

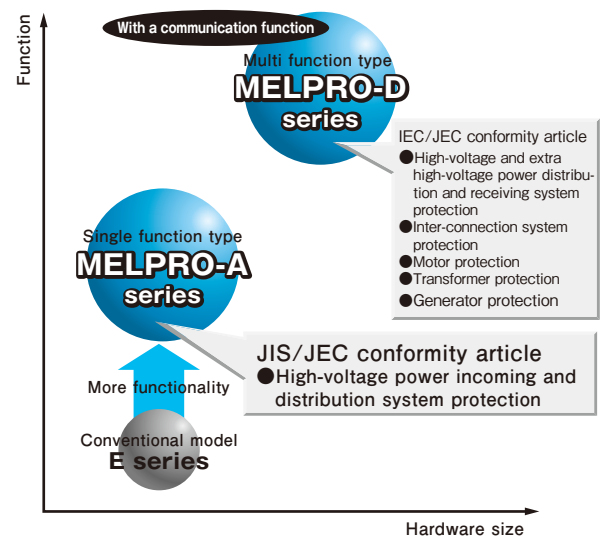


Digital Protection Relay *MELPRO™*-A Series



"MELPRO-A series" Digital Protection the advanced functions possible to support and control system for high voltage power

To improve the reliability of distribution system is quite essential for the stable operation of all facilities installed in any consumer's factories and buildings. In order to realize high reliable distribution system, more functional protection relay as the core for the protection and control system is essentially required. Through passing the age of the electric mechanical type relay and the transistor type relay, today, the main stream of protection relay has been moved to the digital type. The digital type protection relay MELPRO-A series have been developed based on the combination of the plenty know how gained through digital relay history in several ten years and the latest electronics technology, and make possible to respond to the recent age needs for more functionality protection relay system.



2

High accuracy & High speed processing

Adopt the highest performance CPU situated in the front line of the digital age.

The high speed digital computation realizes the high accuracy operating characteristics never before possible. The operating characteristics are configured by the software, so that little deterioration and the stabilized operation can be realized.

Digital operation



High degree of reliability

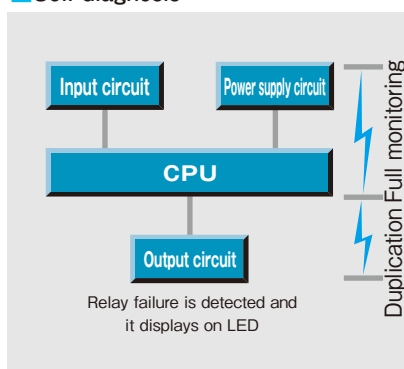
Adopting self-diagnosis function for countermeasures against problem may arise.

The self-diagnosis function which monitors continuously the input, built-in power source and CPU is equipped. In the failures occurring of the relay, they can be detected immediately by the self-diagnosis function. Furthermore, dual output circuit makes possible to prevent the occurrence of misoperation due to the hardware failures.

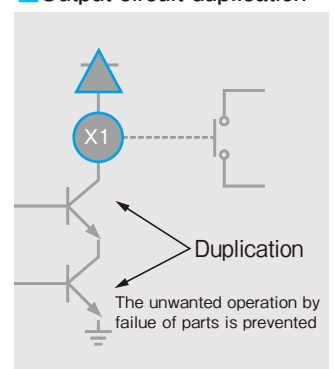
Superior resistance to attack by tough environment

Adopt the structure to be resistant to the disturbances such as the electric surge and noise, harmonics, radio noise from the cellular phone, temperature and humidity.

Self-diagnosis



Output circuit duplication



Relays newly provide port the reliability of protection er system.



Easy Renewal

Since compatible with the conventional model, renewal to MELPRO-A is easy.

The panel cutouts are the same as the conventional model "E series". It can renew easily, without using an adapter etc. Moreover, compatibility with another conventional model is also high, and then design change can be limited as the minimum.

■ Exchange with the old models, such as a induction disk type, is easy.

MELPRO-A series

Switch board

MITSUBISHI conventional model "E series"

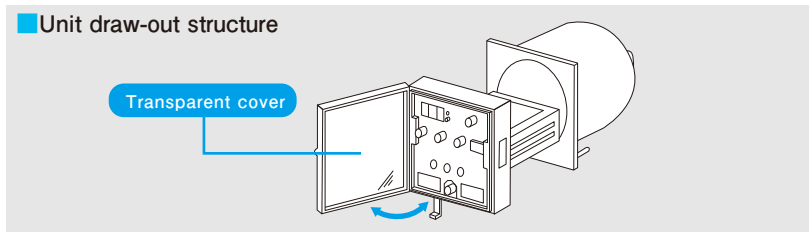
■ Table of old and new type

E series	MELPRO-A series	E series	MELPRO-A series
MOC-E1V-R/RD	MOC-A1V-R/RD	MOV-E1V-R/RD	MOV-A1V-R/RD
MOC-E1T-R/RD	MOC-A1T-R/RD	MGR-E1V-F	MGR-A1V-F
MDG-E1V-R/RD	MDG-A1V-R/RD	MGR-E1V-R/RD	MGR-A1V-R/RD
MDG-E2V-R/RD	MDG-A2V-R/RD	MGR-E1T-R	MGR-A1T-R
MUV-E1V-R/RD	MUV-A1V-R/RD	MVG-E1V-R/RD	MVG-A1V-R/RD
MUV-E11V-R	MUV-A1V-R	MVG-E2V-R/RD	MVG-A2V-R/RD

Saving of maintenance work

Since the RD type is draw-out type, maintenance is smooth and safe.

Since MELPRO-A relay unit can be pulled out from a switchboard without removing any wiring, therefore, MELPRO-A has a good maintainability. Moreover, in a case side, it has a shortening of CT circuit, then, possible automatically to prevent from CT circuit opening.



Full Line-up

The line-up of MELPRO-A comply with wide range requirements on the electrical distribution system, therefore, possible to make easy and free application.

- MELPRO-A Series
- Over current Relay
 - Earth fault directional relay
 - Under voltage relay
 - Over voltage relay
 - Earth fault overvoltage relay
 - Earth fault overcurrent relay

■ MELPRO-A Series・Function list

	MOC	MDG	MUV	MOV	MVG	MGR
Digital type	○	○	○	○	○	
Measurement display function	○	○	○	○	○	
System fault record function		○				
Self-diagnosis function	○	○	○	○	○	
Output circuit duplication	○	○	○	○	○	○
Compatibility with the conventional model	○	○	○	○	○	○

“MELPRO-A series” realizes advanced functions

Overcurrent relay [MOC-A1 type]

The four kinds of operation time characteristics are installed so that protection coordination is easy.

The overcurrent relay is requested to realize the coordinated protection characteristics between relays located in the upper stream or down stream.

The “MOC-A1 type” overcurrent relay equips four kinds of operation characteristic and the required one can be selected by setting.

Moreover, by adopting subdivided step of (0.25-20) the time dial, possible to apply the same setting of the conventional overcurrent relay, then, old relay such as the electro mechanical type can be replaced smoothly.

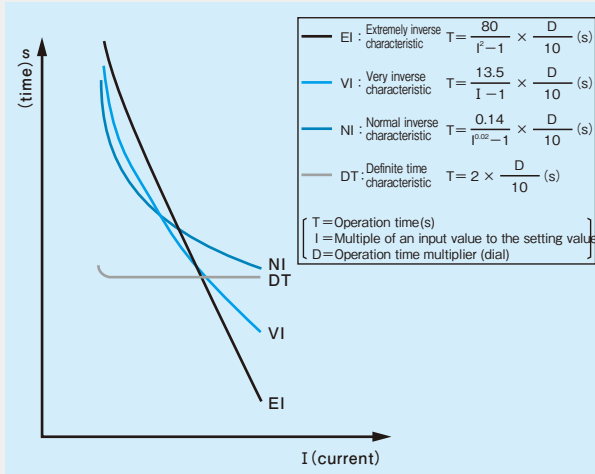


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The optimal operation time characteristic can be chosen along with the characteristic of the overcurrent relay at the sending distribution substation.

Four kinds of operation time characteristics are installed as a time-delayed element. Since the optimal characteristic can be chosen along with the characteristic of the overcurrent relay at the sending distribution substation or the conditions of down stream apparatus, design time can be limited as the minimum.

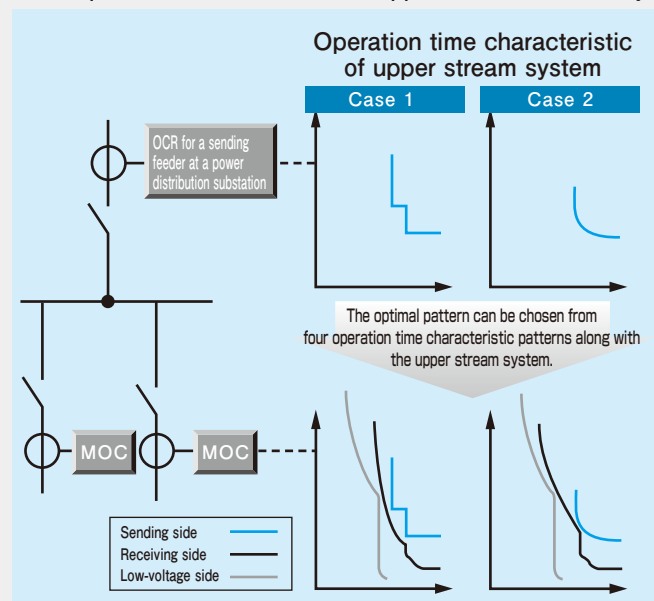
Operation time characteristic pattern



Unwanted operation by excitation inrush current is prevented with the two-step time-delayed characteristic.

Since the instantaneous element of MOC-A1 type relay has the two-step time-delayed characteristic, the unwanted operation prevention against excitation inrush current is easily attained.

Four kinds of operation time characteristics are equipped. The protection coordination with upper stream OCR is easy.



and well coordinated protection by digitization.

Earth fault directional relay [MDG-A1 type]

Possible to detect an earth fault with high sensitivity and to prevent unnecessary operation caused by the earth fault on another feeder.

The countermeasures against unnecessary operation caused by earth fault on the another feeders have been required along with an increasing distribution power system capacity.

Equip with I_o and V_o continuous measurement function and fault recording function.



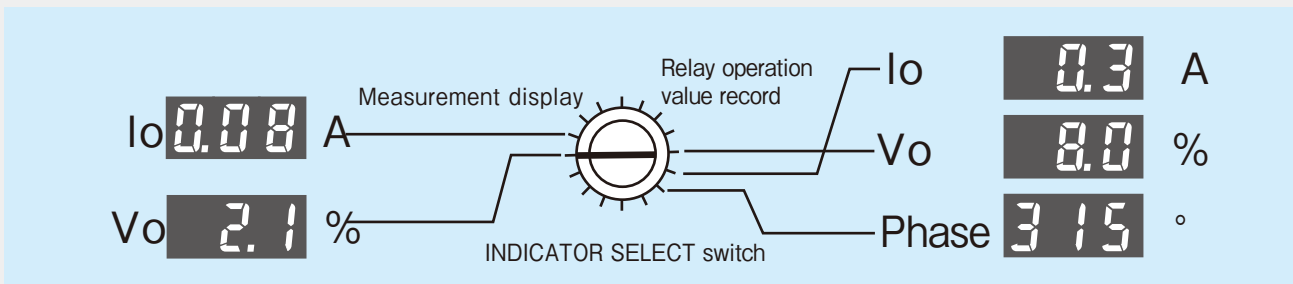
By the substantial measurement display function, a setup of a setting value is easy.

Since the relay itself is always measuring and indicating I_o and V_o of a system, the residual V_o and I_o can be grasped, and the optimal setting is possible.

The data in case of the earth fault is saved by the "System fault record function".

The system input value at the time of the occurrence of the earth fault is measured and saved. Since each value, such as I_o , V_o , and a phase, is indicated on LED by changing a display selection switch, early investigation of the cause of the fault and prompt operation restoration are possible.

Each saved data is displayed by changeover switch.

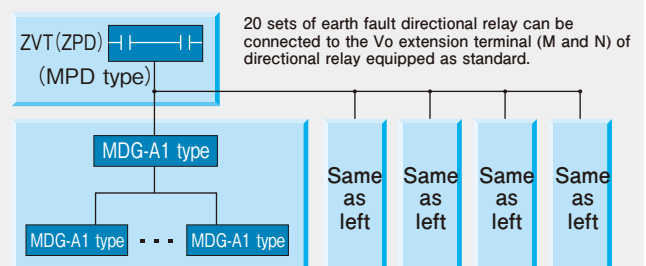


The same relay model can respond to the protection for the electric circuit of all classes.

Extension and change of an installation place are also easy.

Due to adopting variable setting on I_o , V_o and operation time, MDG-A1 type relay can be applicable for any circuit such as incoming feeder and distribution feeder in the high voltage power system. Moreover, flexibility brought by adopting operating condition changeover switch can respond to all high voltage power system protections.

A maximum of 105 earth-fault directional relays are connectable with one set of the zero-phase voltage detector ZVT(ZPD).



Products List of MELPRO-A Series

① Overcurrent Relay (MOC-A1)

	Type	Structure	Description
<p> EI: Extremely inverse characteristic $T = \frac{80}{I - 1} \times \frac{D}{10}$ (s) VI: Very inverse characteristic $T = \frac{13.5}{I - 1} \times \frac{D}{10}$ (s) NI: Normal inverse characteristic $T = \frac{0.14}{I^{1.5} - 1} \times \frac{D}{10}$ (s) DT: Definite time characteristic $T = 2 \times \frac{D}{10}$ (s) </p> <p> T = Operation time (s) I = Multiple of an input value to the setting value D = Operation time multiplier (dial) </p>	MOC-A1	Static (Digital Type)	It is the static type overcurrent relay which contains a two-phases over-current element which fully conforms to JIS C 4602 (1986) standard, and is suitable for protection of a high-voltage power incoming or distribution feeder.

② Earth Fault Directional Relay (MDG-A1/A2)

	Type	Structure	Description
	MDG-A1	Static (Digital Type)	It is the static type relay which fully conforms to JIS C 4609 standard, and is used for the earth fault directional protection of a high-voltage power incoming when the charging current of the protected section is large. This relay is used combining the MPD-2 or MPD-3 type capacitor earthed zero-phase voltage detector and MZT type ZCT.
	MDG-A2		It is the static type relay conforms to JIS C 4609, and is used for the earth fault directional protection of a high-voltage power distribution. This relay is used combining commercial EVT and MZT type ZCT.

③ Earth Fault Overcurrent Relay (MGR-A1)

	Type	Structure	Description
	MGR-A1	Static (Analog Type)	It is the static type relay which fully conforms to JIS C 4601 standard, and is used for earth fault protection. This relay is used combining MZT type ZCT. In addition, since unnecessary operation may occur at the external fault when the charging current of the protected section is large, adoption of the earth fault directional relay is needed.

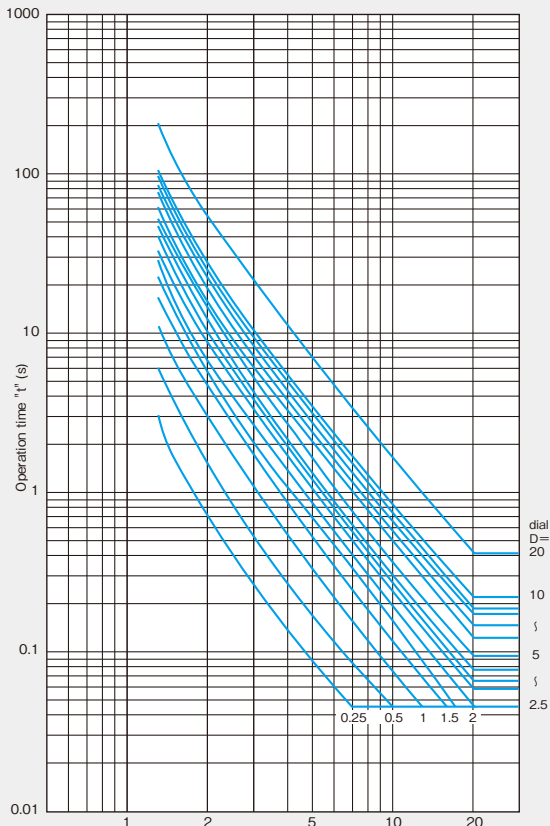
④ Voltage Relay (MUV-A1, MOV-A1, MVG-A1/A2)

	Type	Structure	Description
	MUV-A1	Static (Digital Type)	It is the static type relay conforms to JEC 2511 standard, and is used for undervoltage protection.
	MOV-A1		It is the static type relay conforms to JEC 2511 standard, and is used for overvoltage protection.
	MVG-A1		It is the static type relay conforms to JEC 2511 standard, and is used for earth fault overvoltage protection. This relay is used combining the MPD-2 or MPD-3 type capacitor earthed zero-phase voltage detector.
	MVG-A2		It is the static type relay conforms to JEC 2511 standard, and is used for earth fault overvoltage protection. This relay is used combining commercial EVT.

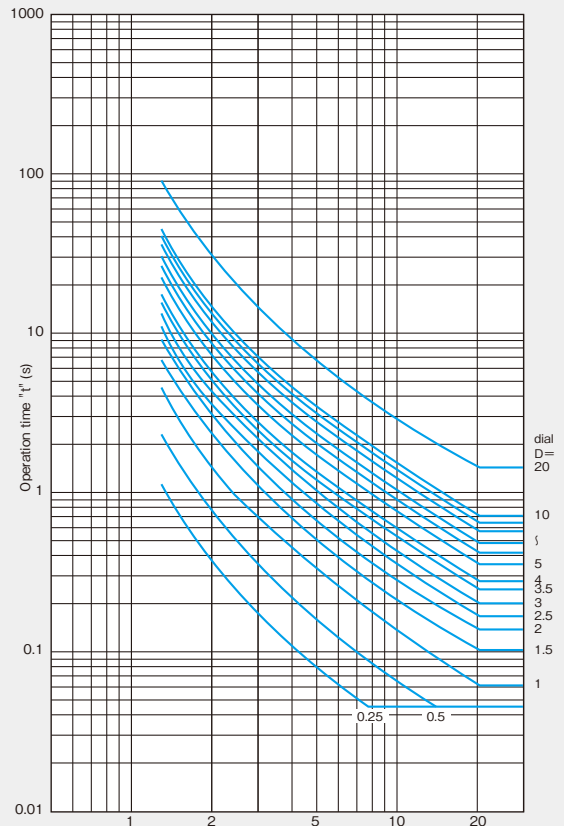
Naming of MELPRO-A Series and Related Products

Type						
MOC	Overcurrent	A1	Series	V	Voltage trip	
MDG	Earth fault directional	A2	Series	VB		
MGR	Earth fault overcurrent	A2 type is available only for MDG and MVG.		T		Current trip
MUV	Undervoltage			T type is available only for MOC and MGR		
MOV	Overvoltage			R	Round body case (small)	
MVG	Earth fault overvoltage			RD	Round body draw-out case (small)	
					F	Flush mounting type
					F type is available only for MGR.	

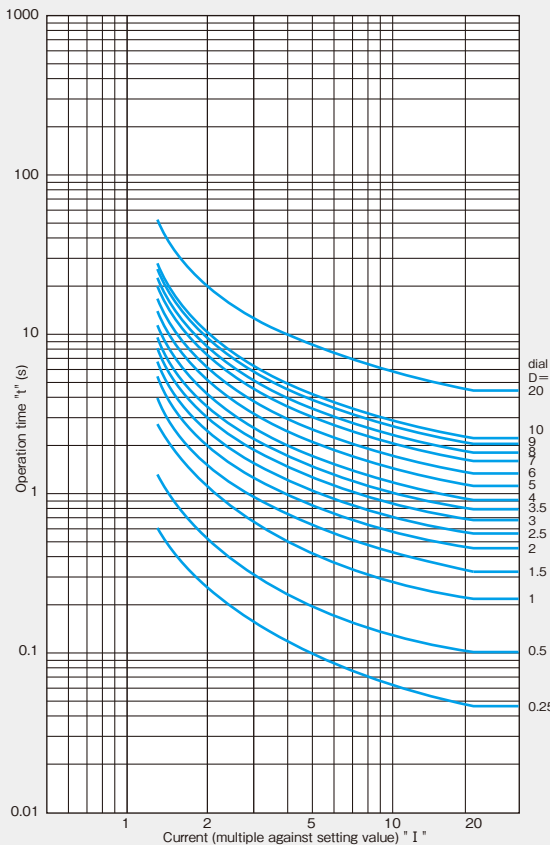
Operation Time Characteristics of Overcurrent Relay



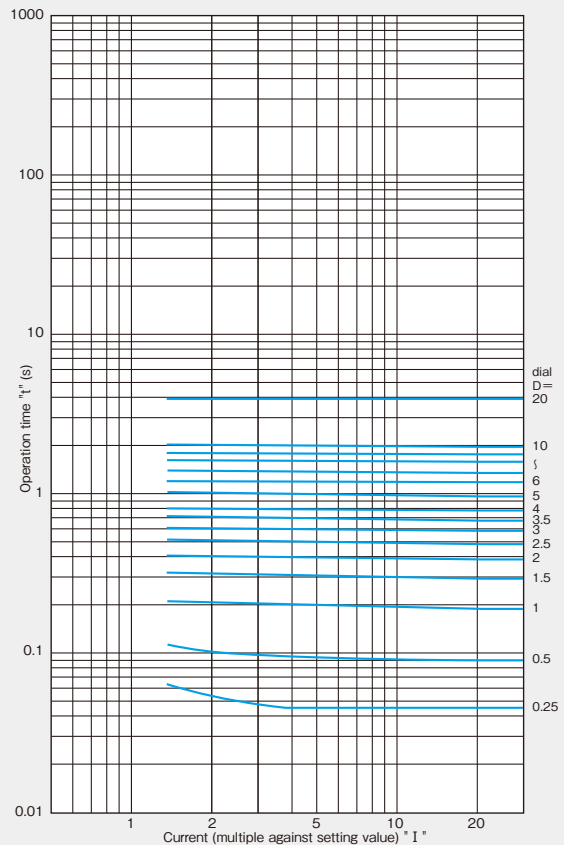
EI : Extremely inverse time-delayed characteristic
 $t = \frac{80}{I^2 - 1} \times \frac{D}{10}$ (s)



VI : Very inverse time-delayed characteristic
 $t = \frac{13.5}{I - 1} \times \frac{D}{10}$ (s)



NI : Normal inverse time-delayed characteristic
 $t = \frac{0.14}{I^{0.02} - 1} \times \frac{D}{10}$ (s)



DT : Definite time-delayed characteristic
 $t = 2 \times \frac{D}{10}$ (s)

Type, rating and specification

Name		Overcurrent Relay	Earth Fault Directional Relay	Earth Fault Overcurrent Relay	Undervoltage Relay	
Type		MOC-A1	MDG-A1	MGR-A1	MUV-A1	
Rating	Frequency	50Hz/60Hz switched	50Hz/60Hz switched	50Hz/60Hz common use	50Hz/60Hz switched	
	CT·VT	5A	—	—	110V	
	ZCT·EVT	—	0.2A·7V	0.2A	—	
Specifications	Setting	<p><u>Time-delayed current operation value</u> LOCK—3—3.5—4—4.5—5—6A</p> <p><u>Dial</u> 0.25—0.5—1—1.5—2—2.5—3—3.5—4—5—6—7—8—9—10—20</p> <p><u>Instantaneous current operation value</u> LOCK—10—15—20—25—30—35—40—50—60A (Operation time is 50ms or less at the time of 200% input of a setting value)</p> <p><u>Operation characteristic</u> Extremely inverse Very inverse Normal inverse Definite time</p>	<p><u>I_o Operation Value</u> 0.1—0.2—0.4—0.6—0.8—1.0A (Primary value of MZT type ZCT)</p> <p><u>V_o Operation Value</u> LOCK—2.5—5—7.5—10% (100%=3810V at 6.6kV power system)</p> <p><u>Operation time</u> INST(50~100ms) —0.2—0.3—0.4—0.5—0.6—0.7—0.8—0.9—1.0s</p> <p><u>Operation condition</u> Characteristic angle lead 10°/45° switched</p>	<p><u>I_o Operation Value</u> 0.1—0.2—0.4—0.6A (Primary value of MZT type ZCT)</p> <p><u>Operation time</u> INST(75ms or less at the time of 400% input of a setting value) —0.2s</p>	<p><u>Operation Value</u> LOCK—60—65—70—75—80—85—90—95—100V</p> <p><u>Operation time</u> 0.1—0.2—0.5—1.0—1.5—2.0—2.5—3.0—4.0—5.0s</p>	
		Protection Elements	·50/51×2	·67G	·51N	·27
		Measurement	·Current	·I _o ·V _o ·Phase	(Not applicable)	·Voltage
LineUp		Voltage trip MOC-A1V-R(RD) Current trip MOC-A1T-R(RD)	MDG-A1V-R(RD)	Voltage trip MGR-A1V-R(RD) MGR-A1V-F MGR-A1VB-F Current trip MGR-A1T-R(RD)	MUV-A1V-R(RD)	
Applications		Used for overload and phase fault protection. [P10 Fig.1]	Used to protect high voltage feeder line of an isolated neutral system. [P11 Fig.2]	Used to protect high voltage feeder line of an isolated neutral system. [P12 Fig.3]	Used to detect abnormal voltage between line. [P13 Fig.4]	
Remarks		Fully conform to JIS C4602	ZCT:Type MZT ZVT:Type MPD-3 Fully conform to JIS C4609	ZCT:Type MZT Fully conform to JIS C4601	Conform to JEC2511	

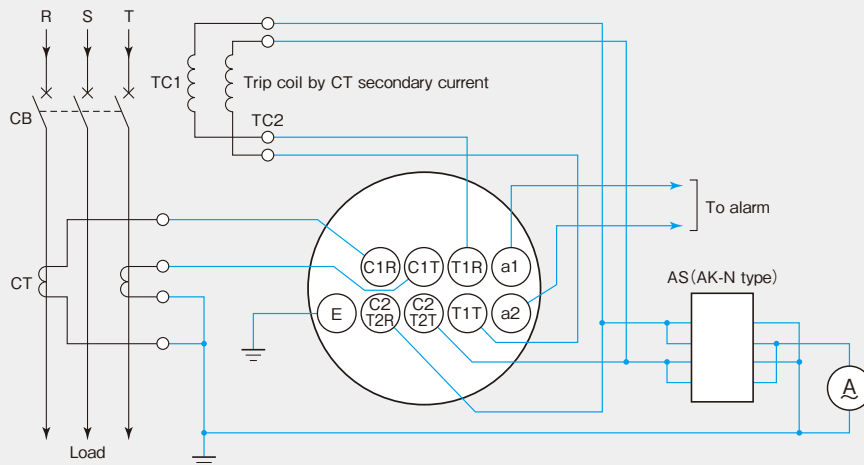
(NOTE) LOCK : Mean to set the element out of use.

Name		Overvoltage Relay	Earth Fault Overvoltage Relay	Earth Fault Directional Relay	Earth Fault Overvoltage Relay	
Type		MOV-A1	MVG-A1	MDG-A2V	MVG-A2	
Rating	Frequency	50Hz/60Hz switched	50Hz/60Hz switched	50Hz/60Hz switched	50Hz/60Hz switched	
	CT·VT	110V	—	—	—	
	ZCT·EVT	—	7V	0.2A·110V/190V	110V/190V	
Specifications	Setting	<u>Operation Value</u> LOCK—115—120— 125—130—135— 140—145—150V <u>Operation time</u> 0.1—0.2—0.5—1.0— 1.5—2.0—2.5—3.0— 4.0—5.0s	<u>Operation Value</u> LOCK—2—4—6—8— 10—12—14—16—18— 20% (100%=3810V at 6.6kV power system) <u>Operation time</u> INST (60ms or less) —0.2—0.5—1.0— 1.5—2.0—2.5—3.0— 4.0—5.0s	<u>Io Operation Value</u> 0.1—0.2—0.4—0.6— 0.8—1.0A (Primary value of MZT type ZCT) <u>Vo Operation Value</u> LOCK—2.5—5—7.5— 10% (100%=110V/190V) <u>Operation time</u> INST (50~100ms) —0.2—0.3—0.4— 0.5—0.6—0.7—0.8— 0.9—1.0s	<u>Operation Value</u> LOCK—2—4—6—8— 10—12—14—16—18— 20% (100%=110V/190V) <u>Operation time</u> INST (60ms or less) —0.2—0.5—1.0— 1.5—2.0—2.5—3.0— 4.0—5.0s	
		Protection Elements	·59	·64	·67G	·64
		Measurement	·Voltage	·Vo	·Io ·Vo ·Phase	·Vo
LineUp		MOV—A1V—R(RD)	MVG—A1V—R(RD)	MDG—A2V—R(RD)	MVG—A2V—R(RD)	
Applications		Used to detect abnormal voltage between line. [P13 Fig.5]	Used to protect high voltage feeder line of an isolated neutral system. [P13 Fig.6]	Used to protect high voltage feeder line of an isolated neutral system. [P14 Fig.7]	Used to protect high voltage feeder line of an isolated neutral system. [P14 Fig.8]	
Remarks		Conform to JEC2511	ZVT : Type MPD—3 Conform to JEC2511	ZCT : Type MZT Conform to JIS C4609	Conform to JEC2511	

(NOTE) LOCK : Mean to set the element out of use.

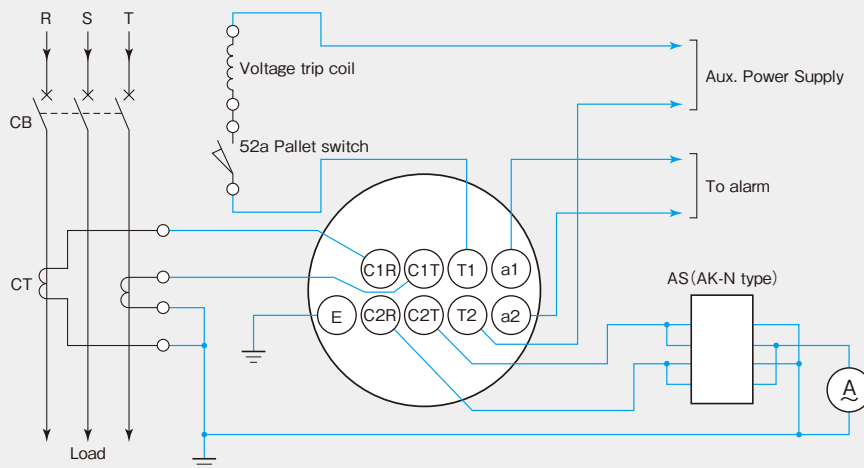
Connection Diagrams

a. CT secondary current trip method (MOC-A1T)



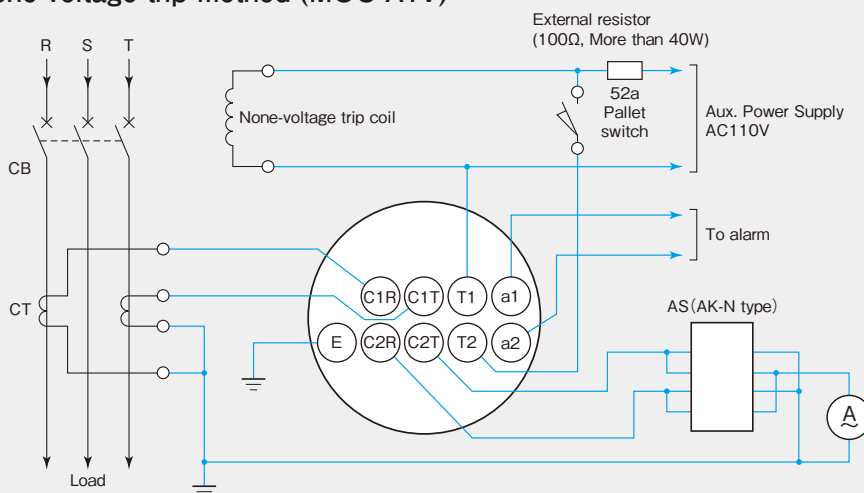
* In normal case, CT secondary current flows as below.
 CT--- Terminal C1R--- Terminal C2T2R--- AS--- CT
 In case of fault detecting, CT secondary current flow is changed as below so that the CB trip coil is energized and CB is tripped.
 CT--- Terminal C1R--- T1R--- TC1--- AS--- CT
 Regarding phase T, please replace terminal number suffix from R to T.

b. Voltage trip method (MOC-A1V)



* In case of fault detecting, contact between terminal T1 and T2 is closed, then trip coil is energized and CB is tripped.

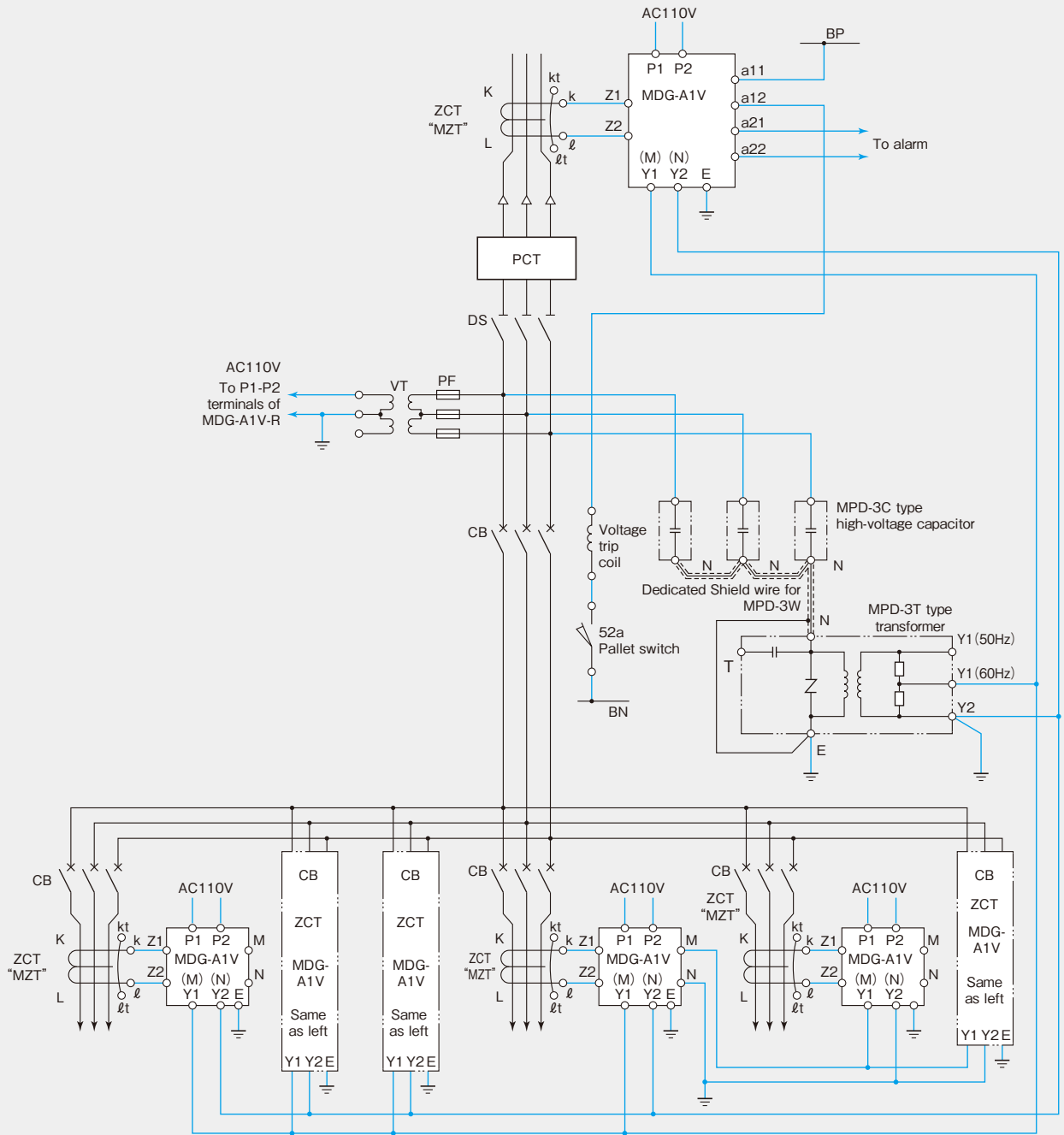
c. None-voltage trip method (MOC-A1V)



* In case of fault detecting, contact between terminal T1 and T2 is closed, then trip coil is de-energized and CB is tripped.

- * Connect the line shown as .
- * Please be sure to earth CT secondary neutral and case earth (E terminal).
- * Please connect the secondary output polarity of each phase CT and relay terminals as shown in the figures.

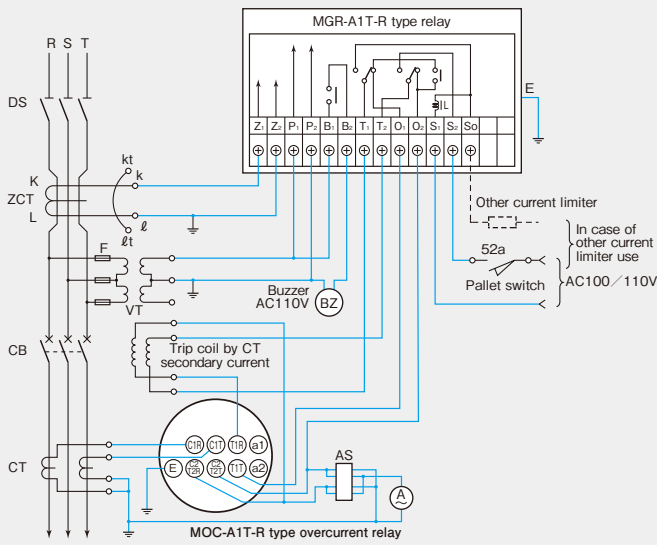
Figure 1 MOC-A1



- Note 1) The wire for the connection from ZCT and ZVT to the relay and the connection between Vo extension terminals (from M-N to Y1-Y2) should be used 2-core shield wire of 0.75-1 mm².
 In addition, please keep a burden less than 5 ohms in both ways. (About 100m of one way in the case of 0.75mm²)
- Note 2) When there is much connection of relay number to ZVT, please perform Vo supply to each feeder from Vo extension terminal (M, N) of an MDG-A1V type relay. (A maximum of 20-set connection is possible.)
 In addition, MPD-2 type can connect to ten sets and MPD-3 type to five sets.
 However, since the abnormality in self-diagnosis will occur if it connects more than the number of regulation, please do not connect more than the number of regulation by any means.
- Note 3) Please supply Vo to the MDG-A1V type relay which supplies Vo for extension directly from MPD type ZVT.
- Note 4) Illustration of CB tripping circuit and an alarm circuit of the MDG-A1V type relay for feeder protection is omitted. The same circuit as the power incoming circuit is applicable for feeder protection.
- Note 5) A voltage tripping scheme is shown in the above figure. In case of CT secondary current tripping scheme, type MGX-1 auxiliary box is needed.
- Note 6) In MDG-A1V-RD type, since between Z2-Y2 becomes open at the time the relay drawn out, please connect between Z2-Y2 terminals with 2 mm² electric wire externally.
- Note 7) Please do not earth the terminal ℓ of MZT type ZCT.
- Note 8) Connect the line shown as — .

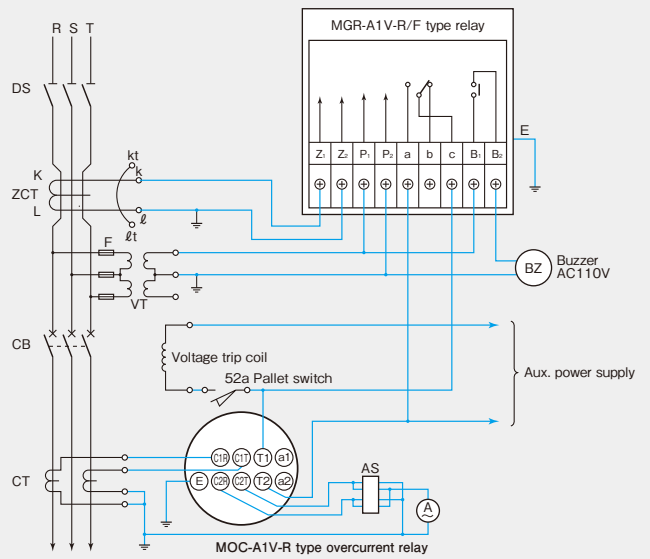
Figure 2 MDG-A1

a. Current trip method



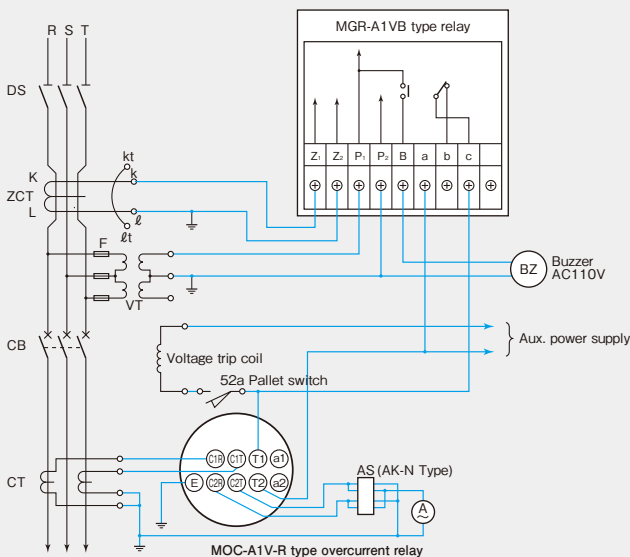
1. Connect the line shown as —.
2. Please decide the specification of current limiter along with the trip coil rating of CB.
3. If the built-in reactor is used by using S1 terminal, wiring (....) of So terminal is unnecessary.
4. The case where an MOC-A1T-R type overcurrent relay is used together is shown.
5. Please do not short-circuit kt and It terminal of zero-phase current transformer.
6. When taking the auxiliary power supply of S1-S2 from the load side of CB, the pallet switch of the CB is unnecessary.

b. Voltage trip method(1)



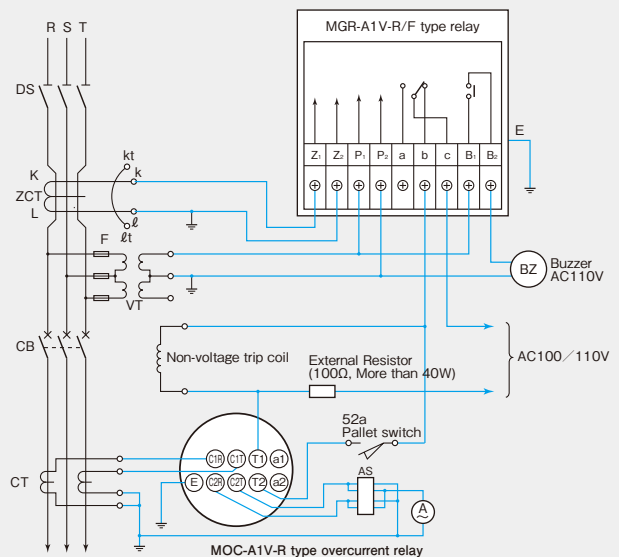
1. Connect the line shown as —.
2. The case where an MOC-A1V-R type overcurrent relay is used together is shown.
3. Please do not short-circuit kt and It terminal of zero-phase current transformer.
4. There is no E terminal in MGR-A1V-F relay.

c. Voltage trip method(2)



1. Connect the line shown as —.
2. The case where an MOC-A1V-R type overcurrent relay is used together is shown.
3. Please do not short-circuit kt and It terminal of zero-phase current transformer.

d. Non-voltage trip method

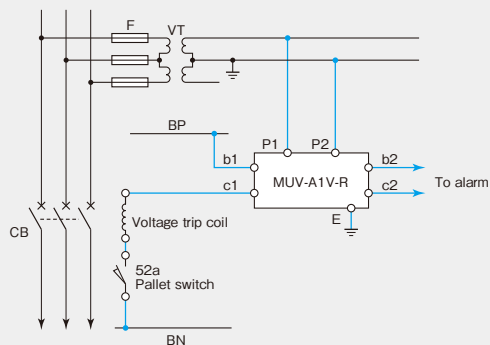


1. Connect the line shown as —.
2. The case where an MOC-A1V-R type overcurrent relay is used together is shown.
3. Please do not short-circuit kt and It terminal of zero-phase current transformer.
4. There is no E terminal in MGR-A1V-F relay.

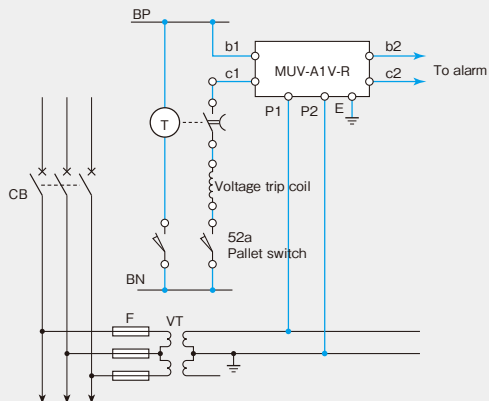
Figure 3 MGR-A1

a. Voltage trip method

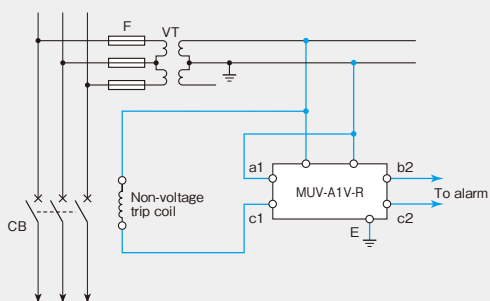
a-1 In case of input from source side VT



a-2 In case of input from load side VT



b. Non-voltage trip method

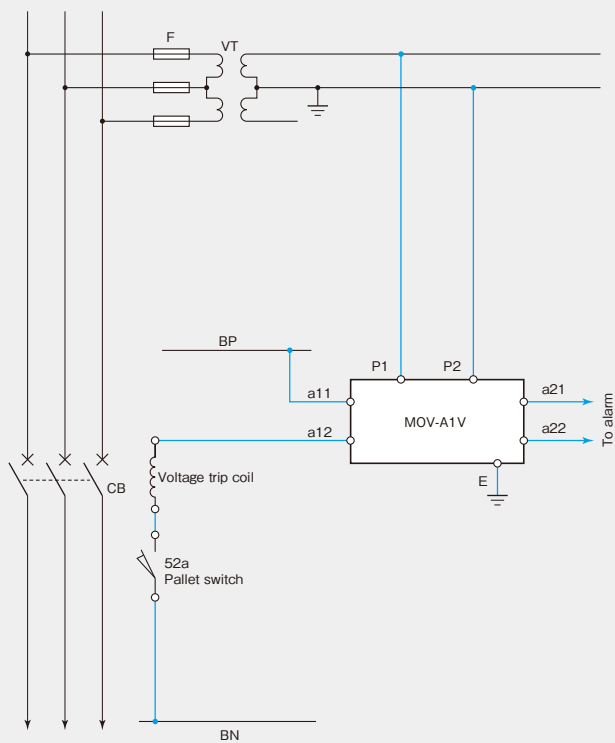


*Connect the line shown as — .

Note) When voltage is restored by CB re-close, please prepare a timer circuit as countermeasure for incorrect operation caused by the delay of relay reset as shown in the above figure. (about 2~3s timer is recommended.)

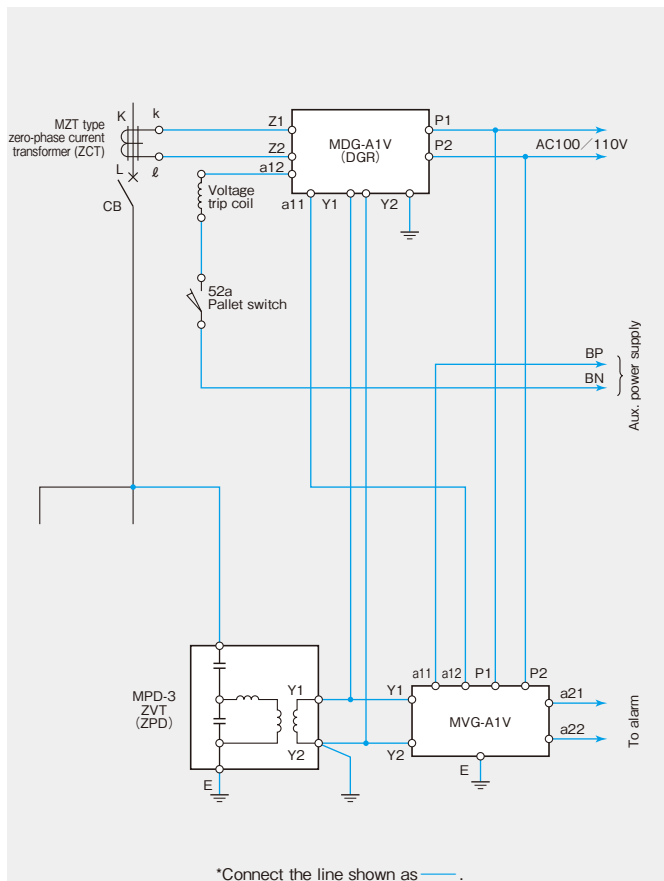
Figure 4 MUV-A1

In case of input from source side VT



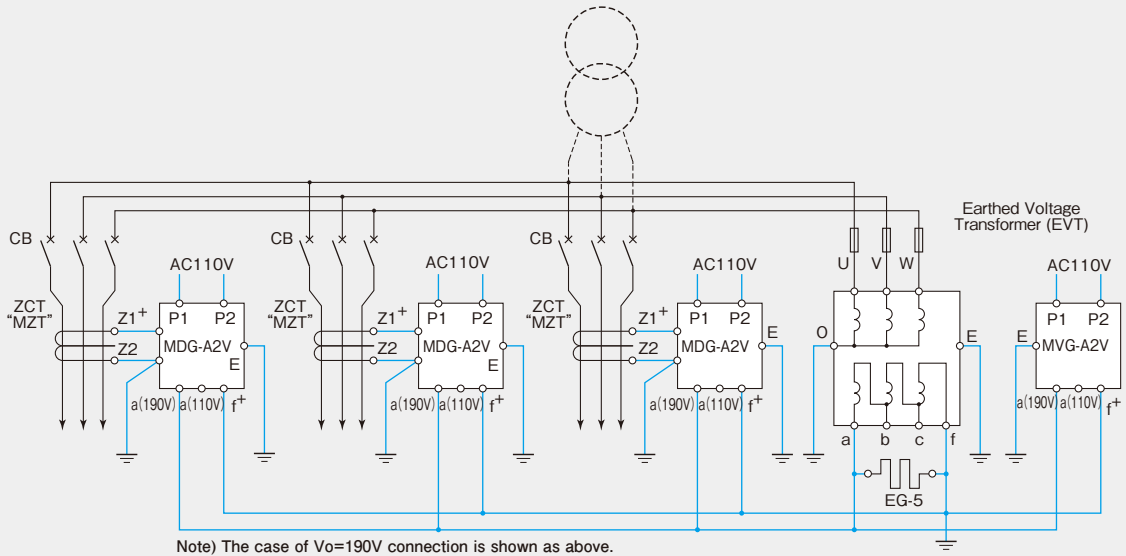
*Connect the line shown as — .

Figure 5 MOV-A1



*Connect the line shown as — .

Figure 6 MVG-A1

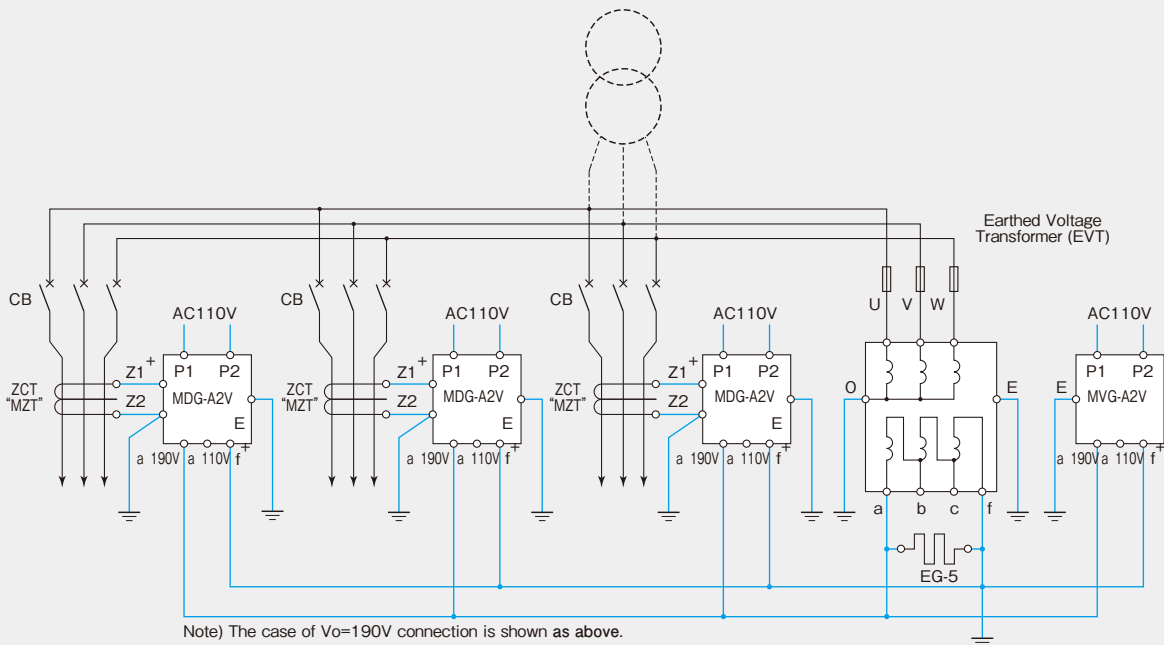


The setting value of EG-5 type current limiting resistor

		System voltage	
		6.6kV	3.3kV
V_o rating	Style number of EG-5		
190V	191PHA	25Ω	50Ω
110V	192PHA	8Ω	16Ω

*Connect the line shown as —.

Figure 7 MDG-A2



The setting value of EG-5 type current limiting resistor

		System voltage	
		6.6kV	3.3kV
V_o rating	Style number of EG-5		
190V	191PHA	25Ω	50Ω
110V	192PHA	8Ω	16Ω

*Connect the line shown as —.

Figure 8 MVG-A2

Mounting and Dimensions

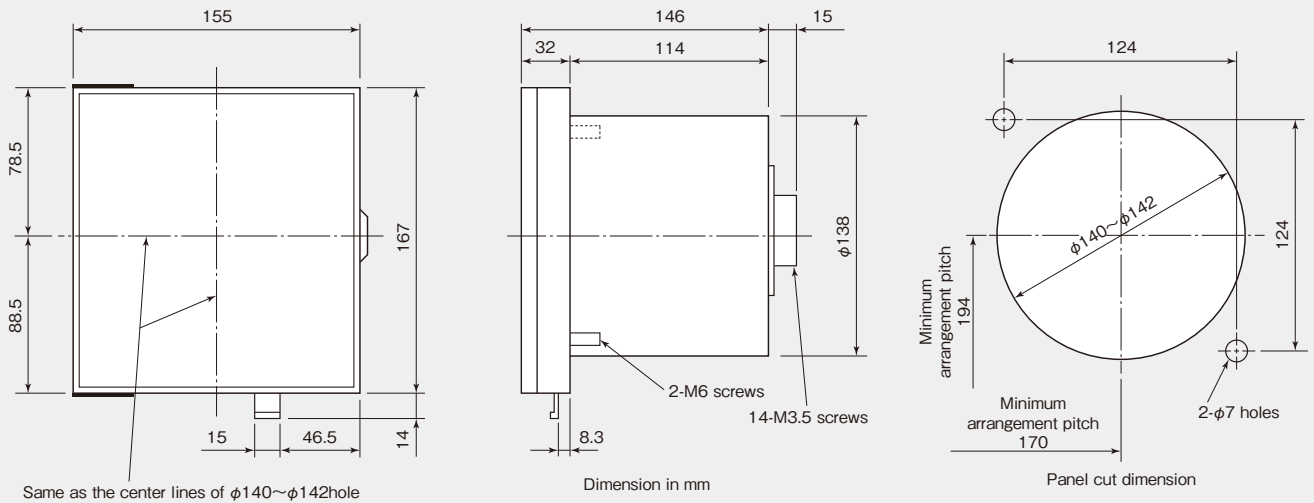


Fig9-1 MOC, MGR, MDG, MUV, MOV, MVG-□-R type

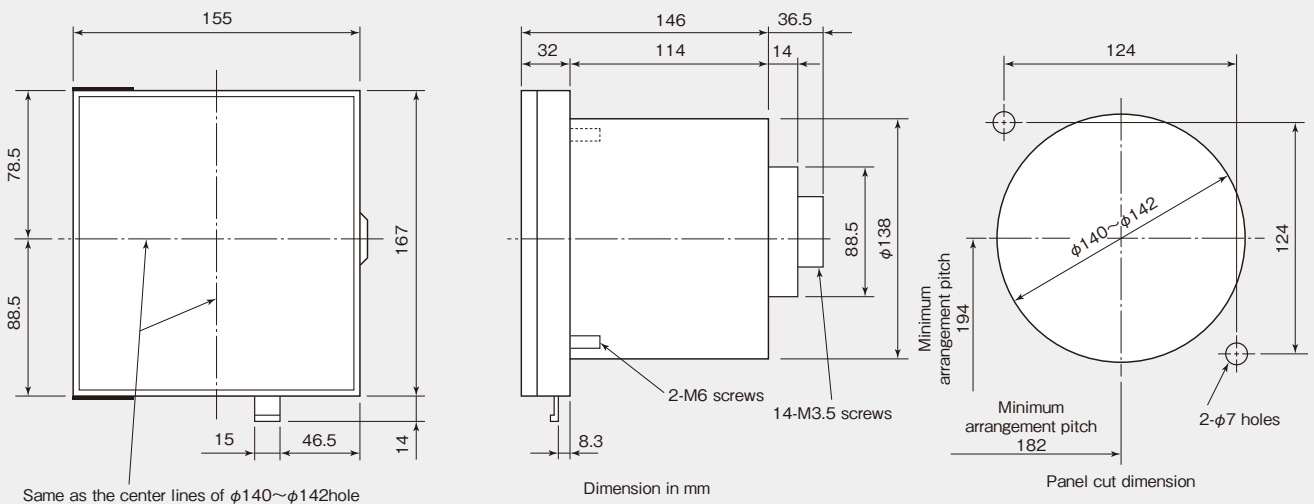


Fig9-2 MOC, MGR, MDG, MUV, MOV, MVG-□-RD type

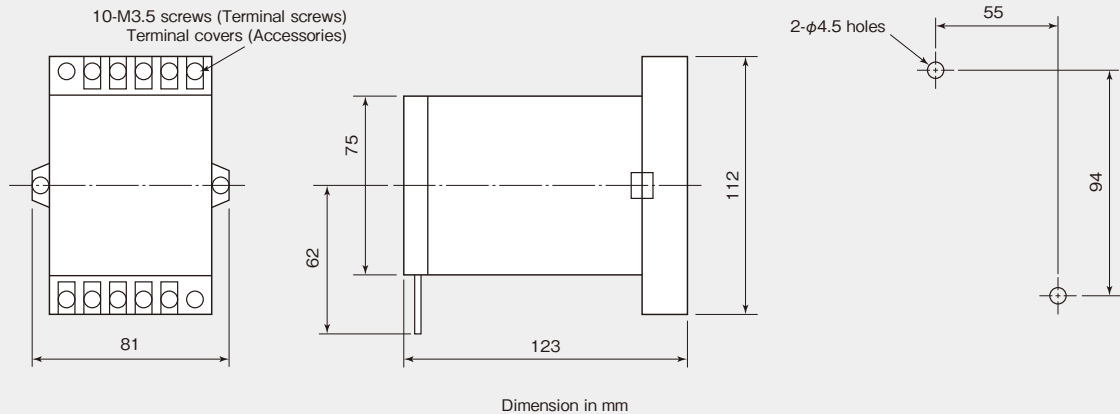
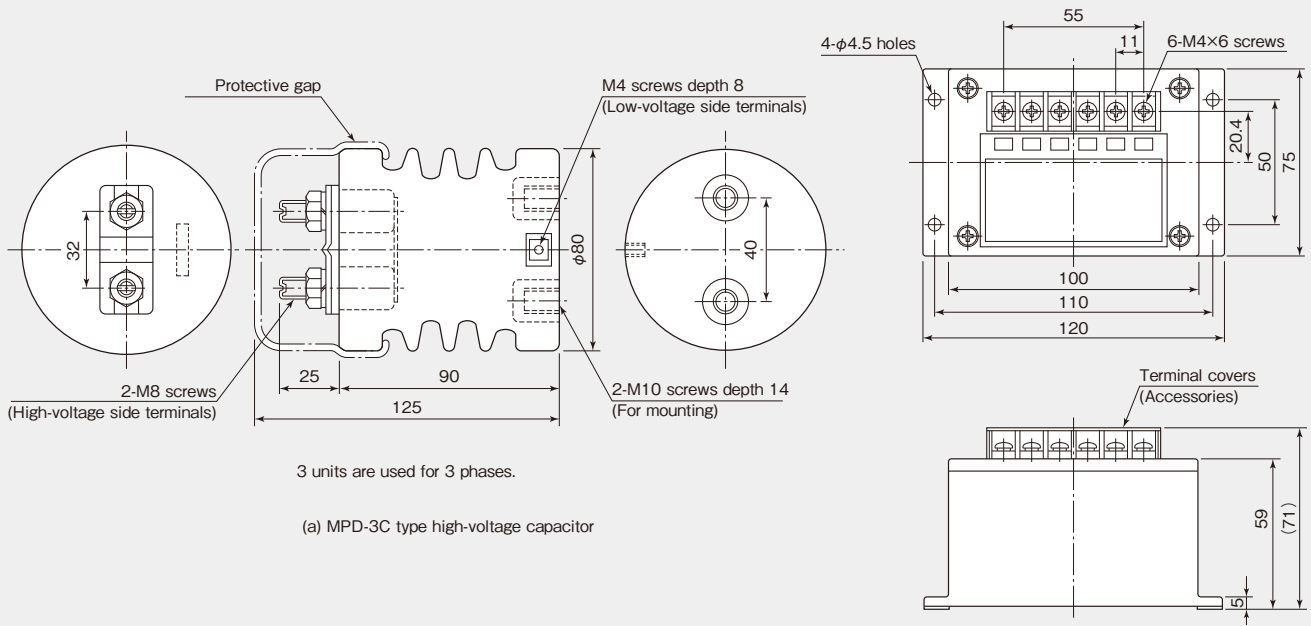


Fig9-3 MGR-A1V-F, MGR-A1VB-F type

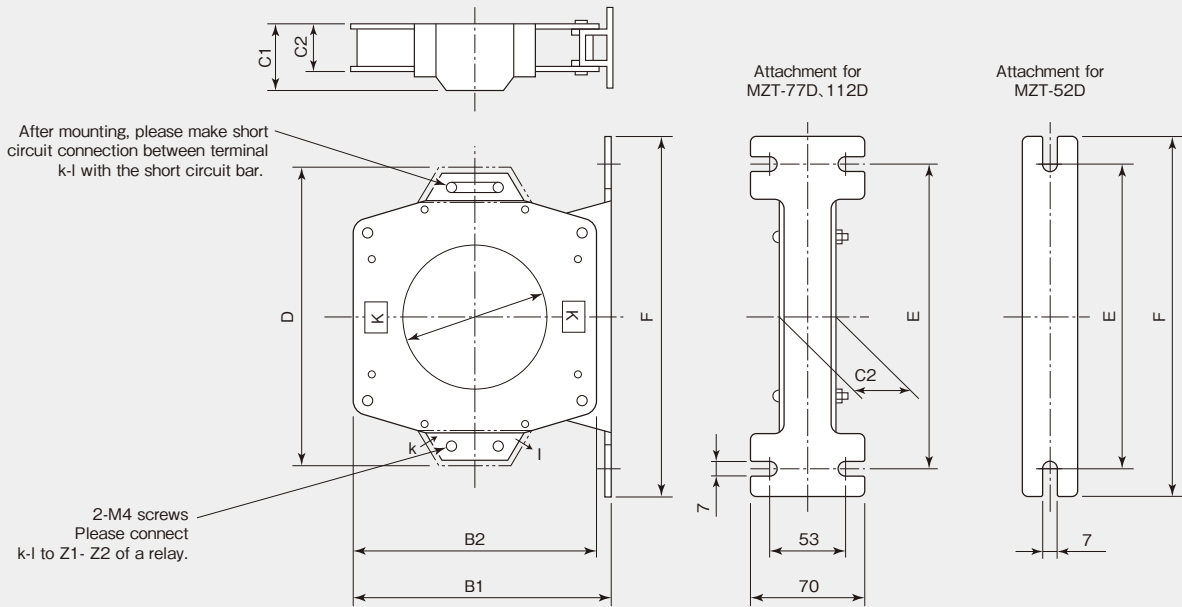


3 units are used for 3 phases.

(a) MPD-3C type high-voltage capacitor

(b) MPD-3T type transformer box

Fig9-4 MPD-3 type



* M6 screw should be used for attachment.

Dimensions

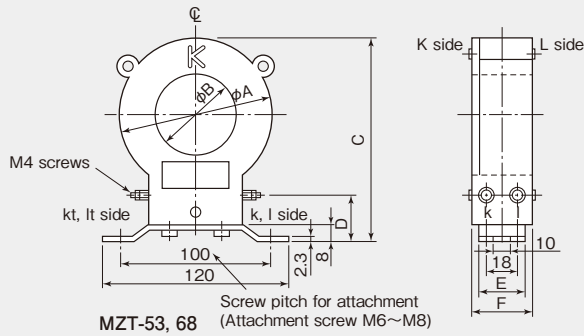
(mm)

Type	Window diameter	Outer dimensions		Thickness		Outer dimensions	Attachment pitch	Outer dimension of attachment
	A	B1	B2	C1	C2	D	E	F
MZT-52D	52	140.5	123	55	36.4	159	170	200
MZT-77D	77	157	146	58.5	40	185	195	230
MZT-112D	112	200	186	61	43	229	225	260

Fig9-5(a) MZT type ZCT (Split-core type)

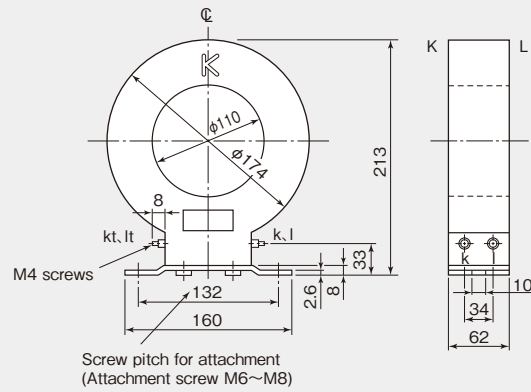
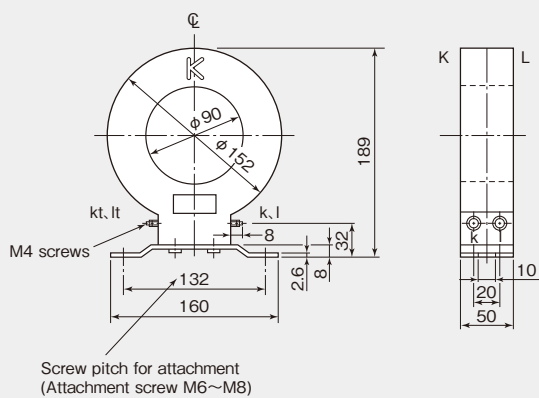
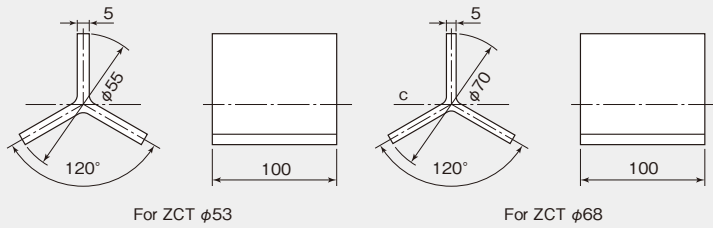
Dimensions (mm)

Type	A	B	C	D	E	F
MZT-53	100	53	130	28	30	38
MZT-68	124	68	158	29	40	40



Specification of spacer (for primary conductor partition)

Inner diameter of ZCT	Primary current rating	Remarks
φ 53mm	200A	Applicable for a cable with outer diameter of cable single core less than 18mm.
φ 68mm	400A	Applicable for a cable with outer diameter of cable single core less than 26mm.



In addition, please note that the spacer is available for MZT-53 and MZT-68 only.

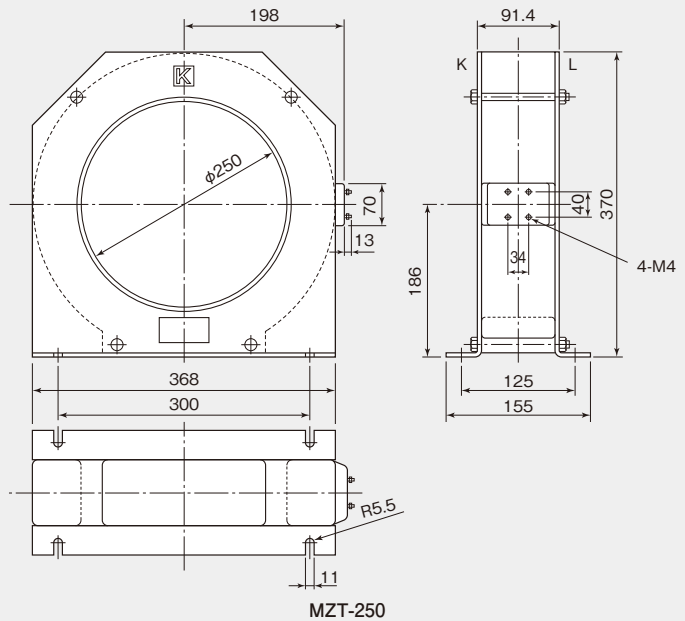
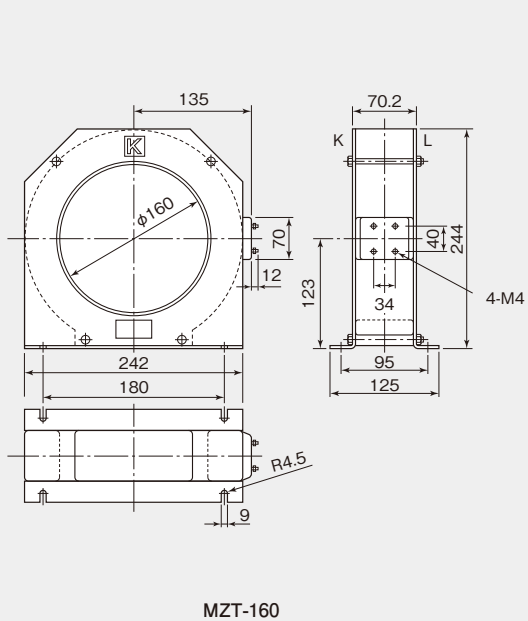
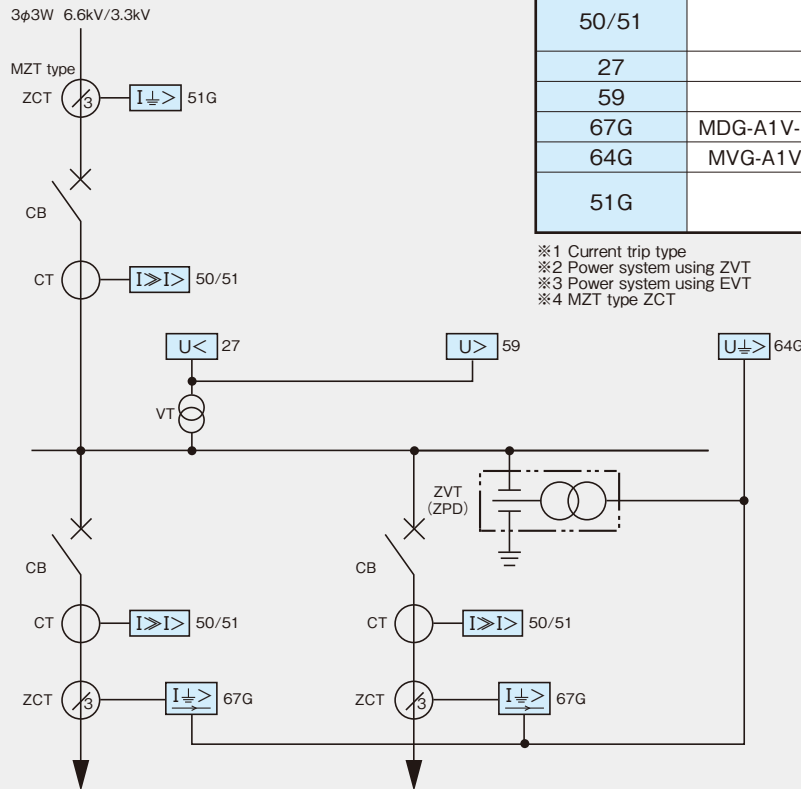


Fig9-5(b) MZT type ZCT (Through type)

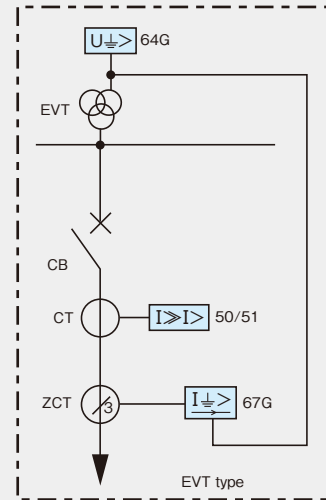
Applications

Applications(Example)



Device No.	MELPRO™-A
50/51	MOC-A1V-R/RD MOC-A1T-R/RD ※1
27	MUV-A1V-R/RD
59	MOV-A1V-R/RD
67G	MDG-A1V-R/RD ※2,4 MDG-A2V-R/RD ※3,4
64G	MVG-A1V-R/RD ※2 MVG-A2V-R/RD ※3
51G	MGR-A1V-R/RD ※4 MGR-A1T-R/RD ※1,4

※1 Current trip type
 ※2 Power system using ZVT
 ※3 Power system using EVT
 ※4 MZT type ZCT



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 un-observe safety information, incorrect use, or improper use may endanger personnel and equipment and cause personnel injury or physical damage.

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 as 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
Brass	M4	0.961N·m (9.8kgf·cm)	0.824~1.11N·m (8.4~11.3kgf·cm)	Type MZT Secondary terminal(k, ℓ)

- (3) Grounding should be 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 $\pm 5\%$ 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 operation 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°C \pm 10°C -Relative humidity: Less than 90% -Magnetic field: Less than 80A/m -Atmospheric pressure: 86~106 $\times 10^3$ 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= $100\% \times$ (max-min)/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 MITSUBISHI 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.

Request when placing order

Thank you very much for your usual selecting the MITSUBISHI ELECTRIC CORPORATION products.

When ordering our products described in this catalogue, please read and agree the followings before ordering as long as any special condition are not nominated in the offer document, contract document, catalogue other than this.

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 defect 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, such as medical system for life-sustaining, in nuclear power plants, power plants, aerospace, and transportation devices (automobile, train, ship, etc) shall be excluded. 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.
- (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, are 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 is terminated. (However, please consider the replacement for the products being in operation during 15 years from ex-work.)
- (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.

Digital Protection Relay

MELPRO[™]-A Series



CAUTION

TO PREVENT IT FROM THE RISK OF DAMAGE AND MAL FUNCTION,
BE SURE TO READ OPERATING AND MAINTENANCE (SERVICING)
INSTRUCTIONS BEFORE USING.

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TOKYO, 100-8310, JAPAN

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