

# LS ELECTRIC

Top 100  
Global  
Innovator  
for 10 years

**Susol** Super Solution

**Metasol** Meta Solution

## Air Circuit Breakers



تهران - خیابان لاله زارنو - بالاتر از منوچهری - پاساژ البرز ۲ - طبقه اول - واحد ۲۳۵

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**Susol** Super Solution

**Metasol** Meta Solution

# ACB

## Air Circuit Breakers

Premium Susol/Metasol ACB meets your demands for high breaking capacity, fully line-up, and optimized panel size.

Various accessories and connection methods realize user-friendly handling.

Susol/Metasol provides you with total solutions with an advanced trip relay for measurement, diagnosis, analysis, and communication as well as protective functions for absolute protective coordination and electric power monitoring system.

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# Super/Meta Solution

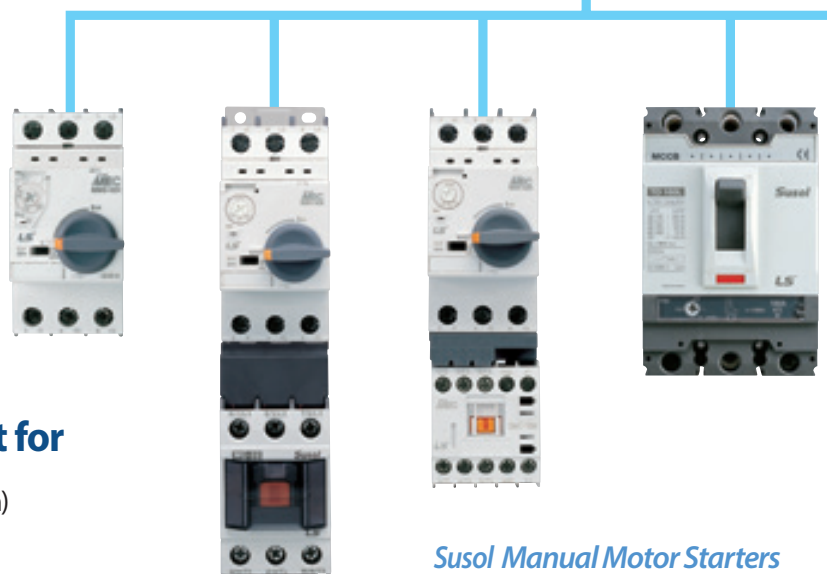


# LS Super Solution series



## ■ Susol series circuit breakers are suitable for

- Protection of power distribution
- Protection of motor & its control device
- Controlling and disconnecting circuits



## ■ Optimum technical support for

- (Cascading, Discrimination, Type 2 coordination)
- Selecting economical protection system
  - Guarantee safety of the installation
  - Reducing the stress on components and damage
  - Guarantee service continuity

*Susol Manual Motor Starters*



*Susol Air Circuit Breakers*



*Susol Molded Circuit Breakers*



*Susol Magnetic Contactors & Overload Relays*

# Susol

Super solution

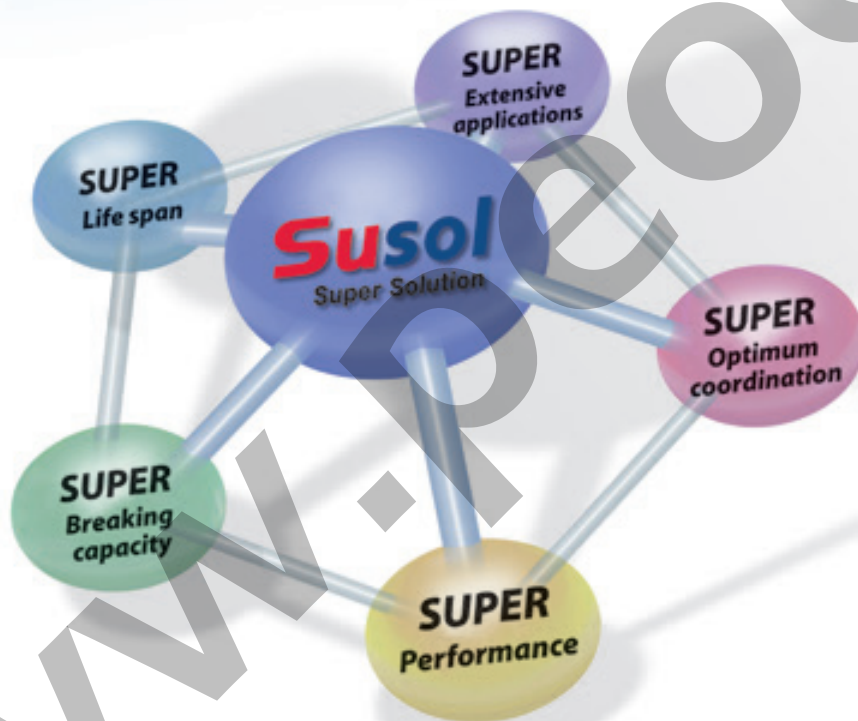


Air circuit breaker is to be installed in low voltage distribution line to break the circuit when over current, short circuit, or ground fault occurs in order to protect user and other subordinate components.

# Susol ACB

Air Circuit Breakers

LS Technology, **150kA** only



- *KS certified (KS C 4620)*
- *KEPIC (Nuclear rating) and quality (Q-class) certified.*
- *LR, ABS, DNV, KR, BV, GL, RINA, NK certified*
- *Maximum breaking capacity : 150kA (6300AF at 500Vac)*
- *2000/4000/6300AF, 3 Ampere Frame Sizes*
- *N phase current conducting capacity : 100%*
- *Offers variety of accessories including digital trip relay with metering/measuring/analysis/communication functions.*
- *Rated impulse voltage (Uimp) : 12kV*

## ■ Ratings

- *In : 630~6300AF 3,4 poles, fixed or draw-in/out type*
- *Ics : 85/100/150kA, 500Vac rating*
- *Icw : 65/85/100kA*

*LS has passed and achieved Korea's highest and toughest KS rating (KS C 8325 KS C 4620) to prove its safety and functionality in ACB market.*

# Full line-up & Compact

Up to 6300A, Susol ACB provides fully lined-up 3 frame.

For each frame, there is just one size, which is smaller and more compact.

It makes it possible for you to design the optimized volume panel.

**630~2000AF**

**630~4000AF**



W = 334mm

W = 412mm

85kA

100kA

## AH-06~20D

|    |        |
|----|--------|
| 06 | 630AF  |
| 08 | 800AF  |
| 10 | 1000AF |
| 13 | 1250AF |
| 16 | 1600AF |
| 20 | 2000AF |

Icu=Ics=85kA/500Vac  
W=334(3p), 419(4p)mm

## AH-06~40E

|    |        |    |        |
|----|--------|----|--------|
| 06 | 630AF  | 20 | 2000AF |
| 08 | 800AF  | 25 | 2500AF |
| 10 | 1000AF | 32 | 3200AF |
| 13 | 1250AF | 40 | 4000AF |
| 16 | 1600AF |    |        |

Icu=Ics=100kA/500Vac  
W=412(3p), 527(4p)mm



4000~6300AF



150kA

- The highest breaking capacity:  
150kA (6300AF at 500Vac)
- 3 ampere frame sizes:  
2000/4000/6300AF
- N phase current conducting capacity: 100%

**AH-40~63G**

|    |        |
|----|--------|
| 40 | 4000AF |
| 50 | 5000AF |
| 63 | 6300AF |

Icu=Ics=150kA/500Vac  
W=785(3p), 1015(4p)mm

# Trip Relay (OCR)

*Trip relays are classified according to function.*

Trip relays are classified according to their usages and functions to maximize customers' satisfaction. Classified trip relays and easy installation.

- Protection: overload, short current, ground fault, earth leakage, under voltage, over voltage, under frequency, over frequency, reverse power, unbalance, etc
- Measurement: voltage, ampere, power, energy, frequency, power factor, Harmonics, etc.
- Event & fault recording: Max. 256 events & faults
- Communication: Modbus/RS-485, Profibus-DP



Susol ACB Trip Relay functioning world-best protection can be interlocked with mechanism. It makes the breaking capacity of ACB improved and ACB's life enhanced, and provides advanced functions - measurement, diagnosis, analysis, and communication.

# Susol ACB Trip relay

**N type**



**A type**



**P/S type**



- L/S/I/G/Thermal
- Self Power
- RTC Timer mounted
- Fault information (LED)

- L/S/I/G(or EL)
- Thermal
- ZSI (Protective coordination)
- Remote Reset
- Modbus/RS-485
- Profibus-DP
- Self Power
- AC/DC 100~250V
- DC 15~60V
- RTC Timer mounted
- Fault Recording (10EA)

- L/S/I/G(or EL)
- Thermal (linear hot start)
- UV/OV/OF/UF/rP/Vun/lun
- Measurement: V/A/W/Wh/F/PF
- Harmonics (63th), Waveform (S Type)
- ZSI (Protective coordination)
- Remote Reset
- Modbus/RS-485
- Profibus-DP
- AC/DC 100~250V
- DC 15~60V
- RTC Timer mounted
- Event Recording (256EA)
- Fault Recording (256EA)
- Fault Wave (S Type)

## Trip relays series



**N Type (Normal)**  
 • Self-power + Overcurrent protection



**P Type (Power Meter)**  
 • A type + Power Meter +  
 Voltage / Frequency / Unbalance protection



**A Type (Ammeter)**  
 • Current Meter + Overcurrent protection +  
 DO control + Communication



**S Type (Supreme)**  
 • P type + Harmonics analysis (63 th) +  
 Fault wave recording

# Metasol

Meta solution

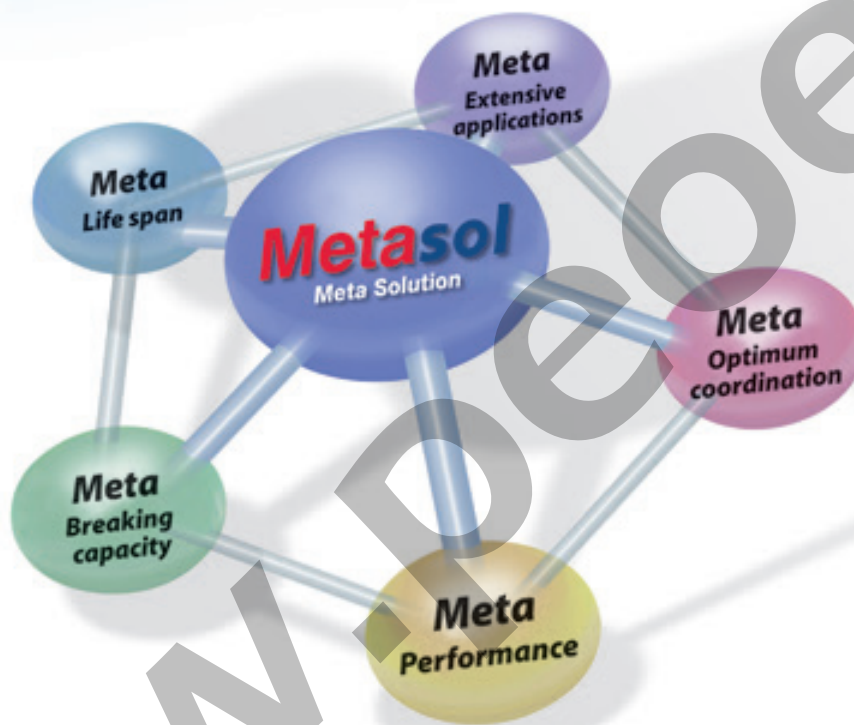


Air circuit breaker is to be installed in low voltage distribution line to break the circuit when over current, short circuit, or ground fault occurs in order to protect user and other subordinate components.

# Metasol ACB

## Air Circuit Breakers

This technology leads to Susol **Metasol.**



- *KS certified (KS C 4620)*
- *KEPIC(Nuclear rating) and quality (Q-class) certified.*
- *LR, ABS, DNV, KR, BV, GL, RINA, NK certified*
- *Maximum breaking capacity : 120kA (6300AF at 500Vac)*
- *2000/4000/5000/6300AF, 4 Ampere Frame Sizes*
  - 2 different types(AS, AN) for medium and small sizes(below 3200AF)
  - Large size (4000AF and above) Size, variety of line up
- *N phase current conducting capacity : 100%*
- *Offers variety of accessories including digital trip relay with metering/mearsuring/analysis/ communication functions.*
- *Rated impulse voltage (Uimp) : 12kV*

### ■ Ratings

- *In : 630~1600AF 3 • 4 poles, fixed or draw-in/out type (AN type)*  
*630~6300AF 3 • 4 poles, fixed or draw-in/out type (AS type)*
- *Ics : 65/70kA, 500Vac (AN type)*  
*70/85/100/120kA, 500Vac (AS type)*
- *Icw : 50/65kA (AN type)*  
*65/85/85/100kA (AS type)*

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# Full line-up & Compact

Up to 6300A, Metasol ACB provides fully lined-up 4 frame.

For each frame, there is just one size, which is smaller and more compact.

It makes it possible for you to design the optimized volume panel.

630~1600 AF (AN)

630~2000 AF (AS)

2000~4000 AF (AS)

4000 /



W = 334mm



W = 412mm



(65kA)

70kA

(70kA)

85kA

## AN-06~16D

|    |        |
|----|--------|
| 06 | 630AF  |
| 08 | 800AF  |
| 10 | 1000AF |
| 13 | 1250AF |
| 16 | 1600AF |

Icu=Ics=65kA/500Vac  
W=334(3p), 419(4p)mm

## AS-06~20D

|    |        |
|----|--------|
| 06 | 630AF  |
| 08 | 800AF  |
| 10 | 1000AF |
| 13 | 1250AF |
| 16 | 1600AF |
| 20 | 2000AF |

Icu=Ics=70kA/500Vac  
W=334(3p), 419(4p)mm

## AS-20~40E

|    |        |
|----|--------|
| 20 | 2000AF |
| 25 | 2500AF |
| 32 | 3200AF |
| 40 | 4000AF |

Icu=Ics=85kA/500Vac  
W=412(3p), 527(4p)mm

5000 AF (AS)

4000~6300 AF (AS)



W = 629mm

W = 785mm

D = 375mm

100kA ..... 120kA

### AS-50F

|    |        |
|----|--------|
| 40 | 4000AF |
| 50 | 5000AF |

Icu=Ics=100kA/500Vac  
W=629(3p), 799(4p)mm

### AS-40~63G

|    |        |
|----|--------|
| 40 | 4000AF |
| 50 | 5000AF |
| 63 | 6300AF |

Icu=Ics=120kA/500Vac  
W=785(3p), 1015(4p)mm

- The highest breaking capacity:  
150kA (6300AF at 500Vac)
- 4 ampere frame sizes:  
2000/4000/5000/6300AF
- N phase current conducting capacity: 100%

# Trip Relay (OCR)

*Trip relays are classified according to function.*

Trip relays are classified according to their usages and functions to maximize customers' satisfaction. Classified trip relays and easy installation.

- Protection: overload, short current, ground fault, earth leakage, under voltage, over voltage, under frequency, over frequency, reverse power, unbalance, etc
- Measurement: voltage, ampere, power, energy, frequency, power factor, Harmonics, etc.
- Event & fault recording: Max. 256 events & faults
- Communication: Modbus/RS-485, Profibus-DP



Metasol ACB Trip Relay functioning world-best protection can be interlocked with mechanism. It makes the breaking capacity of ACB improved and ACB's life enhanced, and provides advanced functions - measurement, diagnosis, analysis, and communication.



# Metasol ACB Trip relay

**N type**



**A type**



**P/S type**



- L/S/I/G/Thermal
- Self Power
- RTC Timer mounted
- Fault information (LED)

- L/S/I/G(or EL)
- Thermal
- ZSI (Protective coordination)
- Remote Reset
- Modbus/RS-485
- Profibus-DP

- Self Power
- AC/DC 100~250V
- DC 15~60V
- RTC Timer mounted
- Fault Recording (10EA)

- L/S/I/G(or EL)
- Thermal (linear hot start)
- UV/OV/OF/UF/rP/Vun/Iun
- Measurement: V/A/W/Wh/F/PF
- Harmonics (63th), Waveform (S Type)
- ZSI (Protective coordination)
- Remote Reset
- Modbus/RS-485
- Profibus-DP

- AC/DC 100~250V
- DC 15~60V
- RTC Timer mounted
- Event Recording (256EA)
- Fault Recording (256EA)
- Fault Wave (S Type)

## Trip relays series



### N Type (Normal)

- Self-power + Overcurrent protection



### P Type (Power Meter)

- A type + Power Meter + Voltage / Frequency / Unbalance protection



### A Type (Ammeter)

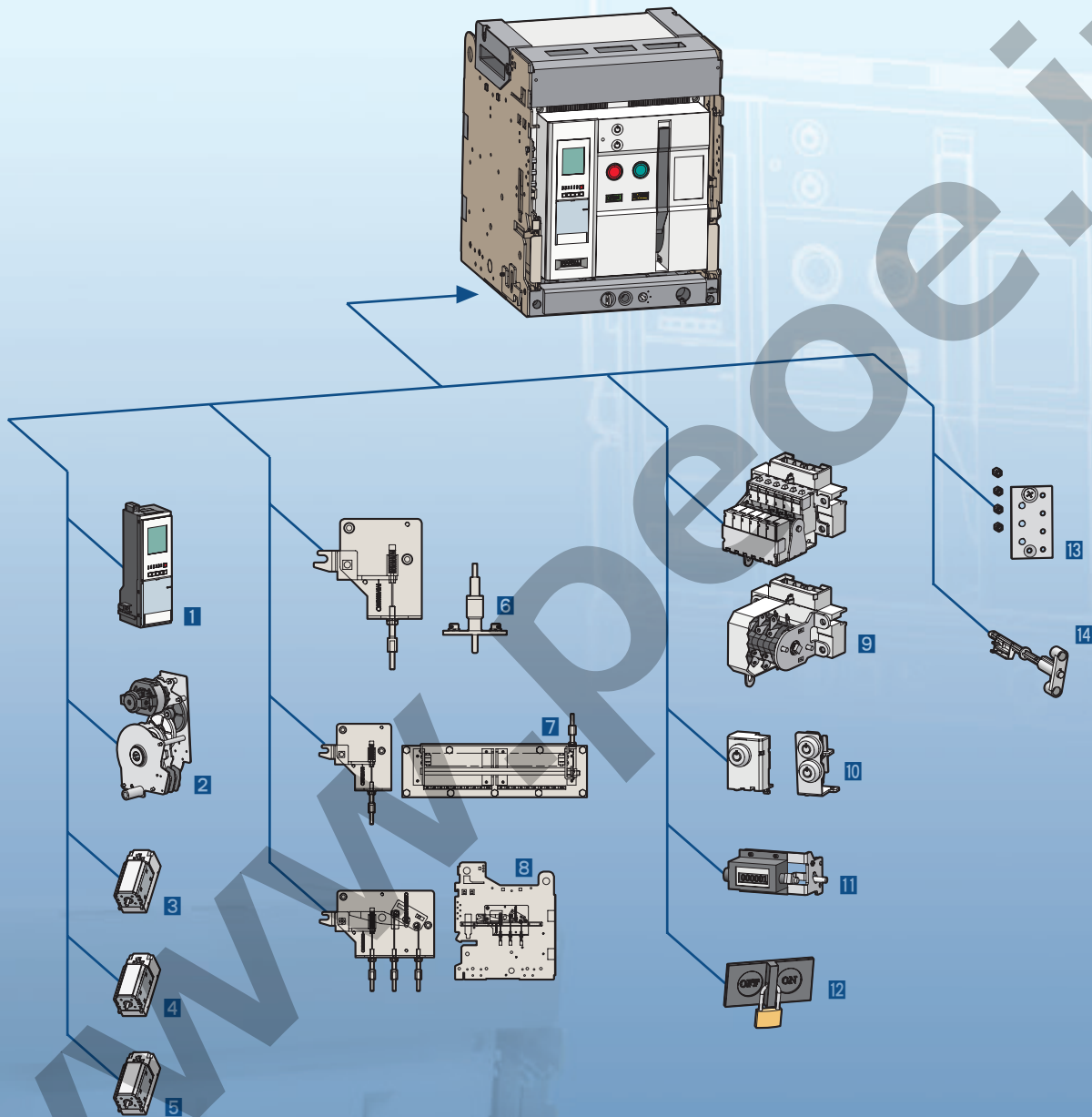
- Current Meter + Overcurrent protection + DO control + Communication



### S Type (Supreme)

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

# Accessories



## ACB

1 Trip Relay (OCR)

2 Motor (M)

3 Closing Coil (CC)

4 Shunt Coil (SHT)

5 Under Voltage Trip Device (UVT)

6 Door Interlock (DI)

7 MOC (Mechanical  
Operated Cell Switch)

8 Mechanical Interlock (MI)

9 Auxiliary Switch (AX)

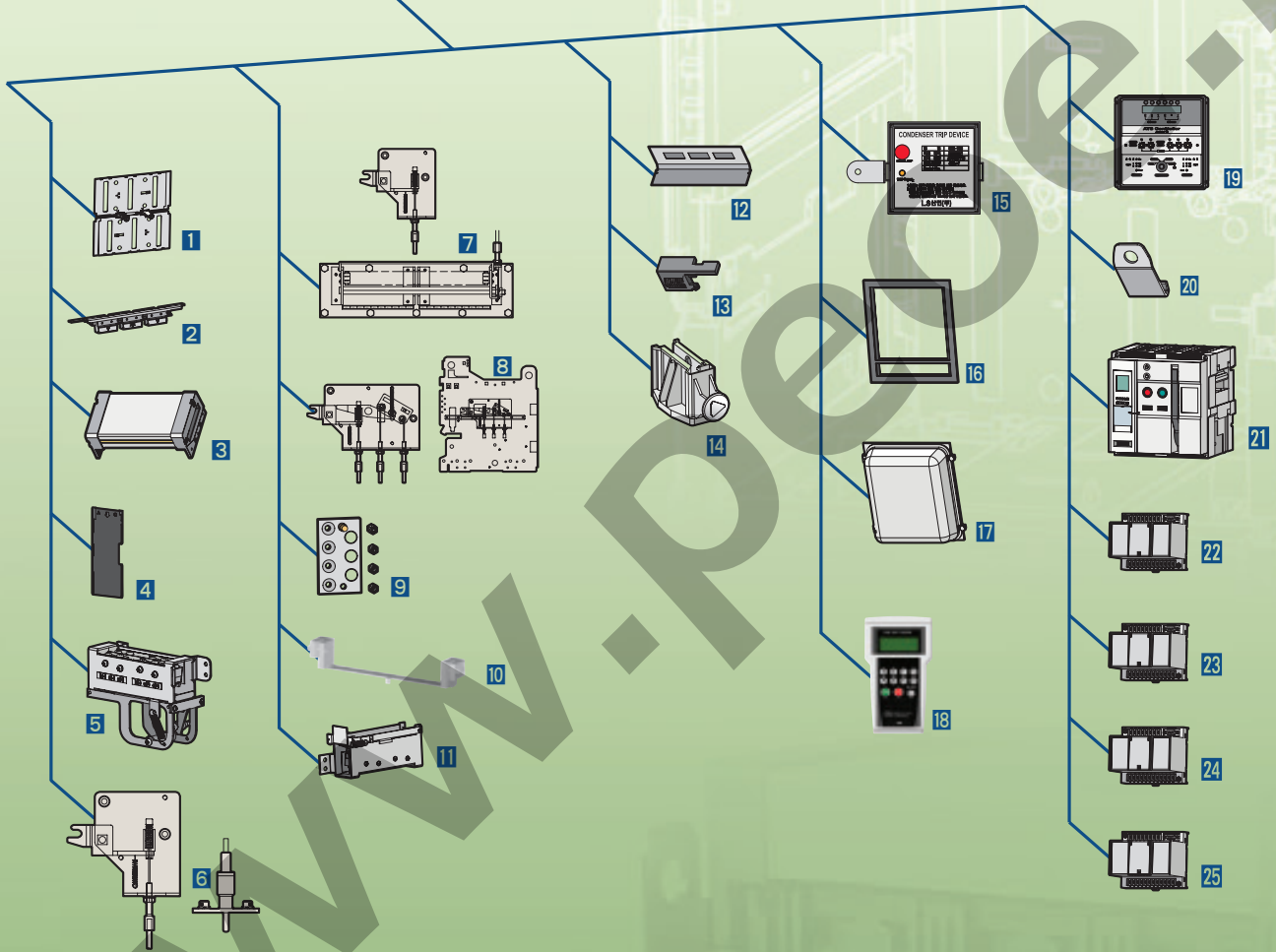
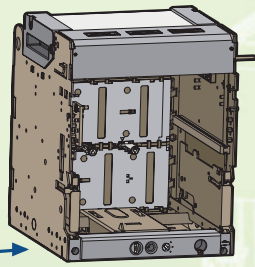
10 Key Lock (K1),  
Double Key Lock (K3)

11 Counter (C)

12 On/Off Button Lock (B)

13 Miss Insertion Preventing Device (MIP)

14 Manual Reset Button (MRB)



## Cradle

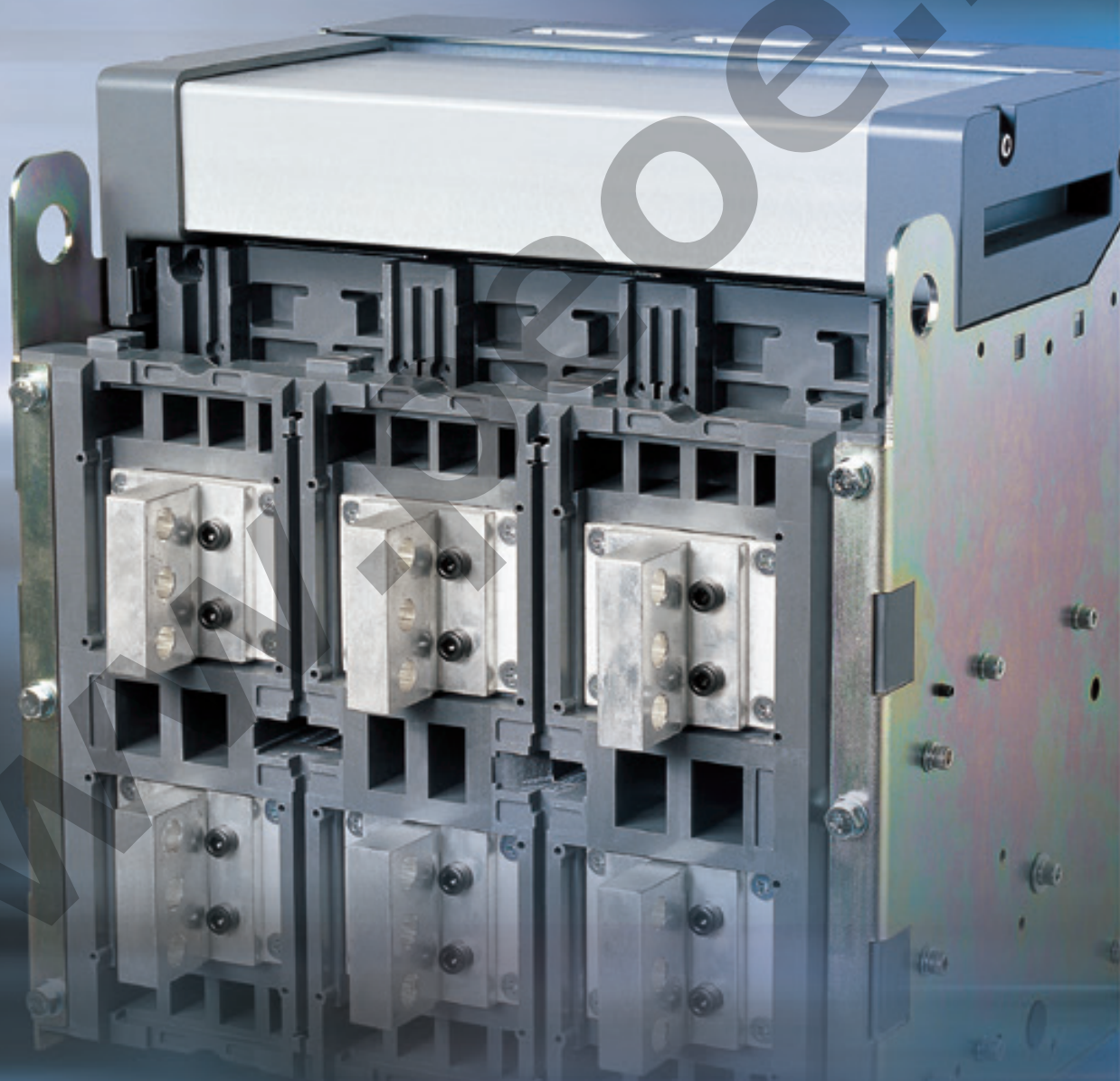
- 1 Safety Shutter (ST)
- 2 Manual Connector
- 3 Zero Arc Space (ZAS)
- 4 Insulation Barrier (IB)
- 5 Cell Switch (CEL)
- 6 Door Interlock (DI)
- 7 MOC (Mechanical Operated Cell switch)
- 8 Mechanical Interlock (MI)
- 9 Miss Insertion Prevent Device (MIP)
- 10 Body Supporter (BSP)
- 11 Shorting "b" Contact (SBC)
- 12 Safety Control Cover (SC)
- 13 Racking Interlock (RI)
- 14 Safety Shutter Lock (STL)

## Other

- 15 Condenser Trip Device (CTD)
- 16 Door Frame (DF)
- 17 Dust Cover (DC)
- 18 OCR Tester (OT)
- 19 ATS Controller (ATS)
- 20 Lifting Hook (LH)
- 21 Dummy ACB
- 22 UVT Time Delay Controller (UDC)
- 23 Profibus-DP Communication module
- 24 Remote I/O
- 25 Temperature Alarm

# Connection and Installation

---



Diversified terminal connection methods of the ACB main circuit for users.

# Multiple connections

## *Various installation methods*

### Standard connection



Horizontal type



Vertical type



Front type

### Mixed connection



Horizontal / Vertical type



Vertical / Horizontal type



Horizontal / Front type



Vertical / Front type



Front / Horizontal type



Front / Vertical type

- The Front connection type is suitable for the panel that demands narrow depth for stallation.
- The connection can be modified between vertical type and horizontal type by rotating the terminals through 90 degrees for the breakers such as AN-06~16D, AS-20E~32E, AH-06D~20D, AH-06E~32E.  
Note: AS-20D, AH-20D, AS-40E, AH-40E types are equipped with vertical-only terminals.

• Please refer to the rating lists (Page 34~37) because the installation method is various according to the rated current.

# External configuration

Susol · Metasol

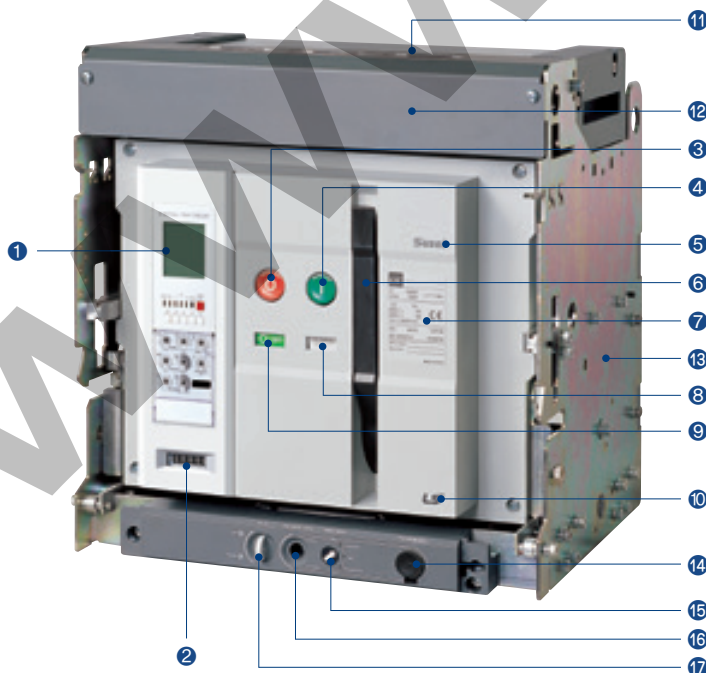
## Fixed type ACB



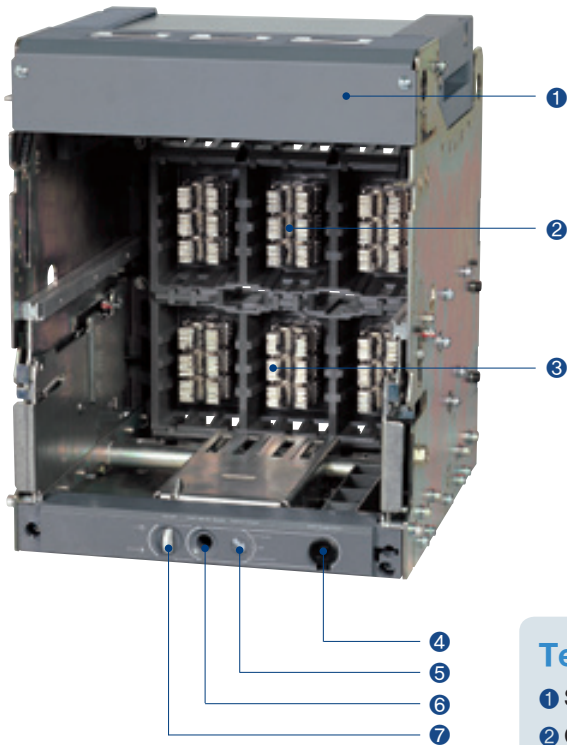
### Terms

- ① Trip relay
- ② Counter
- ③ OFF button
- ④ ON button
- ⑤ Series name
- ⑥ Charge handle
- ⑦ Rated name plate
- ⑧ Charge/Discharge indicator
- ⑨ ON/OFF indicator
- ⑩ Corporation logo
- ⑪ Arc cover (Zero Arc Space)
- ⑫ Safety control cover
- ⑬ Cradle
- ⑭ Draw-out handle
- ⑮ Position indicator
- ⑯ Handle inserting hole
- ⑰ Pad lock button
- ⑱ Arc chute
- ⑲ Front cover
- ⑳ Fixed type bracket

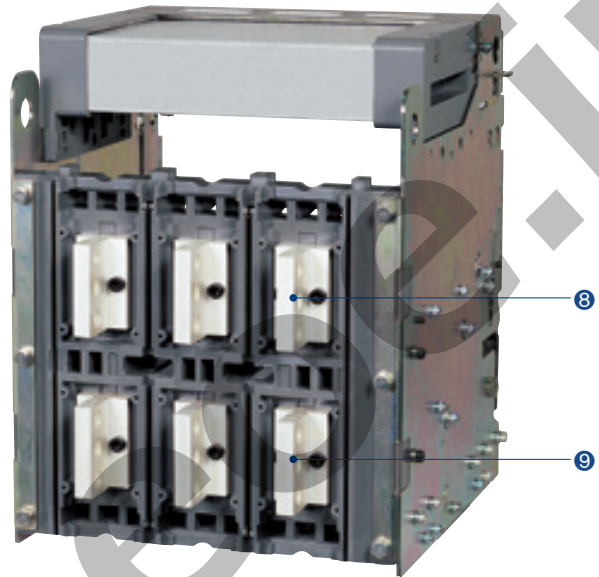
## Draw-out ACB (Cradle)



### Cradle (Internal)



### Cradle (Rear)

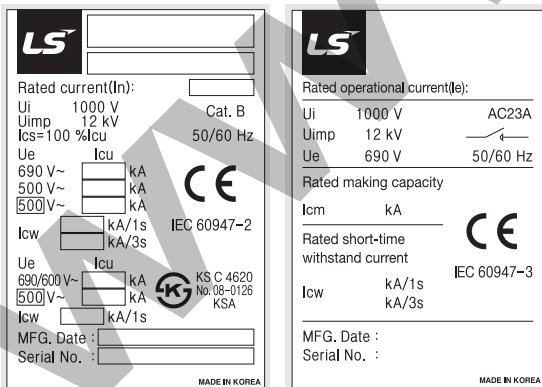


#### Terms

- ① Safety control cover
- ② Cradle finger
- ③ Cradle finger
- ④ Draw-out handle
- ⑤ Position indicator
- ⑥ Handle inserting hole
- ⑦ Pad lock button
- ⑧ Connecting terminal
- ⑨ Connecting terminal

### Rated name plate

#### [Acronym explanation]



- 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
- MFG. Date: Manufacturing date
- Icm: Rated making capacity

#### [Secondary nameplate]

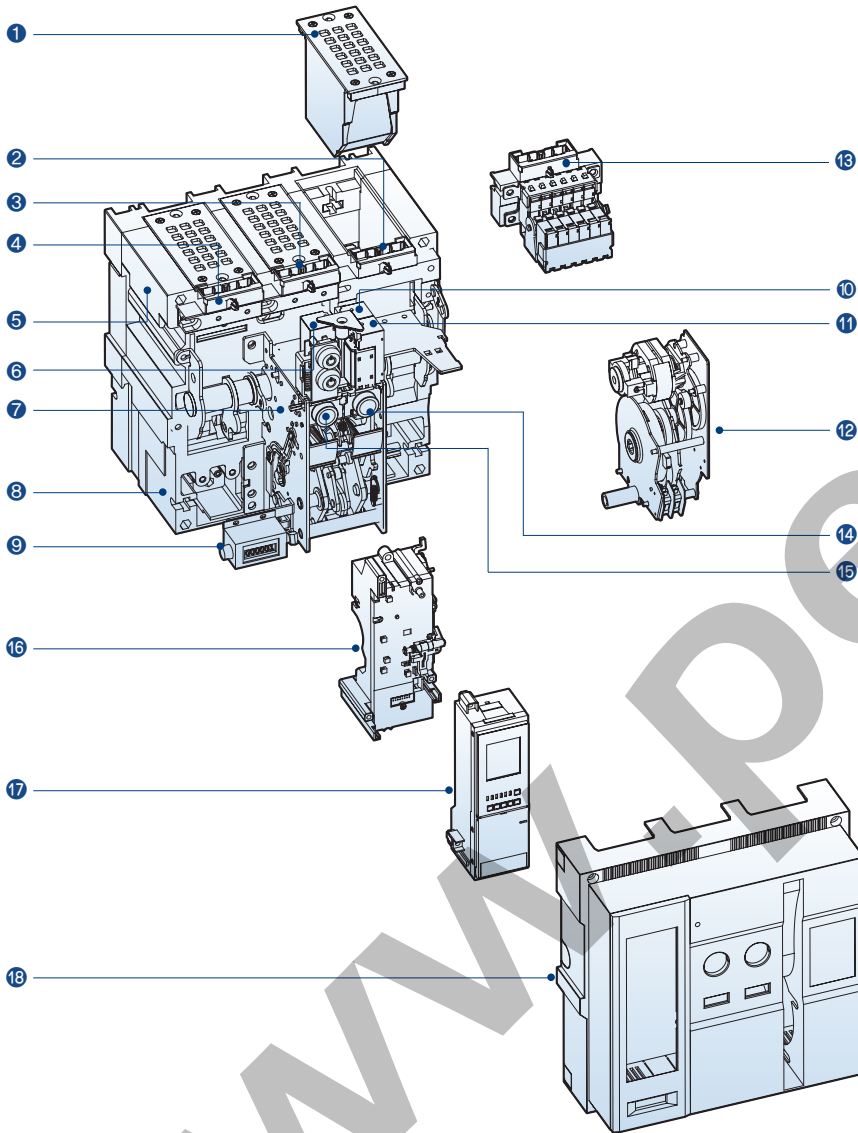
| ACCESSORIES  |  |
|--|--|
| <input type="checkbox"/> Motor charge                |  |
| <input type="checkbox"/> Closing coil                |  |
| <input type="checkbox"/> Shunt tripping coil         |  |
| <input type="checkbox"/> Auxiliary switches          |  |
| <input type="checkbox"/> OCR Control source          |  |
| <input type="checkbox"/> Alarm switch                |  |
| <input type="checkbox"/> Digital Trip Relay(OCR)     |  |
| <input type="checkbox"/> Alarm (LSIG) Reset          |  |
| <input type="checkbox"/> Zone Selective Interlocking |  |
| <input type="checkbox"/> Communication               |  |
| <input type="checkbox"/> Earth/Leakage               |  |
| <input type="checkbox"/> Temperature sensor          |  |

#### Explanation of terminologies

- Motor charge  Control power and terminal No.
- Closing coil  Control power and terminal No.
- 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.

# Internal configuration

Susol · Metasol

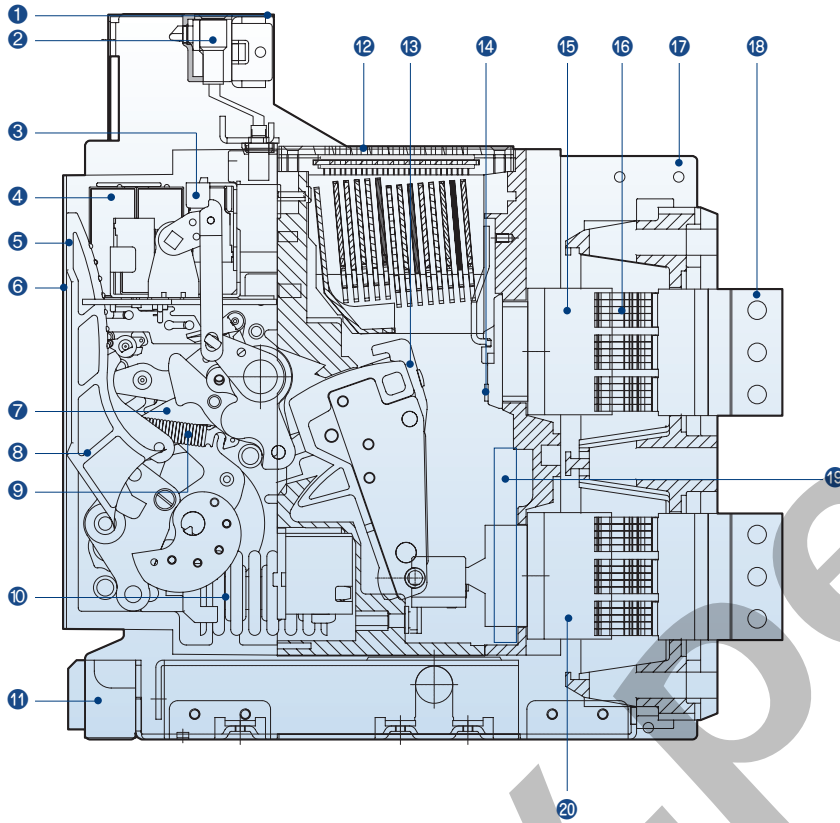


## Terms

- ① Arc chute
- ② Aux. switch control terminal
- ③ Control power supply terminal
- ④ Trip relay control terminal
- ⑤ Carrying grip
- ⑥ Shunt coil
- ⑦ Mechanism
- ⑧ Main body
- ⑨ Counter
- ⑩ Shunt coil
- ⑪ Closing coil
- ⑫ Motor Ass'y
- ⑬ Aux. switch
- ⑭ ON button
- ⑮ OFF button
- ⑯ MTD base
- ⑰ Trip relay
- ⑱ Front cover

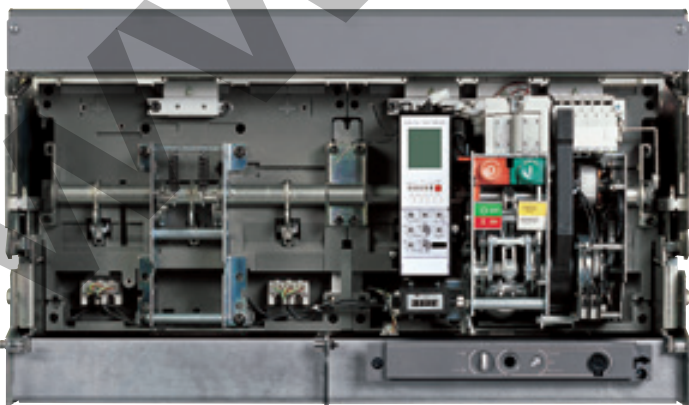




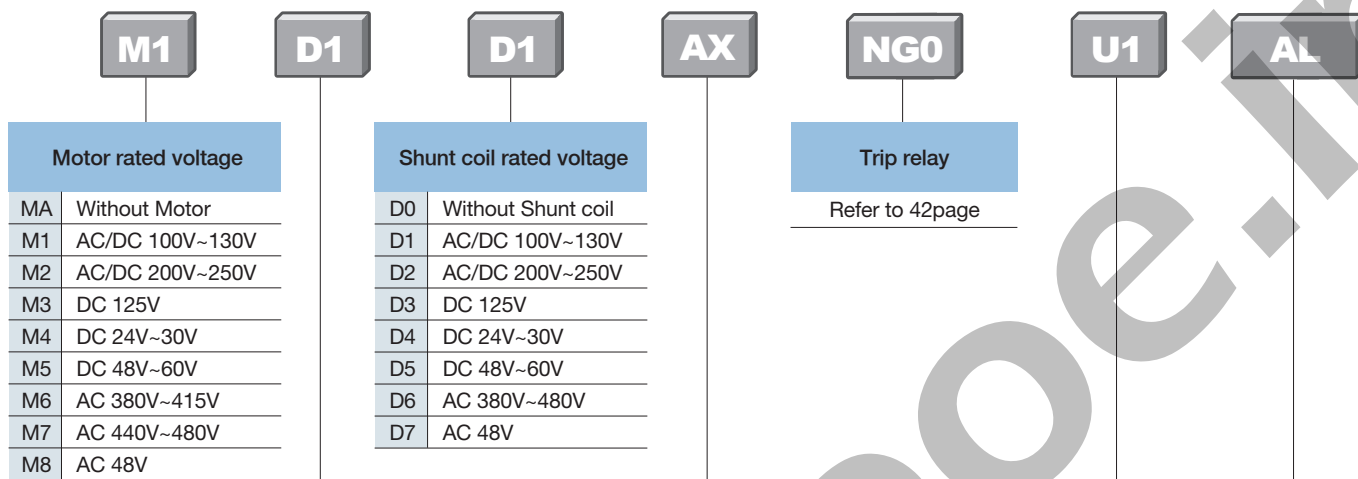


### Terms

- ① Control circuit terminal block
- ② Control terminal
- ③ Auxiliary switches
- ④ Closing, Shunt, UVT coil
- ⑤ Trip relay
- ⑥ Front cover
- ⑦ Mechanism
- ⑧ Charge handle
- ⑨ Trip spring
- ⑩ Closing spring
- ⑪ Draw-in/out device
- ⑫ Arc chute
- ⑬ Moving contact
- ⑭ Fixed contact
- ⑮ Terminal on line side
- ⑯ Cradle finger
- ⑰ Cradle
- ⑱ Connecting terminal
- ⑲ Power supply CT
- ⑳ Terminal on load side







| 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          |

| 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             |

**Trip relay**  
Refer to 42page

| 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               |

| Aux. contact & charging types |  |
|-------------------------------|--|
| AX                            | Standard OFF-Charge 3a3b                 |
| AC                            | Standard ON-Charge 3a3b                  |
| BX                            | Standard OFF-Charge 5a5b                 |
| BC                            | Standard ON-Charge 5a5b                  |
| HX                            | High capacity OFF-Charge 5a5b            |
| HC                            | High capacity ON-Charge 5a5b             |
| CC                            | Standard ON-Charge 6a6b                  |
| JC                            | High capacity ON-Charge 6a6b             |
| GX                            | High capacity OFF-Charge 3a3b            |
| GC                            | High capacity ON-Charge 3a3b             |
| TX                            | TCS OFF-Charge 4a4b <small>Note)</small> |
| TC                            | TCS ON-Charge 5a5b <small>Note)</small>  |

| 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

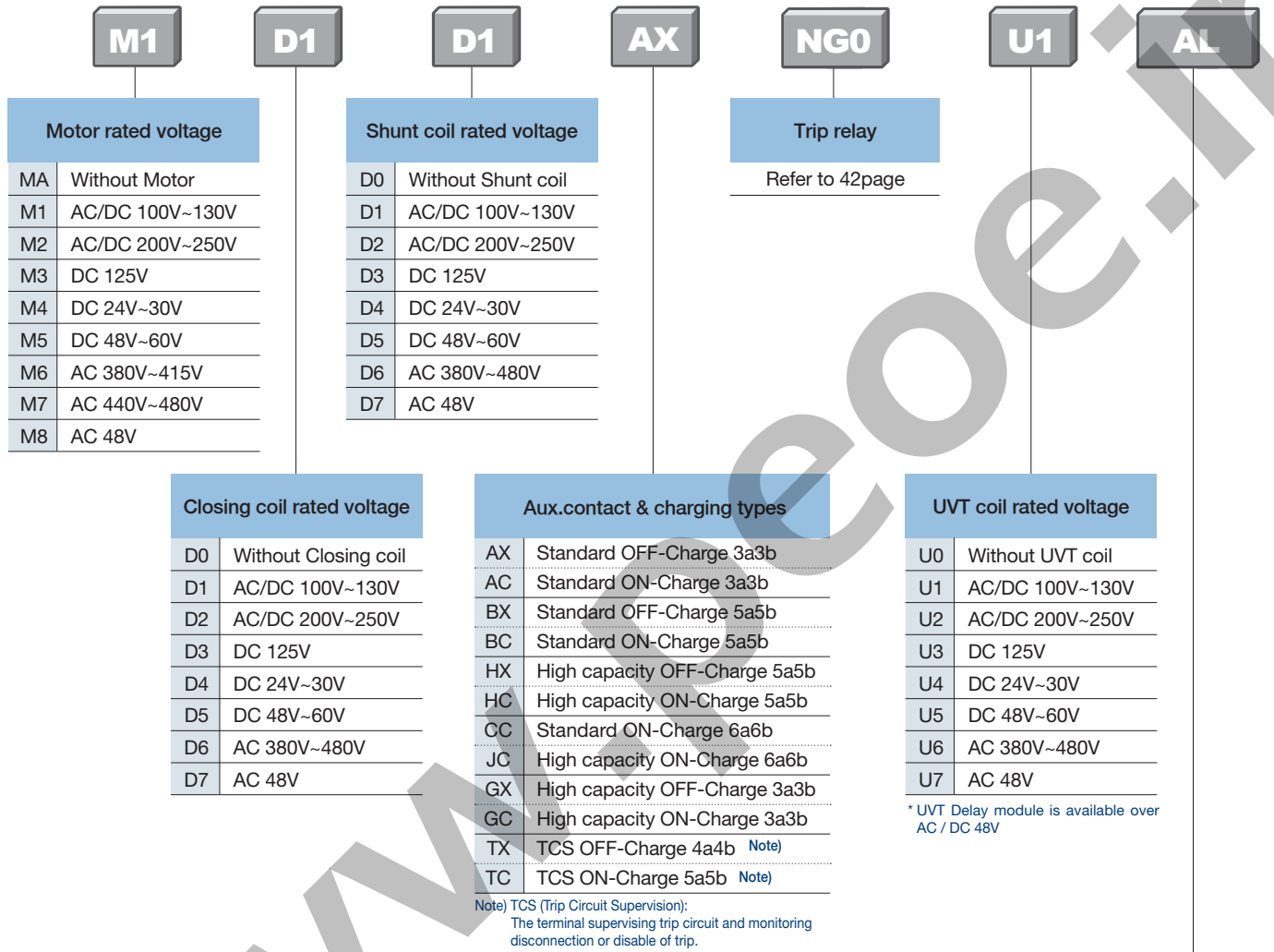
Note) TCS (Trip Circuit Supervision):  
The terminal supervising trip circuit and monitoring disconnection or disable of trip.

| Option | Type name                             | Option | Type name  |
|--------|---------------------------------------|--------|--|
| AL     | AL1+MRB                               | B      | B On/Off Button lock   |
| A1     | AL1+MRB+RES (AC110~130V)              | M      | MI Mechanical interlock  |
| A2     | AL1+AL2+MRB                           | D      | DI or MOC Door Interlock or MOC (Mechanism operated cell switch)   |
| A3     | AL1+MRB+RES (DC110~125V)              |        |  |
| A4     | AL1+MRB+RES (AC200~250V)              | K      | K1 Key lock  |
| A5     | AL1+MRB+Auto reset                    | K2     | K2 Key Interlock set   |
| A6     | AL1+AL2+MRB+Auto reset                | K3     | K3 Key lock double   |
| A7     | AL1+MRB+RES (DC110~125V)+Auto reset   | R      | RCS Ready to close switch  |
| A8     | AL1+MRB+RES (AC200~250V)+Auto reset   | T      | TM Temperature monitoring  |
| A9     | AL1+MRB+RES (AC110~130V)+Auto reset   | H1~H7  | SHT2 AC/DC 100~130V<br>AC/DC 200~250V<br>DC 125V<br>DC 24~30V<br>DC 48~60V<br>AC 380~480V<br>AC 48V<br>Double shunt coil |
| Y2     | AL1+AL2+MRB (2b contact)              |        |  |
| Y6     | AL1+AL2+MRB+Auto reset (2b contact)   |        |  |
| Z2     | AL1+AL2+MRB (1a1b contact)            |        |  |
| Z6     | AL1+AL2+MRB+Auto reset (1a1b contact) |        |  |
| C      | C Counter                             |        |  |
| S      | CS2 Charge switch communication       |        |  |

Note) 1. Reduplicate of AL is not available  
2. Reduplicate of Key lock is not available  
3. Reduplicate of Double shunt coil is not available. It can not be used simultaneously with UVT.

4. RCS and CS2 cannot be used simultaneously  
5. TM and auxiliary contacts TX, TC, CC, JC cannot be used simultaneously.  
6. MI, DI and MOC cannot be used simultaneously with SBC.





| 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          |

| 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             |

**Trip relay**  
Refer to 42page

| 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               |

| Aux.contact & charging types |  |
|------------------------------|--|
| AX                           | Standard OFF-Charge 3a3b                 |
| AC                           | Standard ON-Charge 3a3b                  |
| BX                           | Standard OFF-Charge 5a5b                 |
| BC                           | Standard ON-Charge 5a5b                  |
| HX                           | High capacity OFF-Charge 5a5b            |
| HC                           | High capacity ON-Charge 5a5b             |
| CC                           | Standard ON-Charge 6a6b                  |
| JC                           | High capacity ON-Charge 6a6b             |
| GX                           | High capacity OFF-Charge 3a3b            |
| GC                           | High capacity ON-Charge 3a3b             |
| TX                           | TCS OFF-Charge 4a4b <small>Note)</small> |
| TC                           | TCS ON-Charge 5a5b <small>Note)</small>  |

| 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

Note) TCS (Trip Circuit Supervision):  
The terminal supervising trip circuit and monitoring disconnection or disable of trip.

| Option | Type name                             | Option | Type name  |
|--------|---------------------------------------|--------|--|
| AL     | AL1+MRB                               | B      | B On/Off Button lock   |
| A1     | AL1+MRB+RES (AC110~130V)              | M      | MI Mechanical interlock  |
| A2     | AL1+AL2+MRB                           | D      | DI or MOC Door Interlock or MOC (Mechanism operated cell switch)   |
| A3     | AL1+MRB+RES (DC110~125V)              |        |  |
| A4     | AL1+MRB+RES (AC200~250V)              | K      | K1 Key lock  |
| A5     | AL1+MRB+Auto reset                    | K2     | K2 Key Interlock set   |
| A6     | AL1+AL2+MRB+Auto reset                | K3     | K3 Key lock double   |
| A7     | AL1+MRB+RES (DC110~125V)+Auto reset   | R      | RCS Ready to close switch  |
| A8     | AL1+MRB+RES (AC200~250V)+Auto reset   | T      | TM Temperature monitoring  |
| A9     | AL1+MRB+RES (AC110~130V)+Auto reset   | H1~H7  | SHT2 AC/DC 100~130V<br>AC/DC 200~250V<br>DC 125V<br>DC 24~30V<br>DC 48~60V<br>AC 380~480V<br>AC 48V<br>Double shunt coil |
| Y2     | AL1+AL2+MRB (2b contact)              |        |  |
| Y6     | AL1+AL2+MRB+Auto reset (2b contact)   |        |  |
| Z2     | AL1+AL2+MRB (1a1b contact)            |        |  |
| Z6     | AL1+AL2+MRB+Auto reset (1a1b contact) |        |  |
| C      | C Counter                             |        |  |
| S      | CS2 Charge switch communication       |        |  |

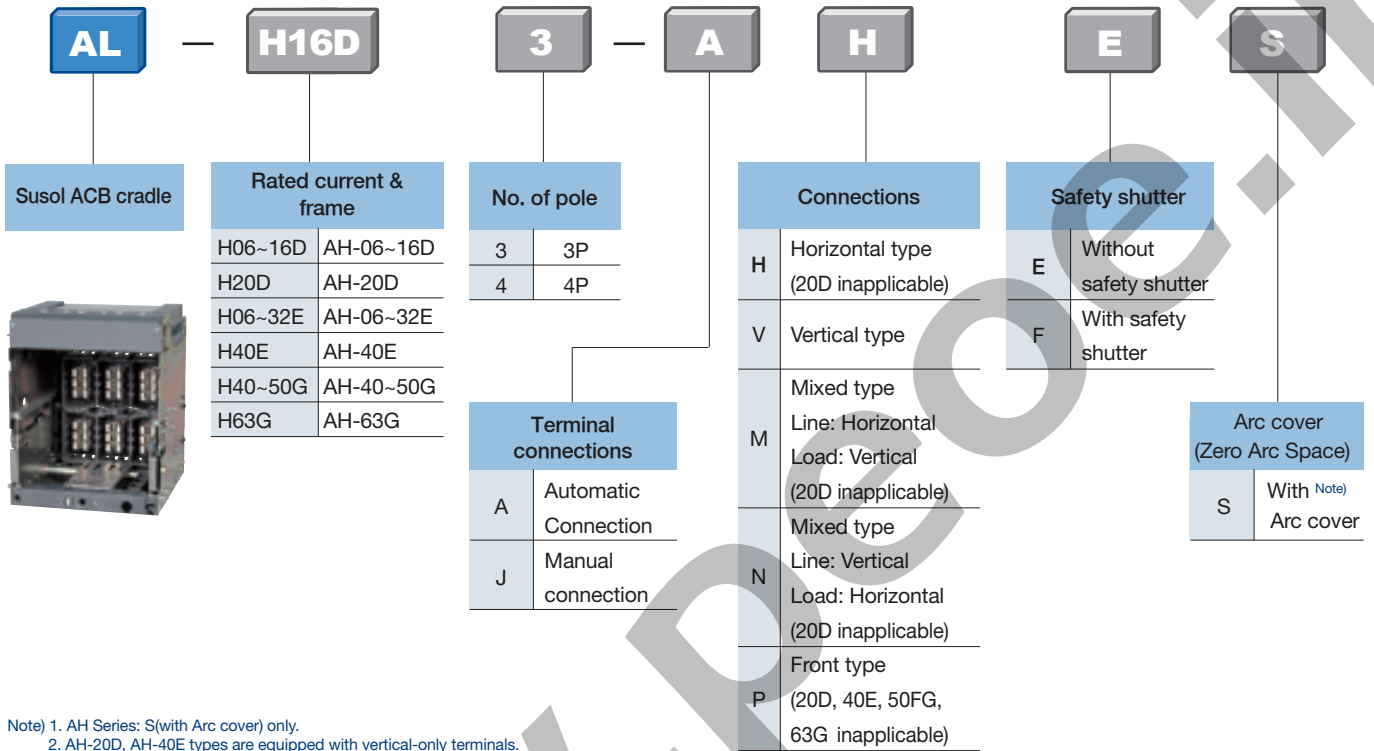
Note) 1. Reduplicate of AL is not available  
2. Reduplicate of Key lock is not available  
3. Reduplicate of Double shunt coil is not available. It can not be used simultaneously with UVT.

4. RCS and CS2 cannot be used simultaneously  
5. TM and auxiliary contacts TX, TC, CC, JC cannot be used simultaneously.  
6. MI cannot be used simultaneously with DI or MOC

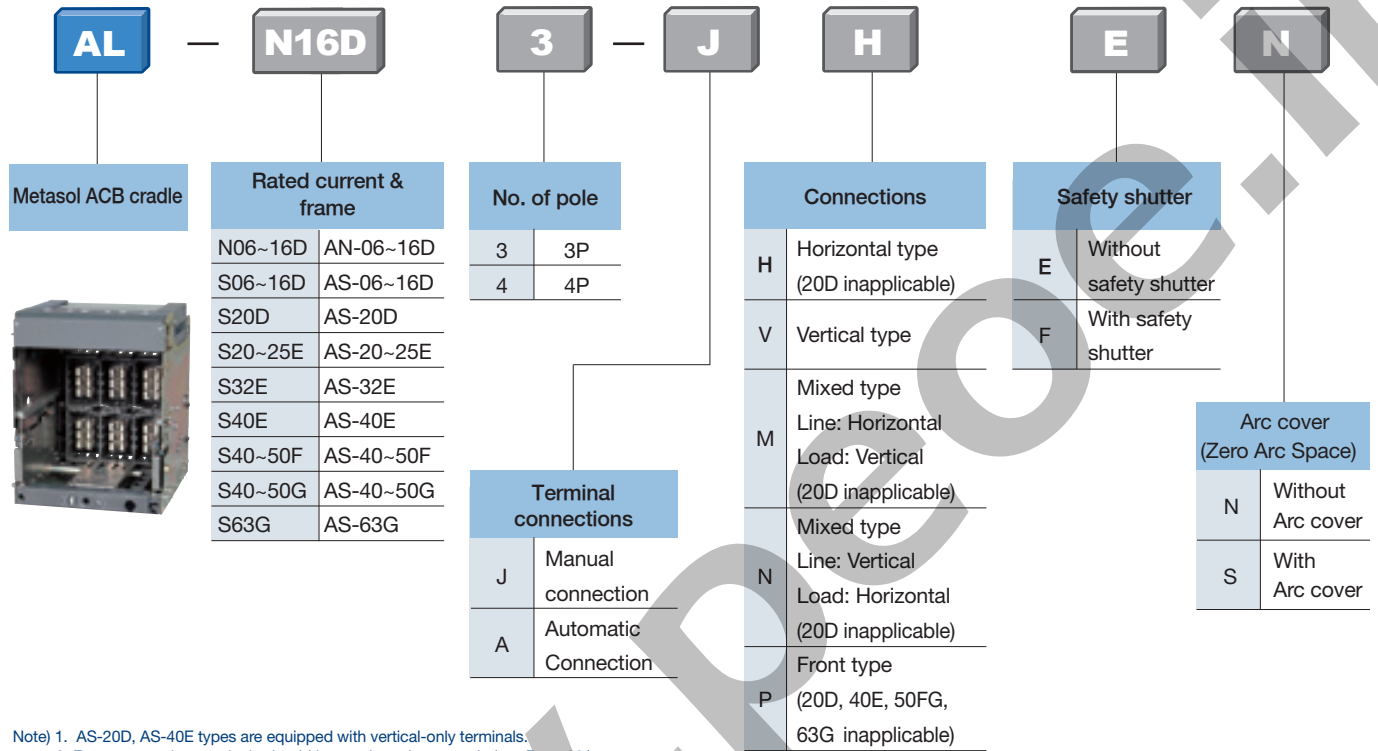
# Ordering

Susol

## Cradle



Note) 1. AH Series: S(with Arc cover) only.  
 2. AH-20D, AH-40E types are equipped with vertical-only terminals.  
 3. Front connection terminals should be purchased separately (see Page 68.)



Note) 1. AS-20D, AS-40E types are equipped with vertical-only terminals.  
 2. Front connection terminals should be purchased separately (see Page 68.)

# Ordering

Susol

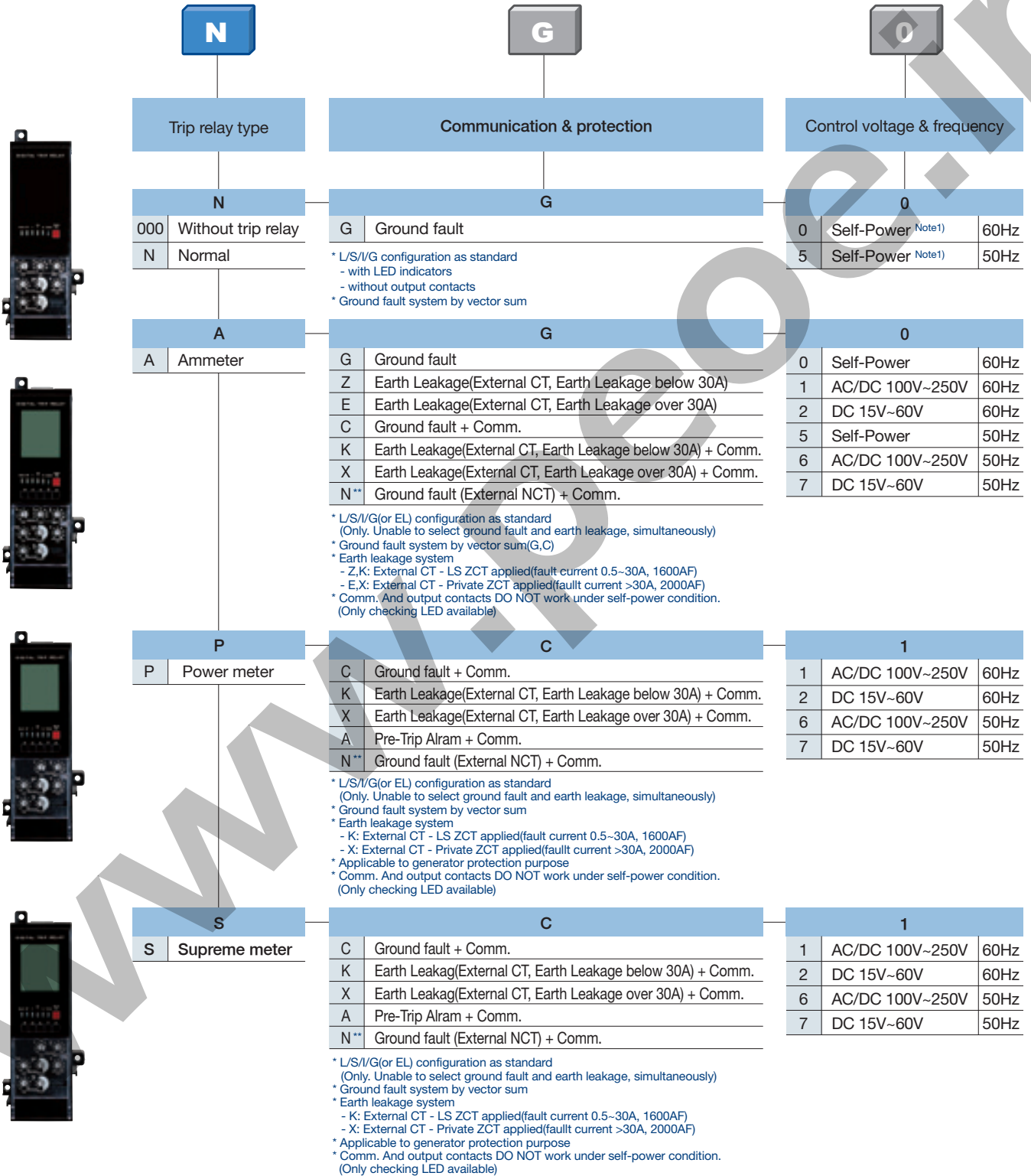
## Trip relay

| N               |                    | G   |   | 0                           |                              |      |
|-----------------|--------------------|---|---|-----------------------------|------------------------------|------|
| Trip relay type |                    | Communication & protection  |   | Control voltage & frequency |                              |      |
| N               |                    | G   |   | 0                           |                              |      |
| 000             | Without trip relay | G   | Ground fault  | 0                           | Self-Power <sup>Note1)</sup> | 60Hz |
| N               | Normal             | * L/S//G configuration as standard<br>- with LED indicators<br>- without output contacts<br>* Ground fault system by vector sum   |   | 5                           | Self-Power <sup>Note1)</sup> | 50Hz |
| A               |                    | G   |   | 0                           |                              |      |
| A               | Ammeter            | G   | Ground fault  | 0                           | Self-Power                   | 60Hz |
|                 |                    | Z   | Earth Leakage(External CT, Earth Leakage below 30A)         | 1                           | AC/DC 100V~250V              | 60Hz |
|                 |                    | E   | Earth Leakage(External CT, Earth Leakage over 30A)          | 2                           | DC 15V~60V                   | 60Hz |
|                 |                    | C   | Ground fault + Comm.  | 5                           | Self-Power                   | 50Hz |
|                 |                    | K   | Earth Leakage(External CT, Earth Leakage below 30A) + Comm. | 6                           | AC/DC 100V~250V              | 50Hz |
|                 |                    | X   | Earth Leakage(External CT, Earth Leakage over 30A) + Comm.  | 7                           | DC 15V~60V                   | 50Hz |
|                 |                    | N**   | Ground fault (External NCT) + Comm.                         |                             |                              |      |
|                 |                    | * L/S//G(or EL) configuration as standard<br>(Only. Unable to select ground fault and earth leakage, simultaneously)<br>* Ground fault system by vector sum(G,C)<br>* Earth leakage system<br>- Z,K: External CT - LS ZCT applied(fault current 0.5~30A, 1600AF)<br>- E,X: External CT - Private ZCT applied(fault current >30A, 2000AF)<br>* Comm. And output contacts DO NOT work under self-power condition.<br>(Only checking LED available)  |   |                             |                              |      |
| P               |                    | C   |   | 1                           |                              |      |
| P               | Power meter        | C   | Ground fault + Comm.  | 1                           | AC/DC 100V~250V              | 60Hz |
|                 |                    | K   | Earth Leakage(External CT, Earth Leakage below 30A) + Comm. | 2                           | DC 15V~60V                   | 60Hz |
|                 |                    | X   | Earth Leakage(External CT, Earth Leakage over 30A) + Comm.  | 6                           | AC/DC 100V~250V              | 50Hz |
|                 |                    | A   | Pre-Trip Alarm + Comm.                                      | 7                           | DC 15V~60V                   | 50Hz |
|                 |                    | N**   | Ground fault (External NCT) + Comm.                         |                             |                              |      |
|                 |                    | * L/S//G(or EL) configuration as standard<br>(Only. Unable to select ground fault and earth leakage, simultaneously)<br>* Ground fault system by vector sum<br>* Earth leakage system<br>- K: External CT - LS ZCT applied(fault current 0.5~30A, 1600AF)<br>- X: External CT - Private ZCT applied(fault current >30A, 2000AF)<br>* Applicable to generator protection purpose<br>* Comm. And output contacts DO NOT work under self-power condition.<br>(Only checking LED available) |   |                             |                              |      |
| S               |                    | C   |   | 1                           |                              |      |
| S               | Supreme meter      | C   | Ground fault + Comm.  | 1                           | AC/DC 100V~250V              | 60Hz |
|                 |                    | K   | Earth Leakage(External CT, Earth Leakage below 30A) + Comm. | 2                           | DC 15V~60V                   | 60Hz |
|                 |                    | X   | Earth Leakage(External CT, Earth Leakage over 30A) + Comm.  | 6                           | AC/DC 100V~250V              | 50Hz |
|                 |                    | A   | Pre-Trip Alarm + Comm.                                      | 7                           | DC 15V~60V                   | 50Hz |
|                 |                    | N**   | Ground fault (External NCT) + Comm.                         |                             |                              |      |
|                 |                    | * L/S//G(or EL) configuration as standard<br>(Only. Unable to select ground fault and earth leakage, simultaneously)<br>* Ground fault system by vector sum<br>* Earth leakage system<br>- K: External CT - LS ZCT applied(fault current 0.5~30A, 1600AF)<br>- X: External CT - Private ZCT applied(fault current >30A, 2000AF)<br>* Applicable to generator protection purpose<br>* Comm. And output contacts DO NOT work under self-power condition.<br>(Only checking LED available) |   |                             |                              |      |

\*\* AN, PN, SN provide the function to detect and protect the ground fault current by applying the NCT (Neutral CT) in the neutral wire when 3pole circuit breaker is used in 3-phase 4-wire system. Please use NCT with the secondary output of 5A rating. (NCT is not provided)

Note) 1. L/S//G(or EL) configuration as standard (Only. Unable to select ground fault and earth leakage, simultaneously)  
2. Ground fault, earth leakage and pre-trip alarm functions are alternative.  
3. The functions like Metering, Communication, ZSI, Remote reset and Digital output are NOT available only under Self-power condition.  
4. Voltage module should be required for P and S types purchased separately





\*\* AN, PN, SN provide the function to detect and protect the ground fault current by applying the NCT (Neutral CT) in the neutral wire when 3pole circuit breaker is used in 3-phase 4-wire system. Please use NCT with the secondary output of 5A rating. (NCT is not provided)

Note) 1. L/S//G(or EL) configuration as standard (Only. Unable to select ground fault and earth leakage, simultaneously)  
2. Ground fault, earth leakage and pre-trip alarm functions are alternative.  
3. The functions like Metering, Communication, ZSI, Remote reset and Digital output are NOT available only under Self-power condition.  
4. Voltage module should be required for P and S types purchased separately





| Susol  |                      |                |                      |                               |                        |                        |                        |                                |
|--|----------------------|----------------|----------------------|-------------------------------|------------------------|------------------------|------------------------|--------------------------------|
| AH-06E   | AH-08E               | AH-10E         | AH-13E               | AH-16E                        | AH-20E                 | AH-25E                 | AH-32E                 | AH-40E                         |
| 630  | 800                  | 1000           | 1250                 | 1600                          | 2000                   | 2500                   | 3200                   | 4000                           |
| 200, 400, 630                                    | 400, 630, 800, (800) | 630, 800, 1000 | 630, 800, 1000, 1250 | 800, 1000, 1250, 1600, (1600) | 1000, 1250, 1600, 2000 | 1250, 1600, 2000, 2500 | 1600, 2000, 2500, 3200 | 2000, 2500, 3200, 4000, (3200) |
| 0.4 ~ 1.0  |                      |                |                      |                               |                        |                        |                        |                                |
| 630  | 800                  | 1000           | 1250                 | 1600                          | 2000                   | 2500                   | 3200                   | 4000                           |
| 1,000  |                      |                |                      |                               |                        |                        |                        |                                |
| 690  |                      |                |                      |                               |                        |                        |                        |                                |
| 12   |                      |                |                      |                               |                        |                        |                        |                                |
| 50/60  |                      |                |                      |                               |                        |                        |                        |                                |
| 3/4  |                      |                |                      |                               |                        |                        |                        |                                |
| 100  |                      |                |                      |                               |                        |                        |                        |                                |
| 100  |                      |                |                      |                               |                        |                        |                        |                                |
| 85   |                      |                |                      |                               |                        |                        |                        |                                |
| 100%   |                      |                |                      |                               |                        |                        |                        |                                |
| 220  |                      |                |                      |                               |                        |                        |                        |                                |
| 220  |                      |                |                      |                               |                        |                        |                        |                                |
| 187  |                      |                |                      |                               |                        |                        |                        |                                |
| 85   |                      |                |                      |                               |                        |                        |                        |                                |
| 75   |                      |                |                      |                               |                        |                        |                        |                                |
| 65   |                      |                |                      |                               |                        |                        |                        |                                |
| Less than 25ms under Icw/Less than 75ms over Icw |                      |                |                      |                               |                        |                        |                        |                                |
| 80ms under                                       |                      |                |                      |                               |                        |                        |                        |                                |
| 15,000   |                      |                |                      |                               |                        |                        |                        |                                |
| 5,000  |                      |                |                      |                               |                        |                        |                        |                                |
| ●  |                      |                |                      |                               |                        |                        |                        |                                |
| ○  |                      |                |                      |                               |                        |                        |                        |                                |
| ○  |                      |                |                      |                               |                        |                        |                        |                                |
| ○  |                      |                |                      |                               |                        |                        |                        |                                |
| 87/103   |                      |                |                      |                               |                        |                        |                        |                                |
| 107/139  |                      |                |                      |                               |                        |                        |                        |                                |
| 85/101   |                      |                |                      |                               |                        |                        |                        |                                |
| 102/145  |                      |                |                      |                               |                        |                        |                        |                                |
| 44/55  |                      |                |                      |                               |                        |                        |                        |                                |
| 65/85  |                      |                |                      |                               |                        |                        |                        |                                |
| 44/55  |                      |                |                      |                               |                        |                        |                        |                                |
| 61/81  |                      |                |                      |                               |                        |                        |                        |                                |
| 42/53  |                      |                |                      |                               |                        |                        |                        |                                |
| 60/80  |                      |                |                      |                               |                        |                        |                        |                                |
| 430×412×375                                      |                      |                |                      |                               |                        |                        |                        |                                |
| 430×527×375                                      |                      |                |                      |                               |                        |                        |                        |                                |
| 300×378×295                                      |                      |                |                      |                               |                        |                        |                        |                                |
| 300×493×295                                      |                      |                |                      |                               |                        |                        |                        |                                |
| N, A, P, S type                                  |                      |                |                      |                               |                        |                        |                        |                                |
| KS / KEMA / KERI / GOST / CCC                    |                      |                |                      |                               |                        |                        |                        |                                |
| LR, ABS, DNV, KR, BV, GL, RINA, NK               |                      |                |                      |                               |                        |                        |                        |                                |

| Susol  |                        |                        |
|--|------------------------|------------------------|
| AH-40G   | AH-50G                 | AH-63G                 |
| 4000   | 5000                   | 6300                   |
| 2000, 2500, 3200, 4000                           | 2500, 3200, 4000, 5000 | 3200, 4000, 5000, 6300 |
| 4000   | 5000                   | 6300                   |
| 1,000  |                        |                        |
| 690  |                        |                        |
| 12   |                        |                        |
| 50/60  |                        |                        |
| 3/4  |                        |                        |
| 150  |                        |                        |
| 150  |                        |                        |
| 100  |                        |                        |
| 100%   |                        |                        |
| 330  |                        |                        |
| 330  |                        |                        |
| 220  |                        |                        |
| 100  |                        |                        |
| 85   |                        |                        |
| 75   |                        |                        |
| Less than 25ms under Icw/Less than 75ms over Icw |                        |                        |
| 90ms under                                       |                        |                        |
| 10,000   |                        |                        |
| 2,000  |                        |                        |
| ○  |                        |                        |
| ●  |                        |                        |
| -  |                        |                        |
| -  |                        |                        |
| -  |                        |                        |
| 181/223  |                        |                        |
| 186/230  |                        |                        |
| 179/221  |                        |                        |
| 184/228  |                        |                        |
| 97/117   |                        |                        |
| 102/124  |                        |                        |
| 98/123   |                        |                        |
| 103/130  |                        |                        |
| 96/121   |                        |                        |
| 101/128  |                        |                        |
| 460×785×375                                      |                        |                        |
| 460×1015×375                                     |                        |                        |
| 300×751×295                                      |                        |                        |
| 300×981×295                                      |                        |                        |
| N, A, P, S type                                  |                        |                        |
| KS / KEMA / KERI / GOST / CCC                    |                        |                        |
| LR, ABS, DNV, KR, BV, GL, RINA, NK               |                        |                        |

※ Derating of the rated current is required according to the ambient temperature around the breaker in a panel if it is higher than the reference value. (See pages 123 to 126)

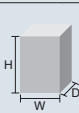
※ It is possible to connect power and load side reversely, but please use it for normal connection for maintenance and safety.

# Ratings

Susol

## Switch-Disconnecter



| Type                                    |   |                       | Susol  |        |             |        |        |        |
|---|---|-----------------------|--|--------|-------------|--------|--------|--------|
| Ampere frame (AF)                       |   |                       | DH-06D   | DH-08D | DH-10D      | DH-13D | DH-16D | DH-20D |
| Rated current (A)                       | (In max)  | at 40°C               | 630  | 800    | 1000        | 1250   | 1600   | 2000   |
| Setting current (A)*                    | Control trip relay (... × In max)   |                       | 0.4 ~ 1.0  |        |             |        |        |        |
| Rated current of neutral pole (A)       |   |                       | 630  | 800    | 1000        | 1250   | 1600   | 2000   |
| Rated insulation voltage (V)            | (Ui)  |                       | 1,000  |        |             |        |        |        |
| Rated operational voltage (V)           | (Ue)  |                       | 690  |        |             |        |        |        |
| Rated impulse withstand voltage (kV)    | (Uimp)  |                       | 12   |        |             |        |        |        |
| Frequency (Hz)                          |   |                       | 50/60  |        |             |        |        |        |
| Number of poles (P)                     |   |                       | 3/4  |        |             |        |        |        |
| Rated making capacity (kA peak)         | (Icm)   | IEC 60947-2 AC ~ 690V | 143  |        |             |        |        |        |
| Rated short-time withstand current (kA) | (Icw)   | 1 sec                 | 65   |        |             |        |        |        |
|   |   | 2 sec                 | 60   |        |             |        |        |        |
|   |   | 3 sec                 | 50   |        |             |        |        |        |
| Operating time (ms)                     | Maximum total breaking time   |                       | Less than 25ms under Icw/Less than 75ms over Icw |        |             |        |        |        |
|   | Maximum closing time  |                       | 80ms under                                       |        |             |        |        |        |
| Life cycle (time)                       | Mechanical  |                       | 20,000   |        |             |        |        |        |
|   | Electrical  |                       | 5,000  |        |             |        |        |        |
| Connections**                           | Draw-out / Fixed  | Horizontal connection |  | ●      |             |        |        | -      |
|   |   | Vertical connection   |  | ○      |             |        |        | ●      |
|   |   | Front connection      |  | ○      |             |        |        | -      |
|   |   | Mixed connection      |  | ○      |             |        |        | -      |
| Weight (kg)<br>(3P/4P)                  | Draw-out type   | Main body             | Motor charging type                              |        | 63/74       |        |        | 70/85  |
|   |   | (With cradle)         | Manual charging type                             |        | 61/72       |        |        | 68/83  |
|   |   | Cradle only           |  |        | 29/32       |        |        | 33/40  |
|   | Fixed type  | Motor charging type   |  | 34/44  |             |        | 38/47  |        |
|   |   | Manual charging type  |  | 32/42  |             |        | 36/45  |        |
|   |   |                       |  |        |             |        |        |        |
| External dimensions (mm)<br>(H×W×D)     |  | Draw-out              | 3P   |        | 430×334×375 |        |        |        |
|   |   | type                  | 4P   |        | 430×419×375 |        |        |        |
|   |   | Fixed type            | 3P   |        | 300×300×295 |        |        |        |
|   |   |                       | 4P   |        | 300×385×295 |        |        |        |

\* Refer to trip relay specification. \*\* ●: Standard, ○: Option

Note) 1. Life time means not guarantee, but limitation.

Quality guarantee: On/Off frequency on the basis of IEC60947-3 within the term of guarantee

2. In case of Marine ACB, please contact us.

3. DH-20D, DH-40E types are equipped with vertical-only terminals.



| Susol  |                               |                      |                               |  |                                 |                                 |                                 |   |
|--|-------------------------------|----------------------|-------------------------------|--|---------------------------------|---------------------------------|---------------------------------|---|
| DH-06E   | DH-08E                        | DH-10E               | DH-13E                        | DH-16E                                 | DH-20E                          | DH-25E                          | DH-32E                          | DH-40E                                  |
| 630  | 800                           | 1000                 | 1250                          | 1600                                   | 2000                            | 2500                            | 3200                            | 4000                                    |
| 200,<br>400,<br>630                              | 400,<br>630,<br>800,<br>(800) | 630,<br>800,<br>1000 | 630,<br>800,<br>1000,<br>1250 | 800,<br>1000,<br>1250,<br>1600, (1600) | 1000,<br>1250,<br>1600,<br>2000 | 1250,<br>1600,<br>2000,<br>2500 | 1600,<br>2000,<br>2500,<br>3200 | 2000,<br>2500,<br>3200,<br>4000, (3200) |
| 0.4 ~ 1.0  |                               |                      |                               |  |                                 |                                 |                                 |   |
| 630  | 800                           | 1000                 | 1250                          | 1600                                   | 2000                            | 2500                            | 3200                            | 4000                                    |
| 1,000  |                               |                      |                               |  |                                 |                                 |                                 |   |
| 690  |                               |                      |                               |  |                                 |                                 |                                 |   |
| 12   |                               |                      |                               |  |                                 |                                 |                                 |   |
| 50/60  |                               |                      |                               |  |                                 |                                 |                                 |   |
| 3/4  |                               |                      |                               |  |                                 |                                 |                                 |   |
| 187  |                               |                      |                               |  |                                 |                                 |                                 |   |
| 85   |                               |                      |                               |  |                                 |                                 |                                 |   |
| 75   |                               |                      |                               |  |                                 |                                 |                                 |   |
| 65   |                               |                      |                               |  |                                 |                                 |                                 |   |
| Less than 25ms under Icw/Less than 75ms over Icw |                               |                      |                               |  |                                 |                                 |                                 |   |
| 80ms under                                       |                               |                      |                               |  |                                 |                                 |                                 |   |
| 15,000   |                               |                      |                               |  |                                 |                                 |                                 |   |
| 5,000  |                               |                      |                               |  |                                 |                                 |                                 |   |
|  |                               |                      |                               | ●                                      |                                 |                                 |                                 | -                                       |
|  |                               |                      |                               | ○                                      |                                 |                                 |                                 | ●                                       |
|  |                               |                      |                               | ○                                      |                                 |                                 |                                 | -                                       |
|  |                               |                      |                               | ○                                      |                                 |                                 |                                 | -                                       |
|  |                               |                      |                               | 87/103                                 |                                 |                                 |                                 | 107/139                                 |
|  |                               |                      |                               | 85/101                                 |                                 |                                 |                                 | 102/145                                 |
|  |                               |                      |                               | 44/55                                  |                                 |                                 |                                 | 65/85                                   |
|  |                               |                      |                               | 44/55                                  |                                 |                                 |                                 | 61/81                                   |
|  |                               |                      |                               | 42/53                                  |                                 |                                 |                                 | 60/80                                   |
| 430×412×375                                      |                               |                      |                               |  |                                 |                                 |                                 |   |
| 430×527×375                                      |                               |                      |                               |  |                                 |                                 |                                 |   |
| 300×378×295                                      |                               |                      |                               |  |                                 |                                 |                                 |   |
| 300×493×295                                      |                               |                      |                               |  |                                 |                                 |                                 |   |

※ Derating of the rated current is required according to the ambient temperature around the breaker in a panel if it is higher than the reference value. (See pages 123 to 126)

# Ratings

Metasol

## Circuit Breaker



| Type                                    |                                   |
|---|-----------------------------------|
| Ampere frame                            | (AF)                              |
| Rated current (A)                       | (In max) at 40°C                  |
| Setting current (A)*                    | Control trip relay (... × In max) |
| Rated current of neutral pole (A)       |                                   |
| Rated insulation voltage (V)            | (Ui)                              |
| Rated operational voltage (V)           | (Ue)                              |
| Rated impulse withstand voltage (kV)    | (Uimp)                            |
| Frequency (Hz)                          |                                   |
| Number of poles (P)                     |                                   |
| Rated breaking capacity (kA sym)        |                                   |
| AC 50/60Hz                              | (Icu) IEC 60947-2<br>KS C 4620    |
| Rated service breaking capacity (kA)    | (Ics) ... %×Icu                   |
| Rated making capacity (kA peak)         |                                   |
| AC 50/60Hz                              | (Icm) IEC 60947-2<br>KS C 4620    |
| Rated short-time withstand current (kA) | (Icw)                             |
| Operating time (ms)                     |                                   |
| Life cycle (time)                       | Mechanical<br>Electrical          |
| Connections**                           | Draw-out / Fixed                  |
| Weight (kg)                             | Draw-out type                     |
| (3P/4P)                                 | Fixed type                        |
| External dimensions (mm)                | (H×W×D)                           |
| Trip relay                              |                                   |
| Certificate & Approval                  |                                   |
| Marine classification                   |                                   |



| Metasol  |                             |                      |                               |                                |
|--|-----------------------------|----------------------|-------------------------------|--------------------------------|
| AN-06D   | AN-08D                      | AN-10D               | AN-13D                        | AN-16D                         |
| 630  | 800                         | 1000                 | 1250                          | 1600                           |
| 200,<br>400,<br>630                              | 200,<br>400,<br>630,<br>800 | 630,<br>800,<br>1000 | 630,<br>800,<br>1000,<br>1250 | 800,<br>1000,<br>1250,<br>1600 |
| 0.4 ~ 1.0  |                             |                      |                               |                                |
| 630  | 800                         | 1000                 | 1250                          | 1600                           |
| 1,000  |                             |                      |                               |                                |
| 690  |                             |                      |                               |                                |
| 12   |                             |                      |                               |                                |
| 50/60  |                             |                      |                               |                                |
| 3/4  |                             |                      |                               |                                |
| 65   |                             |                      |                               |                                |
| 65   |                             |                      |                               |                                |
| 50   |                             |                      |                               |                                |
| 100%   |                             |                      |                               |                                |
| 143  |                             |                      |                               |                                |
| 143  |                             |                      |                               |                                |
| 105  |                             |                      |                               |                                |
| 50   |                             |                      |                               |                                |
| 42   |                             |                      |                               |                                |
| 36   |                             |                      |                               |                                |
| Less than 25ms under Icw/Less than 75ms over Icw |                             |                      |                               |                                |
| 80ms under                                       |                             |                      |                               |                                |
| 20,000   |                             |                      |                               |                                |
| 5,000  |                             |                      |                               |                                |
| ●  |                             |                      |                               |                                |
| ○  |                             |                      |                               |                                |
| ○  |                             |                      |                               |                                |
| ○  |                             |                      |                               |                                |
| 63/74  |                             |                      |                               |                                |
| 61/72  |                             |                      |                               |                                |
| 29/32  |                             |                      |                               |                                |
| 34/44  |                             |                      |                               |                                |
| 32/42  |                             |                      |                               |                                |
| 430×334×375                                      |                             |                      |                               |                                |
| 430×419×375                                      |                             |                      |                               |                                |
| 300×300×295                                      |                             |                      |                               |                                |
| 300×385×295                                      |                             |                      |                               |                                |
| N, A, P, S type                                  |                             |                      |                               |                                |
| KS / KEMA / KERI / GOST                          |                             |                      |                               |                                |
| -  |                             |                      |                               |                                |

\* Refer to trip relay specification. \*\* ●: Standard, ○: Option

Note) 1. Life time means not guarantee, but limitation.

Quality guarantee: On/Off frequency on the basis of IEC60947-2 within the term of guarantee

2. The use of AN-D, AS-D and AS-F in IT systems is limited to 500 V network voltage.

3. AS-20D, AS-40E types are equipped with vertical-only terminals.

## Metasol



| Metasol  |                    |                |                      |                       |                        |
|--|--------------------|----------------|----------------------|-----------------------|------------------------|
| AS-06D   | AS-08D             | AS-10D         | AS-13D               | AS-16D                | AS-20D                 |
| 630  | 800                | 1000           | 1250                 | 1600                  | 2000                   |
| 200, 400, 630                                    | 200, 400, 630, 800 | 630, 800, 1000 | 630, 800, 1000, 1250 | 800, 1000, 1250, 1600 | 1000, 1250, 1600, 2000 |
| 0.4 ~ 1.0  |                    |                |                      |                       |                        |
| 630  | 800                | 1000           | 1250                 | 1600                  | 2000                   |
| 1,000  |                    |                |                      |                       |                        |
| 690  |                    |                |                      |                       |                        |
| 12   |                    |                |                      |                       |                        |
| 50/60  |                    |                |                      |                       |                        |
| 3/4  |                    |                |                      |                       |                        |
| 70   |                    |                |                      |                       |                        |
| 70   |                    |                |                      |                       |                        |
| 65   |                    |                |                      |                       |                        |
| 100%   |                    |                |                      |                       |                        |
| 154  |                    |                |                      |                       |                        |
| 154  |                    |                |                      |                       |                        |
| 143  |                    |                |                      |                       |                        |
| 65   |                    |                |                      |                       |                        |
| 50   |                    |                |                      |                       |                        |
| 42   |                    |                |                      |                       |                        |
| Less than 25ms under Icw/Less than 75ms over Icw |                    |                |                      |                       |                        |
| 80ms under                                       |                    |                |                      |                       |                        |
| 20,000   |                    |                |                      |                       |                        |
| 5,000  |                    |                |                      |                       |                        |
| ●  | -                  |                |                      |                       |                        |
| ○  | ●                  |                |                      |                       |                        |
| ○  | -                  |                |                      |                       |                        |
| ○  | -                  |                |                      |                       |                        |
| 63/74  | 70/85              |                |                      |                       |                        |
| 61/72  | 63/83              |                |                      |                       |                        |
| 29/32  | 33/40              |                |                      |                       |                        |
| 34/44  | 38/47              |                |                      |                       |                        |
| 32/42  | 36/45              |                |                      |                       |                        |
| 430×334×375                                      |                    |                |                      |                       |                        |
| 430×419×375                                      |                    |                |                      |                       |                        |
| 300×300×295                                      |                    |                |                      |                       |                        |
| 300×385×295                                      |                    |                |                      |                       |                        |
| N, A, P, S type                                  |                    |                |                      |                       |                        |
| KS / KEMA / KERI / GOST                          |                    |                |                      |                       |                        |
| LR, ABS, DNV, KR, BV, GL, RINA, NK               |                    |                |                      |                       |                        |

| Metasol  |                        |                        |                        |
|--|------------------------|------------------------|------------------------|
| AS-20E   | AS-25E                 | AS-32E                 | AS-40E                 |
| 2000   | 2500                   | 3200                   | 4000                   |
| 200, 400, 630, 800, 1000, 1250, 1600, 2000       | 1250, 1600, 2000, 2500 | 1600, 2000, 2500, 3200 | 2000, 2500, 3200, 4000 |
| 0.4 ~ 1.0  |                        |                        |                        |
| 2000   | 2500                   | 3200                   | 4000                   |
| 1,000  |                        |                        |                        |
| 690  |                        |                        |                        |
| 12   |                        |                        |                        |
| 50/60  |                        |                        |                        |
| 3/4  |                        |                        |                        |
| 85   |                        |                        |                        |
| 85   |                        |                        |                        |
| 85   |                        |                        |                        |
| 100%   |                        |                        |                        |
| 187  |                        |                        |                        |
| 187  |                        |                        |                        |
| 187  |                        |                        |                        |
| 85   |                        |                        |                        |
| 75   |                        |                        |                        |
| 65   |                        |                        |                        |
| Less than 25ms under Icw/Less than 75ms over Icw |                        |                        |                        |
| 80ms under                                       |                        |                        |                        |
| 15,000   |                        |                        |                        |
| 5,000  |                        |                        |                        |
| ●  | -                      |                        |                        |
| ○  | ●                      |                        |                        |
| ○  | -                      |                        |                        |
| ○  | -                      |                        |                        |
| 87/103   | 104/147                |                        |                        |
| 85/101   | 102/145                |                        |                        |
| 44/50  | 58/70                  |                        |                        |
| 44/55  | 63/100                 |                        |                        |
| 42/53  | 61/98                  |                        |                        |
| 430×412×375                                      |                        |                        |                        |
| 430×527×375                                      |                        |                        |                        |
| 300×378×295                                      |                        |                        |                        |
| 300×493×295                                      |                        |                        |                        |
| N, A, P, S type                                  |                        |                        |                        |
| KS / KEMA / KERI / GOST                          |                        |                        |                        |
| LR, ABS, DNV, KR, BV, GL, RINA, NK               |                        |                        |                        |

| Metasol  |                        | Metasol                |                        |                        |
|--|------------------------|------------------------|------------------------|------------------------|
| AS-40F   | AS-50F                 | AS-40G                 | AS-50G                 | AS-63G                 |
| 4000   | 5000                   | 4000                   | 5000                   | 6300                   |
| 2000, 2500, 3200, 4000, (3200, 4000)             | 2500, 3200, 4000, 5000 | 2000, 2500, 3200, 4000 | 2500, 3200, 4000, 5000 | 3200, 4000, 5000, 6300 |
| 0.4 ~ 1.0  |                        |                        |                        |                        |
| 4000   | 5000                   | 4000                   | 5000                   | 6300                   |
| 1,000  |                        |                        |                        |                        |
| 690  |                        |                        |                        |                        |
| 12   |                        |                        |                        |                        |
| 50/60  |                        |                        |                        |                        |
| 3/4  |                        |                        |                        |                        |
| 100  |                        |                        |                        |                        |
| 100  |                        |                        |                        |                        |
| 85   |                        |                        |                        |                        |
| 100%   |                        |                        |                        |                        |
| 220  |                        |                        |                        |                        |
| 220  |                        |                        |                        |                        |
| 187  |                        |                        |                        |                        |
| 85   |                        |                        |                        |                        |
| 75   |                        |                        |                        |                        |
| 65   |                        |                        |                        |                        |
| Less than 25ms under Icw/Less than 75ms over Icw |                        |                        |                        |                        |
| 90ms under                                       |                        |                        |                        |                        |
| 10,000   |                        |                        |                        |                        |
| 2,000  |                        |                        |                        |                        |
| ○  | ○                      |                        |                        |                        |
| ●  | ●                      |                        |                        |                        |
| -  | -                      |                        |                        |                        |
| -  | -                      |                        |                        |                        |
| 107/139  | 181/223                |                        | 186/230                |                        |
| 102/145  | 179/221                |                        | 184/228                |                        |
| 65/85  | 97/117                 |                        | 102/124                |                        |
| 61/81  | 98/123                 |                        | 103/130                |                        |
| 60/80  | 96/121                 |                        | 101/128                |                        |
| 460×629×375                                      |                        |                        |                        |                        |
| 460×799×375                                      |                        |                        |                        |                        |
| 300×597×295                                      |                        |                        |                        |                        |
| 300×767×295                                      |                        |                        |                        |                        |
| N, A, P, S type                                  |                        |                        |                        |                        |
| KS / KEMA / KERI / GOST                          |                        |                        |                        |                        |
| LR, ABS, DNV, KR, BV, GL, RINA, NK               |                        |                        |                        |                        |

※ Derating of the rated current is required according to the ambient temperature around the breaker in a panel if it is higher than the reference value. (See pages 123 to 126)  
 ※ It is possible to connect power and load side reversely, but please use it for normal connection for maintenance and safety.

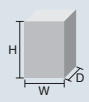
# Ratings

Metasol

## Switch-Disconnecter



| Type                                    |   |                         |
|---|---|-------------------------|
| Ampere frame                            | (AF)                                    |                         |
| Rated current (A)                       | (In max) at 40°C                        |                         |
| Setting current *                       | (A) Control trip relay ( ... × In max)  |                         |
| Rated current of neutral pole           | (A)                                     |                         |
| Rated insulation voltage (V)            | (Ui)                                    |                         |
| Rated operational voltage (V)           | (Ue)                                    |                         |
| Rated impulse withstand voltage (kV)    | (Uimp)                                  |                         |
| Frequency                               | (Hz)                                    |                         |
| Number of poles                         | (P)                                     |                         |
| Rated making capacity (kA peak)         | (Icm) IEC 60947-3 AC 690V / 600V / 550V |                         |
| Rated short-time withstand current (kA) | (Icw) 1 sec                             |                         |
|   | 2 sec                                   |                         |
|   | 3 sec                                   |                         |
| Operating time (t)                      | (ms) Total breaking time                |                         |
|   | Closing time                            |                         |
| Life cycle                              | (time) Mechanical                       |                         |
|   | Electrical                              |                         |
| Connections **                          | Draw-out type/<br>Fixed type            | Horizontal connection   |
|   |   | Vertical connection     |
|   |   | Front connection        |
|   |   | Mixed connection        |
| Weight (kg)<br>(3P/4P)                  | Draw-out type                           | Main body (With cradle) |
|   |   | Motor charging type     |
|   | Fixed type                              | Manual charging type    |
|   |   | Cradle only             |
| External dimensions (mm)<br>(H×W×D)     | Draw-out type                           | 3P                      |
|   |   | 4P                      |
|   | Fixed type                              | 3P                      |
|   |   | 4P                      |



| Metasol  |                     |                      |                               |                                |
|--|---------------------|----------------------|-------------------------------|--------------------------------|
| DN-06D   | DN-08D              | DN-10D               | DN-13D                        | DN-16D                         |
| 630  | 800                 | 1000                 | 1250                          | 1600                           |
| 200,<br>400,<br>630                              | 400,<br>630,<br>800 | 630,<br>800,<br>1000 | 630,<br>800,<br>1000,<br>1250 | 800,<br>1000,<br>1250,<br>1600 |
| 0.4~1.0  |                     |                      |                               |                                |
| 630  | 800                 | 1000                 | 1250                          | 1600                           |
| 1000   |                     |                      |                               |                                |
| 690  |                     |                      |                               |                                |
| 12   |                     |                      |                               |                                |
| 50/60  |                     |                      |                               |                                |
| 3/4  |                     |                      |                               |                                |
| 105  |                     |                      |                               |                                |
| 50   |                     |                      |                               |                                |
| 42   |                     |                      |                               |                                |
| 36   |                     |                      |                               |                                |
| Less than 25ms under Icw/Less than 75ms over Icw |                     |                      |                               |                                |
| 80ms under                                       |                     |                      |                               |                                |
| 20000  |                     |                      |                               |                                |
| 5000   |                     |                      |                               |                                |
| ●  | ●                   | ●                    | ●                             | ●                              |
| ○  | ○                   | ○                    | ○                             | ○                              |
| ○  | ○                   | ○                    | ○                             | ○                              |
| ○  | ○                   | ○                    | ○                             | ○                              |
| 63/74  |                     |                      |                               |                                |
| 61/72  |                     |                      |                               |                                |
| 29/32  |                     |                      |                               |                                |
| 34/44  |                     |                      |                               |                                |
| 32/42  |                     |                      |                               |                                |
| 430×334×375                                      |                     |                      |                               |                                |
| 430×419×375                                      |                     |                      |                               |                                |
| 300×300×295                                      |                     |                      |                               |                                |
| 300×385×295                                      |                     |                      |                               |                                |

\* Refer to trip relay specification. \*\* ●: Standard, ○: Option

Note) 1. Life time means not guarantee, but limitation.

Quality guarantee: On/Off frequency on the basis of IEC60947-3 within the term of guarantee  
2. DS-20D, DS-40E types are equipped with vertical-only terminals.





| Metasol  |               |                |                      |                       |                        |
|--|---------------|----------------|----------------------|-----------------------|------------------------|
| DS-06D   | DS-08D        | DS-10D         | DS-13D               | DS-16D                | DS-20D                 |
| 630  | 800           | 1000           | 1250                 | 1600                  | 2000                   |
| 200, 400, 630                                    | 400, 630, 800 | 630, 800, 1000 | 630, 800, 1000, 1250 | 800, 1000, 1250, 1600 | 1000, 1250, 1600, 2000 |
| 0.4~1.0  |               |                |                      |                       |                        |
| 630  | 800           | 1000           | 1250                 | 1600                  | 2000                   |
| 1000   |               |                |                      |                       |                        |
| 690  |               |                |                      |                       |                        |
| 12   |               |                |                      |                       |                        |
| 50/60  |               |                |                      |                       |                        |
| 3/4  |               |                |                      |                       |                        |
| 143  |               |                |                      |                       |                        |
| 65   |               |                |                      |                       |                        |
| 50   |               |                |                      |                       |                        |
| 42   |               |                |                      |                       |                        |
| Less than 25ms under Icw/Less than 75ms over Icw |               |                |                      |                       |                        |
| 80ms under                                       |               |                |                      |                       |                        |
| 20000  |               |                |                      |                       |                        |
| 5000   |               |                |                      |                       |                        |
| ●  | ●             | ●              | ●                    | ●                     | -                      |
| ○  | ○             | ○              | ○                    | ○                     | ●                      |
| ○  | ○             | ○              | ○                    | ○                     | -                      |
| ○  | ○             | ○              | ○                    | ○                     | -                      |
| 63/74  |               |                |                      |                       | 70/85                  |
| 61/72  |               |                |                      |                       | 68/83                  |
| 29/32  |               |                |                      |                       | 33/40                  |
| 34/44  |               |                |                      |                       | 38/47                  |
| 32/42  |               |                |                      |                       | 36/45                  |
| 430×334×375                                      |               |                |                      |                       |                        |
| 430×419×375                                      |               |                |                      |                       |                        |
| 300×300×295                                      |               |                |                      |                       |                        |
| 300×385×295                                      |               |                |                      |                       |                        |

| Metasol  |                        |                        |                        |
|--|------------------------|------------------------|------------------------|
| DS-20E   | DS-25E                 | DS-32E                 | DS-40E                 |
| 2000   | 2500                   | 3200                   | 4000                   |
| 200, 400, 630, 800, 1000, 1250, 1600, 2000       | 1250, 1600, 2000, 2500 | 1600, 2000, 2500, 3200 | 2000, 2500, 3200, 4000 |
| 0.4~1.0  |                        |                        |                        |
| 2000   | 2500                   | 3200                   | 4000                   |
| 1000   |                        |                        |                        |
| 690  |                        |                        |                        |
| 12   |                        |                        |                        |
| 50/60  |                        |                        |                        |
| 3/4  |                        |                        |                        |
| 187  |                        |                        |                        |
| 85   |                        |                        |                        |
| 75   |                        |                        |                        |
| 65   |                        |                        |                        |
| Less than 25ms under Icw/Less than 75ms over Icw |                        |                        |                        |
| 80ms under                                       |                        |                        |                        |
| 15000  |                        |                        |                        |
| 5000   |                        |                        |                        |
| ●  | ●                      | ●                      | -                      |
| ○  | ○                      | ○                      | ●                      |
| ○  | ○                      | ○                      | -                      |
| ○  | ○                      | ○                      | -                      |
| 87/103   |                        | 107/139                |                        |
| 85/101   |                        | 102/145                |                        |
| 44/50  |                        | 65/85                  |                        |
| 44/55  |                        | 61/81                  |                        |
| 42/53  |                        | 60/80                  |                        |
| 430×412×375                                      |                        |                        |                        |
| 430×527×375                                      |                        |                        |                        |
| 300×378×295                                      |                        |                        |                        |
| 300×493×295                                      |                        |                        |                        |

※ Derating of the rated current is required according to the ambient temperature around the breaker in a panel if it is higher than the reference value. (See pages 123 to 126)

# Trip relay(OCR)

The trip relay of Susol 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.







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# Trip relays

Susol · Metasol

## Trip relay types

| Classification       | N type  | A type   | P type  | S type   |
|----------------------|---|--|---|--|
| Externals            |  |   |   |   |
| Current protection   | • L/S/I/G/Thermal   | • L/S/I/G(or EL)<br>• Thermal<br>• ZSI (Protective coordination)   | • L/S/I/G(or EL)<br>• Thermal (linear hot start)<br>• ZSI (Protective coordination)   | • L/S/I/G(or EL)<br>• Thermal (linear hot start)<br>• ZSI (Protective coordination)  |
| Other protection     | -   | -  | • Over/Under voltage<br>• Over/Under frequency<br>• Unbalance(Voltage/Current)<br>• Reverse power                           | • 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  |
| Pre Trip Alarm       | -   | -  | • Overload protection relays : DO (Alarm)<br>(Ground fault is not available when using Pre trip alarm)                      | • Overload protection relays : DO (Alarm)<br>(Ground fault is not available when using Pre trip alarm)   |
| 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 works over 20% of load current.                    | • Self Power<br>- Power source works over 20% of load current<br>- External power source are required for comm.<br>• AC/DC 100~250V<br>• DC 15~60V | • AC/DC 100~250V<br>• DC 15~60V   | • AC/DC 100~250V<br>• DC 15~60V  |
| RTC timer            | -   | • 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<br>(Fault/Current/Date and Time)  | • 256 records<br>(Fault/Current/Date and Time)  | • 256 records<br>• Last fault wave form recording (Voltage, current are recorded in 3-phase, and can be read only by communication)  |
| Event recording      | -   | -  | • 256 records(Content, Status, Date)  | • 256 records(Content, Status, Date)   |
| Operating button     | • Reset button  | • Reset, Menu<br>Up/Down, Tap, Enter   | • Reset, Menu<br>Up/Down, Tap, Enter  | • Reset, Menu<br>Up/Down, Tap, 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 display minimum range of OCR current

- 1) A type: When more 15% than rated current (In)
- 2) P/S type: When more 12% than rated current (In)

\* L/S/I/G(or EL)configuration as standard (Only. Unable to select ground fault and earth leakage, simultaneously)

# Trip relays

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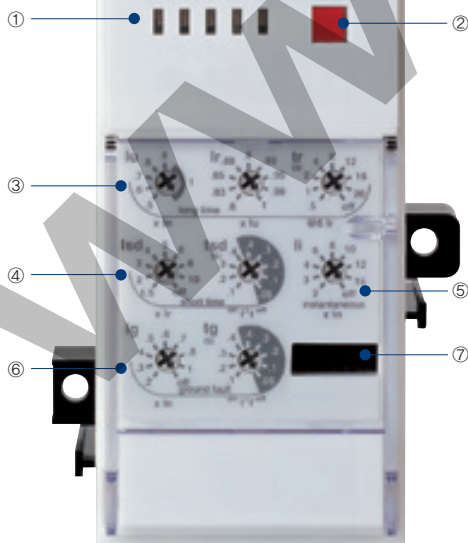
## N type: 「Normal」 type

- Optimized protection function
- OCR, OCGR function according IEC60947-2
- Overload protection
  - Long-time delay
  - Thermal
- Short-circuit protection
  - Short-time delay / Instantaneous
  - I<sup>2</sup>t On/Off optional (for short-time delay)
- Ground fault protection
  - I<sup>2</sup>t On/Off optional
- Self-Power

① LED: Indication of trip info. and overload state

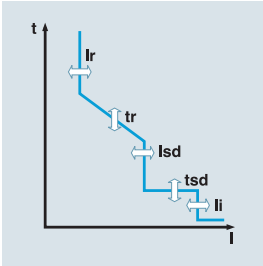


- Ig: LED indicating ground-fault
- Ild/li: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload  
(Turn on above 90%, Blink above 105%)



- ② Reset Key: Fault reset or battery check
- ③ Iu, Ir: Long-time current setting, tr: Long-time tripping delay setting
- ④ Ild: Short-time current setting, tsd: Short-time tripping delay setting
- ⑤ li: Instantaneous current setting
- ⑥ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
- ⑦ Test terminal: OCR test terminal (Connected with OCR tester)

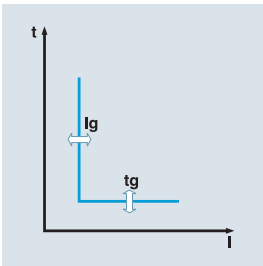
## Protection



| Long time                              |                          |      |      |      |      |     |      |      |      |     |
|--|--------------------------|------|------|------|------|-----|------|------|------|-----|
| Current setting (A)                    | $I_u = I_n \times \dots$ | 0.5  | 0.6  | 0.7  | 0.8  | 0.9 | 1.0  |      |      |     |
|  | $I_r = I_u \times \dots$ | 0.8  | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1.0 |
| Time delay (s)                         | $t_r @ (1.5 \times I_r)$ | 12.5 | 25   | 50   | 100  | 200 | 300  | 400  | 500  | Off |
| Accuracy: $\pm 15\%$ or<br>below 100ms | $t_r @ (6.0 \times I_r)$ | 0.5  | 1    | 2    | 4    | 8   | 12   | 16   | 20   | Off |
|  | $t_r @ (7.2 \times I_r)$ | 0.34 | 0.69 | 1.38 | 2.7  | 5.5 | 8.3  | 11   | 13.8 | Off |

| Short time                             |  |      |     |     |     |     |   |   |    |     |
|--|--|------|-----|-----|-----|-----|---|---|----|-----|
| Current setting (A)                    | $I_{sd} = I_r \times \dots$            | 1.5  | 2   | 3   | 4   | 5   | 6 | 8 | 10 | Off |
| Time delay (s)                         | $I^2t$ Off                             | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |     |
|  | $I^2t$ On @ $(10 \times I_r)$          | 0.1  | 0.2 | 0.3 | 0.4 |     |   |   |    |     |
| Accuracy : $\pm 10\%$ or<br>below 50ms | Min. Trip<br>Time(ms)                  | 20   | 80  | 160 | 260 | 360 |   |   |    |     |
|  | ( $I^2t$ Off)<br>Max. Trip<br>Time(ms) | 80   | 140 | 240 | 340 | 440 |   |   |    |     |

| Instantaneous       |                          |            |   |   |   |   |    |    |    |     |
|---------------------|--------------------------|------------|---|---|---|---|----|----|----|-----|
| Current setting (A) | $I_l = I_n \times \dots$ | 2          | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time       |                          | below 50ms |   |   |   |   |    |    |    |     |



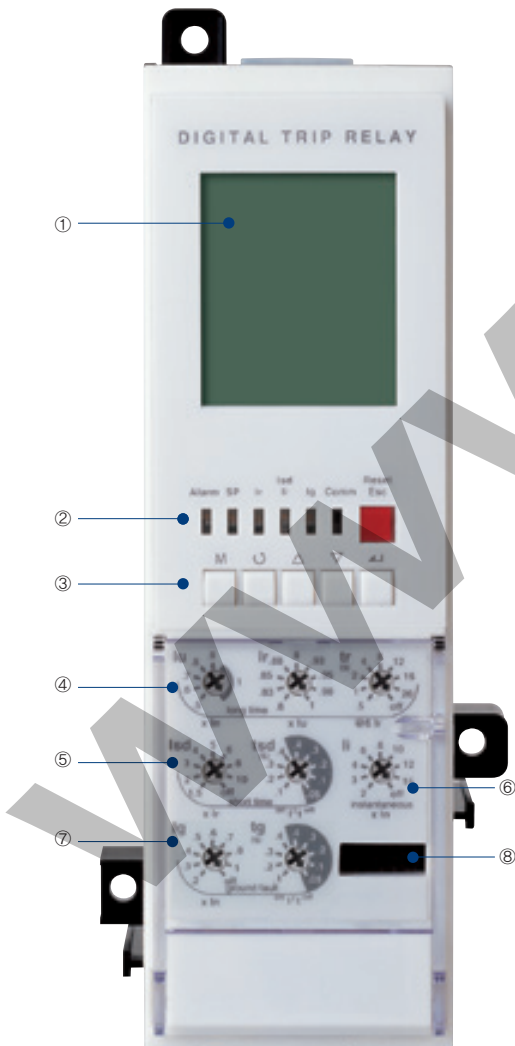
| Ground fault  |  |      |     |     |     |     |     |     |     |     |
|---|--|------|-----|-----|-----|-----|-----|-----|-----|-----|
| Pick-up (A)   | $I_g = I_n \times \dots$               | 0.2  | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| Time delay (s)  | $I^2t$ Off                             | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |     |     |     |     |
|   | $I^2t$ On @ $(1 \times I_n)$           | 0.1  | 0.2 | 0.3 | 0.4 |     |     |     |     |     |
| Accuracy : $\pm 10\%$ ( $I_g \geq 0.4 I_n$ )<br>$\pm 20\%$ ( $I_g < 0.4 I_n$ )<br>or below 50ms | Min. Trip<br>Time(ms)                  | 20   | 80  | 160 | 260 | 360 |     |     |     |     |
|   | ( $I^2t$ Off)<br>Max. Trip<br>Time(ms) | 80   | 140 | 240 | 340 | 440 |     |     |     |     |

# Trip relays

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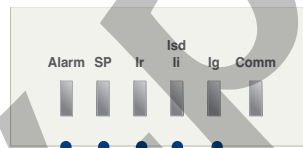
## A type: 「Ammeter」 type

- Overload protection
  - Long-time delay
  - Thermal
- Short-circuit protection
  - Short-time delay / Instantaneous
  - I<sup>2</sup>t On/Off optional (for short-time delay)
- Ground Fault( or Earth Leakage) Protection
  - Ground Fault : Available to select I<sup>2</sup>t ON/OFF
  - Earth Leakage : Applied to use External CT or Private ZCT  
Available to select Alarm/Trip
- 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)
  - Fixed
- Communication
  - Modbus/RS485
  - Profibus-DP



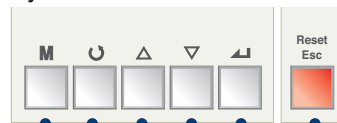
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



- Ig: LED indicating ground-fault
- Isd/li: 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%)

③ 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

④ Iu, Ir: Long-time current setting, tr: Long-time tripping delay setting

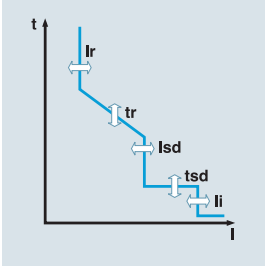
⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑥ Ii: Instantaneous current setting

⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

⑧ Test terminal: OCR test terminal (Connected with OCR tester)

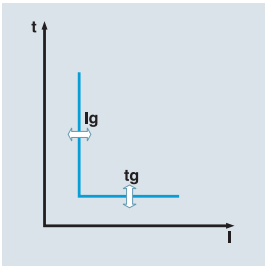
## Protection



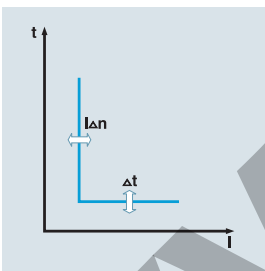
| Long time                              |                          |      |      |      |      |     |      |      |      |     |
|--|--------------------------|------|------|------|------|-----|------|------|------|-----|
| Current setting (A)                    | $I_u = I_n \times \dots$ | 0.5  | 0.6  | 0.7  | 0.8  | 0.9 | 1.0  |      |      |     |
|  | $I_r = I_u \times \dots$ | 0.8  | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1.0 |
| Time delay (s)                         | $t_r @ (1.5 \times I_r)$ | 12.5 | 25   | 50   | 100  | 200 | 300  | 400  | 500  | Off |
| Accuracy: $\pm 15\%$ or<br>below 100ms | $t_r @ (6.0 \times I_r)$ | 0.5  | 1    | 2    | 4    | 8   | 12   | 16   | 20   | Off |
|  | $t_r @ (7.2 \times I_r)$ | 0.34 | 0.69 | 1.38 | 2.7  | 5.5 | 8.3  | 11   | 13.8 | Off |

| Short time                             |                               |      |     |     |     |     |   |   |    |     |
|--|-------------------------------|------|-----|-----|-----|-----|---|---|----|-----|
| Current setting (A)                    | $I_{sd} = I_r \times \dots$   | 1.5  | 2   | 3   | 4   | 5   | 6 | 8 | 10 | Off |
| Time delay (s)                         | $I^2t$ Off                    | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |     |
|  | $I^2t$ On @ $(10 \times I_r)$ | 0.1  | 0.2 | 0.3 | 0.4 |     |   |   |    |     |
| Accuracy : $\pm 10\%$ or<br>below 50ms | Min. Trip Time(ms)            | 20   | 80  | 160 | 260 | 360 |   |   |    |     |
|  | Max. Trip Time(ms)            | 80   | 140 | 240 | 340 | 440 |   |   |    |     |

| Instantaneous       |                          |            |   |   |   |   |    |    |    |     |
|---------------------|--------------------------|------------|---|---|---|---|----|----|----|-----|
| Current setting (A) | $I_i = I_n \times \dots$ | 2          | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time       |                          | below 50ms |   |   |   |   |    |    |    |     |



| Ground fault  |                              |      |     |     |     |     |     |     |     |     |
|---|------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| Pick-up (A)   | $I_g = I_n \times \dots$     | 0.2  | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| Time delay (s)  | $I^2t$ Off                   | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |     |     |     |     |
|   | $I^2t$ On @ $(1 \times I_n)$ | 0.1  | 0.2 | 0.3 | 0.4 |     |     |     |     |     |
| Accuracy : $\pm 10\%$ ( $I_g \geq 0.4 I_n$ )<br>$\pm 20\%$ ( $I_g < 0.4 I_n$ )<br>or below 50ms | Min. Trip Time(ms)           | 20   | 80  | 160 | 260 | 360 |     |     |     |     |
|   | Max. Trip Time(ms)           | 80   | 140 | 240 | 340 | 440 |     |     |     |     |



| Earth leakage (Option) |                |     |     |     |     |     |    |    |    |     |
|------------------------|----------------|-----|-----|-----|-----|-----|----|----|----|-----|
| Current setting (A)    | $I_{\Delta n}$ | 0.5 | 1   | 2   | 3   | 5   | 10 | 20 | 30 | Off |
| Time delay (ms)        | Alarm Time(ms) | 140 | 230 | 350 | 800 | 950 |    |    |    |     |
|                        | Trip Time(ms)  | 140 | 230 | 350 | 800 |     |    |    |    |     |
| Accuracy: $\pm 15\%$   | $\Delta t$     |     |     |     |     |     |    |    |    |     |

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

# Trip relays

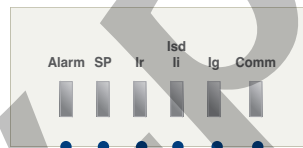
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## P type: «Power meter» type

- Overload protection
  - Long-time delay
  - Thermal
- Short-circuit protection
  - Short-time delay / Instantaneous
  - I<sup>2</sup>t On/Off optional (for short-time delay)
- Ground Fault ( or Earth Leakage) Protection
  - Ground Fault : Available to select I<sup>2</sup>t ON/OFF
  - Earth Leakage : Applied to use External CT or Private ZCT Available to select Alarm/Trip
- 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

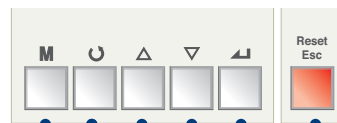
① Graphic LCD: Indication of measurement and information

② 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%)

③ 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

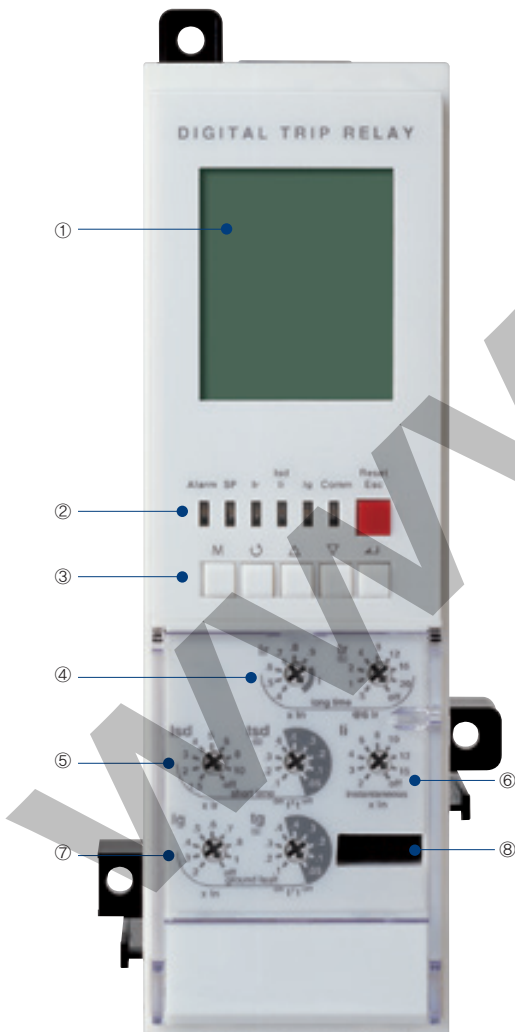
④ Ir: Long-time current setting, tr: Long-time tripping delay setting

⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑥ Ii: Instantaneous current setting

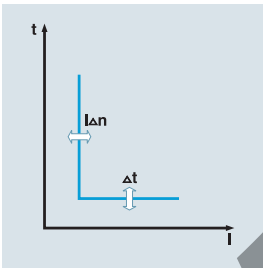
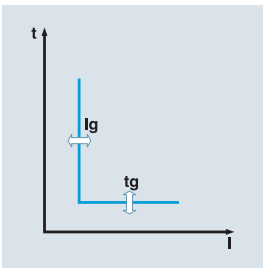
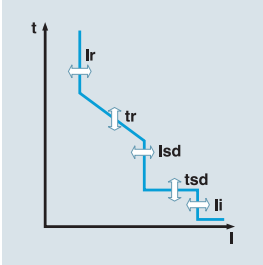
⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

⑧ Test terminal: OCR test terminal (Connected with OCR tester)





### Protection



| Long time                              |                          |      |      |      |     |     |     |     |      |     |
|--|--------------------------|------|------|------|-----|-----|-----|-----|------|-----|
| Current setting (A)                    | $I_r = I_n \times \dots$ | 0.4  | 0.5  | 0.6  | 0.7 | 0.8 | 0.9 | 1.0 |      |     |
| Time delay (s)                         | $t_r @ (1.5 \times I_r)$ | 12.5 | 25   | 50   | 100 | 200 | 300 | 400 | 500  | Off |
| Accuracy: $\pm 15\%$ or<br>below 100ms | $t_r @ (6.0 \times I_r)$ | 0.5  | 1    | 2    | 4   | 8   | 12  | 16  | 20   | Off |
|  | $t_r @ (7.2 \times I_r)$ | 0.34 | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11  | 13.8 | Off |

| Short time  |                              |      |     |     |     |     |   |   |    |     |
|---|------------------------------|------|-----|-----|-----|-----|---|---|----|-----|
| Current setting (A)                                     | $I_{sd} = I_r \times \dots$  | 1.5  | 2   | 3   | 4   | 5   | 6 | 8 | 10 | Off |
| Time delay (s)<br>Accuracy: $\pm 10\%$ or<br>below 50ms | $I^2t$ Off                   | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |     |
|   | $I^2t$ On $@(10 \times I_r)$ | 0.1  | 0.2 | 0.3 | 0.4 |     |   |   |    |     |
|   | Min. Trip Time(ms)           | 20   | 80  | 160 | 260 | 360 |   |   |    |     |
|   | Max. Trip Time(ms)           | 80   | 140 | 240 | 340 | 440 |   |   |    |     |

| Instantaneous       |                          |            |   |   |   |   |    |    |    |     |
|---------------------|--------------------------|------------|---|---|---|---|----|----|----|-----|
| Current setting (A) | $I_i = I_n \times \dots$ | 2          | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time       |                          | below 50ms |   |   |   |   |    |    |    |     |

| Ground fault   |                             |      |     |     |     |     |     |     |     |     |
|--|-----------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| Pick-up (A)  | $I_g = I_n \times \dots$    | 0.2  | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| Time delay (s)<br>Accuracy: $\pm 10\%$ ( $I_g \geq 0.4 I_n$ )<br>$\pm 20\%$ ( $I_g < 0.4 I_n$ )<br>or below 50ms | $I^2t$ Off                  | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |     |     |     |     |
|  | $I^2t$ On $@(1 \times I_n)$ | 0.1  | 0.2 | 0.3 | 0.4 |     |     |     |     |     |
|  | Min. Trip Time(ms)          | 20   | 80  | 160 | 260 | 360 |     |     |     |     |
|  | Max. Trip Time(ms)          | 80   | 140 | 240 | 340 | 440 |     |     |     |     |

| Earth leakage (Option)                  |                |     |     |     |     |     |    |    |    |     |
|---|----------------|-----|-----|-----|-----|-----|----|----|----|-----|
| Current setting (A)                     | $I_{\Delta n}$ | 0.5 | 1   | 2   | 3   | 5   | 10 | 20 | 30 | Off |
| Time delay (ms)<br>Accuracy: $\pm 15\%$ | 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

| PTA (Pre Trip Alarm) |                          |     |      |     |      |     |      |     |      |     |
|----------------------|--------------------------|-----|------|-----|------|-----|------|-----|------|-----|
| Current setting (A)  | $I_p = I_r \times \dots$ | 0.6 | 0.65 | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 | 1   |
| Time delay (s)       | $t_p @ (1.2 \times I_p)$ | 1   | 5    | 10  | 15   | 20  | 25   | 30  | 35   | Off |
| Accuracy: $\pm 15\%$ |                          |     |      |     |      |     |      |     |      |     |

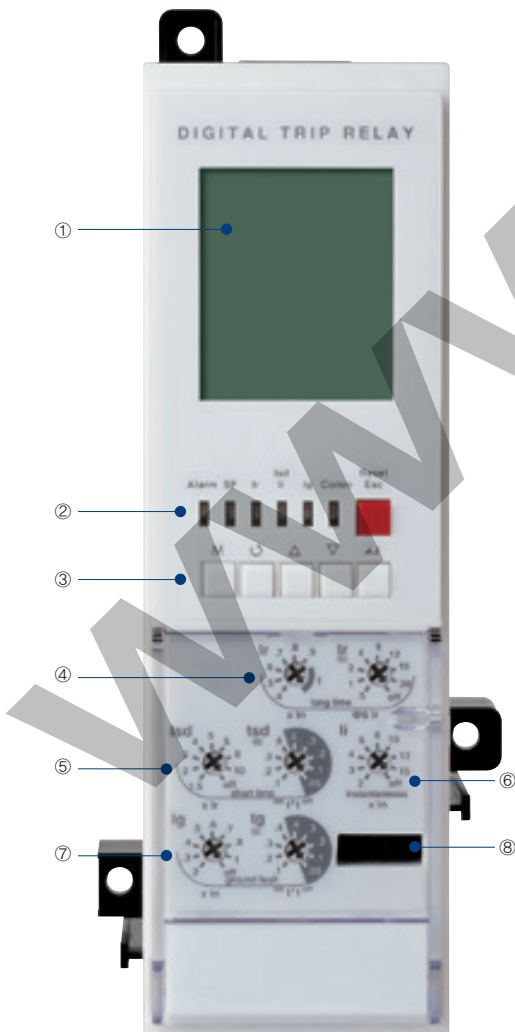
| Other protection  | Pick-up                |      |                               | Time delay(s) |        |               |
|-------------------|------------------------|------|-------------------------------|---------------|--------|---------------|
|                   | Setting range          | Step | Accuracy                      | Setting range | Step   | Accuracy      |
| Under voltage     | 80V ~ 0V_Pick-up       | 1V   | $\pm 5\%$                     | 1.2~40sec     | 0.1sec | $\pm 0.1$ sec |
| Over voltage      | UV_Pick-up ~ 980V      | 1V   | $\pm 5\%$                     |               |        |               |
| Voltage unbalance | 6% ~ 99%               | 1%   | $\pm 2.5\%$ or ( $\pm 10\%$ ) |               |        |               |
| Reverse power     | 10~500 kW              | 1kW  | $\pm 10\%$                    |               |        |               |
| Over power        | 500~5000 kW            | 1kW  | $\pm 10\%$                    |               |        |               |
| Current unbalance | 6% ~ 99%               | 1%   | $\pm 2.5\%$ or ( $\pm 10\%$ ) | 1.2~40sec     | 0.1sec | $\pm 0.1$ sec |
| Over frequency    | 60Hz UF_Pick-up ~ 65   | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |
| Under frequency   | 50Hz UF_Pick-up ~ 55   | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |
| Over frequency    | 60Hz 55Hz ~ OF_Pick-up | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |
| Under frequency   | 50Hz 45Hz ~ OF_Pick-up | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |

# Trip relays

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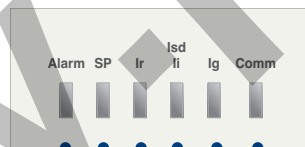
## S type: 「Supreme meter」 type

- Overload protection
  - Long-time delay
  - Thermal
- Short-circuit protection
  - Short-time delay / Instantaneous
  - I<sup>2</sup>t On/Off optional (for short-time delay)
- Ground Fault( or Earth Leakage) Protection
  - Ground Fault : Available to select I<sup>2</sup>t ON/OFF
  - Earth Leakage : Applied to use External CT or Private ZCT Available to select Alarm/Trip
- 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
  - Fault wave recording: records the latest fault wave
- 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
- Power quality analysis
  - Measurement for 1st~63th harmonics
  - THD, TDD, k-Factor
  - Voltage/current waveform capture
- 3 DO(Digital output)
  - Programmable for alarm, trip and general DO
- Communication
  - Modbus/RS485
  - Profibus-DP



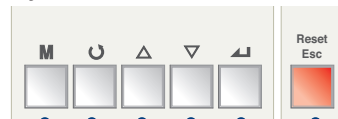
① Graphic LCD: Indication of measurement and information

② 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 LED and battery test LED
- Alarm: LED indicating an overload (Turn on above 90%, Blink above 105%)

③ 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

④ Ir: Long-time current setting, tr: Long-time tripping delay setting

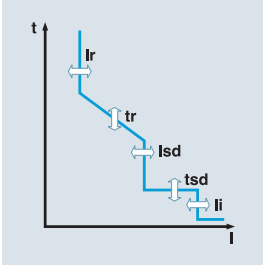
⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑥ Ii: Instantaneous current setting

⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

⑧ Test terminal: OCR test terminal (Connected with OCR tester)

### Protection



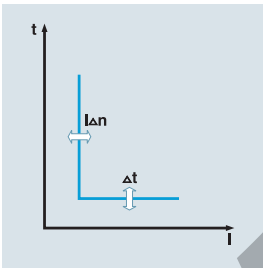
| Long time                              |                          |      |      |      |     |     |     |     |      |     |
|--|--------------------------|------|------|------|-----|-----|-----|-----|------|-----|
| Current setting (A)                    | $I_r = I_n \times \dots$ | 0.4  | 0.5  | 0.6  | 0.7 | 0.8 | 0.9 | 1.0 |      |     |
| Time delay (s)                         | $t_r @ (1.5 \times I_r)$ | 12.5 | 25   | 50   | 100 | 200 | 300 | 400 | 500  | Off |
| Accuracy: $\pm 15\%$ or<br>below 100ms | $t_r @ (6.0 \times I_r)$ | 0.5  | 1    | 2    | 4   | 8   | 12  | 16  | 20   | Off |
|  | $t_r @ (7.2 \times I_r)$ | 0.34 | 0.69 | 1.38 | 2.7 | 5.5 | 8.3 | 11  | 13.8 | Off |

| Short time  |                              |      |     |     |     |     |   |   |    |     |
|---|------------------------------|------|-----|-----|-----|-----|---|---|----|-----|
| Current setting (A)                                     | $I_{sd} = I_r \times \dots$  | 1.5  | 2   | 3   | 4   | 5   | 6 | 8 | 10 | Off |
| Time delay (s)<br>Accuracy: $\pm 10\%$ or<br>below 50ms | $I^2t$ Off                   | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |     |
|   | $I^2t$ On $@(10 \times I_r)$ |      | 0.1 | 0.2 | 0.3 | 0.4 |   |   |    |     |
|   | Min. Trip Time(ms)           | 20   | 80  | 160 | 260 | 360 |   |   |    |     |
|   | Max. Trip Time(ms)           | 80   | 140 | 240 | 340 | 440 |   |   |    |     |

| Instantaneous       |                          |            |   |   |   |   |    |    |    |     |
|---------------------|--------------------------|------------|---|---|---|---|----|----|----|-----|
| Current setting (A) | $I_i = I_n \times \dots$ | 2          | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Off |
| Tripping time       |                          | below 50ms |   |   |   |   |    |    |    |     |



| Ground fault   |                             |      |     |     |     |     |     |     |     |     |
|--|-----------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| Pick-up (A)  | $I_g = I_n \times \dots$    | 0.2  | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | Off |
| Time delay (s)<br>Accuracy: $\pm 10\%$ ( $I_g \geq 0.4 I_n$ )<br>$\pm 20\%$ ( $I_g < 0.4 I_n$ )<br>or below 50ms | $I^2t$ Off                  | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 |     |     |     |     |
|  | $I^2t$ On $@(1 \times I_n)$ |      | 0.1 | 0.2 | 0.3 | 0.4 |     |     |     |     |
|  | Min. Trip Time(ms)          | 20   | 80  | 160 | 260 | 360 |     |     |     |     |
|  | Max. Trip Time(ms)          | 80   | 140 | 240 | 340 | 440 |     |     |     |     |



| Earth leakage (Option)                  |                |     |     |     |     |     |    |    |    |     |
|---|----------------|-----|-----|-----|-----|-----|----|----|----|-----|
| Current setting (A)                     | $I_{\Delta n}$ | 0.5 | 1   | 2   | 3   | 5   | 10 | 20 | 30 | Off |
| Time delay (ms)<br>Accuracy: $\pm 15\%$ | 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

| PTA (Pre Trip Alarm) |                          |     |      |     |      |     |      |     |      |     |
|----------------------|--------------------------|-----|------|-----|------|-----|------|-----|------|-----|
| Current setting (A)  | $I_p = I_r \times \dots$ | 0.6 | 0.65 | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 | 1   |
| Time delay (s)       | $t_p @ (1.2 \times I_p)$ | 1   | 5    | 10  | 15   | 20  | 25   | 30  | 35   | Off |
| Accuracy: $\pm 15\%$ |                          |     |      |     |      |     |      |     |      |     |

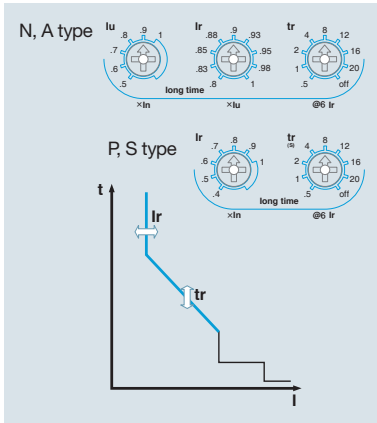
| Other protection  | Pick-up                |      |                               | Time delay(s) |        |               |
|-------------------|------------------------|------|-------------------------------|---------------|--------|---------------|
|                   | Setting range          | Step | Accuracy                      | Setting range | Step   | Accuracy      |
| Under voltage     | 80V ~ 0V_Pick-up       | 1V   | $\pm 5\%$                     | 1.2~40sec     | 0.1sec | $\pm 0.1$ sec |
| Over voltage      | UV_Pick-up ~ 980V      | 1V   | $\pm 5\%$                     |               |        |               |
| Voltage unbalance | 6% ~ 99%               | 1%   | $\pm 2.5\%$ or ( $\pm 10\%$ ) | 0.2~40sec     |        |               |
| Reverse power     | 10~500 kW              | 1kW  | $\pm 10\%$                    |               |        |               |
| Over power        | 500~5000 kW            | 1kW  | $\pm 10\%$                    | 1.2~40sec     |        |               |
| Current unbalance | 6% ~ 99%               | 1%   | $\pm 2.5\%$ or ( $\pm 10\%$ ) |               |        |               |
| Over frequency    | 60Hz UF_Pick-up ~ 65   | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |
| Under frequency   | 50Hz UF_Pick-up ~ 55   | 1Hz  | $\pm 0.1$ Hz                  | 1.2~40sec     |        |               |
| Over frequency    | 60Hz 55Hz ~ OF_Pick-up | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |
| Under frequency   | 50Hz 45Hz ~ OF_Pick-up | 1Hz  | $\pm 0.1$ Hz                  |               |        |               |

# Trip relays

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## Operation characteristics

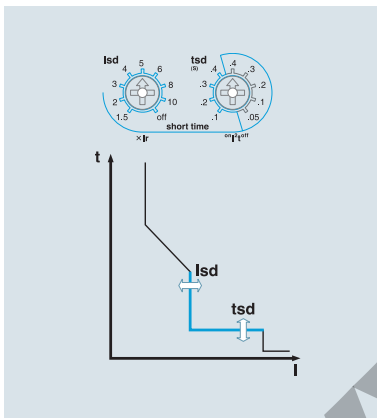
### Long-time delay (L)



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

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

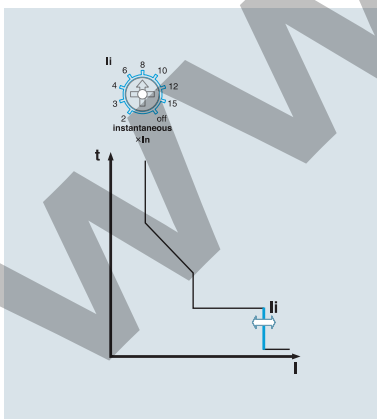
### Short-time delay (S)



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

- Standard current setting knob:  $I_{sd}$ 
  - Setting range:  $(1.5-2-3-4-5-6-8-10-Off) \times I_r$
- Time delay setting knob:  $t_{sd}$ 
  - Standard operating time is based on the time of  $10 \times I_r$ .
  - Inverse time ( $I^2 t$  On): 0.1-0.2-0.3-0.4 sec
  - Definite time ( $I^2 t$  Off): 0.05-0.1-0.2-0.3-0.4 sec
- Relay operates basing on the largest load current among R/S/T/N phase.
- 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.

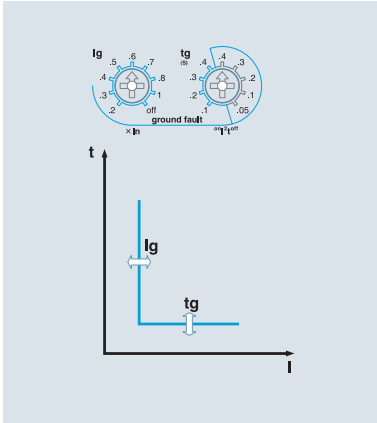
### Instantaneous (I)



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

- Standard current setting knob:  $I_i$ 
  - Setting range:  $(2-3-4-6-8-10-12-15-Off) \times I_n$
- Relay operates basing on the largest load current among R/S/T/N phase.
- Total breaking time is below 50ms.

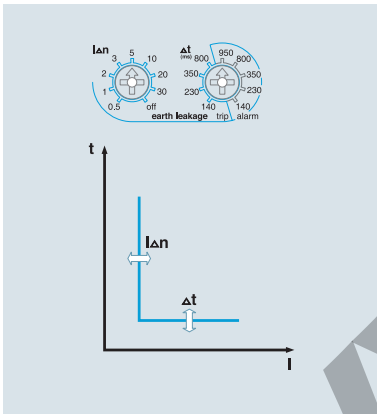
## Ground Fault (G)



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

- Standard setting current knob:  $I_g$ 
  - Setting range:  $(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off) \times I_n$
- Time delay setting knob:  $t_g$ 
  - 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
- 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)
- 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.
- 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 earth-leakage 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)

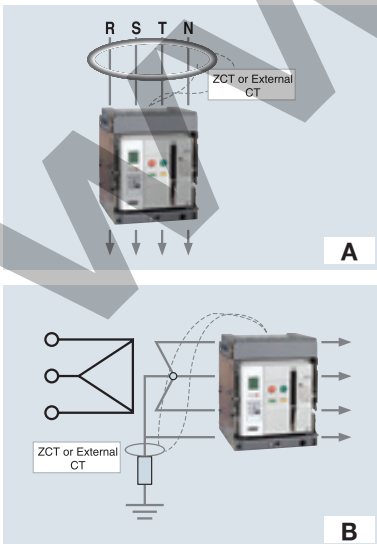
- Standard setting current knob:  $I_{\Delta n}$ 
  - Setting range: 0.5-1-2-3-5-10-20-30-Off (A)
- Time delay setting knob:  $\Delta t$ 
  - Trip time: 140-230-350-800 ms
  - Alarm time: 140-230-350-800-950 ms
- Settings within its alarm range will prevent its breaker from tripping but activating its alarm.
- 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.
- 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.

### ※ 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 ( $0.5A \times 20 = 10A$ )

### ※ 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  $400A \times 20\% = 80A$   
4000A ACB Min. Earth-leakage current  $4000A \times 20\% = 800A$
- 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.



# Trip relays

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## Measurement function

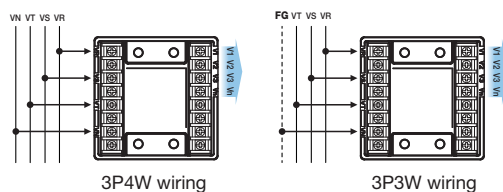
| Type      | Class.         | Measurement element            | Detailed element  | Unit  | Display range |   |
|-----------|----------------|--------------------------------|---|---|---------------|---|
| S         | A              | Current                        | Line current  | $I_a, I_b, I_c$   | A             | A type: 0.15In~17In<br>P/S type: 0.12In~1.6In |
|           |                | Normal current                 | $I_n$   |   |               |   |
|           |                | Reverse current                | $I_r$   |   |               |   |
|           | Voltage        | Voltage                        | Line voltage  | $V_{ab}, V_{bc}, V_{ca}$                                  | V             | 60-690V                                       |
|           |                |                                | Phase voltage   | $V_a, V_b, V_c$   |               |   |
|           |                |                                | Normal voltage  | $V_n$   |               |   |
|           |                |                                | Reverse voltage   | $V_r$   |               |   |
|           | Angle          | Angle                          | Line-to-line  | $\angle V_{abla}, \angle V_{b\Delta}, \angle V_{c\Delta}$ | °             | 0~360°  |
|           |                |                                | Line-to-current   | $\angle V_{abI_c}, \angle V_{bcI_a}, \angle V_{caI_b}$    |               |   |
|           |                |                                | Phase-to-phase  | $\angle V_aV_b, \angle V_bV_c$                            |               |   |
|           | Power          | Power                          | Active power  | $P_{a(ab)}, P_{b(bc)}, P_{c(ca)}, P$                      | kW            | 1kW~99999kW                                   |
|           |                |                                | Reactive power  | $Q_{a(ab)}, Q_{b(bc)}, Q_{c(ca)}, Q$                      | kVar          | 1kVar~99999kVar                               |
|           |                |                                | Apparent power  | $S_{a(ab)}, S_{b(bc)}, S_{c(ca)}, S$                      | kVA           | 1kVA~99999kVA                                 |
|           | Energy         | Energy                         | Active energy   | $WH_{a(ab)}, WH_{b(bc)}, WH_{c(ca)}, WH$                  | kWh, MWh      | 1kWh~9999.99MWh                               |
|           |                |                                | Reactive energy   | $VARH_{a(ab)}, VARH_{b(bc)}, VARH_{c(ca)}, VARH$          | kVarh, Mvarh  | 1kVarh~9999.99MVarh                           |
|           |                |                                | Reverse active energy                                   | $rWH_{a(ab)}, rWH_{b(bc)}, rWH_{c(ca)}, rWH$              | kWh, MWh      | 1kWh~9999.99MWh                               |
|           | Freq.          | Freq.                          | Frequency   | Frequency   | Hz            | 45~65Hz                                       |
|           | Power factor   | Power factor(PF)               | $PF_{a(ab)}, PF_{b(bc)}, PF_{c(ca)}, PF$                | -   | -             | + : Lead, - : Lag                             |
| Unbalance | Unbalance rate | $I_{unbalance}, V_{unbalance}$ | -   | %   | 0.0~100.0     |   |
| Demand    | Demand         | Active power demand            | Peak demand   | kW  | 1kW~99999kW   |   |
|           |                | Current demand                 | Peak demand   | A   | 80A~65535A    |   |
| Harmonics | Harmonics      | Voltage harmonics              | 1st~63th harmonics of $V_{a(ab)}, V_{b(bc)}, V_{c(ca)}$ | V   | 60-690V       |   |
|           |                | Current harmonics              | 1st~63th harmonics of $I_a, I_b, I_c$                   | A   | 80A ~ 65535A  |   |
|           |                | THD, TDD                       | -   | %   | 0.0 ~ 100.0   |   |
|           |                | K-Factor                       | -   | -   | 0.0 ~ 100.0   |   |

## Shield Cable

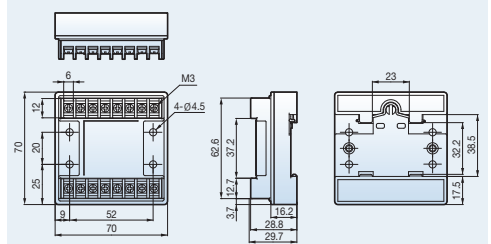


For P and S type Trip relay, separate voltage module is necessary to measure other element besides current (Separate purchase is needed)

- Voltage input range: AC 60~690V
- Input/Output Ratio → 220V: 200mV

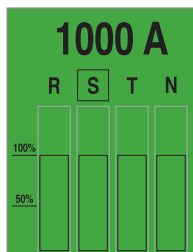


### ■ Dimensions (mm)

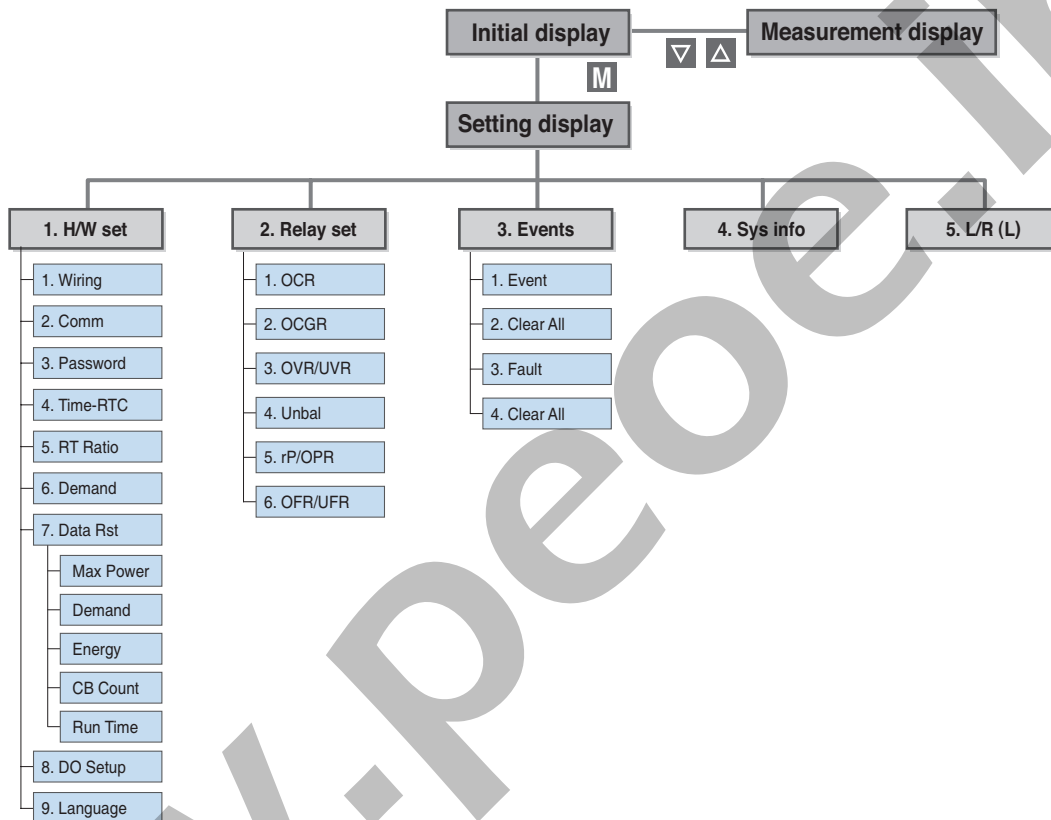


- Note) 1. Be sure to use a shielding wire for the secondary wiring of the Voltage module.  
2. The maximum length of use is less than 3.5m.

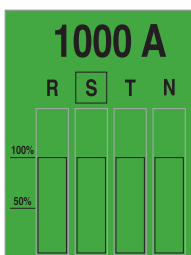
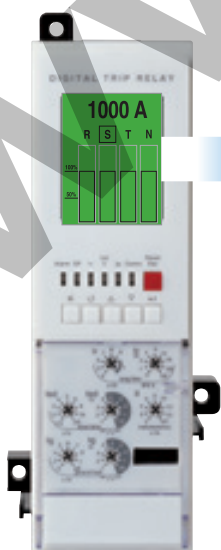
## Man machine interface



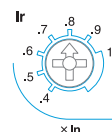
Initial display



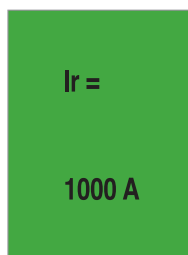
### An example of graphic LCD display



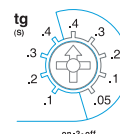
Initial display



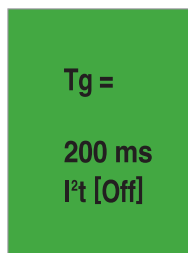
Ir adjustment knob



Displayed screen when changing Ir value into 1.0  
(After 3 sec, return to initial display)



tg adjustment knob

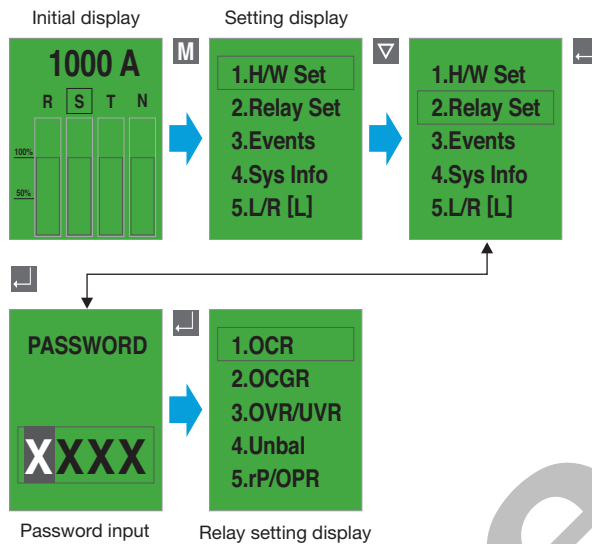


Displayed screen when changing tg value into 0.2  
(After 3sec, return to initial display)

# Trip relays

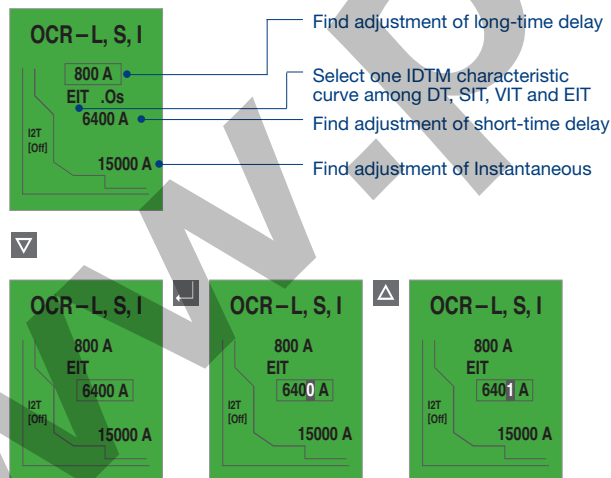
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## Protection element setting

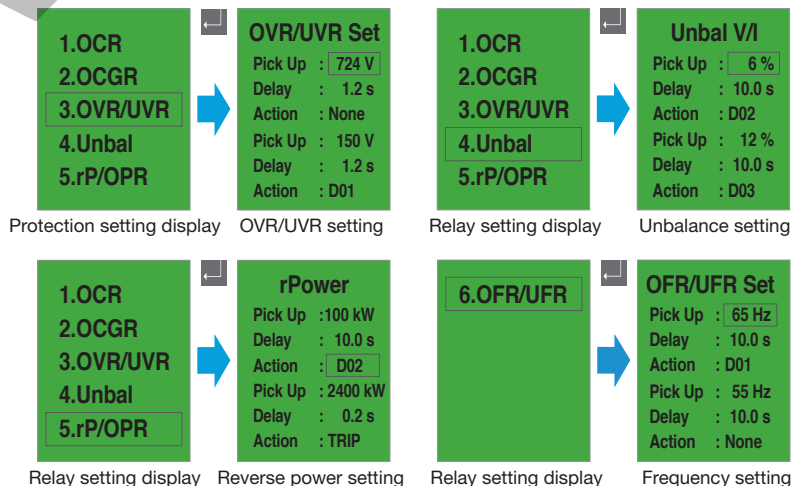


## Find adjustment of protection setting current

- OCR and OCGR's current setting is basically controlled by knob's setting values.
- The fine current that cannot be controlled by knob is adjustable by using  $\nabla$ ,  $\Delta$  key.
- Fine adjustment is only adjustable in the present knob and next knob's setting range, when moving knob, the adjusted data becomes reset state.

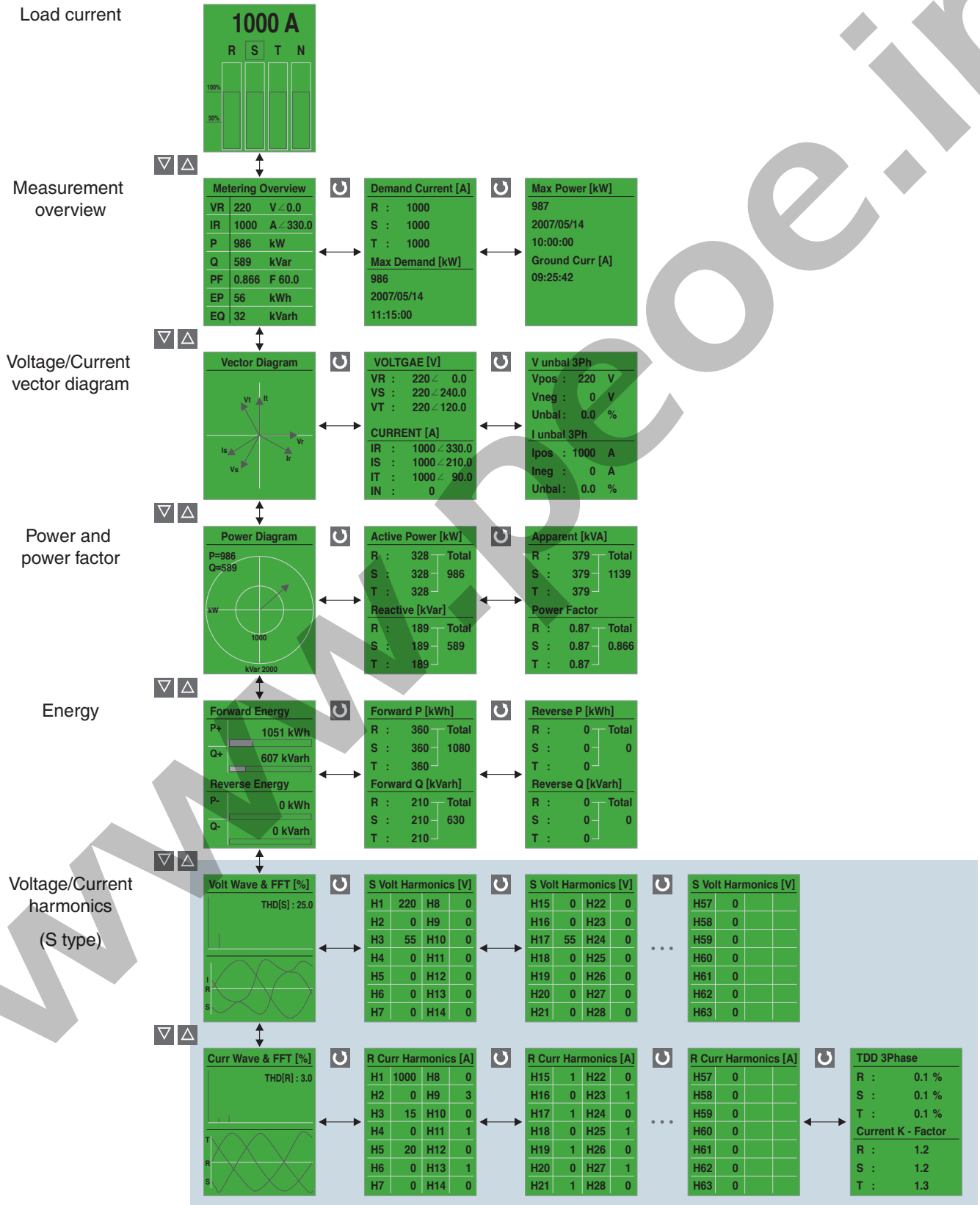


- The setting method of OCGR is same with OCR's, fine adjustment is available.





## Measurement element display

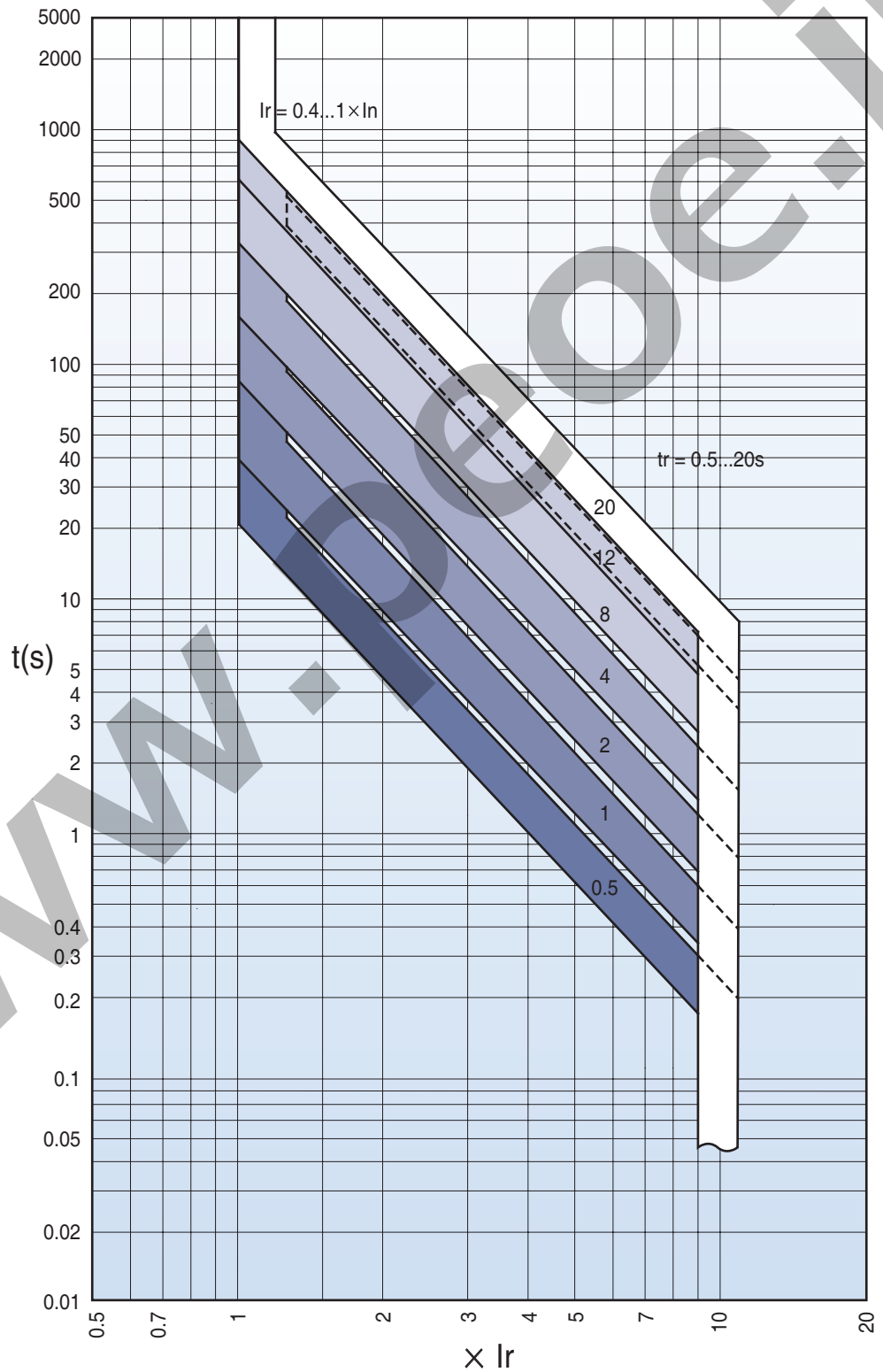


# Trip relays

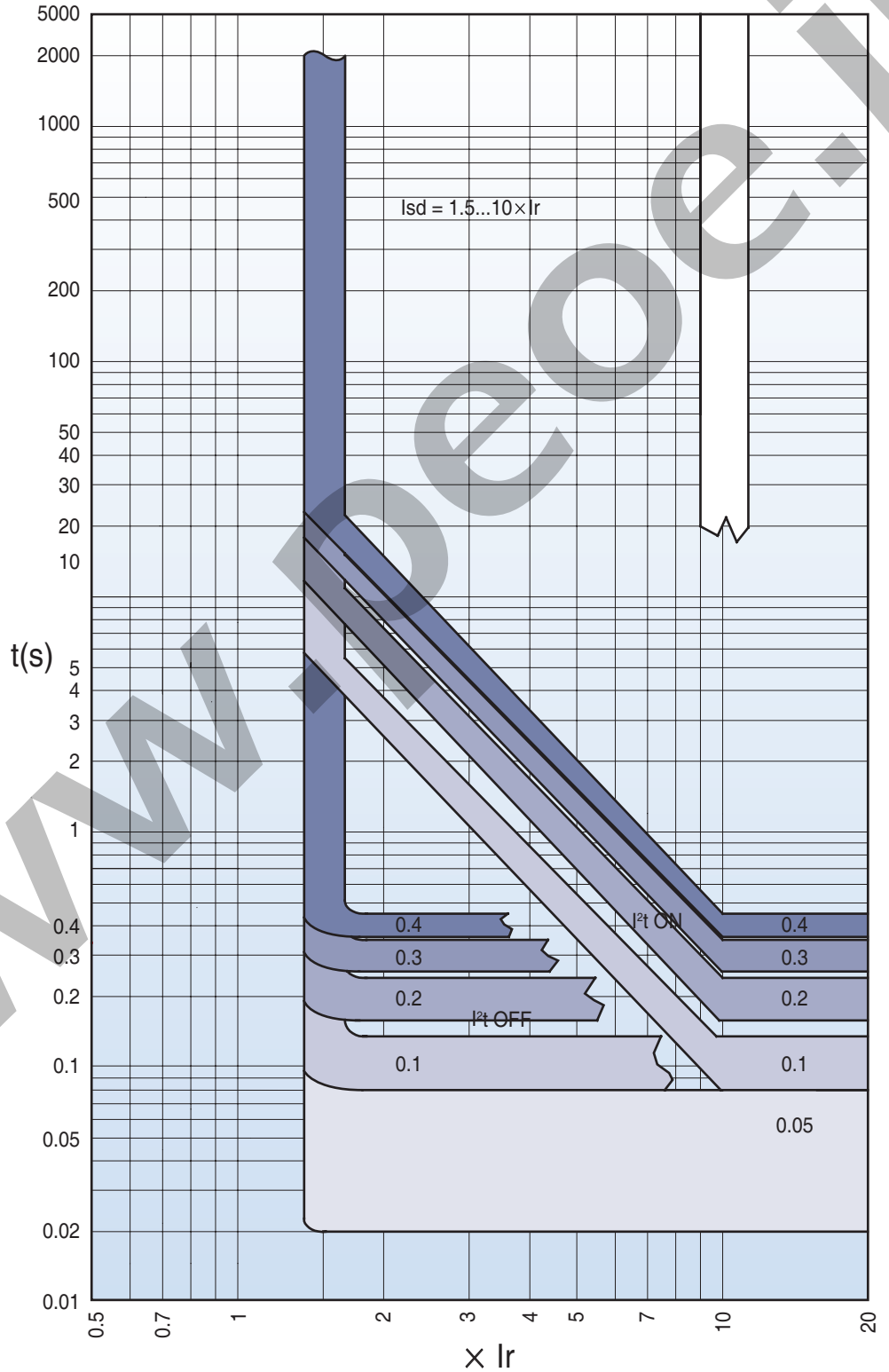
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## Characteristics curves

Long-time delay (L)



Short-time delay (S)

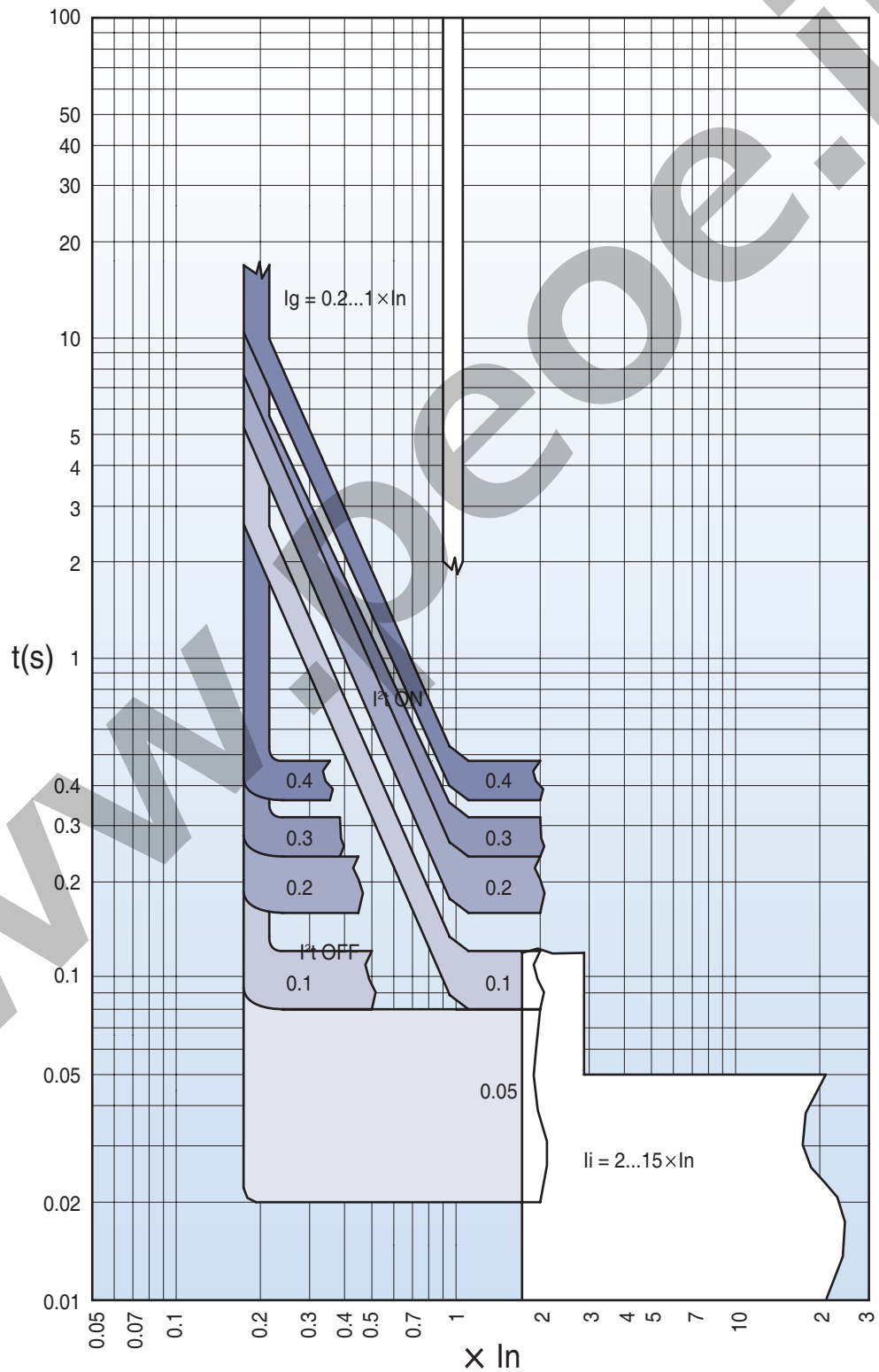


# Trip relays

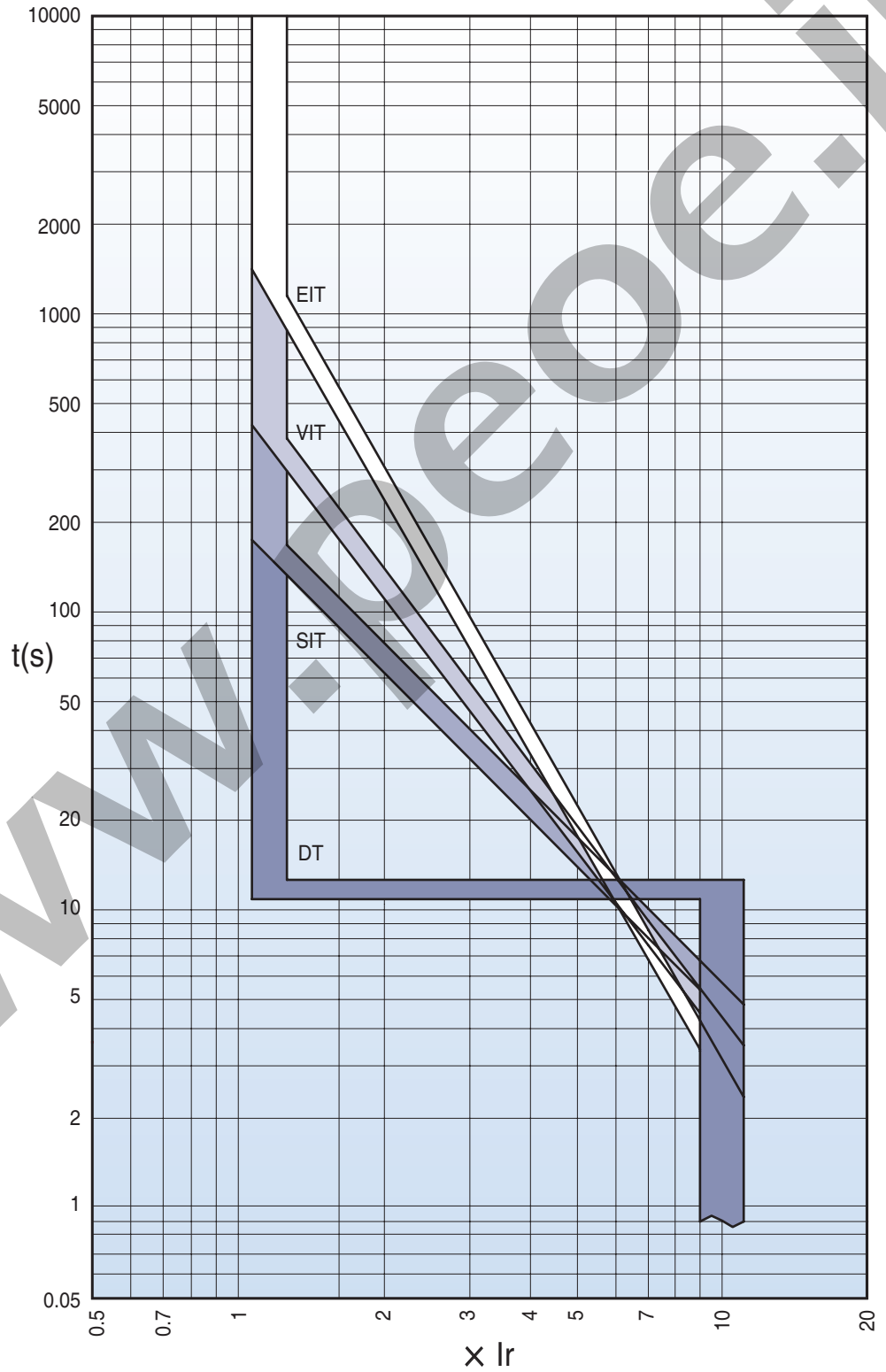
Susol · Metasol

## Characteristics curves

Instantaneous (I)  
Ground fault (G)



IDMTL

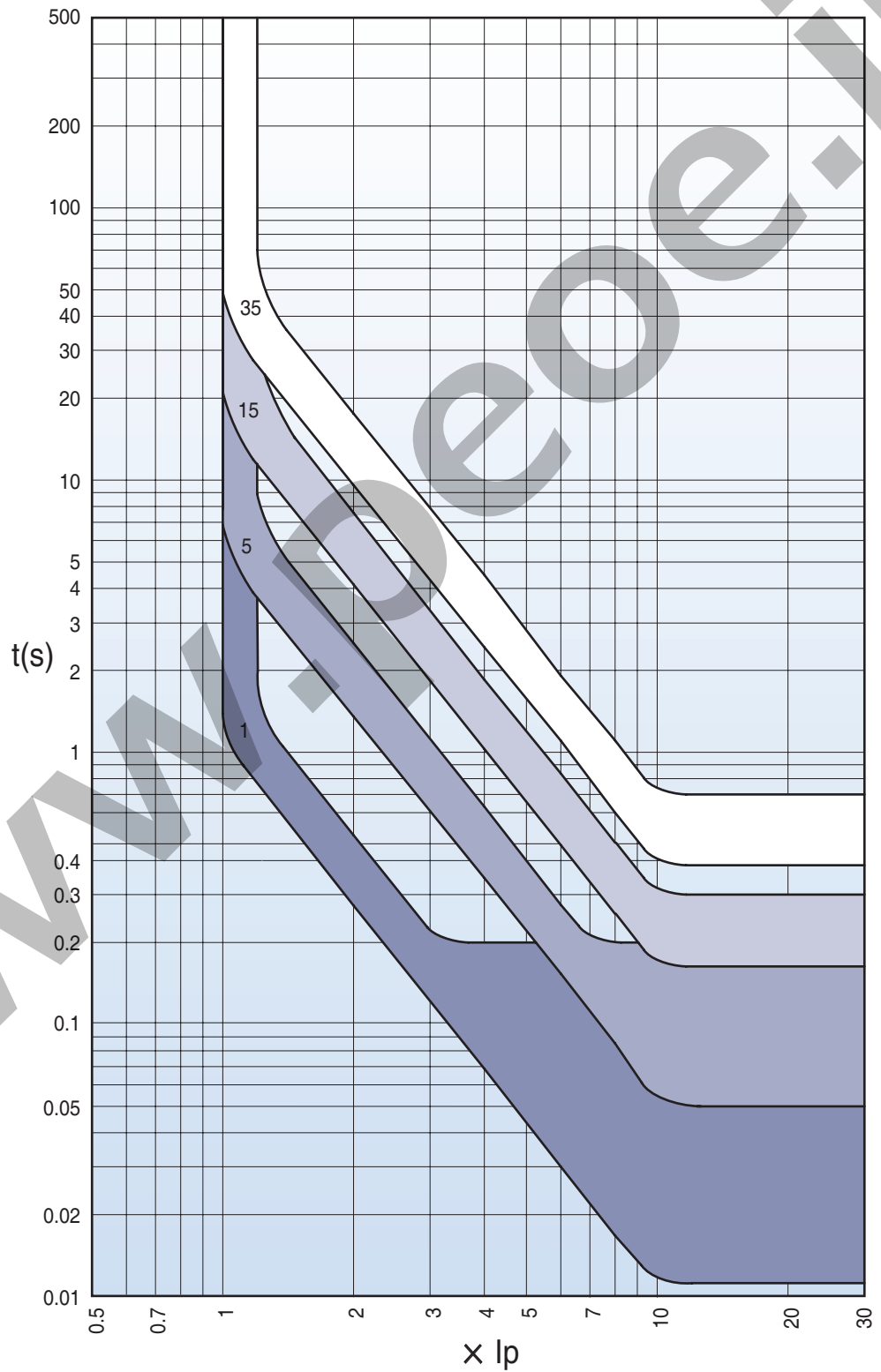


# Trip relays

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## Characteristics curves

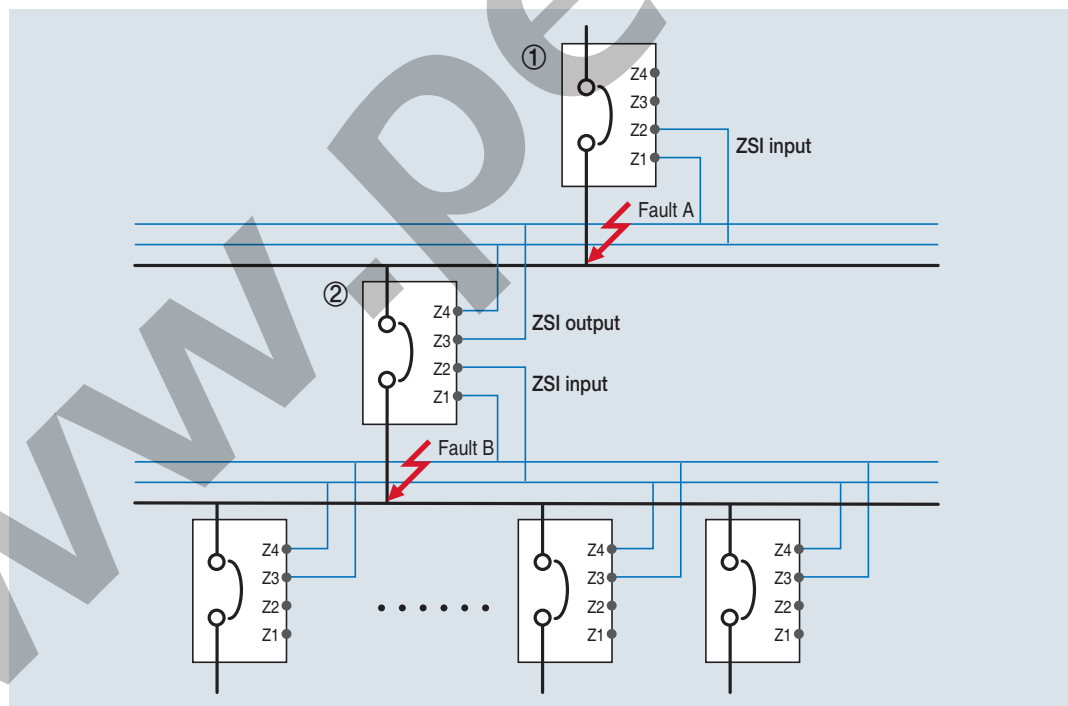
Pre Trip Alarm



## 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.

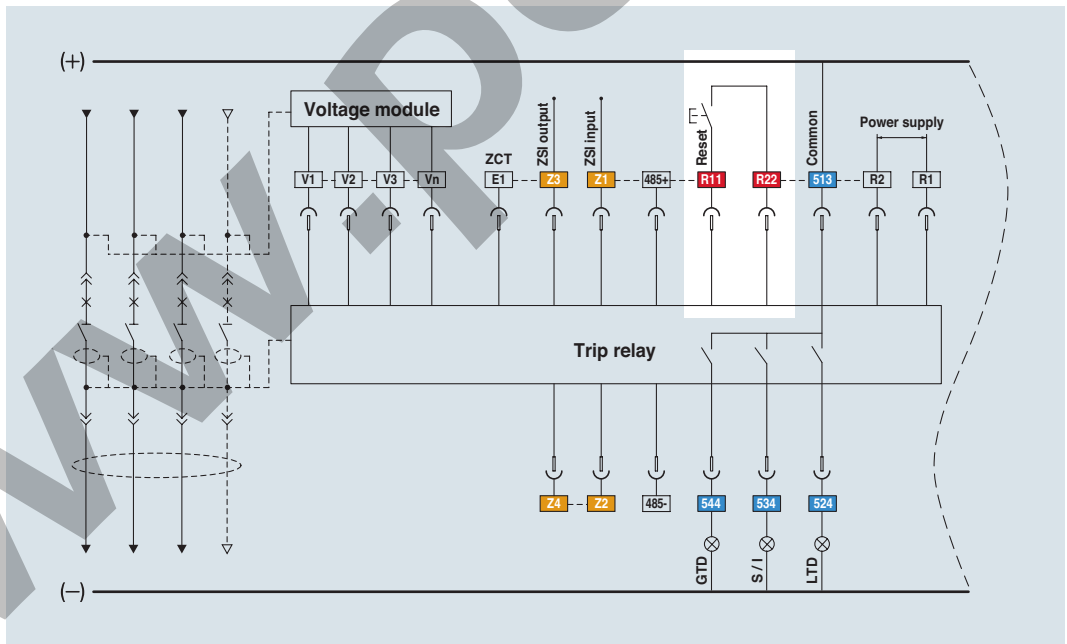
# Trip relays

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## 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  | Not available | Not available | Not available | Not available | Not available | Not available | Not available | Not available | Fixed        |
|            | DO2(534)       | ×         | ●          | ●             | ×      |                |               |               |               |               |               |               |               |               |              |
|            | DO3(544)       | ×         | ×          | ×             | ●      |                |               |               |               |               |               |               |               |               |              |



## Communication

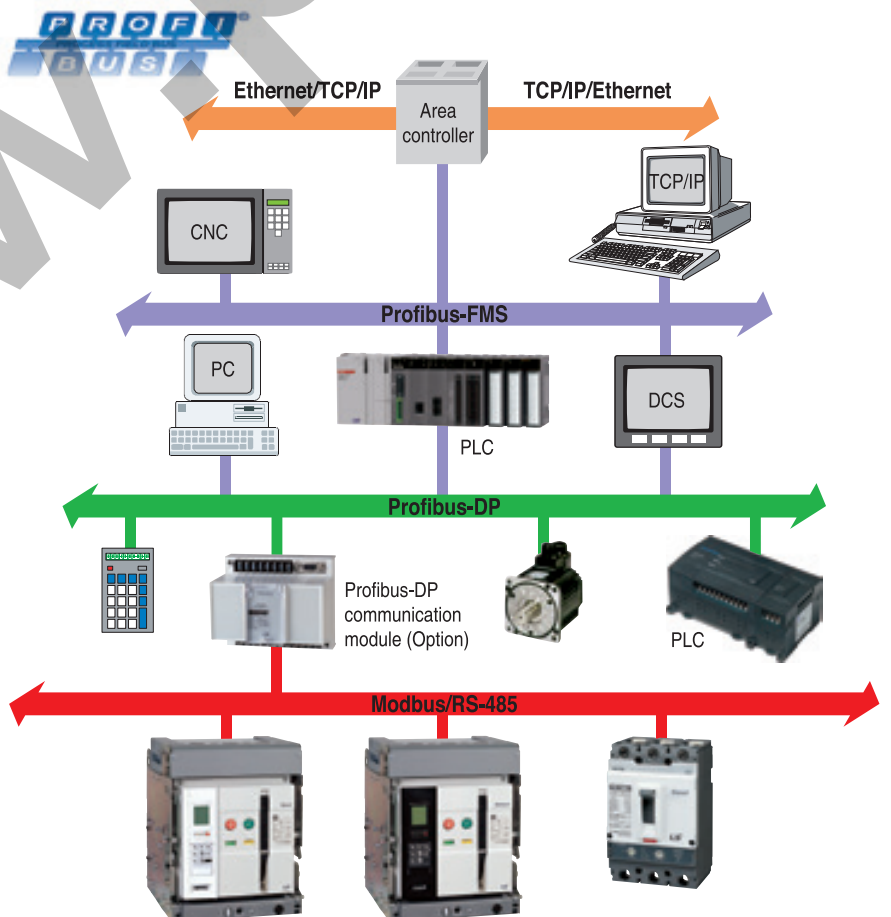
### Modbus/RS-485

- 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)

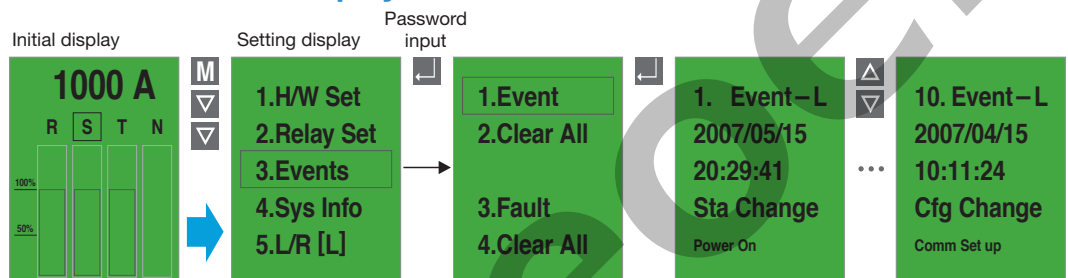
# Trip relays

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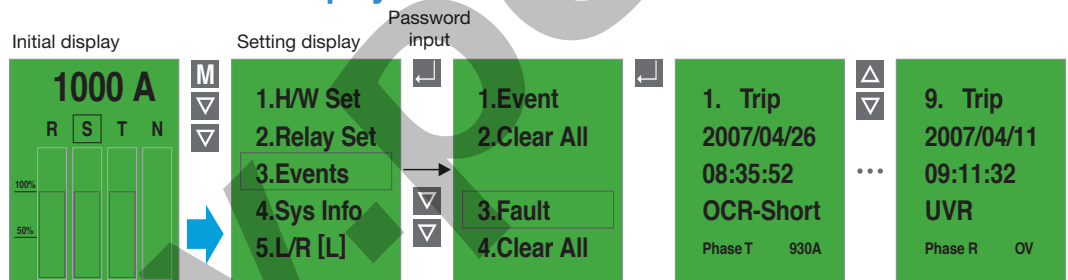
## Event & fault recording (P, S type)

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



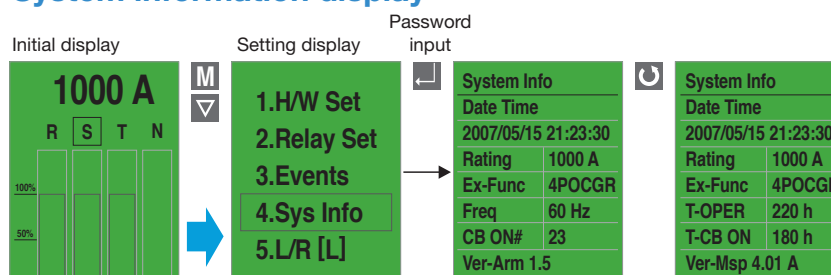
\* Fault information is recorded only when there is external control power

## System information

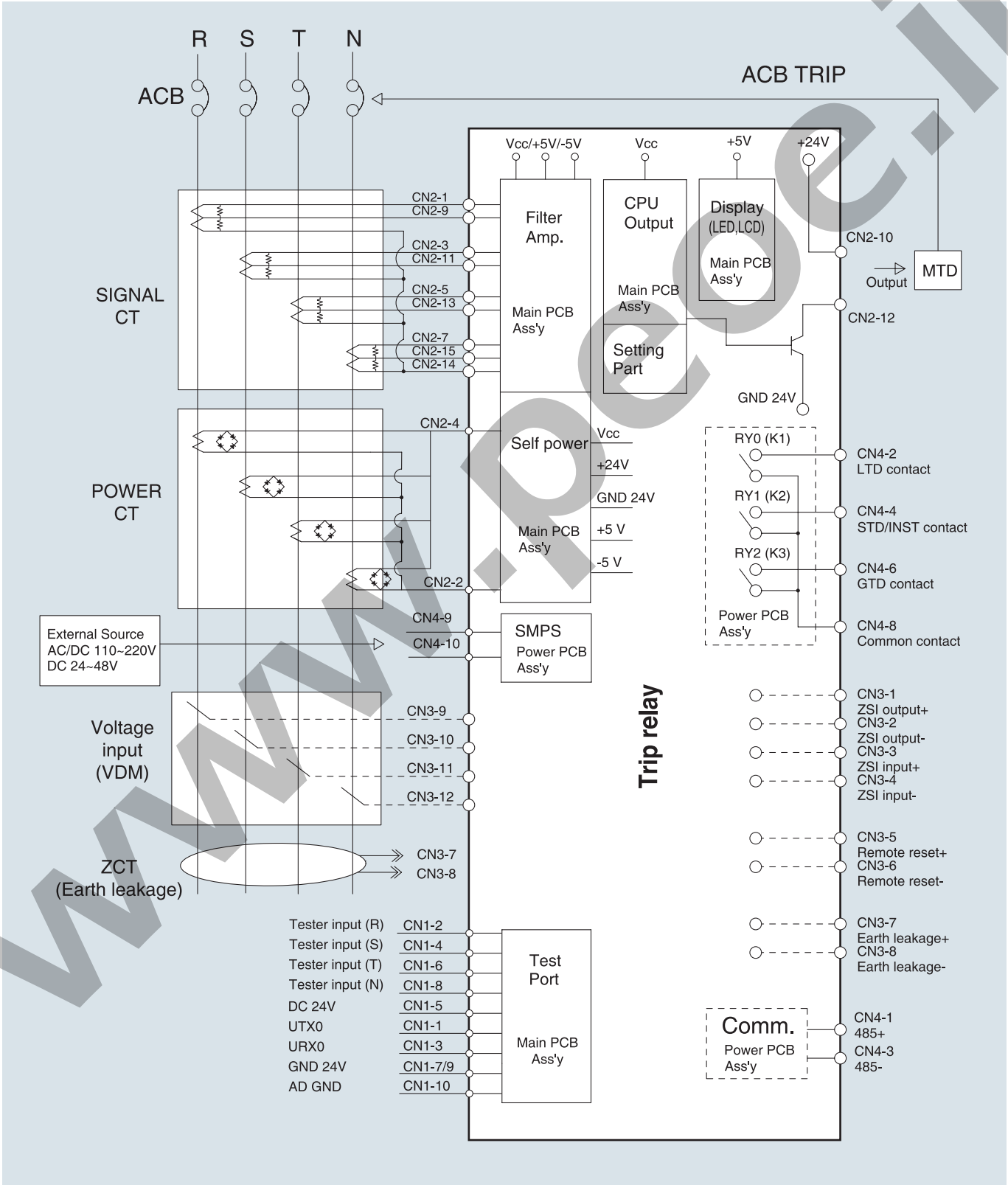
P and S type can indicate information as followings with the information of the ACB.

- Present time: year/month/date/hour/minute/ms
- ACB current ratings
- N-phase current ratings: 100%
- Frequency information: 60Hz/50Hz
- Closing numbers of breaker: CB ON numbers
- Trip relay operating time: OCR ON time
- ON time of breaker: CB ON time
- F/W ver. information

### System information display



# System block diagram



# Accessories

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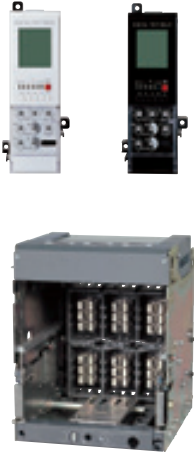


| Mounting | Accessories         |                                      | AH       |        | AS       |        | AN       |        | Remark | Page |
|----------|---------------------|--------------------------------------|----------|--------|----------|--------|----------|--------|--------|------|
|          |                     |                                      | Standard | Option | Standard | Option | Standard | Option |        |      |
| Internal | SHT1                | Shunt Coil                           | ●        | ○      | ●        | ○      | ●        | ○      | *      | 70   |
|          | SHT2                | Double Shunt Coil                    |          | ○      |          | ○      |          |        | *      | 71   |
|          | CC                  | Closing Coil                         | ●        | ○      | ●        | ○      | ●        | ○      | *      | 72   |
|          | M                   | Motor                                | ●        | ○      | ●        | ○      | ●        | ○      | *      | 73   |
|          | CS1                 | Charge Switch                        | ●        | ○      | ●        | ○      | ●        | ○      | *      | 73   |
|          | CS2                 | Charge Switch Communication          |          | ○      |          | ○      |          | ○      | *      | 73   |
|          | UVT                 | Under Voltage Trip Device            |          | ○      |          | ○      |          | ○      | *      | 74   |
|          | AL                  | Trip Alarm Contact                   |          | ○      |          | ○      |          | ○      | *      | 75   |
|          | MRB                 | Manual Reset Button                  |          | ○      |          | ○      |          | ○      | *      | 75   |
|          | RES                 | Remote Reset Switch                  |          | ○      |          | ○      |          | ○      | *      | 76   |
|          | RCS                 | Ready to Close Switch                |          | ○      |          | ○      |          | ○      | *      | 76   |
|          | C                   | Counter                              | ●        |        |          | ○      |          | ○      | *      | 83   |
|          | AX                  | Auxiliary Switch                     |          | ○      |          | ○      |          | ○      | *      | 77   |
|          | TM                  | Temperature Alarm                    |          | ○      |          | ○      |          | ○      | *      | 94   |
|          | MI                  | Mechanical Interlock                 |          | ○      |          | ○      |          | ○      | *      | 85   |
| External | K1                  | Key Lock                             |          | ○      |          | ○      |          | ○      | *      | 78   |
|          | K2                  | Key Interlock Set                    |          | ○      |          | ○      |          | ○      | *      | 78   |
|          | K3                  | Double Key Lock                      |          | ○      |          | ○      |          | ○      | *      | 79   |
|          | B                   | On/Off Button lock                   |          | ○      |          | ○      |          | ○      | *      | 79   |
|          | LH                  | Lifting Hook                         |          | ○      |          | ○      |          | ○      |        | 79   |
|          | CTD                 | Condenser Trip Device                |          | ○      |          | ○      |          | ○      |        | 79   |
|          | ATS                 | Automatic Transfer Switch Controller |          | ○      |          | ○      |          | ○      |        | 81   |
|          | DC                  | Dust Cover                           |          | ○      |          | ○      |          | ○      |        | 83   |
|          | DF                  | Door Frame                           |          | ○      |          | ○      |          | ○      |        | 87   |
|          | OT                  | OCR Tester                           |          | ○      |          | ○      |          | ○      |        | 82   |
|          | J                   | Manual Connector                     |          | ○      |          | ○      | ●        |        | *      |      |
| A        | Automatic Connector | ●                                    |          | ●      |          |        | ○        | *      |        |      |

Note) 1. Reduplicate of AL is not available  
 2. Reduplicate of Key lock is not available  
 3. Reduplicate of Double shunt coil is not available. It can not be used simultaneously with UVT.  
 4. RCS and CS2 cannot be used simultaneously  
 5. TM and auxiliary contacts TX, TC, CC, JC cannot be used simultaneously.  
 \* Separate purchasing is not allowed. Each item should be purchased with the main body.

## Front connection terminal types

| Connection type           | Code        | Description                                     | Breaker  |
|---------------------------|-------------|---|----------|
| Front connection/Standard | 62363461507 | SUB ASS'Y, ADAPTER KIT ASS'Y_FRONT, AN/AS/AH-D3 | D3-Frame |
| Front connection/Standard | 62363462510 | SUB ASS'Y, ADAPTER KIT ASS'Y_FRONT, AN/AS/AH-D4 | D4-Frame |
| Front connection/Standard | 62363463507 | SUB ASS'Y, ADAPTER KIT ASS'Y_FRONT, AN/AS/AH-E3 | E3-Frame |
| Front connection/Standard | 62363464512 | SUB ASS'Y, ADAPTER KIT ASS'Y_FRONT, AN/AS/AH-E4 | E4-Frame |
| Front connection/Mixed    | 62363461508 | SUB ASS'Y, ADAPTER KIT ASS'Y_F&V/H, AN/AS/AH-D3 | D3-Frame |
| Front connection/Mixed    | 62363462511 | SUB ASS'Y, ADAPTER KIT ASS'Y_F&V/H, AN/AS/AH-D4 | D4-Frame |
| Front connection/Mixed    | 62363463506 | SUB ASS'Y, ADAPTER KIT ASS'Y_F&V/H, AN/AS/AH-E3 | E3-Frame |
| Front connection/Mixed    | 62363464511 | SUB ASS'Y, ADAPTER KIT ASS'Y_F&V/H, AN/AS/AH-E4 | E4-Frame |



| Mounting   | Accessories        |                                 | AH       |        | AS       |        | AN       |        | Remark | Page |
|------------|--------------------|---------------------------------|----------|--------|----------|--------|----------|--------|--------|------|
|            |                    |                                 | Standard | Option | Standard | Option | Standard | Option |        |      |
| Trip relay | N                  | N type                          |          | ○      |          | ○      |          | ○      | *      | 44   |
|            | A                  | A type                          |          | ○      |          | ○      |          |        | *      | 46   |
|            | P                  | P type                          |          | ○      |          | ○      |          | ○      | *      | 48   |
|            | S                  | S type                          |          | ○      |          | ○      |          | ○      | *      | 50   |
|            | VM                 | Voltage Module                  |          | ○      |          | ○      |          | ○      | **     | 54   |
|            | ZCT                | ZCT for the earth leakage       |          | ○      |          | ○      |          | ○      |        |      |
| Cradle     | SBC                | Shorting "b" Contact            |          | ○      |          | ○      |          | ○      |        | 89   |
|            | ST                 | Safety Shutter                  |          | ○      |          | ○      |          | ○      | *      | 86   |
|            | STL                | Safety Shutter Lock             |          | ○      |          | ○      |          | ○      |        | 86   |
|            | MIP                | Miss Insertion Prevent Device   |          | ○      |          | ○      |          | ○      |        | 92   |
|            | MOC                | Mechanical Operated Cell Switch |          | ○      |          | ○      |          | ○      |        | 84   |
|            | CEL                | Cell Switch                     |          | ○      |          | ○      |          | ○      |        | 88   |
|            | DI                 | Door Interlock                  |          | ○      |          | ○      |          | ○      |        | 85   |
|            | ZAS                | Zero Arc Space                  | ●        |        |          | ○      |          | ○      | *      | 89   |
|            | SC                 | Safety Control Cover            | ●        |        | ●        |        | ●        |        | ***    | 90   |
|            | BSP                | Body Supporter                  |          | ○      |          | ○      |          | ○      | *      | 90   |
|            | RI                 | Racking Interlock               |          | ○      |          | ○      |          | ○      |        | 91   |
|            | PL                 | Pad Lock/ Position Lock         | ●        |        | ●        |        | ●        |        | *      | 91   |
|            | IB                 | Interphase Barrier              | ●        |        |          | ○      |          | ○      | *      | 87   |
|            | UDC                | UVT Time Delay Controller       |          | ○      |          | ○      |          | ○      |        | 93   |
| ADP        | Compatible Adapter |                                 | ○        |        | ○        |        | ○        |        |        |      |
| Other      | RPH                | Reverse Phase ACB               |          | ○      |          | ○      |          | ○      |        |      |
|            | DUM                | Dummy ACB                       |          | ○      |          | ○      |          | ○      |        |      |
|            | VAD                | Various Connection Type         |          | ○      |          | ○      |          | ○      |        |      |
|            | RCO                | Remote I/O                      |          | ○      |          | ○      |          | ○      |        | 95   |
|            | PC                 | Profibus-DP comm. module        |          | ○      |          | ○      |          | ○      |        | 65   |

Note) 1. MI cannot be used simultaneously with DI or MOC  
 2. MI, DI and MOC cannot be used simultaneously with SBC.  
 3. CEL for right side attachment type is not available when using MI, DI and MOC.  
 \* Separate purchasing is not allowed. Each item should be purchased with the main body.  
 \*\* Voltage module should be purchased with P/S type trip relay.  
 \*\*\* It is available only when the control block is in the mode of auto-connection.

Option



55223460402  
 HANDLE ASS'Y, DRAW,  
 LONG

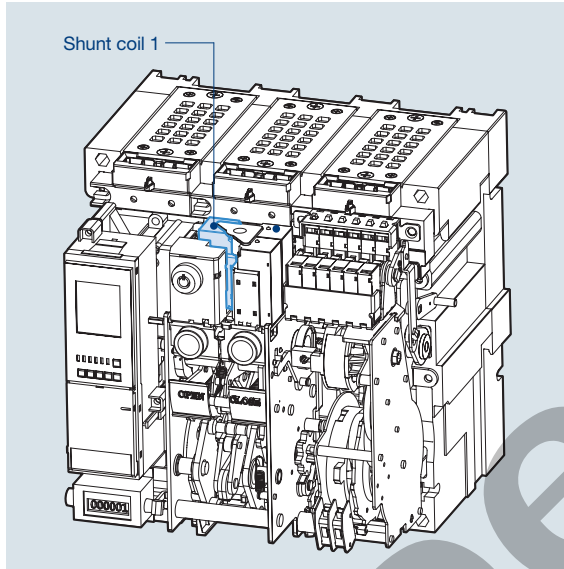


55223460404  
 HANDLE ASS'Y, DRAW,  
 LONG, AL-D, E, F, G, H, YX

# Accessories

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## Shunt Coil [SHT1]

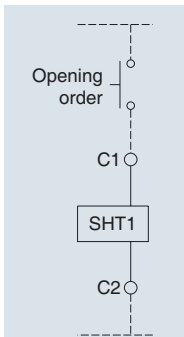


- SHT1 is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 200ms to coil terminals(C1, C2).
- When UVT coil is installed, its location is changed.

### 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            | Less than 40ms under |
| 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).



\* The dotted line to be made by the customer

Wiring Diagram

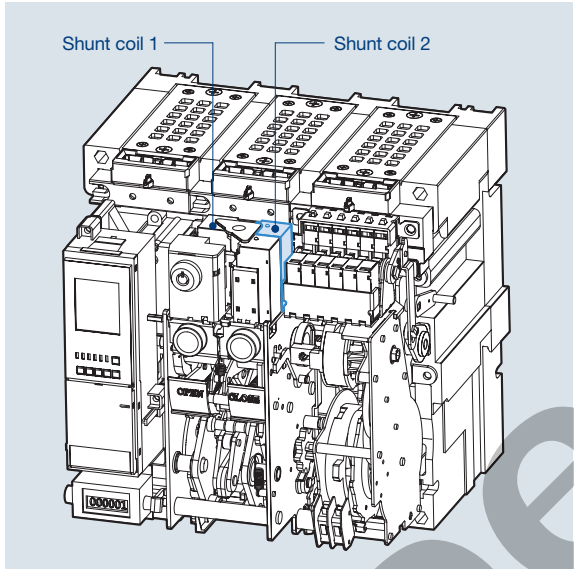
### 2. Specification of the wire

- 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<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) | #14 AWG<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) |
| Operating voltage | 100% | 95.7m                             | 61m                               | 457.8m                            | 287.7m                            |
|                   | 85%  | 62.5m                             | 38.4m                             | 291.7m                            | 183.2m                            |

## Double Shunt Coil [SHT2]

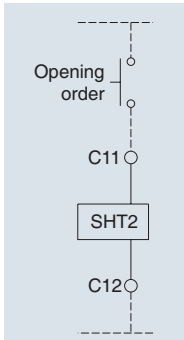


- SHT2 is a control device which trips a circuit breaker doubly from the outside. When SHT1 doesn't operate normally, it can trip a circuit breaker safely.
- Shunt coil 1: Install it at existing location.
- Shunt coil 2: Install it on the right side of the Shunt coil 1
- It is not available with UVT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

### 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            | Less than 40ms |
| 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).



\* The dotted line to be made by the customer

Wiring Diagram

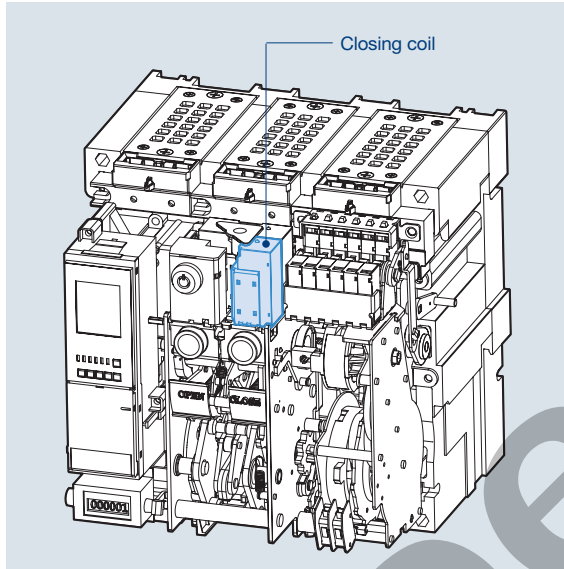
### 2. Specification of the wire

- 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<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) | #14 AWG<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) |
| Operating voltage | 100% | 95.7m                             | 61m                               | 457.8m                            | 287.7m                            |
|                   | 85%  | 62.5m                             | 38.4m                             | 291.7m                            | 183.2m                            |

## Closing Coil [CC]

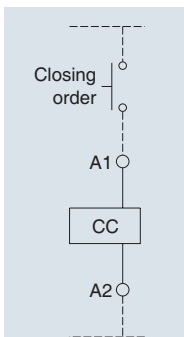


- It is a control device which closes a circuit breaker, when the voltage is applied continuously or instantaneously over 200ms to the coil terminals (A1, A2).

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

| Rated voltage (Vn) |         | Operating voltage range (V) | Power consumption (VA or W) |              | Shunt time (ms)           |
|--------------------|---------|-----------------------------|-----------------------------|--------------|---------------------------|
| DC (V)             | AC (V)  |                             | Inrush                      | Steady-state |                           |
| 24~30              | -       | 0.85~1.1 Vn                 | 200                         | 5            | Less than 80ms/90ms under |
| 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 standard for each rated voltage (Vn).



\* The dotted line to be made by the customer

Wiring Diagram

### 2. Specification of the wire

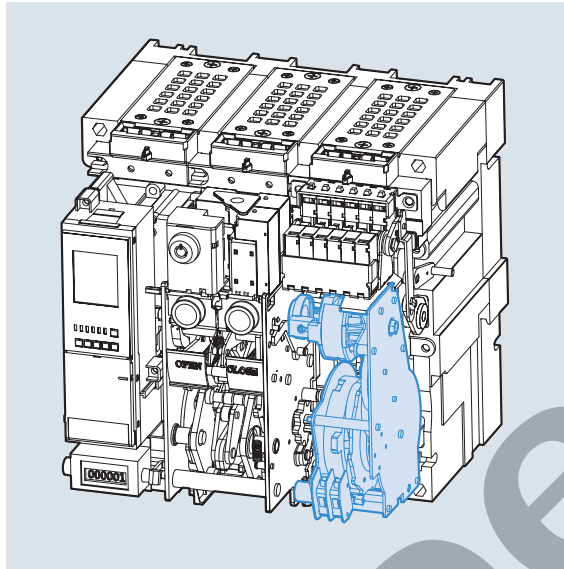
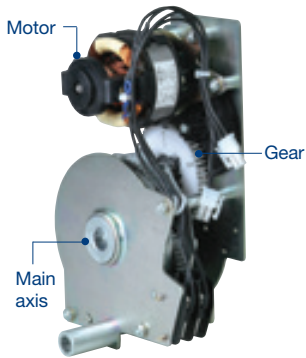
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

|                   |      | Rated voltage (Vn)                |                                   |                                   |                                   |
|-------------------|------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
|                   |      | DC 24~30V                         |                                   | DC / AC 48V                       |                                   |
| Wire type         |      | #14 AWG<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) | #14 AWG<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) |
| 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 5sec.                   |              |                |                |         |             |
| Dielectric strength     | 2kV/min                           |              |                |                |         |             |
| Using temperature range | -20° ~ 60°                        |              |                |                |         |             |
| Using humidity range    | Max. RH 80% (No dew condensation) |              |                |                |         |             |
| Charge switch           | 10A at 250VAC                     |              |                |                |         |             |

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| Type      | AH-D   | AH-E   | AH-G   | AN, AS-D | AN, AS-E | AS-F   | AS-G   |
|-----------|--------|--------|--------|----------|----------|--------|--------|
| Endurance | 20,000 | 15,000 | 10,000 | 20,000   | 15,000   | 10,000 | 10,000 |

\* Unit: Cycle (Frequency 2 cycles/ min)

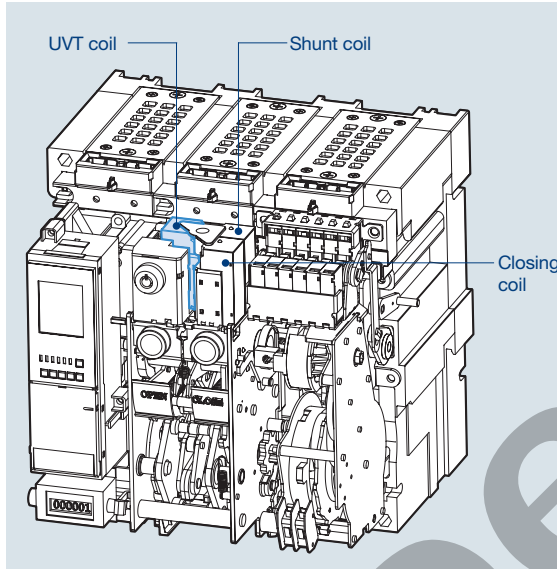
## Charge Switch [CS1]

## Charge Switch Communication [CS2]

# Accessories

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## 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            | Less than 50ms |
| 48~60              | 48      |                             |            |                             |              |                |
| 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. Specification of the wire

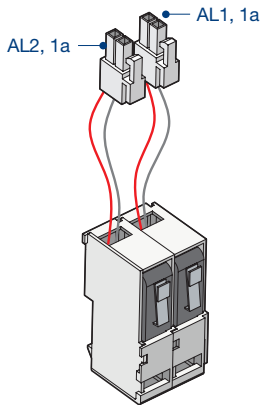
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC/AC 48~60V of rated voltage.

The maximum wire length

|                   |      | Rated voltage (Vn)                |                                   |                                   |                                   |
|-------------------|------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
|                   |      | DC 24~30V                         |                                   | DC / AC 48V                       |                                   |
| Wire type         |      | #14 AWG<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) | #14 AWG<br>(2.08mm <sup>2</sup> ) | #16 AWG<br>(1.31mm <sup>2</sup> ) |
| Operating voltage | 100% | 48.5m                             | 30.5m                             | 233.2m                            | 143.9m                            |
|                   | 85%  | 13.4m                             | 8.8m                              | 62.5m                             | 39.3m                             |

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.
- To re-close a circuit breaker after a trip, press MRB to reset it for closing.
- 2pcs of electrical trip switch (AL1, AL2, 1a) are provided (Option)
- Trip alarm contact and MRB(Manual reset bottom) need to be purchased together.

### 1. Electrical characteristics of trip alarm contact

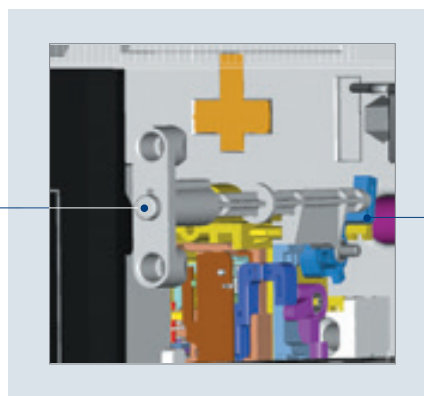
| Rated voltage (V) | Non-inductive load (A) |           | Inductive load (A) |            | Inrush current |
|-------------------|------------------------|-----------|--------------------|------------|----------------|
|                   | Resistive load         | lamp load | Inductive load (A) | Motor 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]



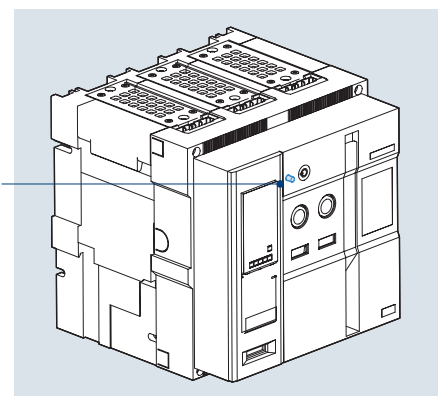
- It is a function which resets a circuit breaker manually when a circuit breaker is tripped by OCR.
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted 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.

Manual Reset Button



Manual Reset Button

MRB reset lever



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

# Accessories

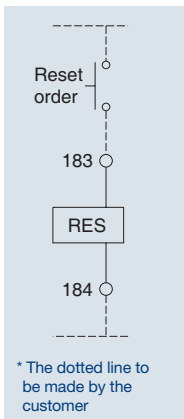
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## Remote Reset Switch [RES]

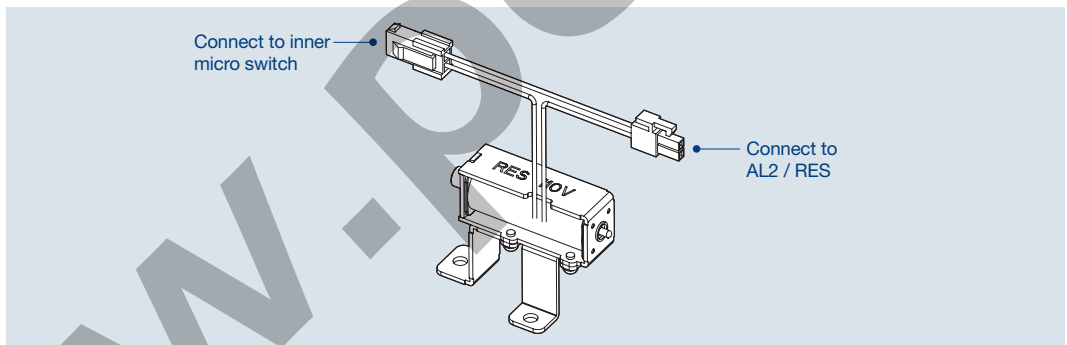
- Following tripping, this function resets the "fault trip" alarm contacts (AL) and the mechanical indicator (MRB) and enables circuit breaker closing.  
Push button switch: AC 125V 10A, AC 250V 6A, DC 110V 2.2A, DC 220V 1.1A Resistive load
- In case of auto reset type circuit breaker  
Following tripping, 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.

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

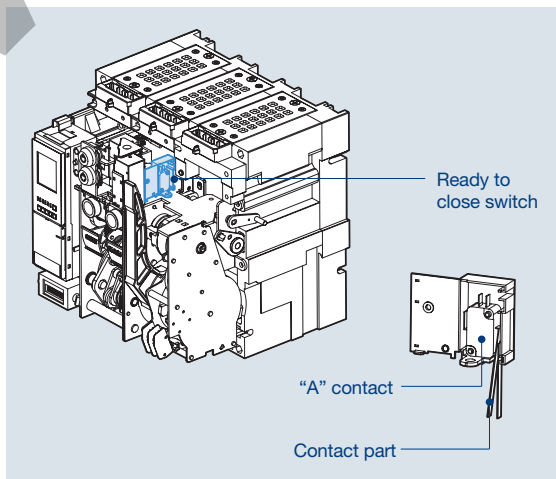
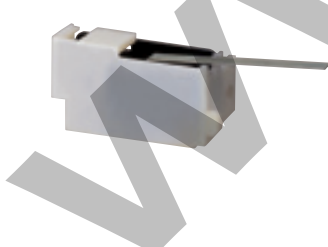
| Rated voltage  | Operating current (Max.) |      | Operating time                  | Wire spec. |
|----------------|--------------------------|------|---------------------------------|------------|
| AC 110~130V    | AC                       | 6A   |                                 |            |
| DC 110~125V    | DC                       | 5A   |                                 |            |
| AC/DC 200~250V | AC                       | 3A   |                                 |            |
|                | DC                       | 2.5A | #16 AWG (1.31 mm <sup>2</sup> ) |            |



Wiring Diagram



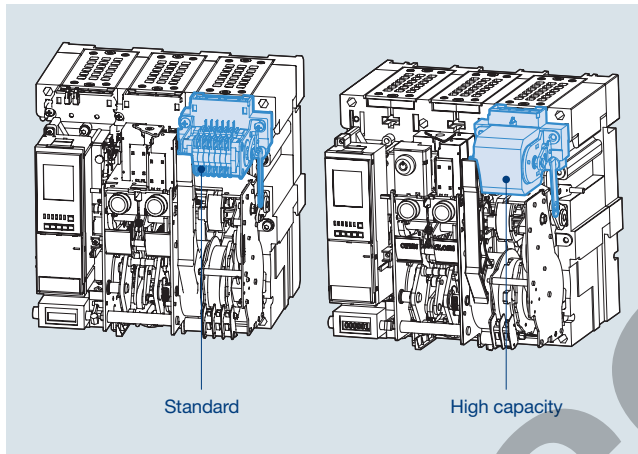
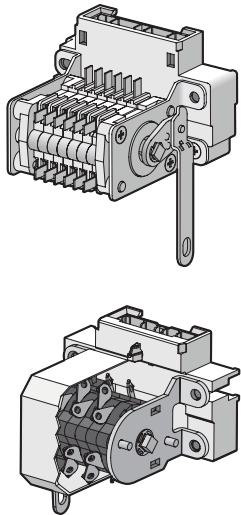
## Ready to Close Switch [RCS]



- 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 | 250/125 Vac | 10 A   |
|                    | 250 Vdc     | 0.3 A  |
|                    | 125 Vdc     | 0.6 A  |
|                    | 48 Vdc      | 3 A    |
|                    | 24 Vdc      | 5 A    |

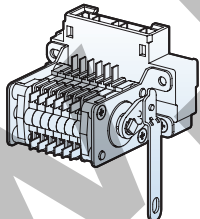
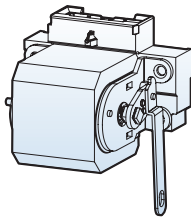
## Auxiliary switch [AX]



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

| AUX. contact & charging types |                               |
|-------------------------------|-------------------------------|
| AX                            | Standard OFF charge 3a3b      |
| AC                            | Standard ON charge 3a3b       |
| BX                            | Standard OFF charge 5a5b      |
| BC                            | Standard ON charge 5a5b       |
| HX                            | High capacity OFF charge 5a5b |
| HC                            | High capacity ON charge 5a5b  |
| CC                            | Standard ON charge 6a6b       |
| JC                            | High capacity ON Charge 6a6b  |
| GX                            | High capacity OFF charge 3a3b |
| GC                            | High capacity ON charge 3a3b  |

### Standard classification

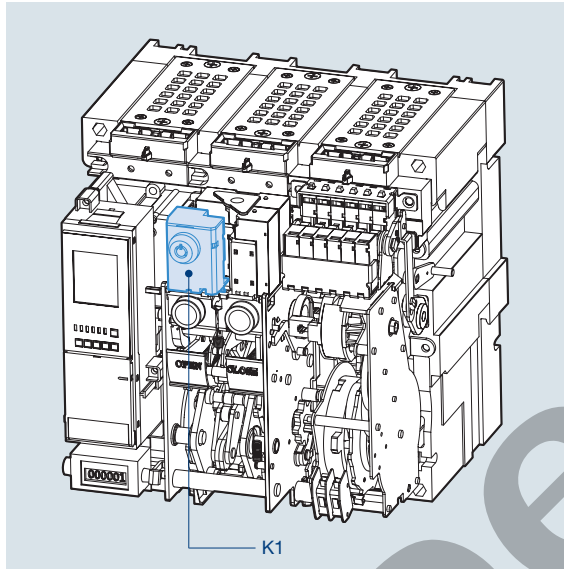
| Standard  |              | High capacity   |              |
|---|--------------|---|--------------|
| 2000, 5000AF  | 4000, 6300AF | 2000, 5000AF  | 4000, 6300AF |
|  |              |  |              |

| Classification                  |    |      | Standard       |                | High capacity  |                | Remark                             |
|---------------------------------|----|------|----------------|----------------|----------------|----------------|------------------------------------|
|                                 |    |      | Resistive load | Inductive load | Resistive load | Inductive load |                                    |
| Minimum current                 |    |      | DC24V, 5mA     |                | DC5V, 1mA      |                |                                    |
| Contact capacity                | AC | 490V | 5A             | 2A             | 5A             | 2.5A           |                                    |
|                                 |    | 250V | 10A            | 6A             | 10A            | 10A            |                                    |
|                                 |    | 125V | 10A            | 6A             | 10A            | 10A            |                                    |
|                                 | DC | 250V | 0.3A           | 0.3A           | 3A             | 1.5A           |                                    |
|                                 |    | 125V | 0.6A           | 0.6A           | 10A            | 6A             |                                    |
|                                 |    | 30V  | 10A            | 6A             | 10A            | 10A            |                                    |
| No. of Contact that can be used | AX | 3a3b | -              | -              | -              | -              | Standard charging type             |
|                                 | BX | 5a5b | -              | -              | -              | -              |                                    |
|                                 | HX | -    | -              | -              | 5a5b           | -              |                                    |
|                                 | GX | -    | -              | -              | 3a3b           | -              |                                    |
|                                 | AC | 3a3b | -              | -              | -              | -              | Rapid auto-reclosing charging type |
|                                 | BC | 5a5b | -              | -              | -              | -              |                                    |
|                                 | CC | 6a6b | -              | -              | -              | -              |                                    |
|                                 | HC | -    | -              | -              | 5a5b           | -              |                                    |
|                                 | JC | -    | -              | -              | 6a6b           | -              |                                    |
| GC                              | -  | -    | -              | 3a3b           | -              |                |                                    |

# Accessories

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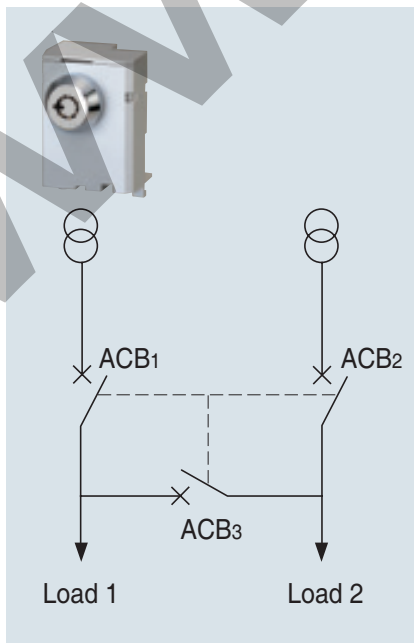
## Key Lock [K1]



- 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



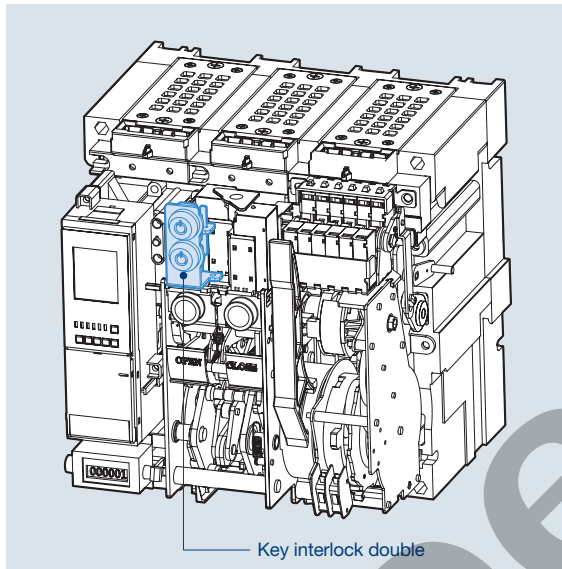
- 3 circuit breakers can be arranged for the continuous power supply to the load side and be interlocked mutually by using Key Lock embedded in each circuit breaker.

\* How to order: 3 breakers must be ordered as a set, and K2 description must be added to the additional breakers. (2 keys are provided per 3 breakers.)

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

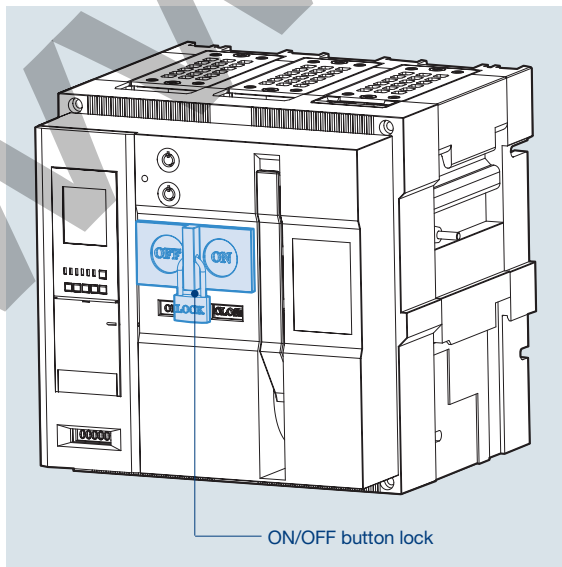
○ : Release ● : Lock

## Double Key Lock [K3]



- When only two keys are released at the same time, circuit breakers operate. Handling method is same as K1.

## ON/OFF Button Lock [B]



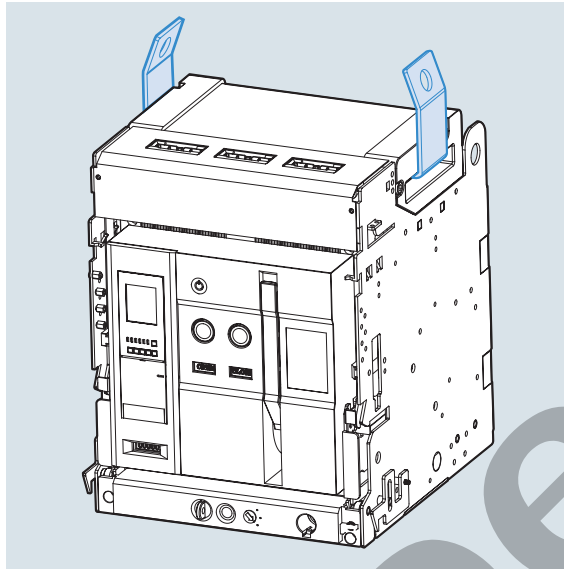
- It is to prevent manual operation of ACB's closing/tripping button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.

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

# Accessories

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## Lifting Hook [LH]



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

## Condenser Trip Device [CTD]



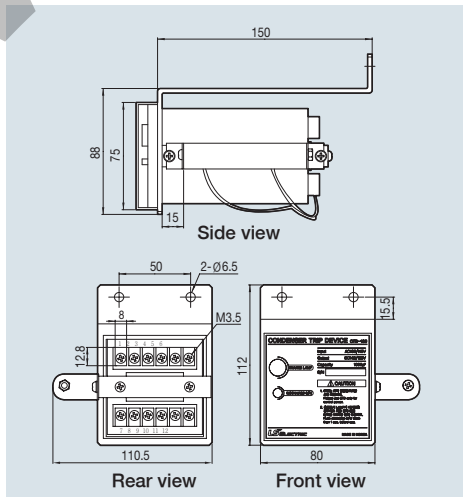
- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, it can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.

### Ratings

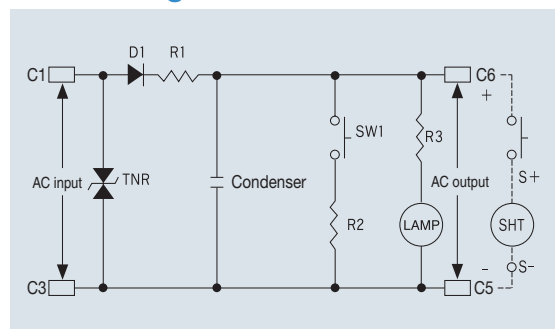
| Ratings                    | Specification |             |
|----------------------------|---------------|-------------|
| Model                      | CTD-100       | CTD-200     |
| Rated input voltage (V)    | AC 100/110    | AC 200/220  |
| Frequency (Hz)             | 50/60         | 50/60       |
| 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        | 85~111      |
| Condenser capacity         | 1000 $\mu$ F  | 560 $\mu$ F |

### External dimension

Unit (mm)



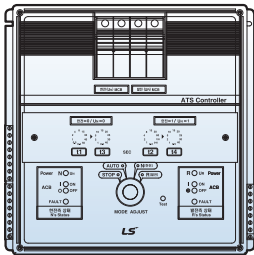
### Circuit diagram



----- User wiring



## Automatic Transfer Switch Controller [ATS]



### Ratings

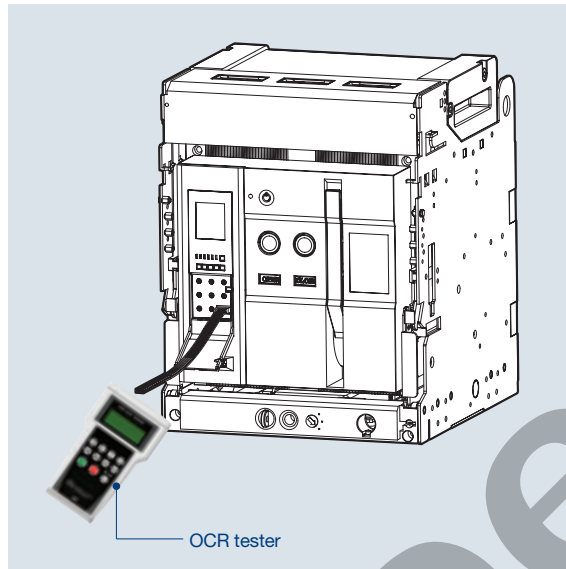
| Model type                                   | ATSC-110                     | ATSC-220                  |
|--|------------------------------|---------------------------|
| Rated voltage                                | AC 110V                      | AC 220V                   |
| Voltage range                                | AC 93.5 (±5%) ~ 126.5V (±5%) | AC 187 (±5%) ~ 253V (±5%) |
| Frequency                                    | 50Hz/60Hz                    |                           |
| Power consumption (apparent power)           | 15.4W                        |                           |
| 4-location switch (stop, N, R, Auto)         | ■                            | ■                         |
| Time setting (t1~t4)                         | ■                            | ■                         |
| Fault function (OCR/Circuit breaker trouble) | ■                            | ■                         |
| Output contact (Auto, Load burden)           | ■                            | ■                         |

- t1: The delayed time from when UN (power supply of electric company) is tripped to when generator start-up signal contact is closed. (t1: 0.2, 0.5, 1, 2, 4, 8, 15, 30, 40, 50secs)
- t2: The delayed time from when UN is closed to when ACB<sub>2</sub> is tripped. (t2: 0.2, 1, 2, 4, 8, 15, 30, 60, 120, 240secs)
- t3: The delayed time from when ACB<sub>1</sub> is tripped to when ACB<sub>2</sub> is closed. (t3: 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40secs)
- t4: The delayed time from when ACB<sub>2</sub> is tripped to when ACB<sub>1</sub> is closed. (t4: 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40secs)
- Stop-mode: This mode is for compulsory trip of ACB<sub>1</sub>(electric power company) or ACB<sub>2</sub> (power station) when UN (power supply of electric power company) or UR (power supply of power station) is available  
\*UN or UR should be kept in ON position
- N-mode: This mode is for compulsory closing of ACB<sub>1</sub> when UN is available.  
\* it does not matter to be ON or OFF position of UR and if converting to N-mode while using UR, generator start-up signal contact is opened.
- R-mode: This mode is for compulsory closing of ACB<sub>2</sub> during the use of UR regardless of that UN is available or not.
- Auto-mode: This mode is for transferring a circuit breaker automatically to available power supply of UN or UR. In short, it trips the circuit breaker where power supply is not available and it close the circuit breaker where power supply is available.

# Accessories

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## OCR Tester [OT]



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

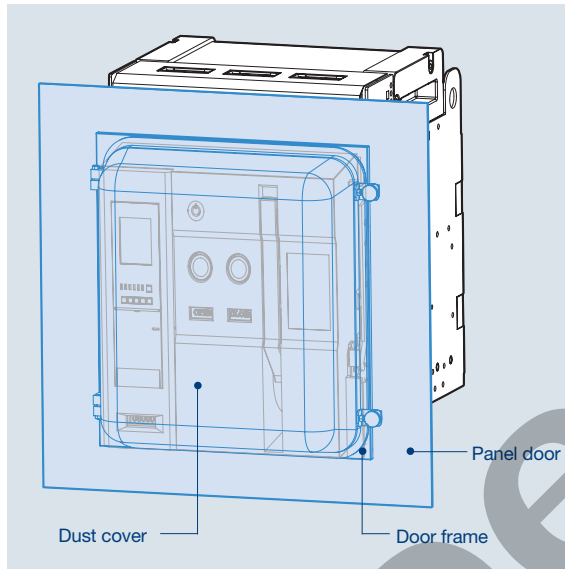
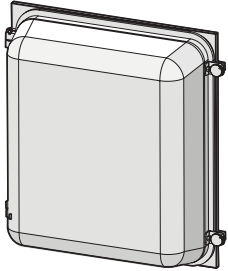
1. Maximum 17 times rated current can be inputted.
2. It is possible to enter the current value and phase on each of R/S/T/N
3. Frequency is adjustable.
4. It is available to test for long time delay / short time delay / instantaneous / ground fault.

### Configuration



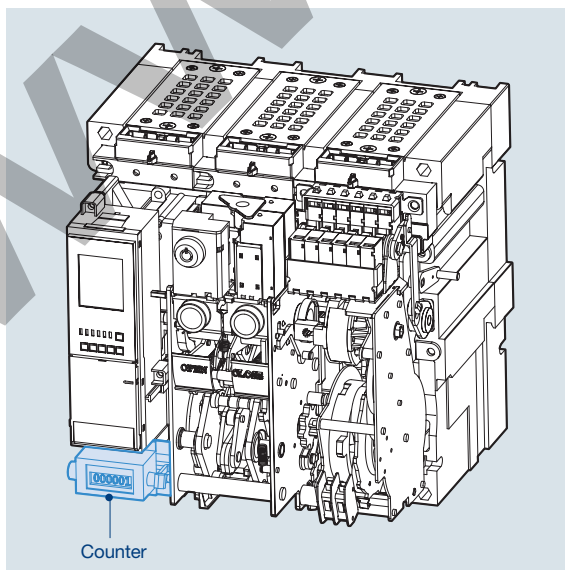
|                 |                                  |
|-----------------|----------------------------------|
| R S T N         | R, S, T, N phase signal input    |
| ⤴ ⤵             | Increase / Decrease signal input |
| ENT. ESC        | Signal setting / Delete          |
| START STOP      | Waveform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

## Dust Cover [DC]



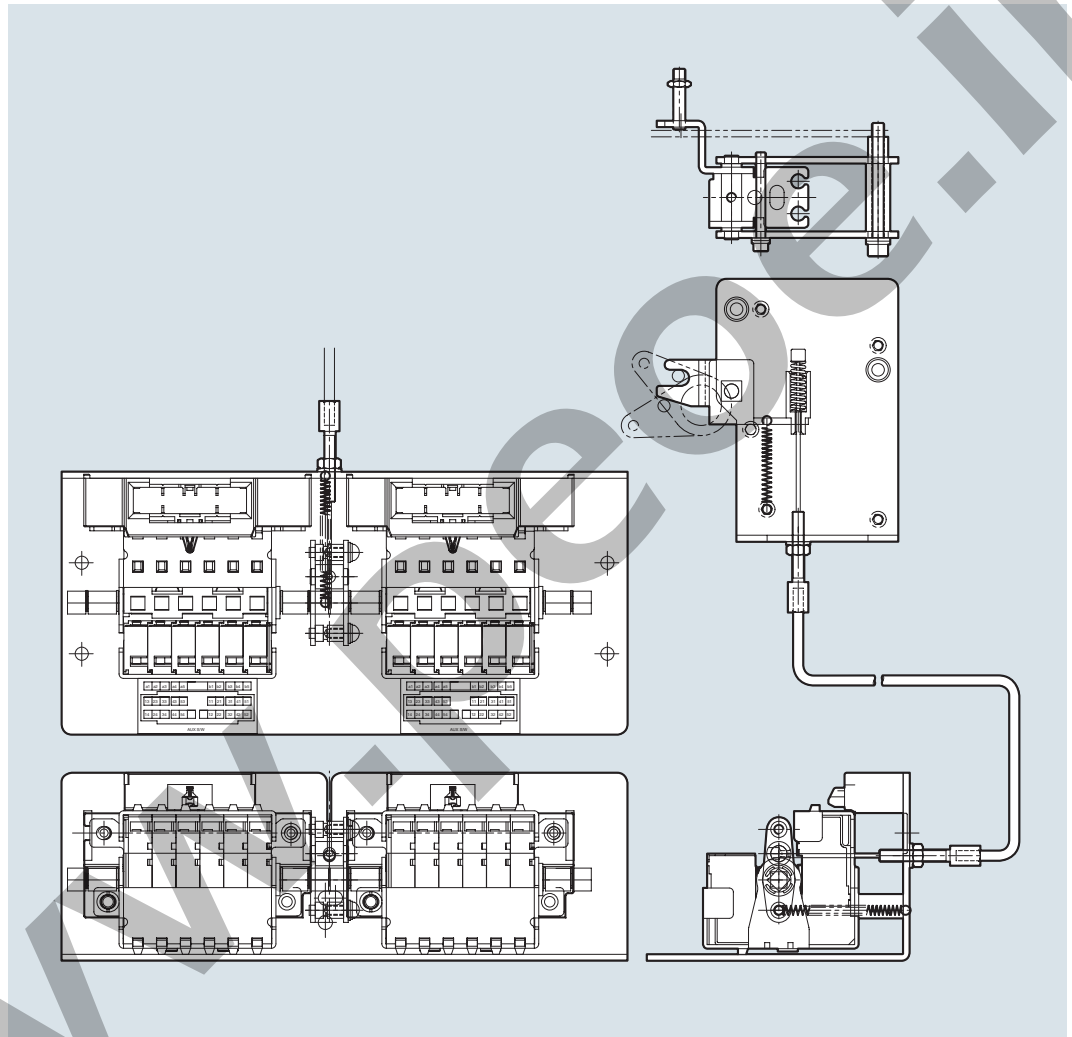
- Attach it to the door frame.
- It protects the product dust and moisture that may affect the operation of the instrument at the same time (IP54) which may cause fault operation and enhances the sealing degree by being mounted to protrude type of panel.
- It is transparent so that the front side of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

## Counter [C]



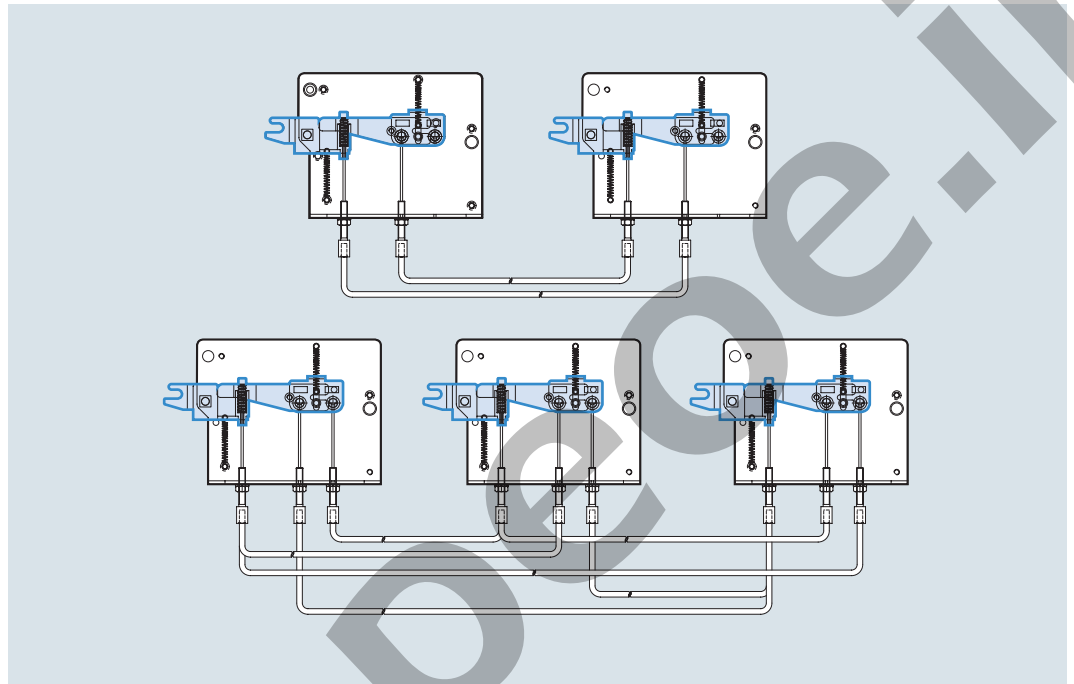
- It displays the total number of ON/OFF operation of ACB.

## Mechanical Operated Cell Switch [MOC]



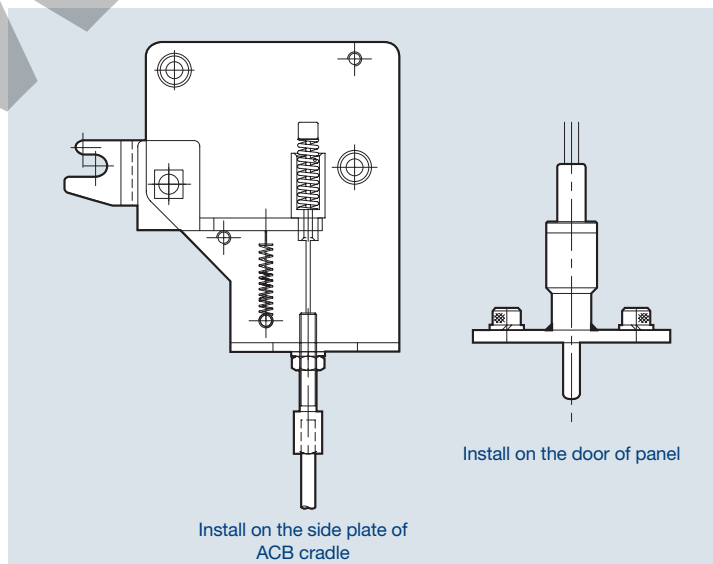
- It is the contact (10a10b) which displays the ON/OFF condition of ACB. It mechanically operates only when the breaker is "CONNECTED" position. A standard type and a high capacity type is available.
- The contact capacity is as same as the ratings of aux. contacts.
- When MOC link is installed to cradle, 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

## Door Interlock [DI]

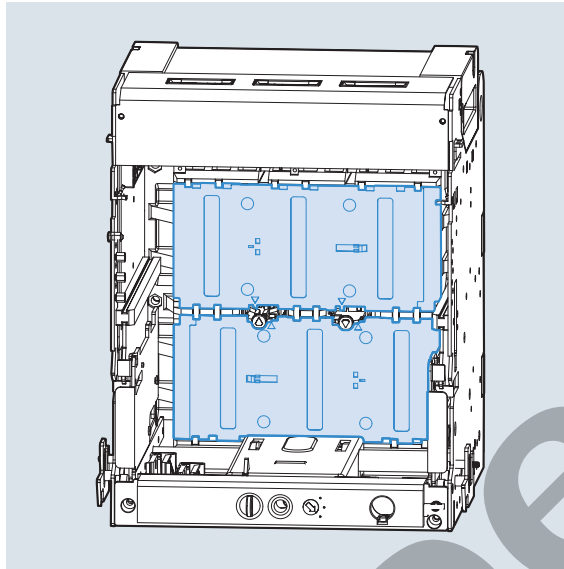


- It is a safety device which does not allow the panel door to open when a circuit breaker is in the "ON" position.





# Accessories

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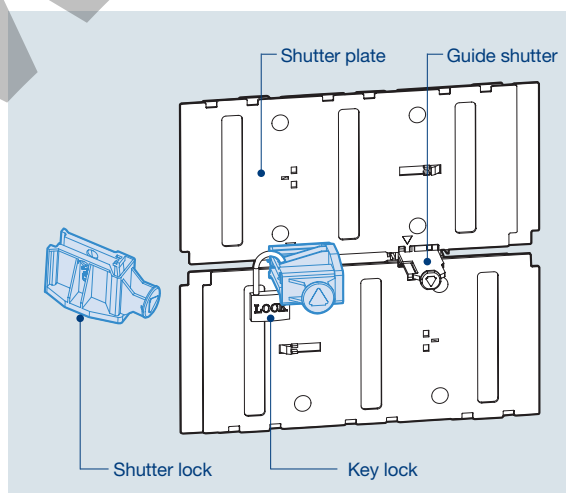
## Safety Shutter [ST]



- 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.
- There are 4 types of Safety Shutter and they are divided as shown in figure below.

| The types of safety shutter plate  |  |
|--|--|
| 2000/5000AF, 3P  | 4000/6300AF, 3P  |
|   |   |
| 2000/5000AF, 4P  | 4000/6300AF, 4P  |
|  |  |

## Safety Shutter Lock [STL]



- It is a locking device which prevents safety shutter from being opened when it is closed.
- If shutter lock is connected with guide shutter, the guide shutter can not be pushed structurally. Thus, it is not available to open the safety shutter.

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

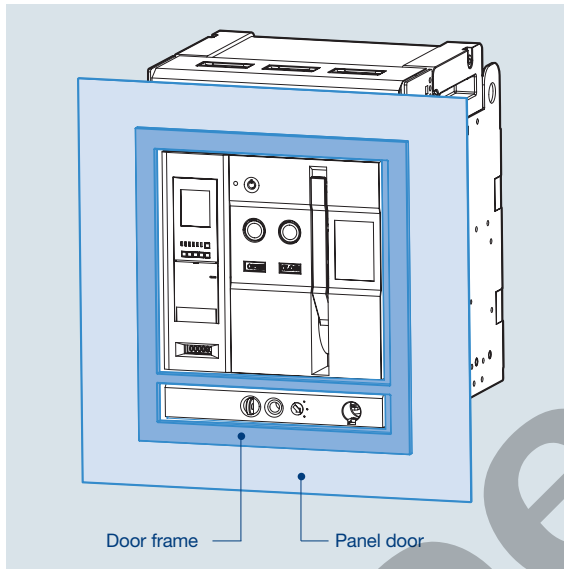
## Door Frame [DF]



Fixed type

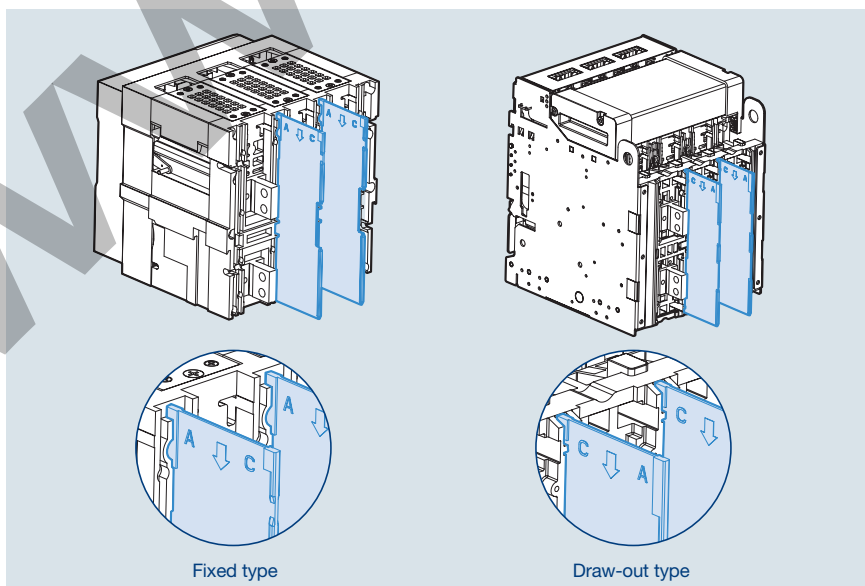


Draw-out type



- 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.

## Interphase Barrier [IB]

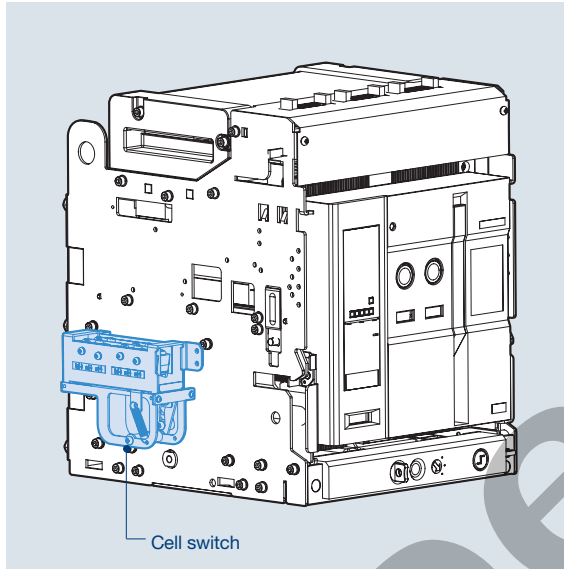
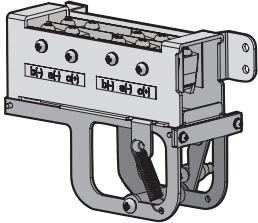


- Interphase barrier prevents the arc which may arise and result in short-circuit between phases in advance
- As “C” stands for “CRADLE”, install the Interphase barrier in the direction of “C” in case of Draw-out type.
- As “A” stands for “ACB main frame”, install the Interphase barrier in the direction of “A” in case of Fixed type.

# Accessories

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## Cell Switch [CEL]



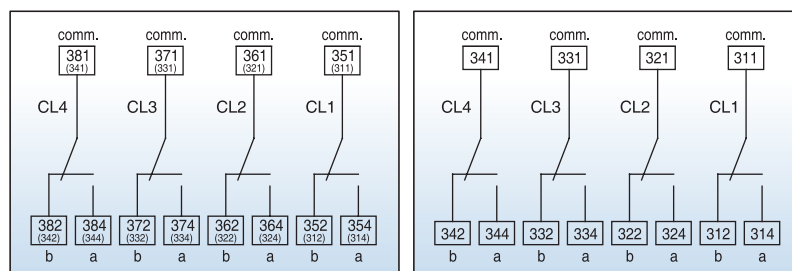
- It is a contact which indicates the present position of ACB. (CONNECTED, TEST, DISCONNECTED)

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

※ Contact configuration can be changeable if necessary.

| ACB position      |                        | DISCONNECTED   |      | CONNECTED |
|-------------------|------------------------|----------------|------|-----------|
|                   |                        | DISCONNECTED   | TEST | CONNECTED |
| Contact operation | CL-C<br>(Connected)    | OFF            | OFF  | ON        |
|                   | CL-T<br>(Test)         | OFF            | ON   | OFF       |
|                   | CL-D<br>(Disconnected) | ON             | OFF  | OFF       |
| Contact capacity  | Voltage(V)             | Resistive load | 460V | 2.5       |
|                   |                        |                | 250V | 10        |
|                   |                        | 125V           | 10   |           |
|                   | DC                     | 250V           | 3    | 1.5       |
|                   |                        | 125V           | 10   | 10        |
|                   |                        | 30V            | 10   | 10        |
| Contact number    |                        | 4C             |      |           |

### Terminal (4C, 8C)

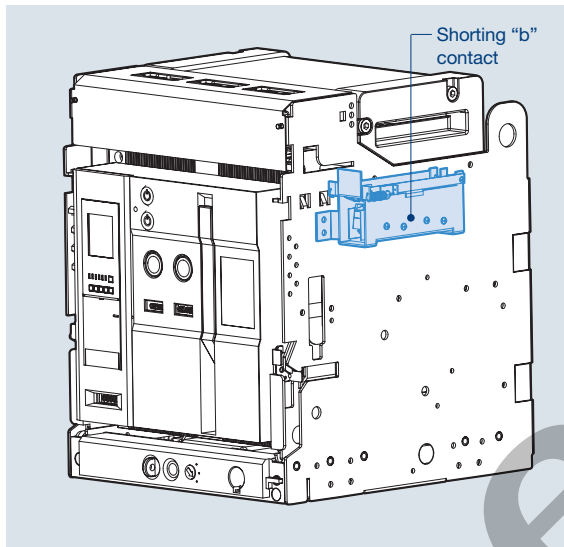
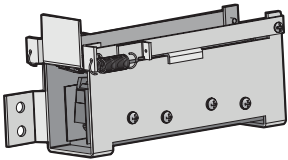


4C attached to the right side of cradle

4C attached to the left side of cradle



## Shorting “b” Contact [SBC]

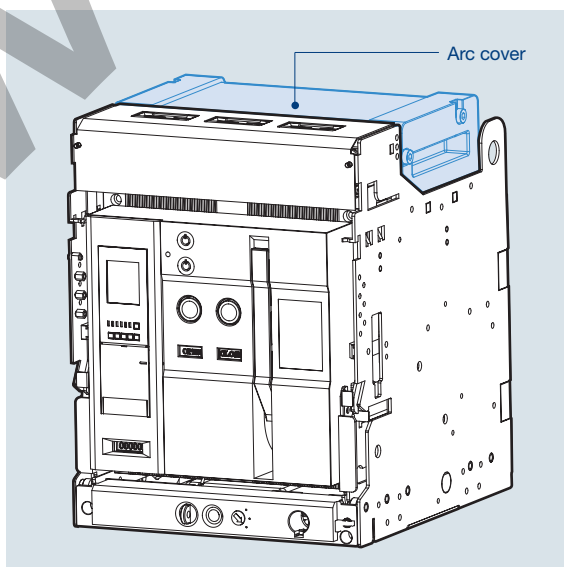
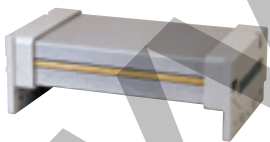


- It is the contact which keeps the external control circuit in normal by Aux. contact which disconnects “Axb” when ACB is moved from CONNECTED position to TEST position. The number of “shorting b-contact” corresponds to the number of “Axb” (4b)

### Contact condition (Link between Axb and shorting “b” contact)

| ACB position                                     | ACB condition | Close position<br>[Auxiliary contact(Axb):OFF] | Open position<br>[Auxiliary contact(Axb):ON] |
|--|---------------|--|--|
| Connected position<br>(Shorting b contact : OFF) |               | Axb  / SBC                                     | Axb  / SBC                                   |
| Test position<br>(Shorting b contact : ON)       |               | Axb  SBC                                       | Axb  SBC                                     |

## 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.

- It is categorized into 8 types by ratings and poles.

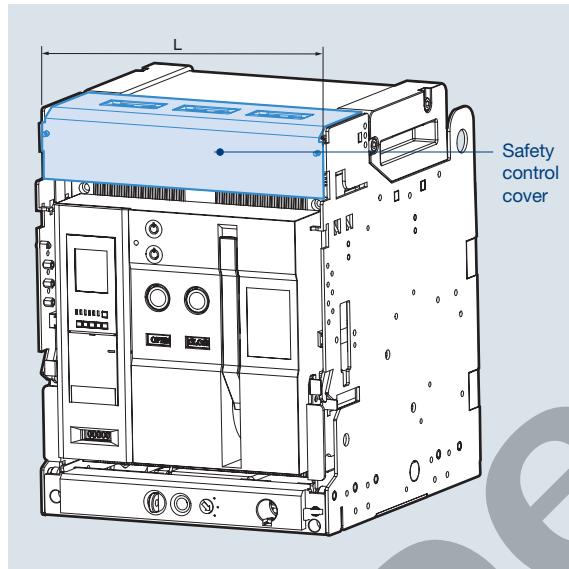
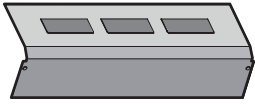
| Ampere frame | Cover length (mm) |
|--------------|-------------------|
| 2000AF 3P    | 281.4             |
| 2000AF 4P    | 366.4             |
| 4000AF 3P    | 359.4             |
| 4000AF 4P    | 474.4             |
| 5000AF 3P    | 576.4             |
| 5000AF 4P    | 746.4             |
| 6300AF 3P    | 732.4             |
| 6300AF 4P    | 962.4             |

\* Zero Arc Space is only applicable for withdrawable type.

# Accessories

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## Safety Control Cover [SC]

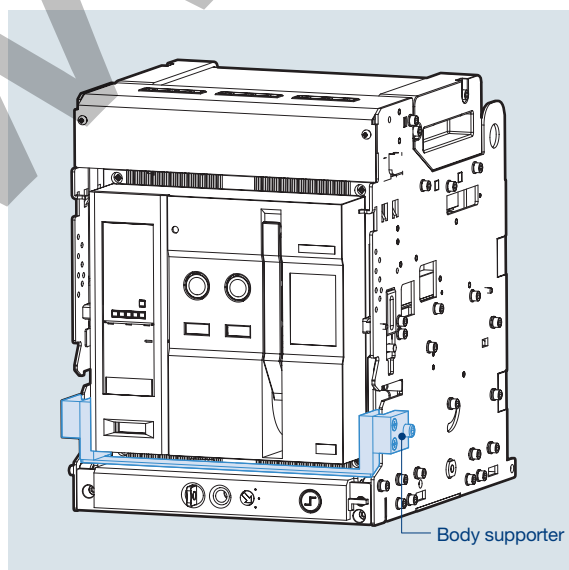


- It protects control terminals which are exposed to the outside, and prevents the damage resulting from foreign substances.
- It is categorized into 8 types by ratings and poles.

| Ampere frame | Cover length (mm) |
|--------------|-------------------|
| 2000AF 3P    | 334               |
| 2000AF 4P    | 419               |
| 4000AF 3P    | 412               |
| 4000AF 4P    | 527               |
| 5000AF 3P    | 629               |
| 5000AF 4P    | 799               |
| 6300AF 3P    | 785               |
| 6300AF 4P    | 1015              |

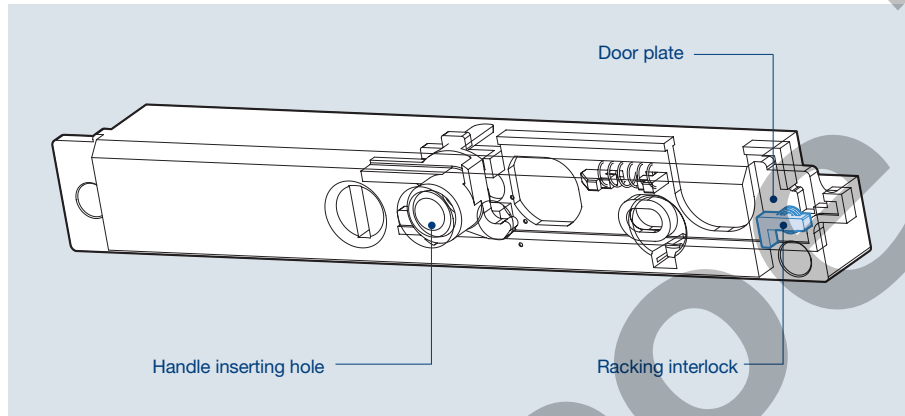
- It is available only when the control block is in the mode of auto-connection.

## Body Supporter [BSP]



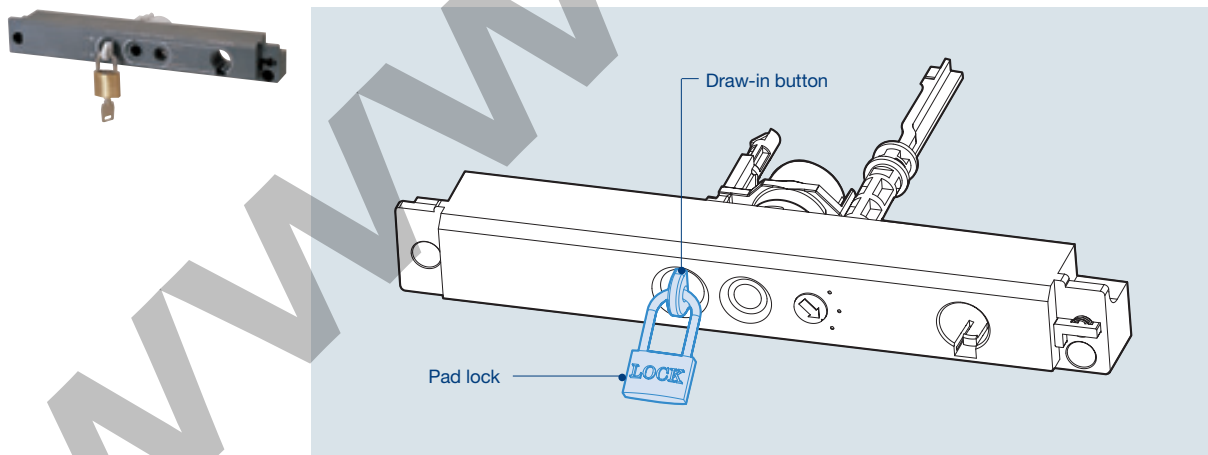
- It interlocks the main body of the circuit breaker and the cradle mechanically to fix the former in the connected position. Therefore, all draw-in/out operations are not available.

## 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]



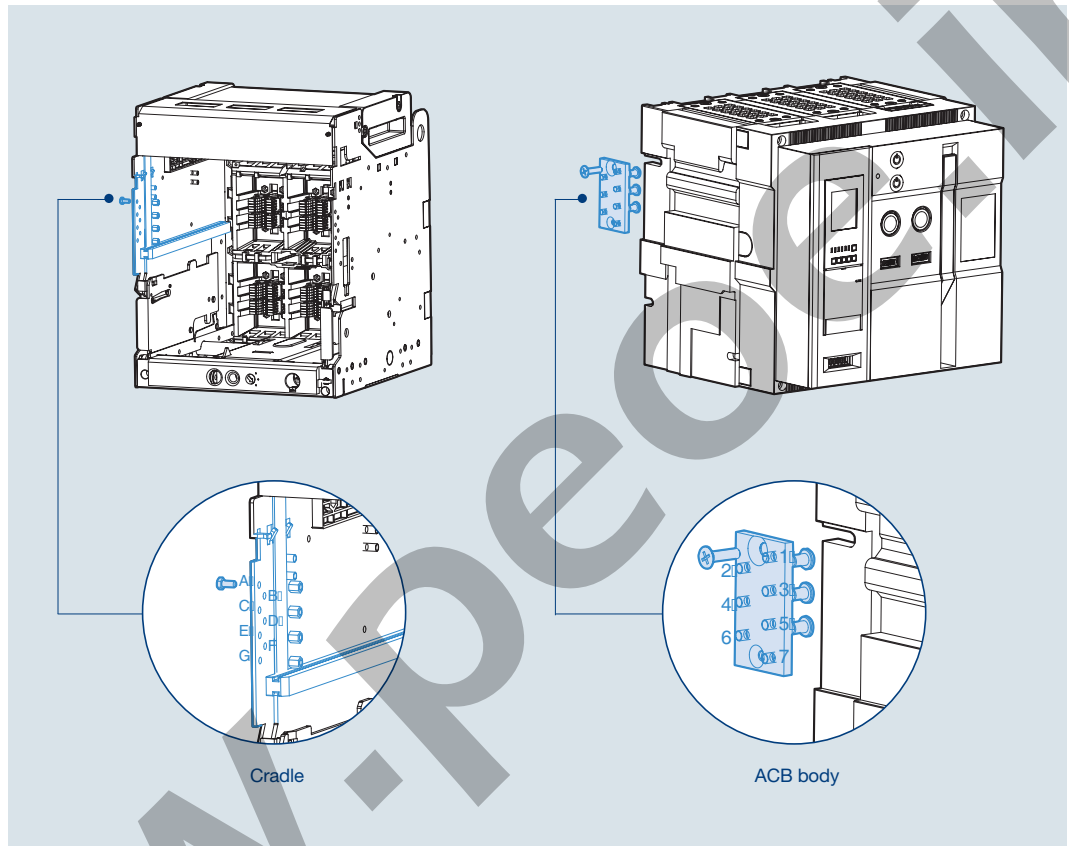
ACB is subject to restriction regarding moving in connected, test, disconnected when drawing in or out. If main body of ACB is placed in 3 positions, it is locked and stopped when drawing in or out.

- 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)

# Accessories

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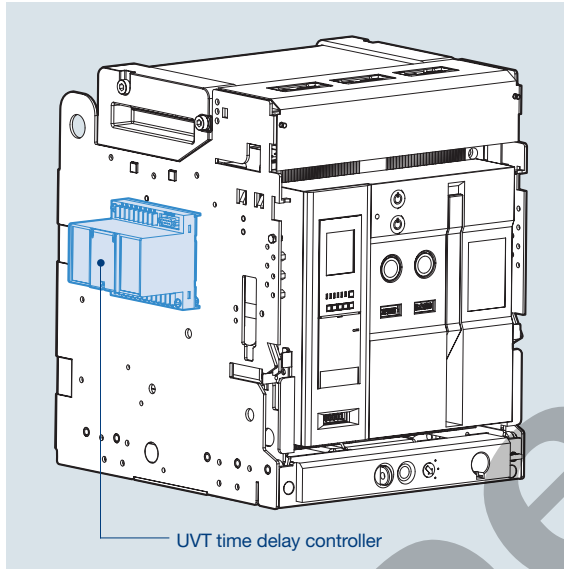
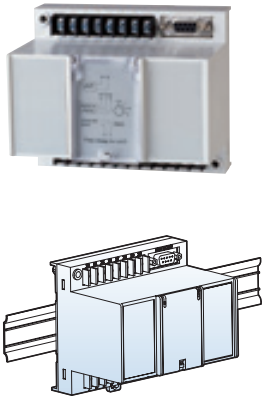
## Miss Insertion Prevent Device [MIP]



- 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.

| Cradle | ACB | Cradle | ACB | Cradle | ACB | Cradle | ACB |
|--------|-----|--------|-----|--------|-----|--------|-----|
| ABCD   | 567 | ADEF   | 237 | ABEG   | 346 | BCEG   | 146 |
| ABCE   | 467 | ADEG   | 236 | ABFG   | 345 | BDEF   | 137 |
| ABCF   | 457 | ADFG   | 235 | ACDE   | 267 | BDEG   | 136 |
| ABCG   | 456 | AEFG   | 234 | ACDF   | 257 | BDFG   | 135 |
| ABDE   | 367 | BCDE   | 167 | ACDG   | 256 | CDEF   | 127 |
| ABDF   | 357 | BCDF   | 157 | ACEF   | 247 | CDEG   | 126 |
| ABDG   | 356 | BCDG   | 156 | ACEG   | 246 | CEFG   | 124 |
| ABEF   | 347 | BCEF   | 147 | ACFG   | 245 | DEFG   | 123 |

## UVT Time Delay Controller [UDC]



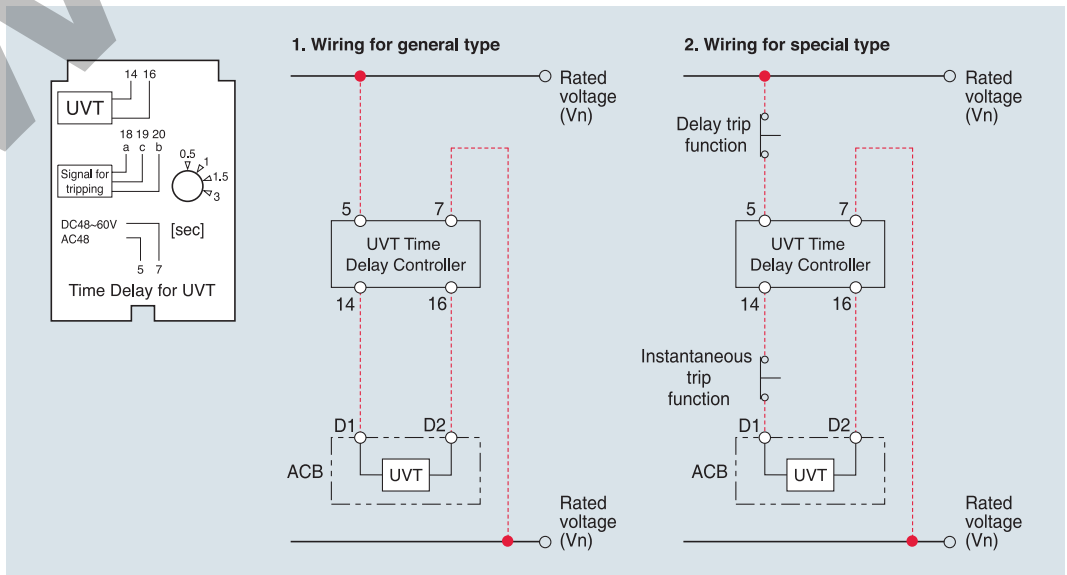
- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown. There are two types, Instantaneous type and time delay type.
- It can be installed on the rail or to the cradle.
- Instantaneous type: only available with UVT coil.
- 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 5Vn | 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



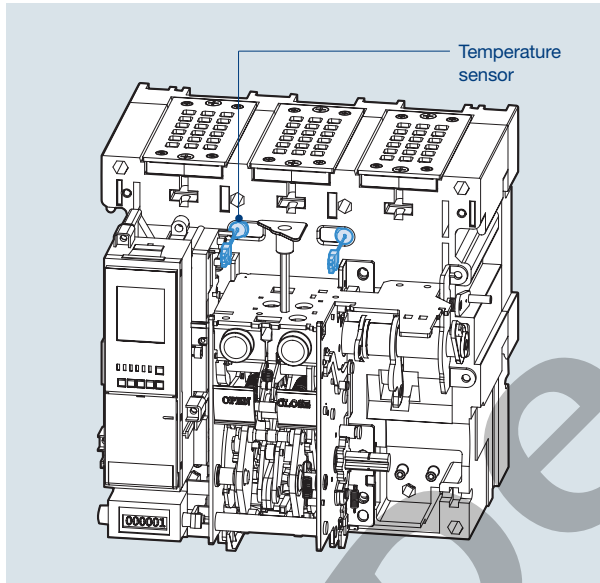
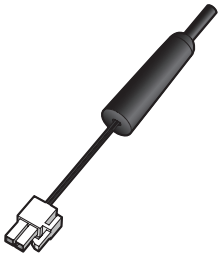
\* The wiring presented with red color should be set by users.

# Accessories

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## Temperature Remote I/O Unit [TRIO Unit]

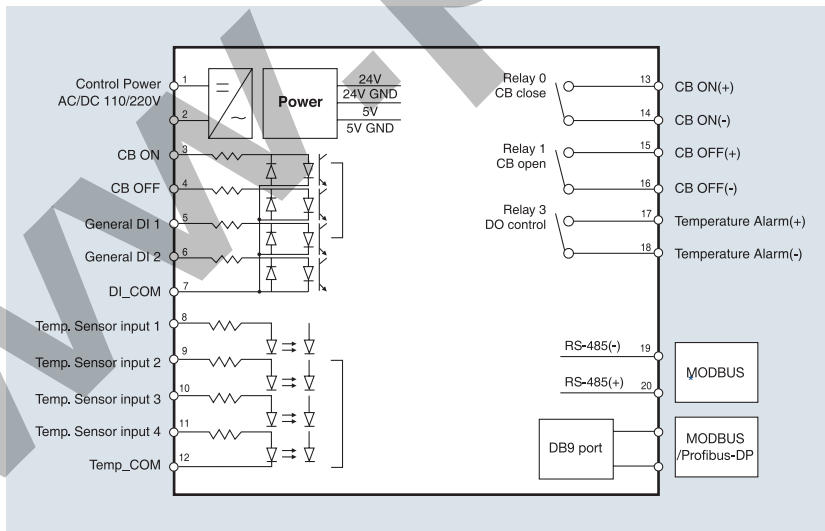
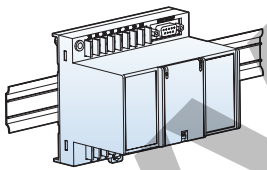
### Temperature monitoring function



- TRIO unit is a device to show the temperature through a sensor inside of ACB.
- The temperature sensor can be installed up to 2 and the output is connected to control terminal blocks.
- It displays the maximum temperature of them and transmits through a network.
- If the temperature is higher than a standard, an alarm can occur.
- TRIO unit communicates with Modbus / RS-485 basically, Profibus-DP need to be purchased separately.
- TRIO unit is installed on the cradle or the inside of panel.

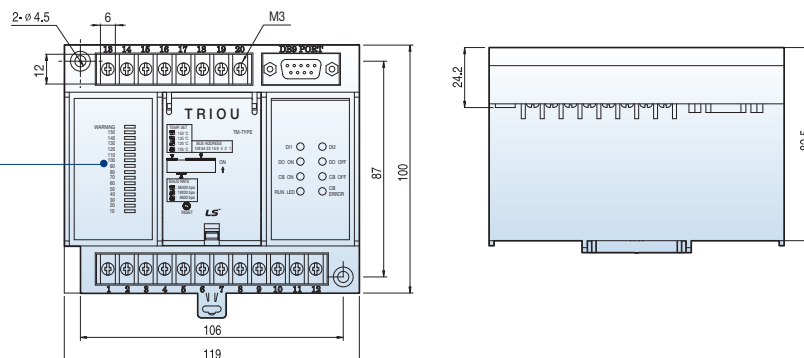


TRIO UNIT

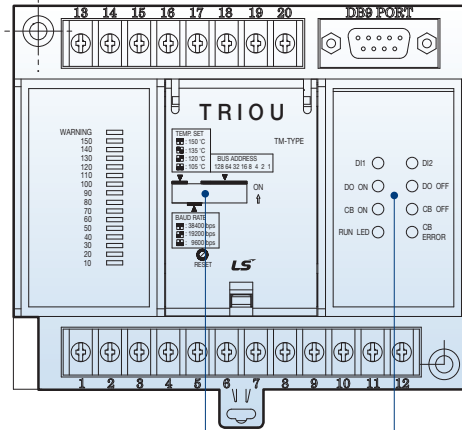


\* DB9 Port is connected only when a repeater is used.

Temperature LED(°C): 10 ~ 150°C,  
Warning  
(Indicates the maximum value)



### Remote control function (CB ON/OFF)



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

- TRIOU unit has the I/O contact which can trip or close the ACB from the remote site by communication.
- It supports SBO (Select Before Operation) function

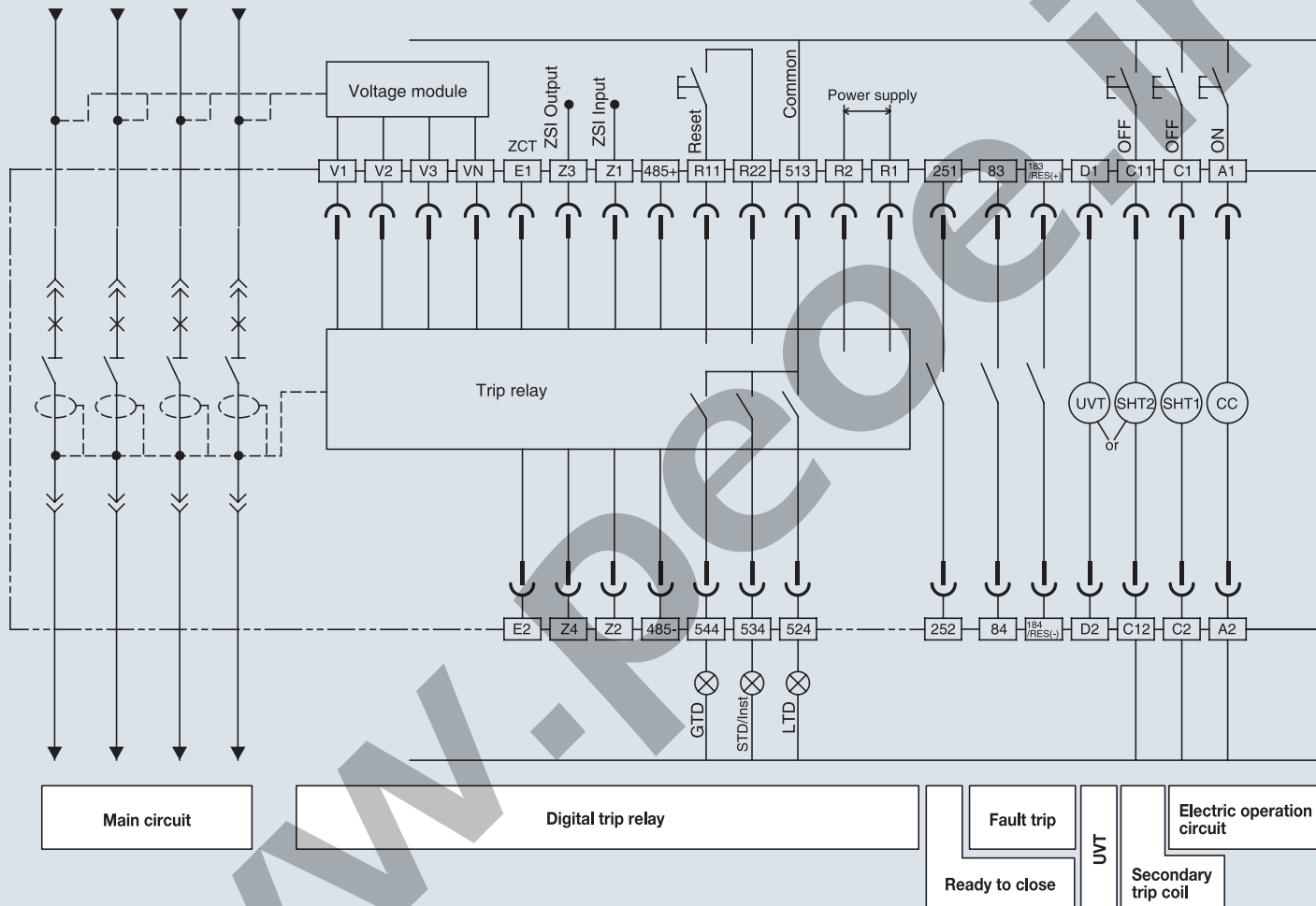
| LED | Status   |  |
|-----|----------|--|
| 1   | DI1      | Indicates digital Input #1condition                                    |
| 2   | DI2      | Indicates digital Input #2condition                                    |
| 3   | DO ON    | Indicates temperature alarm output is ON                               |
| 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 |

|            | 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 (cos $\phi$ =0.4, L/R=7ms) |
|            | Max. switching capacity    | 1880VA, 150W         |   |

# Electrical diagram

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



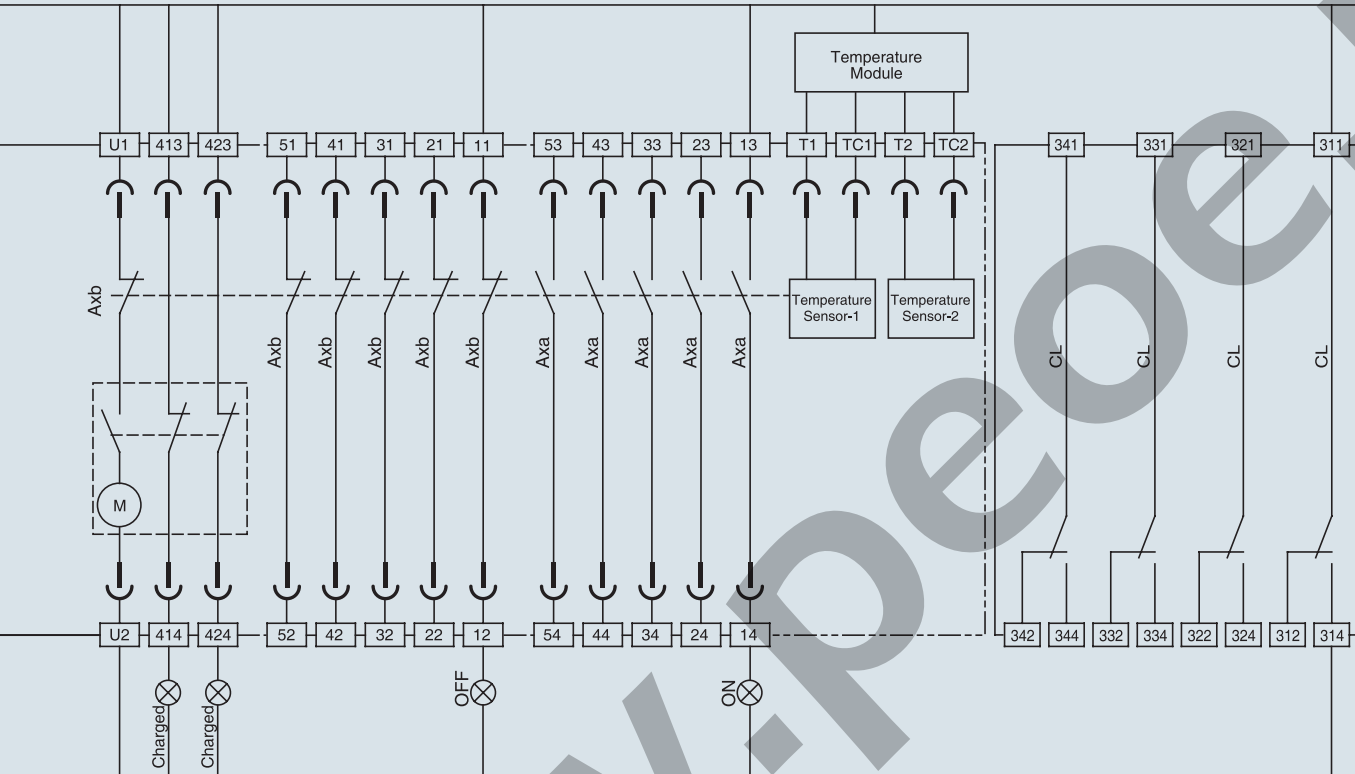
## Terminal code description

|     |     |   |    |    |                              |
|-----|-----|---|----|----|------------------------------|
| 13  | 14  | ~ | 63 | 64 | Auxiliary switch "a"         |
| 11  | 12  | ~ | 61 | 62 | Auxiliary switch "b"         |
| 413 | 414 |   |    |    | Charged signal               |
| 423 | 424 |   |    |    | Charged signal communication |
| U1  | U2  |   |    |    | Motor charging               |
| A1  | A2  |   |    |    | Closing coil                 |
| C1  | C2  |   |    |    | Shunt trip                   |
| C11 | C12 |   |    |    | 2nd shunt trip               |

|      |       |   |
|------|-------|---|
| D1   | D2    | Voltage input terminal of UVT               |
| 83   | 84    | Alarm1 "a"                                  |
| 183  | 184   | Alarm2 "a"                                  |
| 251  | 252   | Ready to close switch                       |
| R1   | R2    | Control power                               |
| 513  | ~ 544 | Alarm contact                               |
| R11  | R22   | Alarm reset (Trip cause LED, Alarm contact) |
| 485+ | 485-  | RS-485 communication                        |

- Note) 1. The diagram is shown with circuits de-energized, all devices open, connected 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 3a3b. The auxiliary switch in above diagram is composed of 5a5b. See 66 page for more detail on auxiliary switches.  
 4. Option  
 - Ready to close contact, Trip alarm contact, UVT coil, Fully charged contact, secondary trip coil  
 - Cell switch, Temperature module, Voltage module, Remote close-open module, ZCT, ZSI  
 5. Please consult us for the use of ZSI (Zone selective Interlocking).  
 6. Refer to the page 47 for the connection of Trip relay and the page 61 for UVT.  
 7. For connecting RS-485 verify if the polarity is correct





Charge completion contact

Auxiliary switch

Thermal, communication remote control module

Cell switch

### Accessory code description

|          |        |                    |
|----------|--------|--------------------|
| Z1       | Z2     | ZSI input          |
| Z3       | Z4     | ZSI output         |
| E1       | E2     | ZCT                |
| VN       | V3     | Voltage module     |
| TC1, TC2 | T1, T2 | Temperature module |
| 311      | 344    | Position switch    |

|          |                                |
|----------|--------------------------------|
| Ax       | Auxiliary switch               |
| LTD      | Long time delay trip indicator |
| STD/Inst | Short time delay/instantaneous |
| GTD      | Ground fault trip indicator    |
| CL       | Cell switch                    |
| (M)      | Motor                          |
| (CC)     | Closing coil                   |
| (ST1)    | Shunt tripping device 1        |
| (ST2)    | Shunt tripping device 2        |
| (UVT)    | UVT coil                       |

|   |   |
|---|---|
| — | Internal wiring   |
| — | External wiring (by customer)                             |
| — | Connector of the control circuit terminal of drawout type |

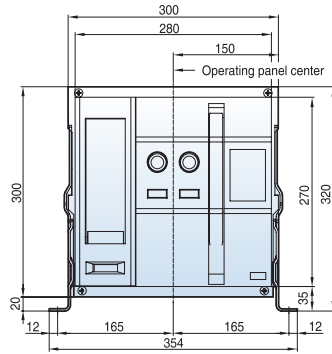
# Dimensions

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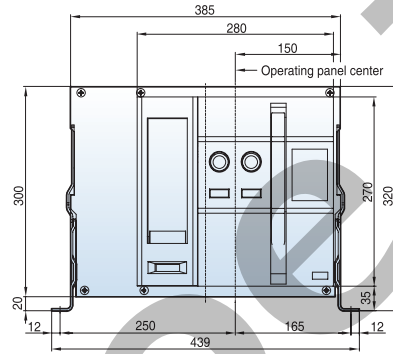
## Fixed type 2000AF (630~1600A: AH/AN/AS-06~16D)

Dimensions: [mm]

### Front view

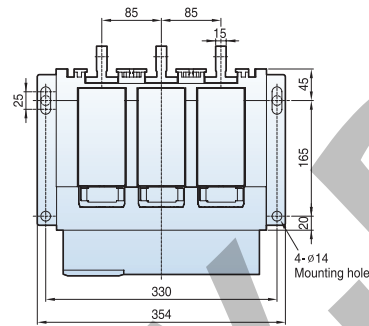


3P

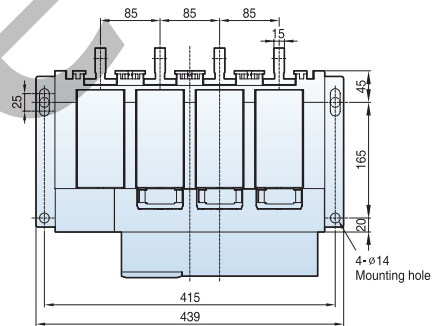


4P

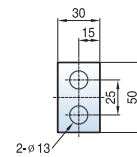
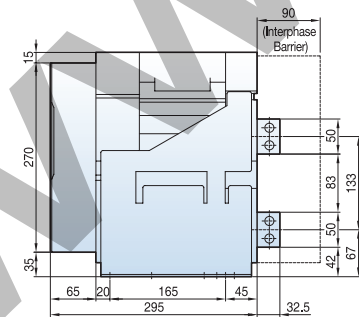
### Vertical type



3P

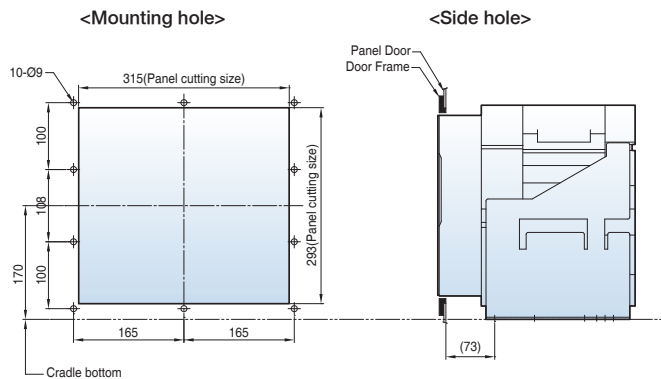


4P



<Conductor>

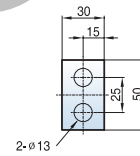
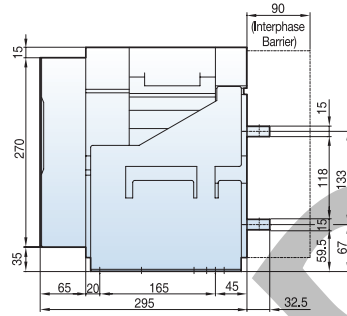
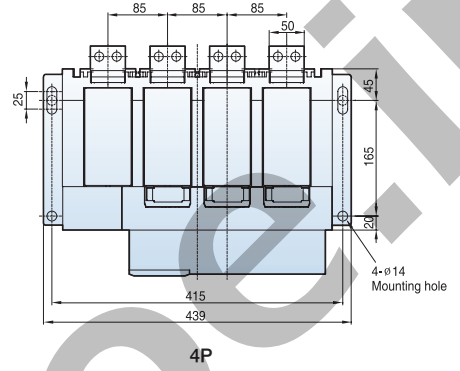
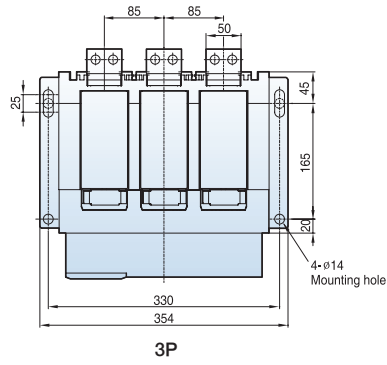
### Door Frame: DF (AH/AN/AS-D/E)



Note) The dimensions are for fixed type.

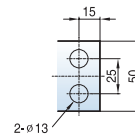
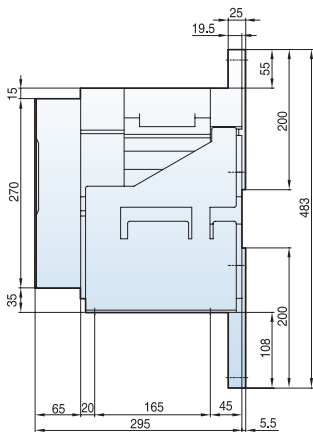
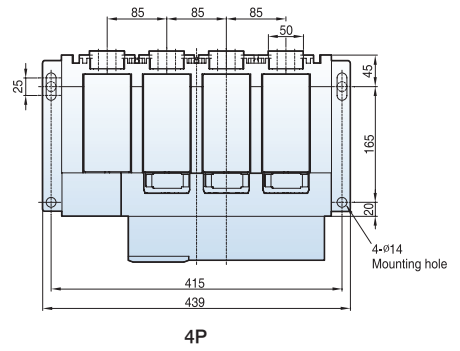
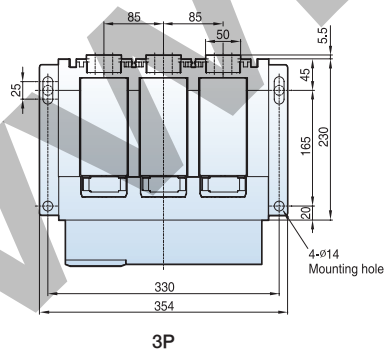
Horizontal type

Dimensions: [mm]



<Conductor>

Front connection type



<Conductor>

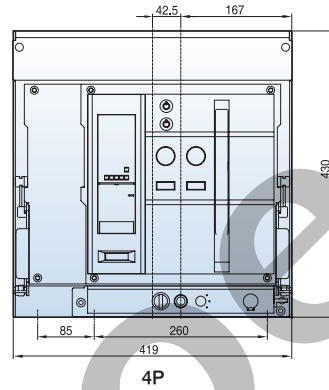
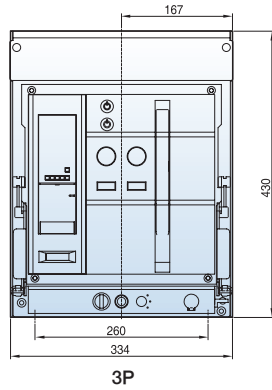
# Dimensions

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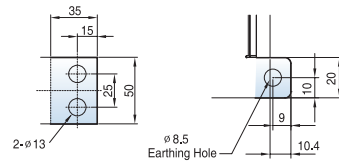
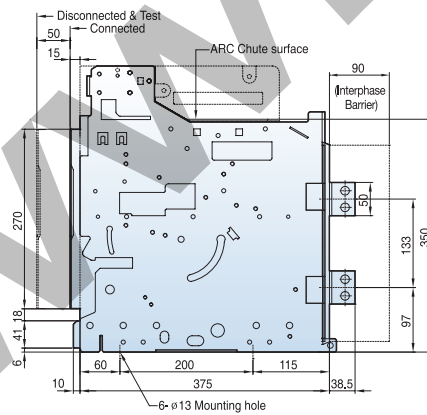
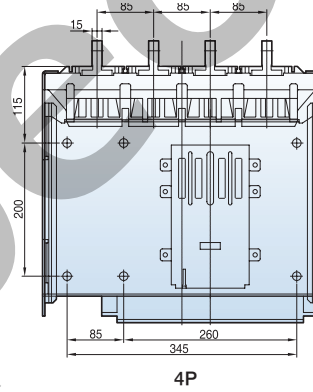
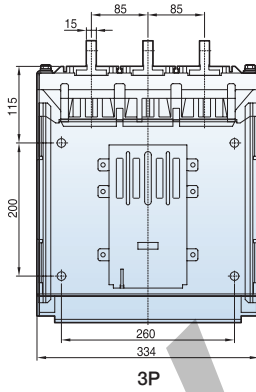
## Draw-out type 2000AF (630~1600A: AH/AN/AS-06~16D)

Dimensions: [mm]

Front view

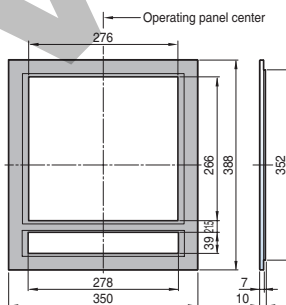


Vertical type



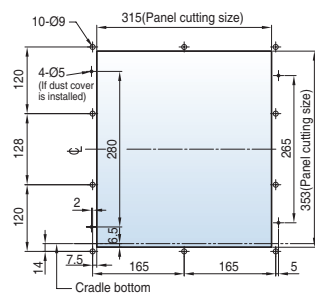
<Conductor>

### Door Frame: DF (AH/AN/AS-D/E)

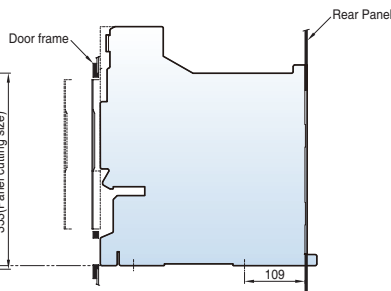


<External size>

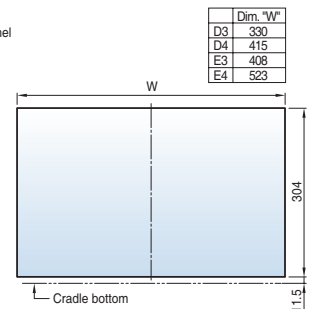
<Mounting hole>



<Side hole>



<Panel cutting >

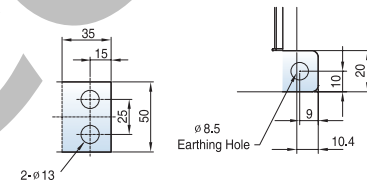
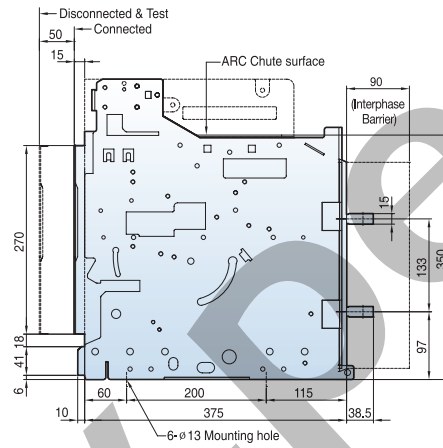
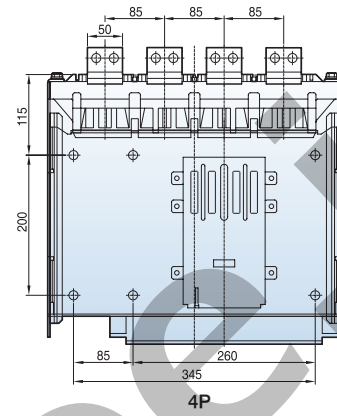
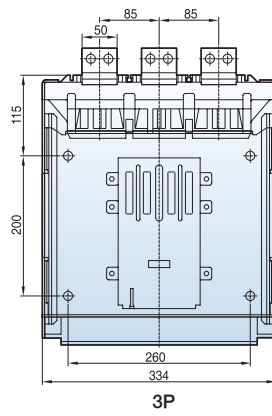


|    | Dim. "W" |
|----|----------|
| D3 | 330      |
| D4 | 415      |
| E3 | 408      |
| E4 | 523      |

Note) The dimensions are for drawout type.

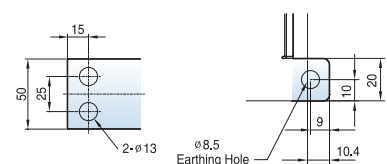
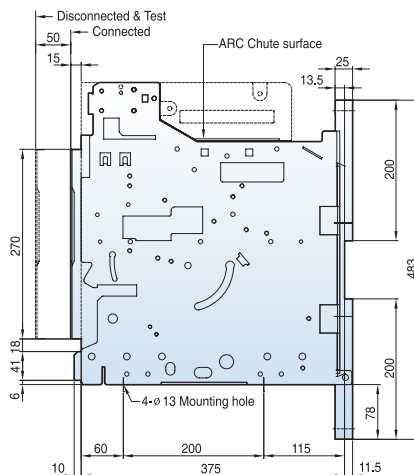
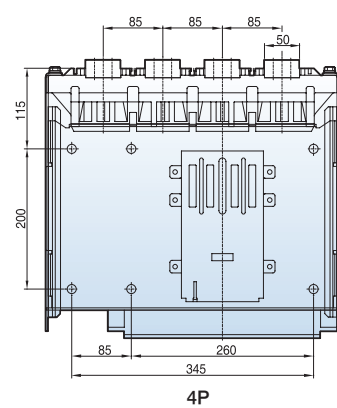
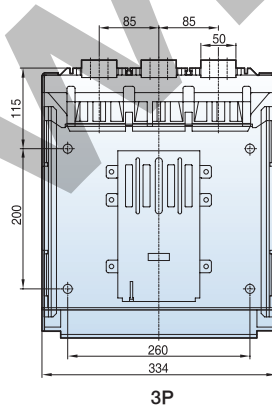
Horizontal type

Dimensions: [mm]



<Conductor>

Front connection type



<Conductor>

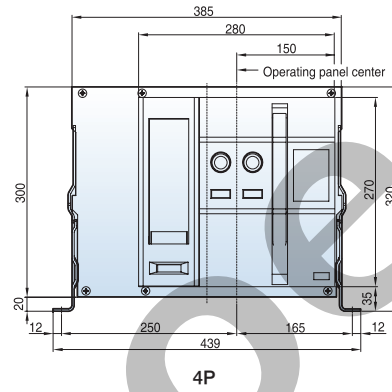
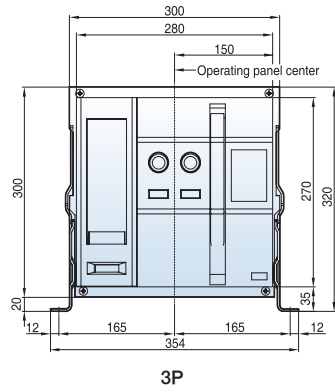
# Dimensions

Susol · Metasol

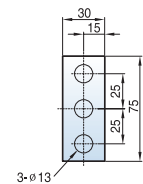
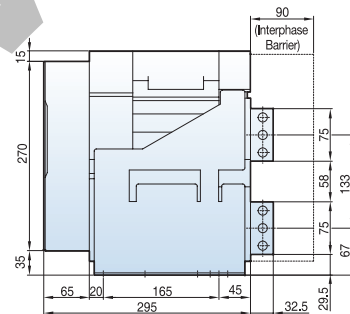
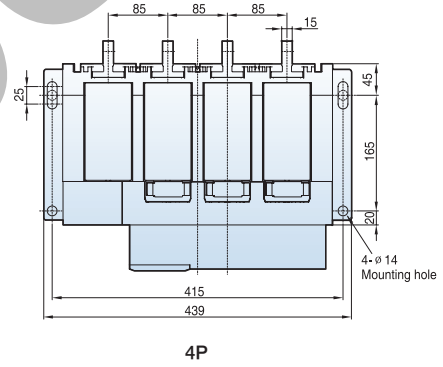
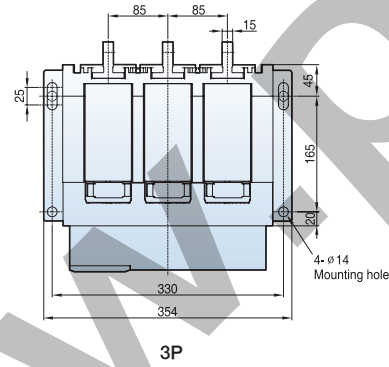
## Fixed type 2000AF (2000A: AH/AS-20D)

Dimensions: [mm]

### Front view



### Vertical type

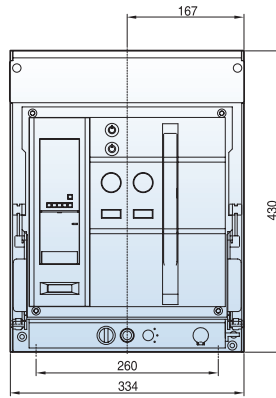


<Conductor>

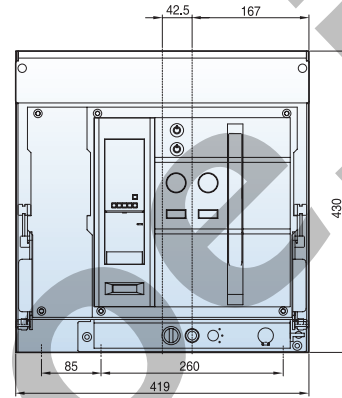
## Draw-out type 2000AF (2000A: AH/AS-20D)

Dimensions: [mm]

### Front view

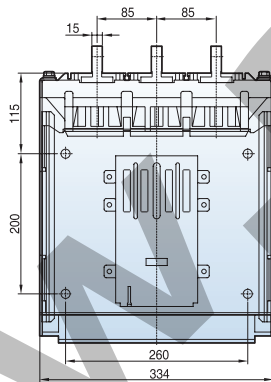


3P

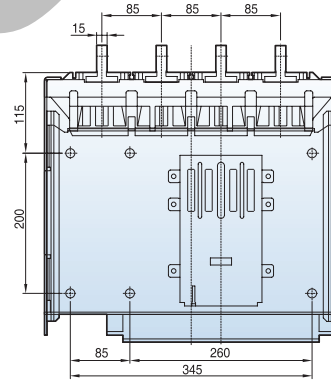


4P

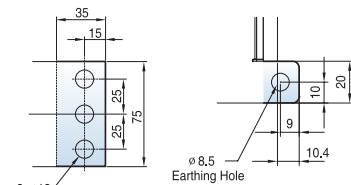
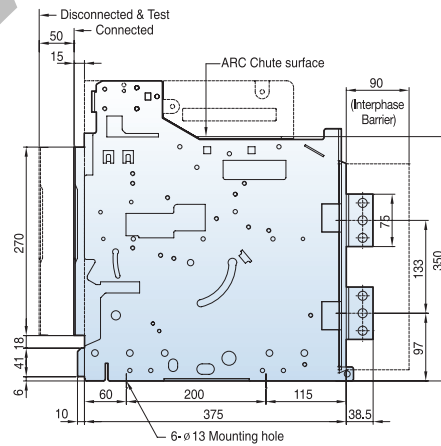
### Vertical type



3P



4P



<Conductor>

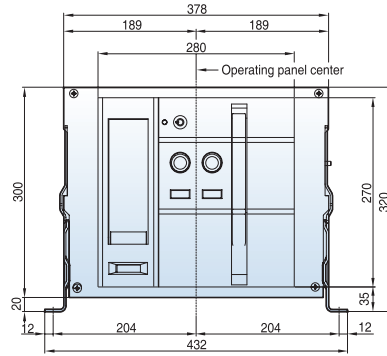
# Dimensions

Susol · Metasol

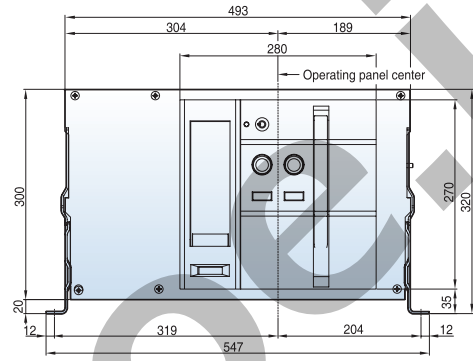
## Fixed type 4000AF (2000~3200A: AH/AS-20~32E)

Dimensions: [mm]

### Front view

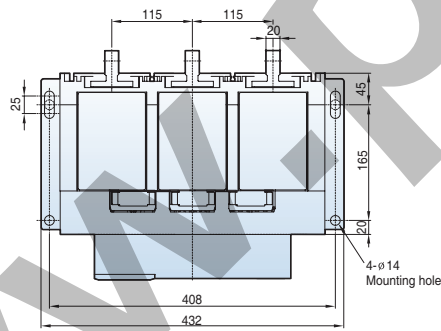


3P

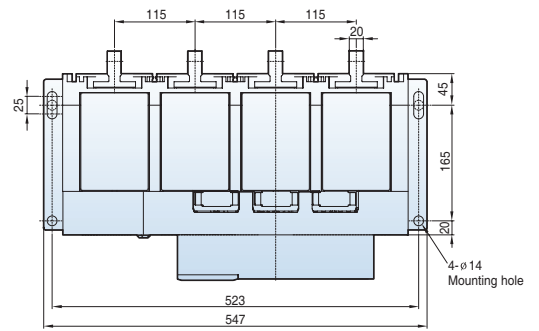


4P

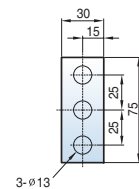
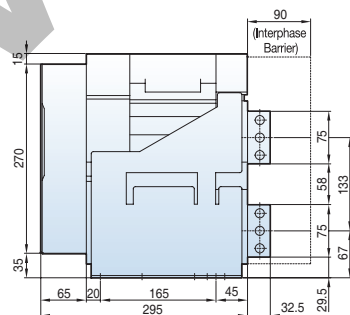
### Vertical type



3P



4P

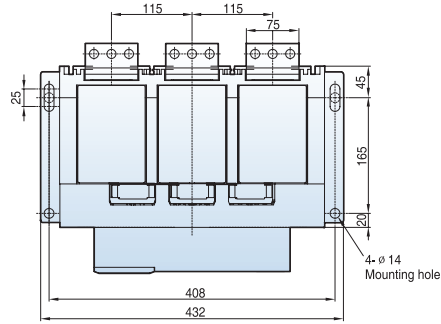


<Conductor>

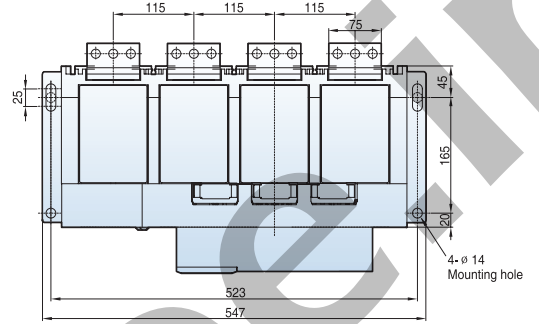


Horizontal type

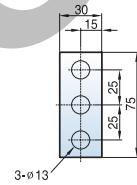
Dimensions: [mm]



3P

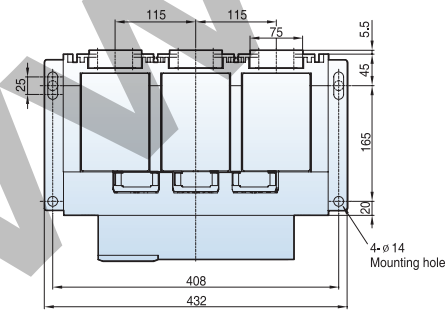


4P

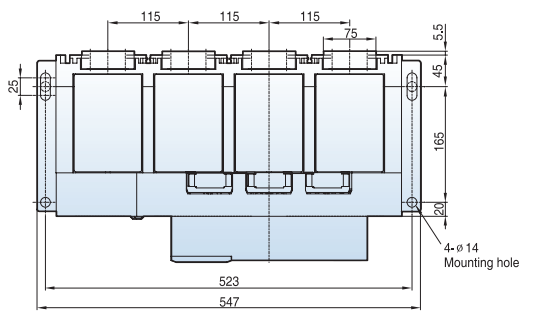


<Conductor>

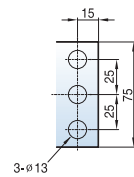
Front connection type



3P



4P



<Conductor>

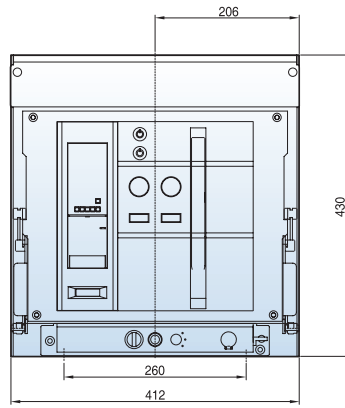
# Dimensions

Susol · Metasol

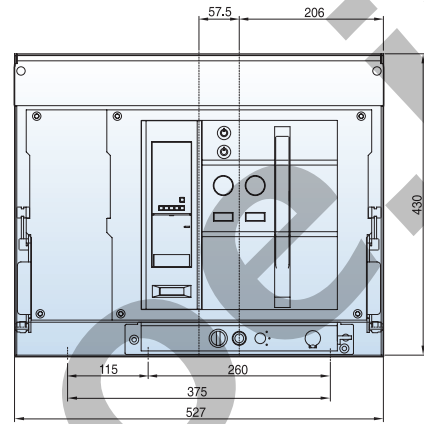
## Draw-out type 4000AF (2000~3200A: AH/AS-20~32E)

Dimensions: [mm]

### Front view

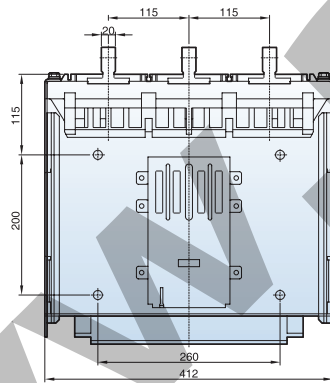


3P

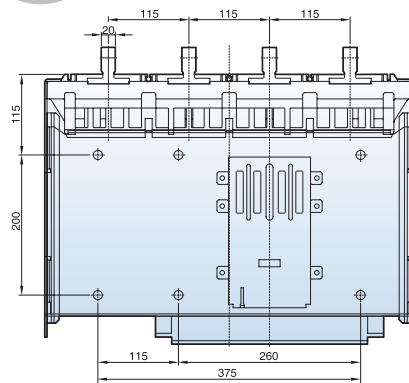


4P

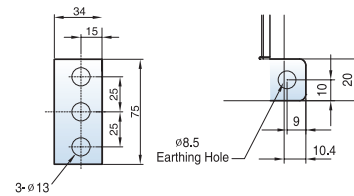
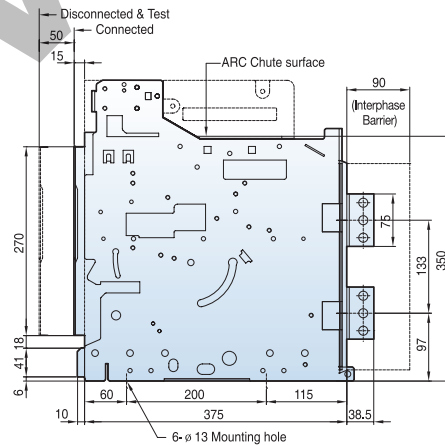
### Vertical type



3P

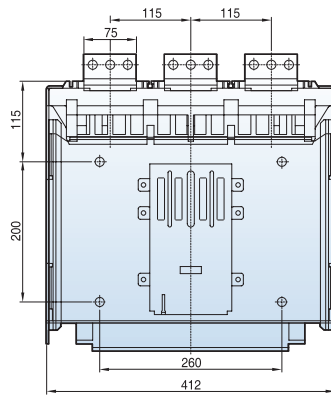


4P

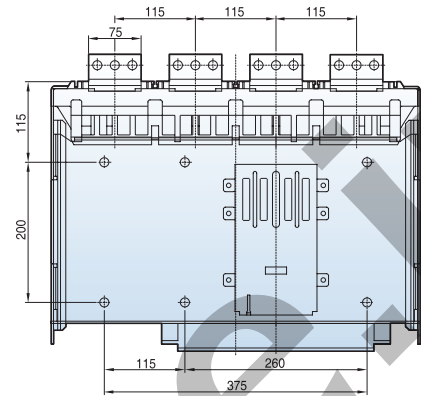


<Conductor>

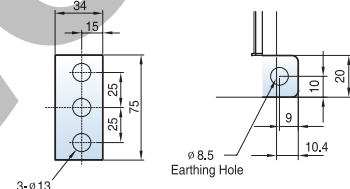
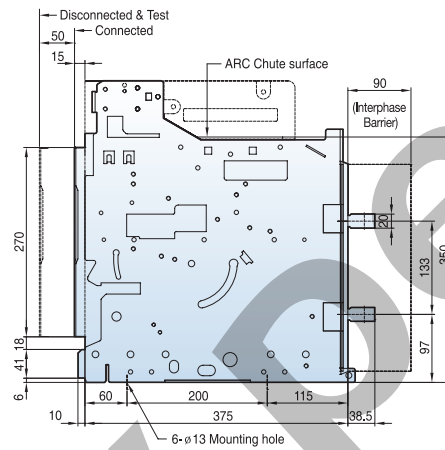
Horizontal type



3P

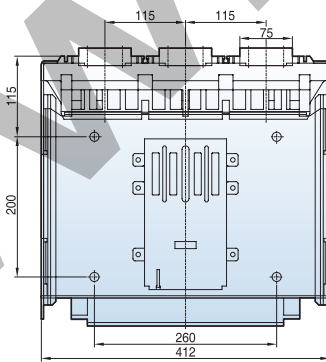


4P

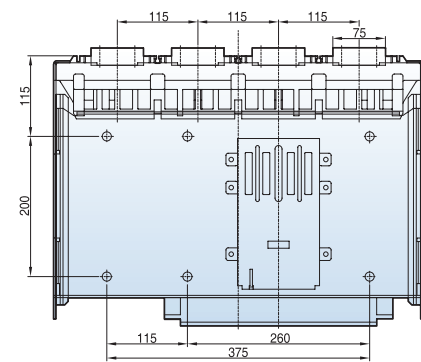


<Conductor>

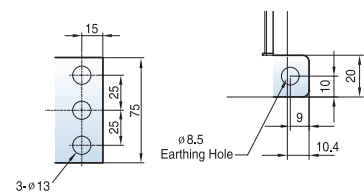
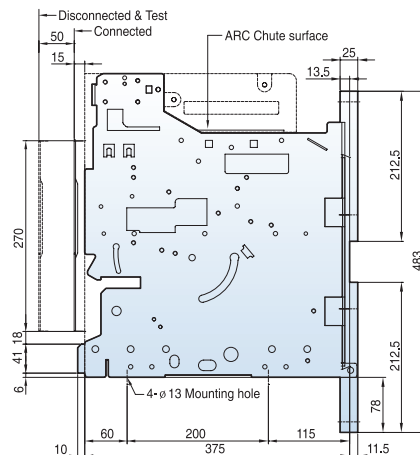
Front connection type



3P



4P



<Conductor>

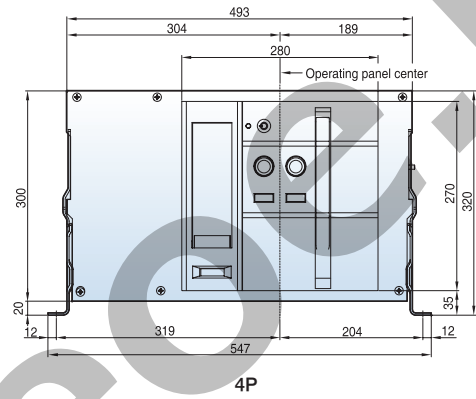
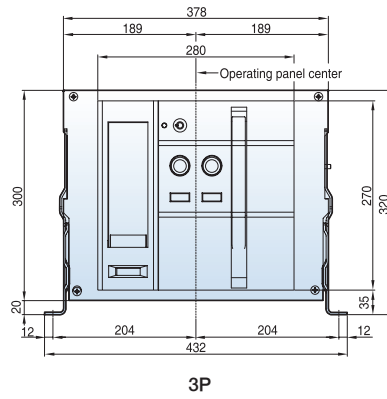
# Dimensions

Susol · Metasol

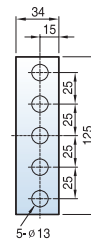
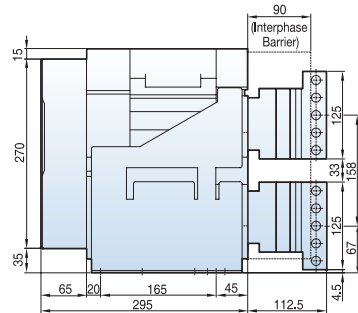
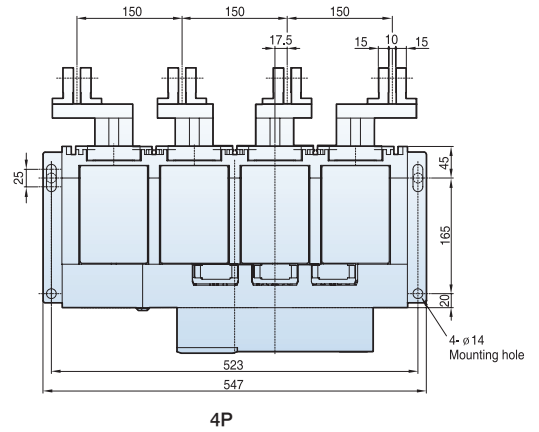
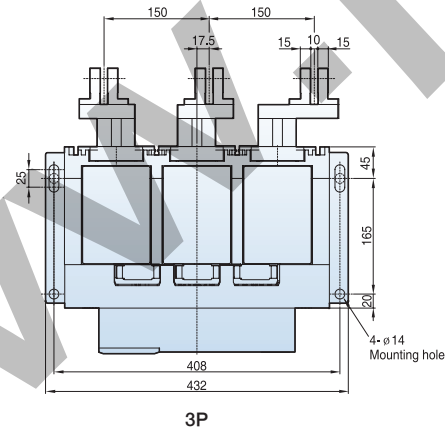
## Fixed type 4000AF (4000A: AH/AS-40E)

Dimensions: [mm]

### Front view



### Vertical type

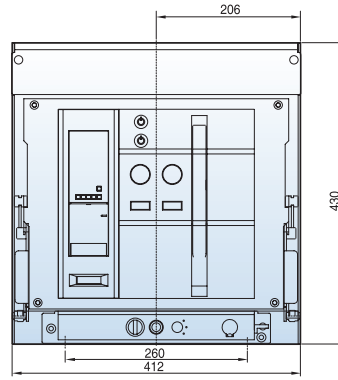


<Conductor>

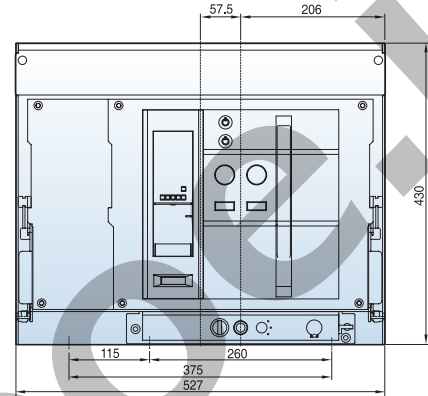
## Draw-out type 4000AF (4000A: AH/AS-40E)

Dimensions: [mm]

### Front view

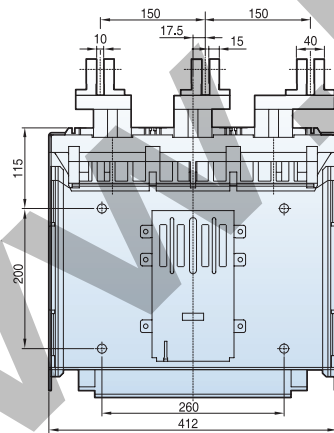


3P

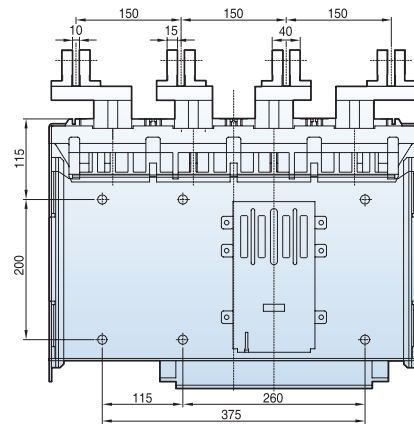


4P

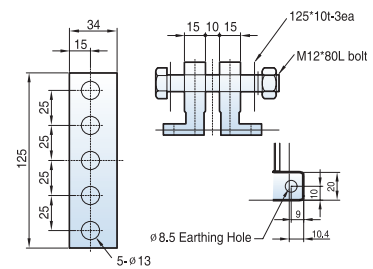
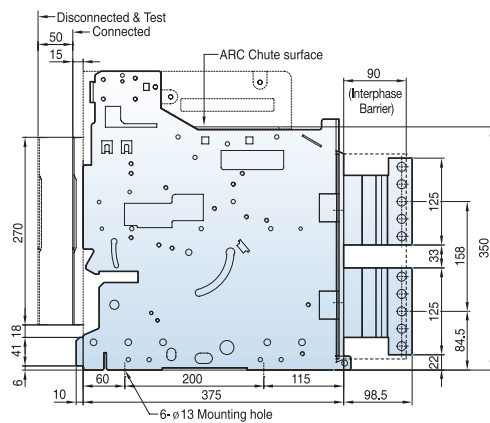
### Vertical type



3P



4P



<Conductor>

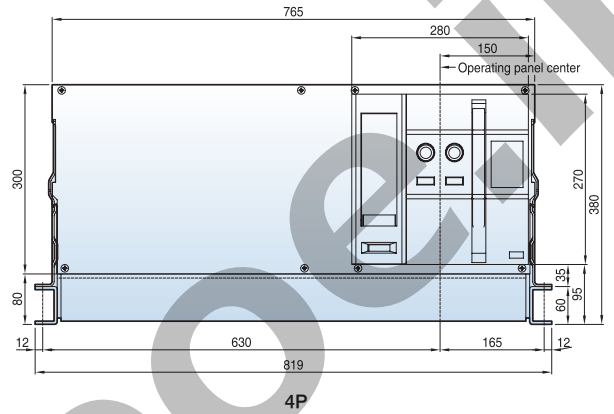
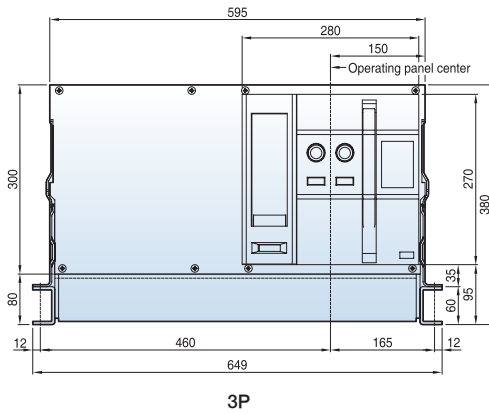
# Dimensions

Metasol

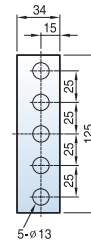
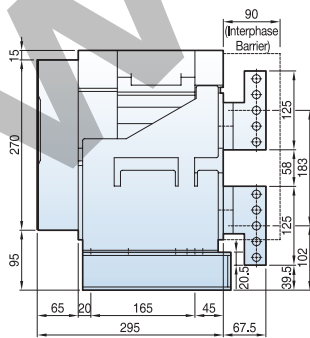
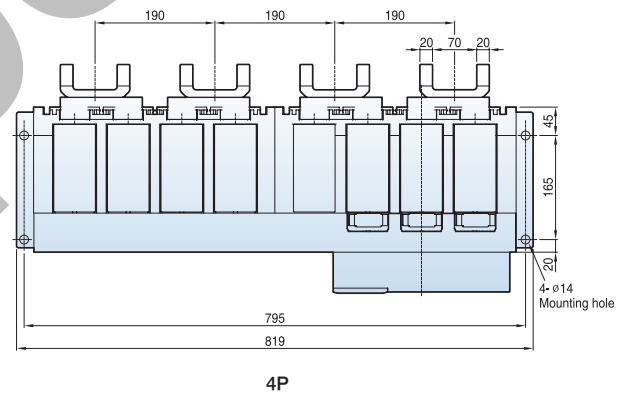
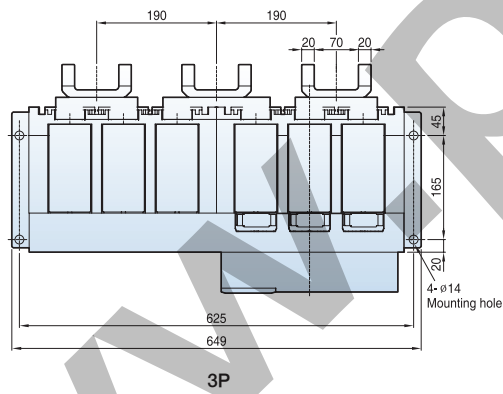
## Fixed type 5000AF (4000~5000A: AS-40~50F)

Dimensions: [mm]

### Front view



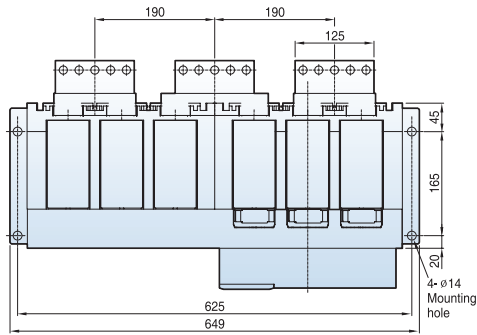
### Vertical type



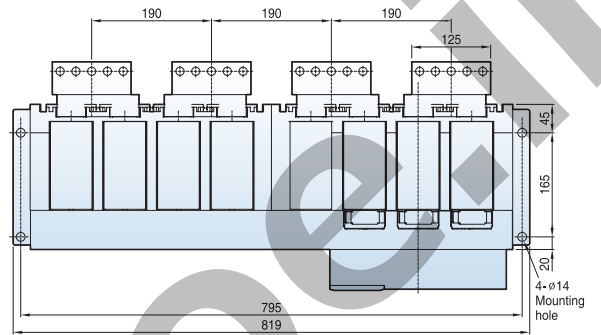
<Conductor>

Horizontal type

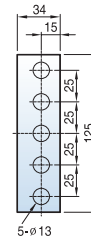
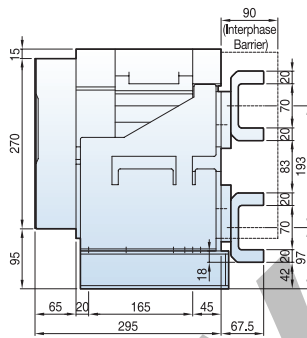
Dimensions: [mm]



3P

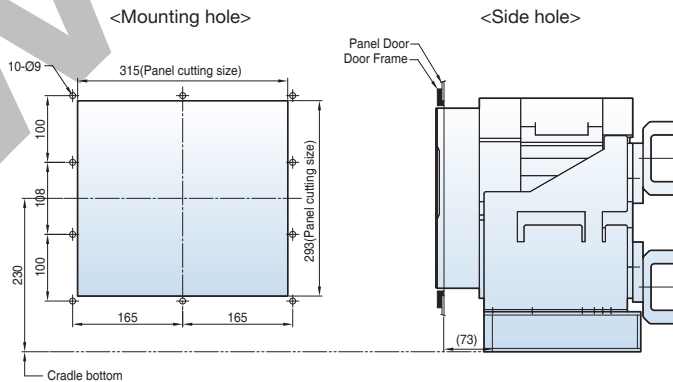


4P



<Conductor>

Door Frame: DF (AH-G, AS-F)



Note) The dimensions are for fixed type.

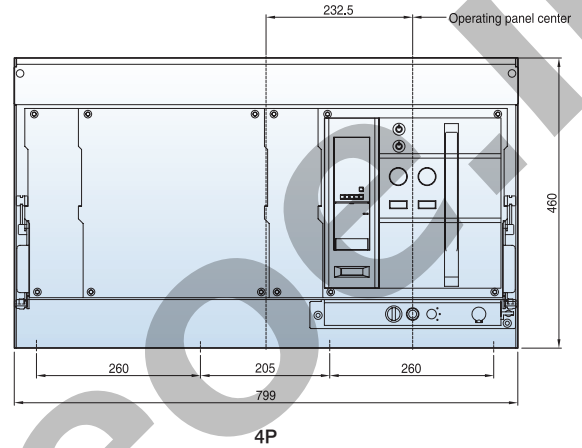
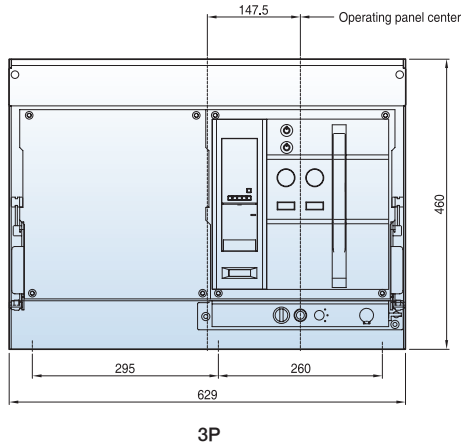
# Dimensions

Metasol

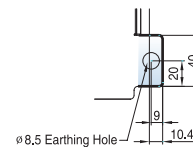
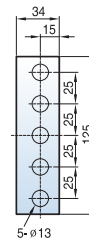
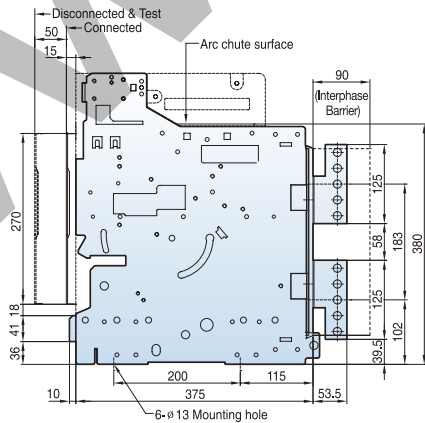
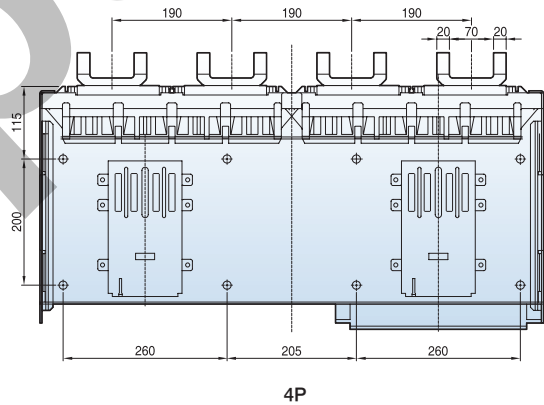
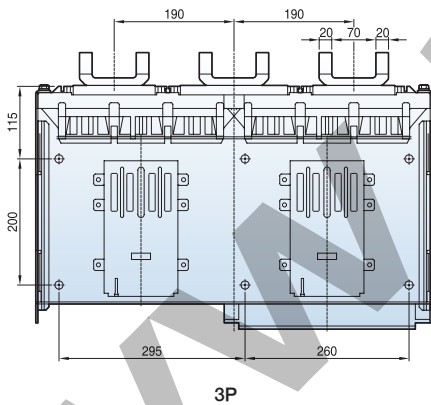
## Draw-out type 5000AF (4000~5000A: AS-40~50F)

Dimensions: [mm]

### Front view



### Vertical type

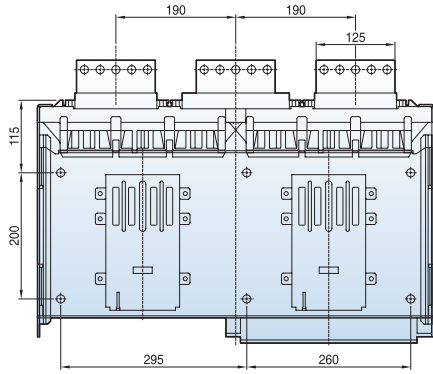


<Conductor>

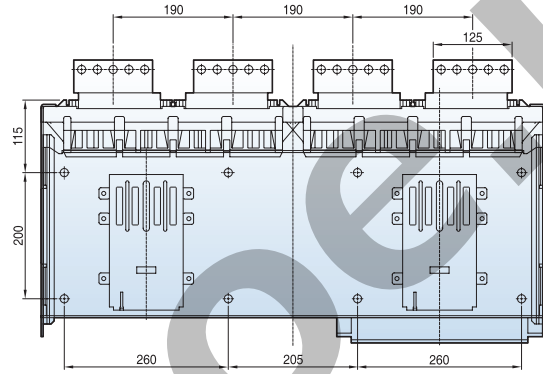


Horizontal type

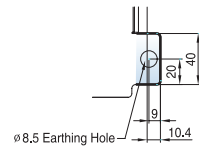
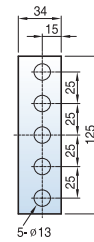
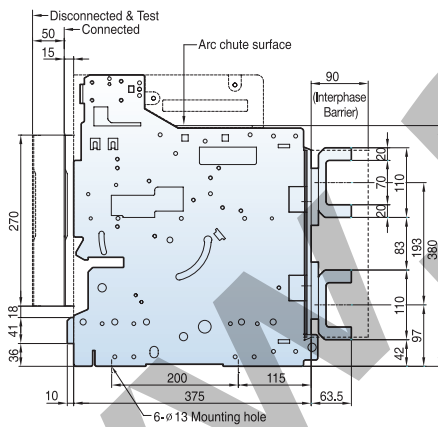
Dimensions: [mm]



3P



4P



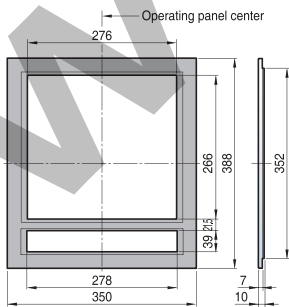
<Conductor>

Door Frame: DF (AH-G, AS-F)

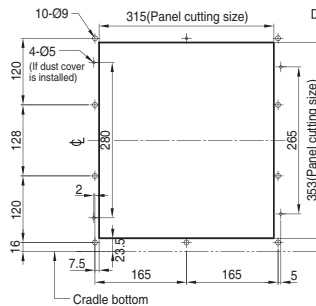
<Mounting hole>

<Side hole>

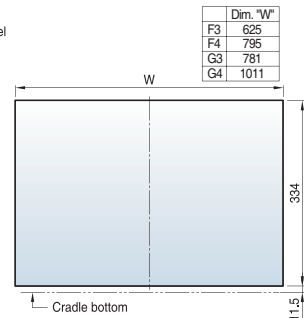
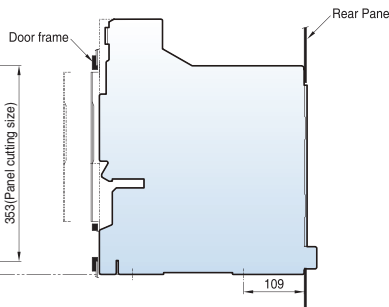
<Panel cutting >



<External size>



Note) The dimensions are for drawout type.



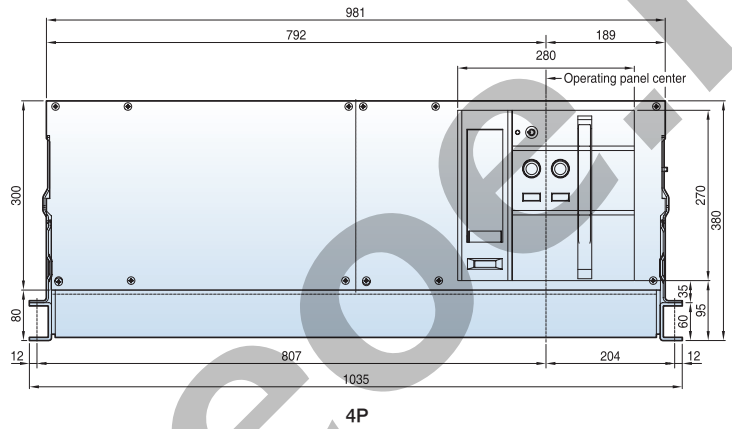
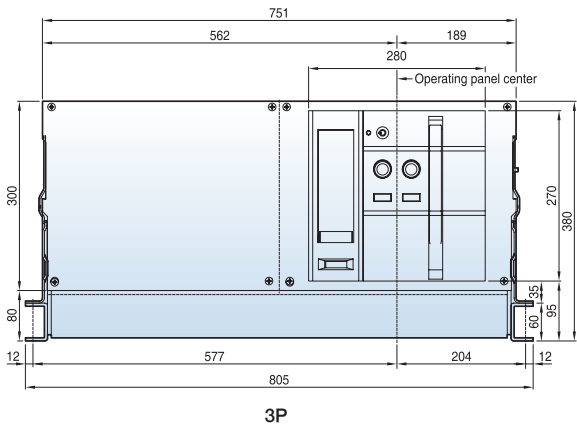
# Dimensions

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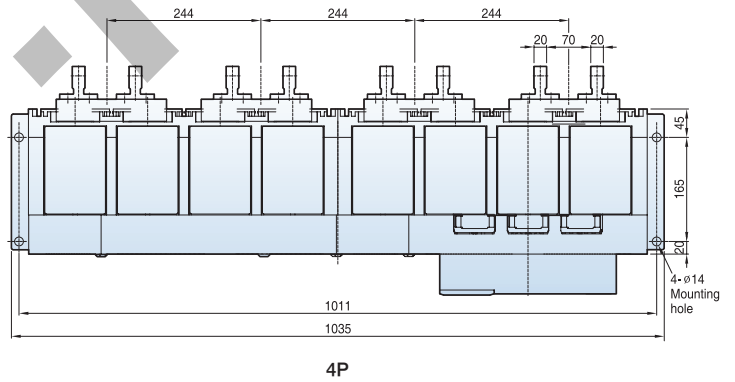
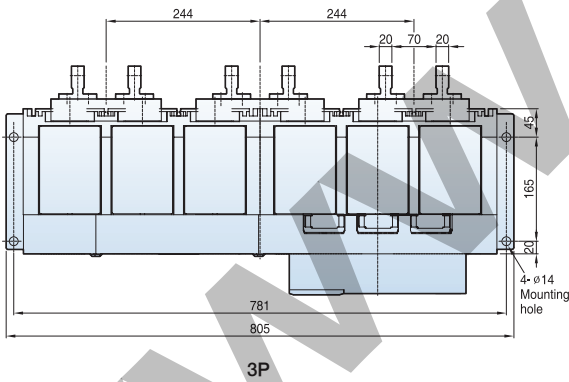
## Fixed type 6300AF (4000A~6300A: AH/AS-40~63G)

Dimensions: [mm]

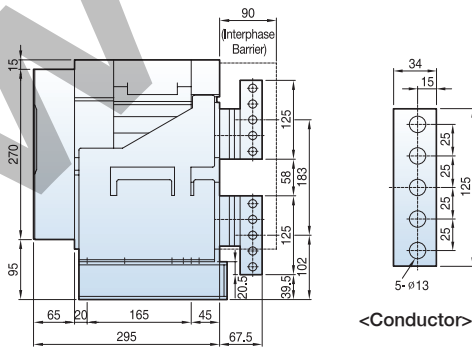
### Front view



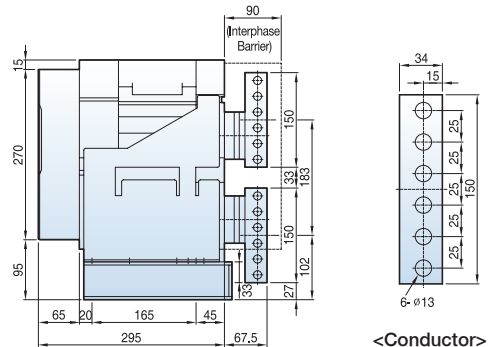
### Vertical type



### 4000A~5000A

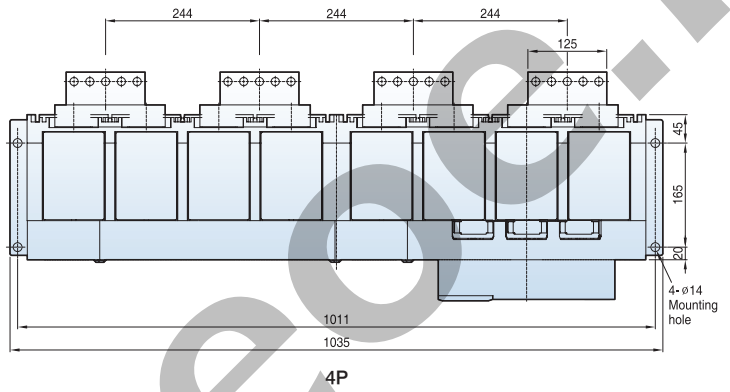
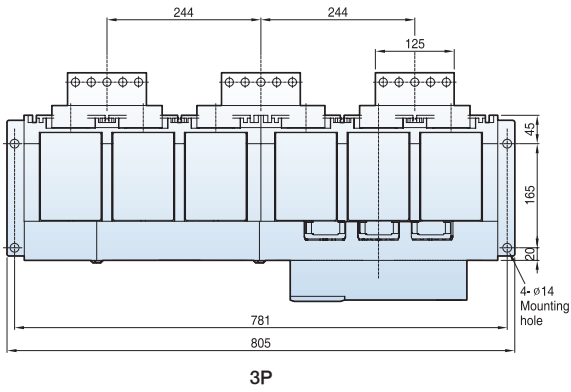


### 6300A

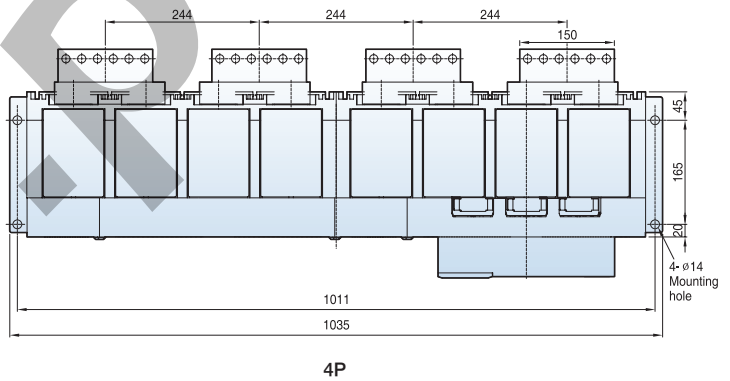
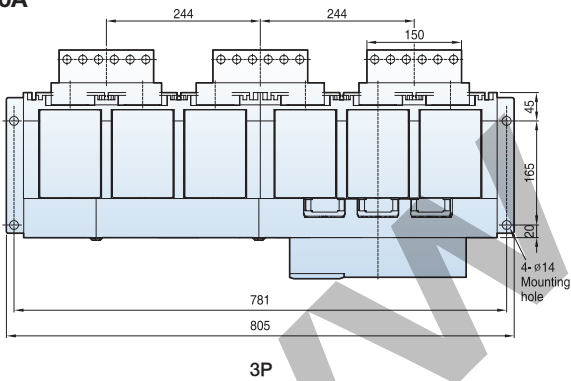


Horizontal type

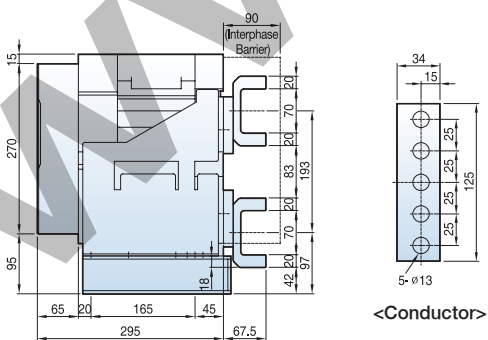
4000A~5000A



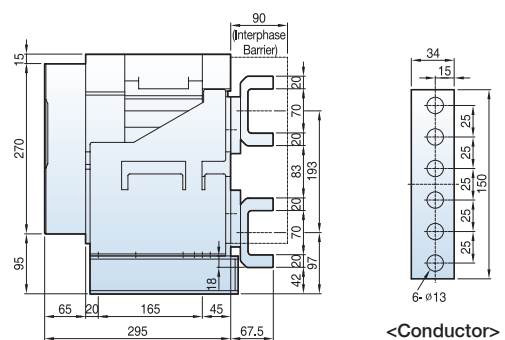
6300A



4000A~5000A



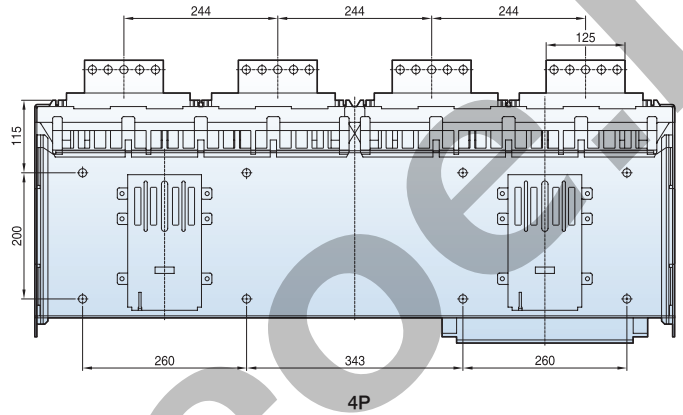
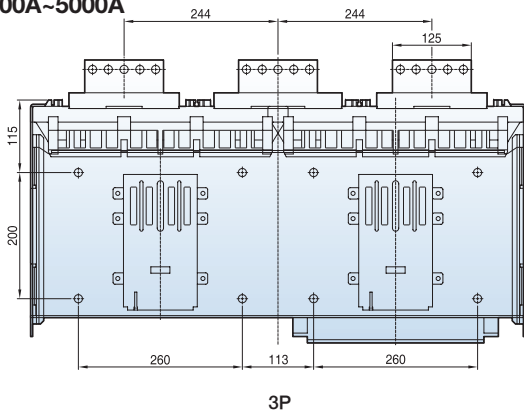
6300A



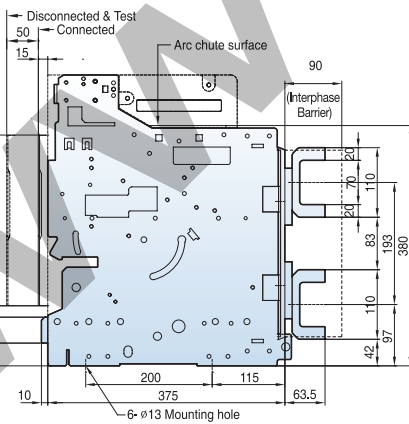
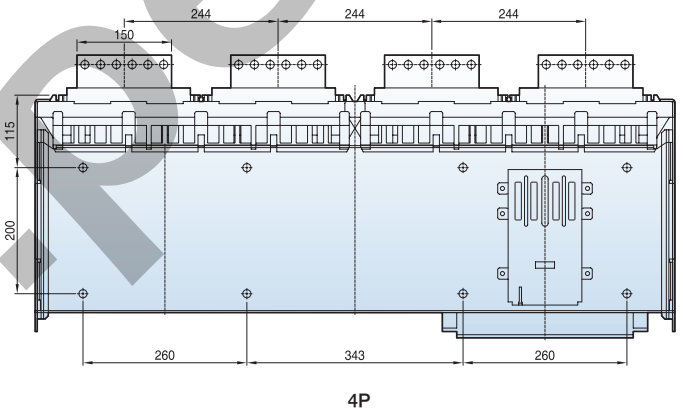
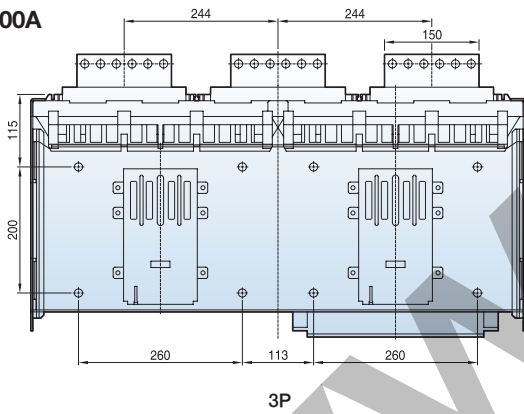


Horizontal type

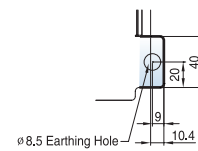
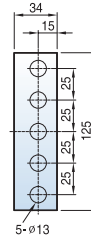
4000A~5000A



6300A

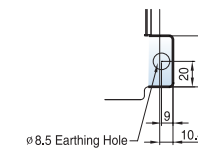
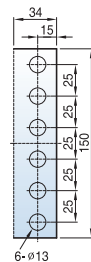


4000A~5000A



<Conductor>

6300A



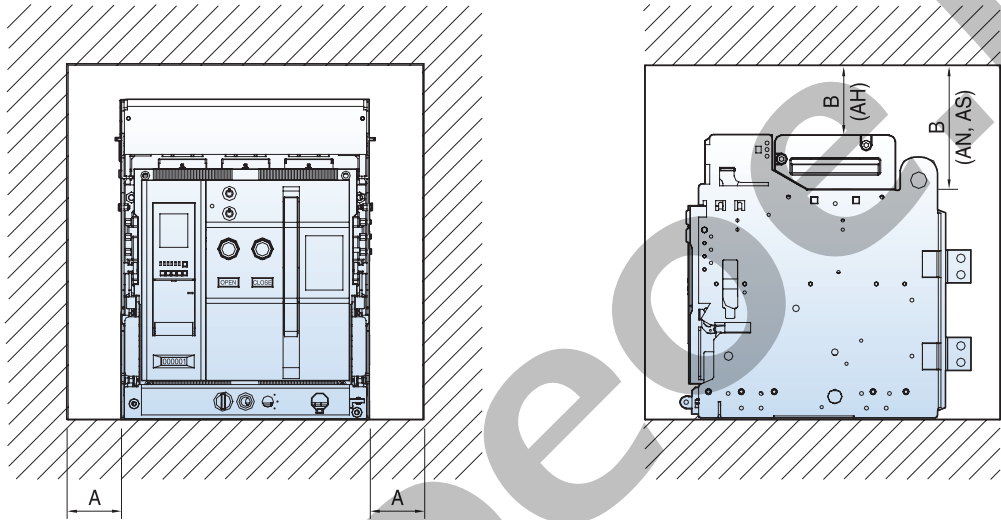
<Conductor>

# Technical information

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## Insulation voltage

You should keep the isolation distance between ACB and panel as below table.

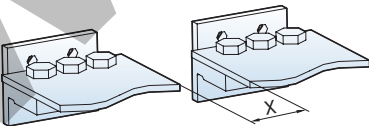


| Type     |       | A  | B   |
|----------|-------|----|-----|
| Fixed    | AN/AS | 50 | 150 |
|          | AH    | 50 | 150 |
| Draw out | AN/AS | 50 | 150 |
|          | AH    | 50 | 0   |

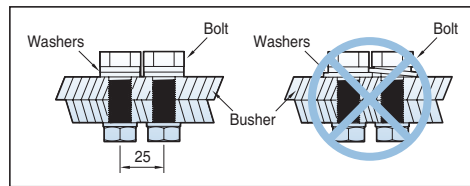
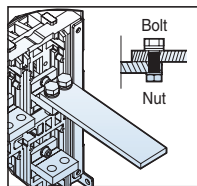
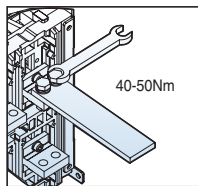
Note) When drawing the distribution panel, it is available to use regardless of the distance between ACB and the wall of the panel because Susol ACB(draw-in/out type) extinguishes the arc in the Arc Chute and Arc Cover clearly.

## Minimum isolation distance

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





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



| Screw type | Tightening torque |           |               |           |
|------------|-------------------|-----------|---------------|-----------|
|            | Standard(kgf-cm)  | Tolerance | Standard(N.m) | Tolerance |
| M8         | 135               | ±16       | 13.3          | ±1.6      |
| M10        | 270               | ±32       | 26.5          | ±3.2      |
| M12        | 480               | ±57       | 46.6          | ±5.6      |

## Temperature derating

The table below indicates the maximum current rating, for each connection type, as a function of the ambient temperature around the circuit breaker and the busbars. Circuit breakers with mixed connections have the same derating as horizontally connected breakers. For ambient temperatures greater than 60°C, consult us. Temperature inside the switchboard around the circuit breaker and its connection: T<sub>i</sub> (IEC 60947-2)

| Frame                          | Rated current          | ACB terminal              | Applicable busbar size  |  |                                      |             |                                      |            |           |       |       |  |       |       |       |       |       |       |       |       |
|--------------------------------|------------------------|---------------------------|-------------------------|---|--------------------------------------|-------------|--------------------------------------|------------|-----------|-------|-------|---|-------|-------|-------|-------|-------|-------|-------|-------|
|                                |                        |                           |                         | Horizontal type   |                                      |             |                                      |            |           |       |       | Vertical type   |       |       |       |       |       |       |       |       |
|                                |                        |                           |                         | 40°C  | 45°C                                 | 50°C        | 55°C                                 | 60°C       | 65°C      | 70°C  | 40°C  | 45°C  | 50°C  | 55°C  | 60°C  | 65°C  | 70°C  |       |       |       |
| 1600AF<br>AN-D<br>AS-D<br>AH-D | 200A                   | 15t×50×1EA                | 5t×50×1EA               | 200A  | 200A                                 | 200A        | 200A                                 | 200A       | 200A      | 200A  | 200A  | 200A  | 200A  | 200A  | 200A  | 200A  | 200A  |       |       |       |
|                                | 400A                   |                           |                         | 400A  | 400A                                 | 400A        | 400A                                 | 400A       | 400A      | 400A  | 400A  | 400A  | 400A  | 400A  | 400A  | 400A  | 400A  | 400A  |       |       |
|                                | 630A                   |                           | 5t×50×2EA<br>10t×60×1EA | 630A  | 630A                                 | 630A        | 630A                                 | 630A       | 630A      | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  |       |
|                                |                        |                           |                         | 800A  | 6t×50×2EA<br>10t×60×1EA              | 800A        | 800A                                 | 800A       | 800A      | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  |
|                                | 1000A                  |                           | 8t×50×2EA<br>6t×75×2EA  |   |                                      | 1000A       | 1000A                                | 1000A      | 1000A     | 1000A | 1000A | 1000A   | 1000A | 1000A | 1000A | 1000A | 1000A | 1000A | 1000A | 1000A |
|                                |                        |                           |                         | 1250A   | 8t×60×2EA<br>10t×50×2EA              | 1250A       | 1250A                                | 1250A      | 1250A     | 1250A | 1200A | 1140A   | 1250A | 1250A | 1250A | 1250A | 1250A | 1250A | 1250A | 1250A |
|                                |                        |                           |                         |   |                                      | 1600A       | 6t×75×3EA<br>10t×60×2EA<br>8t×60×3EA | 1600A      | 1600A     | 1520A | 1480A | 1420A   | 1240A | 1180A | 1600A | 1600A | 1580A | 1550A | 1500A | 1320A |
|                                |                        |                           |                         | 2000AF<br>AS/AH-D   | 2000A                                |             |                                      | 15t×75×1EA | 8t×75×3EA | -     | -     | -   | -     | -     | -     | -     | 2000A | 2000A | 1940A | 1860A |
|                                | 10t×100×2EA            |                           | -                       |   |                                      | -           | -                                    |            | -         | -     | -     | -   | -     | -     | -     | -     | -     | -     | -     | -     |
|                                | 3200AF<br>AS-E<br>AH-E |                           | 630A                    | 20t×75×1EA  | 5t×50×2EA<br>10t×60×1EA              | 630A        | 630A                                 | 630A       | 630A      | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  | 630A  |
| 800A                           |                        | 6t×50×2EA<br>10t×60×1EA   |                         |   |                                      | 800A        | 800A                                 | 800A       | 800A      | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  | 800A  |
|                                |                        |                           | 1000A                   |   | 8t×50×2EA<br>6t×75×2EA               | 1000A       | 1000A                                | 1000A      | 1000A     | 1000A | 1000A | 1000A   | 1000A | 1000A | 1000A | 1000A | 1000A | 1000A | 1000A | 1000A |
| 1250A                          |                        | 8t×60×2EA<br>10t×50×2EA   |                         |   |                                      | 1250A       | 1250A                                | 1250A      | 1250A     | 1250A | 1250A | 1250A   | 1250A | 1250A | 1250A | 1250A | 1250A | 1250A | 1250A | 1250A |
|                                |                        |                           | 1600A                   |   | 6t×75×3EA<br>10t×60×2EA<br>8t×60×3EA | 1600A       | 1600A                                | 1600A      | 1600A     | 1600A | 1600A | 1520A   | 1600A | 1600A | 1600A | 1600A | 1600A | 1600A | 1600A | 1600A |
| 2000A                          |                        | 8t×75×3EA<br>10t×100×2EA  |                         |   |                                      | 2000A       | 2000A                                | 2000A      | 2000A     | 2000A | 1900A | 1800A   | 2000A | 2000A | 2000A | 2000A | 2000A | 2000A | 2000A | 2000A |
|                                |                        |                           |                         |   |                                      | 2500A       | 10t×75×3EA<br>8t×75×4EA              | 2500A      | 2500A     | 2500A | 2400A | 2300A   | 2220A | 2140A | 2500A | 2500A | 2500A | 2500A | 2400A | 2320A |
| 3200A                          |                        | 10t×100×3EA<br>10t×75×4EA |                         |   |                                      |             |                                      | 3200A      | 3200A     | 3100A | 3000A | 2900A   | 2600A | 2460A | 3200A | 3200A | 3120A | 3050A | 2950A | 2650A |
|                                |                        |                           | 4000AF<br>AS/AH-E       |   | 4000A                                | 10t×100×3EA | 10t×100×4EA                          | -          | -         | -     | -     | -   | -     | -     | 4000A | 4000A | 3950A | 3800A | 3680A | 3310A |
| 10t×75×5EA                     |                        | -                         |                         |   |                                      |             | -                                    | -          | -         | -     | -     | -   | -     | -     | -     | -     | -     | -     | -     | -     |
| 5000AF<br>AS-F                 | 4000A                  | 20t×125×2EA               | 10t×100×4EA             | 4000A   | 4000A                                | 3920A       | 3860A                                | 3800A      | 3650A     | 3500A | 4000A | 4000A   | 3960A | 3900A | 3880A | 3750A | 3620A |       |       |       |
|                                | 5000A                  |                           | 10t×125×4EA             | 5000A   | 5000A                                | 4900A       | 4800A                                | 4700A      | 4000A     | 3800A | 5000A | 5000A   | 4950A | 4900A | 4850A | 4140A | 3950A |       |       |       |
| 6300AF<br>AS-G                 | 4000A                  | 20t×125×2EA               | 10t×100×4EA             | 4000A   | 4000A                                | 4000A       | 4000A                                | 4000A      | 4000A     | 4000A | 4000A | 4000A   | 4000A | 4000A | 4000A | 4000A | 4000A |       |       |       |
|                                | 5000A                  |                           | 10t×125×4EA             | 5000A   | 5000A                                | 4900A       | 4820A                                | 4750A      | 4690A     | 4490A | 5000A | 5000A   | 4950A | 4870A | 4850A | 4830A | 4630A |       |       |       |
| AH-G                           | 6300A                  | 20t×150×2EA               | 10t×150×4EA             | 6300A   | 6300A                                | 6170A       | 6040A                                | 5900A      | 5020A     | 4780A | 6300A | 6300A   | 6220A | 6160A | 6100A | 5220A | 4980A |       |       |       |

# Technical information

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## Operating conditions

### Ambient temperature

ACB devices can operate under the following temperature conditions

- The electrical and mechanical characteristics are stipulated for an ambient temperature of -5°C to +40°C
- The average temperature should be within + 35°C
- Reduce the continuous conducting current when the temperature is over 45°C (refer to temperature derating)
- Storage condition : -20°C to + 60°C is recommended.

### Altitude

Susol ACB is designed for operation at altitudes under 2000m. At altitudes higher than 2000m, emitting heat is lowered and operating voltage, continuous current capacity, and breaking capacity will be reduced. Durability of the insulation is also reduced according to the atmosphere pressure.

According to the below table, change the ratings upon a service condition.

| Item                           | Altitude [m] | 2000m | 3000m   | 4000m   | 5000m   |
|--------------------------------|--------------|-------|---------|---------|---------|
| Withstand voltage [V]          |              | 3500  | 3150    | 2500    | 2100    |
| Average insulating voltage [V] |              | 1000  | 900     | 700     | 600     |
| Max. using voltage [V]         |              | 690   | 620     | 540     | 470     |
| Current compensation constant  |              | 1×In  | 0.98×In | 0.96×In | 0.94×In |

### Environment

Under clean air;

Maximum temperature + 40°C (relative humidity should be under 85%)

Maximum temperature + 20°C (relative humidity should be under 90%)

Do not apply under corrosive or ammonia gas circumstances

(H<sub>2</sub>S ≤ 0.01ppm, SO<sub>2</sub> ≤ 0.01ppm, NH<sub>3</sub> ≤ a few ppm)

#### \* Extreme atmosphere conditions

Under high temperature and/or high humidity, the insulation durability, electrical and mechanical features could be deteriorated. At these conditions, increasing corrosion-resistant dealing needs. Corrosion-resistant parts need under this conditions.

### Internal resistance and power consumption (per pole)

| AF        | Rated current (A) | Fixed type            |                              | Draw-out type         |                              |
|-----------|-------------------|-----------------------|------------------------------|-----------------------|------------------------------|
|           |                   | Inner resistance (mΩ) | Power consumption (W/3Phase) | Inner resistance (mΩ) | Power consumption (W/3Phase) |
| AN-16D    | 630               | 0.02                  | 24                           | 0.04                  | 48                           |
|           | 800               | 0.02                  | 38                           | 0.04                  | 77                           |
|           | 1,000             | 0.02                  | 60                           | 0.04                  | 120                          |
|           | 1,250             | 0.02                  | 94                           | 0.04                  | 188                          |
|           | 1,600             | 0.02                  | 154                          | 0.04                  | 307                          |
| AH/AS-20D | 630               | 0.015                 | 18                           | 0.03                  | 36                           |
|           | 800               | 0.015                 | 29                           | 0.03                  | 58                           |
|           | 1,000             | 0.015                 | 45                           | 0.03                  | 90                           |
|           | 1,250             | 0.015                 | 70                           | 0.03                  | 141                          |
|           | 1,600             | 0.015                 | 115                          | 0.03                  | 230                          |
| AH/AS-32E | 2,000             | 0.013                 | 156                          | 0.027                 | 324                          |
|           | 2,000             | 0.01                  | 120                          | 0.02                  | 240                          |
|           | 2,500             | 0.01                  | 188                          | 0.02                  | 375                          |
| AH/AS-40E | 3,200             | 0.01                  | 307                          | 0.02                  | 614                          |
|           | 2,000             | 0.01                  | 120                          | 0.02                  | 240                          |
|           | 2,500             | 0.01                  | 188                          | 0.02                  | 375                          |
| AS-50F    | 3,200             | 0.01                  | 307                          | 0.02                  | 614                          |
|           | 4,000             | 0.008                 | 384                          | 0.011                 | 528                          |
|           | 4,000             | 0.008                 | 384                          | 0.011                 | 528                          |
| AH/AS-63G | 5,000             | 0.008                 | 600                          | 0.011                 | 825                          |
|           | 4,000             | 0.006                 | 288                          | 0.009                 | 432                          |
|           | 5,000             | 0.006                 | 450                          | 0.009                 | 675                          |
|           | 6,300             | 0.005                 | 595                          | 0.007                 | 833                          |

Note) 1. Above power consumption is whole power consumption for each Rated current, 50/60Hz, 3/4pole.  
2. This is inner assistant value per 1 pole.

3. Power factor = 1.0

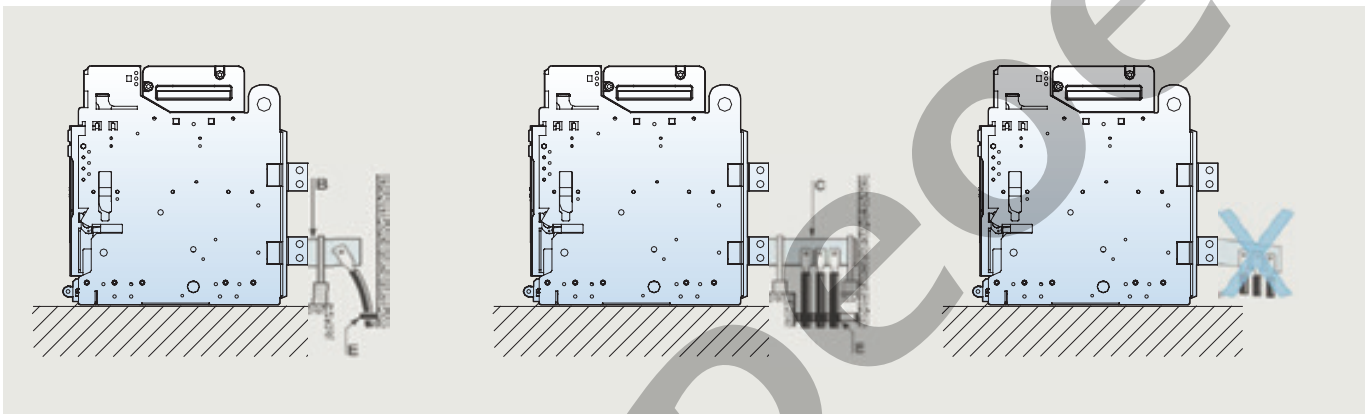


## Installation recommendation

### BUS-BAR Connection

#### Cables connections

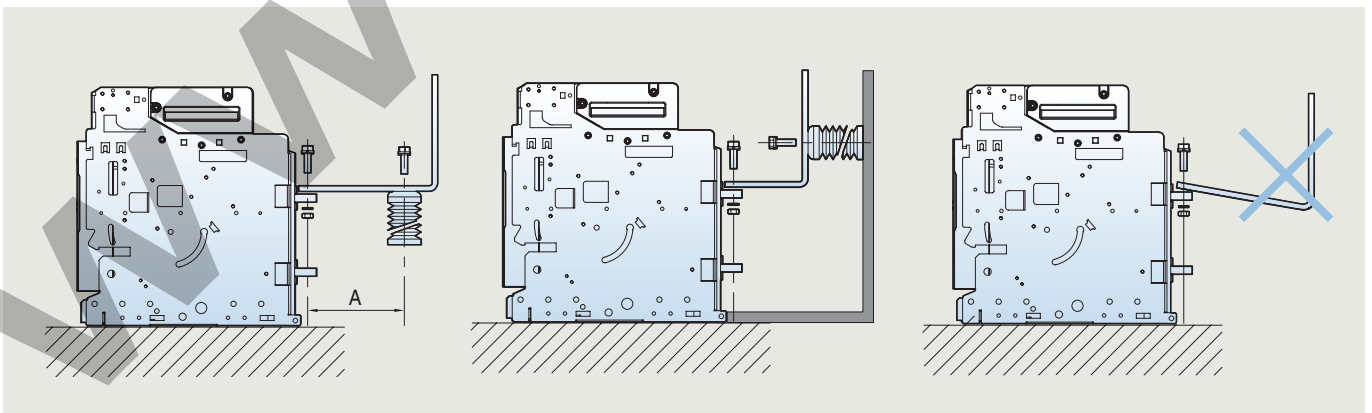
Make sure that no excessive mechanical force put on the rear terminals for cable connection. Extension terminal is fixed such as B, C and cable is to fixed to the frame such as E



#### 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 (Table 1) from the access area to withstand the electrical force during the short circuit faults.

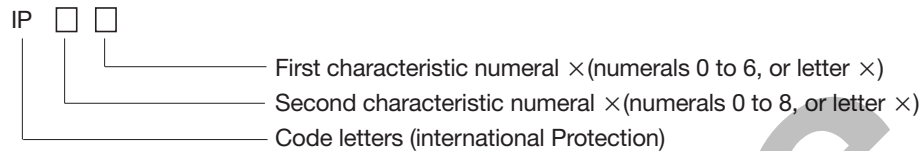


(Table 1) Maximum safe distance A

| Short capacity (kA) | 30  | 50  | 65  | 80  | 100 | 150 |
|---------------------|-----|-----|-----|-----|-----|-----|
| Length A (mm)       | 350 | 300 | 250 | 150 | 150 | 150 |

## Installation recommendation

### Protection degree provided by enclosures (IP Code) IEC 60529



#### First characteristic numeral

|   | Degree of protection  |  |
|---|---|--|
|   | Brief description   | Definition   |
| 0 | Non-protected   | -  |
| 1 | Protected against solid foreign objects of 50mm Ø and greater   | The object probe sphere of 50mm Ø, shall not fully penetrate   |
| 2 | Protected against solid foreign objects of 12.5mm Ø and greater | The object probe sphere of 12.5mm Ø, shall not fully penetrate   |
| 3 | Protected against solid foreign objects of 2.5mm Ø and greater  | The object probe sphere of 2.5mm Ø, shall not penetrate at all   |
| 4 | Protected against solid foreign objects of 1.0mm Ø and greater  | The object probe of 1.0mm Ø, shall not penetrate at all  |
| 5 | Dust-protected  | Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety |
| 6 | Dust-tight  | No ingress of dust   |

#### Second characteristic numeral

|   | Degree of protection   |   |
|---|--|---|
|   | Brief description  | Definition  |
| 0 | Non-protected  | -   |
| 1 | Protected against vertically falling water drops                                 | Vertically falling drops shall have no harmful effects  |
| 2 | Protected against vertically falling water drops when enclosure tilted up to 15° | Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical   |
| 3 | Protected against spraying water   | Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects  |
| 4 | Protected against spraying water   | Water splashed against the enclosure from any direction shall have no harmful effects   |
| 5 | Protected against spraying jets  | Water projected in powerful jets against the enclosure from any direction shall have no harmful effects   |
| 6 | Protected against powerful water jets  | Water projected in powerful jets against the enclosure from any direction shall have no harmful effects   |
| 7 | Protected against the effects of temporary immersion in water                    | Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time   |
| 8 | Protected against the effects of continuous immersion in water                   | Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7 |

Derating table

ambient temperature outside of the switchboard: Ta (IEC 60439-1)

| Switchboard composition<br>(2300×800×900)   |         |                                    |       |       |       |       |                   |       |      |      |      |      |
|---|---------|------------------------------------|-------|-------|-------|-------|-------------------|-------|------|------|------|------|
| Connection type   |         | Model type AS/AH-06/08E, AN-06/08D |       |       |       |       | AS/AH-10E, AN-10D |       |      |      |      |      |
| Model type  |         | 2EA-50×6                           |       |       |       |       | 2EA-50×8          |       |      |      |      |      |
| Busbar dimensions(mm)   |         | 2EA-50×6                           |       |       |       |       | 2EA-50×8          |       |      |      |      |      |
| Ventilated switchboard(IP31)<br><br>Area of outlet vents: 350cm <sup>2</sup><br>Area of inlet vents: 350cm <sup>2</sup> | Ta=35°C | 4                                  |       |       |       |       | 800 ↓             |       |      |      |      |      |
|   |         | 3                                  |       |       |       |       | 800 ↓             | 800 ↓ |      |      |      | 1000 |
|   |         | 2                                  |       |       |       | 800 ↓ | 800 ↓             | 800 ↓ |      |      | 1000 | 1000 |
|   |         | 1                                  | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓             | 800 ↓ | 1000 | 1000 | 1000 | 1000 |
|   | Ta=45°C | 4                                  |       |       |       |       |                   | 800 ↓ |      |      |      |      |
|   |         | 3                                  |       |       |       |       | 800 ↓             | 800 ↓ |      |      |      | 1000 |
|   |         | 2                                  |       |       |       | 800 ↓ | 800 ↓             | 800 ↓ |      |      | 1000 | 1000 |
|   |         | 1                                  | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓             | 800 ↓ | 1000 | 1000 | 1000 | 1000 |
|   | Ta=55°C | 4                                  |       |       |       |       |                   | 800 ↓ |      |      |      |      |
|   |         | 3                                  |       |       |       |       | 800 ↓             | 800 ↓ |      |      |      | 1000 |
|   |         | 2                                  |       |       |       | 800 ↓ | 800 ↓             | 800 ↓ |      |      | 1000 | 1000 |
|   |         | 1                                  | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓             | 800 ↓ | 1000 | 1000 | 1000 | 1000 |
| Non Ventilated switchboard(IP41/54)<br>   | Ta=35°C | 4                                  |       |       |       |       | 800 ↓             |       |      |      |      |      |
|   |         | 3                                  |       |       |       |       | 800 ↓             | 800 ↓ |      |      |      | 1000 |
|   |         | 2                                  |       |       |       | 800 ↓ | 800 ↓             | 800 ↓ |      |      | 1000 | 1000 |
|   |         | 1                                  | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓             | 800 ↓ | 1000 | 1000 | 1000 | 1000 |
|   | Ta=45°C | 4                                  |       |       |       |       |                   | 800 ↓ |      |      |      |      |
|   |         | 3                                  |       |       |       |       | 800 ↓             | 800 ↓ |      |      |      | 1000 |
|   |         | 2                                  |       |       |       | 800 ↓ | 800 ↓             | 800 ↓ |      |      | 1000 | 1000 |
|   |         | 1                                  | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓             | 800 ↓ | 1000 | 1000 | 1000 | 1000 |
|   | Ta=55°C | 4                                  |       |       |       |       |                   | 800 ↓ |      |      |      |      |
|   |         | 3                                  |       |       |       |       | 800 ↓             | 800 ↓ |      |      |      | 1000 |
|   |         | 2                                  |       |       |       | 800 ↓ | 800 ↓             | 800 ↓ |      |      | 1000 | 1000 |
|   |         | 1                                  | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓ | 800 ↓             | 800 ↓ | 1000 | 1000 | 1000 | 1000 |

# Technical information

Susol · Metasol

## Installation recommendation

### Derating table

ambient temperature outside of the switchboard: Ta (IEC 60439-1)

| Switchboard composition<br>(2300×800×900)   |         |                   |      |      |      |                   |      |      |      |
|---|---------|-------------------|------|------|------|-------------------|------|------|------|
| Connection type   |         | AS/AH-13E, AN-13D |      |      |      | AS/AH-16E, AN-16D |      |      |      |
| Model type  |         | 2EA-75×6          |      |      |      | 2EA-60×10         |      |      |      |
| Busbar dimensions(mm)   |         | 2EA-75×6          |      |      |      | 2EA-60×10         |      |      |      |
| Ventilated switchboard(IP31)<br><br>Area of outlet vents: 350cm <sup>2</sup><br>Area of inlet vents: 350cm <sup>2</sup> | Ta=35°C | 4                 |      |      |      |                   |      |      |      |
|   |         | 3                 |      |      |      | 1250              |      |      |      |
|   |         | 2                 |      |      | 1250 | 1250              |      |      | 1600 |
|   |         | 1                 | 1250 | 1250 | 1250 | 1250              | 1600 | 1600 | 1600 |
|   | Ta=45°C | 4                 |      |      |      |                   |      |      |      |
|   |         | 3                 |      |      |      | 1250              |      |      |      |
|   |         | 2                 |      |      | 1250 | 1250              |      |      | 1600 |
|   |         | 1                 | 1250 | 1250 | 1250 | 1250              | 1600 | 1600 | 1600 |
|   | Ta=55°C | 4                 |      |      |      |                   |      |      |      |
|   |         | 3                 |      |      |      | 1250              |      |      |      |
|   |         | 2                 |      |      | 1250 | 1250              |      |      | 1470 |
|   |         | 1                 | 1250 | 1250 | 1250 | 1250              | 1500 | 1600 | 1600 |
| Non Ventilated switchboard(IP41/54)<br>   | Ta=35°C | 4                 |      |      |      |                   |      |      |      |
|   |         | 3                 |      |      |      | 1250              |      |      |      |
|   |         | 2                 |      |      | 1250 | 1250              |      |      | 1600 |
|   |         | 1                 | 1250 | 1250 | 1250 | 1250              | 1600 | 1600 | 1600 |
|   | Ta=45°C | 4                 |      |      |      |                   |      |      |      |
|   |         | 3                 |      |      |      | 1250              |      |      |      |
|   |         | 2                 |      |      | 1250 | 1250              |      |      | 1500 |
|   |         | 1                 | 1250 | 1250 | 1250 | 1250              | 1480 | 1600 | 1600 |
|   | Ta=55°C | 4                 |      |      |      |                   |      |      |      |
|   |         | 3                 |      |      |      | 1250              |      |      |      |
|   |         | 2                 |      |      | 1250 | 1250              |      |      | 1400 |
|   |         | 1                 | 1250 | 1250 | 1250 | 1250              | 1400 | 1520 | 1500 |

Derating table

ambient temperature outside of the switchboard: Ta (IEC 60439-1)

| Switchboard composition<br>(2300×800×900)   |         |   |      |      |      | AS/AH-20E,<br>2EA-75×10 |      | AS/AH-25E<br>3EA-75×10 |      | AS/AH-32E<br>4EA-75×10 |  | AS/AH-40E<br>4EA-75×10 |  |
|---|---------|---|------|------|------|-------------------------|------|------------------------|------|------------------------|--|------------------------|--|
| Connection type   |         |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
| Model type  |         |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
| Busbar dimensions(mm)   |         |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
| Ventilated switchboard(IP31)<br><br>Area of outlet vents: 350cm <sup>2</sup><br>Area of inlet vents: 350cm <sup>2</sup> | Ta=35°C | 4 |      |      |      |                         |      |                        |      |                        |  |                        |  |
|   |         | 3 |      |      | 2000 |                         |      |                        |      |                        |  |                        |  |
|   |         | 2 | 2000 | 2000 | 2000 | 2400                    | 2500 | 3100                   | 3200 | 3750                   |  |                        |  |
|   | 1       |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
|   | Ta=45°C | 4 |      |      | 2000 |                         |      |                        |      |                        |  |                        |  |
|   |         | 3 |      |      | 2000 |                         |      |                        |      |                        |  |                        |  |
|   |         | 2 | 2000 | 2000 | 2000 | 2300                    | 2400 | 2900                   | 3100 | 3550                   |  |                        |  |
|   | 1       |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
|   | Ta=55°C | 4 |      |      | 2000 |                         |      |                        |      |                        |  |                        |  |
|   |         | 3 |      |      | 2000 |                         |      |                        |      |                        |  |                        |  |
|   |         | 2 | 2000 | 2000 | 2000 | 2200                    | 2300 | 2700                   | 2900 | 3300                   |  |                        |  |
|   | 1       |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
| Non Ventilated switchboard(IP41/54)<br>   | Ta=35°C | 4 |      |      |      |                         |      |                        |      |                        |  |                        |  |
|   |         | 3 |      |      | 2000 |                         |      |                        |      |                        |  |                        |  |
|   |         | 2 | 2000 | 2000 | 2000 | 2115                    | 2275 | 2650                   | 2850 | 3320                   |  |                        |  |
|   | 1       |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
|   | Ta=45°C | 4 |      |      | 1900 |                         |      |                        |      |                        |  |                        |  |
|   |         | 3 |      |      | 1900 |                         |      |                        |      |                        |  |                        |  |
|   |         | 2 | 1900 | 1960 | 1960 | 2000                    | 2150 | 2550                   | 2700 | 3120                   |  |                        |  |
|   | 1       |   |      |      |      |                         |      |                        |      |                        |  |                        |  |
|   | Ta=55°C | 4 |      |      | 1780 |                         |      |                        |      |                        |  |                        |  |
|   |         | 3 |      |      | 1780 |                         |      |                        |      |                        |  |                        |  |
|   |         | 2 | 1800 | 1920 | 1920 | 1900                    | 2020 | 2370                   | 2530 | 2960                   |  |                        |  |
|   | 1       |   |      |      |      |                         |      |                        |      |                        |  |                        |  |



# Technical information

Susol · Metasol

## Installation recommendation

### Derating table

ambient temperature outside of the switchboard: Ta (IEC 60439-1)

| Switchboard composition<br>(2300×800×900)   |         | AS-40F     |      | AS-50F     |      | AS/AH-40G  |      | AS/AH-50G  |      | AS/AH-63G  |      |
|---|---------|------------|------|------------|------|------------|------|------------|------|------------|------|
| Connection type   |         | AS-40F     |      | AS-50F     |      | AS/AH-40G  |      | AS/AH-50G  |      | AS/AH-63G  |      |
| Model type  |         | AS-40F     |      | AS-50F     |      | AS/AH-40G  |      | AS/AH-50G  |      | AS/AH-63G  |      |
| Busbar dimensions(mm)   |         | 4EA-100×10 |      | 4EA-125×10 |      | 4EA-100×10 |      | 4EA-125×10 |      | 4EA-150×10 |      |
| Ventilated switchboard(IP31)<br><br>Area of outlet vents: 500cm <sup>2</sup><br>Area of inlet vents: 500cm <sup>2</sup> | Ta=35°C | 4          |      |            |      |            |      |            |      |            |      |
|   |         | 3          |      |            |      |            |      |            |      |            |      |
|   |         | 2          | 3900 | 4000       | 4750 | 4800       | 4000 | 4000       | 4750 | 5000       | 5850 |
|   |         | 1          |      |            |      |            |      |            |      |            |      |
|   | Ta=45°C | 4          |      |            |      |            |      |            |      |            |      |
|   |         | 3          |      |            |      |            |      |            |      |            |      |
|   |         | 2          | 3850 | 3900       | 4350 | 4650       | 4000 | 4000       | 4450 | 4850       | 5670 |
|   |         | 1          |      |            |      |            |      |            |      |            |      |
|   | Ta=55°C | 4          |      |            |      |            |      |            |      |            |      |
|   |         | 3          |      |            |      |            |      |            |      |            |      |
|   |         | 2          | 3800 | 3850       | 4200 | 4400       | 4000 | 4000       | 4200 | 4600       | 5350 |
|   |         | 1          |      |            |      |            |      |            |      |            |      |
| Non Ventilated switchboard(IP41/54)<br>  | Ta=35°C | 4          |      |            |      |            |      |            |      |            |      |
|   |         | 3          |      |            |      |            |      |            |      |            |      |
|   |         | 2          | 3800 | 3900       | 4200 | 4550       | 4000 | 4000       | 4400 | 4650       | 5290 |
|   |         | 1          |      |            |      |            |      |            |      |            |      |
|   | Ta=45°C | 4          |      |            |      |            |      |            |      |            |      |
|   |         | 3          |      |            |      |            |      |            |      |            |      |
|   |         | 2          | 3650 | 3800       | 3950 | 4250       | 4000 | 4000       | 4100 | 4400       | 5040 |
|   |         | 1          |      |            |      |            |      |            |      |            |      |
|   | Ta=55°C | 4          |      |            |      |            |      |            |      |            |      |
|   |         | 3          |      |            |      |            |      |            |      |            |      |
|   |         | 2          | 3550 | 3650       | 3700 | 4050       | 3900 | 3950       | 3850 | 4150       | 4730 |
|   |         | 1          |      |            |      |            |      |            |      |            |      |

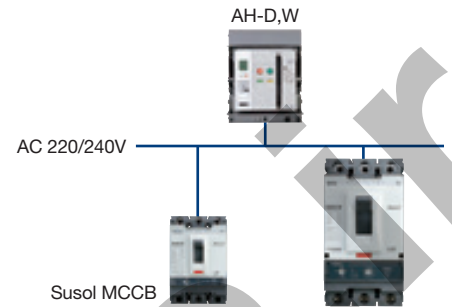
## Protective coordination

Rated voltage: AC 220/240V

Main breaker(Main ACB): Susol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Downstream breaker |                   | Upstream breaker                                  |     | Product type      | Susol AH series |   |        |     |     |        |     |        |        |        |        |
|--------------------|-------------------|---|-----|-------------------|-----------------|---|--------|-----|-----|--------|-----|--------|--------|--------|--------|
|                    |                   |   |     |                   | AH-D,W          |   |        |     |     |        |     |        |        |        |        |
|                    |                   |   |     |                   |                 |   | AH-06D |     |     | AH-08D |     | AH-10D | AH-13D | AH-16D | AH-20D |
|                    |                   |   |     | Rated current [A] |                 |   | 200    | 400 | 630 | 400    | 630 | 800    | 1000   | 1250   | 1600   |
|                    |                   | Short time delay trip current (Max. 10In) Is [kA] |     |                   | 2               | 4 | 6.3    | 4   | 6.3 | 8      | 10  | 12.5   | 16     | 20     |        |
| Model              | Rated current [A] | Ultimate breaking capacity Icu [kA]               | 85  |                   |                 |   |        |     |     |        |     |        |        |        |        |
| Susol MCCB         | TD100N            | 100   | 85  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD100H            | 100   | 100 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD100L            | 100   | 200 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD160N            | 160   | 85  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD160H            | 160   | 100 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD160L            | 160   | 200 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS100N            | 100   | 100 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS100H            | 100   | 120 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS100L            | 100   | 200 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS160N            | 160   | 100 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS160H            | 160   | 120 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS160L            | 160   | 200 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS250N            | 250   | 100 |                   | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS250H            | 250   | 120 |                   | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS250L            | 250   | 200 |                   | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS400N            | 400   | 100 |                   |                 | T |        | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS400H            | 400   | 120 |                   |                 | T |        | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS400L            | 400   | 200 |                   |                 | T |        | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS630N            | 630   | 100 |                   |                 |   |        |     | T   | T      | T   | T      | T      | T      |        |
|                    | TS630H            | 630   | 120 |                   |                 |   |        |     | T   | T      | T   | T      | T      | T      |        |
| TS630L             | 630               | 200   |     |                   |                 |   |        | T   | T   | T      | T   | T      | T      |        |        |
| TS800N             | 800               | 100   |     |                   |                 |   |        |     | T   | T      | T   | T      | T      |        |        |
| TS800H             | 800               | 120   |     |                   |                 |   |        |     | T   | T      | T   | T      | T      |        |        |
| TS800L             | 800               | 200   |     |                   |                 |   |        |     | T   | T      | T   | T      | T      |        |        |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, marked number is breaking capacity limit (Unit: kA) for protective coordination.  
 3. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

# Technical information

Susol

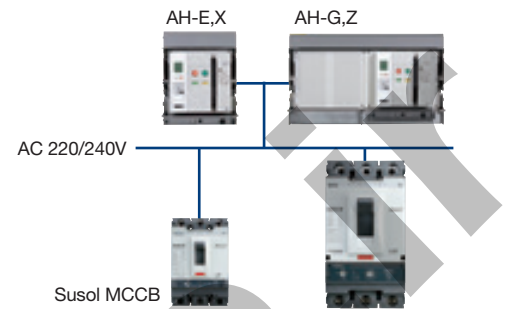
## Protective coordination

Rated voltage: AC 220/240V

Main breaker(Main ACB): Susol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Upstream breaker   |                   | Product type                                     | Susol AH series   |     |        |        |        |        |        |        |        |        |        |        |        |      |
|--------------------|-------------------|--|-------------------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|                    |                   |  | AH-E,X            |     |        |        |        |        |        |        |        |        |        | AH-G,Z |        |      |
|                    |                   |  | AH-06E            |     | AH-08E | AH-10E | AH-13E | AH-16E | AH-20E | AH-25E | AH-32E | AH-40E | AH-40G | AH-50G | AH-63G |      |
|                    |                   |  | Rated current [A] | 400 | 630    | 800    | 1000   | 1250   | 1600   | 2000   | 2500   | 3200   | 4000   | 4000   | 5000   | 6300 |
| Downstream breaker |                   | Short time delay trip current (Max. 10In) Is[kA] | 4                 | 6.3 | 8      | 10     | 12.5   | 16     | 20     | 25     | 32     | 40     | 40     | 50     | 63     |      |
|                    |                   |  | 100               |     |        |        |        |        |        |        |        |        |        | 150    |        |      |
| Model              | Rated current [A] | Ultimate breaking capacity Icu [kA]              |                   |     |        |        |        |        |        |        |        |        |        |        |        |      |
| Susol MCCB         | TD100N            | 100  | 85                | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD100H            | 100  | 100               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD100L            | 100  | 200               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD160N            | 160  | 85                | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD160H            | 160  | 100               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD160L            | 160  | 200               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS100N            | 100  | 100               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS100H            | 100  | 120               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS100L            | 100  | 200               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS160N            | 160  | 100               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS160H            | 160  | 120               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS160L            | 160  | 200               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS250N            | 250  | 100               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS250H            | 250  | 120               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS250L            | 250  | 200               | T   | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS400N            | 400  | 100               |     | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS400H            | 400  | 120               |     | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS400L            | 400  | 200               |     | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS630N            | 630  | 100               |     |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS630H            | 630  | 120               |     |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
| TS630L             | 630               | 200  |                   |     | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |
| TS800N             | 800               | 100  |                   |     |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |
| TS800H             | 800               | 120  |                   |     |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |
| TS800L             | 800               | 200  |                   |     |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, marked number is breaking capacity limit (Unit: kA) for protective coordination.  
 3. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.



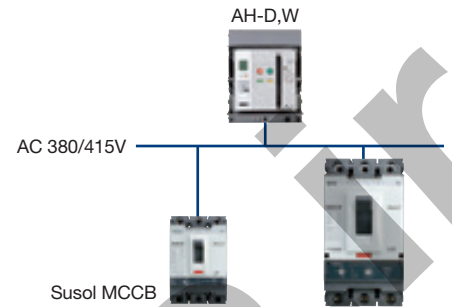
## Protective coordination

Rated voltage: AC 380/415V

Main breaker(Main ACB): Susol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Downstream breaker |                   | Upstream breaker                                  |     | Product type      | Susol AH series |   |        |     |     |        |     |        |        |        |        |
|--------------------|-------------------|---|-----|-------------------|-----------------|---|--------|-----|-----|--------|-----|--------|--------|--------|--------|
|                    |                   |   |     |                   | AH-D,W          |   |        |     |     |        |     |        |        |        |        |
|                    |                   |   |     |                   |                 |   | AH-06D |     |     | AH-08D |     | AH-10D | AH-13D | AH-16D | AH-20D |
|                    |                   |   |     | Rated current [A] |                 |   | 200    | 400 | 630 | 400    | 630 | 800    | 1000   | 1250   | 1600   |
|                    |                   | Short time delay trip current (Max. 10In) Is [kA] |     |                   | 2               | 4 | 6.3    | 4   | 6.3 | 8      | 10  | 12.5   | 16     | 20     |        |
| Model              | Rated current [A] | Ultimate breaking capacity Icu [kA]               | 85  |                   |                 |   |        |     |     |        |     |        |        |        |        |
| Susol MCCB         | TD100N            | 100   | 50  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD100H            | 100   | 85  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD100L            | 100   | 150 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD160N            | 160   | 50  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD160H            | 160   | 85  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TD160L            | 160   | 150 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS100N            | 100   | 50  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS100H            | 100   | 85  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS100L            | 100   | 150 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS160N            | 160   | 50  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS160H            | 160   | 85  | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS160L            | 160   | 150 | T                 | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS250N            | 250   | 50  |                   | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS250H            | 250   | 85  |                   | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS250L            | 250   | 150 |                   | T               | T | T      | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS400N            | 400   | 65  |                   |                 | T |        | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS400H            | 400   | 85  |                   |                 | T |        | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS400L            | 400   | 150 |                   |                 | T |        | T   | T   | T      | T   | T      | T      | T      |        |
|                    | TS630N            | 630   | 65  |                   |                 |   |        |     | T   | T      | T   | T      | T      | T      |        |
|                    | TS630H            | 630   | 85  |                   |                 |   |        |     | T   | T      | T   | T      | T      | T      |        |
| TS630L             | 630               | 150   |     |                   |                 |   |        | T   | T   | T      | T   | T      | T      |        |        |
| TS800N             | 800               | 65  |     |                   |                 |   |        |     | T   | T      | T   | T      | T      |        |        |
| TS800H             | 800               | 100   |     |                   |                 |   |        |     | T   | T      | T   | T      | T      |        |        |
| TS800L             | 800               | 150   |     |                   |                 |   |        |     | T   | T      | T   | T      | T      |        |        |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, marked number is breaking capacity limit (Unit: kA) for protective coordination.  
 3. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

# Technical information

Susol

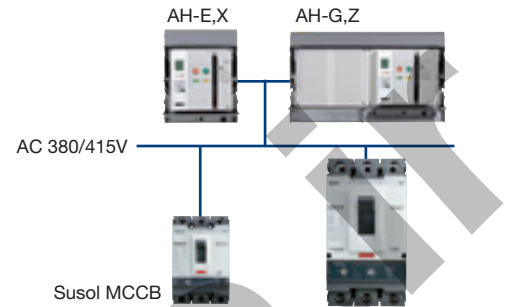
## Protective coordination

Rated voltage: AC 380/415V

Main breaker(Main ACB): Susol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Upstream breaker   |  | Product type                        | Susol AH series |        |        |        |        |        |        |        |        |        |        |        |      |
|--------------------|--|-------------------------------------|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|                    |  |                                     | AH-E,X          |        |        |        |        |        |        |        |        |        | AH-G,Z |        |      |
|                    |  |                                     | AH-06E          | AH-08E | AH-10E | AH-13E | AH-16E | AH-20E | AH-25E | AH-32E | AH-40E | AH-40G | AH-50G | AH-63G |      |
| Downstream breaker | Rated current [A]                                |                                     | 400             | 630    | 800    | 1000   | 1250   | 1600   | 2000   | 2500   | 3200   | 4000   | 4000   | 5000   | 6300 |
|                    | Short time delay trip current (Max. 10In) Is[kA] |                                     | 4               | 6.3    | 8      | 10     | 12.5   | 16     | 20     | 25     | 32     | 40     | 40     | 50     | 63   |
| Model              | Rated current [A]                                | Ultimate breaking capacity Icu [kA] | 100             |        |        |        |        |        |        |        |        |        | 150    |        |      |
| Susol MCCB         | TD100N   | 100                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD100H   | 100                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD100L   | 100                                 | 150             | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD160N   | 160                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD160H   | 160                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TD160L   | 160                                 | 150             | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS100N   | 100                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS100H   | 100                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS100L   | 100                                 | 150             | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS160N   | 160                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS160H   | 160                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS160L   | 160                                 | 150             | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS250N   | 250                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS250H   | 250                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS250L   | 250                                 | 150             | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS400N   | 400                                 | 65              |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS400H   | 400                                 | 85              |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS400L   | 400                                 | 150             |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS630N   | 630                                 | 65              |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
|                    | TS630H   | 630                                 | 85              |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T    |
| TS630L             | 630  | 150                                 |                 |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |
| TS800N             | 800  | 65                                  |                 |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |
| TS800H             | 800  | 100                                 |                 |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |
| TS800L             | 800  | 150                                 |                 |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      |      |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, marked number is breaking capacity limit (Unit: kA) for protective coordination.  
 3. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

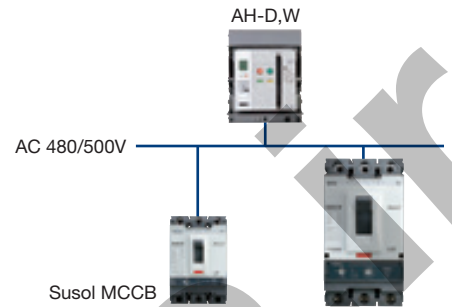
## Protective coordination

Rated voltage: AC 480/500V

Main breaker(Main ACB): Susol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Downstream breaker |        | Upstream breaker |    | Product type                                      | Susol AH series   |                   |     |     |        |     |        |        |        |        |
|--------------------|--------|------------------|----|---|-------------------|-------------------|-----|-----|--------|-----|--------|--------|--------|--------|
|                    |        |                  |    |   | AH-D,W            |                   |     |     |        |     |        |        |        |        |
|                    |        |                  |    |   |                   | AH-06D            |     |     | AH-08D |     | AH-10D | AH-13D | AH-16D | AH-20D |
|                    |        |                  |    | Model   | Rated current [A] | Rated current [A] | 200 | 400 | 630    | 400 | 630    | 800    | 1000   | 1250   |
|                    |        |                  |    | Short time delay trip current (Max. 10In) Is [kA] | 2                 | 4                 | 6.3 | 4   | 6.3    | 8   | 10     | 12.5   | 16     | 20     |
|                    |        |                  |    | Ultimate breaking capacity Icu [kA]               | 85                |                   |     |     |        |     |        |        |        |        |
| Susol MCCB         | TD100N | 100              | 30 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TD100H | 100              | 50 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TD100L | 100              | 65 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TD160N | 160              | 30 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TD160H | 160              | 50 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TD160L | 160              | 65 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS100N | 100              | 42 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS100H | 100              | 65 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS100L | 100              | 85 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS160N | 160              | 42 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS160H | 160              | 65 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS160L | 160              | 85 | T   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS250N | 250              | 42 |   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS250H | 250              | 65 |   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS250L | 250              | 85 |   | T                 | T                 | T   | T   | T      | T   | T      | T      | T      | T      |
|                    | TS400N | 400              | 42 |   |                   | T                 |     | T   | T      | T   | T      | T      | T      | T      |
|                    | TS400H | 400              | 65 |   |                   | T                 |     | T   | T      | T   | T      | T      | T      | T      |
|                    | TS400L | 400              | 85 |   |                   | T                 |     | T   | T      | T   | T      | T      | T      | T      |
| TS630N             | 630    | 42               |    |   |                   |                   |     | T   | T      | T   | T      | T      |        |        |
| TS630H             | 630    | 65               |    |   |                   |                   |     | T   | T      | T   | T      | T      |        |        |
| TS630L             | 630    | 85               |    |   |                   |                   |     | T   | T      | T   | T      | T      |        |        |
| TS800N             | 800    | 42               |    |   |                   |                   |     |     | T      | T   | T      | T      |        |        |
| TS800H             | 800    | 85               |    |   |                   |                   |     |     | T      | T   | T      | T      |        |        |
| TS800L             | 800    | 100              |    |   |                   |                   |     |     | T      | T   | T      | T      |        |        |

Note) 1. On table, protective coordination is not available for areas where number is missing.

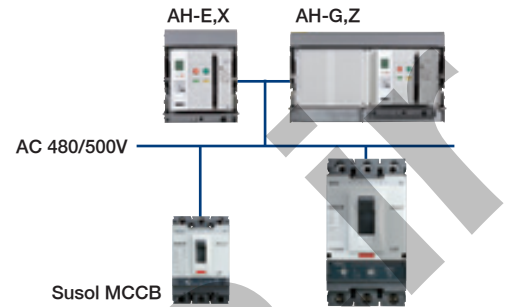
2. On table, marked number is breaking capacity limit (Unit: kA) for protective coordination.

3. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

# Technical information

Susol

## Protective coordination



Rated voltage: AC 480/500V

Main breaker(Main ACB): Susol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.

| Upstream breaker   |  | Product type                        | Susol AH series |        |        |        |        |        |        |        |        |        |        |        |   |
|--------------------|--|-------------------------------------|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|
|                    |  |                                     | AH-E,X          |        |        |        |        |        |        |        |        |        | AH-G,Z |        |   |
|                    |  |                                     | AH-06E          | AH-08E | AH-10E | AH-13E | AH-16E | AH-20E | AH-25E | AH-32E | AH-40E | AH-40G | AH-50G | AH-63G |   |
| Downstream breaker | Rated current [A]                                | 400                                 | 630             | 800    | 1000   | 1250   | 1600   | 2000   | 2500   | 3200   | 4000   | 4000   | 5000   | 6300   |   |
|                    | Short time delay trip current (Max. 10In) Is[kA] | 4                                   | 6.3             | 8      | 10     | 12.5   | 16     | 20     | 25     | 32     | 40     | 40     | 50     | 63     |   |
| Model              | Rated current [A]                                | Ultimate breaking capacity Icu [kA] | 100             |        |        |        |        |        |        |        |        |        | 150    |        |   |
| Susol MCCB         | TD100N   | 100                                 | 30              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TD100H   | 100                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TD100L   | 100                                 | 65              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TD160N   | 160                                 | 30              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TD160H   | 160                                 | 50              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TD160L   | 160                                 | 65              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS100N   | 100                                 | 42              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS100H   | 100                                 | 65              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS100L   | 100                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS160N   | 160                                 | 42              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS160H   | 160                                 | 65              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS160L   | 160                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS250N   | 250                                 | 42              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS250H   | 250                                 | 65              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS250L   | 250                                 | 85              | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS400N   | 400                                 | 42              |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS400H   | 400                                 | 65              |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS400L   | 400                                 | 85              |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS630N   | 630                                 | 42              |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
|                    | TS630H   | 630                                 | 65              |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T |
| TS630L             | 630  | 85                                  |                 |        | T      | T      | T      | T      | T      | T      | T      | T      | T      | T      |   |
| TS800N             | 800  | 42                                  |                 |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      |   |
| TS800H             | 800  | 85                                  |                 |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      |   |
| TS800L             | 800  | 100                                 |                 |        |        | T      | T      | T      | T      | T      | T      | T      | T      | T      |   |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, marked number is breaking capacity limit (Unit: kA) for protective coordination.  
 3. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

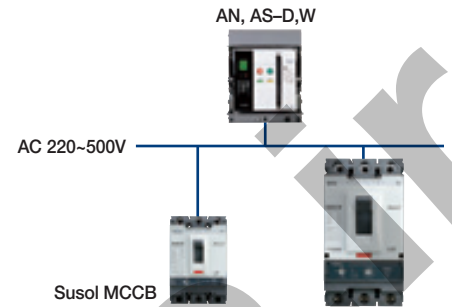
## Protective coordination

Rated voltage: AC 220~500V

Main breaker(Main ACB): Metasol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Upstream breaker   |  | Product type                        | Metasol AN, AS series |     |     |            |     |      |            |            |            |            |            |        |   |
|--------------------|--|-------------------------------------|-----------------------|-----|-----|------------|-----|------|------------|------------|------------|------------|------------|--------|---|
|                    |  |                                     | AN, AS-D,W            |     |     |            |     |      |            |            |            |            | AS-F,Y     |        |   |
|                    |  |                                     | AN, AS-06D            |     |     | AN, AS-06D |     |      | AN, AS-10D | AN, AS-13D | AN, AS-13D | AN, AS-16D | AS-40F     | AS-50F |   |
| Downstream breaker | Rated current [A]                                | 200                                 | 400                   | 630 | 400 | 630        | 800 | 1000 | 1250       | 1600       | 2000       | 4000       | 5000       |        |   |
|                    | Short time delay trip current (Max. 10In) Is[kA] | 2                                   | 4                     | 6.3 | 4   | 6.3        | 8   | 10   | 12.5       | 16         | 20         | 40         | 50         |        |   |
| Model              | Rated current [A]                                | Ultimate breaking capacity Icu [kA] | AN : 65kA / AS : 70kA |     |     |            |     |      |            |            |            |            | AS : 100kA |        |   |
| Susol MCCB         | TD100N   | 100                                 | 85                    | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TD100H   | 100                                 | 100                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TD100L   | 100                                 | 200                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TD160N   | 160                                 | 85                    | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TD160H   | 160                                 | 100                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TD160L   | 160                                 | 200                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS100N   | 100                                 | 100                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS100H   | 100                                 | 120                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS100L   | 100                                 | 200                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS160N   | 160                                 | 100                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS160H   | 160                                 | 120                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS160L   | 160                                 | 200                   | T   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS250N   | 250                                 | 100                   | -   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS250H   | 250                                 | 120                   | -   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS250L   | 250                                 | 200                   | -   | T   | T          | T   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS400N   | 400                                 | 100                   | -   | -   | T          | -   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS400H   | 400                                 | 120                   | -   | -   | T          | -   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS400L   | 400                                 | 200                   | -   | -   | T          | -   | T    | T          | T          | T          | T          | T          | T      | T |
|                    | TS630N   | 630                                 | 100                   | -   | -   | -          | -   | -    | T          | T          | T          | T          | T          | T      | T |
|                    | TS630H   | 630                                 | 120                   | -   | -   | -          | -   | -    | T          | T          | T          | T          | T          | T      | T |
| TS630L             | 630  | 200                                 | -                     | -   | -   | -          | -   | T    | T          | T          | T          | T          | T          | T      |   |
| TS800N             | 800  | 100                                 | -                     | -   | -   | -          | -   | -    | T          | T          | T          | T          | T          | T      |   |
| TS800H             | 800  | 120                                 | -                     | -   | -   | -          | -   | -    | T          | T          | T          | T          | T          | T      |   |
| TS800L             | 800  | 200                                 | -                     | -   | -   | -          | -   | -    | T          | T          | T          | T          | T          | T      |   |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

# Technical information

Metasol

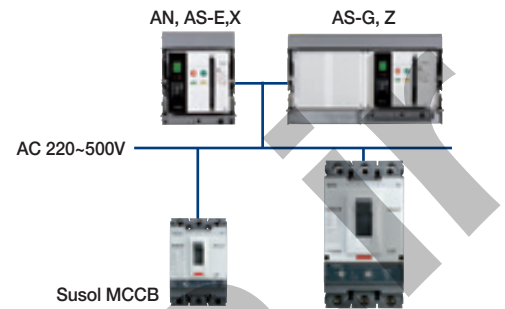
## Protective coordination

Rated voltage: AC 220~500V

Main breaker(Main ACB): Metasol ACB

Downstream breaker(Downstream MCCB): Susol MCCB TD/TS series

Below protective coordination table is based on ACB equipped with OCR under arrangement of short time delay trip current as 10 times of rated current.



| Upstream breaker   |  | Product type                        | Metasol AN, AS series |     |        |        |        |        |            |            |            |        |           |        |        |   |
|--------------------|--|-------------------------------------|-----------------------|-----|--------|--------|--------|--------|------------|------------|------------|--------|-----------|--------|--------|---|
|                    |  |                                     | AN, AS-E,X            |     |        |        |        |        |            |            |            |        | AS-G,Z    |        |        |   |
|                    |  |                                     | AS-06E                |     | AS-08E | AS-10E | AS-13E | AS-16E | AN, AS-20E | AN, AS-25E | AN, AS-32E | AS-40E | AS-40G    | AS-50G | AS-63G |   |
| Downstream breaker | Rated current [A]                                | 400                                 | 630                   | 800 | 1000   | 1250   | 1600   | 2000   | 2500       | 3200       | 4000       | 4000   | 5000      | 6300   |        |   |
|                    | Short time delay trip current (Max. 10In) Is[kA] | 4                                   | 6.3                   | 8   | 10     | 12.5   | 16     | 20     | 25         | 32         | 40         | 40     | 50        | 63     |        |   |
| Model              | Rated current [A]                                | Ultimate breaking capacity Icu [kA] | AN: 70kA / AS: 85kA   |     |        |        |        |        |            |            |            |        | AS: 120kA |        |        |   |
| Susol MCCB         | TD100N   | 100                                 | 85                    | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TD100H   | 100                                 | 100                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TD100L   | 100                                 | 200                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TD160N   | 160                                 | 85                    | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TD160H   | 160                                 | 100                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TD160L   | 160                                 | 200                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS100N   | 100                                 | 100                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS100H   | 100                                 | 120                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS100L   | 100                                 | 200                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS160N   | 160                                 | 100                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS160H   | 160                                 | 120                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS160L   | 160                                 | 200                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS250N   | 250                                 | 100                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS250H   | 250                                 | 120                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS250L   | 250                                 | 200                   | T   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS400N   | 400                                 | 100                   | -   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS400H   | 400                                 | 120                   | -   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS400L   | 400                                 | 200                   | -   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS630N   | 630                                 | 100                   | -   | -      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
|                    | TS630H   | 630                                 | 120                   | -   | -      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      | T |
| TS630L             | 630  | 200                                 | -                     | -   | T      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      |   |
| TS800N             | 800  | 100                                 | -                     | -   | -      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      |   |
| TS800H             | 800  | 120                                 | -                     | -   | -      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      |   |
| TS800L             | 800  | 200                                 | -                     | -   | -      | T      | T      | T      | T          | T          | T          | T      | T         | T      | T      |   |

Note) 1. On table, protective coordination is not available for areas where number is missing.  
 2. On table, areas that is marked as T are capable of total discrimination up to its Downstream breaker's rated short breaking capacity.

# Standards & Approval

Susol · Metasol



## AH, AS, AN series Air Circuit Breakers comply with the following international standard;

### IEC 60947-1

Low-voltage switchgear and controlgear  
- Part 1: General rules

### IEC 60947-2

Low-voltage switchgear and controlgear  
- Part 2: Circuit-breakers

The following certificates are available on a request.

- CE Declaration of conformity
- Certificate of conformance test (CB) - IEC 60947
- Full type test report issued by KEMA
- Letter of origin
- Taiwan TPC

## CE conformity marking

The CE conformity marking shall indicate conformity to all the obligations imposed on the manufacturer, as regards his products, by virtue of the European Community directives providing for the affixing of the CE marking.

When the CE marking is affixed on a product, it represents a declaration of the manufacturer or of his authorized representative that the product in question conforms to all the applicable provisions including the conformity assessment procedures. This prevents the Member States from limiting the marketing and putting into service of products bearing the CE marking, unless this measure is justified by the proved non-conformity of the product.

## IECEE CB SCHEME

The IECEE CB Scheme is the world's first truly international system for acceptance of test reports dealing with the safety of electrical and electronic products. It is a multilateral agreement among participating countries and certification organizations. A manufacturer utilizing a CB test report issued by one of these organizations can obtain national certification in all other member countries of the CB Scheme.

The Scheme is based on the use of international (IEC) Standards. If some members' national standards are not yet completely harmonized with IEC Standards, national differences are permitted if clearly declared to all other members. The CB Scheme utilizes CB Test Certificates to attest that product samples have successfully passed the appropriate tests and are in compliance with the requirements of the relevant IEC Standard and with the declared national differences of various member countries.

The main objective of the Scheme, is to facilitate trade by promoting harmonization of the national standards with international Standards and cooperation among product certifiers worldwide in order to bring product manufacturers a step closer to the ideal concept of 'one product, one test, one mark, where applicable'.

- LR, ABS, DNV, KR, BV, GL, RINA, NK
- GOST, TPC



# Time chart

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## Long time

| xlr  | tr    | 0.5    | 1      | 2      | 4      | 8       | 12      | 16      | 20 |
|------|-------|--------|--------|--------|--------|---------|---------|---------|----|
| 1.11 | 58806 | 117611 | 235223 | 470445 | 940890 | 1411335 | 1881780 | 2352225 |    |
| 1.15 | 36041 | 72082  | 144163 | 288326 | 576652 | 864978  | 1153305 | 1441631 |    |
| 1.20 | 26827 | 53654  | 107308 | 214615 | 429231 | 643846  | 858461  | 1073077 |    |
| 1.25 | 21777 | 43553  | 87106  | 174212 | 348424 | 522636  | 696848  | 871060  |    |
| 1.30 | 18408 | 36817  | 73634  | 147268 | 294535 | 441803  | 589071  | 736338  |    |
| 1.35 | 15947 | 31895  | 63789  | 127579 | 255157 | 382736  | 510314  | 637893  |    |
| 1.40 | 14049 | 28098  | 56197  | 112393 | 224787 | 337180  | 449573  | 561967  |    |
| 1.45 | 12532 | 25063  | 50126  | 100252 | 200504 | 300756  | 401009  | 501261  |    |
| 1.50 | 11286 | 22573  | 45145  | 90290  | 180580 | 270870  | 361160  | 451450  |    |
| 1.55 | 10244 | 20488  | 40977  | 81954  | 163907 | 245861  | 327814  | 409768  |    |
| 1.60 | 9359  | 18717  | 37434  | 74869  | 149737 | 224606  | 299474  | 374343  |    |
| 1.65 | 8596  | 17193  | 34386  | 68771  | 137542 | 206313  | 275084  | 343855  |    |
| 1.70 | 7934  | 15867  | 31734  | 63468  | 126936 | 190404  | 253873  | 317341  |    |
| 1.75 | 7352  | 14704  | 29408  | 58815  | 117631 | 176446  | 235261  | 294077  |    |
| 1.80 | 6838  | 13675  | 27351  | 54702  | 109404 | 164106  | 218808  | 273509  |    |
| 1.85 | 6380  | 12760  | 25521  | 51041  | 102082 | 153123  | 204164  | 255205  |    |
| 1.90 | 5970  | 11941  | 23882  | 47764  | 95528  | 143292  | 191056  | 238820  |    |
| 1.95 | 5602  | 11204  | 22408  | 44815  | 89630  | 134446  | 179261  | 224076  |    |
| 2.00 | 5269  | 10537  | 21075  | 42150  | 84299  | 126449  | 168598  | 210748  |    |
| 2.05 | 4966  | 9932   | 19865  | 39730  | 79459  | 119189  | 158919  | 198649  |    |
| 2.10 | 4691  | 9381   | 18762  | 37525  | 75049  | 112574  | 150099  | 187623  |    |
| 2.15 | 4439  | 8877   | 17754  | 35508  | 71017  | 106525  | 142034  | 177542  |    |
| 2.20 | 4207  | 8415   | 16829  | 33659  | 67318  | 100976  | 134635  | 168294  |    |
| 2.25 | 3995  | 7989   | 15979  | 31957  | 63914  | 95871   | 127829  | 159786  |    |
| 2.30 | 3798  | 7597   | 15194  | 30387  | 60775  | 91162   | 121550  | 151937  |    |
| 2.35 | 3617  | 7234   | 14468  | 28936  | 57871  | 86807   | 115742  | 144678  |    |
| 2.40 | 3449  | 6897   | 13795  | 27590  | 55180  | 82769   | 110359  | 137949  |    |
| 2.45 | 3292  | 6585   | 13170  | 26339  | 52679  | 79018   | 105358  | 131697  |    |
| 2.50 | 3147  | 6294   | 12588  | 25176  | 50351  | 75527   | 100702  | 125878  |    |
| 2.55 | 3011  | 6022   | 12045  | 24090  | 48180  | 72269   | 96359   | 120449  |    |
| 2.60 | 2884  | 5769   | 11538  | 23075  | 46151  | 69226   | 92301   | 115377  |    |
| 2.65 | 2766  | 5531   | 11063  | 22126  | 44251  | 66377   | 88503   | 110628  |    |
| 2.70 | 2654  | 5309   | 10618  | 21235  | 42471  | 63706   | 84941   | 106177  |    |
| 2.75 | 2550  | 5100   | 10200  | 20399  | 40799  | 61198   | 81597   | 101997  |    |
| 2.80 | 2452  | 4903   | 9807   | 19613  | 39226  | 58840   | 78453   | 98066   |    |
| 2.85 | 2359  | 4718   | 9436   | 18873  | 37746  | 56619   | 75491   | 94364   |    |
| 2.90 | 2272  | 4544   | 9087   | 18175  | 36350  | 54524   | 72699   | 90874   |    |
| 2.95 | 2189  | 4379   | 8758   | 17516  | 35032  | 52547   | 70063   | 87579   |    |
| 3.00 | 2112  | 4223   | 8446   | 16893  | 33786  | 50679   | 67572   | 84464   |    |
| 3.05 | 2038  | 4076   | 8152   | 16303  | 32607  | 48910   | 65214   | 81517   |    |
| 3.10 | 1968  | 3936   | 7872   | 15745  | 31490  | 47235   | 62980   | 78725   |    |
| 3.15 | 1902  | 3804   | 7608   | 15215  | 30431  | 45646   | 60862   | 76077   |    |
| 3.20 | 1839  | 3678   | 7356   | 14713  | 29425  | 44138   | 58851   | 73563   |    |
| 3.25 | 1779  | 3559   | 7117   | 14235  | 28470  | 42705   | 56940   | 71175   |    |
| 3.30 | 1723  | 3445   | 6890   | 13781  | 27561  | 41342   | 55122   | 68903   |    |
| 3.35 | 1669  | 3337   | 6674   | 13348  | 26696  | 40044   | 53392   | 66741   |    |
| 3.40 | 1617  | 3234   | 6468   | 12936  | 25872  | 38808   | 51744   | 64680   |    |
| 3.45 | 1568  | 3136   | 6272   | 12543  | 25086  | 37629   | 50172   | 62715   |    |
| 3.50 | 1521  | 3042   | 6084   | 12168  | 24336  | 36504   | 48672   | 60841   |    |
| 3.55 | 1476  | 2952   | 5905   | 11810  | 23620  | 35430   | 47240   | 59050   |    |
| 3.60 | 1433  | 2867   | 5734   | 11468  | 22935  | 34403   | 45871   | 57338   |    |
| 3.65 | 1393  | 2785   | 5570   | 11140  | 22281  | 33421   | 44561   | 55702   |    |
| 3.70 | 1353  | 2707   | 5413   | 10827  | 21654  | 32481   | 43308   | 54135   |    |
| 3.75 | 1316  | 2632   | 5263   | 10527  | 21054  | 31581   | 42108   | 52634   |    |
| 3.80 | 1280  | 2560   | 5120   | 10239  | 20479  | 30718   | 40957   | 51196   |    |
| 3.85 | 1245  | 2491   | 4982   | 9963   | 19927  | 29890   | 39854   | 49817   |    |
| 3.90 | 1212  | 2425   | 4849   | 9699   | 19398  | 29096   | 38795   | 48494   |    |

| xlr  | tr   | 0.5  | 1    | 2    | 4     | 8     | 12    | 16    | 20 |
|------|------|------|------|------|-------|-------|-------|-------|----|
| 3.95 | 1181 | 2361 | 4722 | 9445 | 18889 | 28334 | 37779 | 47223 |    |
| 4.00 | 1150 | 2300 | 4600 | 9201 | 18401 | 27602 | 36802 | 46003 |    |
| 4.05 | 1121 | 2241 | 4483 | 8966 | 17932 | 26898 | 35864 | 44830 |    |
| 4.10 | 1093 | 2185 | 4370 | 8740 | 17481 | 26221 | 34961 | 43701 |    |
| 4.15 | 1065 | 2131 | 4262 | 8523 | 17046 | 25569 | 34092 | 42615 |    |
| 4.20 | 1039 | 2079 | 4157 | 8314 | 16628 | 24942 | 33256 | 41570 |    |
| 4.25 | 1014 | 2028 | 4056 | 8113 | 16225 | 24338 | 32451 | 40563 |    |
| 4.30 | 990  | 1980 | 3959 | 7919 | 15837 | 23756 | 31674 | 39593 |    |
| 4.35 | 966  | 1933 | 3866 | 7731 | 15463 | 23194 | 30926 | 38657 |    |
| 4.40 | 944  | 1888 | 3776 | 7551 | 15102 | 22653 | 30204 | 37755 |    |
| 4.45 | 922  | 1844 | 3688 | 7377 | 14754 | 22131 | 29507 | 36884 |    |
| 4.50 | 901  | 1802 | 3604 | 7209 | 14417 | 21626 | 28835 | 36043 |    |
| 4.55 | 881  | 1762 | 3523 | 7046 | 14093 | 21139 | 28185 | 35231 |    |
| 4.60 | 861  | 1722 | 3445 | 6889 | 13779 | 20668 | 27557 | 34447 |    |
| 4.65 | 842  | 1684 | 3369 | 6738 | 13475 | 20213 | 26951 | 33688 |    |
| 4.70 | 824  | 1648 | 3295 | 6591 | 13182 | 19773 | 26364 | 32955 |    |
| 4.75 | 806  | 1612 | 3225 | 6449 | 12898 | 19347 | 25796 | 32245 |    |
| 4.80 | 789  | 1578 | 3156 | 6312 | 12624 | 18935 | 25247 | 31559 |    |
| 4.85 | 772  | 1545 | 3089 | 6179 | 12358 | 18536 | 24715 | 30894 |    |
| 4.90 | 756  | 1513 | 3025 | 6050 | 12100 | 18150 | 24200 | 30250 |    |
| 4.95 | 741  | 1481 | 2963 | 5925 | 11851 | 17776 | 23701 | 29627 |    |
| 5.00 | 726  | 1451 | 2902 | 5804 | 11609 | 17413 | 23218 | 29022 |    |
| 5.05 | 711  | 1422 | 2844 | 5687 | 11374 | 17062 | 22749 | 28436 |    |
| 5.10 | 697  | 1393 | 2787 | 5574 | 11147 | 16721 | 22294 | 27868 |    |
| 5.15 | 683  | 1366 | 2732 | 5463 | 10927 | 16390 | 21853 | 27317 |    |
| 5.20 | 670  | 1339 | 2678 | 5356 | 10713 | 16069 | 21425 | 26782 |    |
| 5.25 | 657  | 1313 | 2626 | 5252 | 10505 | 15757 | 21010 | 26262 |    |
| 5.30 | 644  | 1288 | 2576 | 5152 | 10303 | 15455 | 20607 | 25758 |    |
| 5.35 | 632  | 1263 | 2527 | 5054 | 10107 | 15161 | 20215 | 25268 |    |
| 5.40 | 620  | 1240 | 2479 | 4959 | 9917  | 14876 | 19834 | 24793 |    |
| 5.45 | 608  | 1217 | 2433 | 4866 | 9732  | 14598 | 19464 | 24330 |    |
| 5.50 | 597  | 1194 | 2388 | 4776 | 9552  | 14329 | 19105 | 23881 |    |
| 5.55 | 586  | 1172 | 2344 | 4689 | 9378  | 14066 | 18755 | 23444 |    |
| 5.60 | 575  | 1151 | 2302 | 4604 | 9207  | 13811 | 18415 | 23019 |    |
| 5.65 | 565  | 1130 | 2261 | 4521 | 9042  | 13563 | 18084 | 22605 |    |
| 5.70 | 555  | 1110 | 2220 | 4441 | 8881  | 13322 | 17762 | 22203 |    |
| 5.75 | 545  | 1091 | 2181 | 4362 | 8724  | 13087 | 17449 | 21811 |    |
| 5.80 | 536  | 1071 | 2143 | 4286 | 8572  | 12858 | 17144 | 21430 |    |
| 5.85 | 526  | 1053 | 2106 | 4212 | 8423  | 12635 | 16847 | 21058 |    |
| 5.90 | 517  | 1035 | 2070 | 4139 | 8279  | 12418 | 16557 | 20697 |    |
| 5.95 | 509  | 1017 | 2034 | 4069 | 8138  | 12206 | 16275 | 20344 |    |
| 6.00 | 500  | 1000 | 2000 | 4000 | 8000  | 12000 | 16000 | 20001 |    |
| 6.05 | 492  | 983  | 1967 | 3933 | 7866  | 11799 | 15733 | 19666 |    |
| 6.10 | 483  | 967  | 1934 | 3868 | 7736  | 11604 | 15471 | 19339 |    |
| 6.15 | 476  | 951  | 1902 | 3804 | 7608  | 11413 | 15217 | 19021 |    |
| 6.20 | 468  | 936  | 1871 | 3742 | 7484  | 11226 | 14968 | 18710 |    |
| 6.25 | 460  | 920  | 1841 | 3682 | 7363  | 11045 | 14726 | 18408 |    |
| 6.30 | 453  | 906  | 1811 | 3622 | 7245  | 10867 | 14490 | 18112 |    |
| 6.35 | 446  | 891  | 1782 | 3565 | 7129  | 10694 | 14259 | 17823 |    |
| 6.40 | 439  | 877  | 1754 | 3508 | 7017  | 10525 | 14034 | 17542 |    |
| 6.45 | 432  | 863  | 1727 | 3453 | 6907  | 10360 | 13814 | 17267 |    |
| 6.50 | 425  | 850  | 1700 | 3400 | 6799  | 10199 | 13599 | 16998 |    |
| 6.55 | 418  | 837  | 1674 | 3347 | 6694  | 10042 | 13389 | 16736 |    |
| 6.60 | 412  | 824  | 1648 | 3296 | 6592  | 9888  | 13184 | 16480 |    |
| 6.65 | 406  | 811  | 1623 | 3246 | 6492  | 9738  | 12984 | 16230 |    |
| 6.70 | 400  | 799  | 1598 | 3197 | 6394  | 9591  | 12788 | 15985 |    |
| 6.75 | 394  | 787  | 1575 | 3149 | 6298  | 9447  | 12597 | 15746 |    |



| x <sub>lr</sub> \ tr | 0.5 | 1   | 2    | 4    | 8    | 12   | 16    | 20    |
|----------------------|-----|-----|------|------|------|------|-------|-------|
| 6.80                 | 388 | 776 | 1551 | 3102 | 6205 | 9307 | 12410 | 15512 |
| 6.85                 | 382 | 764 | 1528 | 3057 | 6113 | 9170 | 12227 | 15283 |
| 6.90                 | 376 | 753 | 1506 | 3012 | 6024 | 9036 | 12048 | 15060 |
| 6.95                 | 371 | 742 | 1484 | 2968 | 5936 | 8905 | 11873 | 14841 |
| 7.00                 | 366 | 731 | 1463 | 2925 | 5851 | 8776 | 11702 | 14627 |
| 7.05                 | 360 | 721 | 1442 | 2884 | 5767 | 8651 | 11534 | 14418 |
| 7.10                 | 355 | 711 | 1421 | 2843 | 5685 | 8528 | 11371 | 14213 |
| 7.15                 | 350 | 701 | 1401 | 2803 | 5605 | 8408 | 11210 | 14013 |
| 7.20                 | 345 | 691 | 1382 | 2763 | 5527 | 8290 | 11053 | 13816 |
| 7.25                 | 341 | 681 | 1362 | 2725 | 5450 | 8175 | 10899 | 13624 |
| 7.30                 | 336 | 672 | 1344 | 2687 | 5374 | 8062 | 10749 | 13436 |
| 7.35                 | 331 | 663 | 1325 | 2650 | 5301 | 7951 | 10601 | 13252 |
| 7.40                 | 327 | 654 | 1307 | 2614 | 5229 | 7843 | 10457 | 13071 |
| 7.45                 | 322 | 645 | 1289 | 2579 | 5158 | 7737 | 10316 | 12895 |
| 7.50                 | 318 | 636 | 1272 | 2544 | 5089 | 7633 | 10177 | 12721 |
| 7.55                 | 314 | 628 | 1255 | 2510 | 5021 | 7531 | 10041 | 12552 |
| 7.60                 | 310 | 619 | 1239 | 2477 | 4954 | 7431 | 9908  | 12385 |
| 7.65                 | 306 | 611 | 1222 | 2444 | 4889 | 7333 | 9778  | 12222 |
| 7.70                 | 302 | 603 | 1206 | 2412 | 4825 | 7237 | 9650  | 12062 |
| 7.75                 | 298 | 595 | 1191 | 2381 | 4762 | 7143 | 9524  | 11906 |
| 7.80                 | 294 | 588 | 1175 | 2350 | 4701 | 7051 | 9401  | 11752 |
| 7.85                 | 290 | 580 | 1160 | 2320 | 4640 | 6961 | 9281  | 11601 |
| 7.90                 | 286 | 573 | 1145 | 2291 | 4581 | 6872 | 9163  | 11453 |
| 7.95                 | 283 | 565 | 1131 | 2262 | 4523 | 6785 | 9047  | 11308 |
| 8.00                 | 279 | 558 | 1117 | 2233 | 4466 | 6700 | 8933  | 11166 |
| 8.05                 | 276 | 551 | 1103 | 2205 | 4411 | 6616 | 8821  | 11026 |
| 8.10                 | 272 | 544 | 1089 | 2178 | 4356 | 6534 | 8712  | 10889 |
| 8.15                 | 269 | 538 | 1076 | 2151 | 4302 | 6453 | 8604  | 10755 |
| 8.20                 | 266 | 531 | 1062 | 2125 | 4249 | 6374 | 8498  | 10623 |
| 8.25                 | 262 | 525 | 1049 | 2099 | 4197 | 6296 | 8395  | 10494 |
| 8.30                 | 259 | 518 | 1037 | 2073 | 4147 | 6220 | 8293  | 10366 |
| 8.35                 | 256 | 512 | 1024 | 2048 | 4097 | 6145 | 8193  | 10242 |
| 8.40                 | 253 | 506 | 1012 | 2024 | 4048 | 6071 | 8095  | 10119 |
| 8.45                 | 250 | 500 | 1000 | 2000 | 3999 | 5999 | 7999  | 9998  |
| 8.50                 | 247 | 494 | 988  | 1976 | 3952 | 5928 | 7904  | 9880  |
| 8.55                 | 244 | 488 | 976  | 1953 | 3906 | 5858 | 7811  | 9764  |
| 8.60                 | 241 | 482 | 965  | 1930 | 3860 | 5790 | 7720  | 9650  |
| 8.65                 | 238 | 477 | 954  | 1908 | 3815 | 5723 | 7630  | 9538  |
| 8.70                 | 236 | 471 | 943  | 1886 | 3771 | 5657 | 7542  | 9428  |
| 8.75                 | 233 | 466 | 932  | 1864 | 3728 | 5592 | 7455  | 9319  |
| 8.80                 | 230 | 461 | 921  | 1843 | 3685 | 5528 | 7370  | 9213  |
| 8.85                 | 228 | 455 | 911  | 1822 | 3643 | 5465 | 7287  | 9108  |
| 8.90                 | 225 | 450 | 901  | 1801 | 3602 | 5403 | 7204  | 9005  |
| 8.95                 | 223 | 445 | 890  | 1781 | 3562 | 5343 | 7123  | 8904  |
| 9.00                 | 220 | 440 | 880  | 1761 | 3522 | 5283 | 7044  | 8805  |
| 9.05                 | 218 | 435 | 871  | 1741 | 3483 | 5224 | 6966  | 8707  |
| 9.10                 | 215 | 431 | 861  | 1722 | 3444 | 5167 | 6889  | 8611  |
| 9.15                 | 213 | 426 | 852  | 1703 | 3407 | 5110 | 6813  | 8516  |
| 9.20                 | 211 | 421 | 842  | 1685 | 3369 | 5054 | 6739  | 8423  |
| 9.25                 | 208 | 417 | 833  | 1666 | 3333 | 4999 | 6666  | 8332  |
| 9.30                 | 206 | 412 | 824  | 1648 | 3297 | 4945 | 6594  | 8242  |
| 9.35                 | 204 | 408 | 815  | 1631 | 3261 | 4892 | 6523  | 8153  |
| 9.40                 | 202 | 403 | 807  | 1613 | 3227 | 4840 | 6453  | 8066  |
| 9.45                 | 200 | 399 | 798  | 1596 | 3192 | 4788 | 6384  | 7981  |
| 9.50                 | 197 | 395 | 790  | 1579 | 3159 | 4738 | 6317  | 7896  |
| 9.55                 | 195 | 391 | 781  | 1563 | 3125 | 4688 | 6251  | 7813  |
| 9.60                 | 193 | 387 | 773  | 1546 | 3093 | 4639 | 6185  | 7732  |

| x <sub>lr</sub> \ tr | 0.5 | 1   | 2   | 4    | 8    | 12   | 16   | 20   |
|----------------------|-----|-----|-----|------|------|------|------|------|
| 9.65                 | 191 | 383 | 765 | 1530 | 3060 | 4591 | 6121 | 7651 |
| 9.70                 | 189 | 379 | 757 | 1514 | 3029 | 4543 | 6058 | 7572 |
| 9.75                 | 187 | 375 | 749 | 1499 | 2998 | 4496 | 5995 | 7494 |
| 9.80                 | 185 | 371 | 742 | 1483 | 2967 | 4450 | 5934 | 7417 |
| 9.85                 | 184 | 367 | 734 | 1468 | 2937 | 4405 | 5873 | 7342 |
| 9.90                 | 182 | 363 | 727 | 1453 | 2907 | 4360 | 5814 | 7267 |
| 9.95                 | 180 | 360 | 719 | 1439 | 2878 | 4316 | 5755 | 7194 |
| 10.00                | 178 | 356 | 712 | 1424 | 2849 | 4273 | 5697 | 7122 |

Short time

| x <sub>lr</sub> \ t <sub>sd</sub> | 0.1  | 0.2   | 0.3   | 0.4   |
|-----------------------------------|------|-------|-------|-------|
| 1.40                              | 5102 | 10204 | 15306 | 20408 |
| 1.45                              | 4756 | 9512  | 14269 | 19025 |
| 1.50                              | 4444 | 8889  | 13333 | 17778 |
| 1.55                              | 4162 | 8325  | 12487 | 16649 |
| 1.60                              | 3906 | 7813  | 11719 | 15625 |
| 1.65                              | 3673 | 7346  | 11019 | 14692 |
| 1.70                              | 3460 | 6920  | 10381 | 13841 |
| 1.75                              | 3265 | 6531  | 9796  | 13061 |
| 1.80                              | 3086 | 6173  | 9259  | 12346 |
| 1.85                              | 2922 | 5844  | 8766  | 11687 |
| 1.90                              | 2770 | 5540  | 8310  | 11080 |
| 1.95                              | 2630 | 5260  | 7890  | 10519 |
| 2.00                              | 2500 | 5000  | 7500  | 10000 |
| 2.05                              | 2380 | 4759  | 7139  | 9518  |
| 2.10                              | 2268 | 4535  | 6803  | 9070  |
| 2.15                              | 2163 | 4327  | 6490  | 8653  |
| 2.20                              | 2066 | 4132  | 6198  | 8264  |
| 2.25                              | 1975 | 3951  | 5926  | 7901  |
| 2.30                              | 1890 | 3781  | 5671  | 7561  |
| 2.35                              | 1811 | 3622  | 5432  | 7243  |
| 2.40                              | 1736 | 3472  | 5208  | 6944  |
| 2.45                              | 1666 | 3332  | 4998  | 6664  |
| 2.50                              | 1600 | 3200  | 4800  | 6400  |
| 2.55                              | 1538 | 3076  | 4614  | 6151  |
| 2.60                              | 1479 | 2959  | 4438  | 5917  |
| 2.65                              | 1424 | 2848  | 4272  | 5696  |
| 2.70                              | 1372 | 2743  | 4115  | 5487  |
| 2.75                              | 1322 | 2645  | 3967  | 5289  |
| 2.80                              | 1276 | 2551  | 3827  | 5102  |
| 2.85                              | 1231 | 2462  | 3693  | 4925  |
| 2.90                              | 1189 | 2378  | 3567  | 4756  |
| 2.95                              | 1149 | 2298  | 3447  | 4596  |
| 3.00                              | 1111 | 2222  | 3333  | 4444  |
| 3.05                              | 1075 | 2150  | 3225  | 4300  |
| 3.10                              | 1041 | 2081  | 3122  | 4162  |
| 3.15                              | 1008 | 2016  | 3023  | 4031  |
| 3.20                              | 977  | 1953  | 2930  | 3906  |
| 3.25                              | 947  | 1893  | 2840  | 3787  |
| 3.30                              | 918  | 1837  | 2755  | 3673  |
| 3.35                              | 891  | 1782  | 2673  | 3564  |

| x <sub>lr</sub> \ t <sub>sd</sub> | 0.1 | 0.2  | 0.3  | 0.4  |
|-----------------------------------|-----|------|------|------|
| 3.40                              | 865 | 1730 | 2595 | 3460 |
| 3.45                              | 840 | 1680 | 2520 | 3361 |
| 3.50                              | 816 | 1633 | 2449 | 3265 |
| 3.55                              | 793 | 1587 | 2380 | 3174 |
| 3.60                              | 772 | 1543 | 2315 | 3086 |
| 3.65                              | 751 | 1501 | 2252 | 3002 |
| 3.70                              | 730 | 1461 | 2191 | 2922 |
| 3.75                              | 711 | 1422 | 2133 | 2844 |
| 3.80                              | 693 | 1385 | 2078 | 2770 |
| 3.85                              | 675 | 1349 | 2024 | 2699 |
| 3.90                              | 657 | 1315 | 1972 | 2630 |
| 3.95                              | 641 | 1282 | 1923 | 2564 |
| 4.00                              | 625 | 1250 | 1875 | 2500 |
| 4.05                              | 610 | 1219 | 1829 | 2439 |
| 4.10                              | 595 | 1190 | 1785 | 2380 |
| 4.15                              | 581 | 1161 | 1742 | 2323 |
| 4.20                              | 567 | 1134 | 1701 | 2268 |
| 4.25                              | 554 | 1107 | 1661 | 2215 |
| 4.30                              | 541 | 1082 | 1622 | 2163 |
| 4.35                              | 528 | 1057 | 1585 | 2114 |
| 4.40                              | 517 | 1033 | 1550 | 2066 |
| 4.45                              | 505 | 1010 | 1515 | 2020 |
| 4.50                              | 494 | 988  | 1481 | 1975 |
| 4.55                              | 483 | 966  | 1449 | 1932 |
| 4.60                              | 473 | 945  | 1418 | 1890 |
| 4.65                              | 462 | 925  | 1387 | 1850 |
| 4.70                              | 453 | 905  | 1358 | 1811 |
| 4.75                              | 443 | 886  | 1330 | 1773 |
| 4.80                              | 434 | 868  | 1302 | 1736 |
| 4.85                              | 425 | 850  | 1275 | 1700 |
| 4.90                              | 416 | 833  | 1249 | 1666 |
| 4.95                              | 408 | 816  | 1224 | 1632 |
| 5.00                              | 400 | 800  | 1200 | 1600 |
| 5.05                              | 392 | 784  | 1176 | 1568 |
| 5.10                              | 384 | 769  | 1153 | 1538 |
| 5.15                              | 377 | 754  | 1131 | 1508 |
| 5.20                              | 370 | 740  | 1109 | 1479 |
| 5.25                              | 363 | 726  | 1088 | 1451 |
| 5.30                              | 356 | 712  | 1068 | 1424 |
| 5.35                              | 349 | 699  | 1048 | 1398 |

# Time chart

Susol · Metasol

## Short time

| $\frac{tsd}{xIr}$ | 0.1 | 0.2 | 0.3  | 0.4  |
|-------------------|-----|-----|------|------|
| 5.40              | 343 | 686 | 1029 | 1372 |
| 5.45              | 337 | 673 | 1010 | 1347 |
| 5.50              | 331 | 661 | 992  | 1322 |
| 5.55              | 325 | 649 | 974  | 1299 |
| 5.60              | 319 | 638 | 957  | 1276 |
| 5.65              | 313 | 627 | 940  | 1253 |
| 5.70              | 308 | 616 | 923  | 1231 |
| 5.75              | 302 | 605 | 907  | 1210 |
| 5.80              | 297 | 595 | 892  | 1189 |
| 5.85              | 292 | 584 | 877  | 1169 |
| 5.90              | 287 | 575 | 862  | 1149 |
| 5.95              | 282 | 565 | 847  | 1130 |
| 6.00              | 278 | 556 | 833  | 1111 |
| 6.05              | 273 | 546 | 820  | 1093 |
| 6.10              | 269 | 537 | 806  | 1075 |
| 6.15              | 264 | 529 | 793  | 1058 |
| 6.20              | 260 | 520 | 780  | 1041 |
| 6.25              | 256 | 512 | 768  | 1024 |
| 6.30              | 252 | 504 | 756  | 1008 |
| 6.35              | 248 | 496 | 744  | 992  |
| 6.40              | 244 | 488 | 732  | 977  |
| 6.45              | 240 | 481 | 721  | 961  |
| 6.50              | 237 | 473 | 710  | 947  |
| 6.55              | 233 | 466 | 699  | 932  |
| 6.60              | 230 | 459 | 689  | 918  |
| 6.65              | 226 | 452 | 678  | 905  |
| 6.70              | 223 | 446 | 668  | 891  |
| 6.75              | 219 | 439 | 658  | 878  |
| 6.80              | 216 | 433 | 649  | 865  |
| 6.85              | 213 | 426 | 639  | 852  |
| 6.90              | 210 | 420 | 630  | 840  |
| 6.95              | 207 | 414 | 621  | 828  |
| 7.00              | 204 | 408 | 612  | 816  |
| 7.05              | 201 | 402 | 604  | 805  |
| 7.10              | 198 | 397 | 595  | 793  |
| 7.15              | 196 | 391 | 587  | 782  |
| 7.20              | 193 | 386 | 579  | 772  |
| 7.25              | 190 | 380 | 571  | 761  |
| 7.30              | 188 | 375 | 563  | 751  |
| 7.35              | 185 | 370 | 555  | 740  |
| 7.40              | 183 | 365 | 548  | 730  |
| 7.45              | 180 | 360 | 541  | 721  |
| 7.50              | 178 | 356 | 533  | 711  |
| 7.55              | 175 | 351 | 526  | 702  |
| 7.60              | 173 | 346 | 519  | 693  |
| 7.65              | 171 | 342 | 513  | 683  |
| 7.70              | 169 | 337 | 506  | 675  |
| 7.75              | 166 | 333 | 499  | 666  |
| 7.80              | 164 | 329 | 493  | 657  |
| 7.85              | 162 | 325 | 487  | 649  |
| 7.90              | 160 | 320 | 481  | 641  |
| 7.95              | 158 | 316 | 475  | 633  |
| 8.00              | 156 | 312 | 469  | 625  |
| 8.05              | 154 | 309 | 463  | 617  |
| 8.10              | 152 | 305 | 457  | 610  |
| 8.15              | 151 | 301 | 452  | 602  |
| 8.20              | 149 | 297 | 446  | 595  |

## Ground fault

| $\frac{tsd}{xIr}$ | 0.1 | 0.2 | 0.3 | 0.4 |
|-------------------|-----|-----|-----|-----|
| 8.25              | 147 | 294 | 441 | 588 |
| 8.30              | 145 | 290 | 435 | 581 |
| 8.35              | 143 | 287 | 430 | 574 |
| 8.40              | 142 | 283 | 425 | 567 |
| 8.45              | 140 | 280 | 420 | 560 |
| 8.50              | 138 | 277 | 415 | 554 |
| 8.55              | 137 | 274 | 410 | 547 |
| 8.60              | 135 | 270 | 406 | 541 |
| 8.65              | 134 | 267 | 401 | 535 |
| 8.70              | 132 | 264 | 396 | 528 |
| 8.75              | 131 | 261 | 392 | 522 |
| 8.80              | 129 | 258 | 387 | 517 |
| 8.85              | 128 | 255 | 383 | 511 |
| 8.90              | 126 | 252 | 379 | 505 |
| 8.95              | 125 | 250 | 375 | 499 |
| 9.00              | 123 | 247 | 370 | 494 |
| 9.05              | 122 | 244 | 366 | 488 |
| 9.10              | 121 | 242 | 362 | 483 |
| 9.15              | 119 | 239 | 358 | 478 |
| 9.20              | 118 | 236 | 354 | 473 |
| 9.25              | 117 | 234 | 351 | 467 |
| 9.30              | 116 | 231 | 347 | 462 |
| 9.35              | 114 | 229 | 343 | 458 |
| 9.40              | 113 | 226 | 340 | 453 |
| 9.45              | 112 | 224 | 336 | 448 |
| 9.50              | 111 | 222 | 332 | 443 |
| 9.55              | 110 | 219 | 329 | 439 |
| 9.60              | 109 | 217 | 326 | 434 |
| 9.65              | 107 | 215 | 322 | 430 |
| 9.70              | 106 | 213 | 319 | 425 |
| 9.75              | 105 | 210 | 316 | 421 |
| 9.80              | 104 | 208 | 312 | 416 |
| 9.85              | 103 | 206 | 309 | 412 |
| 9.90              | 102 | 204 | 306 | 408 |
| 9.95              | 101 | 202 | 303 | 404 |
| 10.00             | 100 | 200 | 300 | 400 |

| $\frac{tg}{xIn}$ | 0.1  | 0.2  | 0.3  | 0.4   |
|------------------|------|------|------|-------|
| 0.20             | 2500 | 5000 | 7500 | 10000 |
| 0.21             | 2268 | 4535 | 6803 | 9070  |
| 0.22             | 2066 | 4132 | 6198 | 8264  |
| 0.23             | 1890 | 3781 | 5671 | 7561  |
| 0.24             | 1736 | 3472 | 5208 | 6944  |
| 0.25             | 1600 | 3200 | 4800 | 6400  |
| 0.26             | 1479 | 2959 | 4438 | 5917  |
| 0.27             | 1372 | 2743 | 4115 | 5487  |
| 0.28             | 1276 | 2551 | 3827 | 5102  |
| 0.29             | 1189 | 2378 | 3567 | 4756  |
| 0.30             | 1111 | 2222 | 3333 | 4444  |
| 0.31             | 1041 | 2081 | 3122 | 4162  |
| 0.32             | 977  | 1953 | 2930 | 3906  |
| 0.33             | 918  | 1837 | 2755 | 3673  |
| 0.34             | 865  | 1730 | 2595 | 3460  |
| 0.35             | 816  | 1633 | 2449 | 3265  |
| 0.36             | 772  | 1543 | 2315 | 3086  |
| 0.37             | 730  | 1461 | 2191 | 2922  |
| 0.38             | 693  | 1385 | 2078 | 2770  |
| 0.39             | 657  | 1315 | 1972 | 2630  |
| 0.40             | 625  | 1250 | 1875 | 2500  |
| 0.41             | 595  | 1190 | 1785 | 2380  |
| 0.42             | 567  | 1134 | 1701 | 2268  |
| 0.43             | 541  | 1082 | 1622 | 2163  |
| 0.44             | 517  | 1033 | 1550 | 2066  |
| 0.45             | 494  | 988  | 1481 | 1975  |
| 0.46             | 473  | 945  | 1418 | 1890  |
| 0.47             | 453  | 905  | 1358 | 1811  |
| 0.48             | 434  | 868  | 1302 | 1736  |
| 0.49             | 416  | 833  | 1249 | 1666  |
| 0.50             | 400  | 800  | 1200 | 1600  |
| 0.51             | 384  | 769  | 1153 | 1538  |
| 0.52             | 370  | 740  | 1109 | 1479  |
| 0.53             | 356  | 712  | 1068 | 1424  |
| 0.54             | 343  | 686  | 1029 | 1372  |
| 0.55             | 331  | 661  | 992  | 1322  |
| 0.56             | 319  | 638  | 957  | 1276  |
| 0.57             | 308  | 616  | 923  | 1231  |
| 0.58             | 297  | 595  | 892  | 1189  |
| 0.59             | 287  | 575  | 862  | 1149  |
| 0.60             | 278  | 556  | 833  | 1111  |
| 0.61             | 269  | 537  | 806  | 1075  |
| 0.62             | 260  | 520  | 780  | 1041  |
| 0.63             | 252  | 504  | 756  | 1008  |
| 0.64             | 244  | 488  | 732  | 977   |
| 0.65             | 237  | 473  | 710  | 947   |
| 0.66             | 230  | 459  | 689  | 918   |
| 0.67             | 223  | 446  | 668  | 891   |
| 0.68             | 216  | 433  | 649  | 865   |
| 0.69             | 210  | 420  | 630  | 840   |
| 0.70             | 204  | 408  | 612  | 816   |
| 0.71             | 198  | 397  | 595  | 793   |
| 0.72             | 193  | 386  | 579  | 772   |
| 0.73             | 188  | 375  | 563  | 751   |
| 0.74             | 183  | 365  | 548  | 730   |
| 0.75             | 178  | 356  | 533  | 711   |
| 0.76             | 173  | 346  | 519  | 693   |

| $\frac{tg}{xIn}$ | 0.1 | 0.2 | 0.3 | 0.4 |
|------------------|-----|-----|-----|-----|
| 0.77             | 169 | 337 | 506 | 675 |
| 0.78             | 164 | 329 | 493 | 657 |
| 0.79             | 160 | 320 | 481 | 641 |
| 0.80             | 156 | 313 | 469 | 625 |
| 0.81             | 152 | 305 | 457 | 610 |
| 0.82             | 149 | 297 | 446 | 595 |
| 0.83             | 145 | 290 | 435 | 581 |
| 0.84             | 142 | 283 | 425 | 567 |
| 0.85             | 138 | 277 | 415 | 554 |
| 0.86             | 135 | 270 | 406 | 541 |
| 0.87             | 132 | 264 | 396 | 528 |
| 0.88             | 129 | 258 | 387 | 517 |
| 0.89             | 126 | 252 | 379 | 505 |
| 0.90             | 123 | 247 | 370 | 494 |
| 0.91             | 121 | 242 | 362 | 483 |
| 0.92             | 118 | 236 | 354 | 473 |
| 0.93             | 116 | 231 | 347 | 462 |
| 0.94             | 113 | 226 | 340 | 453 |
| 0.95             | 111 | 222 | 332 | 443 |
| 0.96             | 109 | 217 | 326 | 434 |
| 0.97             | 106 | 213 | 319 | 425 |
| 0.98             | 104 | 208 | 312 | 416 |
| 0.99             | 102 | 204 | 306 | 408 |
| 1.00             | 100 | 200 | 300 | 400 |

# Ordering sheet

For faster quote processing, please use the following request for ordering sheet. For each section, check the applicable box or enter value corresponding to your choice.

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

| ACB main body                | Type of ACB  | <input type="checkbox"/> AH <input type="checkbox"/> AN <small>Note 1</small> <input type="checkbox"/> AS  |   |   | Quantity  |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |                                     |                              |                              |   |   |                                     |                                     |   |                                     |                                     |               |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                 |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
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|                              | Trip relay   | <input type="checkbox"/> NO<br><input type="checkbox"/> YES  |   |   |   |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   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|                              |  | <table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th colspan="2">Frequency</th> <th colspan="2">Control voltage</th> <th colspan="2">Comm.</th> <th colspan="2">Optional function</th> </tr> <tr> <th>60Hz</th> <th>50Hz</th> <th>No</th> <th>AC/DC 100-250V</th> <th>DC 15-60V</th> <th>No</th> <th>Yes</th> <th>Earth leakage detection</th> <th>External CT ground fault</th> </tr> </thead> <tbody> <tr> <td rowspan="10">N Normal</td> <td><input type="checkbox"/> NGO</td> <td><input type="checkbox"/> NG5</td> <td><input checked="" type="checkbox"/></td> <td>-</td> <td>-</td> <td><input checked="" type="checkbox"/></td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td><input type="checkbox"/> AG0</td> <td><input type="checkbox"/> AG5</td> <td><input checked="" type="checkbox"/></td> <td>-</td> <td>-</td> <td><input checked="" type="checkbox"/></td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td><input type="checkbox"/> AG1</td> <td><input 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type="checkbox"/> | - | - | - | <input type="checkbox"/> AK1 | <input type="checkbox"/> AK6 | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input type="checkbox"/> AK2 | <input type="checkbox"/> AK7 | - | - | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input type="checkbox"/> AX1 | <input type="checkbox"/> AX6 | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> AX2 | <input type="checkbox"/> AX7 | - | - | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | P Power meter | <input type="checkbox"/> PC1 | <input type="checkbox"/> PC6 | <input checked="" type="checkbox"/> | - | - | <input 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type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input type="checkbox"/> SX2 | <input type="checkbox"/> SX7 | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input type="checkbox"/> SA1 | <input type="checkbox"/> SA6 | <input checked="" type="checkbox"/> | - | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> SA2 | <input type="checkbox"/> SA7 | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | - | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <small>Note</small> ) - Standard function: Ground fault detection<br>- Communication function is not available under no control voltage<br>- AN, AS type is not available for S Meter<br>- P(Power), S(Supreme) Meter is also available for generator protection<br>- P, S Meter needs the accessory(VDM) for voltage measurement |  |  |  |
|                              | Type   | Frequency  |   | Control voltage   |   |                                     | Comm.                               |                                     | Optional function                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                        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           |   |                                     |                                     |   |  |  |  |
|                              |  | 60Hz   | 50Hz  | No  | AC/DC 100-250V  | DC 15-60V                           | No                                  | Yes                                 | Earth leakage detection             | External CT ground fault |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |       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     |   |                                     |                                     |   |  |  |  |
|                              | N Normal   | <input type="checkbox"/> NGO   | <input type="checkbox"/> NG5  | <input checked="" type="checkbox"/>   | -   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |    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 |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              |  | <input type="checkbox"/> AG0   | <input type="checkbox"/> AG5  | <input checked="" type="checkbox"/>   | -   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |              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                                 |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AG1 |  | <input type="checkbox"/> AG6   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AG2 |  | <input type="checkbox"/> AG7   | -   | -   | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                         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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AZ0 |  | <input type="checkbox"/> AZ5   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AZ1 |  | <input type="checkbox"/> AZ6   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                         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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AZ2 |  | <input type="checkbox"/> AZ7   | -   | -   | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AE0 |  | <input type="checkbox"/> AE5   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AE1 |  | <input type="checkbox"/> AE6   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> AE2 |  | <input type="checkbox"/> AE7   | -   | -   | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/> | -                                   | -                                   | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| A Ammeter                    | <input type="checkbox"/> AC1   | <input type="checkbox"/> AC6   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |          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|                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> AC2   | <input type="checkbox"/> AC7   | -   | -   | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |          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|                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> AK1   | <input type="checkbox"/> AK6   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |          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|                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> AK2   | <input type="checkbox"/> AK7   | -   | -   | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |          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|   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> AX1   | <input type="checkbox"/> AX6   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |          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|                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> AX2   | <input type="checkbox"/> AX7   | -   | -   | <input checked="" type="checkbox"/>   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |          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|                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | P Power meter  | <input type="checkbox"/> PC1   | <input type="checkbox"/> PC6  | <input checked="" type="checkbox"/>   | -   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |               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      |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              |  | <input type="checkbox"/> PC2   | <input type="checkbox"/> PC7  | -   | <input checked="" type="checkbox"/>   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |              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                                 |   |                                     |   |                                     |                                     |   |  |  |  |
|                              |  | <input type="checkbox"/> PK1   | <input type="checkbox"/> PK6  | <input checked="" type="checkbox"/>   | -   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |              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                                 |   |                                     |   |                                     |                                     |   |  |  |  |
|                              |  | <input type="checkbox"/> PK2   | <input type="checkbox"/> PK7  | -   | <input checked="" type="checkbox"/>   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |              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                                 |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> PX1 |  | <input type="checkbox"/> PX6   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> PX2 |  | <input type="checkbox"/> PX7   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> PA1 |  | <input type="checkbox"/> PA6   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                         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       |   |                                     |   |                                     |                                     |   |  |  |  |
| <input type="checkbox"/> PA2 |  | <input type="checkbox"/> PA7   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |   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       |   |                                     |   |                                     |                                     |   |  |  |  |
| S Supreme meter              |  | <input type="checkbox"/> SC1   | <input type="checkbox"/> SC6  | <input checked="" type="checkbox"/>   | -   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |              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|   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              |  | <input type="checkbox"/> SC2   | <input type="checkbox"/> SC7  | -   | <input checked="" type="checkbox"/>   | -                                   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                        |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                   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|   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> SK1   | <input type="checkbox"/> SK6   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |                                     |                              |                              |   |   |                                     |                                     |   |                                     |                                     |               |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                        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|   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> SK2   | <input type="checkbox"/> SK7   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | -                                   | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |               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|   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> SX1   | <input type="checkbox"/> SX6   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |               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|   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> SX2   | <input type="checkbox"/> SX7   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | -                                   |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |               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|   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> SA1   | <input type="checkbox"/> SA6   | <input checked="" type="checkbox"/>   | -   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |                                     |                              |                              |   |   |                                     |                                     |   |                                     |                                     |               |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                 |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | <input type="checkbox"/> SA2   | <input type="checkbox"/> SA7   | -   | <input checked="" type="checkbox"/>   | -   | <input checked="" type="checkbox"/> | -                                   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |                                     |                              |                              |   |   |                                     |                                     |   |                                     |                                     |               |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                 |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
| No. of poles                 | <input type="checkbox"/> 3-pole <input type="checkbox"/> 4-pole                                      |  | <input type="checkbox"/> Standard type (R, S, T, N)<br><input type="checkbox"/> Reverse phase type (N, R, S, T)                     |   |   |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |   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           |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
| Installation type            | <input type="checkbox"/> Draw-out type <input type="checkbox"/> Fixed type                           |  |   |   |   |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                     |   |                              |                              |   |                                     |   |               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|   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
| Closing type                 | <input type="checkbox"/> Manual closing<br><input type="checkbox"/> Electrical closing               |  | <input type="checkbox"/> Standard type (OFF-Charge method)<br><input type="checkbox"/> Rapid auto-reclosing type (ON-Charge method) |   |   |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |                                     |                              |                              |   |                                     |   |                                     |   |   |                                     |                              |                              |   |   |                                     |                                     |   |   |                                     |           |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |   |   |                                     |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |   |   |                                     |                                     |   |                                   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                         |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
|                              | • Charge method: Charging completion contact(1b) is basically installed<br>• Motor operating voltage |  | <input type="checkbox"/> AC/DC 100V~130V<br><input type="checkbox"/> AC/DC 200V~250V  |   | <input type="checkbox"/> DC 125V <input type="checkbox"/> DC 24V~30V <input type="checkbox"/> DC 48V~60V<br><input type="checkbox"/> DC 380V~415V <input type="checkbox"/> AC 440V~480V <input type="checkbox"/> AC 48V |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                            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                     |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |   |                              |                              |                                     |   |   |                                     |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
| Closing voltage              | <input type="checkbox"/> AC/DC 100V~130V <input type="checkbox"/> DC 125V                            |  | <input type="checkbox"/> AC/DC 200V~250V  |   | <input type="checkbox"/> DC 24V~30V <input type="checkbox"/> DC 48V~60V <input type="checkbox"/> AC 380V~480V <input type="checkbox"/> AC 48V   |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                 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            |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |                                     |                              |                              |   |   |                                     |                                     |   |                                     |                                     |               |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   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                                    |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |
| Trip voltage                 | <input type="checkbox"/> AC/DC 100V~130V <input type="checkbox"/> DC 125V                            |  | <input type="checkbox"/> AC/DC 200V~250V  |   | <input type="checkbox"/> DC 24V~30V <input type="checkbox"/> DC 48V~60V <input type="checkbox"/> AC 380V~480V <input type="checkbox"/> AC 48V   |                                     |                                     |                                     |                                     |                          |       |  |                   |  |      |      |    |                |           |    |     |                         |                          |          |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   |                 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            |   |                                     |   |                              |                              |   |                                     |   |                                     |   |                                     |                                     |                              |                              |   |   |                                     |                                     |   |                                     |                                     |               |                              |                              |                                     |   |   |                                     |   |   |   |                              |                              |   |                                     |   |                                     |   |   |   |                              |                              |                                     |   |   |                                     |   |   |   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                                    |   |                                     |                                     |                              |                              |   |                                     |   |                                     |   |                                     |                                     |   |  |  |  |

|             |   |   |  |
|-------------|---|---|--|
| ACB cradle  | Cradle type   | <input type="checkbox"/> No safety shutter (E class) <input type="checkbox"/> Safety shutter attachment (F class) |  |
|             | Terminal connection   | <input type="checkbox"/> Manual connection <input type="checkbox"/> Automatic connection                          |  |
| Connections | <input type="checkbox"/> Horizontal <input type="checkbox"/> Vertical   | <input type="checkbox"/> Front connection   |  |
|             | <input type="checkbox"/> Line: Horizontal, Load: Vertical <input type="checkbox"/> Line: Vertical, Load: Horizontal | <input type="checkbox"/> Separate order/ User Installation  |  |

|  |  |  |   |  |  |
|--|--|--|---|--|--|
| ACB accessory  | Main body  | Standard accessory   | • Aux. contact(AX)  | <input type="checkbox"/> Standard type (3a3b, Standard installation) <input type="checkbox"/> Extended type (5a5b) <small>Note 3</small> <input type="checkbox"/> High capacity (5a5b) <small>Note 3</small> |  |
|  |  |  | • Key Lock(K1, K3)  | <input type="checkbox"/> Single key, K1 (ON-Lock) <input type="checkbox"/> Double key, K3 (ON-Lock)  |  |
|  |  |  | • Undervoltage trip device (UVT, Instantaneous)   |  |  |
|  |  |  | <input type="checkbox"/> AC/DC 100V~130V <input type="checkbox"/> AC/DC 200V~250V <input type="checkbox"/> DC 125V  | <input type="checkbox"/> DC 24V~30V <input type="checkbox"/> DC 48V~60V <input type="checkbox"/> AC/DC 380V~480V <input type="checkbox"/> AC 48V   |  |
|  |  |  | • Mechanical operation contact (MOC, Door Interlock (DI))   | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |
|  |  |  | • Mechanical interlock (MI)   | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |
|  |  |  | • Counter(C) <small>Note 2</small>  | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |
|  |  |  | • Miss insertion preventive device (MIP)  | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |
|  |  |  | • Double shunt coil(SHT2)   | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |
|  |  |  | • Ready-to-close switch(RCS)  | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |
| • Trip alarm switch, Manual reset button(AL, MRB)  | <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type  |  |   |  |  |
| <input type="checkbox"/> Key interlock (K2, ON-Lock)   | <input type="checkbox"/> ON/OFF Button Lock <input type="checkbox"/> Temperature Alarm |  |   |  |  |
| ACB Cradle   | Standard accessory   | <input type="checkbox"/> Safety shutter lock(STL)                  |   |  |  |
|  |  | <input type="checkbox"/> Zero arc space(ZAS) <small>Note 2</small> |   |  |  |
| Separate purchase  | Main body  | Cradle mounting  | <input type="checkbox"/> Interphase Barrier(IB)<br><input type="checkbox"/> Slow closing lever(SL)  |  |  |
|  |  |  | <input type="checkbox"/> Cell switch(CL) <input type="checkbox"/> 4c <input type="checkbox"/> 8c  |  |  |
|  |  |  | <input type="checkbox"/> Door interlock(DI)   |  |  |
|  |  |  | <input type="checkbox"/> Mechanical operation contact (MOC) <input type="checkbox"/> Standard type (10a10b) <input type="checkbox"/> High capacity(10a10b)                  |  |  |
|  |  |  | <input type="checkbox"/> Mechanical Interlock (MI) <input type="checkbox"/> Wire type (2 terminals) <input type="checkbox"/> Wire type (3 terminals)                        |  |  |
|  |  |  | <input type="checkbox"/> Shortening b-contact (SBC, 4b Max) <input type="checkbox"/> 1b <input type="checkbox"/> 2b <input type="checkbox"/> 3b <input type="checkbox"/> 4b |  |  |
|  |  |  | <input type="checkbox"/> Miss insertion preventive device (MIP) <input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type                       |  |  |
|  |  |  | <input type="checkbox"/> Cradle mounting block(CMB) <input type="checkbox"/> Safety control cover(SC)   |  |  |
|  |  |  | <input type="checkbox"/> Racking interlock(RI) <input type="checkbox"/> Interphase Barrier(IB) <small>Note 2</small>  |  |  |
|  |  |  | External mounting   | <input type="checkbox"/> UVT time delay controller(UDC)  |  |
| <input type="checkbox"/> AC/DC 100V~130V <input type="checkbox"/> AC/DC 200V~250V <input type="checkbox"/> DC 125V <input type="checkbox"/> DC 48V~60V <input type="checkbox"/> AC 380V~480V <input type="checkbox"/> AC 48V |  |  |   |  |  |
| <input type="checkbox"/> Door frame (DF) <input type="checkbox"/> Condenser trip device (CTD) <input type="checkbox"/> OCR tester  |  |  |   |  |  |
| <input type="checkbox"/> Dust cover(DC) <input type="checkbox"/> Profibus-DP Comm.(PC) <input type="checkbox"/> Temperature alarm(TM) <input type="checkbox"/> Remote I/O(RCO)   |  |  |   |  |  |

Note 1. In case of D type of Metasol (AN), frame size is in the range of 630-1600AF  
 2. The standard accessory for Susol (AH).  
 3. Aux. contact with extended/high capacity type adopts the rapid auto-reclosing method and available up to 6a6b.



**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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