Korea Patent Registration No. 10-2270144 (20-06-2021)

IOP ®

kepco TRUSTED PARTNER

Inconvenience Operation Preventive

IOP Earth Leakage Circuit Breaker

For a safe electric world!

For the protection of precious property, lives!

To increase productivity!

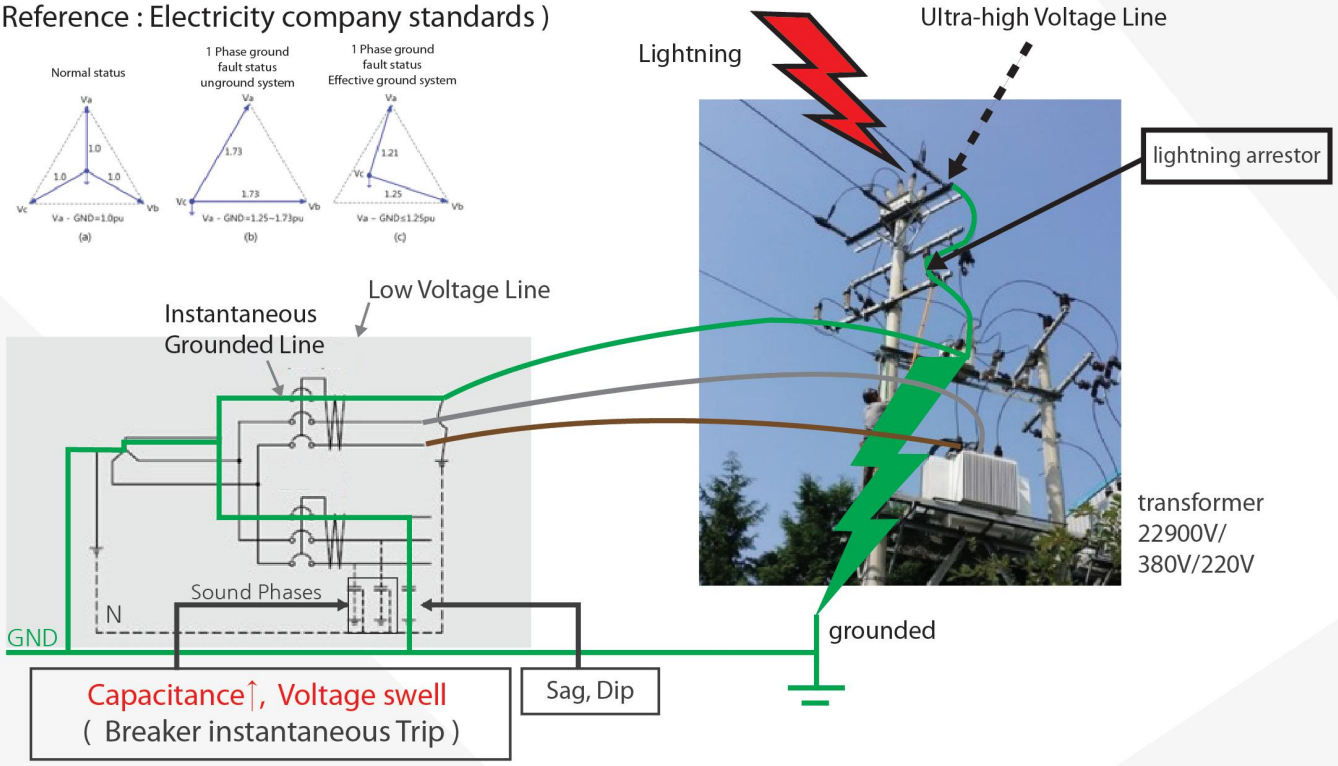
JSI

Jaeshininfomation Co.,Ltd

:: Problems of Single-Phase Earth Leakage Cirait Breaker (ELCB, RCD)

In the event of a lightning or grounding accident, an instantaneous voltage drop occurs in the accidential phase. The capacitance of the components in the other two healthy phases is due to the instantaneous voltage rise and the capacitance rise between phase line and ground too, and then the leakage current is raised instantaneously, and circuit breakers installed on a sound lines are momentarily tripped. The phenomenon is occurring, and this unnecessary operation has been misunderstood for surge voltage.

(Reference : Electricity company standards)



:: An Analysis Model of Unnecessary Operation of Single-Phase ELCB

In the event of a lightning strike on the power distribution line, a phase 1 grounding occurs through an arrestor.

① In the ELCB installed on the sound phase, the Capacitance and Voltage between the ground and line, increase 1.73 times or more.
② Capacitive leakage current (IGC) rising (Application formula : $IGC = 2 \times \pi \times f \times C \times V$)
③ Normal type ELCB will be instantaneously tripped by this formula.
④ In this case, most of the instantaneous leakage current event time is generated within the system protection time of 100 msec.
⑤ This condition is called unnecessary operation and an IOP ELCB of time delay type which delays operation time is required to prevent this case.

What is IOP ELCB?

01 :: What is the single phase IOP ELCB?

Most of the general ELCBs are instantaneous trip instantaneously but the IOP ELCBs are unnecessary operation prevention which becomes a delayed operation type trip (Inconvenience Operating Prevent), means single phase high sensitivity ELCBs.

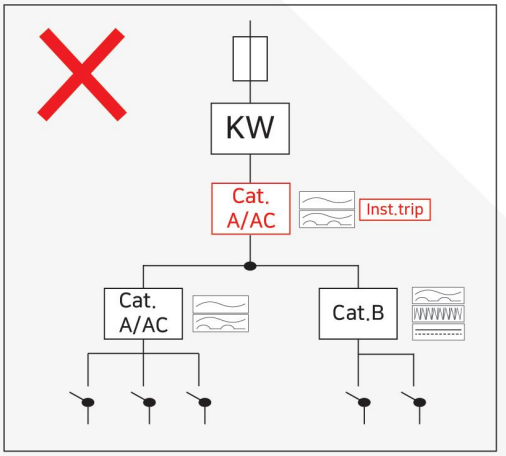
02 :: Specification of single-phase IOP ELCB

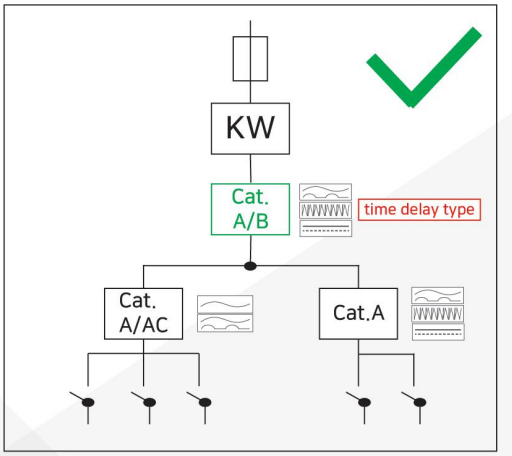
Specification	IOP-32	IOP-52
Operation Std	IEC60947-2 Category A (Delay 4c operation)	
Number of pole & Number elements	2P 2E	
Rated current(A)	15,20,30	15,20,30,40,50
Rated Voltage(V)	220 ~ 240	
Protective function	Over load and short-circuit protection	
Frequency (Hz)	50 / 60Hz	
Rated sensitive Leakage current	30mA(High Sensitivity) / 50mA, 100mA(Medium Sensitivity)	
Non-operating Leakage Current	15mA(High Sensitivity)) / 25mA,50mA(Medium Sensitivity)	
Trip Time	within 0.1 second	
Rated inpulse withstand Voltage(Uimp) (KV)	4	4
Rated Cut-off Current	2.5KA	5kA

03 :: Comparison of operating characteristics with general earth leakage breaker

Items	IOP ELCB	General ELCB
Operation Std	IEC60947-2	IEC60947-2
	Category A	Category A
Trip Type	Time delay: 4c	Instantaneous trip
Trip Time	within 0.1 sec	0.03 sec / within 0.1 sec
Protection Cooperation	Possible	Impossible
Installation Position	Upper side	Bottom side

04 :: Installation Method for Category A and B Leakage Breakers for Protection Cooperation





Installation Instructions

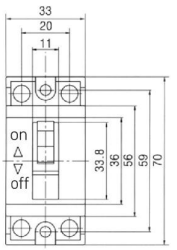
- General ELCBs shall be installed at the bottom, and time delay type ELCBs may be installed freely at the top or bottom.
- If time delay type ELCB must be installed at the top and generl type (instantaneous trip) ELCB is combined at the bottom, protection cooperation is possible. If an instantaneous leakage current occurs at the bottom, only the bottom general type ELCB is tripped, and the top time delay type ELCB should not trip at the same time.

01 IOP-32

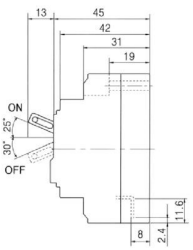
Breaker Technical Specification

-Std : IEC60947-2, KS C 4613 (Industrial)
-Rated Voltage : AC200~240V, 50/60Hz
-Rated Load Current : 15, 20A, 30A
-Rated Sensitivity Current : 30mA
-Rated Non-trip Current : 15mA
-Operating time : within 0.1sec (Dealy time : 4c)
-Over-current trip method : fully electronic
-Rated Impulse Voltage(Uimp):4kV
-Rated cut-off current(Icu) : 220V, 2.5kA
-Rated Service cut-off Capacity(Ics) : 100%Icu

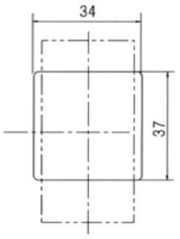
Front View



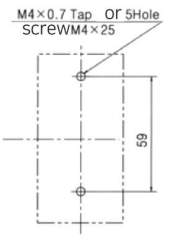
Side View



Panel Cover Cutout Dimensions



Panel Installation Dimensions

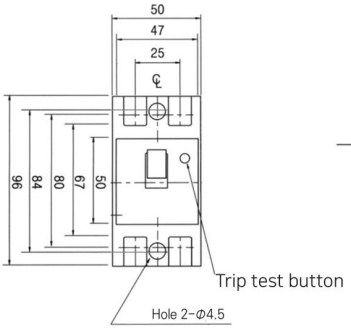


02 IOP-52

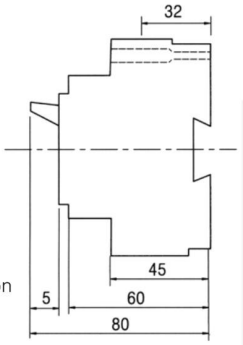
Breaker Technical Specification

-Std : IEC60947-2, KS C 4613 (Industrial)
-Rated Voltage : AC200 ~240V, 50/60Hz
-Rated Load Current : 15, 20A, 30A, 40A, 50A
-Rated Sensitivity Current : 30mA
-Rated Non-trip Current : 15mA
-Operating time : within 0.1sec (Dealy time : 4c)
-Over-current trip method : fully electronic
-Rated Impulse Voltage(Uimp):4kV
-Rated cut-off current(Icu) : 220V, 5kA
-Rated Service cut-off Capacity(Ics) : 50%Icu

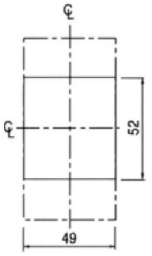
Front View



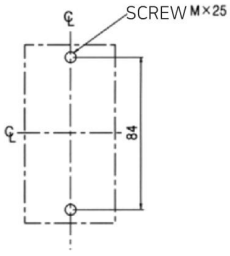
Side View



Panel Cover Cutout Dimensions



Panel Installation Dimensions



Preventable Fire Accidents

If a three-phase ELCB had been installed in the cooling tower power line.

3-Phase ELCB IOP

Problems of 3-Phase General ELCB (instantaneous trip) Type

- Industrial three-phase ELCBs are sometimes tripped, so they avoid using them, and installing MCCB instead of ELCB, they install and operate them as leakage alarms on the upper switchboard, making it difficult to prevent fire.
- If it is applied to the refrigerator and freezer and occasionally tripped, the compressor motor overheats and fires occur due to ELCBs while using MCCBs due to concerns over damage to the food in refrigerator.
- When installing and operating general type ELCB, it has a problem of unnecessary operation due to the occurrence of instantaneous leakage current when operating (M/C)magnet contactor at the load side. Most ELCBs use instantaneous trip type which inevitably leads to unnecessary operation.
- Fires frequently occur due to overheating of the three-phase air cooler motor. (when installing a MCCB)
- Due to the instantaneous trip operation, it is not suitable to use as general ELCBs for motor protection, so it is being replaced with MCCBs.

Inconvenience Operating Prevent (IOP) 3-phase ELCB(Earth Leakage Circuit Breaker)?

- What is a three-phase medium-sensitive IOP (Inconvenience Operating Prevent) ELCB?

It refers to a three-phase medium-sensitivity ELCB of a trip operation delay time type that is not unnecessarily tripped by an increase in the instantaneous leakage current.

Korea Patented Technology and Operational Characteristics

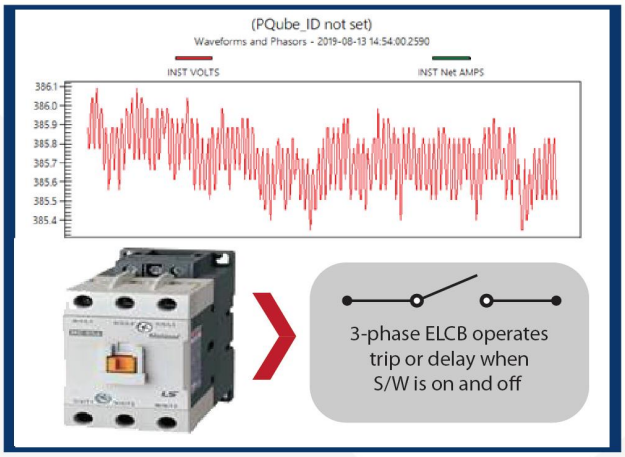
- The present three-phase short circuit breaker is a medium-sensitivity ELCB that trips with a leakage current of 100mA to 1,000mA within 0.1sec. This patent application product designs a trip delay type three-phase ELCB by applying a time sequential comparison algorithm when an instantaneous leakage current occurs.

- If a leakage current exceeding 0.1 second occurs, it can be recognized as a short circuit and trip normally to prevent electrical leakage fire, so that the production equipment can install and operate ELCB sufficiently.

- Korea Patent Registration No. 10-2270144 (22. 06, 2021)

OK!

IOP 3 Phase ELCB will operate with time delay (4c)



NO!

Normal 3 Phase ELCB instantaneously tripped

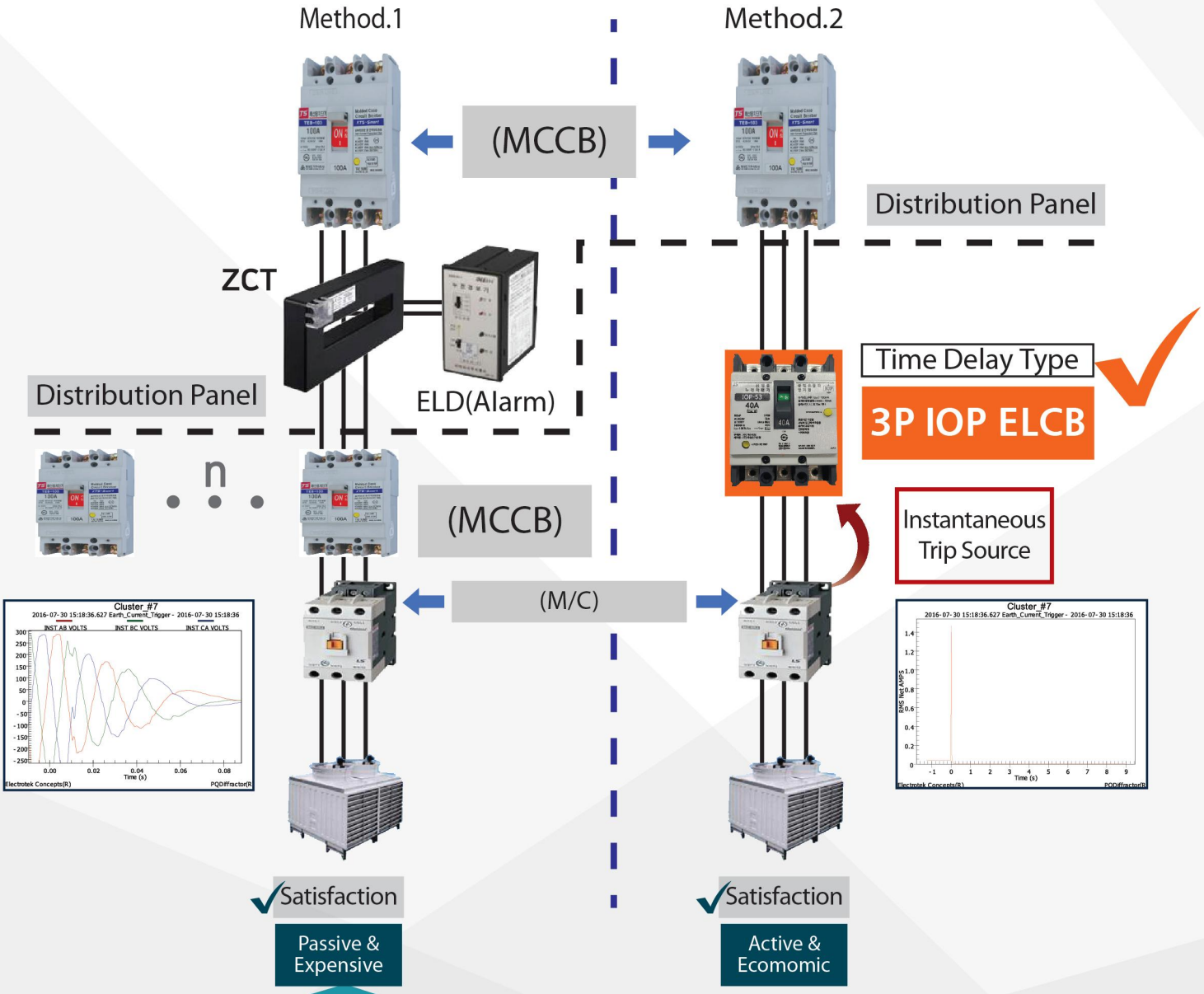
IOP ELCBs Installation Advantages

- Protection cooperation operation is possible.
- Prevention of leakage fire for industrial production equipments.
- Support for normal operation of industhial production equipments.

Application Fields

- Motor protection 3-phase ELCBs
- 3-phase ELCB for semiconductor and display equipments
- 3-phase ELCB inside factory production equipments
- Large refrigerator, freezer, air conditioner motor
- For compression compressors
- Electric vehicle chargers
- 3 phase inverter fountain pumps
- For elevators and escalators
- Injection machines
- For fans of 3-phase air conditioner outdoor unit

How to Install and Operate



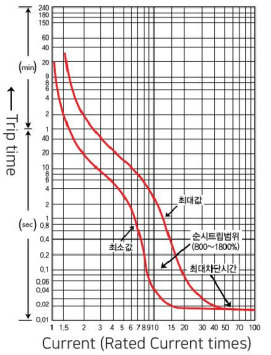
Breaker Technical Specification

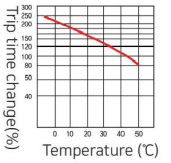
Operating Characteristics Curve and Appearance Dimensions

- Operational configuration and power : 3P3W, 400V~460V, 50/60Hz
- Rated sensitivity current : 100mA
- Rated non-trip current : 50mA
- Rated cut-off current : 460V, 5kA
- Trip time : within 0.1 sec (Delay time : 4c)
- Rated load current : 15A, 20A, 30A, 40A, 50A
- Over-current trip method : fully electronic

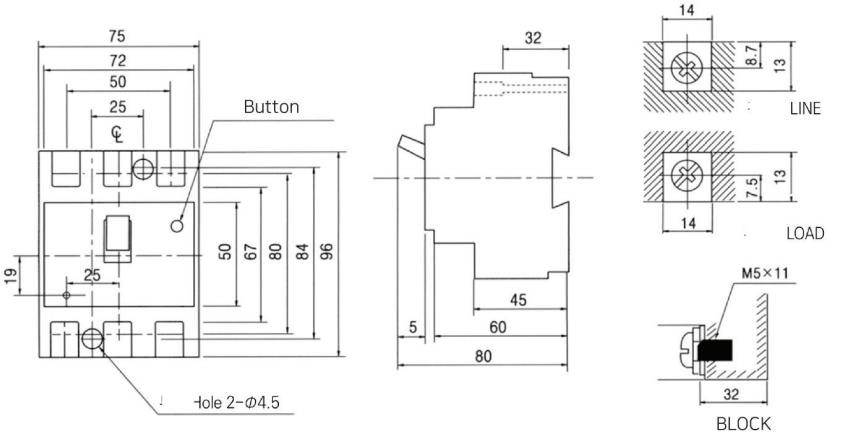
IOP-53

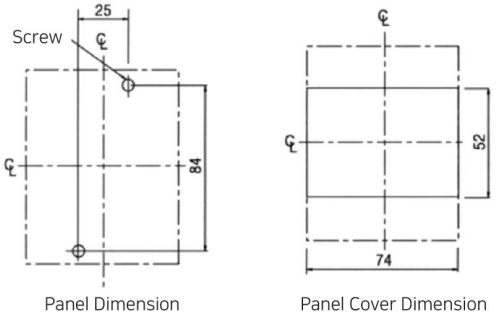
▣ Operation Characteristic Curve/
Temperature Compensation Curve





Dimensions





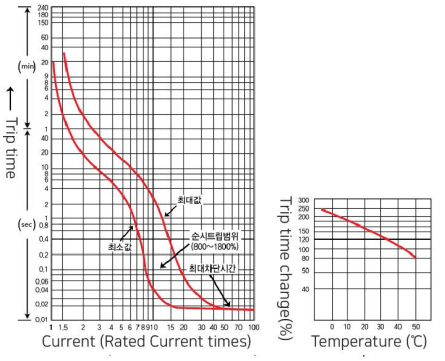
Breaker Technical Specification

Operating Characteristics Curve and Appearance Dimensions

- Operational configuration and power : 3P3W, 400V~460V, 50/60Hz
- Rated sensitivity current : 100mA
- Rated non-trip current : 50mA
- Rated cut-off current : 460V, 14kA
- Trip time : within 0.1 sec (Delay time : 4c)
- Rated load current : 30A, 50A, 60A, 75A, 100A
- Over-current trip method : fully electronic

IOP-103

▣ Operation Characteristic Curve/
Temperature Compensation Curve



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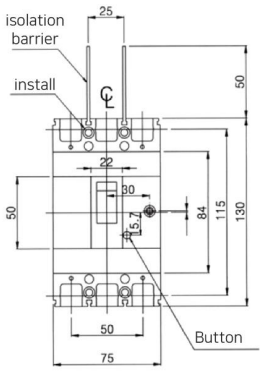
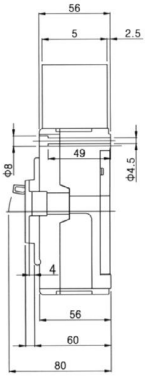
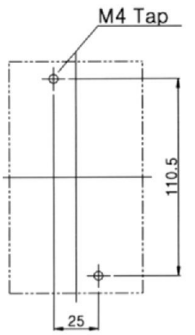
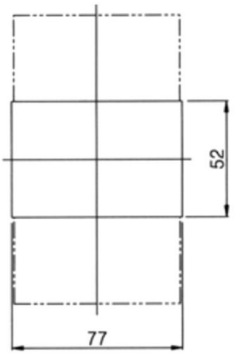


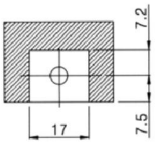


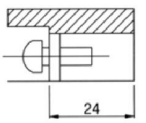


Panel Dimension



Panel Cover Dimension





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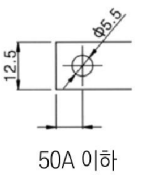

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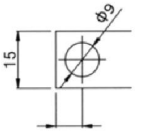


60~100A

BLOCK

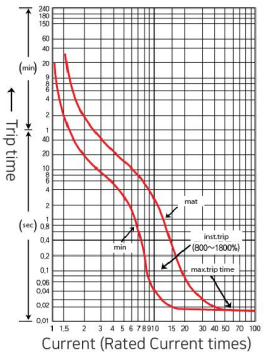
Breaker Technical Specification

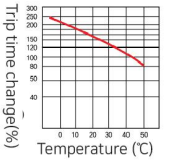
Operating Characteristics Curve and Appearance Dimensions

- Operational configuration and power : 3P4W, 400V~460V, 50/60Hz
- Rated sensitivity current : 100mA
- Rated non-trip current : 50mA
- Rated cut-off current : 460V, 14kA
- Trip time : within 0.1 sec (Delay time : 4c)
- Rated load current : 30A, 50A, 60A, 75A, 100A, 125A,150A,175A, 200A
- Over-current trip method : fully electronic

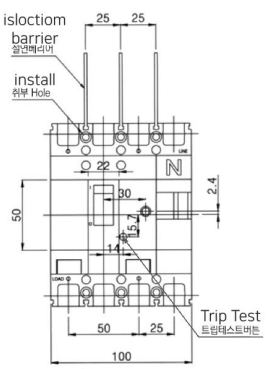
IOP-104

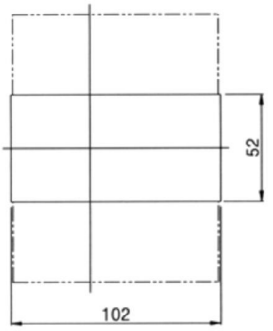
▣ Operation Characteristic Curve/
Temperature Compensation Curve



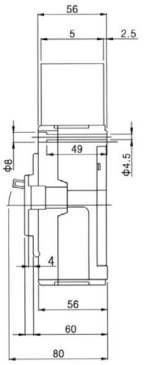


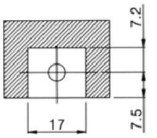
Dimensions

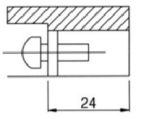




PaneL Cover Dimension







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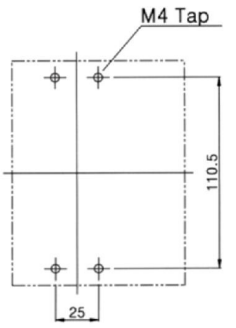
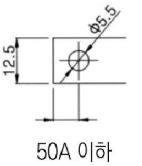


Panel Dimension



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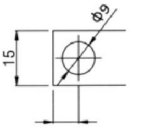

60~100A

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Internet Search

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