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2020

Susol Super Solution

# Compact ACB

## Compact Air Circuit Breakers 1600A




LS ELECTRIC

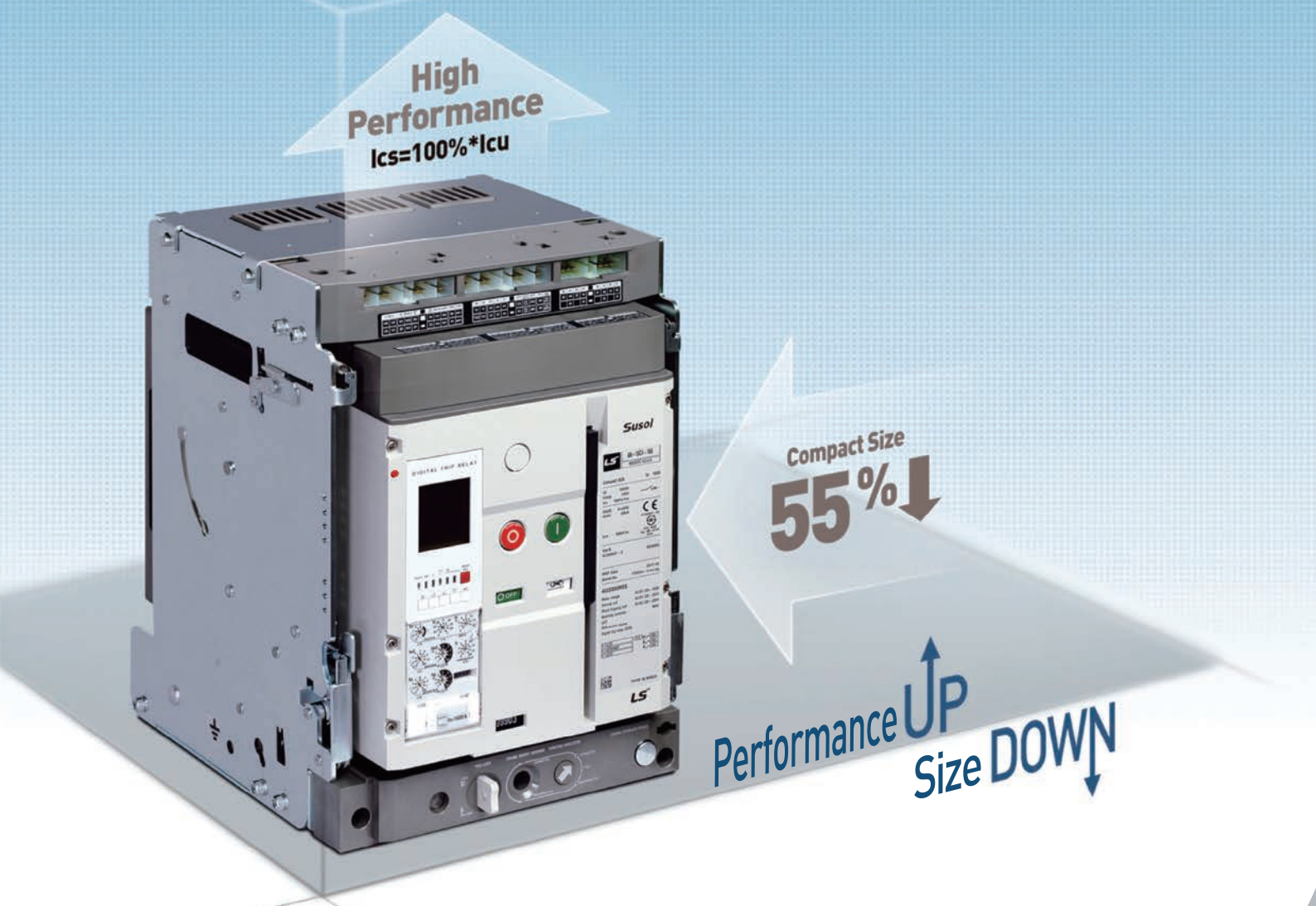
# Compact ACB 1600A

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# Change low voltage switchgears!

Another evolution of size,
cost and performance for
low voltage power circuit breakers!

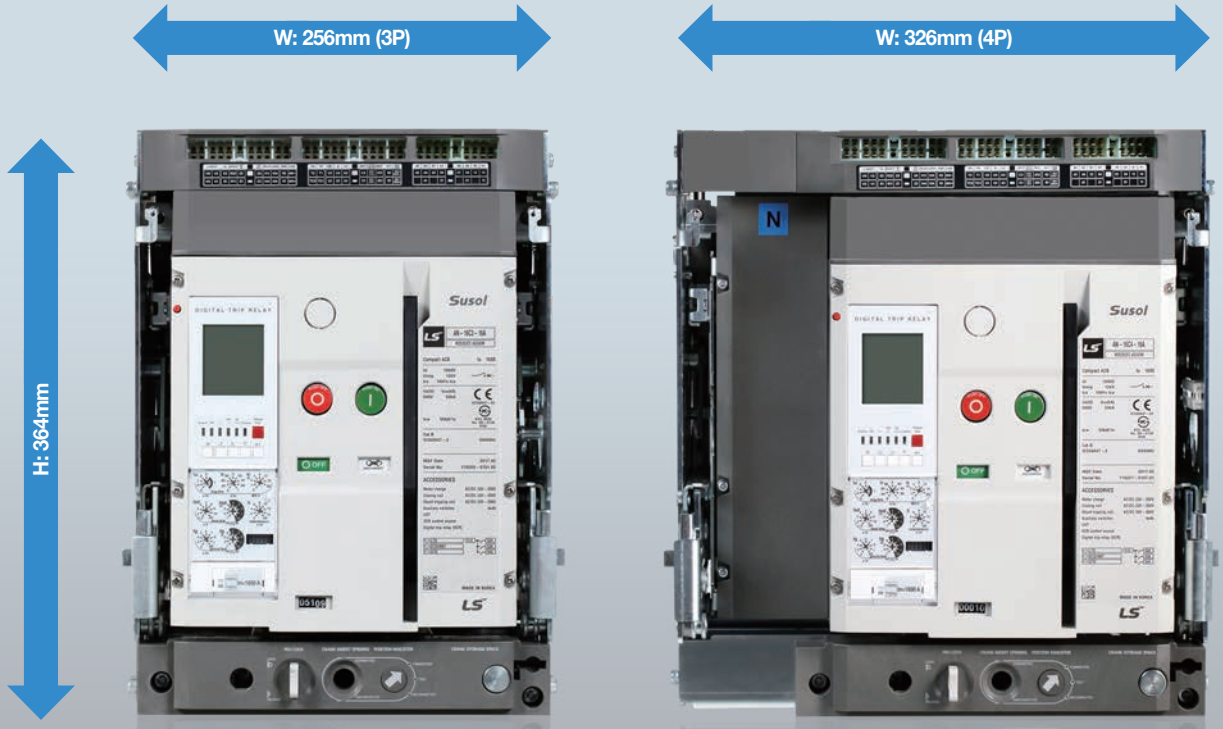



## Susol Super Solution
## Compact ACB 1600A

- Cat.A (Current limiting type) 150kA/415V
- Cat.B (General type) 50kA/690V, Icw = 50kA/1sec (30kA/3sec)

LS ELECTRIC

# Compact ACB 1600A




Susol

## Utilization Category

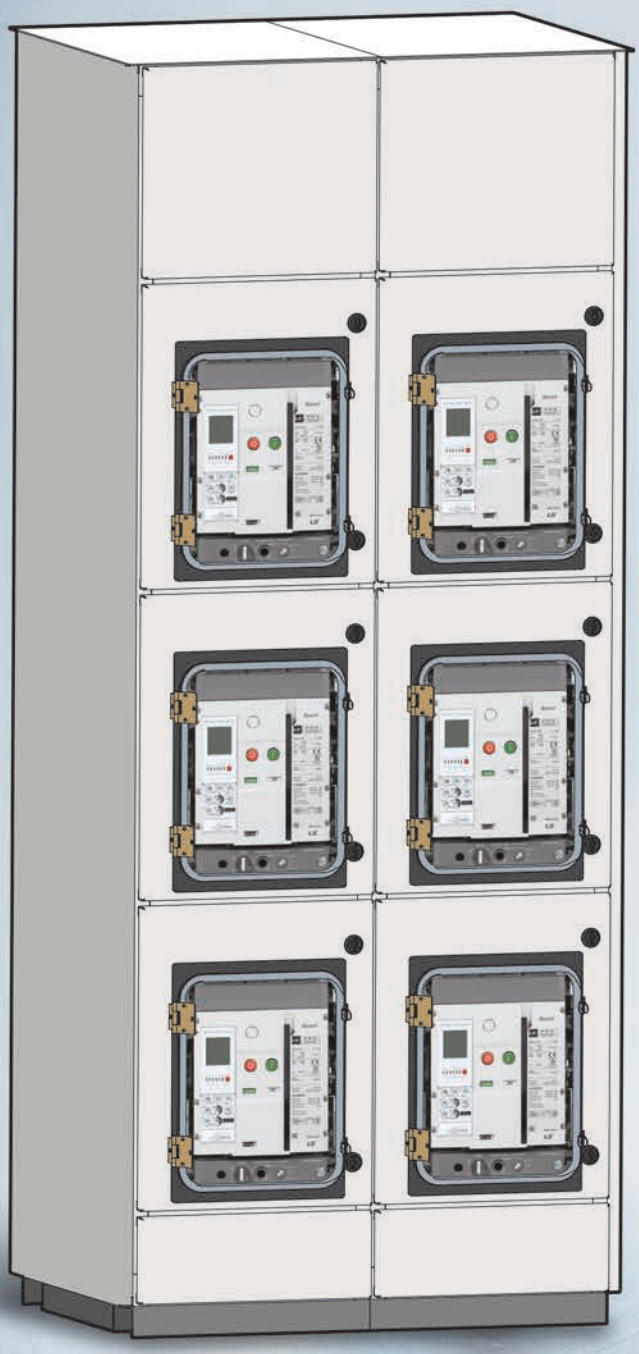



| AN type | AH type | AR type |
|---|---|---|
| AN-08: 800AF | AH-08: 800AF | AR-08: 800AF |
| AN-16: 1600AF | AH-16: 1600AF | AR-10: 1000AF |
| Ics = 100% * Icu = 42kA/690Vac | Ics = 100% * Icu = 50kA/690Vac | Ics = 100% * Icu = 150kA/415Vac |

## Features

- Significantly reduced size compared to existing products ...55%
- Category A breaker:
  rated current 400A~1000A, breaking capacity 150kA/415Vac, Ics = 100% * Icu■
- Category B breaker:
  rated current 400A~1600A, breaking capacity 50kA/690Vac, Ics = 100% * Icu■
- Rated short-time current (Icw): 50kA/1s (Cat.B)■
- Operation durability without maintenance: 12500 operations (Cat.B), 5000 operations (Cat.A)■
- Rating Plug application: Easy to change rated current without CT replacement■
- Various control power sources■
- Various accessories■
- Application Standards and Certification: IEC 60947-2 (DEKRA CB certification), GB 14048.2 (CCC certification)

# Compact ACB switchgear



## Reduction of size and weight of switchgears

- Easy transportation and handling■
- Reduced raw material usage■
- Reduced installation space

# Compact size

**55%**

Thanks to the reduced size by 55% it is easy to handle the breaker as well as reducing the space and raw materials in the switchgear fabrication.

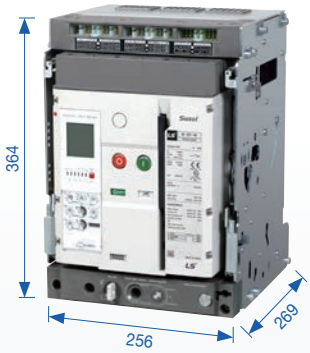
## Compact type

Unit (mm)

### E-frame ACB




### C-frame(Compact) ACB




### 3-high




### 4-high



# Compact ACB




**AN** – **16** **C** **3** **10** **J**

| Category B | |
|---|---|
| AN | 42kA/690V |
| AH | 50kA/690V |

| AF | |
|---|---|
| 08 | 800AF |
| 16 | 1600AF |

| Phase array | |
|---|---|
| C | (N)RST |
| V | RST(N) |

| No. of pole | |
|---|---|
| 3 | 3P |
| 4 | 4P |

| Rated current | |
|---|---|
| 00 | Without OCR & CT |
| 04 | 400A |
| ⋮ | ⋮ |
| 16 | 1600A |

| Installation & Connection | |
|---|---|
| withdrawable type | |
| A | Automatic connection |
| J | Manual Connection |
| Fixed type | |
| H | Horizontal type |
| V | Vertical type |
| M | Upper-Horizontal / Lower-Vertical type |
| N | Upper-Vertical / Lower-Horizontal type |
| P | Plane type |
| Z | Plane spread type |
| R | Spread type |
| T | Plane vertical type |
| X | Cable Lug type |

| Category A | |
|---|---|
| AR | 150kA/415V |

| AF | |
|---|---|
| 08 | 800AF |
| 10 | 1000AF |

| Rated current | |
|---|---|
| 00 | Without OCR & CT |
| 04 | 400A |
| ⋮ | ⋮ |
| 10 | 1000A |

# Circuit breaker ratings





| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Common characteristics** | | | | | | | | |
| Number of poles | (P) | | | 3P/4P | | | | |
| Frequency | (Hz) | | | 50/60Hz | | | | |
| Rated operational voltage | (V, Ue) | | | 690V | | | | |
| Rated insulation voltage | (V, Ui) | | | 1000V | | | | |
| Rated impulse withstand voltage | (kV, Uimp) | | | 12kV | | | | |
| **Circuit breaker as per IEC60947-2** | | | | | | | | |
| Type | | | | AN/AH/AR-C | | | | |
| Description | | | | AN-08C | AN-16C | AH-08C | AH-16C | AR-08C | AR-10C |
| Ampere Frame | (AF) | | | 800 | 1600 | 800 | 1600 | 800 | 1000 |
| Rated current (In Max.) at 40℃ | (A) | | | 400 | - | 400 | - | 400 | - |
| | (A) | | | 630 | - | 630 | - | 630 | - |
| | (A) | | | 800 | 800 | 800 | 800 | 800 | 800 |
| | (A) | | | - | 1000 | - | 1000 | - | 1000 |
| | (A) | | | - | 1250 | - | 1250 | - | - |
| | (A) | | | - | 1600 | - | 1600 | - | - |
| Rated current of neutral pole | (A) | | | 100% | | | | |
| Rated breaking capacity (Icu) | (kA) | IEC60947-2 | AC 800V [5] | - | | 40 | | - | |
| | | | AC 690V/600V/550V | 42 | | 50 | | - | |
| | | | AC 500V/480V/460V | 42 | | 50 | | 130 [1] | |
| | | | AC 415V/380V/220V | 50 | | 60 | | 150 | |
| Rated service breaking capacity (Ics) | (kA,%×Icu) | | | 100% | | | | |
| Rated making capacity (Icm) | (kA) | | | 88.2 | | 105 | | 17 [2] | |
| Rated Short-time capacity (Icw) | (kA) | | 1sec/3sec | 42/25 | | 50/30 | | 10 [3] | |
| Operating time (t) | (ms) | | Total breaking time | 40 | | | | | |
| | | | Closing time | 80 | | | | | |
| **Common mechanical and electrical life cycle** | | | | | | | | |
| Life cycle | (time) | | Mechanical | 12,500 | | | | 5,000 | |
| | | | Electrical | 6,000 | | | | 3,000 | |
| **Common dimension and weight** | | | | | | | | |
| Weight | (kg) | Draw-out type (3P/4P) | | 22/26 | | | | |
| | | Fixed type (3P/4P) | | 16/19.5 | | | | |
| Dimension | (mm) | Draw-out type | 3P | W: 256 D: 269.5 [4] H: 364.3 | | | | |
| | | | 4P | W: 326 D: 269.5 [4] H: 364.3 | | | | |
| | | Fixed type | 3P | W: 272.4 D: 198.5 [4] H: 322 | | | | |
| | | | 4P | W: 342.4 D: 198.5 [4] H: 322 | | | | |

1) 130kA/460V, 100kA/500V
2) at 500V
3) 0.5sec
4) Exclude terminal length
5) No DEKRA CB at AC 800V Icu (Secured test report for short circuit performance at KTC

# Compact DSU




**DH** – **16** **C** **3** **00** **J**

| DH |
|---|
| Switch-disconnector |

| AF | |
|---|---|
| 08 | 800AF |
| 10 | 1000AF |
| 13 | 1250AF |
| 16 | 1600AF |

| Phase array | |
|---|---|
| C | (N) RST |
| V | RST (N) |

| No. of pole | |
|---|---|
| 3 | 3P |
| 4 | 4P |

| Rated current | |
|---|---|
| 00 | Without OCR & CT |

| Installation & Connection | |
|---|---|
| withdrawable type | |
| A | Automatic connection |
| J | Manual Connection |
| Fixed type | |
| H | Horizontal type |
| V | Vertical type |
| M | Upper-Horizontal / Lower-Vertical type |
| N | Upper-Vertical / Lower-Horizontal type |
| P | Plane type |
| Z | Plane spread type |
| R | Spread type |
| T | Plane vertical type |
| X | Cable Lug type |

# Circuit breaker ratings

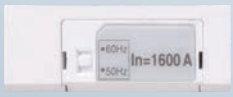




| | | | | | | |
|---|---|---|---|---|---|---|
| **Common characteristics** | | | | | | |
| Number of poles | (P) | | 3P/4P | | | |
| Frequency | (Hz) | | 50/60Hz | | | |
| Rated operational voltage | (V, Ue) | | 690V | | | |
| Rated insulation voltage | (V, Ui) | | 1000V | | | |
| Rated impulse withstand voltage | (kV, Uimp) | | 12kV | | | |
| **Circuit Breaker as per IEC60947-3** | | | | | | |
| Type | | | DH-C | | | |
| Description | | | DH-08C | DH-10C | DH-13C | DH-16C |
| Ampere Frame | (AF) | | 800 | 1000 | 1250 | 1600 |
| Rated operational current at 40℃ | (A, Ie) | | 800 | 1000 | 1250 | 1600 |
| Rated current of neutral pole | (%) | | 100 | 100 | 100 | 100 |
| Rated making capacity (Icm) | (kA) | | 105 | | | |
| Rated Short-time capacity (Icw) | (kA) | 1sec | 50 | | | |
| Operating time (t) | (ms) | Total breaking time | 40 | | | |
| | | Closing time | 80 | | | |
| **Common Mechanical and Electrical Life Cycle** | | | | | | |
| Life cycle | (time) | Mechanical | 12,500 | | | |
| | | Electrical | 5,000 | | | |
| **Common Demension and Weight** | | | | | | |
| Weight (3P/4P) | (kg) | Draw-out type (3P/4P) | 22/26 | | | |
| | | Fixed type (3P/4P) | 16/19.5 | | | |
| Dimension (3P/4P) | (mm) | Draw-out type | H : 361.3. / D : 257 W (3P/4P) | 255.4/326 | | |
| | | Fixed type | H : 268, / D : 185.6 W (3P/4P) | 209/279 | | |

# Trip Relay




Rating Plug

## Rating Plug for selection of rated current and frequency

**Rating Plug enables the changing rated current(In) without CT replacement**

- Rating Plug for 800AF: 400, 600, 630, 800A (4 types)
- Rating Plug for 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)

**Frequency selection switch: set to 50Hz or 60Hz**

# Trip relay series

Trip relays are classified according to their usages and functions to maximize customers' satisfaction.




### N Type (Normal)

- Current protection
- L/S/I/G/Thermal
- Self power
- RTC timer mounted
- Fault information (LED)

### A Type (Ammeter)

- Current Meter + Current protection + DO control + Communication
- L/S/I/G
- Thermal
- ZSI (Protective coordination)
- Remote reset
- Modbus/RS-485
- Profibus-DP
- Self power
- AC/DC 100~250V
- DC 24~60V
- RTC timer mounted
- Recording (10EA)

### P Type (Power Meter)

- A type + Power Meter + Voltage / Frequency / Unbalance protection
- L/S/I/G
- Thermal (linear hot start)
- UV/OV/OF/UF/rP/Vun/Iun
- Measurement: V/A/W/Wh/F/PF
- ZSI (Protective coordination)
- Remote Reset
- Modbus/RS-485
- Profibus-DP
- AC/DC 100~250V
- DC 24~60V
- RTC timer mounted
- Event recording (256EA)
- Fault recording (256EA)

### S Type (Supreme Meter)

- P type + Harmonics analysis (63 th) + Fault wave recording

# Connection



# Various installation methods

## Rear Connection



Vertical type, V



Horizontal type, H



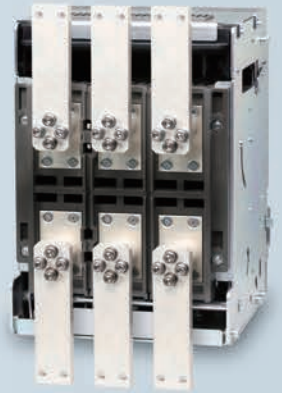
Spreader type, R



Mixed type, M



Mixed type, N



Flat type, P

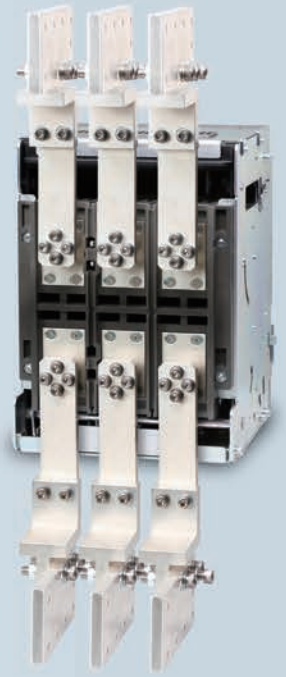
## Front Connection



Spread type, Z



Vertical type, T



Cable lug type, X

- The Front connection type is suitable for the narrow-depth panels.
- The connection can be modified between vertical type and horizontal type by rotating the terminals through 90 degrees.

# Accessories

## Main body


Miss Insertion Preventing Device (MIP)


Auxiliary Switch (FX)


Ready to Close switch (RCS)


Shunt Coil (SHT)


Closing Coil (CC)


Under Voltage Trip Device (UVT)


Manual Reset Button (MRB)


Key Lock (K1)

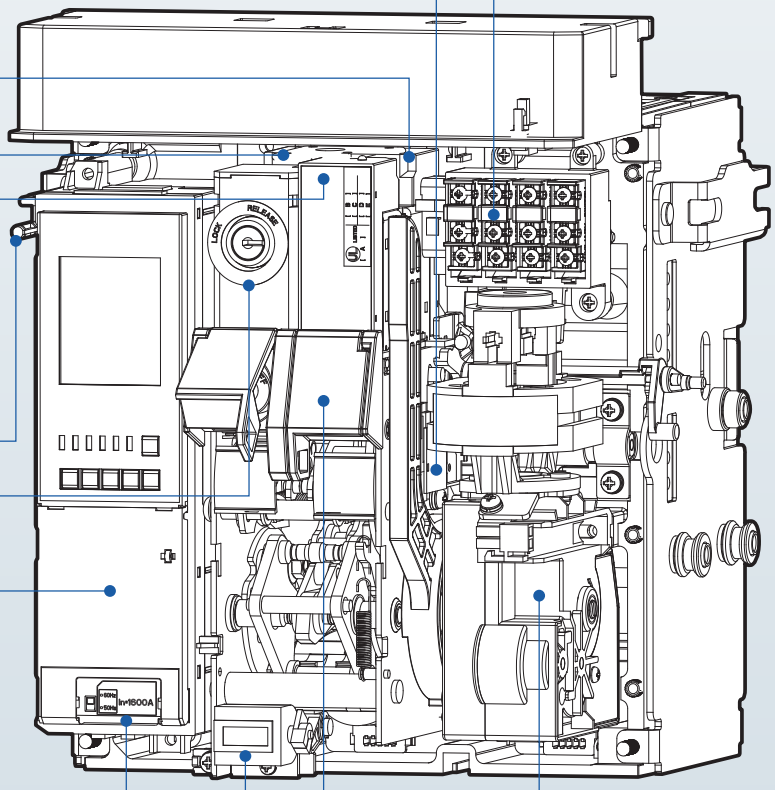

Trip Relay (OCR)


Rating plug

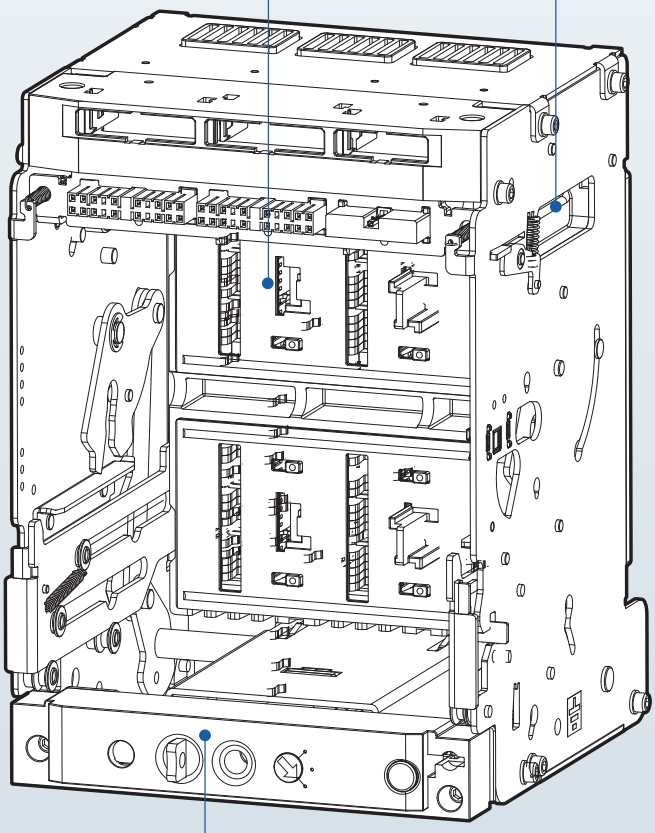

Counter (C)


ON/OFF Button Padlock (B)


Motor (M)



# Cradle



Miss Insertion Preventing Device (MIP)



Condensor Trip Device (CTD)



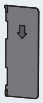
Safety Shutter (ST)



Lifting Hook (LH)



Interphase Barrier (IB)



UVT Time Delay Controller (UDC)



Remote I/O Unit (RCO)



Cell SW (CEL)



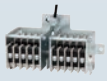
Door Interlock (DI)



Mechanical Interlock (MI)



Mechanical Operated Cell SW (MOC)



Racking Interlock & Position Lock (RI)



Door Frame (DF)



Dust Cover (DC)



OCR Tester (OT)

# External configuration

## Draw-out (Main body)




### Marking



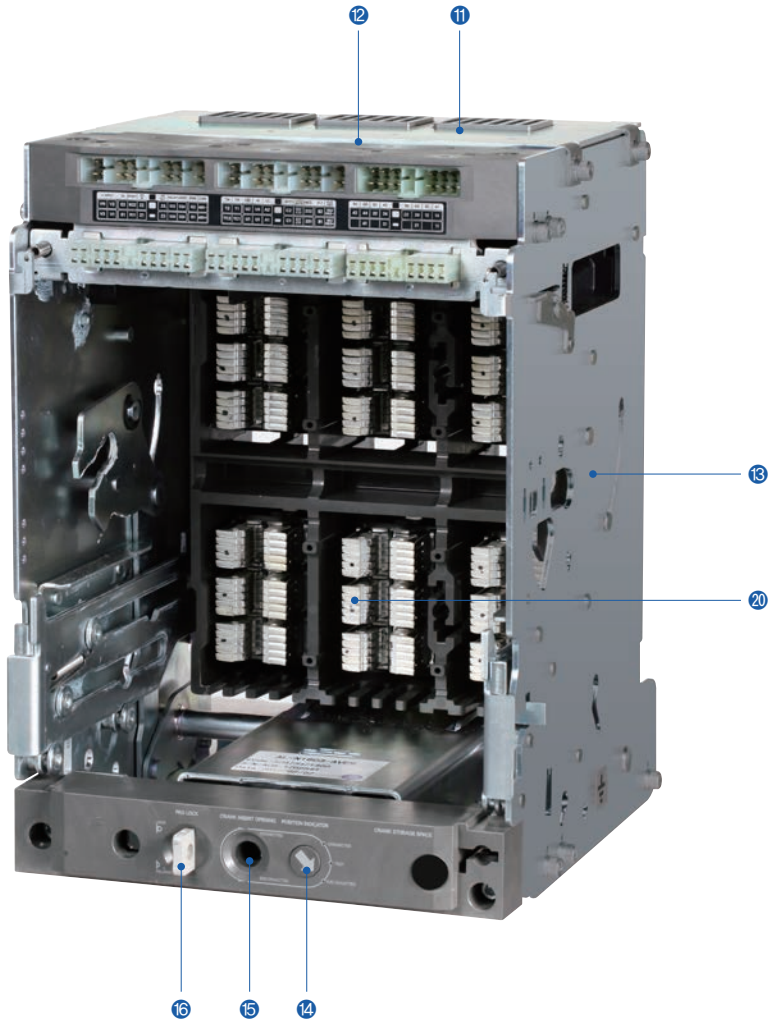

- Ui: Rated insulation voltage
- Uimp: Impulse withstand voltage
- Ue: Rated operational voltage (AC base)
- Icu: Ultimate breaking capacity
- Ics: Service breaking capacity
- Icw: Short time withstand capacity
- Icm: Rated making capacity
- MFG. Date: Manufacturing date

- Motor charge
- Closing coil
- Shunt tripping coil

Control power and terminal No.

- Auxiliary switches: Contact specification and terminal No.
- Under voltage trip: UVT terminal No.
- OCR control source: Trip relay control power
- Alarm switch: Alarm and terminal No.
- Digital trip relay: Switching diagram
- Z.S.I: Input/Output terminal No.
- Reset: LED/LCD reset
- Communication: Communication and terminal No.
- Voltage module: Phase voltage and symbol
- Earth/Leakage: Ground fault / Earth leakage input terminal No.

## Draw-out (Cradle)




### Terms

1. Trip relay
2. Counter
3. OFF button
4. ON button
5. Series name
6. Charge handle
7. Name plate
8. Charge/Discharge indicator
9. ON/OFF indicator
10. Company logo
11. Arc cover (Zero Arc Space)
12. Safety control cover
13. Cradle
14. Position indicator
15. Handle inserting hole
16. Pad lock button
17. Arc chute
18. Front cover
19. Rating Plug
20. Cradle finger

# Ordering

## Main body




| Air circuit breaker |
|---|
| AN / AH |

| Ampere frame (CT Spec.) | |
|---|---|
| 08 | 800AF |
| 16 | 1600AF |

| Frame sizes & phase array | |
|---|---|
| C | Standard (N) RST |
| V | Reverse phase RST (N) |

| Number of poles | |
|---|---|
| 3 | 3P (C) |
| 4 | 4P (C, V) |

| Rated current | |
|---|---|
| 00 | None |
| 04 | 400A |
| 06 | 630A |
| 08 | 800A |
| 10 | 1000A |
| 13 | 1250A |
| 16 | 1600A |

| Installation & Connection | |
|---|---|
| withdrawable type | |
| A | Automatic connection |
| J | Manual connetion |
| Fixed type | |
| H | Horizontal type |
| V | Vertical type |
| M | Upper-Horizontal / Lower-Vertical type |
| N | Upper-Vertical / Lower-Horizontal type |
| P | Flat type |
| Z** | Flat spread type |
| R*** | Spread type |
| T** | Flat vertical type |
| X** | Cable lug type |

| AR |
|---|

| | |
|---|---|
| 08 | 800AF |
| 10 | 1000AF |

| | |
|---|---|
| 00 | None |
| 04 | 400A |
| 06 | 630A |
| 08 | 800A |
| 10 | 1000A |

| DH |
|---|
| Switch-disconnector |

| | |
|---|---|
| 08 | 800AF |
| 10 | 1000AF |
| 13 | 1250AF |
| 16 | 1600AF |

| | |
|---|---|
| C | Standard (N) RST |
| V | Reverse phase RST (N) |

| | |
|---|---|
| 3 | 3P (C) |
| 4 | 4P (C, V) |

| | |
|---|---|
| 00 | None |

* Ampare frame of AR must be selected up to 1000AF.
* A rated current of AR must be selected up to 1000A.
* Installation method is common to all models
** When using Z, T and X type, please purchase adapter kit separately after ordering P type product (Refer to fixed adapter kit table)
*** When using R type, purchase purchase adapter kit separately after ordering H type product (Refer to fixed adapter kit table)

1. Fixed type Adaptor Kit

| Number | Part Name | Product Name | How to install | Pole |
|---|---|---|---|---|
| 62363471509 | Terminal Kit Ass'y | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD_FIXED,AN,AH,AR-C3 | Z | 3 |
| 62363471510 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD_FIXED,AN.AH,AR-C4 | Z | 4 |
| 62363471511 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD/VER_FIXED,AN,AH,AR-C3 | T | 3 |
| 62363471512 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD/VER_FIXED,AN,AH,AR-C4 | T | 4 |
| 62363471513 | | SUB ASS'Y,ADAPTER KIT ASS'Y_LUG_FIXED,AN,AH,AR-C3 | X | 3 |
| 62363471514 | | SUB ASS'Y,ADAPTER KIT ASS'Y_LUG_FIXED,AN,AH,AR-C4 | X | 4 |
| 62363471515 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD,AN,AH-C3 | R | 3 |
| 62363471516 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD,AN.AH-C4 | R | 4 |

M1 D1 D1 FX NG0 U1 AL

| Motor rated voltage | |
|---|---|
| MA | Without Motor |
| M1 | AC/DC 100V~130V |
| M2 | AC/DC 200V~250V |
| M3 | DC 125V |
| M4 | DC 24V~30V |
| M5 | DC 48V~60V |
| M6 | AC 380V~415V |
| M7 | AC 440V~480V |
| M8 | AC 48V |

| Closing coil rated voltage | |
|---|---|
| D0 | Without Closing coil |
| D1 | AC/DC 100V~130V |
| D2 | AC/DC 200V~250V |
| D3 | DC 125V |
| D4 | DC 24V~30V |
| D5 | DC 48V~60V |
| D6 | AC 380V~480V |
| D7 | AC 48V |

| Shunt coil rated voltage | |
|---|---|
| D0 | Without Shunt coil |
| D1 | AC/DC 100V~130V |
| D2 | AC/DC 200V~250V |
| D3 | DC 125V |
| D4 | DC 24V~30V |
| D5 | DC 48V~60V |
| D6 | AC 380V~480V |
| D7 | AC 48V |

| Aux.contact & charging types | |
|---|---|
| FX | Standard OFF-Charge 4C |
| FC | Standard ON-Charge 4C |
| LC | Standard ON-Charge 3C TCS |
| PX | Standard 4C with “OFF” charging type _ low-level contacts |
| PC | Standard 4C with “ON” charging type _ low-level contacts |

* TCS (Trip Circuit Supervision)
* Auxiliary switch for micro load (Order No. 83011176209)

| Trip relay |
|---|
| Refer to 21page |

| UVT coil rated voltage | |
|---|---|
| U0 | Without UVT coil |
| U1 | AC/DC 100V~130V |
| U2 | AC/DC 200V~250V |
| U3 | DC 125V |
| U4 | DC 24V~30V |
| U5 | DC 48V~60V |
| U6 | AC 380V~480V |
| U7 | AC 48V |

* UVT Delay module is available over AC / DC 48V

| Accessories |
|---|

| Code | Description | Option description |
|---|---|---|
| AL | AL1 + MRB | |
| A1 | AL1 + MRB + RES(AC110~130V) *AC Only | |
| A2 | AL1 + AL2 + MRB | |
| A3 | AL1 + MRB + RES(DC 110~125V) *DC Only | |
| A4 | AL1 + MRB + RES(AC 200~250V) *AC Only | |
| A5 | AL1 + MRB + Auto Reset | |
| A6 | AL1 + AL2 + MRB + Auto Reset | |
| A7 | AL1 + MRB + RES(DC 110~125V) + Auto Reset *DC Only | |
| A8 | AL1 + MRB + RES(AC 200~250V) + Auto Reset *AC Only | |
| A9 | AL1 + MRB + RES(AC 110~130V) + Auto Reset *AC Only | |
| C | C | Counter |
| B | B | On/Off Button lock |
| M | MI | Mechanical interlock |
| D | DI or MOC | Door Interlock or MOC (Mechanism operated cell switch) |
| K | K1 | Key Lock |
| K2 | K2 | Key Interlock Set |
| R | RCS | Ready to Close switch |
| H1 | SHT2 Note 2) | AC/DC 100~130V, Double Shunt coil |
| H2 | | AC/DC 200~250V, Double Shunt coil |
| H3 | | DC 125V, Double Shunt coil |
| H4 | | DC 24~30V, Double Shunt coil |
| H5 | | DC 48~60V, Double Shunt coil |
| H6 | | AC 380~480V, Double Shunt coil |
| H7 | | AC 48V, Double Shunt coil |

Note 1) * If mixed option is more than 5, it is separated by mixed option code.
2) UVT & SHT2 can be not applicable together.

| | |
|---|---|
| E01 | A4 (AL1 + MRB + RES(AC200~250V))+C(Counter)+B(ON/OFF Button Lock) +K(Key Lock)+R(Ready to close switch)+M(Mechanicl Interlock) |
| E02 | AL (AL1 + MRB)+K(Key Lock(OFF Lock))+R(Ready to close switch)+D(Door Interlock or MOC)+H1(AC/DC 100V ~ 130V, Double Shunt Coil) |
| E03 | C(Counter)+B(ON/OFF Button Lock)+K2(Key Interlock Set)+R(Ready to close switch) |
| E04 | A4(AL1 + MRB + RES(AC200~250V))+B(ON/OFF Button Lock)+K(Key Lock(OFF Lock))+M(Mechanical Interlock) |
| E05 | A1(AL1+MRB+RES110~130V)+B(ON/OFF Button Lock)+K(Key Lock(OFF Lock))+R(Ready to close switch)+M(Mechanical Interlock) |
| E06 | A2(AL1+AL2+MRB)+C(Counter)+K(Key Lock(OFF Lock))+R(Ready to close switch) |

# Ordering

## Cradle

AL – H16C 3 – J H E S

| Air circuit breaker | |
|---|---|
| LS ACB Cradle | |
| AL | Bottom operating cradle |

| Type & Ampare frame | |
|---|---|
| H16C | AH 400~ 1600A |

| Number of poles | |
|---|---|
| 3 | 3P |
| 4 | 4P |

| Secondary connection type | |
|---|---|
| J | Manual connection |
| A | Auto connection |

| Installation & Connection | |
|---|---|
| H | Horizontal type |
| V | Vertical type |
| M | Upper-Horizontal/ Lower-Vertical type |
| N | Upper-Vertical/ Lower-Horizontal type |
| P** | Flat type |
| Z** | Flat spread type |
| R*** | Spread type |
| T** | Flat vertical type |
| X** | Cable lug type |

| Arc cover | |
|---|---|
| S | with arc cover |

| Shtter | |
|---|---|
| E | without shutter |
| F | with shutter |

Note1) The cradle of "AL-H" must be selected to use ACB of "AR" type.
** When using P, Z, T and X type, please purchase adapter kit separately after ordering P type product (Refer to fixed adapter kit table)
*** When using R type, purchase purchase adapter kit separately after ordering H type product (Refer to fixed adapter kit table)

2. Draw-out type Adaptor Kit (Cradle)

| Number | Part Name | Product Name | How to install | Pole |
|---|---|---|---|---|
| 62363471501 | Terminal Kit Ass'y | SUB ASS'Y,ADAPTER KIT ASS'Y_FRONT,AN,AH-C3 | P | 3 |
| 62363471502 | | SUB ASS'Y,ADAPTER KIT ASS'Y_FRONT,AN,AH-C4 | P | 4 |
| 62363471503 | | SUB ASS'Y,ADAPTER KIT ASS'Y_FRONT_SPREAD,AN,AH-C3 | Z | 3 |
| 62363471504 | | SUB ASS'Y,ADAPTER KIT ASS'Y_FRONT_SPREAD,AN.AH-C4 | Z | 4 |
| 62363471505 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD/VER,AN,AH-C3 | T | 3 |
| 62363471506 | | SUB ASS'Y,ADAPTER KIT ASS'Y_SPREAD/VER,AN,AH-C4 | T | 4 |
| 62363471507 | | SUB ASS'Y,ADAPTER KIT ASS'Y_LUG,AN,AH-C3 | X | 3 |
| 62363471508 | | SUB ASS'Y,ADAPTER KIT ASS'Y_LUG,AN,AH-C4 | X | 4 |

## Various installation methods

| Type | H | V | M | N | P |
|---|---|---|---|---|---|
| Form |  |  |  |  |  |
| **Type** | **Z** | **R** | **T** | **X** | |
| Form |  |  |  |  | |

# Trip relay










| Trip relay type | | Communication & protection | | Control voltage & frequency | |
|---|---|---|---|---|---|
| 0 | Without trip relay | G | Ground fault (Residual earth fault protection), No communication | 0 | Self-Power, 60Hz |
| N | Normal | | * L,S,I,G configuration as standard (with LED indicators) | 5 | Self-Power, 50Hz |
| A | Ammeter | G | Ground fault (Residual earth fault protection), No communication | 0 | Self-Power, 60Hz |
| | | Z | Gruond fault (Extermal CT, Earth leakage below 30A) | 1 | AC/DC 110V~250V, 60Hz |
| | | E | Ground fault (Extermal CT, Earth leakage over 30A) | 2 | DC 24V~60V, 60Hz |
| | | C | Comm. + Ground fault (Residual earth fault protection) | 5 | Self-Power, 50Hz |
| | | K | Comm. + Ground fault (Extermal CT, Earth leakage below 30A) | 6 | AC/DC 110V~250V, 50Hz |
| | | X | Comm. + Ground fault (Extermal CT, Earth leakage over 30A) | 7 | DC 24V~60V, 50Hz |
| | | | * Comm. And output contacts DO NOT work under self-power condition. (AC0, AK0, AX0, AC5, AK5, AX5)<br>* Communication and output contacts for L,S,I,G do not work except OCR LED without control power supply.<br>- AG0, AG5, AZ0, AZ5, AE0, AE5<br>* Z, K: External CT - LS ZCT applied (fault current 0.5~30A, 1600AF)<br>* E, X: External CT - Private ZCT applied (faullt current >30A) | | |
| P | Power meter | C | Comm. + Ground fault (Residual earth fault protection) | 1 | AC/DC 110V~250V, 60Hz |
| | | K | Comm. + Ground fault (Extermal CT, Earth leakage below 30A) | 2 | DC 24V~60V, 60Hz |
| | | X | Comm. + Ground fault (Extermal CT, Earth leakage over 30A) | 6 | AC/DC 110V~250V, 50Hz |
| | | | * Communication functions are normal. (Function unavailable without control power supply)<br>* Applicable to generator protection purpose<br>* Voltage module of P type or more is basic.<br>* K: External CT - LS ZCT applied (fault current 0.5~30A, 1600AF)<br>* X: External CT - Private ZCT applied (faullt current >30A) | 7 | DC 24V~60V, 50Hz |
| S | Supreme meter | C | Comm. + Ground fault (Residual earth fault protection) | 1 | AC/DC 110V~250V, 60Hz |
| | | K | Comm. + Ground fault (Extermal CT, Earth leakage below 30A) | 2 | DC 24V~60V, 60Hz |
| | | X | Comm. + Earth leakage (Extermal CT, Earth leakage over 30A) | 6 | AC/DC 110V~250V, 50Hz |
| | | | * Communication functions are normal. (Function unavailable without control power supply)<br>* Applicable to generator protection purpose<br>* Voltage module of P type or more is basic.<br>* K: External CT - LS ZCT applied (fault current 0.5~30A, 1600AF)<br>* X: External CT - Private ZCT applied (faullt current >30A) | 7 | DC 24V~60V, 50Hz |

# Trip relay (OCR)

The trip relay of Compact ACB provides the additional protection functions for voltage, frequency, unbalance, and others in addition to main protection functions for over current, short-circuit, ground fault. It supports the advanced measurement functions for voltage, current, power, electric energy, harmonics, communication function, and others. Analog trip function interlocked with mechanism enhanced a durability of devices as well as the breaking capacity of ACB.
Zone selective interlocking function makes the protective coordination more simple and thermal memory can be applied to various loads.




## Rating Plug for selection

Rating Plug enables the changing rated current(In) without CT replacement

- **800AF**
  In: 400-600-630-800A (4 types)
- **1600AF**
  In: 800-1000-1200-1250-1600A (5 types)

Frequency selection switch: set to 50Hz or 60Hz

## Trip relay types

| Classification | N type | A type | P type | S type |
|---|---|---|---|---|
| Externals |  |  |  |  |
| Current protection | • L/S/I/G/Thermal | • L/S/I/G/Thermal<br>• ZSI (Protective coordination) | • L/S/I/G<br>• ZSI (Protective coordination)<br>• Thermal (Linear Hot Start) | • L/S/I/G<br>• ZSI (Protective coordination)<br>• Thermal (Linear Hot Start) |
| Other protection | - | • Earth leakage (Option) | • Earth leakage (Option)<br>• Over/Under voltage<br>• Over/Under frequency<br>• Unbalance (Voltage/Current<br>• Reverse power | • Earth leakage (Option)<br>• Over/Under voltage<br>• Over/Under frequency<br>• Unbalance (Voltage/Current<br>• Reverse power |
| Measurement function | - | • Current (R/S/T/N) | • 3 Phase Voltage/Current RMS/Vector<br>• Power (P, Q, S), PF (3-Phase)<br>• Energy (Positive/Negative)<br>• Frequency, Demand | • 3 Phase Voltage/Current RMS/Vector<br>• Power (P, Q, S), PF (3-Phase)<br>• Energy (Positive/Negative)<br>• Frequency, Demand<br>• Voltage/Current harmonics (1st~63th)<br>• 3 Phase Waveforms<br>• THD, TDD, K–Factor |
| Fine adjustment | - | - | • Fine adjustment for long/short time delay/instantaneous/ ground | • Fine adjustment for long/short time delay/instantaneous/ ground |
| Digital Output | | • 3DO (Fixed)<br>• L, S/I, G Alarm | • 3DO (Programmable)<br>• Trip, Alarm, General | • 3DO (Programmable)<br>• Trip, Alarm, General |
| IDMTL setting | - | - | • Compliance with IEC60255-3: SIT, VIT, EIT, DT | • Compliance with IEC60255-3: SIT, VIT, EIT, DT |
| Communication | - | • Modbus/RS–485<br>• Profibus–DP | • Modbus/RS–485<br>• Profibus–DP | • Modbus/RS–485<br>• Profibus–DP |
| Power supply | • Self Power<br>–Power source worksover 20% of load current. | • Self Power<br>–Power source worksover 20% of load current.<br>–External power source are required for comm.<br>• AC/DC 100~250V<br>• DC 24~60V | • AC/DC 100~250V<br>• DC 24~60V<br>• Basic protection function (L/S/I/G) is still under normal operation without control power. | • AC/DC 100~250V<br>• DC 24~60V<br>• Basic protection function (L/S/I/G) is still under normal operation without control power. |
| RTC Timer | • Available | • Available | • Available | • Available |
| LED for trip info. | • Long time delay<br>• Short time delay/Instantaneous<br>• Ground fault | • Long time delay<br>• Short time delay/Instantaneous<br>• Ground fault | • Long time delay<br>• Short time delay/Instantaneous<br>• Ground fault | • Long time delay<br>• Short time delay/Instantaneous<br>• Ground fault |
| Fault recording | - | • 10 records (Fault/Current/Date and Time) | • 256 records | • 256 records<br>• Last fault wave form recording (3 Phase) |
| Event recording | - | - | • 256 records (Content, Status, Date) | • 256 records (Content, Status, Date) |
| Operating button | • Reset button | • Reset, Menu Up/Down, Left/Right, Enter | • Reset, Menu Up/Down, Left/Right, Enter | • Reset, Menu Up/Down, Left/Right, Enter |

Each OCR type has Battery in itself.

1. Battery lifespan
   1) When turned off: 14~28years
   2) When using 1 LED consecutively or turned off: 7~14days

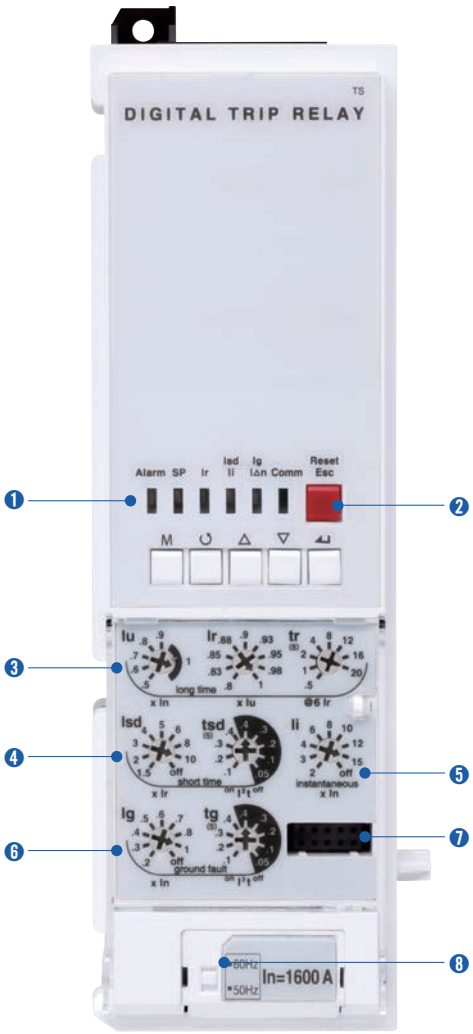
2. The recognizable range of OCR current
   1) 1Ø: When more 20% than rated current(In) (ratio to In regardless of Iu and Ir)
   2) 3Ø: When more 12% than rated current(In)

# Trip relay

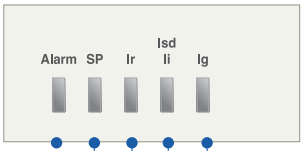
## N type: 「Normal」 type

■ Optimized protection function
■ OCR, OCGR function according IEC60947-2
■ Overload protection
– Long-time delay
– Thermal
■ Short-circuit protection
– Short-time delay/Instantaneous
– I²t On/Off optional (for short-time delay)
■ Ground fault protection
– I²t On/Off optional
■ Self Power

■ Rating Plug for selection of rated current and frequency
• Rating Plug type
– 800AF: 400, 600, 630, 800A (4 types)
– 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
• Frequency selection switch: set to 50Hz or 60Hz



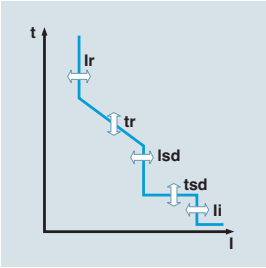

❶ LED: Indication of trip info. and overload state



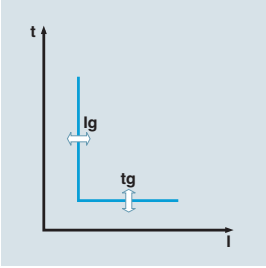

Ig: LED indicating ground-fault
Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

❷ Reset Key: Fault reset or battery check
❸ Iu, Ir: Long-time current setting, tr: Long-time tripping delay setting
❹ Isd: Short-time current setting, tsd: Short-time tripping delay setting
❺ Ii: Instantaneous current setting
❻ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
❼ Test terminal: OCR test terminal (Connected with OCR tester)
❽ Rating Plug: Rated current (In) and frequency selection

## Protection




| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Long time** | | | | | | | | | | | |
| Current setting (A) | Iu = In×... | | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | | | |
| | Ir = Iu×... | | 0.8 | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1.0 |
| Time delay (s) | tr@(1.5×Ir) | | 12.5 | 25 | 50 | 100 | 200 | 300 | 400 | 500 | |
| Accuracy: ±15% or | tr@(6.0×Ir) | | 0.5 | 1 | 2 | 4 | 8 | 12 | 16 | 20 | |
| below 100ms | tr@(7.2×Ir) | | 0.34 | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11 | 13.8 | |
| **Short time** | | | | | | | | | | | |
| Current setting (A) | Isd = Ir×... | Cat. B | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | 10 | Off |
| Accuracy : ±10% | | Cat. A | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | (Not set) | Off |
| Time delay (s) | tsd | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| @ 10×Ir | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | | |
| **Instantaneous** | | | | | | | | | | | |
| Current setting (A) | Ii = In×... | | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time | | | below 50ms | | | | | | | | |
| **Ground fault** | | | | | | | | | | | |
| Pick-up (A) | | | | | | | | | | | |
| Accuracy: ±10%(Ig>0.4In) | Ig = In×... | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| ±20%(Ig≤0.4In) | | | | | | | | | | | |
| Time delay (s) | tg | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| @10×Ir | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | | |



## A type: 「Ammeter」 type

■ Overload protection
- – Long-time delay
- – Thermal

■ Short-circuit protection
- – Short-time delay/Instantaneous
- – I²t On/Off optional (for short-time delay)

■ Ground fault protection
- – I²t On/Off optional

■ Realization of protective coordination by ZSI (Zone Selective Interlocking)

■ High-performance and high-speed MCU built-in
- – Accurate measurement with tolerance of 1.0%

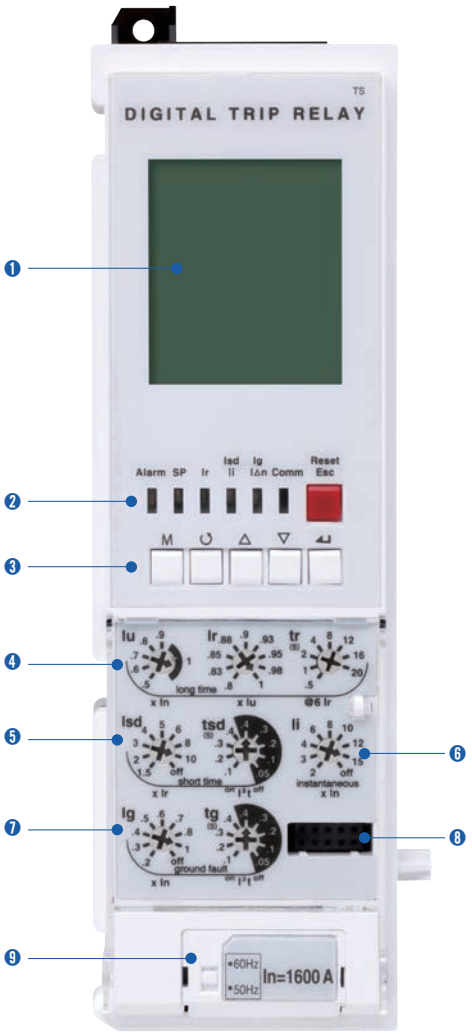
■ Fault recording
- – Records Max. up to 10 fault information about fault type, fault phase, fault data, occurrence time of fault

■ SBO (Select Before Operation)
- – High reliability for control and setting change method

■ 3 DO (Digital Output)

■ Communication
- – Modbus/RS485
- – Profibus–DP

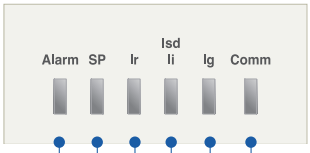
■ Rating Plug for selection of rated current(In) and frequency
- • Rating Plug type
  - – 800AF: 400, 600, 630, 800A (4 types)
  - – 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
- • Frequency selection switch: set to 50Hz or 60Hz




* When communication is flashing phone icon on the LCD.

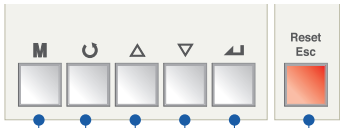
❶ LCD: Indication of measurement and information

❷ LED: Indication of trip info. and overload state




- Comm: LED indicating comm. state (Blink when running) *
- Ig: LED indicating ground-fault
- Isd/Ii: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload (Turn on above 90%, Blink above 105%)

❸ Key: Move to menu or reset




- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

❹ Ir: Long-time current setting, tr: Long-time tripping delay setting

❺ Isd: Short-time current setting, tsd: Short-time tripping delay setting

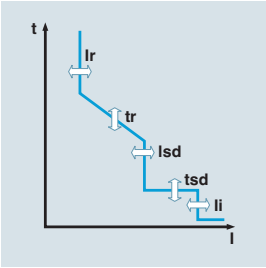
❻ Ii: Instantaneous current setting

❼ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

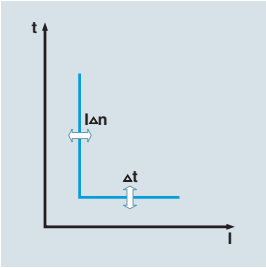
❽ Test terminal: OCR test terminal (Connected with OCR tester)

❾ Rating Plug: Rated current (In) and frequency selection

## Protection




| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Long time** | | | | | | | | | | | |
| Current setting (A) | Iu = In×... | | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | | | |
| | Ir = Iu×... | | 0.8 | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1.0 |
| Time delay (s) | tr@(1.5×Ir) | | 12.5 | 25 | 50 | 100 | 200 | 300 | 400 | 500 | |
| Accuracy : ±15% or | tr@(6.0×Ir) | | 0.5 | 1 | 2 | 4 | 8 | 12 | 16 | 20 | |
| below 100ms | tr@(7.2×Ir) | | 0.34 | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11 | 13.8 | |
| **Short time** | | | | | | | | | | | |
| Current setting (A) | Isd = Ir×... | Cat. B | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | 10 | Off |
| Accuracy : ±10% | | Cat. A | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | (Not set) | Off |
| Time delay (s) | tsd | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| @10×Ir | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | | |
| **Instantaneous** | | | | | | | | | | | |
| Current setting (A) | Ii = In×... | | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time | | | below 50ms | | | | | | | | |
| **Ground fault** | | | | | | | | | | | |
| Pick-up (A)<br>Accuracy: ±10%(Ig>0.4In)<br>±20%(Ig≤0.4In) | Ig = In×... | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| Time delay (s) | tg | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| @10×Ir | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | | |



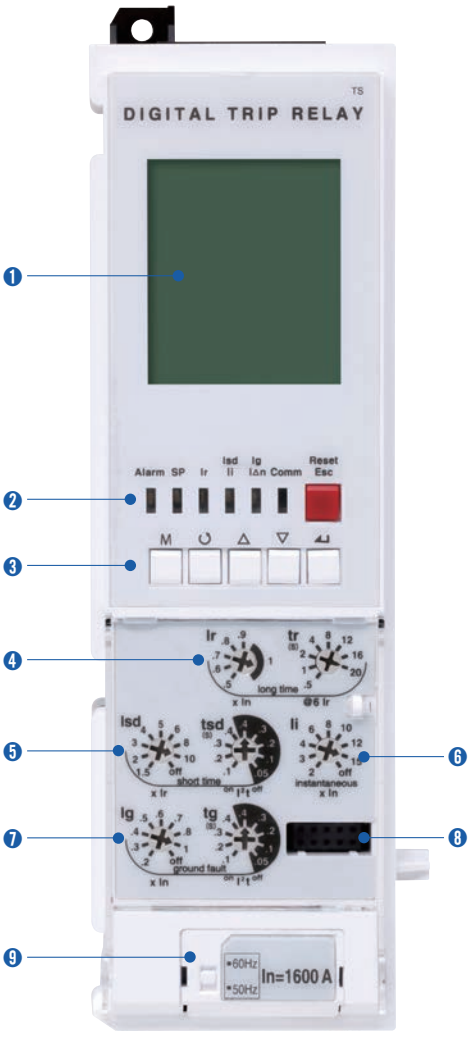

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Earth leakage (Option)** | | | | | | | | | | | |
| Current setting (A)) | I△n | | 0.5 | 1 | 2 | 3 | 5 | 10 | 20 | 30 | Off |
| Time delay (ms)<br>Accuracy : ±15% | △t | Alarm Time (ms) | 140 | 230 | 350 | 800 | 950 | | | | |
| | | Trip Time (ms) | 140 | 230 | 350 | 800 | | | | | |

Note) Unable to select ground fault and earth leakage, simultaneously

## P type: 「Power meter」 type

■ Overload protection
– Long-time delay – Thermal
■ Short-circuit protection
– Short-time delay/Instantaneous
– I²t On/Off optional (for short-time delay)
■ Ground fault protection
– I²t On/Off optional
■ Protection for Over voltage/Under voltage/Over frequency/ Under frequency/Unbalance/Reverse power
■ Realization of protective coordination by ZSI (Zone Selective Interlocking)
■ The fine-adjustable setting by knob and key
■ IDMTL setting (SIT, VIT, EIT, DT curve)
– Basic setting : “None”. Thermal curve.
■ Measurement and display function
– High detailed measurement for 3 phase current/Voltage/ Power/Energy/Phase angle/Frequency/PF/Demand
– 128 x 128 Graphic LCD
– Indicates current/voltage vector diagram and waveform

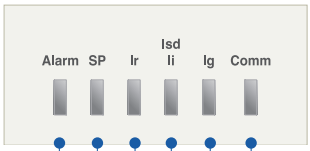
■ Fault recording
– Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
■ Event recording
– Records events of device related to setting change, operation and state change. (Max. up to 256)
■ SBO (Select Before Operation)
– High reliability for control and setting change method
■ 3 DO (Digital output)
– Programmable for alarm, trip and general DO
■ Communication
– Modbus/RS485 – Profibus–DP
■ Rating Plug for selection of rated current(In) and frequency
• Rating Plug type
– 800AF: 400, 600, 630, 800A (4 types)
– 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
• Frequency selection switch: set to 50Hz or 60Hz




* When communication is flashing phone icon on the LCD.

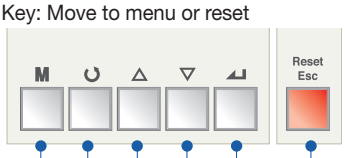
❶ LCD: Indication of measurement and information

❷ LED: Indication of trip info. and overload state




Comm: LED indicating comm. state (Blink when running) *
Ig: LED indicating ground-fault
Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

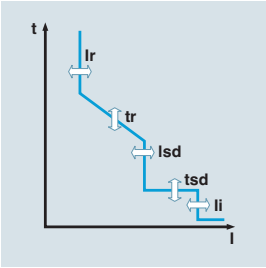
❸ Key: Move to menu or reset



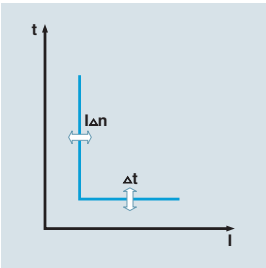

Reset/ESC: Fault reset or ESC from menu
Enter: Enter into secondary menu or setting input
Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
Right/Left: Move the cursor or setting right/left on screen (Rotation)
Menu: Menu display ↔ Measurement display

❹ Ir: Long-time current setting, tr: Long-time tripping delay setting
❺ Isd: Short-time current setting, tsd: Short-time tripping delay setting
❻ Ii: Instantaneous current setting
❼ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
❽ Test terminal: OCR test terminal (Connected with OCR tester)
❾ Rating Plug: Rated current (In) and frequency selection

## Protection




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Long time** | | | | | | | | | | |
| Current setting (A) | Ir = Iu×... | | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | |
| Time delay (s) | tr@(1.5×Ir) | | 12.5 | 25 | 50 | 100 | 200 | 300 | 400 | 500 |
| Accuracy : ±15% or | tr@(6.0×Ir) | | 0.5 | 1 | 2 | 4 | 8 | 12 | 16 | 20 |
| below 100ms | tr@(7.2×Ir) | | 0.34 | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11 | 13.8 |
| **Short time** | | | | | | | | | | |
| Current setting (A) Accuracy : ±10% | Isd = Ir×... | Cat. B | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | 10 Off |
| | | Cat. A | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | (Not set) Off |
| Time delay (s) @10×Ir | tsd | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | |
| **Instantaneous** | | | | | | | | | | |
| Current setting (A) | Ii = In×... | | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 Off |
| Tripping time | | | below 50ms | | | | | | | |
| **Ground fault** | | | | | | | | | | |
| Pick-up (A) Accuracy : ±10%(Ig>0.4In) ±20%(Ig≤0.4In) | Ig = In×... | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 Off |
| Time delay (s) @10×Ir | tg | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | |




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Earth leakage (Option)** | | | | | | | | | | |
| Current setting (A) | I△n | | 0.5 | 1 | 2 | 3 | 5 | 10 | 20 | 30 Off |
| Time delay (ms) Accuracy : ±15% | △t | Alarm Time (ms) | 140 | 230 | 350 | 800 | 950 | | | |
| | | Trip Time (ms) | 140 | 230 | 350 | 800 | | | | |

Note) Earth leakage function is available with ZCT or external CT

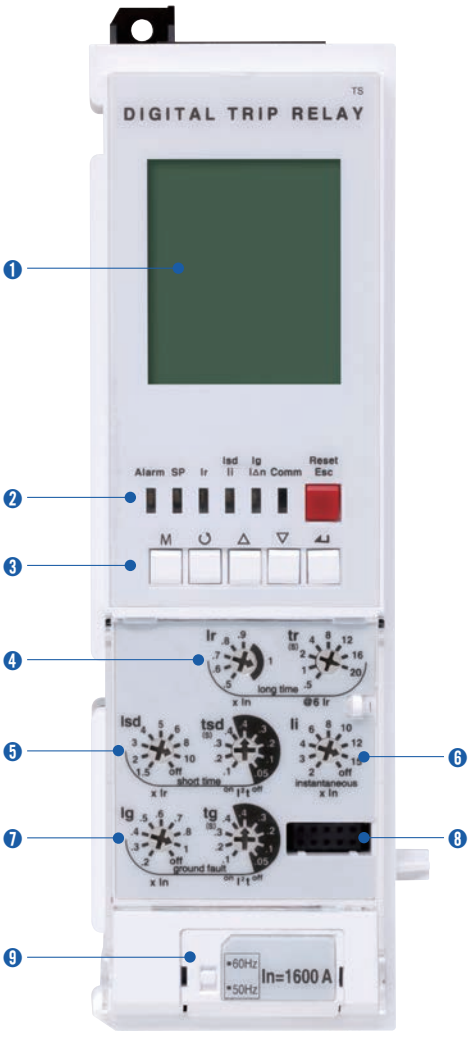
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Earth leakage (Option)** | | | | | | | | | | |
| Current setting (A) | Ip = Ir×... | | 0.6 | 0.65 | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 1 |
| Time delay (ms) Accuracy : ±15% | tp@(1.2×Ip) | | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 Off |

| Other protection | | Pick-up | | | Time delay(s) | | |
|---|---|---|---|---|---|---|---|
| | | Setting range | Step | Accuracy | Setting range | Step | Accuracy |
| Under voltage | | 80V ~ OV_Pick-up | 1V | ±5% | 1.2~40 | 0.1 | ±0.1 |
| Over voltage | | UV_Pick-up ~ 980V | 1V | ±5% | | | |
| Voltage unbalance | | 6% ~ 99% | 1% | ±2.5% or (*±10%) | | | |
| Reverse power | | 10 ~ 500kW | 1kW | ±10% | 0.2~40 | | |
| Over power | | 500~5000 kW | 1kW | ±10% | | | |
| Current unbalance | | 6% ~ 99% | 1% | ±2.5% or (*±10%) | 1.2~40 | | |
| Over frequency | 60Hz | UF_Pick-up ~ 65 | 1Hz | ±0.1Hz | | | |
| | 50Hz | UF_Pick-up ~ 55 | 1Hz | ±0.1Hz | | | |
| Under frequency | 60Hz | 55Hz ~ OF_Pick-up | 1Hz | ±0.1Hz | | | |
| | 50Hz | 45Hz ~ OF_Pick-up | 1Hz | ±0.1Hz | | | |

## S type: 「Supreme meter」 type

■ Overload protection
– Long-time delay – Thermal
■ Short-circuit protection
– Short-time delay/Instantaneous
– I²t On/Off optional (for short-time delay)
■ Ground fault protection
– I²t On/Off optional
■ Protection for Over voltage/Under voltage/Over frequency/ Under frequency/Unbalance/Reverse power
■ Realization of protective coordination by ZSI (Zone Selective Interlocking)
■ The fine-adjustable setting by knob and key
■ IDMTL setting (SIT, VIT, EIT, DT curve)
– Basic setting : “None”. Thermal curve.
■ Measurement and display function
– High detailed measurement for 3 phase current/Voltage/ Power/Energy/Phase angle/Frequency/PF/Demand
– 128 x 128 Graphic LCD
– Indicates current/voltage vector diagram and waveform

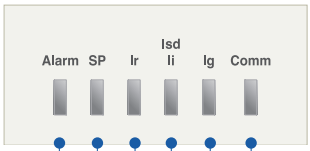
■ Fault recording
– Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
■ Event recording
– Records events of device related to setting change, operation and state change. (Max. up to 256)
■ SBO (Select Before Operation)
– High reliability for control and setting change method
■ 3 DO (Digital output)
– Programmable for alarm, trip and general DO
■ Communication
– Modbus/RS485 – Profibus–DP
■ Rating Plug for selection of rated current(In) and frequency
• Rating Plug type
– 800AF: 400, 600, 630, 800A (4 types)
– 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
• Frequency selection switch: set to 50Hz or 60Hz




* When communication is flashing phone icon on the LCD.

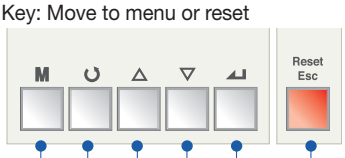
❶ LCD: Indication of measurement and information

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Comm: LED indicating comm. state (Blink when running) *
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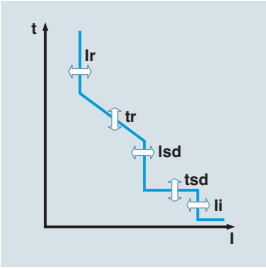
❸ Key: Move to menu or reset



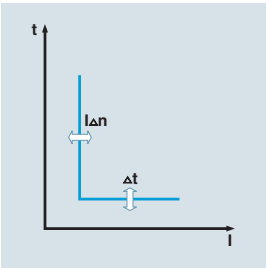

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Enter: Enter into secondary menu or setting input
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❹ Ir: Long-time current setting, tr: Long-time tripping delay setting
❺ Isd: Short-time current setting, tsd: Short-time tripping delay setting
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❼ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
❽ Test terminal: OCR test terminal (Connected with OCR tester)
❾ Rating Plug: Rated current (In) and frequency selection

## Protection




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Long time** | | | | | | | | | | |
| Current setting (A) | Iu = Iu×... | | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | |
| Time delay (s) | tr@(1.5×Ir) | | 12.5 | 25 | 50 | 100 | 200 | 300 | 400 | 500 |
| Accuracy : ±15% or | tr@(6.0×Ir) | | 0.5 | 1 | 2 | 4 | 8 | 12 | 16 | 20 |
| below 100ms | tr@(7.2×Ir) | | 0.34 | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11 | 13.8 |
| **Short time** | | | | | | | | | | |
| Current setting (A) | Isd = Ir×... | Cat. B | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | 10 | Off |
| Accuracy : ±10% | | Cat. A | 1.5 | 2 | 3 | 4 | 5 | 6 | 8 | (Not set) | Off |
| Time delay (s) | tsd | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| @10×Ir | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | |
| **Instantaneous** | | | | | | | | | | |
| Current setting (A) | Ii = In×... | | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time | | | below 50ms | | | | | | | |
| **Ground fault** | | | | | | | | | | |
| Pick-up (A)<br>Accuracy : ±10%(Ig>0.4In)<br>±20%(Ig≤0.4In) | Ig = In×... | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| Time delay (s) | tg | I²t Off | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| @10×Ir | | I²t On | | 0.1 | 0.2 | 0.3 | 0.4 | | | |
| | (I²t Off) | Min. Trip Time (ms) | 20 | 80 | 160 | 260 | 360 | | | |
| | | Max. Trip Time (ms) | 80 | 140 | 240 | 340 | 440 | | | |




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Earth leakage (Option)** | | | | | | | | | | |
| Current setting (A) | I△n | | 0.5 | 1 | 2 | 3 | 5 | 10 | 20 | 30 | Off |
| Time delay (ms)<br>Accuracy : ±15% | △t | Alarm Time (ms) | 140 | 230 | 350 | 800 | 950 | | | | |
| | | Trip Time (ms) | 140 | 230 | 350 | 800 | | | | | |

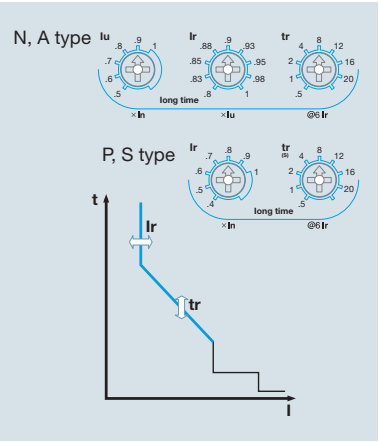
Note) Earth leakage function is available with ZCT or external CT

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Earth leakage (Option)** | | | | | | | | | | |
| Current setting (A) | Ip = Ir×... | 0.6 | 0.65 | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 | 1 |
| Time delay (ms)<br>Accuracy : ±15% | tp@(1.2×Ip) | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | Off |

| Other protection | | Pick-up | | | Time delay(s) | | |
|---|---|---|---|---|---|---|---|
| | | Setting range | Step | Accuracy | Setting range | Step | Accuracy |
| Under voltage | | 80V ~ OV_Pick-up | 1V | ±5% | 1.2~40 | 0.1 | ±0.1 |
| Over voltage | | UV_Pick-up ~ 980V | 1V | ±5% | | | |
| Voltage unbalance | | 6% ~ 99% | 1% | ±2.5% or (*±10%) | | | |
| Reverse power | | 10 ~ 500kW | 1kW | ±10% | 0.2~40 | | |
| Over power | | 500~5000 kW | 1kW | ±10% | | | |
| Current unbalance | | 6% ~ 99% | 1% | ±2.5% or (*±10%) | 1.2~40 | | |
| Over frequency | 60Hz | UF_Pick-up ~ 65 | 1Hz | ±0.1Hz | | | |
| | 50Hz | UF_Pick-up ~ 55 | 1Hz | ±0.1Hz | | | |
| Under frequency | 60Hz | 55Hz ~ OF_Pick-up | 1Hz | ±0.1Hz | | | |
| | 50Hz | 45Hz ~ OF_Pick-up | 1Hz | ±0.1Hz | | | |

# Operation characteristics

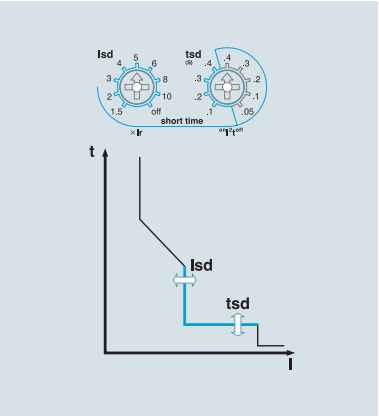
## Long-time delay (L)




**The function for overload protection which has time delayed characteristic in inverse ratio to fault current.**

1. Standard current setting knob: Ir
   1) Setting range in P type and S type: (0.4–0.5–0.6–0.7–0.8–0.9–1.0)×In
   2) Setting range in N type and A type: (0.4 ~ 1.0)×In
      – Iu: (0.5–0.6–0.7–0.8–0.9–1.0) ×In
      – Ir: (0.8–0.83–0.85–0.88–0.9–0.93–0.95–0.98–1.0)×Iu
2. Time delay setting knob: tr
   – Standard operating time is based on the time of 6×Ir
   – Setting range: 0.5–1–2–4–8–12–16–20 sec
3. Relay pick-up current
   – When current over (1.15)×Ir flows in, relay is picked up.
4. Relay operates basing on the largest load current among R/S/T/N phase.

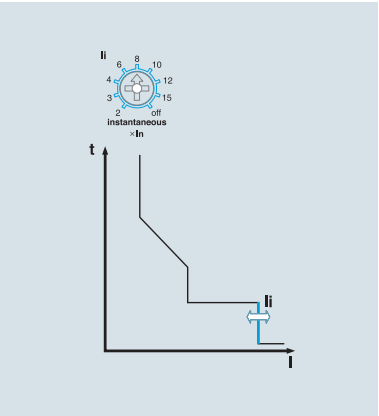
## Short-time delay (S)




**The function for fault current (over current) protection which has definite time characteristic and time delayed in inverse ratio to fault current.**

1. Standard current setting knob: Isd
   – Setting range: (Cat B: 1.5–2–3–4–5–6–8–10–Off)
   (Cat A: 1.5–2–3–4–5–6–8–Off)
2. Time delay setting knob: tsd
   – Standard operating time is based on the time of 10×Ir.
   – Inverse time ($I^2t$ On): 0.1–0.2–0.3–0.4 sec
   – Definite time ($I^2t$ Off): 0.05–0.1–0.2–0.3–0.4 sec
3. Relay operates basing on the largest load current among R/S/T/N phase.
4. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.

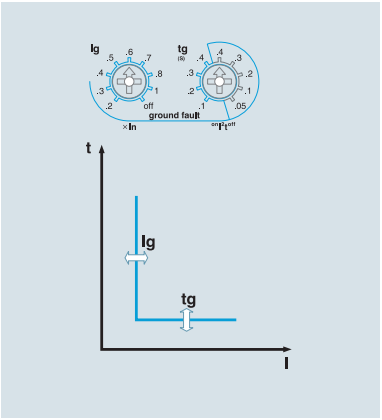
## Instantaneous (I)




**The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.**

1. Standard current setting knob: Ii
   – Setting range: (2–3–4–6–8–10–12–15–Off)×In
2. Relay operates basing on the largest load current among R/S/T/N phase.
3. Total breaking time is below 50ms.

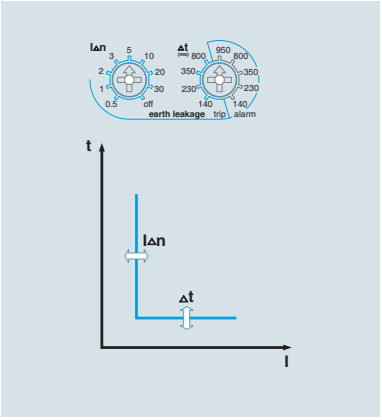
## Ground Fault (G)




**The function for breaking ground fault current above setting value after time-delay to protect the circuit from ground fault.**

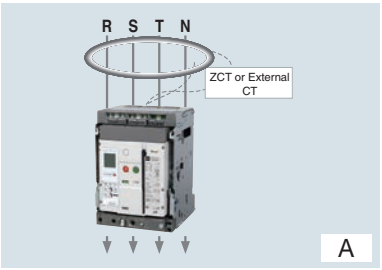
1. Standard setting current knob: Ig
   – Setting range: (0.2–0.3–0.4–0.5–0.6–0.7–0.8–1.0–Off)×In
2. Time delay setting knob: tg
   – Inverse time ($I^2t$ On): 0.1–0.2–0.3–0.4 sec
   – Definite time ($I^2t$ Off): 0.05–0.1–0.2–0.3–0.4 sec
3. Ground fault current is vector sum of each phase current. Therefore, 3pole products may operate under its phase-unbalance including ground fault situations. (R+S+T+(N) Phase)
4. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.
5. Ground-fault functions are basically provided with products equipped with a trip relay through its internal CT that is embedded in each phase. (But, it can't be used with earthleakage protection function at the same time)

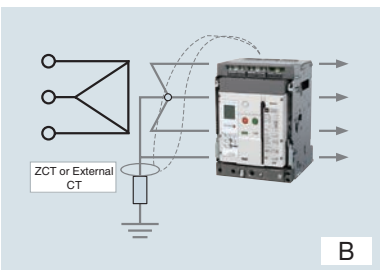
## Earth Leakage (G) - Option




**The function for breaking earth leakage current above setting value after time delay to protect the circuit from earth leakage. (A, P, S type)**

1. Standard setting current knob: I△n
   – Setting range: 0.5–1–2–3–4–5–10–20–30–Off (A)
2. Time delay setting knob: △t
   – Trip time: 140–230–350–800 ms
   – Alarm time: 140–230–350–800–950 ms
3. This function is enabled and can be used only with standard ZCT provided by LS or private external CT (secondary output 5A) selected by customers.




* Use cautions with earth-leakage current settings

- When using a standard ZCT provided by LS, the setting range is from 0.5 to 30A which is based on its primary current. But ACB installed like A type (displayed on the left side) should only be cable-connected and its rated current should be less than 1600A.
- When using other CT selected by customers, the setting range is from 0.5 to 5A based on its secondary current.(Secondary output rating : 5A)
  Hence, under 100:5A CT, if trip relay is set to 0.5A, earth-leakage exceeding 10A will activate its operation (0.5A×20 = 10A)

※ Guideline for the external CT usage

- Earth-leakage protection characteristics using the standard CT which is installed inside of ACB can protect currents from 20 to 100% range on its rated current.
- As rated currents on ACB increases, current that is covered by its standard CT increase as well. This can not protect against small leakage currents.
  ex) 400A ACB Min. Earth-leakage current 400A×20% =80A
  4000A ACB Min. Earth-leakage current 4000A×20% =800A
- Therefore, customers are advised to install an external CT in accordance with its rated currents within its systems. And choose trip relay (E, X type) which is required with external CT usage in order to provide earth-leakage functions.

## Measurement function

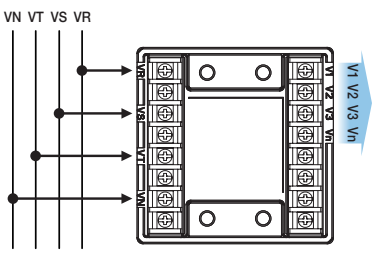
S type / P type / A type

| Class. | Measurement element | Detailed element | Unit | Display range |
|---|---|---|---|---|
| Current | Line current | Ia, Ib, Ic | A | 80A~65,535A |
| | Normal current | $I_1$ | | |
| | Reverse current | $I_2$ | | |
| Voltage | Line voltage | Vab, Vbc, Vca | V | 60~690V |
| | Phase voltage | Va, Vb, Vc | | |
| | Normal voltage | $V_1$ | | |
| | Reverse voltage | $V_2$ | | |
| Angle | Line-to-line, Line-to-current | ∠VabIa, ∠VabIb, ∠VabIc, ∠VabVbc, ∠VabVca | ° | 0~360° |
| | Phase-to-phase | ∠VaVb, ∠VaVc | | |
| | Phase-to-current | ∠VaIa, ∠VbIb, ∠VcIc | | |
| Power | Active power | | kW | 1kW~99999kW |
| | Reactive power | | kVar | 1kVar~99999kVar |
| | Apparent power | | kVA | 1kVA~99999kVA |
| Energy | Active energy | WHa(ab), WHb(bc), WHc(ca), WH | kWh, MWh | 1kWh~9999.99MWh |
| | Reactive energy | VARHa(ab), VARHb(bc), VARHc(ca), VARH | kVarh, Mvarh | 1kVarh~9999.99MVarh |
| | Reverse active energy | rWHa(ab), rWHb(bc), rWHc(ca), rWH | kWh, MWh | 1kWh~9999.99MWh |
| Freq. | Frequency (F) | Frequency | Hz | 45~65Hz |
| Power factor | Power factor (PF) | PFa(ab), PFb(bc), PFc(ca), PF | | + : Lead<br>– : Lag |
| Unbalance | Unbalance rate | Iunalance, Vunbalance | % | 0.0~100.0 |
| Demand | Active power demand | Peak demand | kW | 1kW~99999kW |
| | Current demand | Peak demand | A | 80A~65535A |
| Harmonics | Voltage harmonics | 1st~63th harmonics of Va(ab),Vb(bc),Vc(ca) | V | 60~690V |
| | Current | 1st~63th harmonics of Ia,Ib,Ic | A | 80A~65535A |
| | THD, TDD | | % | 0.0~100.0 |
| | K–Factor | | – | 0.0~100.0 |

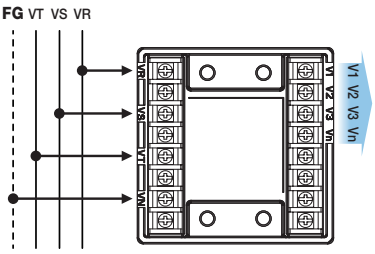


## Voltage Module

P and S type Trip relay, separate voltage module is necessary to measure other element besides current (Seperate purchase is needed)
- Voltage input range: AC 60~690V




3P4W wiring

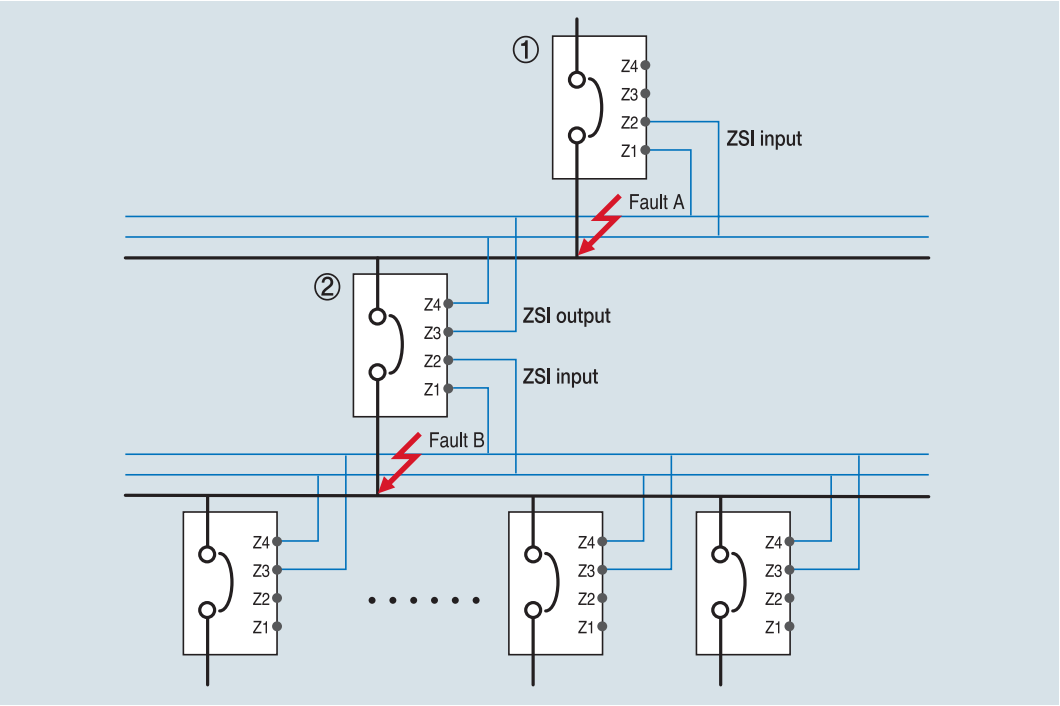



3P3W wiring

# ZSI–Zone Selective Interlocking (A, P, S type)

**Zone-selective interlocking drops delay time that eliminates faults for breakers.**
**It minimizes the shock that all kinds of electric machineries get under fault conditions.**

1. In case of that short time-delay or ground fault accident occurs at ZSI built in system, the breaker at accident site sends ZSI signal to halt upstream breaker's operation.
2. To eliminate a breakdown, trip relay of ACB at accident site activates trip operation without time delay.
3. The upstream breaker that received ZSI signal adhere to pre-set short time-delay or ground fault time-delay for protective coordination in the system.
   However upstream breaker that did not receive its signal will trip instantaneously.
4. For ordinary ZSI operation, it should arrange operation time accordingly so that downstream circuit breakers will react before upstream ones under overcurrent/short time delay/ ground fault situations.
5. ZSI connecting line needs to be Max. 3m.




1) Occurrence of fault A
   - Only breaker ① performs instantaneous trip operation.
2) Occurrence of fault B
   - Breaker ② performs instantaneous trip operation,
     breaker ① performs trip operation after prearranged delay time
   - But if breaker ② did not break the fault normally,
     breaker ① performs instantaneous trip operation to protect system.

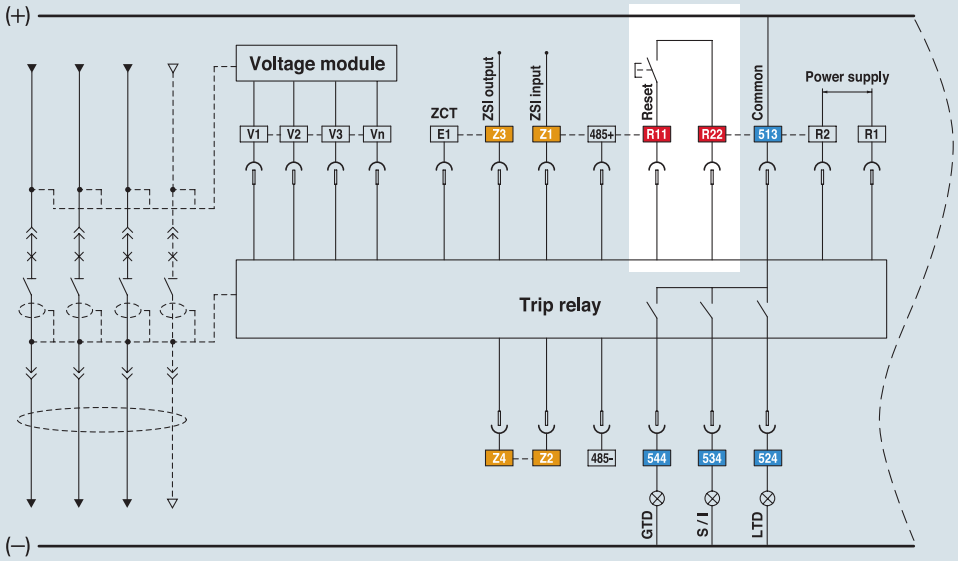
## Remote reset and digital I/O (A, P, S type)

**In case of that ACB operates due to accidents or over current,
Trip relay indicates the information of the accident through the LED and LCD.
Trip relay A, P and S type is possible to perform the remote reset by digital input,
and have 3 DO(Digital output).**

1. Methods to reset Trip relay is to push the Reset button on the frontal side and to use the remote reset.
2. Digital input
   - [R11-R22] input: Remote reset
   - [Z1-Z2] Input: ZSI input
   - [E1-E2] Input: ZCT for earth leakage detection or external CT input

※ All DI are dry contact that has 3.3V of recognition voltage. When inputting close by SSR(Solid State Relay) or open-collector, connect collector (Drain) to R11.

3. Digital output 3a(524, 534, 544-513)
   - Fault output: Long/Short time delay, Instantaneous, Ground fault, UVR, OVR, UFR, OFR, rPower, Vunbal, Iunbal
     (Maintains state as Latch form until user pushes reset.)
   - General DO: when setting L/R as remote, it is available to control close/open remotely by using communication.

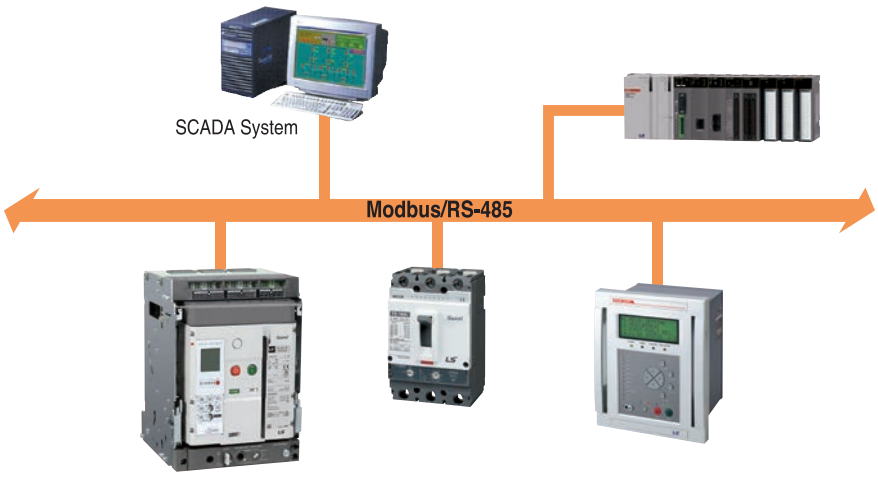



| Trip Relay | Digital Output | Long time | Short time | Instantaneous | Ground | Overload Alarm | OVR | UVR | rPower | Vunbal | Iunbal | OFR | UFR | OPR | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P,S type | DO1(524) | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Programmable |
| | DO2(534) | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| | DO3(544) | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| A type | DO1(524) | ● | × | × | × | Not available | | | | | | | | | Fixed |
| | DO2(534) | × | ● | ● | × | | | | | | | | | | |
| | DO3(544) | × | × | × | ● | | | | | | | | | | |

# Communication

## Modbus/RS-485

- Operation mode: Differential
- Distance: Max. 1.2km
- Cable: General RS-485 shielded twist 2–Pair cable
- Baud rate: 9600bps, 19200bps, 38400bps
- Transmission method: Half-Duplex
- Termination: 100Ω

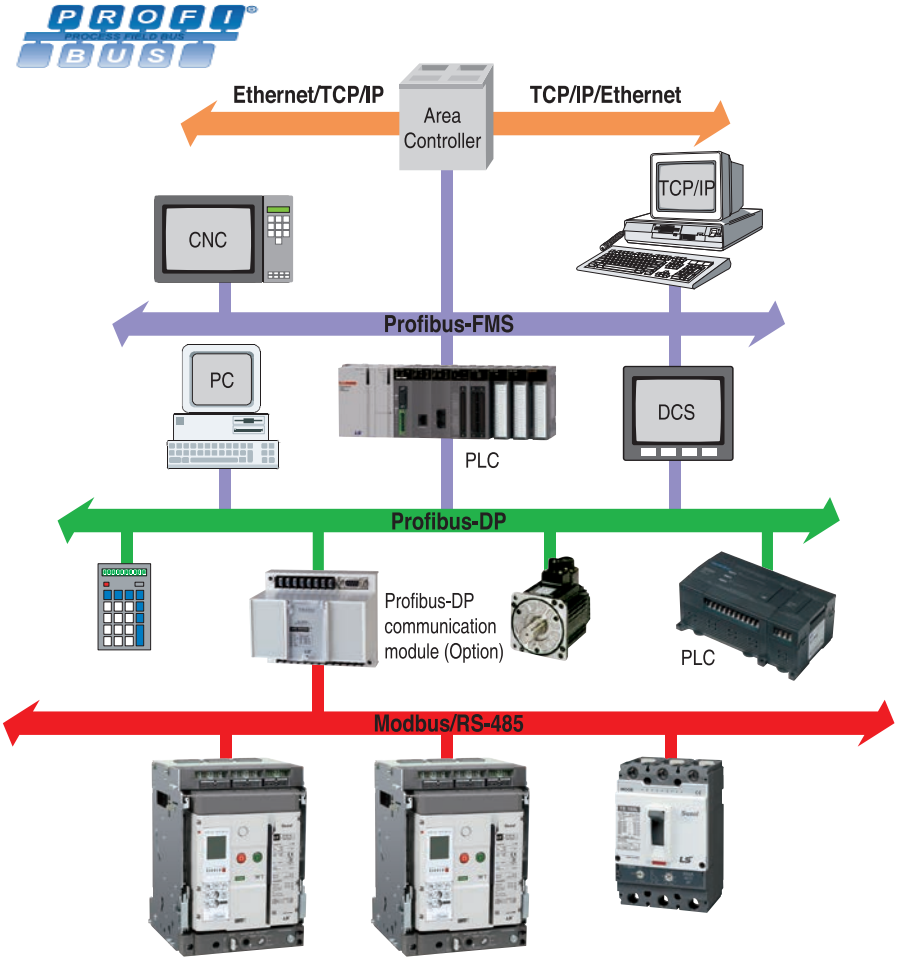



## Profibus-DP

- Profibus-DP module is installed separately (Option)
- Operation mode: Differential
- Distance: Max. 1.2km
- Cable: Profibus–DP Shielded twist 2–Pair cable
- Baud rate: 9600bps~12Mbps
- Transmission method: Half-Duplex
- Termination:100Ω
- Standard: EN 50170/DIN 19245



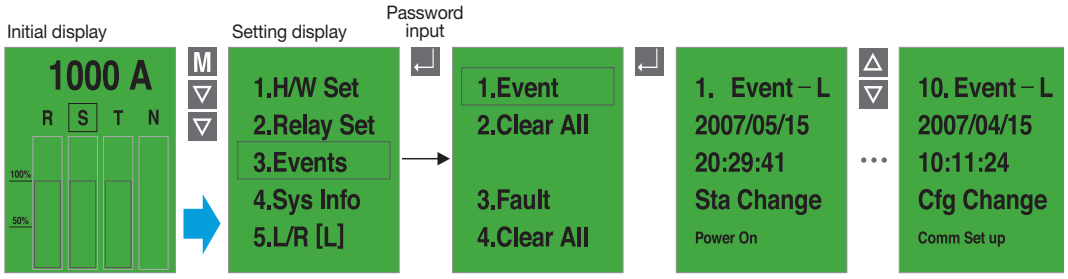
Profibus-DP communication module (Option)



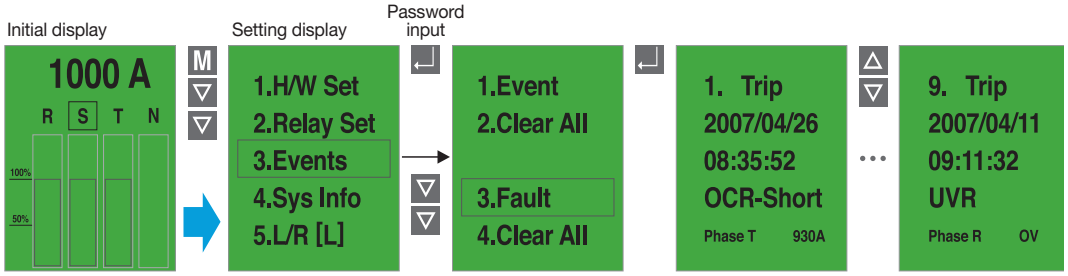
## Event & Fault Recording (P, S type)

When there are events such as setting change, Info. change, error of self-diagnose, state change, P and S type record Max. up to 256 information of the events in accordance with time(ms). In addition, they can record Max. up to 256(up to 10 for A type) information of the faults such as fault cause, fault phase, fault value and so on in accordance with time(ms).

### Event information display




### Fault information display

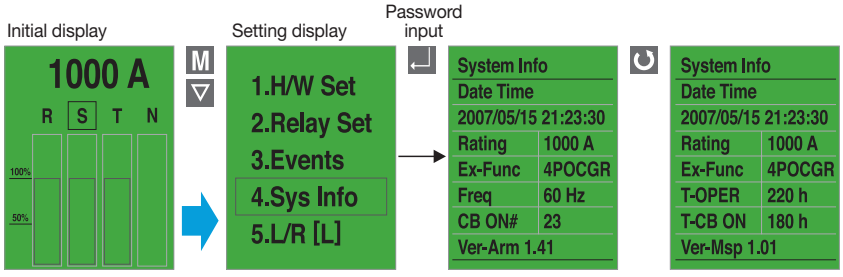



## System Information

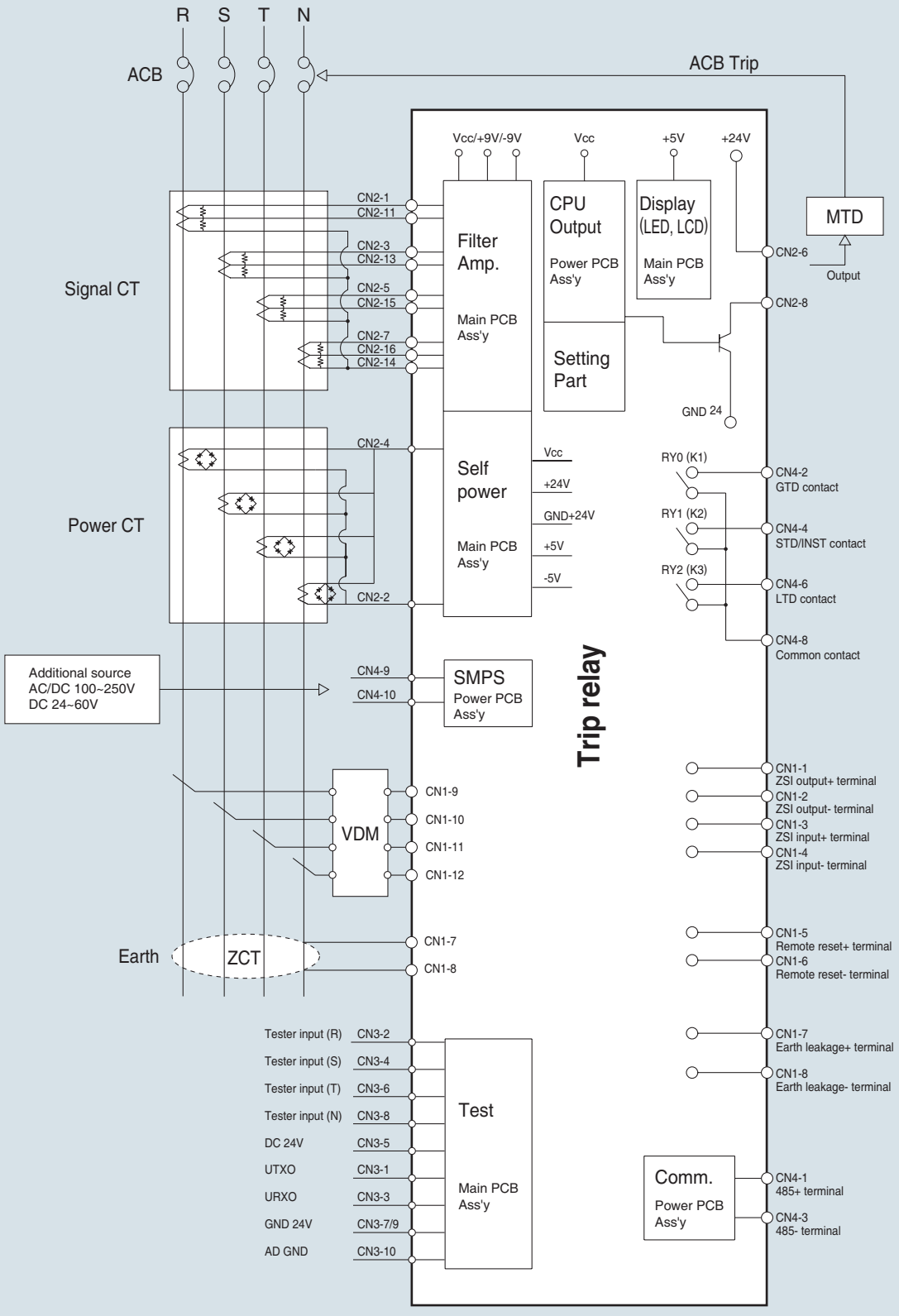
P and S type can indicate information as followings with the information of the ACB.

- Present time: year/month/date/hour/minute/ms
- Ex–Func: Special function (3P OCGR, 4P OCGR, Ex OCGR)
- Closing numbers of breaker: CB ON numbers
- ON time of breaker: CB ON time
- ACB current ratings
- Frequency information: 60Hz / 50Hz
- Trip relay operating time: OCR ON time
- S/W ver. information

### System information display

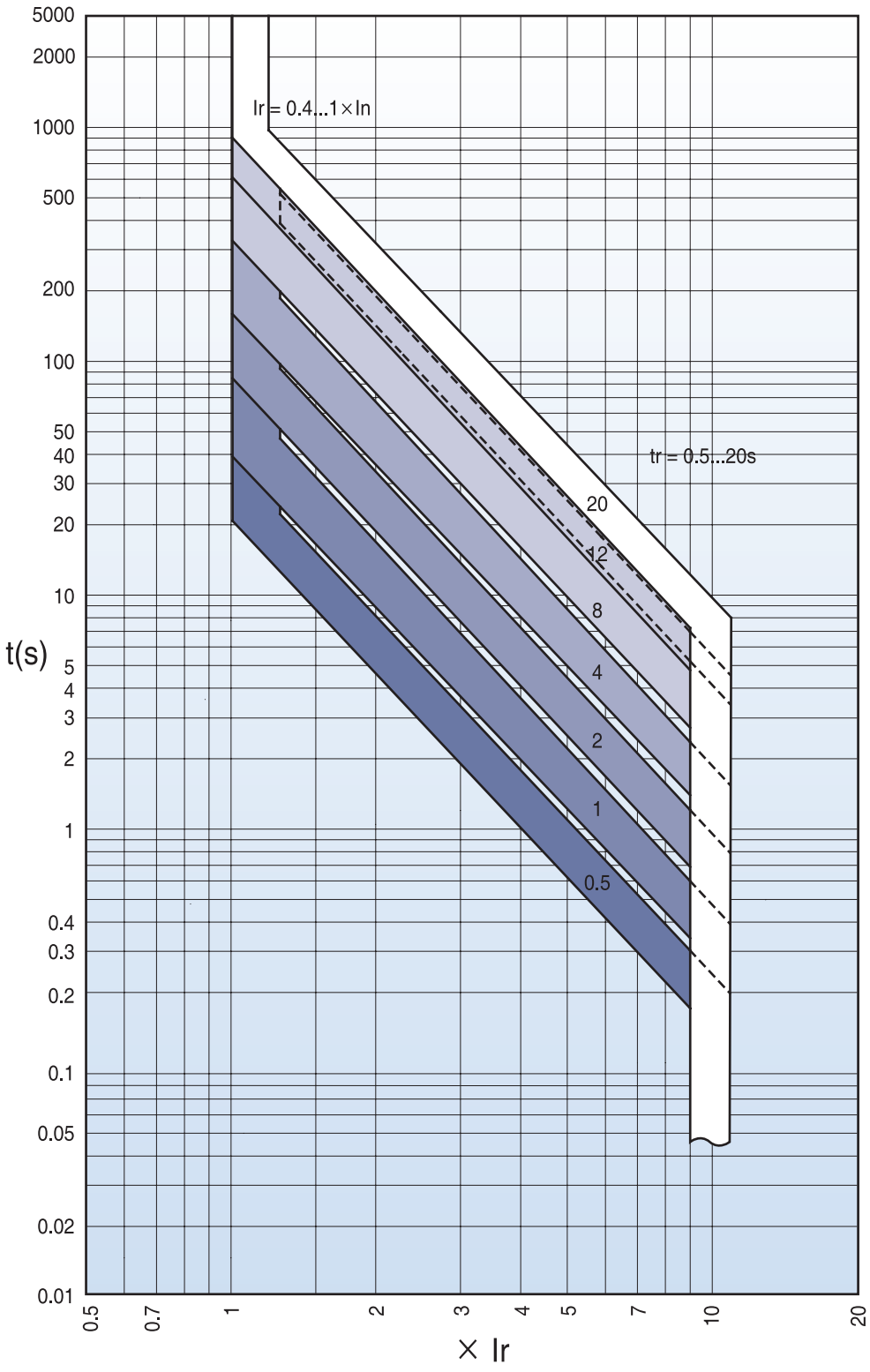


# System block diagram

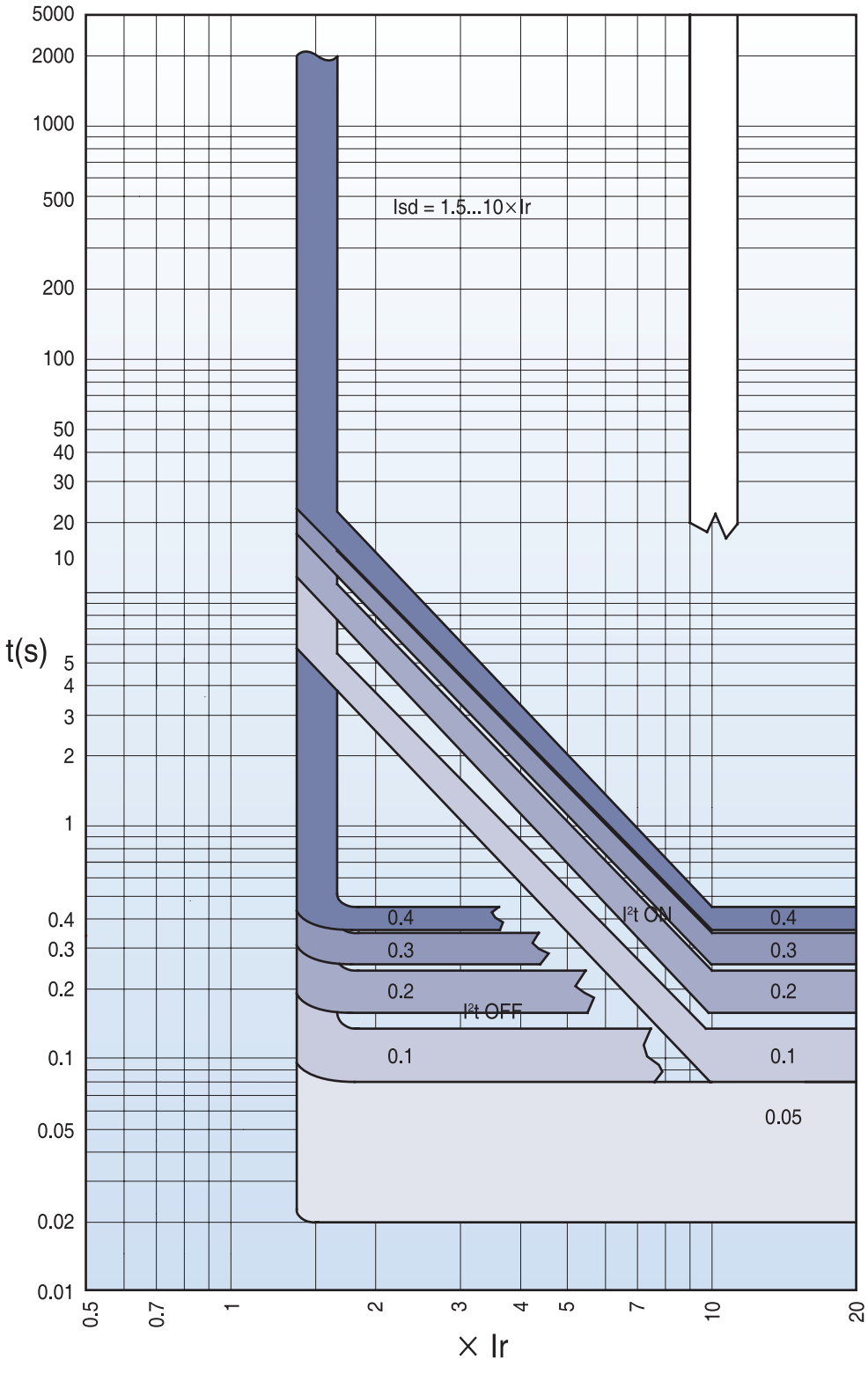


## Characteristics curves

### Long-time delay (L)

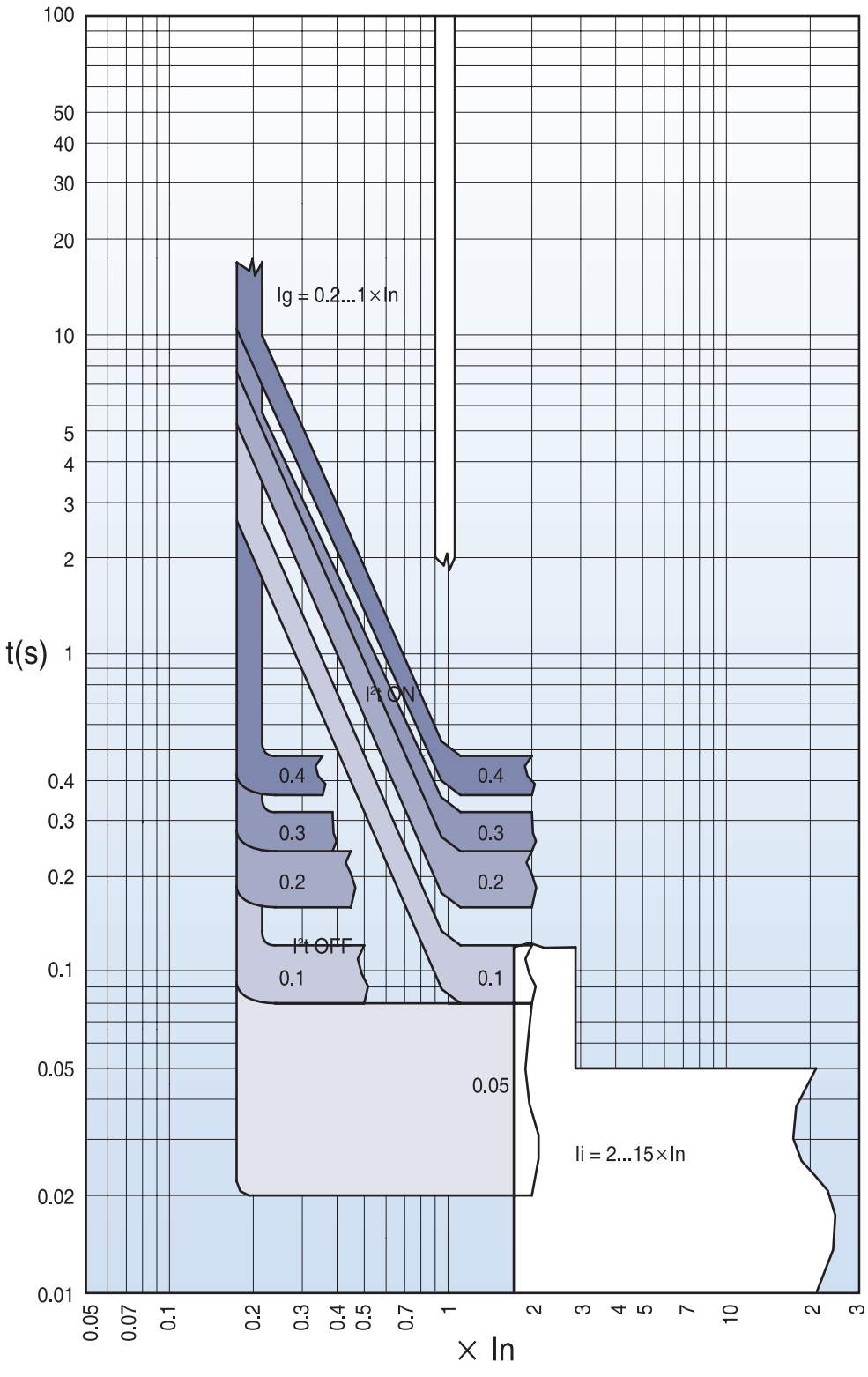


## Short-time delay (S)

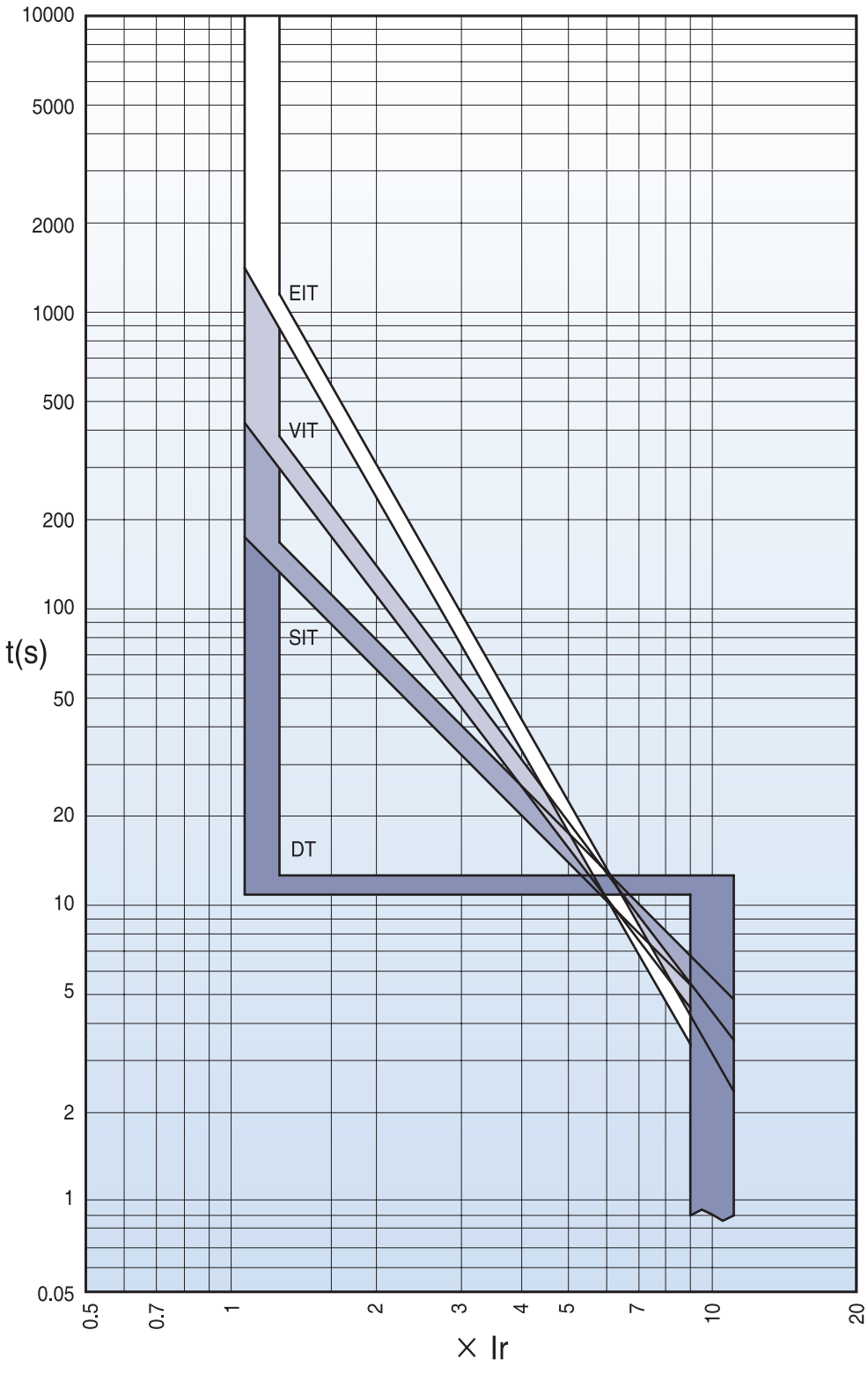


## Characteristics curves

### Instantaneous (I)
### Ground fault (G)



## IDMTL


10000
5000
2000
1000
500
200
100
50
20
10
5
2
1
0.05
t(s)
EIT
VIT
SIT
DT
0.5
0.7
1
2
3
4
5
7
10
20
× Ir

## Main body





| Mounting | Accessories | | Supply category | | Remark Note) | Page |
|---|---|---|---|---|---|---|
| | | | Standard | Option | | |
| Internal | SHT 1 | Shunt Coil | - | ○ | * | 48 |
| | SHT 2 | Double Shunt Coil | - | ○ | * | 49 |
| | CC | Closing Coil | - | ○ | * | 50 |
| | M | Motor | - | ○ | * | 51 |
| | CS1 | Charge Switch | - | ○ | * | |
| | UVT | Under Voltage Trip Device | - | ○ | * | 52 |
| | AL | Trip Alarm Contact | - | ○ | * | 53 |
| | MRB | Manual Reset Button | - | ○ | * | 54 |
| | RES | Remote Reset Switch | - | ○ | * | 55 |
| | RCS | Ready to Close Switch | - | ○ | * | 56 |
| | C | Counter | - | ○ | * | 56 |
| | FX | Auxiliary Switch | ● | - | * | 58 |
| External | K1 | Key Lock | - | ○ | * | 57 |
| | K2 | Key Interlock Set | - | ○ | * | 57 |
| | B | ON/OFF Button Lock | - | ○ | * | 58 |
| | LH | Lifting Hook | - | ○ | - | 59 |
| | CTD | Condenser Trip Device | - | ○ | - | 59 |
| | DC | Dust Cover | - | ○ | - | 61 |
| | OT | OCR Tester | - | ○ | - | 60 |
| | A | Automatic Connector | ● | - | * | |

* Seperate purchasing is not allowed. Each item should be purchased with the main body.

# Cradle



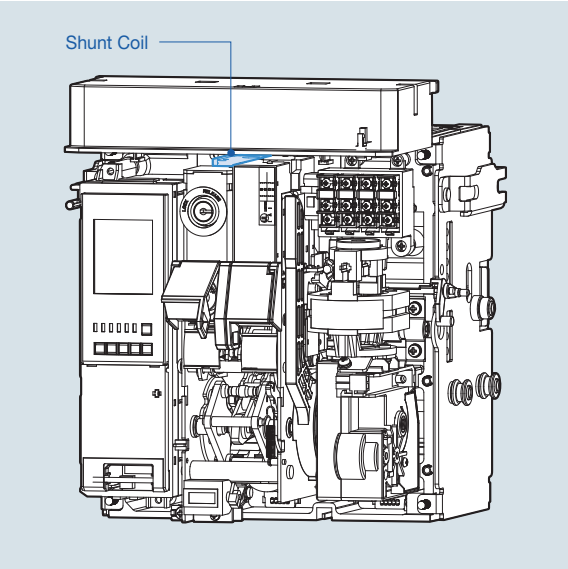


| Mounting | Accessories | | Supply category | | Remark Note) | Page |
|---|---|---|---|---|---|---|
| | | | Standard | Option | | |
| Trip relay | N | N type | - | ○ | * | 26 |
| | A | A type | - | ○ | * | 28 |
| | P | P type | - | ○ | * | 30 |
| | S | S type | - | ○ | * | 32 |
| | VM | Voltage Module | - | ○ | ** | 36 |
| | ZCT | ZCT for the earth leakage | - | ○ | | |
| Cradle | MI | Mechanical Interlock | - | ○ | | 63 |
| | ST | Safety Shutter | - | ○ | * | 64 |
| | DF | Door Frame | - | ○ | | 64 |
| | MIP | Miss Insertion Prevent Device | - | ○ | | 69 |
| | MOC | Mechanical Operated Cell Switch | - | ○ | | 62 |
| | CEL | Cell Switch | - | ○ | | 66 |
| | DI | Door Interlock | - | ○ | | 67 |
| | ZAS | Zero Arc Space (Arc Cover) | ● | - | * | 67 |
| | SC | Safety Control Cover | ● | - | * | |
| | RI | Racking Interlock | - | ○ | | 68 |
| | PL | Pad Lock/Position Lock | ● | - | * | 68 |
| | IB | Interphase Barrier | ● | - | - | 65 |
| | UDC | UVT time delay controller | - | ○ | | 70 |
| | ADP | Compatible Adapter | - | ○ | - | |
| Other | RPH | Reverse Phase ACB | - | ○ | - | |
| | VAD | Various Connection Type | - | ○ | - | |
| | RCO | Remote I/O | - | ○ | - | 71 |
| | PC | Profibus-DP comm. module | - | ○ | - | |

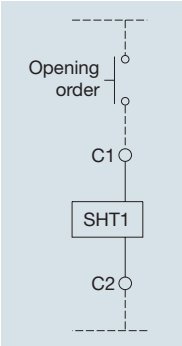
* Seperate purchasing is not allowed. Each item should be purchased with the main body.
** Voltage module should be purchased with P/S type trip relay.

## Shunt Coil [SHT1]






- SHT1 is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 200ms to coil terminals (C1, C2).
- When UVT coil is installed, its location is changed.




Wiring Diagram

### 1. Rated voltage and characteristics of trip coil

| Rated voltage (Vn) | | Operating voltage range (V) | Power consumption (VA or W) | | Trip time (ms) |
|---|---|---|---|---|---|
| DC (V) | AC (V) | | Inrush | Steady-state | |
| 24~30 | – | 0.7~1.1 Vn | 200 | 5 | 40 |
| 48~60 | 48 | 0.7~1.1 Vn | | | |
| 100~130 | 100~130 | 0.7~1.1 Vn | | | |
| 200~250 | 200~250 | 0.7~1.1 Vn | | | |
| – | 380~480 | 0.7~1.1 Vn | | | |

Note) Operating voltage range is the min. rated voltage standard for each rated voltage (Vn).

### 2. Specification of the wire

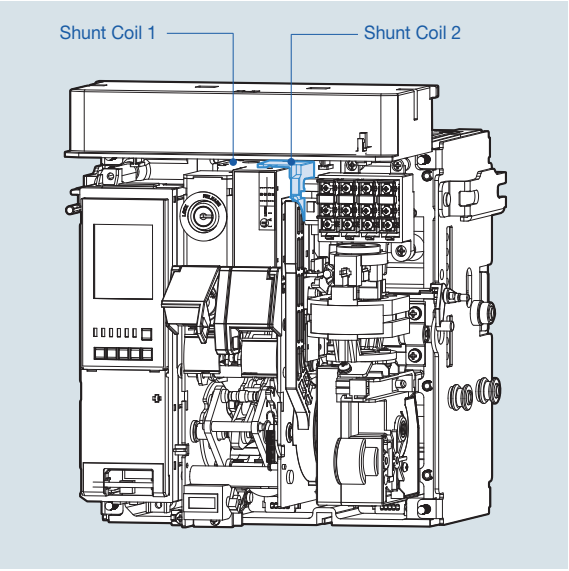
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

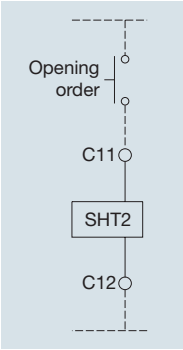
| | | Rated voltage (Vn) | | | |
|---|---|---|---|---|---|
| | | DC 24~30V | | DC/AC 48V | |
| Wire type | | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) |
| Operating voltage | 100% | 95.7m | 61m | 457.8m | 287.7m |
| | 85% | 62.5m | 38.4m | 291.7m | 183.2m |

# Double Shunt Coil [SHT2]






- SHT2 is a control device which trips a circuit breaker doubly from the outside. When SHT1 doesn't operate normally, it can trip a circuit breaker safely.
- Shunt coil 1: Install it at existing location.
- Shunt coil 2: Install it on the right side of the Shunt coil 1
- It is not available with UVT coil when installing double shunt coil.




Wiring Diagram

### 1. Rated voltage and characteristics of trip coil

| Rated voltage (Vn) | | Operating voltage range (V) | Power consumption (VA or W) | | Trip time (ms) |
|---|---|---|---|---|---|
| DC (V) | AC (V) | | Inrush | Steady-state | |
| 24~30 | – | 0.7~1.1 Vn | 200 | 5 | 40 |
| 48~60 | 48 | 0.7~1.1 Vn | | | |
| 100~130 | 100~130 | 0.7~1.1 Vn | | | |
| 200~250 | 200~250 | 0.7~1.1 Vn | | | |
| – | 380~480 | 0.7~1.1 Vn | | | |

Note) Operating voltage range is the min. rated voltage standard for each rated voltage (Vn).

### 2. Specification of the wire

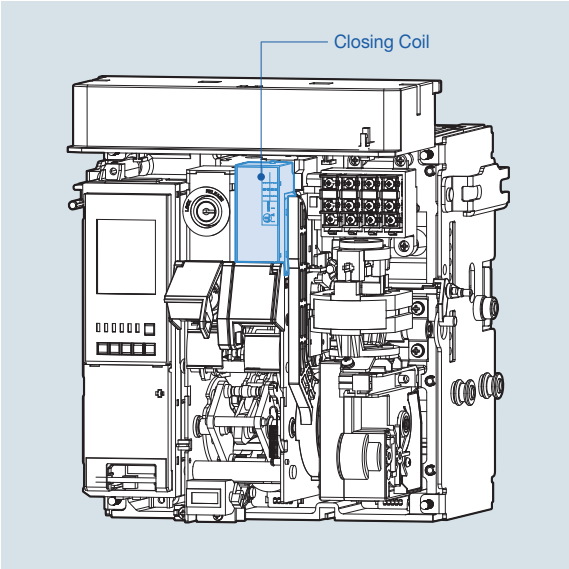
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

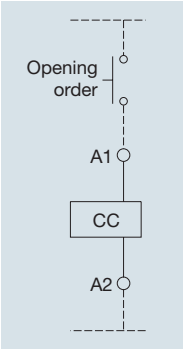
| | | Rated voltage (Vn) | | | |
|---|---|---|---|---|---|
| | | DC 24~30V | | DC/AC 48V | |
| Wire type | | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) |
| Operating voltage | 100% | 95.7m | 61m | 457.8m | 287.7m |
| | 85% | 62.5m | 38.4m | 291.7m | 183.2m |

## Closing Coil [CC]






- It is a control device which closes a circuit breaker, when the voltage is applied continuously or instantaneously over 200ms to the coil terminals (A1, A2).




Wiring Diagram

### 1. Rated voltage and characteristics of closing coil

| Rated voltage (Vn) | | Operating voltage range (V) | Power consumption (VA or W) | | Trip time (ms) |
|---|---|---|---|---|---|
| DC (V) | AC (V) | | Inrush | Steady-state | |
| 24~30 | – | 0.85~1.1 Vn | 200 | 5 | 80 |
| 48~60 | 48 | 0.85~1.1 Vn | | | |
| 100~130 | 100~130 | 0.85~1.1 Vn | | | |
| 200~250 | 200~250 | 0.85~1.1 Vn | | | |
| – | 380~480 | 0.85~1.1 Vn | | | |

Note) Operating voltage range is the min. rated voltage standard for each rated voltage (Vn).

### 2. Specification of the wire

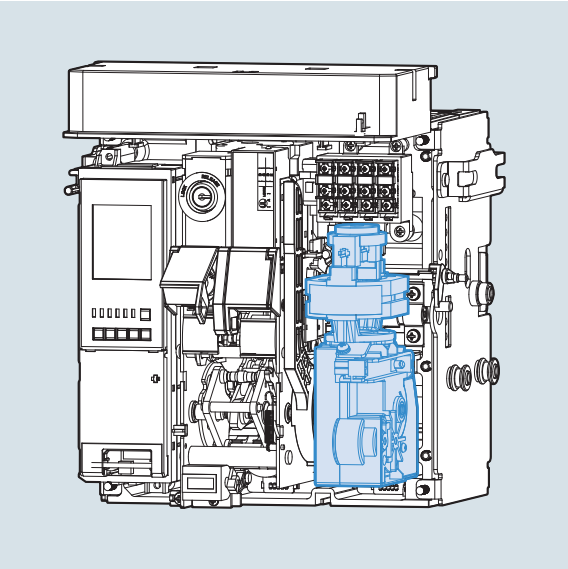
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

| | | Rated voltage (Vn) | | | |
|---|---|---|---|---|---|
| | | DC 24~30V | | DC/AC 48V | |
| Wire type | | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) |
| Operating voltage | 100% | 95.7m | 61m | 457.8m | 287.7m |
| | 85% | 62.5m | 38.4m | 291.7m | 183.2m |

# Motor [M]



- Charge the closing spring of a circuit breaker by the external power source. Without the external power source, charge manually.
- Operating voltage range (IEC 60947) 85%~110%Vn

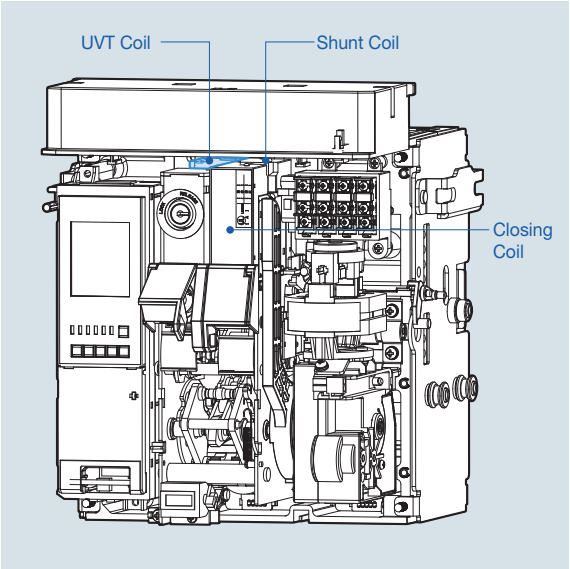
| Input voltage (V) | DC 24~30V | AC/DC 48~60V | AC/DC 100~130V | AC/DC 200~250V | AC 380V | AC 440~480V |
|---|---|---|---|---|---|---|
| Load current (max.) | 5A | 3A | 1A | 0.5A | 0.3A | 0.3A |
| Starting current (Max.) | 5 times of load current | | | | | |
| Load rpm (Motor) | 15000~19000 rpm | | | | | |
| Charge time | Less than 3sec. | | | | | |
| Dielectric strength | 2kV/min | | | | | |
| Using temperature range | -20°~ 60° | | | | | |
| Using humidity range | Max. RH 80% (No dew condensation) | | | | | |
| Endurance | 15,000 cycle (Load connection, 2 times/min) | | | | | |
| Charge switch | 10A at 250VAC | | | | | |

# Charge Switch [CS1]

- It is a built-in contact which sends the signal to the outside, when motor charging is completed. (1a)
- It has a “1a” contact built-in for complete charging.
- 10A at 250VAC

## Under Voltage Trip Device [UVT]






- If the voltage of the main or the control power is under voltage, UVT which is installed inside of the breaker breaks the circuit automatically.
  Please connect with UVT time-delay device in order to present the time-delay function because UVT is technically instantaneous type.
- The closing of a circuit breaker is impossible mechanically or electrically if control power not supplied to UVT.
  To close the circuit breaker, 65~85% of rated voltage should be applied to both terminals of UVT coil (D1, D2).
- When using UVT coil, the double trip coil can not be used, and the location of trip coil is changed.

### 1. Rated voltage and characteristics of UVT coil

| Rated voltage (Vn) | | Operating voltage range (V) | | Power consumption (VA or W) | | Trip time (ms) |
|---|---|---|---|---|---|---|
| DC (V) | AC (V) | Pick up | Drop out | Inrush | Steady-state | |
| 24~30 | – | 0.65~0.85 Vn | 0.4~0.6 Vn | 200 | 5 | 50 |
| 48~60 | 48 | | | | | |
| 100~130 | 100~130 | | | | | |
| 200~250 | 200~250 | | | | | |
| – | 380~480 | | | | | |

Note) Operating voltage range is the min. rated voltage standard for each rated voltage (Vn).

### 2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

| | | Rated voltage (Vn) | | | |
|---|---|---|---|---|---|
| | | DC 24~30V | | DC/AC 48V | |
| Wire type | | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) | #14 AWG (2.08mm²) | #16 AWG (1.31mm²) |
| Operating voltage | 100% | 95.7m | 61m | 457.8m | 287.7m |
| | 85% | 62.5m | 38.4m | 291.7m | 183.2m |

Note) In case of using UVT coil, the location of Shunt coil is changed.

# Trip Alarm Contact [AL]




- When a circuit breaker is tripped by OCR which operates against the fault current (Over Current Relay), Trip Alarm switch provides the information regarding the trip of circuit breaker by sending the electrical signal from the mechanical indicator on front cover of main circuit breaker or internal auxiliary switch. (Installed at the inside of circuit breaker)

- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted to output the information occurred from fault circuit breaker.

- MRB and AL can be operated only when tripping by OCR, but doesn't be operated by OFF button and OFF operation of trip coil.

- For the manual reset type circuit breaker, to reset the circuit breaker after a circuit breaker trip, push the manual reset button(MRB) manually or operate the remote reset button(RES). Push the reset button on the OCR to reset the LED lamp and fault cause display relay contact (terminal 513~544) on the OCR.
  - Option AL, A1, A2, A3, A4 applicable

- For the auto reset type circuit breaker, it can be reset when the interlock is automatically released after a circuit breaker trip, and if the terminals R11, R22(dry contact) is set to Common, then the LED lamp and fault cause display relay contact(terminal 513~544) on the OCR are remotely reset.
  - Option A5, A6, A7, A8, A9 applicable

- One(AL1, 1b) or two(AL1, AL2, 1b) electrical trip alarm(AL) switches are provided as an option according to the order specifications.

- The AL2 and RES cannot be simultaneously used, so select only one option.

**1. Electrical characteristics of trip alarm contact**

| Rated voltage (V) | Non-inductive load (A) | | Inductive load (A) | | Inrush current |
|---|---|---|---|---|---|
| | Resistive load | lamp load | Inductive load | Motor load | |
| 8V DC | 11 | 3 | 6 | 3 | Max. 24A |
| 30V DC | 10 | 3 | 6 | 3 | |
| 125V DC | 0.6 | 0.1 | 0.6 | 0.1 | |
| 250V DC | 0.3 | 0.05 | 0.3 | 0.05 | |
| 250V AC | 11 | 1.5 | 6 | 2 | |

## Manual Reset Button [MRB]



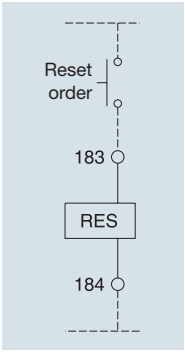
- It is a function which resets a circuit  breaker manually when a circuit breaker is tripped by OCR.
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted to output the information occurred from fault circuit breaker.
- MRB can be operated only by OCR but not by OFF operation of circuit breaker. To re-close a circuit breaker after a trip, press MRB to reset it for closing.




Note) The manual reset button is protruded in the event of trip.

# Remote Reset Switch [RES]

- Following tripping, this function resets the "fault trip" alarm contacts (AL) and the mechanical indicator (MRB) and enables circuit breaker closing.
  Push button switch: AC 125V 10A, AC 250V 6A, DC 110V 2.2A, DC 220V 1.1A Resistive load
- In case of auto reset type circuit breaker
  Following tripping, a reset of Manual Reset Button (MRB) or Remote Reset Switch (RES) is no longer required to enable circuit breaker closing.
  The mechanical indicator (MRB) and electrical indicator (AL) remain in fault position until the reset button is pressed.
- AL2 and RES are alternative.

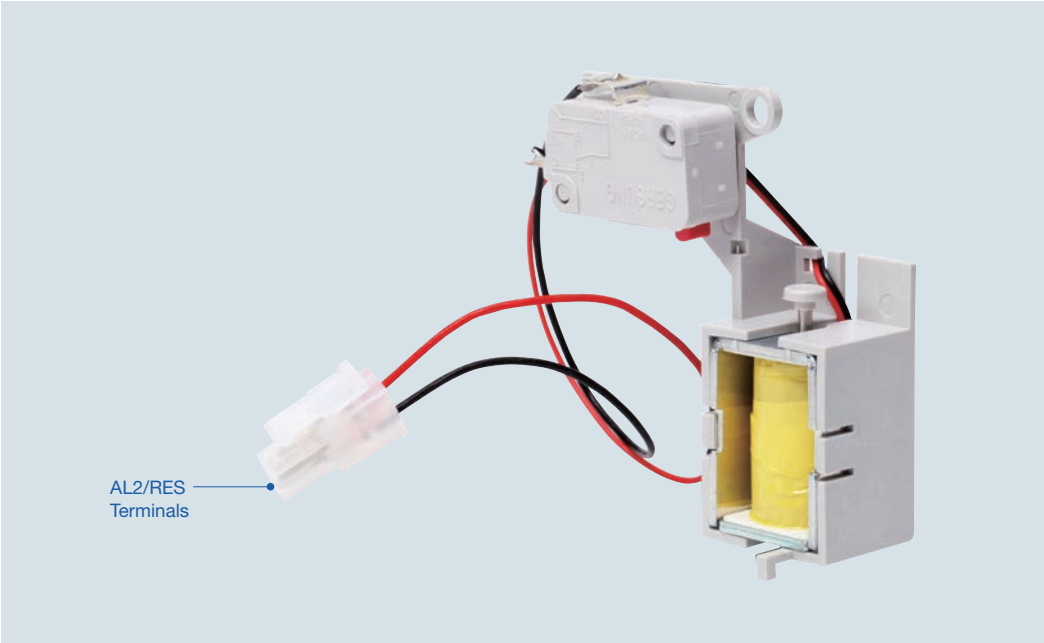


Wiring Diagram

### 1. Rated voltage and rated current of RES

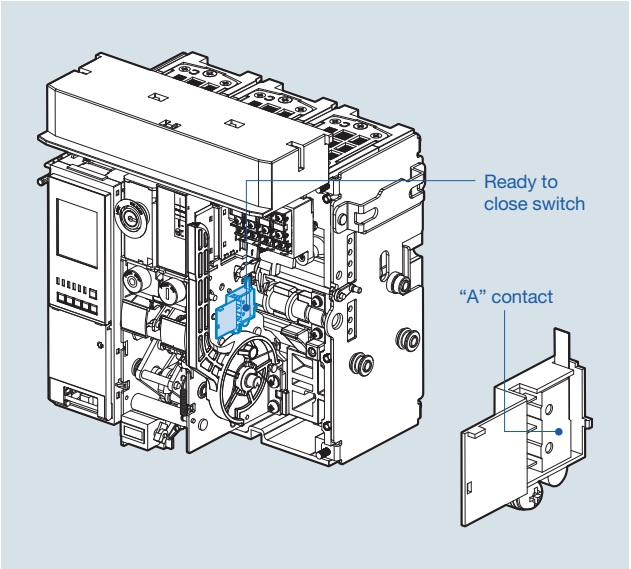
| Rated voltage | Operating current (Max.) | Operating time | Wire spec. |
|---|---|---|---|
| AC 110~130V | 3.7A | Less 40ms | #16 AWG (1.31mm²) |
| DC 110~125V | 2.4A | | |
| AC 200~250V | 2.2A | | |

### 2. Appearance



## Ready to Close Switch [RCS]



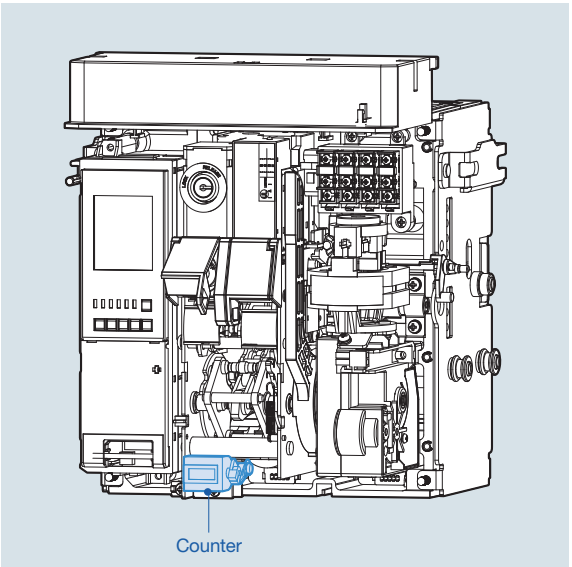



- It interlocks with mechanism of circuit breaker.
- It indicates the status that the circuit breaker is ready to do closing operation.
- When mechanism is in OFF position or in Charge, contact is output with "ON" and it indicates that mechanism can be closed.

| Classification | Standard | | Remark |
|---|---|---|---|
| Contactor Capacity | 250Vac | 3A | |
| | 250Vdc | 5A | |
| | 125Vdc | 0.6 A | |

## Counter [C]

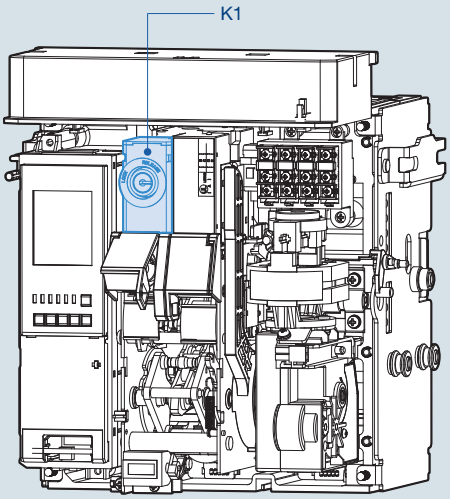



- It displays the total number of ON/OFF operation of ACB.

## Key Lock [K1]



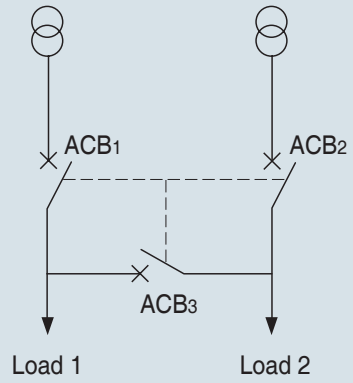



- It is a device for locking which prevents a certain circuit breaker from being operated by user's discretion when two or more circuit breakers are used at the same time.
- K1: Preventing mechanical closing

## Key Interlock Set [K2]

### Wiring





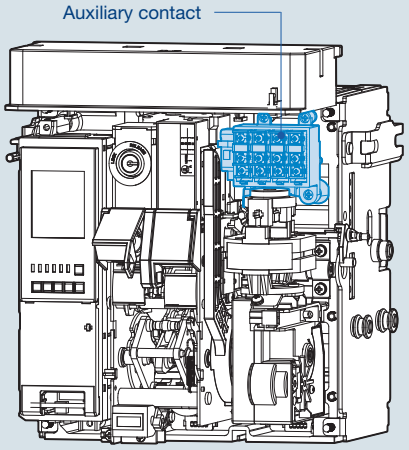

- 3 circuit breakers can be arranged for the continuous power supply to the load side and be interlocked mutually by using Key Lock embedded in each circuit breaker. Two same keys will be provided.

| ACB–1 | ACB–2 | ACB–3 | Status | |
|---|---|---|---|---|
| | | | LOAD1 | LOAD2 |
| ● | ● | ● | OFF | OFF |
| ● | ○ | ○ | OFF | ON |
| ○ | ● | ○ | ON | OFF |
| ○ | ○ | ● | ON | ON |
| ● | ● | ○ | OFF | OFF |
| ● | ○ | ● | OFF | ON |
| ○ | ● | ● | ON | OFF |

○: Release ●: Lock

## Auxiliary Switch [FX]






- It is a contact used to monitor ON/OFF position of ACB from remote place.

∗Auxiliary switch for micro load (Order No. 83011176209)

### Classification

| Switch classification | Description | Resistive load | |
|---|---|---|---|
| | | MAX. | MIN. |
| Standard | FC, FX, LC | AC250V 3A<br>AC125V 5A | DC5V 160mA |
| Micro load | Oder No. 8301176209 | AC125V 0.1A<br>DC30V 0.1A | DC5V 1mA |

## ON/OFF Button Lock [B]

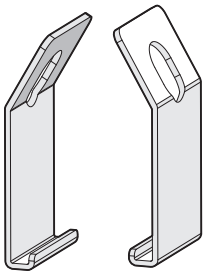





- It is to prevent manual operation of ACB's closing/tripping button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.
  (Electrical ON/OFF operation is possible)

Note) Padlocks(Ø5 ~ Ø6) are not supplied.

## Lifting Hook [LH]





- It is a device to make an ACB easy to shift.
- Please hang it to both handles of the cradle.

## Condenser Trip Device [CTD]

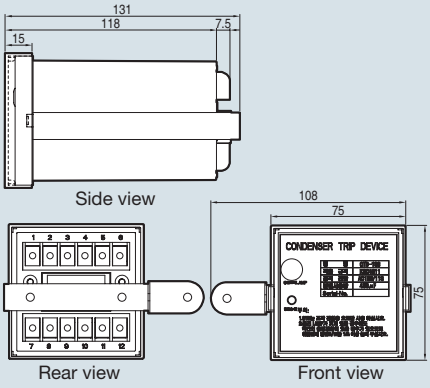



- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, It can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.

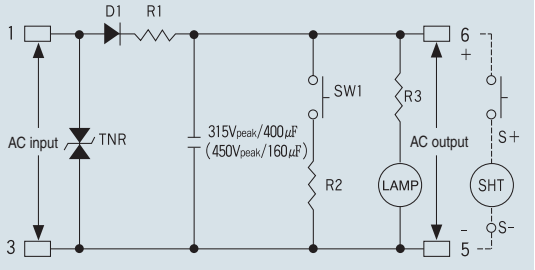
### Ratings

| Ratings | Specification | |
|---|---|---|
| Model | CTD–100 | CTD–200 |
| Rated input voltage (V) | AC 100/110 | AC 200/220 |
| Frequency (Hz) | 50/60 | 50/60 |
| Rated charge voltage (V) | 140/155 | 280/310 |
| Charging time | Within 5s | Within 5s |
| Trip possible time | Over 3 min | Over 2 min |
| Range of Input voltage (%) | 85~110 | 85~110 |
| Condenser capacity | 400㎌ | 160㎌ |

### External dimension




### Circuit diagram



## OCR Tester [OT]







- It is a device which can test for the operation of Trip Relay under no power condition.

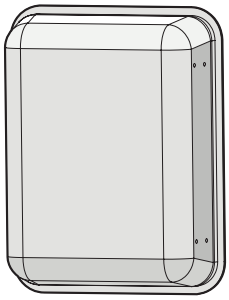
1. Maximum 17 times rated current can be inputted.
2. It is possible to enter the current value and phase on each of R/S/T/N
3. Frequency is adjustable.
4. It is available to test for long time delay/short time delay/instantaneous /ground fault.

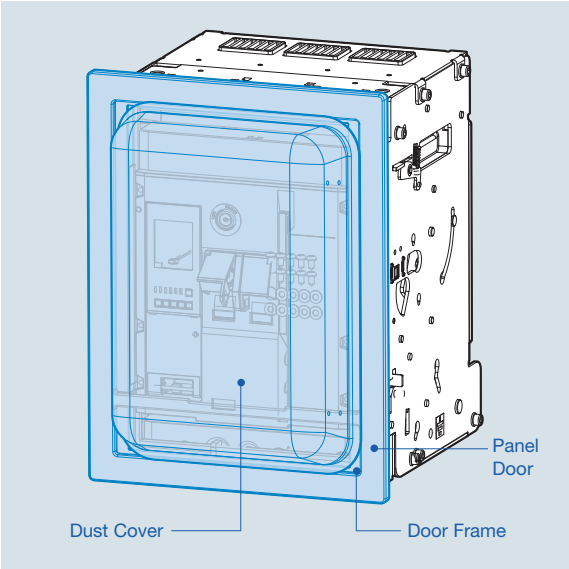
### Configuration



| | |
|---|---|
| R S T N | R, S, T, N phase signal input |
| ▲ ▼ | Increase/Decrease signal input |
| ENT. ESC | Signal setting/Delete |
| START STOP | Waveform generation/Stop |
| 50Hz 60Hz Hz | Select frequency |

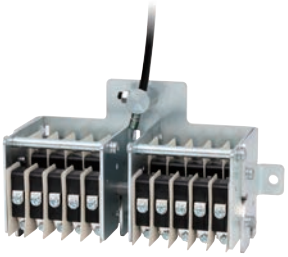
# Dust Cover [DC] [IP54]

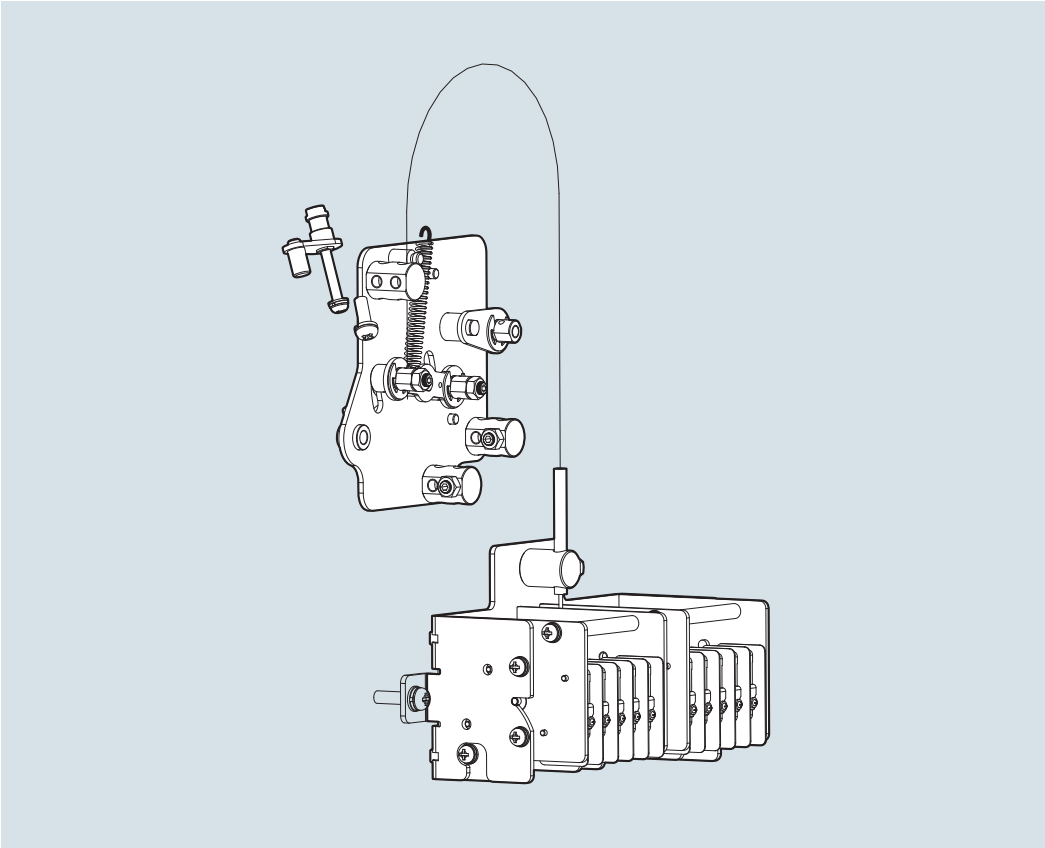




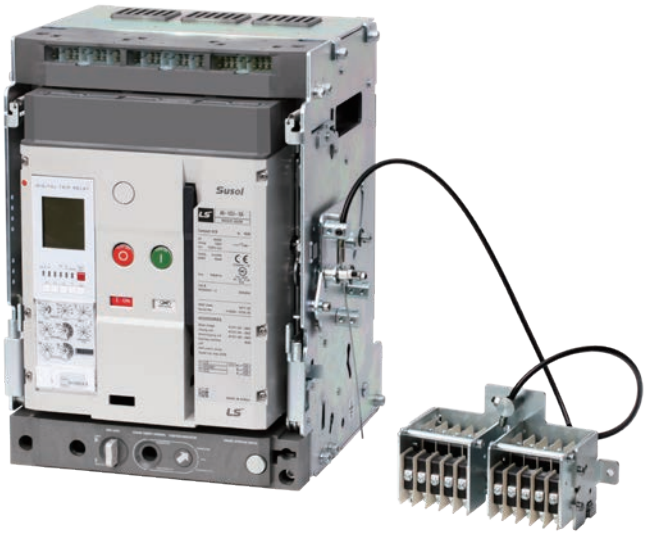

- Attach it to the door frame.
- It protects the product dust and moisture that may affect the operation of the instrument at the same time (IP54) which may cause fault operation and enhances the sealing degree by being mounted to protrude type of panel.
- It is transparent so that the front side of ACB is visible and the Cover can be opened/closed even if ACB is drawn out to until TEST position.

## Mechanical Operated Cell Switch [MOC]



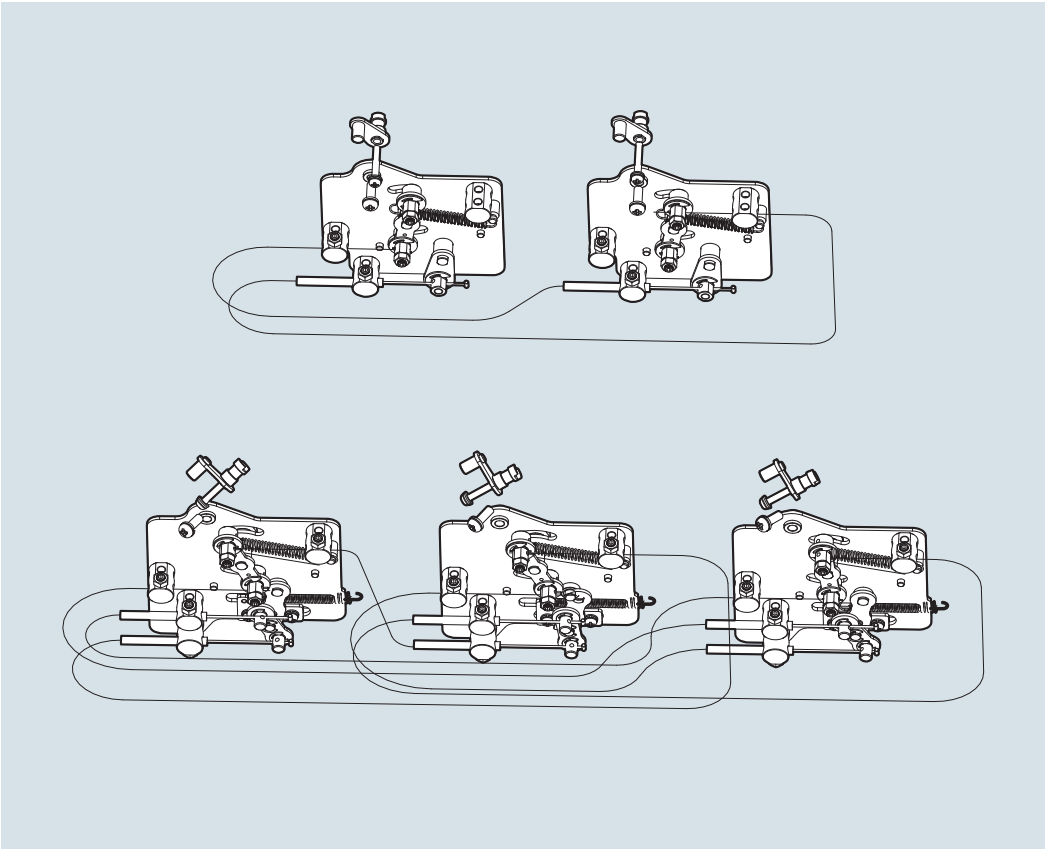


- It is the contact (10a10b) which displays the ON/OFF condition of ACB.
  It mechanically operates only when the breaker is "CONNECTED" position.
  A standard type and a high capacity type is available.
- When MOC link is installed to cradle, MOC can be equipped with the inside of panel.



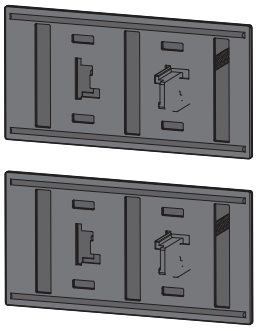
# Mechanical Interlock [MI]

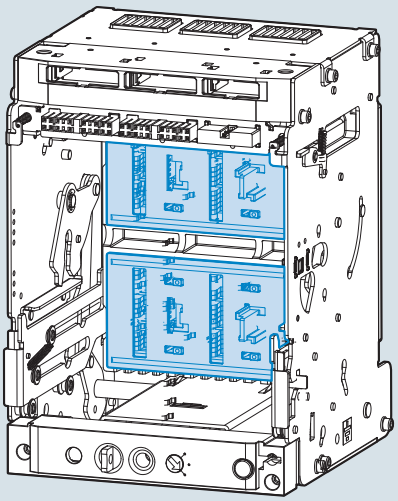




- It is used to interlock closing and trip between two or three breakers mechanically so as to prevent unintended operation at the same time.
- Wire type interlock can be applied upto 3 breakers

## Safety Shutter [ST]

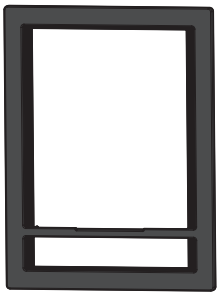




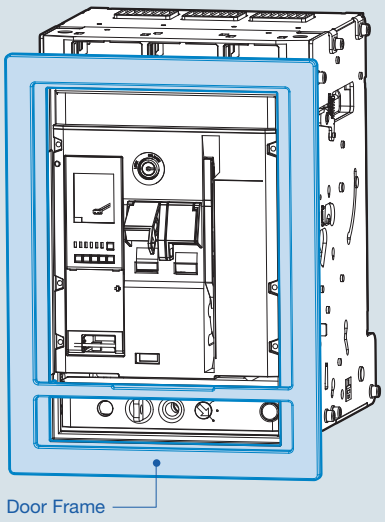
- It is the automatic safety device to protect the connectors of main circuit by cutting off dangerous contact from outside while the breaker is drawn out. When the ACB is drawn in, the shutter is automatically opened.
- Plate Shutter is a total of 2 models

| The types of safety shutter plate |
|---|
| 3P |
|  |
| 4P |
|  |

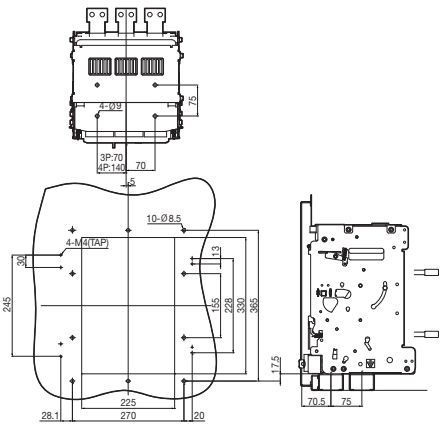
## Door Frame [DF] [IP3X]



Draw-out type

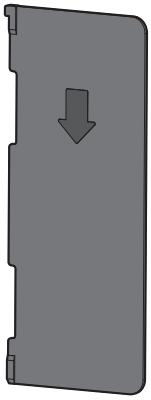


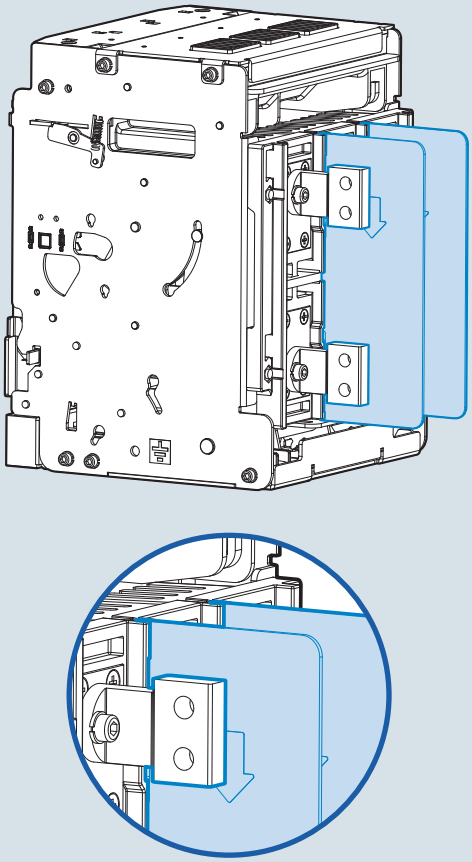

- When structuring the embedded type of ACB panel, it protects the protrude front of ACB and the cutting side of panel door by attaching it to the panel door.




Switchboard door cut dimension

# Interphase Barrier [IB]

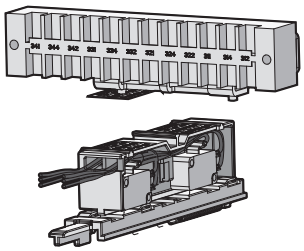


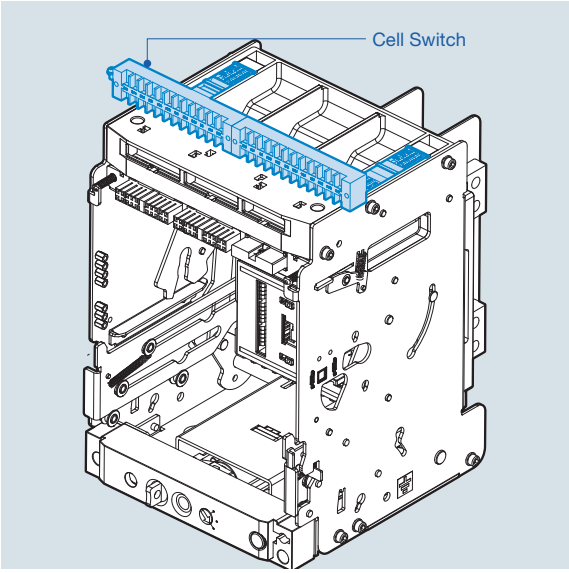


Draw-out type

- Interphase barrier prevents the arc which may arise and result in short-circuit between phases in advance

## Cell Switch [CEL]






• It is a contact which indicates the present position of ACB. (CONNECTED, TEST, DISCONNECTED)

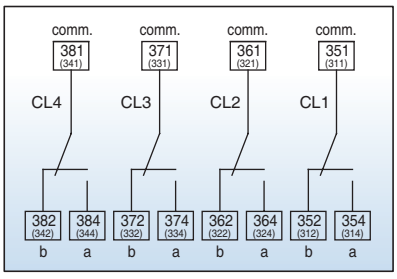
<Contact configuration>
4C: 1Disconnected +1Test +2Connected
8C: 2Disconnected +2Test +4Connected

※ Contact configuration can be changeable if necessary.

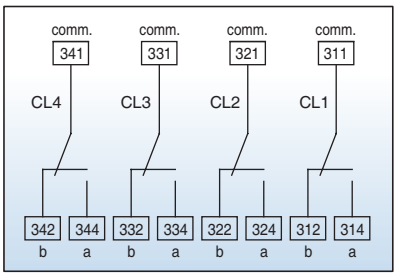
### Operating characteristic

| ACB position | | | DISCONNECTED | | CONNECTED |
|---|---|---|---|---|---|
| Draw-in and draw-out position | | | DISCONNECTED | TEST | CONNECTED |
| Contact operation | CL–C (CONNECTED) | | OFF | | ON |
| | CL–T (TEST) | | OFF | ON | |
| | CL–D (DISCONNECTED) | | ON | OFF | |
| Contact capacity | Voltage (V) | | Resistive load | | Inductive load |
| | AC | 460 | 5 | | 2.5 |
| | | 250 | 10 | | 10 |
| | | 125 | | | |
| | DC | 250 | 3 | | 1.5 |
| | | 125 | 10 | | 10 |
| | | 30 | 10 | | |
| Contact number | | | 4C | | |

### Terminal (4C, 8C)

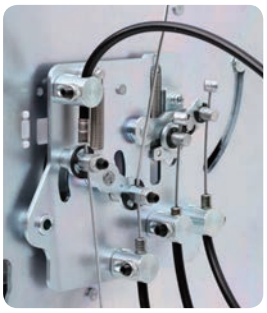



4C attached to the right side of cradle

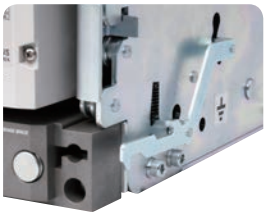



4C attached to the left side of cradle

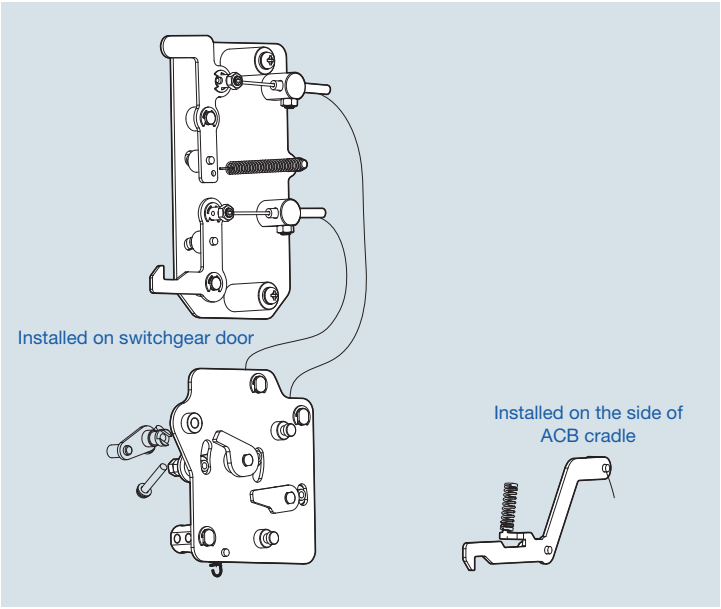
## Door Interlock [DI]



Wite type



Catch type



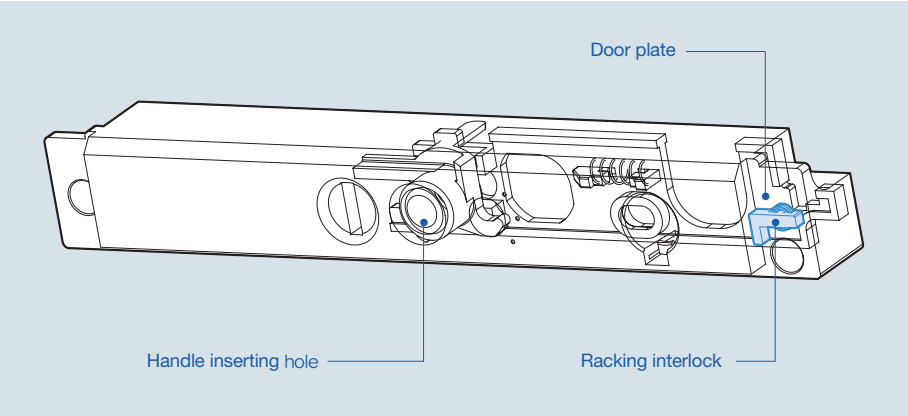

- It is a safety device which does not allow the panel door to open when a circuit breaker is in the “ON” position.

## Zero Arc Space [ZAS]




- Arc which may arise while breaking fault current is extinguished first by Arc chute in main body of circuit breaker and then completely extinguished by Arc cover.
  By preventing arc from exposing to the outside, it protects itself from all kinds of accidents.

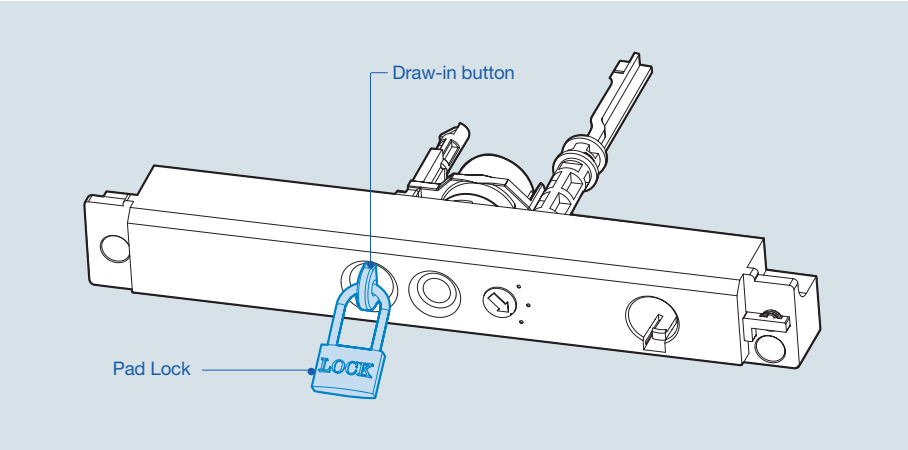
## Racking Interlock [RI]




- When panel door is opened, Draw in/out handle doesn't be inserted. Thus, panel handle can be inserted only when panel door is closed.

## Pad Lock / Position Lock [PL]

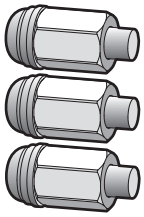


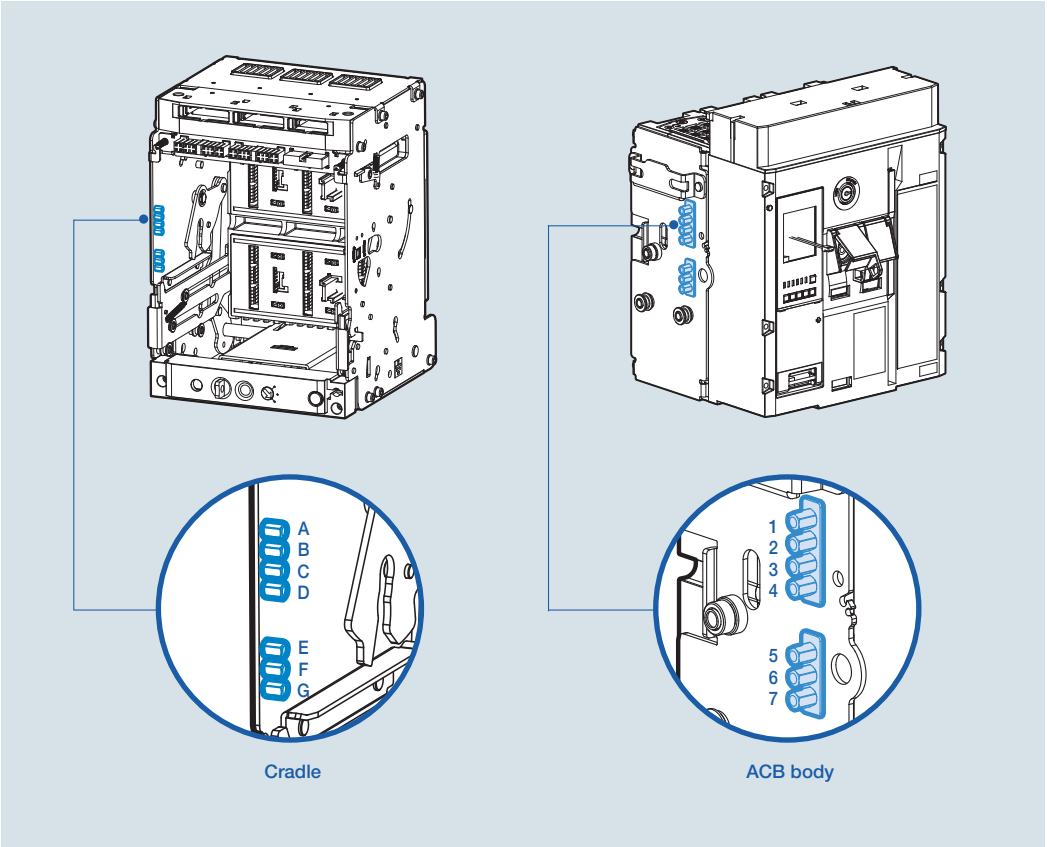



ACB is subject to restriction regarding moving in connected, test, disconnected when drawing in or out. If main body of ACB is placed in 3 positions, it is locked and stopped when drawing in or out.

- As shown in the figure, if draw-in/out button pops out, it means locking is operating.
- To continue Draw-in/out operation, release lock by pushing Draw-in/out button
- In case it is locked as shown in the figure above, main body of ACB can not be drawn in or out into the cradle.
- For the lock device, user has to purchase it. (Ø5 ~ Ø6)

# Miss Insertion Prevent Device [MIP]





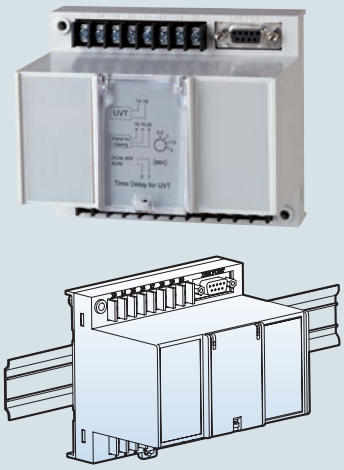

- When the main body of ACB is inserted to the cradle, if the ratings of ACB does not match with cradle, it mechanically prevents ACB from being inserted into cradle of ACB.
- The installation method is variable according to ratings.

| | Rating | Cradle | ACB |
|---|---|---|---|
| AN | 400 | ABCD | 567 |
| | 600 | ABCE | 467 |
| | 630 | ABCF | 457 |
| | 800 | ABCG | 456 |
| | 1000 | ABDE | 367 |
| | 1200 | ABDF | 357 |
| | 1250 | ABDG | 356 |
| | 1600 | ABEF | 347 |

| | Rating | Cradle | ACB |
|---|---|---|---|
| AH | 400 | ABEG | 346 |
| | 600 | ABFG | 345 |
| | 630 | ACDE | 267 |
| | 800 | ACDF | 257 |
| | 1000 | ACDG | 256 |
| | 1200 | ACEF | 247 |
| | 1250 | ACEG | 246 |
| | 1600 | ACFG | 245 |

| | Rating | Cradle | ACB |
|---|---|---|---|
| AR | 400 | ADEF | 237 |
| | 600 | ADFG | 235 |
| | 630 | AEFG | 234 |
| | 800 | BCDE | 167 |
| | 1000 | BCDF | 157 |

# UVT Time Delay Controller [UDC]



Attached to din-rail or switchboard

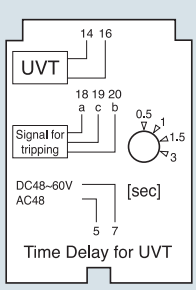
- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown. There are two types, Instantaneous type and time delay type.
- Instantaneous type: only available with UVT coil.
- Time delay type: available by connecting UVT coil and UVT time delay controller.
- Common use for the all types.

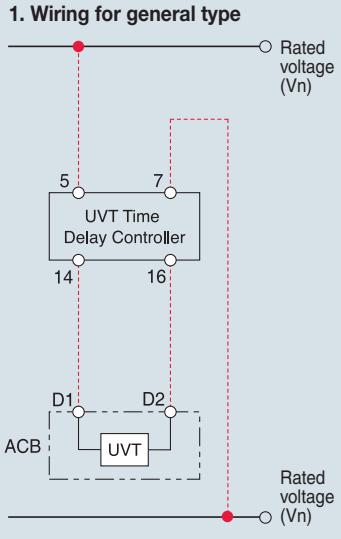
### 1. The rated voltage and characteristic of UVT time delay controller

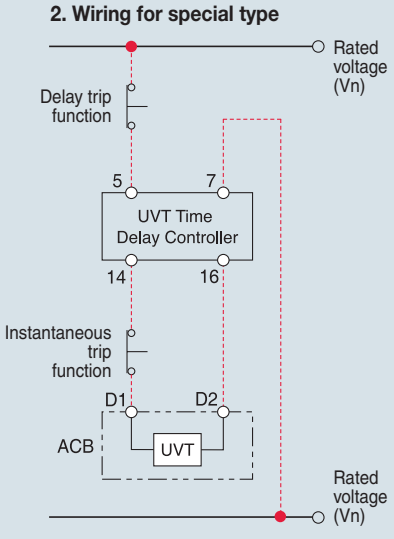
| Rated voltage (Vn) | | Operating voltage range (V) | | Power consumption (VA or W) | | Trip time (s) |
|---|---|---|---|---|---|---|
| DC (V) | AC (V) | Pick up | Drop out | Inrush | Steady-state | |
| 48~60 | 48 | 0.65~0.85 Vn | 0.4~0.6 Vn | 200 | 5 | 0.5, 1, 1.5, 3 |
| 100~130 | 100~130 | | | | | |
| 200~250 | 200~250 | | | | | |
| – | 380~480 | | | | | |

Note) Operating voltage range is the min. rated standard for each rated voltage (Vn).

### 2. Wiring



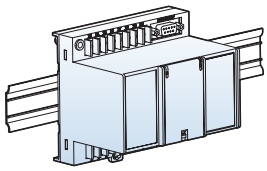



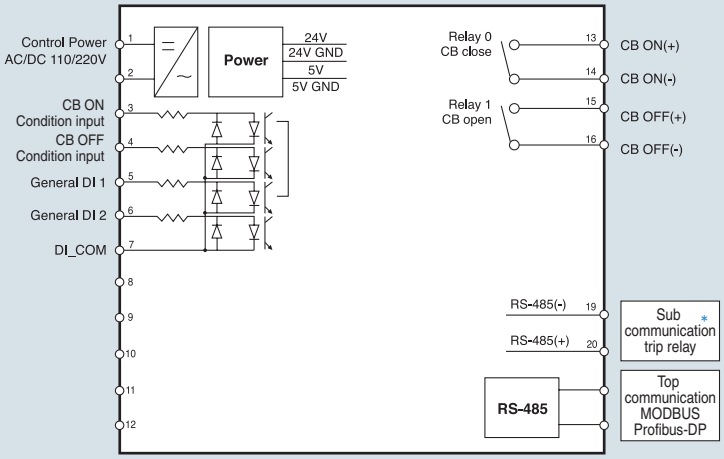

* The wiring presented with red color should be set by uesers.

# Remote I/O Unit [RCO]



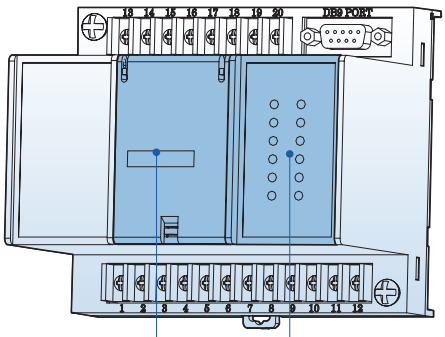
Remote I/O Unit






*In case of using Profibus-DP communication, it needs to communicate with ACB trip relay.

| Classification | | Applied range | Remarks |
|---|---|---|---|
| CB control | Contact switching capacity | AC230V 16A / DC30V 16A | |
| | Max. switching capacity | 3680VA, 480W | |
| Alarm | Contact switching capacity | AC230V 6A / DC25V 6A | Induction load (cosØ=0.4, L/R=7ms) |
| | Max. switching capacity | 1880VA, 150W | |

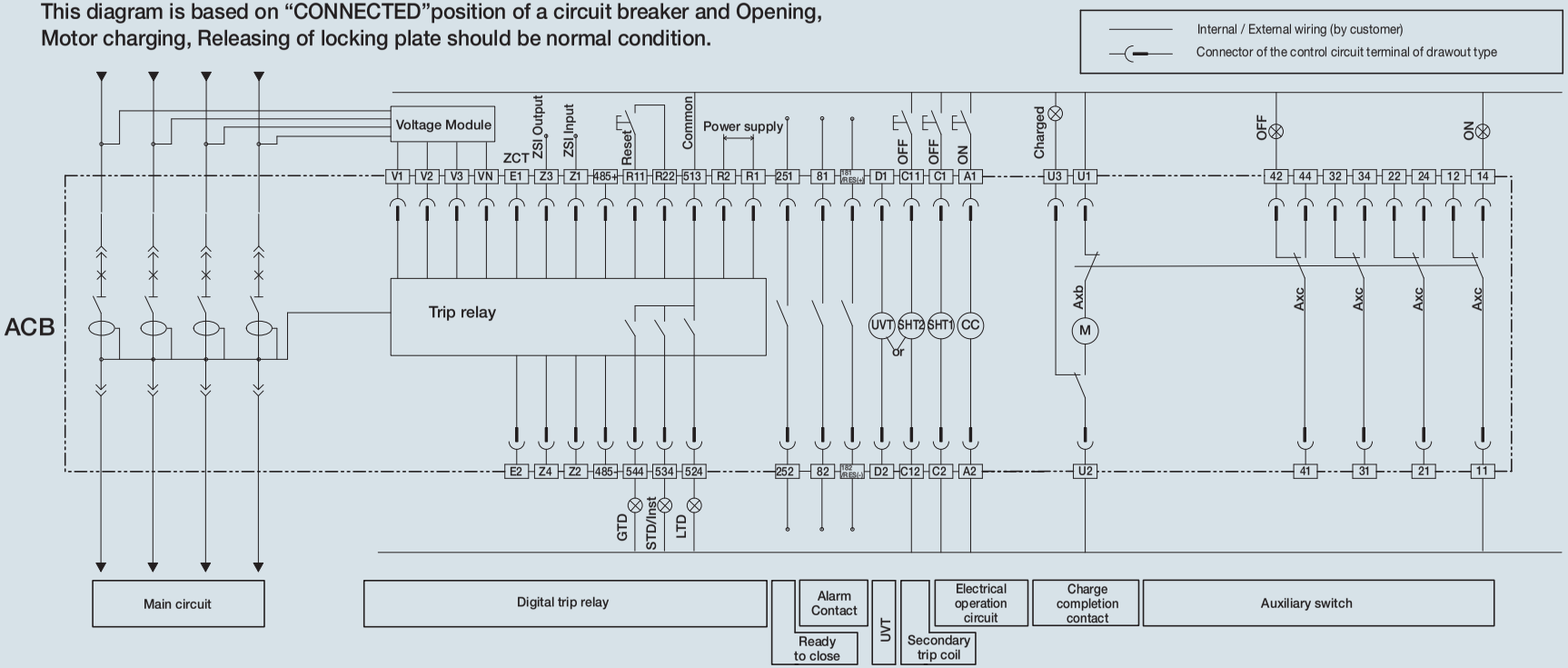


- Baud rate setting
- Comm. address setting
- Temperature setting

- Remote I/O unit has the I/O contact which can trip or close the ACB from the remote site by communication.
- For the General DO, the output of DI1 or DI2 is selectable.
- Remote I/O Unit communicates with Modbus / RS-485 communication basically, Profibus-DP need to be purchased separately.
- It supports SBO (Select Before Operation) function and guarantees the control reliability.
- Remote I/O Unit can be installed on the cradle of ACB or the inside of panel.

| LED | | Status |
|---|---|---|
| 1 | DI1 | Indicates digital Input #1condition |
| 2 | DI2 | Indicates digital Input #2condition |
| 3 | DO ON | Indicates temperature alarm output is ON |
| 4 | DO OFF | Indicates temperature alarm output is OFF |
| 5 | CB ON | Indicates circuit break close condition |
| 6 | CB OFF | Indicates circuit break open condition |
| 7 | RUN LED | Indicates unit run condition |
| 8 | CB ERROR | Indicates circuit break terminal Disconnection/control Err condition |

This diagram is based on “CONNECTED”position of a circuit breaker and Opening, Motor charging, Releasing of locking plate should be normal condition.




## Terminal code description

| | | |
|---|---|---|
| 11 12 ~ 41 42 | Auxiliary switch "b" contact | |
| 11 14 ~ 41 44 | Auxiliary switch "a" contact | |
| U3 U2 | Charge completion signal | |
| U1 U2 | Motor charging | |
| A1 A2 | Closing coil | |
| C1 C2 | Shunt trip | |
| C11 C12 | 2nd shunt trip | |

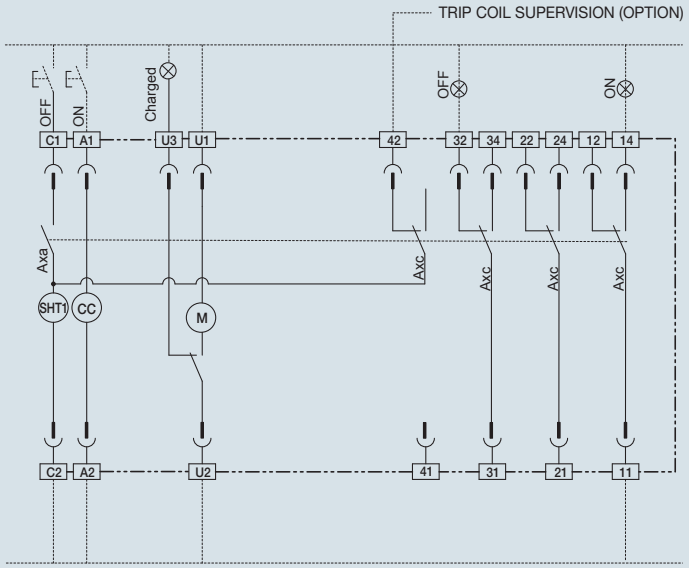
| | |
|---|---|
| D1 D2 | Voltage input terminal of UVT coil |
| 81 82 | Alarm1 "a" contact |
| 181 182 | Alarm2 "a" contact or RES Coil |
| 251 252 | Ready to close switch |
| R1 R2 | Control power for trip unit |
| 513 ~ 544 | Fault cause indication contacts |
| R11 R22 | Alarm reset (Trip cause LEDs, contacts) |

| | |
|---|---|
| Z1 Z2 | ZSI input |
| Z3 Z4 | ZSI output |
| E1 E2 | ZCT |
| VN ~ V3 | Voltage module |
| 485+ ~ 485+ | RS-485 Communication |
| 311 ~ 344 | Cell switch |

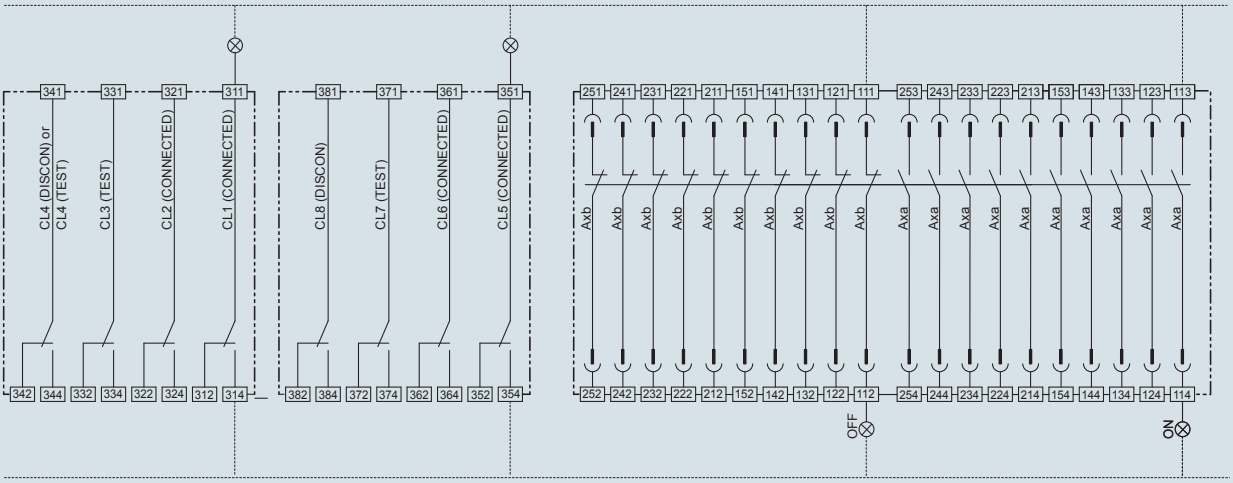
## Accessory code description

| | |
|---|---|
| Axc | Auxiliary switch |
| LTD | Long time delay trip indicator |
| STD/Inst | Short time delay/instantaneous |
| GTD | Ground fault trip indicator |
| CL1~CL4 | Cell switch |
| M | Motor |
| CC | Closing coil |
| SHT1 | 1st Shunt coil |
| SHT2 | 2nd Shunt coil |
| UVT | UVT coil |

Note) 1. The diagram is shown with circuit de-energized, all devices open and charged and relays in normal position
2. Relay is normal condition and charging type is "Off-Charging"
3. The standard of auxiliary contact is 4C.
4. Option
- Ready to close contact, Trip alarm contact, UVT coil, Fully charged contact, secondary trip coil
- Temperature module, Voltage module, ZCT, ZSI
5. Please consult us for the use of ZSI (Zone selective Interlocking)
6. For connecting RS-485 verify if the polarity is correct
7. Contact configuration for Cell Switch can be changeable if necessary




Electrical operation circuit | Charge completion contact | Auxiliary switch




Cell switch 4C | Cell switch 8C (4C Addition) | MOC (Mechanical Operated Cell switchs)

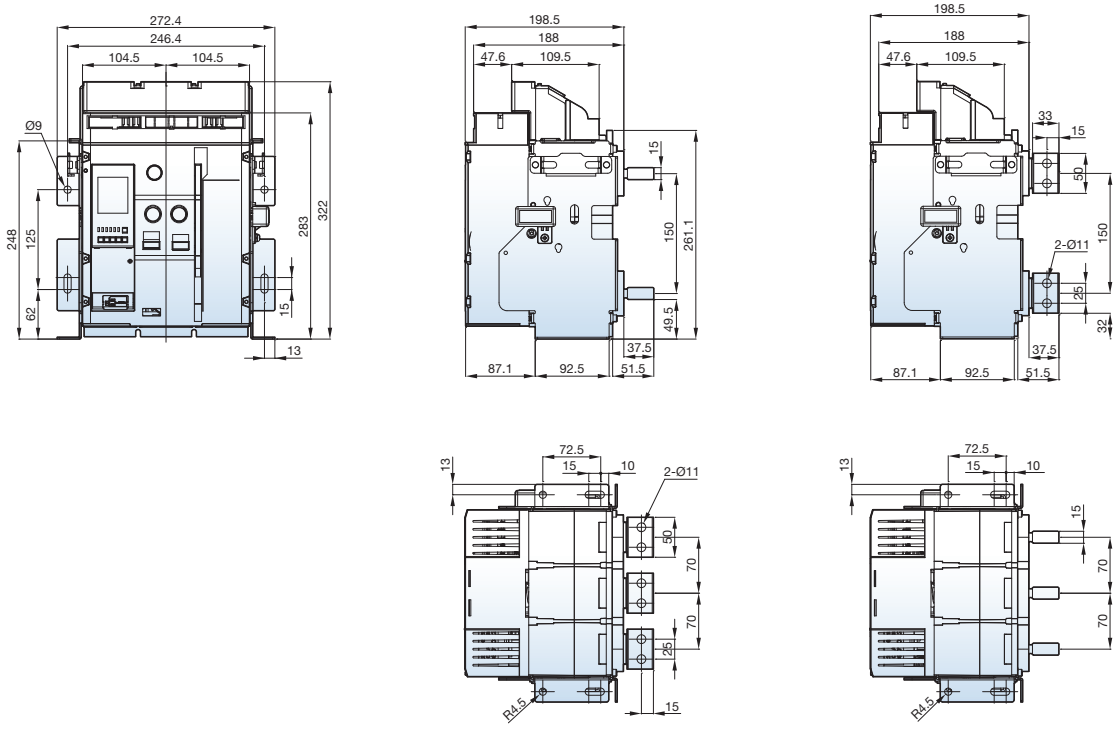
## Terminal symbol

| | |
|---|---|
| 311 ~ 344 | Cell switch |
| 111 ~ 254 | MOC |

# Dimensions

• 3P [Fixed H: Horizontal type / V: Vertical type]

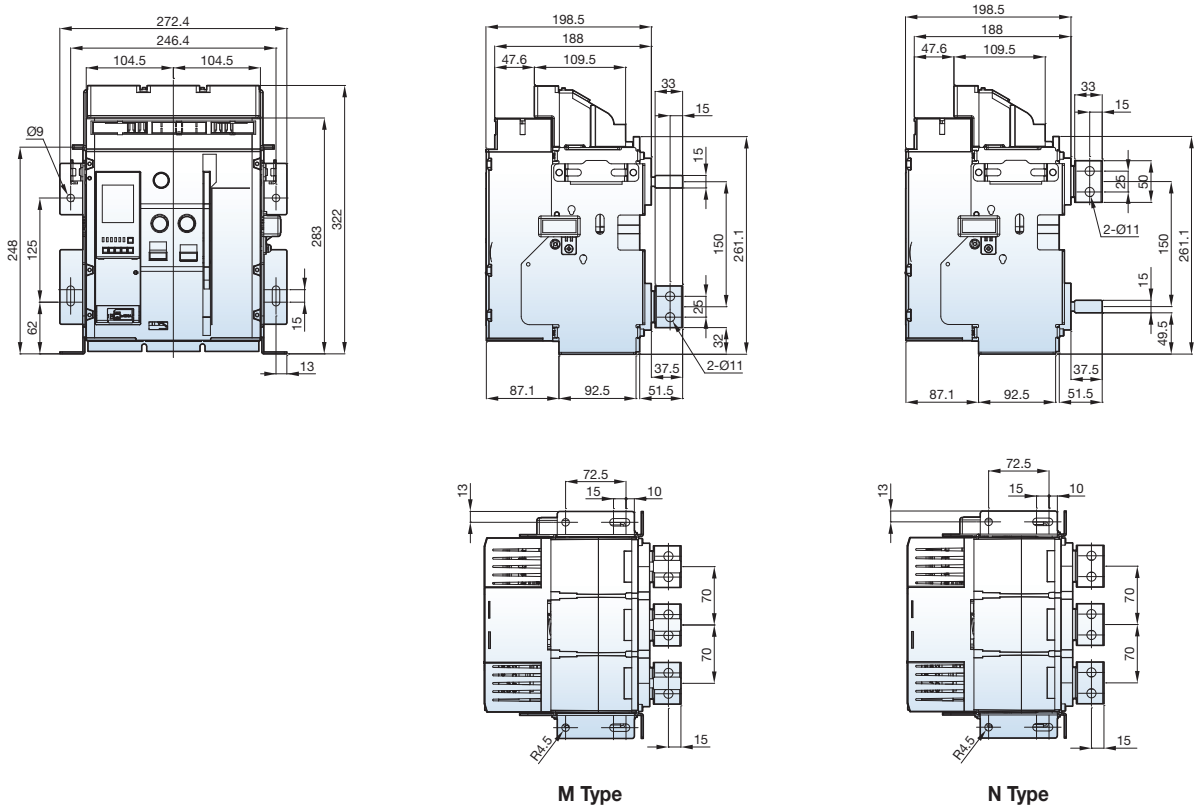
(Unit : mm)




**H Type** (Horizontal type)

**V Type** (Vertical type)

• 3P [Fixed M: Upper-Horizontal type, Lower-Vertical type / N: Upper-Vertical type, Lower-Horizontal type]

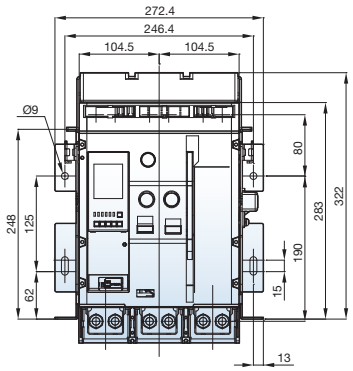


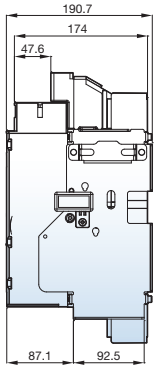

**M Type**
(Upper-Horizontal type, Lower-Vertical type)

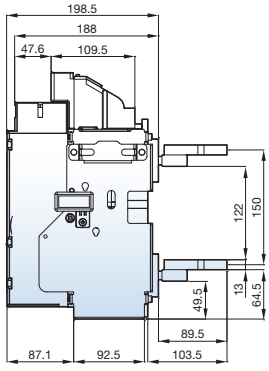
**N Type**
(Upper-Vertical type, Lower-Horizontal type)

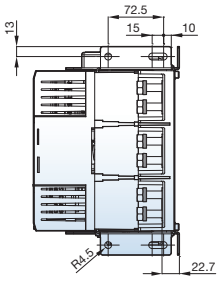
• 3P [Fixed P: Plane type / R: Spread type]

(Unit : mm)

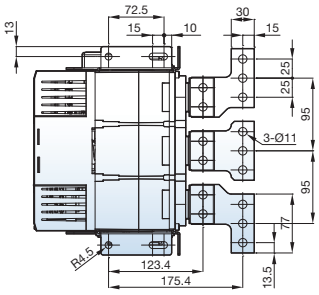


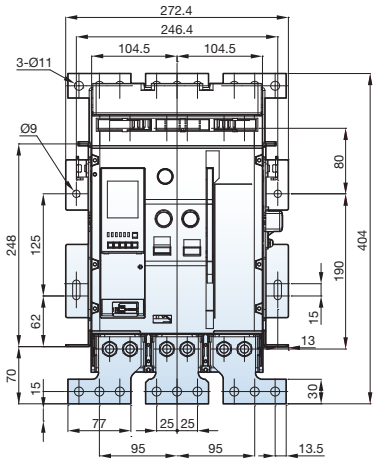



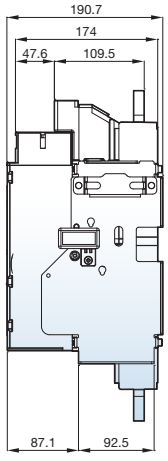

**P Type** (Plane type)

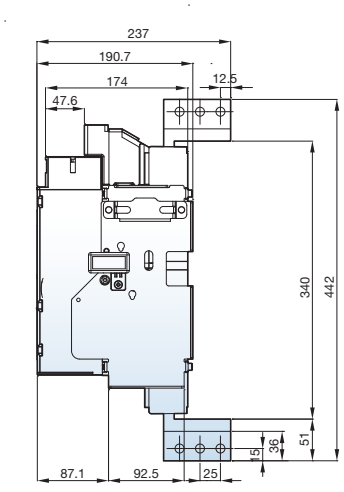


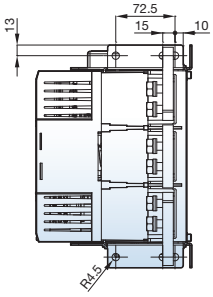

**R Type** (Spread type)

• 3P [Fixed Z: Plane spread type / T: Plane vertical type]

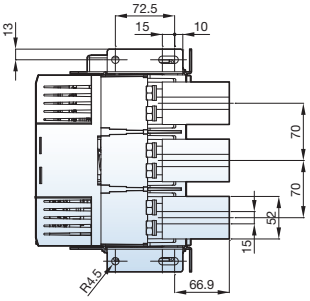



**Z Type** (Plane spread type)

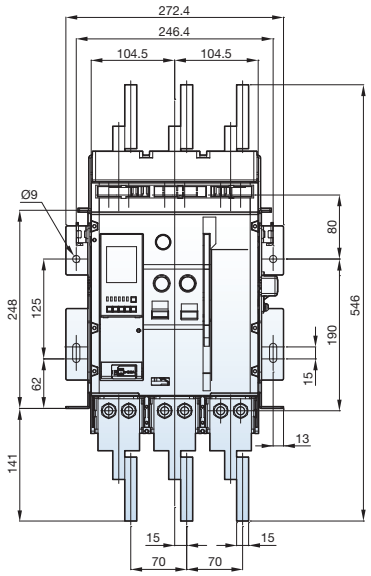


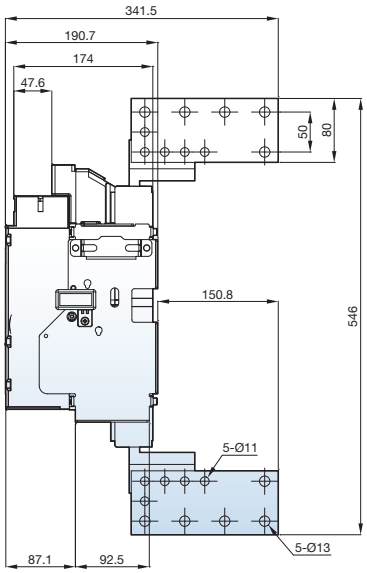

**T Type** (Plane vertical type)

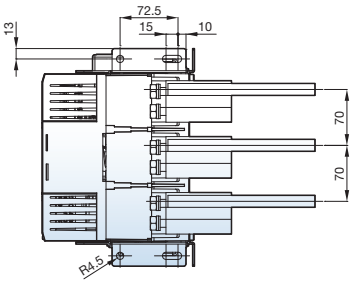
# Dimensions

• 3P [Fixed X: Cable lug type]

(Unit : mm)



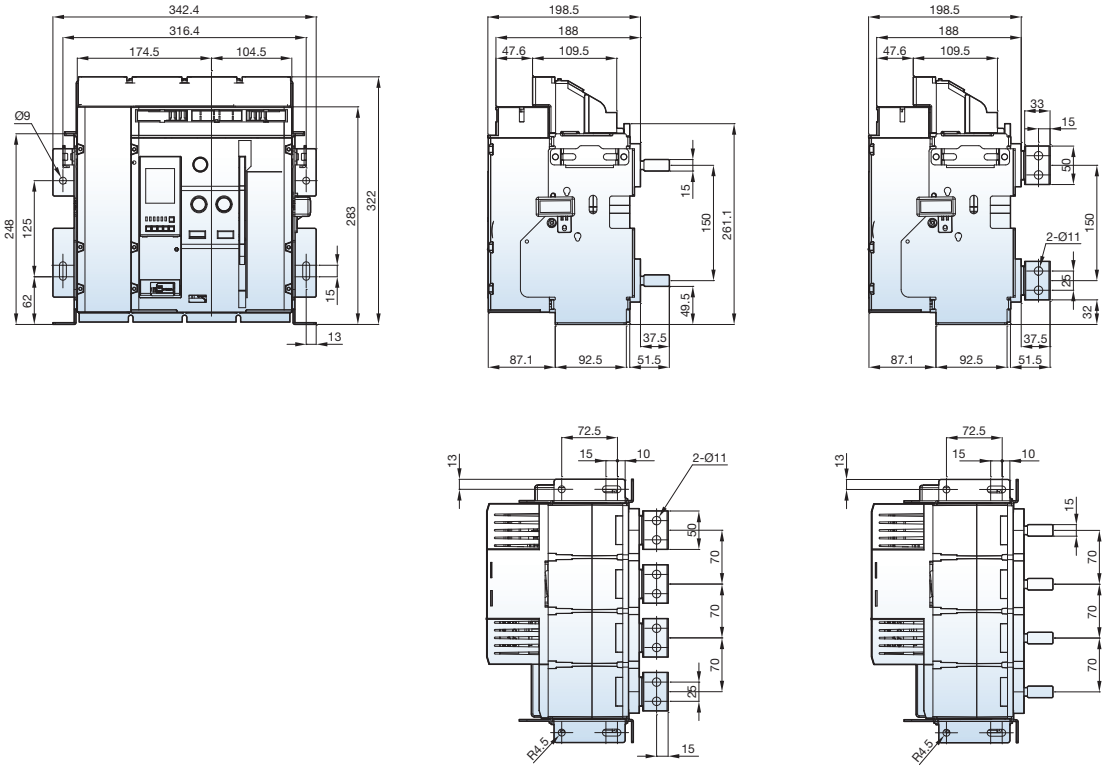




**X Type** (Cable lug type)

• 4P [Fixed H: Horizontal type / V: Vertical type]

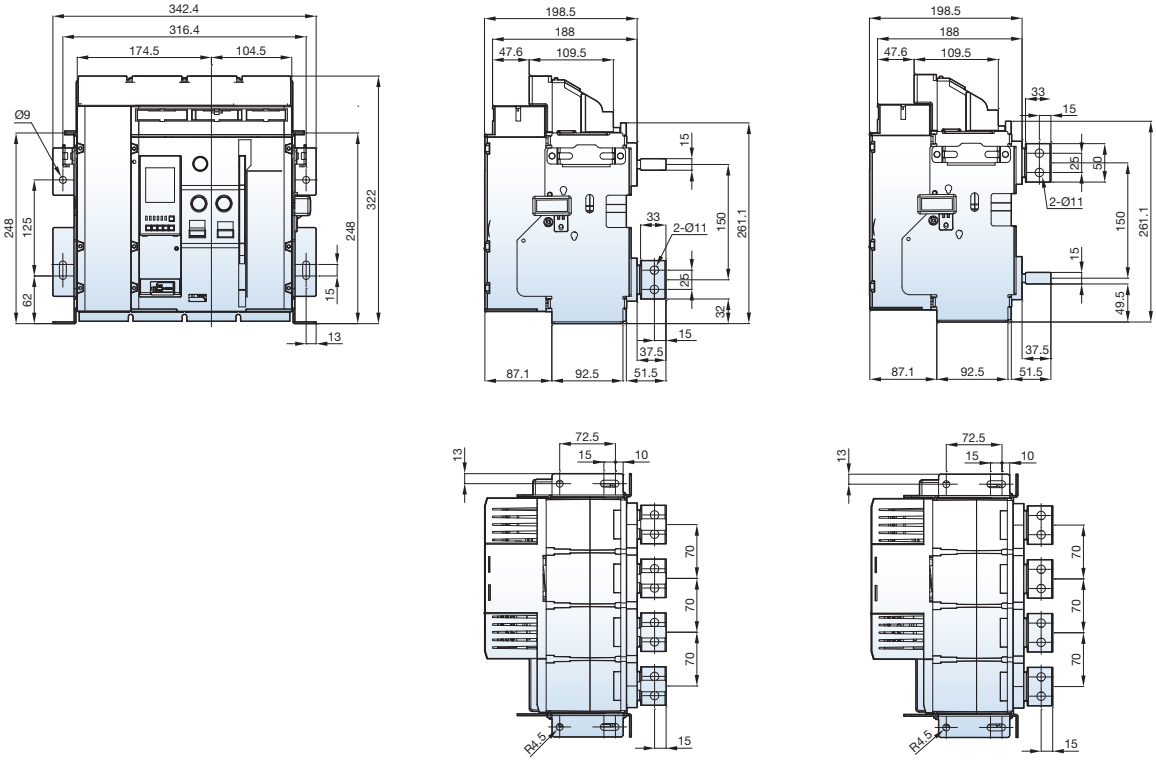
(Unit : mm)




**H Type** (Horizontal type)

**V Type** (Vertical type)

• 4P [Fixed M: Upper-Horizontal type, Lower-Vertical type / N: Upper-Vertical type, Lower-Horizontal type]



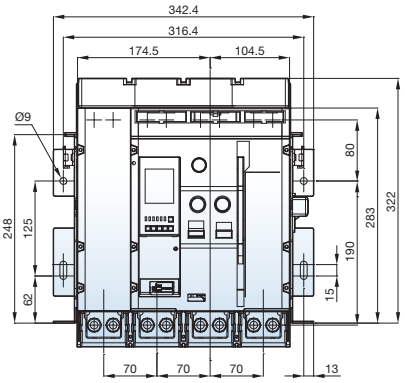

**M Type**
(Upper-Horizontal type, Lower-Vertical type)

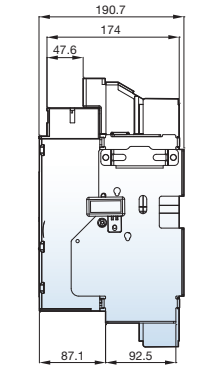
**N Type**
(Upper-Vertical type, Lower-Horizontal type)

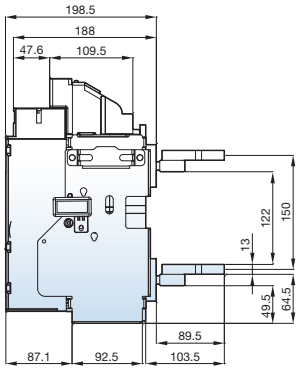
# Dimensions

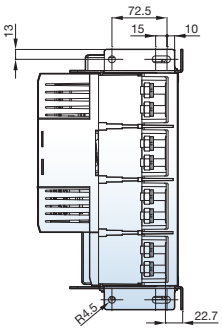
• 4P [Fixed P: Plane type / R: Spread type]

(Unit : mm)

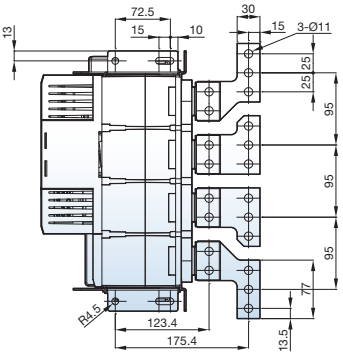


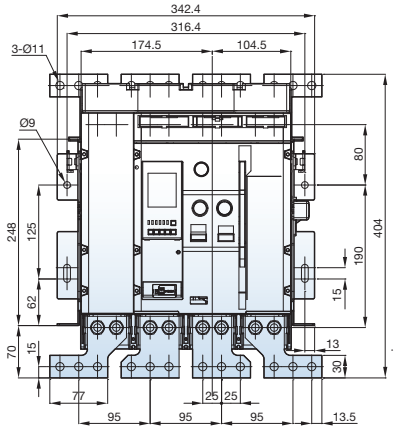



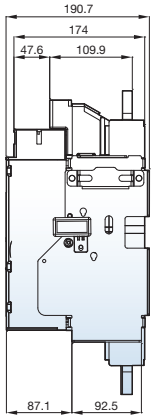

**P Type** (Plane type)

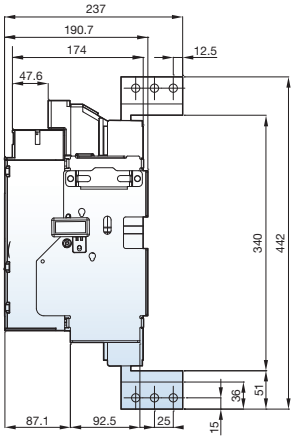


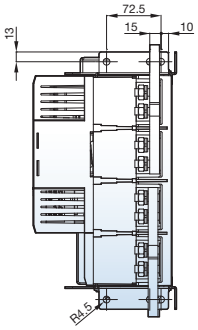

**R Type** (Spread type)

• 4P [Fixed Z: Plane spread type / T: Plane vertical type]

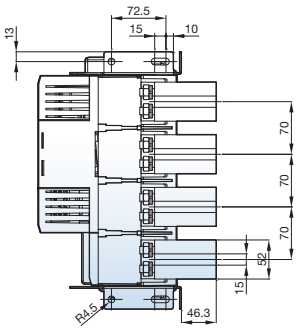


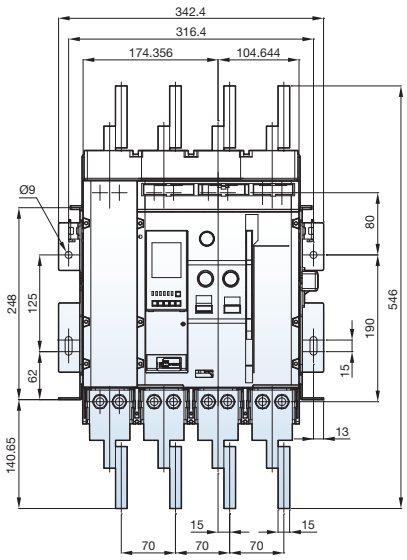

**Z Type** (Plane spread type)

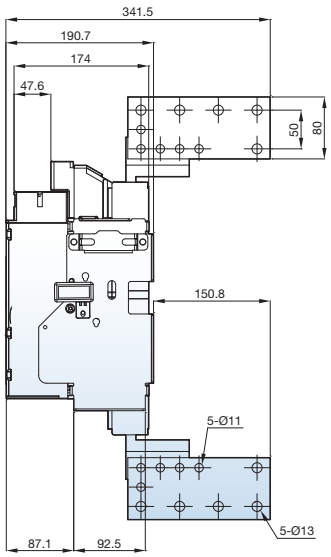


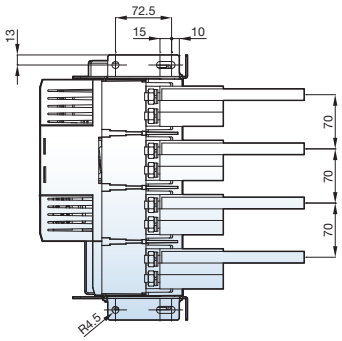

**T Type** (Plane vertical type)

• 4P [Fixed X: Cable lug type]

(Unit : mm)



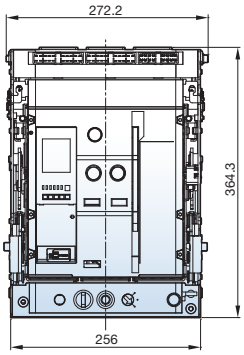



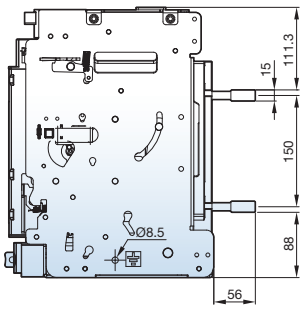

**X Type** (Cable lug type)

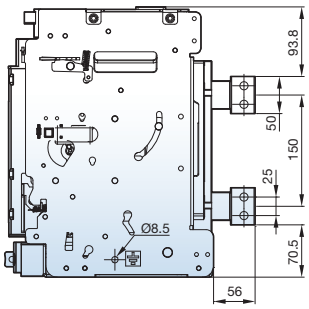
# Dimensions

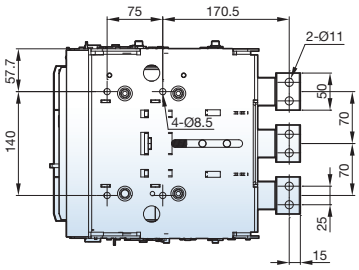
• 3P [Draw-out H: Horizontal type / V: Vertical type]

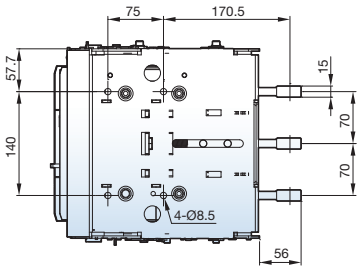
(Unit : mm)



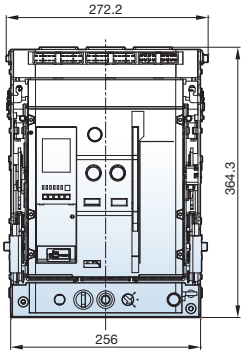



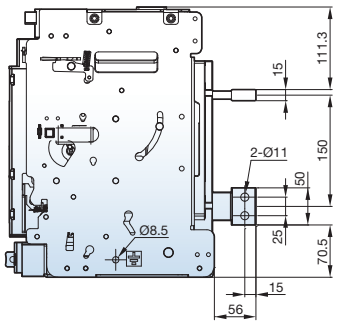



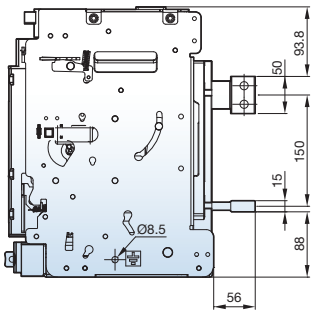

**H Type** (Horizontal type)

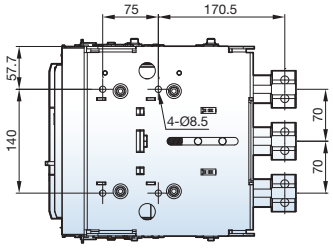
**V Type** (Vertical type)

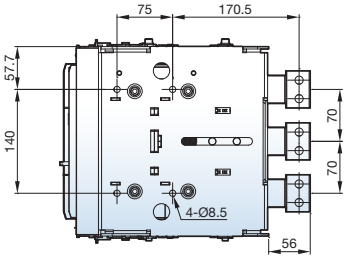
• 3P [Draw-out M: Upper-Horizontal type, Lower-Vertical type / N: Upper-Vertical type, Lower-Horizontal type]



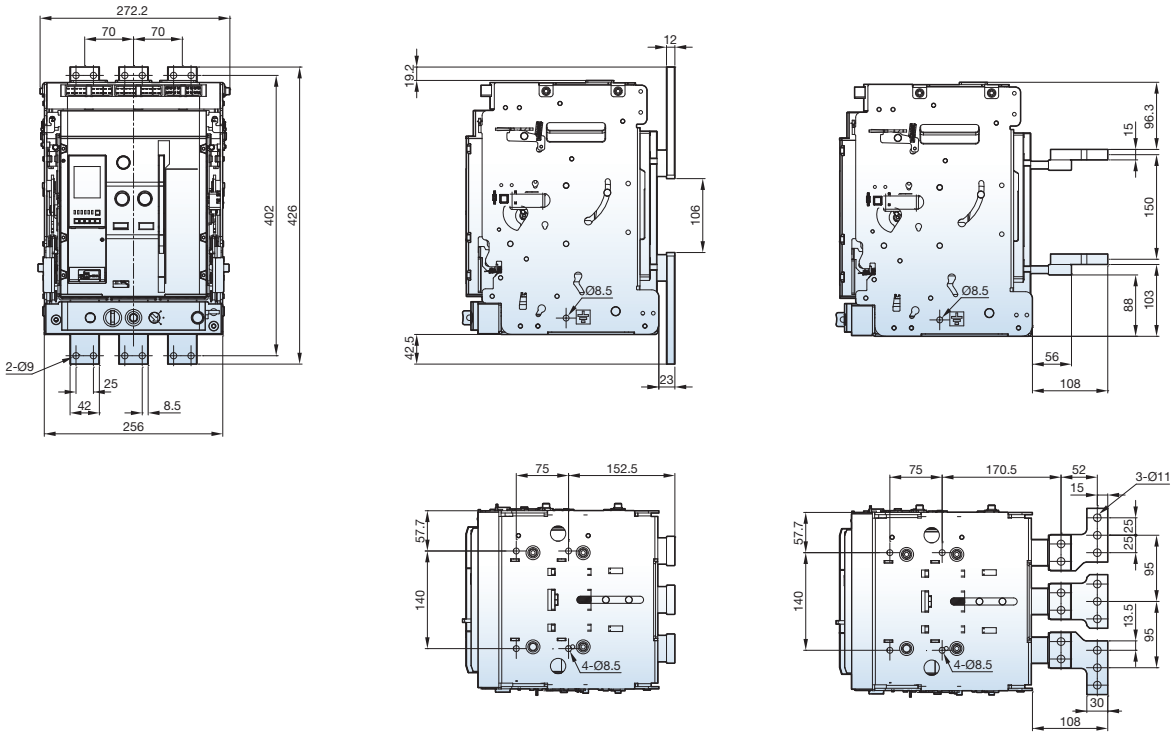




**M Type**
(Upper-Horizontal type, Lower-Vertical type)

**N Type**
(Upper-Vertical type, Lower-Horizontal type)

• 3P [Draw-out P: Plane type / R: Spread type]

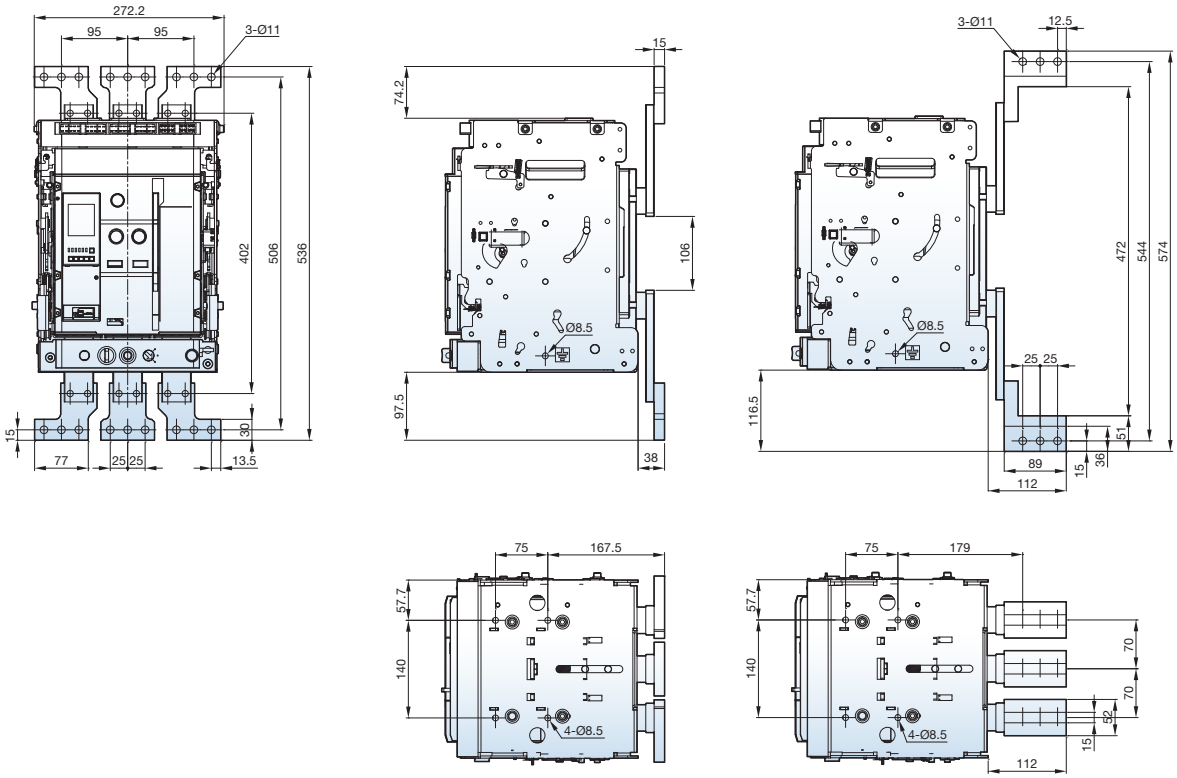
(Unit : mm)




**P Type** (Plane type)

**R Type** (Spread type)

• 3P [Draw-out Z: Plane spread type / T: Plane vertical type]



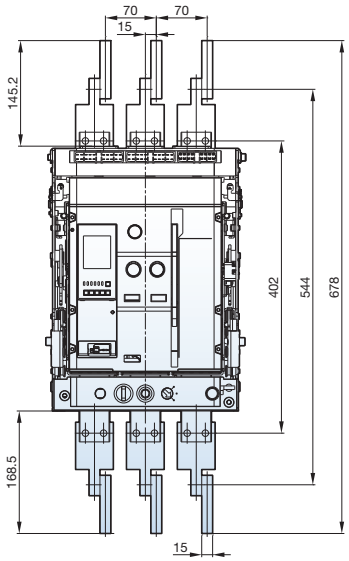

**Z Type** (Plane spread type)

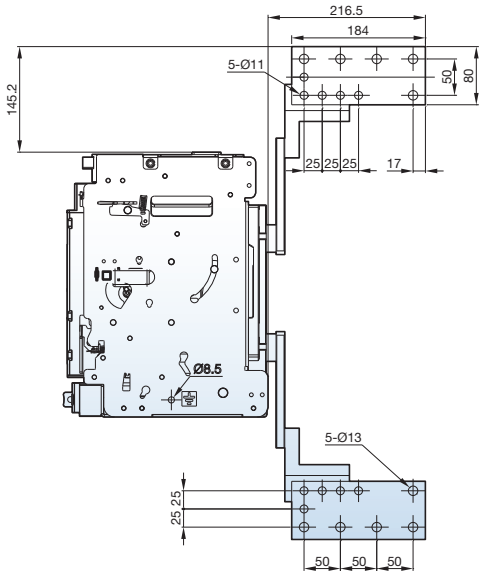
**T Type** (Plane vertical type)

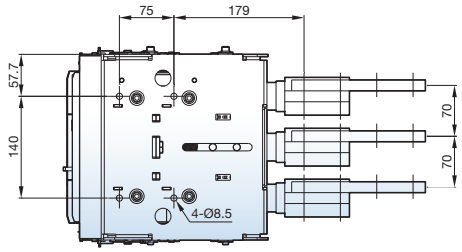
# Dimensions

• 3P [Draw-out X: Cable lug type]

(Unit : mm)



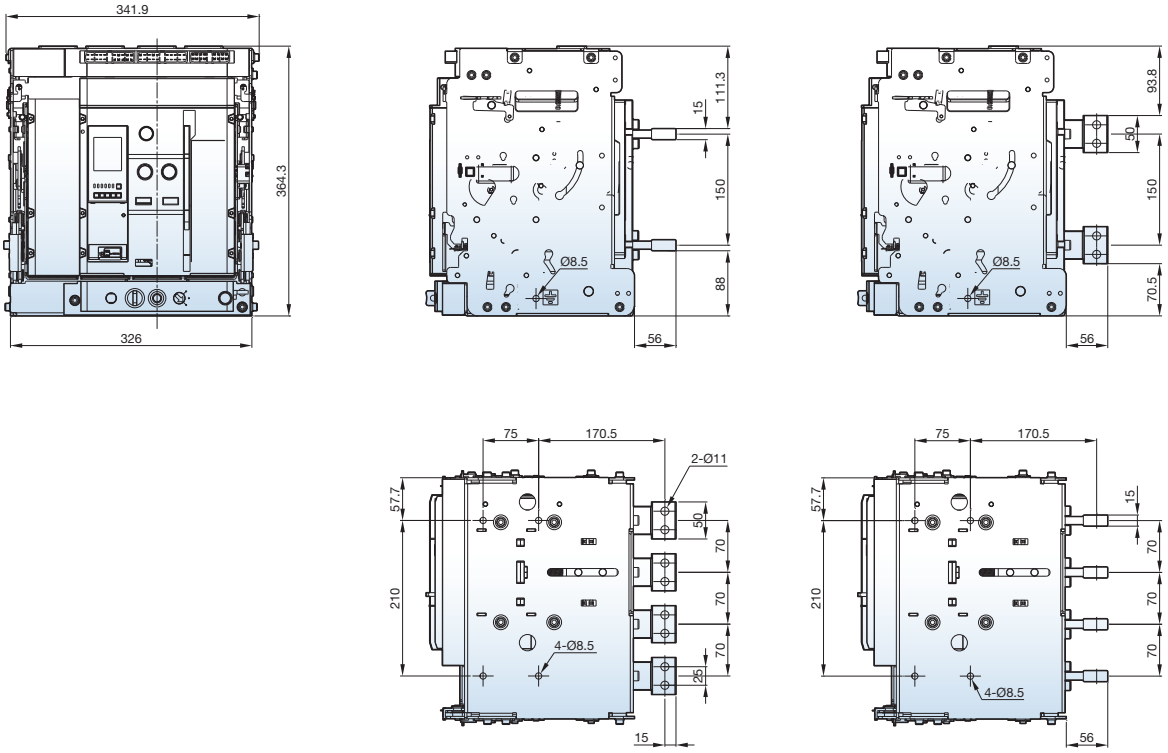




**X Type** (Cable lug type)

• 4P [Draw-out H: Horizontal type / V: Vertical type]

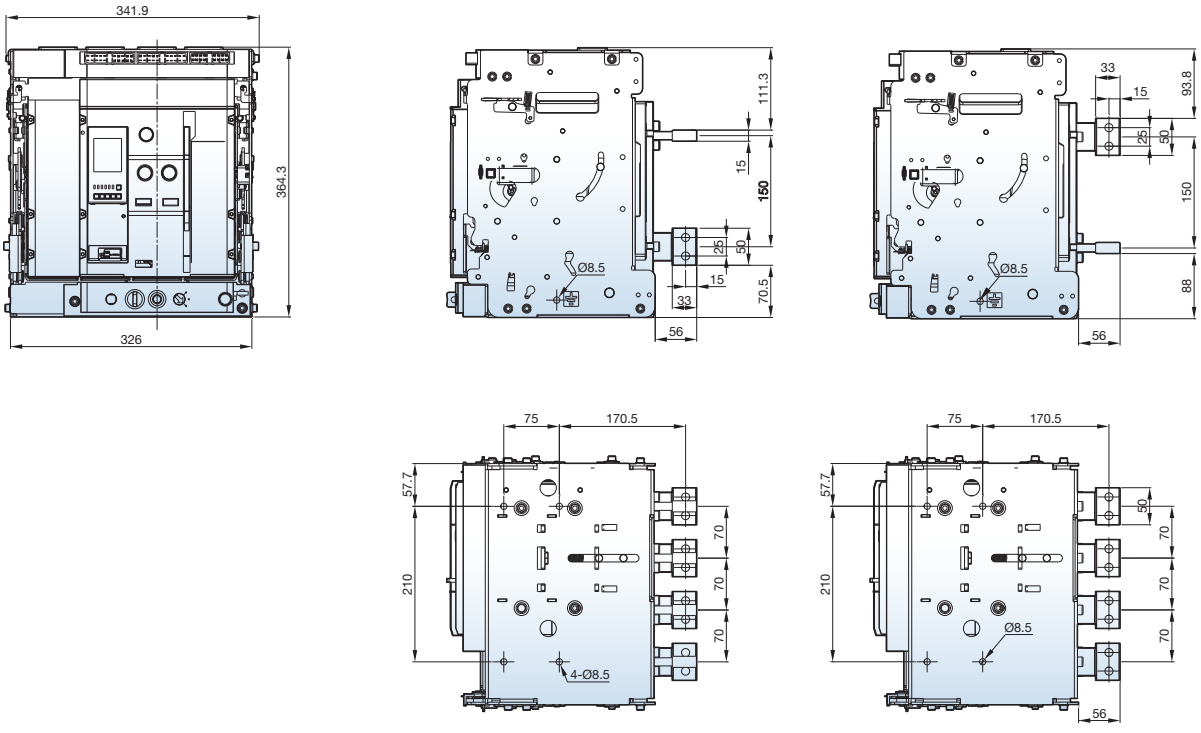
(Unit : mm)




**H Type** (Horizontal type)

**V Type** (Vertical type)

• 4P [Draw-out M: Upper-Horizontal type, Lower-Vertical type / N: Upper-Vertical type, Lower-Horizontal type]



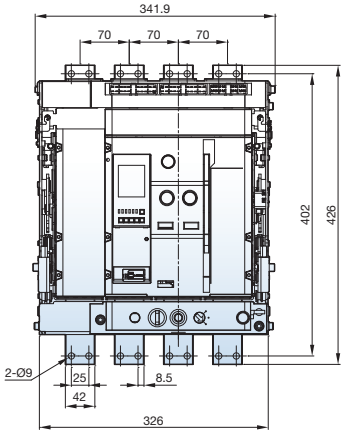

**M Type**
(Upper-Horizontal type, Lower-Vertical type)

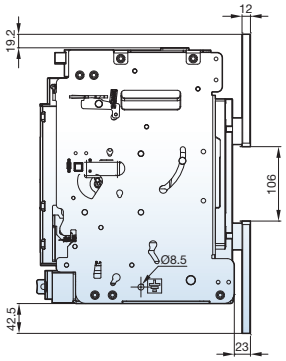
**N Type**
(Upper-Vertical type, Lower-Horizontal type)

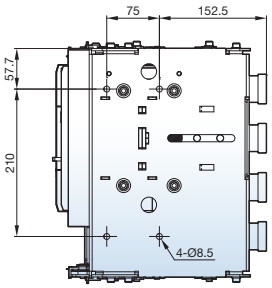
# Dimensions

• 4P [Draw-out P: Plane type / R: Spread type]

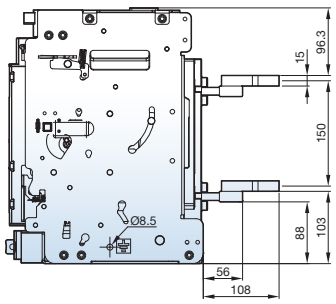
(Unit : mm)

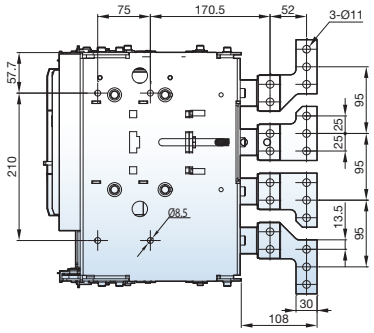


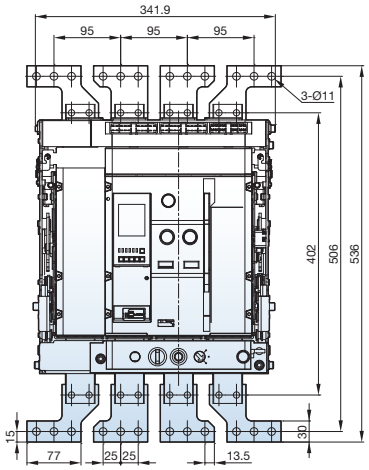

**P Type** (Plane type)

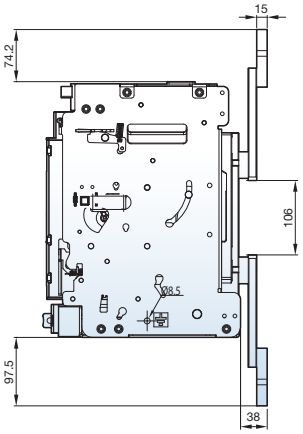


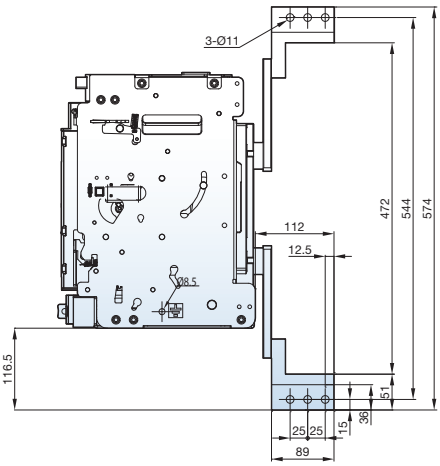



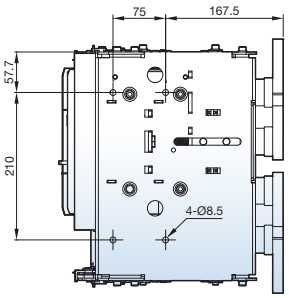

**R Type** (Spread type)

• 4P [Draw-out Z: Plane spread type / T: Plane vertical type]

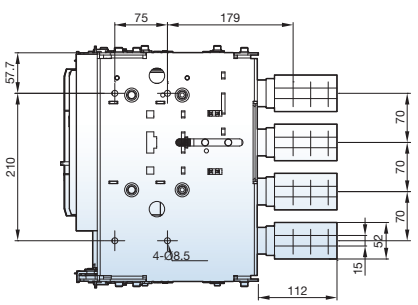


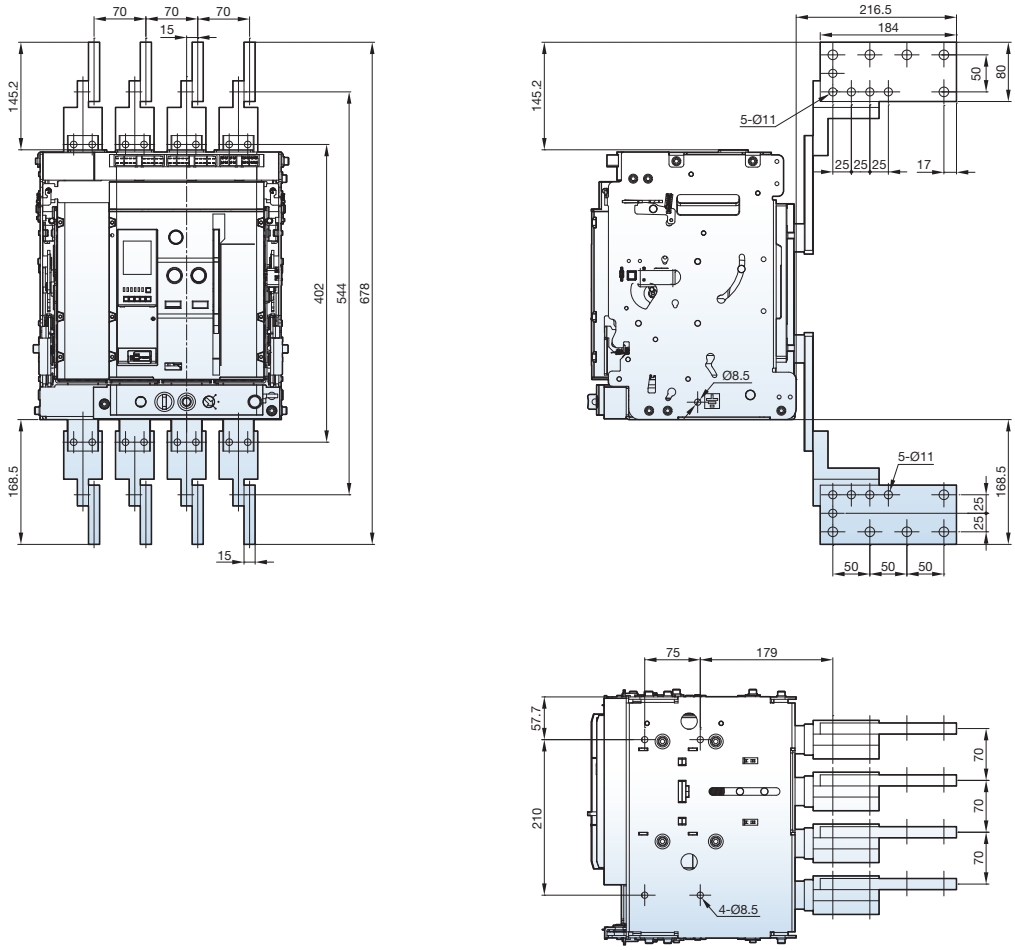

**Z Type** (Plane spread type)




**T Type** (Plane vertical type)

• 4P [Draw-out X: Cable lug type]

(Unit : mm)




**X Type** (Cable lug type)

# Normal / Special service condition

## Normal service conditions

If under ordinary conditions the following normal working conditions are all satisfied, Compact ACB should be used under this condition unless otherwise specified.

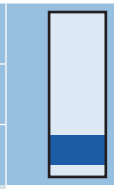
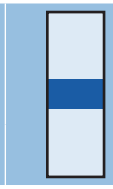
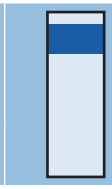
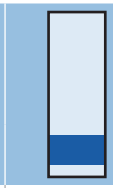
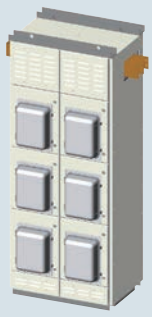
1) Ambient temperature
   A range of max. +40°C to min. -5°C is recommended. However, the average temperature of 24 hours does not exceed +35°C.
2) Altitude 2,000m or less.
3) Environmental conditions
   The air must be clean, and the relative humidity does not exceed 85% at a max. of +40°C and 90% at 20°C. Do not use and store in presence of corrosive or ammonia gas. ($H_2S \leq 0.01$ppm, $SO_2 \leq 0.01$ppm, $NH_3 \leq$ a few ppm)
4) Installation conditions
   When installing Compact ACB, refer to catalogue or the installation instructions in the instruction manual.
5) Storage temperature
   A range of max. +60°C to min. -20°C is recommended.
6) Replacement
   Approx. 15 years (depends on number of breaking of over current or service condition). Please see maintenance and inspection for further detail.

## Special service conditions

If In the case of special service condition, modified air circuit breakers are available. Please specify when ordering. Service life may be shorter, it depends on service conditions.

1) Special environmental conditions
   If it is used at high temperature and/or high humidity, the insulation durability and other electrical or mechanical features may deteriorate. Therefore, the breaker should be specially treated. Moisture fungus treatment with increased corrosion-resistance is recommended. When using products under this condition, please contact LS service team or nearest sales representatives.
2) Special ambient temperature
   If the ambient temperature exceeds +40 , reduce the continuous conducting current for a use referring to Table. A.
3) Special altitude
   If it is used at the 2,000m or higher the heat radiation rate is reduced and the operating voltage, continuous current capacity and breaking capacity are decreased. Moreover the durability of the insulation is also decreased owing to the atmospheric pressure. Contact us for further detail.

**Table A. Rated current correction table according to ambient temperature**

| Switchgear composition | | | 3 |  | |  | |  | |  | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | | | | | | | | |
| | | | 1 | | | | | | | | |
| Connection Type | | | | Vertical | | | Horizontal | | | | |
| Busbar dimensions (mm) | | | | 2b. 50×10 | | | | | | | |
| Switchgear | | | 3 | | | 1330 | | | 1190 | | |
|  2000×400×600 | IP41 | 35°C | 2 | | 1400 | | | 1240 | | | |
| | | | 1 | 1500 | | | 1310 | | | | |
| | | 45°C | 3 | | | 1270 | | | 1120 | | |
| | | | 2 | | 1320 | | | 1180 | | | |
| | | | 1 | 1420 | | | 1240 | | | | |
| | | 55°C | 3 | | | 1190 | | | 1050 | | |
| | | | 2 | | 1240 | | | 1090 | | | |
| | | | 1 | 1330 | | | 1160 | | | | |
| | IP54 | 35°C | 3 | | | 1230 | | | 1090 | | |
| | | | 2 | | 1310 | | | 1160 | | | |
| | | | 1 | 1390 | | | 1300 | | | | |
| | | 45°C | 3 | | | 1150 | | | 1020 | | |
| | | | 2 | | 1240 | | | 1100 | | | |
| | | | 1 | 1310 | | | 1220 | | | | |
| | | 55°C | 3 | | | 1080 | | | 960 | | |
| | | | 2 | | 1160 | | | 1020 | | | |
| | | | 1 | 1220 | | | 1140 | | | | |

# Altitude and Isolation Voltage

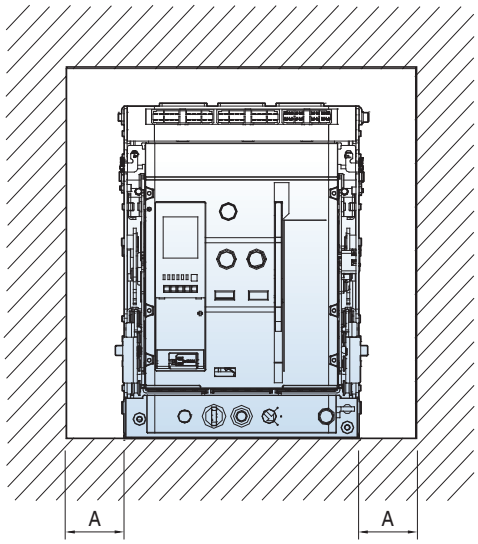
## Altitude

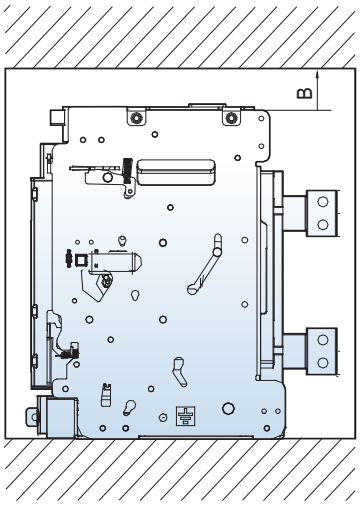
Compact ACB is designed for operation at altitudes under 2000m. At altitudes higher than 2000m, change the ratings upon a service condition.

| Item \ Altitude [m] | 2000 | 3000 | 4000 | 5000 |
|---|---|---|---|---|
| Withstand voltage (V) | 3500 | 3150 | 2500 | 2100 |
| Average insulating voltage (V) | 1000 | 900 | 700 | 600 |
| Max. using voltage (V) | 690 | 590 | 520 | 460 |
| Current compensation constant | 1×In | 0.99×In | 0.96×In | 0.94×In |

## Insulation clearance

When drawing the electric power supply panel, please keep the distance of Insulation clearance between Compact ACB and panel as listed in table.



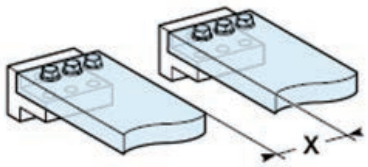




(Unit : mm)

| Type | A | B |
|---|---|---|
| Fixed | 50 | 150 |
| Fixed (With Arc screen) | 5 | 50 |
| Draw-out | 5 | 50 |

## Minimum clearances distance

For the safety, all the electric charging parts need to be installed over minimum clearances distance.



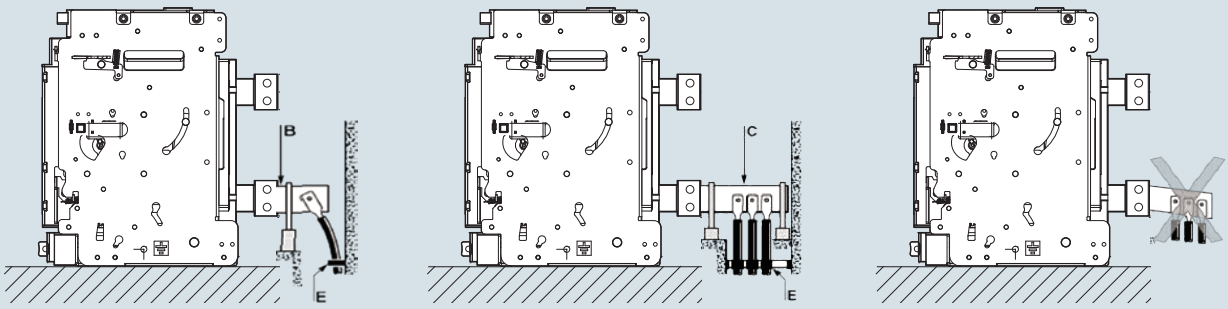

| Insulating voltage (Ui) | Minimum clearances distance (X min) |
|---|---|
| 600V | 8 mm |
| 1000V | 14 mm |

# Installation recommendation

## BUS-BAR Connection

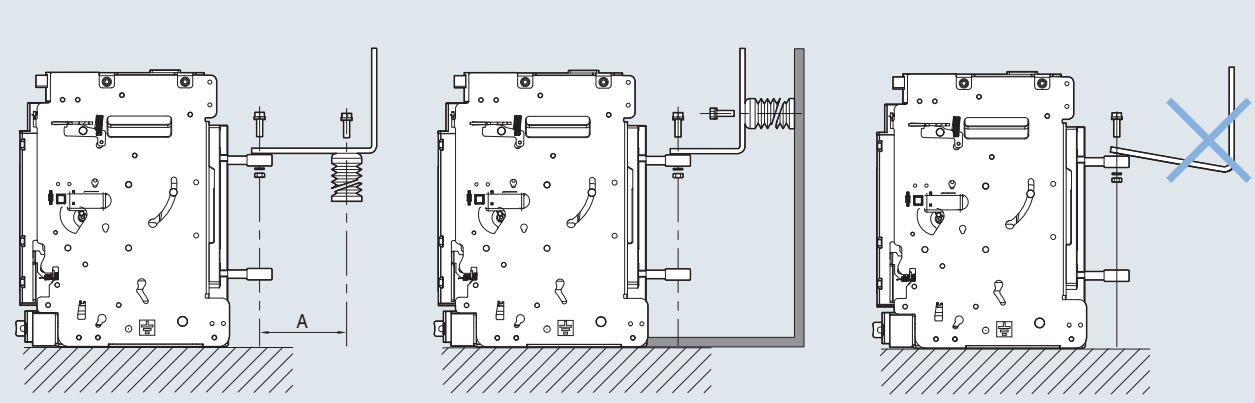
## Cables connections

Make sure that no excessive mechanical force put on the rear terminals for cable connection.
Extension terminal is fixed such as B, C and cable is to fixed to the frame such as E




## Bus-bar connection

For busbar connection, connect access parts with a provided torque and fix with parallel installing the support not to apply terminal weight to circuit breaker.
In order to prevent the spread safety or secondary accidents, secure maximum safe distance A from the connection point (Compact ACB 690V 50kA 1600A The maximum safety clearance is 250mm) so that it can withstand the electric force generated in the event of a short circuit.
(Support strength: Insulator bending load 720kg or more, tensile strength 3000kg or more)




※ You can not get a warranty for damage caused by any modifications.

# Memo

# Ordering sheet

If rated current or the order you placed is different from the ordering sheet listed below, please fill out another ordering sheet upon your specification.

| Receipt | LS ELECTRIC Co., Ltd. | Order Day | | Distributor Name | |
|---|---|---|---|---|---|
| Project | | Contractor | | | |
| Delivery place | | Delivery date | | PNL Maker | |

**ACB Main body**

| | |
|---|---|
| Type of ACB | ● Susol Compact ☐ AN ☐ AH ☐ AR |
| Frame size | ☐ C (400~1600AF) |
| Ratings | AF |
| Rated current (Rating Plug) | A |
| Trip Relay | ☐ NO |
| | ☐ YES |

| Type | Frequency | | Control voltage | | | Comm. | | Optional function | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 60Hz | 50Hz | NO | AC/DC 110~220V | DC 24~48V | NO | YES | Earth leakage detection | External CT ground fault | Pre-Trip Alarm |
| Normal | ☐ NGO | ☐ NG5 | ● | - | - | ● | - | - | - | - |
| Ammeter | ☐ AGO | ☐ AG5 | ● | - | - | ● | - | - | - | - |
| | ☐ AG1 | ☐ AG6 | - | ● | - | ● | - | - | - | - |
| | ☐ AE0 | ☐ AE5 | ● | - | - | ● | - | - | ● | - |
| | ☐ AE1 | ☐ AE6 | - | ● | - | ● | - | - | ● | - |
| | ☐ AE2 | ☐ AE7 | - | - | ● | ● | - | - | ● | - |
| | ☐ AC1 | ☐ AC6 | - | ● | | - | ● | - | - | - |
| | ☐ AC2 | ☐ AC7 | - | - | ● | - | ● | - | - | - |
| | ☐ AX1 | ☐ AX6 | - | ● | | - | ● | - | ● | - |
| | ☐ AX2 | ☐ AX7 | - | - | ● | - | ● | - | ● | - |

| Type | Frequency | | Control voltage | | | Comm. | | Optional function | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 60Hz | 50Hz | NO | AC/DC 110~220V | DC 24~48V | NO | YES | Earth leakage detection | External CT ground fault | Pre-Trip Alarm |
| Power Meter | ☐ PC1 | ☐ PC6 | - | ● | - | - | ● | - | - | - |
| | ☐ PC2 | ☐ PC7 | - | - | ● | - | ● | - | - | - |
| | ☐ PX1 | ☐ PX6 | - | ● | - | - | ● | - | ● | - |
| | ☐ PX2 | ☐ PX7 | - | - | ● | - | ● | - | ● | - |
| Supreme Meter | ☐ SC1 | ☐ SC6 | - | ● | - | - | ● | - | - | - |
| | ☐ SC2 | ☐ SC7 | - | - | ● | - | ● | - | - | - |
| | ☐ SX1 | ☐ SX6 | - | ● | - | - | ● | - | ● | - |
| | ☐ SX2 | ☐ SX7 | - | - | ● | - | ● | - | ● | - |

Note) 1. Standard function: Ground fault detection
2. Communication function is not available under no control voltage
3. Power/Supreme Meter is also available for Generator protection

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No.of poles | ☐ 3-pole | | | ☐ 4-pole | | | |
| Installation type | ☐ Draw-out type | | | ☐ Fixed type | | | |
| Phase arranging order | ☐ Standard type (N, R, S, T) | | | ☐ Reverse phase type (R, S, T, N) | | | |
| Closing type | ☐ Manual closing | | | | | | |
| | ☐ Electrical closing | | | | | | |
| | • Charge method | | | ☐ Standard type (OFF-Charging method) | | | |
| | | | | ☐ Rapid auto-reclosing type (ON-Charging method) | | | |
| | • Motor operating voltage | ☐ AC/DC 100V~130V | | ☐ DC 125V | ☐ 24V~30V | ☐ DC 48V~60V | |
| | | ☐ AC/DC 200V~250V | | ☐ AC 380V~415V | ☐ AC 440V~480V | ☐ AC 48V | |
| Closing voltage | ☐ AC/DC 100V~130V | ☐ DC 125V | ☐ AC/DC 200V~250V | ☐ DC 24V~30V | ☐ DC 48V~60V | ☐ AC 380V~480V | ☐ AC 48V |
| Tripping voltage | ☐ AC/DC 100V~130V | ☐ DC 125V | ☐ AC/DC 200V~250V | ☐ DC 24V~30V | ☐ DC 48V~60V | ☐ AC 380V~480V | ☐ AC 48V |

**ACB Cradle**

| | | | | | | |
|---|---|---|---|---|---|---|
| Cradle type | ☐ No Safety Shutter (E class) | | | ☐ Safety Shutter Attachment (F class) | | |
| Installation type | ☐ Manual connection | | | ☐ Automatic connection | | |

**Bus-bar connection**

| | | | | | | |
|---|---|---|---|---|---|---|
| Bus-bar type | ☐ Horizontal | ☐ Vertical | ☐ Plane | ☐ Upper: Horizontal, Lower: Vertical | ☐ Upper: Vertical, Lower: Horizontal | ☐ Customer mounting |
| | ☐ Horizontal with Spreaders | | ☐ Plane with Spreaders | | ☐ Vertical with Extention | ☐ Cable-Lug |

**ACB Accessory**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ACB Main body | Standard | • Aux. contact | ☐ Standard type (4c, standard installation) | | | | |
| | | • Key Lock | | ☐ Single Key (ON-Lock) | | | |
| | | • Undervoltage trip device (UVT, Instantaneous type) | | ☐ AC/DC 100V~130V | ☐ DC 125V | ☐ AC/DC 200V~250V | |
| | | | | ☐ DC 24V~30V | ☐ DC 48V~60V | ☐ AC 380V~480V | ☐ AC 48V |
| | | • Counter | | ☐ Non-attachment type | | ☐ Attachment type | |
| | | • Miss insertion preventive device (MIP) | | ☐ Non-attachment type | | | |
| | | • Double trip device (Same with Tripping voltage) | | ☐ Non-attachment type | | ☐ Attachment type | |
| | | • Ready-to-close switch | | ☐ Non-attachment type | | ☐ Attachment type | |
| | | • Trip Alarm switch, Manual Reset Button | | ☐ Non-attachment type | | ☐ Attachment type | |
| | | • Key Interlock (K2, ON–Lock) | | | | ☐ Attachment type | |
| | | • ON/OFF Button Lock | | | | ☐ Attachment type | |
| | | • Micro Load type (4 max.) | | ☐ Non-attachment type | | qty. | |
| | Cradle mounting (Non-attachment type) | • Cell switch (CL) | ☐ 4c | ☐ 8c | | | |
| | | ☐ Door Interlock with Wire type | | ☐ Door Interlock with Catch type | | | |
| | | • Mechanical operation contact (MOC) | | ☐ Standard type (10a10b) | | | |
| | | • Mechanical Interlock (MI) | | ☐ Wire type (2 terminals) | | ☐ Wire type (3 terminals) | |
| | | ☐ Miss insertion preventive device (MIP) | | | | | |
| | | ☐ Racking Interlock | ☐ Insulation barrier | | | | |
| | External mounting | • UVT time delay controller | | ☐ AC/DC 100V~130V | ☐ DC 125V | ☐ AC/DC 200V~250V | |
| | | | | ☐ DC 48V~60V | ☐ AC 380V~480V | | ☐ AC 48V |
| | | ☐ Door Frame (DF) | ☐ Condenser trip device (CTD) | | ☐ OCR Tester | | |
| | | ☐ Dust Cover | ☐ Profibus-DP Comm. | ☐ Remote closing & trip | | | |

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.



**Safety Instructions**

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.



- According to The WEEE Directive, please do not discard the device with your household waste.

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**2020. 06**

Specifications in this catalog are subject to change without notice due to continuous product development and improvement.



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