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for 10 years

**Susol**

# COMPACT ACB

Compact Air Circuit Breakers 1600A



**LS** ELECTRIC

# Compact ACB 1600A

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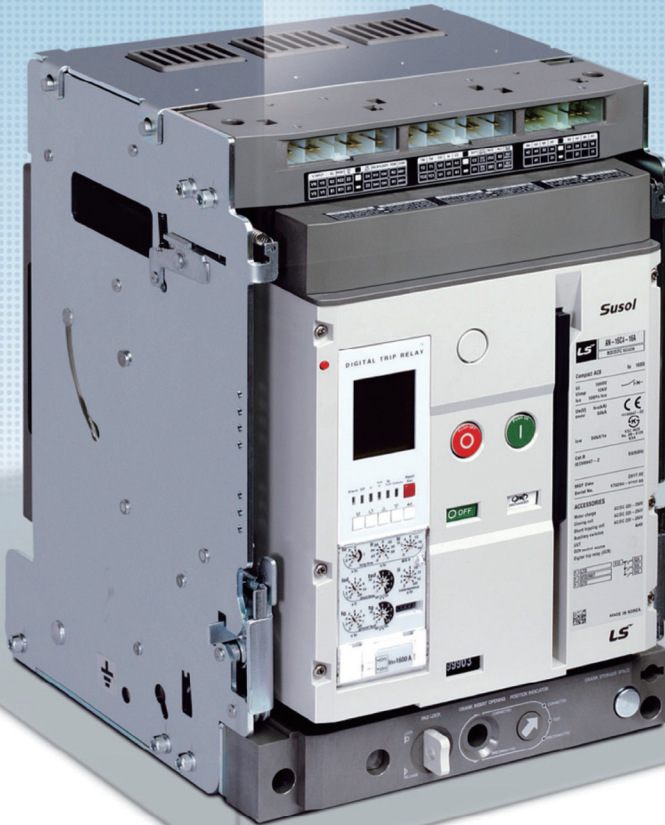
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# Change low voltage switchgears!

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

High Performance  
 $I_{cs}=100\% \cdot I_{cu}$



Compact Size  
55% ↓

Performance ↑  
Size DOWN ↓

## **Susol** Super Solution Compact ACB 1600A

- Cat.A (Current limiting type) 150kA/415V
- Cat.B (General type) 50kA/690V,  $I_{cw}=50\text{kA}/1\text{sec}$  (30kA/3sec)  
40kA/800V,  $I_{cw}=40\text{kA}/1\text{sec}$

**LS** ELECTRIC

# Compact ACB 1600A



**Susol**



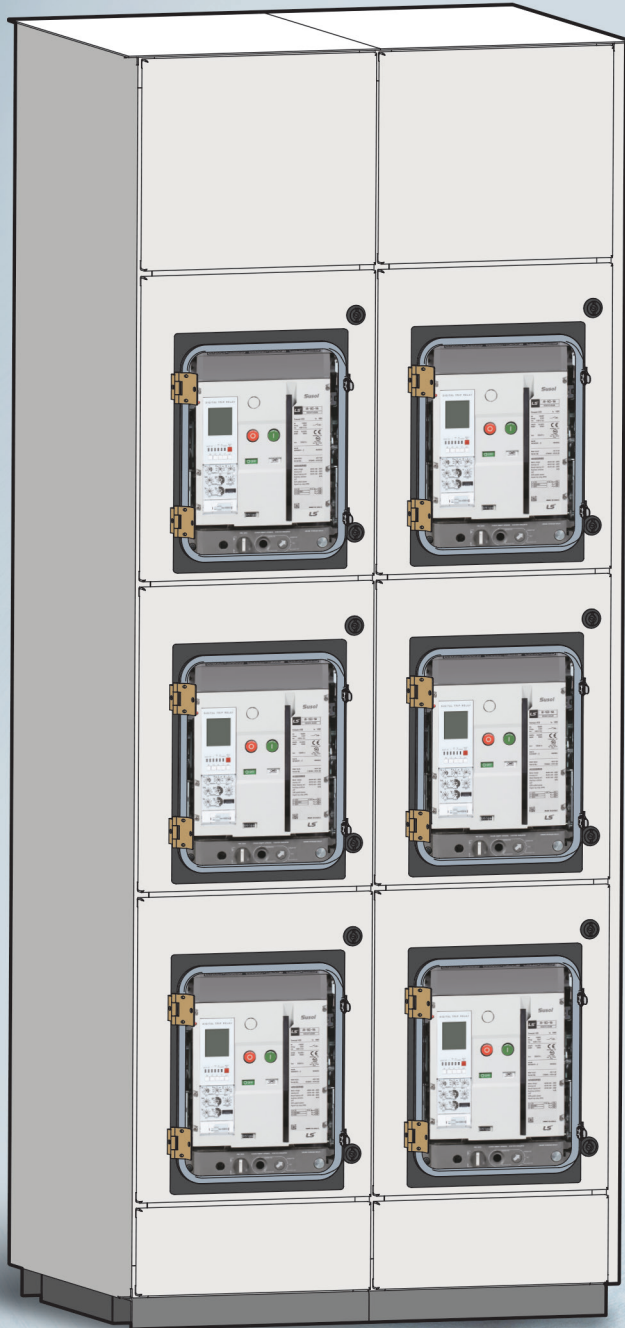
# Selectivity Category



## Features

- Significantly reduced size compared to existing products ...55%
- Category A breaker (AR type):
  - Rated current 400A~1000A, breaking capacity 150kA/415Vac,  $I_{cs} = 100\% * I_{cu}$
- Category B breaker (AH, AN type):
  - Rated current 400A~1600A, breaking capacity 50kA/690Vac,  $I_{cs}=100\%*I_{cu}$
  - Rated short-time current( $I_{cw}$ ): 50kA/1s (Cat.B)
- Category B breaker (AW type):
  - Rated current 400A~1600A, breaking capacity 40kA/800Vac,  $I_{cs}=100\%*I_{cu}$
  - Rated short-time current( $I_{cw}$ ): 40kA/1s (Cat.B)
- Operation durability without maintenance: 12500 operations (Cat.B), 5000 operations (Cat.A)
- Rating Plug application: Easy to change rated current without CT replacement
- Various control power sources
- Various accessories
- Application Standards and Certification: IEC 60947-2 (DEKRA CB certification), GB 14048.2 (CCC certification)

# Compact ACB switchgear



## Reduction of size and weight of switchgears

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



# Compact size



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

## Compact type

Unit (mm)

E-frame ACB



C-frame(Compact) ACB



3-high



4-high



# Compact ACB



**AN**

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

Category A	
AR	150kA/415V

—

**16**

AF	
08	800AF
16	1600AF

AF	
08	800AF
10	1000AF

**C**

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

**3**

No. of pole	
3	3P
4	4P

**10**

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

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

**J**

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

# Circuit breaker ratings



Common characteristics								
Number of poles	(P)					3P / 4P		
Frequency	(Hz)					50/60Hz		
Rated operational voltage	(V, Ue)					690V <sup>1)</sup>		
Rated insulation voltage	(V, Ui)					1000V		
Rated impulse withstand voltage	(kV, Uimp)					12kV		
Circuit breaker as per IEC60947-2								
Type			AN/AH/AR-C					
Description			AN-08C	AN-16C	AH-08C	AH-16C	AR-08C	AR-10C
Ampere Frame	(AF)		800	1600	800	1600	800	1000
Rated current (In Max.) at 40°C	(A)		400	-	400	-	400	-
	(A)		630	-	630	-	630	-
	(A)		800	800	800	800	800	800
	(A)		-	1000	-	1000	-	1000
	(A)		-	1250	-	1250	-	-
	(A)		-	1600	-	1600	-	-
Rated current of neutral pole	(A)		100%					
Rated breaking capacity (Icu)	(kA)	IEC60947-2	AC 690V/600V/550V	42	50		-	
			AC 500V/480V/460V	42	50		130 <sup>2)</sup>	
			AC 415V/380V/220V	50	60		150	
Rated service breaking capacity (Ics)	(kA, %×Icu)		100%					
Rated making capacity (Icm)	(kA)	IEC60947-2	AC 690V/600V/550V	88.2	105		-	
			AC 500V/480V/460V	88.2	105		286 <sup>3)</sup>	
			AC 415V/380V/220V	105	132		330	
Rated Short-time capacity (Icw)	(kA)		1sec/3sec	42/25	50/30		10 <sup>4)</sup>	
Operating time (t)	(ms)		Total breaking time	Less than 25ms under Icw/Less than 75ms over Icw			9ms under	
			Closing time	80ms under				
Common mechanical and electrical life cycle								
Life cycle	(time)		Mechanical	12,500			5,000	
			Electrical	6,000			3,000	
Common dimension and weight								
Weight	(kg)		Draw-out type (3P/4P)	22/26				
			Fixed type (3P/4P)	16/19.5				
Dimension	(mm)	Draw-out type	3P	W: 256 D: 274.5 <sup>5)</sup> H: 364.3				
			4P	W: 326 D: 274.5 <sup>5)</sup> H: 364.3				
		Fixed type	3P	W: 272.4 D: 198.5 <sup>5)</sup> H: 322				
			4P	W: 342.4 D: 198.5 <sup>5)</sup> H: 322				

1) 690V at AN, AH type and 500V at AR type. 2) 130kA/460V, 100kA/500V

3) 220kA at 480/500V, 286kA at 440/460V 4) 0.5sec

5) Exclude terminal length



# Compact DSU



**DH**

DH  
Switch-  
disconnecter

**16**

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

**C**

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

**3**

No. of pole	
3	3P
4	4P

**00**

Rated current	
00	Without OCR & CT

**J**

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



# Switch-disconnectors ratings



Common characteristics					
Number of poles	(P)			3P/4P	
Frequency	(Hz)			50/60Hz	
Rated operational voltage	(V, Ue)			690V	
Rated insulation voltage	(V, Ui)			1000V	
Rated impulse withstand voltage	(kV, Uimp)			12kV	
Switch-disconnectors as per IEC60947-3					
Type				DH-C	
Description				DH-08C    DH-10C    DH-13C    DH-16C	
Ampere Frame	(AF)			800    1000    1250    1600	
Rated operational current at 40°C	(A, Ie)			800    1000    1250    1600	
Rated current of neutral pole	(%)			100    100    100    100	
Rated making capacity (Icm)	(kA)			105	
Rated Short-time capacity (Icw)	(kA)	1sec		50	
Operating time (t)	(ms)	Total opening time	Less than 25ms under Icw/Less than 75ms over Icw		
		Closing time	80ms under		
Common Mechanical and Electrical Life Cycle					
Life cycle	(time)	Mechanical	12,500		
		Electrical	5,000		
Common Demension and Weight					
Weight (3P/4P)	(kg)	Draw-out type (3P/4P)	22/26		
		Fixed type (3P/4P)	16/19.5		
Dimension (3P/4P)	(mm)	Draw-out type	H : 364.3	W (3P/4P)	256/326
			D : 274.5		
		Fixed type	H : 322	W (3P/4P)	272.4/342.4
			D : 198.5		

# Compact ACB up to 800V



**AW**

Category B	
AW	40kA/800V

—

**16**

AF	
08	800AF
16	1600AF

**C**

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

**3**

No. of pole	
3	3P
4	4P

**10**


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

**J**

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

# Circuit breaker ratings

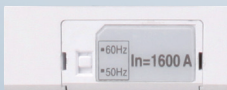


Characteristics			
Number of poles	(P)		3 / 4
Rated operational voltage (Ue)	(Vac)		~ 800
Rated insulation voltage (Ui)	(V)		1000
Rated impulse withstand voltage (Uimp)	(kV)		12kV
Version			Fixed / Withdrawable
Suitability for isolation			
Degree of pollution	IEC60661-1		3
CB certification according to IEC 60947-2			
Type			AW-C
Description			AW-08C      AW-16C
Ampere Frame	(AF)		800      1600
Rated current (In max)	(A)		400      800
			630      1000
			800      1250 1600
Rated ultimate breaking capacity (Icu)	800V	(kA)	40
Rated service breaking capacity (Ics)		(% Icu)	100
Rated short-time withstand current (Icw)	1s	(kA)	40
	3s	(kA)	40
Rated making capacity (Icm)		(%)	84
Selectivity category (according to IEC 60947-2)			B
Operation time (ms)	Total Breaking time	< Icw	max. 75
		≥ Icw	max. 25
	Closing time		max. 80
Mechanical and Electrical Life cycle			
Endurance (times) (Without maintenance)	Mechanical		12,500
	Electrical		500
Dimension and Weight			
Weight	Draw-out (3P/4P)	(kg)	22/26
	Fixed (3P/4P)	(kg)	16/19.5
External Dimensions (H×W×D)	Draw-out	3P (mm)	W: 256 D: 274.5 <sup>1)</sup> H: 364.3
		4P (mm)	W: 326 D: 274.5 <sup>1)</sup> H: 364.3
	Fixed	3P (mm)	W: 272.4 D: 198.5 <sup>1)</sup> H: 322
		4P (mm)	W: 342.4 D: 198.5 <sup>1)</sup> H: 322

1) Exclude terminal length  
\* AW-08/16C are applicable for IT system



# Trip Relay



Rating Plug

## Rating Plug for selection of rated current and frequency

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

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

Frequency selection switch: set to 50Hz or 60Hz



# Trip relay series

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



## N Type (Normal)

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



## A Type (Ammeter)

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



## P Type (Power Meter)

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



## S Type (Supreme Meter)

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

# Connection



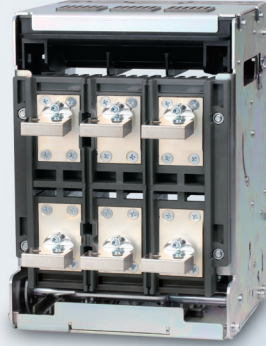


# Various installation methods

## Rear Connection



Vertical type, V



Horizontal type, H



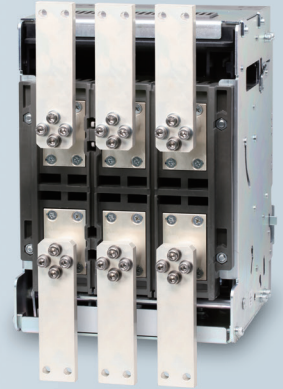
Spreader type, R



Mixed type, M



Mixed type, N

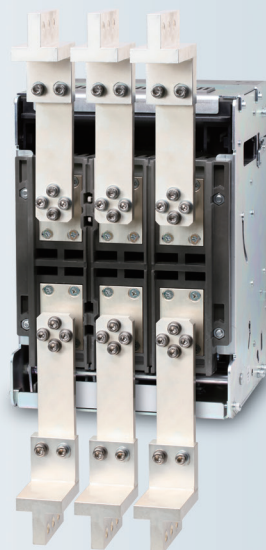


Flat type, P

## Front Connection



Spread type, Z



Vertical type, T



Cable lug type, X

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

# Accessories

## Main body



Miss Insertion Preventing Device (MIP)



Auxiliary Switch (FX)



Ready to Close switch (RCS)



Shunt Coil (SHT)



Closing Coil (CC)



Under Voltage Trip Device (UVT)



Manual Reset Button (MRB)



Key Lock (K1)



Trip Relay (OCR)



Rating plug



Counter (C)



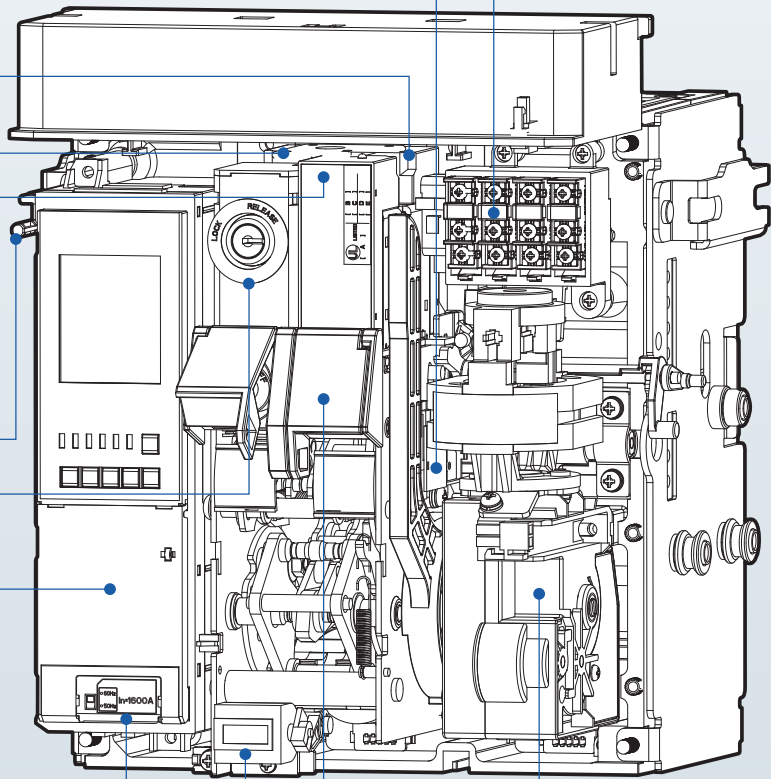
ON/OFF Button Padlock (B)



Motor (M)

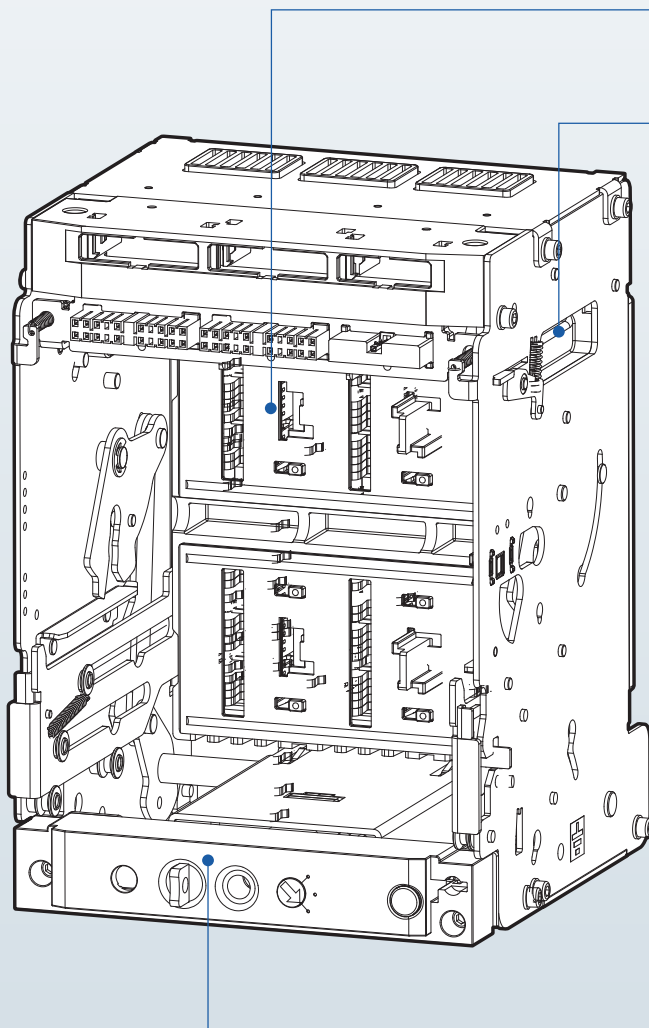


Door frame (DF)





# Cradle



Miss Insertion Preventing Device (MIP)



Condensor Trip Device (CTD)



Safety Shutter (ST)



Lifting Hook (LH)



Interphase Barrier (IB)



UVT Time Delay Controller (UDC)



Remote I/O Unit (RCO)



Cell SW (CEL)



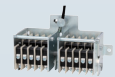
Door Interlock (DI)



Mechanical Interlock (MI)



Mechanical Operated Cell SW (MOC)



Racking Interlock & Position Lock (RI)



Door Frame (DF)



Dust Cover (DC)

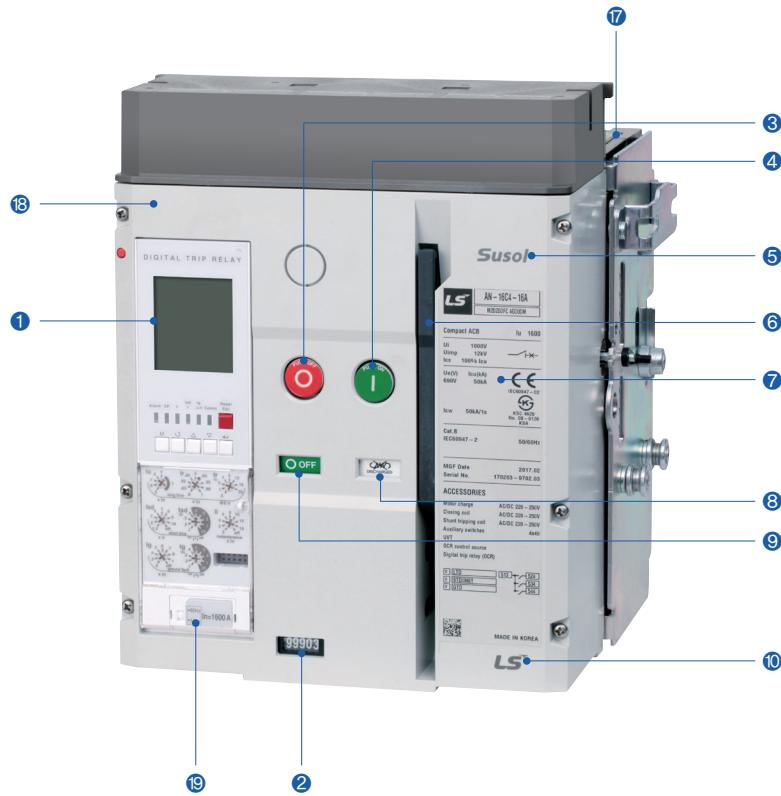


OCR Tester (OT)



# External configuration

## Draw-out (Main body)



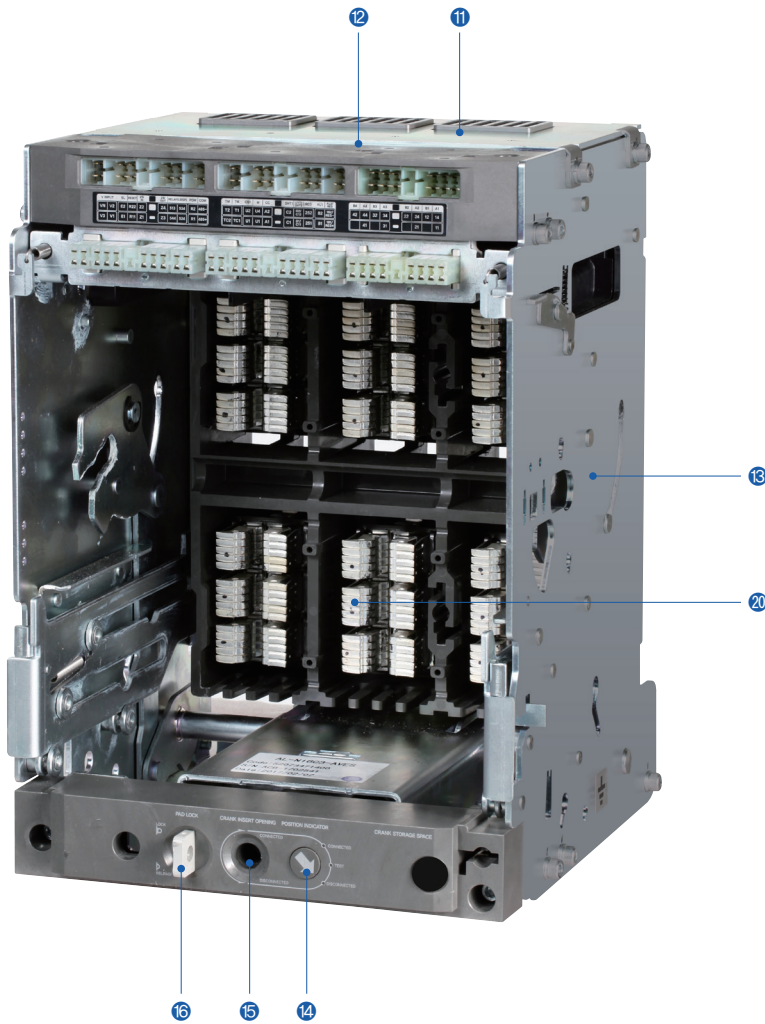
## Marking

<b>LS</b>	<b>AN-16C3-16A</b>	
	M2D2D2FC AGU0UM	
Compact ACB	Iu 1600	
Ui 1000V		
Uimp 12kV		
Ics 100% Icu		
Ue(V) 690V	Icu(kA) 50kA	
	IEC60947-02	
Icw 50kA/1s	GB/T 14048.2:2008	
Cat. B	50/60Hz	
IEC60947-2		
MFG Date	2017.02	
Serial No.	170203-9701.02	
MADE IN KOREA		
<b>ACCESSORIES</b>		
Motor charge	AC/DC 200 ~ 250V	
Closing coil	AC/DC 200 ~ 250V	
Shunt tripping coil	AC/DC 200 ~ 250V	
Auxiliary switches	4c	
UVT		
OCR control source		
Digital trip relay (OCR)		
V LTD	5T3	524
V STD/INST		534
V LTD		544

- Ui: Rated insulation voltage
- Uimp: Impulse withstand voltage
- Ue: Rated operational voltage (AC base)
- Icu: Ultimate breaking capacity
- Ics: Service breaking capacity
- Icw: Short time withstand capacity
- Icm: Rated making capacity
- MFG. Date: Manufacturing date
- Motor charge  Control power and terminal No.
- Closing coil
- Shunt tripping coil
- Auxiliary switches: Contact specification and terminal No.
- Under voltage trip: UVT terminal No.
- OCR control source: Trip relay control power
- Alarm switch: Alarm and terminal No.
- Digital trip relay: Switching diagram
- Z.S.I: Input/Output terminal No.
- Reset: LED/LCD reset
- Communication: Communication and terminal No.
- Voltage module: Phase voltage and symbol
- Earth/Leakage: Ground fault / Earth leakage input terminal No.



## Draw-out (Cradle)

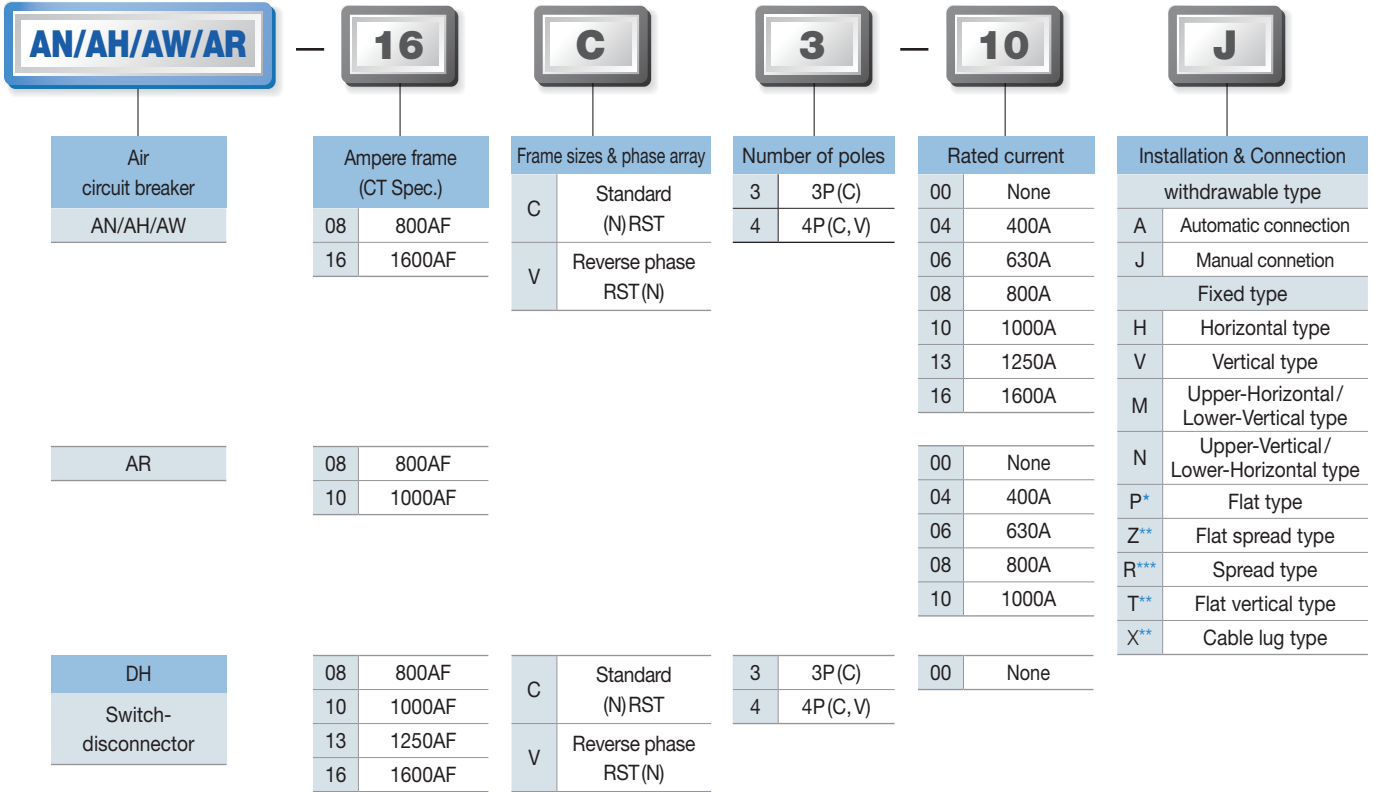


### Terms

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

# Ordering

## Main body



\* Ampere frame of AR must be selected up to 1000AF.

\* A rated current of AR must be selected up to 1000A.

\* Installation method is common to all models

\*\* When using Z, T and X type, please purchase adapter kit separately after ordering P type product (Refer to fixed adapter kit table)

\*\*\* When using R type, purchase purchase adapter kit separately after ordering H type product (Refer to fixed adapter kit table)

### Fixed type Adaptor Kit

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

\* Ordering a P type for Fixed type requires a separate order for Arc Screen (for AH/AR/AW type)

### Arc Screen Order Code for Fixed P type

Number	Part Name	Product Name
72313471504	Arc Screen (Fixed P type only) 3P	TOTAL ASS'Y,ARC SCREEN,3P P TYPE,AN,AH,AR-C
72313471506	Arc Screen (Fixed P type only) 4P	TOTAL ASS'Y,ARC SCREEN,4P P TYPE,AN,AH,AR-C





**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 21 page

**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

**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**

FX	Standard OFF-Charge 4C
FC	Standard ON-Charge 4C
LC	Standard ON-Charge 3C TCS
PX	Standard 4C with "OFF" charging type _ low-level contacts
PC	Standard 4C with "ON" charging type _ low-level contacts

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

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

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

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

# Ordering

## Cradle

AL

—

H16C

—

3

—

J

—

H

—

E

—

S

**Air circuit breaker**

LS ACB Cradle

AL Bottom operating cradle

**Type & Ampere frame**

H16C 400~1600A

**Number of poles**

3	3P
4	4P

**Secondary connection type**

J	Manual connection
A	Auto connection

**Installation & Connection**

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

**Arc cover**

S	with arc cover
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**Shutter**

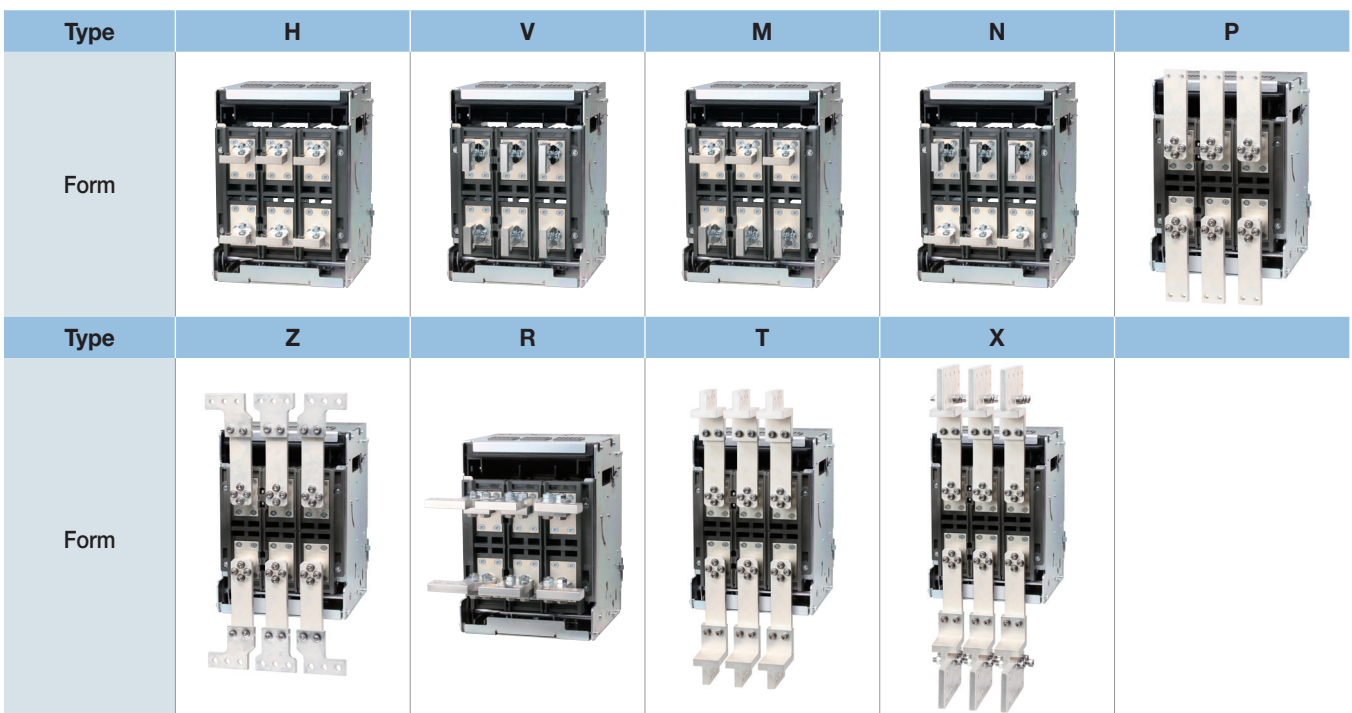
E	without shutter
F	with shutter

Note1) All of the AW/AH/AN/AR type ACB bodies use 'AL-H16C' cradle in common.  
 \*\* When using P, Z, T and X type, please purchase adapter kit separately after ordering P type product (Refer to fixed adapter kit table)  
 \*\*\* When using R type, purchase adapter kit separately after ordering H type product (Refer to fixed adapter kit table)

### 2. Draw-out type Adaptor Kit (Cradle)

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

## Various installation methods





## Trip relay



### Trip relay type

0	Without trip relay
N	Normal

A	Ammeter
---	---------

P	Power meter
---	-------------

S	Supreme meter
---	---------------



### Communication & protection

G	Ground fault (Residual earth fault protection), No communication
---	--

\* L,S,I,G configuration as standard (with LED indicators)

G	Ground fault (Residual earth fault protection), No communication
Z	Ground fault (External CT, Earth leakage below 30A)
E	Ground fault (External CT, Earth leakage over 30A)
C	Comm. + Ground fault (Residual earth fault protection)
K	Comm. + Ground fault (External CT, Earth leakage below 30A)
X	Comm. + Ground fault (External CT, Earth leakage over 30A)

\* Comm. And output contacts DO NOT work under self-power condition. (AC0, AK0, AX0, AC5, AK5, AX5)  
 \* Communication and output contacts for L,S,I,G do not work except OCR LED without control power supply.  
 - AG0, AG5, AZ0, AZ5, AE0, AE5  
 \* Z, K: External CT - LS ZCT applied (fault current 0.5-30A, 1600AF)  
 \* E, X: External CT - Private ZCT applied (fault current >30A)

C	Comm. + Ground fault (Residual earth fault protection)
K	Comm. + Ground fault (External CT, Earth leakage below 30A)
X	Comm. + Ground fault (External CT, Earth leakage over 30A)

\* Communication functions are normal. (Function unavailable without control power supply)  
 \* Applicable to generator protection purpose  
 \* Voltage module of P type or more is basic.  
 \* K: External CT - LS ZCT applied (fault current 0.5-30A, 1600AF)  
 \* X: External CT - Private ZCT applied (fault current >30A)

C	Comm. + Ground fault (Residual earth fault protection)
K	Comm. + Ground fault (External CT, Earth leakage below 30A)
X	Comm. + Earth leakage (External CT, Earth leakage over 30A)

\* Communication functions are normal. (Function unavailable without control power supply)  
 \* Applicable to generator protection purpose  
 \* Voltage module of P type or more is basic.  
 \* K: External CT - LS ZCT applied (fault current 0.5-30A, 1600AF)  
 \* X: External CT - Private ZCT applied (fault current >30A)



### Control voltage & frequency

0	Self-Power, 60Hz
5	Self-Power, 50Hz

0	Self-Power, 60Hz
1	AC/DC 110V-250V, 60Hz
2	DC 24V-60V, 60Hz
5	Self-Power, 50Hz
6	AC/DC 110V-250V, 50Hz
7	DC 24V-60V, 50Hz

1	AC/DC 110V-250V, 60Hz
2	DC 24V-60V, 60Hz
6	AC/DC 110V-250V, 50Hz
7	DC 24V-60V, 50Hz

1	AC/DC 110V-250V, 60Hz
2	DC 24V-60V, 60Hz
6	AC/DC 110V-250V, 50Hz
7	DC 24V-60V, 50Hz

# Trip relay (OCR)

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



## Rating Plug for selection

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

- 800AF





In: 400-600-630-800A (4 types)

- 1600AF

In: 800-1000-1200-1250-1600A (5 types)

Frequency selection switch: set to 50Hz or 60Hz

## Trip relay types

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

Each OCR type has Battery in itself.

1. Battery lifespan

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

2. The recognizable range of OCR current

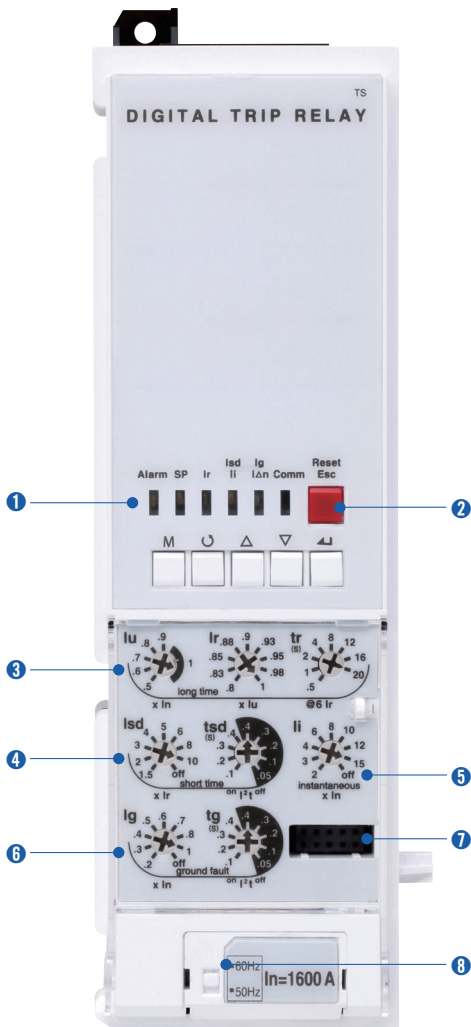
- 1) 10: When more 20% than rated current(I<sub>n</sub>) (ratio to I<sub>n</sub> regardless of I<sub>u</sub> and I<sub>r</sub>)
- 2) 30: When more 12% than rated current(I<sub>n</sub>)



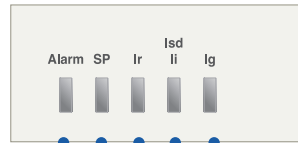
# Trip relay

## N type: 'Normal' type

- Optimized protection function
  - OCR, OCGR function according IEC60947-2
  - Overload protection
    - Long-time delay
    - Thermal
  - Short-circuit protection
    - Short-time delay/Instantaneous
    - 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
- Rating Plug for selection of rated current and frequency
    - Rating Plug type
      - 800AF: 400, 600, 630, 800A (4 types)
      - 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
    - Frequency selection switch: set to 50Hz or 60Hz



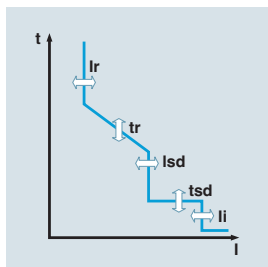
1 LED: Indication of trip info. and overload state



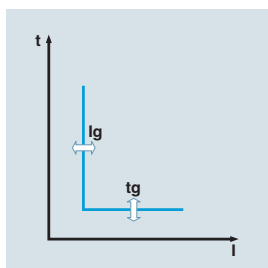
- Ig: LED indicating ground-fault
- lsd/li: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload  
(Turn on above 90%, Blink above 105%)

- 2 Reset Key: Fault reset or battery check
- 3 lu, lr: Long-time current setting, tr: Long-time tripping delay setting
- 4 lsd: Short-time current setting, tsd: Short-time tripping delay setting
- 5 li: Instantaneous current setting
- 6 lg: Ground fault current setting, tg: Ground fault tripping delay setting
- 7 Test terminal: OCR test terminal (Connected with OCR tester)
- 8 Rating Plug: Rated current (In) and frequency selection

## Protection



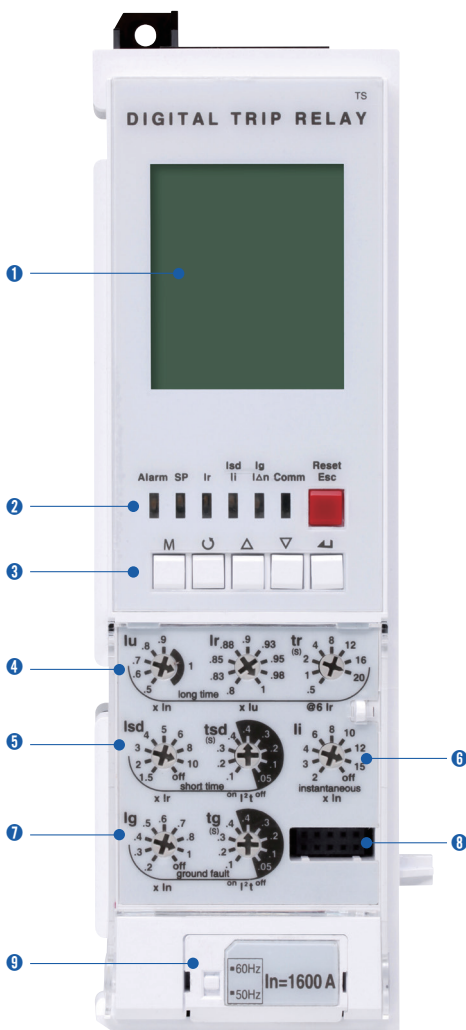
Long time											
Current setting (A)	$I_u = I_n \times \dots$		0.5	0.6	0.7	0.8	0.9	1.0			
	$I_r = I_u \times \dots$		0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98 1.0	
Time delay (s)	$t_r @ (1.5 \times I_r)$		12.5	25	50	100	200	300	400	500	
Accuracy: $\pm 15\%$ or below 100ms	$t_r @ (6.0 \times I_r)$		0.5	1	2	4	8	12	16	20	
	$t_r @ (7.2 \times I_r)$		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	
Short time											
Current setting (A)	$I_{sd} = I_r \times \dots$	Cat. B	1.5	2	3	4	5	6	8	10	Off
		Cat. A	1.5	2	3	4	5	6	8	(Not set)	Off
Time delay (s) @ $10 \times I_r$	tsd	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4				
		$I^2t$ On		0.1	0.2	0.3	0.4				
	$(I^2t \text{ Off})$	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)											
Accuracy: $\pm 10\%$ ( $I_g > 0.4 I_n$ ) $\pm 20\%$ ( $I_g \leq 0.4 I_n$ )	$I_g = I_n \times \dots$		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ $10 \times I_r$	tg	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4				
		$I^2t$ On		0.1	0.2	0.3	0.4				
	$(I^2t \text{ Off})$	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				



# Trip relay

## A type: 「Ammeter」 type

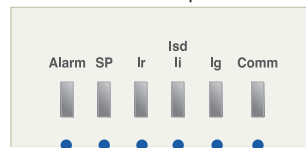
- Overload protection
  - Long-time delay
  - Thermal
- Short-circuit protection
  - Short-time delay/Instantaneous
  - I<sup>2</sup>t On/Off optional (for short-time delay)
- Ground fault protection
  - I<sup>2</sup>t On/Off optional
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- High-performance and high-speed MCU built-in
  - Accurate measurement with tolerance of 1.0%
- Fault recording
  - Records Max. up to 10 fault information about fault type, fault phase, fault data, occurrence time of fault
- SBO (Select Before Operation)
  - High reliability for control and setting change method
- 3 DO (Digital Output)
- Communication
  - Modbus/RS485
  - Profibus-DP
- Rating Plug for selection of rated current(I<sub>n</sub>) and frequency
  - Rating Plug type
    - 800AF: 400, 600, 630, 800A (4 types)
    - 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
  - Frequency selection switch: set to 50Hz or 60Hz



\* When communication is flashing phone icon on the LCD.

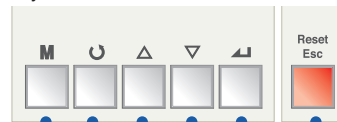
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



- Comm: LED indicating comm. state (Blink when running) \*
- Ig: LED indicating ground-fault
- Isd/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 Ir: Long-time current setting, tr: Long-time tripping delay setting

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

⑥ li: Instantaneous current setting

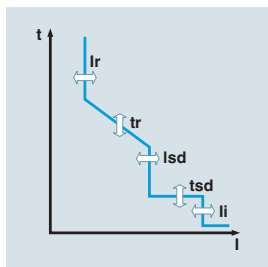
⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting

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

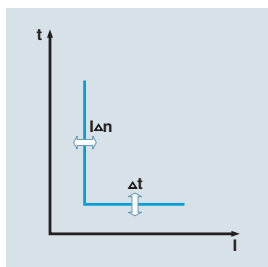
⑨ Rating Plug: Rated current (I<sub>n</sub>) and frequency selection



## 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		
Accuracy : $\pm 15\%$ or below 100ms	$t_r @ (6.0 \times I_r)$		0.5	1	2	4	8	12	16	20		
	$t_r @ (7.2 \times I_r)$		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8		
Short time												
Current setting (A)	$I_{sd} = I_r \times \dots$	Cat. B	1.5	2	3	4	5	6	8	10	Off	
		Cat. A	1.5	2	3	4	5	6	8	(Not set)	Off	
Time delay (s)	$t_{sd} @ 10 \times I_r$	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4					
		$I^2t$ On		0.1	0.2	0.3	0.4					
	$(I^2t \text{ Off})$	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)												
Accuracy: $\pm 10\%$ ( $I_g > 0.4 I_n$ ) $\pm 20\%$ ( $I_g \leq 0.4 I_n$ )	$I_g = I_n \times \dots$		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off	
Time delay (s)	$t_g @ 10 \times I_r$	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4					
		$I^2t$ On		0.1	0.2	0.3	0.4					
	$(I^2t \text{ Off})$	Min. Trip Time (ms)	20	80	160	260	360					
		Max. Trip Time (ms)	80	140	240	340	440					
Earth leakage (Option)												
Current setting (A)	$I_{\Delta n}$		0.5	1	2	3	5	10	20	30	Off	
Time delay (ms)	$\Delta t$	Alarm Time (ms)	140	230	350	800	950					
		Trip Time (ms)	140	230	350	800						

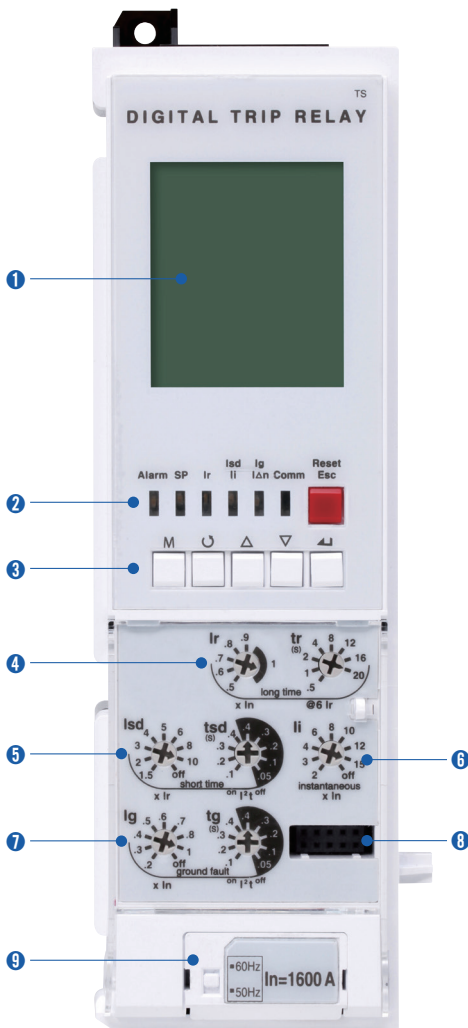


Note) Unable to select ground fault and earth leakage, simultaneously

# Trip relay

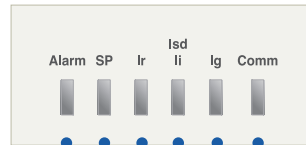
## P type: 「Power meter」 type

- 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 protection
  - I<sup>2</sup>t On/Off optional
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and key
- IDMTL setting (SIT, VIT, EIT, DT curve)
  - Basic setting : “None”. Thermal curve.
- Measurement and display function
  - High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
  - 128 x 128 Graphic LCD
  - Indicates current/voltage vector diagram and waveform
- Fault recording
  - Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
- Event recording
  - Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
  - High reliability for control and setting change method
- 3 DO (Digital output)
  - Programmable for alarm, trip and general DO
- Communication
  - Modbus/RS485    – Profibus-DP
- Rating Plug for selection of rated current(I<sub>n</sub>) and frequency
  - Rating Plug type
    - 800AF: 400, 600, 630, 800A (4 types)
    - 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
  - Frequency selection switch: set to 50Hz or 60Hz



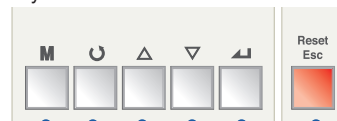
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



- Comm: LED indicating comm. state (Blink when running) \*
- Ig: LED indicating ground-fault
- Isd/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

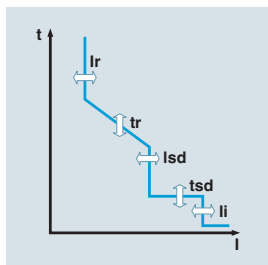


- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

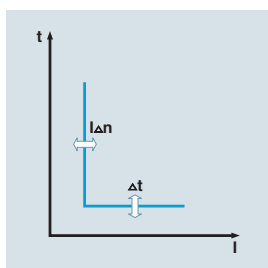
- ④ Ir: Long-time current setting, tr: Long-time tripping delay setting
- ⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting
- ⑥ li: Instantaneous current setting
- ⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
- ⑧ Test terminal: OCR test terminal (Connected with OCR tester)
- ⑨ Rating Plug: Rated current (I<sub>n</sub>) and frequency selection

\* When communication is flashing phone icon on the LCD.

## Protection



Long time											
Current setting (A)	$I_r = I_{ux}...$		0.4	0.5	0.6	0.7	0.8	0.9	1.0		
Time delay (s)	$tr@(1.5 \times I_r)$		12.5	25	50	100	200	300	400	500	
Accuracy : $\pm 15\%$ or below 100ms	$tr@(6.0 \times I_r)$		0.5	1	2	4	8	12	16	20	
	$tr@(7.2 \times I_r)$		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	
Short time											
Current setting (A)	$I_{sd} = I_{rx}...$	Cat. B	1.5	2	3	4	5	6	8	10	Off
		Cat. A	1.5	2	3	4	5	6	8	(Not set)	Off
Time delay (s) @ $10 \times I_r$	tsd	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4				
		$I^2t$ On		0.1	0.2	0.3	0.4				
	$(I^2t$ Off)	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	$I_i = I_{nx}...$		2	3	4	6	8	10	12	15	Off
Tripping time			below 50ms								
Ground fault											
Pick-up (A)											
Accuracy : $\pm 10\%$ ( $I_g > 0.4 I_n$ ) $\pm 20\%$ ( $I_g \leq 0.4 I_n$ )	$I_g = I_{nx}...$		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ $10 \times I_r$	tg	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4				
		$I^2t$ On		0.1	0.2	0.3	0.4				
	$(I^2t$ Off)	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				



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

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

Earth leakage (Option)											
Current setting (A)	$I_p = I_{rx}...$		0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Time delay (ms) Accuracy : $\pm 15\%$	$t_p@(1.2 \times I_p)$		1	5	10	15	20	25	30	35	Off

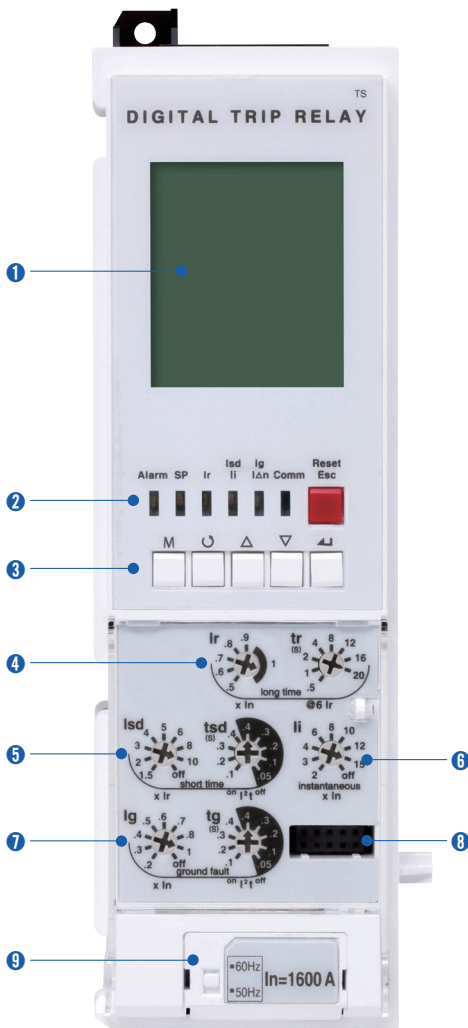
Other protection	Pick-up			Time delay(s)		
	Setting range	Step	Accuracy	Setting range	Step	Accuracy
Under voltage	80V ~ OV_Pick-up	1V	$\pm 5\%$	1.2~40	0.1	$\pm 0.1$
Over voltage	UV_Pick-up ~ 980V	1V	$\pm 5\%$			
Voltage unbalance	6% ~ 99%	1%	$\pm 2.5\%$ or ( $*\pm 10\%$ )			
Reverse power	10 ~ 500kW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



# Trip relay

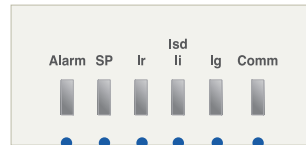
## S type: 「Supreme meter」 type

- 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 protection
  - I<sup>2</sup>t On/Off optional
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and key
- IDMTL setting (SIT, VIT, EIT, DT curve)
  - Basic setting : “None”. Thermal curve.
- Measurement and display function
  - High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
  - 128 x 128 Graphic LCD
  - Indicates current/voltage vector diagram and waveform
- Fault recording
  - Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
- Event recording
  - Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
  - High reliability for control and setting change method
- 3 DO (Digital output)
  - Programmable for alarm, trip and general DO
- Communication
  - Modbus/RS485
  - Profibus-DP
- Rating Plug for selection of rated current(I<sub>n</sub>) and frequency
  - Rating Plug type
    - 800AF: 400, 600, 630, 800A (4 types)
    - 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
  - Frequency selection switch: set to 50Hz or 60Hz



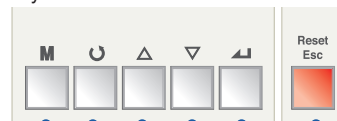
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



- Comm: LED indicating comm. state (Blink when running) \*
- Ig: LED indicating ground-fault
- Isd/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

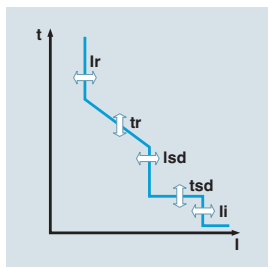


- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

- ④ Ir: Long-time current setting, tr: Long-time tripping delay setting
- ⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting
- ⑥ li: 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)
- ⑨ Rating Plug: Rated current (I<sub>n</sub>) and frequency selection

\* When communication is flashing phone icon on the LCD.

## Protection



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

Short time			1.5	2	3	4	5	6	8	10	Off
Current setting (A)	$I_{sd} = I_{rx} \dots$	Cat. B									
Accuracy : $\pm 10\%$		Cat. A	1.5	2	3	4	5	6	8	10	Off
Time delay (s)	$t_{sd}$	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4				
@ $10 \times I_r$		$I^2t$ On		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			2	3	4	6	8	10	12	15	Off
Current setting (A)	$I_i = I_{nx} \dots$										
Tripping time			below 50ms								

Ground fault			0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Pick-up (A)											
Accuracy : $\pm 10\%$ ( $I_g > 0.4 I_n$ ) $\pm 20\%$ ( $I_g \leq 0.4 I_n$ )	$I_g = I_{nx} \dots$										
Time delay (s)	$t_g$	$I^2t$ Off	0.05	0.1	0.2	0.3	0.4				
@ $10 \times I_r$		$I^2t$ On		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)			0.5	1	2	3	5	10	20	30	Off
Current setting (A)	$I_{\Delta n}$										
Time delay (ms)	$\Delta t$	Alarm Time (ms)	140	230	350	800	950				
Accuracy : $\pm 15\%$		Trip Time (ms)	140	230	350	800					

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

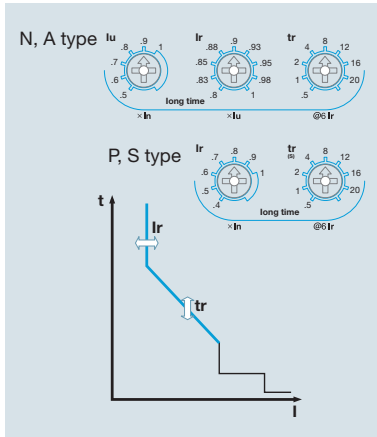
Earth leakage (Option)			0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Current setting (A)	$I_p = I_{rx} \dots$										
Time delay (ms)	$t_p @ (1.2 \times I_p)$		1	5	10	15	20	25	30	35	Off
Accuracy : $\pm 15\%$											

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

# Trip relay

## Operation characteristics

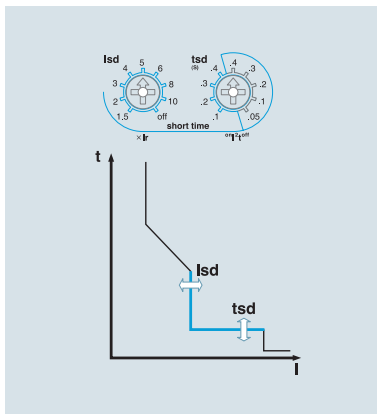
### Long-time delay (L)



**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:  $(0.4 \sim 1.0) \times I_n$ 
    - lu:  $(0.5-0.6-0.7-0.8-0.9-1.0) \times I_n$
    - lr:  $(0.8-0.83-0.85-0.88-0.9-0.93-0.95-0.98-1.0) \times I_u$
- 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 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.

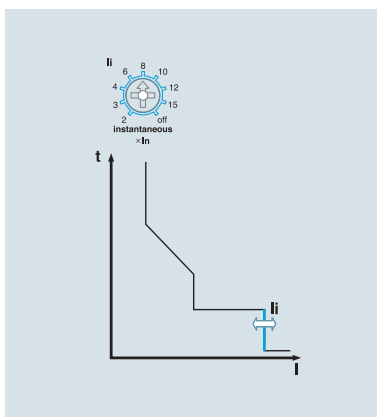
### Short-time delay (S)



**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: (Cat B: 1.5-2-3-4-5-6-8-10-Off)
  - (Cat A: 1.5-2-3-4-5-6-8-Off)
- 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)

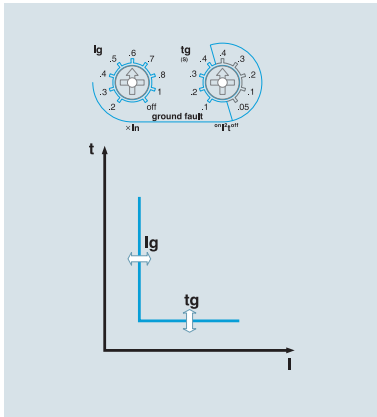


**The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.**

- 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.



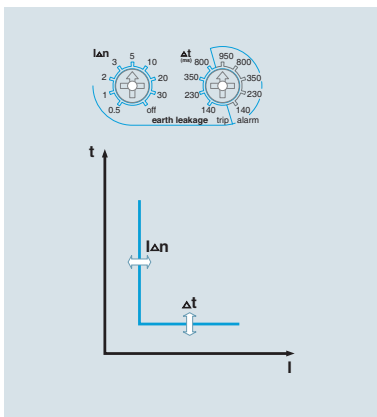
## Ground Fault (G)



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

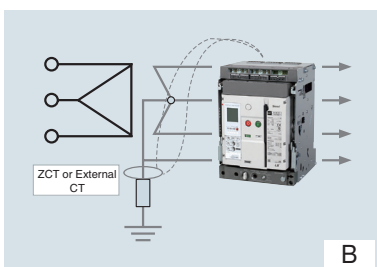
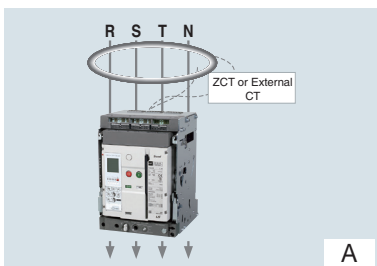
- Standard setting current knob:  $I_g$ 
  - Setting range:  $(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off) \times I_n$
- Time delay setting knob:  $t_g$ 
  - Inverse time ( $I^2t$  On):  $0.1-0.2-0.3-0.4$  sec
  - Definite time ( $I^2t$  Off):  $0.05-0.1-0.2-0.3-0.4$  sec
- Ground fault current is vector sum 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 earthleakage protection function at the same time)

## Earth Leakage (G) - Option



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

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



**\* Use cautions with earth-leakage current settings**

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

**※ 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.

## Measurement function

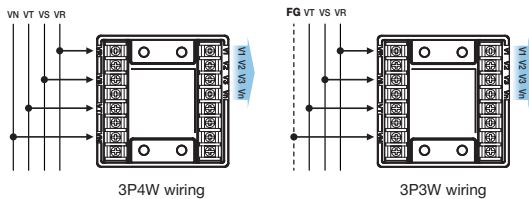


Class.	Measurement element	Detailed element	Unit	Display range
Current	Line current	Ia, Ib, Ic	A	80A~65,535A
	Normal current	I <sub>1</sub>		
	Reverse current	I <sub>2</sub>		
Voltage	Line voltage	Vab, Vbc, Vca	V	60~690V
	Phase voltage	Va, Vb, Vc		
	Normal voltage	V <sub>1</sub>		
	Reverse voltage	V <sub>2</sub>		
Angle	Line-to-line, Line-to-current	∠VabIa, ∠VablIb, ∠VabIc, ∠VabVbc, ∠VabVca	°	0~360°
	Phase-to-phase	∠VaVb, ∠VaVc		
	Phase-to-current	∠Vala, ∠Vblb, ∠Vclc		
Power	Active power		kW	1kW~99999kW
	Reactive power		kVar	1kVar~99999kVar
	Apparent power		kVA	1kVA~99999kVA
Energy	Active energy	WHa(ab), WHb(bc), WHc(ca), WH	kWh, MWh	1kWh~9999.99MWh
	Reactive energy	VARHa(ab), VARHb(bc), VARHc(ca), VARH	kVarh, Mvarh	1kVarh~9999.99MVarh
	Reverse active energy	rWHa(ab), rWHb(bc), rWHc(ca), rWH	kWh, MWh	1kWh~9999.99MWh
Freq.	Frequency (F)	Frequency	Hz	45~65Hz
Power factor	Power factor (PF)	PFa(ab), PFb(bc), PFc(ca), PF		+ : Lead - : Lag
Unbalance	Unbalance rate	Iunbalance, Vunbalance	%	0.0~100.0
Demand	Active power demand	Peak demand	kW	1kW~99999kW
	Current demand	Peak demand	A	80A~65535A
Harmonics	Voltage harmonics	1st~63th harmonics of Va(ab), Vb(bc), Vc(ca)	V	60~690V
	Current	1st~63th harmonics of Ia, Ib, Ic	A	80A~65535A
	THD, TDD		%	0.0~100.0
	K-Factor		-	0.0~100.0

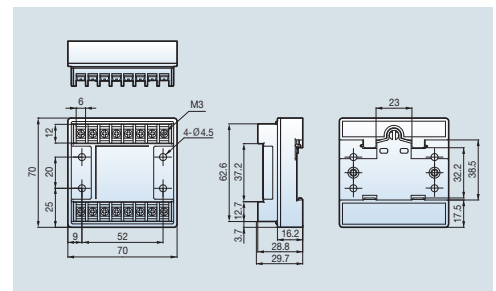


## Shield cable

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



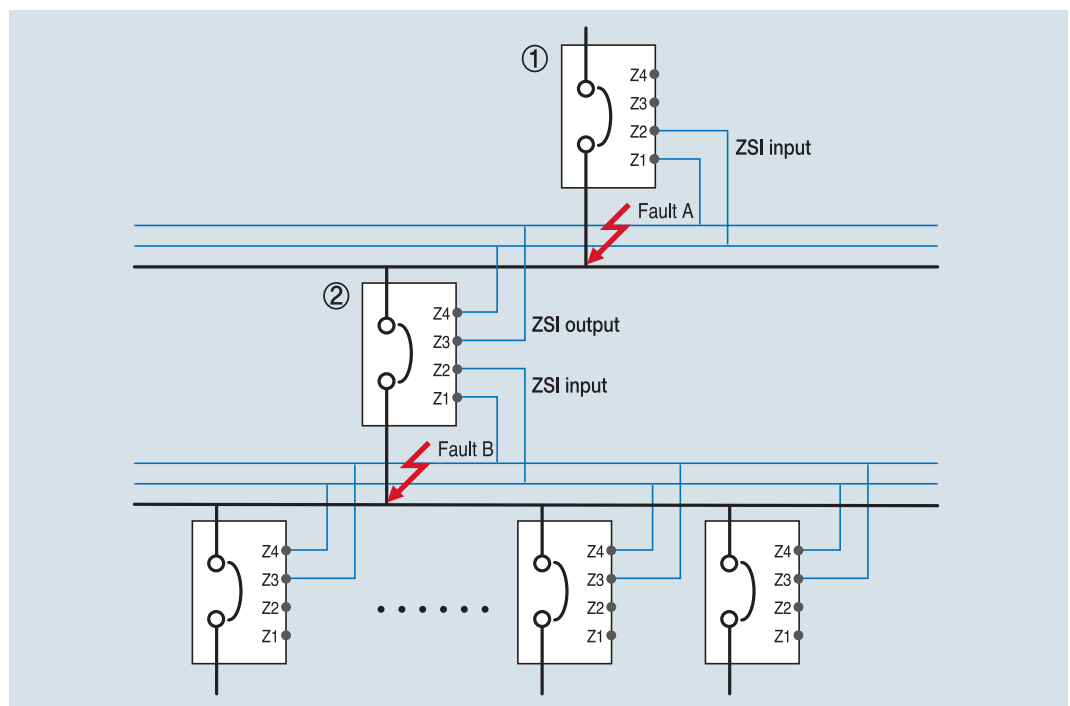
- Note) 1. Be sure to use a shielding wire for the secondary wiring of the Shield cable.  
2. The maximum length of use is less than 3.5m.



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

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

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



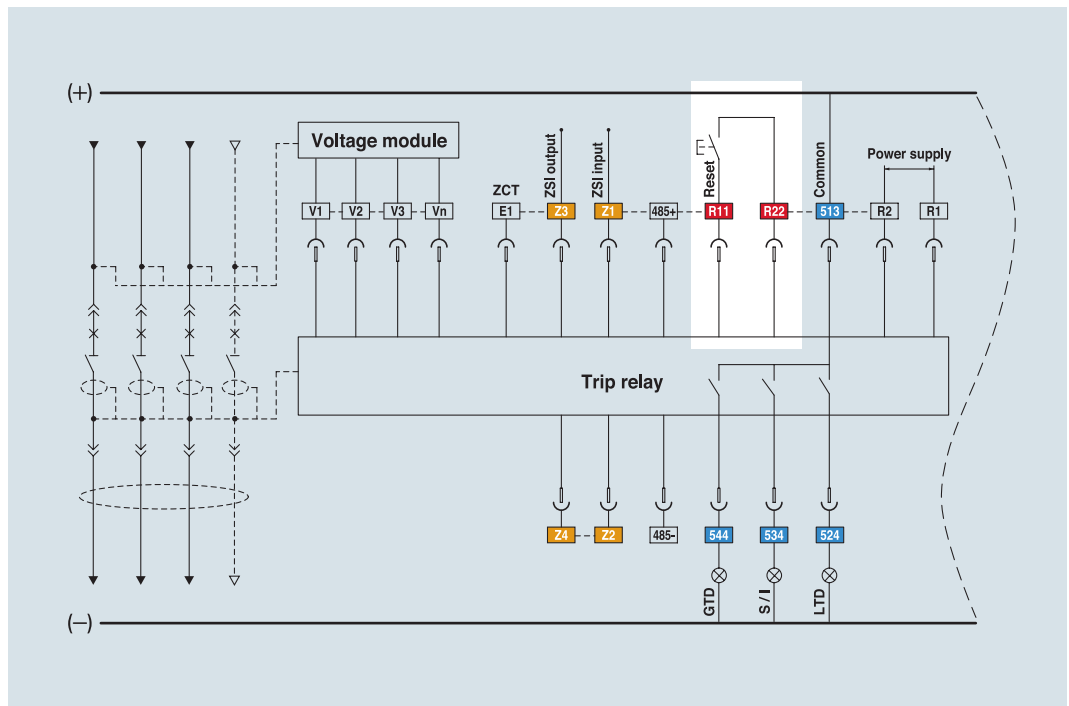
- 1) Occurrence of fault A
  - Only breaker ① performs instantaneous trip operation.
- 2) Occurrence of fault B
  - Breaker ② performs instantaneous trip operation, breaker ① performs trip operation after prearranged delay time
  - But if breaker ② did not break the fault normally, breaker ① performs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



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

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

1. Methods to reset Trip relay is to push the Reset button on the frontal side and to use the remote reset.
2. Digital input
  - [R11-R22] input: Remote reset
  - [Z1-Z2] Input: ZSI input
  - [E1-E2] Input: ZCT for earth leakage detection or external CT input
- ※ All DI are dry contact that has 3.3V of recognition voltage. When inputting close by SSR(Solid State Relay) or open-collector, connect collector (Drain) to R11.
3. Digital output 3a(524, 534, 544-513)
  - Fault output: Long/Short time delay, Instantaneous, Ground fault, UVR, OVR, UFR, OFR, rPower, Vunbal, lunbal (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	lunbal	OFR	UFR	OPR	Note
P,S type	DO1(524)	●	○	○	○	○	○	○	○	○	○	○	○	○	Programmable
	DO2(534)	○	●	●	○	○	○	○	○	○	○	○	○	○	
	DO3(544)	○	○	○	●	○	○	○	○	○	○	○	○	○	
A type	DO1(524)	●	×	×	×	Not available									Fixed
	DO2(534)	×	●	●	×										
	DO3(544)	×	×	×	●										

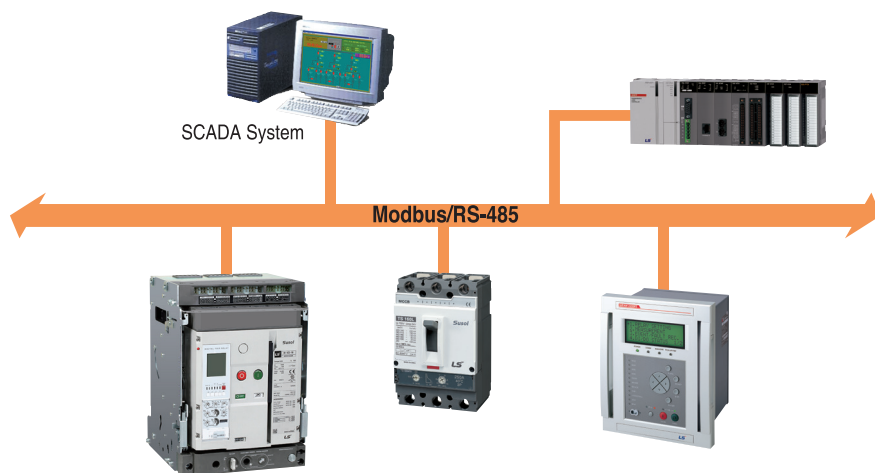
## Communication

### Modbus/RS-485

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

※ RS485 Communication precautions

- 1) Operation mode and maximum communication distance: Support up to 1.2km in differential mode.
- 2) Communication line and cable specification: Use universal AWG22, twisted shield par cable.
- 3) Please make sure to ground the shield of the communication line.

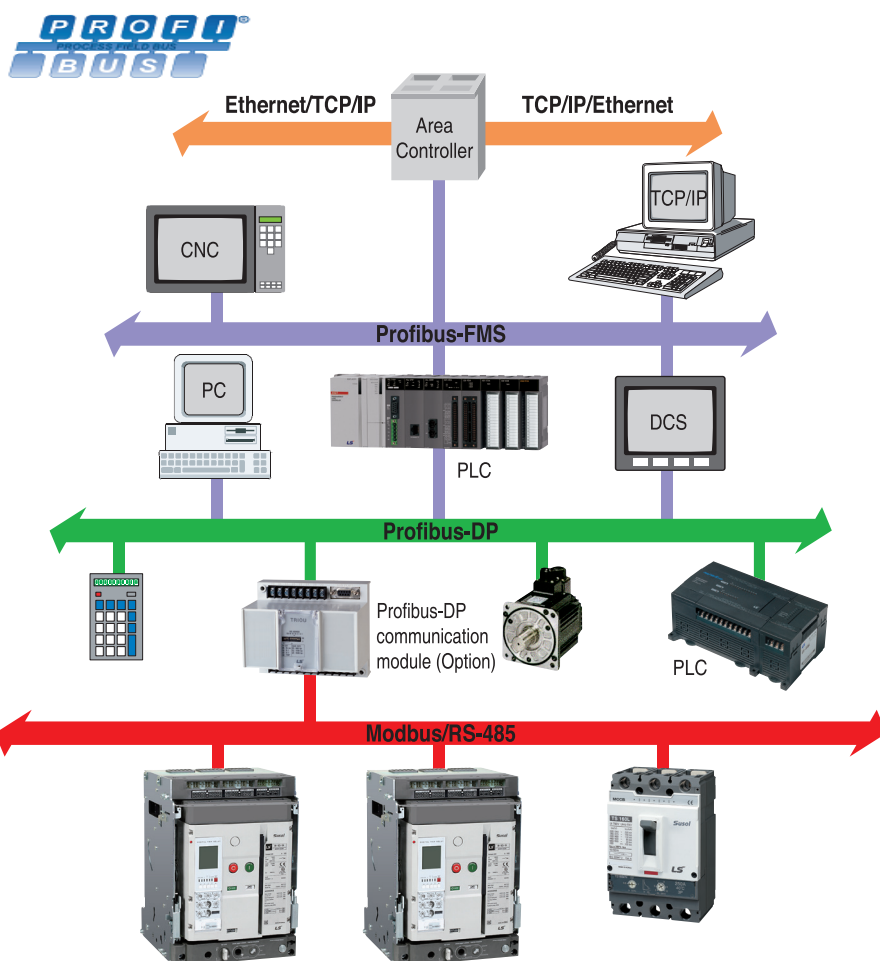


### Profibus-DP

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



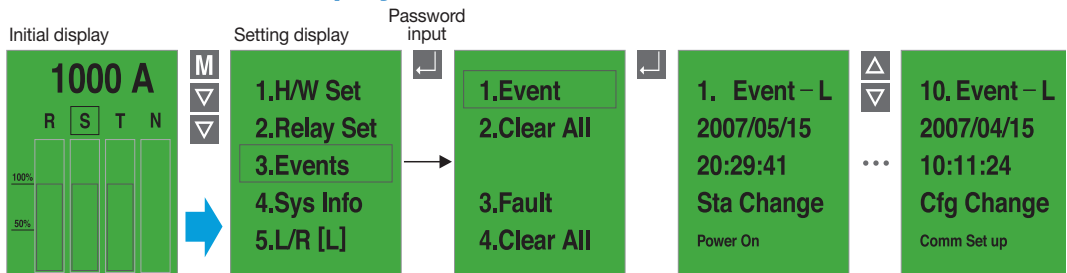
Profibus-DP communication module (Option)



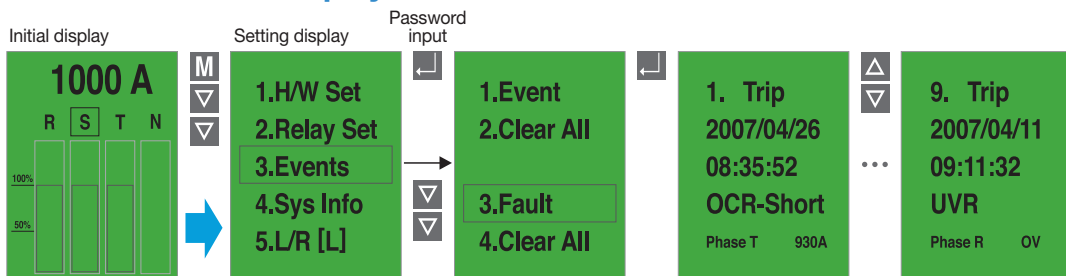
## Event & Fault Recording (P, S type)

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

### Event information display



### Fault information display

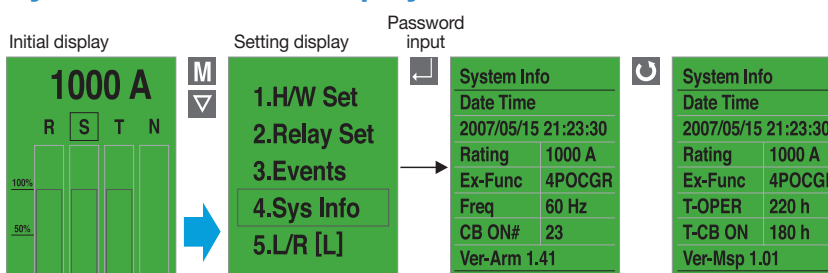


## System Information

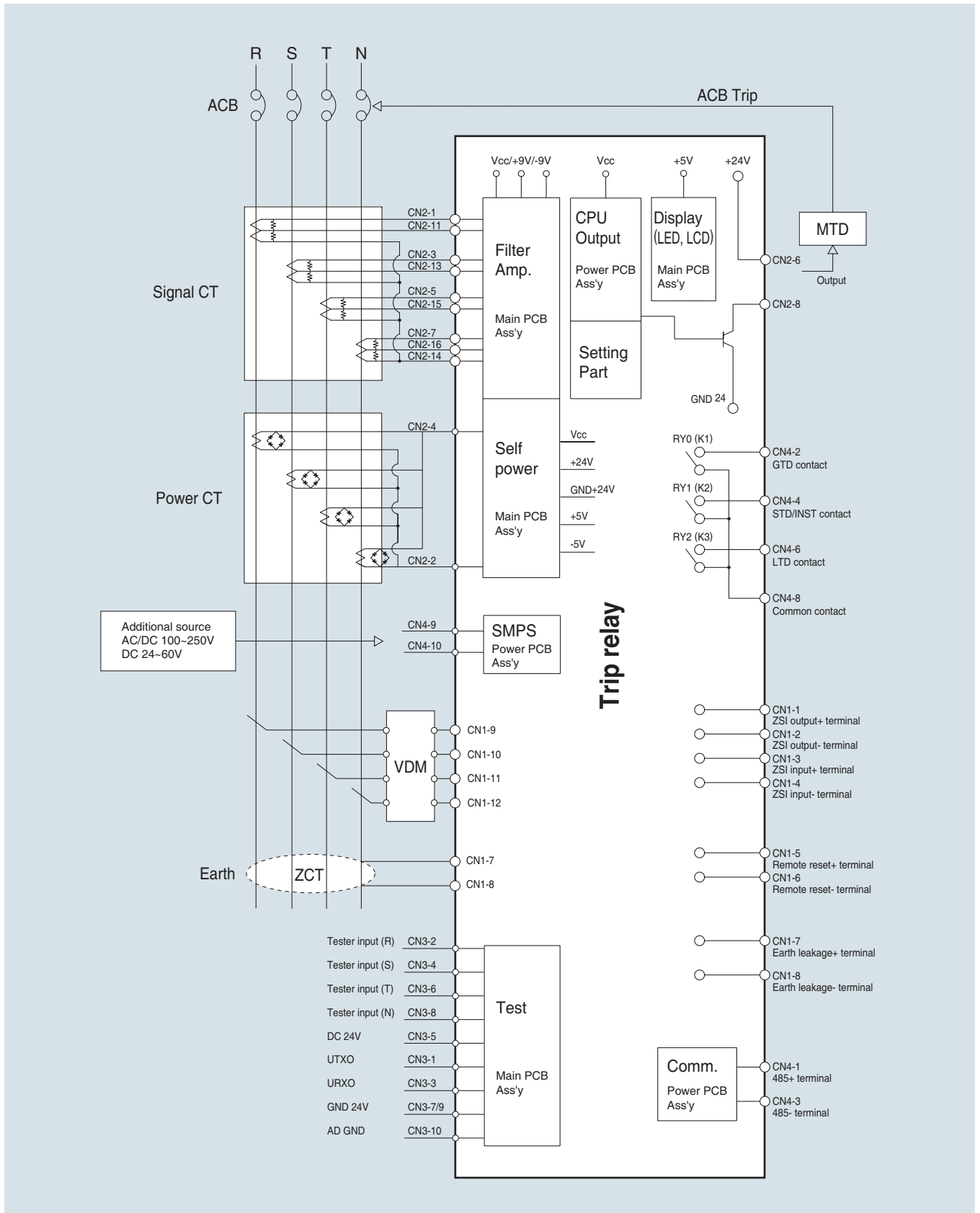
P and S type can indicate information as followings with the information of the ACB.

- Present time: year/month/date/hour/minute/ms
- ACB current ratings
- Ex-Func: Special function (3P OCGR, 4P OCGR, Ex OCGR)
- 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
- S/W ver. information

### System information display



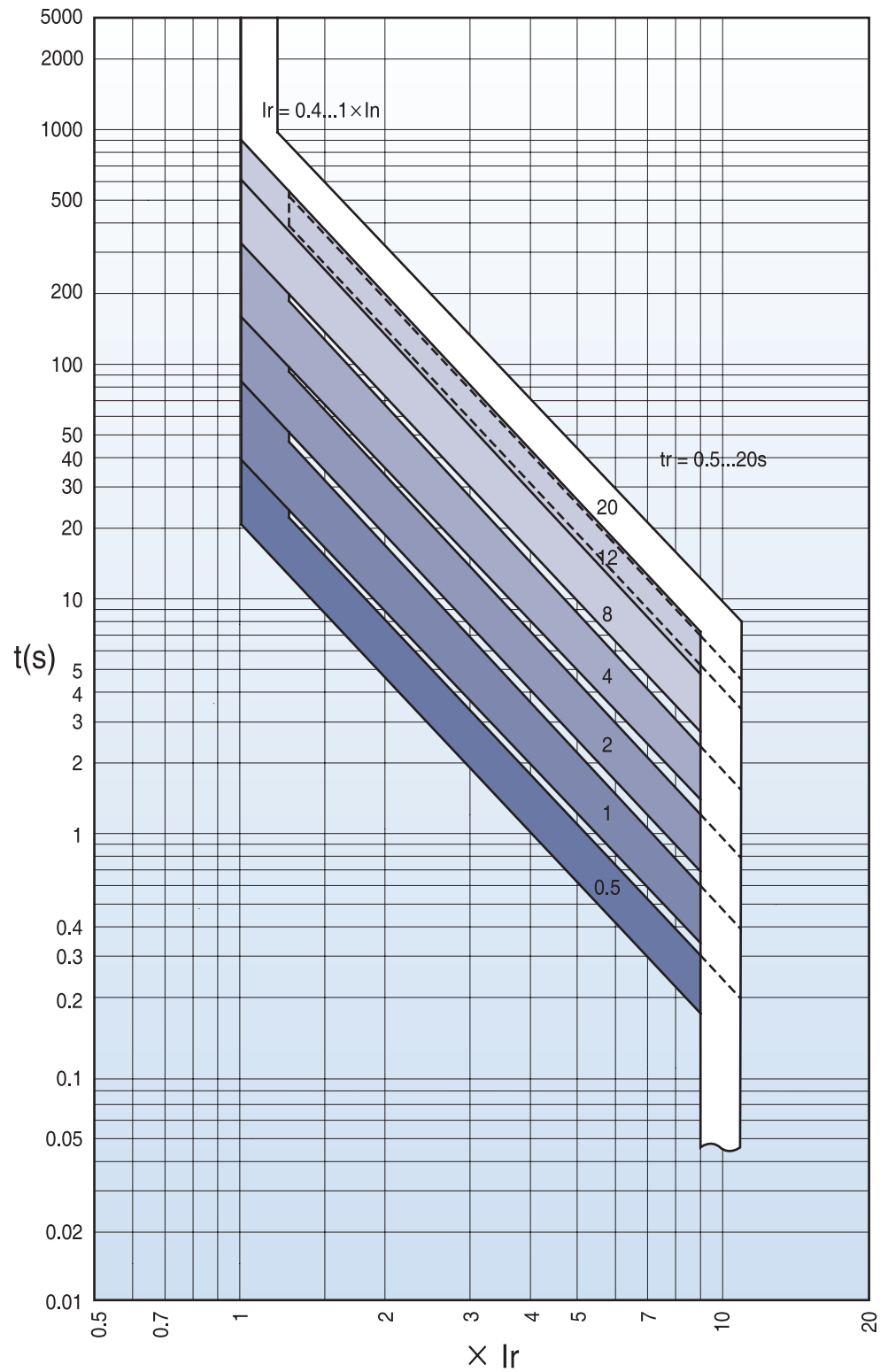
## System block diagram



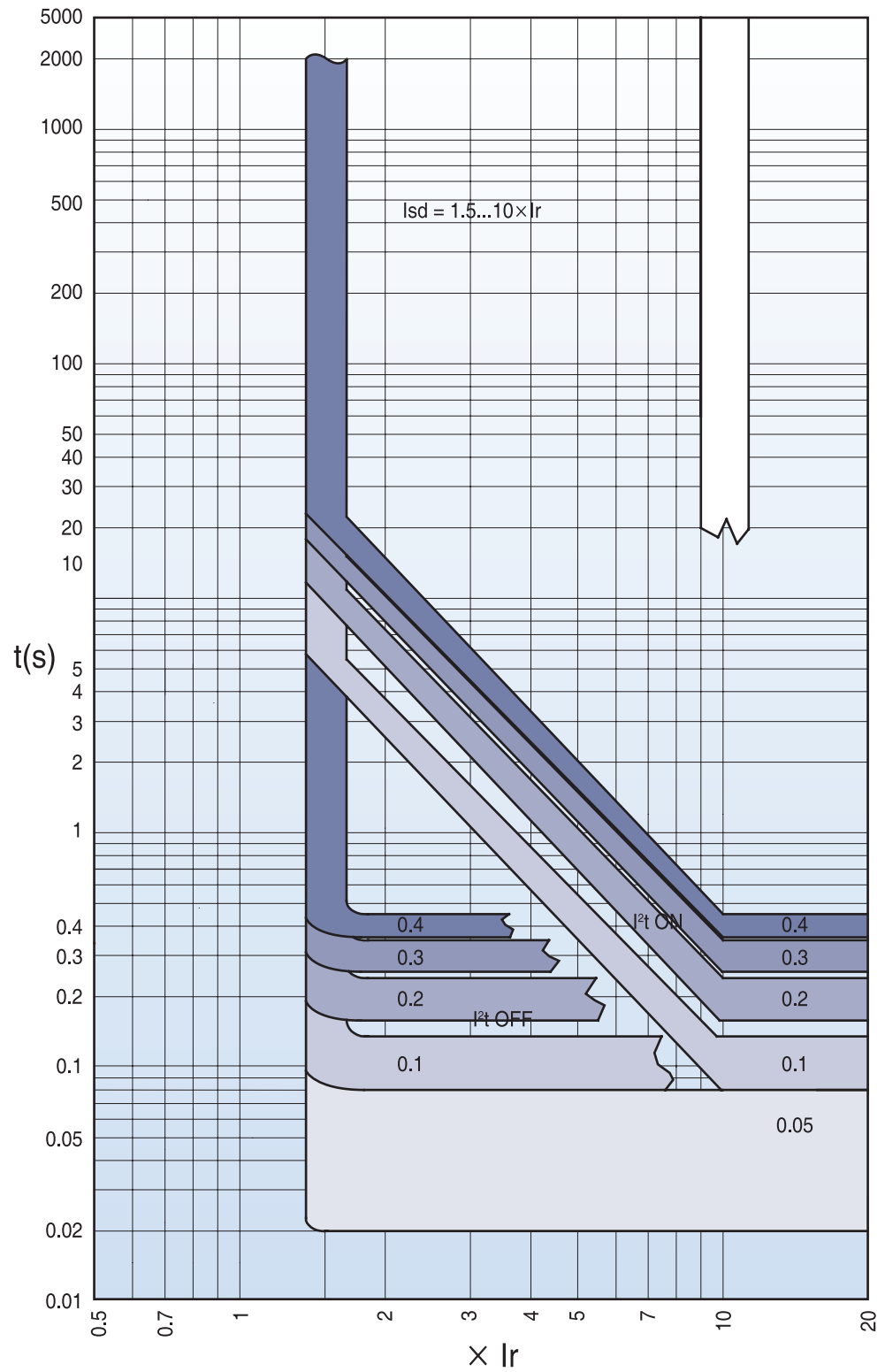


## Characteristics curves

### Long-time delay (L)

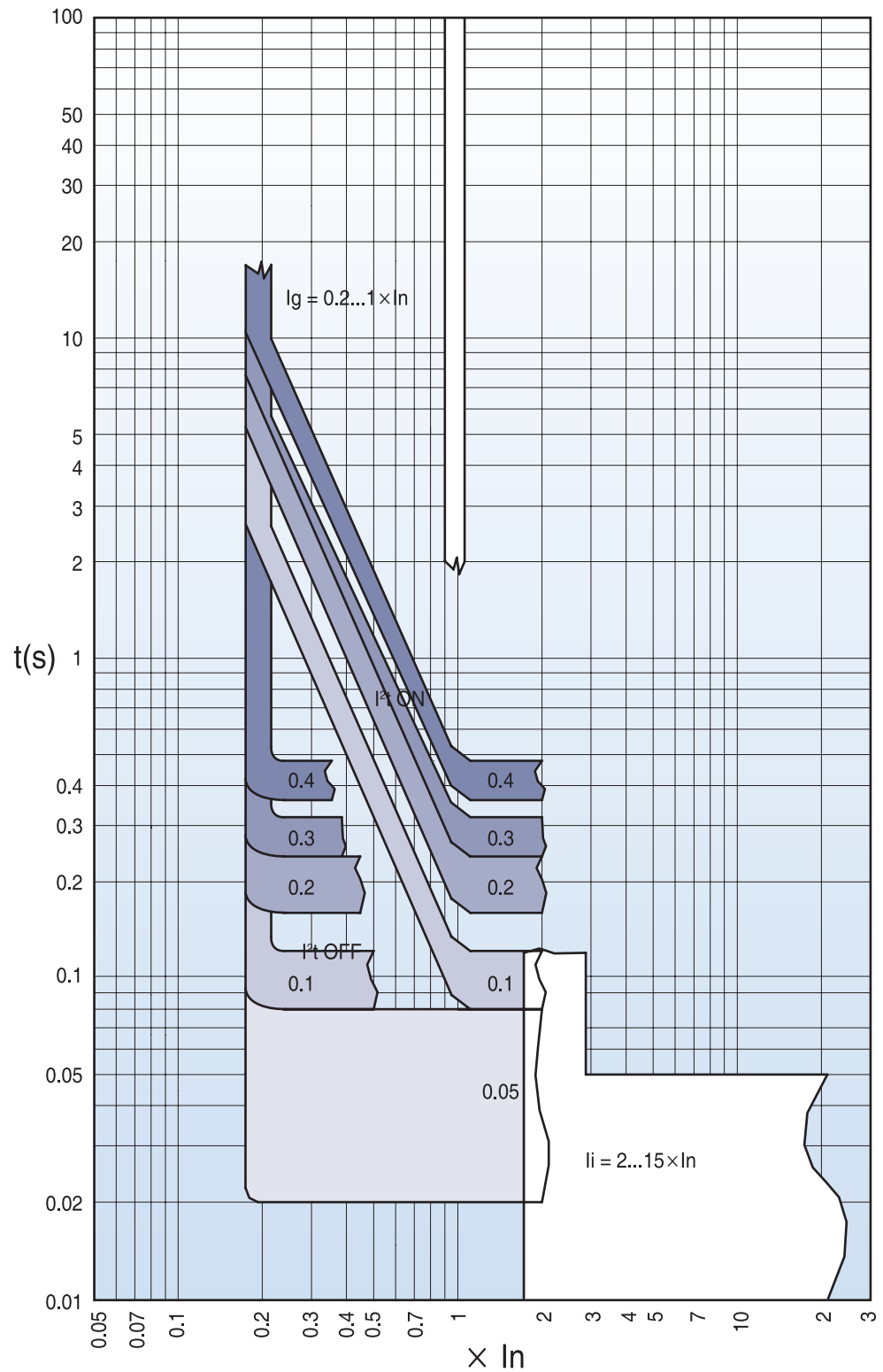


Short-time delay (S)

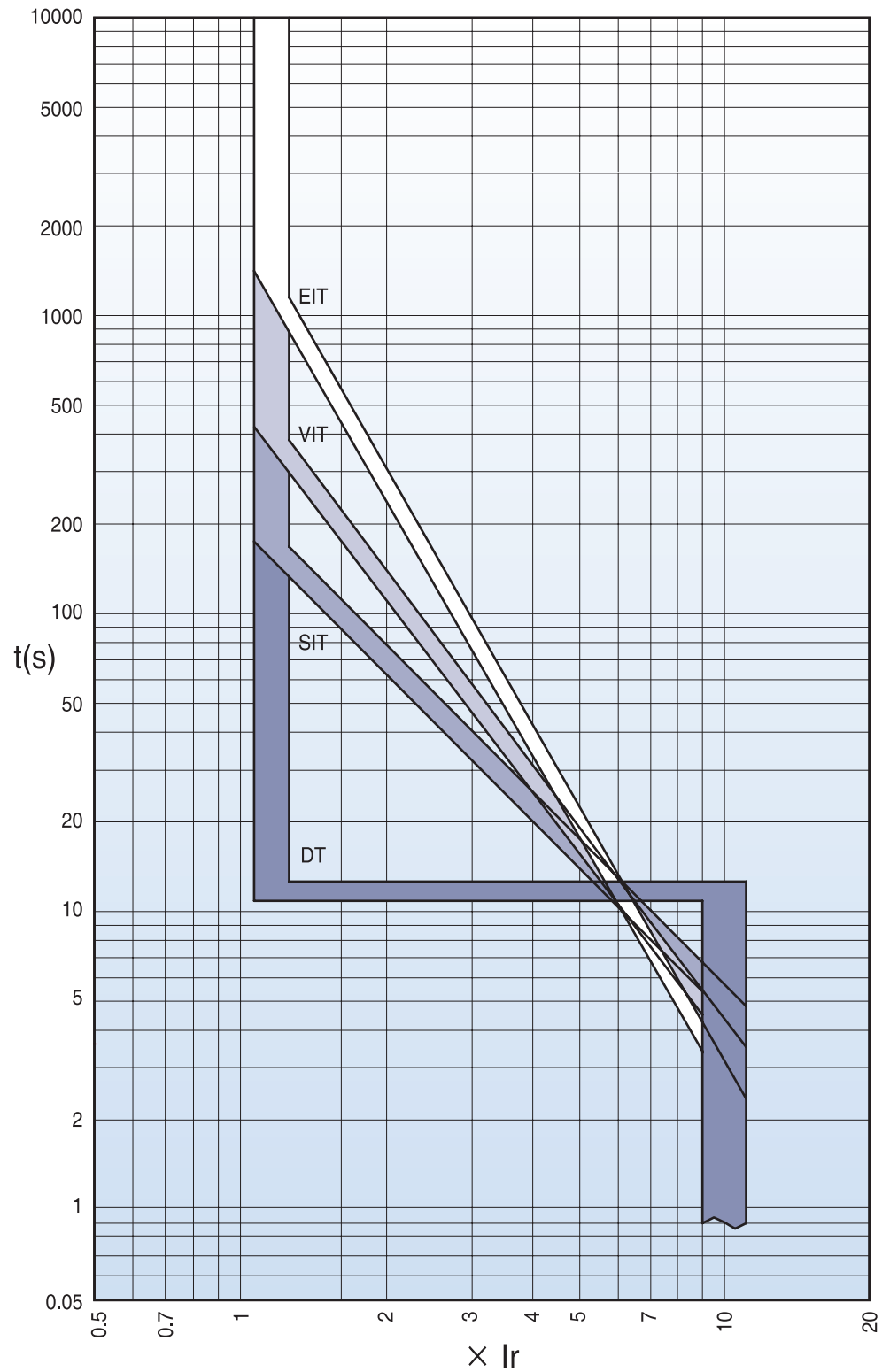


## Characteristics curves

Instantaneous (I)  
Ground fault (G)



IDMTL





# Accessories

## Main body



Mounting	Accessories		Supply category		Remark <sup>Note)</sup>	Page
			Standard	Option		
Internal	SHT 1	Shunt Coil	-	○	*	50
	SHT 2	Double Shunt Coil	-	○	*	51
	CC	Closing Coil	-	○	*	52
	M	Motor	-	○	*	53
	CS1	Charge Switch	-	○	*	
	UVT	Under Voltage Trip Device	-	○	*	54
	AL	Trip Alarm Contact	-	○	*	55
	MRB	Manual Reset Button	-	○	*	56
	RES	Remote Reset Switch	-	○	*	57
	RCS	Ready to Close Switch	-	○	*	58
	C	Counter	-	○	*	58
	FX	Auxiliary Switch	●	-	*	60
	MI	Mechanical Interlock	-	○	*	65
External	K1	Key Lock	-	○	*	59
	K2	Key Interlock Set	-	○	*	59
	B	ON/OFF Button Lock	-	○	*	60
	LH	Lifting Hook	-	○	-	61
	CTD	Condenser Trip Device	-	○	-	61
	DC	Dust Cover	-	○	-	64
	IT	i-Tester	-	○	-	62
	A	Automatic Connector	●	-	*	
	DF	Door Frame	-	○	-	66

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

## Cradle

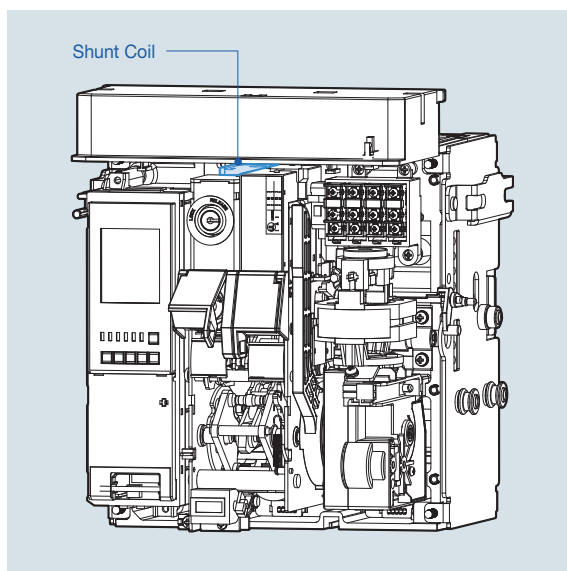


Mounting	Accessories		Supply category		Remark <small>Note)</small>	Page
			Standard	Option		
Trip relay	N	N type	-	○	*	28
	A	A type	-	○	*	30
	P	P type	-	○	*	32
	S	S type	-	○	*	34
	VM	Voltage Module	-	○	**	38
	ZCT	ZCT for the earth leakage	-	○		
Cradle	ST	Safety Shutter	-	○	*	66
	DF	Door Frame	-	○		66
	MIP	Miss Insertion Prevent Device	-	○		71
	MOC	Mechanical Operated Cell Switch	-	○		65
	CEL	Cell Switch	-	○		68
	DI	Door Interlock	-	○		69
	ZAS	Zero Arc Space (Arc Cover)	●	-	*	69
	SC	Safety Control Cover	●	-	*	
	RI	Racking Interlock	-	○		70
	PL	Pad Lock/Position Lock	●	-	*	70
	IB	Interphase Barrier	●	-	-	67
	UDC	UVT time delay controller	-	○		72
	ADP	Compatible Adapter	-	○	-	
Other	RPH	Reverse Phase ACB	-	○	-	
	VAD	Various Connection Type	-	○	-	
	RCO	Remote I/O	-	○	-	73
	PC	Profibus-DP comm. module	-	○	-	

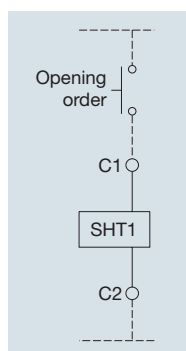
\* Separate purchasing is not allowed. Each item should be purchased with the main body.

\*\* Voltage module should be purchased with P/S type trip relay.

## Shunt Coil [SHT1]



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



Wiring Diagram

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

Rated voltage (Vn)		Operating voltage range (V)	Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)		Inrush	Steady-state	
24~30	-	0.7~1.1 Vn	200	5	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).

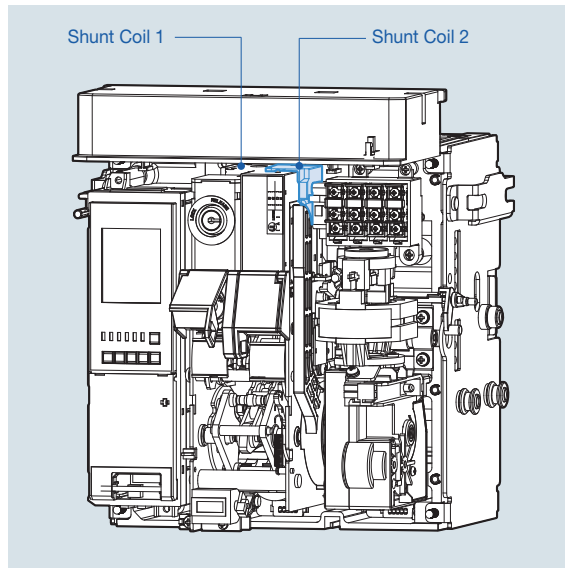
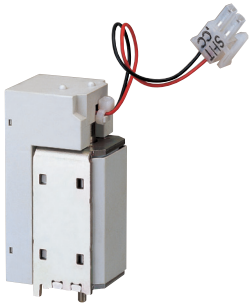
### 2. Specification of the wire

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

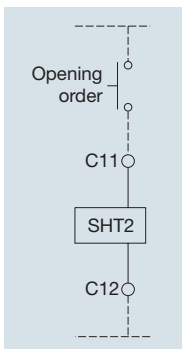
The maximum wire length

		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (1.31mm <sup>2</sup> )	#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (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.



Wiring Diagram

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

Rated voltage (Vn)		Operating voltage range (V)	Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)		Inrush	Steady-state	
24~30	-	0.7~1.1 Vn	200	5	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).

### 2. Specification of the wire

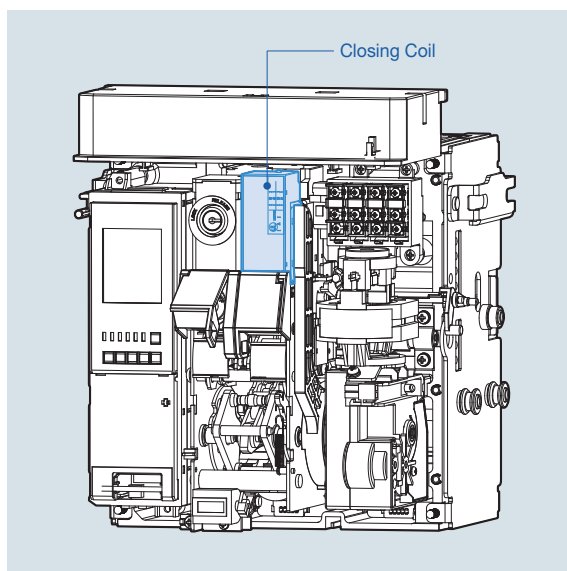
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

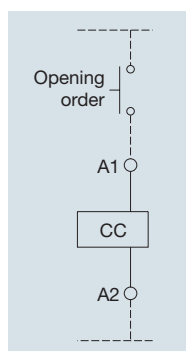
		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (1.31mm <sup>2</sup> )	#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (1.31mm <sup>2</sup> )
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m



## 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).



Wiring Diagram

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

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

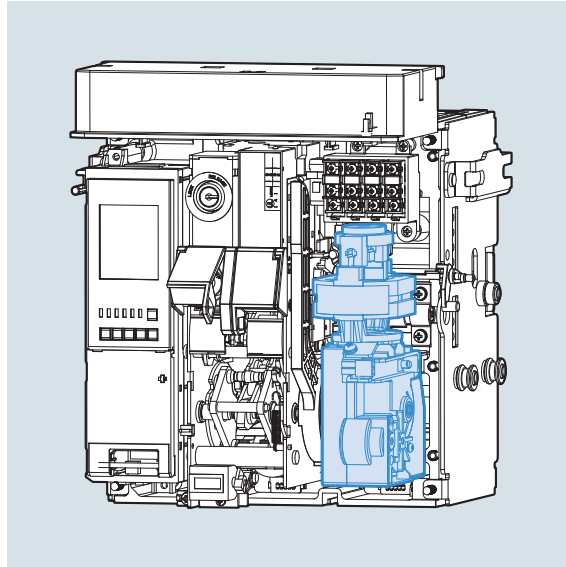
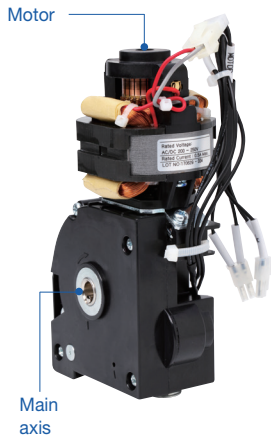
### 2. Specification of the wire

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

The maximum wire length

		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (1.31mm <sup>2</sup> )	#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (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]



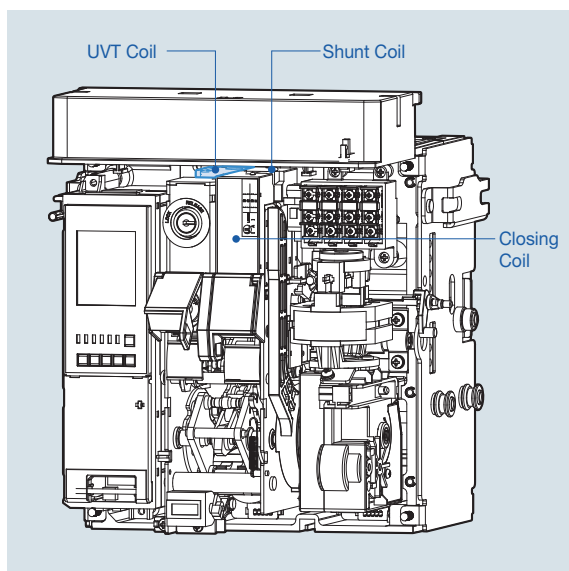
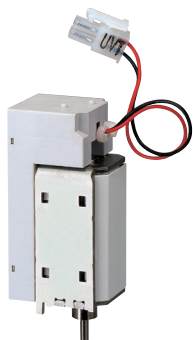
- Charge the closing spring of a circuit breaker by the external power source. Without the external power source, charge manually.
- Operating voltage range (IEC 60947) 85%~110%Vn

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 3sec.					
Dielectric strength	2kV/min					
Using temperature range	-20°~ 60°					
Using humidity range	Max. RH 80% (No dew condensation)					
Endurance	15,000 cycle (Load connection, 2 times/min)					
Charge switch	10A at 250VAC					

## Charge Switch [CS1]

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

## Under Voltage Trip Device [UVT]



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

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

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

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

### 2. Specification of the wire

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

The maximum wire length

		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (1.31mm <sup>2</sup> )	#14 AWG (2.08mm <sup>2</sup> )	#16 AWG (1.31mm <sup>2</sup> )
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

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

## Trip Alarm Contact [AL]



- When a circuit breaker is tripped by OCR which operates against the fault current (Over Current Relay), Trip Alarm switch provides the information regarding the trip of circuit breaker by sending the electrical signal from the mechanical indicator on front cover of main circuit breaker or internal auxiliary switch. (Installed at the inside of circuit breaker)
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted to output the information occurred from fault circuit breaker.
- MRB and AL can be operated only when tripping by OCR, but doesn't be operated by OFF button and OFF operation of trip coil.
- For the manual reset type circuit breaker, to reset the circuit breaker after a circuit breaker trip, push the manual reset button(MRB) manually or operate the remote reset button(RES). Push the reset button on the OCR to reset the LED lamp and fault cause display relay contact (terminal 513~544) on the OCR.
  - Option AL, A1, A2, A3, A4 applicable
- For the auto reset type circuit breaker, it can be reset when the interlock is automatically released after a circuit breaker trip, and if the terminals R11, R22(dry contact) is set to Common, then the LED lamp and fault cause display relay contact(terminal 513~544) on the OCR are remotely reset.
  - Option A5, A6, A7, A8, A9 applicable
- One(AL1, 1b) or two(AL1, AL2, 1b) electrical trip alarm(AL) switches are provided as an option according to the order specifications.
- The AL2 and RES cannot be simultaneously used, so select only one option.

### 1. Electrical characteristics of trip alarm contact

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



## Manual Reset Button [MRB]

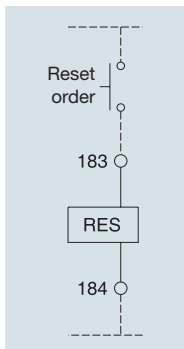


- It is a function which resets a circuit breaker manually when a circuit breaker is tripped by OCR.
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted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



## Remote Reset Switch [RES]

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

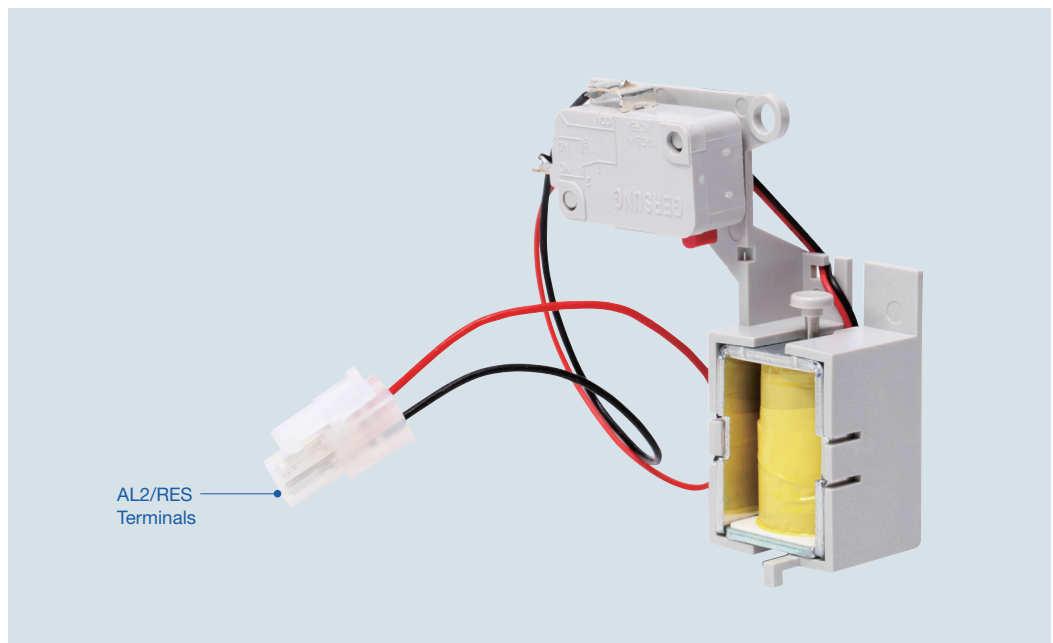


Wiring Diagram

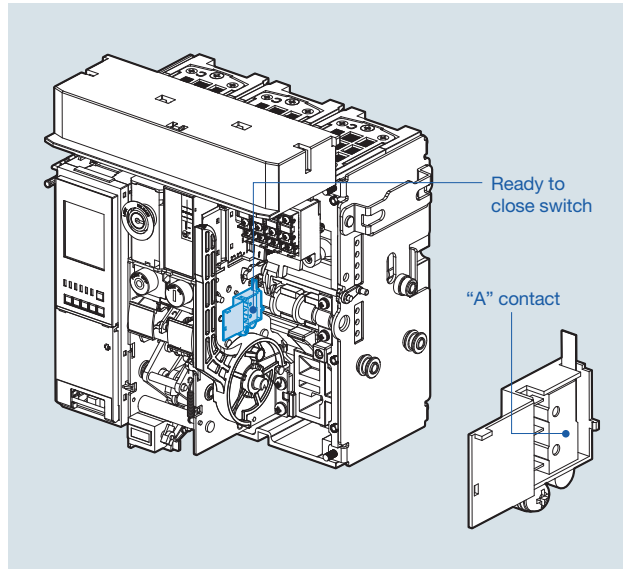
### 1. Rated voltage and rated current of RES

Rated voltage	Operating current (Max.)	Operating time	Wire spec.
AC 110~130V	3.7A	Less 40ms	#16 AWG (1.31mm <sup>2</sup> )
DC 110~125V	2.4A		
AC 200~250V	2.2A		

### 2. Appearance



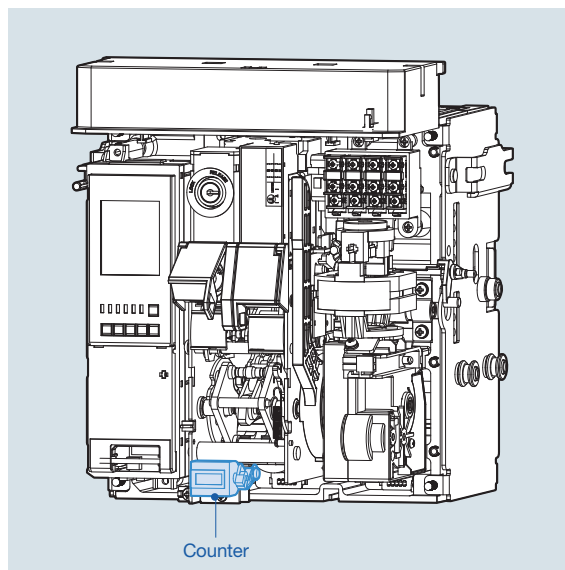
## Ready to Close Switch [RCS]



- RCS operates with the mechanism of the Breaker.
- It indicates the status of the Breaker that is ready for closing operation.
- When mechanism is in OFF and Charged position, the contact closes which indicates that mechanism is ready to be closed.

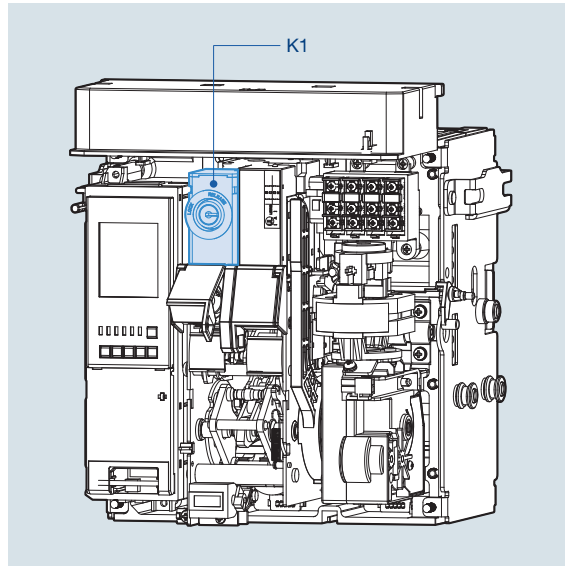
Classification	Standard		Remark
Contactor	250Vac	3A	
Capacity	250Vdc	5A	
	125Vdc	0.6 A	

## Counter [C]



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

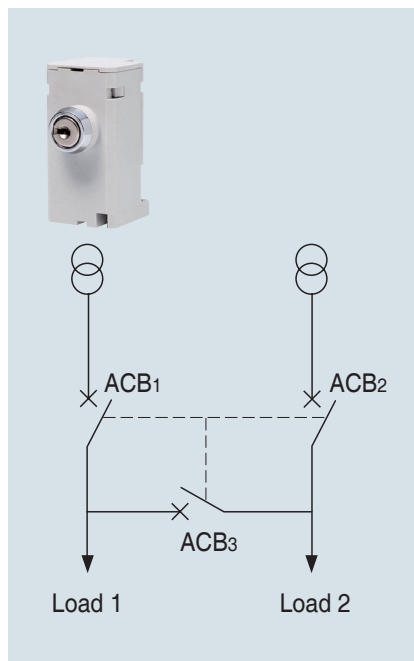
## Key Lock [K1]



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

## Key Interlock Set [K2]

### Wiring



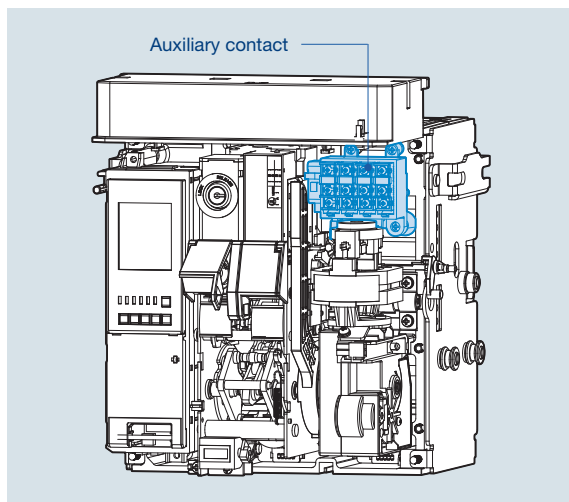
- 3 circuit breakers can be arranged for the continuous power supply to the load side and be interlocked mutually by using Key Lock embedded in each circuit breaker. Two same keys will be provided.

\* 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
●	○	○	OFF	ON
○	●	○	ON	OFF
○	○	●	ON	ON
●	●	○	OFF	OFF
●	○	●	OFF	ON
○	●	●	ON	OFF

○: Release ●: Lock

## Auxiliary Switch [FX]



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

\* Auxiliary switch for micro load (Order No. 8301176209)

### Classification

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

## ON/OFF Button Lock [B]

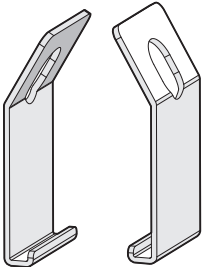


- It is to prevent manual operation of ACB's closing/tripping button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.  
(Electrical ON/OFF operation is possible)

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



## Lifting Hook [LH]



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

## Condenser Trip Device [CTD]

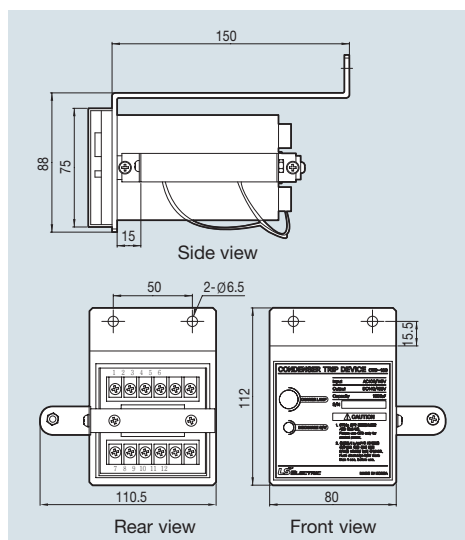


- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, It can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.

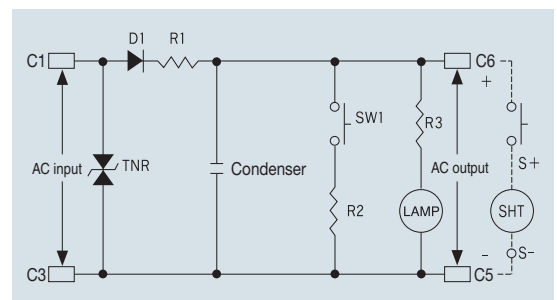
### Ratings

Ratings	Specification	
Model	CTD-100	CTD-200
Rated input voltage (V)	AC 100/110	AC 200/220
Frequency (Hz)	50/60	50/60
Rated charge voltage (V)	140/155	280/310
Charging time	Within 5s	Within 5s
Trip possible time	Over 3 min	Over 2 min
Range of Input voltage (%)	85~110	85~110
Condenser capacity	1000 $\mu$ F	560 $\mu$ F

### External dimension



### Circuit diagram



# Accessories

## i-Tester

The i-Tester (Intelligent Tester) is an accessory to test-drive ACB/MCCB. As a stand-alone type, it not only performs various relay tests such as manual/auto/user tests, but also has various functions such as self-calibration function, device information setting, relay setting, and device status checking. In addition, it supports 256×128 graphic LCD and supports not only English but also Chinese and Russian languages. It has the function to output the test and test results in the same way using the upper Manager S/W.

### Features



- **Calibration function**

- The calibration function of i-Tester is used to calibrates the error using the output value set in i-Tester and the measurement current data.

- **Device H/W setting function**

- It consists of the part to set the system configuration and time of the device and the part to set the language and time of the i-Tester itself.

- **Relay setting function**

- It consists of the part to check the current relay element of the device and the part to set the relay.

- **Relay test**

- As a part for testing the relay, it is composed of manual/automatic/user tests so that various relay tests can be conducted.

- **Control function**

- It provides a function to clear or reset the device data and to control DO and CB.

- **System information**

- It consists of the device information, relay status, and tester system information.

- **Test history**

- It consists of a part to check the test history stored in i-Tester and a part to delete the saved history information.

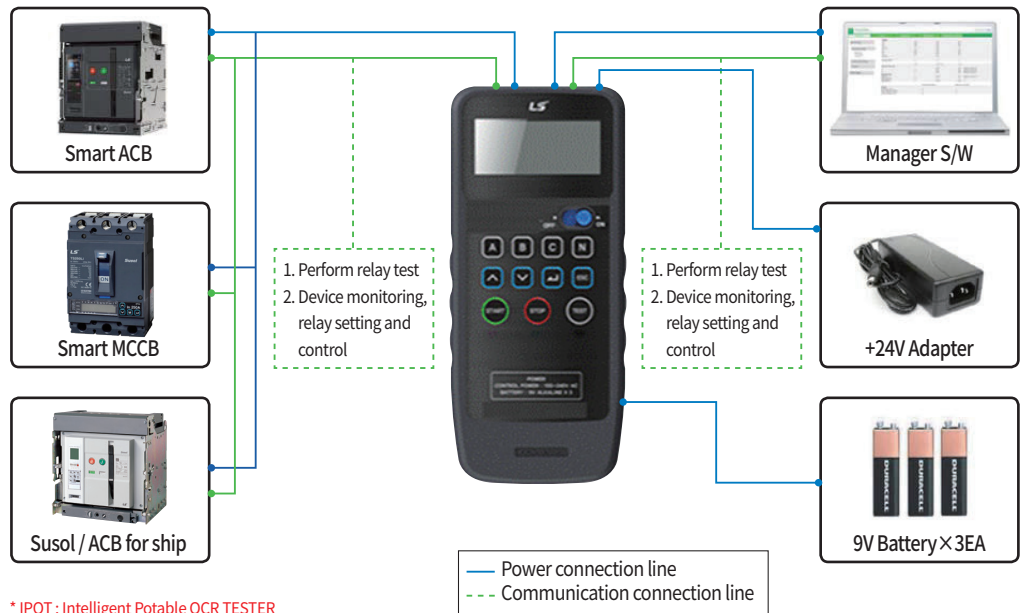
### Specification

Type	Details
Model name	IPOT
Rated voltage	DC24V adapter, 9V alkaline battery 3EA, USB or rechargeable battery (10000mAH or more)
HMI	Graphic LCD module( 256×128 Graphic LCD)
Supported language	English, Chinese, Russian
Key functions	<ul style="list-style-type: none"><li>· Device information checking function (information, DI, DO, self-diagnosis)</li><li>· Relay and H/W information setting function</li><li>· Device control and reset function</li><li>· Relay test function<ul style="list-style-type: none"><li>- Manual/auto/user test function</li></ul></li><li>· Test history storage (up to 255) and output (PDF) function</li></ul>
LCD composition	Navigation TREE configuration for all
Size	98(W)×210.5(H)×43.5(D), unit : mm

Exterior description



Device usage example

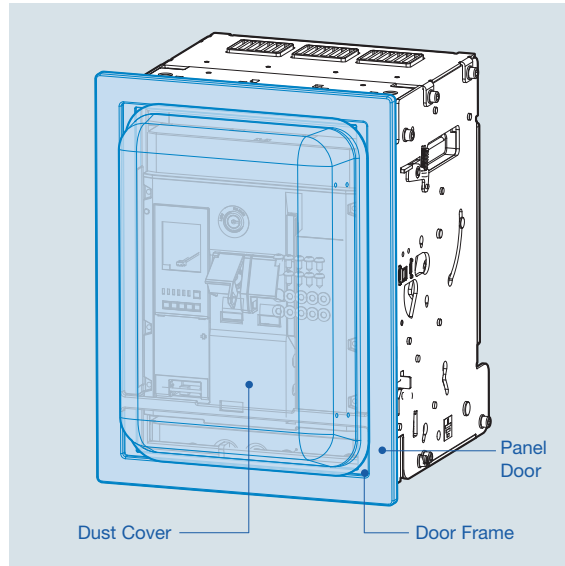
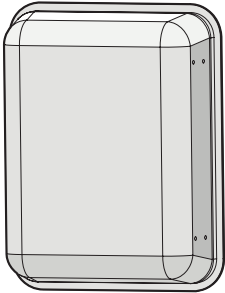


Target device

Circuit breaker	Smart ACB(STU), Susol/Metasol ACB(OCR), Smart MCCB, TS1600
-----------------	--

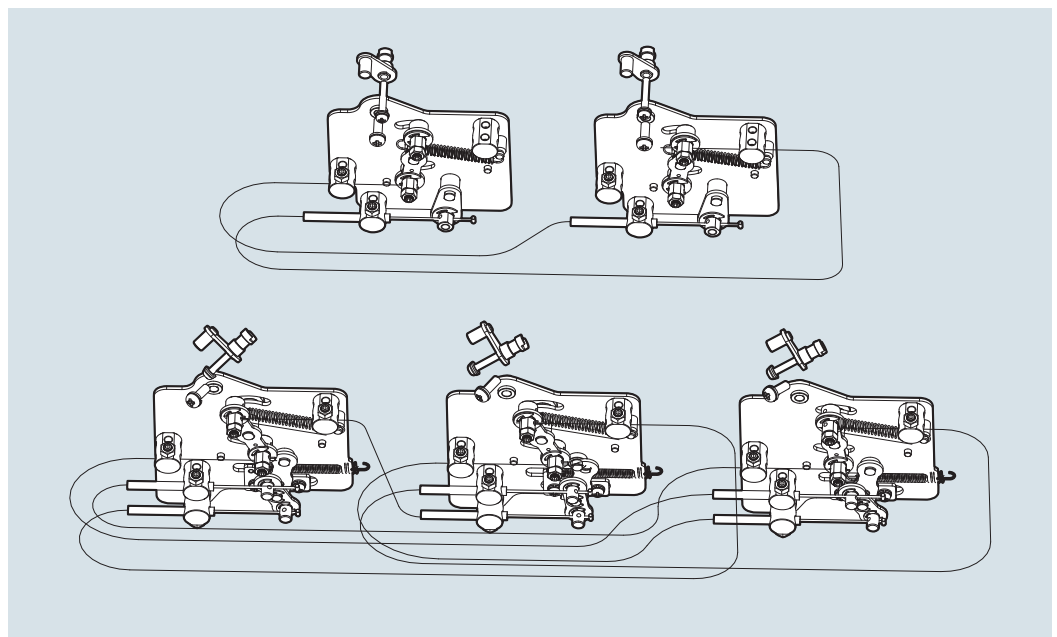
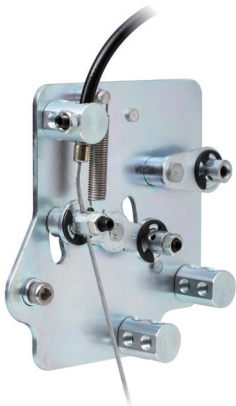
# Accessories

## Dust Cover [DC] [IP54]



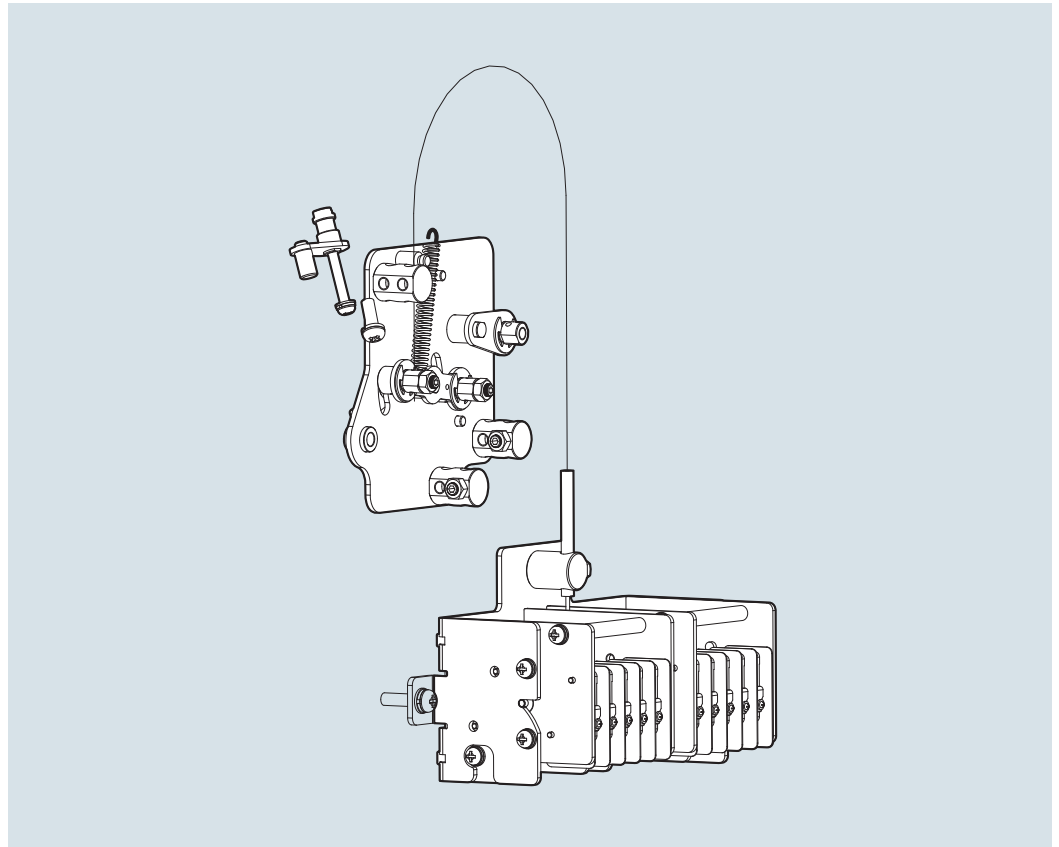
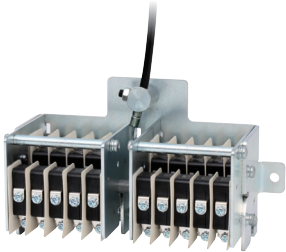
- Attach it to the door frame.
- It protects the product dust and moisture that may affect the operation of the instrument at the same time (IP54) which may cause fault operation and enhances the sealing degree by being mounted to protrude type of panel.
- It is transparent so that the front side of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

## Mechanical Interlock [MI]

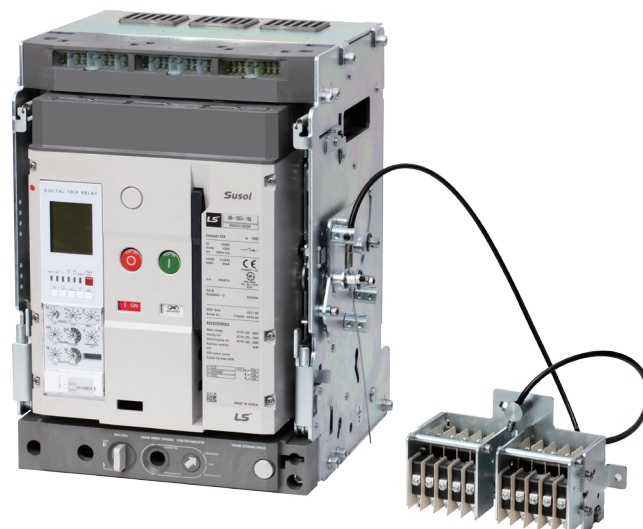


- It is used to interlock closing and trip between two or three breakers mechanically so as to prevent unintended operation at the same time.
- Wire type interlock can be applied upto 3 breakers

## Mechanical Operated Cell Switch [MOC]

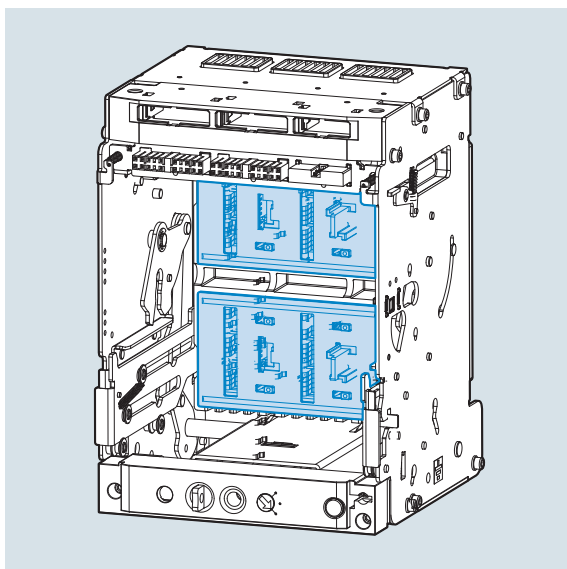
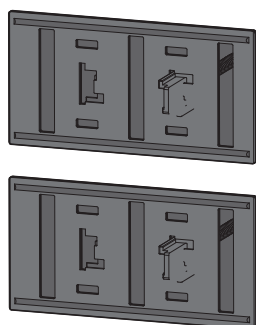


- It is the contact (10a10b) which displays the ON/OFF condition of ACB.  
It mechanically operates only when the breaker is “CONNECTED” position.  
A standard type and a high capacity type is available.
- When MOC link is installed to cradle, MOC can be equipped with the inside of panel.





## Safety Shutter [ST]

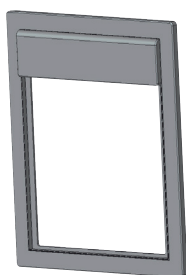


- It is the automatic safety device to protect the connectors of main circuit by cutting off dangerous contact from outside while the breaker is drawn out. When the ACB is drawn in, the shutter is automatically opened.

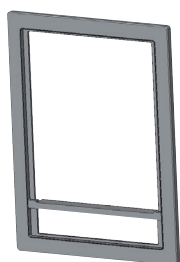
- Plate Shutter is a total of 2 models

The types of safety shutter plate	
3P	
4P	

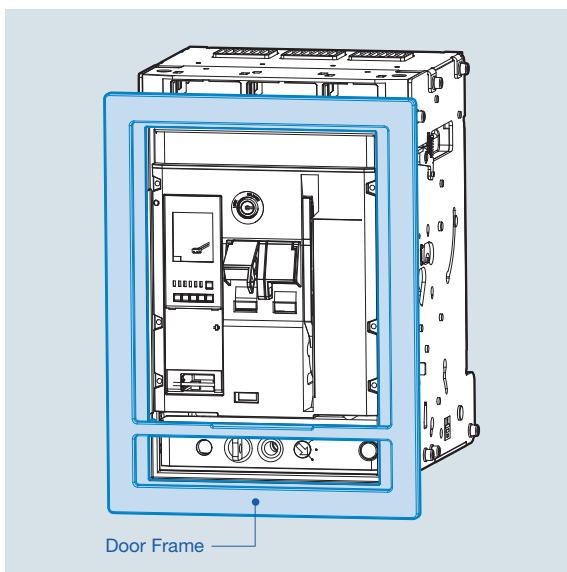
## Door Frame [DF] [IP3X]



Fixed type

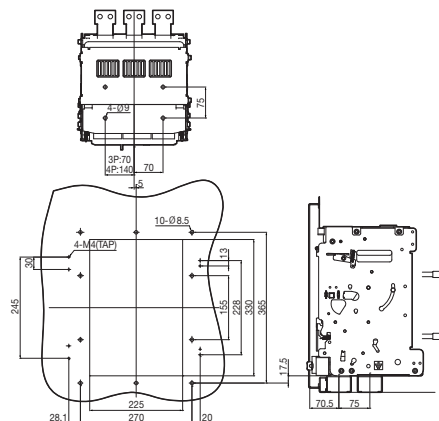


Draw-out type



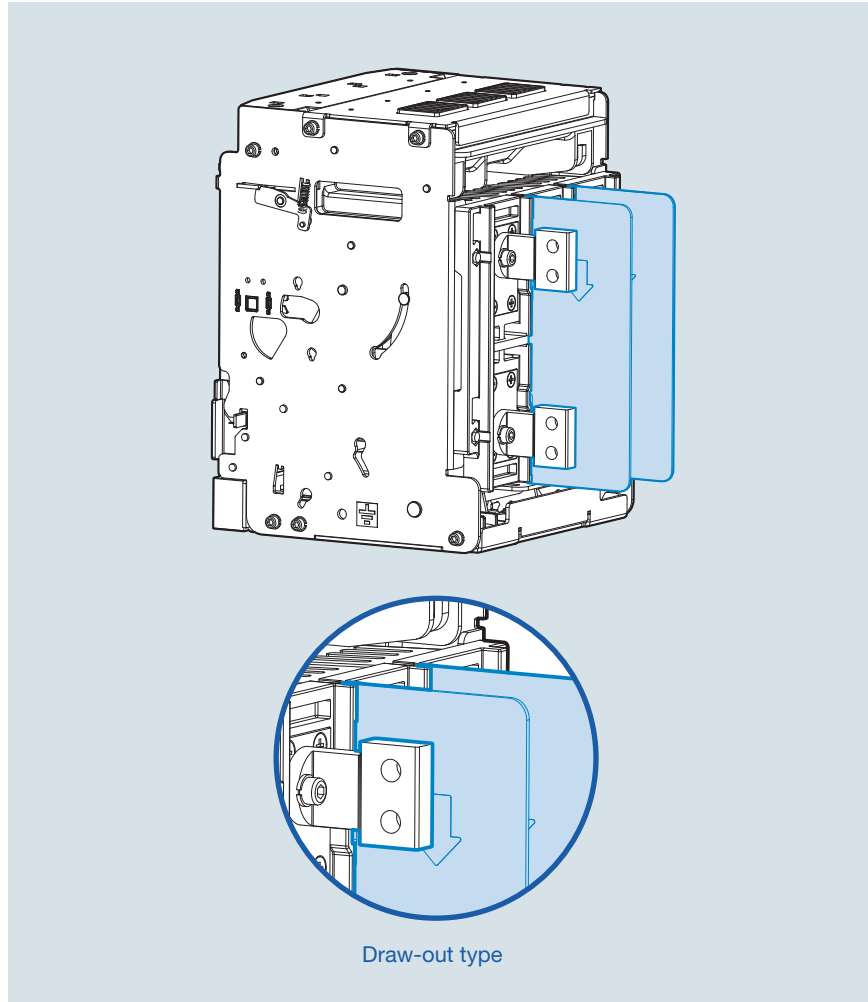
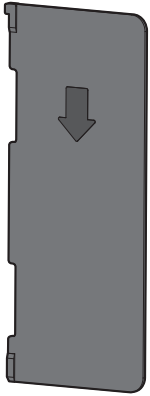
Door Frame

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



Switchboard door cut dimension

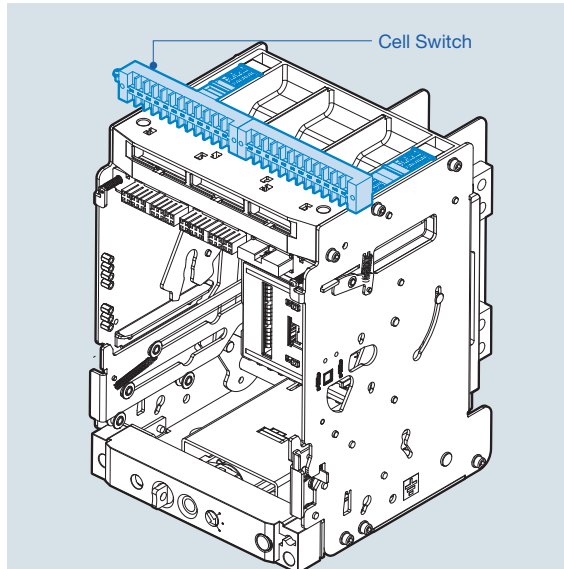
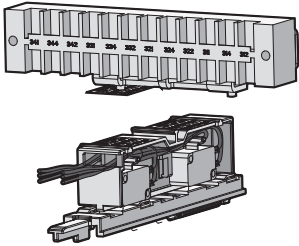
## Interphase Barrier [IB]



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

# Accessories

## Cell Switch [CEL]



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

<Contact configuration>

4C: 1Disconnected +1Test +2Connected

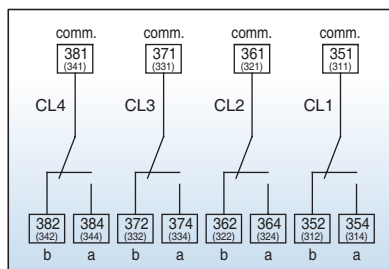
8C: 2Disconnected +2Test +4Connected

※ Contact configuration can be changeable if necessary.

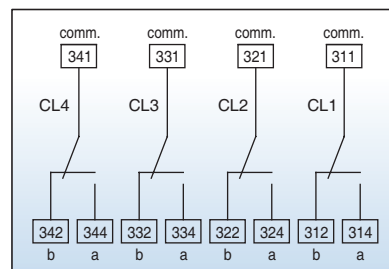
## Operating characteristic

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

## Terminal (4C, 8C)



4C attached to the right side of cradle

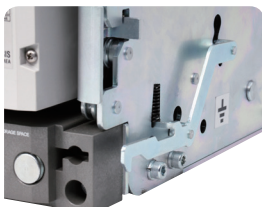


4C attached to the left side of cradle

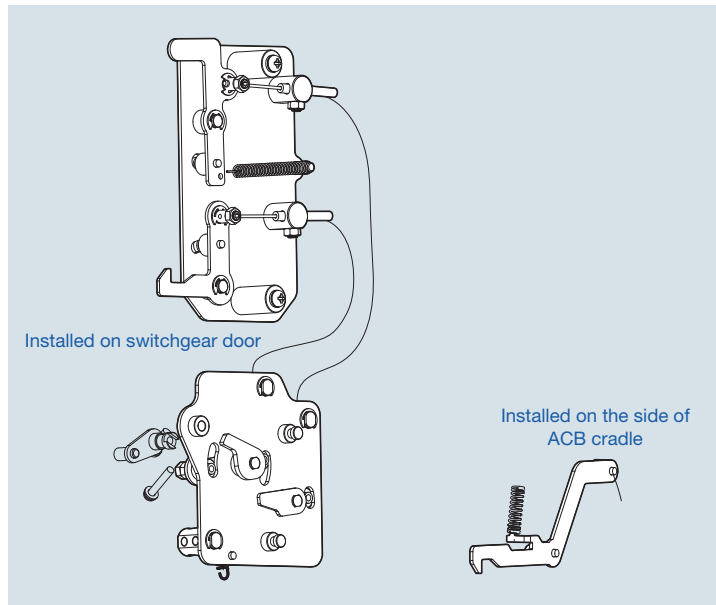
## Door Interlock [DI]



Wite type



Catch type



Installed on switchgear door

Installed on the side of ACB cradle

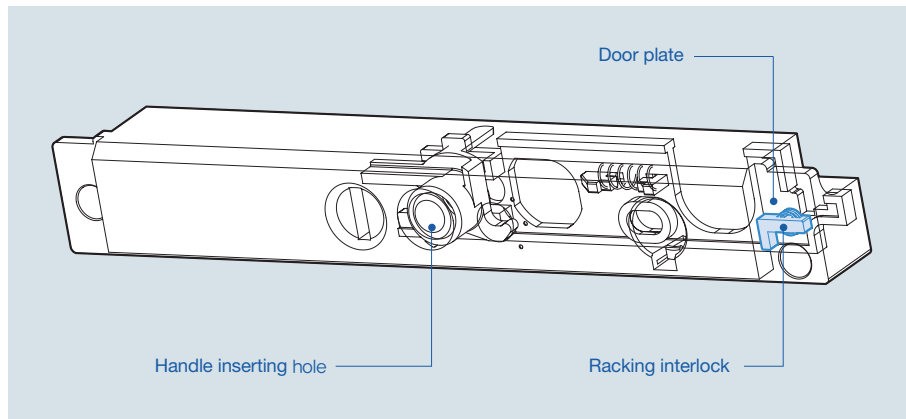
- It is a safety device which does not allow the panel door to open when a circuit breaker is in the "ON" position.

## Zero Arc Space [ZAS]



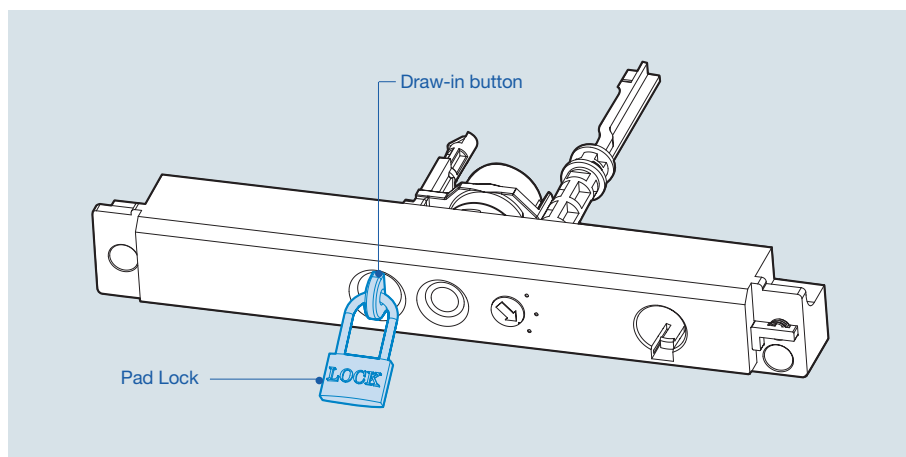
- Arc which may arise while breaking fault current is extinguished first by Arc chute in main body of circuit breaker and then completely extinguished by Arc cover. By preventing arc from exposing to the outside, it protects itself from all kinds of accidents.

## Racking Interlock [RI]



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

## Pad Lock / Position Lock [PL]

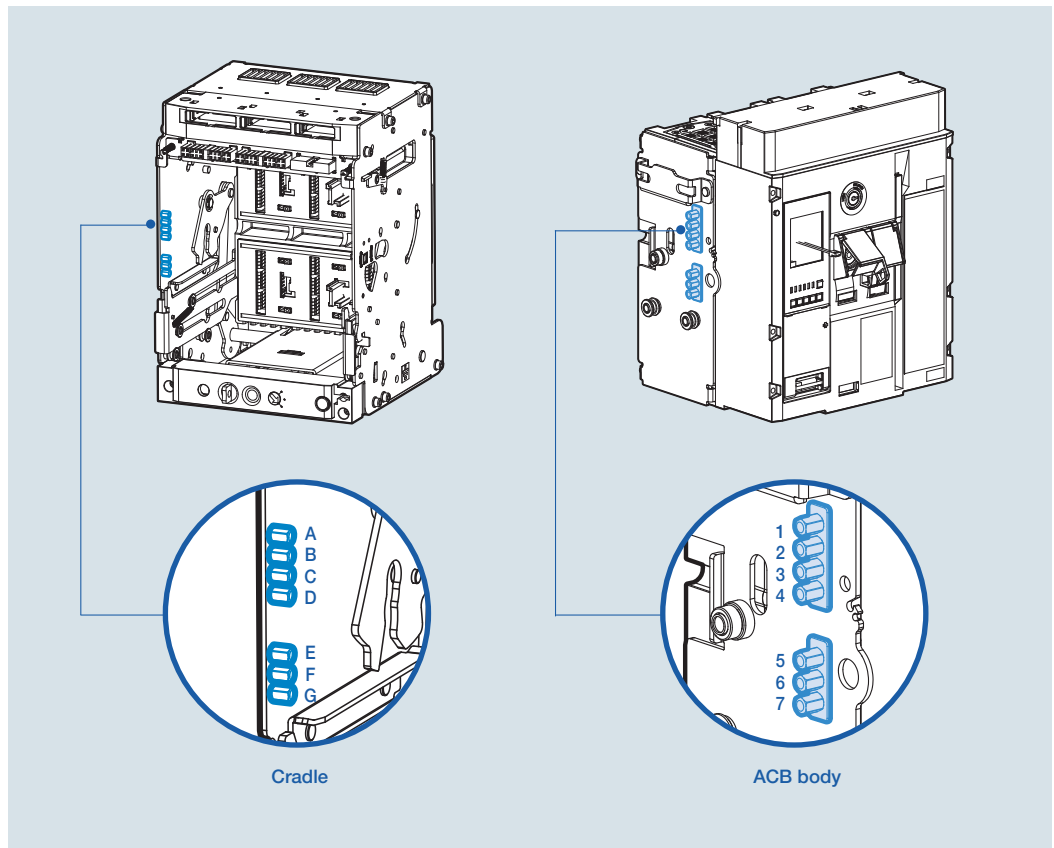
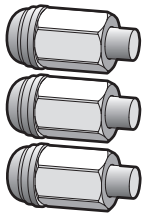


ACB is subject to restriction regarding moving in connected, test, disconnected when drawing in or out. If main body of ACB is placed in 3 positions, it is locked and stopped when drawing in or out.

- As shown in the figure, if draw-in/out button pops out, it means locking is operating.
- To continue Draw-in/out operation, release lock by pushing Draw-in/out button
- In case it is locked as shown in the figure above, main body of ACB can not be drawn in or out into the cradle.
- For the lock device, user has to purchase it. ( $\varnothing 5 \sim \varnothing 6$ )



## Miss Insertion Prevent Device [MIP]



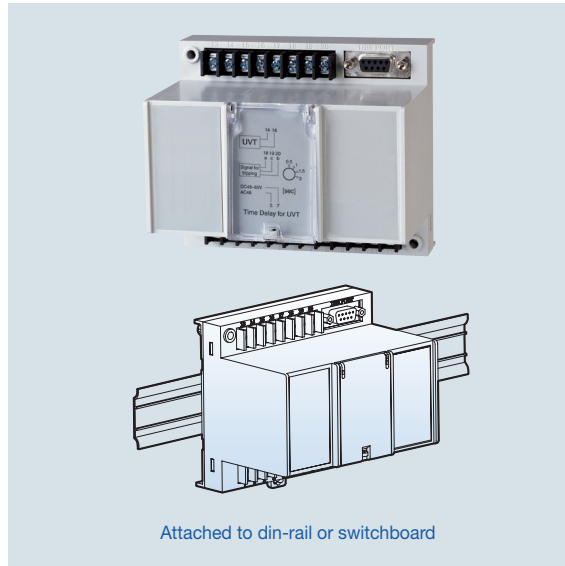
- When the main body of ACB is inserted to the cradle, if the ratings of ACB does not match with cradle, it mechanically prevents ACB from being inserted into cradle of ACB.
- The installation method is variable according to ratings.

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

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

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

## UVT Time Delay Controller [UDC]



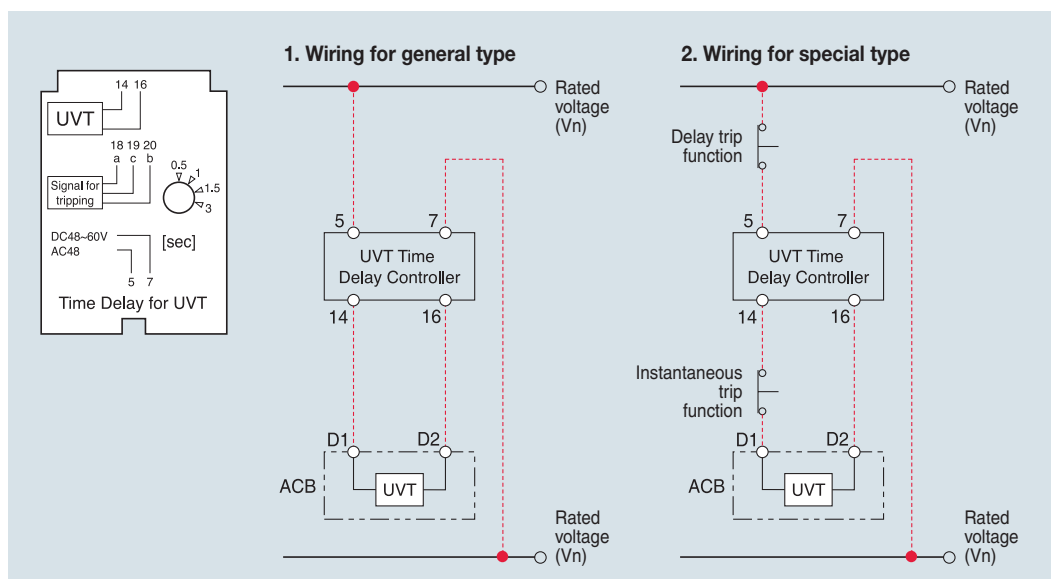
- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown. There are two types, Instantaneous type and time delay type.
- Instantaneous type: only available with UVT coil.
- Time delay type: available by connecting UVT coil and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

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

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

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

### 2. Wiring

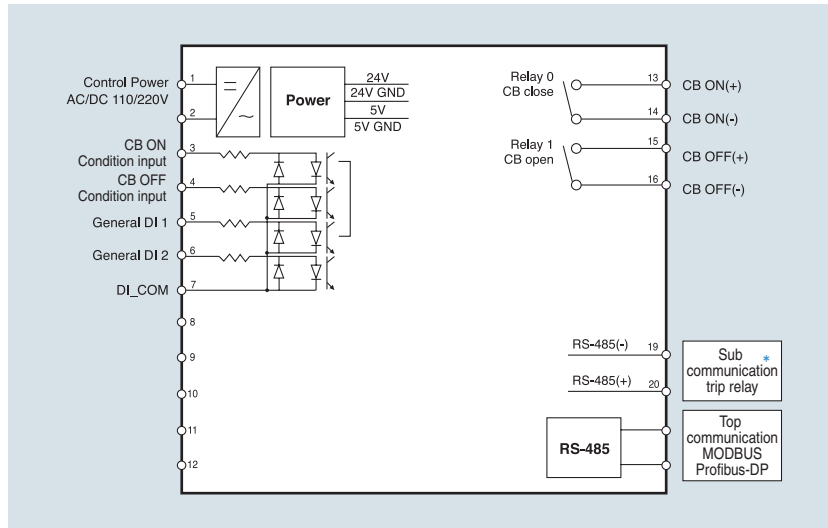
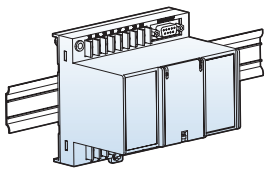


\* The wiring presented with red color should be set by users.

## Remote I/O Unit [RCO]

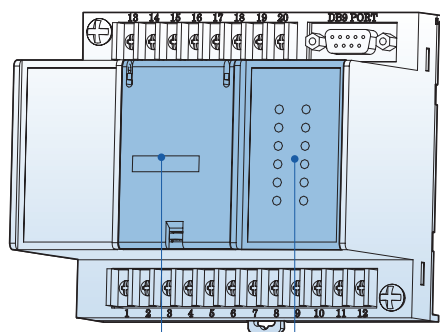


Remote I/O Unit



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

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



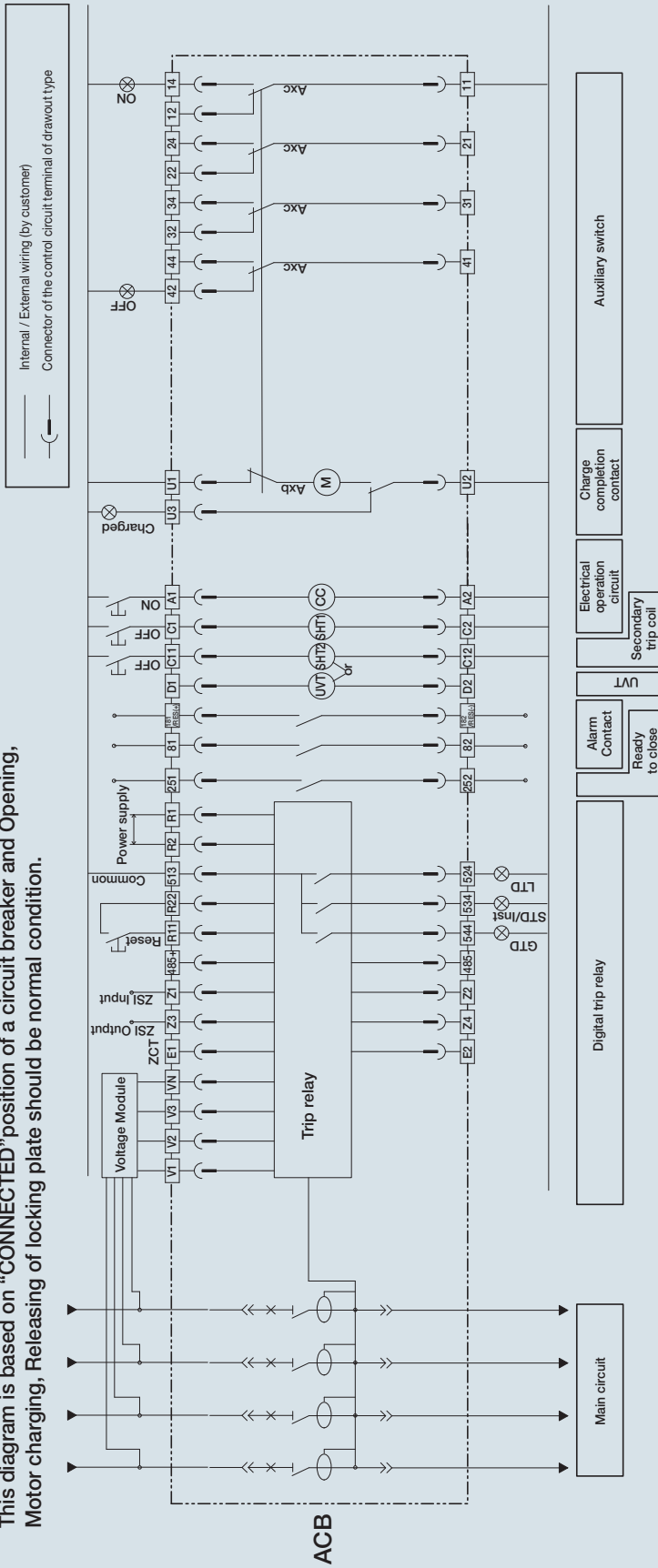
- Baud rate setting
- Comm. address setting
- Temperature setting

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

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

# Control circuit diagram

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

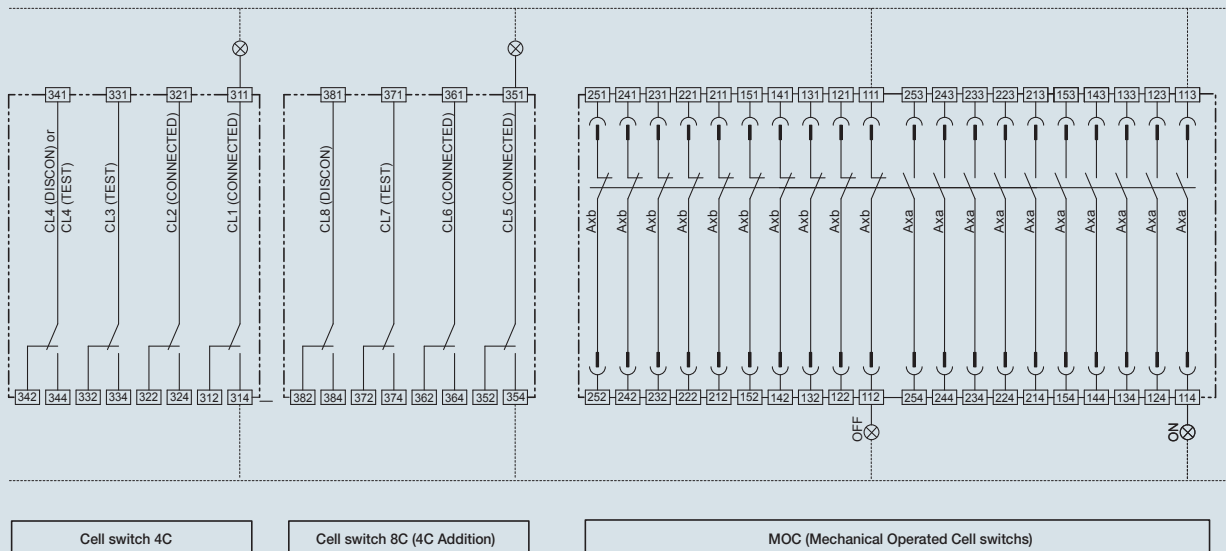
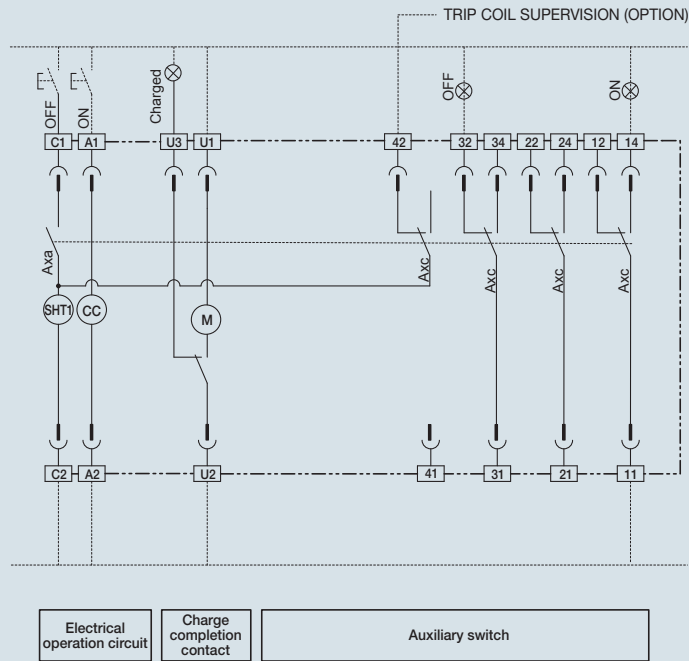
T1	12	~	41	42	Auxiliary switch "b" contact
T1	14	~	41	44	Auxiliary switch "a" contact
U3	U2				Charge completion signal
U1	U2				Motor charging
A1	A2				Closing coil
C1	C2				Shunt trip
C11	C12				2nd shunt trip

## Accessory code description

Axc	Auxiliary switch
LTD	Long time delay trip indicator
STD/Inst	Short time delay/instantaneous
GTD	Ground fault trip indicator
CL1-CL4	Cell switch
(M)	Motor
(CC)	Closing coil
(SFT)	1st Shunt coil
(SFT2)	2nd Shunt coil
(UVT)	UVT coil

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

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



**Terminal symbol**

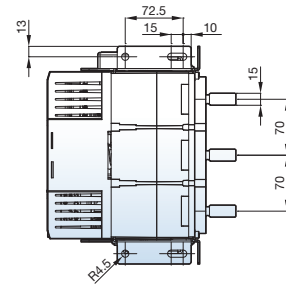
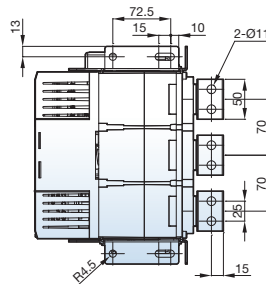
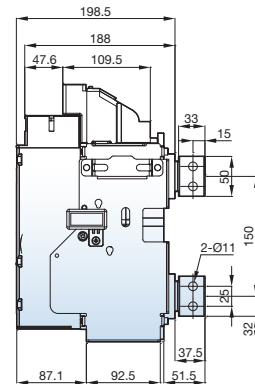
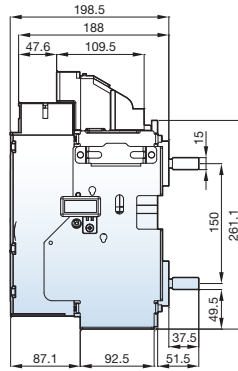
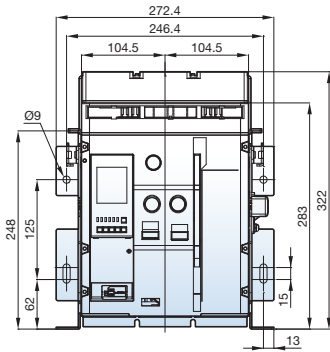
311 ~ 344	Cell switch
111 ~ 254	MOC



# Dimensions

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

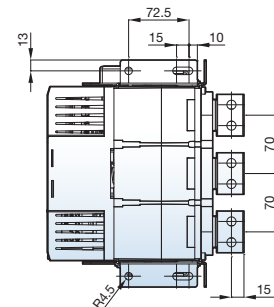
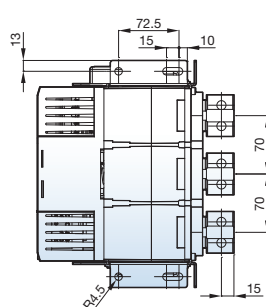
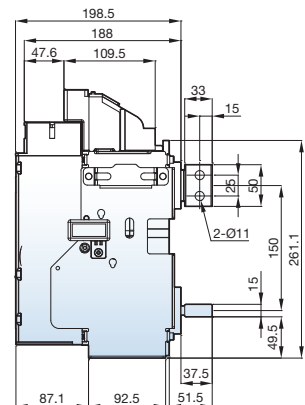
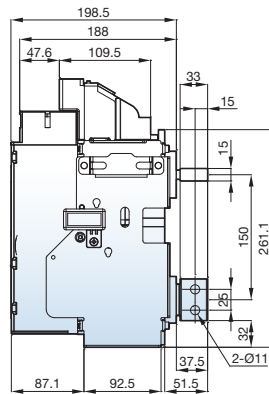
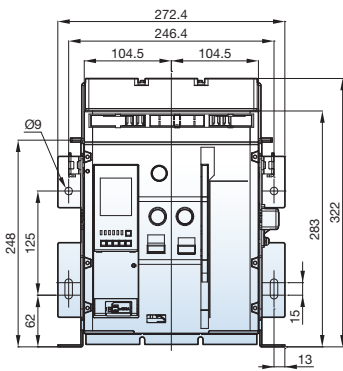
(Unit : mm)



**H Type** (Horizontal type)

**V Type** (Vertical type)

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

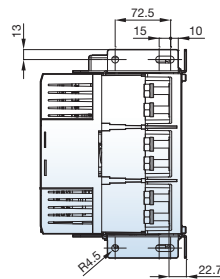
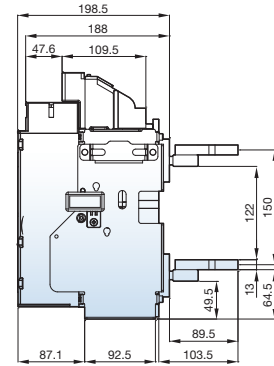
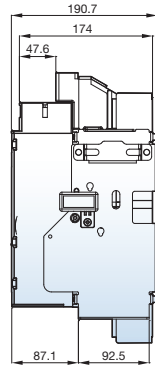
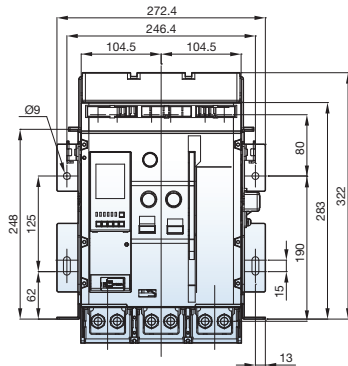


**M Type**  
(Upper-Horizontal type, Lower-Vertical type)

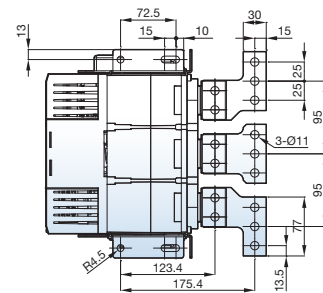
**N Type**  
(Upper-Vertical type, Lower-Horizontal type)

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

(Unit : mm)

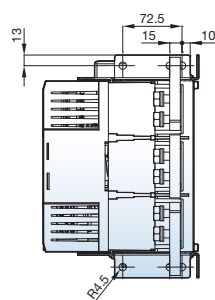
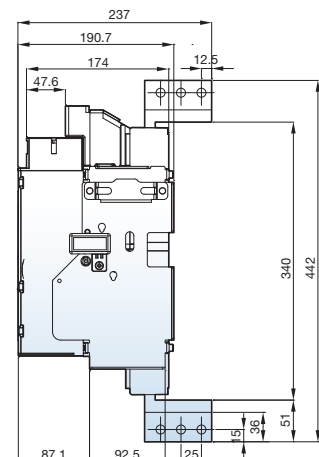
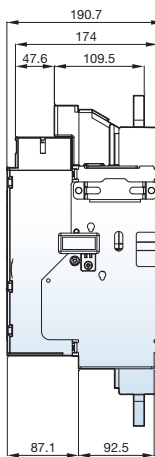
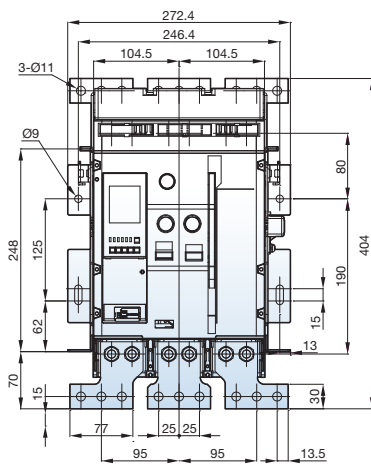


P Type (Plane type)

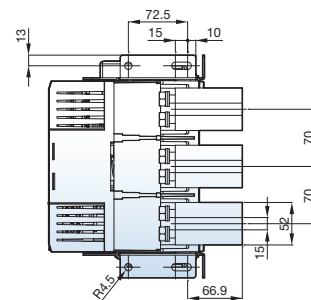


R Type (Spread type)

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



Z Type (Plane spread type)

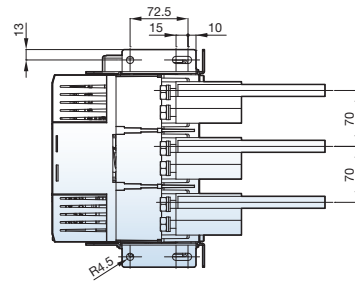
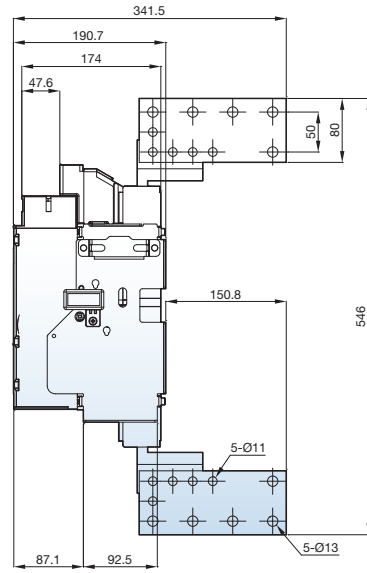
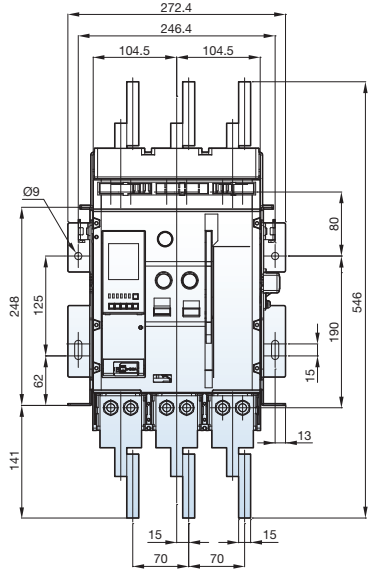


T Type (Plane vertical type)

# Dimensions

• 3P [Fixed X: Cable lug type]

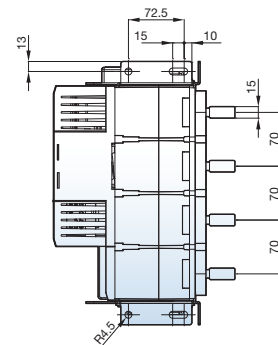
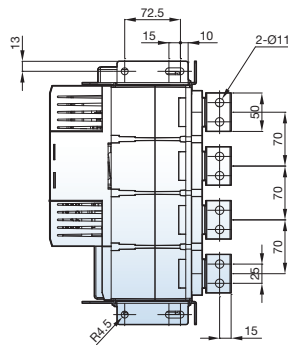
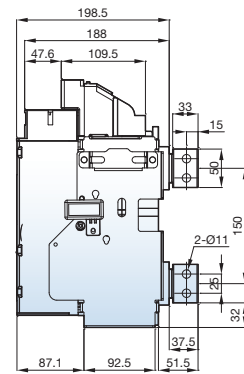
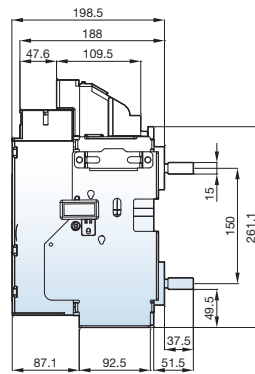
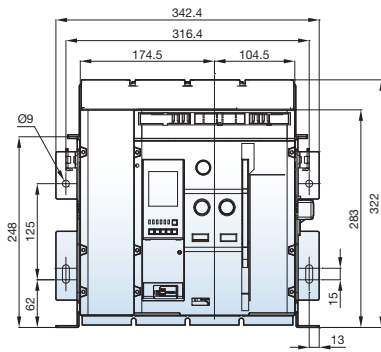
(Unit : mm)



X Type (Cable lug type)

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

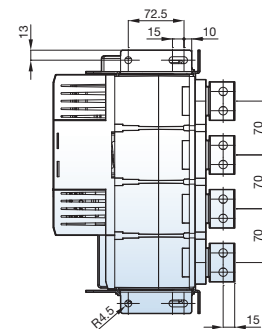
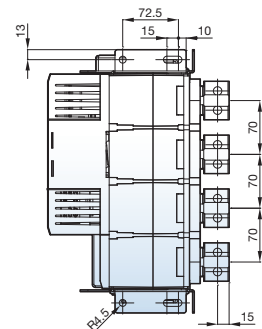
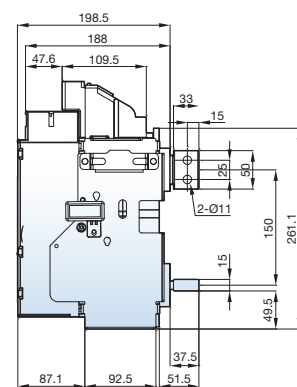
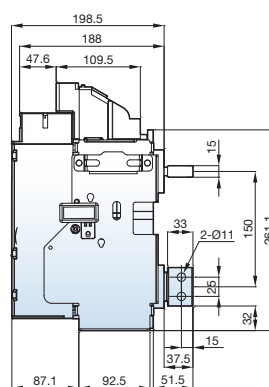
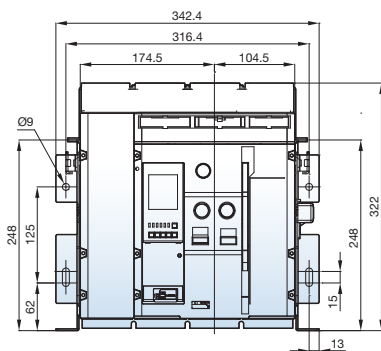
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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



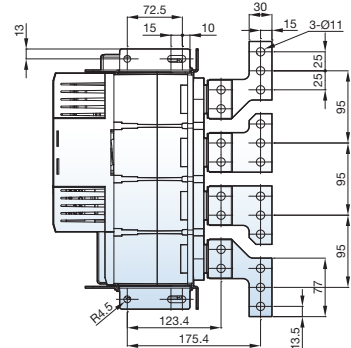
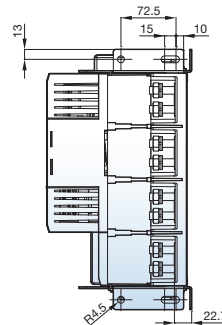
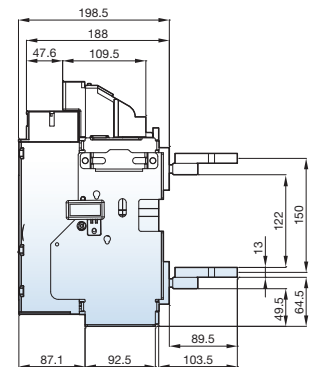
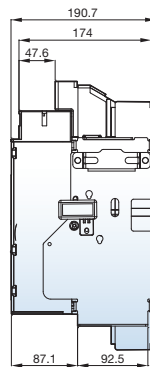
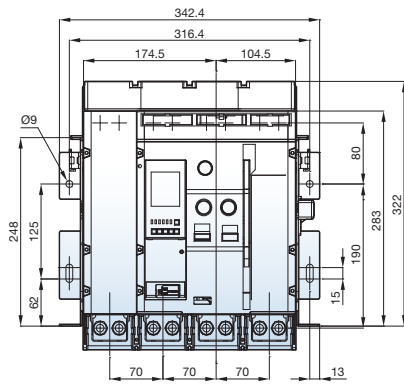
M Type  
(Upper-Horizontal type, Lower-Vertical type)

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

# Dimensions

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

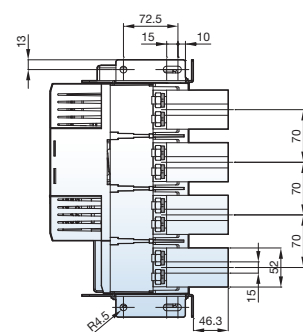
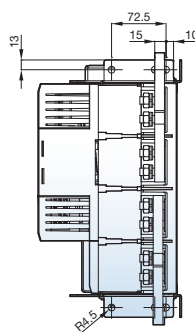
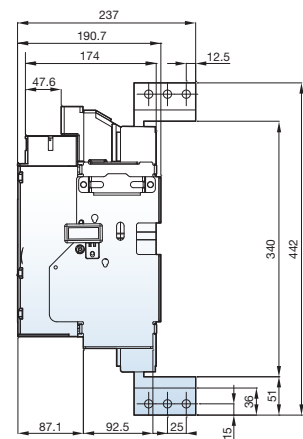
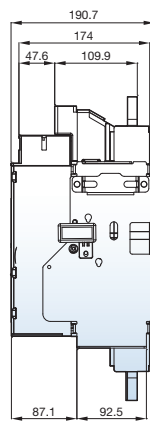
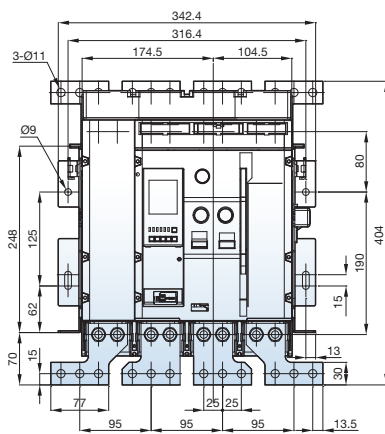
(Unit : mm)



P Type (Plane type)

R Type (Spread type)

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



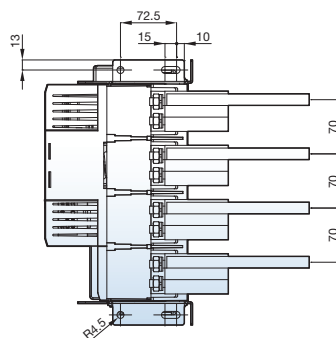
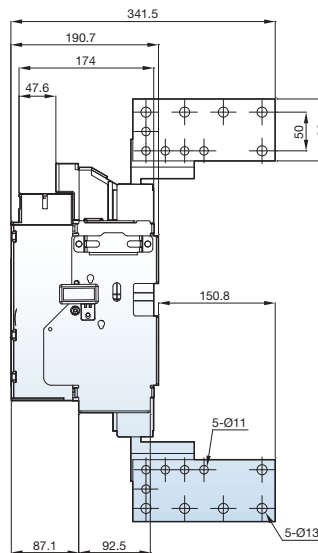
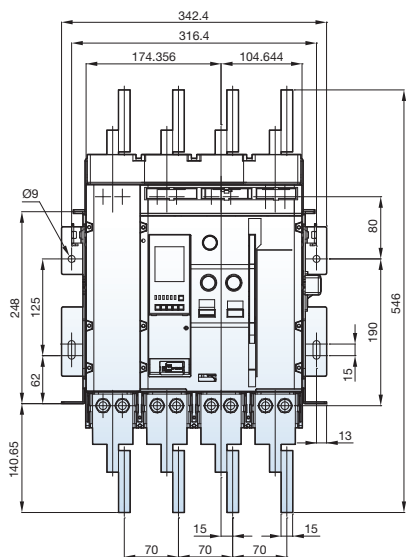
Z Type (Plane spread type)

T Type (Plane vertical type)



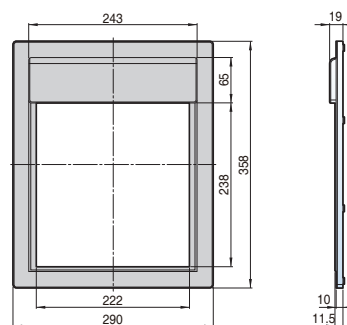
• 4P [Fixed X: Cable lug type]

(Unit : mm)



X Type (Cable lug type)

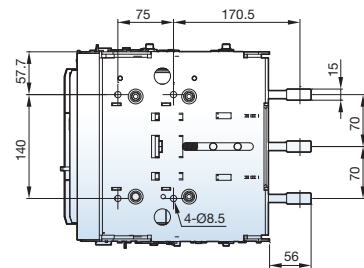
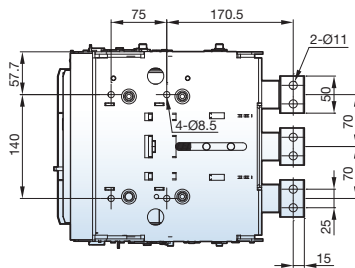
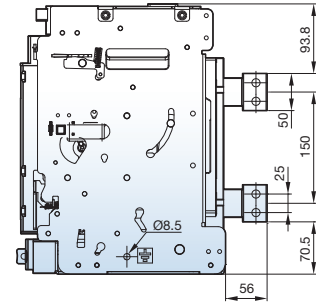
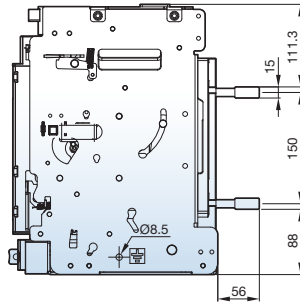
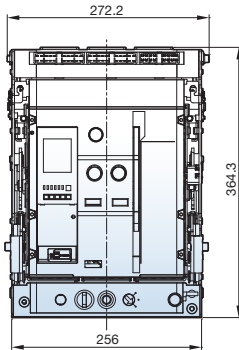
Fixed Door Frame: DF



# Dimensions

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

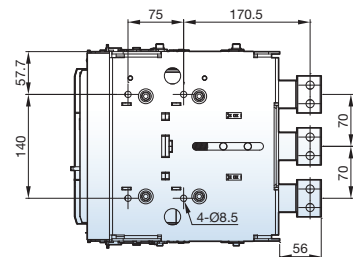
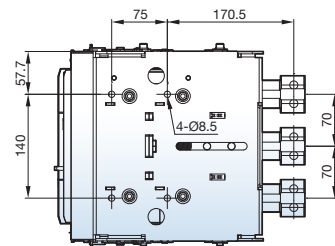
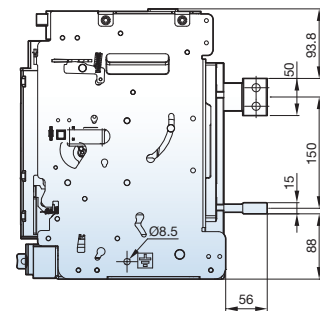
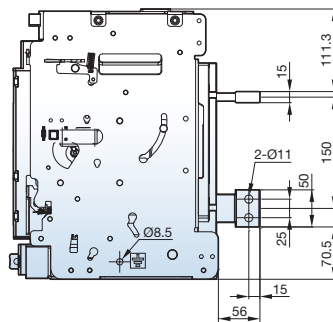
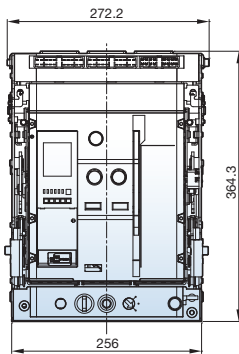
(Unit : mm)



**H Type** (Horizontal type)

**V Type** (Vertical type)

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

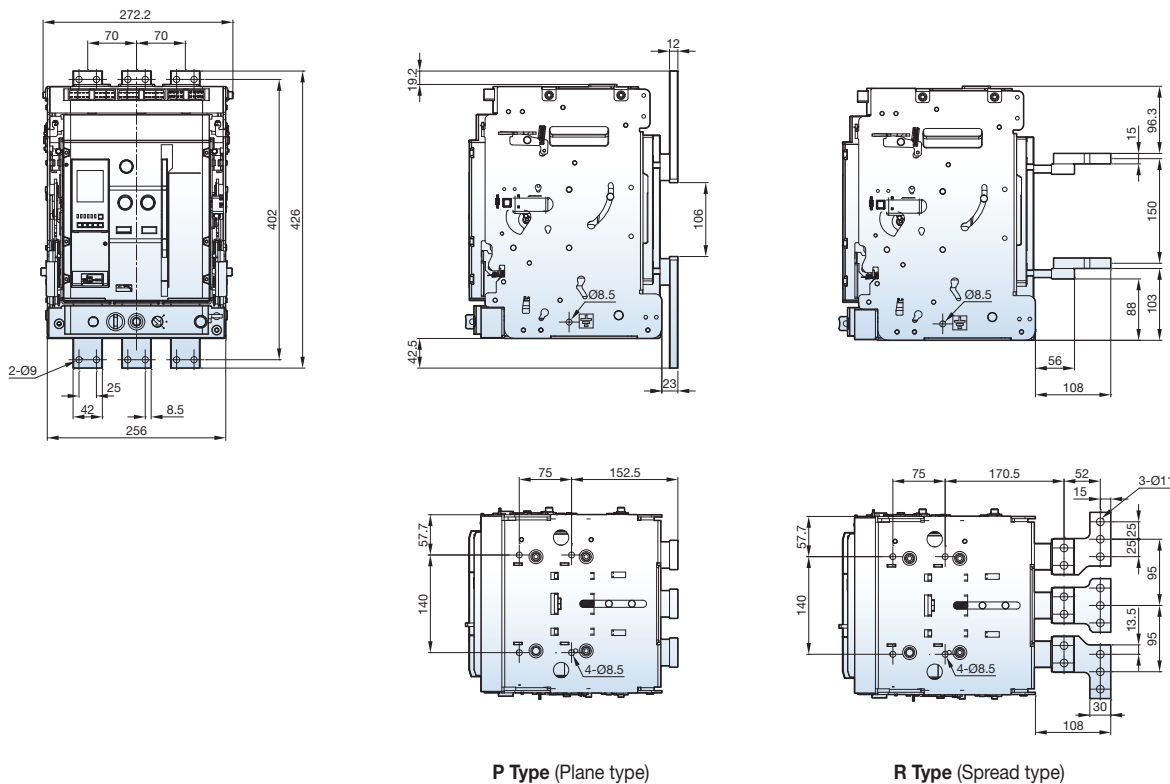


**M Type**  
(Upper-Horizontal type, Lower-Vertical type)

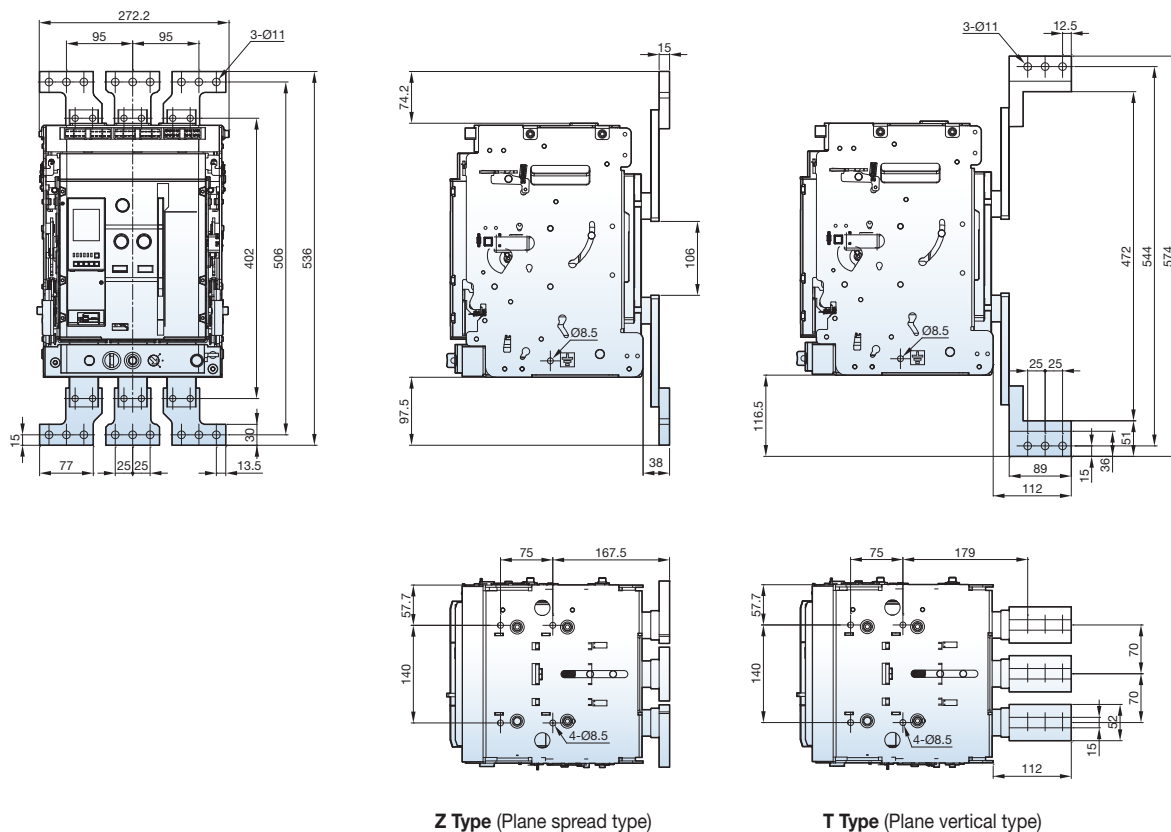
**N Type**  
(Upper-Vertical type, Lower-Horizontal type)

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

(Unit : mm)



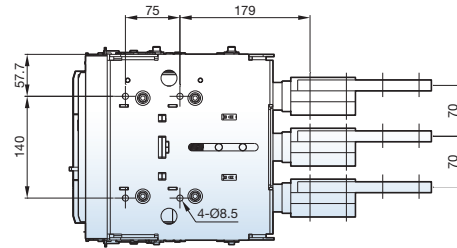
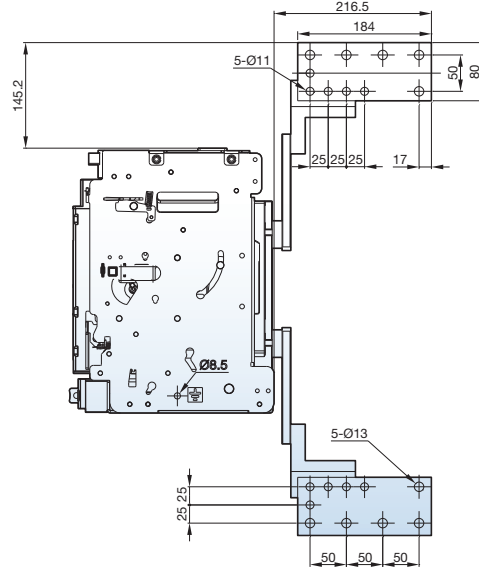
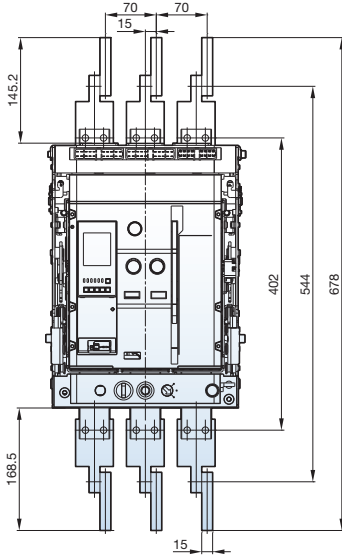
• 3P [Draw-out Z: Plane spread type / T: Plane vertical type]



# Dimensions

• 3P [Draw-out X: Cable lug type]

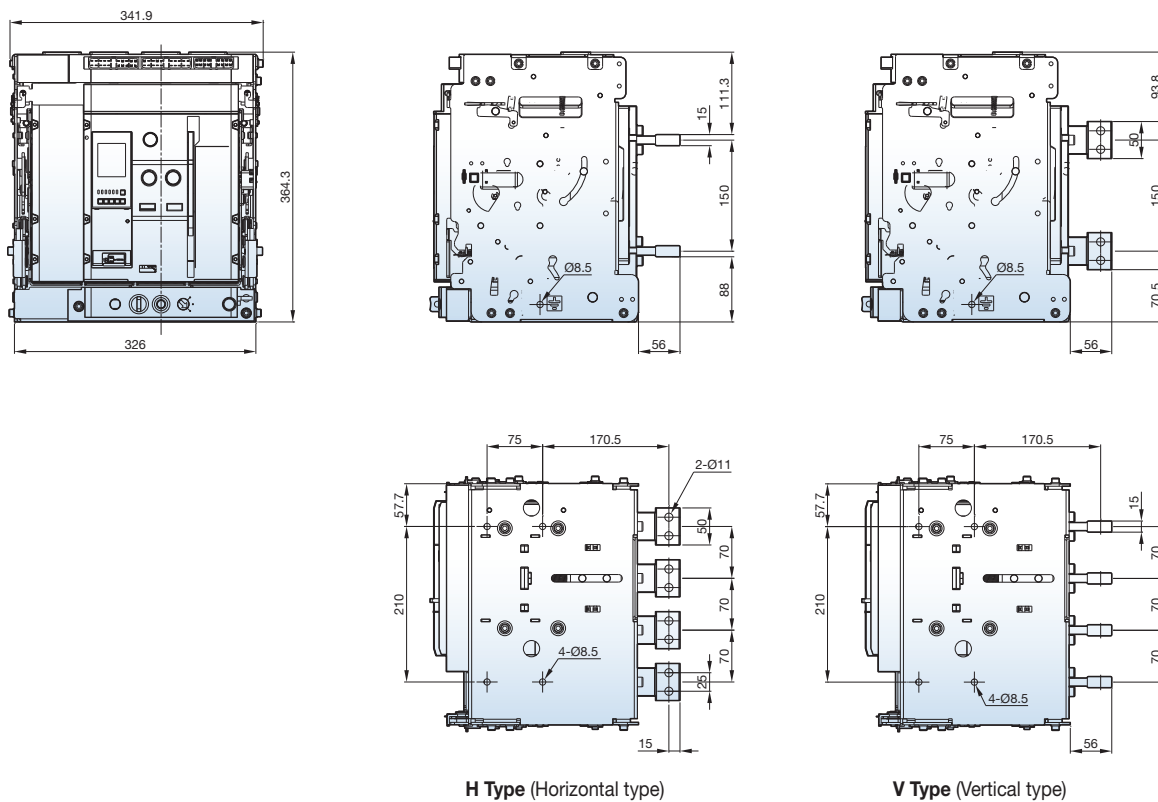
(Unit : mm)



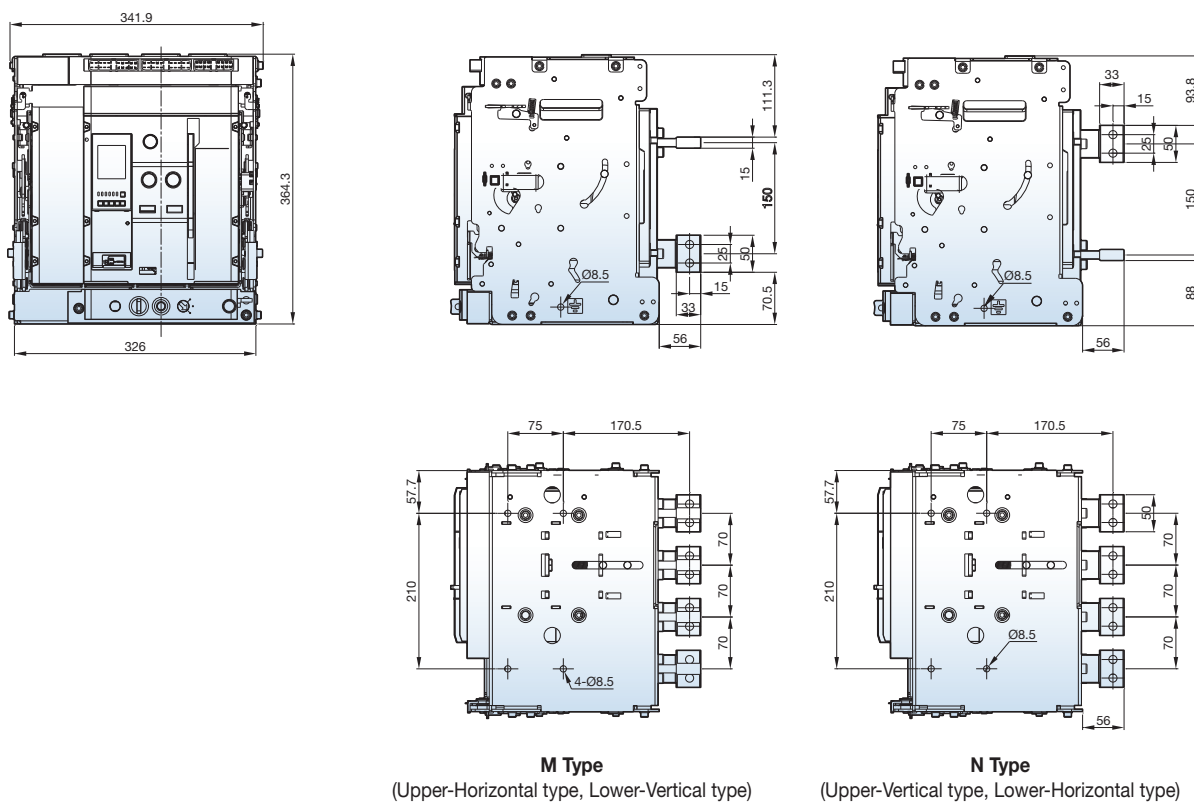
X Type (Cable lug type)

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

(Unit : mm)



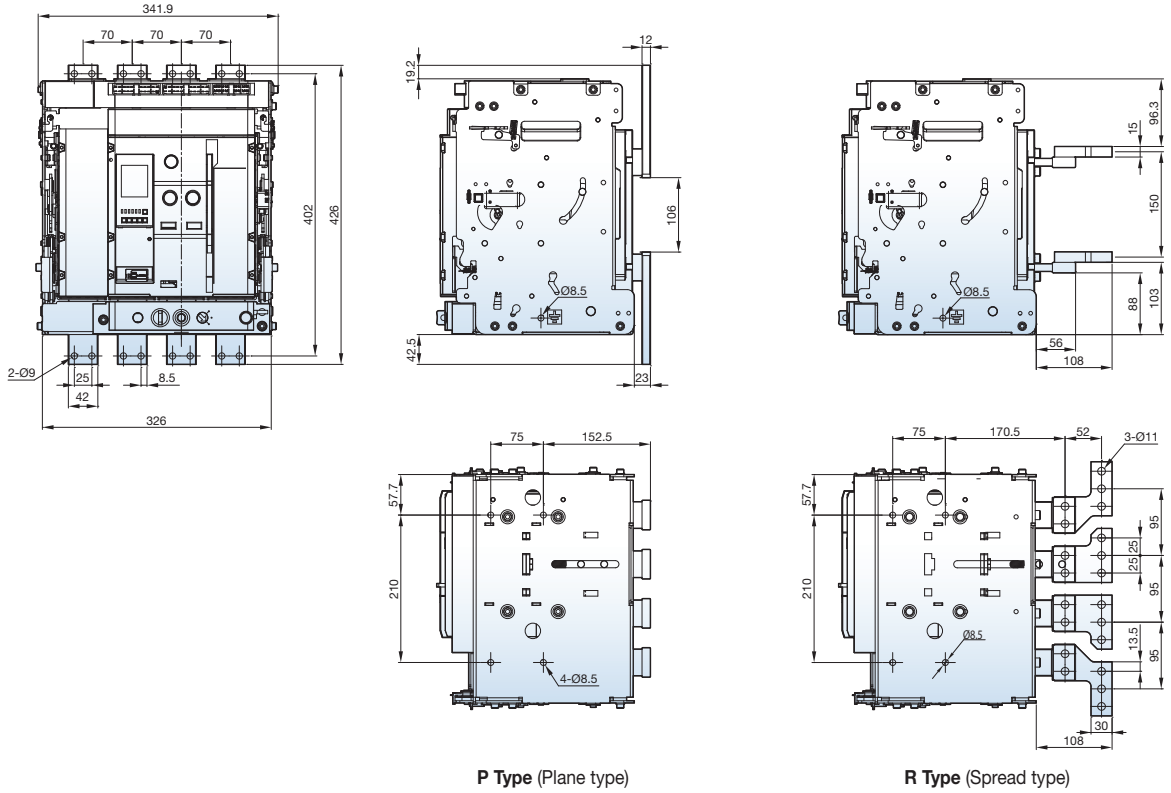
• 4P [Draw-out M: Upper-Horizontal type, Lower-Vertical type / N: Upper-Vertical type, Lower-Horizontal type]



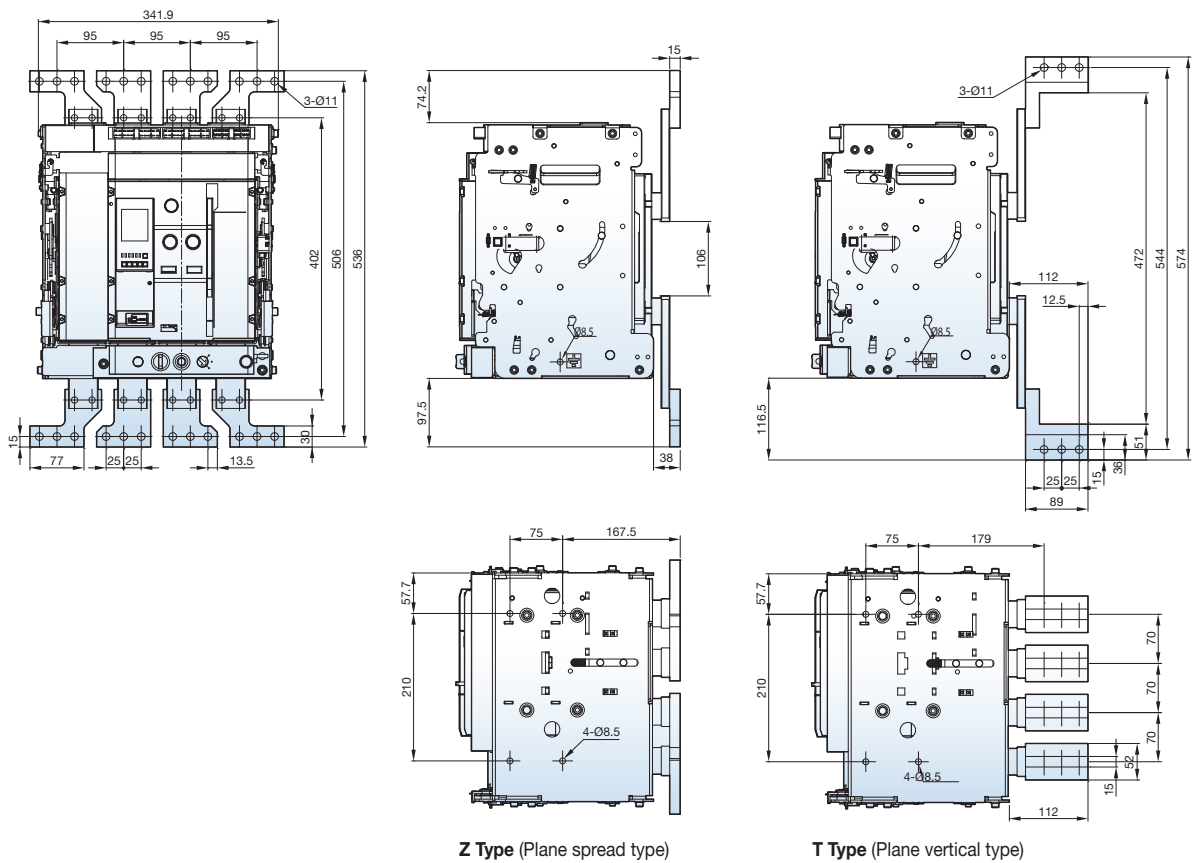
# Dimensions

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

(Unit : mm)



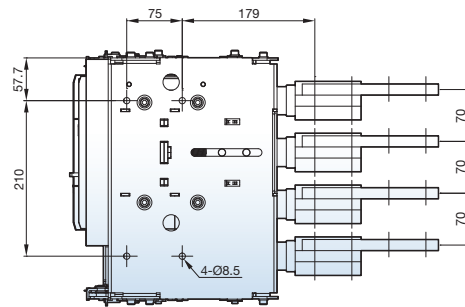
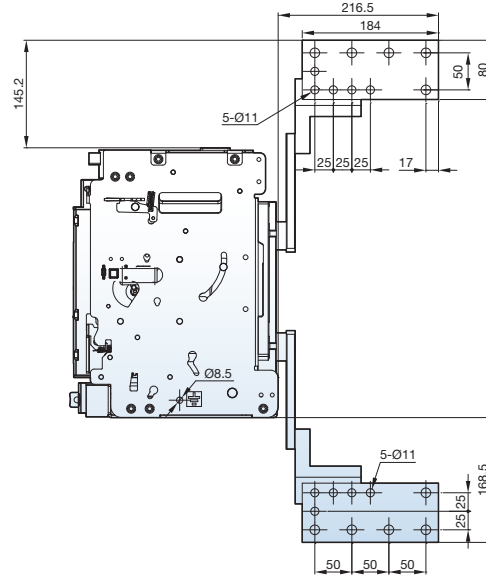
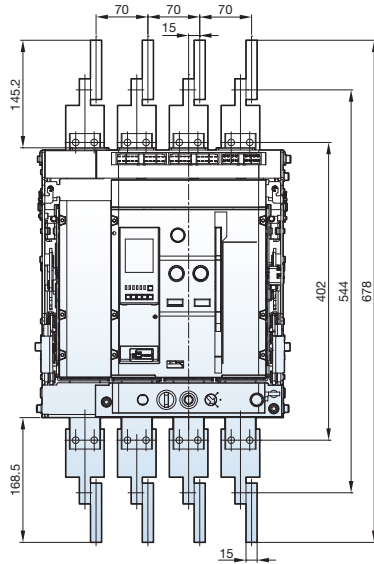
• 4P [Draw-out Z: Plane spread type / T: Plane vertical type]





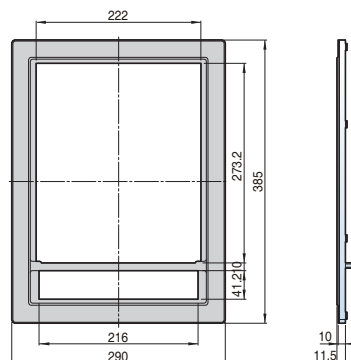
• 4P [Draw-out X: Cable lug type]

(Unit : mm)



X Type (Cable lug type)

Draw-out Door Frame: DF



# Technical information

## Normal / Special service condition

### Normal service conditions

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

- 1) Ambient temperature: A range of max. +40°C to min. -5°C is recommended. However, the average temperature of 24 hours does not exceed +35°C.
- 2) Altitude 2,000m or less.
- 3) Environmental conditions: The air must be clean, and the relative humidity does not exceed 85% at a max. of +40°C and 90% at 20°C. Do not use and store in presence of corrosive or ammonia gas. ( $H_2S \leq 0.01\text{ppm}$ ,  $SO_2 \leq 0.01\text{ppm}$ ,  $NH_3 \leq \text{a few ppm}$ )
- 4) Installation conditions: When installing Compact ACB, refer to catalogue or the installation instructions in the instruction manual.
- 5) Storage temperature: A range of max. +60°C to min. -20°C is recommended.
- 6) Replacement: Inspection and Maintenance should be performed periodically which referred to inspection and replacement period in maintenance manual.  
The recommended product replacement cycle is 10 years from manufacturing date.

### Special service conditions

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

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

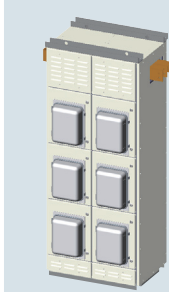
**Table A. Temperature derating (Compact ACB)**

Type	Drawout													
	Horizontal or Plane								Vertical					
	Connection type		Ambient temperature						Connection type		Ambient temperature			
	40	45	50	55	60	65	70	40	45	50	55	60	65	70
AN/AH/AW/AR-08	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A
AR-10	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A
AN/AH/AW-16	1600A	1550A	1500A	1450A	1390A	1330A	1280A	1600A	1600A	1600A	1550A	1500A	1450A	1400A

Type	Fixed													
	Horizontal or Plane								Vertical					
	Connection type		Ambient temperature						Connection type		Ambient temperature			
	40	45	50	55	60	65	70	40	45	50	55	60	65	70
AN/AH/AW/AR-08	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A
AR-10	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A
AN/AH/AW-16	1600A	1600A	1600A	1550A	1500A	1450A	1400A	1600A	1600A	1600A	1600A	1600A	1550A	1500A

\* Ambient temperature is greater than 60°C, consult us. \* According to IEC 60947-2

**Table B. Temperature derating according to IP degree of panel**

Switchgear Compositio	3		2		1		
	Vertical		Vertical		horizontal		
	2b. 50×10		2b. 50×10		2b. 50×10		
 2000×400×600	IP41	35°C	3		1330	1190	
			2		1400		
		45°C	1	1500		1310	
			3		1270		1120
		55°C	2		1320		1180
			1	1420		1240	
	IP54	35°C	3		1190	1050	
			2		1240		
		45°C	1	1330		1160	
			3		1230		1210
		55°C	2		1310		1270
			1	1390		1310	

## Altitude and Isolation Voltage

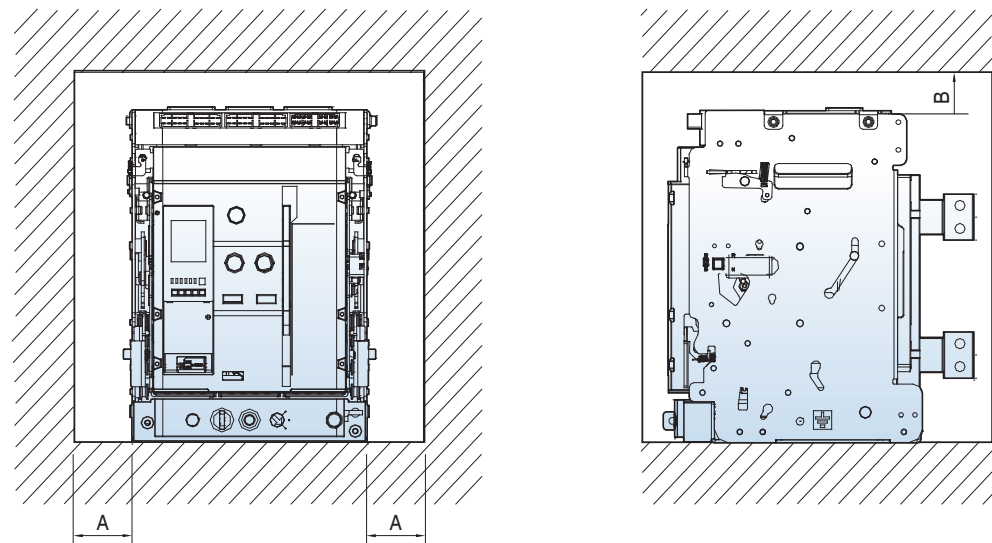
### Altitude

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

Item \ Altitude [m]	2000	3000	4000	5000
Withstand voltage (V)	3500	3150	2800	2450
Average insulating voltage (V)	1000	900	800	700
Max. using voltage (V)	800	720	640	560
	690	620	540	470
Current compensation constant	$1 \times I_n$	$0.98 \times I_n$	$0.96 \times I_n$	$0.94 \times I_n$

### Insulation clearance

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

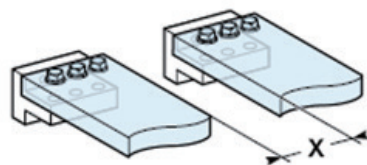


(Unit : mm)

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

### Minimum clearances distance

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



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

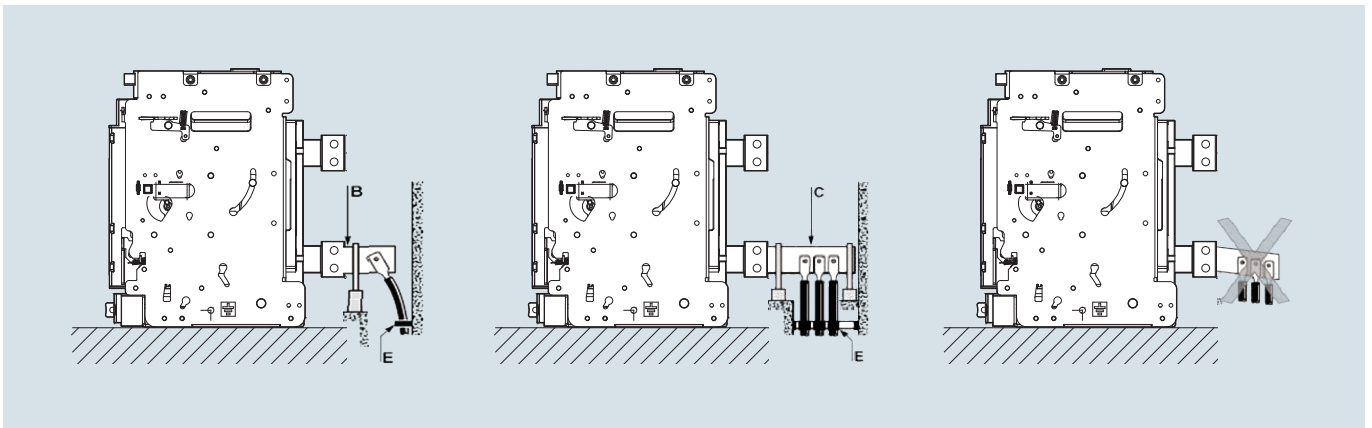
# Technical information

## Installation recommendation

### BUS-BAR Connection

#### Cables connections

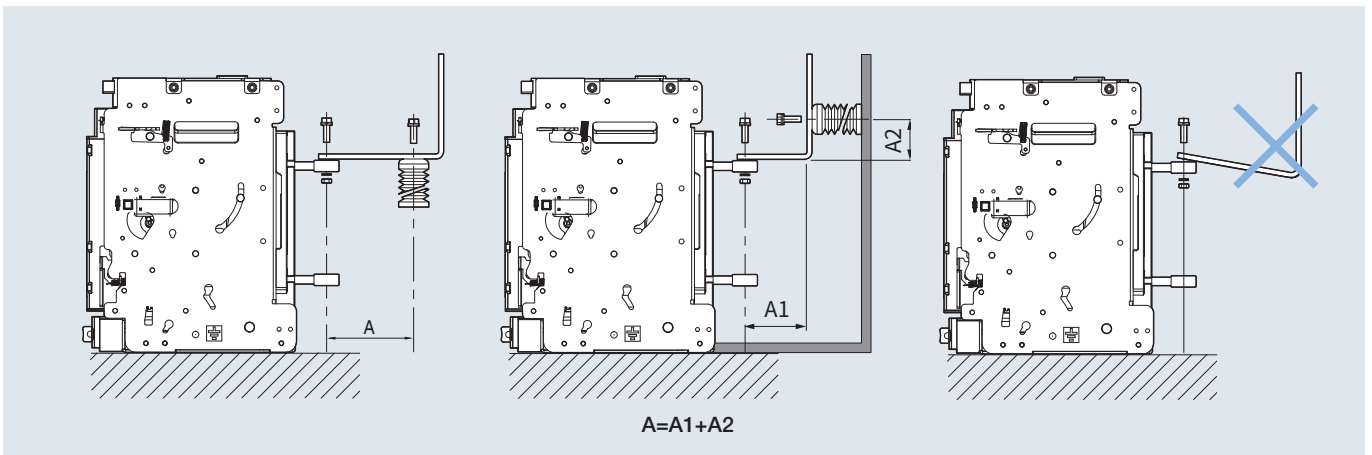
Make sure that no excessive mechanical force put on the rear terminals for cable connection. Extension terminal is fixed such as B, C and cable is to fixed to the frame such as E



#### Bus-bar connection

For busbar connection, connect access parts with a provided torque and fix with parallel installing the support not to apply terminal weight to circuit breaker.

In order to prevent the spread safety or secondary accidents, secure maximum safe distance A from the connection point (Compact ACB 690V 50kA 1600A The maximum safety clearance is 250mm) so that it can withstand the electric force generated in the event of a short circuit. (Support strength: Insulator bending load 720kg or more, tensile strength 3000kg or more)



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

(Table 1) Maximum safe distance A

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

# Ordering sheet

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

Receipt	LS ELECTRIC Co., Ltd.			Order Day				Distributor Name										
Project				Contractor														
Delivery place				Delivery date				PNL Maker										
ACB Main body	Type of ACB	<input checked="" type="checkbox"/> Susol Compact <input type="checkbox"/> AN <input type="checkbox"/> AH <input type="checkbox"/> AR																
	Frame size	<input type="checkbox"/> C (400~1600AF)																
	Ratings	AF																
	Rated current (Rating Plug)	A																
	Trip Relay	<input type="checkbox"/> NO																
		<input type="checkbox"/> YES																
				Frequency		Control voltage		Comm.		Optional function								
		Type	60Hz	50Hz	NO	AC/DC 110~220V	DC 24~48V	NO	YES	Earth leakage detection	External CT ground fault	Pre-Trip Alarm						
		Normal	<input type="checkbox"/> NGO	<input type="checkbox"/> NG5	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-						
		Ammeter	<input type="checkbox"/> AGO	<input type="checkbox"/> AG5	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-						
			<input type="checkbox"/> AG1	<input type="checkbox"/> AG6	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-						
			<input type="checkbox"/> AE0	<input type="checkbox"/> AE5	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-						
			<input type="checkbox"/> AE1	<input type="checkbox"/> AE6	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-						
			<input type="checkbox"/> AE2	<input type="checkbox"/> AE7	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-						
	<input type="checkbox"/> AC1		<input type="checkbox"/> AC6	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-							
<input type="checkbox"/> AC2	<input type="checkbox"/> AC7		<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 type="checkbox"/> AX2	<input type="checkbox"/> AX7	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-									
		Frequency		Control voltage		Comm.		Optional function										
Type	60Hz	50Hz	NO	AC/DC 110~220V	DC 24~48V	NO	YES	Earth leakage detection	External CT ground fault	Pre-Trip Alarm								
Power Meter	<input type="checkbox"/> PC1	<input type="checkbox"/> PC6	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-								
	<input type="checkbox"/> PC2	<input type="checkbox"/> PC7	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-								
	<input type="checkbox"/> PX1	<input type="checkbox"/> PX6	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-								
Supreme Meter	<input type="checkbox"/> PX2	<input type="checkbox"/> PX7	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-								
	<input type="checkbox"/> SC1	<input type="checkbox"/> SC6	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-								
	<input type="checkbox"/> SC2	<input type="checkbox"/> SC7	<input checked="" type="checkbox"/>	-	-	<input checked="" type="checkbox"/>	-	-	-	-								
	<input type="checkbox"/> SX1	<input type="checkbox"/> SX6	<input checked="" type="checkbox"/>	-	-	<input checked="" 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"/>	-									
Note) 1. Standard function: Ground fault detection 2. Communication function is not available under no control voltage																		
3. Power/Supreme Meter is also available for Generator protection																		
No. of poles	<input type="checkbox"/> 3-pole					<input type="checkbox"/> 4-pole												
Installation type	<input type="checkbox"/> Draw-out type					<input type="checkbox"/> Fixed type												
Phase arranging order	<input type="checkbox"/> Standard type (N, R, S, T)					<input type="checkbox"/> Reverse phase type (R, S, T, N)												
Closing type	<input type="checkbox"/> Manual closing																	
	<input type="checkbox"/> Electrical closing																	
	• Charge method					<input type="checkbox"/> Standard type (OFF-Charging method)												
						<input type="checkbox"/> Rapid auto-reclosing type (ON-Charging method)												
	• Motor operating voltage					<input type="checkbox"/> AC/DC 100V~130V		<input type="checkbox"/> DC 125V		<input type="checkbox"/> 24V~30V		<input type="checkbox"/> DC 48V~60V						
					<input type="checkbox"/> AC/DC 200V~250V		<input type="checkbox"/> AC 380V~415V		<input type="checkbox"/> AC 440V~480V		<input type="checkbox"/> AC 48V							
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					
Tripping 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					
ACB Cradle	Cradle type					<input type="checkbox"/> No Safety Shutter (E class)						<input type="checkbox"/> Safety Shutter Attachment (F class)						
	Installation type					<input type="checkbox"/> Manual connection						<input type="checkbox"/> Automatic connection						
Bus-bar connection	Bus-bar type																	
	<input type="checkbox"/> Horizontal		<input type="checkbox"/> Vertical		<input type="checkbox"/> Plane		<input type="checkbox"/> Upper: Horizontal, Lower: Vertical		<input type="checkbox"/> Upper: Vertical, Lower: Horizontal		<input type="checkbox"/> Customer mounting							
<input type="checkbox"/> Horizontal with Spreaders		<input type="checkbox"/> Plane with Spreaders		<input type="checkbox"/> Vertical with Extension		<input type="checkbox"/> Cable-Lug												
ACB Accessory	ACB Main body	Standard																
		• Aux. contact					<input type="checkbox"/> Standard type (4c, standard installation)											
		• Key Lock					<input type="checkbox"/> Single Key (ON-Lock)											
		• Undervoltage trip device (UVT, Instantaneous type)					<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					
		• Counter					<input type="checkbox"/> Non-attachment type						<input type="checkbox"/> Attachment type					
		• Miss insertion preventive device (MIP)					<input type="checkbox"/> Non-attachment type											
		• Double trip device (Same with Tripping voltage)					<input type="checkbox"/> Non-attachment type						<input type="checkbox"/> Attachment type					
		• Ready-to-close switch					<input type="checkbox"/> Non-attachment type						<input type="checkbox"/> Attachment type					
		• Trip Alarm switch, Manual Reset Button					<input type="checkbox"/> Non-attachment type						<input type="checkbox"/> Attachment type					
	• Key Interlock (K2, ON-Lock)											<input type="checkbox"/> Attachment type						
	• ON/OFF Button Lock											<input type="checkbox"/> Attachment type						
	• Micro Load type (4 max.)					<input type="checkbox"/> Non-attachment type						qty.						
	Cradle mounting (Non-attachment type)	• Cell switch (CL)					<input type="checkbox"/> 4c		<input type="checkbox"/> 8c									
		<input type="checkbox"/> Door Interlock with Wire type					<input type="checkbox"/> Door Interlock with Catch type											
• Mechanical operation contact (MOC)					<input type="checkbox"/> Standard type (10a10b)													
• Mechanical Interlock (MI)					<input type="checkbox"/> Wire type (2 terminals)			<input type="checkbox"/> Wire type (3 terminals)										
<input type="checkbox"/> Miss insertion preventive device (MIP)																		
<input type="checkbox"/> Racking Interlock					<input type="checkbox"/> Insulation barrier													
External mounting	• UVT time delay controller					<input type="checkbox"/> AC/DC 100V~130V		<input type="checkbox"/> DC 125V		<input type="checkbox"/> AC/DC 200V~250V								
						<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					<input type="checkbox"/> Profibus-DP Comm.			<input type="checkbox"/> Remote closing & trip									



**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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