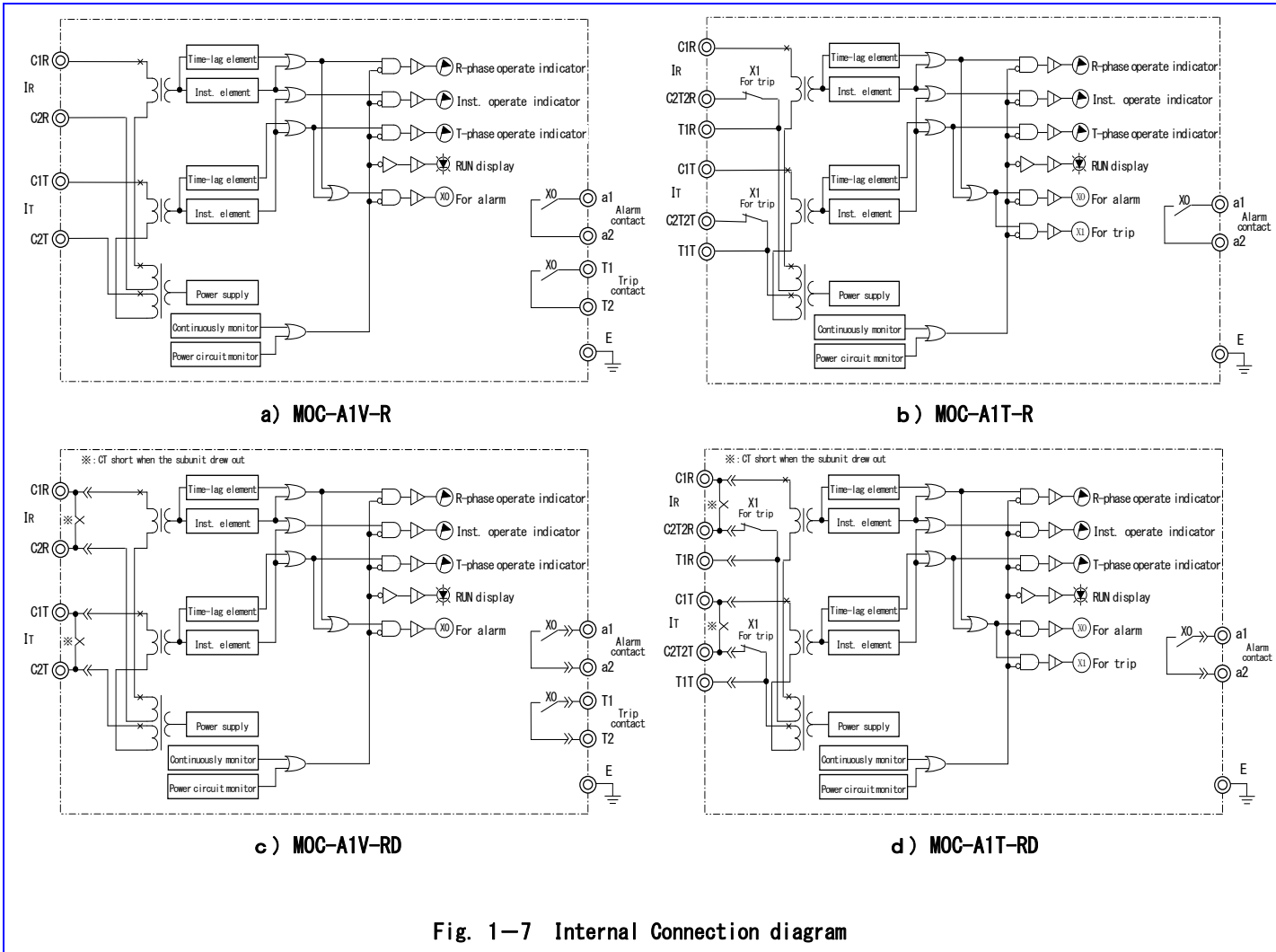
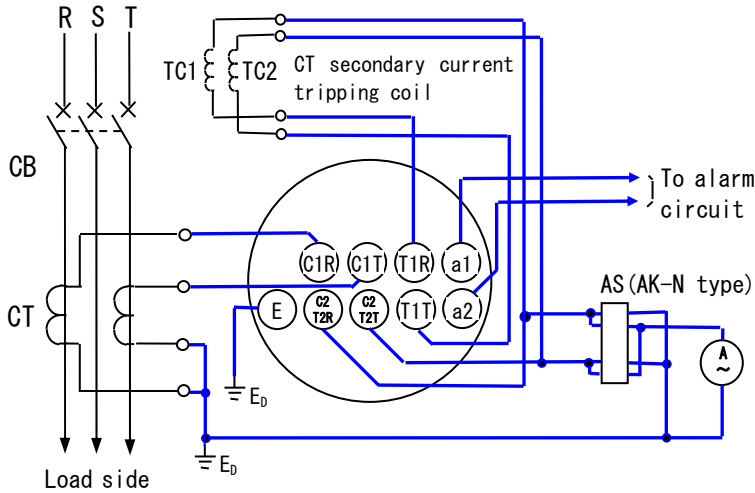


Fig. 1-7 Internal Connection diagram

External Connection Diagram (Example)

a. CT secondary current tripping type (MOC-A1T)

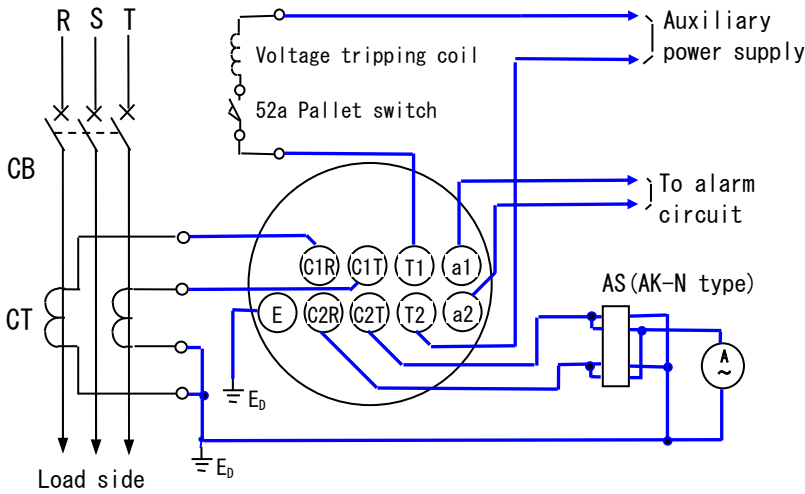


[CB tripping route when fault]

The CT secondary current flows between (C1R) and (C2T) in normal status. When fault occurs, the CT secondary current flows between (C1R) and (T1R), to let the CB trip.

Note) In the case of T-phase, the above terminal number should be changed from "R" to "T"

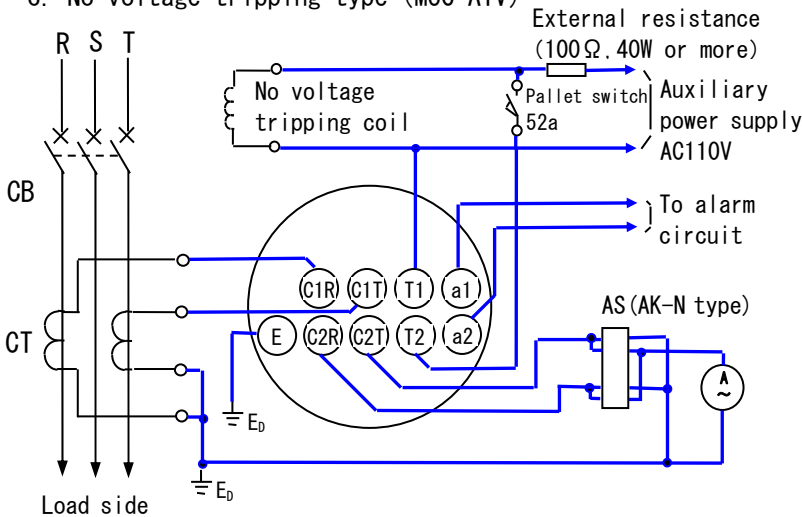
b. Voltage tripping type (MOC-A1V)



[Tripping route when fault]

To let the route of terminals (T1) and (T2) close when fault occurs, so that the trip coil can be demagnetized and make the CB trip.

c. No voltage tripping type (MOC-A1V)



[Tripping route when fault]

To let the route of terminals (T1) and (T2) close when fault occurs, so that the trip coil can be demagnetized and make the CB trip.

- Notes) ① Do connect the CT secondary and relay terminal "E" to earth at Class D please.
 ② Please correctly wire the CT secondary polarity of each phase and relay terminals refer to the above diagram.

Fig. 1-8 External Connection Diagram

Handling Method

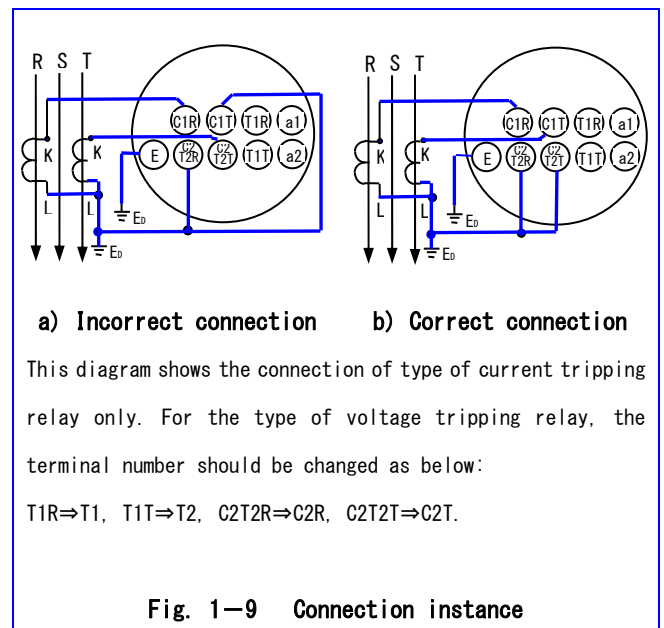
1. Panel assemble

- ① Do connect the relay terminal “E” to earth at Class D please.
- ② Please wire the input terminals of relay corresponding to the polarity of CT secondary output.
(Refer to Fig.1-9)
If the connection of polarity is in wrong, the relay may be not operate when fault. Please pay attention to.
- ③ The adapter is necessary for some type, when use MOC-A serials relay to instead of other old serials which is being used.
- ④ Type MOC-A1V-RD and MOC-A1T-RD are draw-out type that the sub-unit can be drawn out from case.
For detail, refer to section of “Drawing out and Housing operation of Sub-unit” please.

2. Use and Operation

- ① About the setting of frequency, it is set OFF at the time of shipment, so it is necessary to set the frequency switch again according to the using frequency when begin to use this relay.
Refer to the page 20, Cover Handling.
- ② About MOC-A1T-R relay
This type is a current tripping relay. Due to the current flows the tripping coil and make the CB trip through internal “b” contact open, so it is possible to damage the contacts if the current is too big.
Therefore, please check the “b” contacts (between T1R and C2T2R, T1T and C2T2T) and make sure that it is closing when using. At this time, the tripping coil of CB should be disconnected.
- ③ Avoid changing the setting value during relay operating, since it is possible to occur unwanted operation. However, if the setting change is unavoidable, please push up the reset lever in order to lock relay operating.
- ④ To change the setting may be realized manually by the setting switch. It is also possible by using a small

- minus (-) screwdriver. If a large minus (-) screwdriver is used, it may damage the groove of the switch knob.
- ⑤ The switch for setting is a rotary one utilizing snap action. When the setting is changed, turn the switch smoothly so as not to stop it in mid-position.
- ⑥ The position of the display selector switch is not specified in particular, but if it is normally set to **0 | Current Measure (A)**, The input current value can be measured conveniently.
- ⑦ Since the RUN indicator LED is lighting during the normal operation, check it in routine checking please. If it turns off, check input current value at first, and if it is still in OFF state even the input current is approx 1A or more, please contact our local agent and branch office since the relay may fail.



Test

A relay test is carried out sufficiently by maker before shipment. But at the following cases, it is recommended that the test be carried out again.

- a. After the products are unpacked when received
- b. When the equipment starts operation
(Power receiving starts)
- c. When periodical checkup is carried out
(Normally once per year)

1. Testing

- ① MOC-A1 type over current relay is a digital relay which contains 2-phase over current elements, it is available to test basically like as other one-function relay.
- ② About the current input waveform, please use a sine wave without distortion.
- ③ To select the switch for each setting with hand or use a small regular screwdriver (“-” type).
- ④ Set the selector switch position to

1	Lapse
---	-------

 as appropriate according to the test item. Set other switches for setting according to the test conditions of the operation characteristic control points.
- ⑤ If the operation characteristics are tested specially in individual control points (for example, when tested with the in-service setting conditions), the test should be performed with the operation characteristic points when the products are received, a receiving test should be carried out with individual control point after judging the performance of this relay. Please use this data as a later standard.

2. Withstand Voltage Test

Perform the unit test as follows.

- a. Apply 2000V AC (commercial frequency) between all electric circuit and case (E terminal) for one minute, and make sure that no problem.

Type	Voltage Applied Terminals									
MOC-A1V	<table border="0" style="text-align: center;"> <tr> <td>(C1R)</td> <td>(C1T)</td> <td>(T1)</td> <td>(a1)</td> </tr> <tr> <td>(C2R)</td> <td>(C2T)</td> <td>(T2)</td> <td>(a2)</td> </tr> </table>	(C1R)	(C1T)	(T1)	(a1)	(C2R)	(C2T)	(T2)	(a2)	(E)
(C1R)	(C1T)	(T1)	(a1)							
(C2R)	(C2T)	(T2)	(a2)							
MOC-A1T	<table border="0" style="text-align: center;"> <tr> <td>(C1R)</td> <td>(C1T)</td> <td>(T1R)</td> <td>(a1)</td> </tr> <tr> <td>(C2R)</td> <td>(C2T)</td> <td>(T1T)</td> <td>(a2)</td> </tr> </table>	(C1R)	(C1T)	(T1R)	(a1)	(C2R)	(C2T)	(T1T)	(a2)	(E)
(C1R)	(C1T)	(T1R)	(a1)							
(C2R)	(C2T)	(T1T)	(a2)							

- b. Apply 2000V AC (commercial frequency) between all electric circuit and case (E terminal) for one minute, and make sure that no problem.

Type	Voltage Applied Terminals									
MOC-A1V	(C1R) (C2R)	(C1T) (C2T)								
	<table border="0" style="text-align: center;"> <tr> <td>(C1R)</td> <td>(C2R)</td> </tr> <tr> <td>(C1T)</td> <td>(C2T)</td> </tr> </table>	(C1R)	(C2R)	(C1T)	(C2T)	<table border="0" style="text-align: center;"> <tr> <td>(T1)</td> <td>(a1)</td> </tr> <tr> <td>(T2)</td> <td>(a2)</td> </tr> </table>	(T1)	(a1)	(T2)	(a2)
	(C1R)	(C2R)								
(C1T)	(C2T)									
(T1)	(a1)									
(T2)	(a2)									
<table border="0" style="text-align: center;"> <tr> <td>(T1)</td> </tr> <tr> <td>(T2)</td> </tr> </table>	(T1)	(T2)	<table border="0" style="text-align: center;"> <tr> <td>(a1)</td> </tr> <tr> <td>(a2)</td> </tr> </table>	(a1)	(a2)					
(T1)										
(T2)										
(a1)										
(a2)										
MOC-A1T	(C1R) (C2R) (T1R)	(C1T) (C2T) (T1T)								
	<table border="0" style="text-align: center;"> <tr> <td>(C1R)</td> <td>(C2R)</td> <td>(T1R)</td> </tr> <tr> <td>(C1T)</td> <td>(C2T)</td> <td>(T1T)</td> </tr> </table>	(C1R)	(C2R)	(T1R)	(C1T)	(C2T)	(T1T)	<table border="0" style="text-align: center;"> <tr> <td>(a1)</td> </tr> <tr> <td>(a2)</td> </tr> </table>	(a1)	(a2)
(C1R)	(C2R)	(T1R)								
(C1T)	(C2T)	(T1T)								
(a1)										
(a2)										

3. Operation Characteristics Test

- ① Increase the test current gradually, the RUN indicator LED (green) will light up at approx. 0.7A.
This indicates that the electronic circuit has started to operate normally.
- ② For the operating value test of time-lag element, set the selector switch to position 1 and increase the test current gradually until the “0” is displayed in the LED, at this time check the pick-up value please.
In addition, make a sure that it is available to display completely when increase the input current continuously.
- ③ For the operating value test of instantaneous element, due to the input current is big, the time-lag element may operate during adjusting, so it is necessary to set the time-lag element in “Lock” .
- ④ For the operating time test of time-lag element, push up the reset lever to make the relay in lock status when carry out adjusting the test current please.
If the reset lever is not pushed up, the relay will be not in lock status, and at this time the instantaneous element may operate. So in this case, the instantaneous element should be set “Lock” .
- ⑤ But for each test, if the input current is more than 10A, the apply time should be within 3 or 4s and apply the input current at interval of 10s or more.

4. Operation Characteristic Control Point

Perform the test periodically according to the following test condition and criterion.

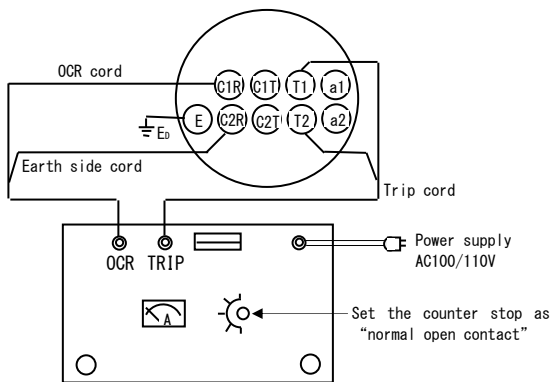
Test Item		Test Condition			Criterion
		Input	Operation value	Operation time	
Operation value	Time-lag	—	Each setting	Minimum setting	±10% of setting value
	Inst.	—	Each setting	—	±15% of setting value
Operation time	Time-lag	300% of setting	Minimum setting	Characteristic test point of operating time	±17% of nominal value
		700% of setting			±12% of nominal value
	Inst.	200% of setting	Minimum setting	—	50ms or less
Non-operating characteristic	Inst.	80% of operating value	Minimum setting	—	Not operate

5. Operation test circuit instance

The following shows some test circuit examples. About the commercial test equipment, please refer to the manual of each maker to carry out test.

a. MOC-A1V-R

(This diagram shows the test connection of MOC-A1V-R, and the MOC-A1V-RD is also same. Refer to the page of terminal layout for the detail terminal arrangement.)



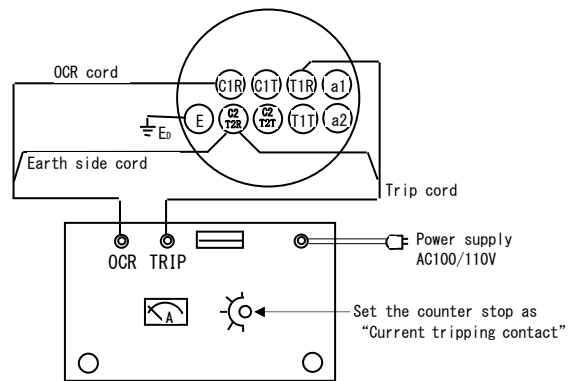
Note) This diagram shows the test of R-phase.

In case the test of T-phase, please change the connection terminal number as following:



b. MOC-A1T-R

(This diagram shows the test connection of MOC-A1T-R, and the MOC-A1T-RD is also same. Refer to the page of terminal layout for the detail terminal arrangement.)

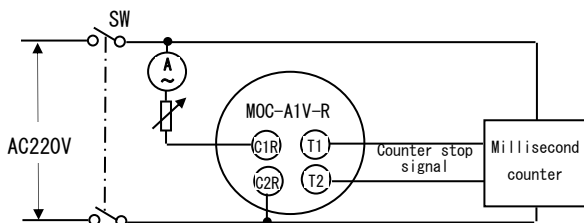


Note) This diagram shows the test of R-phase.

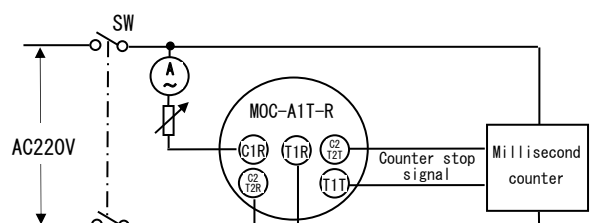
In case the test of T-phase, please change the connection terminal number as following:



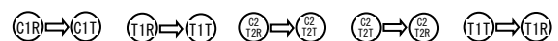
Test based on commercial overcurrent test equipment



The terminal of T1-T2 turn from "open" to "close" when relay operates, at this time the millisecond counter stops.



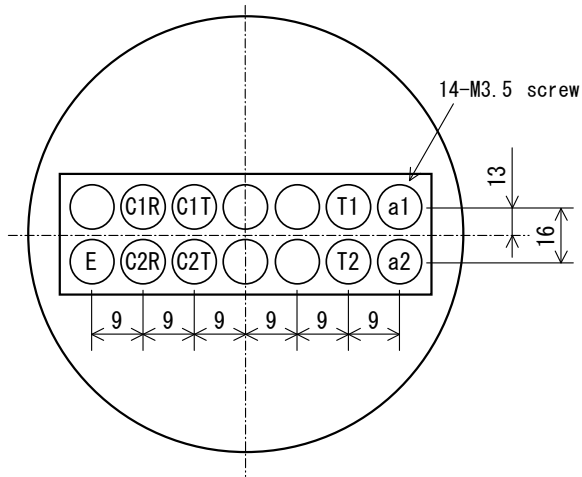
The terminal of C2T2R-T1R turn from "open" to "close" when relay operates, at this time the millisecond counter stops. In case of T-phase input, please change the connection terminal number as following:



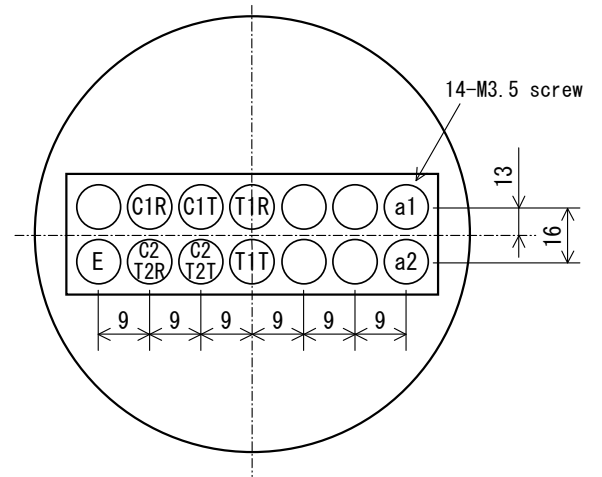
Real load practice exam

Fig. 1-10 Test circuit instance

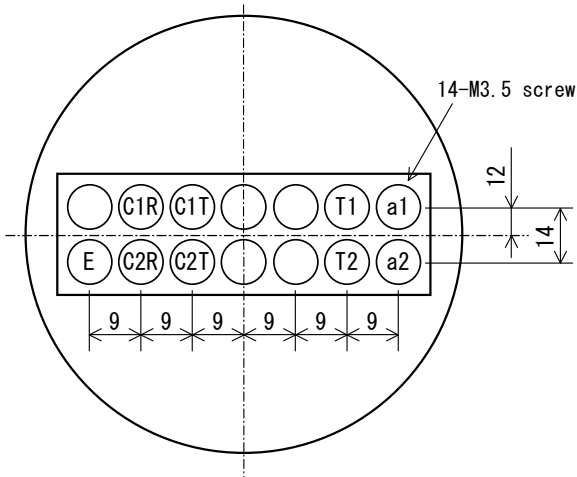
Terminal Layout



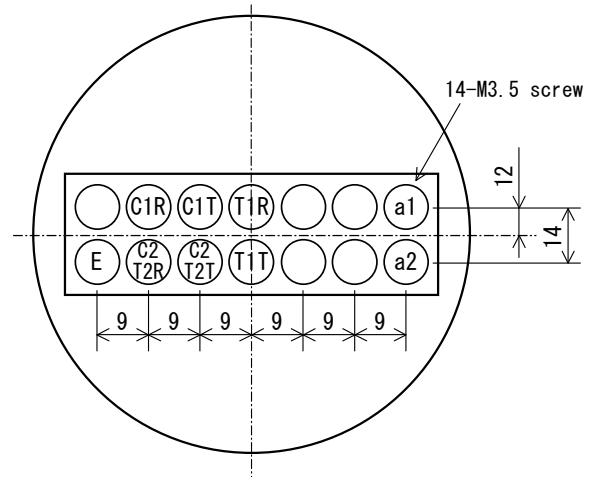
MOC-A1V-R



MOC-A1T-R



MOC-A1V-RD



MOC-A1T-RD

Fig. 1-11 Terminal Layout

Drawing out and Housing operation of Sub-unit

—For compact cylindrical draw-out type (RD type)

it is available to draw out the sub-unit from the relay case instead of removing the external wires. So that easier to carry out checking and testing.

When drawing out and housing, please pay attention to not to touch the electric circuit and move the sub-unit by handing the lever or form.

Otherwise, it is possible to get an electric shock or make internal electric parts damage.

The following operation should be checked when sub-unit be drawn out from relay case.

- Lock the tripping circuit
- Turn off the power supply into relay
- Disconnect CT circuit
- Opened the auxiliary power supply (only the RD type relay)

Note) This relay has the function that the CT secondary Automatically short-circuit when draw out the sub-unit from case.

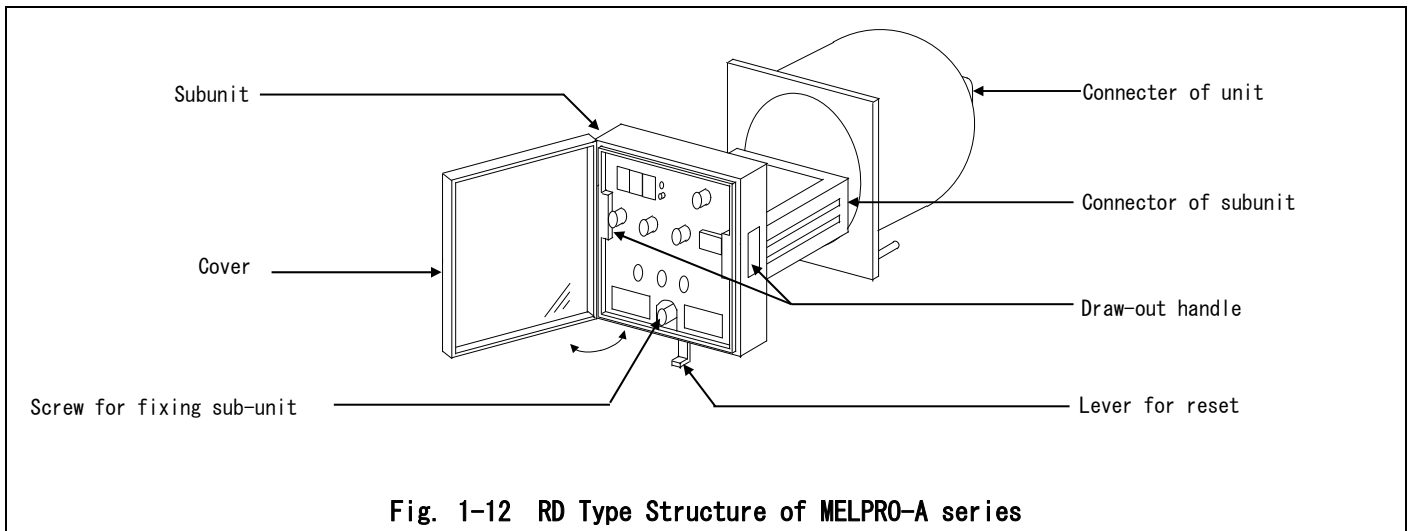
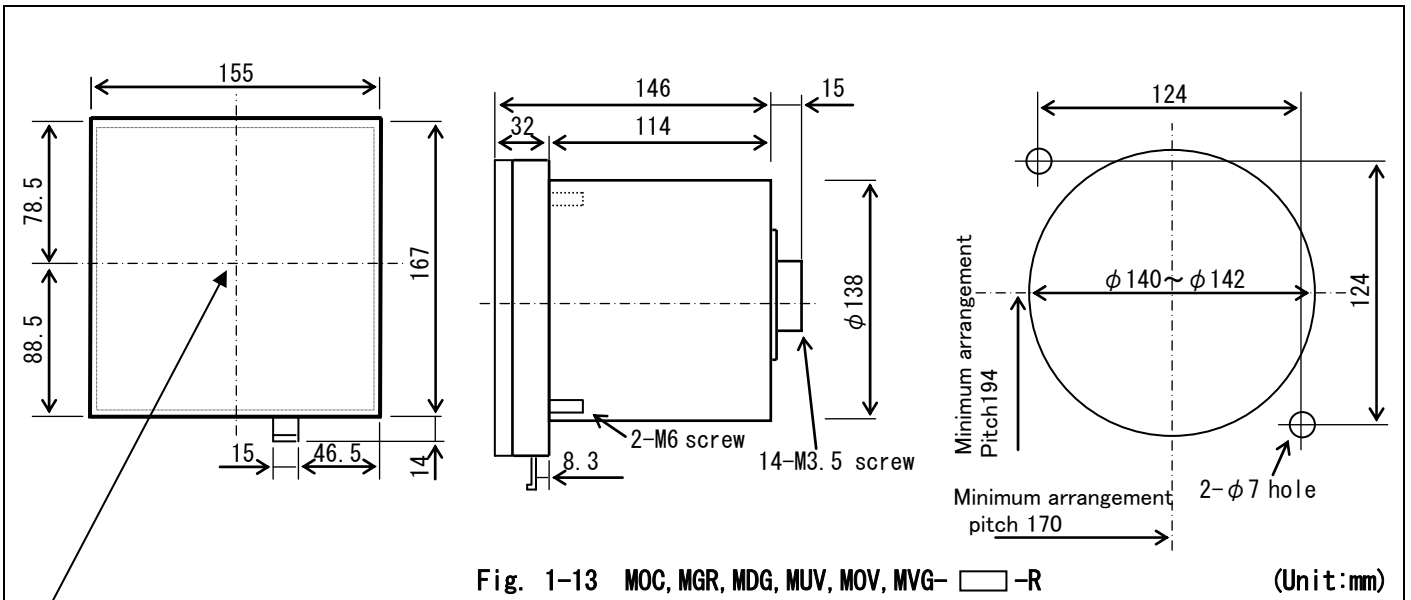
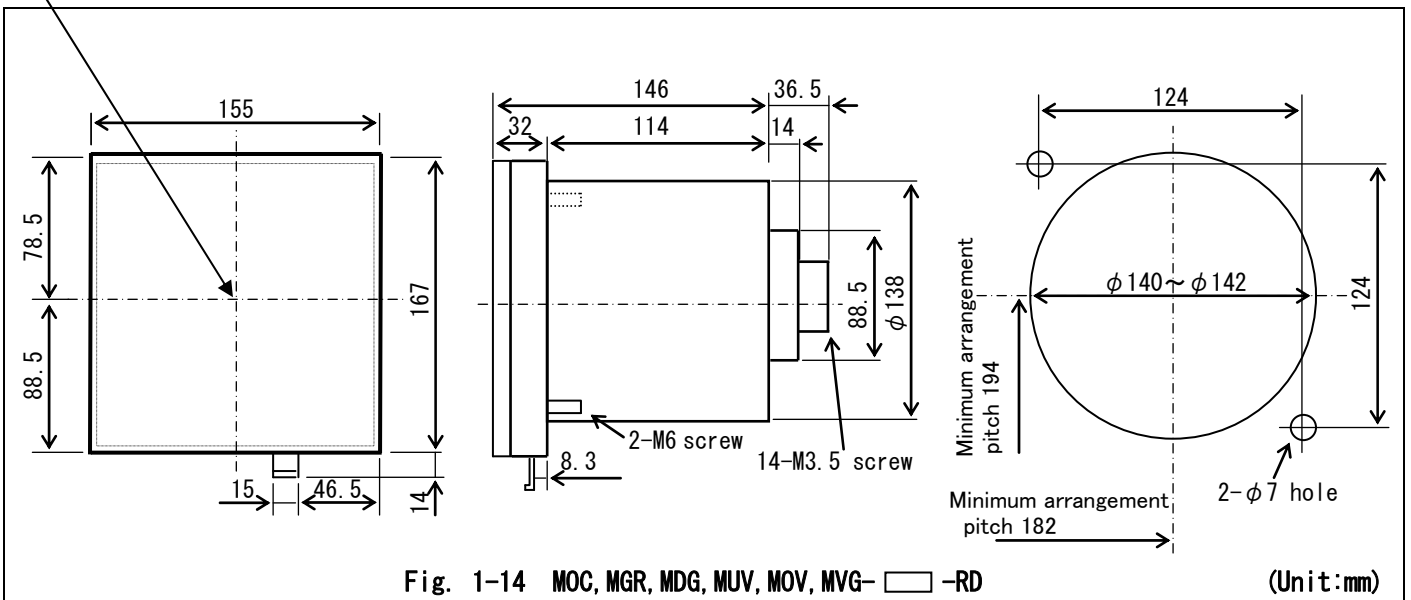


Fig. 1-12 RD Type Structure of MELPRO-A series

Monitoring and Dimensions

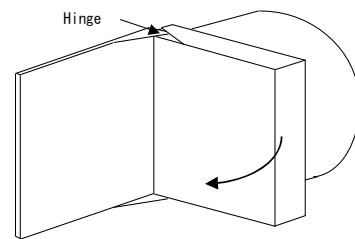


Same as the center lines of $\phi 140\sim 142$ hole

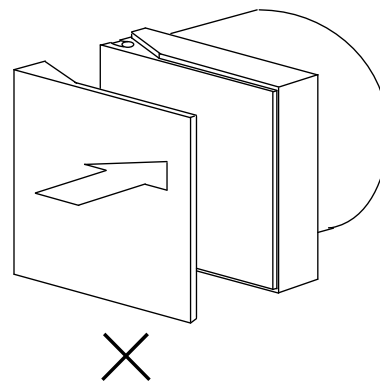
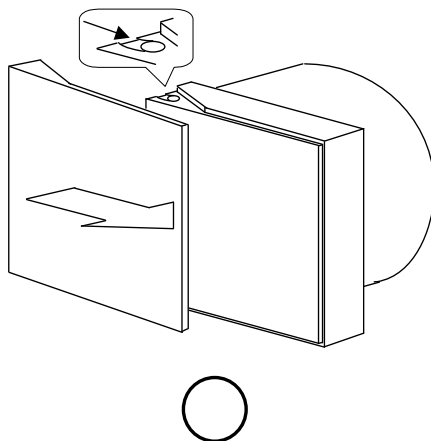


● Cover Handling

Relay cover is opening-and-closing door type. Once forces the cover overload when open it, it will be removed from case. Please refer to the figure shown blow to assemble the cover at horizontal direction. (Do not assemble it at the direction of the front.)



[Cover opening-and-closing]



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.

mitsubishi electric corporation

HEAD OFFICE : 7-3 MARUNOUCHI 2-CHOME, CHIYODA-KU TOKYO, 100-8310, JAPAN

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