

Ace-MEC Air Circuit Breakers



Electric Equipment



LG Industrial Systems
www.lgis.com

Air Circuit Breakers

It is customer's ACB that considers a customer's convenience in the use through the increase in the reliance of the operation characteristic by digital type of trip relay and the easy checking of load condition and fixed current value by LCD.

LG "ATS with ACBs" interlocks the ACBs by mechanically and electrically. It is more reliable in switching operation and faster than existing ATS. The switching time is adjustable.



* Application: The place which require stable power supply (Hospital, Communication facility, Computer room, Pump room, Office building)
* Comparing with the existing ATS, the LG "ATS with ACBs" has high breaking capacity and protects the loads from the over-current and ground fault



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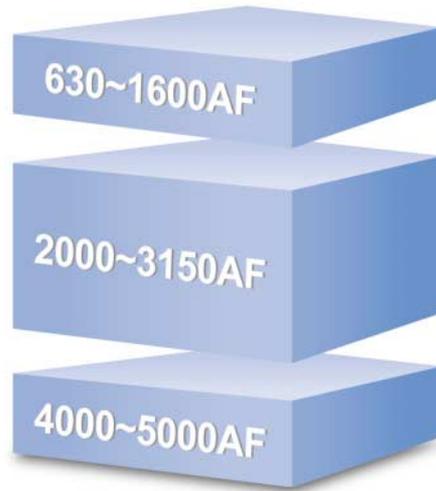
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Characteristics

Compact & Modular design

- More compact overall dimensions and light weights.
- LG Ace-MEC ACB have been made three types of modular design criteria to facilitate their installation and integration in low voltage switch boards.



High breaking capacity

- LG Ace-MEC ACE provides high breaking capacity upto 100kA



Various certification and approval

- LG Ace-MEC ACB is type-tested by IEC 60947 and GB 14048-2-94 standard
- KEMA (Netherlands), ESI (Italy), CCC (China), KERI (Korea), ISO 9001, ISO 14001



Safety and Convenience

- OCR terminals are located in front
- Modulized mechanical part and accessories
- for easy maintenance and inspection Improved draw-out rail for easy draw-out
- Minimized arc space
- Molded frame

* The reverse connection of power source and load part is available but please use the normal connection for the safety in maintenance and inspection



High functional digital type trip relay

- Easy inspection by LCD
 - Load current value
 - Setting values of each trip characteristics
 - Fault current(Max) value
 - Tripping time
- Self-diagnosis function
 - noEr : No error
 - Err-1 : No MTD coil
 - Err-2 : Program error
 - Err-4 : Configuration resistor error
 - Err-8 : Watch dog error
- Self-test function
 - It is available to check whether OCR is operated normally or not by applying external power
- Pre-alarm function
- Contact output of the each tripping cause and LED indication
- OCR alarm contact (AL, 2a)

Variety of accessories

Optional accessories

- Interlock device
 - Mechanical interlock, interlock unit,
 - ATS, ATS controller
- Key interlock(K2, ON-Lock)
- Key lock(K0, K1)
- ON/OFF button lock(B, ON/OFF button lock)
- Door Frame(DF)
- Door Interlock(DI)
- UVT, UVT controller: Standard(1NO 1NC)

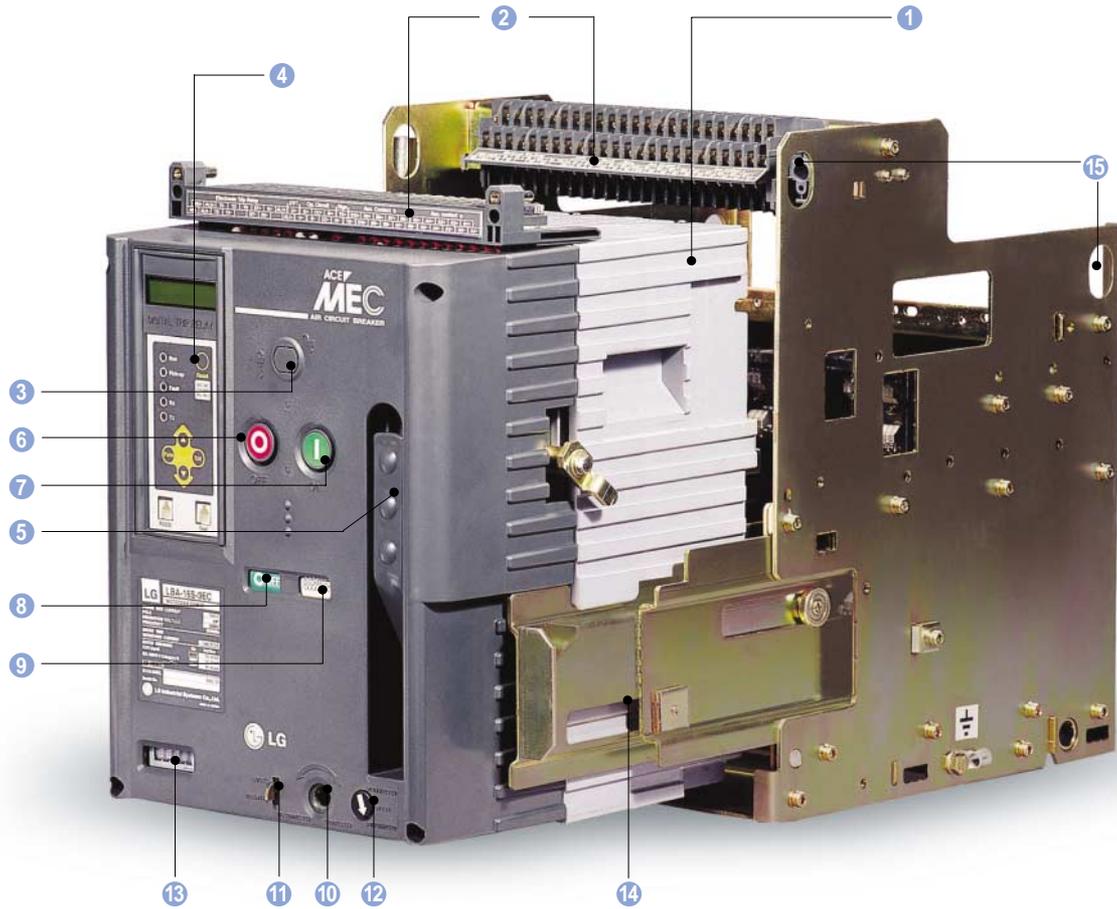
Type	Operating time	Rated voltage	
Instantaneous type	under 0.2sec	AC	110, 220, 380, 460V
		DC	24, 48, 110, 125V
Delay type	over 0.5sec	AC	110, 220, 380, 460V
		DC	24, 48, 110, 125V
	over 3sec	AC	110, 220, 380, 460V
		DC	-

- Cell switch(4C, 8C)
- Shorting B. contact(SBC, 5b max)
- Safety shutter lock(SSL)
- Miss insertion prevent device(MIP)
- Condensor tripping device(CTD)
- OCR tester(OT)

Standard attachment of draw-out type

- Pad lock
- Position indicator (connected, test, disconnected)
- Counter(5-digit)
- Lifting hook
- Shorting b • contact
- Insulating barrier
- OCR alarm contact (AL, 2a)

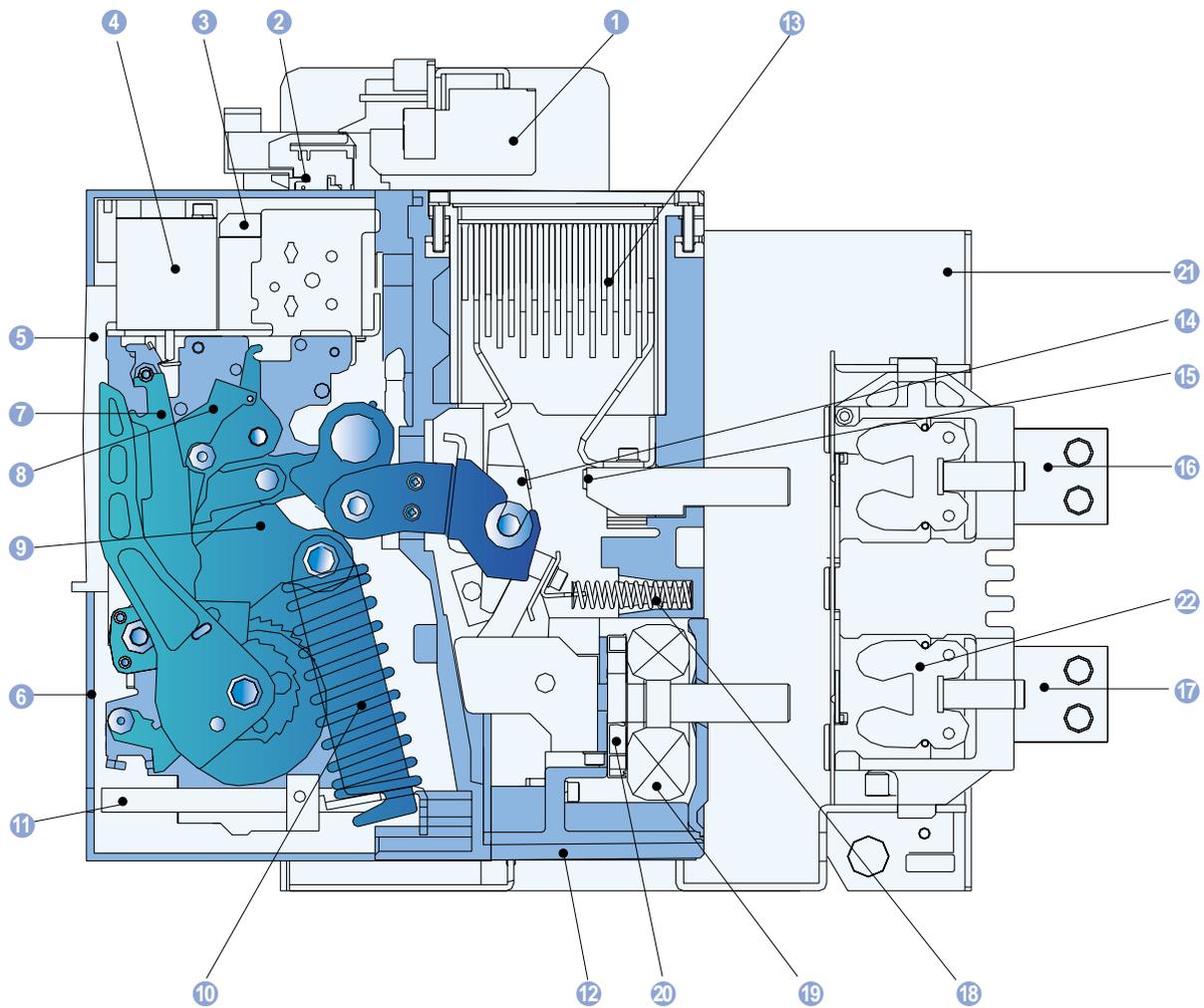
Features and internal structure



- 1 Arc extinguishing chamber
- 2 Control circuit terminal
- 3 Key lock
- 4 Electronic trip relay
- 5 Charging handle

- 6 OFF button
- 7 ON button
- 8 ON/ OFF indicator
- 9 Charging indicator
- 10 Aperture for the draw-out handle

- 11 Pad lock
- 12 Position indicator
- 13 Counter
- 14 Extension rail
- 15 Lifting hook hole



- | | | |
|-----------------------------------|--------------------------------|--------------------------------|
| 1 Control circuit terminal block | 9 Charging mechanism | 17 Main conductor of load part |
| 2 Control terminal | 10 Closing spring | 18 Contact spring |
| 3 Auxiliary switches | 11 Draw-out mechanism | 19 CT for power |
| 4 Shunt trip device, closing coil | 12 Insulated base | 20 Coil for current detection |
| 5 Electronic trip relay | 13 Arc extinguishing chamber | 21 Cradle |
| 6 Front cover | 14 Main movable contact | 22 Main circuit junction |
| 7 Closing mechanism | 15 Main fixed contact | |
| 8 Tripping mechanism | 16 Main conductor of line part | |

Ratings

		Type			LBA-06□□□□C	LBA-08□□□□C	LBA-10□□□□C	LBA-13□□□□C	LBA-16□□□□C	
Rated current	(I _{n max})	(A)				630, 400, 250	800	1000	1250	1600
Rated operating voltage	(U _e)	(V)				690	690	690	690	690
Rated insulation voltage	(U _i)	(V)				1000	1000	1000	1000	1000
Frequency	Note2)	(Hz)				50/60	50/60	50/60	50/60	50/60
Number of poles		(P)				3,4	3,4	3,4	3,4	3,4
Setting current	(I _n)	(A)	OCR-II	For industry	I _{n max.} × 1.0-0.9-0.8-0.7-0.6-0.5-0.4(7 Steps)					
			OCR-III	For industry	I _{n max.} × 1.0-0.9-0.8-0.7-0.6-0.5-0.4(7 Steps)					
				For generator protection	I _{n max.} × 1.0-0.9-0.8-0.7-0.6-0.5-0.4-0.3-0.2(9 Steps)					
Rated current of neutral pole		(A)				630	800	1000	1250	1600
Rated breaking capacity (I _{cu}) (Sym)	(kA)	IEC 60947-2 AC	690V	690V	50	50	50	50	50	
				600V	50	50	50	50	50	
				500V Under	65	65	65	65	65	
Rated service breaking capacity (I _{cs})	(kA)	... % × I _{cu}			100%	100%	100%	100%	100%	
Rated making capacity (I _{cm}) (peak)	(kA)	IEC 60947-2 AC	690V	690V	105	105	105	105	105	
				600V	105	105	105	105	105	
				500V Under	143	143	143	143	143	
Rated short-time capacity (I _{cw})	(kA)			1 sec	65	65	65	65	65	
				2 sec	40	40	40	40	60	
				3 sec	30	30	30	30	50	
Operating time (t)	(ms)			Maximum total breaking time	40	40	40	40	40	
				Closing time	80	80	80	80	80	
Life cycle	ACB	(time)	Mechanical	Without maintenance	10000	10000	10000	10000	10000	
				With maintenance	20000	20000	20000	20000	20000	
		Electrical	Without maintenance	3000	3000	3000	3000	3000		
			With maintenance	5000	5000	5000	5000	5000		
	ATS with ACBs Note 4)	(time)	Mechanical	Without maintenance	10000	10000	10000	10000	10000	
				Electrical	Without maintenance	3000	3000	3000	3000	3000
Weight (3P/4P)	(kg)	Draw-out type	Main body (with cradle)	Motor charging type	66/80	67/81	67/81	67/81	67/81	
				Manual charging type	63/77	64/78	64/78	64/78	64/78	
			Cradle only	26/30	26/30	26/30	26/30	26/30		
		Fixed type	Motor charging type	43/53	44/54	44/54	44/54	44/54		
			Manual charging type	40/50	41/51	41/51	41/51	41/51		
Bus-bar	Connection type	Horizontal type Note5)			Standard	Standard	Standard	Standard	Standard	
		Vertical type			Option	Option	Option	Option	Option	
Closing type	Motor charging type			Standard	Standard	Standard	Standard	Standard		
	Manual charging type			Option	Option	Option	Option	Option		
External dimension	Draw-out type	(mm)	H: 435, D: 479	W(3P/4P)	350/435	350/435	350/435	350/435	350/435	
	Fixed type	(mm)	H: 410, D: 375	W(3P/4P)	345/430	345/430	345/430	345/430	345/430	
Certificate & Approval					KERI, CECI, CCC					

Note) 1. Rated current of IEC standard

2. Trip relay is divided into 50Hz and 60Hz. Please be careful when you order it.

3. The generator protection relay is only available in OCR -III and the 4000/5000AF can only be built in OCR-III.

4. Ace-MEC ACB with interlock device can be a substitute for ATS (For order, refer to page 53)

5. For mainbody, only horizontal type is available. For cradle, vertical type is optional. In case of vertical type use of the horizontal type, the user needs to apply the vertical adapter. The vertical type is standard for 4000/5000AF.

6. For 4000/5000AF, height is 455mm

		Type		LBA-20□□□C	LBA-25□□□C	LBA-32□□□C	LBA-40□□□C	LBA-50□□□C	
Rated current	(I _{n max})	(A)		2000	2500	Note1) 3150(3200)	4000	5000	
Rated operating voltage	(U _e)	(V)		690	690	690	690	690	
Rated insulation voltage	(U _i)	(V)		1000	1000	1000	1000	1000	
Frequency	Note2)	(Hz)		50/60	50/60	50/60	50/60	50/60	
Number of poles		(P)		3,4	3,4	3,4	3,4	3,4	
Setting current	(I _n)	(A)	OCR-II	For industry	I _{n max} × 1.0-0.9-0.8-0.7-0.6-0.5-0.4(7 Steps)			-	
			OCR-III	Note3)	For industry	I _{n max} × 1.0-0.9-0.8-0.7-0.6-0.5-0.4(7 Steps)			
					For generator protection	I _{n max} × 1.0-0.9-0.8-0.7-0.6-0.5-0.4-0.3-0.2(9 Steps)			
Rated current of neutral pole	(A)			2000	2500	3150	2500	2500	
Rated breaking capacity (I _{cu}) (Sym)	(kA)	IEC 60947-2 AC	690V	50	50	50	50	50	
			600V	65	65	65	85	85	
			500V Under	85	85	85	100	100	
Rated service breaking capacity (I _{cs})	(kA)		... % × I _{cu}	100%	100%	100%	100%	100%	
Rated making capacity (I _{cm}) (peak)	(kA)	IEC 60947-2 AC	690V	105	105	105	105	105	
			600V	143	143	143	187	187	
			500V Under	187	187	187	220	220	
Rated short-time capacity (I _{cw})	(kA)		1 sec	65	65	65	85	85	
			2 sec	65	65	65	-	-	
			3 sec	65	65	65	-	-	
Operating time (t)	(ms)		Maximum total breaking time	40	40	40	40	40	
			Closing Time	80	80	80	80	80	
Life cycle	ACB	(time)	Mechanical	Without maintenance	5000	5000	5000	2000	2000
				With maintenance	20000	20000	20000	-	-
		Electrical	Without maintenance	3000	3000	3000	500	500	
			With maintenance	5000	5000	5000	-	-	
	ATS with ACBs Note 4)	(time)	Mechanical	Without maintenance	10000	10000	10000	-	-
			Electrical	Without maintenance	3000	3000	3000	-	-
Weight (3P/4P)	(kg)	Draw-out type	Main body (with cradle)	Motor charging type	95/116	96/117	98/119	244/267	244/267
				Manual charging type	92/113	93/114	95/116	240/263	240/263
			Cradle only	35/43	35/43	36/44	125/140	125/140	
		Fixed type	Motor charging type	63/75	64/76	66/78	119/127	119/127	
			Manual charging type	60/72	61/73	63/75	115/123	115/123	
Bus-bar	Connection type	Horizontal type Note5)	Standard	Standard	Standard	Standard offer in the fixed type			
		Vertical type	Option	Option	Option	Standard offer in the draw-out type			
Closing type	Motor charging type	Standard	Standard	Standard	Standard	Standard			
	Manual charging type	Option	Option	Option	Option	Option			
External dimension	Draw-out type	(mm)	Note6) H: 435, D: 479	W(3P/4P)	485/615	485/615	485/615	960/1090	960/1090
	Fixed type	(mm)	H: 410, D: 375	W(3P/4P)	480/610	480/610	480/610	870/1000	870/1000
Certificate & Approval				KERI, CECI, CCC			KEMA		

Charging method

Manual charging type

The closing coil is charged by manual charging handle. For closing, first charge the spring by using the charging handle, and then press the close button (I, ON) for closing, the open button(O, OFF) for opening

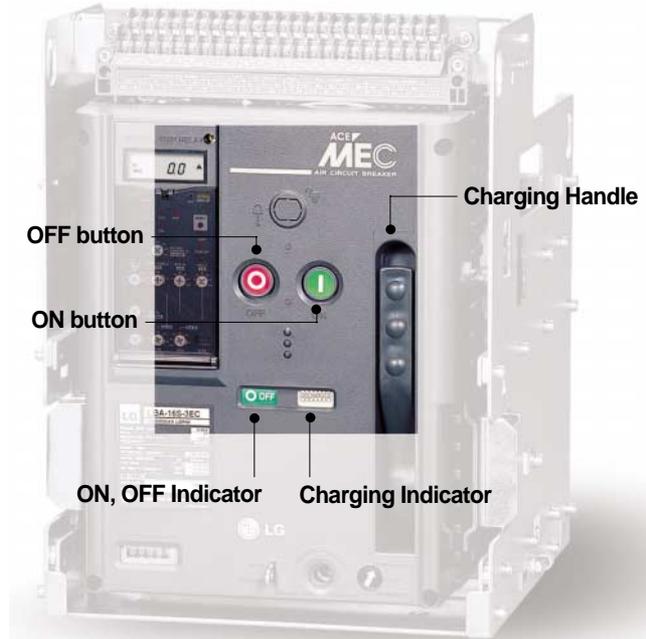
- When closing spring is completely charged, charge indicator indicate "Charge"
- It is mechanically locked not to press the close button (I,ON) and open button(O,OFF) simultaneously
- Contact condition of the main circuit is shown on the (O,OFF), (I,ON) indicator.

Motor charging type

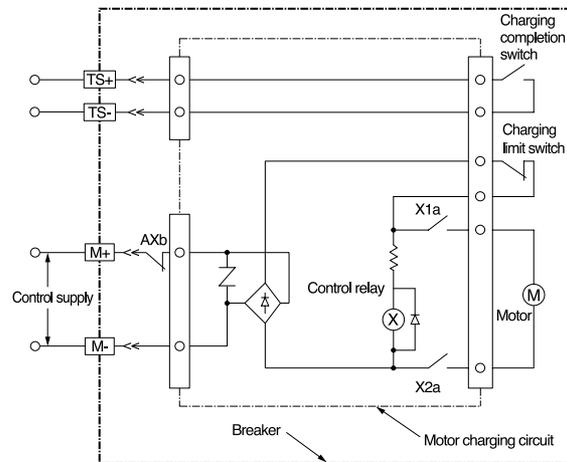
The closing spring is charged by a motor ON charging method or OFF charging method is available selectively.

- OFF charging method: When the breaker opened, the closing spring is charged automatically. It can change to ON charging method by removing b(Axb) contact like beside circuit diagram
- ON charging method: The closing spring is charged automatically when the breaker is closed. It can change to OFF charging method by using b(Axb) contact There is a contact to indicate the charging completion(TS+,TS-). Since the contact signal of charging completion switch is connected to the external terminal, It is easy to construct a circuit(ex. Automatic closing circuit) by using that contact
- Manual charging is also available
- With the breaker closed(I,ON), only manual charging is possible(motor charging cannot be performed)
- With the open button(O,OFF) pressed, closing cannot be performed(electrical and mechanical lock)
- When OFF Lock device is in use, closing cannot be worked.(electrical and mechanical lock)
- Opening should follow at least one second after completion of charging
- Pumping prevent circuit is included with the closing coil(electrical lock)
- Please note that pumping prevent circuit can be reset when the voltage of input signal drops

Voltage	Reset voltage
AC	Rated voltage 85% under
DC	Rated voltage 85% under



● Motor charging circuit



- Note) 1. Since charging completion contact(TS+,TS-) terminal is for contact output power should not be allowed.
 2. Charging completion contact capacity is equal to that high of capacity of auxiliary contact in page 26 .

● Motor ratings

Rated voltage	Inrush current peak value(A)	Steady current(A)	Power consumption(W)	Charging time(sec)
AC/DC 50/60Hz	110	7	3.5	5 Under
	220	7	3.5	
DC	125	7	3.5	
	24	30	11	
	48	30	5.5	

Note) The range of operating voltage: 85~110%

Auxiliary devices

1 Pad lock(PL)

To fix a ACB into a position (Dis-connected, Test, Connected)

* Standard offer in the draw-out type

2 Position Indicator

To indicate the position (Dis-connected, Test, Connected) of a ACB

* Standard offer in the draw-out type

3 Closing Coil (CC)

- To close the breaker by remote control
- The coil only operates when the power is supplied continuously over 100ms
- Power should be supplied separately from the motor charging power.
- Electric pumping prevent circuit is built in it.

Rated voltage(V)	Operational voltage(V)	Inrush current peak value(A)	Steady current(A)	Closing time(sec)
AC/DC	110	94~121	2	0.08 under
	50/60Hz	220	187~242	
DC	125	106~138	2.3	
	24	21~26V	30	
	48	41~53V	30	

- Note) 1. Closing time is from coil excitation to contact closing
 2. Steady current is the value at maximum rated voltage
 3. Please be careful that the pumping prevention circuit is reset when its voltage is under 85% of the rated voltage
 4. The extent of operation voltage is 85~110% of the rated voltage

4 Shunt coil(SHT)

- To open the breaker by remote control
- Use an auxiliary contact(INO) to prevent coil burning
- When the control power is 'OFF' at the ACB is 'ON' state, the ACB remains 'ON'

Rated voltage(V)	Operational voltage(V)	Inrush current peak value(A)	Steady current(A)	Closing time(sec)
AC/DC	110	77~121	2	0.04 under
	50/60Hz	220	154~242	
DC	125	88~138	2.3	
	24	21~26V	30	
	48	41~53V	30	

Note) The extent of operation voltage is 70~110% of the rated voltage.

5 OCR Alarm contact

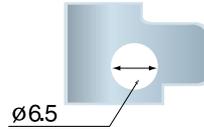
- OCR alarm contact is fundamentally installed in only ACB with trip relay. When the ACB is tripped by the OCR operation, electrical signal flows through the OCR alarm contact for remote supervisory(INO)

Contact type

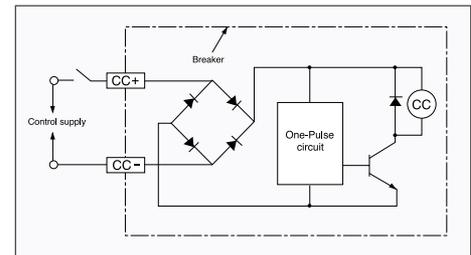
Type	OCR-II	OCR-III
Operational type	Momentary operation type (Under 15ms)	Magnetic maintenance type
Formation of contact	2NO	2NO

Operating condition of contact

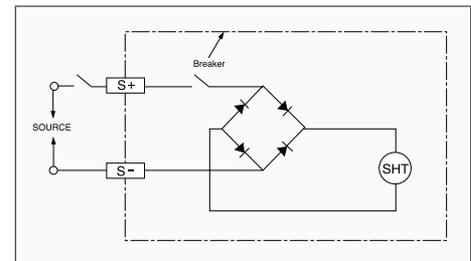
Condition of circuit breaker	Cause of trip	Condition of "a" contact
TRIP	Long-time delay trip, Short-time delay trip, Instantaneous-time delay trip, Ground fault trip	ON
	Trip button, Shunt trip coil(SHT), Undervoltage trip(UVT)	OFF
ON		OFF
OFF		OFF



Pumping prevent circuit



Trip coil circuit



Contact capacity

Type	Capacity
Ratings	AC 250V 5A
	DC 30V 5A
Rated current	5A
Maximum contact voltage	AC 380V
	DC 125V
Maximum contact current	5A
Minimum applicable load	DC 5V 10mA

Electronic trip relay | OCR-II

External configuration

No	The name of knob	Mode	Setting step
1	Setting current	I_n	$(0.4-0.5-0.6-0.7-0.8-0.9-1.0) \times I_n \text{ Max}$ It blinks with OCR trip operation or when it exceeds 115%, "Pick-up"LED blinks
2	Rated continuous current	I_c	$(0.8 - 0.85 - 0.9 - 0.95 - 1.0) \times I_n$
3	Long-time delay tripping time	LTD	15 - 30 - 60 - 120 - 240 - 480 sec
4	Short-time delay tripping current	I_s	$(2-3-4-6-8-10-\text{OFF}) \times I_n$ In OCR trip operation, "STD" LED is turned 'on'
5	Short-time delay tripping time	STD	0.05 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 sec
6	Instantaneous-time delay tripping current	I_i	$(4-6-8-10-12-16-\text{OFF}) \times I_n$ In OCR trip operation, "INST" LED is turned 'on'
7	Pre-alarm	I_p	$(0.7-0.8-0.9-0.95-1.0-\text{OFF}) \times I_c$ In OCR trip operation, "PAL" LED is turned 'on'
8	Ground fault current	I_g	$(0.1-0.2-0.3-0.4-0.5-0.6-\text{OFF}) \times I_n \text{ Max}$ In OCR trip operation, "GTD" LED is turned 'on'
9	Ground fault time	GTD	0.1 - 0.3 - 0.8 - 1.5 - 3.0 sec

LED of the trip indicator and contact

LED	Contact	Kinds of tripping characteristics
LTD	T1 -	Long-time delay tripping indicator
STD	T2 -	Short-time delay tripping indicator
INST	T3	Instantaneous-time delay tripping indicator
GTD	T4	Ground fault tipping indicator
PAL	T5	Pre-alarm indicator
RUN	-	When the breaker closed(I,ON), "RUN" LED turn on and off continuously
PICK UP	-	- Over than 105% of the setting current(I_n) : LED turn on and off - Over than 120% of the setting current(I_n): LED turn off



Formation of output terminal

Type of contact		OCR-II
Control power	Common	R+
	AC 110V	R1-
	AC 220V	R2-
Pre-alarm		AL1+, AL1-
		AL2+, AL2-
Tripping type	Common	T0
	Long-time	T1-
	Short-time	T2-
	Instantaneous	T3
	Ground fault	T4
	Pre-alarm	T5

Note) Only AC power can be used for input power to OCR-II

Button operating procedures & explanation

Operating characteristics of trip			Self-diagnosis check enforcement			Indication of self-diagnosis and load condition		
Button operating	LCD Indicate	Explanation	Button operating order	LCD Indicate	Explanation	Button operating order	LCD Indicate	Explanation
Press the "MODE" button one time	In 630.0 A SET	To indicate setting current(In)	Press the "MODE" button one time	In 630.0 A SET	To indicate setting current(In)	Press the "MODE" button 4 times	noEr	To indicate the result of self-diagnosis - noEr: No error - Err-1: MTD coil does not exist - Err-2: Program error - Err-4: Configuration resistor error - Err-8: Watch dog error Note2
Press the "+" button	15.0 S SET LTD	To indicate long-time delay tripping time(LTD)	Press the "MODE" button	No Trip 630.0 kA TEST	To indicate the value of No trip (self-diagnosis mode)			
Press the "+" button	Ic 630.0 A SET	To indicate continuous current(Ic)	Press the "+" button	No Trip 1.28 kA TEST	To set the value of No trip	Press the "MODE" button	R 500 A	To indicate maximum current among the phase of R, S, T, N
Press the "+" button	Ip 630.0 A SET	To indicate pre-alarm current(Ip)	Press the "MODE" button	Trip 1.28 kA TEST	To set the value of trip			
Press the "+" button	Is 20.00 kA SET	To indicate short-time delay tripping current(In)	Press the "ENT" button	Trip Ip In 1.28 kA TEST	To do self-diagnosis test(Ip, In, TEST letter turn on and off)	Press the "+" button	S 498 A	To indicate operational current of the phase of R-S-T-N in order by pressing "+" button
Press the "+" button	0.3 S SET STD	To indicate short-time delay tripping time		Trip In 6.68 S TEST	-After tripping, indicate the operating time of trip characteristics ("PAL" "LTD" LED turn on) - After 15~20sec, it changes to self-diagnosis display mode automatically			
Press the "+" button	Inst 30.00 kA SET	To indicate instantaneous-time delay tripping current		Trip In 6.68 S TEST				
Press the "+" button	Ig 63.0 A SET	To indicate ground fault tripping current						
Press the "+" button	0.3 S SET GTD	To indicate ground fault tripping time						
Press the "RESET" button	Trip In 6.68 S TEST	To reset "PAL" "LTD" LED						

Note) 1. If "-" button pressed, the characteristics of trip displayed in the reversed order

2. In case of Watch dog error occurs, LCD indicates Error-8 during 15 seconds, then indicates maximum current value among R, S, T phases. At this moment, Run LED is maintaining ON status when Error-8 occurs from the On and Off status in normal condition.

< Watch dog error Reset>

① If press mode button 4 times, LCD indicates Error-8 again. At this moment, press ENT button.

② After switch-OFF input power of over current relay, then switch-ON again.

The way to check tripping time

	LCD Indicate	Button operating order	LCD Indicate	Button operating order	LCD Indicate	Initialization	Remark
Long-time delay trip	Trip Ic R 3.38 kA	Press the "-" button	Trip Ic R 1.1 S	Press the "+" button	Trip Ic R 3.38 kA	• LCD: Press the "ENT" button • LED: Press the "RESET" button	- "PAL" "LTD" LED turn on - To indicate maximum current among the phase of R,S,T
Short-time delay trip	Trip Is R 3.38 kA	Press the "-" button	Trip Is R 0.1 S	Press the "+" button	Trip Is R 3.38 kA		- "STD" LED turn on - To indicate maximum current among the phase of R,S,T
Instantaneous-time delay trip	Trip Inst R >>>>	Press the "-" button	Trip Inst R 0.0 S SET	Press the "+" button	Trip Inst R >>>>		- "INST" LED turn on - Instantaneous trip time is faster than LCD display time. So, it is not available to display the values.
Ground fault trip	Trip Ig N 299 A	Press the "-" button	Trip Ig R 0.1 S	Press the "+" button	Trip Ig N 299 A		- "GTD" LED turn on

Electronic trip relay | OCR-III

External configuration

1 Display LCD

- Display of normal condition: In use current of R, S, T, N phases
- Fault display: Fault phases and kinds of fault
 - Long-time delay trip: L-INV
 - Short-time delay trip: S-INV
 - Instantaneous-time delay trip: INST
 - Ground fault trip: GND ⇒ LCD reset method: Press "Func" button after "Ent"

EX)
FAULT : R
TYPE : L-INV
 ⇒Long-time delay trip occurring in "R" phase

Condition display LED: "Run"

- 2 • The LED blinks with normal operation of OCR.

Over-current display LED

- 3 • "Pick-up" LED: In case of over default pre-alarm current flows the "Pick-up" LED warning blinks and is turned off after OCR operation.
- "Fault" LED: The OCR operation of generating fault turns on "Fault" LED.

Communication display LED: "Rx, Tx"

- 4 • Blinks with normal communication of OCR.

Reset button

- 5 • Out-put contact signal reset and OCR over-current display LED.

Selection button

- 6 • Func: Mode selection button
- Ent : Selection button of various set-up value
- ▲, ▼: Set-up value input button

RS232 Port

- 7 • OCR operation check port as connecting PC

TEST Port

- 8 • Connection button with OCR tester (OT-2000)



Setting step

Operating characteristics	Mode	Setting step
Setting current	I_n	$(0.4-0.5-0.6-0.7-0.8-0.9-1.0) \times I_n$ max. - Industry $(0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0) \times I_n$ max. - Generator protection
Rated continuous current	I_c	$(0.6-0.65-0.7-0.75-0.8-0.85-0.9-0.95-1.0) \times I_n$
Long-time delay tripping time	LTD	15-20-25-30-465-470-475-480sec(Step: 5sec) - Industry 1.5-2.0-2.5-47.0-47.5-48.0sec(Step: 0.5sec) - Generator protection
Short-time delay tripping current	I_s	$(2-3-4-5-6-7-8-9-10-no) \times I_n$
Short-time delay tripping time	STD	0.05-0.06-0.07-0.48-0.49-0.5sec(Step: 0.01sec)
Instantaneous-time delay tripping current	I_{inst}	$(4-5-6-7-8-9-10-11-12-13-14-15-16-no) \times I_n$ - 4000AF under $(4-5-6-7-8-9-10-11-12-no) \times I_n$ - 5000AF over
Pre-alarm	I_p	$(0.7-0.8-0.9-1.0) \times I_c$
Ground fault current	I_g	$(0.3-0.4-0.5-0.6-0.7-0.8-no) \times I_n$ max. - 3Pole $(0.1-0.2-0.3-0.4-0.5-0.6-0.7-0.8-no) \times I_n$ max. - 4Pole
Ground fault time	GTD	0.1-0.2-0.3-2.8-2.9-3.0sec (Step: 0.1sec)

Formation of output terminal

	Type of contact	Mark of contact
Control power	Common	R+(" ")
	AC/DC 100/220V	R2-("-")
	DC24/48V	
Alarm (Holding type contact)		AL1+, AL1-
		AL2+, AL2-
Tripping type	Common	T0
	Time(Long, Short)	T2-
	Instantaneo trip	T3
	Ground trip	T4
	Pre-alarm	T5
Communication		485+, 485-

Note) Only AC power can be used for input power to OCR-II

Button operation method in set-up modes

Set-up procedure of various set-up value

R:**** S:**** T:**** N:****	Ent	Initial window
TOP] ->1. CONFIG 2. SETTING	▼	Initial set-up window
TOP] 1. CONFIG ->2. SETTING	Ent	Set-up mode of its value
Select Password [00]	▲▼	
Select Password [99]	Ent	
SET] ->1. In 2. Ic(x In)	Ent	Current set-up
Set] In : 1.00k 1.0(0.4~1.0)	▲▼ Ent	Set-up step : 0.1 Step (7 Steps)
SET] 1. In ->2. Ic(x In)	▼	Set-up continuously flowing current
Set] Ic : 1.00k 1.0(0.6~1.0)	▲▼ Ent	Set-up step : 0.05 Step (9 Steps)
SET] 2. Ic(x In) ->3. LTD	▼	Long-time delay trip time set-up
Set] LTD : 25Sec (15~480)	▲▼ Ent	Set-up step : 5sec Step (94 Steps)
SET] 3. LTD ->4. Is(x In)	▼	Short-time delay trip current set-up
Set] Is : 10.0k 1.0(2~10, no)	▲▼ Ent	Set-up step : 1 Step (10 Steps)
SET] 4. Is(x In) ->5. STD	▼	Short-time delay trip time set-up
Set] STD : 0.05Sec (0.05~0.5)	▲▼ Ent	Set-up step : 0.01sec Step (46 Steps)
SET] 5. STD ->6. Ig	▼	Ground fault delay trip current set-up
Set] Ig : 800 0.8(0.1~0.8, no)	▲▼ Ent	Set-up step : 0.1 Step (8 Steps)
SET] 6. Ig ->7. GTD	▼	Ground fault delay trip time set-up
Set] GTD : 3.0Sec (0.1~3.0)	▲▼ Ent	Set-up step : 0.1 Step (30 Steps)
SET] 7. GTD ->8. Ip(x Ic)	▼	Pre-alam current set-up
Set] Ip : 1.00k 1.0(0.7~1.0)	▲▼ Ent	Set-up step : 0.1set Step (4 Steps)
SET] 8. Ip ->9. Iinst	▼	Instantaneous-time delay trip set-up
Set] Inst : 16.0k 16(4~16, no)	▲▼ Ent	Set-up step : 1 Step (13 Steps)

SET] 9. Iinst ->10. Update	▼	
Update Setting <Press Enter>	Ent	Set-up value completion
SET] 9. Iinst ->10. Update	Func	Move back to set-up initial window

Fault information method

TOP] -> 2. SETTING 3. FAULT	▼	
TOP] 2. SETTING -> 3. FAULT	Ent	Fault information mode
R:**** S:70.7k T:**** N:****	▼	• Fault phase : S phase • Fault current : 70.7kA
12/03 13:43:14 -> Duty=0s 12ms	▼	• Fault time : 12mon 3day 13hour 43min 14sec • Operation time : 12ms
Duty=0s 12ms -> Prev/Next	▼	Shifts to previous information as pressing "Ent" button.
Duty=0s 12ms -> Prev/Next	Func	• Shifts to next information as pressing "Ent" button. • Shifts to set-up initial window as pressing "Func" button.

Main formation method

TOP] 4. CALIBRATE -> 5. SYSTEM	Ent	Main mode formation
SYS] -> 1. Frequency 2. Frame	Ent	
Sys] 60Hz (50/60)	▼▲ Ent	Main power frequency set-up
SYS] -> 2. Frame 3. User Frame	▼	
Sys] Frame : 1.00k (250~10k)	▼▲ Ent	Set-up ACB frame current
SYS] -> 3. User Frame 4. 3 or 4Pole	▼	
Sys] USR F : **** (250~10k)	▼▲ Ent	In use ACB reted frame current alters by pressing this button.
SYS] -> 4. 3 or 4Pole 5. Update	▼	
Sys] Pole : 4P (3/4Pole)	▼▲ Ent	The number of ACB pole set-up
SYS] 4. 3 or 4Pole -> 5. Update	▼	
Update System <Press Enter>	Ent	
SYS] 4. 3 or 4Pole -> 5. Update	Func	• Shifts to set-up initial window as pressing "Func" button. • Without reseting control power the set-up value is not saved.



Caution

- As calibration, in "CALIBRATE MODE" has been completed by manufacturer calibration by user is prohibited.
- System Data(Main configuration data) is an important basic data and it effects to the operational particularity of ACB. So, please use with its factory released default value. If resetting up of default value is unavoidable, please reset the control power after updating its default value.

Button operation method in set-up modes

Self diagnosis method

TOP] 5. SYSTEM -> 6. DIAGNOSIS	Ent]	Self diagnosis mode Pressing "Ent" button starts self diagnosis. • Normal : "OK" • Falut : "Fail"
DIA] -> 1. COIL : OK 2. RAM : OK	v]	
DIA] -> 2. RAM : OK 3. EEP : OK	v]	
DIA] -> 3. EEP : OK 4. RTC : OK	v]	
DIA] -> 4. RTC : OK 5. CSUM : OK	v]	
DIA] 4. RTC : OK -> 5. CSUM : OK	Func]	

Note) In case it displays "Fail", terminate OCR set-up and please contact us regarding the situation.

OCR test method

TOP] 6. DIAGNOSIS -> 7. TEST	Ent]	OCR test mode
TST] -> 1. Trip 2. Alarm	Ent]	
Start Trip Tst <Press Enter>	Ent]	ACB trip operation
[Testing] --DONE--	Func]	
TST] 1. Trip -> 2. Alarm	v]	OCR warning contact output test
Start Alarm Tst <Press Enter>	Ent]	
[Testing] --DONE--	Func]	OCR LED operation test
TST] 2. Alarm -> 3. LED	v]	
Start LED Tst <Press Enter>	Ent]	Press "Func" button after checking if all LED is OFF after ON. Press "Func" button shifts to initial set-up window.
[Testing] --DONE--	Func]	
TST] 2. Alarm -> 3. LED	Func]	

Date and time set-up

TOP] 7. TEST -> 8. TIME SET	Ent]	Date and time set-up mode
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	Year set-up
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	Month set-up
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	Day set-up
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	Time set-up
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	Minute set-up
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	Second set-up
Date : 2001/12/04 Time : 10:41:33	▲,v] Ent]	
Saved Time <Press Enter>	Ent]	Pressing "Func" button shifts to initial set-up window.

Set-up value initializing method

TOP] 8. TIME SET -> 9. FACT SET	Ent]	Set-up value initial mode
Select Password [00]	▲,v] Ent]	
Select Password [99]	Ent]	• It restores all set-up values as initial set-up value. The TIME SET alteration date is not changed exceptionally.
Factory Setting <Press Enter>	Ent]	
OK! Fact Set <Press Func>	Func]	Pressing "Func" button shifts to initial set-up window.

Operating characteristics of trip relay | OCR-II

Ratings

Classification		Types and ratings of trip relays	
Type	60Hz	LPO	LGP
	50Hz	LPH	LTH
Application		For industry	For industry
Possible number of ACB poles		3, 4P	4P
Operating voltage		AC 110V, 220V	AC 110V, 220V
Communication		-	-
Operating characteristics	Long-time delay (L)	■	■
	Short-time delay (S)	■	■
	Instantaneous time delay (I)	■	■
	Ground fault (G)	-	■
	Pre-alarm (P)	■	■
Setting current (A)	$I_n = \dots \times I_{n \text{ Max}}$	0.4-0.5-0.6-0.7-0.8-0.9-1.0	0.4-0.5-0.6-0.7-0.8-0.9-1.0
Continuous current (A)	$I_c = \dots \times I_n$	0.8-0.85-0.9-0.95-1.0	0.8-0.85-0.9-0.95-1.0
Long-time delay(L)	Trip current (A) $I_L = \dots \times I_c$	1.5	1.5
(Error tolerance : ±10%)	Trip time (sec) LTD	15-30-60-120-240-480	15-30-60-120-240-480
Short-time delay(S)	Trip current (A) $I_s = \dots \times I_n$	2-3-4-6-8-10-OFF	2-3-4-6-8-10-OFF
(Error tolerance : ±15%)	Trip time (sec) STD	0.05-0.1-0.2-0.3-0.4-0.5	0.05-0.1-0.2-0.3-0.4-0.5
Instantaneous time delay(I)	Trip current (A) $I_i = \dots \times I_n$	4-6-8-10-12-16-OFF	4-6-8-10-12-16-OFF
(Error tolerance : ± 20%)	Trip time (sec) INST	0.01 under	0.01 under
Ground fault(G)	Trip current (A) $I_g = \dots \times I_{n \text{ Max}}$	-	0.1-0.2-0.3-0.4-0.5-0.6-OFF
(Error tolerance : ±20%)	Trip time (sec) GTD	-	0.1-0.3-0.8-1.5-3.0
Pre-alarm(P)	Trip current (A) $I_p = \dots \times I_c$	0.7-0.8-0.9-0.95-1.0-OFF	0.7-0.8-0.9-0.95-1.0-OFF
(Error tolerance : ±10%)	Trip time (sec) PAL = ... x LTD	0.5(setting I_p 1.0)	0.5(setting I_p 1.0)

Note) It is impossible to install in 4000/5000AF ACB

• Power consumption of trip relay

Operational Voltage	OCR- II
AC 110~220V	5VA



Operating characteristics of trip relay | OCR-III

Ratings

Classification		Types and ratings of trip relays			
Type	60Hz	N□6	C□6	P□6	M□6
	50Hz	N□5	C□5	P□5	M□5
Application		For industry	For industry	For generator protection	For generator protection
Possible number Of ACB poles		3, 4P	3, 4P	3, 4P	3, 4P
Operating voltage	1	AC/DC 110V/220V	AC/DC 110V/220V	AC/DC 110V/220V	AC/DC 110V/220V
	2	DC24V	DC24V	DC24V	DC24V
	4	DC48V	DC48V	DC48V	DC48V
Communication		-	■	-	■
Communication protocol		-	RS 485	-	RS 485
Protocol		-	DNP 3.0	-	DNP 3.0
Transmission speed		-	9600 bps	-	9600 bps
Setting current	Long-time delay(L)	■	■	■	■
	Short-time delay(S)	■	■	■	■
	Instantaneous time delay (I)	■	■	■	■
	Ground fault (G)	■	■	■	■
	Pre-alarm (P)	■	■	■	■
Setting current	(A)	$I_n = \dots \times I_{n \text{ Max.}}$	<ul style="list-style-type: none"> For industry: 0.4-0.5-0.6-0.7-0.8-0.9-1.0 For generator protection: 0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0 		
Continuous current	(A)	$I_c = \dots \times I_n$	0.6-0.65-0.7-0.75-0.8-0.85-0.9-0.95-1.0		
Long-time delay(L) (Error tolerance : ±10%)	Trip current (A)	$I_L = \dots \times I_c$	1.5		
	Trip time (sec)	LTD	<ul style="list-style-type: none"> For industry : 15-20-25-30-465-470-475-480(Steps: 5sec) For generator protection: 1.5-2.0-2.5-3.0-46.5-47.0-47.5-48.0(Steps: 0.5sec) 		
Short-time delay(S) (Error tolerance: ±15%)	Trip current (A)	$I_s = \dots \times I_n$	2-3-4-5-6-7-8-9-10-no		
	Trip time (sec)	STD	0.05-0.06-0.49-0.5(Steps: 0.01sec)		
Instantaneous time delay(I) (Error tolerance : ±15%)	Trip current (A)	$I_i = \dots \times I_n$	<ul style="list-style-type: none"> 4000A under: 4-5-6-7-8-9-10-11-12-13-14-15-16-no 5000A over: 4-5-6-7-8-9-10-11-12-no 		
	Trip time (sec)	INST	0.01under		
Ground fault(G) (Error tolerance : ±20%)	Trip current (A)	$I_g = \dots \times I_{n \text{ Max.}}$	<ul style="list-style-type: none"> 3 pole: 0.3-0.4-0.5-0.6-0.7-0.8-no 4 pole: 0.1-0.2-0.3-0.4-0.5-0.6-0.7-0.8-no 		
	Trip time (sec)	GTD	0.1-0.2-0.3-2.8-2.9-3.0 (Step: 0.1sec)		
Pre-alarm(P) (Error tolerance : ±10%)	Trip current (A)	$I_p = \dots \times I_c$	0.7-0.8-0.9-1.0		
	Trip time (sec)	PAL = $\dots \times LTD$	0.5(setting I_p 1.0)		

• Power consumption of trip relay

Operational voltage	OCR-III
AC/DC 110/220V	5VA
DC 24V	5VA
DC 48V	5VA

• Trip relay type selection

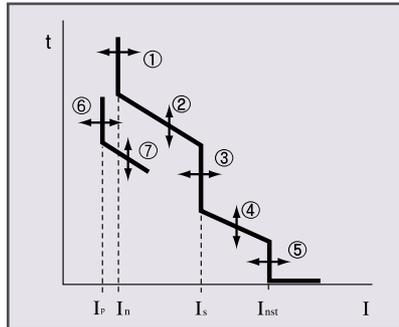
Function		Operational voltage		Frequency	
N	Communication function NO (For industry)	1	AC/DC 110/220V	6	60Hz
		2	DC 24V	5	50Hz
C	Communication function YES (For industry)	4	DC 48V		
P	Communication function NO (For generator protection)				
M	Communication function YES (For generator protection)				

OCR-II

LPO, LPH (Without ground fault trip unit)



Characteristics of protection



- ① Long-time delay pick-up current
- ② Long-time delay tripping time
- ③ Short-time delay pick-up current
- ④ Short-time delay tripping time
- ⑤ Instantaneous pick-up current
- ⑥ Pre-alarm pick-up current
- ⑦ Pre-alarm tripping time

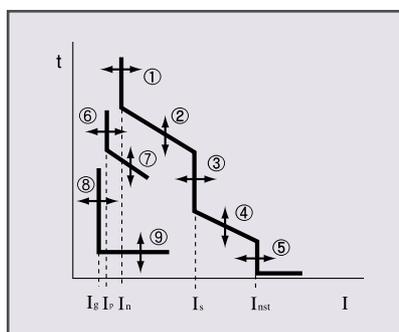
Standard functions

- Setting the fixed current
- Setting the long-time delay tripping current
- Setting the long-time delay tripping time
- Setting the short-time delay tripping current
- Setting the short-time delay tripping time
- Setting the instantaneous-time delay tripping current
- Setting pre-alarm current
- Trip Indicator

LGP, LTH



Characteristics of protection



- ① Long-time delay pick-up current
- ② Long-time delay tripping time
- ③ Short-time delay pick-up current
- ④ Short-time delay tripping time
- ⑤ Instantaneous pick-up current
- ⑥ Pre-alarm pick-up current
- ⑦ Pre-alarm tripping time
- ⑧ Ground fault pick-up current
- ⑨ Ground fault tripping time

Standard functions

- Setting the fixed current
- Setting the long-time delay tripping current
- Setting the long-time delay tripping time
- Setting the short-time delay tripping current
- Setting the short-time delay tripping time
- Setting the instantaneous-time delay tripping current
- Setting the ground fault tripping current
- Setting the ground fault tripping time
- Setting pre-alarm current
- Trip Indicator

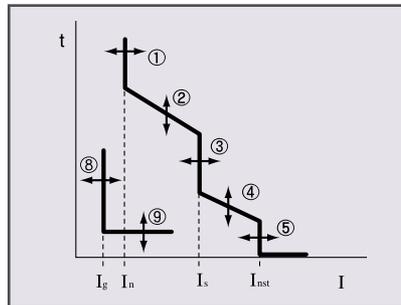
Note) Ground fault trip is available in 4pole type.

Operating characteristics of trip relay | OCR-III

N□6, P□6, N□5, P□5



Characteristics of protection



- ① Long-time delay pick-up current
- ② Long-time delay tripping time
- ③ Short-time delay pick-up current
- ④ Short-time delay tripping time
- ⑤ Instantaneous pick-up current
- ⑥ Pre-alarm pick-up current
- ⑦ Pre-alarm tripping time

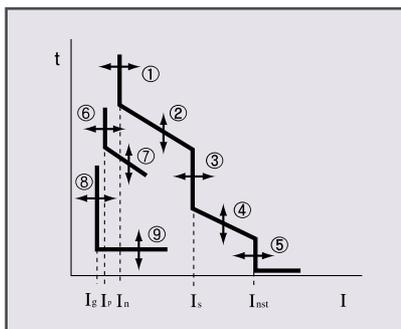
Standard functions

- Setting the fixed current
- Setting the long-time delay tripping current
- Setting the long-time delay tripping time
- Setting the short-time delay tripping current
- Setting the short-time delay tripping time
- Setting the instantaneous-time delay tripping current
- Setting the pre-alarm current
- Trip Indicator
- Communication
 - ① RS232(Port)
 - Setting the fixed value
 - Monitoring the fixed value
 - Monitoring the operating rate of ACB OCR
 - Monitoring the load current of line
 - Performing of calibration ability

C□6, M□6, C□5, M□5



Characteristics of protection



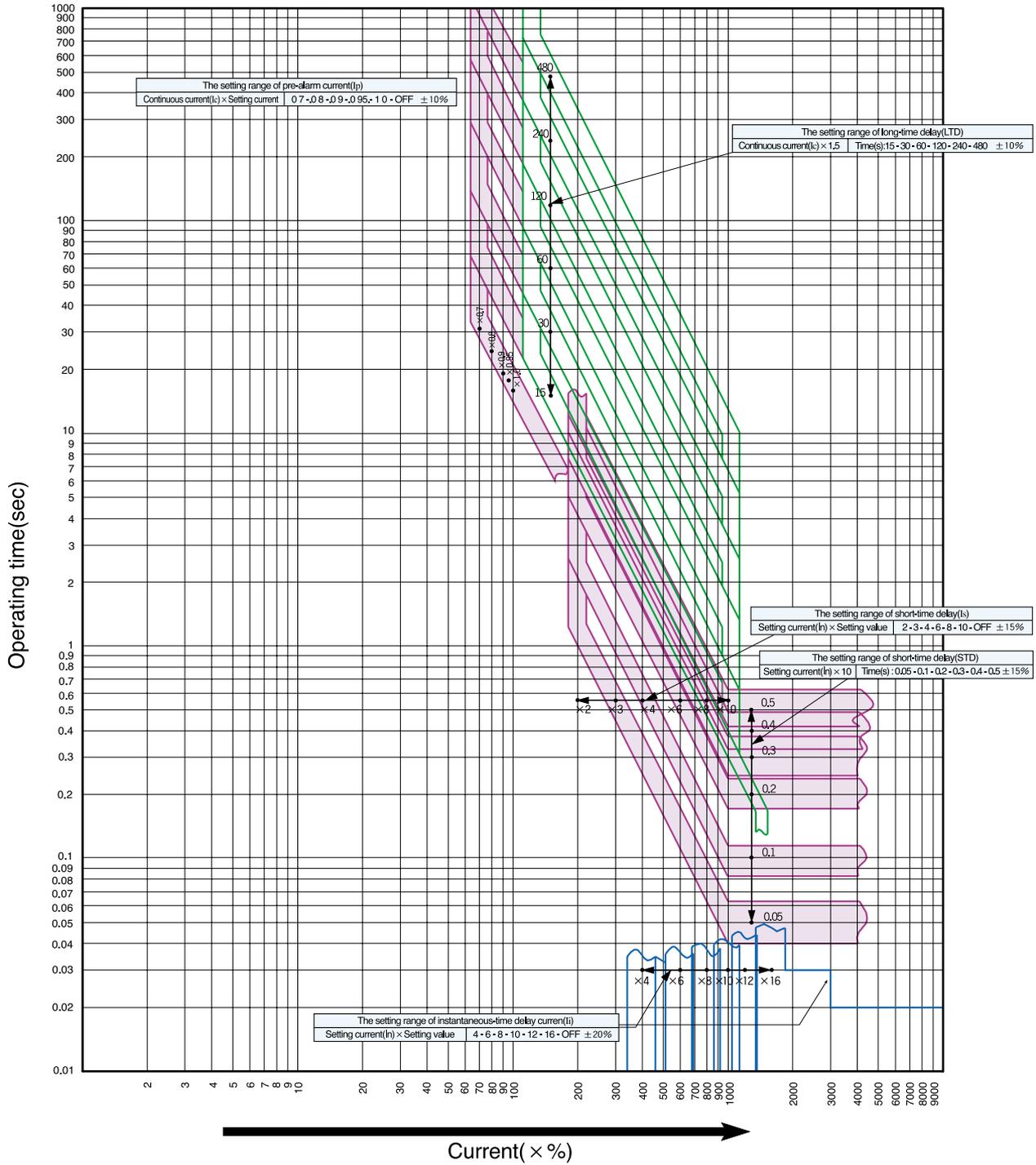
- ① Long-time delay pick-up current
- ② Long-time delay tripping time
- ③ Short-time delay pick-up current
- ④ Short-time delay tripping time
- ⑤ Instantaneous pick-up current
- ⑥ Pre-alarm pick-up current
- ⑦ Pre-alarm tripping time
- ⑧ Ground fault pick-up current
- ⑨ Ground fault trip time

Standard functions

- Setting the fixed current
- Setting the long-time delay tripping current
- Setting the long-time delay tripping time
- Setting the short-time delay tripping current
- Setting the short-time delay tripping time
- Setting the instantaneous-time delay tripping time
- Setting the ground fault tripping current
- Setting the ground fault tripping time
- Setting pre-alarm current
- Trip Indicator
- Communication
 - ① RS232(Port)
 - setting the fixed value
 - Monitoring the fixed value
 - Monitoring the load current of line
 - Monitoring the operating state of ACB OCR
 - Performing of Calibration ability
 - ② RS485(Port : 485+, 485-)
 - Setting the fixed value by remote
 - Monitoring the fixed value
 - Monitoring the load current of line
 - Transmitting the failure information (failure pole, failure factor)
 - Transmitting the self-diagnosis information

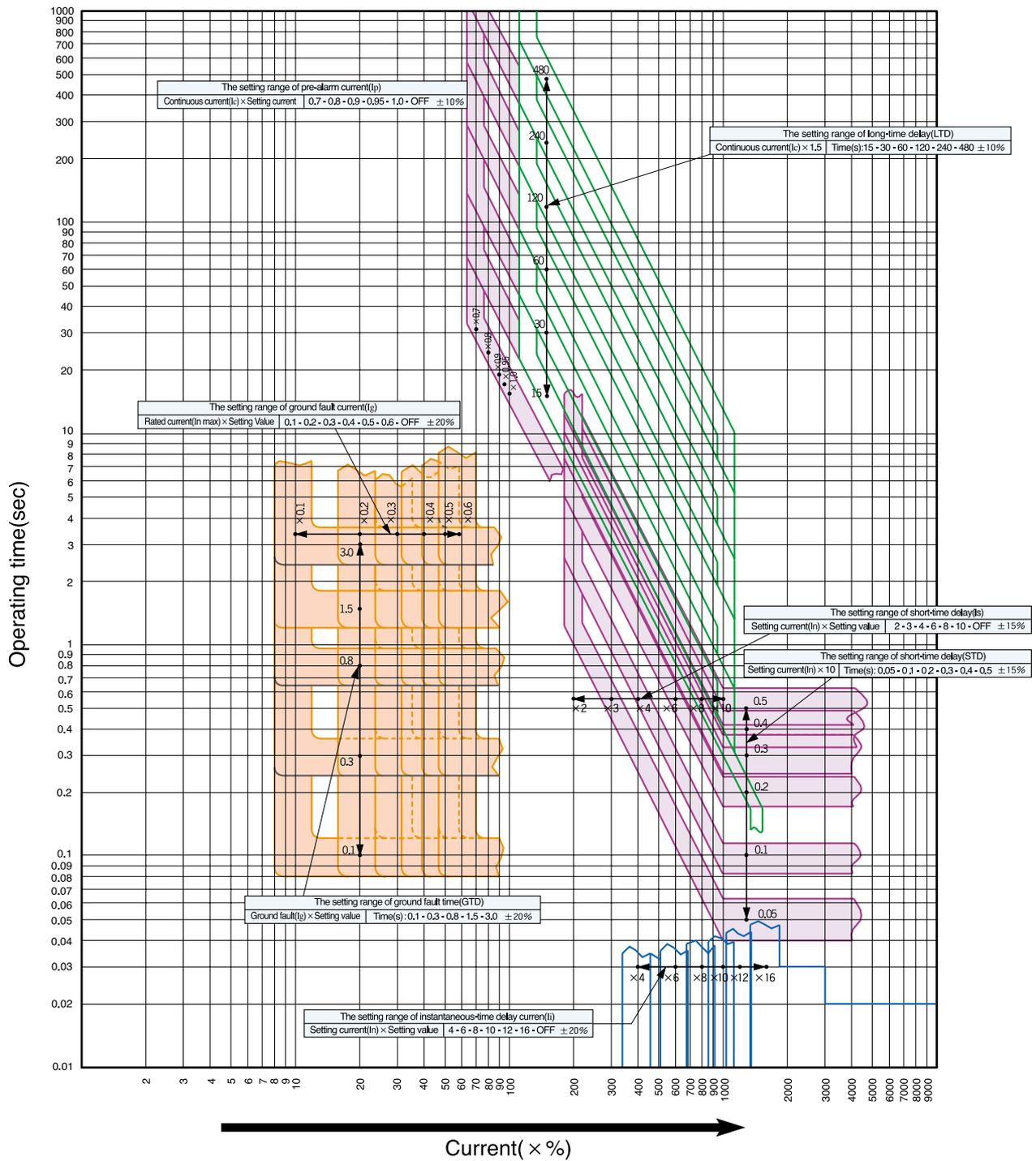
Characteristics curve | OCR-II

LPO, LPH(For industry)



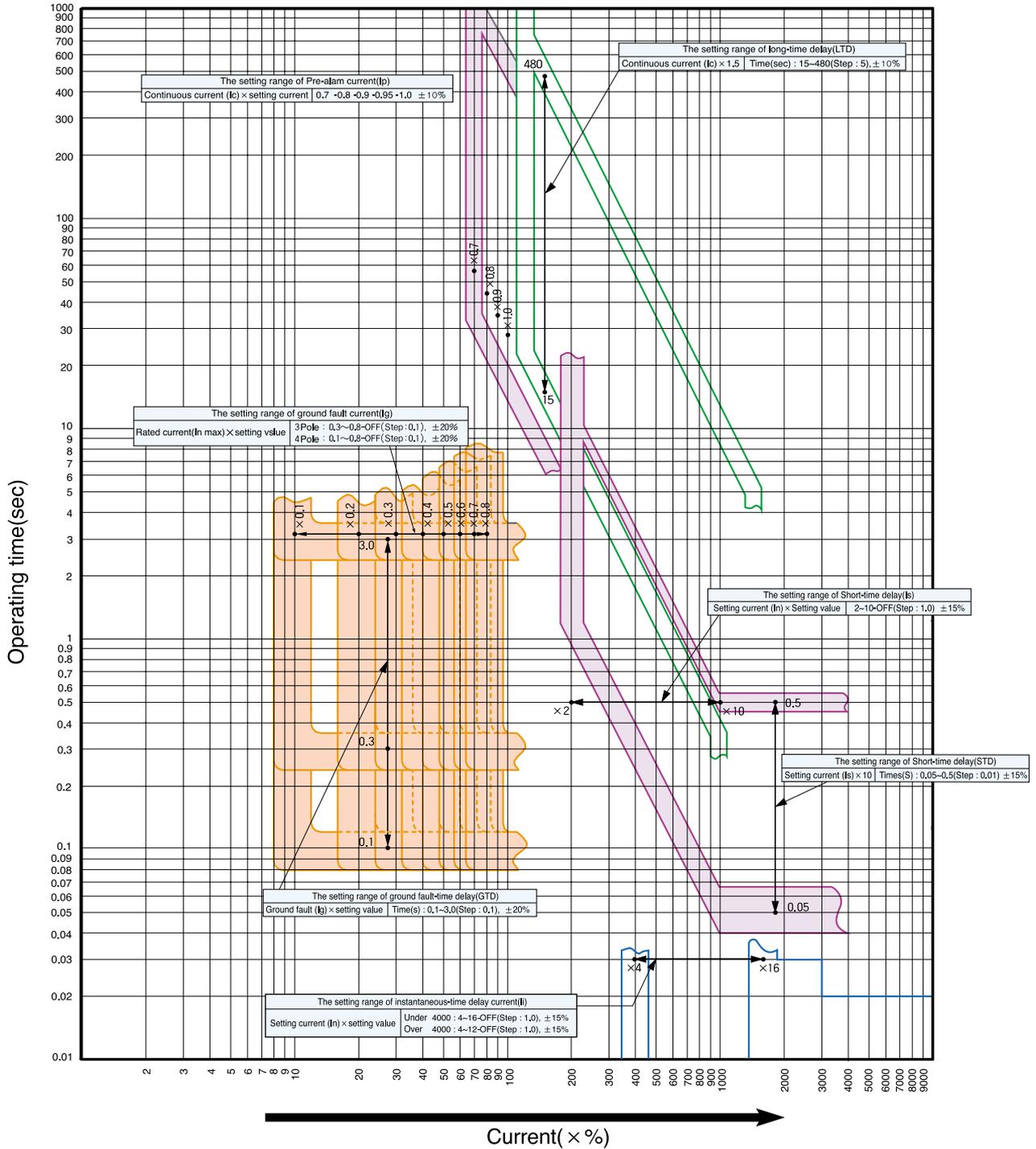
Characteristics curve | OCR-II

LGP, LTH(For industry)



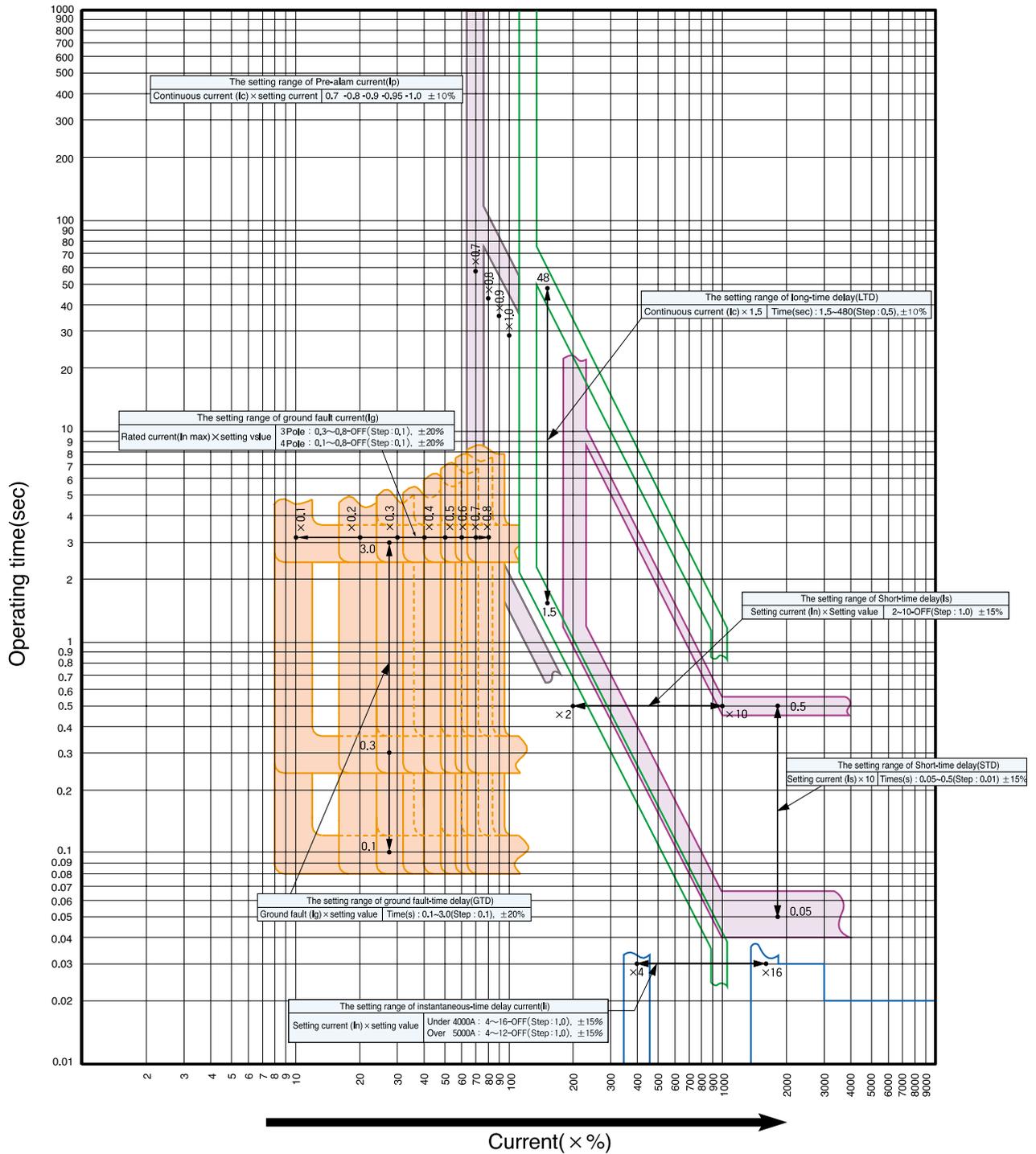
OCR-III

N□6, C□6, N□5, C□5 (For industry)



Characteristics curve | OCR-III

P□6, M□6, P□5, M□5 (For generator protection)



Optional accessories

OCR tester

Ratings

Name	OT-2000
Rated voltage	AC 100~240V
Frequency	50Hz, 60Hz (selection)
Output voltage	$I_{n\max}$: (0-1) → If the value of $I_{n\max}$ is 1, the output voltage is 200mV I_n : (0-30) $\times I_{n\max}$ → It corresponds to the signal of the OCR (Ex. If you set I_n to 30, 6V turns out.)
Type of output voltage	o, g, e <i>Note1</i>)
Stop signal	OCR, a-contact, b-contact
Trip time Check	TC: Detect only the operation state of OCR regardless of the timedelay characteristics. (Apply DC power)

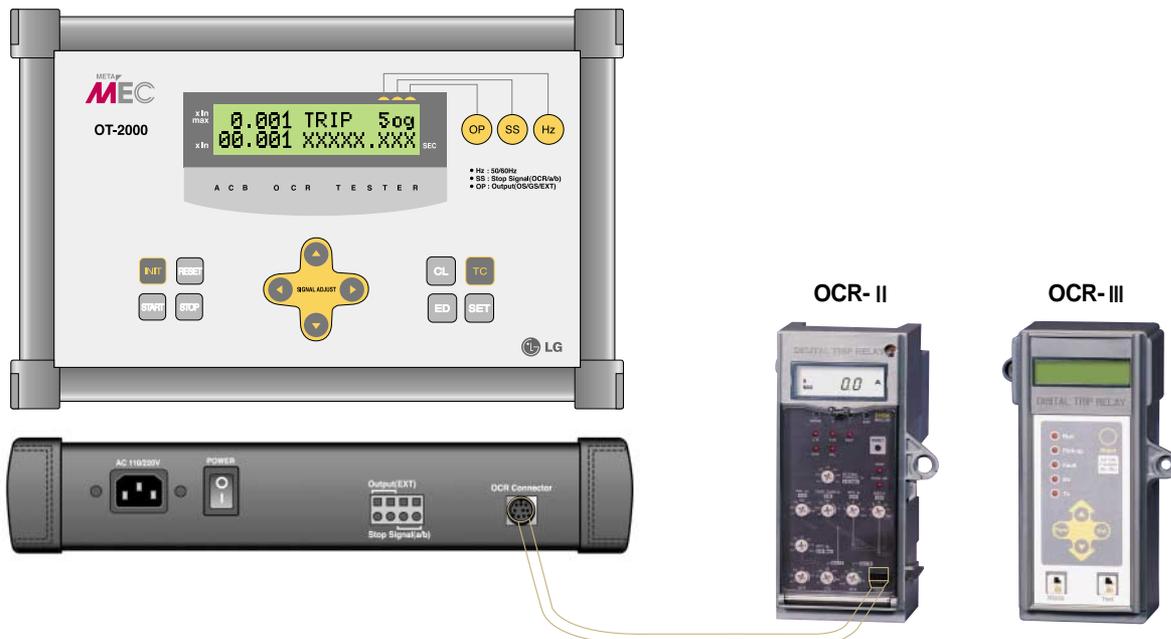
Key operating explanation

- Hz** Key to select frequency (50Hz, 60Hz)
- SS** Key to select type of stop signal input voltage of the OCR tester (OCR, a-contact, b-contact)
- CL** Key to initialize the test current value when ED has been pressed one time.
- TC** Key to test whether OCR is operated normally or not.

- INIT** Key to initialize test current value (I_n , I_n Max) and LED(trip, testing)
- START** Key to start the test.
- STOP** Key to stop the operation of tester device (Timer, stop output signal)
- RESET** Key to initialize timer. (0 ms)
- ED** Key that should be operated at first to revise test the current value, and select type of the test current.
- ▶** Key to shift the digit number of 7-segment, which shows the test current value to right direction
- ◀** Key to shift the digit number of 7-segment, which shows test current value to the left direction
- ▲** Key to increase 1digit by 1digit of 7-segment that shows the test current value.
- ▼** Key to decrease 1digit by 1digit of 7-segment that shows the test current value.
- SET** Key to set the test current value edited by →, ←, ↑, ↓ or CL
- OP** Key to select operational characteristics of trip relay

*Note) 1. - o: Pre-alarm, long-time delay, short-time delay, instantaneous-time delay trip
- g: Ground fault trip
- e: Display output of contact except trip relay(Use to check the tester)*

Connection method



Optional accessories

Auxiliary contact(AX)

- To remote supervisory of the ON/OFF state of the ACB

Ratings

Type		Standard type		High capacity type		Remark	
		Resistive load	Inductive load	Resistive load	Inductive load		
Contact capacity	AC	460V	5A	2A	5A	2.5A	
		250V	10A	10A	10A	10A	
		125V	10A	10A	10A	10A	
	DC	250V	0.3A	0.3A	3A	1.5A	
		125V	0.6A	0.6A	10A	6A	
		30V	10A	6A	10A	10A	
Maximum contact No.	AX	5a5b		-		Standard charging type	
	HX	-		5a4b			
	AC	5a5b		-		High speed reclose charging type	
	HC	-		5a5b			
Selection		Standard offer Note		Option			

Note) When you order the high capacity type auxiliary contact, the standard type auxiliary contact is not offered.

• Contact operating

The condition of ACB	a-contact	b-contact
ON	ON	OFF
OFF	OFF	ON

Cell switch(C)

kTo indicate the position (connected, test, dis-connected) of a ACB

It is installed in the upper and back side of a cradle.

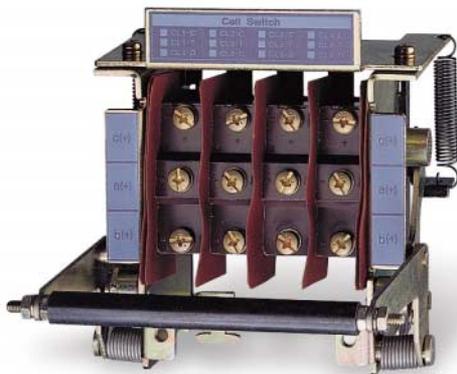
(Common use 630~5000A)

Standard contact configuration

- 4C: 1 Disconnected 1 test 2 connected

- 8C: 2 Disconnected 2 test 4 connected(4C × 2EA)

※ Please change contact configurations if you needed



ACB position		DISCONNECTED		CONNECTED	
Draw-in and draw-out position		DISCONNECTED	TEST	CONNECTED	
Contact operation	CL-C (CONNECTED)	OFF	ON	ON	
	CL-T (TEST)	OFF	ON	OFF	
	CL-D (DISCONNECTED)	ON	OFF	OFF	
Contact capacity	Voltage (V)	Resistive load		Inductive load	
		AC	460	5	2.5
			250	10	10
	DC	250	3	1.5	
		125	10	6	
		30	10	10	
Contact number		4C			

Note) The number of maximum contact: 8C (if needed)

ON/OFF button lock(B)

To protect mis-operation of the ON/OFF button of ACB (common use 630~5000A)

Miss insertion prevent device (MIP)

When the ratings of ACB and cradle does not match, this device mechanically prevent the ACB from being inserted into the cradle of ACB (common use 630~5000A)

Undervoltage trip device(UVT)

To trip the ACB automatically when the voltage of main power or control power source reduces below its normal value. It consists of UVT coil and UVT controller.

UVT is attached to the inside of main body and UVT controller left side of the main(Fixed type) or cradle(Draw-out).

In addition, external output contact(1a1b),which can use UVT operation as external control signal, is supplied.

* For control power use, please apply AC power only.

UVT ratings

Type	Name	Rated voltage	Operating time	UVT out put contact	Pick-up voltage	Drop-off voltage
Instantaneous type	V1	AC 110V	0.2sec under	1c	Over 85% of the rated voltage	Under 75% of the rated voltage
	V2	AC 220V				
	V3	AC 380V				
	V4	AC 460V				
	E1	DC 24V				
	E2	DC 48V				
	E3	DC 110V				
Time delay type	T1	AC 110V	0.5sec over	1c	Over 85% of the rated voltage	Under 75% of the rated voltage
	T2	AC 220V				
	T3	AC 380V				
	T4	AC 460V				
	F1	DC 24V				
	F2	DC 48V				
	F3	DC 110V				
	F4	DC 125V				
	D1	AC 110V	3sec over	-		
	D2	AC 220V				
	D3	AC 380V				
	D4	AC 460V				



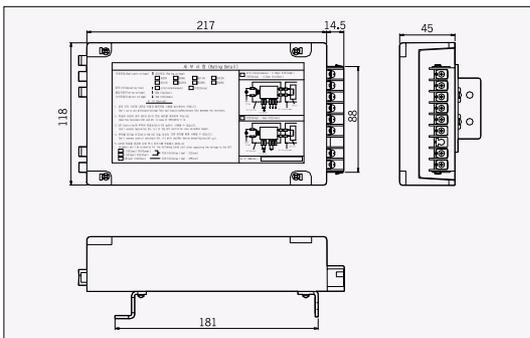
Caution In case of resetting or testing UVT device, please do not maintain 'ON' status of push button for a long time, and besides do not operate often ON/OFF. It can be cause of damage.
(Maintenance duration of 'ON' status : Under 1 second, ON/OFF Cycle : Under 30 Seconds)

Ratings of UVT output contact

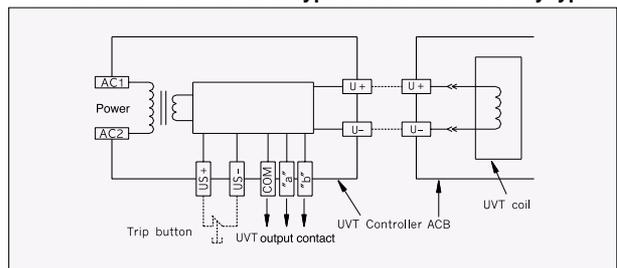
Type	Resistance load	Inductive load
Voltage	AC 125V	5A
	DC 30V	5A

Dimension & Circuit diagram of UVT

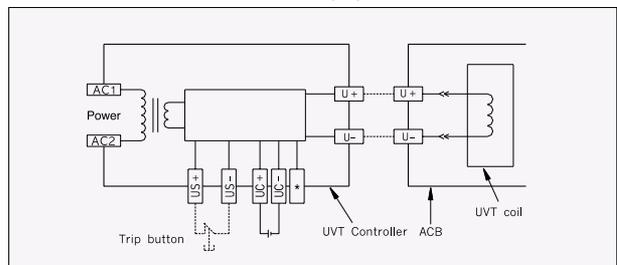
• UVT controller outline dimension



• UVT circuit of instantaneous type and 0.5 sec time delay type



• UVT circuit of 3 sec time delay type



Optional accessories

Key lock(K0, K1)

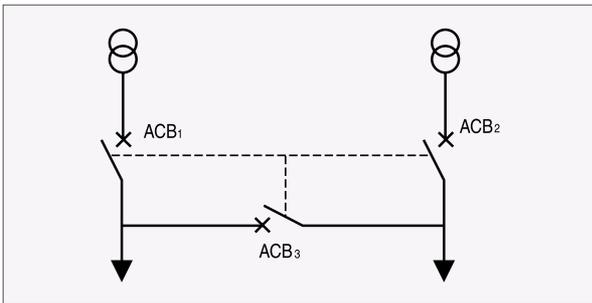
To compulsorily prevent specific breaker from charging(ON) or trip(OFF) when two or more breakers are used together by interlocking

- K0: Mechanical OFF protection
- K1: Mechanical ON protection



Key interlock(K2)

It consists of 3 breakers to supply power stably and it is possible to construct key interlock by using key lock attached to the inside of each breaker

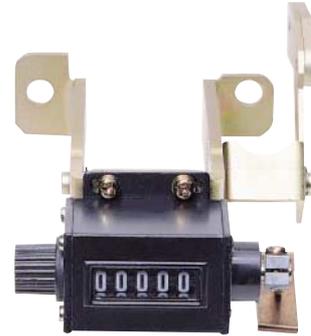


• Operational condition

ACB ₁	ACB ₂	ACB ₃
ON	ON	OFF
OFF	ON	ON
ON	OFF	ON

Counter (C)

To mechanically indicate the times of ON/OFF operation of breaker



Lifting hook (LH)

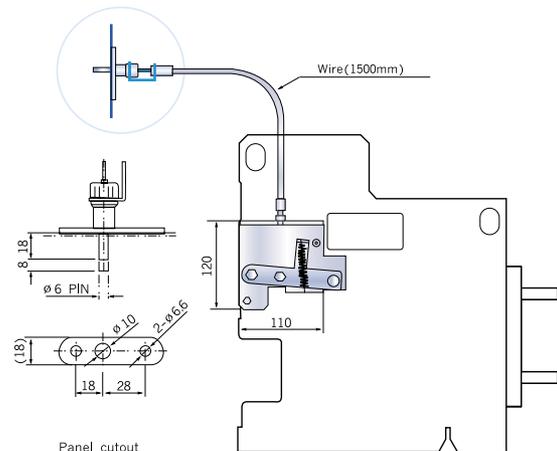
To move the ACB easily

- 630~1600A: Optional offer
- 2000~5000A: Standard offer



Door interlock(DI)

To prevent the panel door from opening when the breaker is ON



Shorting b-contact (SBC)

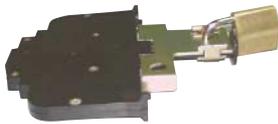
It is the contact to maintain the external control circuit normal condition by disconnection of Axb of auxiliary contact when the position of air circuit breaker is moved from connected position to test position. The number of shorting b contact is the same with the number(5b) of the auxiliary contact Axb of air circuit breaker.

• Contacts(Linkage between Axb and short "b")

ACB position		ACB condition	
		CLOSE	OPEN
Shorting b contact	Connected position	OFF	OFF
	Test position	ON	ON
Auxiliary contacts (Axb)	Connected position	OFF	ON
	Test position	OFF	ON

Safety shutter lock(STL)

To fix safety shutter for the safety during the operation in draw-out state of a breaker.

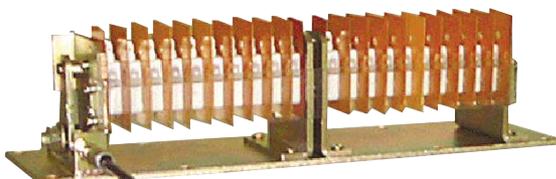


Door frame (DF)

It is the device to look fine after the cut of a switchboard door when the breaker is installed. It helps to check the front of a breaker from the outside of a distributing board easily. ※ Please refer to door frame in 41, 42page.

Mechanical operated cell switch (MOC)

The ACB mechanically operates, only in case of "connected" position of its main board, so as to display its ON/OFF condition by contact 10a and 10b. Both Standard and large types are available. The contact capacity is identical with the rated auxiliary contacts in page 26.



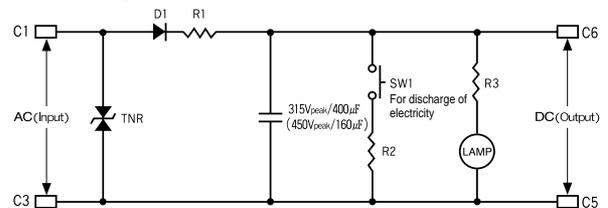
Condenser trip device (CTD)

To trip the breaker electrically within regular time when the control power source is off. It is used with Shunt Coil(SHT). If there isn't DC power, it is possible to supply the power to ACB by rectifying the AC power.

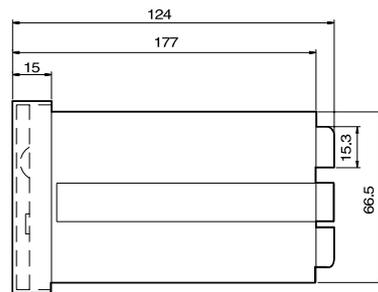
• Ratings

Ratings	Specification	
Type name	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 5sec	Within 5sec
Tripping time	over 3min	over 2min
Range of input voltage(%)	85~110	85~110
Condensor capacity	400 μ F	160 μ F

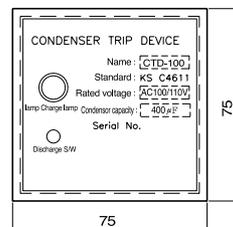
• Circuit diagram



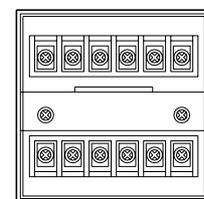
• Outline dimension



<Side view>



<Front view>



<Rear view>

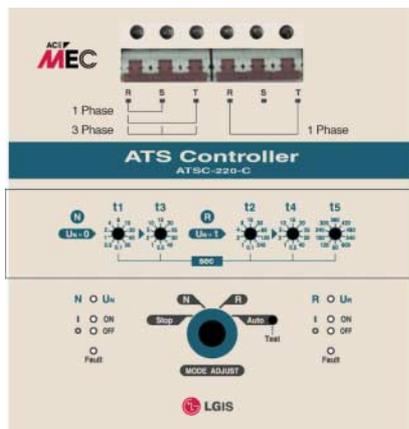
ATS with ACBs

Interlock can be composed only of an electric driven charge type circuit breaker and there are two kinds of bar type and wire one. And in order to incorporate electric Interlock , ATS control is required separately. Electric Interlock charge closing mode, voltage trip coil, closing coil, auxiliary contactor and charge complete contactor are elements for basic composition of ACB.

ATS controller rating

As an operation voltage of ATS Controller it operates a motor of circuit breaker so an operation voltage of ATS controller and an operation of circuit breaker shall be used in the same way.

Model Name	ATSC-110	ATSC-110-C	ATSC-220	ATSC-220-C
Rated voltage	AC110V		AC220V	
Usable voltage range	AC 93.5(±5%)~126.5V(±5%)		AC 187(±5%)~253V(±5%)	
Frequency	50Hz/60Hz			
Consumption power(wave phase)	15.4W			
4-Position switch(stop,N, R, Auto)	■	■	■	■
Test function	■	■	■	■
Transmitter control function	■	■	■	■
NRS function	■	■	■	■
N power selection(Main phase/3phase)	■	■	■	■
Time setting(T1~T6)	■	■	■	■
Fault function(OCR/Circuit breaker trouble)	■	■	■	■
Output contact(auto, load)	■	■	■	■
Communication function (RS-485)	-	■	-	■



- T₁ : At the time when EPCO UN is OFF the delayed time until Generation start-up signal is closed (t₁ : 0.1, 0.5, 1, 2, 4, 8, 15, 30, 40, 50 seconds)
- T₂ : At the time when EPCO UN is ON the delayed time until ACB₂ is tripped (OFF) (t₂ : 0.1, 1, 2, 4, 8, 15, 30, 60, 120, 240 seconds)
- T₃ : At the time when ACB is tripped(OFF) the delayed time until ACB₂ is inputted(ON) (t₃ : 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40 seconds)
- T₄ : At the time when ACB₂ is tripped(OFF) the delayed time until ACB₂ is inputted(ON) (t₄ : 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40 seconds)
- T₅ : At the time when ACB₂ is tripped(OFF) the delayed time until Generation start-up signal contactor is opened (t₅ : 60, 120, 180, 240, 300, 360, 420, 480, 540, 600 seconds)

- Stop-mode : In a state that UN (EPCO power) or UR(The Power , Station power) is usable a mode that ACB₁(EPCO Circuit breaker) and ACB₂ (The Power Station circuit breaker) are tripped (OFF).
- N-mode : In a state that UN (EPCO power) is usable a mode that ACB₁(EPCO circuit breaker) is inputted (ON) artificially -UR (The Power Station power) is not related to ON or OFF state and if converting into N-mode during use of UR (The Power Station power) Generation start-up signal is opened.
- R-mode : In a state that UN (EPCO power) is usable or not a mode that ACB₂(The Power Station circuit breaker) is inputted (ON) artificially in a state that UR(The Power Station power) is usable
- Auto-mode : A mode that unusable power (UN or UR) circuit breaker is tripped (OFF) or usable power circuit breaker is inputted (ON) according to unusability or usability of UN (EPCO power) or UR (The Power Station power).

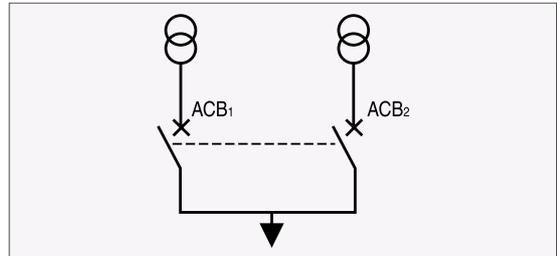
Note) EPCO: Electric Power Co.

Operational condition

In case of using 2 ACBs

- If 1(One) of 2(two) connected ACBs is ON, the other is not ON electrically and mechanically by interlock.
- Operational condition

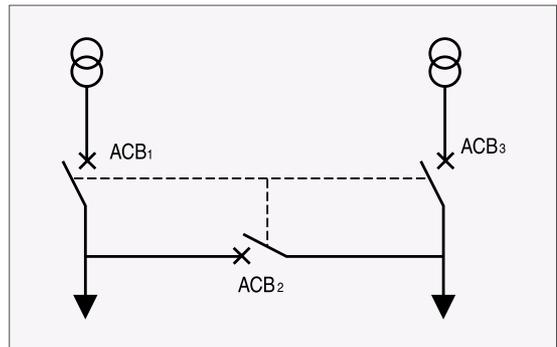
ACB ₁	ACB ₂
OFF	OFF
ON	OFF
OFF	ON



In case of using 3 ACBs

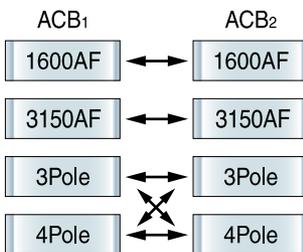
- If 2(two) of 3(three) connected ACBs are ON simultaneously, the other is not ON electrically and mechanically by interlock.
- Operational condition

ACB ₁	ACB ₂	ACB ₃
OFF	OFF	OFF
ON	OFF	OFF
ON	ON	OFF
OFF	ON	ON
OFF	OFF	ON
ON	OFF	ON



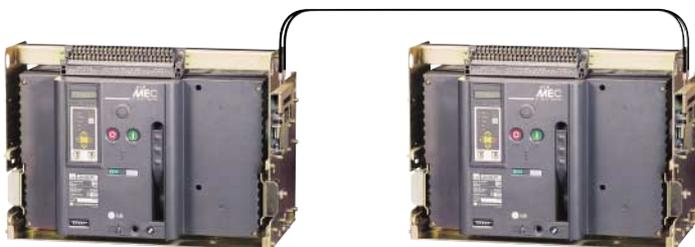
Interlock method

Bar type



Wire type

Interlock is possible regardless of the Ampere Frame sizes and the number of poles. Standard length of wires are 2 meters



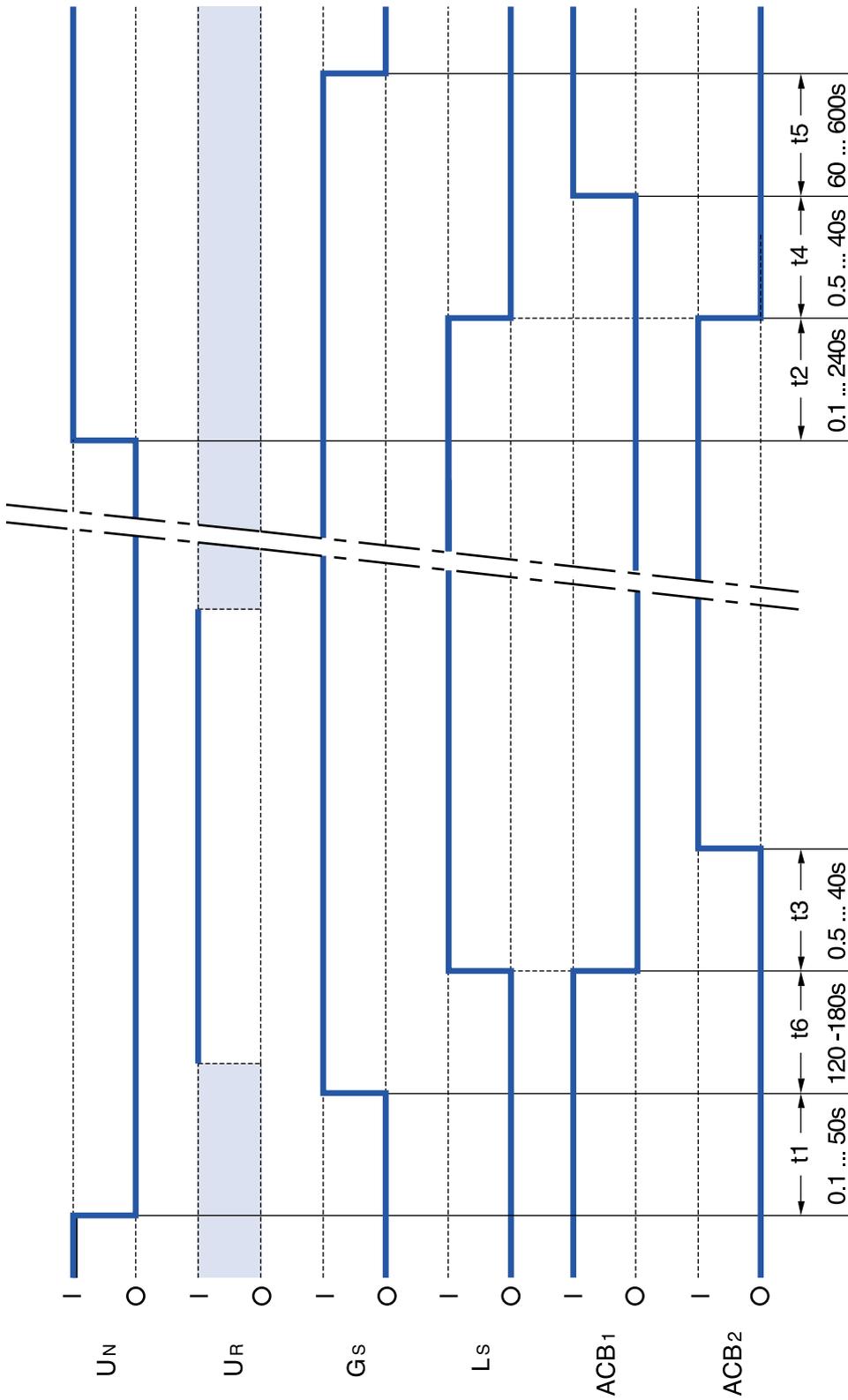
<Wire Type>



<Bar Type>

ATS with ACBs

Time chart



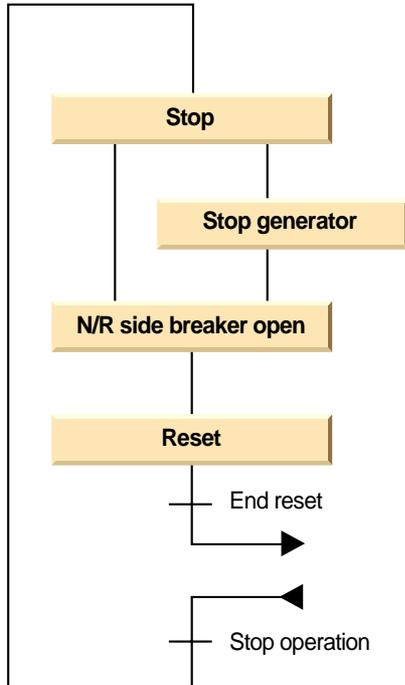
- * U_N : Main power(normal power)
- * U_R : Emergency power (standby power)
- * G_s : Generator start-up signal
- * L_s : Load shedding
- * ACB_1 : N-side breaker(normal breaker)
- * ACB_2 : R-side breaker(stand-by breaker)

* symbol explanation

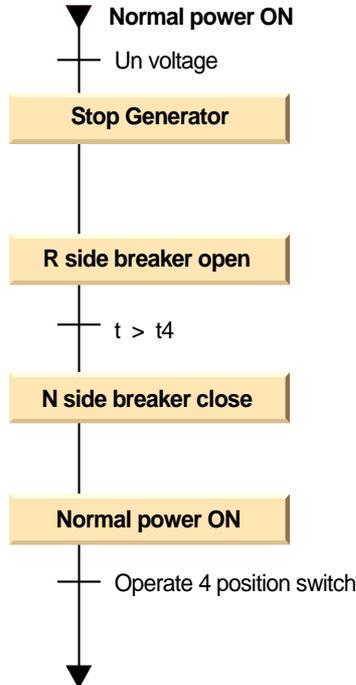
- **I position**: circuit close
- **O position**: circuit open
- : there is no effect whether the condition is ON or OFF

A flow chart of operation

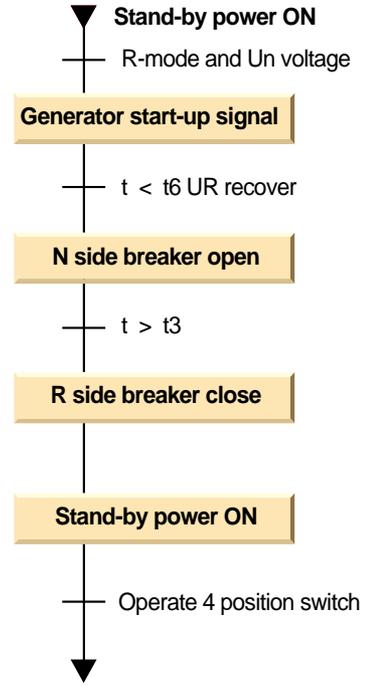
STOP mode



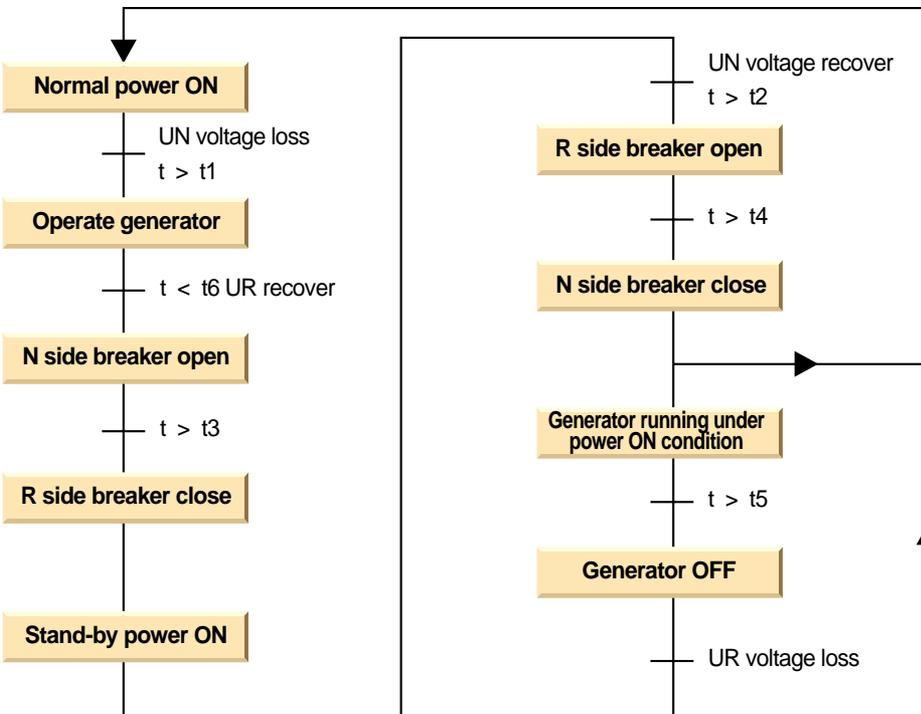
N mode



R mode



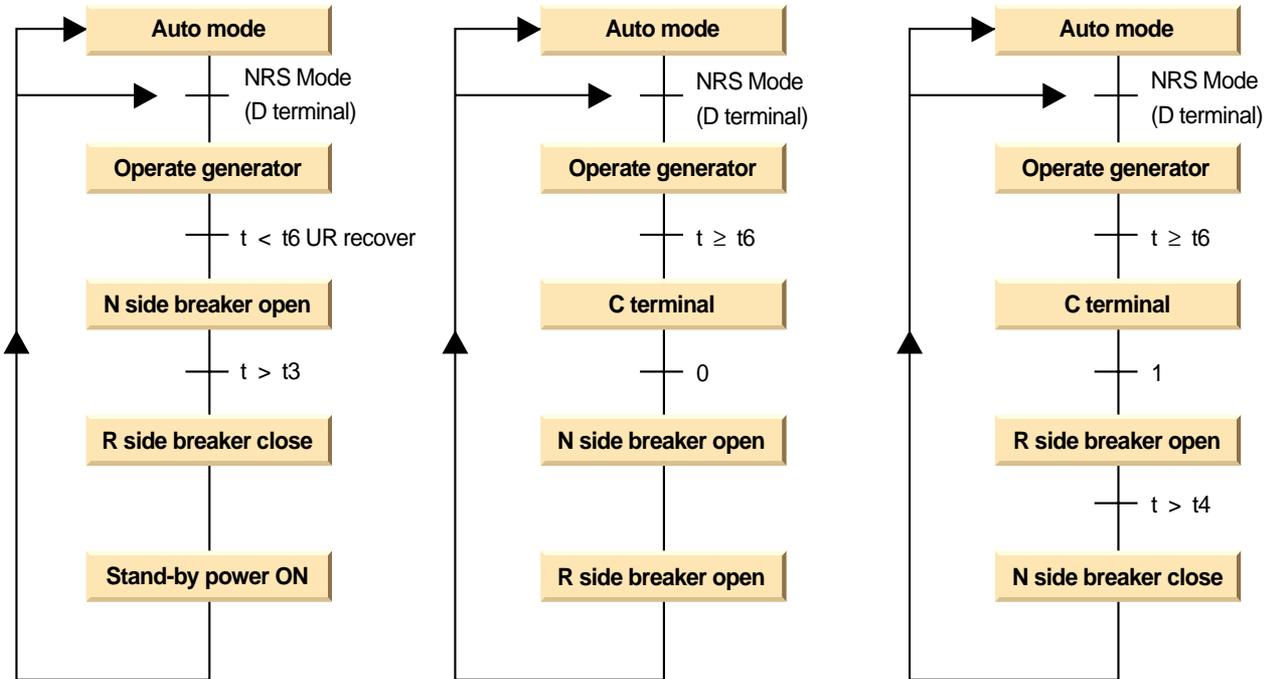
AUTO mode



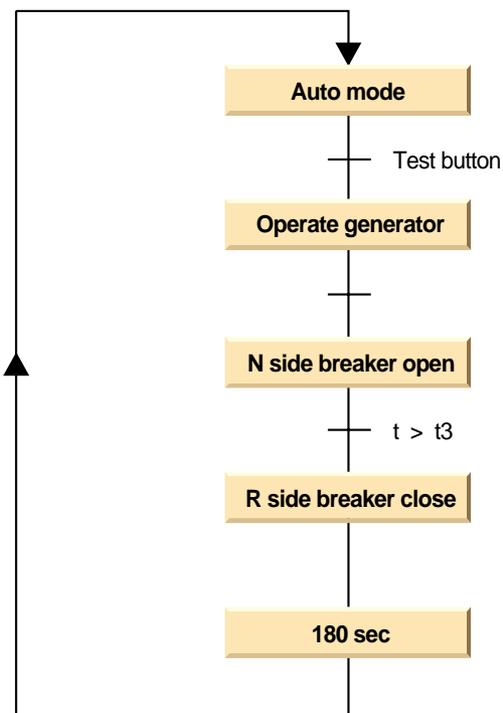
ATS with ACBs

A flow chart of operation

NRS mode



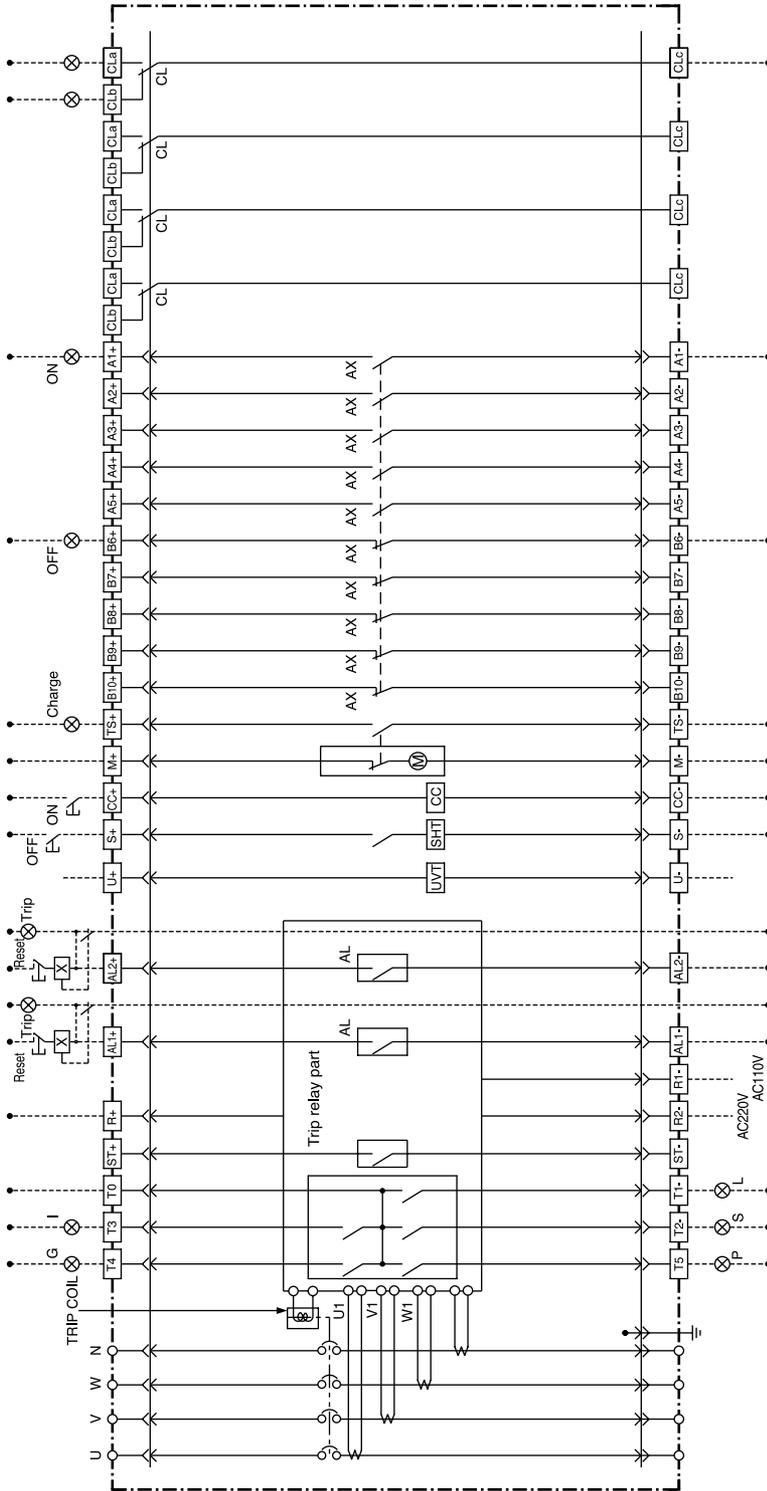
Test mode



Note) If you want to stop the test under test mode, press test button again

Control circuit

OCR-II



Terminal code description

Terminal	Terminal code description	Terminal code description	Terminal code description
A1 ~ A5	Auxiliary switch a-contact terminal	ALH AL-1	OCR signal contact terminal
BE ~ B10 (Nac3)	Auxiliary switch b-contact terminal	AL2H AL2-1	Operational, 15ms under
IS+	Charge complete contact terminal	TO ~ T4 (Nac3)	Trip indication contact terminal
M+	Motor charging power input terminal	TS	Pre-alarm indication contact terminal
CC+	Closing coil power input terminal	GL1 GL1B GL1C	Cell Switch
S+	Trip coil power input terminal	R+ ~ (Nac-4)	Trip relay power input terminal COM
U+	Undervoltage tripping coil terminal	R1- ~ (Nac-4)	Trip relay power input terminal AC110V
ST+	External tripping power input terminal	R2- ~ (Nac-4)	Trip relay power input terminal AC220V

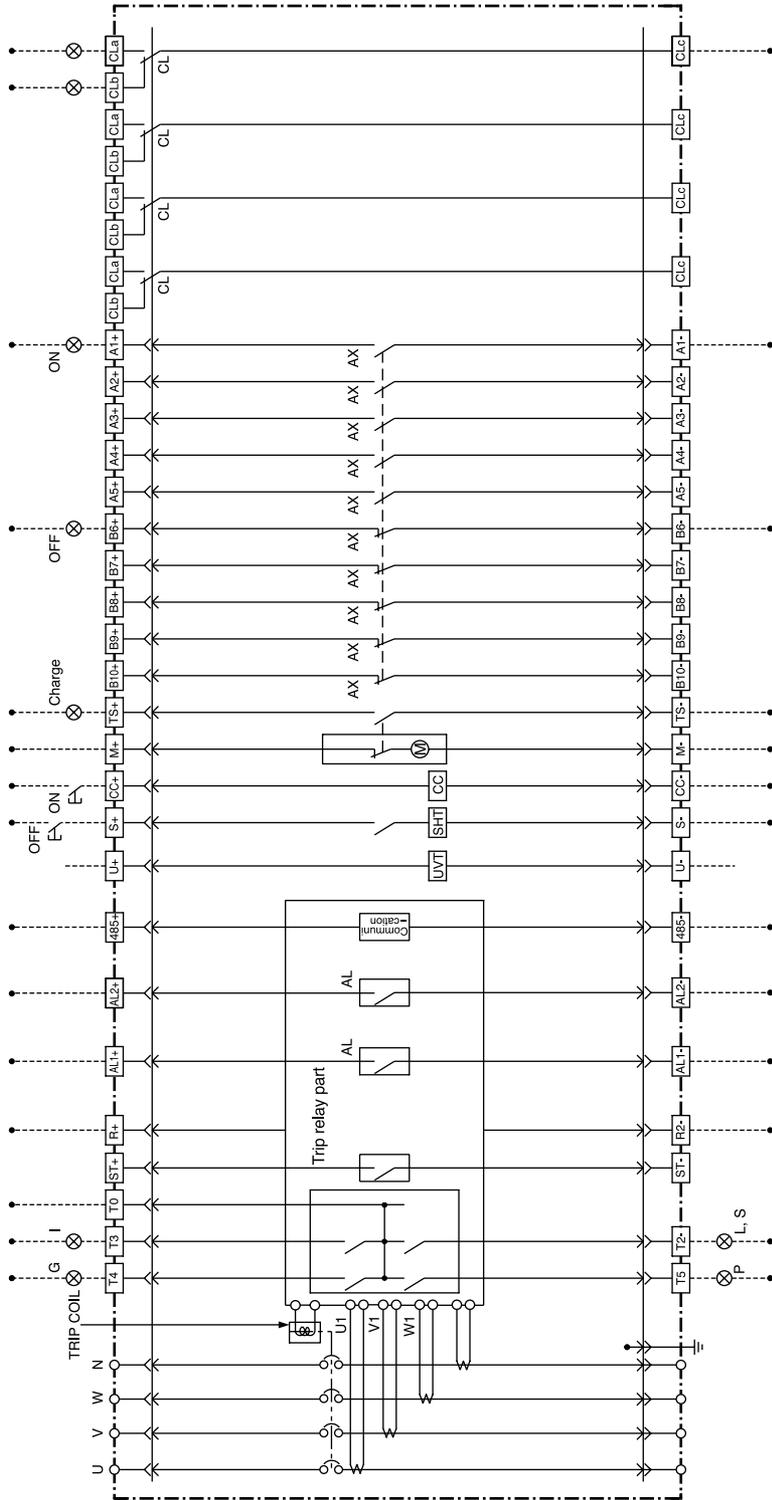
Accessory code description

Accessory code	Accessory code description
⊕	Motor for charging
⊗	Ground-fault delay tripping indication contact
⊗ P	Pre-alarm indication contact
⊗ X	Magnetic maintenance circuit
---	Factory wiring
---	User wiring

- Note 1. In case of auxiliary contact is high capacity, B10H and B10L can not be used because contact composition is 5a4b.
 2. Under voltage trip coil terminal such as U+ or U- shall put output power of UVT controller.
 3. In case of 3poles, T4 terminal shall be removed.
 4. Only alternating current power shall be put to trip relay power terminal such as R+, R-, and R2-.
 5. Above circuit diagram shows ACB locates on "Connected" position and ACB status will be trip or motor charging completion.

Control circuit

OCR-III



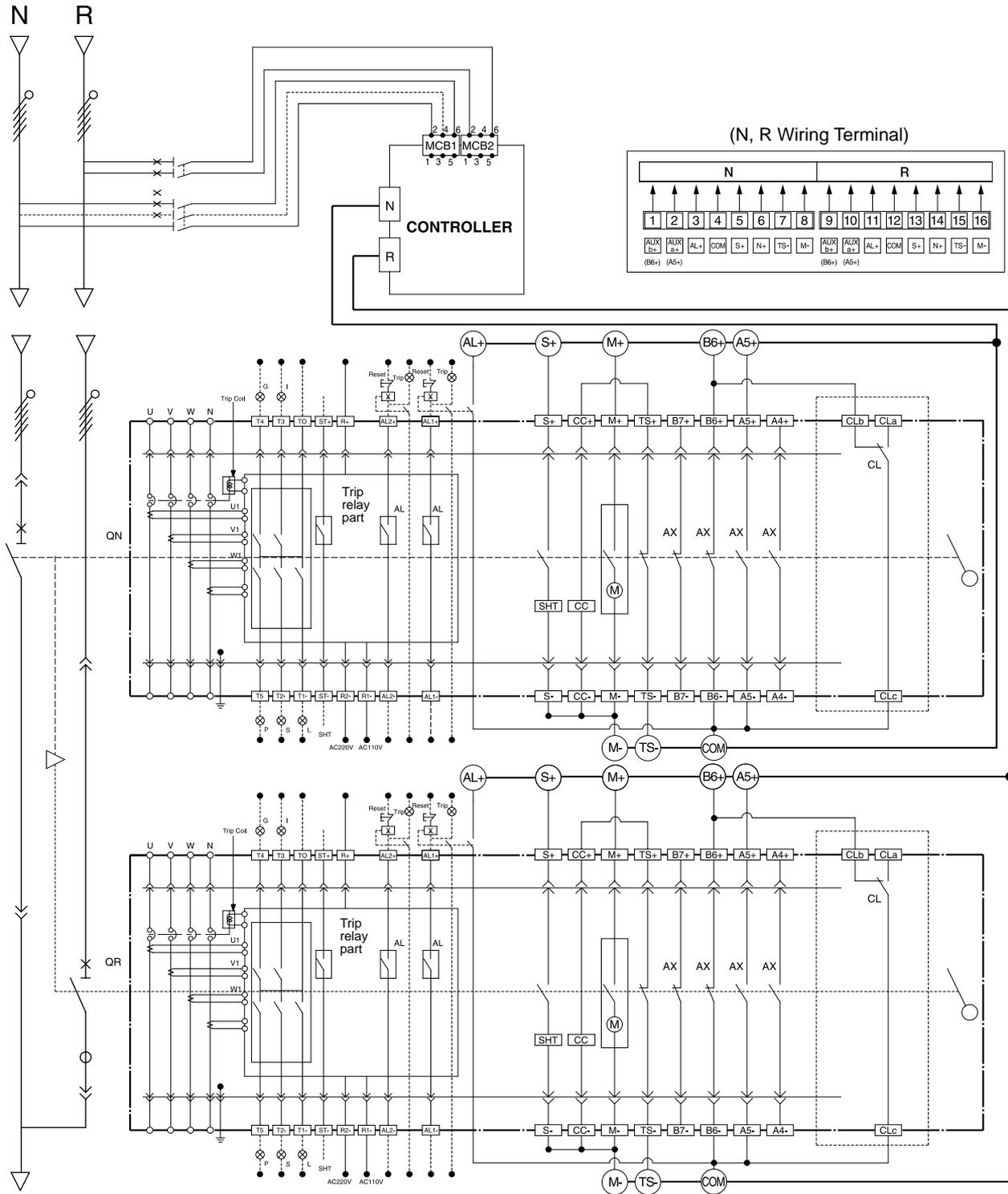
Accessory code description

Terminal	Symbol	Description	Notes
[A1] ~ [A5]	[ALH] [AL-]	Auxiliary switch a-contact terminal	
[B6] ~ [B10] (Note 1)	[AL2H] [AL2-]	Auxiliary switch b-contact terminal	
[TS+] [TS-]	[T0] ~ [T4]	Charge complete contact terminal	
[M+] [M-]	[T5]	Motor charging power input terminal	
[CC+] [CC-]	[G1a] [G1b] [G1c]	Closing coil power input terminal	
[S+] [S-]	[R+] (Note 3) [R2-] (Note 3)	Trip coil power input terminal	
[U+] [U-] (Note 2)	[P]	Under-voltage tripping coil terminal	
[ST+] [ST-]	[Q]	External tripping power input terminal	
[CC]	[X]	Closing coil	Magnetic maintenance circuit
[SHT]		Shunt trip coil	Factory wiring
[UVT]		Under-voltage tripping coil	User wiring
[AL]		OCR signal contact	
[L, S]		Long-time Short-time delay tripping indication contact	
[I]		Instantaneous delay tripping indication contact	
[G]		Ground-fault delay tripping indication contact	
[P]		Pre-alarm indication contact	

Terminal code description

- Note) 1. In case of auxiliary contact is high capacity, [B10H] and [B10-] can not be used because contact composition is 5A/4b.
 2. Under voltage trip coil terminal such as [U+] or [U-] shall put output power of UVT controller.
 3. Only alternating current power shall be put to trip relay power terminal such as [R+] and [R2-].
 4. Above circuit diagram shows ACB locates on "Connected" position and ACB status will be trip or motor charging completion.

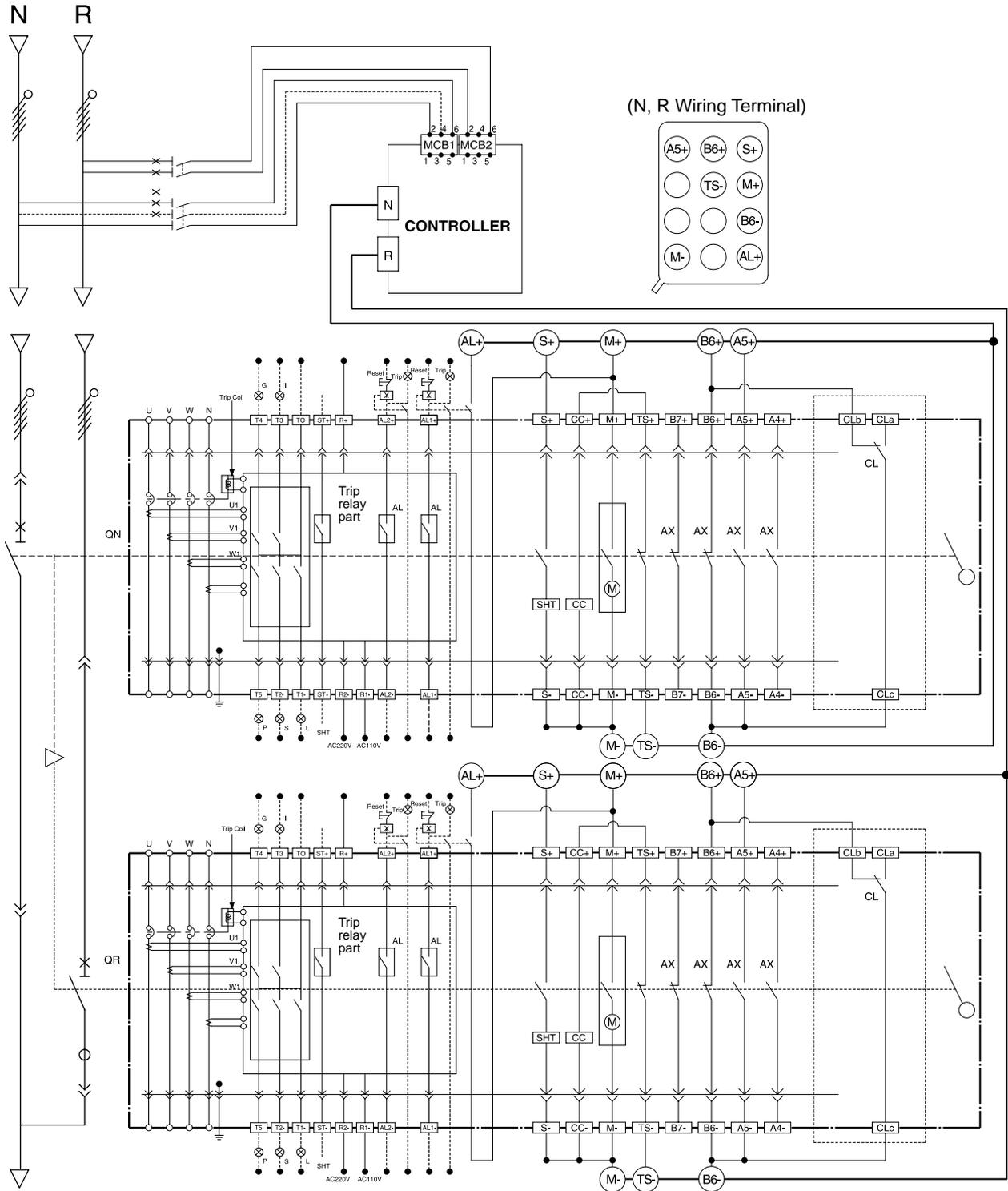
ATS with ACBs (LG controller circuit)



- Note) 1. □□ part shows optional feature "N" and "R" distributing wires are in same condition and applied OCR-II.
 2. In case of connecting the trip relay (OCR-II) Control power R+/R1-: AC110V, R+/R2-: AC220V
 3. In case of connecting the trip relay (OCR-III) Control power R+/R2-: AC/DC110V~220V common use, DC48V, DC24V (R1- contact is not provided)
 4. Please compose "Self maintenance circuit" because alarm contact (AL1+/AL1-, AL2+/AL2-) is a instantaneous operating (under 15ms) type in case of using OCR-II.
 You may not compose "Self maintenance circuit", provided when OCR-III is using for a trip relay.
 5. Please input power to the MCB1, MCB2 of controller from the primary power.
 (If it is tripped OCR at the load part when power is connected, power will not be transferred automatically)
 6. Please connect the control power of trip relay (OCR-II, III) at the primary power section.
 7. According to this circuit drawing, ACB position is "connected" standard, and ACB status is motor charged and tripped.

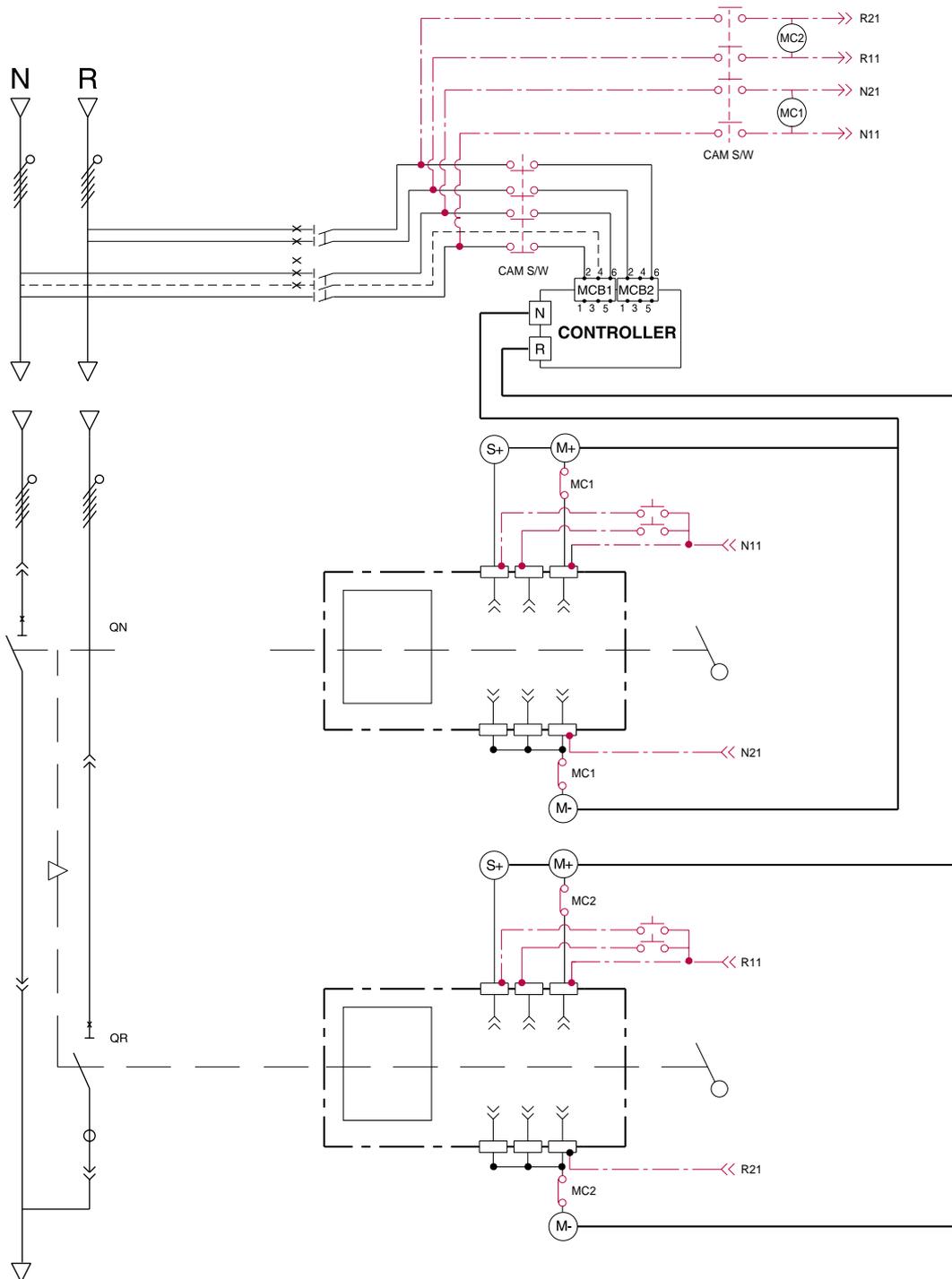
Control circuit

ATS with ACBs (M/G controller circuit)



- Note 1. [] part shows optional feature "N" and "R" distributing wires are in same condition and applied OCR-II.
- In case of connecting the trip relay (OCR-II) Control power R+/R1-: AC/DC110V, R+/R2-: AC220V
 - In case of connecting the trip relay (OCR-III) Control power R+/R2-: AC/DC110V~220V common use, DC48V, DC24V (R1- contact is not provided)
 - Please compose "Self maintenance circuit" because alarm contact (AL1+/AL1-, AL2+/AL2-) is a instantaneous operating (under 15ms) type in case of using OCR-II. You may not compose "Self maintenance circuit", provided when OCR-III is using for a trip relay.
 - Please input power to the MCB1, MCB2 of controller from the primary power. (If it is tripped OCR at the load part when power is connected, power will not be transferred automatically)
 - Please connect the control power of trip relay (OCR-II, III) at the primary power section.
 - According to this circuit drawing, ACB position is "connected" standard, and ACB status is motor charged and tripped.

ATS with ACBs (Manual)



Caution

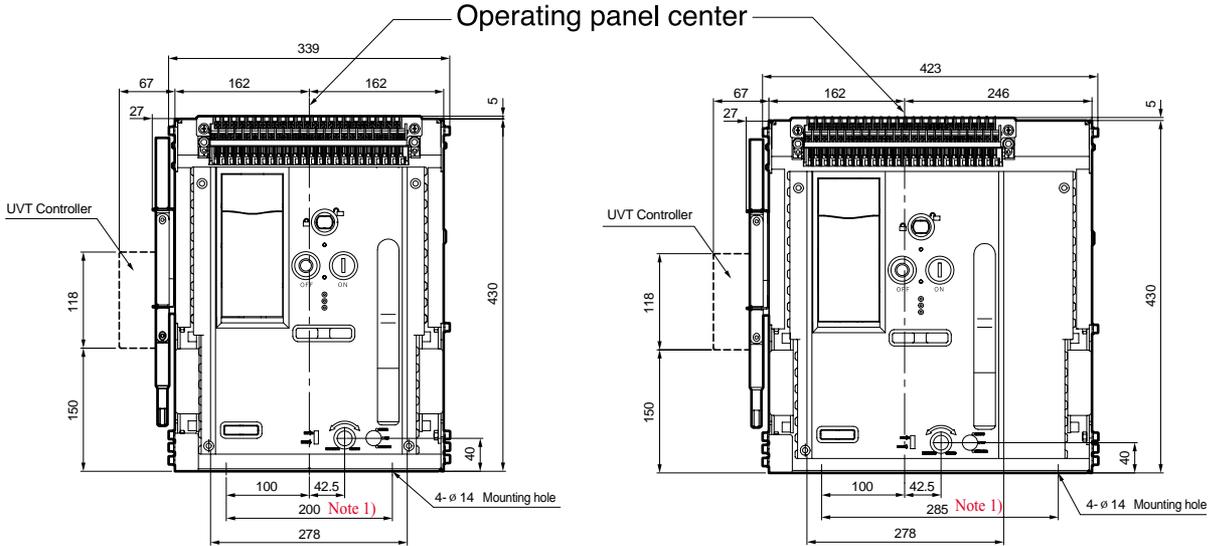
1. ATS Controller will be damaged when MC1 or MC2 is missing. Please compose it essentially.
2. If application of connection wire is required, please compose M+ and M- of Auto mode wiring which shall open when transfer from Auto mode to manual mode.

- Note) 1. Red part shows manual wiring.
 2. Above wiring drawing is simplified, please refer to page 38.
 3. CAM S/W specification : 2position 4contact (4a4b).
 4. MC1, MC2 specification : AX 2b/Minimum contact capacity shall be 10A.
 5. Wiring of Auto/Manual mode of "N", "R" circuit breaker is composed in same way. (When ship a ACB at factory)

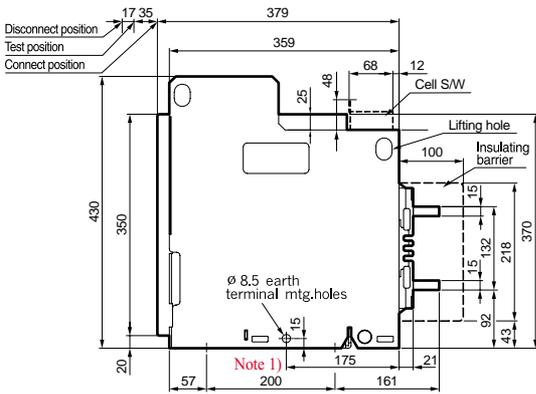
External dimensions (Draw-out type)

Horizontal terminal type (630~1600A)

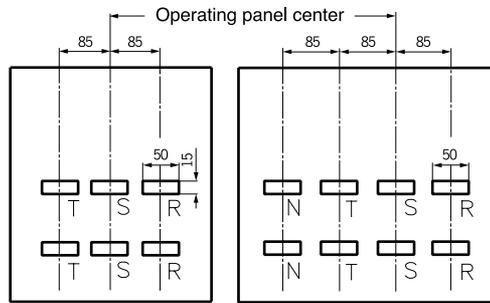
(Unit: mm)



[Front view]



[Side view]

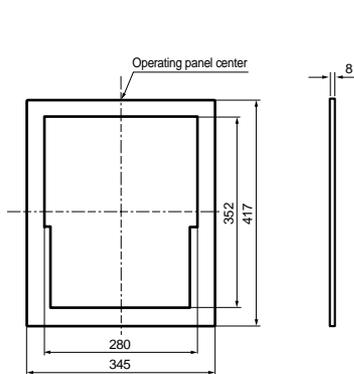


[Rear view]

[Connection conductor]

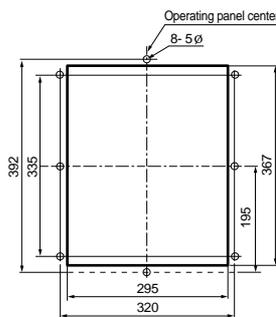
Note 1. Size of mounting hole
 Note 2. Size of connection conductor of Ace-MEC ACB.

Door Frame (DF): (630~1600AF/3,4Pole)



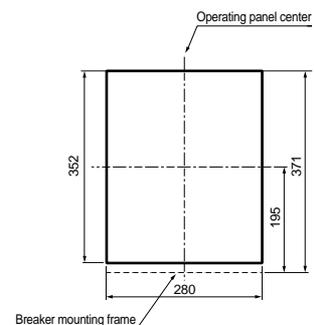
External size

[In case of using DF]



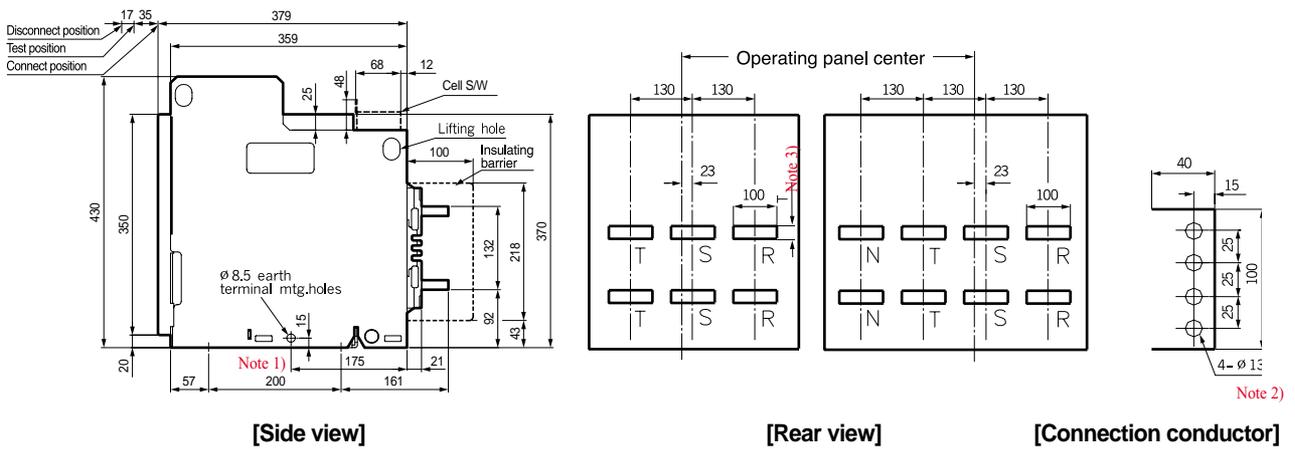
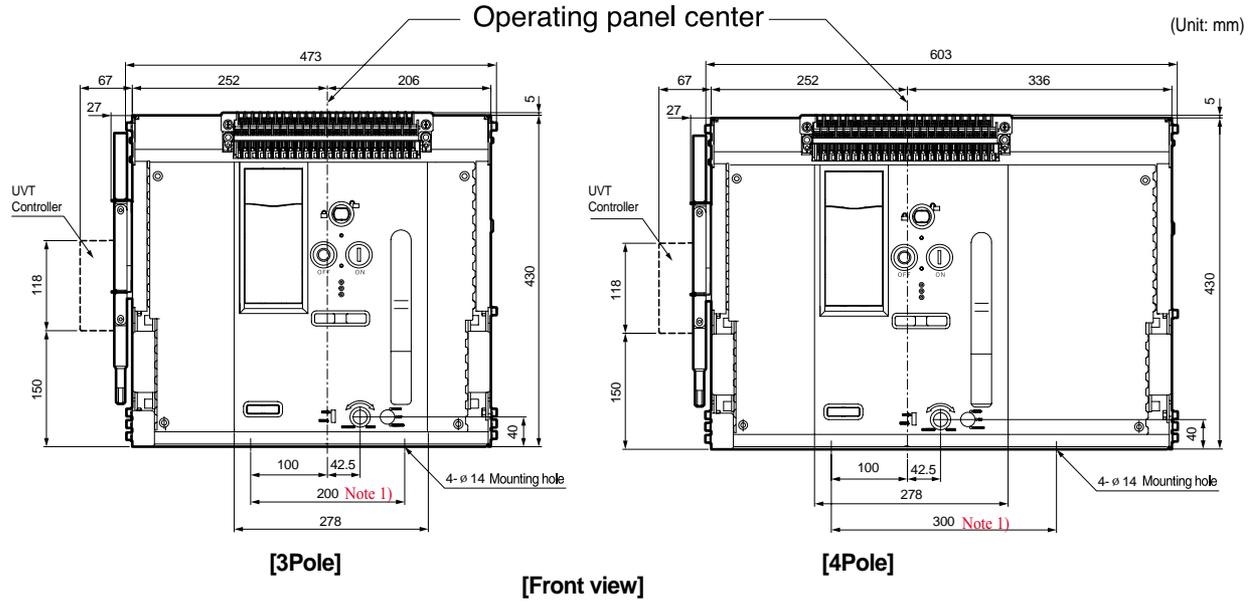
Dimension of cutting panel

[In case of not using DF]



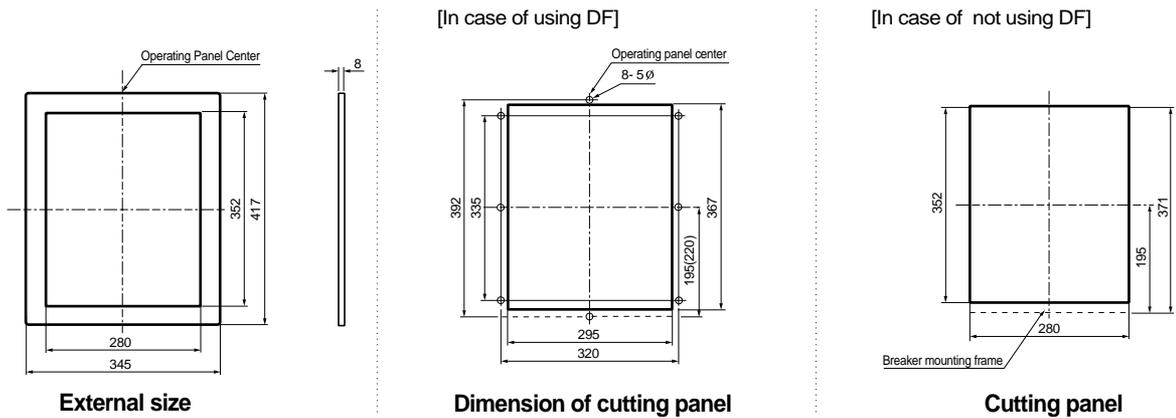
Cutting panel

Horizontal terminal type (2000~3150A)



- Note 1) Size of mounting hole
- Note 2) Size of connection conductor of Ace-MEC ACB.
- Note 3) Please refer to T dimension in 41 page.

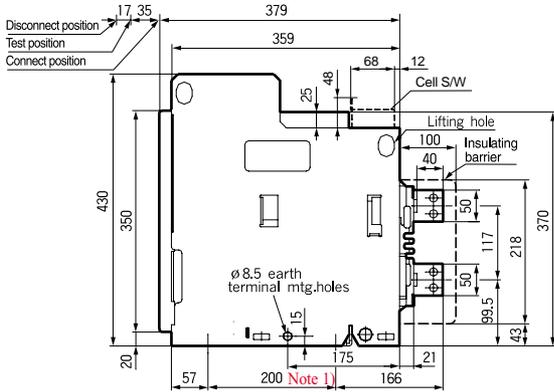
Door frame (DF): (2000~3150AF/3,4Pole)



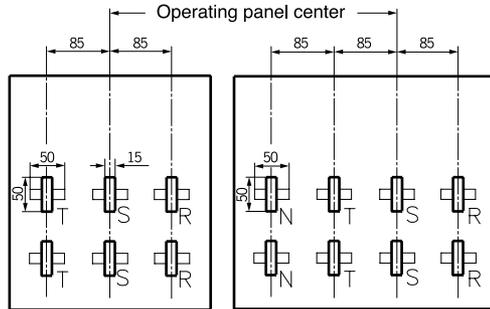
External dimensions (Draw-out type)

Vertical terminal type (630~1600A)

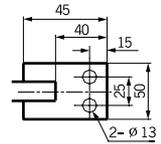
(Unit: mm)



[Side view]

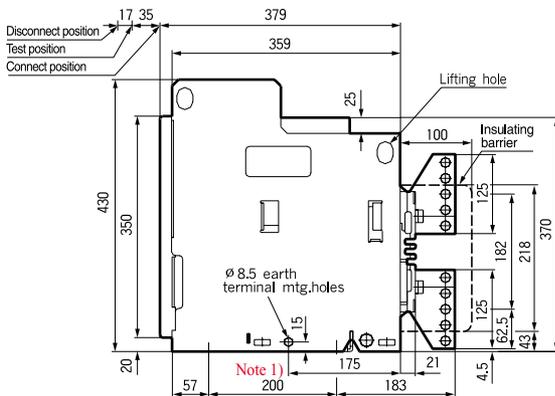


[Rear view]

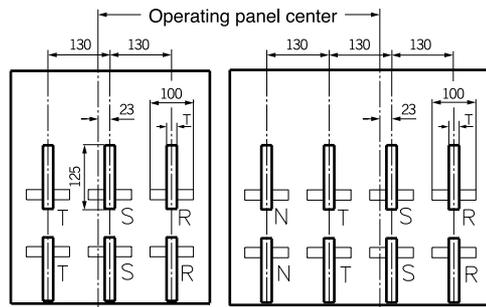


[Connection conductor]

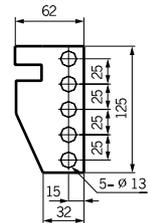
Vertical terminal type (2000~3150A)



[Side view]



[Rear view]



[Connection conductor]

• "T" Size

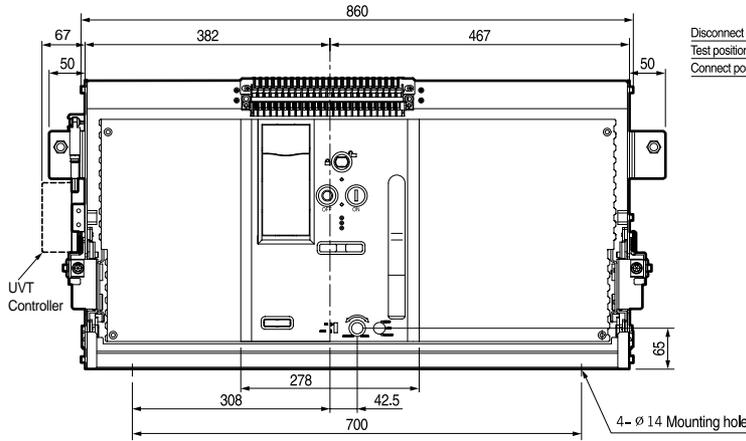
Rated current	T
2000A, 2500A	20
3150A	25

Note) 1. Size of mounting hole

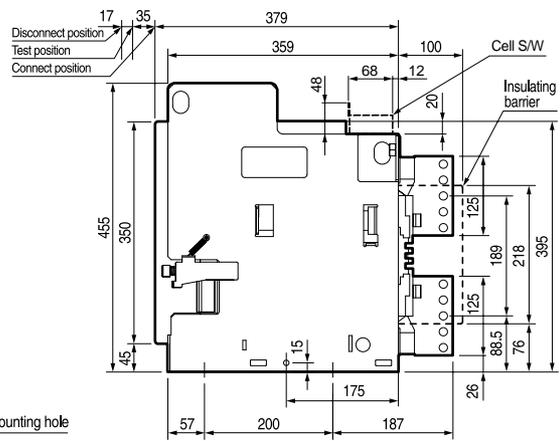
2. Size of connection conductor of Ace-MEC ACB.

Vertical terminal type (4000~5000A)

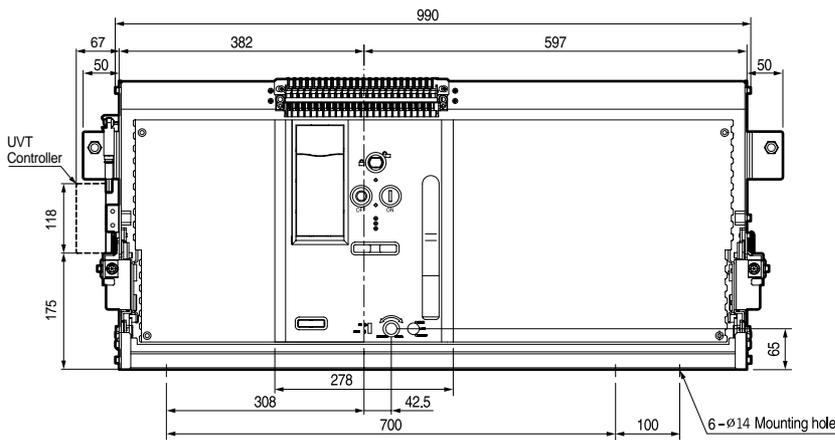
(Unit: mm)



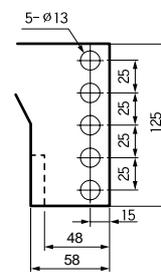
[Front view] [3Pole]



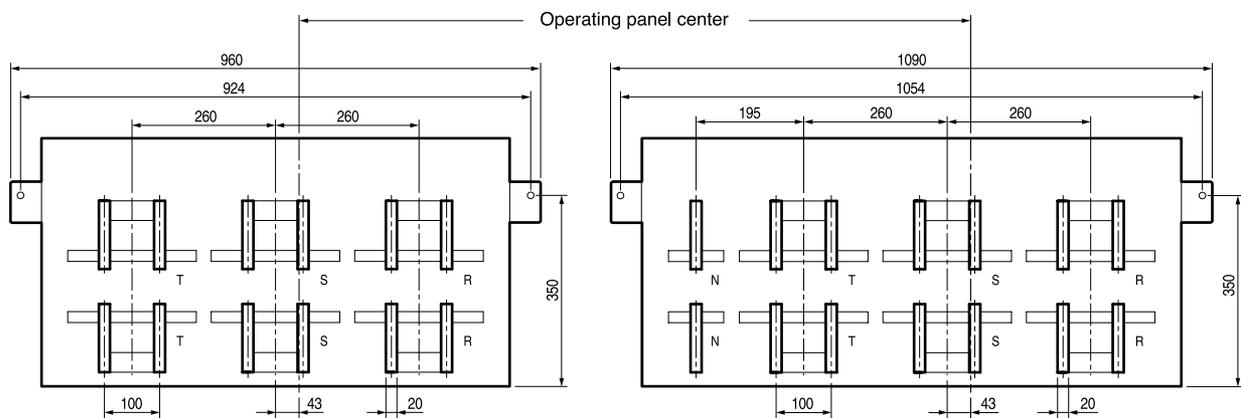
[Side view]



[Front view] [4Pole]



[Connection conductor]



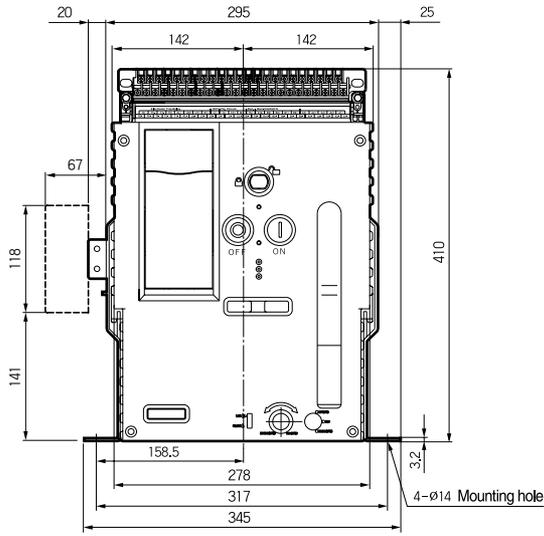
[Rear view]

• Door Frame (DF): (4000~5000AF/3,4Pole): The 2000~3150A of page41 is common use.

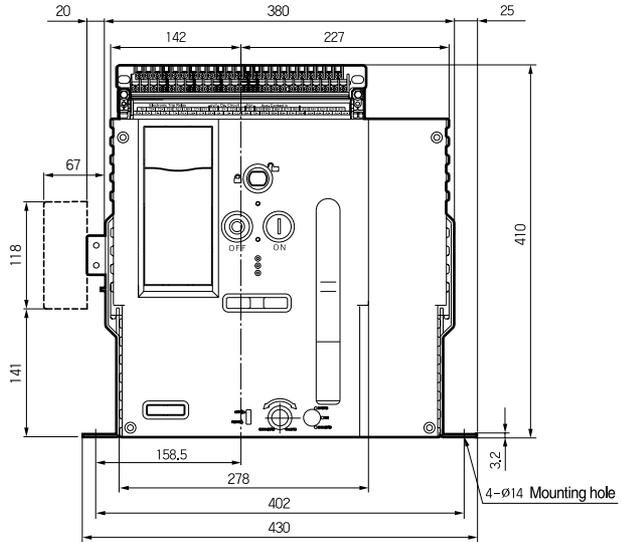
External dimensions(Fixed type)

Horizontal terminal type (630~1600A)

(Unit: mm)

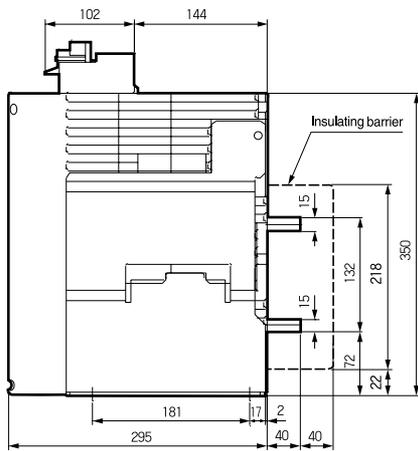


[3Pole]

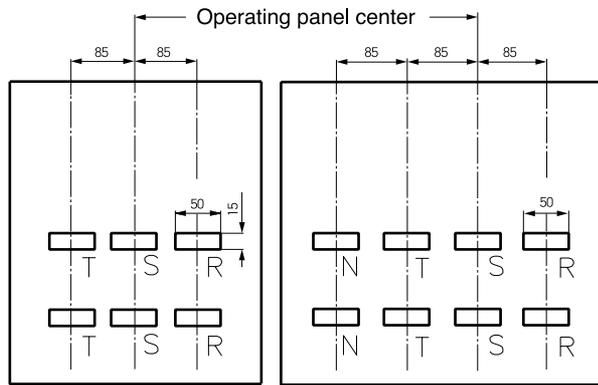


[4Pole]

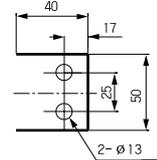
[Front view]



[Side view]

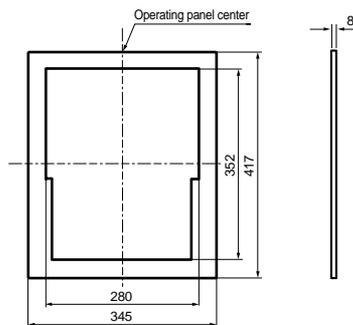


[Rear view]



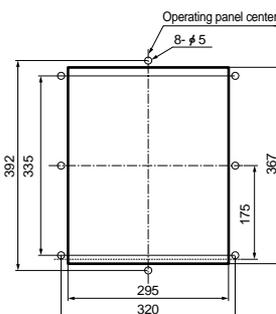
[Connection conductor]

Door Frame (DF) : (630~1600AF/3, 4Pole)



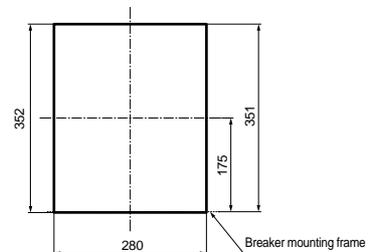
External size

[In case of using DF]



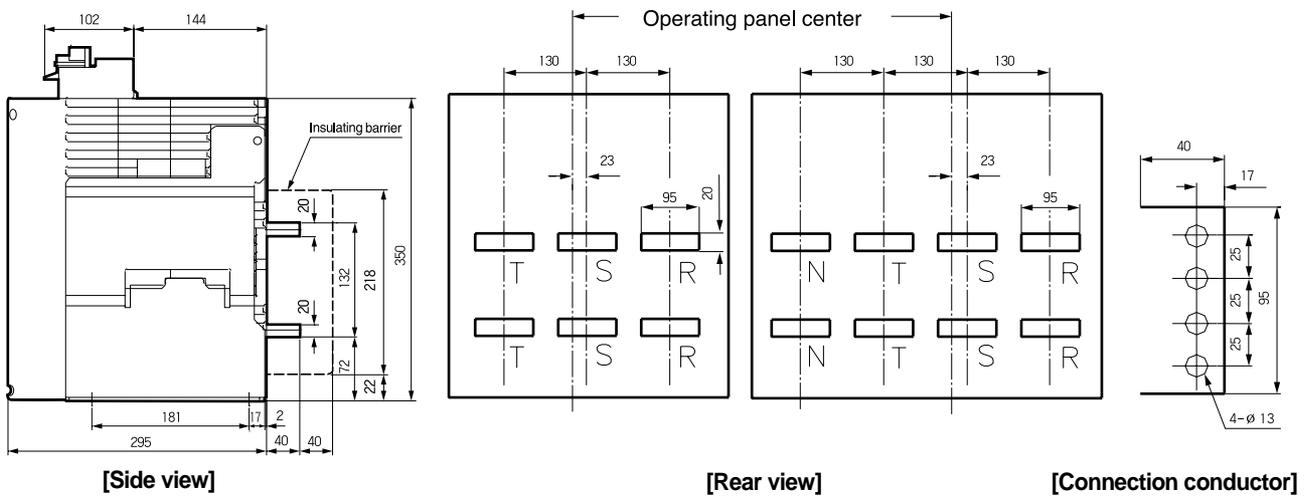
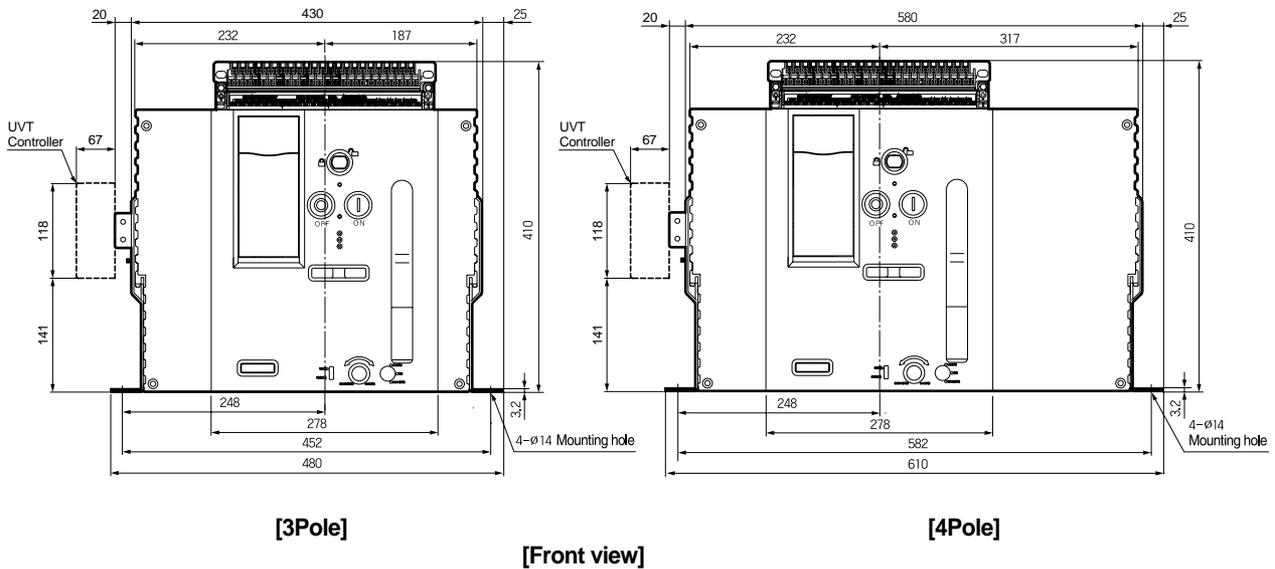
Dimension of cutting panel

[In case of not using DF]

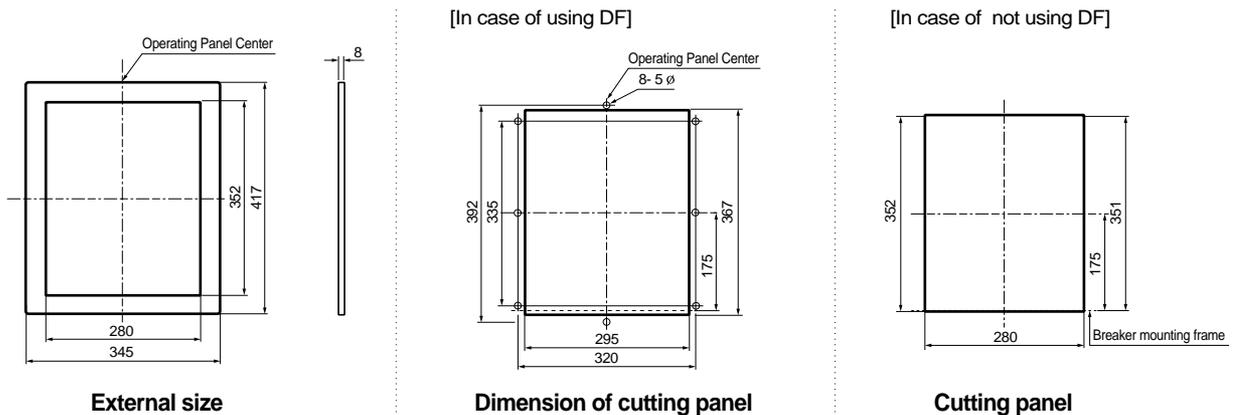


Cutting panel

Horizontal terminal type (2000~3150A)

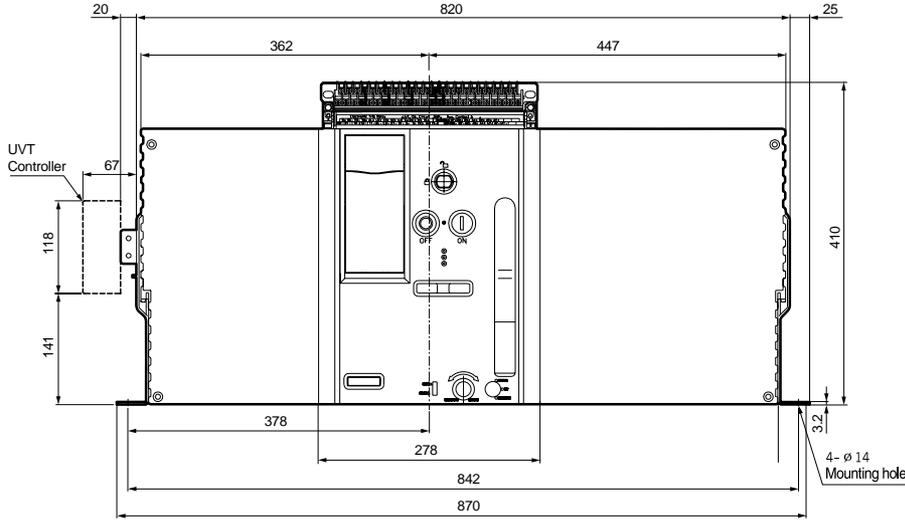


Door Frame (DF) : (2000~3150A, 4000~5000A/3,4Pole)

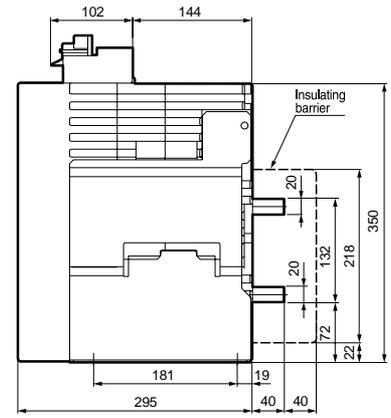


External dimensions(Fixed type)

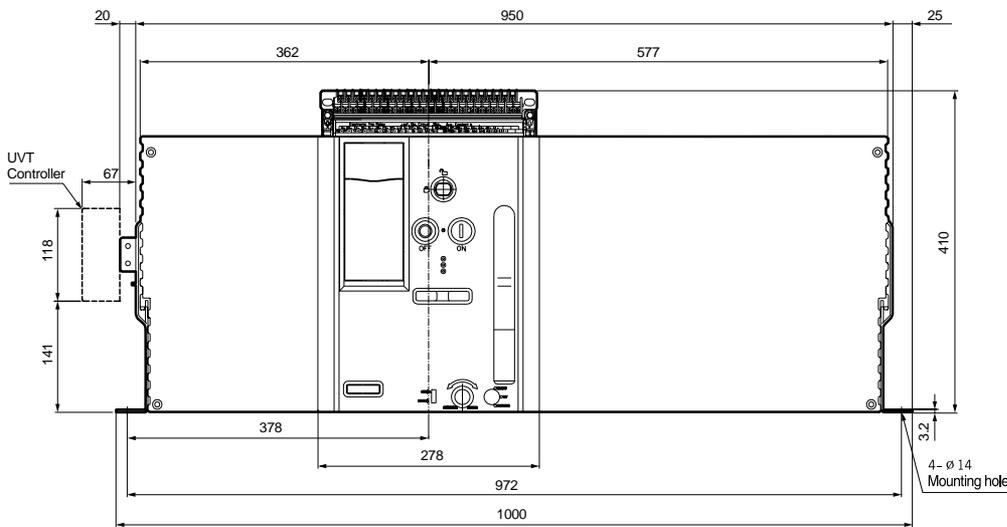
Horizontal terminal type (4000~5000A)



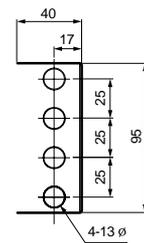
[Front view] [3Pole]



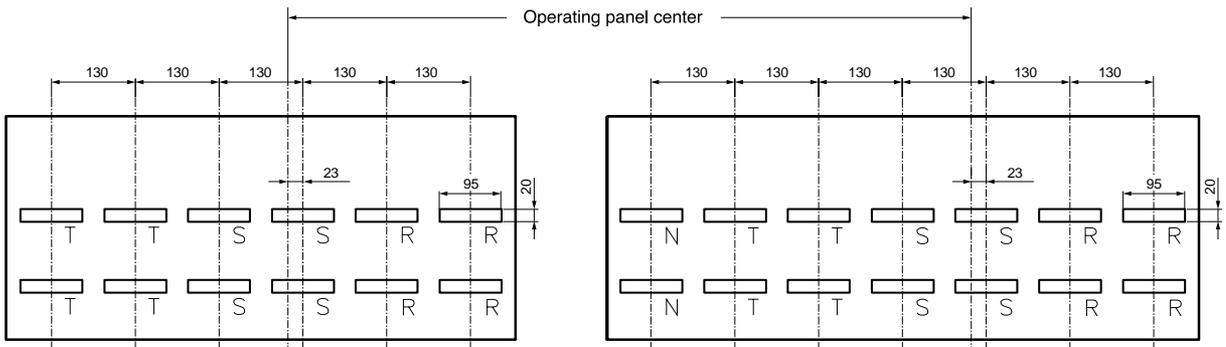
[Side view]



[Front view] [4Pole]



[Connection conductor]



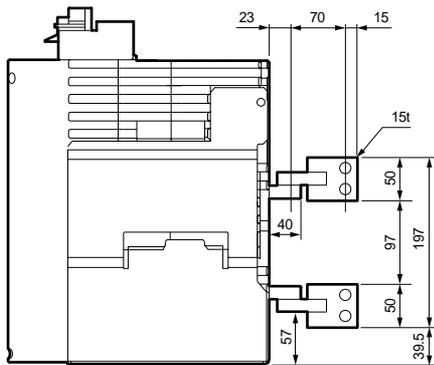
[Rear view]

External dimensions

Vertical adapter attachable type

In order to use as vertical type, user can attach the optional vertical adapter in the existing horizontal connection type ACB

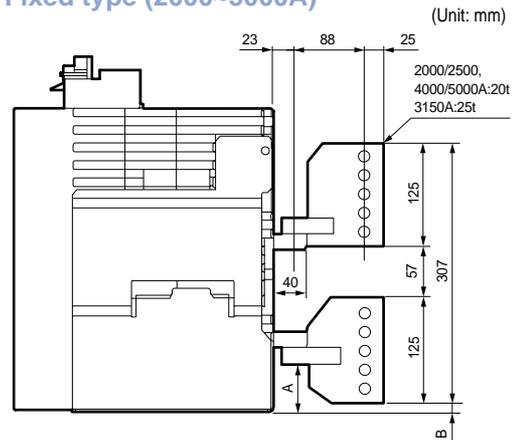
Fixed type (630~1600A)



• Needed units of vertical adapter

Ampere	Pole	Top	Lower	Common	Total
630~1600A	3pole	-	-	6	6
	4pole	-	-	8	8
2000~3150A	3pole	3	3	-	6
	4pole	4	4	-	8
4000~5000A	3pole	6	6	-	12
	4pole	7	7	-	14

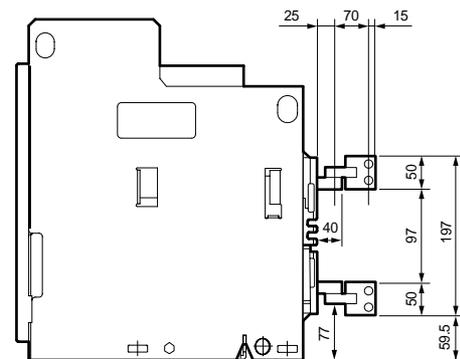
Fixed type (2000~5000A)



• Size

Ampere	A	B
2000, 2500 4000, 5000	52	9
3150	47	4

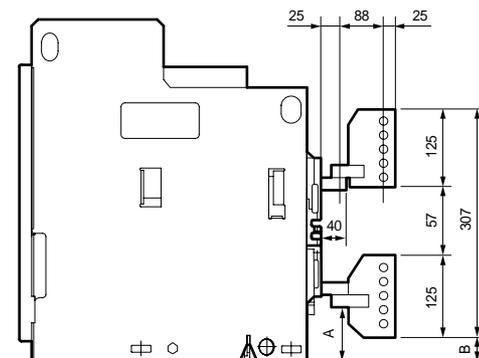
Draw-out type (630~1600A)



• Needed units of vertical adapter

Ampere	Pole	Top	Lower	Common	Total
630~1600A	3pole	-	-	6	6
	4pole	-	-	8	8
2000~3150A	3pole	3	3	-	6
	4pole	4	4	-	8

Draw-out type (2000~3150A)

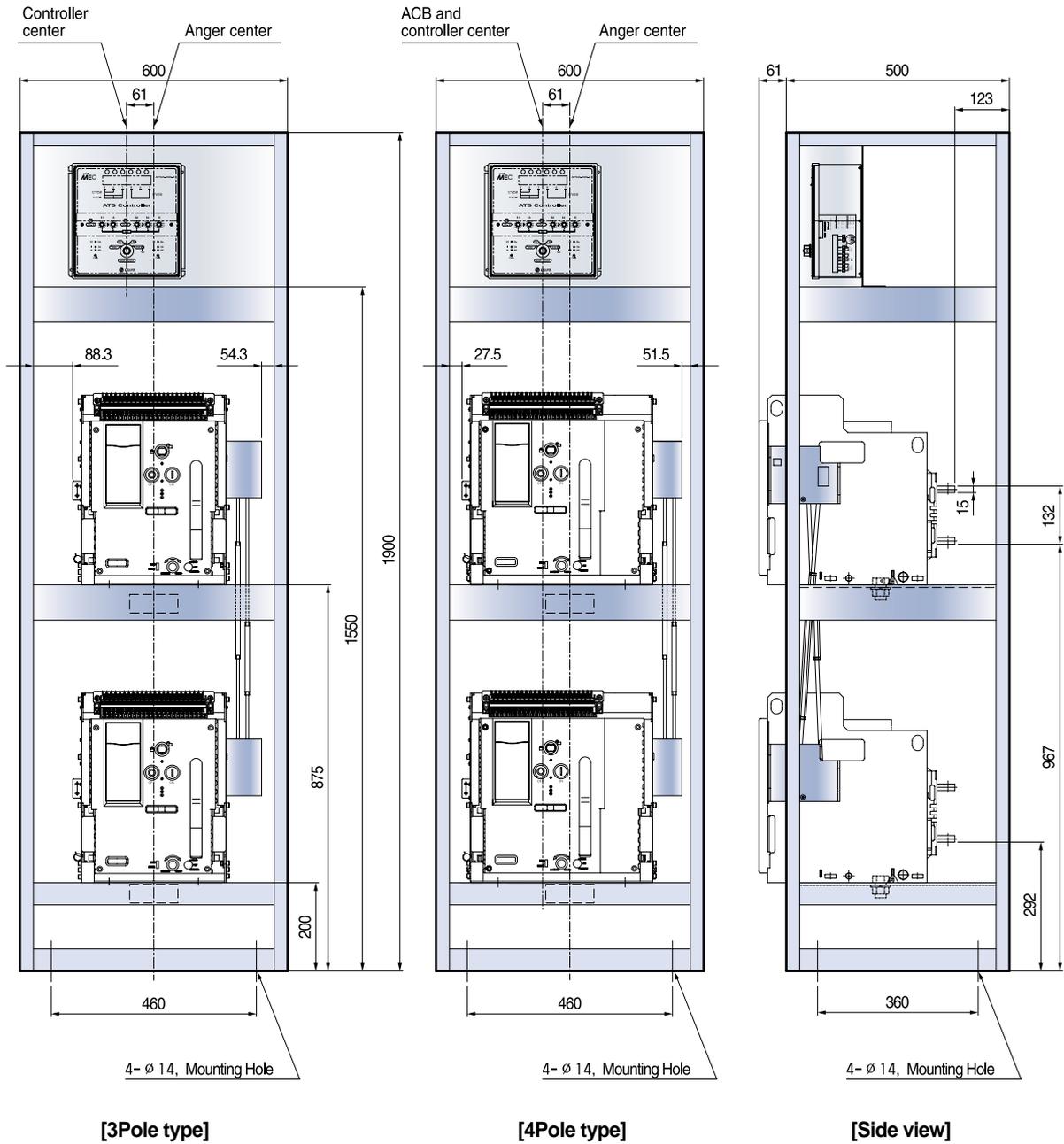


• Size

Ampere	A	B
2000, 2500 3150	72	29
3150	67	24

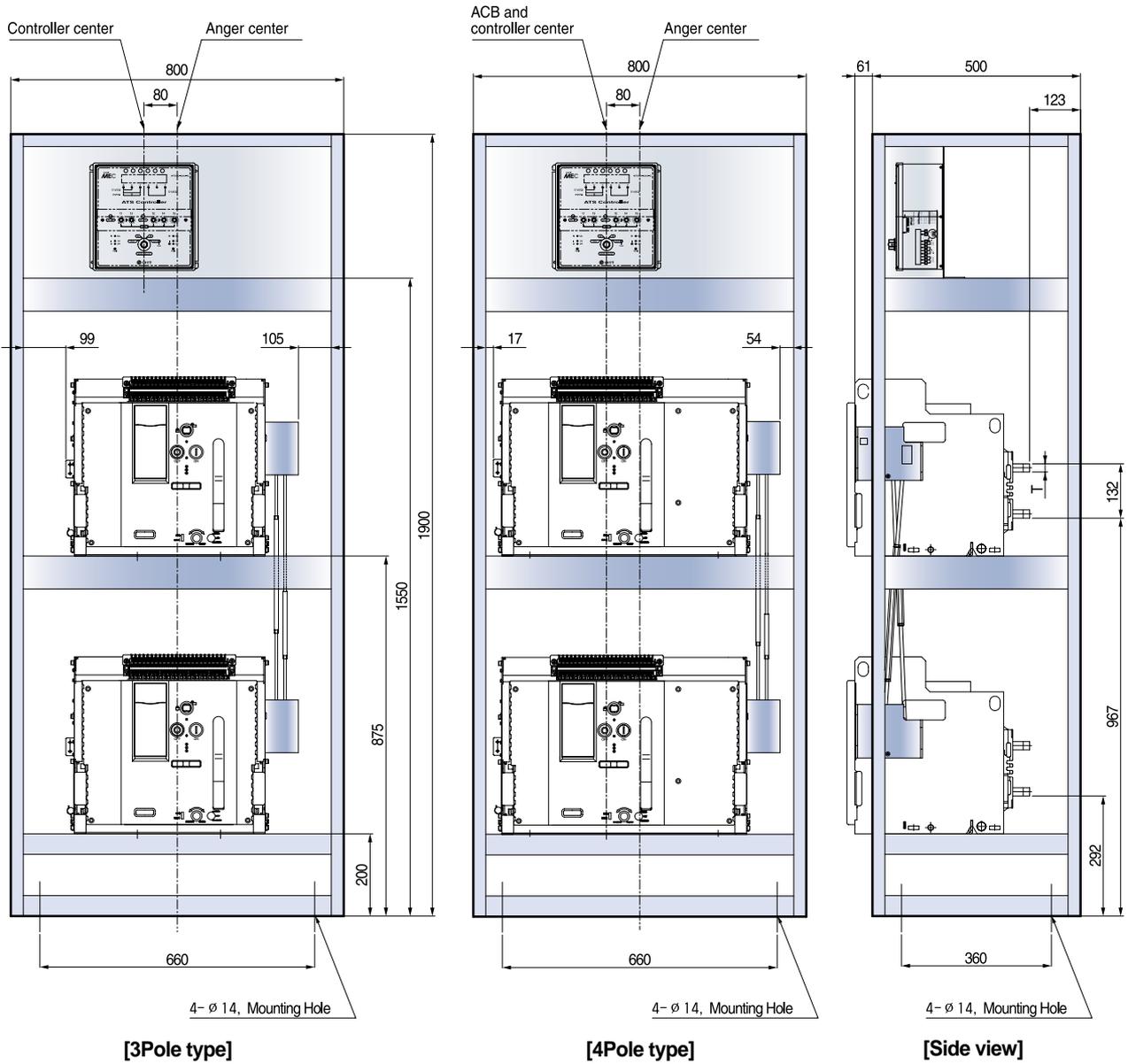
External dimension

ATS with ACBs(630~1600A)



Note) Above size is the standard size of our company. If you need other size, Please contact to us.

ATS with ACBs(2000~3150A)



Note) Above size is the standard size of our company.
If you need other size, please contact to us.

• "T" Size

Rated current	T
2500A	20
3150A	25

Technical information

Deratings by ambient temperature

- **Ambient temperature:** $-5^{\circ}\text{C} \sim \pm 40^{\circ}\text{C}$ (Only applicable when the 24 hours average temperature is below $\pm 35^{\circ}\text{C}$)
- **Altitude:** Below 2000m
- **Environmental condition**
 - Below 85% in humidity with $\pm 40^{\circ}\text{C}$ maximum temperature
 - Within the flammable, ammonia and corrosive gas environment can not be used and stored
($\text{H}_2\text{S} \leq 0.01\text{ppm}$, $\text{SO}_2 \leq 0.01\text{ppm}$, $\text{NH}_3 \leq \text{a few ppm}$)
- **Safekeeping temperature:** $-20^{\circ}\text{C} \sim \pm 60^{\circ}\text{C}$ below $\pm 35^{\circ}\text{C}$ degree of 24 hours average temperature

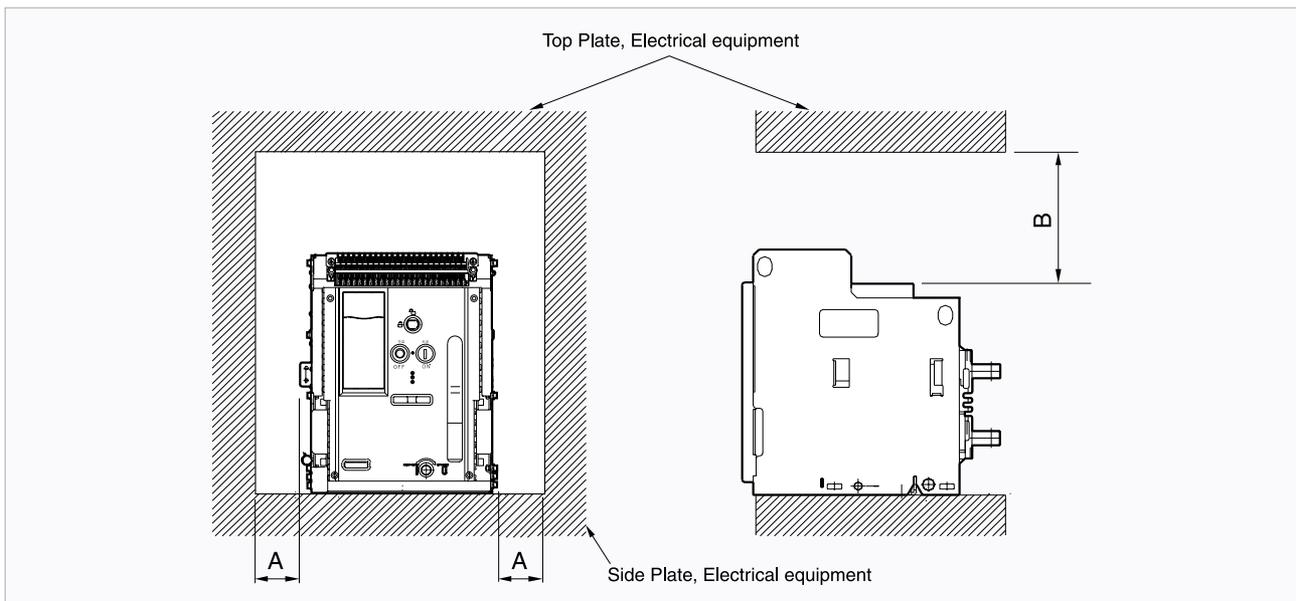
Applicable current of braker in temperature

In case of use of over 40°C in ambient temperature, please refer to below table as adjusting the rated currents

Type	Ambient temperayure	LBA-06	LBA-08	LBA-10	LBA-13	LBA-16	LBA-20	LBA-25	LBA-32	LBA-40	LBA-50
IEC60947-2 (Standarde temp: 40°C)	40°C	630	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000
	45°C	630	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000
	50°C	630	800	1,000	1,250	1,600	2,000	2,500	3,150	4,000	5,000
	55°C	630	800	1,000	1,250	1,550	2,000	2,450	3,000	3,900	4,850
	60°C	630	800	1,000	1,200	1,500	2,000	2,350	2,900	3,750	4,700

Arc Space

When designing switchboard, please keep the distance more than the recommended insulation distance between Ace-MEC ACB and switchboard.



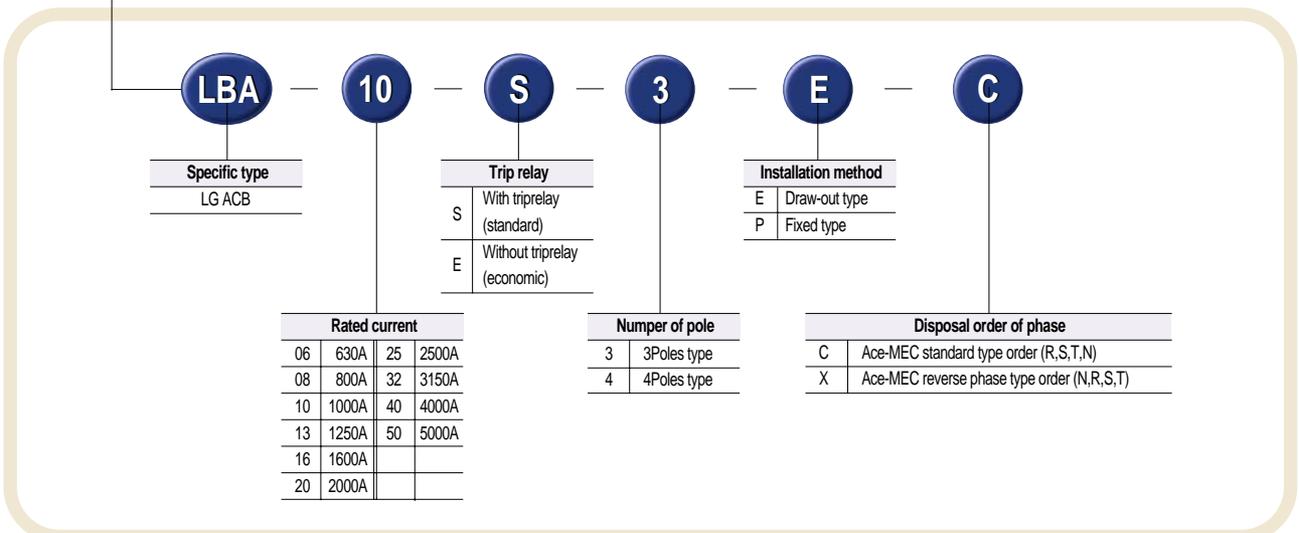
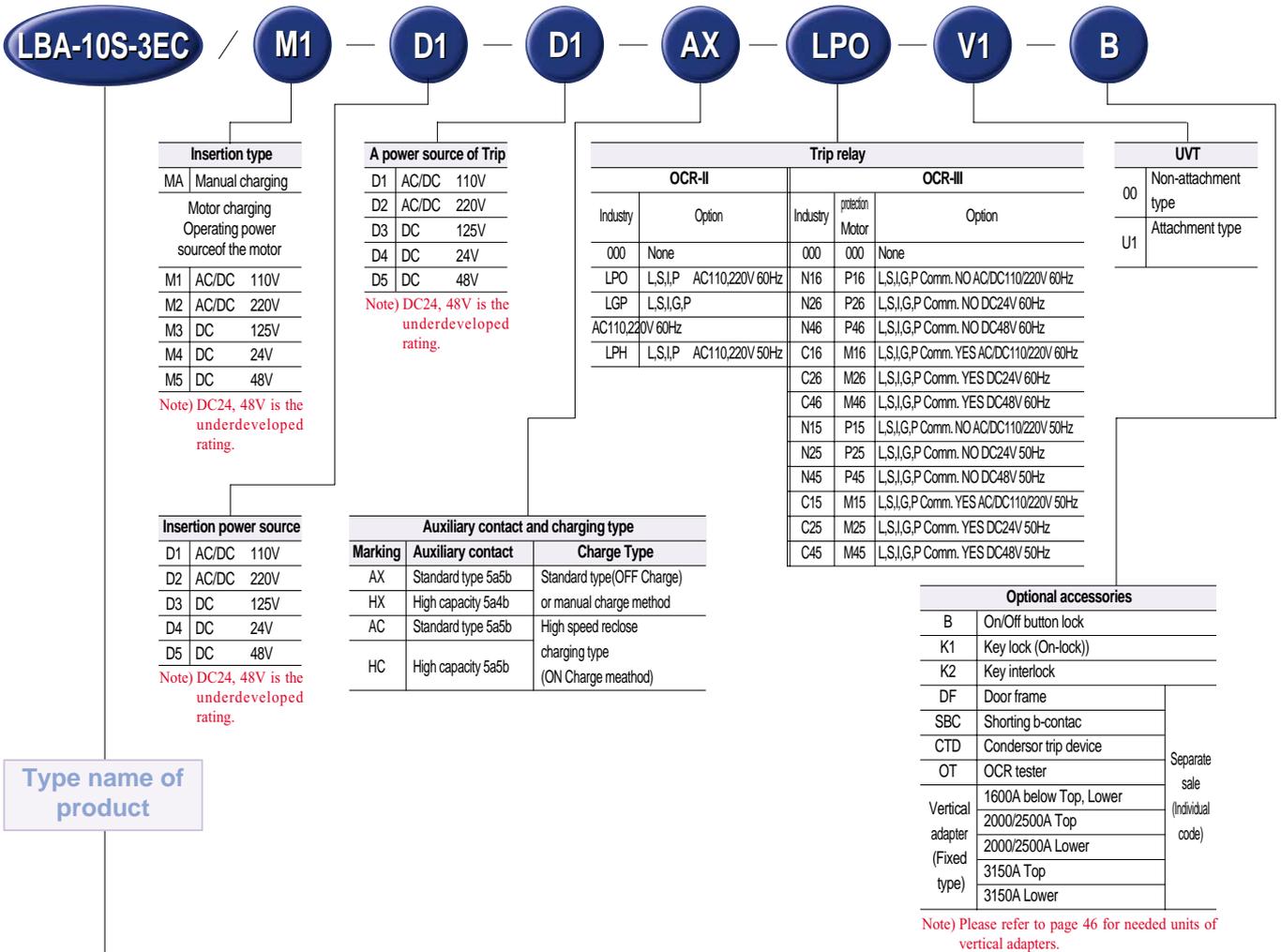
(Unit: mm)

Type	Fixed type	Draw-out type
A	25	25
B	150	150

Note) The number of "A" shall be increased in proportion to the size when attaching UVT, Mechanical Interlock, Door Interlock.

Type selection

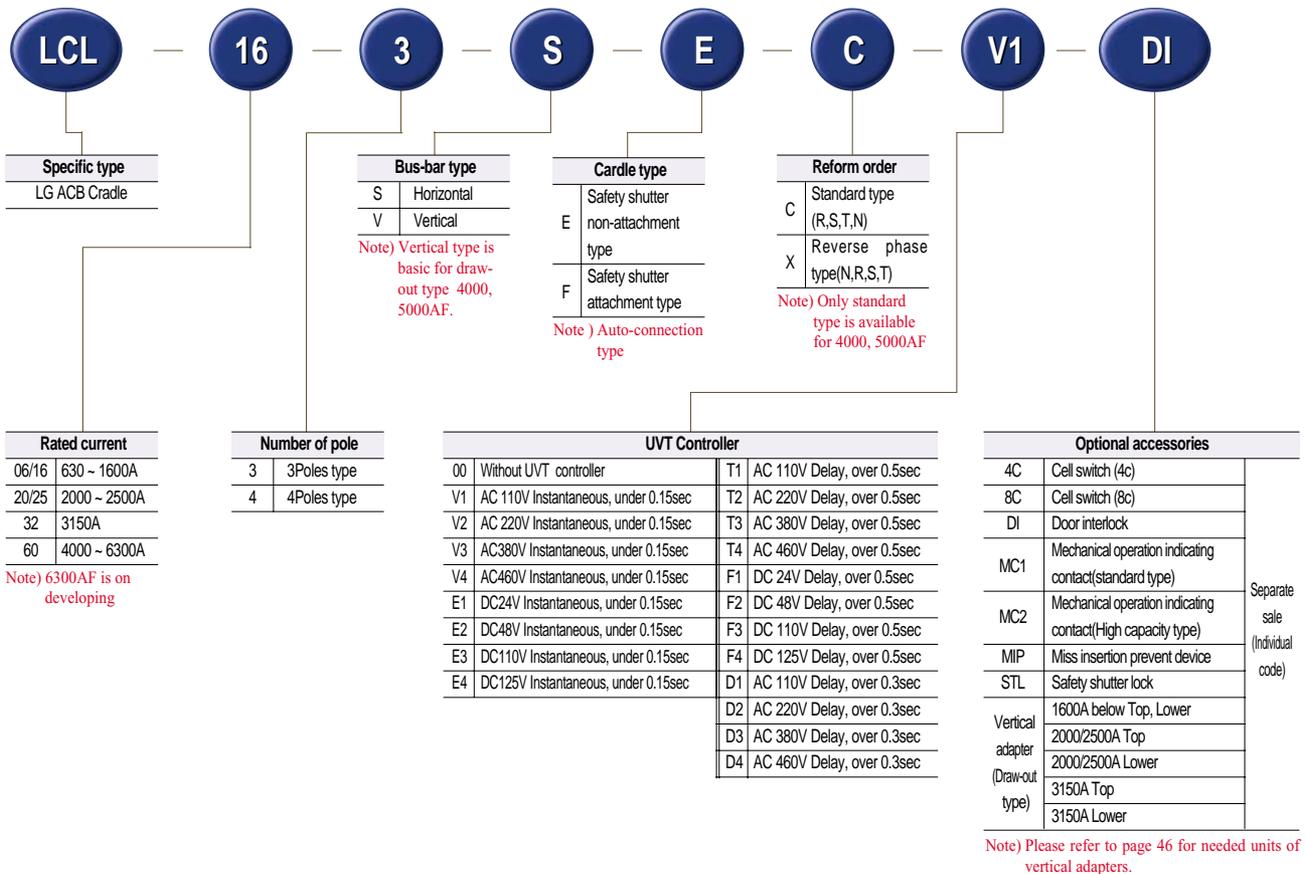
Ace-MEC ACB



Note) Order procedure of Ace-MEC ACB refers to 52 page of Ace-MEC ACB order sheet.

Type selection

Ace-MEC ACB Cradle



Memo

A large, empty rectangular box with rounded corners, intended for writing a memo. The box is white and occupies most of the page below the title.

Leader in Electrics & Automation



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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