



Susol Super Solution

Compact ACB

Compact Air Circuit Breakers 1600A



LSIS

Compact ACB 1600A

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Change low voltage switchgears!

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



Susol Super Solution

Compact ACB 1600A

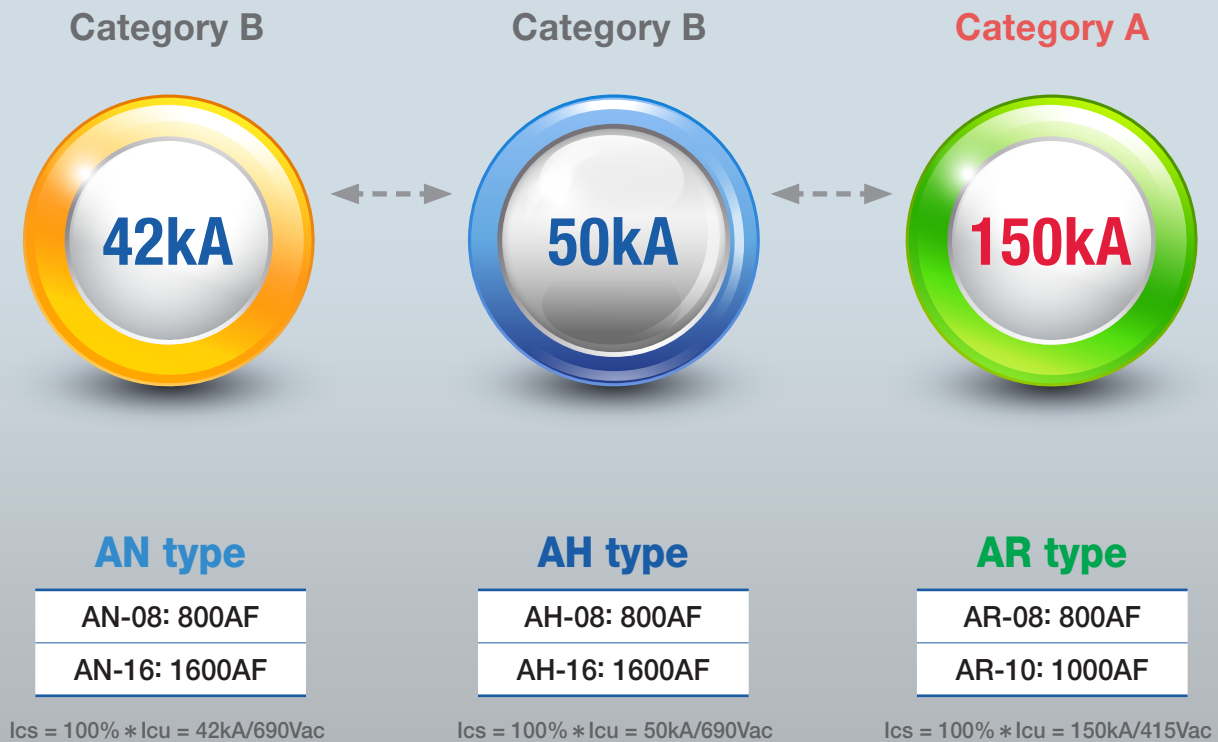
- Cat.A (Current limiting type) 150kA/415V
- Cat.B (General type) 50kA/690V, $I_{cw} = 50kA/1sec$ (30kA/3sec)

Compact ACB 1600A



The Susol logo is prominently displayed in the lower half of the image. It features the word 'Susol' in a bold, italicized font. The 'S' is red, and the remaining letters 'usol' are blue. The logo is set against a background of a city skyline and a grid pattern on a light blue surface.

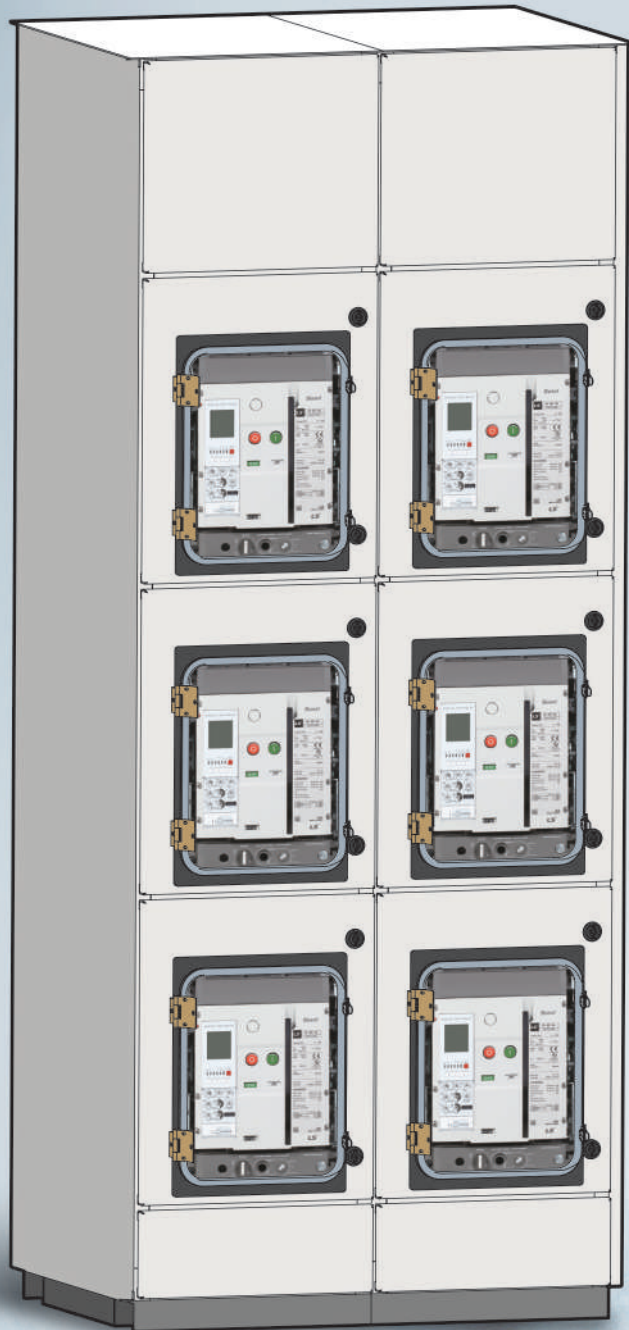
Category type



Features

- Significantly reduced size compared to existing products ...55%
- Category A breaker:
rated current 400A~1000A, breaking capacity 150kA/415Vac, $I_{cs} = 100\% * I_{cu}$
- Category B breaker:
rated current 400A~1600A, breaking capacity 50kA/690Vac, $I_{cs} = 100\% * I_{cu}$
- Rated short-time current (I_{cw}): 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



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

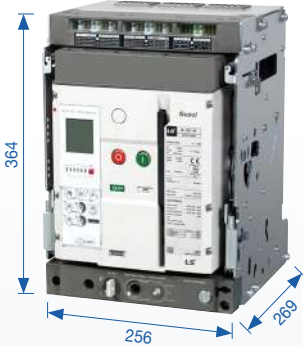
Compact type

Unit (mm)

E-frame ACB



C-frame(Compact) ACB



3-high



4-high



Compact ACB



AN

16

C

3

10

J

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

AF	
08	800AF
16	1600AF

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

No. of pole	
3	3P
4	4P

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

Installation & Connection	
withdrawable type	
A	Auto connection type for bottom operating cradle
J	Manual connection type for bottom operating cradle

Category A	
AR	150kA/415V

AF	
08	800AF
10	1000AF

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

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



Fixed type



Drawable type

Common characteristics								
Number of poles	(P)					3P / 4P		
Frequency	(Hz)					50/60Hz		
Rated operational voltage	(V, Ue)					690V		
Rated insulation voltage	(V, Ui)					1000V		
Rated impulse withstand voltage	(kV, Uimp)					12kV		
Circuit breaker as per IEC60947-2								
Type			AN/AH/AR-C					
Description			AN-08C	AN-16C	AH-08C	AH-16C	AR-08C	AR-10C
Ampere Frame	(AF)		800	1600	800	1600	800	1000
Rated current (In Max.) at 40°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 ¹⁾
			AC 415V/380V/220V	50		60		150
Rated service breaking capacity (Ics)	(kA, %×Icu)		100%					
Rated making capacity (Icm)	(kA)		88.2		105		17 ²⁾	
Rated Short-time capacity (Icw)	(kA)		42/25		50/30		10 ³⁾	
Operating time (t)	(ms)	Total breaking time	40					
		Closing time	80					
Common mechanical and electrical life cycle								
Life cycle	(time)	Mechanical	12,500			5,000		
		Electrical	6,000			3,000		
Common dimension and weight								
Weight	(kg)	Drawable type (3P/4P)	16/19.5					
		Fixed type (3P/4P)	16/19.5					
		Cradle (3P/4P)	22/26					
Dimension	(mm)	Drawable type	3P	W: 256 D: 269.5 ⁴⁾ H: 364.3				
			4P	W: 326 D: 269.5 ⁴⁾ H: 364.3				
		Fixed type	3P	W: 272.4 D: 198.3 ⁴⁾ H: 322				
			4P	W: 342.4 D: 198.3 ⁴⁾ H: 322				

1) 130kA/460V, 100kA/500V

2) at 500V

3) 0.5sec

4) Exclude terminal length

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/Vun/lun
- 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



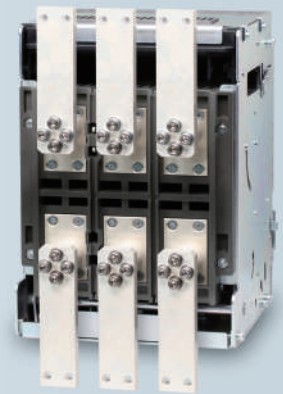
Spreader type, R



Mixed type, M



Mixed type, N

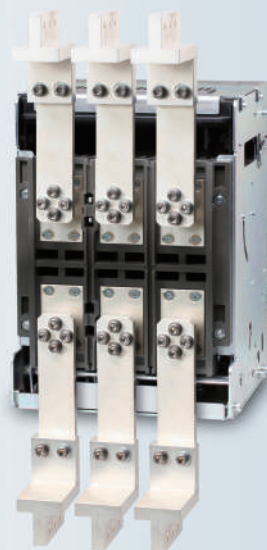


Plain type, P

Front Connection



Spread type, Z



Vertical type, T



Cable lug type, X

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

Accessories

Main body



Miss Insertion Preventing Device (MIP)



Auxiliary Switch (FX)



Ready to Close switch (RCS)



Shunt Coil (SHT)



Closing Coil (CC)



Under Voltage Trip Device (UVT)



Manual Reset Button (MRB)



Key Lock (K1)



Trip Relay (OCR)



Rating plug



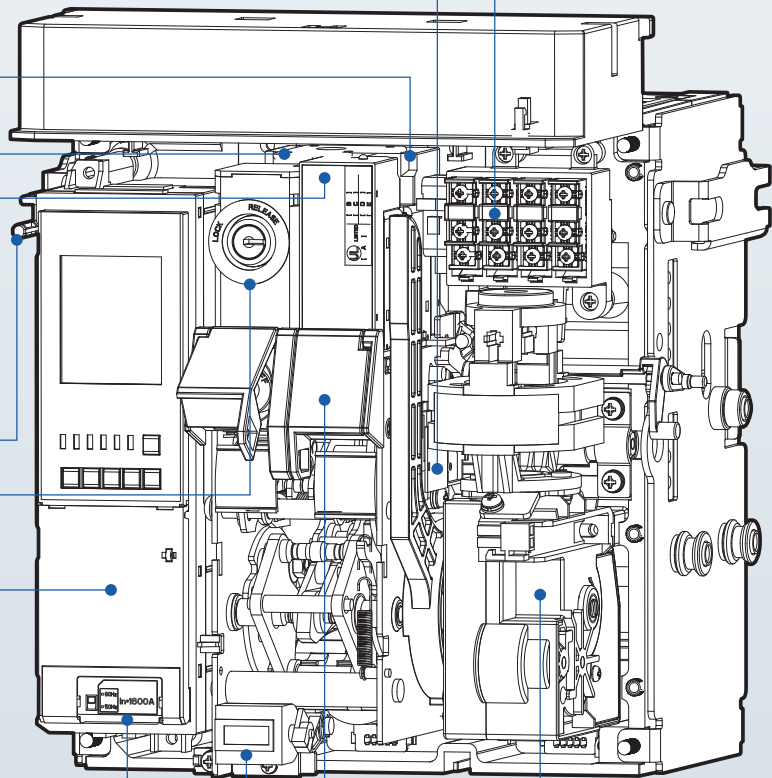
Counter (C)



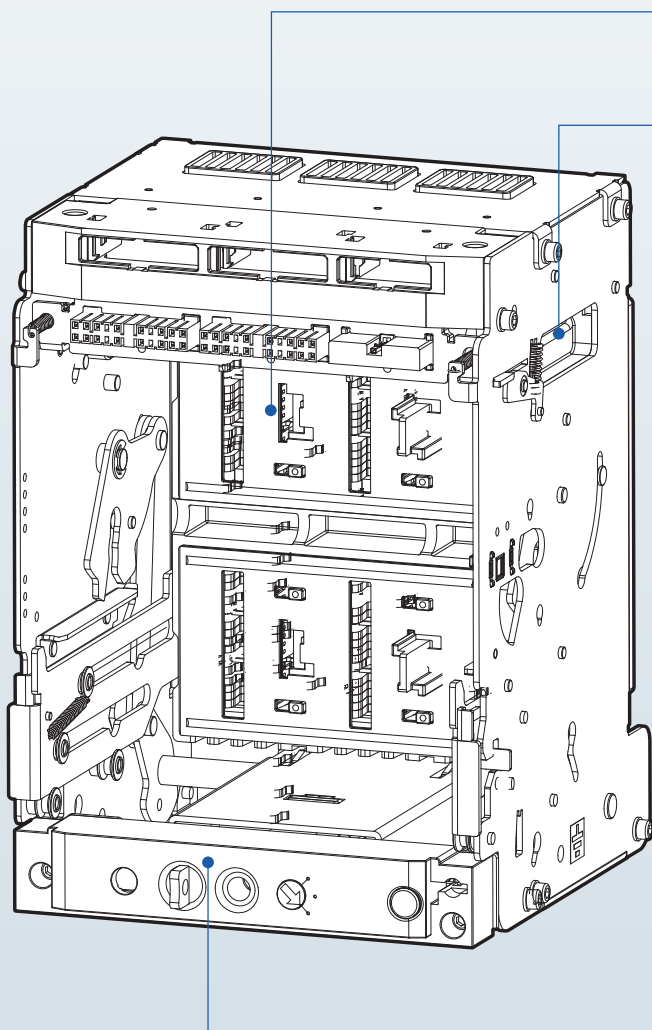
ON/OFF Button Padlock (B)



Motor (M)



Cradle



Miss Insertion Preventing Device (MIP)



Condensor Trip Device (CTD)



Safety Shutter (ST)



Lifting Hook (LH)



Insulation 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)

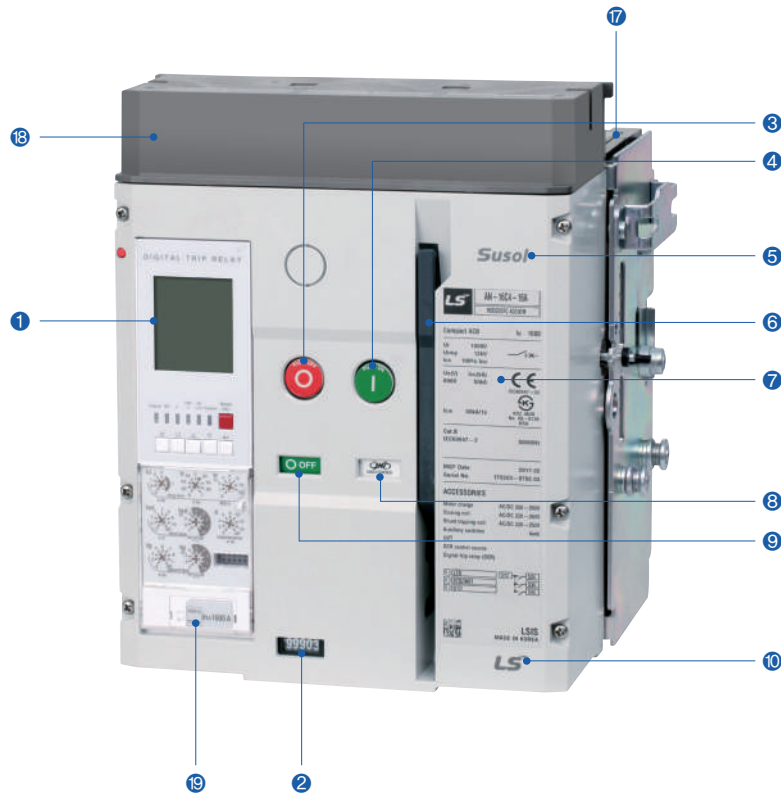


OCR Tester (OT)



External configuration

Draw-out (Main body)

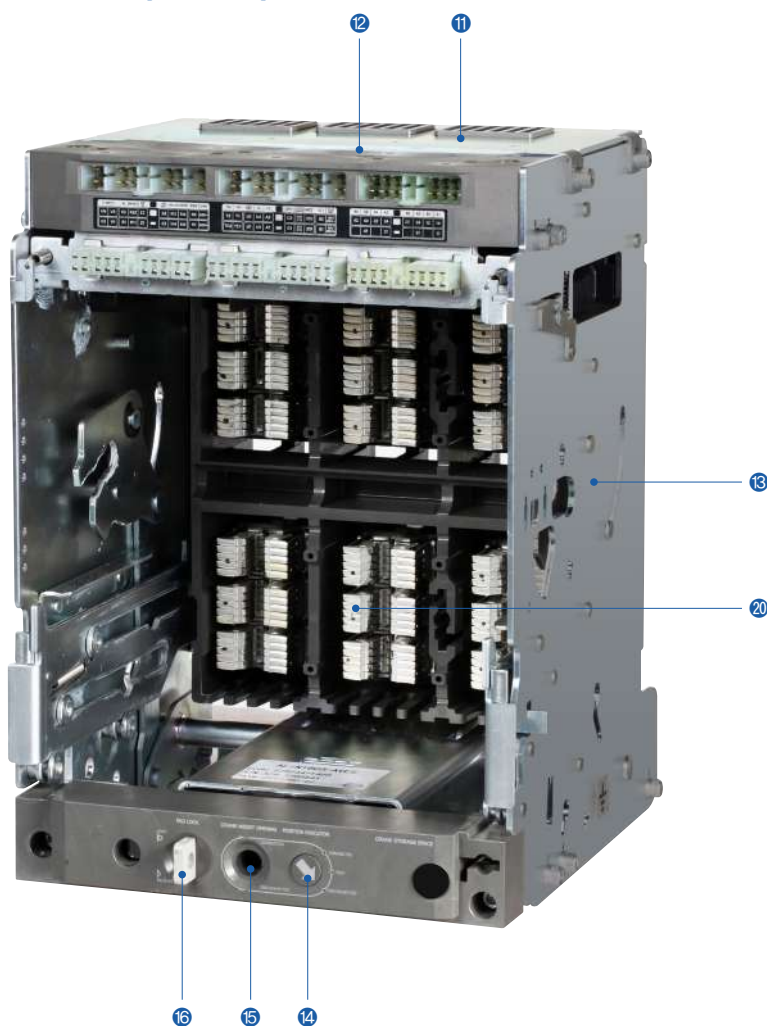


Rated name plate

LS		AN-16C3-16A	
		M20202FC AG2U0M	
Compact ACB		Iu 1600	
Ui	1000V		
Uimp	12kV		
Ics	100%e Icu		
Ue(V)	Icu(kA)		
690V	50kA	IEC60947-02	
Icw	50kA/1s		
		KSC 4620 No. 08-0126 KSA	
Cat. B	IEC60947-2		
		50/60Hz	
MFG Date	2017.02		
Serial No.	170203-9701.02		
ACCESSORIES			
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	513	524	
(V) STD/INST		534	
(V) GTD		544	
		LSIS MADE IN KOREA	

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

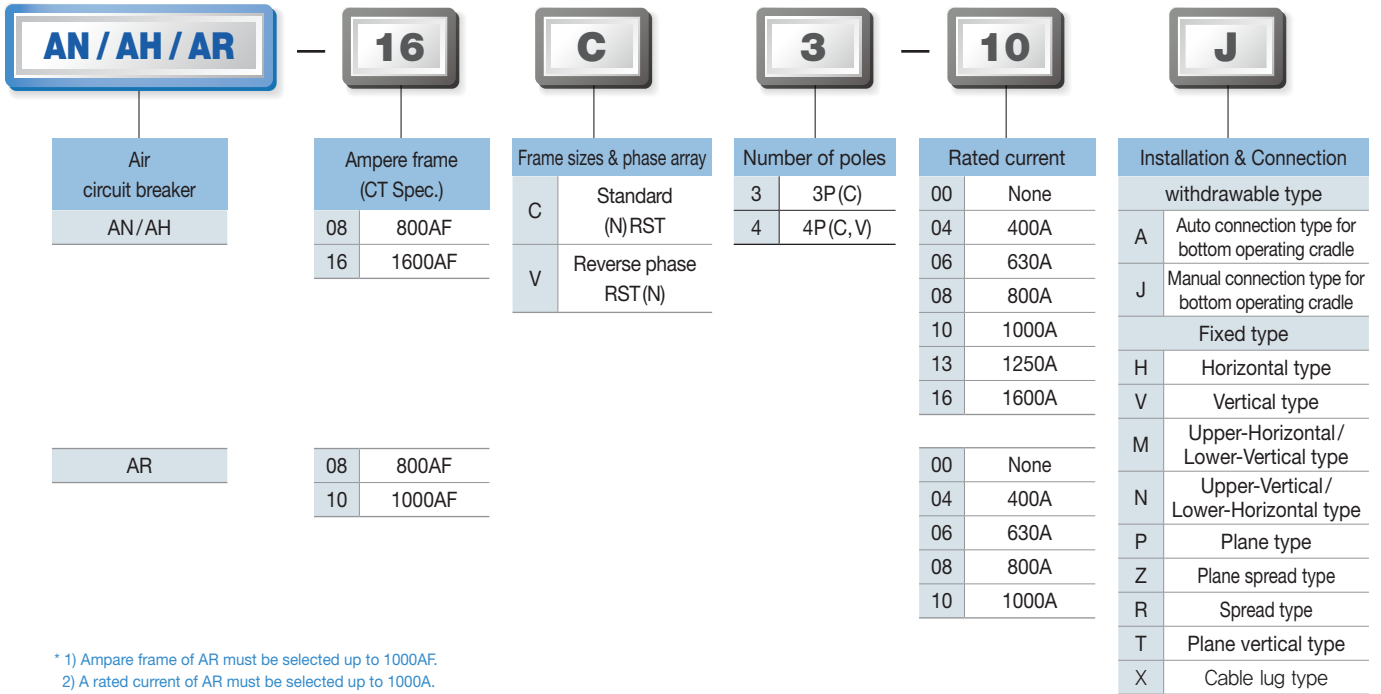


Terms

- ① Trip relay
- ② Counter
- ③ OFF button
- ④ ON button
- ⑤ Series name
- ⑥ Charge handle
- ⑦ Rated name plate
- ⑧ Charge/Discharge indicator
- ⑨ ON/OFF indicator
- ⑩ Corporation logo
- ⑪ Arc cover (Zero Arc Space)
- ⑫ Safety control cover
- ⑬ Cradle
- ⑭ 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





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

Accessories

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
SC	Standard ON-Charge 3C TCS

* TCS (Trip Circuit Supervision)

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)

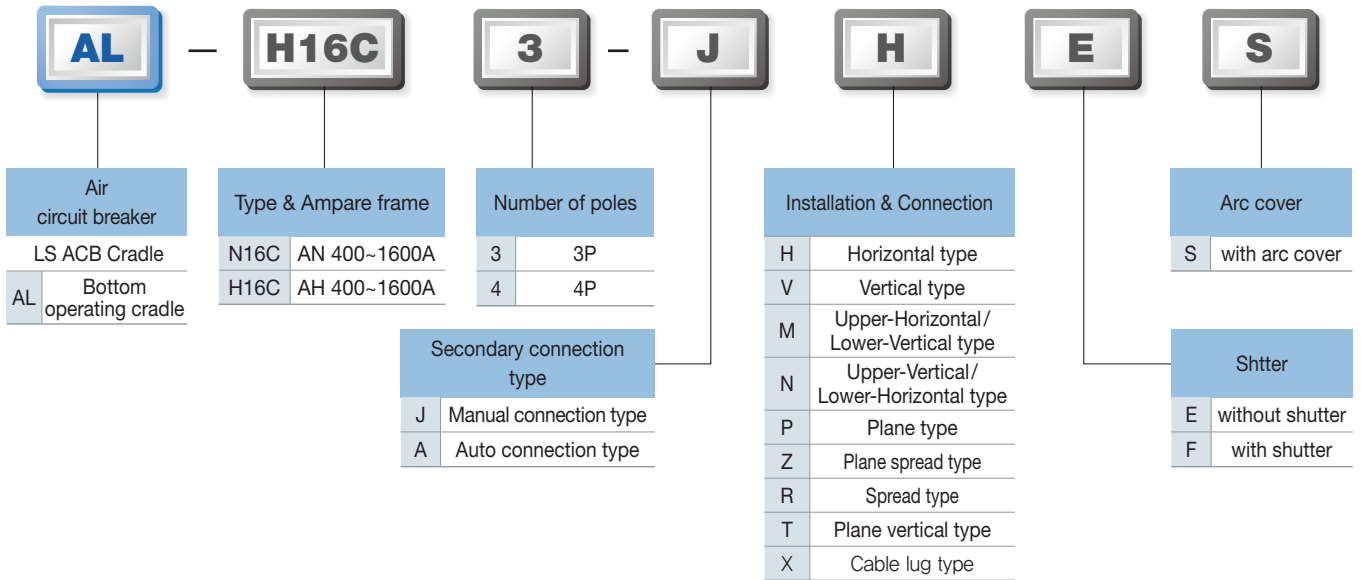
Code	Description	Option description
AL	AL1 + MRB	
A1	AL1 + MRB + RES(AC110~130V) *AC Only	
A2	AL1 + AL2 + MRB	
A3	AL1 + MRB + RES(DC 110~125V) *DC Only	
A4	AL1 + MRB + RES(AC 200~250V) *AC Only	
A5	AL1 + MRB + Auto Reset	
A6	AL1 + AL2 + MRB + Auto Reset	
A7	AL1 + MRB + RES(DC 110~125V) + Auto Reset *DC 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 ^{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.

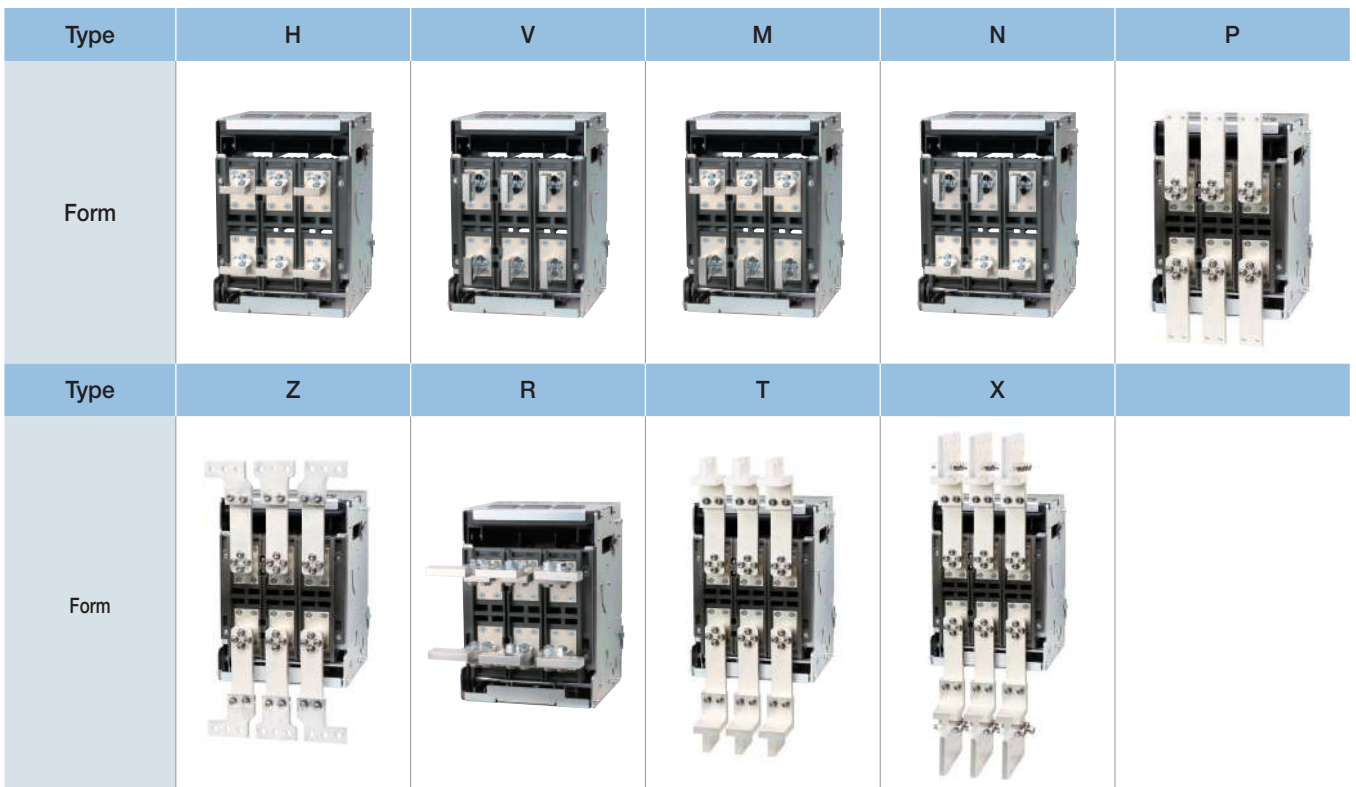
Ordering

Cradle



Note1) The cradle of "AL-H" must be selected to use ACB of "AR" type.
 Note2) Only "J" control terminal manual connection is available for AN models
 Note3) Only "A" control terminal automatic connection is available for AN models

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)

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 * 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(I_n) without CT replacement

- 800AF





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

- 1600AF

I_n : 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 worksover 20% of load current.	• Self Power -Power source worksover 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

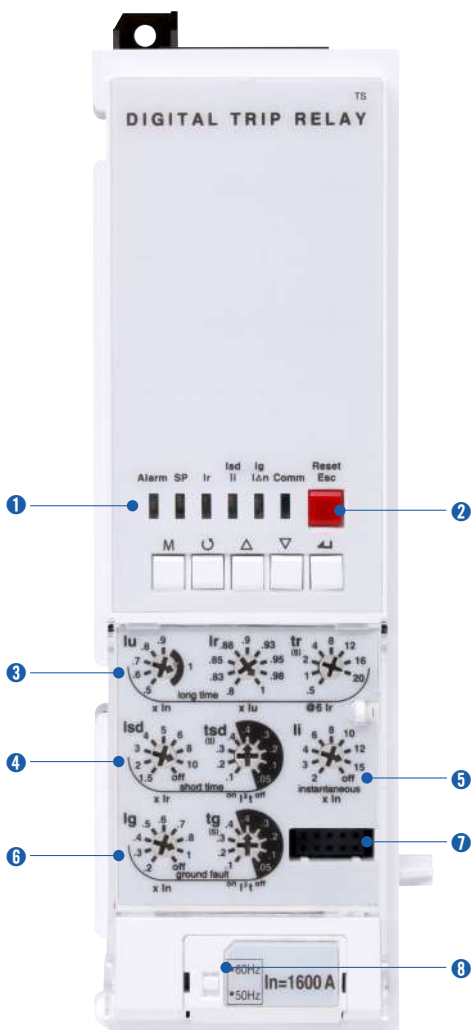
2. The recognizable range of OCR current

- 1) 10: When more 20% than rated current(I_n) (ratio to I_n regardless of I_u and I_r)
- 2) 30: When more 12% than rated current(I_n)

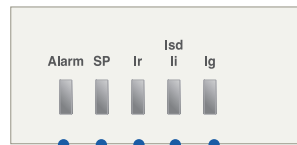
Trip relay

N type: 'Normal' type

- Optimized protection function
 - OCR, OCGR function according IEC60947-2
 - Overload protection
 - Long-time delay
 - Thermal
 - Short-circuit protection
 - Short-time delay/Instantaneous
 - I²t On/Off optional (for short-time delay)
 - Ground fault protection
 - I²t On/Off optional
 - Self Power
- Rating Plug for selection of rated current and frequency
 - Rating Plug type
 - 800AF: 400, 600, 630, 800A (4 types)
 - 1600AF: 800, 1000, 1200, 1250, 1600A (5 types)
 - Frequency selection switch: set to 50Hz or 60Hz



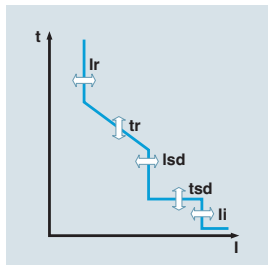
1 LED: Indication of trip info. and overload state



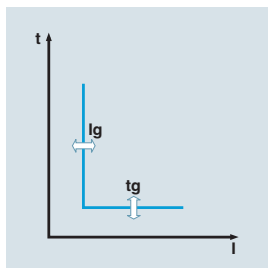
- Ig: LED indicating ground-fault
- Isd/Isi: LED indicating short-time or instantaneous tripping
- Ir: LED indicating long-time delay
- SP: Self-protection and battery test LED
- Alarm: LED indicating an overload
(Turn on above 90%, Blink above 105%)

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

Protection



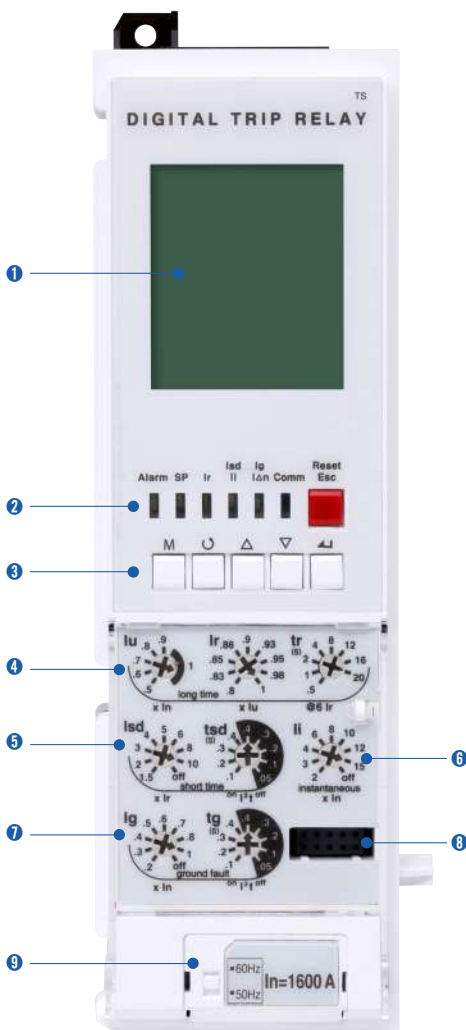
Long time											
Current setting (A)	$I_u = I_n \times \dots$		0.5	0.6	0.7	0.8	0.9	1.0			
	$I_r = I_u \times \dots$		0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0
Time delay (s)	$tr @ (1.5 \times I_r)$		12.5	25	50	100	200	300	400	500	
Accuracy: $\pm 15\%$ or below 100ms	$tr @ (6.0 \times I_r)$		0.5	1	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)	$I_{sd} = I_r \times \dots$	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)	I^2t Off	I^2t Off	0.05	0.1	0.2	0.3	0.4				
		I^2t On		0.1	0.2	0.3	0.4				
@ $10 \times I_r$	$(I^2t$ Off)	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	$I_i = I_n \times \dots$		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)	I^2t Off	I^2t Off	0.05	0.1	0.2	0.3	0.4				
		I^2t On		0.1	0.2	0.3	0.4				
@ $10 \times I_r$	$(I^2t$ 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

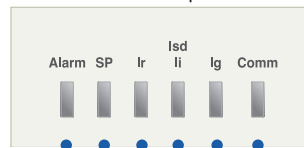
- Overload protection
 - Long-time delay
 - Thermal
- Short-circuit protection
 - Short-time delay/Instantaneous
 - I²t On/Off optional (for short-time delay)
- Ground fault protection
 - I²t On/Off optional
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- High-performance and high-speed MCU built-in
 - Accurate measurement with tolerance of 1.0%
- Fault recording
 - Records Max. up to 10 fault information about fault type, fault phase, fault data, occurrence time of fault
- SBO (Select Before Operation)
 - High reliability for control and setting change method
- 3 DO (Digital Output)
- Communication
 - Modbus/RS485
 - Profibus-DP
- Rating Plug for selection of rated current(I_n) 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.

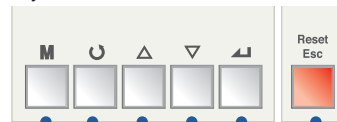
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



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

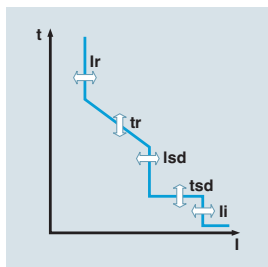
③ Key: Move to menu or reset



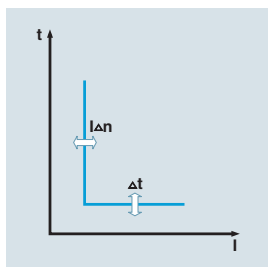
- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

- 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 Is: 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_n) 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)	Δt	Alarm Time (ms)	140	230	350	800	950					
		Trip Time (ms)	140	230	350	800						

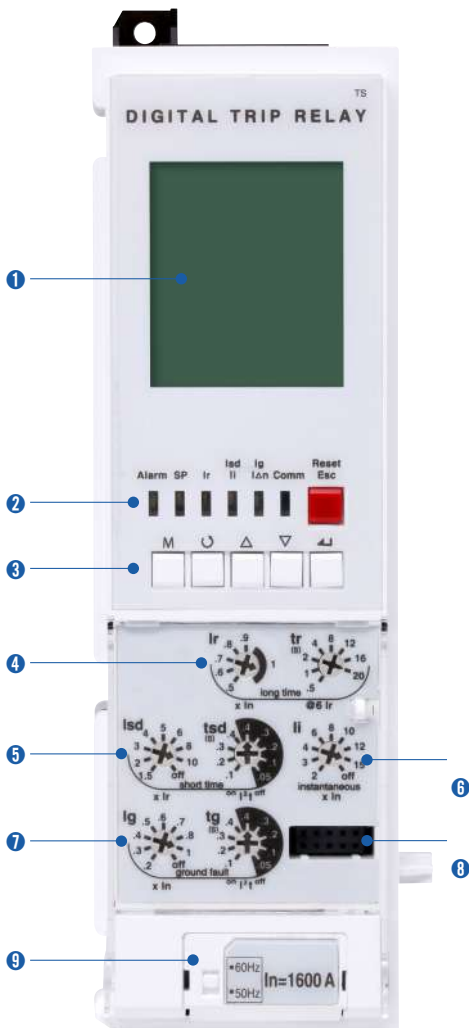


Note) Unable to select ground fault and earth leakage, simultaneously

Trip relay

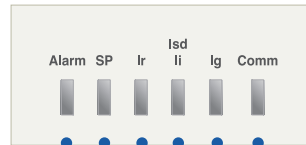
P type: 「Power meter」 type

- Overload protection
 - Long-time delay – Thermal
- Short-circuit protection
 - Short-time delay/Instantaneous
 - I²t On/Off optional (for short-time delay)
- Ground fault protection
 - I²t On/Off optional
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and key
- IDMTL setting (SIT, VIT, EIT, DT curve)
 - Basic setting : “None”. Thermal curve.
- Measurement and display function
 - High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
 - 128 x 128 Graphic LCD
 - Indicates current/voltage vector diagram and waveform
- Fault recording
 - Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
- Event recording
 - Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
 - High reliability for control and setting change method
- 3 DO (Digital output)
 - Programmable for alarm, trip and general DO
- Communication
 - Modbus/RS485 – Profibus-DP
- Rating Plug for selection of rated current(I_n) 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



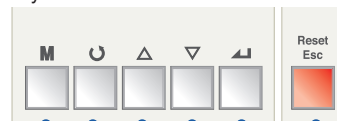
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



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

③ Key: Move to menu or reset

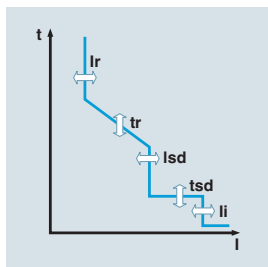


- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

- ④ Ir: Long-time current setting, tr: Long-time tripping delay setting
- ⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting
- ⑥ Ii: Instantaneous current setting
- ⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
- ⑧ Test terminal: OCR test terminal (Connected with OCR tester)
- ⑨ Rating Plug: Rated current (I_n) 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)	$I_r = I_{ux}...$									
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			1.5	2	3	4	5	6	8	10	Off
Current setting (A)	$I_{sd} = I_{rx}...$	Cat. B									
Accuracy : $\pm 10\%$		Cat. A	1.5	2	3	4	5	6	8	10	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			2	3	4	6	8	10	12	15	Off
Current setting (A)	$I_i = I_{nx}...$										
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 : $\pm 10\%$ ($I_g > 0.4 I_n$) $\pm 20\%$ ($I_g \leq 0.4 I_n$)	$I_g = I_{nx}...$										
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)			0.5	1	2	3	5	10	20	30	Off
Current setting (A)	$I_{\Delta n}$										
Time delay (ms) Accuracy : $\pm 15\%$	Δt	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

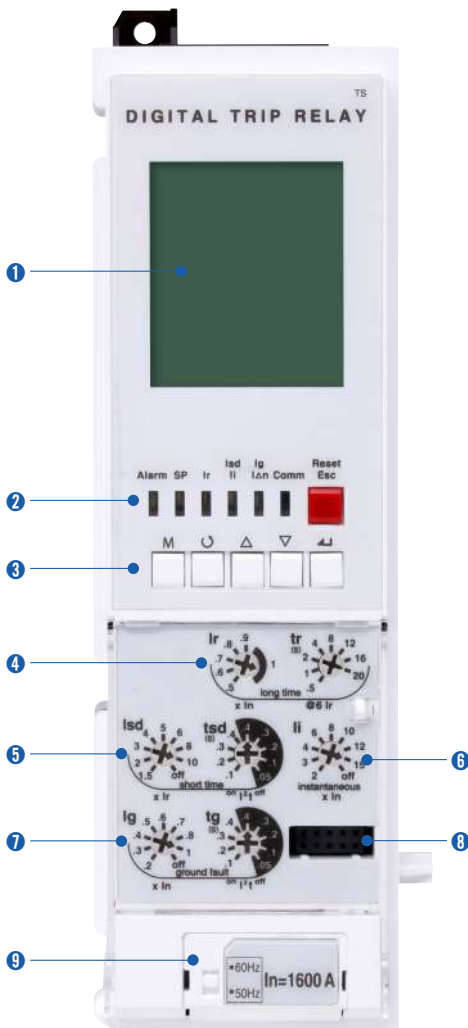
Earth leakage (Option)			0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Current setting (A)	$I_p = I_{rx}...$										
Time delay (ms) Accuracy : $\pm 15\%$	$tp@(1.2 \times I_p)$		1	5	10	15	20	25	30	35	Off

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	± 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			
Current unbalance	6% ~ 99%	1%	$\pm 2.5\%$ or ($*\pm 10\%$)				
Over frequency	60Hz	UF_Pick-up ~ 65	1Hz	± 0.1 Hz			1.2~40
	50Hz	UF_Pick-up ~ 55	1Hz	± 0.1 Hz			
Under frequency	60Hz	55Hz ~ OF_Pick-up	1Hz	± 0.1 Hz			
	50Hz	45Hz ~ OF_Pick-up	1Hz	± 0.1 Hz			

Trip relay

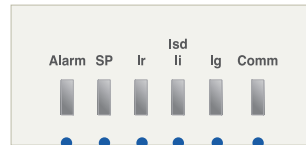
S type: 「Supreme meter」 type

- Overload protection
 - Long-time delay – Thermal
- Short-circuit protection
 - Short-time delay/Instantaneous
 - I²t On/Off optional (for short-time delay)
- Ground fault protection
 - I²t On/Off optional
- Protection for Over voltage/Under voltage/Over frequency/Under frequency/Unbalance/Reverse power
- Realization of protective coordination by ZSI (Zone Selective Interlocking)
- The fine-adjustable setting by knob and key
- IDMTL setting (SIT, VIT, EIT, DT curve)
 - Basic setting : “None”. Thermal curve.
- Measurement and display function
 - High detailed measurement for 3 phase current/Voltage/Power/Energy/Phase angle/Frequency/PF/Demand
 - 128 x 128 Graphic LCD
 - Indicates current/voltage vector diagram and waveform
- Fault recording
 - Records Max. up to 256 fault information about fault type, fault phase, fault value, occurrence time of fault
- Event recording
 - Records events of device related to setting change, operation and state change. (Max. up to 256)
- SBO (Select Before Operation)
 - High reliability for control and setting change method
- 3 DO (Digital output)
 - Programmable for alarm, trip and general DO
- Communication
 - Modbus/RS485 – Profibus-DP
- Rating Plug for selection of rated current(I_n) 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



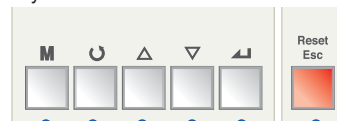
① LCD: Indication of measurement and information

② LED: Indication of trip info. and overload state



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

③ Key: Move to menu or reset

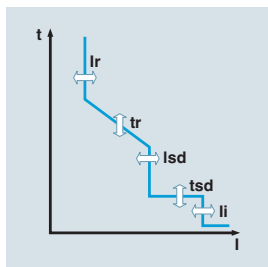


- Reset/ESC: Fault reset or ESC from menu
- Enter: Enter into secondary menu or setting input
- Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
- Right/Left: Move the cursor or setting right/left on screen (Rotation)
- Menu: Menu display ↔ Measurement display

- ④ Ir: Long-time current setting, tr: Long-time tripping delay setting
- ⑤ Isd: Short-time current setting, tsd: Short-time tripping delay setting
- ⑥ Ii: Instantaneous current setting
- ⑦ Ig: Ground fault current setting, tg: Ground fault tripping delay setting
- ⑧ Test terminal: OCR test terminal (Connected with OCR tester)
- ⑨ Rating Plug: Rated current (I_n) 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)	$tr@(1.5 \times I_r)$		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			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) @ $10 \times I_r$	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			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)	$I_g = I_{nx} \dots$	Accuracy : $\pm 10\%$ ($I_g > 0.4 I_n$)									
		$\pm 20\%$ ($I_g \leq 0.4 I_n$)									
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)			0.5	1	2	3	5	10	20	30	Off
Current setting (A)	$I_{\Delta n}$										
Time delay (ms) Accuracy : $\pm 15\%$	Δt	Alarm Time (ms)	140	230	350	800	950				
		Trip Time (ms)	140	230	350	800					

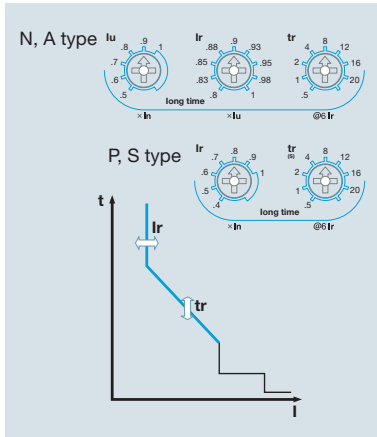
Note) Earth leakage function is available with ZCT or external CT

Earth leakage (Option)			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) Accuracy : $\pm 15\%$	$tp@(1.2 \times I_p)$		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	± 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	± 0.1
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	± 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	$\pm 0.1\text{Hz}$		

Operation characteristics

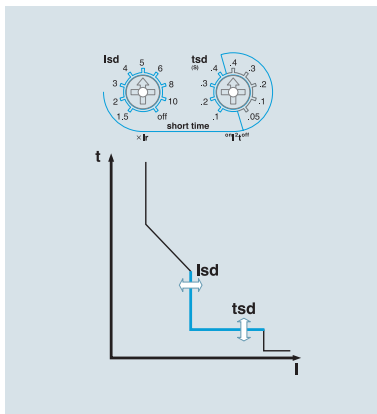
Long-time delay (L)



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: $(0.4 \sim 1.0) \times I_n$
 - I_u : $(0.5-0.6-0.7-0.8-0.9-1.0) \times I_n$
 - I_r : $(0.8-0.83-0.85-0.88-0.9-0.93-0.95-0.98-1.0) \times I_u$
- Time delay setting knob: t_r
 - Standard operating time is based on the time of $6 \times I_r$
 - Setting range: 0.5-1-2-4-8-12-16-20 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.

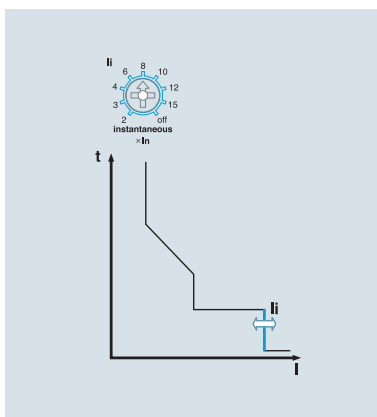
Short-time delay (S)



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.

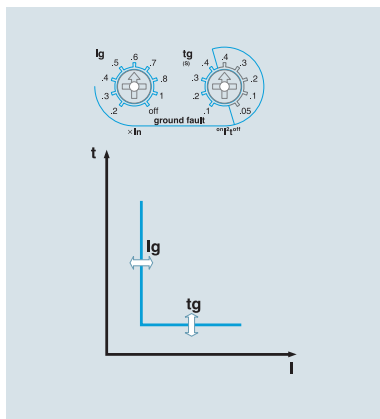
Instantaneous (I)



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.

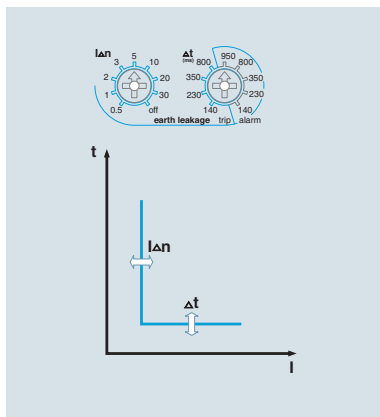
Ground Fault (G)



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

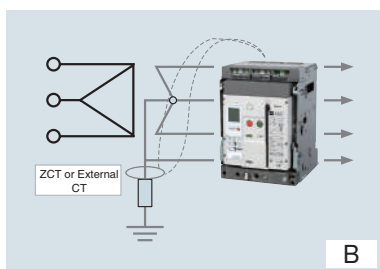
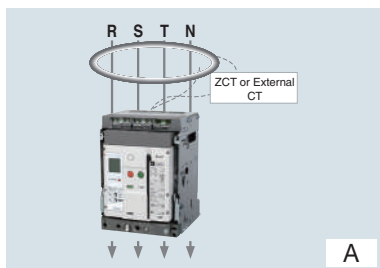
- Standard setting current knob: I_g
 - Setting range: $(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off) \times I_n$
- Time delay setting knob: t_g
 - Inverse time (I^2t On): $0.1-0.2-0.3-0.4$ sec
 - Definite time (I^2t Off): $0.05-0.1-0.2-0.3-0.4$ sec
- Ground fault current is vector sum of each phase current. 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: Δt
 - 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

S type P type A type

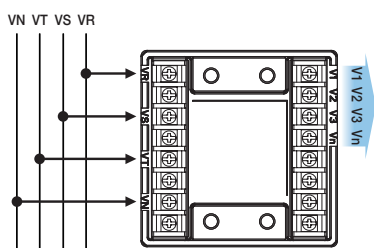
Class.	Measurement element	Detailed element	Unit	Display range	Accuracy
Current	Line current	Ia, Ib, Ic	A	80A~65,535A	±3%
	Normal current	I ₁			
	Reverse current	I ₂			
Voltage	Line voltage	Vab, Vbc, Vca	V	60~690V	±1%
	Phase voltage	Va, Vb, Vc			±1%
	Normal voltage	V ₁			
	Reverse voltage	V ₂			
Angle	Line-to-line, Line-to-current	∠VabIa, ∠VablIb, ∠VablIc, ∠VabVbc, ∠VabVca	°	0~360°	±1°
	Phase-to-phase	∠VaVb, ∠VaVc			±1°
	Phase-to-current	∠VaIa, ∠VblIb, ∠VclIc			±1°
Power	Active power		kW	1kW~99999kW	±3%
	Reactive power		kVar	1kVar~99999kVar	±3%
	Apparent power		kVA	1kVA~99999kVA	±3%
Energy	Active energy	WHa(ab), WHb(bc), WHc(ca), WH	kWh, MWh	1kWh~9999.99MWh	±3%
	Reactive energy	VARHa(ab), VARHb(bc), VARHc(ca), VARH	kVarh, Mvarh	1kVarh~9999.99MVarh	±3%
	Reverse active energy	rWHa(ab), rWHb(bc), rWHc(ca), rWH	kWh, MWh	1kWh~9999.99MWh	±3%
Freq.	Frequency (F)	Frequency	Hz	45~65Hz	
Power factor	Power factor (PF)	PFa(ab), PFb(bc), PFc(ca), PF		+ : Lead - : Lag	
Unbalance	Unbalance rate	lunalance, Vunbalance	%	0.0~100.0	
Demand	Active power demand	Peak demand	kW	1kW~99999kW	
	Current demand	Peak demand	A	80A~65535A	
Harmonics	Voltage harmonics	1st~63th harmonics of Va(ab), Vb(bc), Vc(ca)	V	60~690V	
	Current	1st~63th harmonics of Ia, Ib, Ic	A	80A~65535A	
	THD, TDD		%	0.0~100.0	
	K-Factor		-	0.0~100.0	



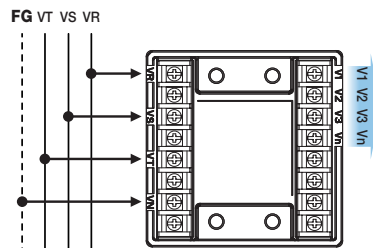
Voltage Module

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

- Voltage input range: AC 60~690V



3P4W wiring

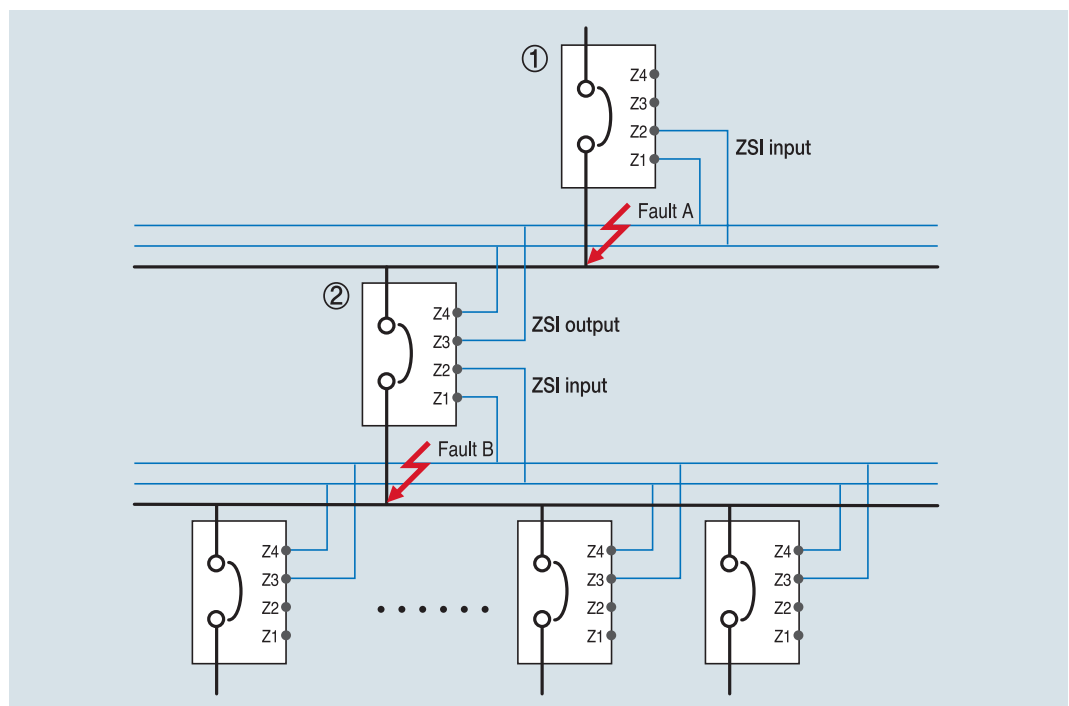


3P3W wiring

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

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

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



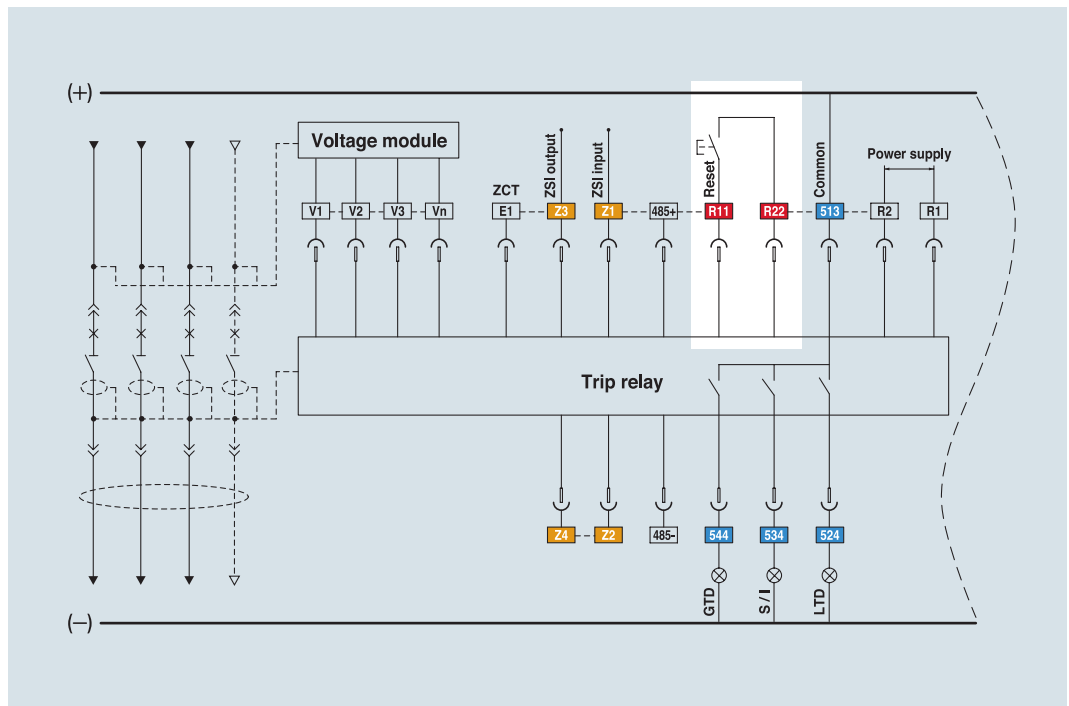
- 1) Occurrence of fault A
 - Only breaker ① performs instantaneous trip operation.
- 2) Occurrence of fault B
 - Breaker ② performs instantaneous trip operation, breaker ① performs trip operation after prearranged delay time
 - But if breaker ② did not break the fault normally, breaker ① performs instantaneous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

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

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

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

※ All DI are dry contact that has 3.3V of recognition voltage. When inputting close by SSR(Solid State Relay) or open-collector, connect collector (Drain) to R11.
3. Digital output 3a(524, 534, 544-513)
 - Fault output: Long/Short time delay, Instantaneous, Ground fault, UVR, OVR, UFR, OFR, rPower, Vunbal, 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.

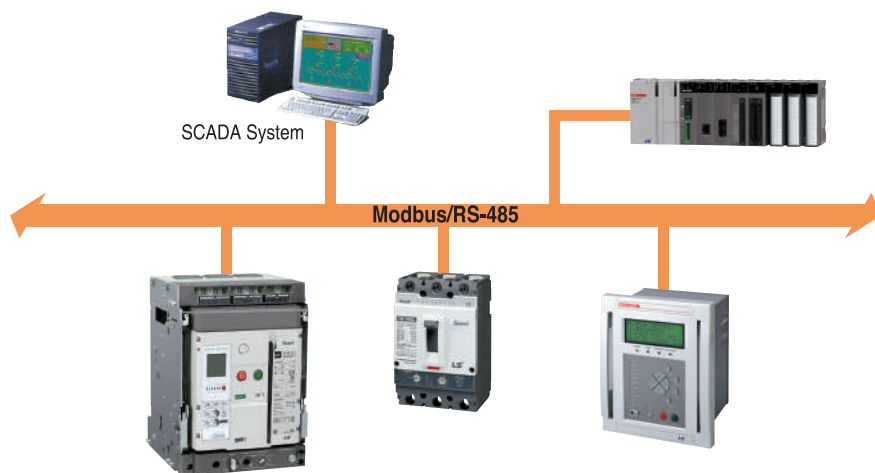


Trip Relay	Digital Output	Long time	Short time	Instantaneous	Ground	Overload Alarm	OVR	UVR	rPower	Vunbal	lunbal	OFR	UFR	OPR	Note
P,S type	DO1(524)	●	○	○	○	○	○	○	○	○	○	○	○	○	Programmable
	DO2(534)	○	●	●	○	○	○	○	○	○	○	○	○	○	
	DO3(544)	○	○	○	●	○	○	○	○	○	○	○	○	○	
A type	DO1(524)	●	×	×	×	Not available	Not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

Communication

Modbus/RS-485

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

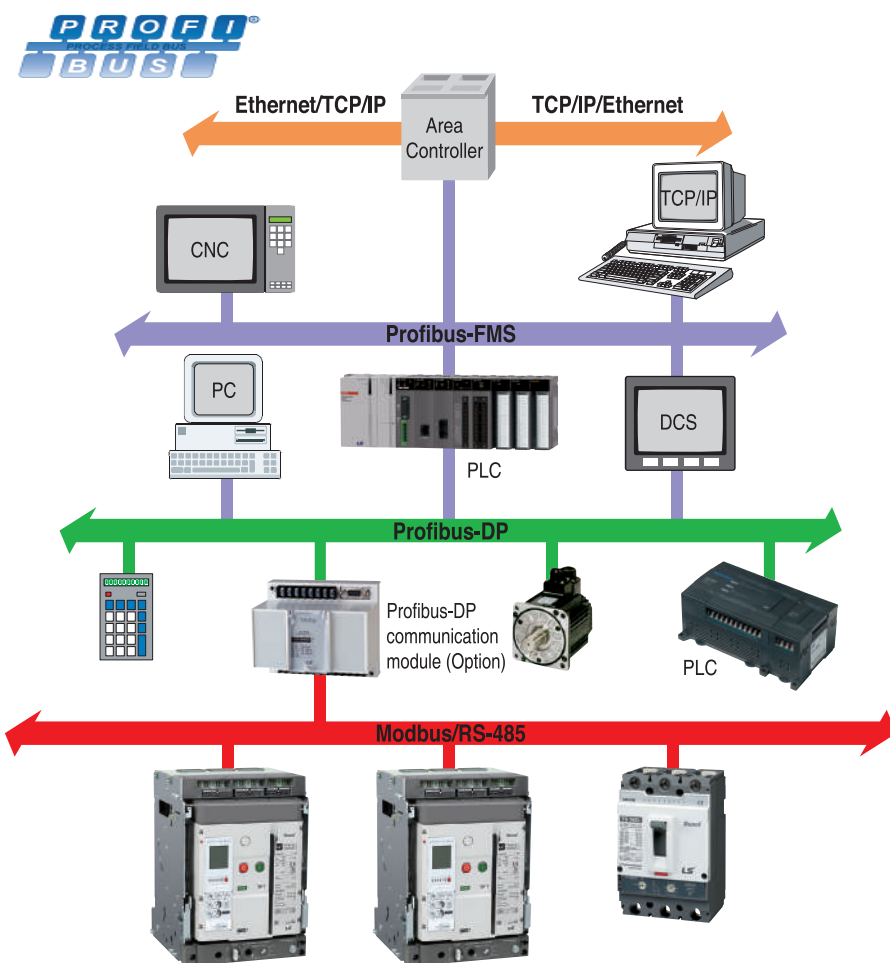


Profibus-DP

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



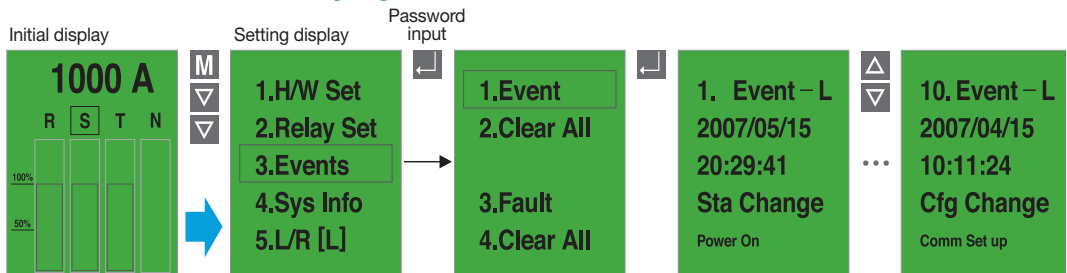
Profibus-DP communication module (Option)



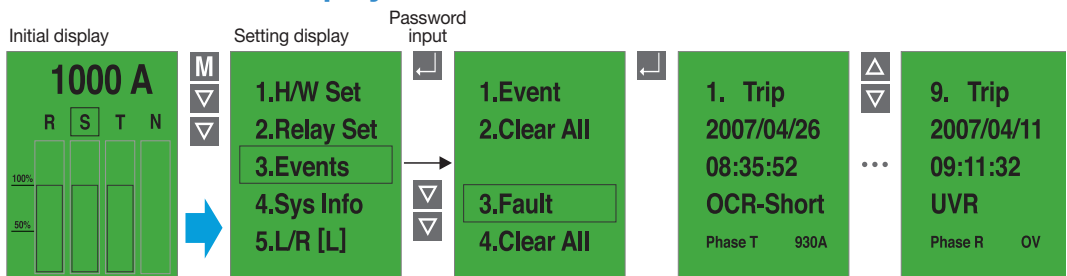
Event & Fault Recording (P, S type)

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

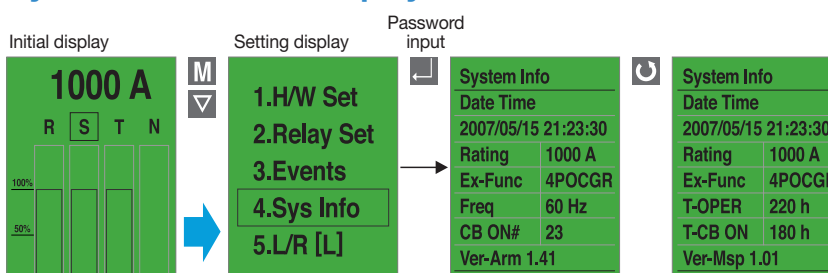


System Information

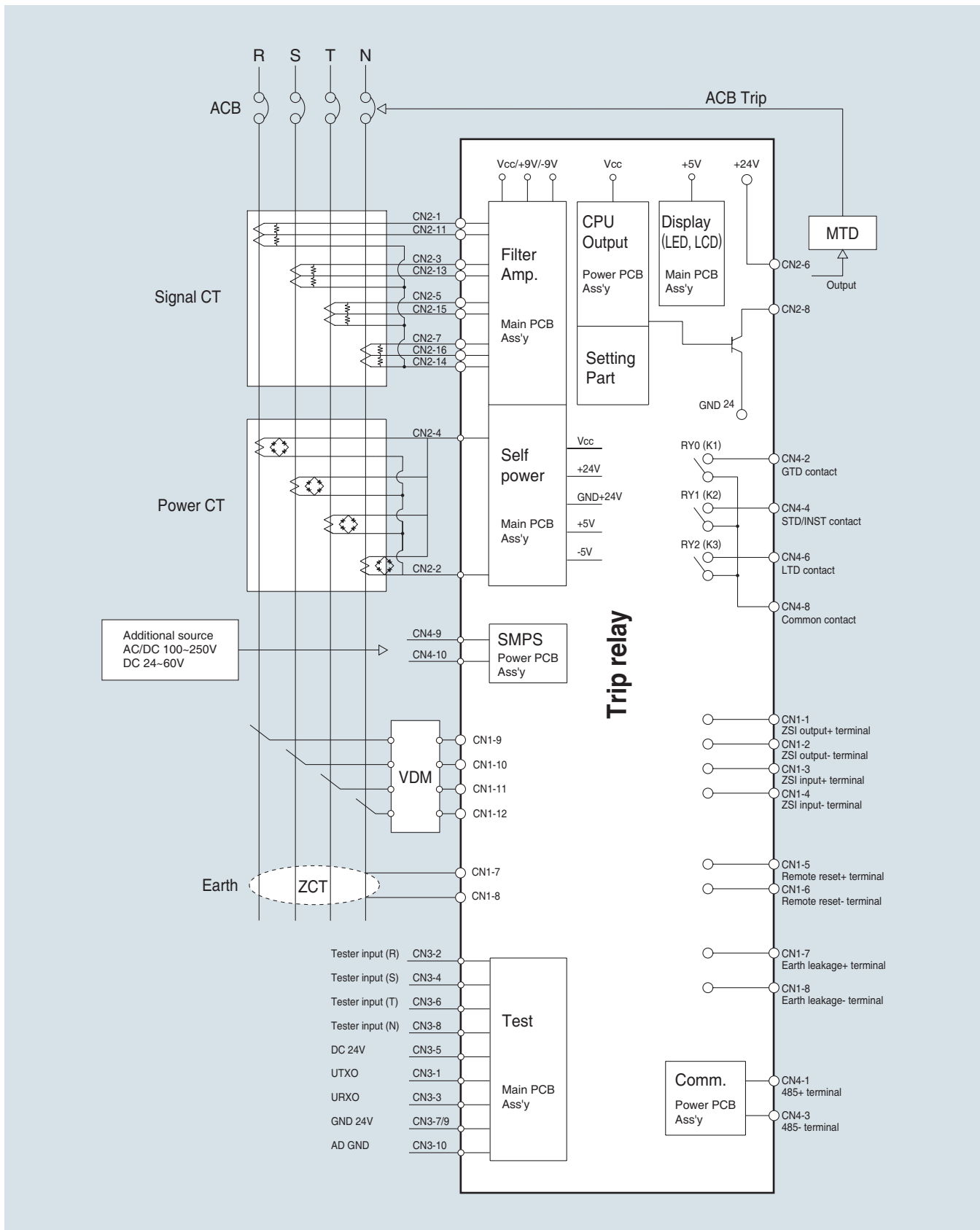
P and S type can indicate information as followings with the information of the ACB.

- 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

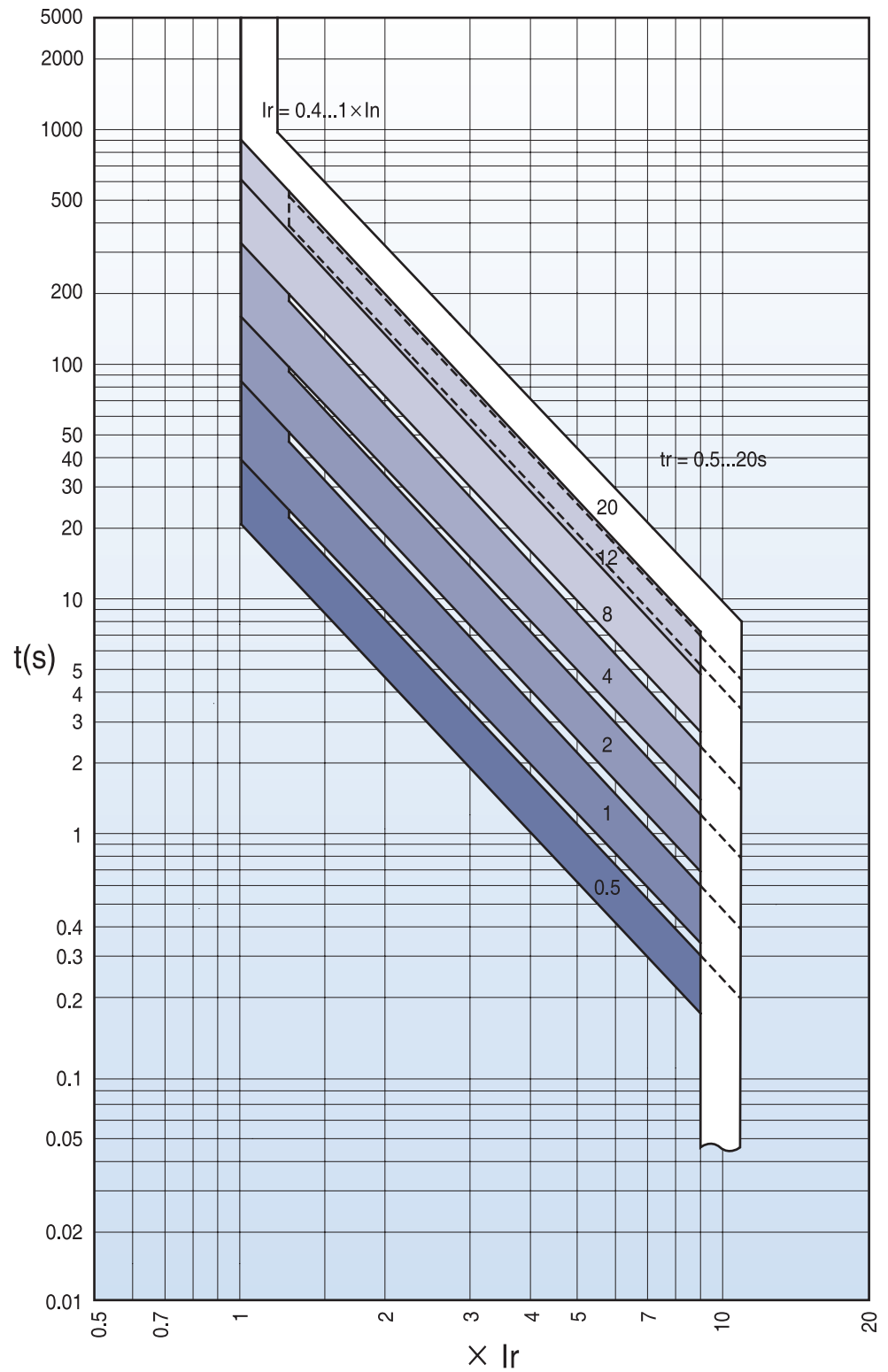


System block diagram

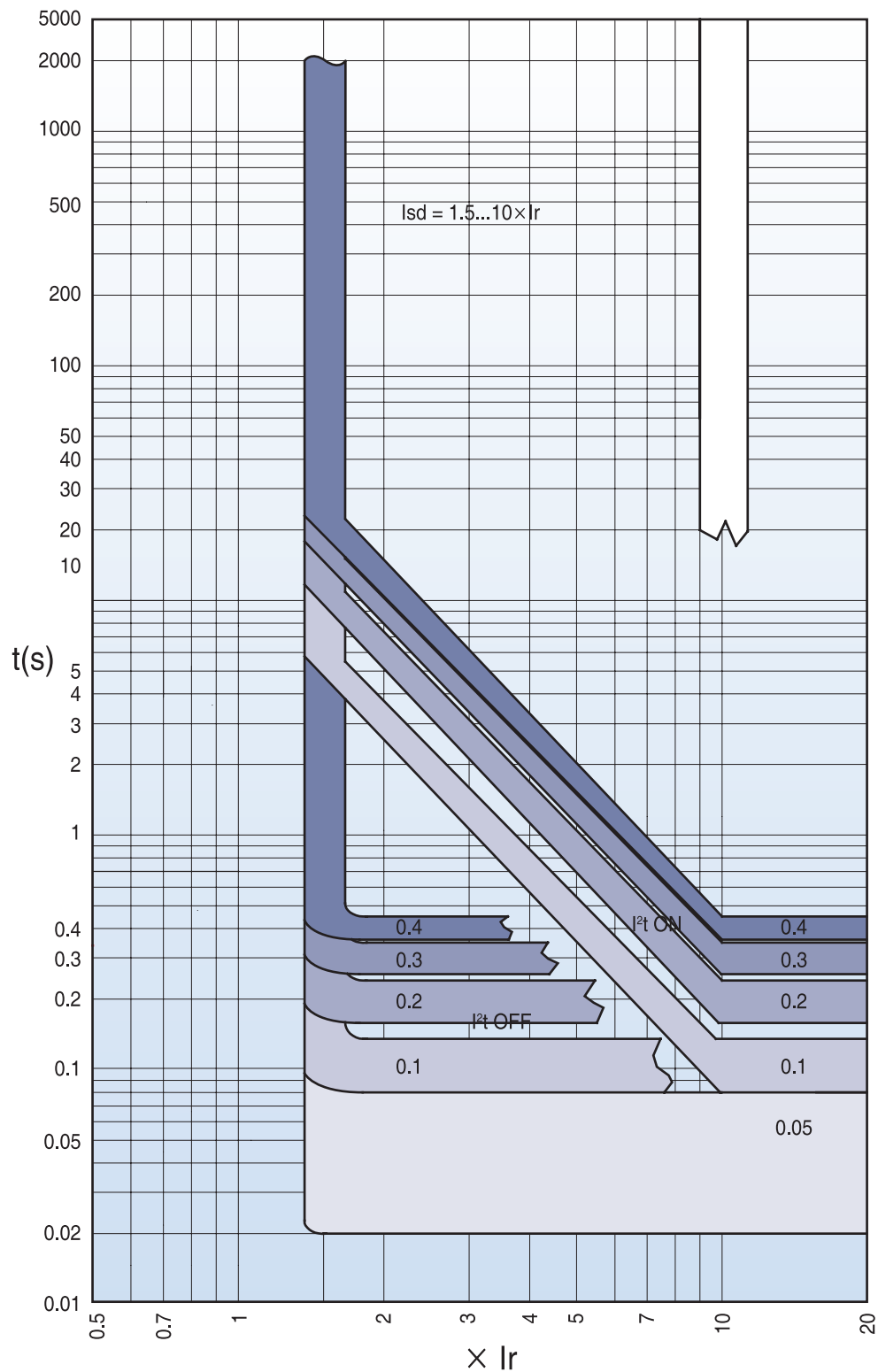


Characteristics curves

Long-time delay (L)

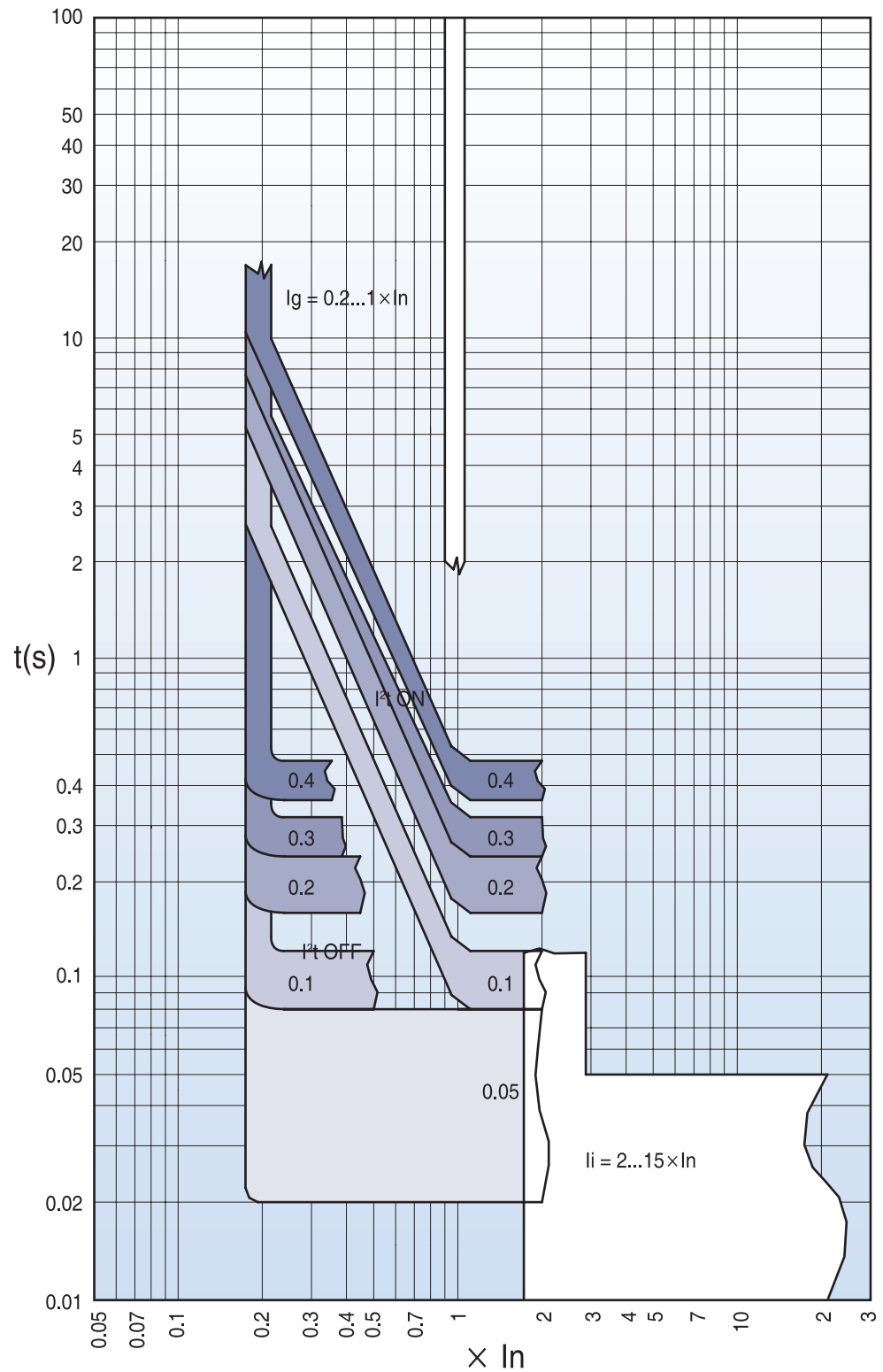


Short-time delay (S)

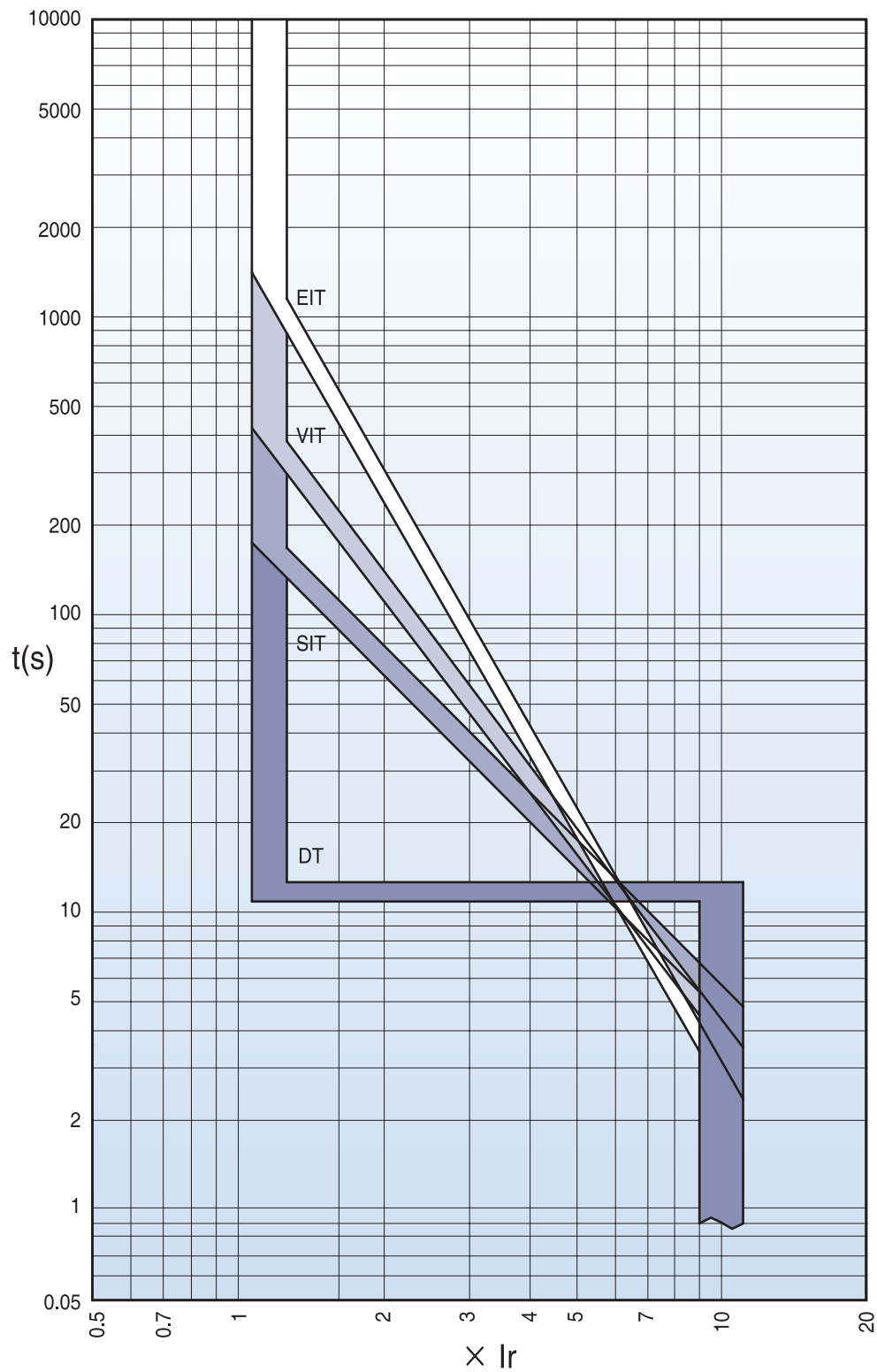


Characteristics curves

Instantaneous (I)
Ground fault (G)



IDMTL



Accessories

Main body



Mounting	Accessories		Supply category		Remark ^{Note)}	Page
			Standard	Option		
Internal	SHT 1	Shunt Coil	-	○	*	46
	SHT 2	Double Shunt Coil	-	○	*	47
	CC	Closing Coil	-	○	*	48
	M	Motor	-	○	*	49
	CS1	Charge Switch	-	○	*	
	UVT	Under Voltage Trip Device	-	○	*	50
	AL	Trip Alarm Contact	-	○	*	51
	MRB	Manual Reset Button	-	○	*	52
	RES	Remote Reset Switch	-	○	*	53
	RCS	Ready to Close Switch	-	○	*	54
	C	Counter	-	○	*	54
	FX	Auxiliary Switch	●	-	*	56
External	K1	Key Lock	-	○	*	55
	K2	Key Interlock Set	-	○	*	55
	B	On/Off Button Lock	-	○	*	56
	LH	Lifting Hook	-	○	-	57
	CTD	Condenser Trip Device	-	○	-	57
	DC	Dust Cover	-	○	-	59
	OT	OCR Tester	-	○	-	58
	A	Automatic Connector	●	-	*	

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

Cradle

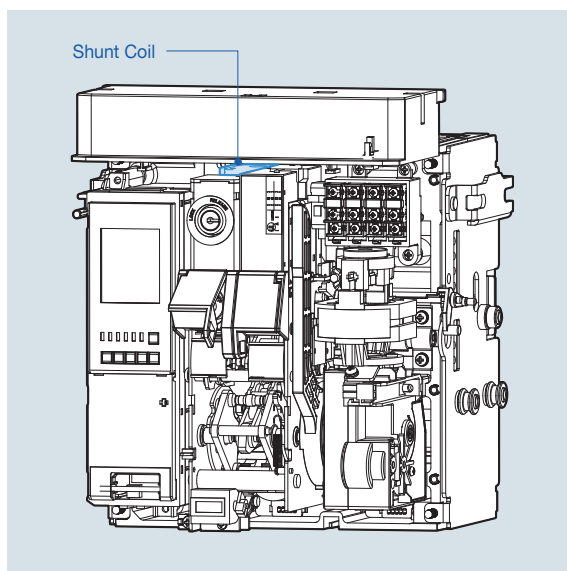


Mounting	Accessories		Supply category		Remark <small>Note)</small>	Page
			Standard	Option		
Trip relay	N	N type	-	○	*	24
	A	A type	-	○	*	26
	P	P type	-	○	*	28
	S	S type	-	○	*	30
	VM	Voltage Module	-	○	**	34
	ZCT	ZCT for the earth leakage	-	○		
Cradle	MI	Mechanical Interlock	-	○		61
	ST	Safety Shutter	-	○	*	62
	DF	Door Frame	-	○		62
	MIP	Miss Insertion Prevent Device	-	○		67
	MOC	Mechanical Operated Cell Switch	-	○		60
	CEL	Cell Switch	-	○		64
	DI	Door Interlock	-	○		65
	ZAS	Zero Arc Space (Arc Cover)	●	-	*	65
	SC	Safety Control Cover	●	-	*	
	RI	Racking Interlock	-	○		66
	PL	Pad Lock/Position Lock	●	-	*	66
	IB	Interphase Barrier	●	-	-	63
	UDC	UVT time delay controller	-	○		68
	ADP	Compatible Adapter	-	○	-	
Other	RPH	Reverse Phase ACB	-	○	-	
	VAD	Various Connection Type	-	○	-	
	RCO	Remote I/O	-	○	-	69
	PC	Profibus-DP comm. module	-	○	-	

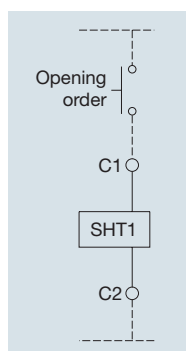
* Seperate purchasing is not allowed. Each item should be purchased with the main body.

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

Shunt Coil [SHT1]



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



Wiring Diagram

1. Rated voltage and characteristics of trip coil

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

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

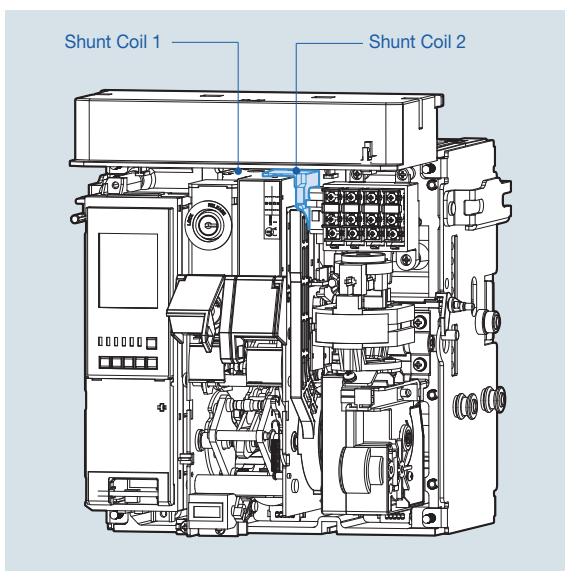
2. Specification of the wire

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

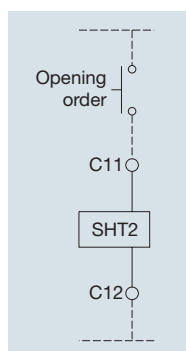
The maximum wire length

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

Double Shunt Coil [SHT2]



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



Wiring Diagram

1. Rated voltage and characteristics of trip coil

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

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

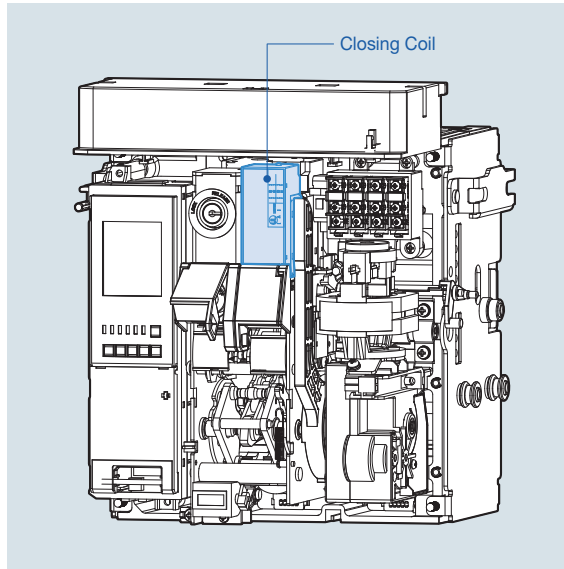
2. Specification of the wire

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

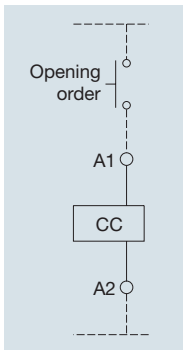
The maximum wire length

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

Closing Coil [CC]



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



Wiring Diagram

1. Rated voltage and characteristics of closing coil

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

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

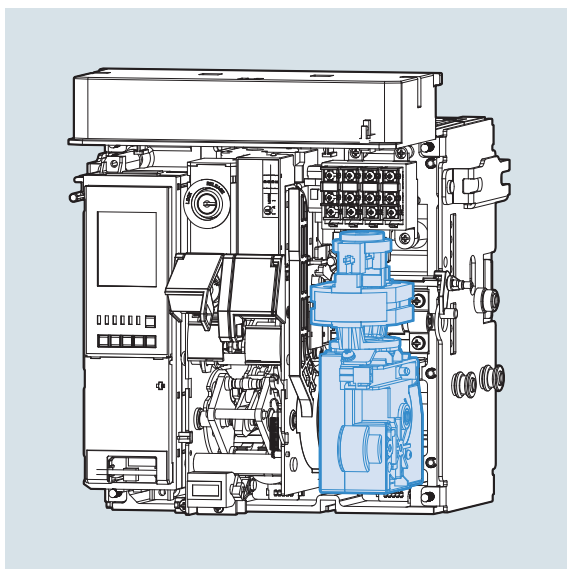
2. Specification of the wire

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

The maximum wire length

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

Motor [M]



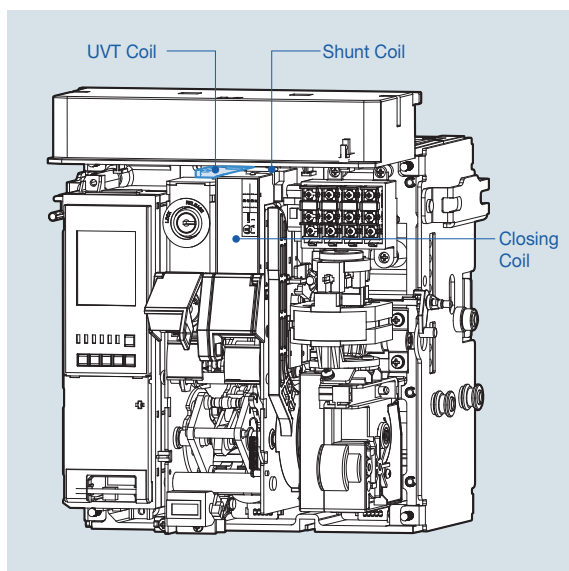
- Charge the closing spring of a circuit breaker by the external power source. Without the external power source, charge manually.
- Operating voltage range (IEC 60947) 85%~110%Vn

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

Charge Switch [CS1]

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

Under Voltage Trip Device [UVT]



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

1. Rated voltage and characteristics of UVT coil

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

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

2. Specification of the wire

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

The maximum wire length

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

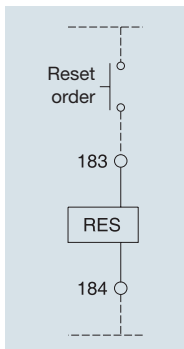


- It is a function which resets a circuit breaker manually when a circuit breaker is tripped by OCR.
- When a circuit breaker tripped by fault current, a mechanical trip indicator (MRB, Manual Reset Button) pops out from the front cover and the switch (AL) which sends control signal electrically is conducted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

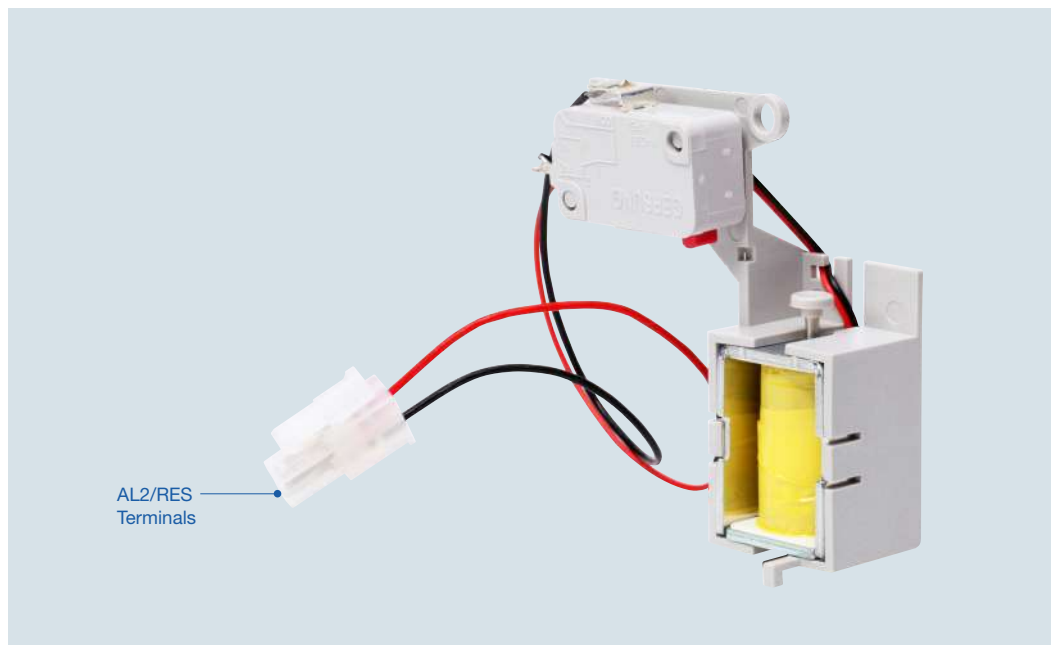


Wiring Diagram

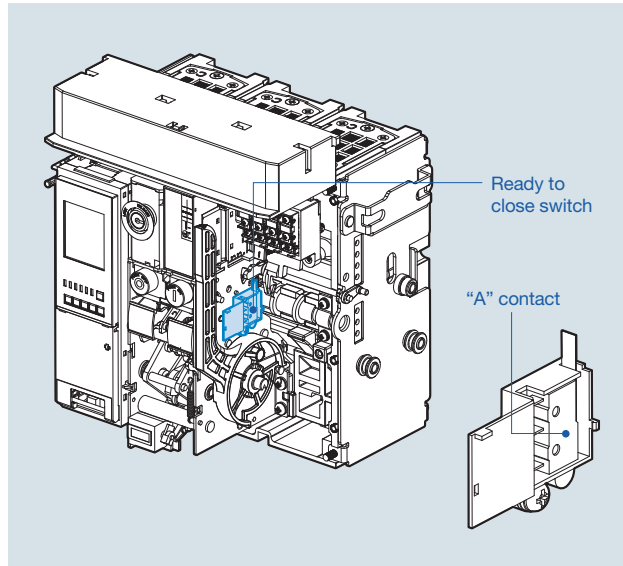
1. Rated voltage and rated current of RES

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

2. Appearance



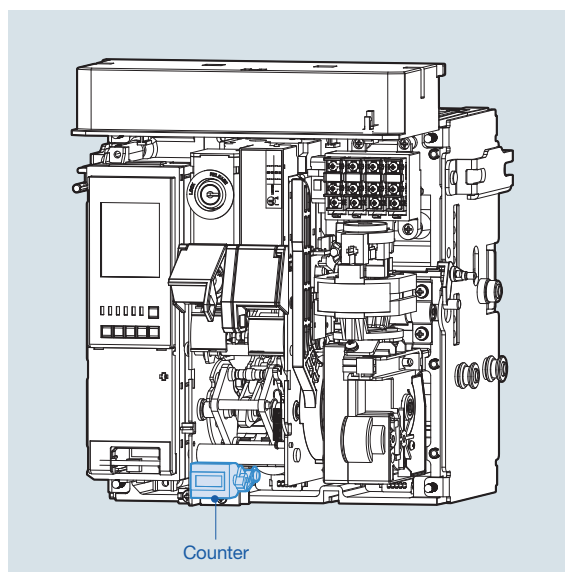
Ready to Close Switch [RCS]



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

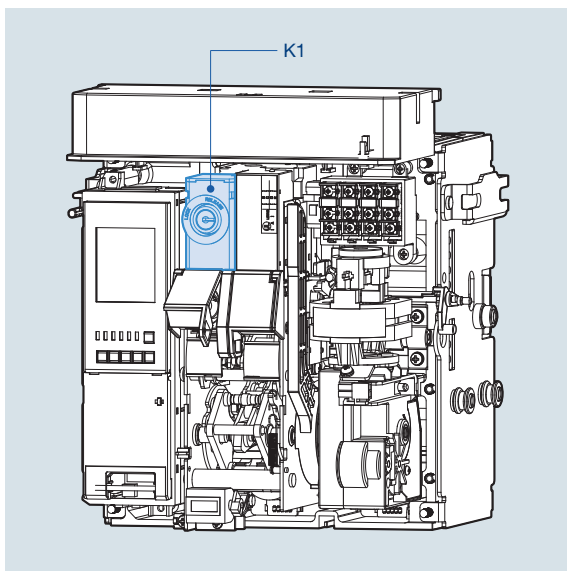
Classification	Standard		Remark
Contactor	250Vac	3A	
Capacity	250Vdc	5A	
	125Vdc	0.6 A	

Counter [C]



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

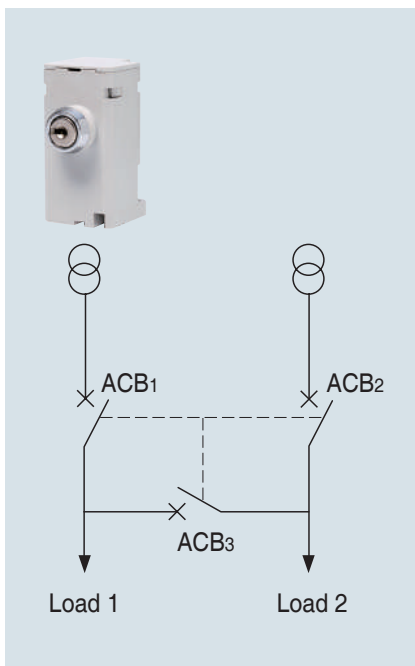
Key Lock [K1]



- 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

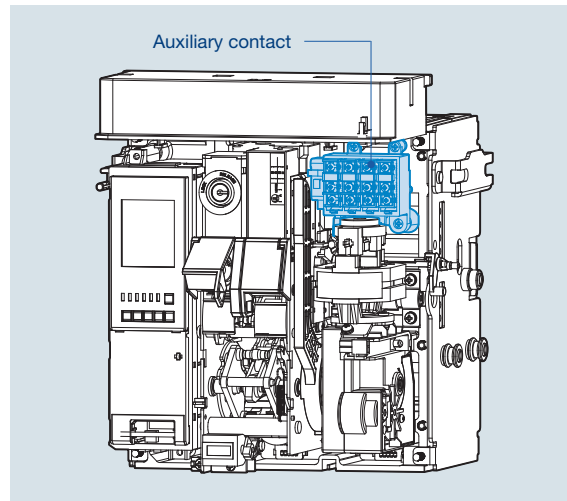


- 3 circuit breakers can be arranged for the continuous power supply to the load side and be interlocked mutually by using Key Lock embedded in each circuit breaker.

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.

Classification

Switch classification	Voltage division	Voltage (V)	Current (A)
			Resistive load
Standard	AC	125	5
	AC	250	3
	DC	125	0.6

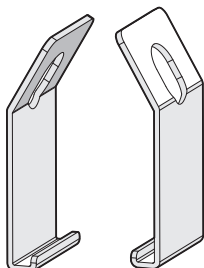
On/Off Button Lock [B]



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

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

Lifting Hook [LH]



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

Condenser Trip Device [CTD]

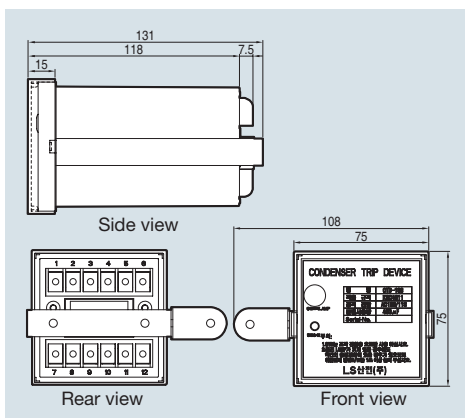


- It gets a circuit breaker tripped electrically within regular time when control power supply is broken down and is used with Shunt coil, SHT. In case there is no DC power, It can be used as the rectifier which supplies DC power to a circuit breaker by rectifying AC power.

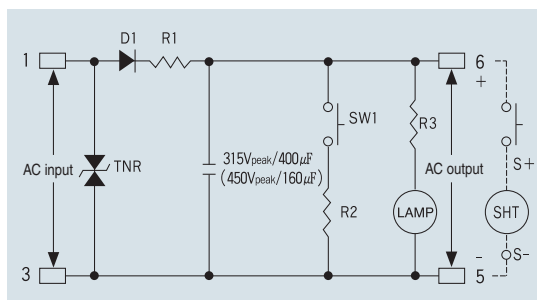
Ratings

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

External dimension



Circuit diagram



Accessories

OCR Tester [OT]



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

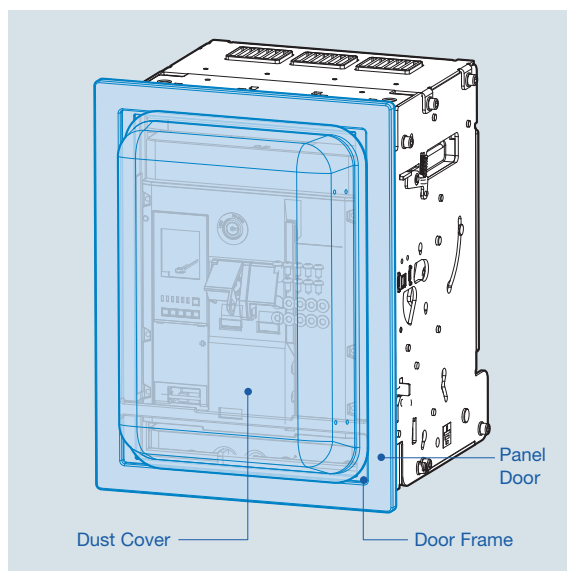
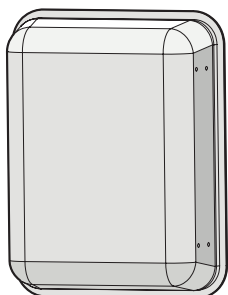
1. Maximum 17 times rated current can be inputted.
2. It is possible to enter the current value and phase on each of R/S/T/N
3. Frequency is adjustable.
4. It is available to test for long time delay/short time delay/instantaneous/ground fault.

Configuration



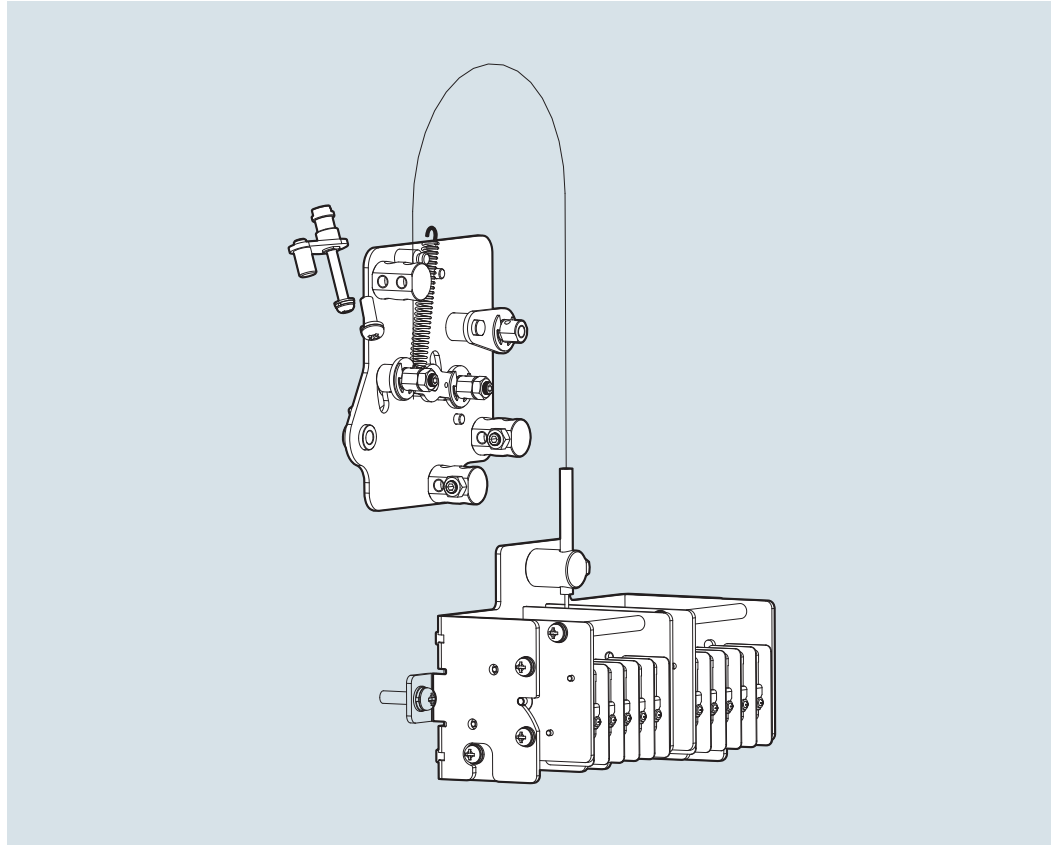
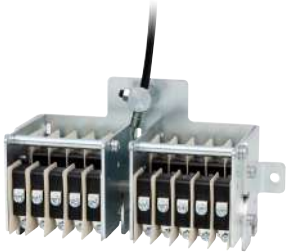
R S T N	R, S, T, N phase signal input
⤴ ⤵	Increase/Decrease signal input
ENT. ESC	Signal setting/Delete
START STOP	Waveform generation/Stop
50Hz 60Hz Hz	Select frequency

Dust Cover [DC] [IP54]



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

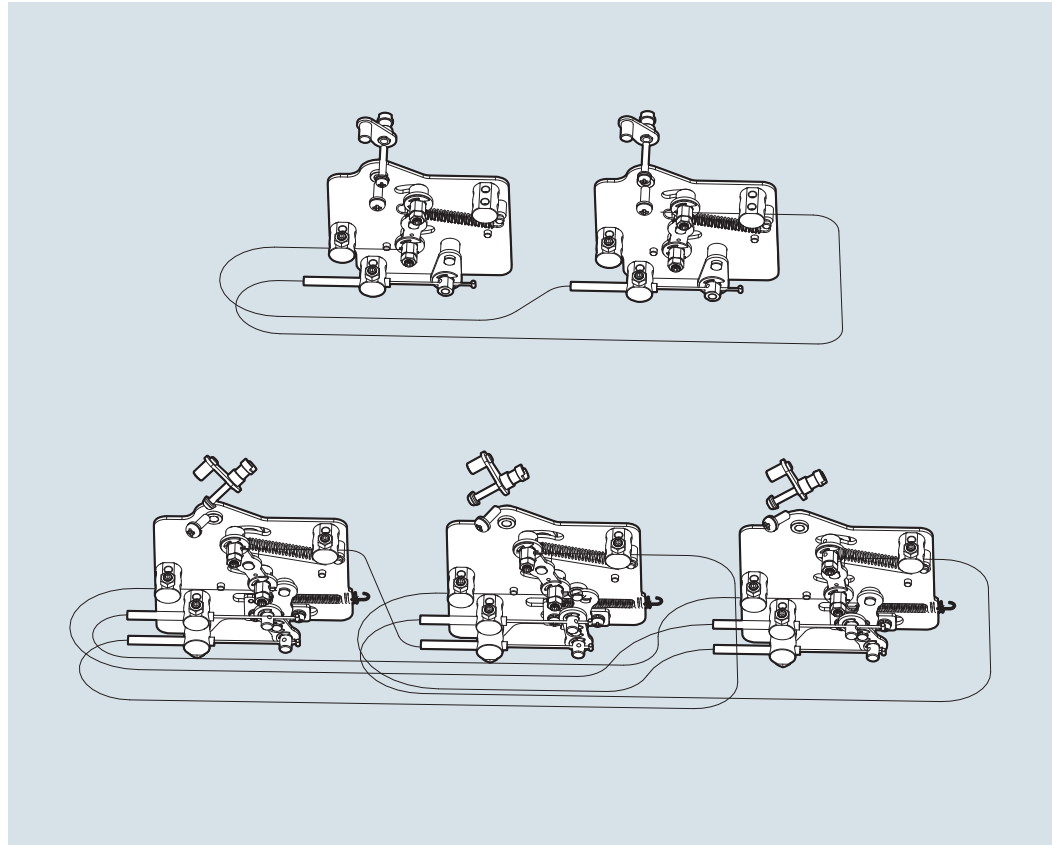
Mechanical Operated Cell Switch [MOC]



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

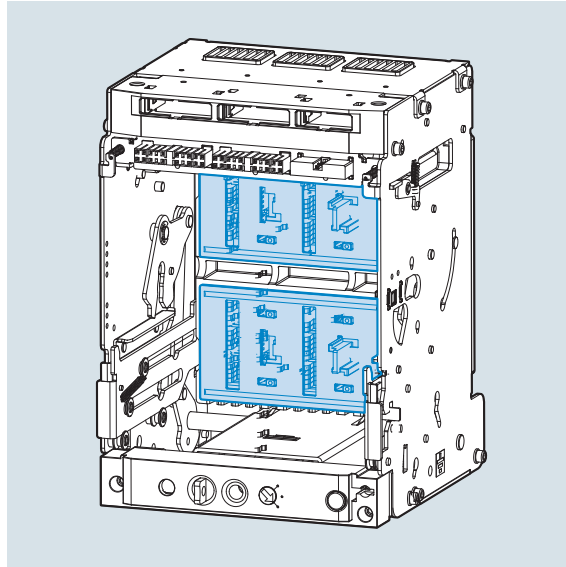
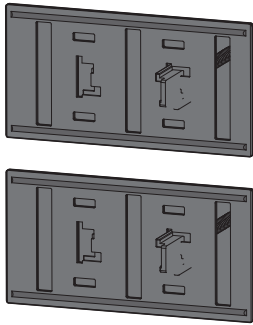


Mechanical Interlock [MI]



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

Safety Shutter [ST]



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

- Plate Shutter is a total of 2 models

The types of safety shutter plate

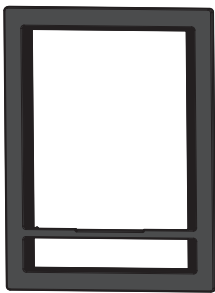
3P



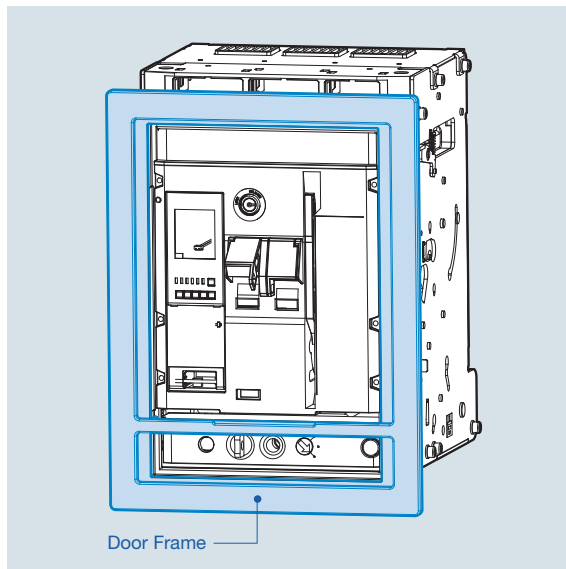
4P



Door Frame [DF] [IP3X]

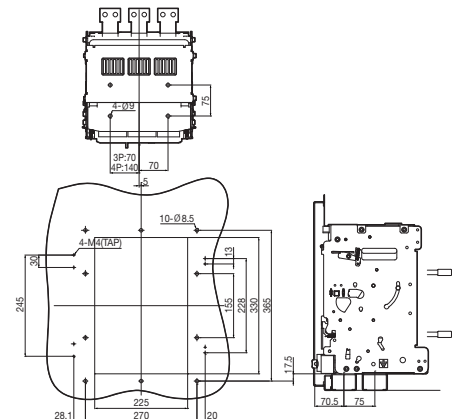


Draw-out type



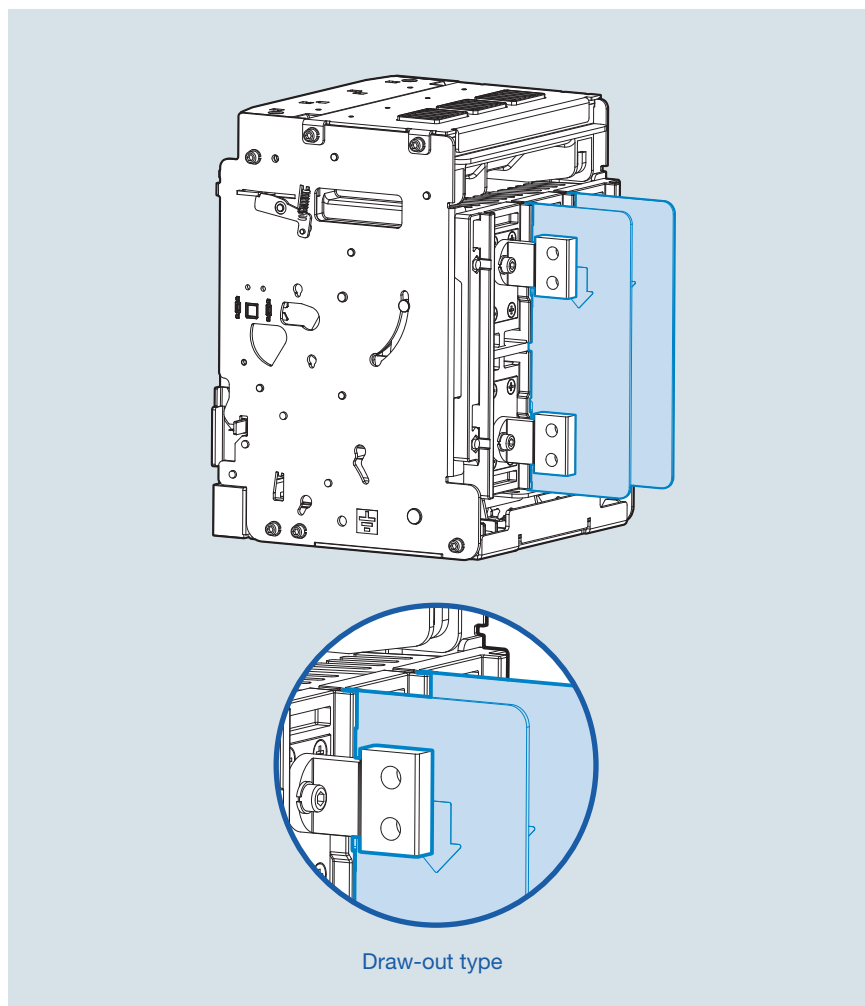
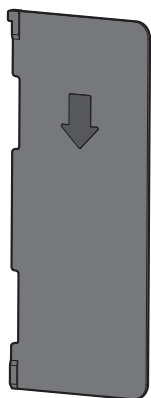
Door Frame

- 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.



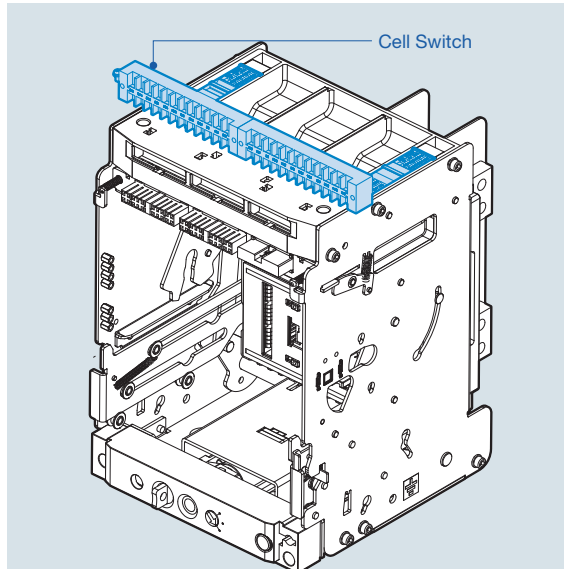
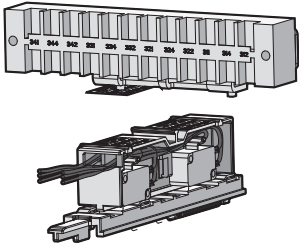
Switchboard door cut dimension

Interphase Barrier [IB]



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

Cell Switch [CEL]



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

<Contact configuration>

4C: 1Disconnected +1Test +2Connected

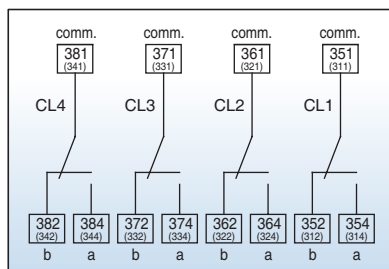
8C: 2Disconnected +2Test +4Connected

※ Contact configuration can be changeable if necessary.

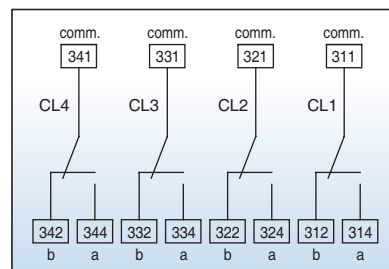
Operating characteristic

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	10	10
	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

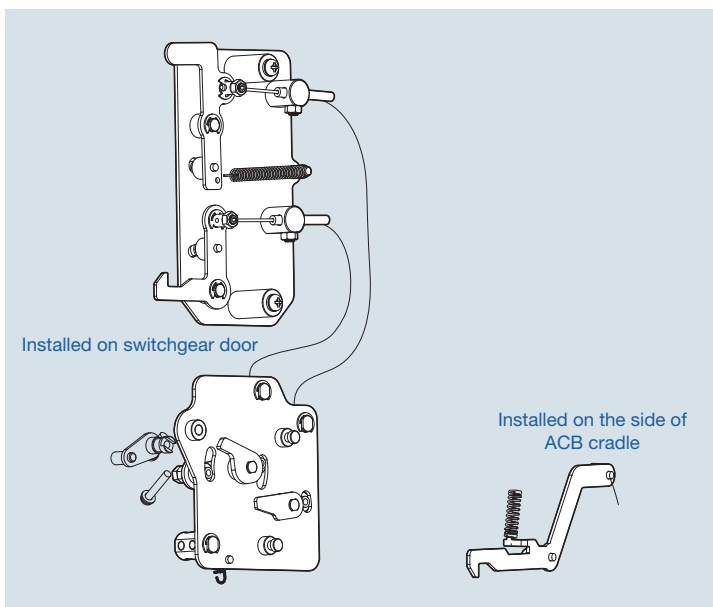
Door Interlock [DI]



Wite type



Catch type



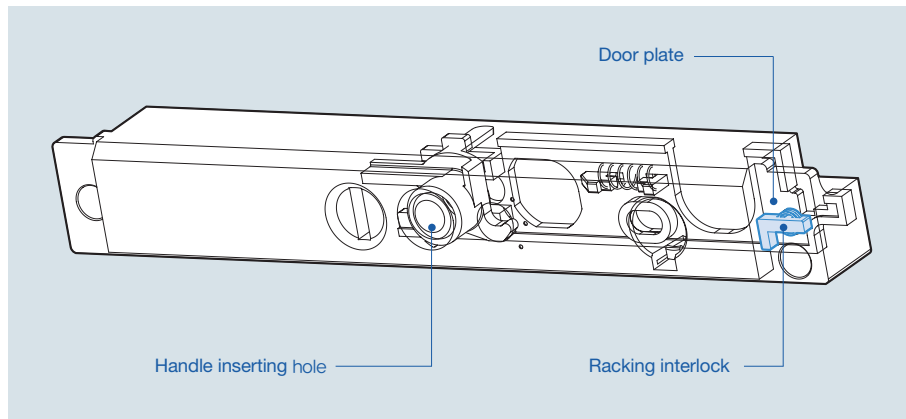
- It is a safety device which does not allow the panel door to open when a circuit breaker is in the "ON" position.

Zero Arc Space [ZAS]



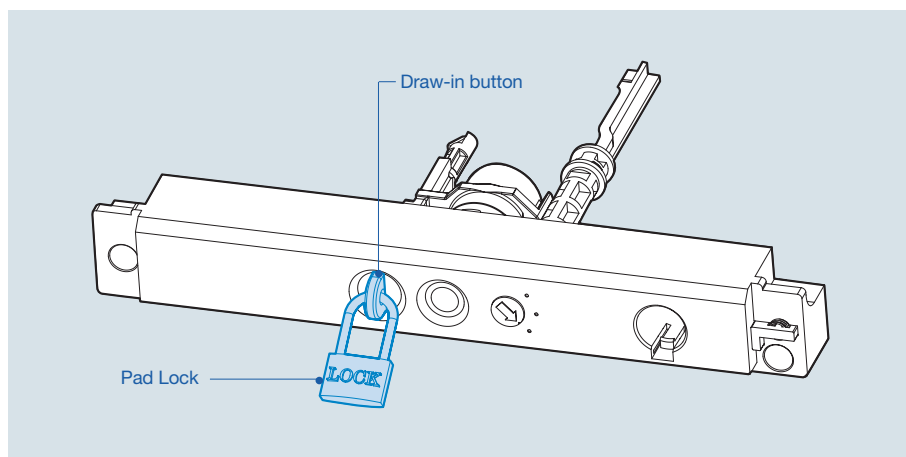
- Arc which may arise while breaking fault current is extinguished first by Arc chute in main body of circuit breaker and then completely extinguished by Arc cover. By preventing arc from exposing to the outside, it protects itself from all kinds of accidents.

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.

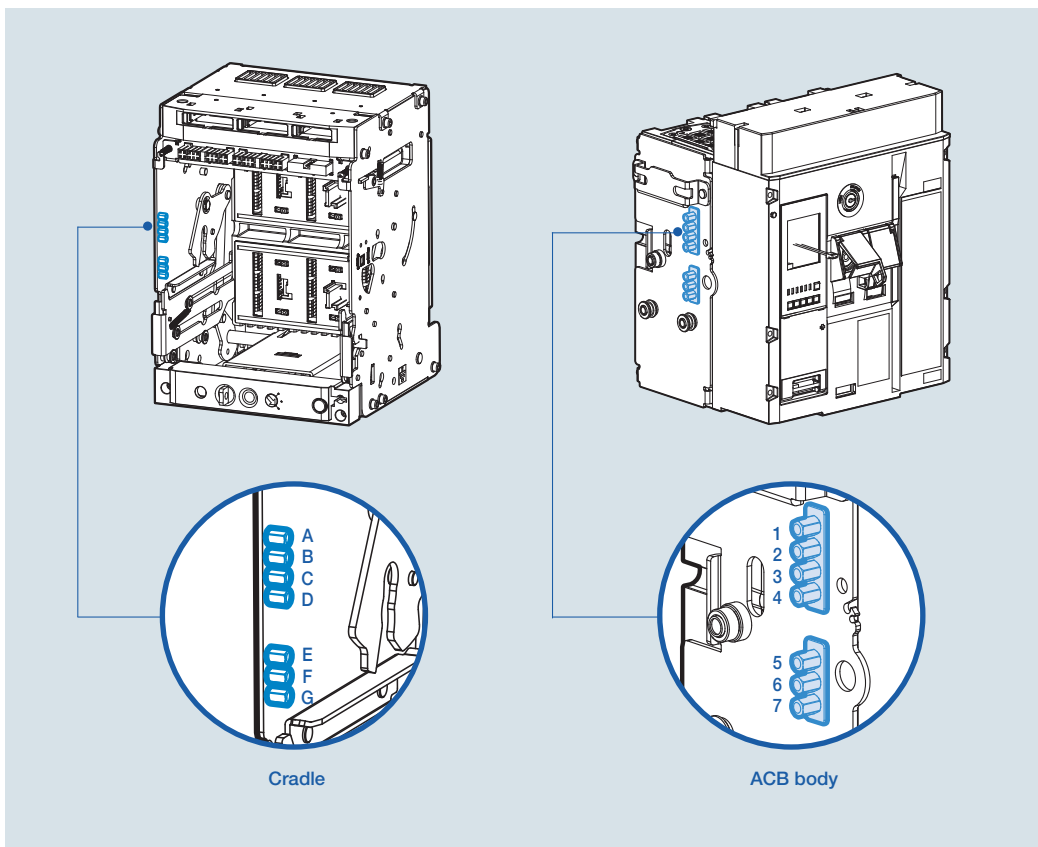
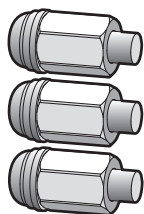
Pad Lock / Position Lock [PL]



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. ($\varnothing 5 \sim \varnothing 6$)

Miss Insertion Prevent Device [MIP]



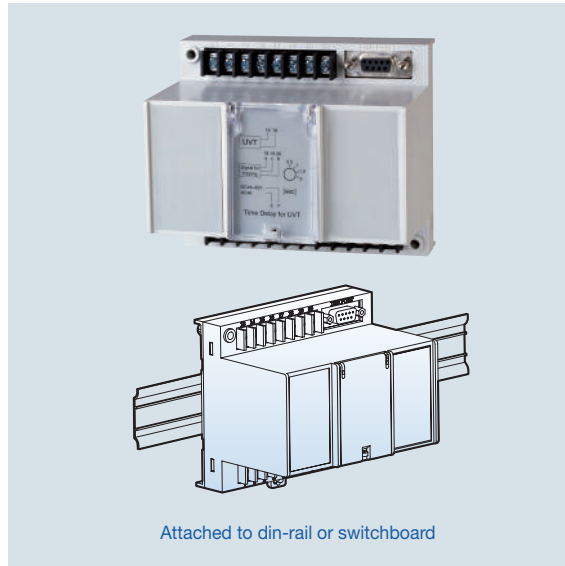
- When the main body of ACB is inserted to the cradle, if the ratings of ACB does not match with cradle, it mechanically prevents ACB from being inserted into cradle of ACB.
- The installation method is variable according to ratings.

	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]



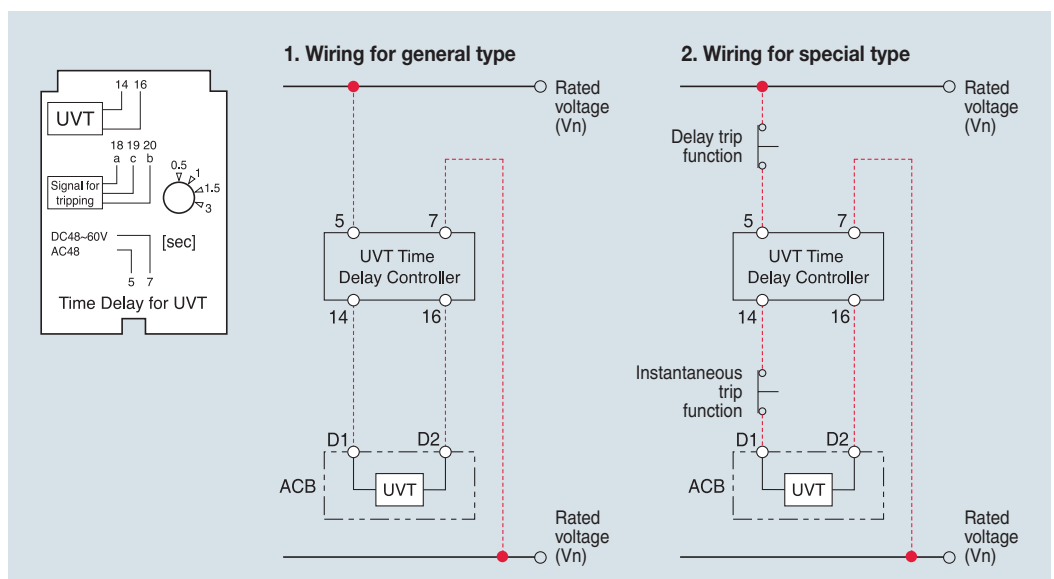
- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown. There are two types, Instantaneous type and time delay type.
- Instantaneous type: only available with UVT coil.
- Time delay type: available by connecting UVT coil and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

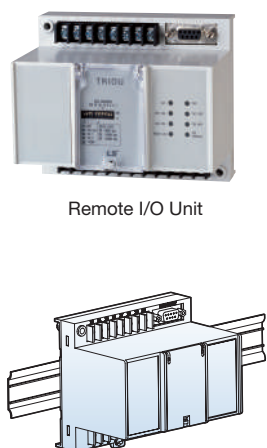
Note) Operating voltage range is the min. rated standard for each rated voltage (Vn).

2. Wiring

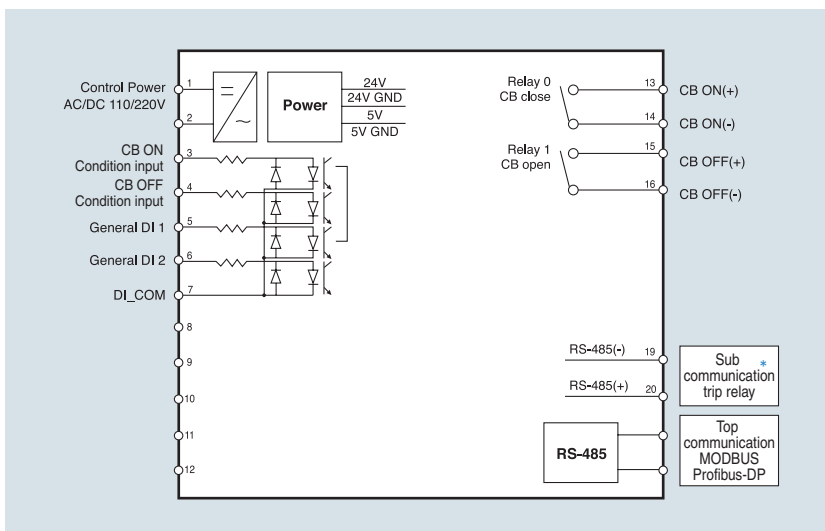


* The wiring presented with red color should be set by users.

Remote I/O Unit [RCO]

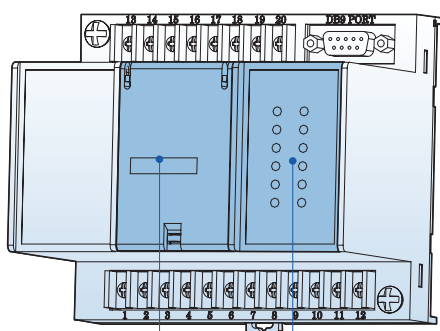


Remote I/O Unit



*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 θ =0.4, L/R=7ms)
	Max. switching capacity	1880VA, 150W	



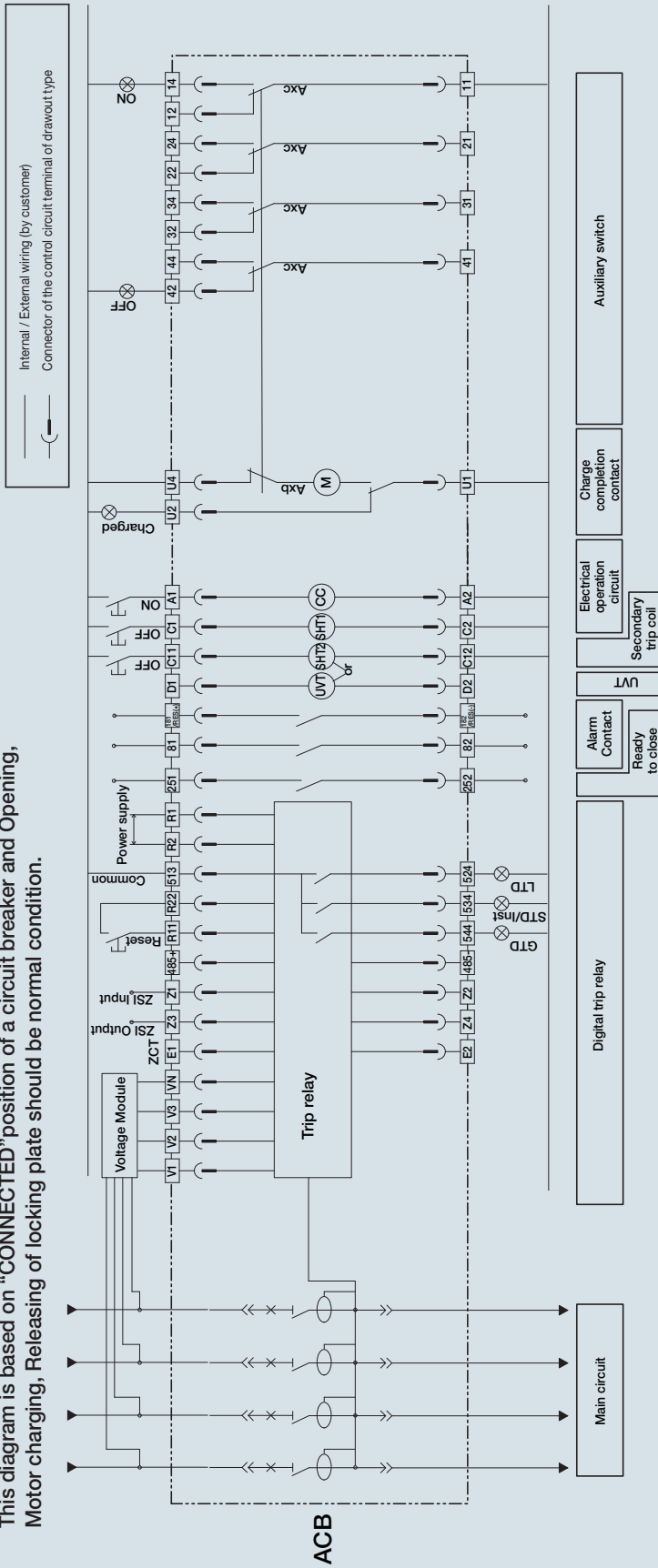
- Baud rate setting
- Comm. address setting
- Temperature setting

- 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

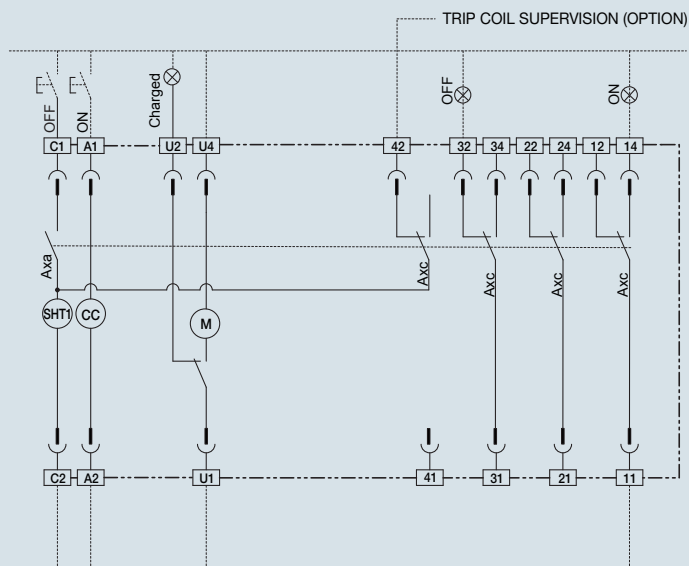
T1	12	~	41	42	Auxiliary switch "b" contact
T1	14	~	41	44	Auxiliary switch "a" contact
U1	U2				Charge completion signal
U1	U4				Motor charging
A1	A2				Closing coil
C1	C2				Shunt trip
C11	C12				2nd shunt trip

Accessory code description

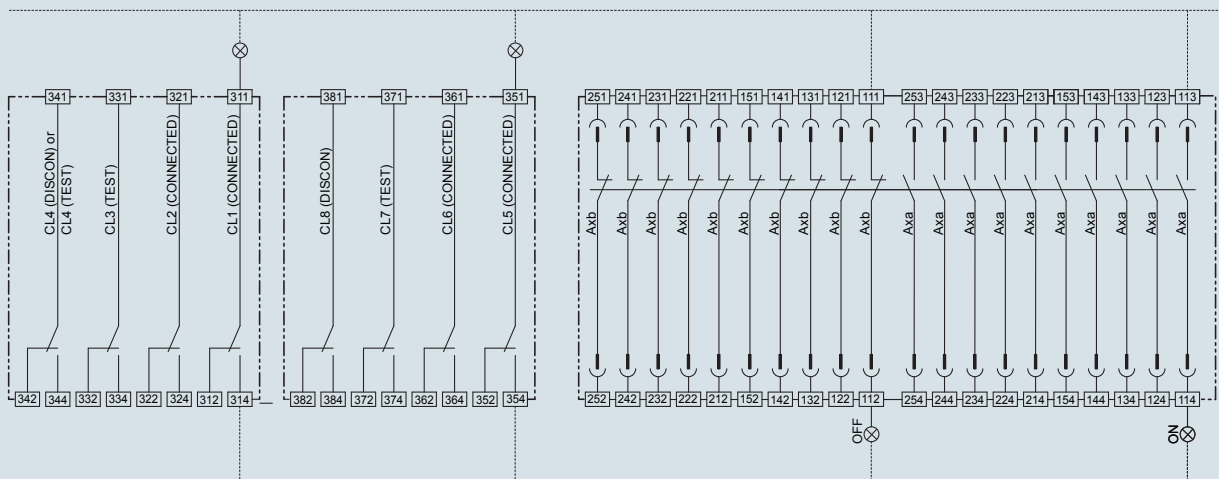
Axc	Auxiliary switch
LTD	Long time delay trip indicator
STD/Inst	Short time delay/instantaneous
GTD	Ground fault trip indicator
CL1-CL4	Cell switch
(M)	Motor
(CC)	Closing coil
(SFT)	1st Shunt coil
(SFT2)	2nd Shunt coil
(UVT)	UVT coil

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



Electrical operation circuit Charge completion contact Auxiliary switch



Cell switch 4C Cell switch 8C (4C Addition) MOC (Mechanical Operated Cell switches)

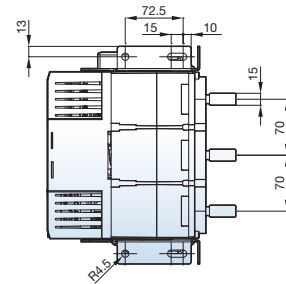
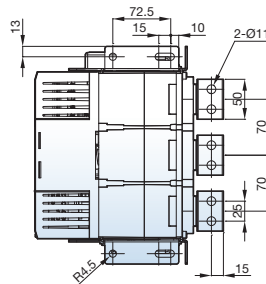
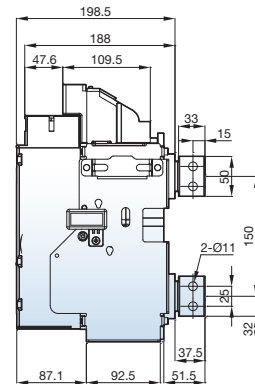
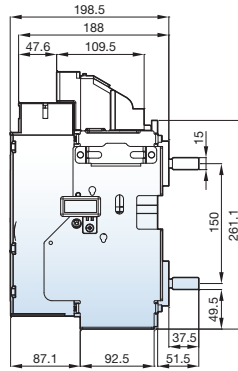
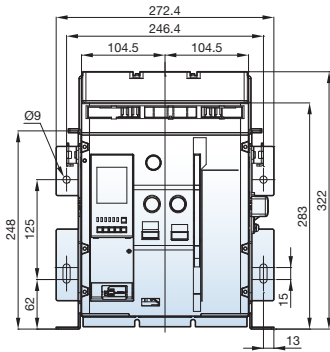
Terminal symbol

311 ~ 344	Cell switch
111 ~ 254	MOC

Dimensions

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

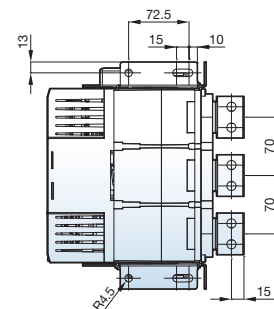
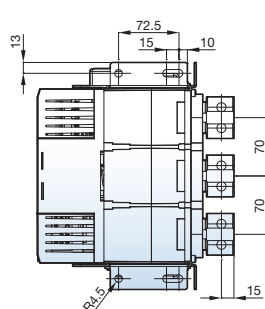
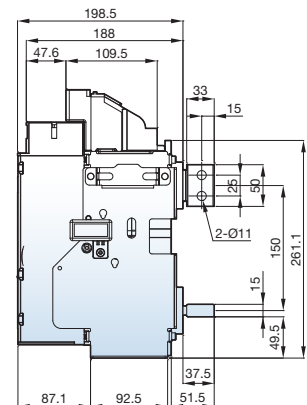
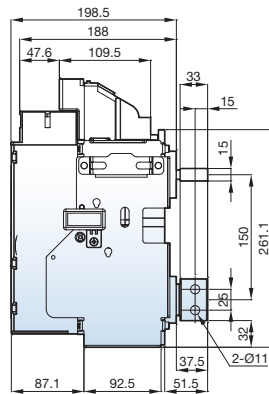
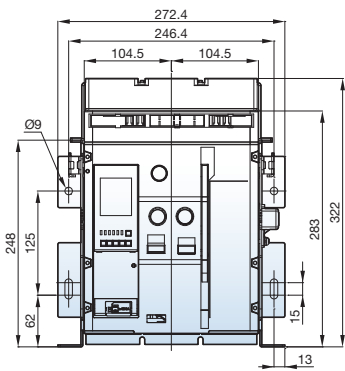
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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



M Type

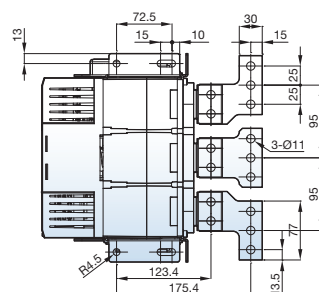
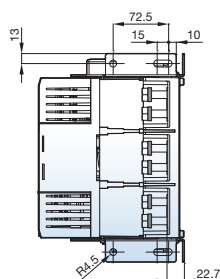
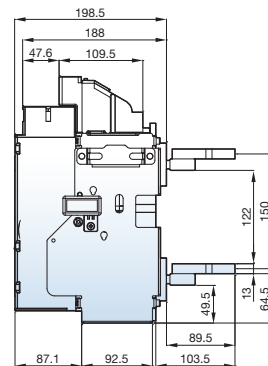
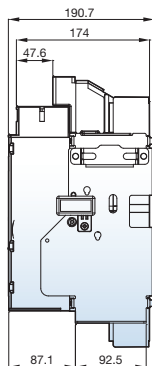
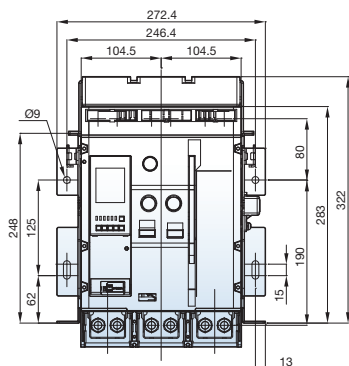
(Upper-Horizontal type, Lower-Vertical type)

N Type

(Upper-Vertical type, Lower-Horizontal type)

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

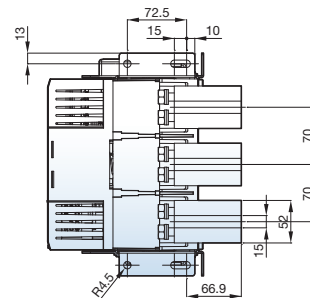
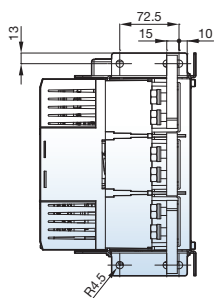
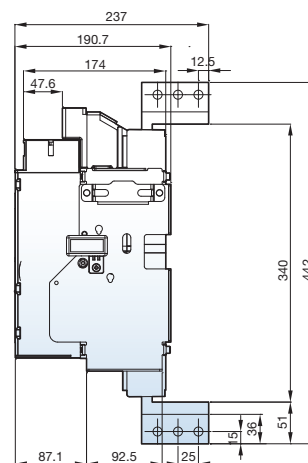
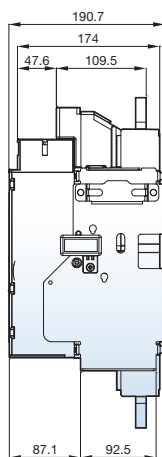
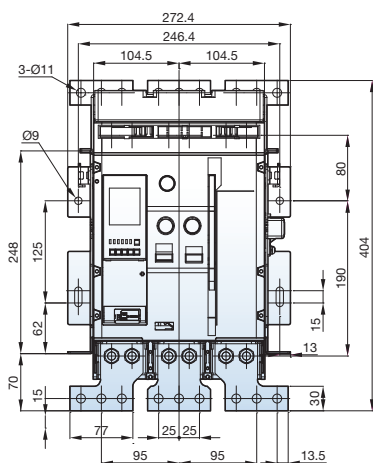
(Unit : mm)



P Type (Plane type)

R Type (Spread type)

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



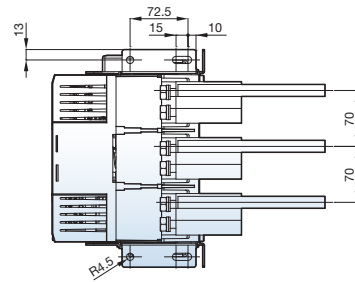
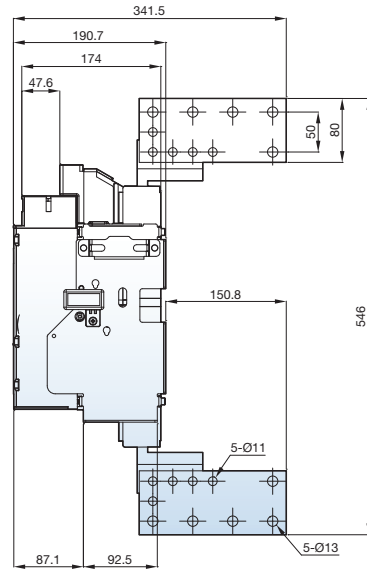
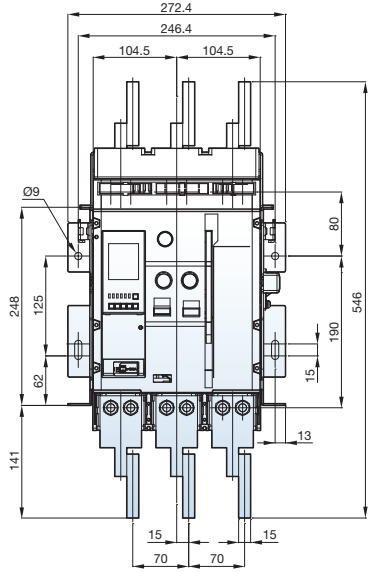
Z Type (Plane spread type)

T Type (Plane vertical type)

Dimensions

• 3P [Fixed X: Cable lug type]

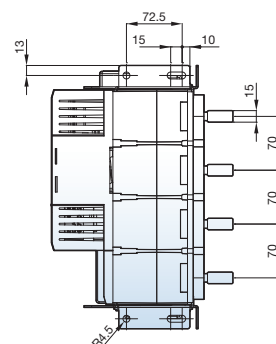
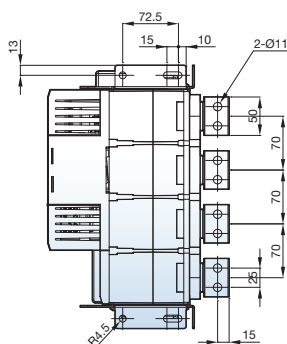
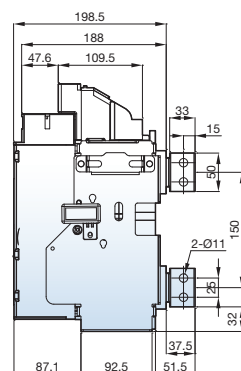
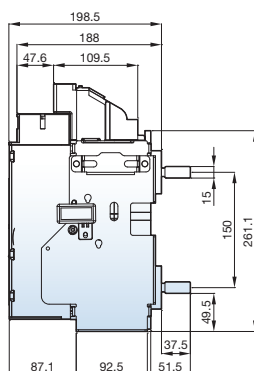
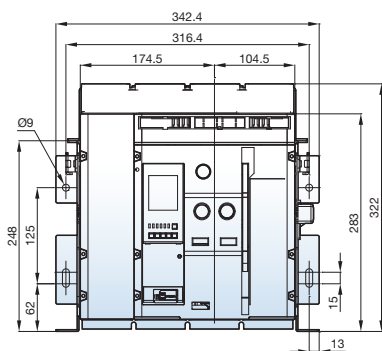
(Unit : mm)



X Type (Cable lug type)

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

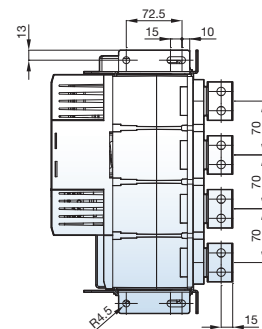
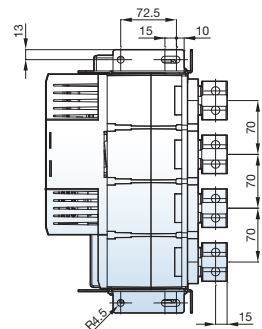
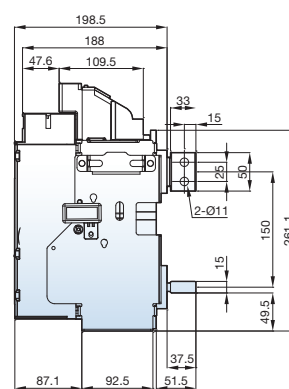
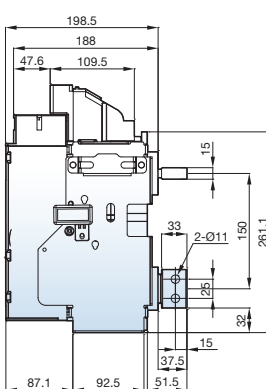
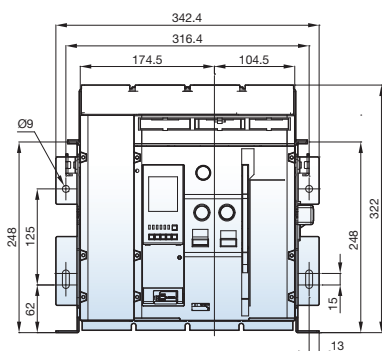
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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



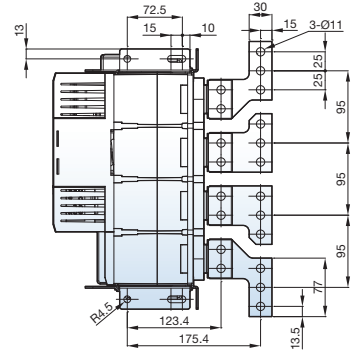
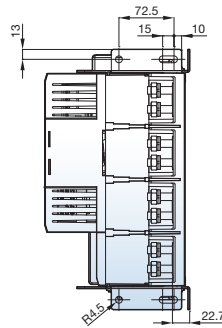
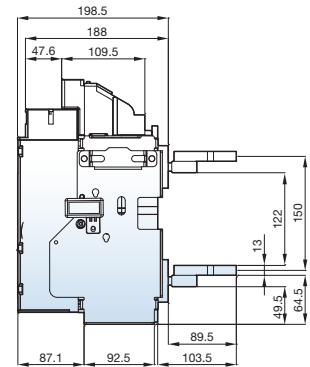
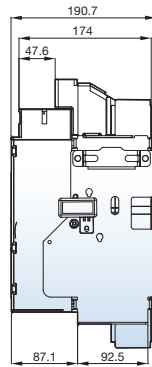
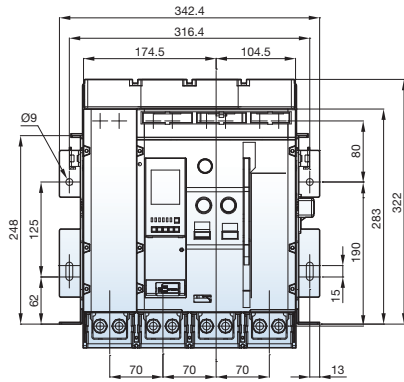
M Type
(Upper-Horizontal type, Lower-Vertical type)

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

Dimensions

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

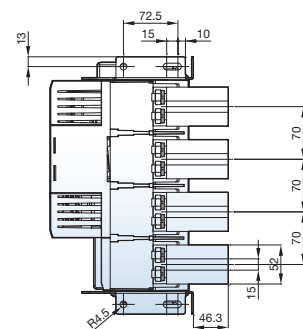
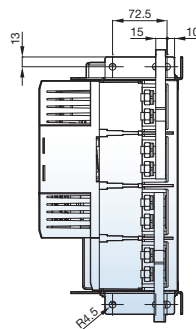
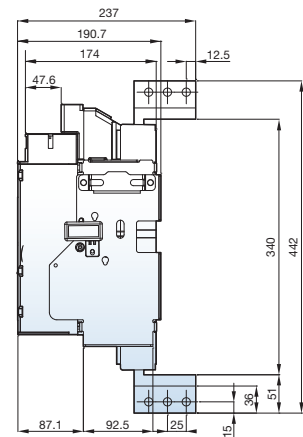
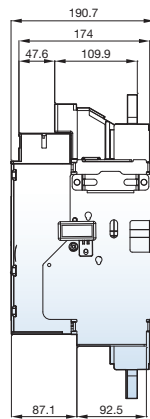
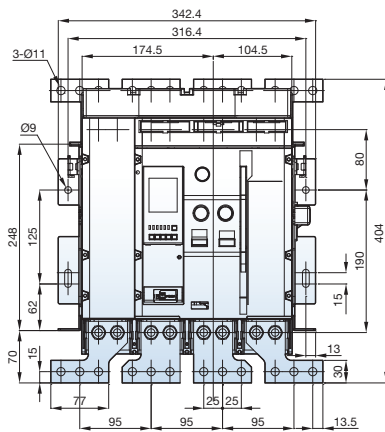
(Unit : mm)



P Type (Plane type)

R Type (Spread type)

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

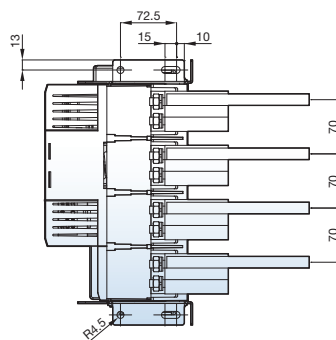
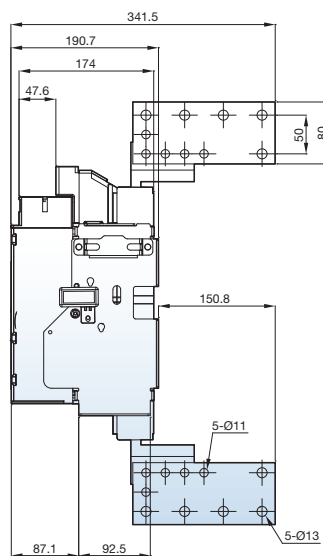
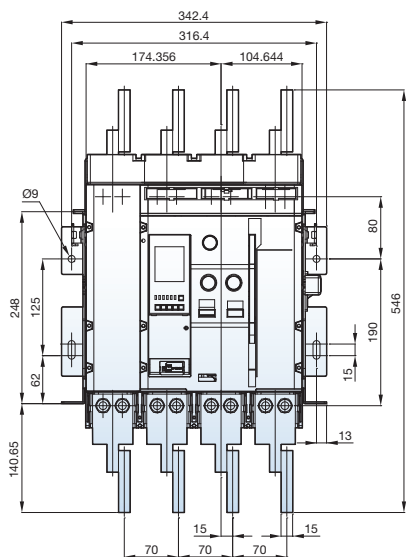


Z Type (Plane spread type)

T Type (Plane vertical type)

• 4P [Fixed X: Cable lug type]

(Unit : mm)

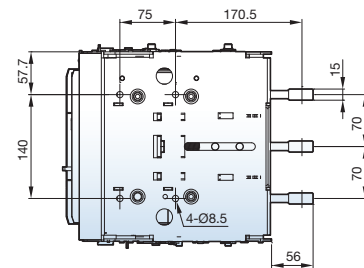
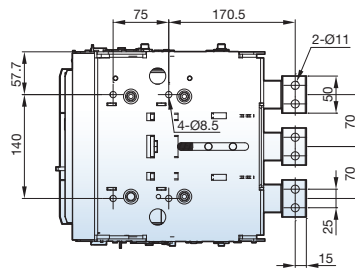
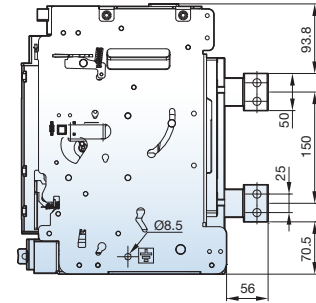
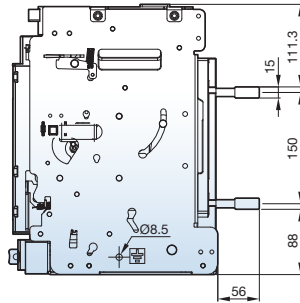
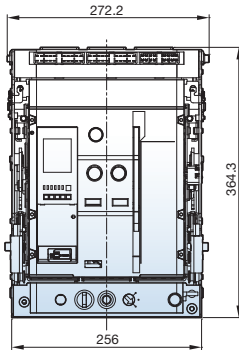


X Type (Cable lug type)

Dimensions

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

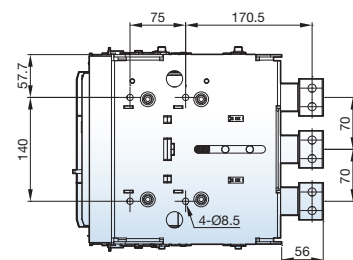
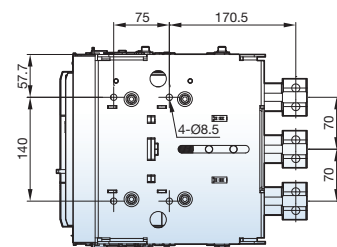
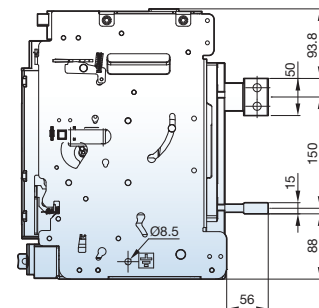
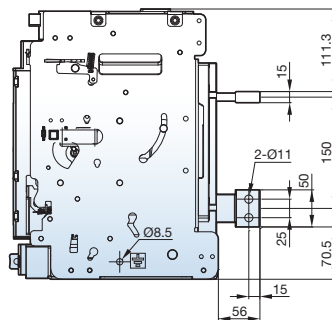
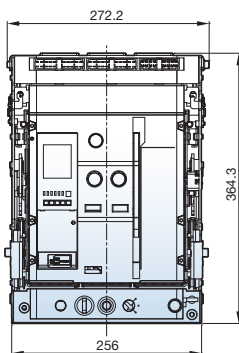
(Unit : mm)



H Type (Horizontal type)

V Type (Vertical type)

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

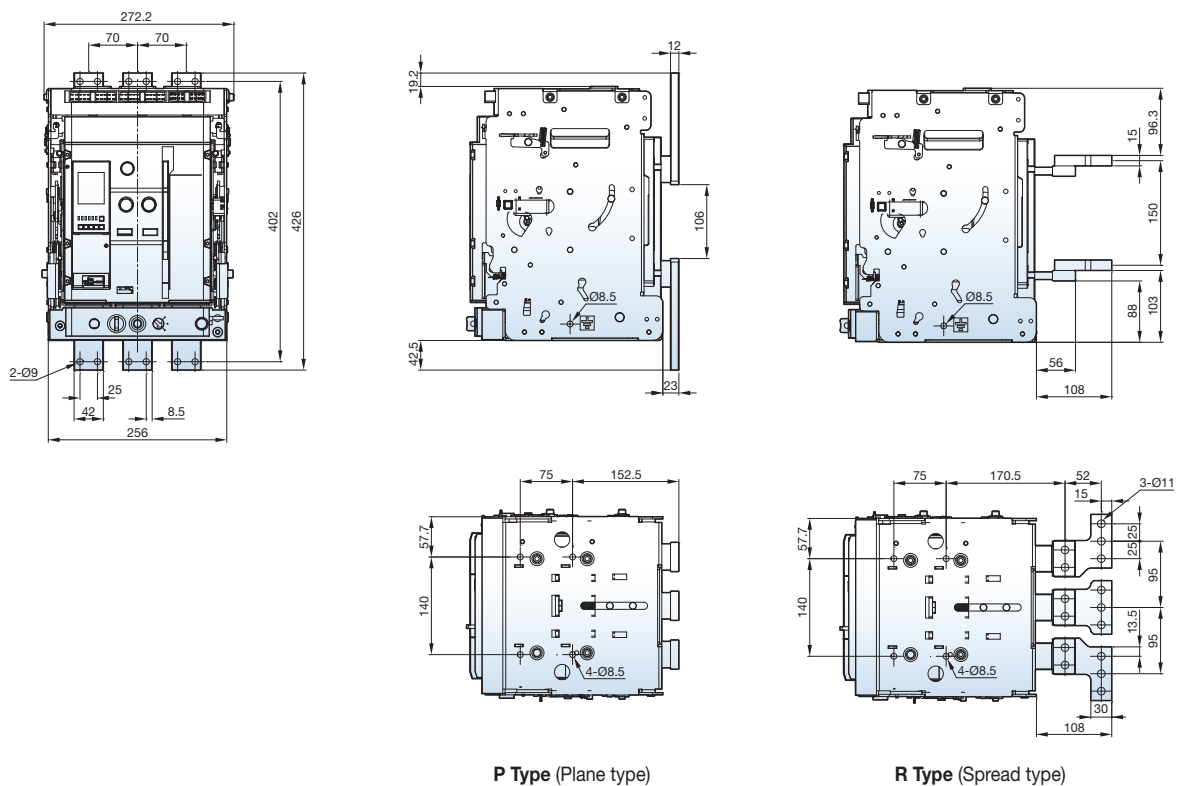


M Type
(Upper-Horizontal type, Lower-Vertical type)

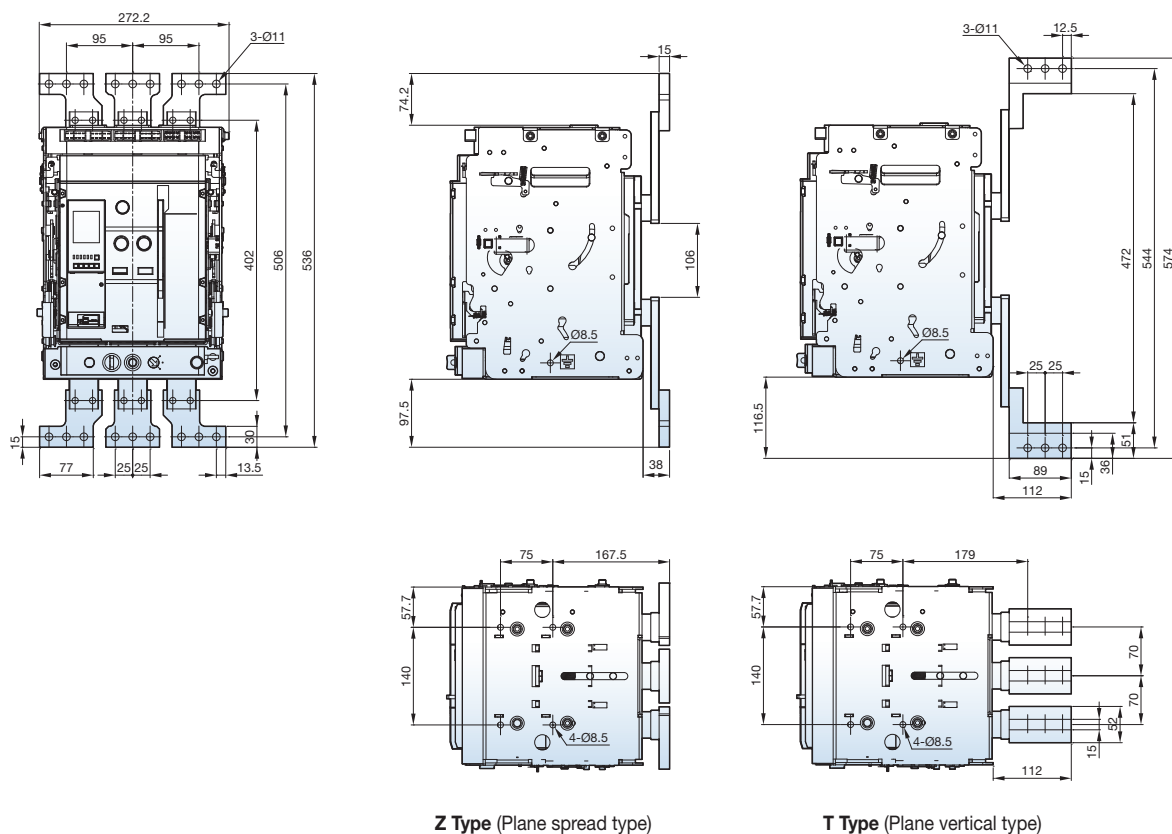
N Type
(Upper-Vertical type, Lower-Horizontal type)

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

(Unit : mm)



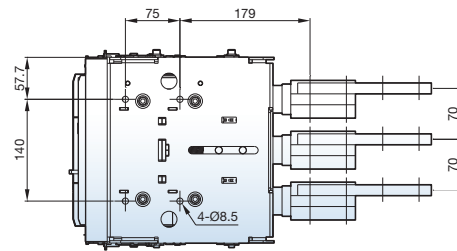
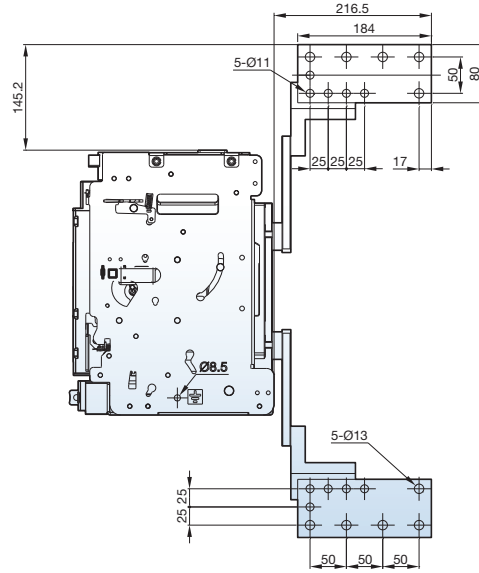
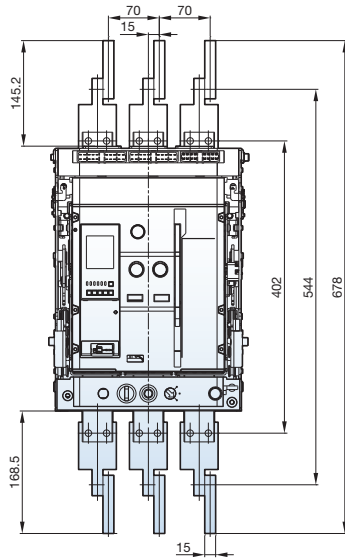
• 3P [Draw-out Z: Plane spread type / T: Plane vertical type]



Dimensions

• 3P [Draw-out X: Cable lug type]

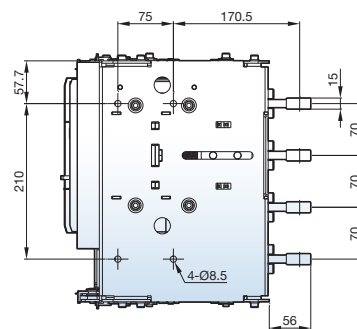
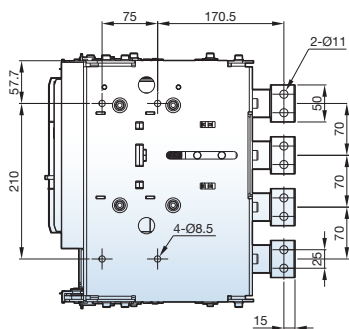
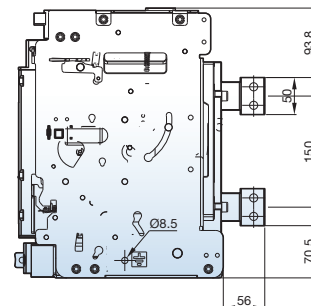
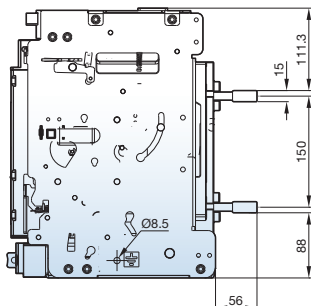
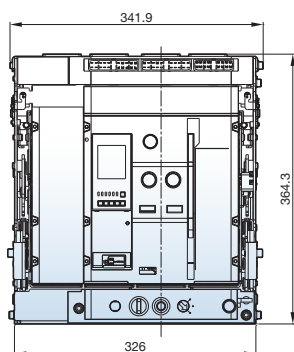
(Unit : mm)



X Type (Cable lug type)

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

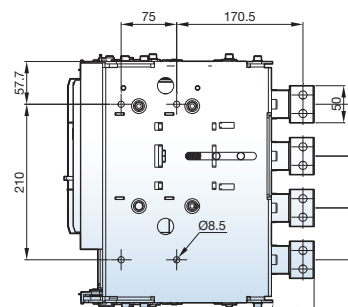
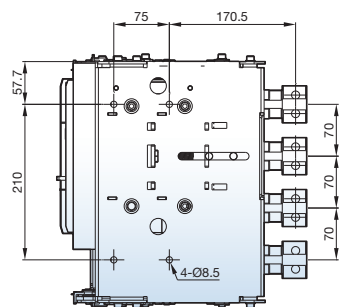
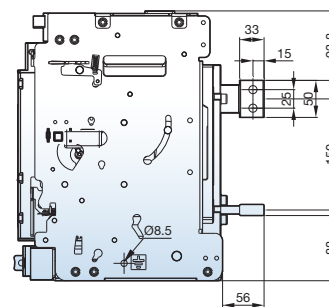
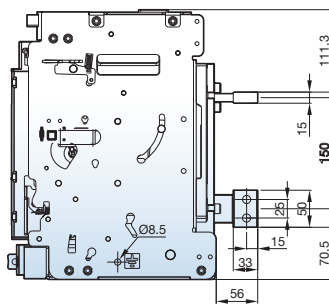
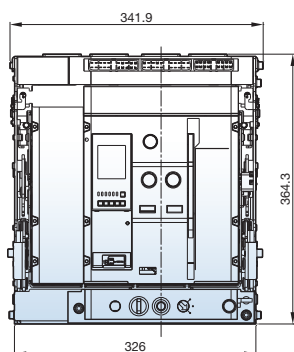
(Unit : mm)



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]



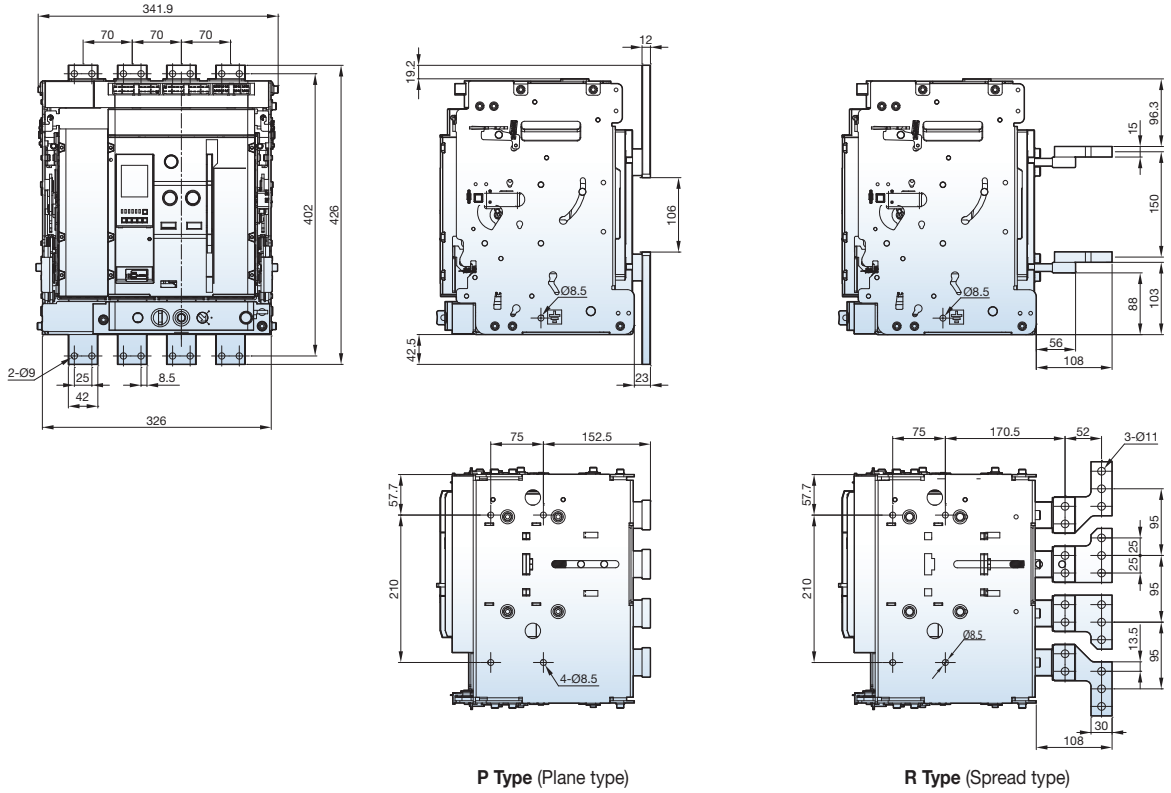
M Type
(Upper-Horizontal type, Lower-Vertical type)

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

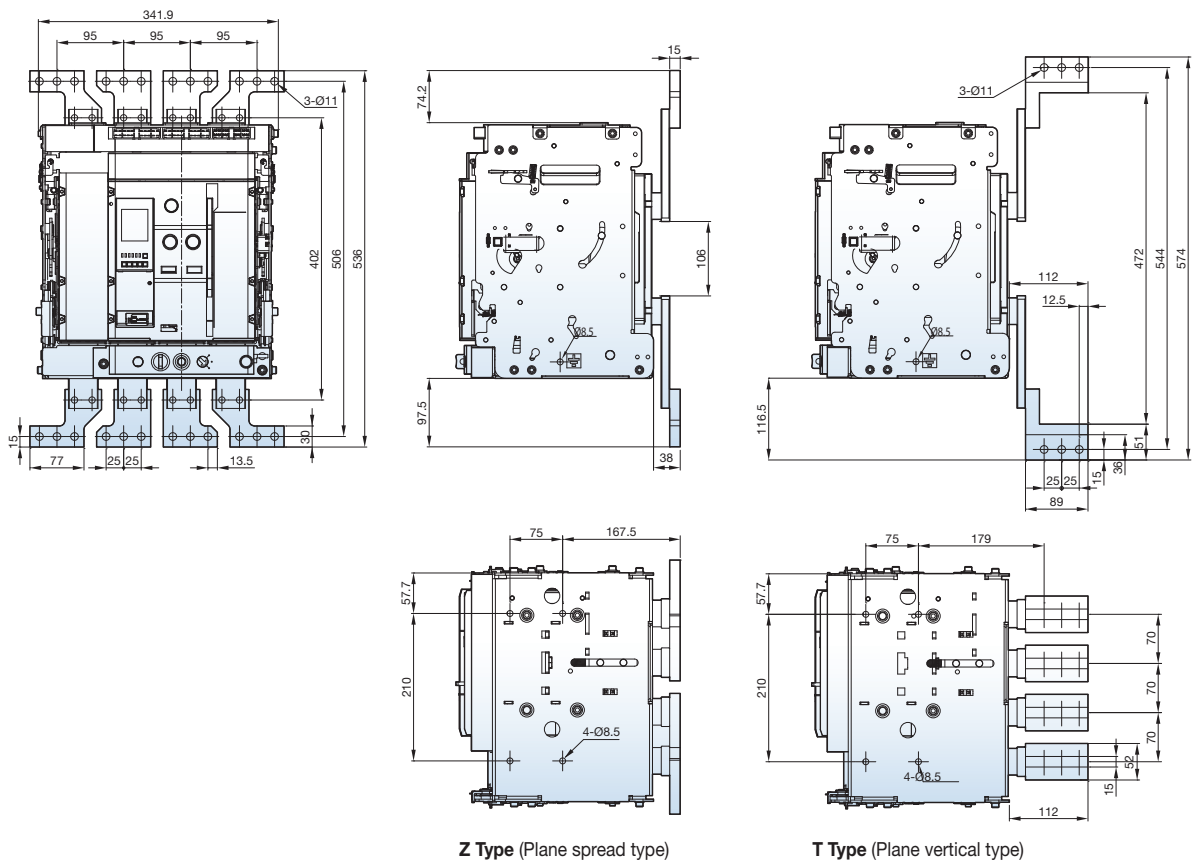
Dimensions

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

(Unit : mm)

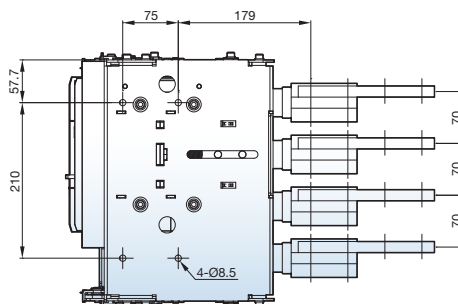
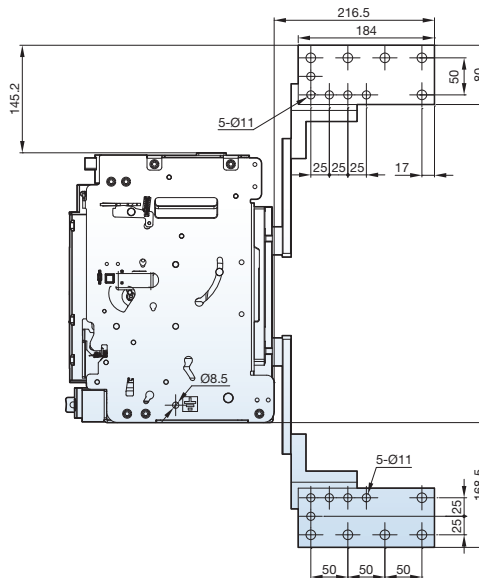
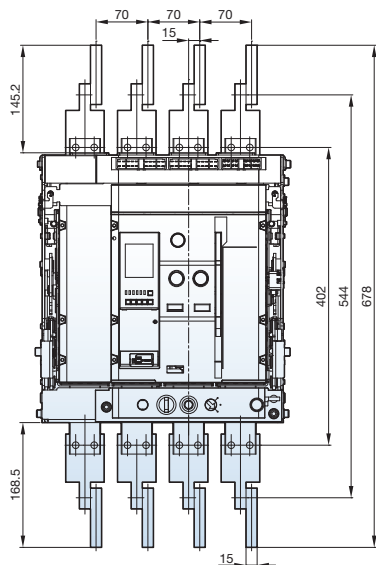


• 4P [Draw-out Z: Plane spread type / T: Plane vertical type]



• 4P [Draw-out X: Cable lug type]

(Unit : mm)



X Type (Cable lug type)

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
Approx. 15 years (depends on number of breaking of over current or service condition). Please see maintenance and inspection for further detail.

Special service conditions

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

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

Table A. Rated current correction table according to ambient temperature

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

Altitude and Isolation Voltage

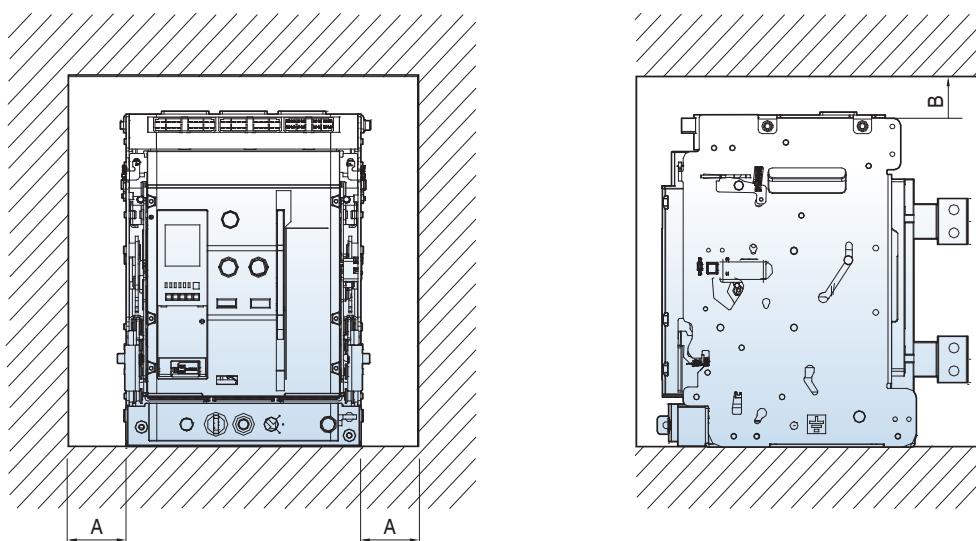
Altitude

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

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

Insulation clearance

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

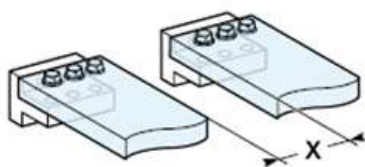


(Unit : mm)

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

Minimum clearances distance

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



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

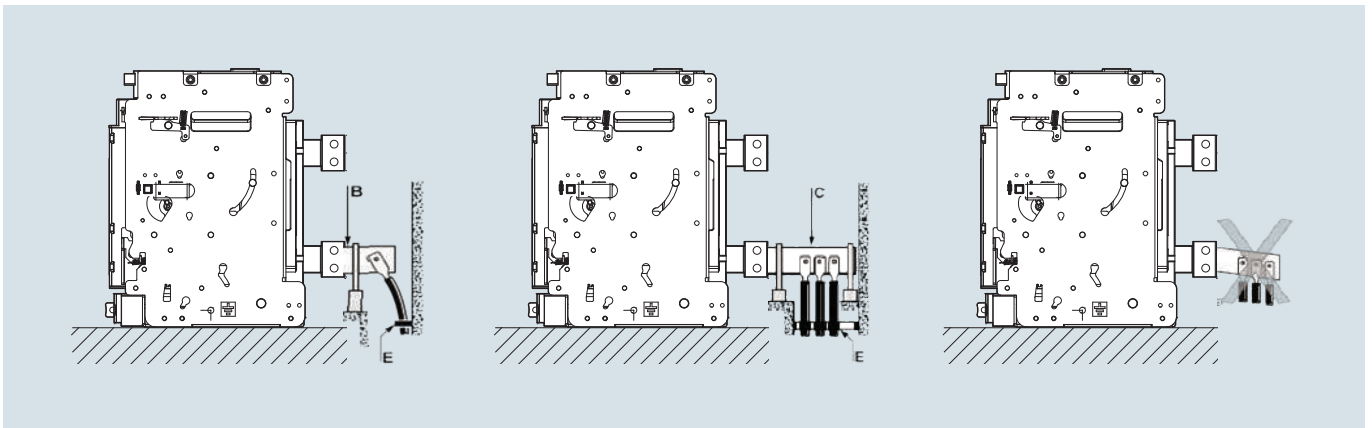
Technical information

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

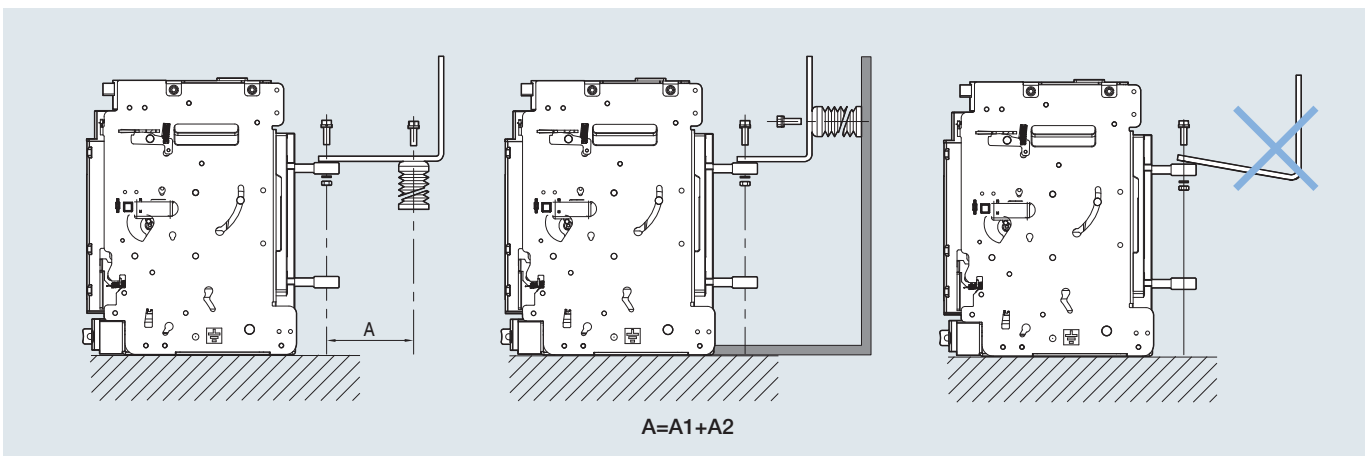


Bus-bar connection

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.

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	LSIS 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																																																																																																																																																																																																																																											
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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"/> AC/DC 200V~250V <input type="checkbox"/> DC 24V~30V <input type="checkbox"/> DC 48V~60V <input type="checkbox"/> AC 380V~415V <input type="checkbox"/> AC 440V~480V <input type="checkbox"/> AC 48V																																																																																																																																																																																																																																							
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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 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	<input type="checkbox"/> Aux. contact <input type="checkbox"/> Standard type (4c, standard installation)																																																																																																																																																																																																																																										
			<input type="checkbox"/> Key Lock					<input type="checkbox"/> Single Key (ON-Lock)																																																																																																																																																																																																																																					
			<input type="checkbox"/> 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																																																																																																																																																																																																																																			
			<input type="checkbox"/> Counter					<input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type																																																																																																																																																																																																																																					
			<input type="checkbox"/> Miss insertion preventive device (MIP)					<input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type																																																																																																																																																																																																																																					
			<input type="checkbox"/> Double trip device (Same with Tripping voltage)					<input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type																																																																																																																																																																																																																																					
			<input type="checkbox"/> Ready-to-close contact					<input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type																																																																																																																																																																																																																																					
			<input type="checkbox"/> Trip Alarm switch, Manual Reset Button					<input type="checkbox"/> Non-attachment type <input type="checkbox"/> Attachment type																																																																																																																																																																																																																																					
			<input type="checkbox"/> Key Interlock (K2, ON-Lock)					<input type="checkbox"/> ON/OFF Button Lock																																																																																																																																																																																																																																					
			Cradle mounting	<input type="checkbox"/> 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																																																																																																																																																																																																																																				
				<input type="checkbox"/> Mechanical operation contact (MOC)					<input type="checkbox"/> Standard type (10a10b)																																																																																																																																																																																																																																				
				<input type="checkbox"/> 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"/> Non-attachment type		<input type="checkbox"/> Attachment type																																																																																																																																																																																																																																		
			External mounting	<input type="checkbox"/> Racking Interlock <input type="checkbox"/> Insulation barrier					<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"/> 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"/> 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.



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Technical Question or After-sales Service

Customer Center-Quick Responsive
Service, Excellent technical support

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