

Beyond X™

Susol Compact ACB

Compact Air Circuit Breakers 1600A for Marine

LS ELECTRIC

Susol

COMPACT ACB 1600A MARINE





Change low voltage switchgears!

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



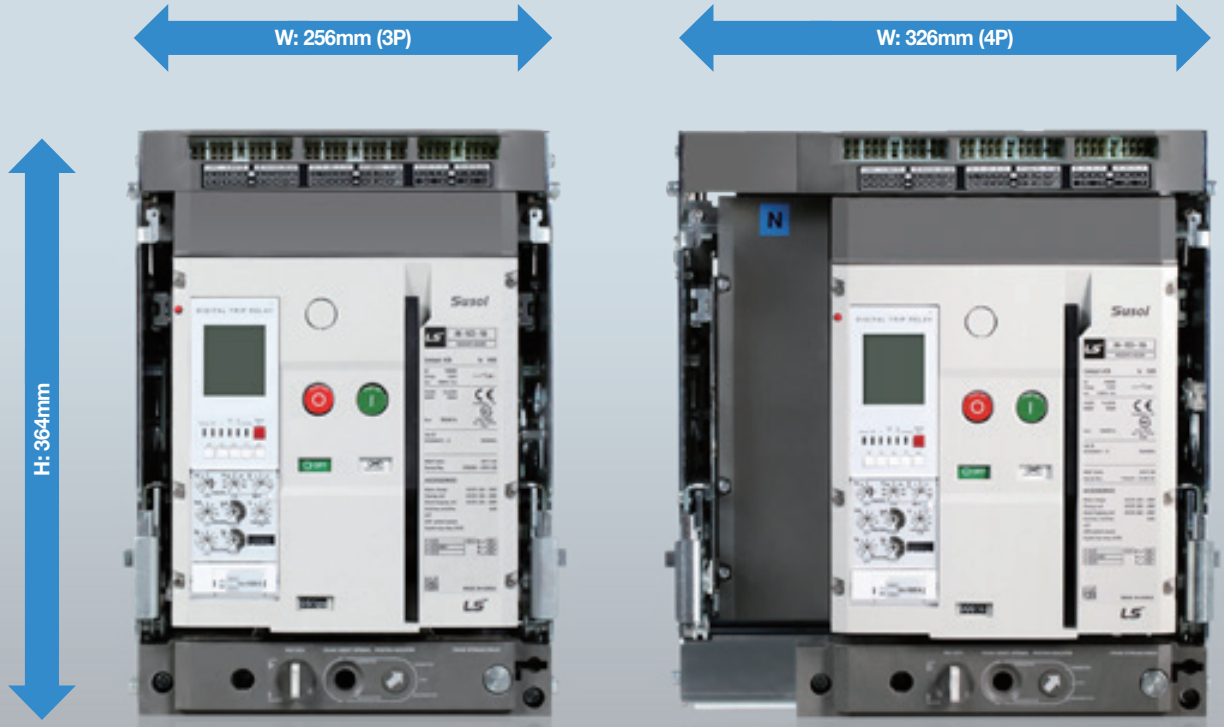
COMPACT ACB 1600A

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

Contents

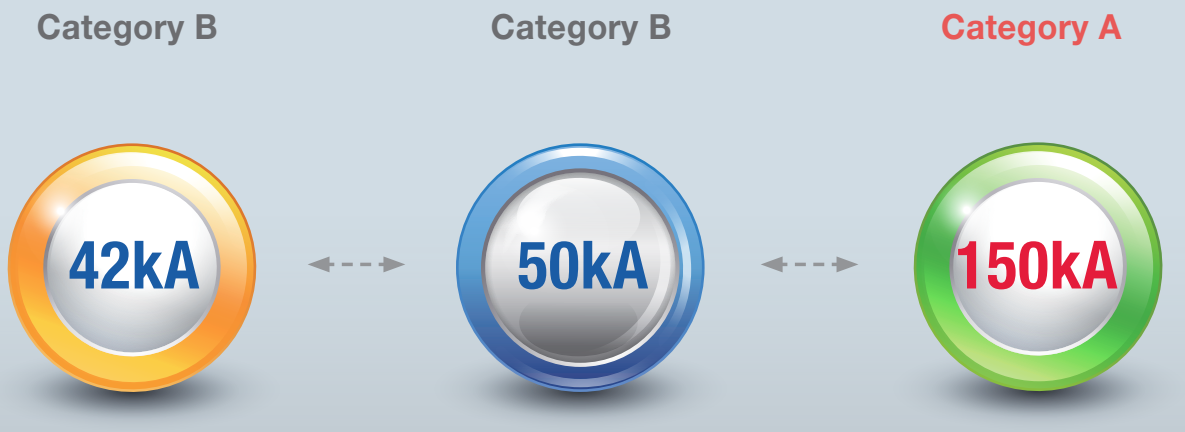
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Marine Compact ACB 1600A



Susol

Selectivity Category

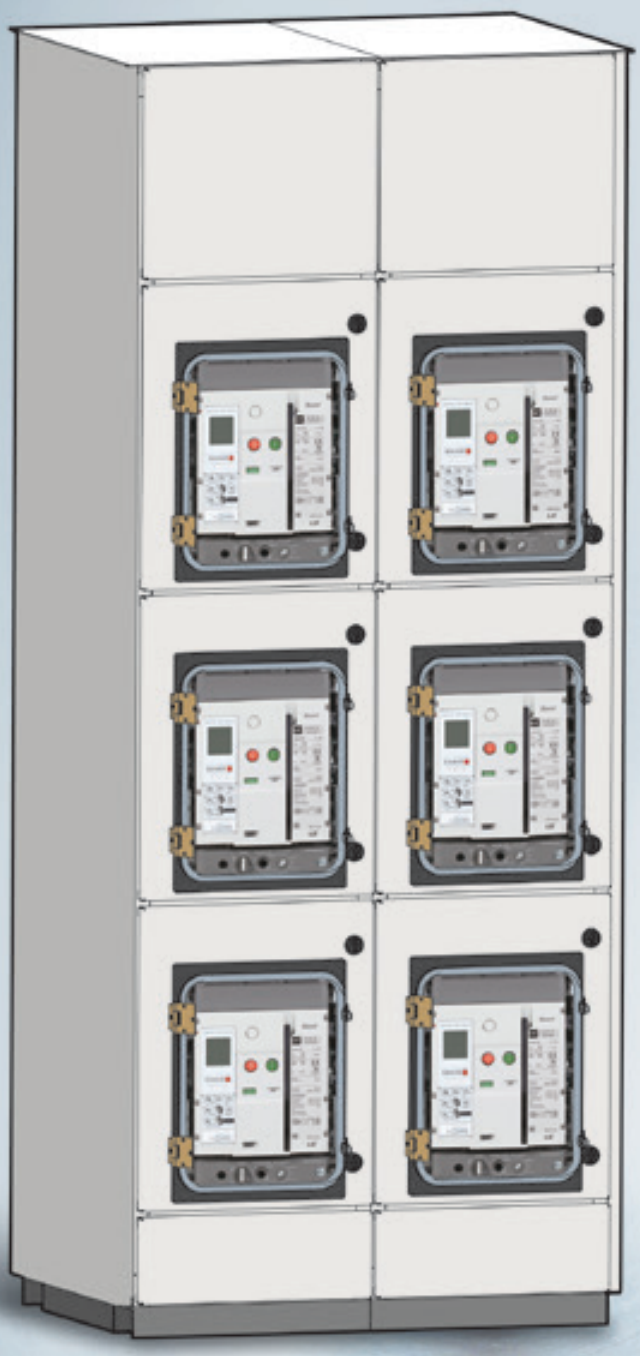


AN type	AH type	AR type
AN-08: 800AF	AH-08: 800AF	AR-08: 800AF
AN-16: 1600AF	AH-16: 1600AF	AR-10: 1000AF
Ics = 100% * Icu = 42kA/690Vac	Ics = 100% * Icu = 50kA/690Vac	Ics = 100% * Icu = 150kA/415Vac

Features

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

Compact ACB switchgear



Reduction of size and weight of switchgears

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

Compact size

55%

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

Compact type

Unit (mm)

E-frame ACB



C-frame(Compact) ACB



3-high



4-high



Marine Compact ACB



AN – **16** **C** **3** **10** **J**

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

AF	
08	800AF
16	1600AF

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

No. of pole	
3	3P
4	4P

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

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

Category A	
AR	150kA/415V

AF	
08	800AF
10	1000AF

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

Circuit breaker ratings



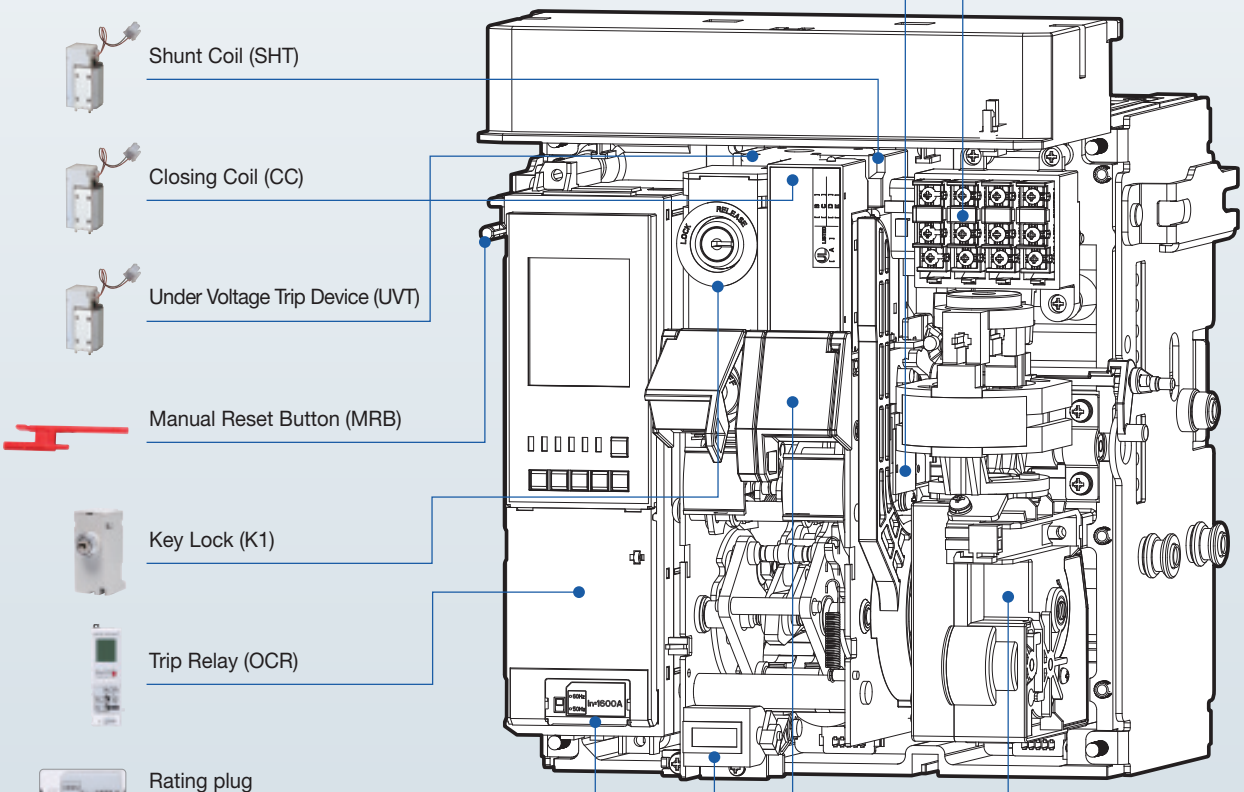


Common characteristics									
Number of poles	(P)			3P/4P					
Frequency	(Hz)			50/60Hz					
Rated operational voltage	(V, Ue)			690V [1]					
Rated insulation voltage	(V, Ui)			1000V					
Rated impulse withstand voltage	(kV, Uimp)			12kV					
Circuit breaker as per IEC60947-2									
Type				AN/AH/AR-C					
Description				AN-08C	AN-16C	AH-08C	AH-16C	AR-08C	AR-10C
Ampere Frame	(AF)			800	1600	800	1600	800	1000
Rated current (In Max.) at 40℃	(A)			400	-	400	-	400	-
	(A)			630	-	630	-	630	-
	(A)			800	800	800	800	800	800
	(A)			-	1000	-	1000	-	1000
	(A)			-	1250	-	1250	-	-
	(A)			-	1600	-	1600	-	-
Rated current of neutral pole	(A)			100%					
Rated breaking capacity (Icu)	(kA)	IEC60947-2	AC 690V/600V/550V	42		50		-	
			AC 500V/480V/460V	42		50		130 [2]	
			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 [3]	
			AC 415V/380V/220V	105		132		330	
Rated Short-time capacity (Icw)	(kA)		1sec/3sec	42/25		50/30		10 [4]	
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 [5] H: 364.3					
			4P	W: 326 D: 274.5 [5] H: 364.3					
		Fixed type	3P	W: 272.4 D: 198.5 [5] H: 322					
			4P	W: 342.4 D: 198.5 [5] 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

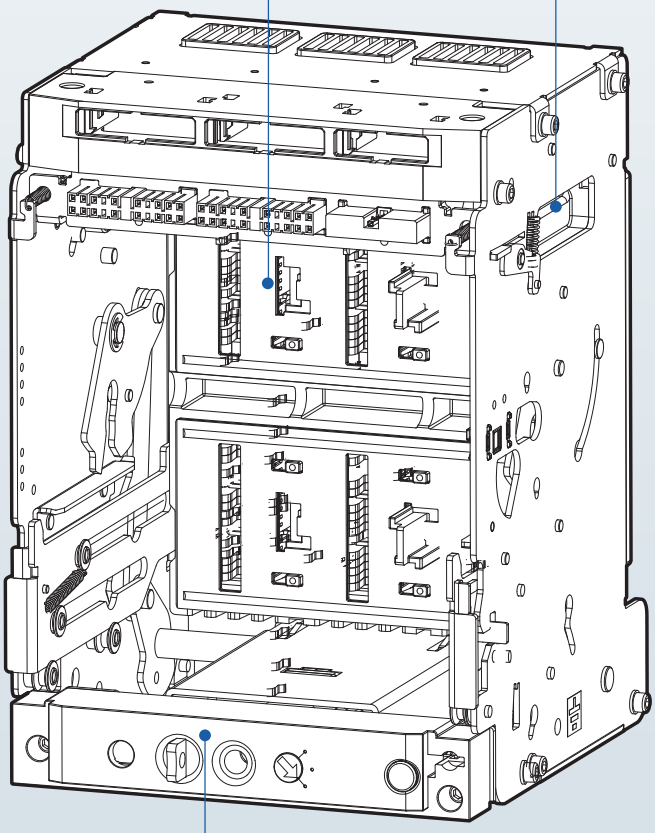
Accessories view

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)



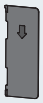
Safety Shutter (ST)



Lifting Hook (LH)



Interphase Barrier (IB)



UVT Time Delay Controller (UDC)



Remote I/O Unit (RCO)



Cell SW (CEL)



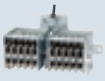
Door Interlock (DI)



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



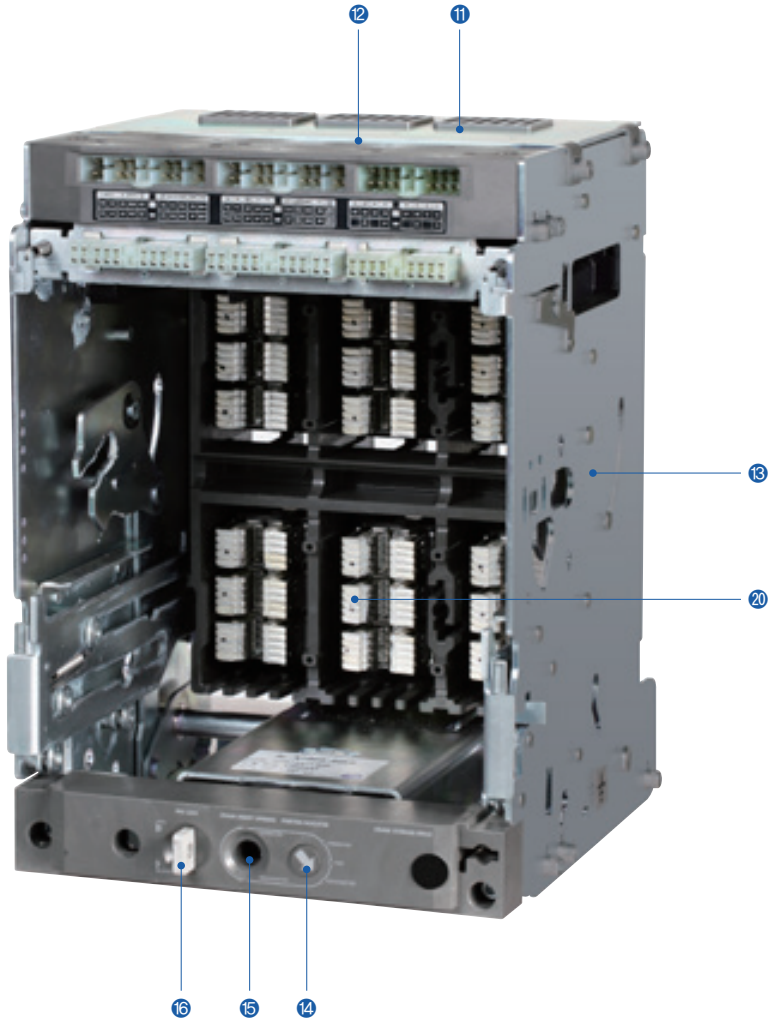
- Ui: Rated insulation voltage
- Uimp: Impulse withstand voltage
- Ue: Rated operational voltage (AC base)
- Icu: Ultimate breaking capacity
- Ics: Service breaking capacity
- Icw: Short time withstand capacity
- Icm: Rated making capacity
- MFG. Date: Manufacturing date

- Motor charge
- Closing coil
- Shunt tripping coil

Control power and terminal No.

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

Draw-out (Cradle)



Terms

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

Ordering

Main body



Air circuit breaker
AN/AH
AR

Ampere frame (CT Spec.)	
08	800AF
16	1600AF
08	800AF
10	1000AF

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

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

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

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

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

1. Fixed type Adaptor Kit

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

M1

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

D1

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

D1

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

FX

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)

NV1

Trip relay
Refer to 18page

U1

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

AL

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

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

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

Ordering

Cradle

AL – H16C 3 – J H E S

Air circuit breaker	
LS ACB Cradle	
AL	Bottom operating cradle

Type & Ampare frame	
H16C	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

Shtter	
E	without shutter
F	with shutter

Arc cover	
S	with arc cover

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 purchase adapter kit separately after ordering H type product (Refer to fixed adapter kit table)

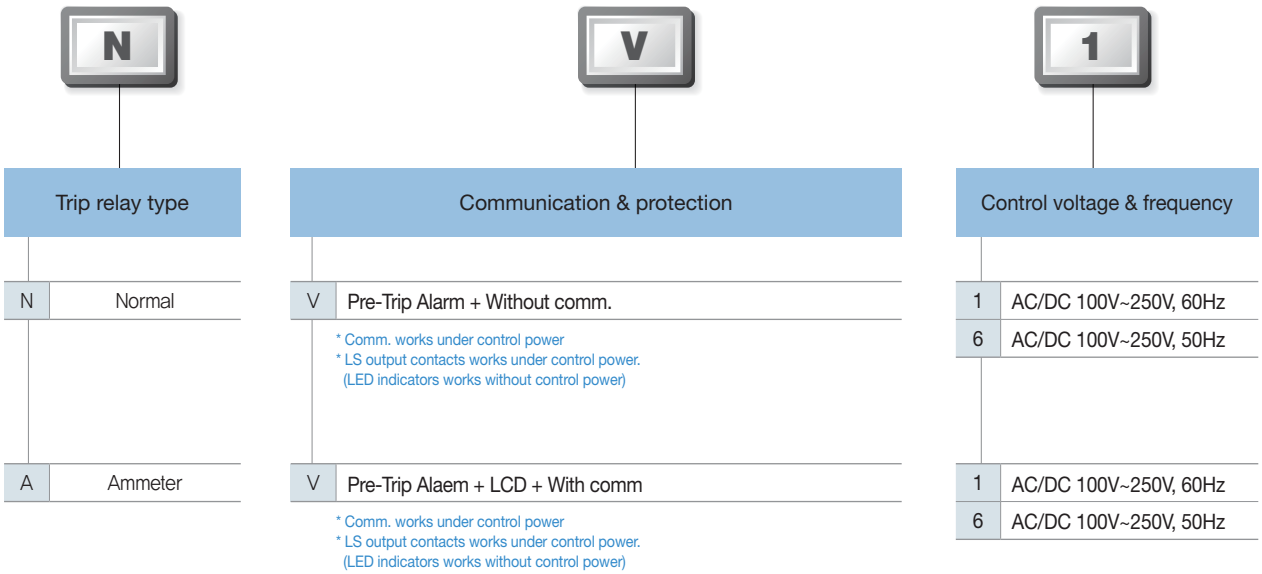
2. Draw-out type Adaptor Kit (Cradle)

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

Various installation methods

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

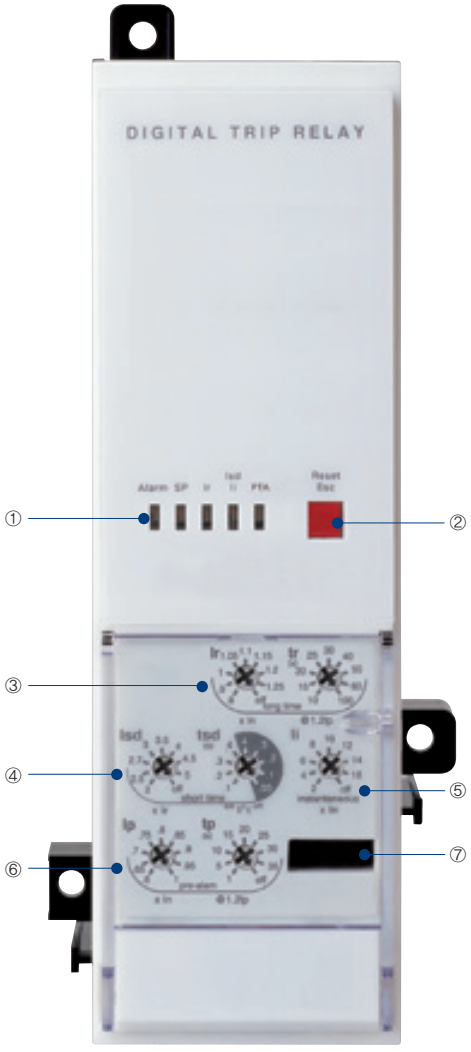
Trip relay


N
V
1
Trip relay type
Communication & protection
Control voltage & frequency
N
Normal
V
Pre-Trip Alarm + Without comm.
* Comm. works under control power
* LS output contacts works under control power.
(LED indicators works without control power)
1
AC/DC 100V~250V, 60Hz
6
AC/DC 100V~250V, 50Hz
A
Ammeter
V
Pre-Trip Alaem + LCD + With comm
* Comm. works under control power
* LS output contacts works under control power.
(LED indicators works without control power)
1
AC/DC 100V~250V, 60Hz
6
AC/DC 100V~250V, 50Hz

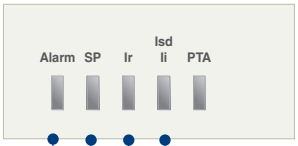
Trip relay

NV type: 「Normal」 type

- Optimized protection function
- OCR, OCGR function according IEC60947-2
- Overload protection
  - Long-time delay
- Short-circuit protection
  - Short-time delay/Instantaneous
  - I^2t On/Off optional (for short-time delay)
- Self Power
- 3DO(Digital Output)
  - Fixed



① LED: Indication of trip info. and overload state



Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: Blink in PTA pick-up, Turn on in long-time delay pick-up

② Reset Key: Fault reset or battery check

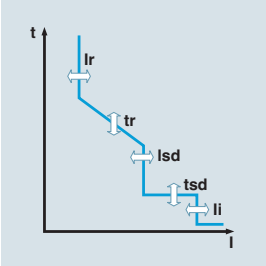
③ Ir: Long-time current setting, tr: Long-time tripping delay setting

④ Isd: Short-time current setting, tsd: Short-time tripping delay setting

⑤ Ii: Instantaneous current setting

⑥ Ip: Pre Trip Alarm current setting, tp: Pre Trip Alarm delay setting

⑦ Test terminal: OCR test terminal (Connected with OCR tester)



Protection

Long time										
Current setting (A)	Ir = In×...		0.8	0.9	1.0	1.05	1.1	1.15	1.2	1.25	Off
Time delay (s)	tr@(1.2×Ir)		10	15	20	25	30	40	50	60	100
Accuracy: ±15% or	tr@(3×Ir)		0.99	1.49	1.99	2.48	2.98	3.97	4.97	5.96	9.93
below 100ms	tr@(6×Ir)		0.24	0.36	0.48	0.59	0.71	0.95	1.19	1.43	2.38
Short time										
Current setting (A) Accuracy : ±10%	Isd = In×...		1.5	2	2.5	3	3.5	4	4.5	5	Off
Time delay (s) @ 10×Ir	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
		I²t On		0.1	0.2	0.3	0.4				
	(I²t Off)	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				
Instantaneous										
Current setting (A)	Ii = In×...		2	4	6	8	10	12	14	16	Off
Tripping time			below 50ms								

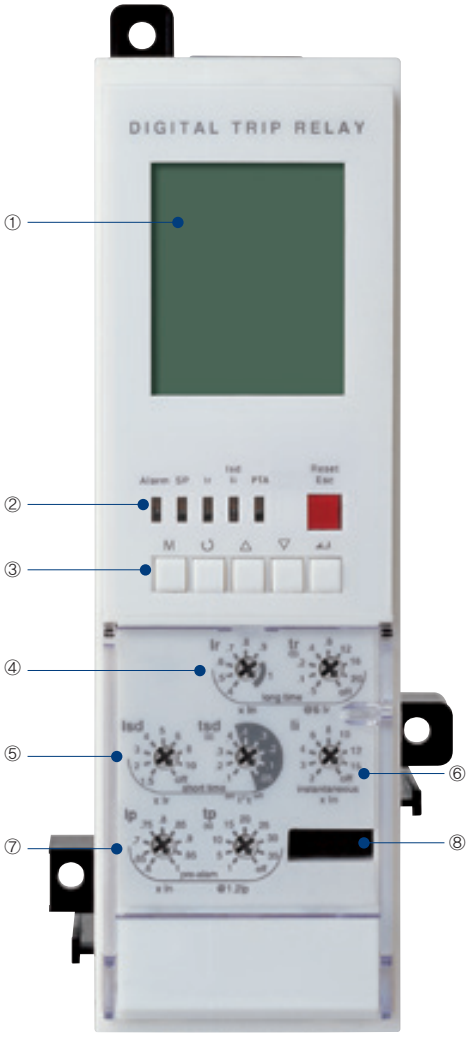
PTA (Pre Trip Alarm)									
Current setting (A)	Ip = In×...0.7	0.7	0.8	0.85	0.9	0.95	1	1.05	1.1	Off
Time delay (s) Accuracy : ±10%	tp@(1.05×Ip)	5	10	15	20	25	30	35	40	45

■ The fine-adjustable setting of the rated current[In]

- In = Ict×[0.4~1.0]
- Setting range: 40~100% of Ict (unit: 0.5%)

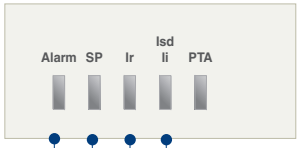
AV type: 「Ammeter」 type

- ■ Optimized protection function
- ■ OCR, OCGR function according IEC60947-2
- ■ Overload protection
  - Long-time delay
- ■ Short-circuit protection
  - Short-time delay/Instantaneous
  - I^2t On/Off optional (for short-time delay)
- ■ Self Power
- ■ 3DO(Digital Output)
  - Fixed
- ■ Realization of protective coordination by ZSI (Zone Selective Interlocking)
- ■ Fault recording
  - Records Max. up to 10 fault information about fault type, fault phase, fault data, occurrence of fault
- ■ SBO
  - High reliability for control and setting change method
- ■ Communication
  - Modbus/RS485



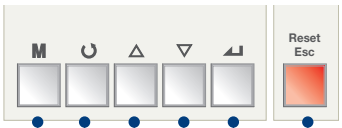
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



Isd/Ii: LED indicating short-time or instantaneous tripping
Ir: LED indicating long-time delay
SP: Self-protection and battery test LED
Alarm: Blink in PTA pick-up, Turn on in long-time delay pick-up

③ Key: Move to menu or reset



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

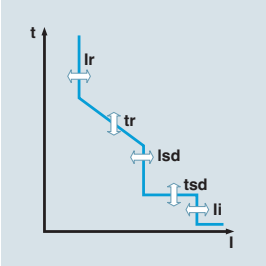
④ Ir: Long-time current setting, tr: Long-time tripping delay setting

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

⑥ Ii: Instantaneous current setting

⑦ Ip: Pre Trip Alarm current setting, tp: Pre Trip Alarm delay setting

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



Protection

Long time										
Current setting (A)	Ir = In×...		0.8	0.9	1.0	1.05	1.1	1.15	1.2	1.25	Off
Time delay (s)	tr@(1.2×Ir)		10	15	20	25	30	40	50	60	100
Accuracy: ±15% or	tr@(3×Ir)		0.99	1.49	1.99	2.48	2.98	3.97	4.97	5.96	9.93
below 100ms	tr@(6×Ir)		0.24	0.36	0.48	0.59	0.71	0.95	1.19	1.43	2.38
Short time										
Current setting (A) Accuracy : ±10%	Isd = In×...		1.5	2	2.5	3	3.5	4	4.5	5	Off
Time delay (s) @ 10×Ir	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)	Ii = In×...		2	4	6	8	10	12	14	16	Off
Tripping time			below 50ms								

PTA (Pre Trip Alarm)									
Current setting (A)	Ip = In×...0.7	0.7	0.8	0.85	0.9	0.95	1	1.05	1.1	Off
Time delay (s) Accuracy : ±10%	tp@(1.05×Ip)	5	10	15	20	25	30	35	40	45

■ The fine-adjustable setting of the rated current[In]

- In = Ict×[0.4~1.0]
- Setting range: 40~100% of Ict (unit: 0.5%)

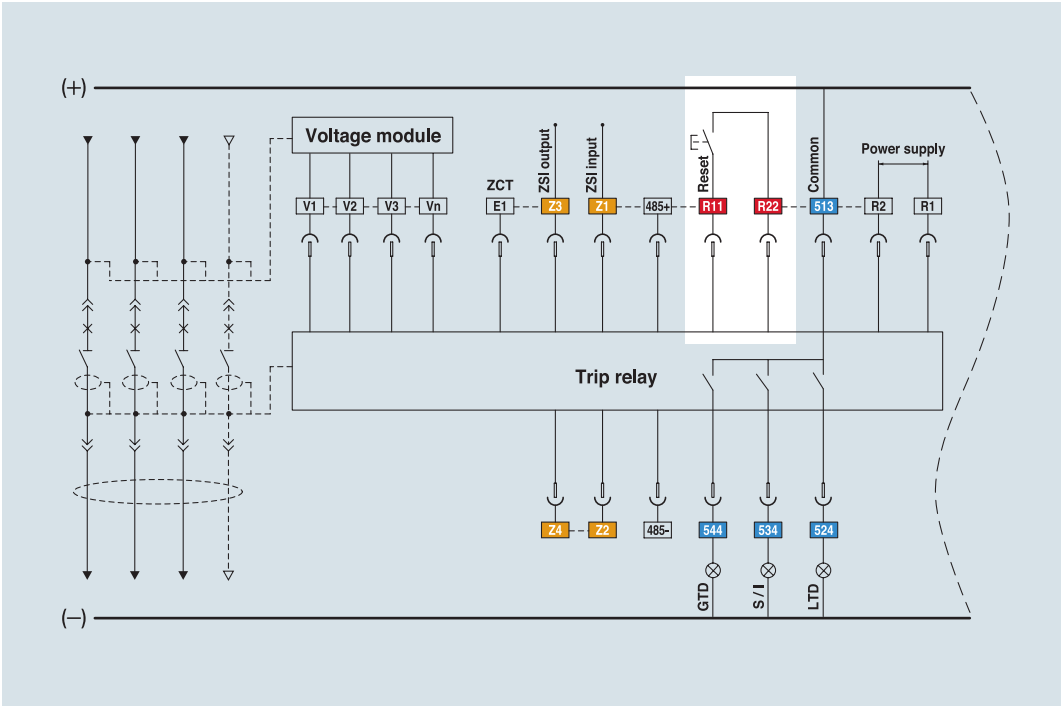
Remote reset and digital I/O (NV type)

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 possible to perform the remote reset by digital input,
and have 3 DO(Digital output).

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

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

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



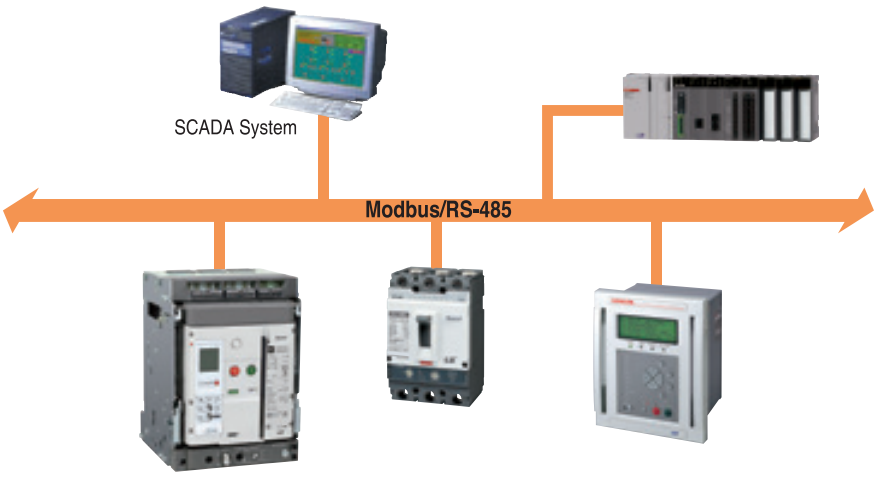
Trip Relay	Digital Output	Long time	Short time	Instantaneous	Ground	Overload Alarm	OVR	UVR	rPower	Vunbal	Iunbal	OFR	UFR	OPR	Note
NV type	DO1(524)	●	×	×	×	Not available									Fixed
	DO2(534)	×	●	●	×										
	DO3(544)	×	×	×	●										

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.

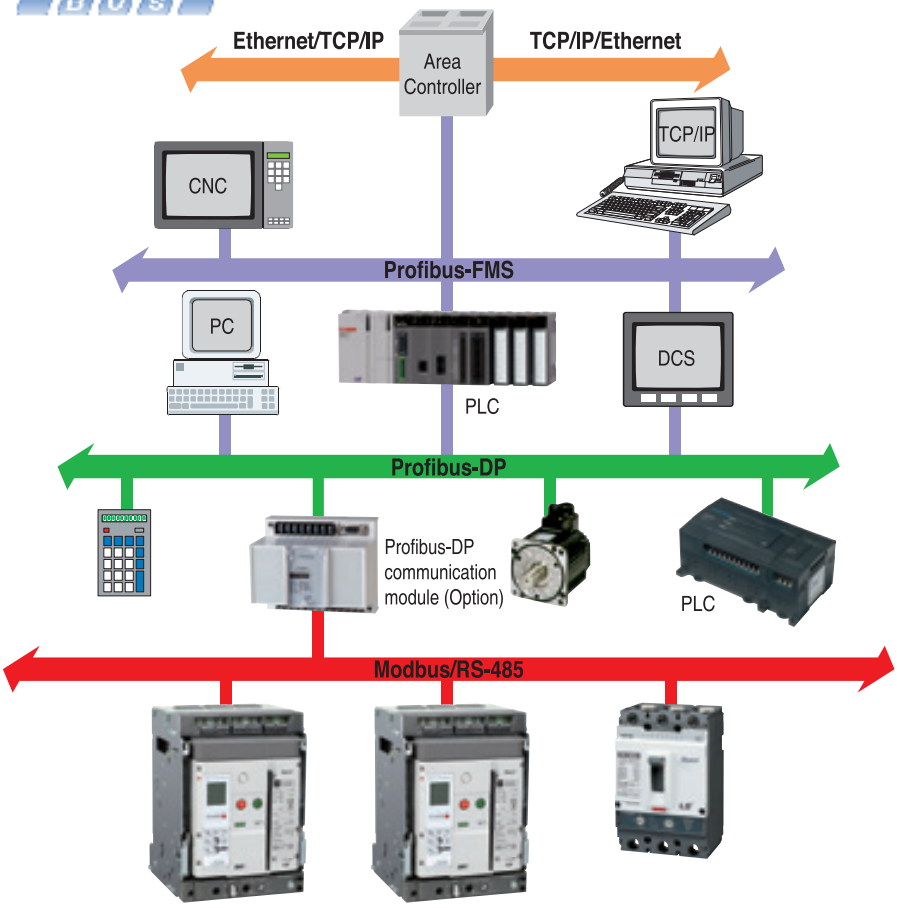


Profibus-DP

- 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

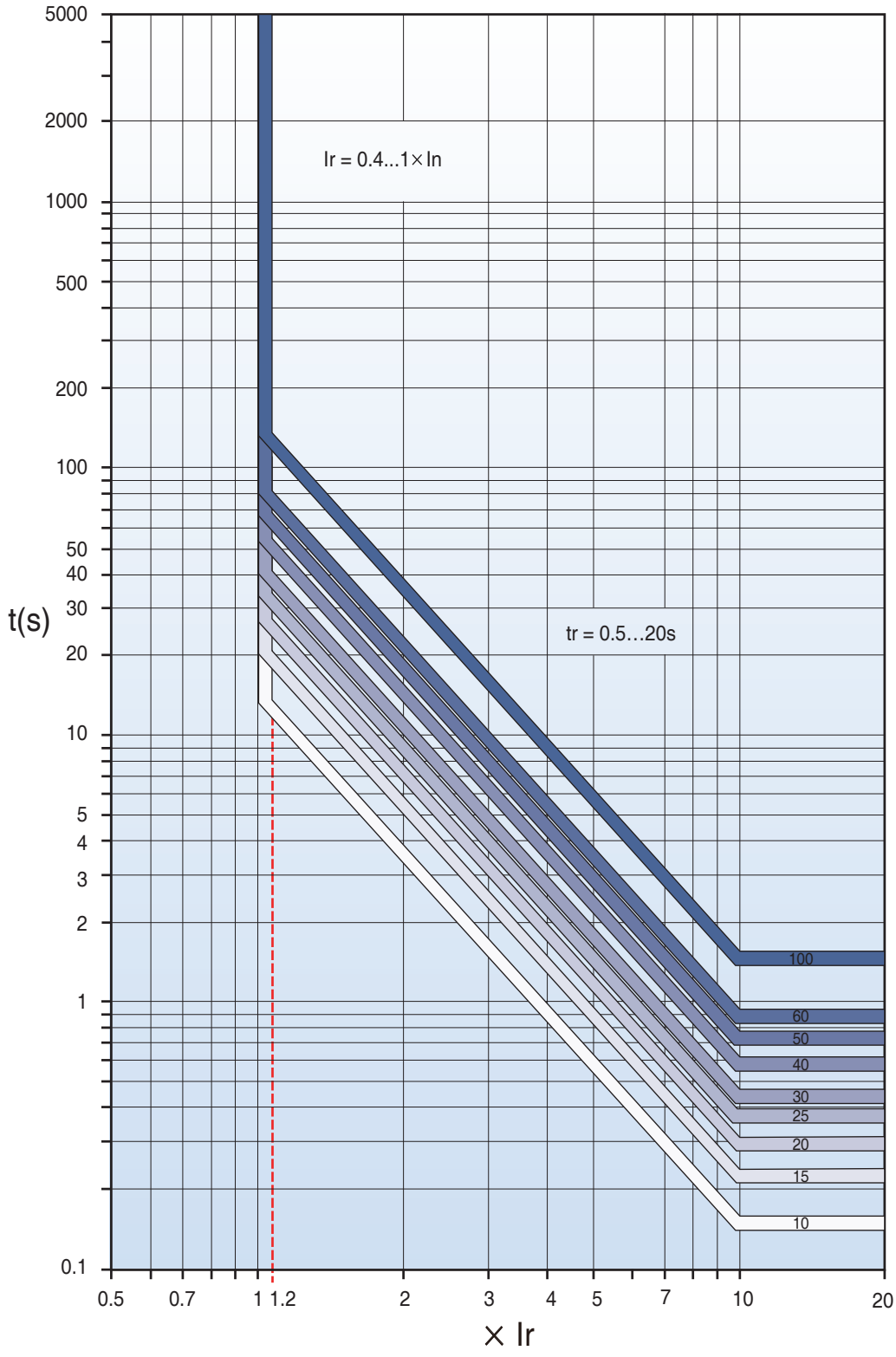


Profibus-DP communication module (Option)



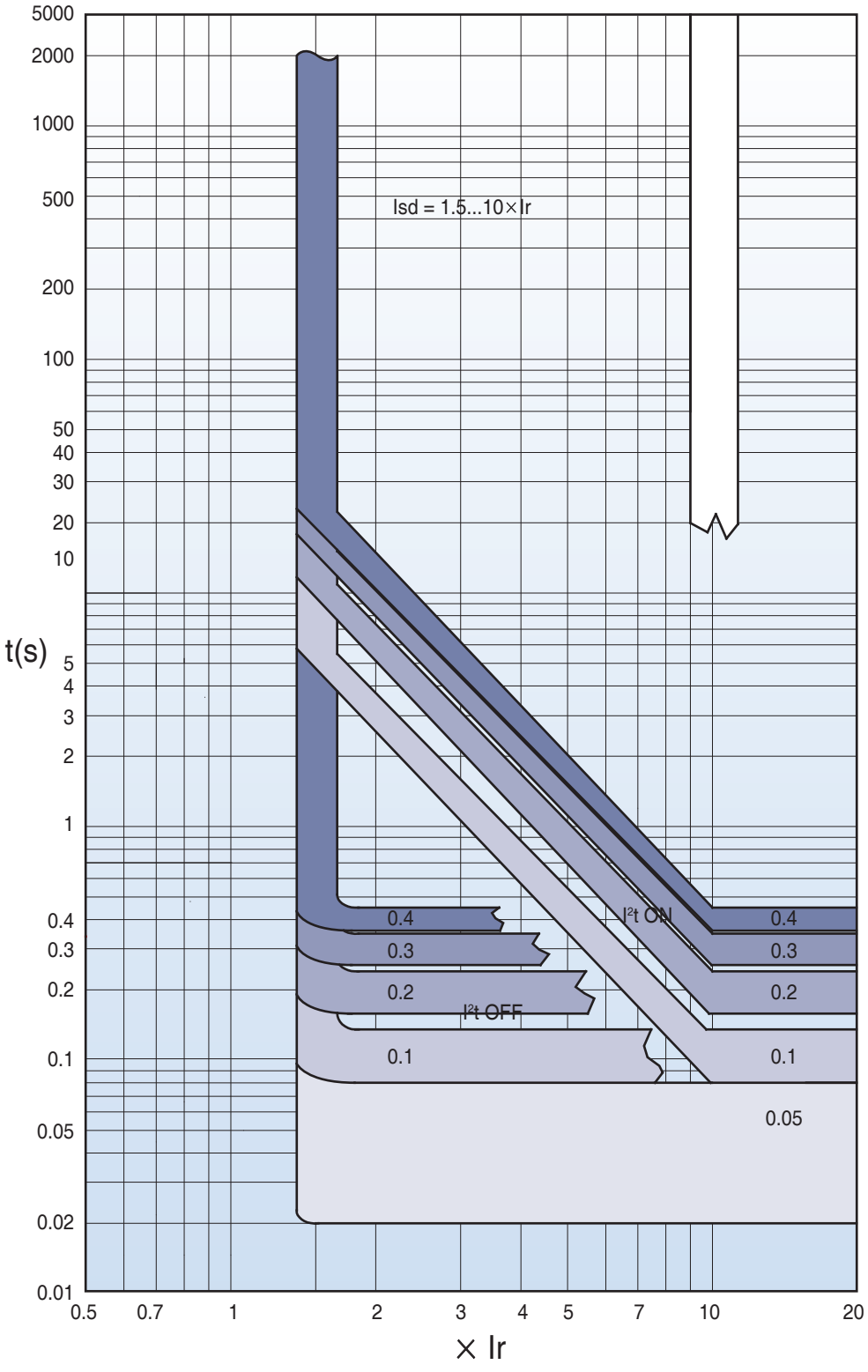
Characteristics curves

Long-time delay (L)



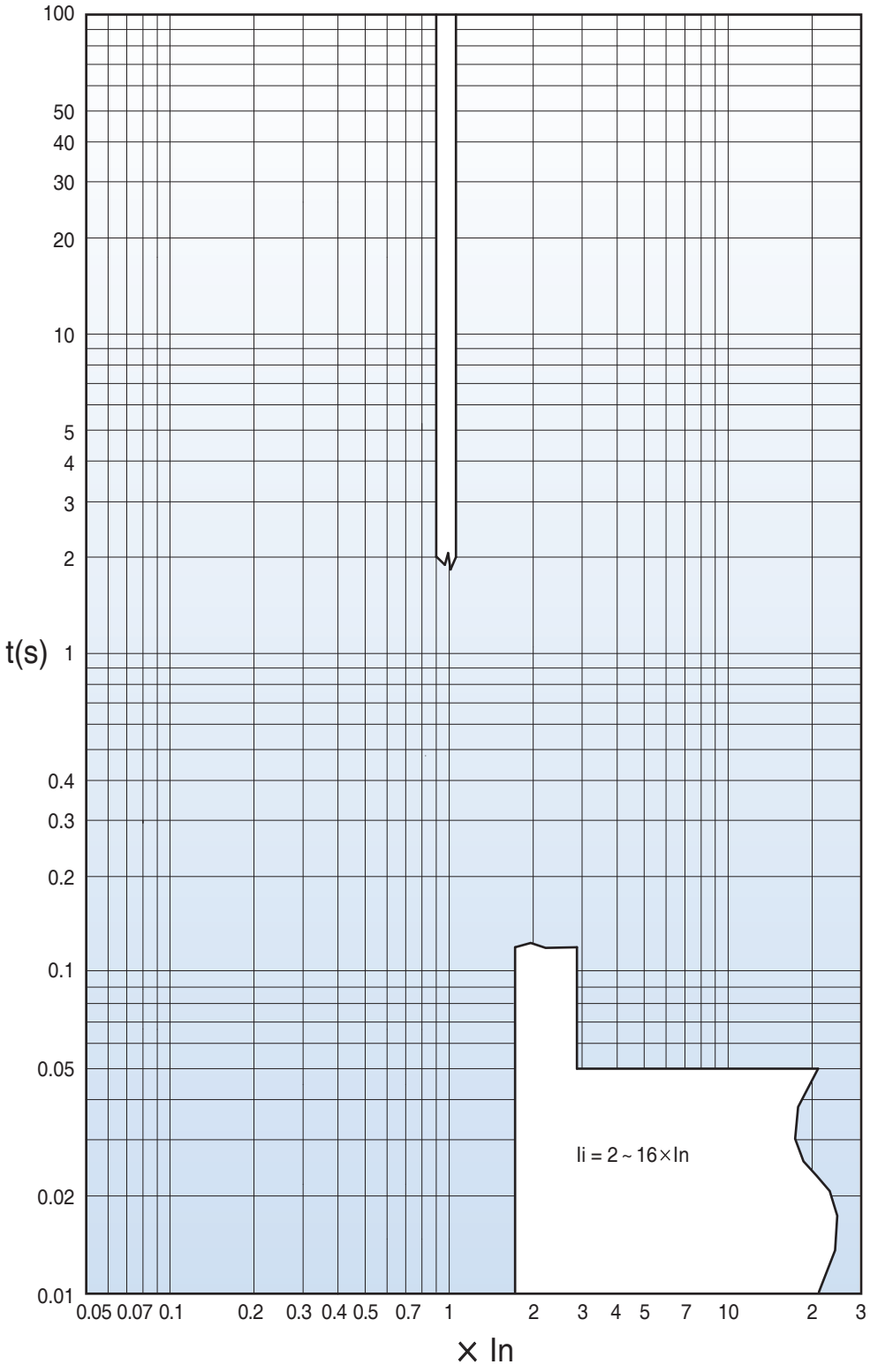
Characteristics curves

Short-time delay (S)



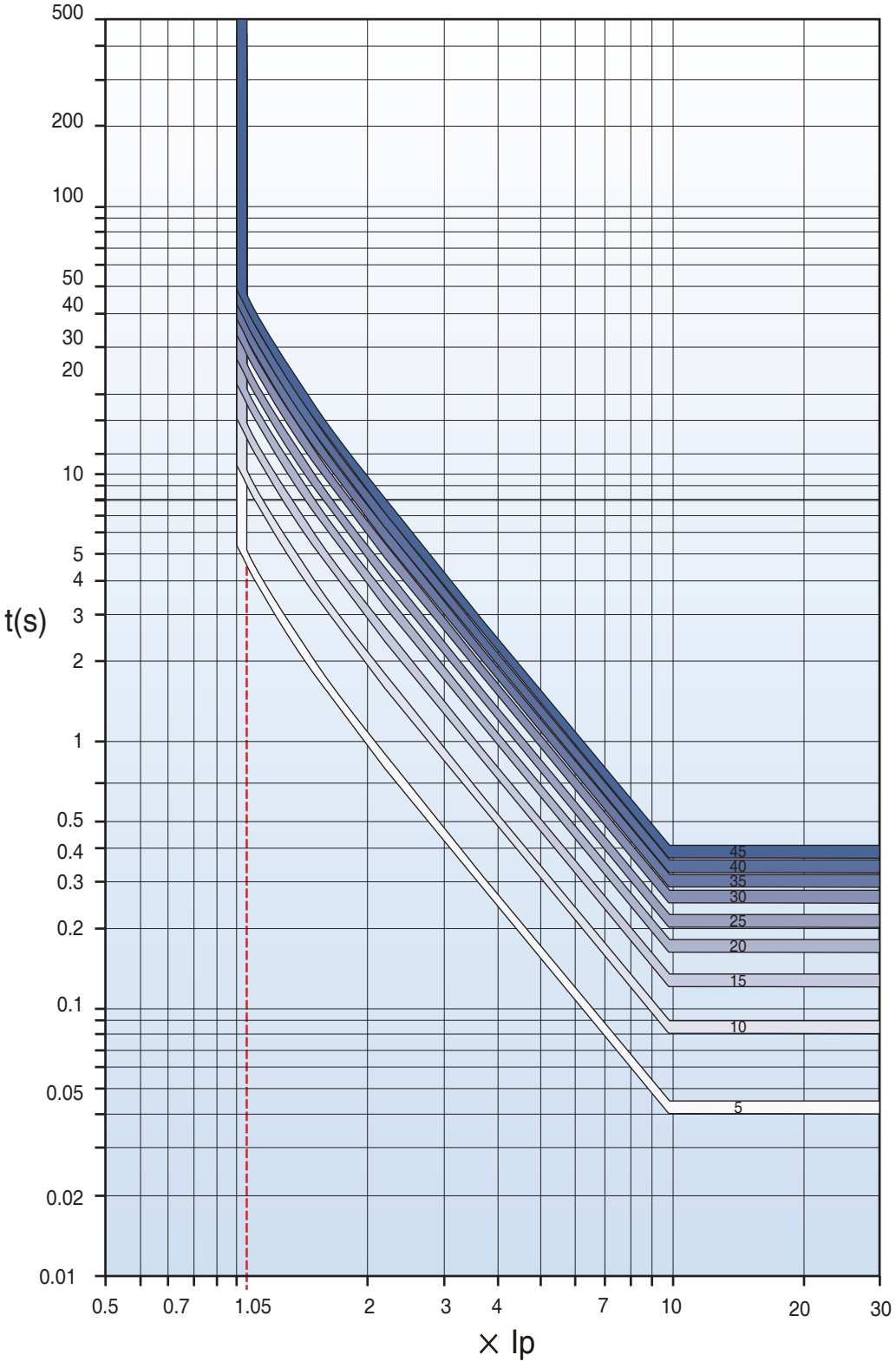
Characteristics curves

Instantaneous (I)

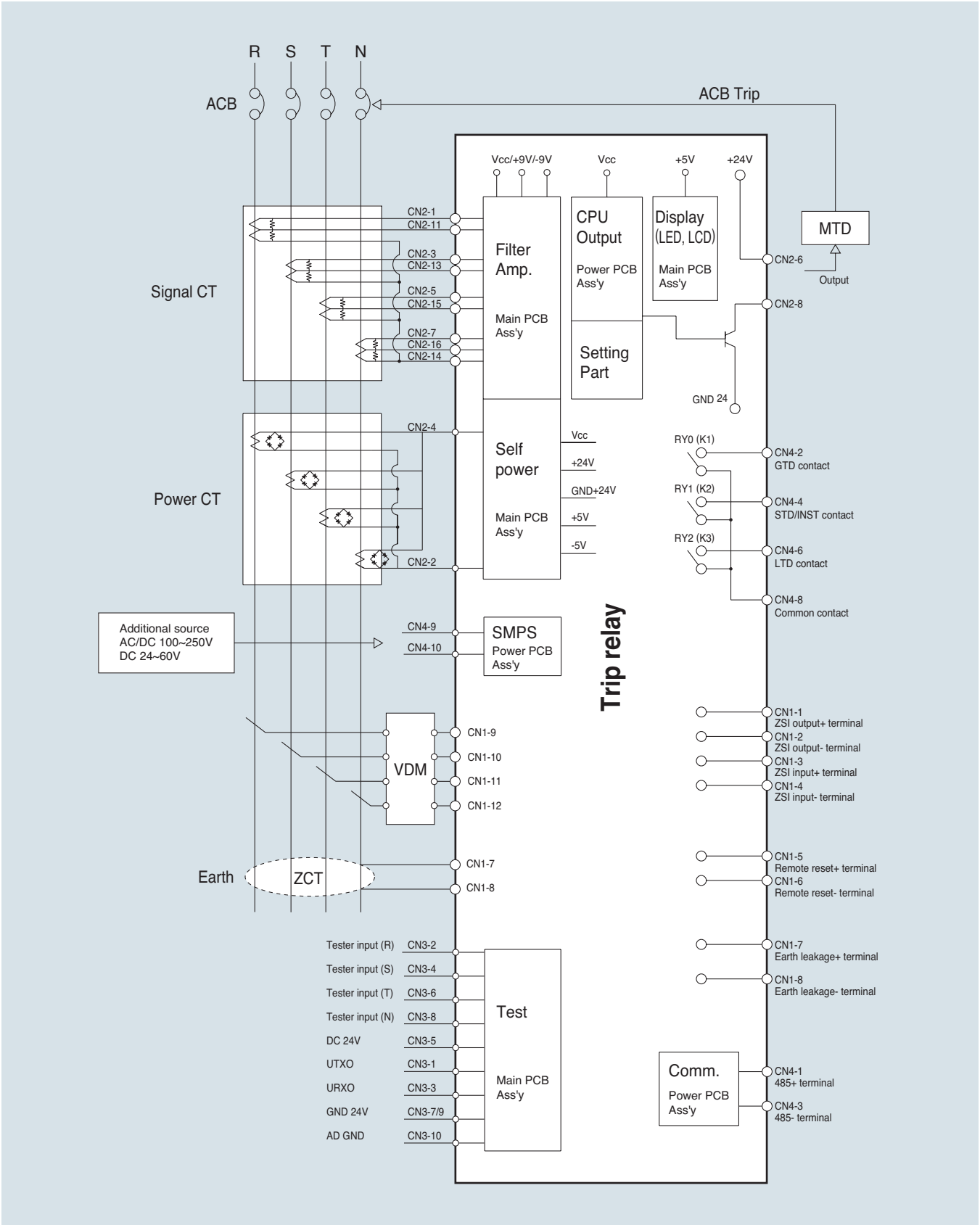


Characteristics curves

Pre Trip Alarm



System block diagram



Main body





Mounting	Accessories		Supply category		Remark Note)	Page
			Standard	Option		
Internal	SHT 1	Shunt Coil	-	○	*	26
	SHT 2	Double Shunt Coil	-	○	*	27
	CC	Closing Coil	-	○	*	28
	M	Motor	-	○	*	29
	CS1	Charge Switch	-	○	*	29
	UVT	Under Voltage Trip Device	-	○	*	30
	AL	Trip Alarm Contact	-	○	*	31
	MRB	Manual Reset Button	-	○	*	32
	RES	Remote Reset Switch	-	○	*	33
	RCS	Ready to Close Switch	-	○	*	34
	C	Counter	-	○	*	34
	FX	Auxiliary Switch	●	-	*	36
	MI	Mechanical Interlock	-	○	*	40
External	K1	Key Lock	-	○	*	35
	K2	Key Interlock Set	-	○	*	35
	B	ON/OFF Button Lock	-	○	*	36
	LH	Lifting Hook	-	○	-	37
	CTD	Condenser Trip Device	-	○	-	37
	IPOT	Intelligent Potable OCR Tester	-	○	-	38
	DC	Dust Cover	-	○	-	40
	A	Automatic Connector	●	-	*	
	DF	Door Frame	-	○	-	42

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

Cradle



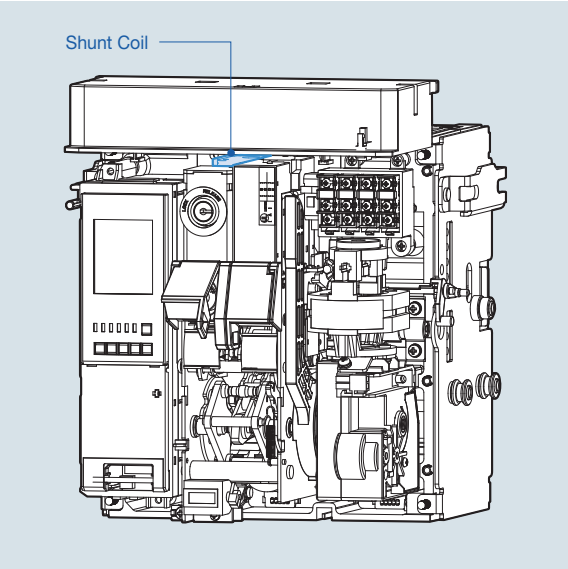


Mounting	Accessories		Supply category		Remark Note)	Page
			Standard	Option		
Trip relay	N	N type	-	○	*	17
	A	A type	-	○	*	19
Cradle	MOC	Mechanical Operated Cell Switch	-	○		41
	ST	Safety Shutter	-	○	*	42
	DF	Door Frame	-	○		42
	IB	Interphase Barrier	●	-	-	43
	CEL	Cell Switch	-	○		44
	DI	Door Interlock	-	○		45
	ZAS	Zero Arc Space (Arc Cover)	●	-	*	45
	SC	Safety Control Cover	●	-	*	
	RI	Racking Interlock	-	○		46
	PL	Pad Lock/Position Lock	●	-	*	46
	MIP	Miss Insertion Prevent Device	-	○		47
	UDC	UVT time delay controller	-	○		48
	ADP	Compatible Adapter	-	○	-	
Other	RPH	Reverse Phase ACB	-	○	-	
	VAD	Various Connection Type	-	○	-	
	RCO	Remote I/O	-	○	-	49
	PC	Profibus-DP comm. module	-	○	-	

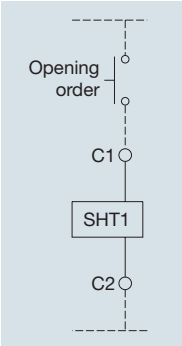
* Seperate purchasing is not allowed. Each item should be purchased with the main body.

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

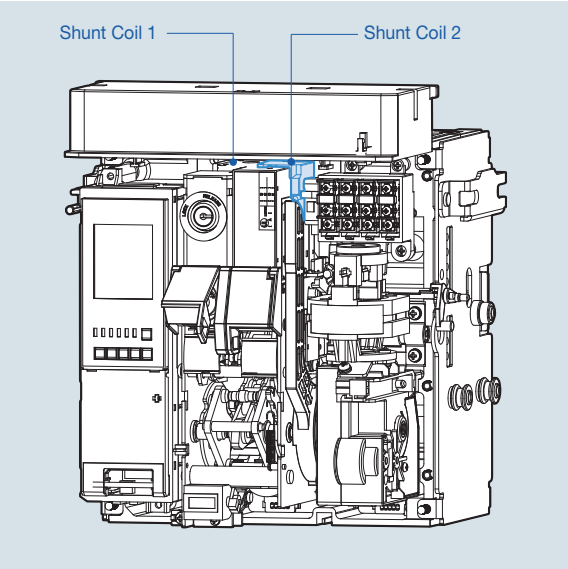
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

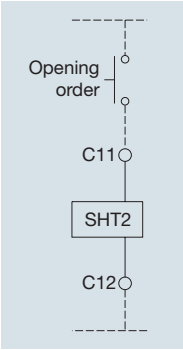
		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm²)	#16 AWG (1.31mm²)	#14 AWG (2.08mm²)	#16 AWG (1.31mm²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

Double Shunt Coil [SHT2]





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



Wiring Diagram

1. Rated voltage and characteristics of trip coil

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

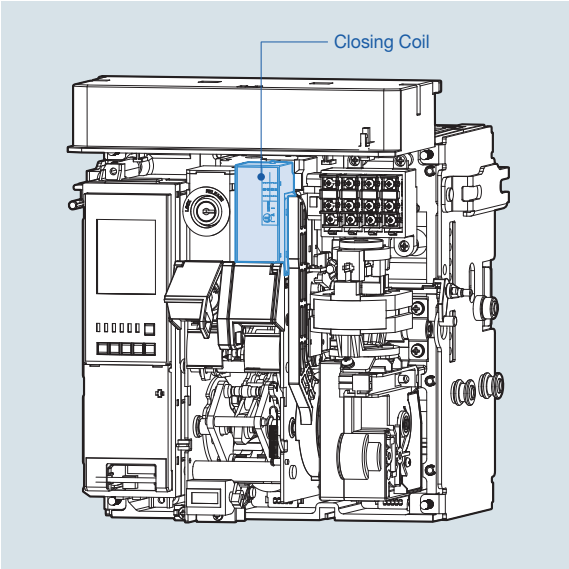
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

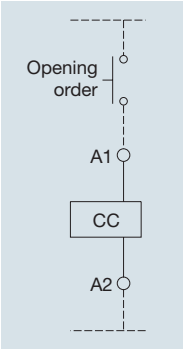
		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm²)	#16 AWG (1.31mm²)	#14 AWG (2.08mm²)	#16 AWG (1.31mm²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

Closing Coil [CC]





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



Wiring Diagram

1. Rated voltage and characteristics of closing coil

Rated voltage (Vn)		Operating voltage range (V)	Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)		Inrush	Steady-state	
24~30	–	0.85~1.1 Vn	200	5	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

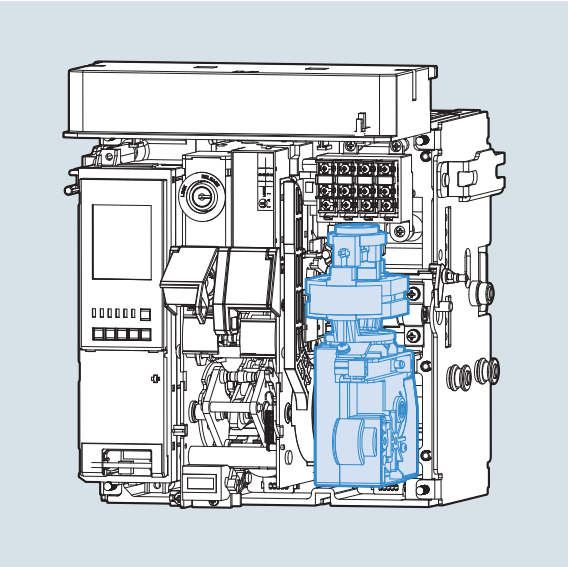
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

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

Motor [M]





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

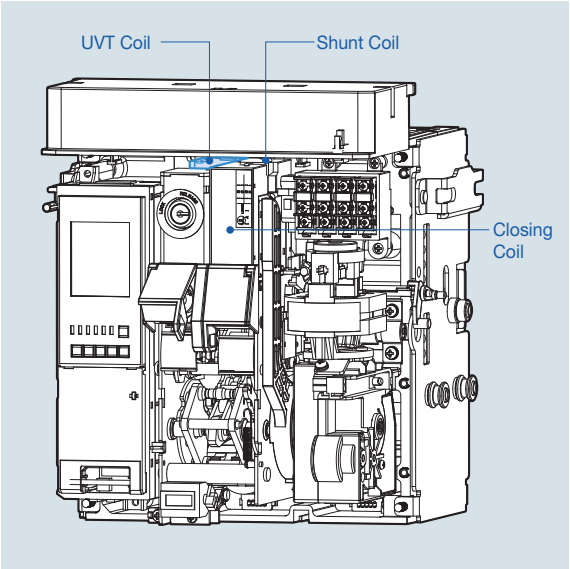
Input voltage (V)	DC 24~30V	AC/DC 48~60V	AC/DC 100~130V	AC/DC 200~250V	AC 380V	AC 440~480V
Load current (max.)	5A	3A	1A	0.5A	0.3A	0.3A
Starting current (Max.)	5 times of load current					
Load rpm (Motor)	15000~19000 rpm					
Charge time	Less than 3sec.					
Dielectric strength	2kV/min					
Using temperature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

Charge Switch [CS1]

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

Under Voltage Trip Device [UVT]





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

1. Rated voltage and characteristics of UVT coil

Rated voltage (Vn)		Operating voltage range (V)		Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)	Pick up	Drop out	Inrush	Steady-state	
24~30	–	0.65~0.85 Vn	0.4~0.6 Vn	200	5	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 (2.08mm²)	#16 AWG (1.31mm²)	#14 AWG (2.08mm²)	#16 AWG (1.31mm²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

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

Trip Alarm Contact [AL]



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

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

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

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

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

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

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

1. Electrical characteristics of trip alarm contact

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

Manual Reset Button [MRB]



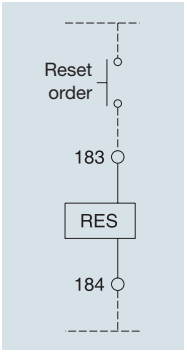
- It is a function which resets a circuit breaker manually when a circuit breaker is tripped by OCR.
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted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



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

Remote Reset Switch [RES]

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

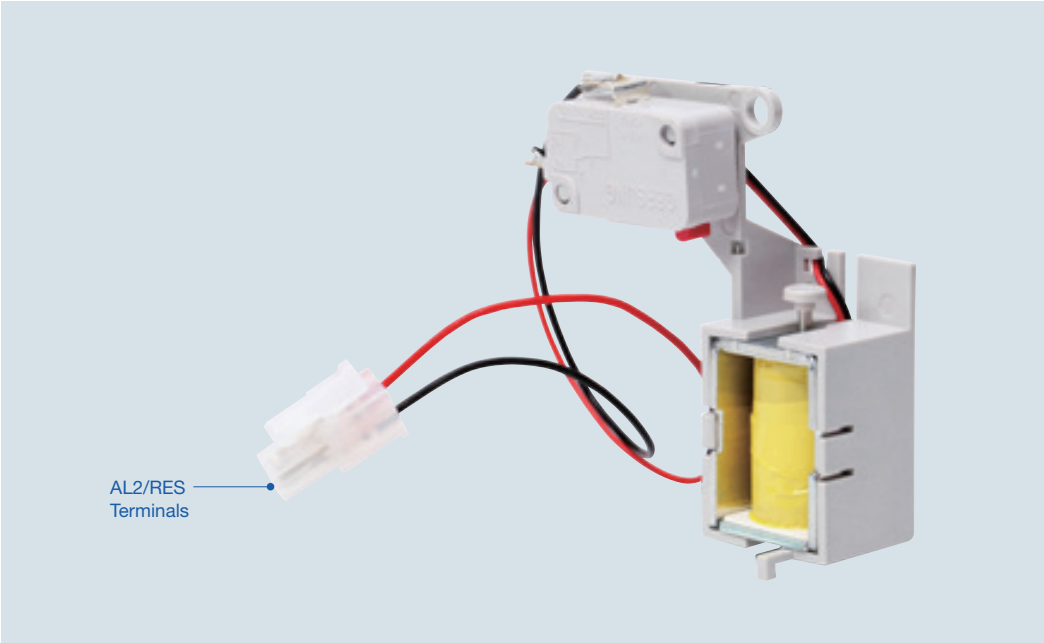


Wiring Diagram

1. Rated voltage and rated current of RES

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

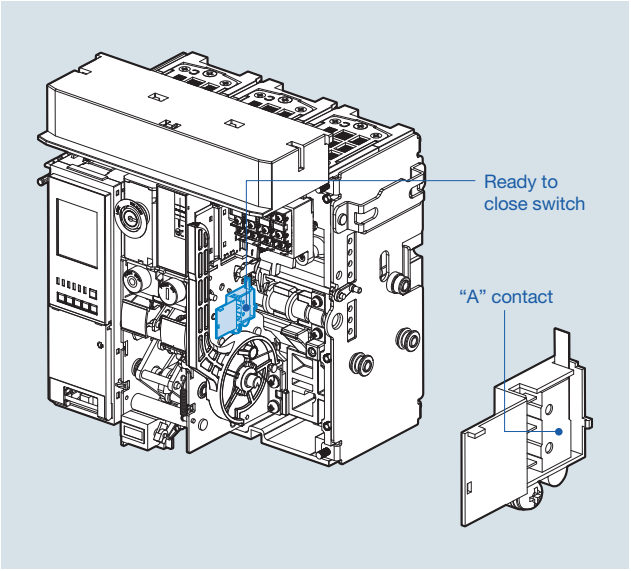
2. Appearance



Accessories

Ready to Close Switch [RCS]



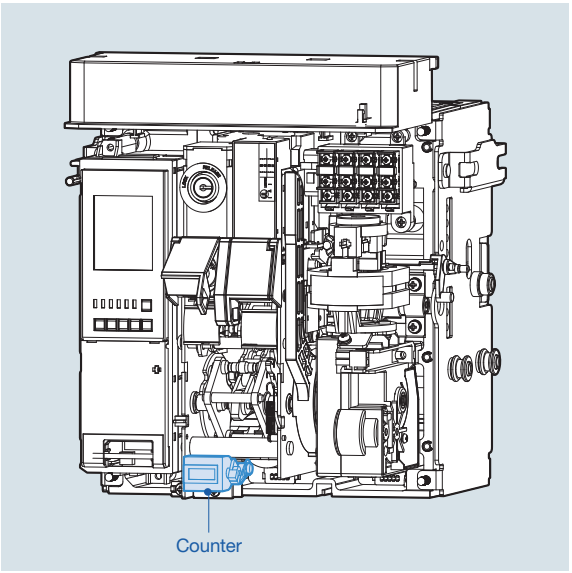


- It interlocks with mechanism of circuit breaker.
- It indicates the status that the circuit breaker is ready to do closing operation.
- When mechanism is in OFF position or in Charge, contact is output with "ON" and it indicates that mechanism can be closed.

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

Counter [C]

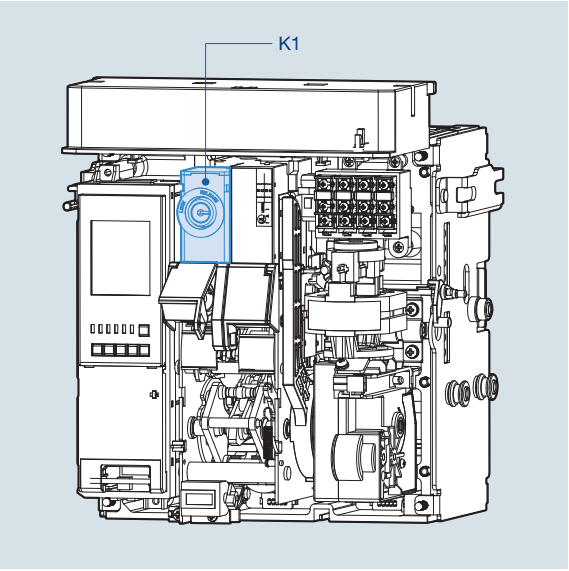




- It displays the total number of ON/OFF operation of ACB.

Key Lock [K1]

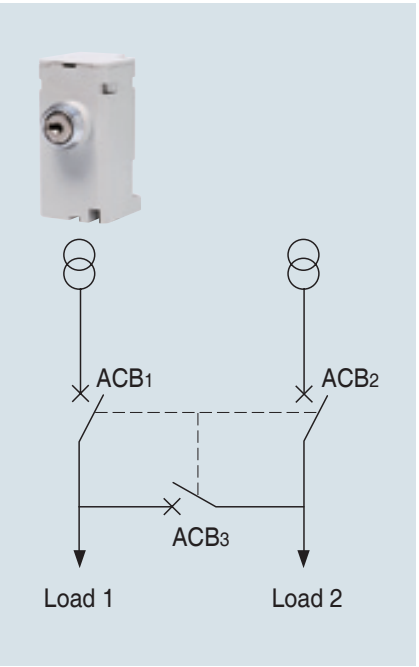




- It is a device for locking which prevents a certain circuit breaker from being operated by user's discretion when two or more circuit breakers are used at the same time.
- K1: Preventing mechanical closing

Key Interlock Set [K2]

Wiring



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

* 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.)

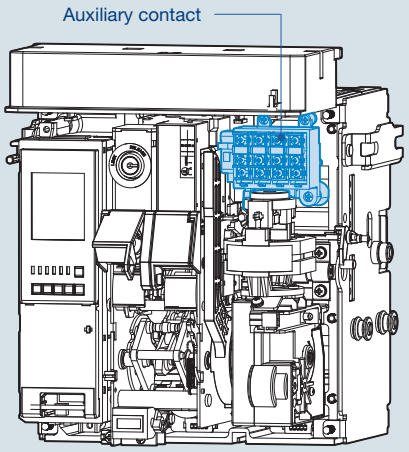
ACB–1	ACB–2	ACB–3	Status	
			LOAD1	LOAD2
●	●	●	OFF	OFF
●	○	○	OFF	ON
○	●	○	ON	OFF
○	○	●	ON	ON
●	●	○	OFF	OFF
●	○	●	OFF	ON
○	●	●	ON	OFF

○: Release ●: Lock

Accessories

Auxiliary Switch [FX]





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

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

Classification

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

ON/OFF Button Lock [B]

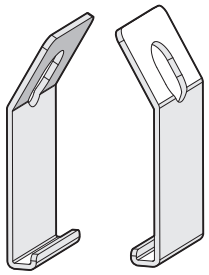




- It is to prevent manual operation of ACB's closing/tripping button due to user's wrong handling.
- It is not possible to handle ON/OFF operation under the "Button lock" status.
  (Electrical ON/OFF operation is possible)

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

Lifting Hook [LH]





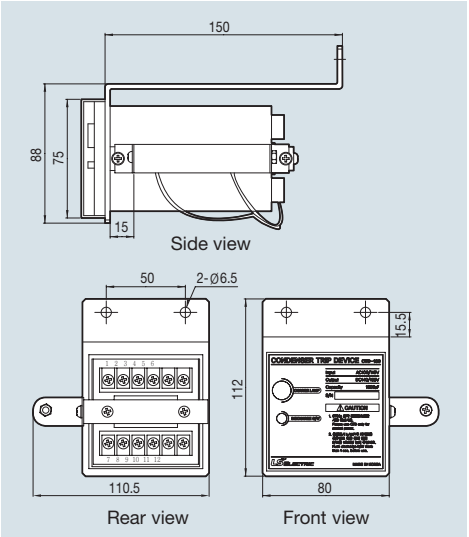
- It is a device to make an ACB easy to shift.
- Please hang it to both handles of the cradle.

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.

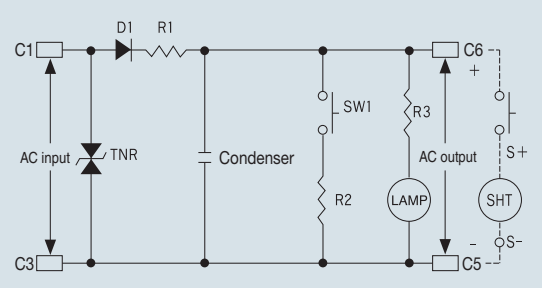
External dimension



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㎌	560㎌

Circuit diagram



IPOT (Intelligent Potable OCR Tester)



The IPOT (Intelligent Potable OCR 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 IPOT is used to calibrates the error using the output value set in IPOT 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 IPOT it self.
- **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

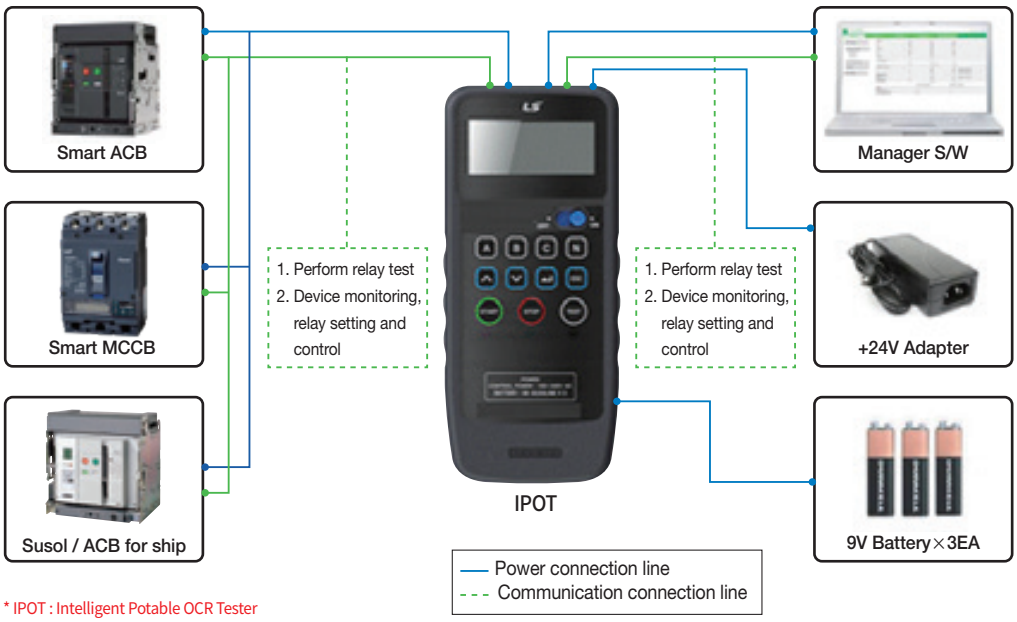
Type	Details
Model name	IPOT
Rated voltage	DC24V adapter, 9V alkaline battery 3EA, USB or rechargeable battery (10000mAH or more)
HMI	Graphic LCD module(256×128 Graphic LCD)
Supported language	English, Chinese, Russian
Key functions	· Device information checking function (information, DI, DO, self-diagnosis) · Relay and H/W information setting function · Device control and reset function · Relay test function - Manual/auto/user test function · Test history storage (up to 255) and output (PDF) function
LCD composition	Navigation TREE configuration for all
Size	98(W)×210.5(H)×43.5(D), unit : mm

Exterior description



Type	Details
❶ Power switch	Power On/Off function
❷ LCD	256×128 graphic LCD
❸ KEY PAD	Menu navigation, setting and operation buttons
❹ Adapter terminal	DC24V power input terminal
❺ USB terminal	USB communication connection terminal (USB2.0)
❻ Signal port	Signal terminals for device testing
❼ Battery	Equipped with 9V alkaline batteries (×3ea)

Device usage example



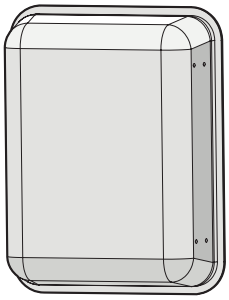
* IPOT : Intelligent Potable OCR Tester

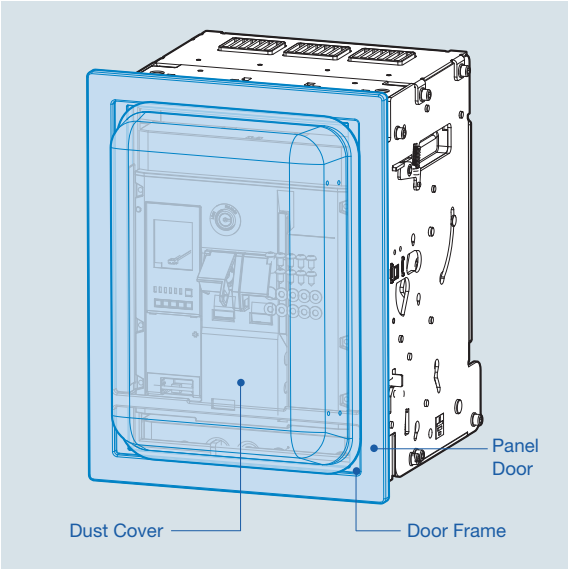
Target device

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

Accessories

Dust Cover [DC] [IP54]

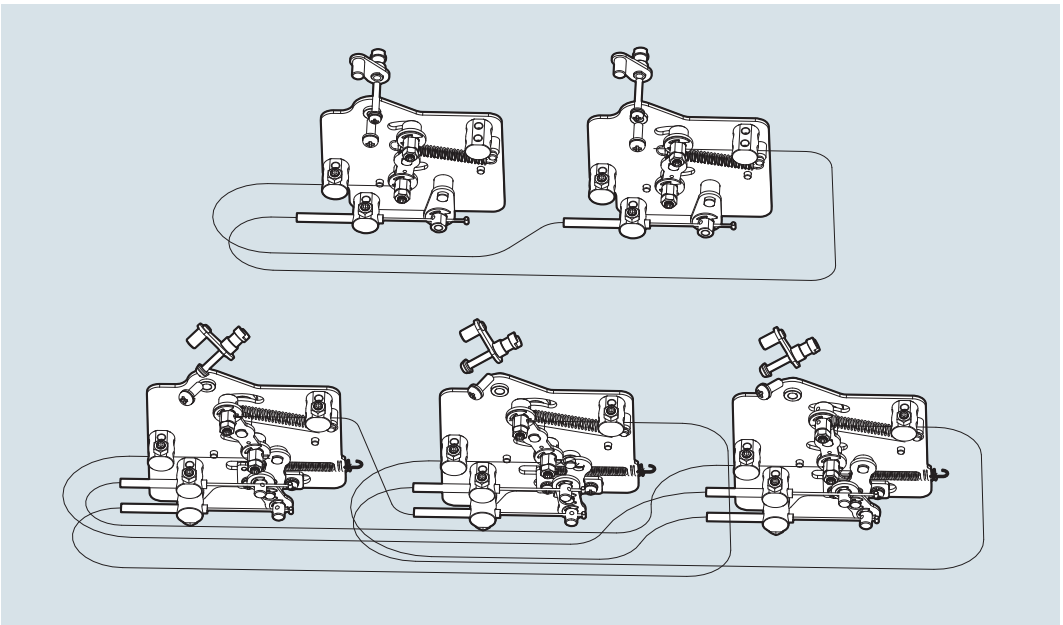




- Attach it to the door frame.
- It protects the product dust and moisture that may affect the operation of the instrument at the same time (IP54) which may cause fault operation and enhances the sealing degree by being mounted to protrude type of panel.
- It is transparent so that the front side of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

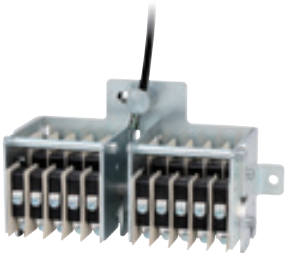
Mechanical Interlock [MI]

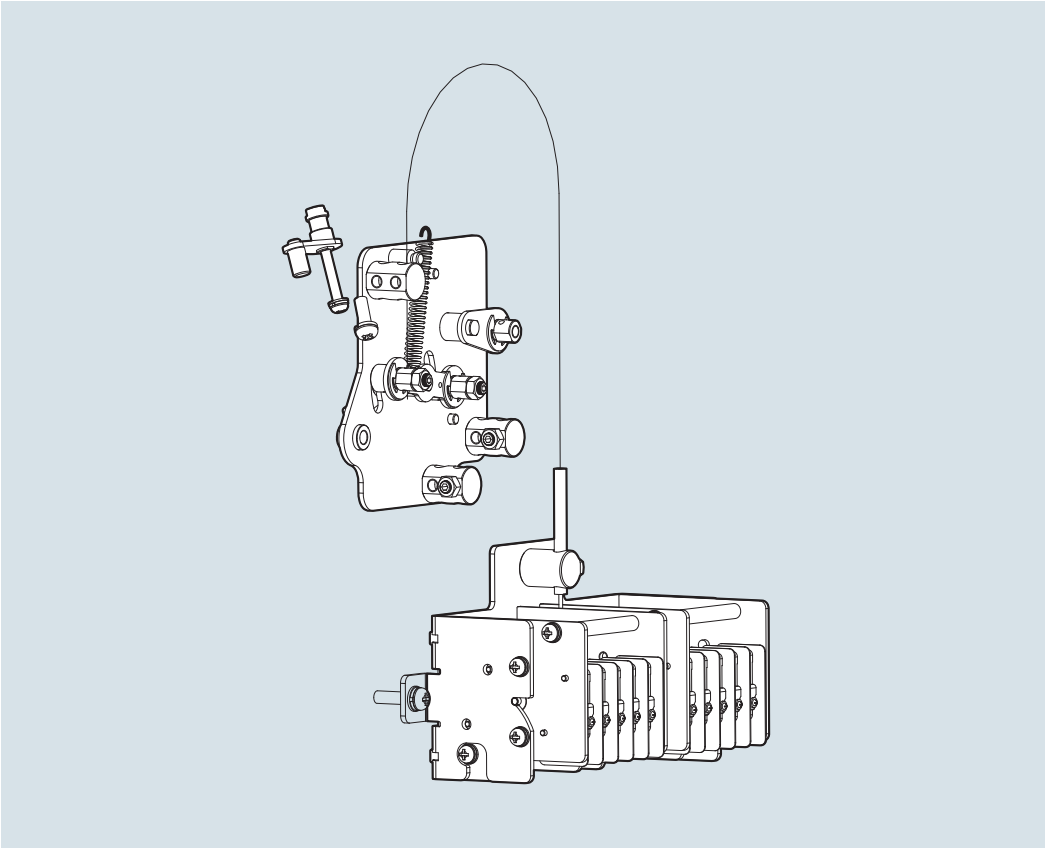




- It is used to interlock closing and trip between two or three breakers mechanically so as to prevent unintended operation at the same time.
- Wire type interlock can be applied upto 3 breakers

Mechanical Operated Cell Switch [MOC]



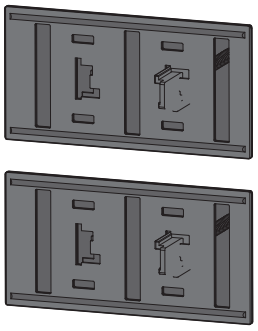


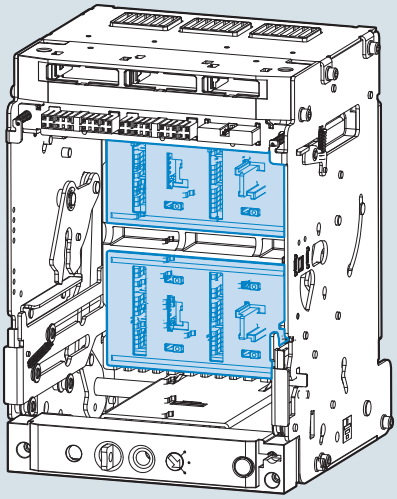
- It is the contact (10a10b) which displays the ON/OFF condition of ACB.
  It mechanically operates only when the breaker is "CONNECTED" position.
  A standard type and a high capacity type is available.
- When MOC link is installed to cradle, MOC can be equipped with the inside of panel.



Accessories

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

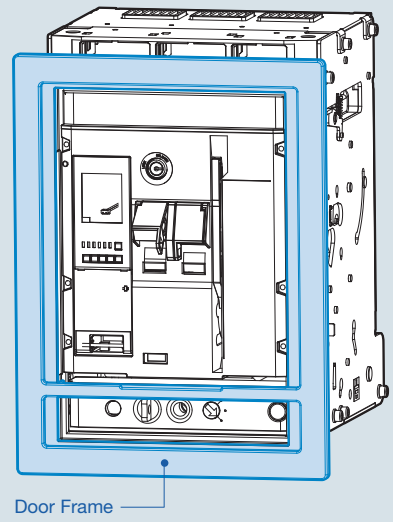

Door Frame [DF] [IP3X]



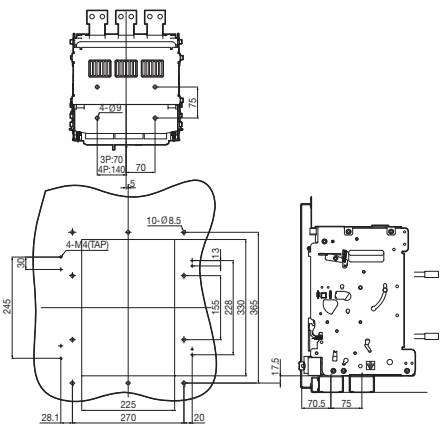
Fixed type



Draw-out type

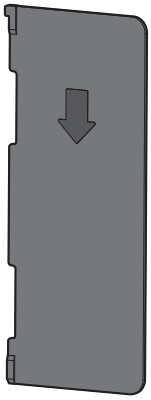


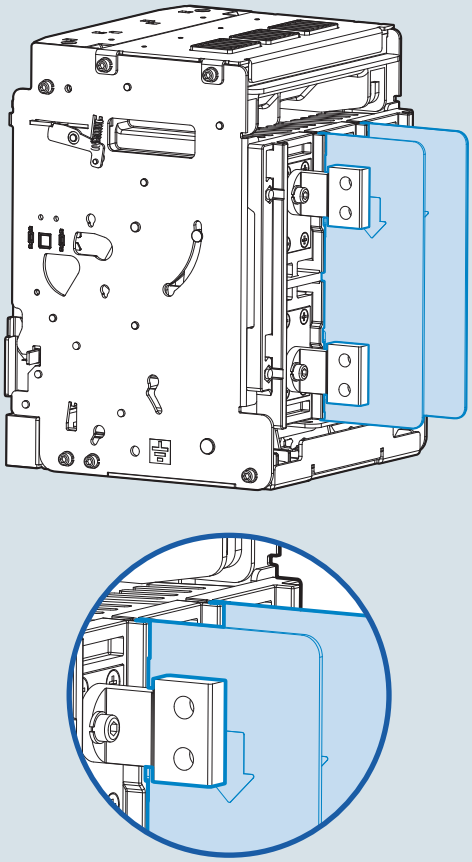
- When structuring the embedded type of ACB panel, it protects the protrude front of ACB and the cutting side of panel door by attaching it to the panel door.



Switchboard door cut dimension

Interphase Barrier [IB]

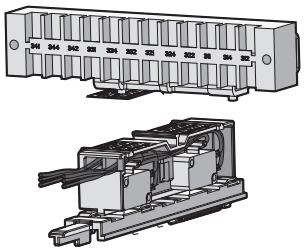


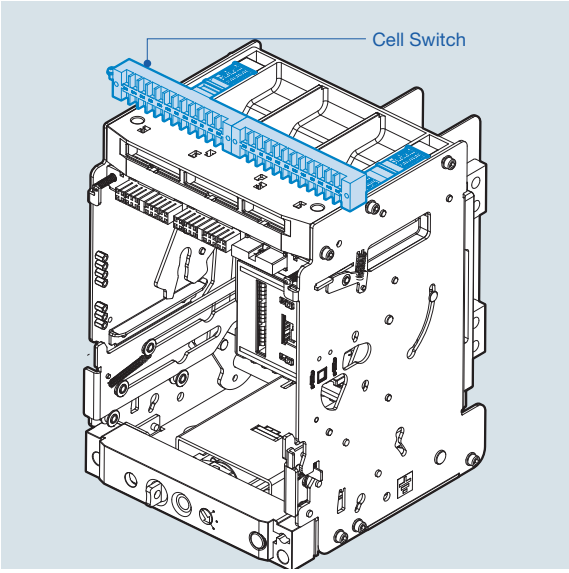


Draw-out type

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

Cell Switch [CEL]





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

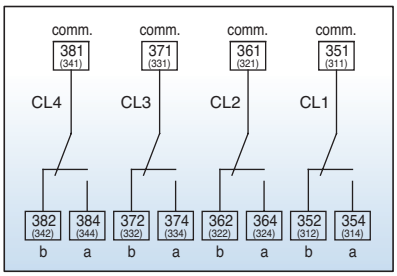
<Contact configuration>
4C: 1Disconnected +1Test +2Connected
8C: 2Disconnected +2Test +4Connected

※ Contact configuration can be changeable if necessary.

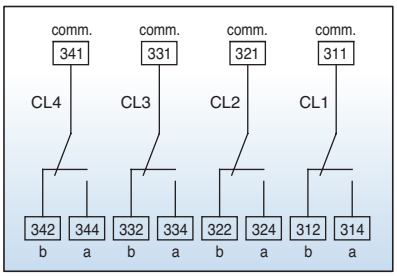
Operating characteristic

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

Terminal (4C, 8C)



4C attached to the right side of cradle



4C attached to the left side of cradle

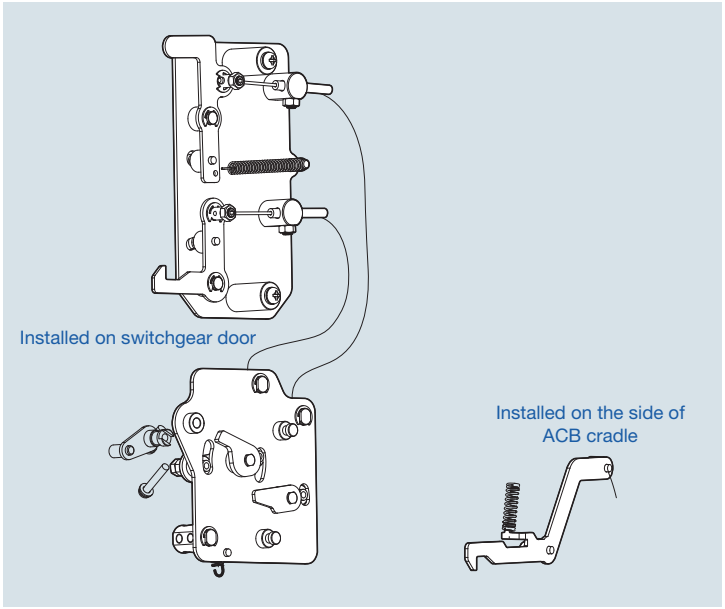
Door Interlock [DI]



Wite type



Catch type



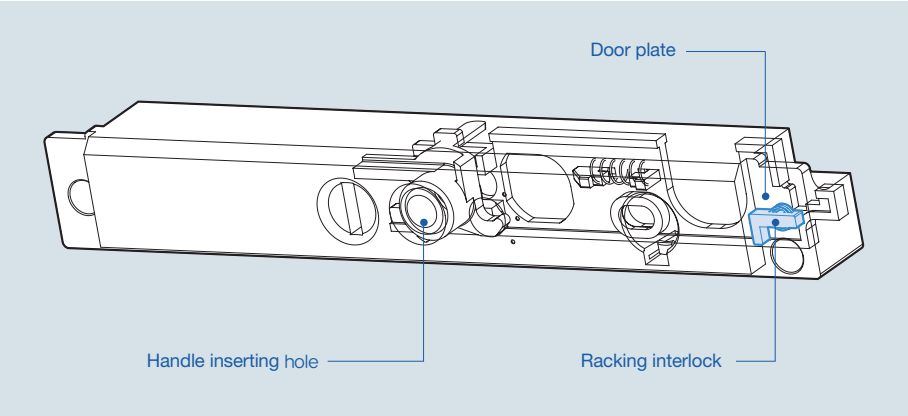
- It is a safety device which does not allow the panel door to open when a circuit breaker is in the “ON” position.

Zero Arc Space [ZAS]



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

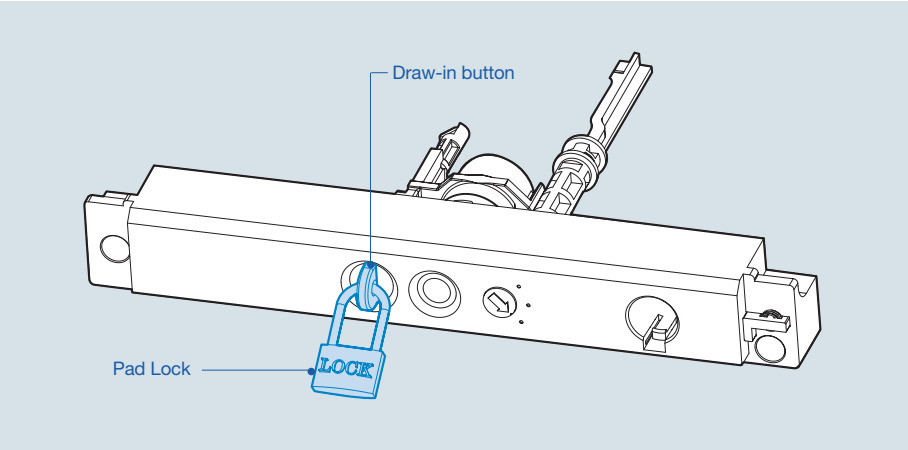
Racking Interlock [RI]



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

Pad Lock / Position Lock [PL]

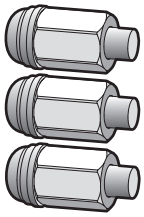


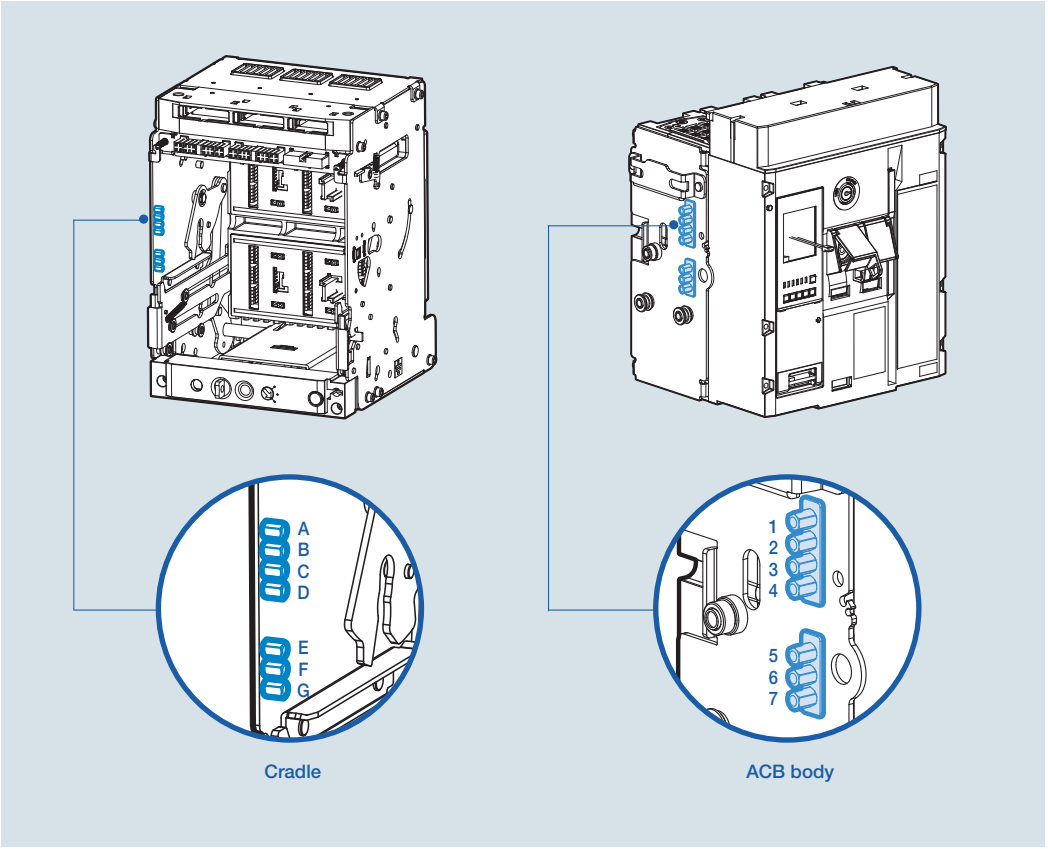


ACB is subject to restriction regarding moving in connected, test, disconnected when drawing in or out. If main body of ACB is placed in 3 positions, it is locked and stopped when drawing in or out.

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

Miss Insertion Prevent Device [MIP]





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

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

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

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

UVT Time Delay Controller [UDC]



Attached to din-rail or switchboard

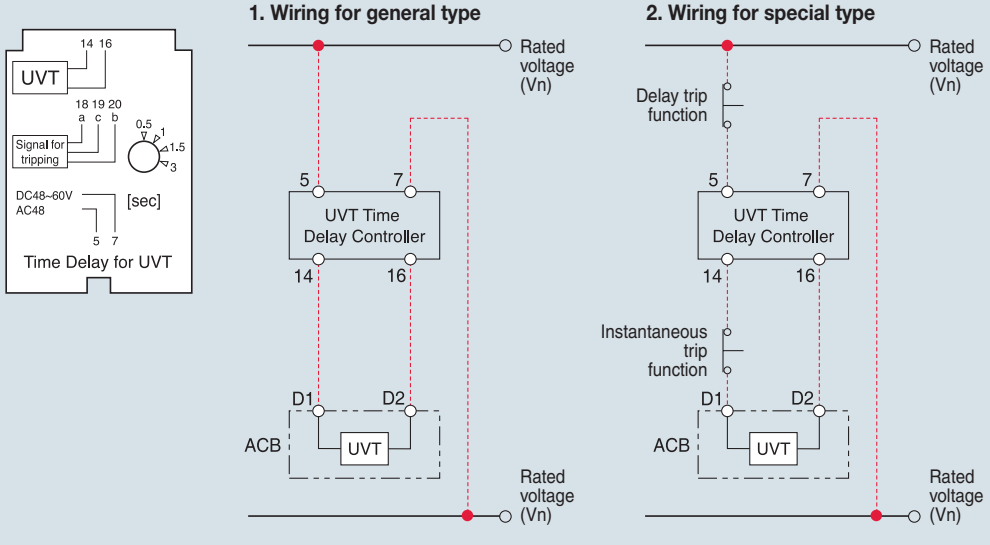
- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown. There are two types, Instantaneous type and time delay type.
- Instantaneous type: only available with UVT coil.
- Time delay type: available by connecting UVT coil and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

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

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

Note) 1. Operating voltage range is the min. rated standard for each rated voltage (Vn).
2. It will operate on time when the power is supplied enough to the UDC over the set of trip time.

2. Wiring

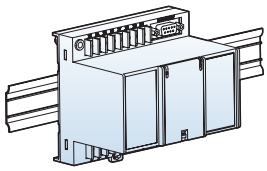


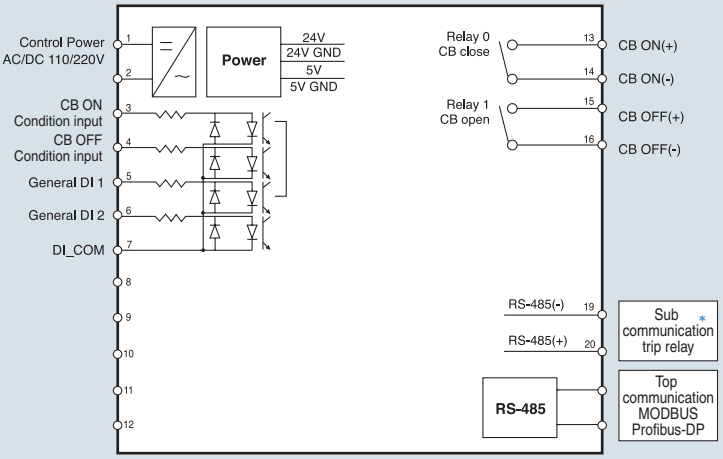
* The wiring presented with red color should be set by uesers.

Remote I/O Unit [RCO]



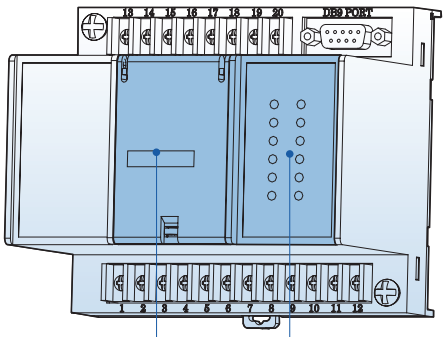
Remote I/O Unit





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

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



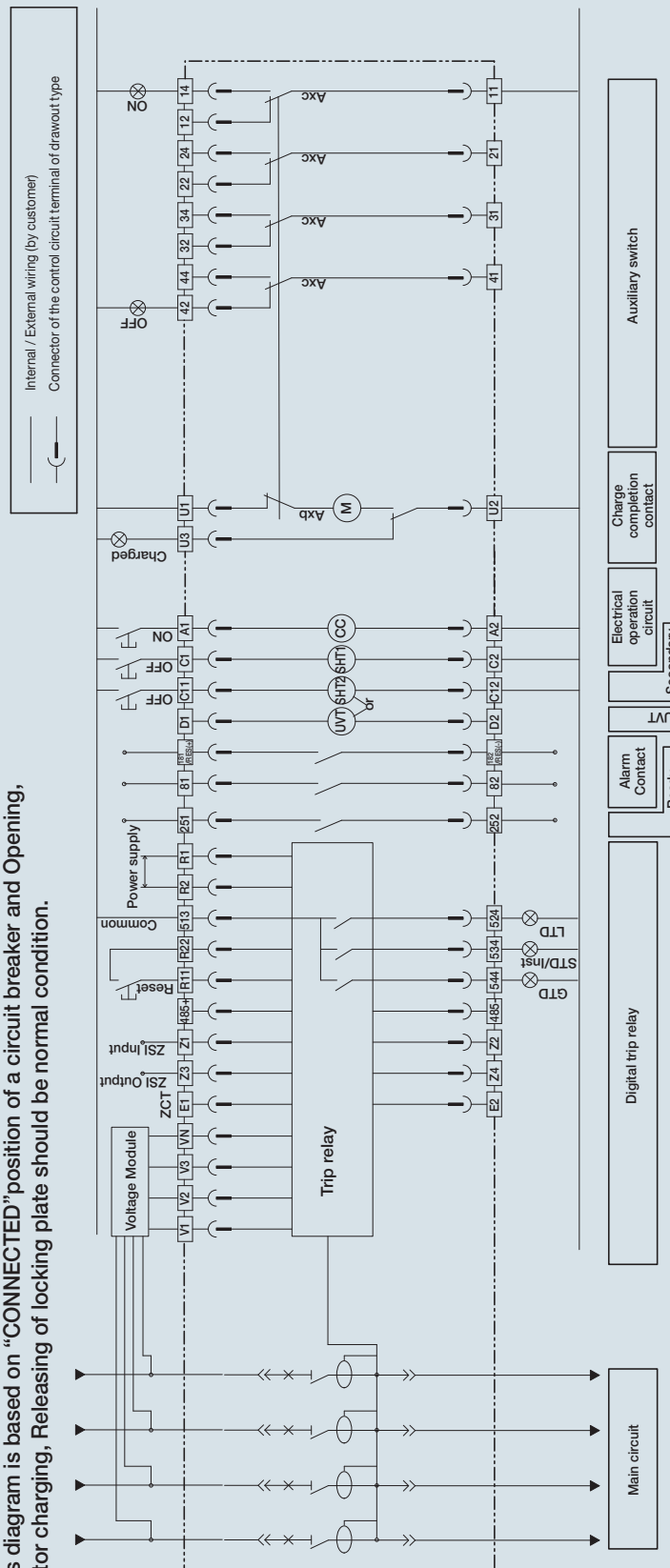
- Baud rate setting
- Comm. address setting
- Temperature setting

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

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

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

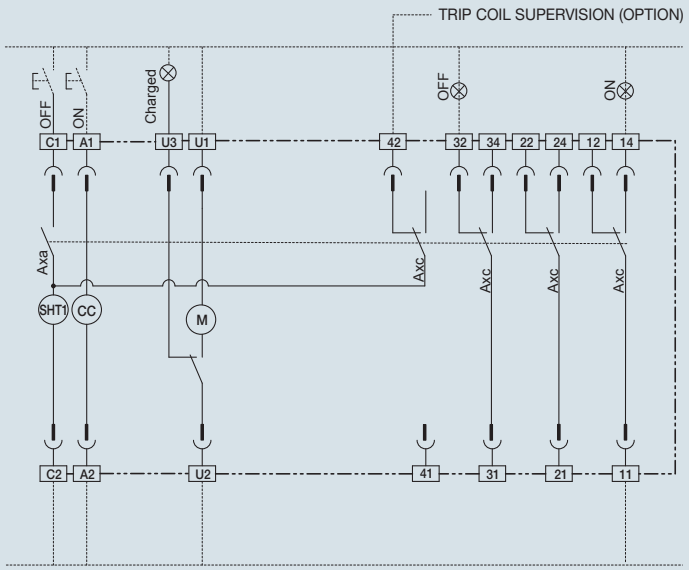
11	12 ~ 41	42	Auxiliary switch "b" contact	D1	D2	Voltage input terminal of UVT coil
11	14 ~ 41	44	Auxiliary switch "a" contact	81	82	Alarm1 "a" contact
U3	U2		Charge completion signal	181	182	Alarm2 "a" contact or RES Coil
U1	U2		Motor charging	251	252	Ready to close switch
A1	A2		Closing coil	R1	R2	Control power for trip unit
C1	C2		Shunt trip	513	~ 544	Fault cause indication contacts
C11	C12		2nd shunt trip	R11	R22	Alarm reset (Trip cause LEDs, contacts)

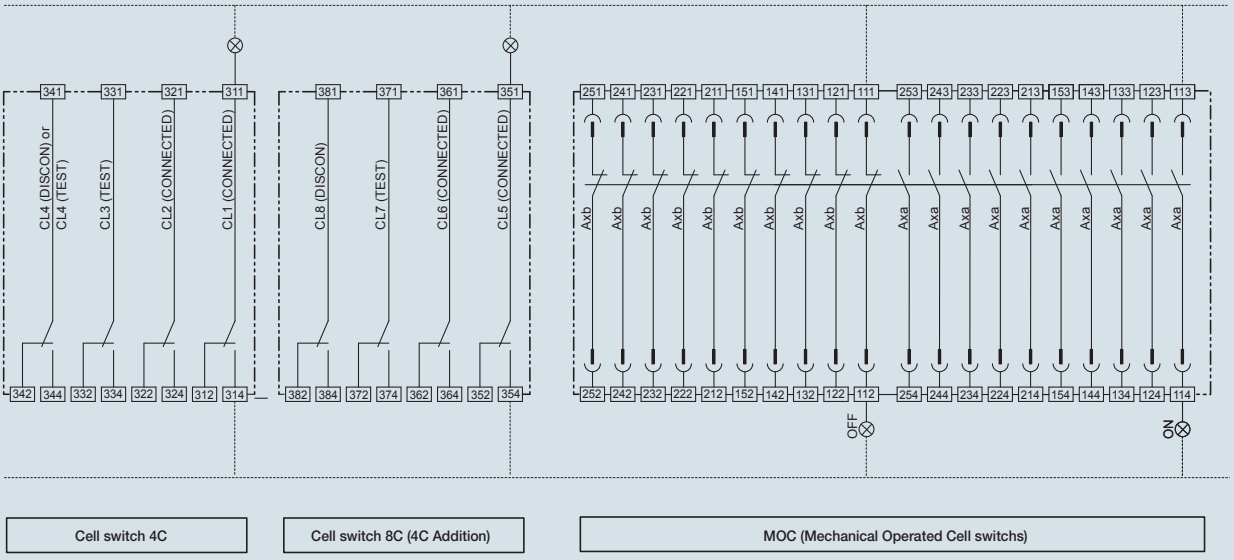
Z1	Z2	ZSI input	
Z3	Z4	ZSI output	
E1	E2	ZCT	
VN	~ V3	Voltage module	
485+	~ 485+	RS-485 Communication	
311	~ 344	Cell switch	

Accessory code description

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

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





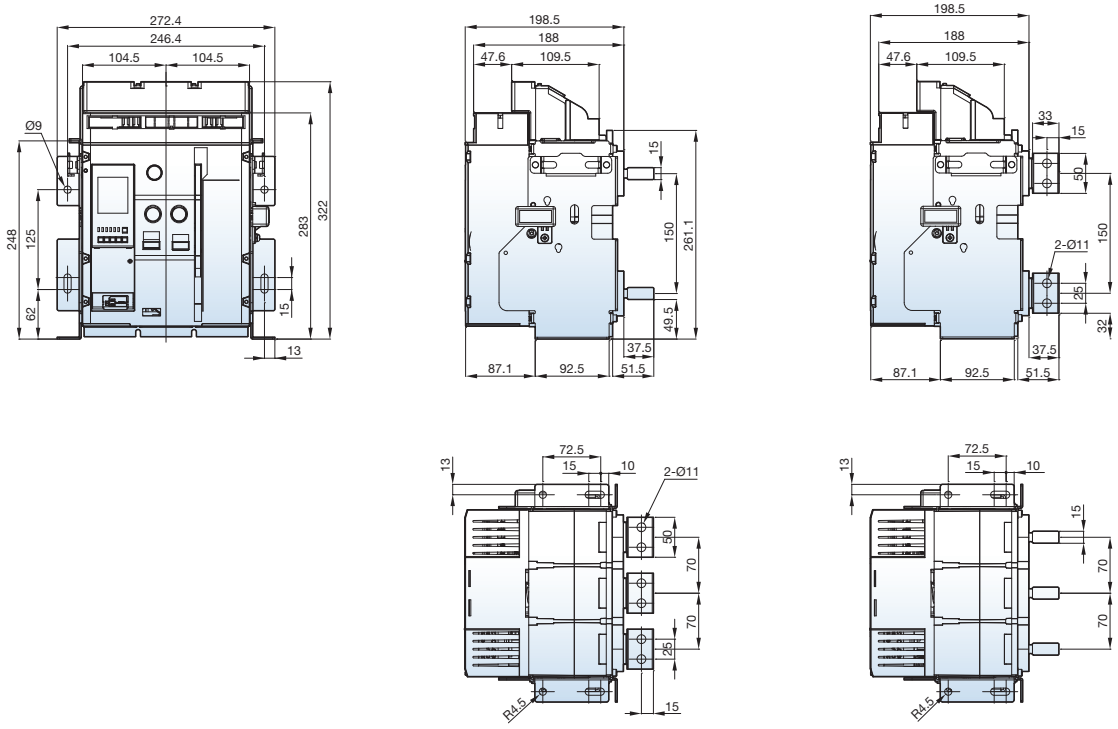
Terminal symbol

311 ~ 344	Cell switch
111 ~ 254	MOC

Dimensions

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

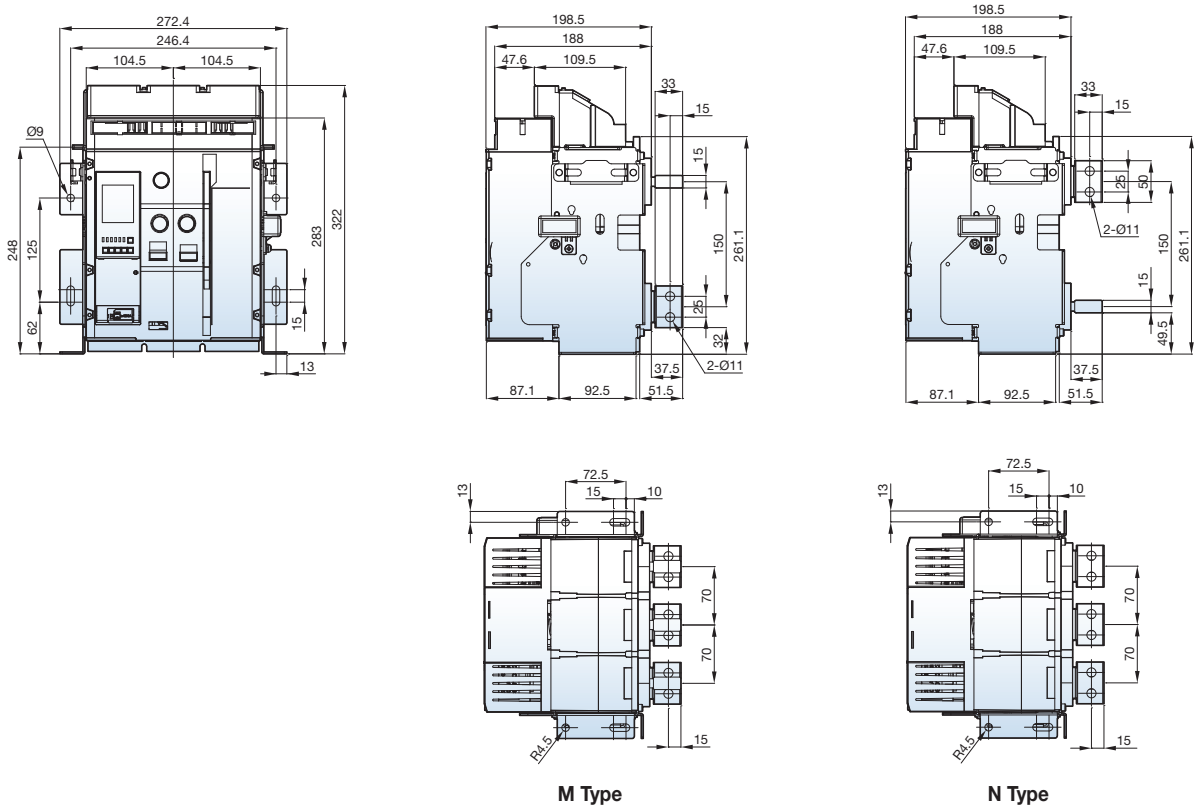
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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

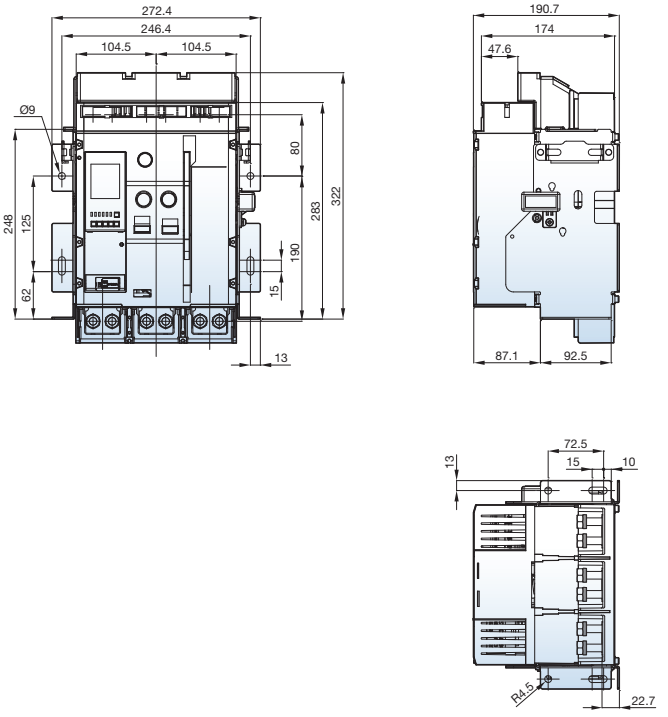


M Type
(Upper-Horizontal type, Lower-Vertical type)

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]



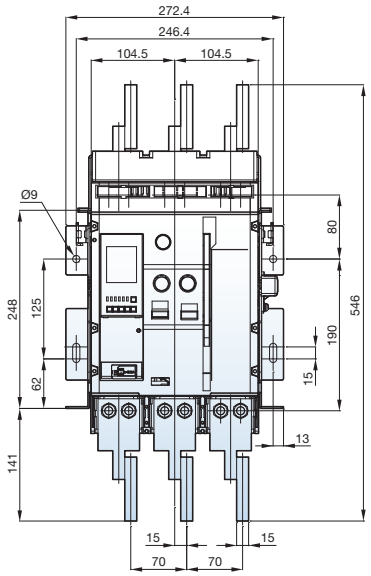
Z Type (Plane spread type)

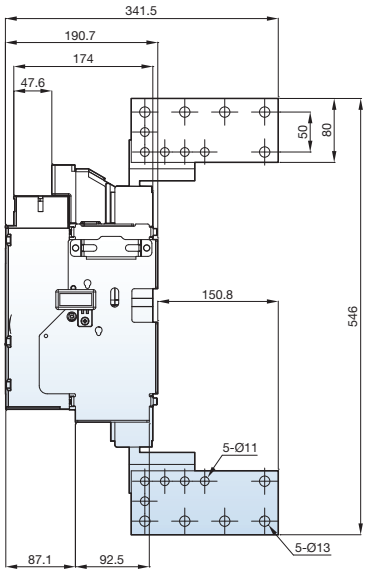
T Type (Plane vertical type)

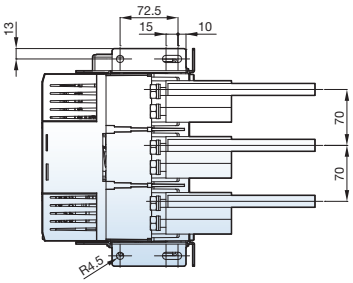
Dimensions

• 3P [Fixed X: Cable lug type]

(Unit : mm)



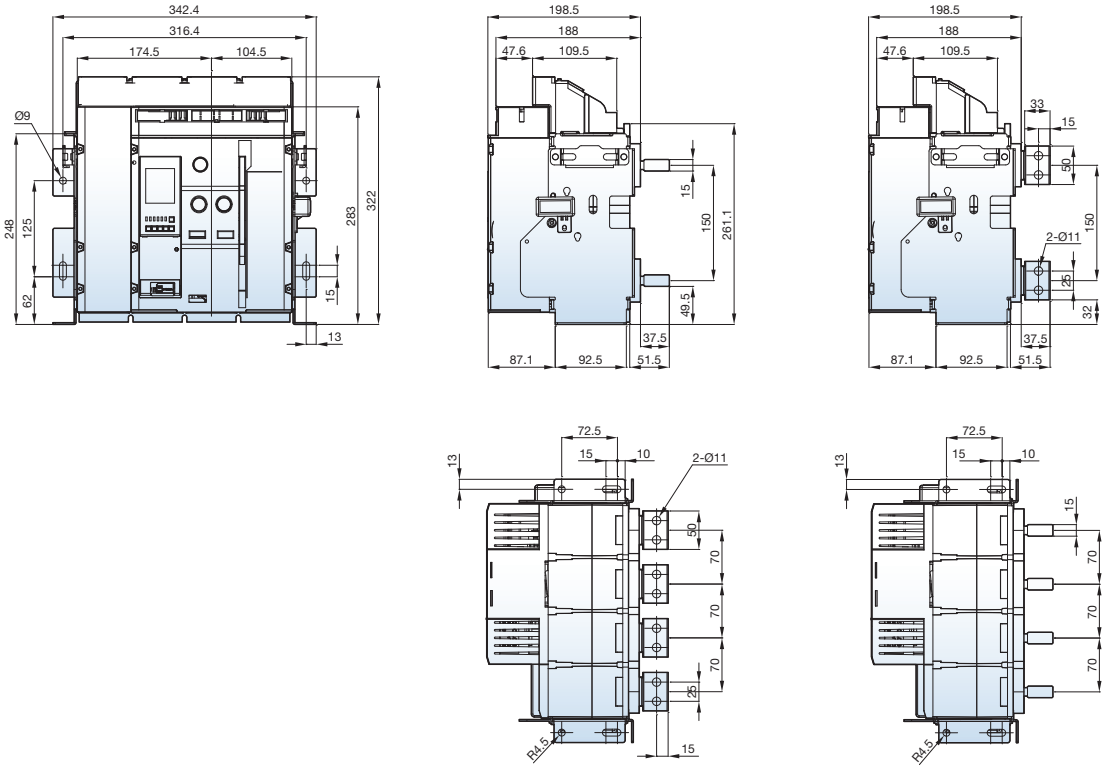




X Type (Cable lug type)

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

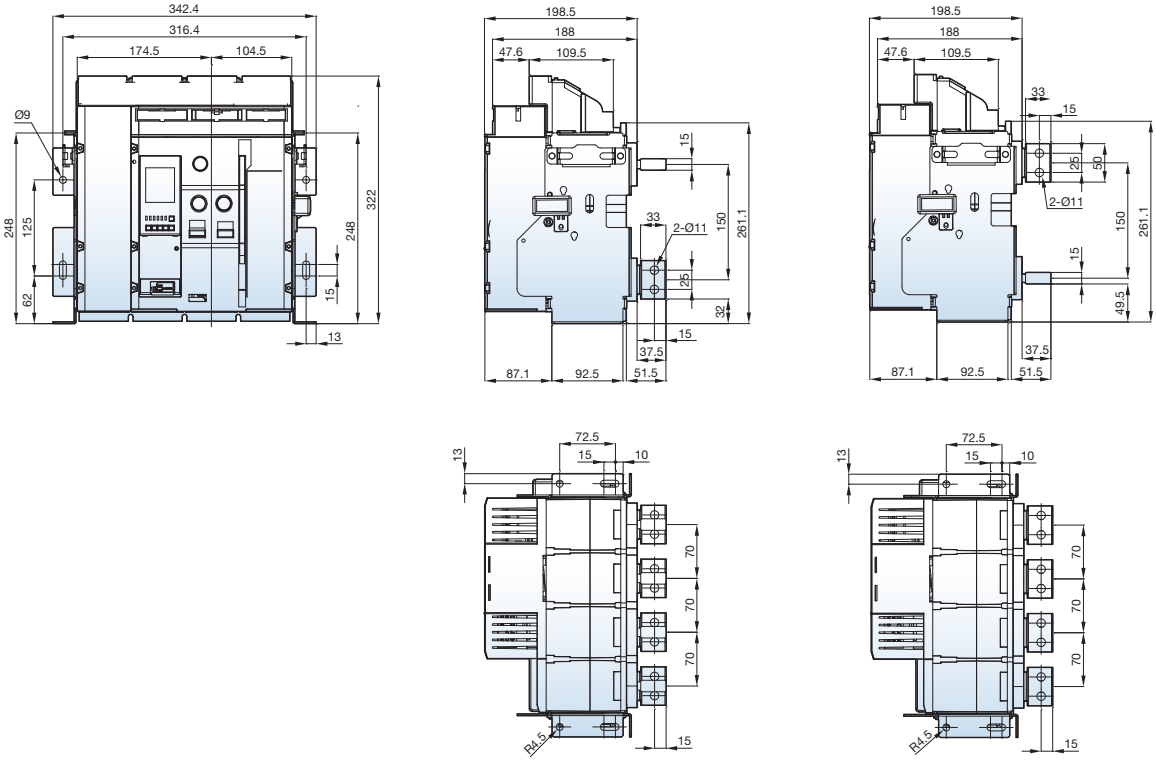
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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



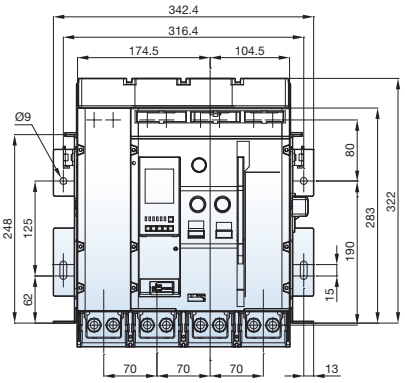
M Type
(Upper-Horizontal type, Lower-Vertical type)

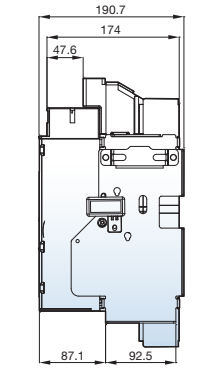
N Type
(Upper-Vertical type, Lower-Horizontal type)

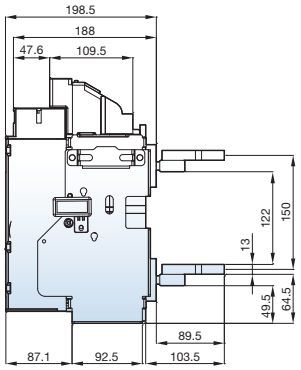
Dimensions

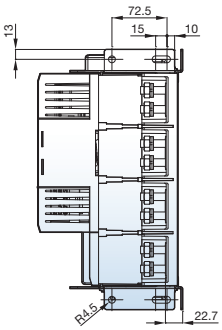
• 4P [Fixed P: Plane type / R: Spread type]

(Unit : mm)

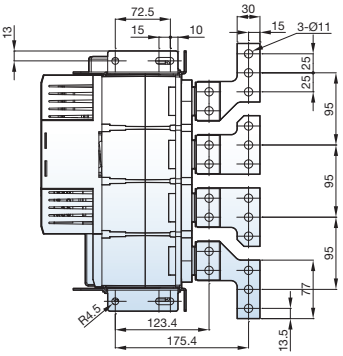






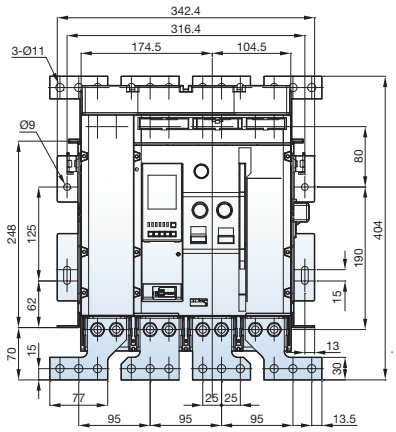


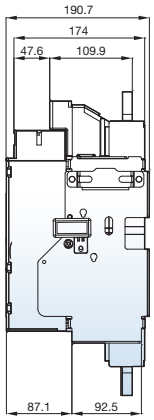
P Type (Plane type)

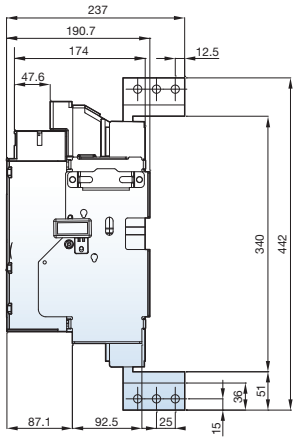


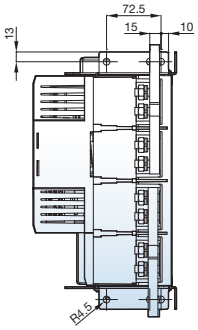
R Type (Spread type)

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

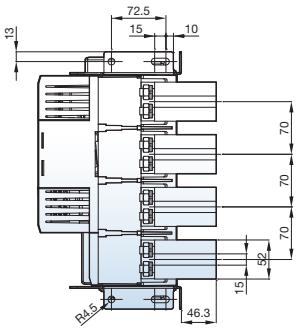








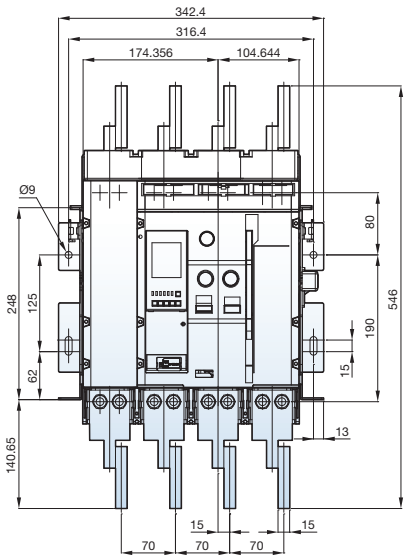
Z Type (Plane spread type)

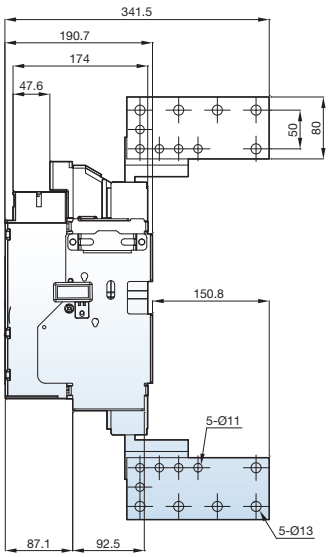


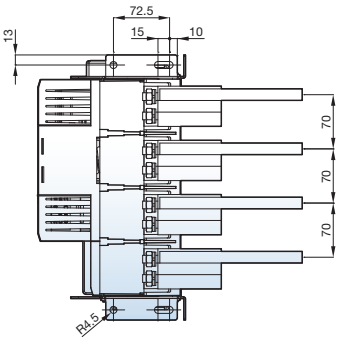
T Type (Plane vertical type)

• 4P [Fixed X: Cable lug type]

(Unit : mm)

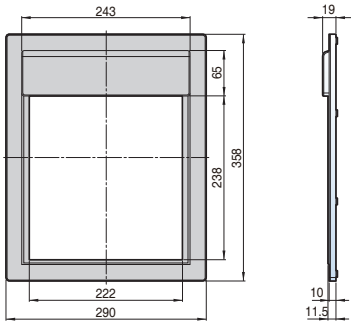






X Type (Cable lug type)

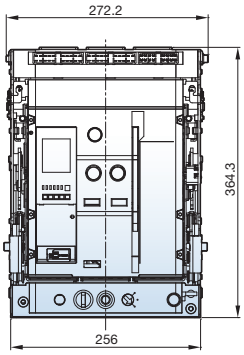
Fixed Door Frame: DF

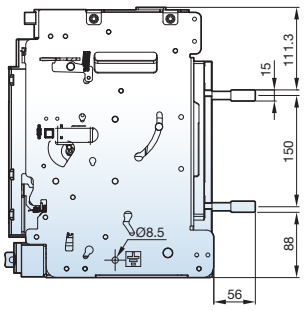


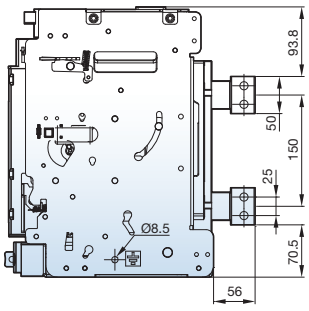
Dimensions

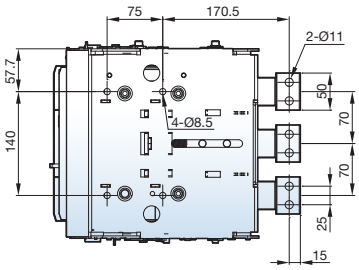
• 3P [Draw-out H: Horizontal type / V: Vertical type]

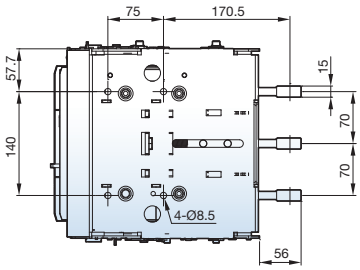
(Unit : mm)







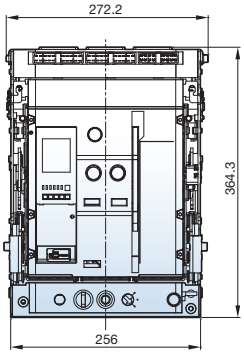


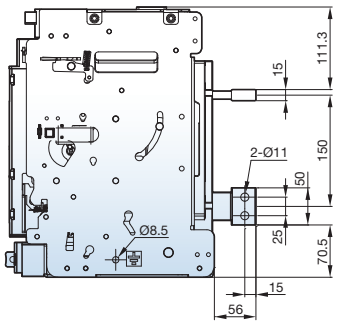


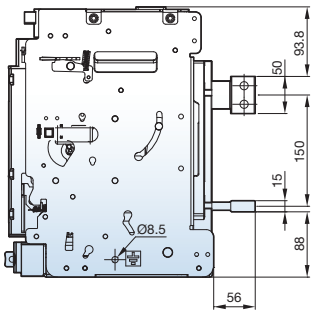
H Type (Horizontal type)

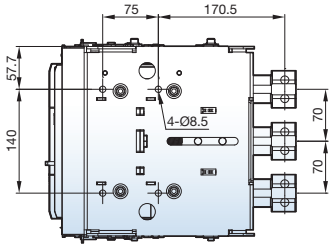
V Type (Vertical type)

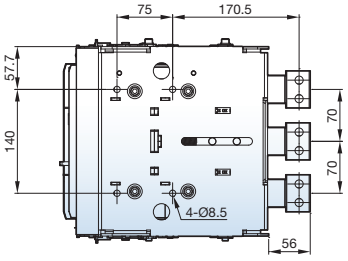
• 3P [Draw-out M: Upper-Horizontal type, Lower-Vertical type / N: Upper-Vertical type, Lower-Horizontal type]









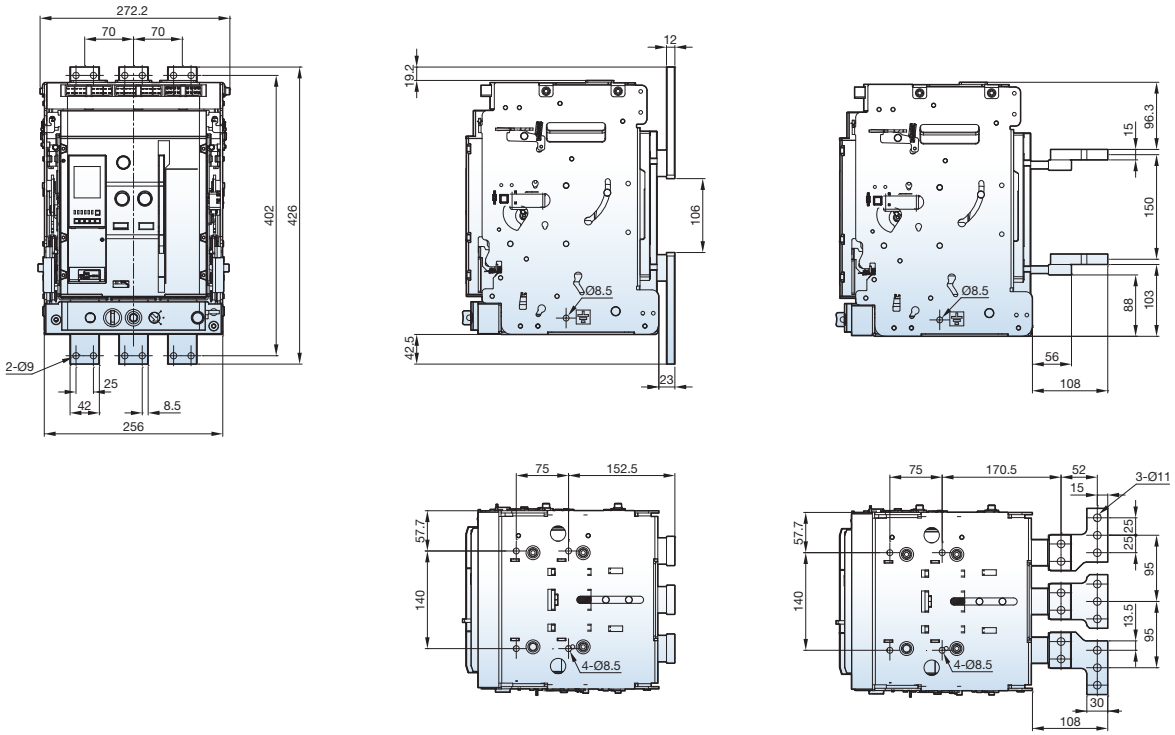


M Type
(Upper-Horizontal type, Lower-Vertical type)

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

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

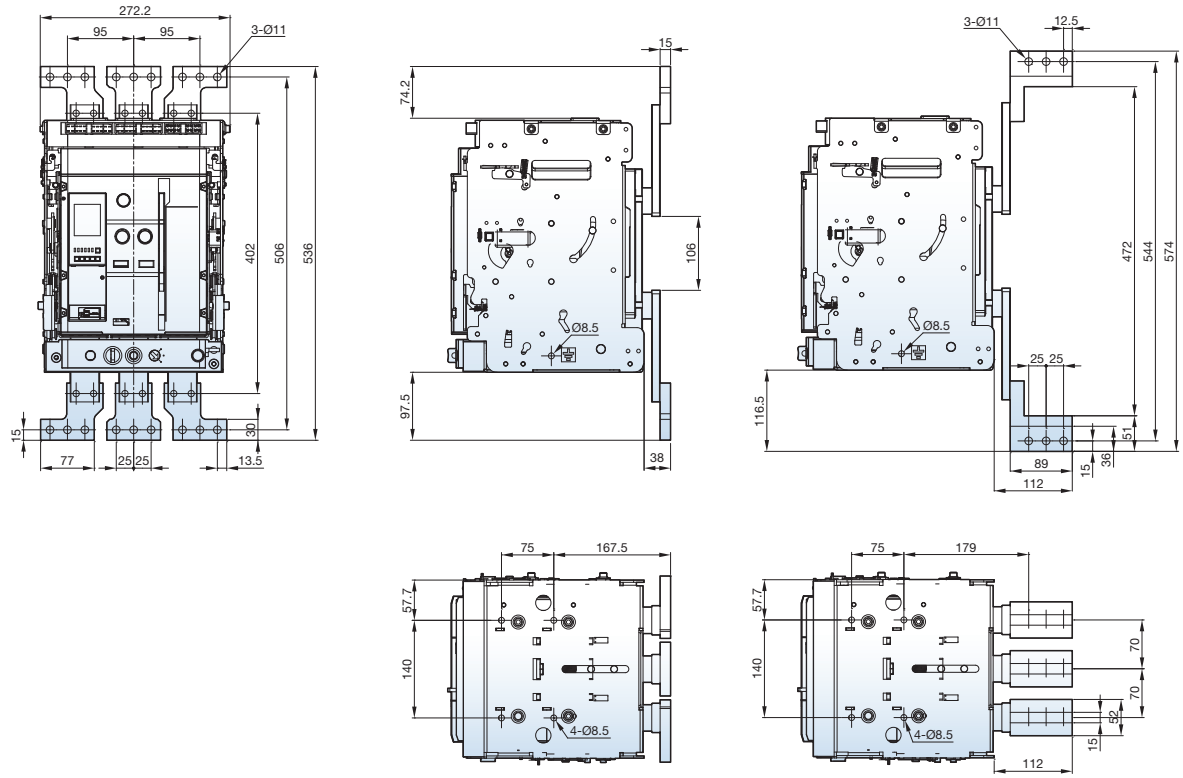
(Unit : mm)



P Type (Plane type)

R Type (Spread type)

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



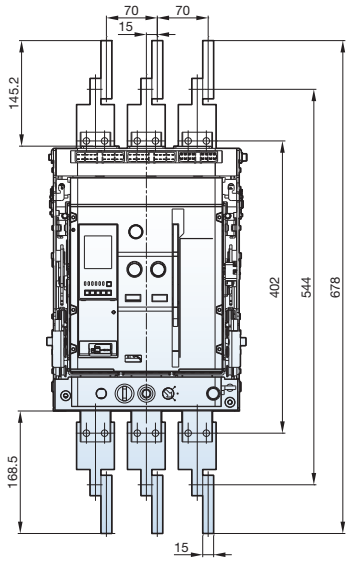
Z Type (Plane spread type)

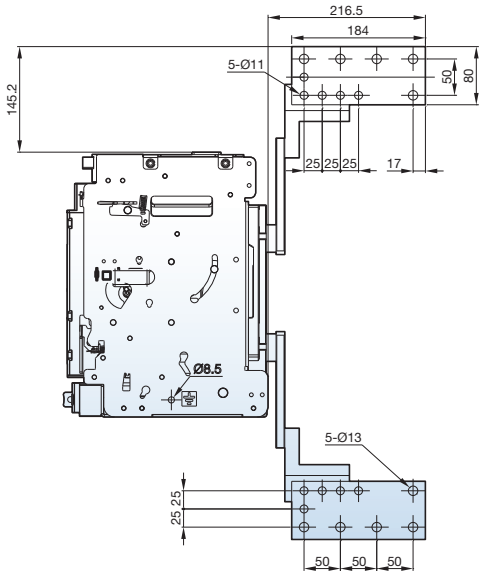
T Type (Plane vertical type)

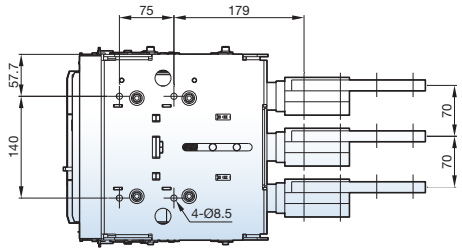
Dimensions

• 3P [Draw-out X: Cable lug type]

(Unit : mm)



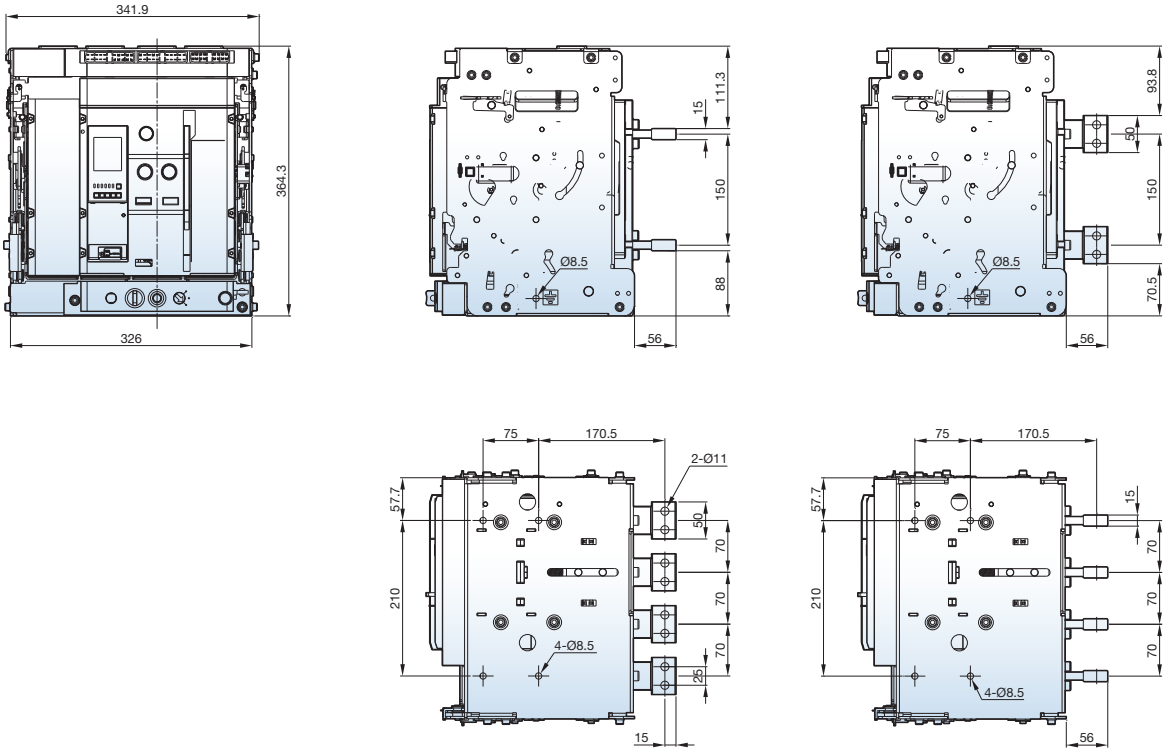




X Type (Cable lug type)

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

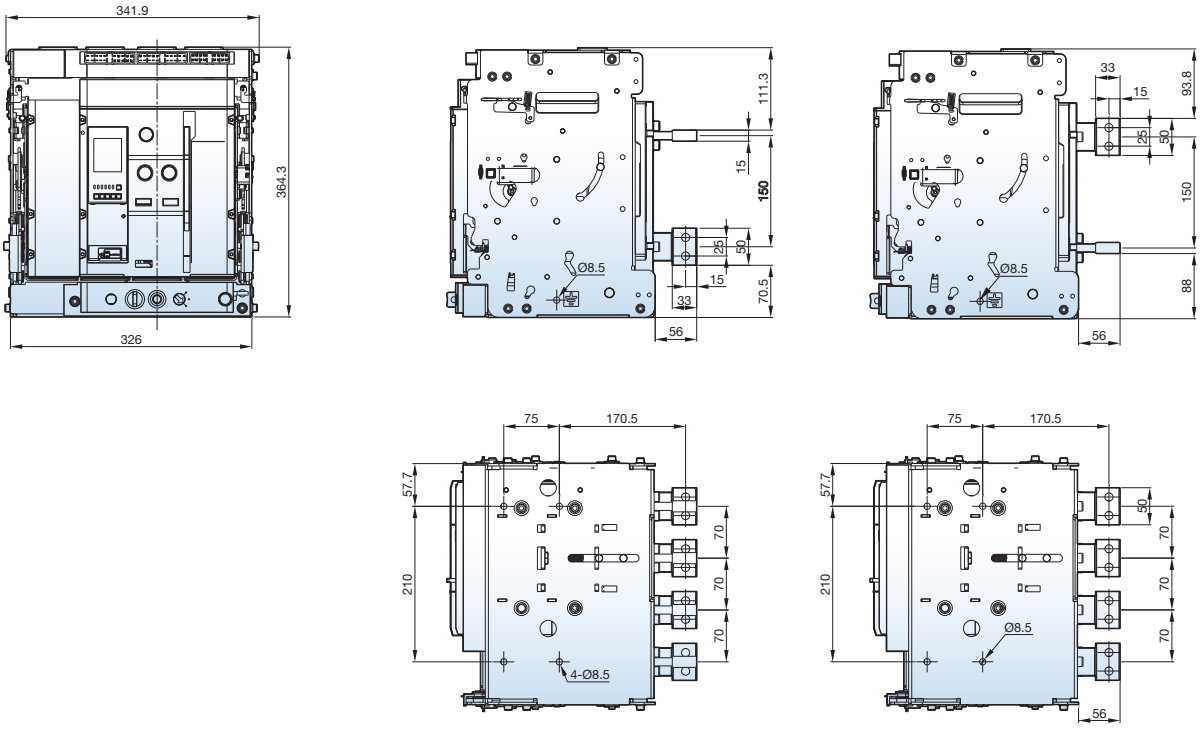
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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



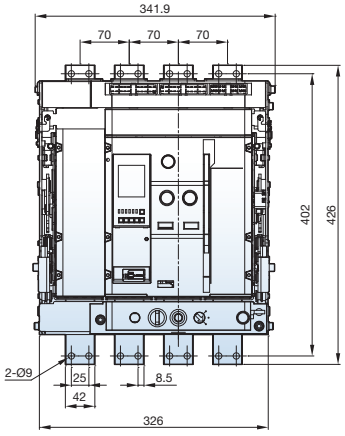
M Type
(Upper-Horizontal type, Lower-Vertical type)

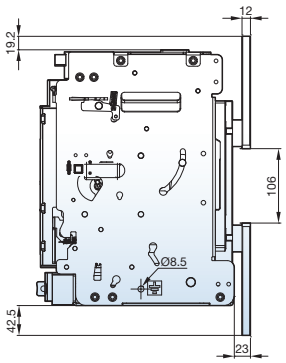
N Type
(Upper-Vertical type, Lower-Horizontal type)

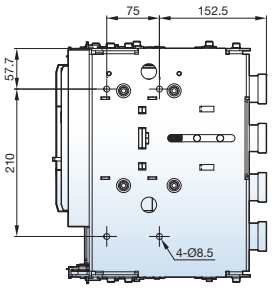
Dimensions

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

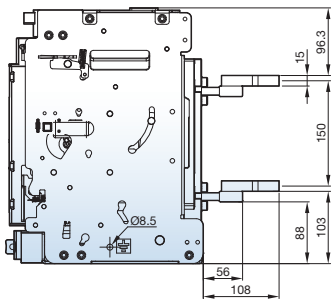
(Unit : mm)

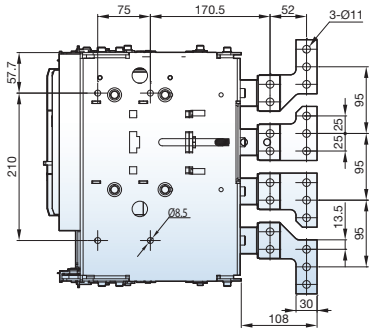






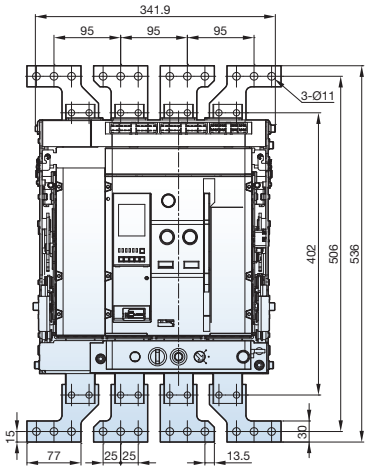
P Type (Plane type)

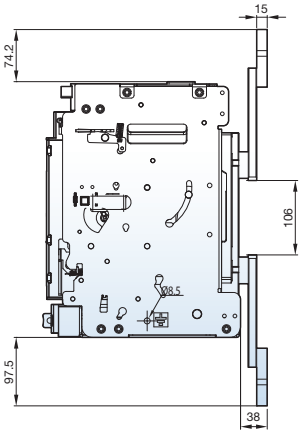


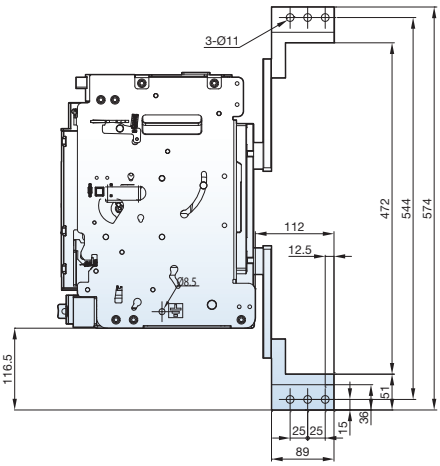


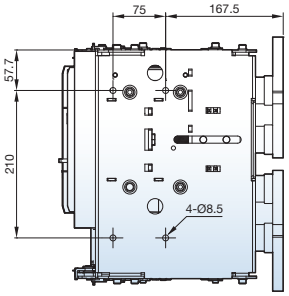
R Type (Spread type)

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

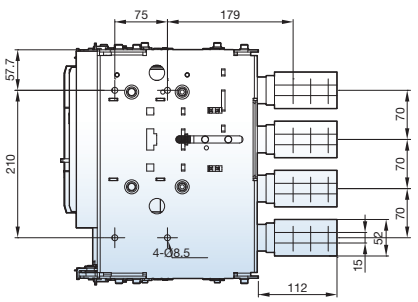








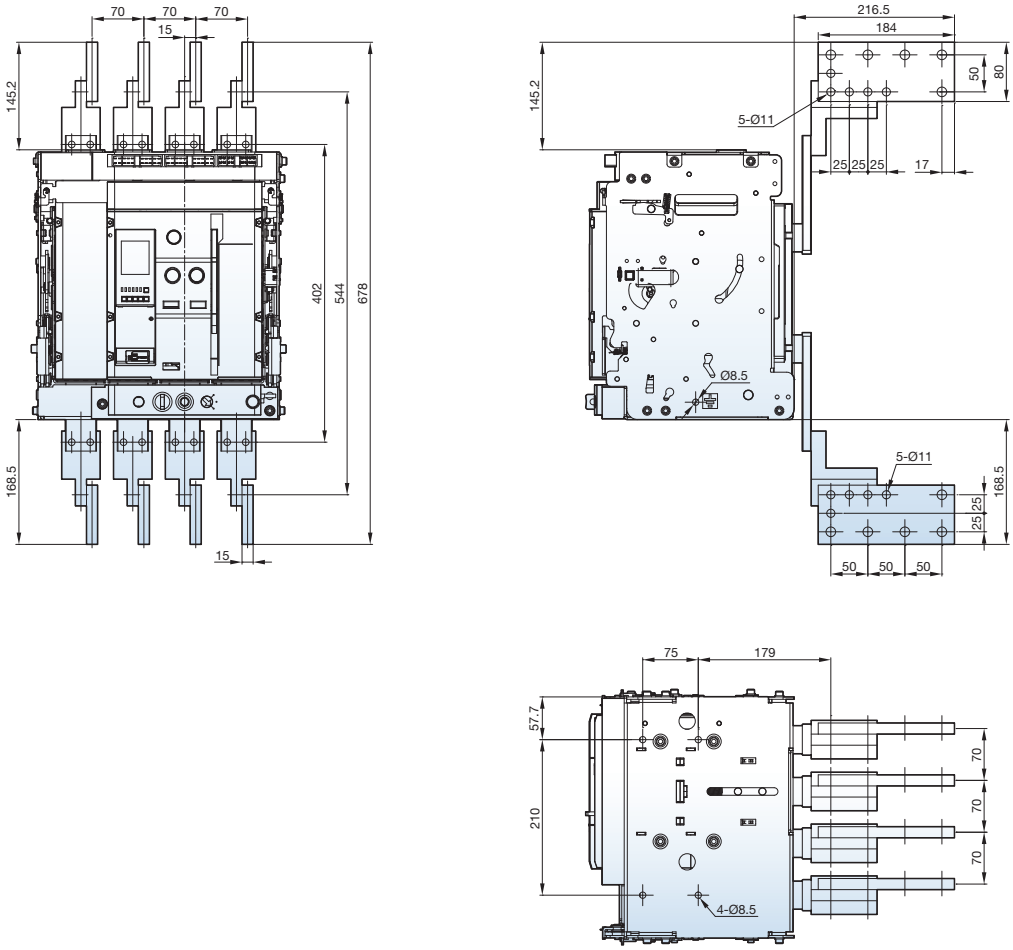
Z Type (Plane spread type)



T Type (Plane vertical type)

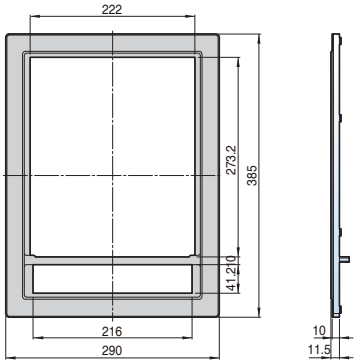
• 4P [Draw-out X: Cable lug type]

(Unit : mm)



X Type (Cable lug type)

Draw-out Door Frame: DF



Normal / Special service condition

Normal service conditions

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

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

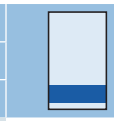
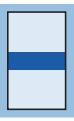
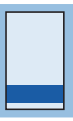
Table A. Temperature derating (Compact ACB)

Type	Drawout													
Connection type	Horizontal or Plane							Vertical						
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													
Connection type	Horizontal or Plane							Vertical						
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						
Connection Type				Vertical			horizontal		
Busbar Dimensions (mm)				2b. 50×10					
Switchgear		35°C	3			1330			1190
			2		1400			1240	
			1	1500			1310		
	IP41	45°C	3			1270			1120
			2		1320			1180	
			1	1420			1240		
		55°C	3			1190			1050
			2		1240			1090	
			1	1330			1160		
	IP54	35°C	3			1230			1210
			2		1310			1270	
			1	1390			1310		
		45°C	3			1150			1140
			2		1240			1220	
			1	1310			1230		
		55°C	3			1080			1080
			2		1160			1120	
			1	1220			1150		



2000×400×600

Altitude and Isolation Voltage

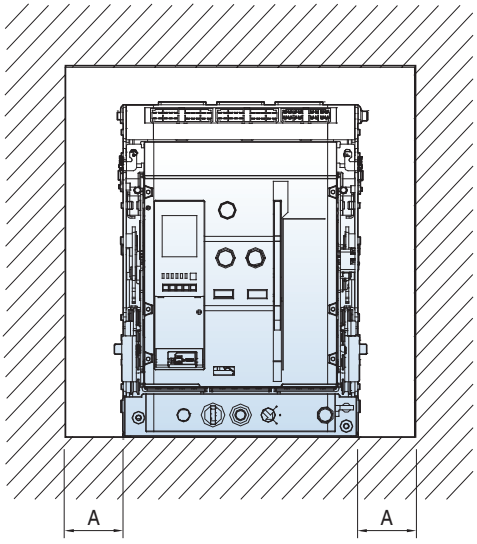
Altitude

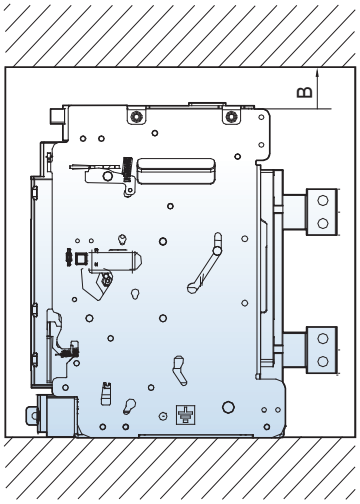
Compact ACB is designed for operation at altitudes under 2000m. At altitudes higher than 2000m, change the ratings upon a service condition.

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×In	0.98×In	0.96×In	0.94×In

Insulation clearance

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



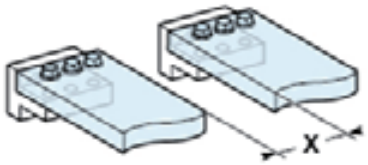


(Unit : mm)

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

Minimum clearances distance

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



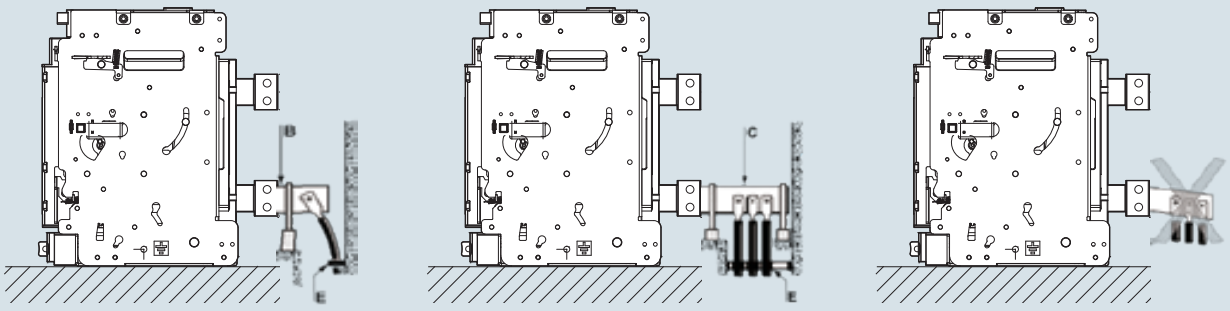
Insulating voltage (Ui)	Minimum clearances distance (X min)
600V	8 mm
1000V	14 mm

Installation recommendation

BUS-BAR Connection

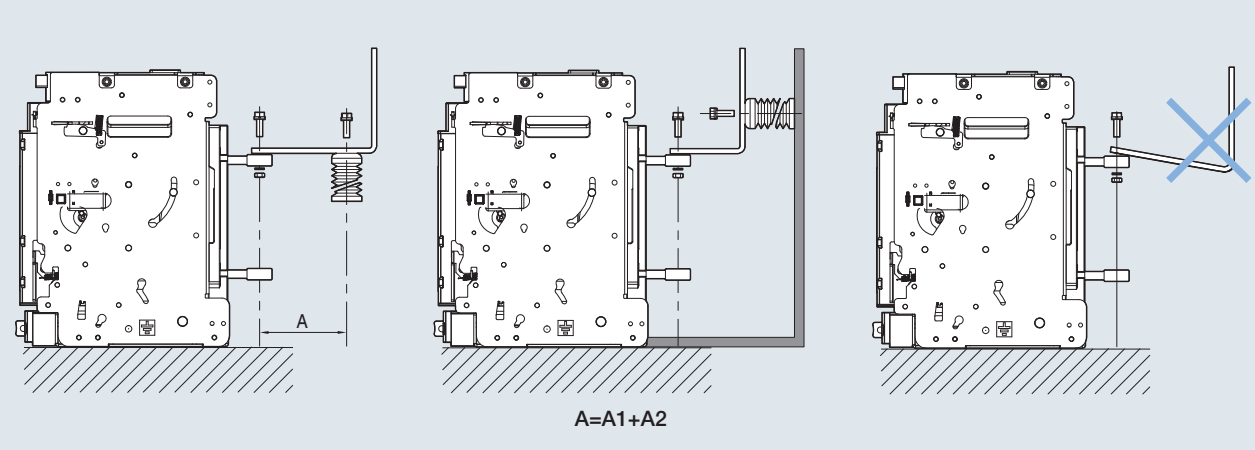
Cables connections

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



Bus-bar connection

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



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

Ordering sheet

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

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

ACB Main body

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

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

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

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

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

ACB Cradle

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

Bus-bar connection

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

ACB Accessory

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

Headquarter
127 LS-ro (Hogye-dong) Dongan-gu, Anyang-si, Gyeonggi-Do, 14119, Korea

Seoul Office
LS Yongsan Tower, 92, Hangang-daero, Yongsan-gu, Seoul, 04386, Korea
TEL: 82-2-2034-4916, 4684, 4429

China

LS ELECTRIC (Dalian) Co., Ltd.
+86-411-8730-5872
china.dalian@lselectric.com.cn

LS ELECTRIC (Wuxi) Co., Ltd.
+86-510-8534-6666
china.wuxi@lselectric.com.cn

LS ELECTRIC (Lishui) Co., Ltd.
+86-133-6207-7980
china.lishui@lselectric.com.cn

Shanghai Office
+86-21-5237-9977
china@lselectric.com.cn

Beijing Office
+86-10-5095-1631
china@lselectric.com.cn

Guangzhou Office
+86-20-3818-2883
china@lselectric.com.cn

Qingdao Office
+86-532-8501-2065
china@lselectric.com.cn

Chengdu Office
+86-28-8670-3201
china@lselectric.com.cn

Nanjing Office
+86-25-8467-0005
china@lselectric.com.cn

India

India Office
+91-80-6142-9108
Info_india@ls-electric.com

Indonesia

PT. LS ELECTRIC INDONESIA
+62-21-2933-7614
indonesia@ls-electric.com

PT SYMPHOS ELECTRIC
+62-81-1900-1474
marketing@symphos-weltraf.com

Italy

Italy office
+39-030-8081-833
italia@ls-electric.com

Japan

LS ELECTRIC Japan Co., Ltd.
+81-3-6268-8241
japan@ls-electric.com

Tokyo Office
+81-3-6268-8241
tokyo@ls-electric.com

Netherlands

LS ELECTRIC Europe B.V.
+31-20-654-1424
europartner@ls-electric.com

Russia

Moscow Office
+7-499-682-6130
info@lselectric-ru.com

Singapore

Singapore Office
+65-6958-8162
singapore@ls-electric.com

Spain

LS ELECTRIC IBERIA S.L.U.
+34-910-28-02-74
iberia@ls-electric.com

Thailand

Bangkok Office
+66-2-128-0295
thailand@ls-electric.com

Türkiye

LS ELECTRIC Türkiye Co., Ltd.
+90-212-806-1252
turkiye@ls-electric.com

U.A.E

LS ELECTRIC Middle East FZE (Dubai)
+971-4-886-5360
middleeast@ls-electric.com

USA

LS ELECTRIC America Inc.
+1-800-891-2941
sales.us@lselectricamerica.com

LS ENERGY SOLUTIONS LLC
+1-980-221-0654
cmfeldman@ls-es.com

MCM Engineering II
+1-435-865-0125
sales.us@lselectricamerica.com

America Western Office
+1-949-333-3140
america@ls-electric.com

America Bastrop Campus
+1-224-352-2265
sales.us@lselectricamerica.com

Vietnam

LS ELECTRIC Vietnam Co., Ltd.
+84-222-2221-110
vietnam@ls-electric.com

Hanoi Sales Office
+84-24-6275-8054
vietnam@ls-electric.com

Ho Chi Minh Sales Office
+84-3823-7890
vietnam@ls-electric.com

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