Leader in Electrics & Automation

Ace-MEC

Air Circuit Breakers

Electric Equipment

LS Industrial Systems
www.lsis.biz

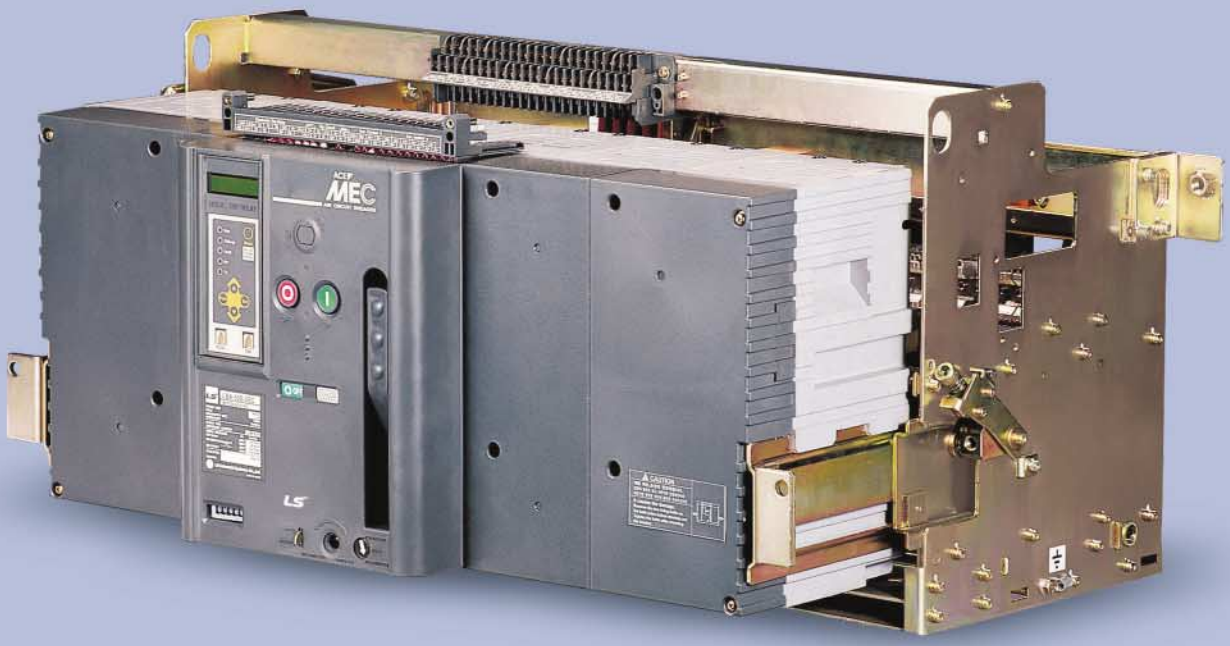
New Name of LG Industrial systems

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.

LS "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 LS "ATS with ACBs" has high breaking capacity and protects the loads from the over-current and ground fault



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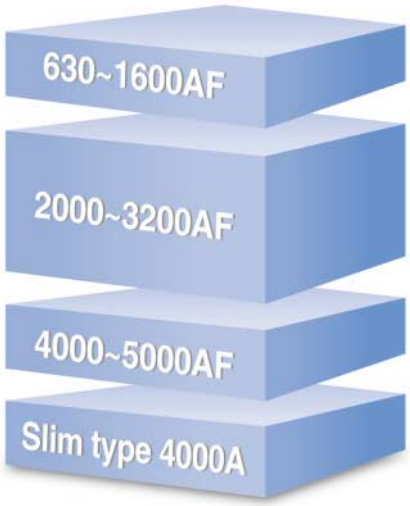
Characteristics

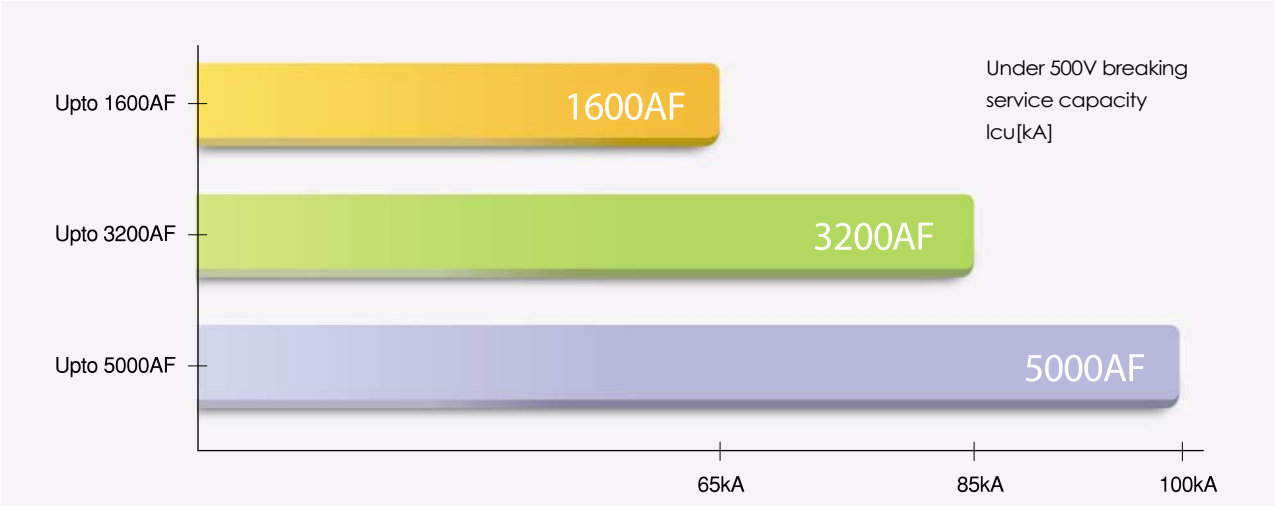
Compact & Modular design

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



High breaking capacity

- LS Ace-MEC ACB provides high breaking capacity up to 100kA



Various certification and approval

- LS Ace-MEC ACB is type-tested by IEC 60947 and GB 14048-2-94 standard
- KEMA (Netherlands), CESI (Italy), 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

※ Neutral pole of ACB 4-pole type is the breaking structure which is opened after pre-closing.

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 resister 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
  - MI (Mechanical Interlock)
  - ATSC (ATS Controller)
- Key interlock, ON-Lock (K2)
- Key lock(K1)
- ON/OFF button lock(B)
- 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, Shorting b contact)
- Safety shutter lock (STL)
- Miss insertion prevent device(MIP)
- Condenser tripping device(CTD)
- OCR tester(OT)

Standard attachment of draw-out type

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

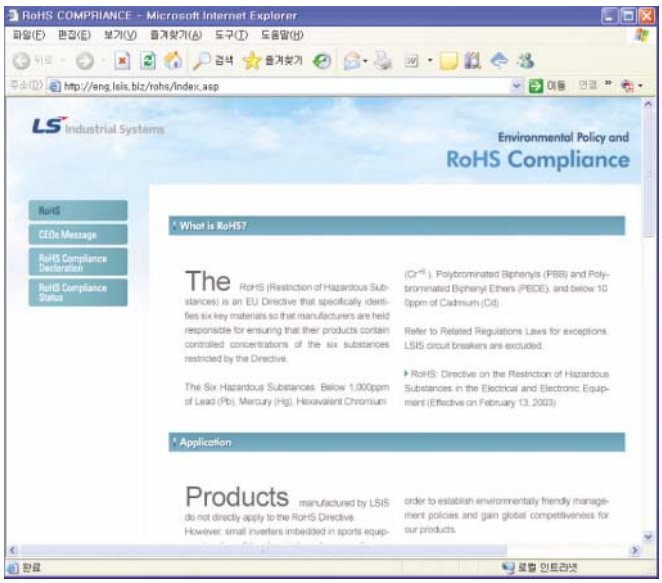
Environmental Policy and RoHSCompliance

What is RoHS?

The RoHS is an EU Directive that specifically identifies six key materiala so that manufacturers are held responsible for Ensuring that their products contain controlled concentration of the six substances restricted by the Diretive.

The six Hazardous Substances : Below 1,000ppm of Lead(Pb), Mercury(Hg), Hexaval-Ent Chromium(Cr+6), Polybrominated Biphenyis(PBB) and Polybrominated Biphenyl ETher(PBDE), and below 10 Oppm of Cadimium(Cd).

▶RoHS : Directive on the Restriction of Hazardous Substances in the Electronic Equipment (Effective on February 13.2003)

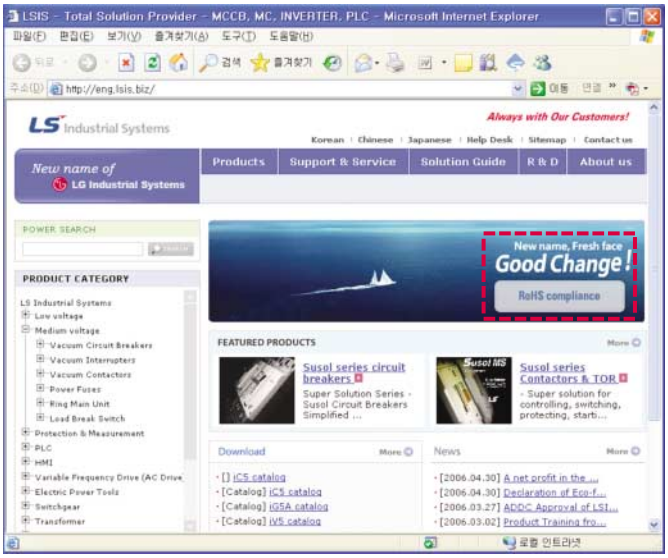


Application

Products manufactured by LSIS do not directly apply to the RoHS Directive.
However, small inverters imbedded in sport equipment and small breakers in large home appliances can be indirectly applied to the Directive.

LSIS continues to comply with the RoHS directive in order to establish environmentally Friendly management policies and global competitiveness for our products.

According to the regulation, eight o the 10 WEEE products excluding 'medical equipment' and 'control systems' must be RoHS compliant.



Declaration of RoHS Compliance

LS Industrial System Co.,Ltd
Yonsei Jaedan Severance Bldg.,84-11, Namdaemunno 5-ga,
Jung-gu, Seoul. 100-733, Korea (Manufacturer)

Do hereby confirm that
With relevance of the EU Directive 2002/95/EC of 27 January 2003 on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment –RoHS , our listed products do not contain any of the following banned substances listed below :

Lead
Mercury
Cadmium
Hexavalent Chromium
Polybrominated Biphenyls (PBB)
Polybrominated Diphenyl Ethers (PBDE)

The following products sold as of July 1, 2006 will be RoHS compliant.

Products Note)
Molded Case Circuit Breaker (MCCB)
Earth Leakage Circuit Breaker (ELCB)
Magnetic Switch (MC,TOR)
Manual Motor Starter (MMS)
Protection & Measurement device
Programmable Logic Controller (PLC)
Variable Frequency Drive (AC Driver)

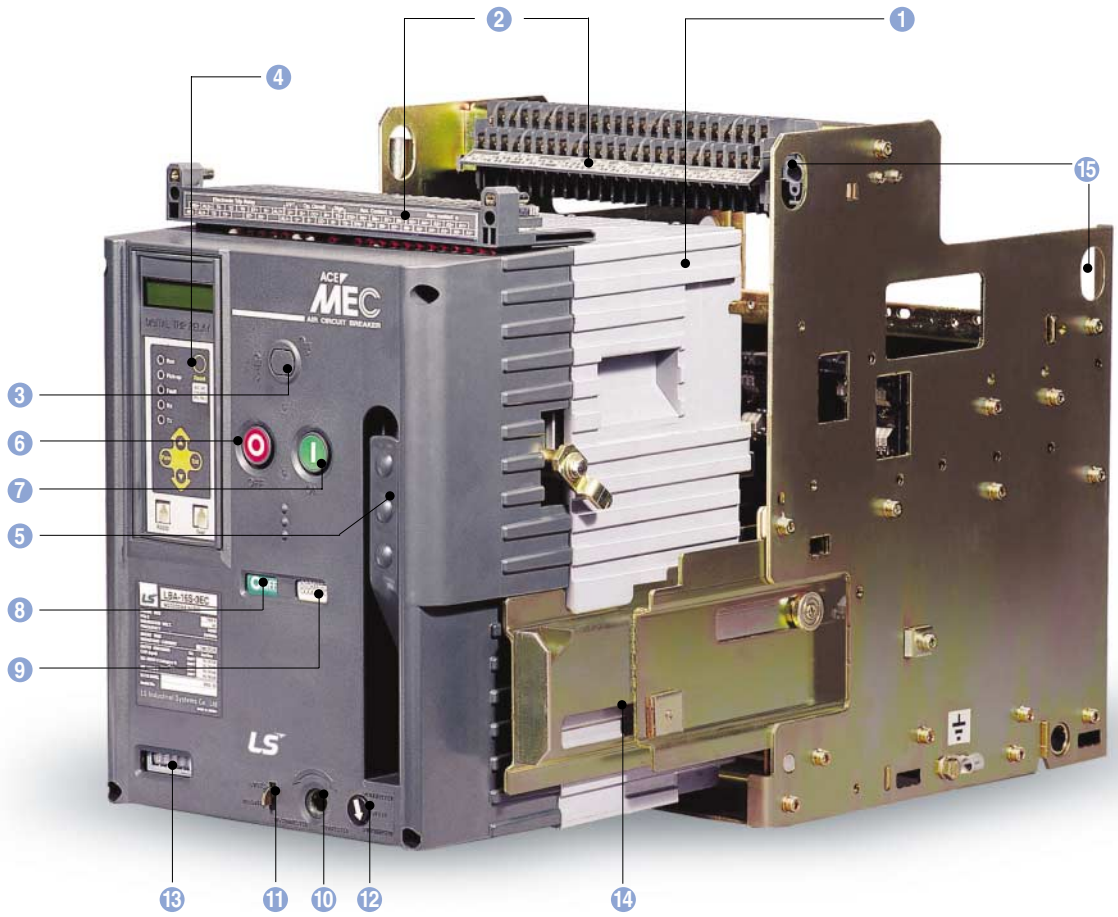
Note) Please visit www.lsis.biz and see "RoHS Compliance" menu to verify the specification of each product's "RoHS Compliance"

Place/Date : Korea/ April 4, 2006

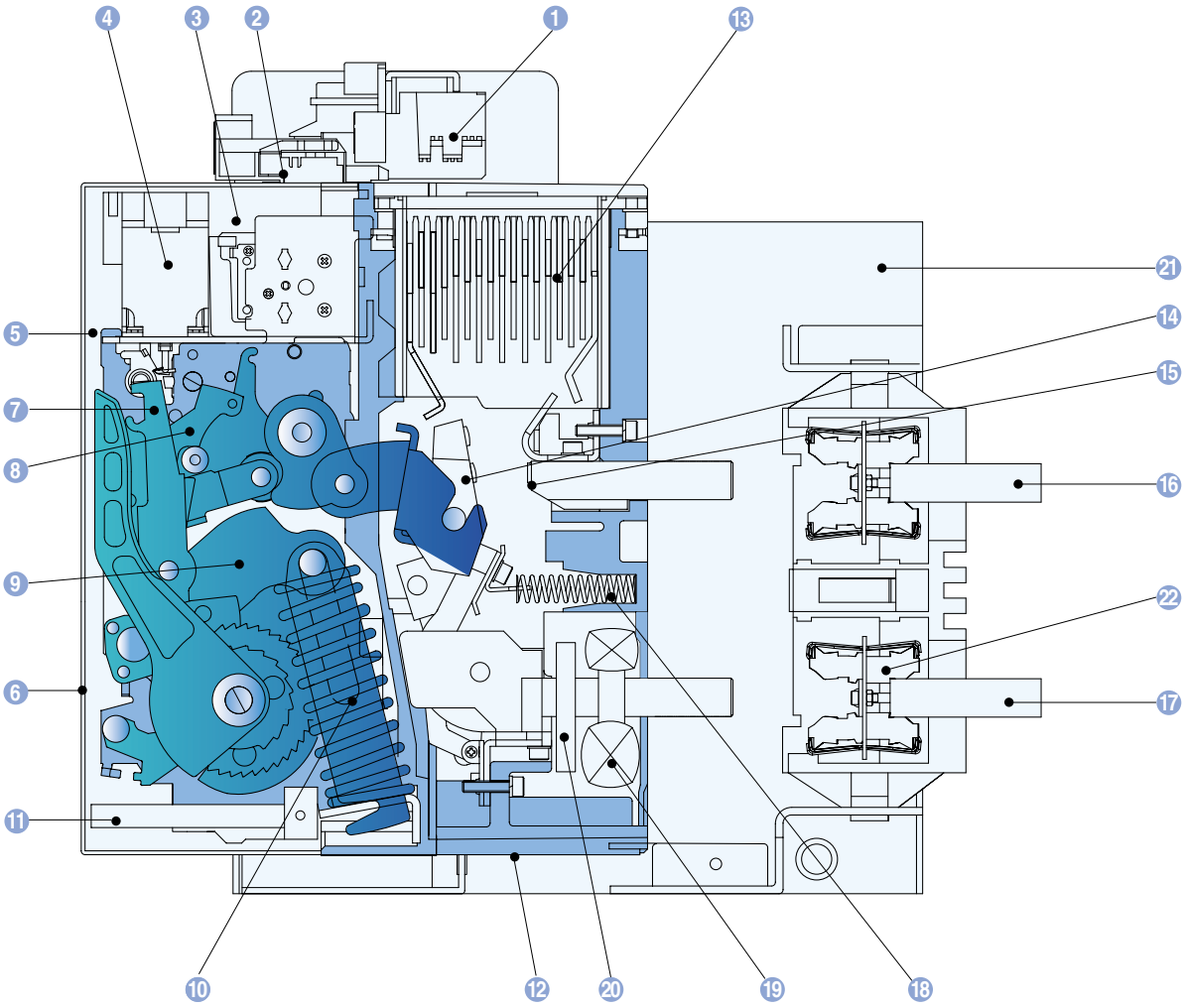
LS Industrial Systems President & CEO Chung-Man KIM

LS Industrial Systems

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

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	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 Note3)		For industry		$I_{n\,max.}$ × 1.0-0.9-0.8-0.7-0.6-0.5-0.4-0.3-0.2(9 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		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		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		12000	12000	12000	12000	12000
				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, CESI, KEMA Note9)				

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.
4. Ace-MEC ACB with interlock device can be a substitute for ATS (For order, refer to page 55)
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 4000/500AF.
6. For 4000/5000AF, height is 455mm
7. Slim type 4000AF, height is H:460, D:509

Type						LBA-20□□□C	LBA-25□□□C	LBA-32□□□C	LBA-4S□□EC Note8) (New)	LBA-40□□□C	LBA-50□□□C
Rated current ($I_{n\,max}$)		(A)				2000	2500	Note1) 3200(3150)	4000	4000	5000
Rated operating voltage (U_e)		(V)				690	690	690	690	690	690
Rated insulation voltage (U_i)		(V)				1000	1000	1000	1000	1000	1000
Frequency Note2)		(Hz)				50/60	50/60	50/60	50/60	50/60	50/60
Number of poles		(P)				3,4	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) Note10)					
			OCR-III Note3)		For industry	$I_{n\,max.}$ × 1.0-0.9-0.8-0.7-0.6-0.5-0.4-0.3-0.2(9 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	3200	4000	2500	2500
Rated breaking capacity (Sym) (I_{CU})		(kA)	IEC 60947-2 AC		690V	50	50	50	50	50	50
					600V	65	65	65	65	85	85
					500V Under	85	85	85	85	100	100
Rated service breaking capacity (I_{CS})		(kA)			··· % × I_{CU}	100%	100%	100%	100%	100%	100%
Rated making capacity (peak) (I_{Cm})		(kA)	IEC 60947-2 AC		690V	105	105	105	105	105	105
					600V	143	143	143	143	187	187
					500V Under	187	187	187	187	220	220
Rated short-time capacity (I_{CW})		(kA)			1 sec	65	65	65	65	85	85
					2 sec	60	60	60	60	65	65
					3 sec	60	60	60	60	65	65
Operating time (t)		(ms)			Maximum total breaking time	40	40	40	40	40	40
					Closing Time	80	80	80	80	80	80
Life cycle	ACB	(time)	Mechanical		Without maintenance	10000	10000	10000	10000	10000	10000
					With maintenance	20000	20000	20000	20000	20000	20000
			Electrical		Without maintenance	3000	3000	3000	3000	3000	3000
					With maintenance	5000	5000	5000	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	123/155	244/267	244/267
					Manual charging type	92/113	93/114	95/116	120/152	240/263	240/263
				Cradle only		35/43	35/43	36/44	59/74	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	Standard offer in the draw-out type	
Closing type					Motor charging type	Standard	Standard	Standard	Standard	Standard	Standard
					Manual charging type	Option	Option	Option	Option	Option	Option
External dimension	Draw-out type	(mm)	Note6) H: 435, D: 479 Note7)		W(3P/4P)	485/615	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, CESI, KEMA Note) 9			KEMA Note) 9	KEMA, CCC	

Note) 8. Slim type 4000A

① The cubicle of High capacity low voltage cubicle can get the most suitable space(Dimension is 40% smaller than existing Ace-Mec ACB 4000A)

② Current capacity of neutral line(N phase) is 100%

③ When the OCR-II is applied, only external input power is available.

④ Only vertical type of plug in type is available.

9. It is guaranteed by KEMA CB certificate.

10. OCR-II is applied to only external CT (power) in slim 4000A ACB.

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

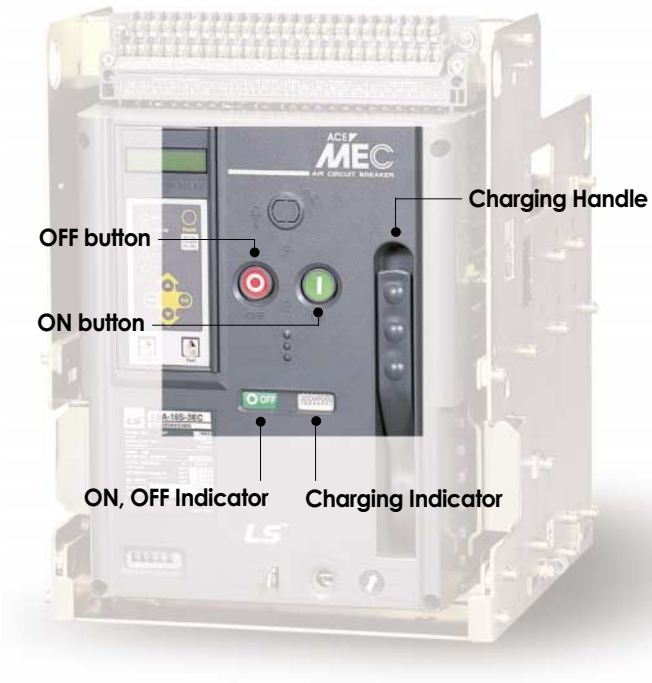
- When closing spring is completely charged, charge indicator indicate "Charge"
- It is mechanically locked not to press the close button (I,ON) and open button(O,OFF) simultaneously
- Contact condition of the main circuit is shown on the (O,OFF), (I,ON) indicator.

Motor charging type

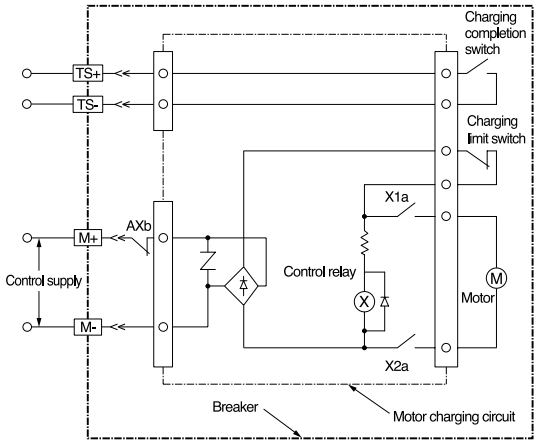
The closing spring is charged by a motor ON charging method or OFF charging method is available selectively.

- 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 27 .

● **Motor ratings**

Rated voltage		Inrush current peak value(A)	Steady current(A)	Power consumption(W)	Charging time(sec)
AC/DC	110	7	3.5	385	5 Under
50/60Hz	220	7	3.5	770	
DC	125	7	3.5	437	
	24	30	11	264	
	48	30	5.5	264	

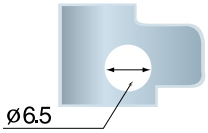
Note) The range of operating voltage: 85~110%

Auxiliary devices

❶ Pad lock(PL)

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

＊ Standard offer in the draw-out type



❷ Position Indicator

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

＊ Standard offer in the draw-out type

❸ 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	1	0.08 under
50/60Hz	220	187~242	3	1.3	
DC	125	106~138	2.3	1	
	24	21~26V	30	3.5	
	48	41~53V	30	7	

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

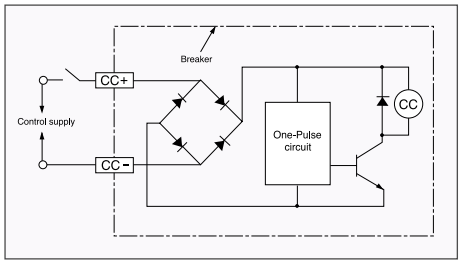
❹ Shunt coil(SHT)

- 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'

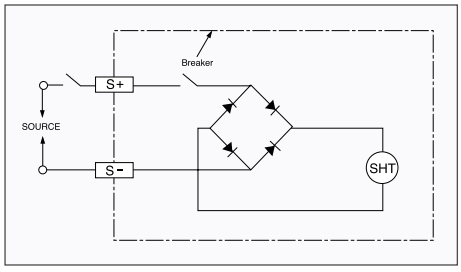
Rated voltage(V)		Operational voltage(V)	Inrush current peak value(A)	Steady current(A)	Closing time(sec)
AC/DC	110	77~121	2	1	0.04 under
50/60Hz	220	154~242	3	1.3	
DC	125	88~138	2.3	1	
	24	21~26V	30	3.5	
	48	41~53V	30	7	

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

- Pumping prevent circuit



- Trip coil circuit



❺ 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

- 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

External configuration

No	The name of knob	Mode	Setting step
❶	Rated current	In	(0.4-0.5-0.6-0.7-0.8-0.9-1.0) × In Max
❷	Continuous current	Ic	(0.6 - 0.7 - 0.8 - 0.85 - 0.9 - 0.95 -1.0) × In
❸	Long-time delay tripping time	LTD	15 - 30 - 60 -120 - 240 - 480 sec
❹	Short-time delay tripping current	Is	(2-3-4-6-8-10-OFF) × In In OCR trip operation, "STD" LED is turned 'on'
❺	Short-time delay tripping time	STD	0.05 - 0.1- 0.2 - 0.3 - 0.4 - 0.5 sec
❻	Instantaneous-time delay tripping current	Ii	(4-6-8-10-12-16-OFF) × In In OCR trip operation, "INST" LED is turned 'on'
❼	Pre-alarm current	Ip	(0.7-0.8-0.9-0.95-1.0-OFF) × Ic In OCR trip operation, "PAL" LED is turned 'on'
❽	Ground fault current	Ig	(0.1-0.2-0.3-0.4-0.5-OFF) × In Max In OCR trip operation, "GTD" LED is turned 'on'
		Inp[Note)]	(0.5-1.0-OFF) × In Max
❾	Ground fault time	GTD	0.1 - 0.3 - 0.8 -1.5 - 3.0 sec

Note) Inp is a function for neutral protection. It protects neutral phase in 4 pole ACB from over current.

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 tripping 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(In): LED turn on and off - Over than 120% of the setting current(In): LED turn off

Formation of output terminal

Type of contact		OCR-II
Control power	Common	R+
	AC/DC 110~220V	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

Button operation method in set-up modes

Top MENU

R:**** S:**** T:**** N:****	Ent	Press the "Ent" button one time.
TOP] –>1. USR + - 2. FACT		

DIAGNOSIS Mode

TOP] –>1. USR + - 2. FACT	Ent	
TOP] –>1. DIAGNOSIS + - 2. FREQUENCY	Ent	
DIA] –>1. COIL : OK + - 2. EEP : OK	▼	Status of the connection to the MTD (OK or Fail) Note1)
DIA] 1. COIL : OK + - –>2. EEP : OK	▼	Status of the OCR EEP ROM
DIA] 2. EEP : OK + - –>3. CSUM : OK		Status of the OCR program check sum

Note 1) If LCD display "1.COIL: FAIL", you should not setting the relay
Please contact your local LSIS representative or LSIS sales office.

FREQUENCY Mode

USR] 1. DIAGNOSIS + - –>2. FREQUENCY	Ent	
FREQ] Freq : 60Hz (50/60Hz)	Mode	If you press the mode button, it displays previous menu.
USR] –>2. FREQUENCY + - 3. SETTING		

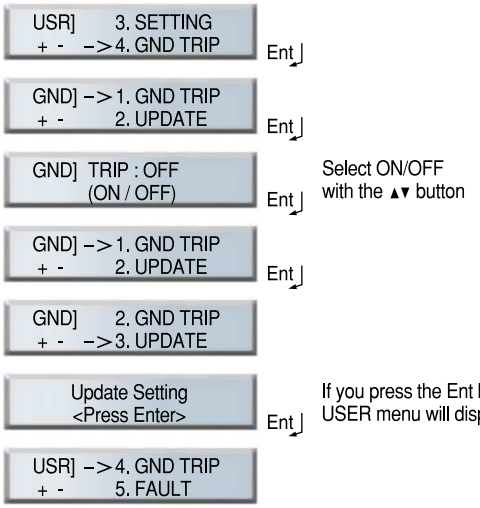
Setting MENU

USR] 2. FREQUENCY + - –>3. SETTING	Ent	
SET] –>1. In + - 2. Ic (*In)	Ent	
Set] In : 1.00k 1.0 (0.4 - 1.0)	Mode	**Rated current setting with knob.** In = 0.4/0.5/0.6/0.7/0.8/0.9/1.0
SET] –>1. In + - 2. Ic (*In)	▲,▼	Move "➡" with the ▲▼ button
SET] 1. In + - –>2. Ic (*In)	Ent	
Set] Ic : 1.00k 1.0 (0.6 - 1.0)	Mode	**Continuous current setting with knob.** Ic=(0.6/0.7/0.8/0.85/0.9/0.95/1.0) × In
SET] –>2. Ic (*In) + - 3. LTD	▲,▼	Move "➡" with the ▲▼ button
SET] 2. Ic (*In) + - –>3. LTD	Ent	
Set] LTD : 15Sec (15-480)	Mode	Set up LTD = 15/30/60/120/240/480sec (1.5 × Ic) with knob.
SET] –>3. LTD + - 4. Is (*In)	▲,▼	Move "➡" with the ▲▼ button
SET] 3. LTD + - –>4. Is (*In)	Ent	
Set] Is : 10.0k 10 (2 - 10, OFF)	Mode	**Short time delay trip current setting with knob.** Is = (2/3/4/6/8/10/OFF) × In
SET] –>4. Is (*In) + - 5. STD	▲,▼	Move "➡" with the ▲▼ button
SET] 4. Is (*In) + - –>5. STD	Ent	
Set] STD : 0.05Sec (0.05 - 0.5)	Mode	**Short time delay trip time setting with knob.** STD = 0.05/0.1/0.2/0.3/0.4/0.5 (10 × In)
SET] –>5. STD + - 6. Ig / Inp	▲,▼	Move "➡" with the ▲▼ button
SET] 5. STD + - –>6. Ig / Inp	Ent	**Ground-fault delay trip current setting with knob.** Ig = (0.1/0.2/0.3/0.4/0.5/OFF) × In Max Inp = (0.5/1.0/OFF) × In Max Note 2)
Set] Ig : 500 0.5 (0.1 - 0.5, OFF)	Mode	
SET] –>6. Ig / Inp + - 7. GTD	▲,▼	Move "➡" with the ▲▼ button
SET] 6. Ig / Inp + - –>7. GTD	Ent	
Set] GTD : 3.0Sec (0.1 - 3.0)	Mode	**Ground-fault delay trip time setting with knob.** GTD = 0.1/0.3/0.8/1.5/3.0sec (Definite time characteristics)
SET] –>7. GTD + - 8. Ip (*Ic)	▲,▼	Move "➡" with the ▲▼ button
SET] 7. GTD + - –>8. Ip (*Ic)	Ent	
Set] Ip : 1.00k 1.0 (0.7 - 1.0)	Mode	**Pre-alarm current setting with knob.** PAL.Ip = (0.7/0.8/0.9/0.95/1.0) × Ic
SET] –>8. Ip (*Ic) + - 9. Iinst	▲,▼	Move "➡" with the ▲▼ button
SET] 8. Ip (*Ic) + - –>9. Iinst	Ent	
Set] Inst : 16.0k 16 (4 - 16, OFF)	Mode	**Instantaneous-time delay trip setting with knob.** (Inst = 4/6/8/10/12/16/OFF) × In
SET] –>9. Iinst + - 1. In		

Note 2) When user set the position of ground fault trip current as OFF position,
Ig and Inp shall be also OFF.

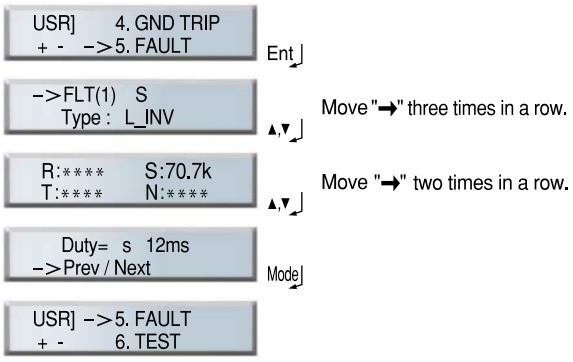
Button operation method in set-up modes

Select Ground Fault



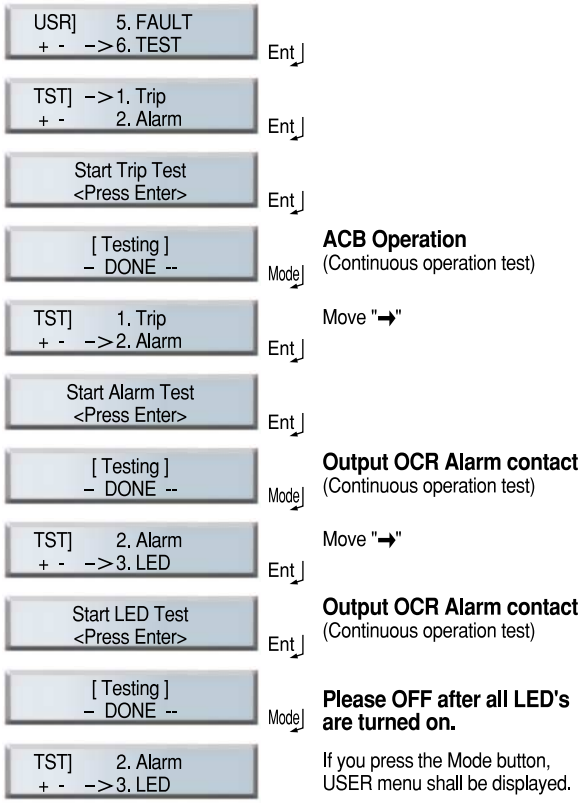
Note) ON: ACB trip, Ground fault Tripping indicator (T0, T4) ON
OFF: ACB No trip, Ground fault Tripping indicator (T0, T4) ON

FAULT Mode



Note) 1. In the status of pressing ▼ Button, if you press "Ent" button, next Fault mode will be displayed.
2. If you press the Mode button, USER menu will display.

TEST Mode



External configuration

❶ 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

❷ Condition display LED: "Run"

- The LED blinks with normal operation of OCR.

❸ Over-current display LED

- "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.

❹ Communication display LED: "Rx, Tx"

- Blinks with normal communication of OCR.

❺ Reset button

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

❻ Selection button

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

❼ RS232 Port

: OCR operation check port as connecting PC

❽ TEST Port

: Connection button with OCR tester (OT-2000)

It is tested by IEC standard 61000-4-3 for mobile checking function and certified class "A" of frequency range from 80MHz to 2.4GHz.

Setting step

Operating characteristics	Mode	Setting step
Rated current	I_n	0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0(9 Steps) × In max. - Industry (0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0) × In max. - Generator protection
Continuous current	I_c	0.6-0.65-0.7-0.75-0.8-0.85-0.9-1.0-no
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) × In
Short-time delay	STD	0.05-0.06-0.07~0.48-0.49-0.5sec(Step: 0.01sec)
tripping time Instantaneous-time delay	I_{inst}	(4-5-6-7-8-9-10-11-12-13-14-15-16-no) × In - 4000AF under (4-5-6-7-8-9-10-11-12-no) × In - 5000AF over
tripping current	I_p	(0.7-0.8-0.9-1.0) × Ic
Pre-alarm Ground fault current Neutral protection	I_g	Ig: (0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0-no) Inp: (0.5-0.6-0.7-0.8-0.9-1.0-no)
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, DC48V	
Alarm (Holding type contact)		AL1+, AL1⁻
		AL2+, AL2⁻
Tripping type	Common	T0
	Time(Long, Short)	T2-
	Instantaneous 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 window set-up**
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	
SET] In :1.00k 1.0(0.2~1.0)	▲,▼ Ent	
SET] 1. In ->2. Ic(x In)	▼ Ent	**Set-up continuously flowing current**
Set] Ic : 1.00k 1.0(0.6~1.0-no)	▲,▼ Ent	Set-up step : 0.05 Step (9 Steps)
SET] 2. Ic(x In) ->3. LTD	▼ Ent	**Long-time delay trip time set-up**
Set] LTD : 25Sec (15~480) or (1.5~48)	▲,▼ Ent	
SET] 3. LTD ->4. Is(x In)	▼ Ent	**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	▼ Ent	**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/Inp	▼ Ent	**Ground fault delay trip current set-up**
SET] Ig : 800 or Inp : 500 0.8(1.0~0.2-no) 0.5(1.0.~0.5-no)	▲,▼ Ent	
SET] 6. Ig ->7. GTD	▼ Ent	**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)	▼ Ent	**Pre-alarm 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	▼ Ent	**Instantaneous-time delay trip set-up**
Set] Inst : 16.0k 16(2~16, no) or 12(2~12, no)	▲,▼ Ent	Set-up step : 1 Step 4000A under: 2~16, no 5000A under: 2~12, no
SET] 9. Iinst ->10. Update	▼ Ent	
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 by pressing "Ent" button.
Duty=0s 12ms ->Prev/Next	Func	• Shifts to next information by pressing "Ent" button. • Shifts to set-up initial window as pressing "Func" button.

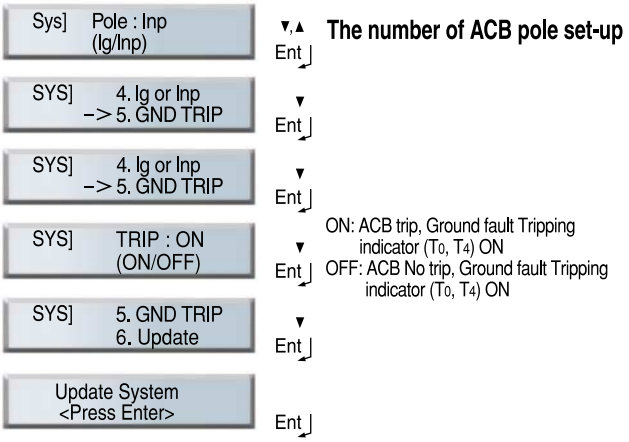
Main formation method

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	▼ Ent	
Sys] Frame : 1.00k (250~10k)	▼,▲ Ent	**Set-up ACB frame current**
SYS] ->3. User Frame 4. Ig or Inp	▼ Ent	
Sys] USR F : **** (250~10k)	▼,▲ Ent	In use ACB reted frame current alters by pressing this button.
SYS] ->4. Ig or Inp 5. GND TRIP	▼ Ent	

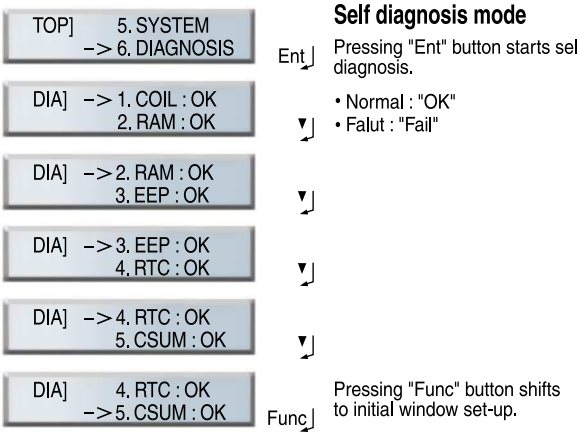
⚠ Caution

1. As calibration, in "CALIBRATE MODE" has been completed by manufacturer calibration by user is prohibited.
2. 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 reseting up of default value is unavoidable, please reset the control power after updating its default value.

Button operation method in set-up modes

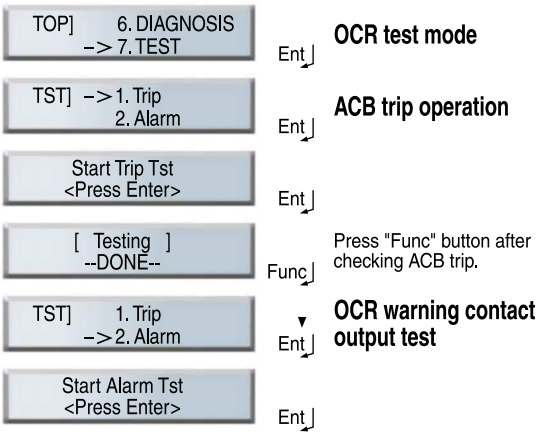


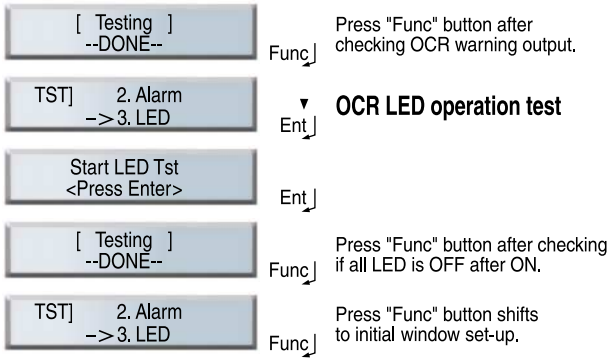
Self diagnosis method



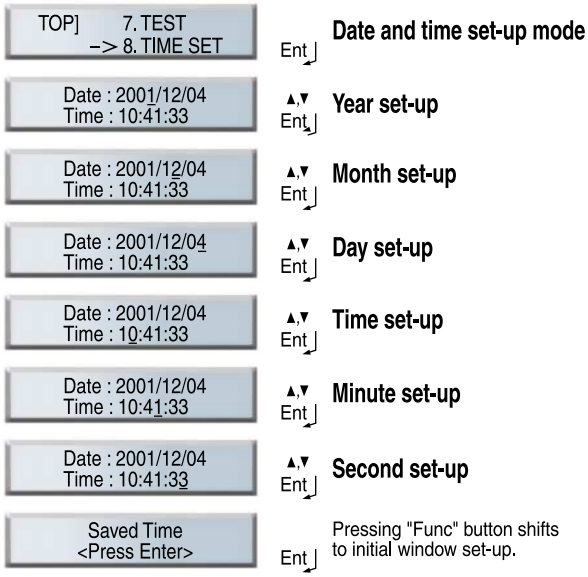
Note)1. In case it displays "Fail", terminate OCR set-up and please contact us regarding the situation.
2. Please do not touch "Ent" button in the Self diagnosis method.

OCR test method

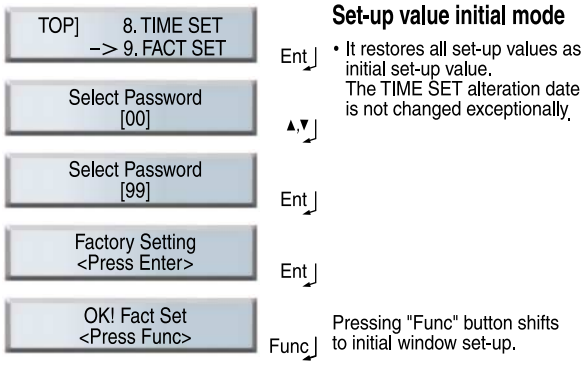




Date and time set-up



Set-up value initializing method



Operating characteristics of trip relay | OCR-II

Ratings

Classification			Types and ratings of trip relays		
Type	60Hz		LS6	LF6	LN6 Note1)
	50Hz		LS5	LF5	LN5 Note1)
Application			For industry	For industry	For industry
Possible number of ACB poles			3, 4P	3,4P	3P
Operating voltage			AC/DC 110V~220V	AC/DC 110V~220V	AC/DC 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)	In = ··· × $I_{n\,Max}$	0.4-0.5-0.6-0.7-0.8-0.9-1.0		
Continuous current	(A)	Ic = ··· × In	0.6-0.7-0.8-0.85-0.9-0.95-1.0		
Long-time delay(L)	Trip current (A)	IL = ··· × Ic	1.5		
(Error tolerance : ±10%)	Trip time (sec)	LTD	15-30-60-120-240-480		
Short-time delay(S)	Trip current (A)	Is = ··· × In	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		
Instantaneous time delay(I)	Trip current (A)	Ii = ··· × In	4-6-8-10-12-16-OFF		
(Error tolerance : ± 20%)	Trip time (sec)	INST	0.025 under Note2)		
Ground fault(G)	Trip current (A)	Ig = ··· × $I_{n\,Max}$	0.1-0.2-0.3-0.4-0.5-OFF		
(Error tolerance : ±20%)		Inp= ··· × $I_{n\,Max}$	0.5-1.0-OFF Note3)		
	Trip time (sec)	GTD	0.1-0.3-0.5-0.7-1.0-1.5-3.0		
Pre-alarm(P)	Trip current (A)	Ip = ··· × Ic	0.7-0.8-0.9-0.95-1.0-OFF		
(Error tolerance : ±10%)	Trip time (sec)	PAL = ··· × LTD	0.5(setting Ip 1.0), Operating time : Half of the long time inverse time		

Note) 1. For type LN5 and LN6, please use Neutral CT (output: 5A) in case of using 3P ACB in 3phase 4wire circuit.
2. In case of short circuit accident, instantaneous operation time of OCR is under 15ms.
3. Inp is a function for neutral protection. It protects neutral phase in 4 pole ACB from over current.

• Power consumption of trip relay

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

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
Operating characteristics	Long-time delay(L)		■	■	■	■
	Short-time delay(S)		■	■	■	■
	Instantaneous time delay (I)		■	■	■	■
	Ground fault (G)		■	■	■	■
	Pre-alarm (P)		■	■	■	■
Rated current	(A)	I_n = ··· × $I_{n\ Max.}$	• For industry: 0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0 • 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 = ··· × 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 = ··· × I_c	1.5			
	Trip time (sec)	LTD	• 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 = ··· × I_n	1.5-2-3-4-5-6-7-8-9-10-no(Steps: 0.5)			
	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 = ··· × I_n	• 4000A under: 2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-no(Steps: 1) • 5000A over: 2-3-4-5-6-7-8-9-10-11-12-no(Steps: 1)			
	Trip time (sec)	INST	0.025 under Note)			
Ground fault(G) (Error tolerance : ±20%)	Trip current (A)	I_g= ··· × In max I_{np}= ··· × In max	• 3 pole: 0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-10-no(Steps: 0.1) • 4 pole: 0.5-0.6-0.7-0.8-0.9-1.0-no (Steps: 0.1)			
	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 = ··· × I_c	0.7-0.8-0.9-1.0			
	Trip time (sec)	PAL = ··· × LTD	0.5(setting Ip 1.0), Operating time : Half of the long time inverse time			

Note) In case of short circuit accident, instantaneous operation time of OCR is under 15ms.

• Power consumption of trip relay

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

• Trip relay type selection

N **1** **6**

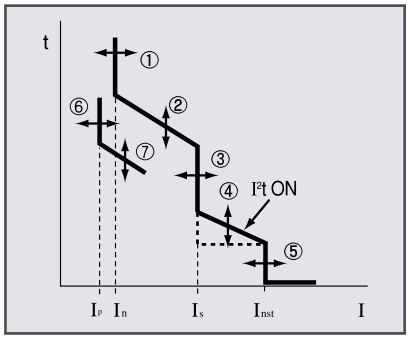
Function	
N	Communication function NO (For industry)
C	Communication function YES (For industry)
P	Communication function NO (For generator protection)
M	Communication function YES (For generator protection)

Operational voltage	
1	AC/DC 110~220V
2	DC 24V
4	DC 48V

Frequency	
6	60Hz
5	50Hz

LS6, LS5 (Without ground fault trip unit)

Characteristics of protection



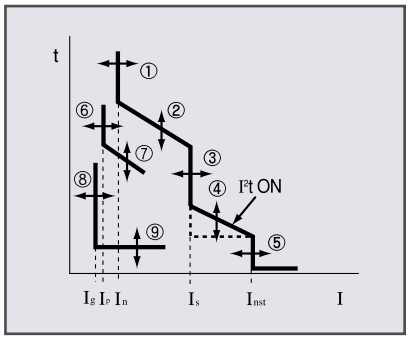
① Long-time delay pick-up current
② Long-time delay tripping time
③ Short-time delay pick-up current
④ Short-time delay tripping time:
I^2t ON (Operating characteristics inverse)
I^2t OFF (Operating characteristics definite)
⑤ Instantaneous pick-up current
⑥ Pre-alarm pick-up current
⑦ Pre-alarm tripping time

Standard functions

- Setting the fixed current
- Setting the long-time delay tripping current
- Setting the long-time delay ripping 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

LF6, LF5, LN6, LN5

Characteristics of protection



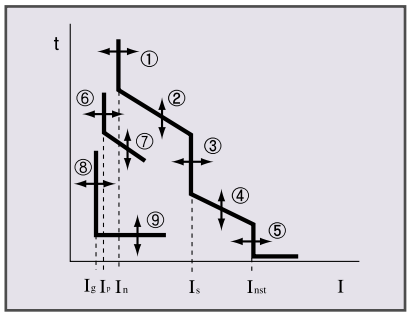
① Long-time delay pick-up current
② Long-time delay tripping time
③ Short-time delay pick-up current
④ Short-time delay tripping time:
I^2t ON (Operating characteristics inverse)
I^2t OFF (Operating characteristics definite)
⑤ Instantaneous pick-up current
⑥ Pre-alarm pick-up current
⑦ Pre-alarm tripping 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 current
- Setting the ground fault tripping current
- Setting the ground fault tripping time
- Setting pre-alarm current
- Trip Indicator

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
⑧ Ground fault pick-up current
⑨ Ground fault trip time

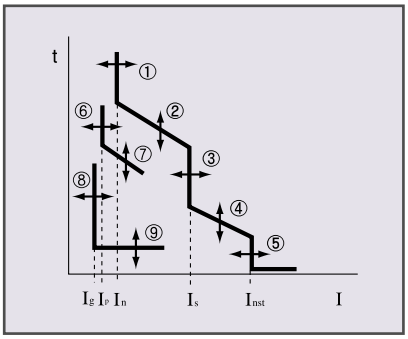
Standard functions

- 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 current
- Setting the pre-alarm current
- Trip Indicator
- Communication

① RS232(Port)
- Setting the fixed value
- Monitoring the fixed value
- Monitoring the operating state of ACB OCR
- Monitoring the load current of line
- Performing of calibration bility

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

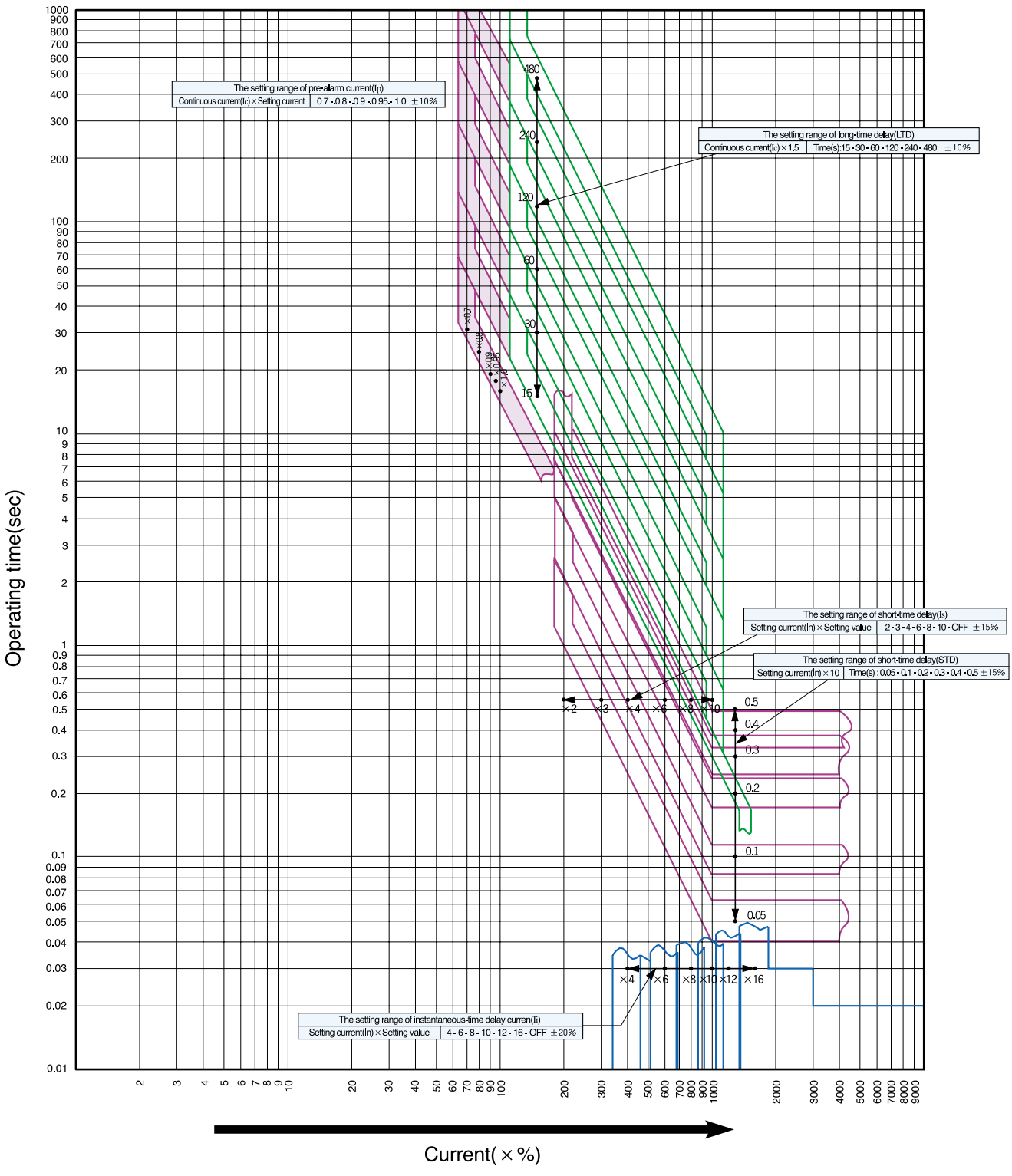
Standard functions

- 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

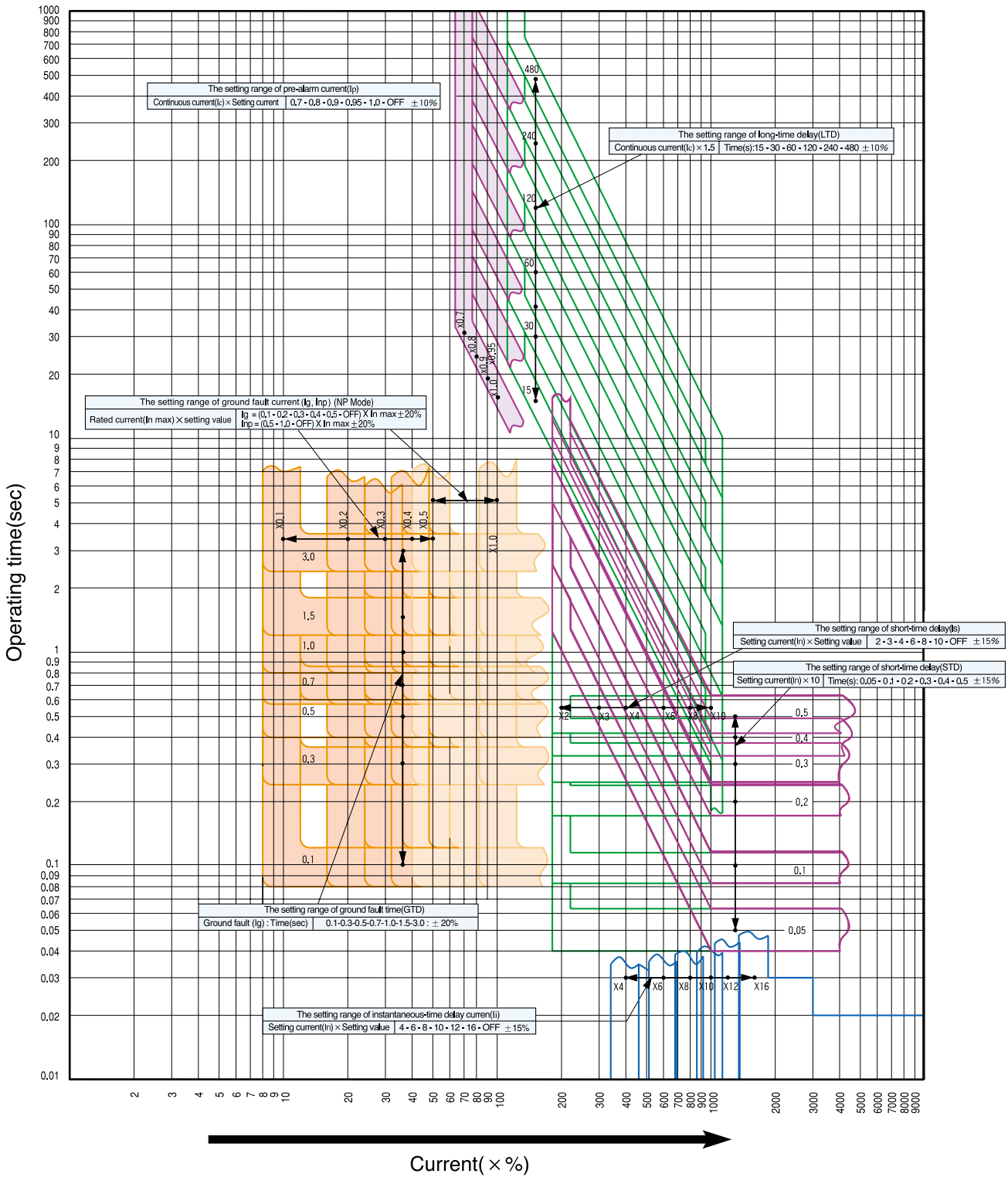
① RS232(Port)
- setting the fixed value
- Monitoring the fixed value
- Monitoring the load current of line
- Monitoring the operating state of ACB OCR
- Performing of Calibration ability

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

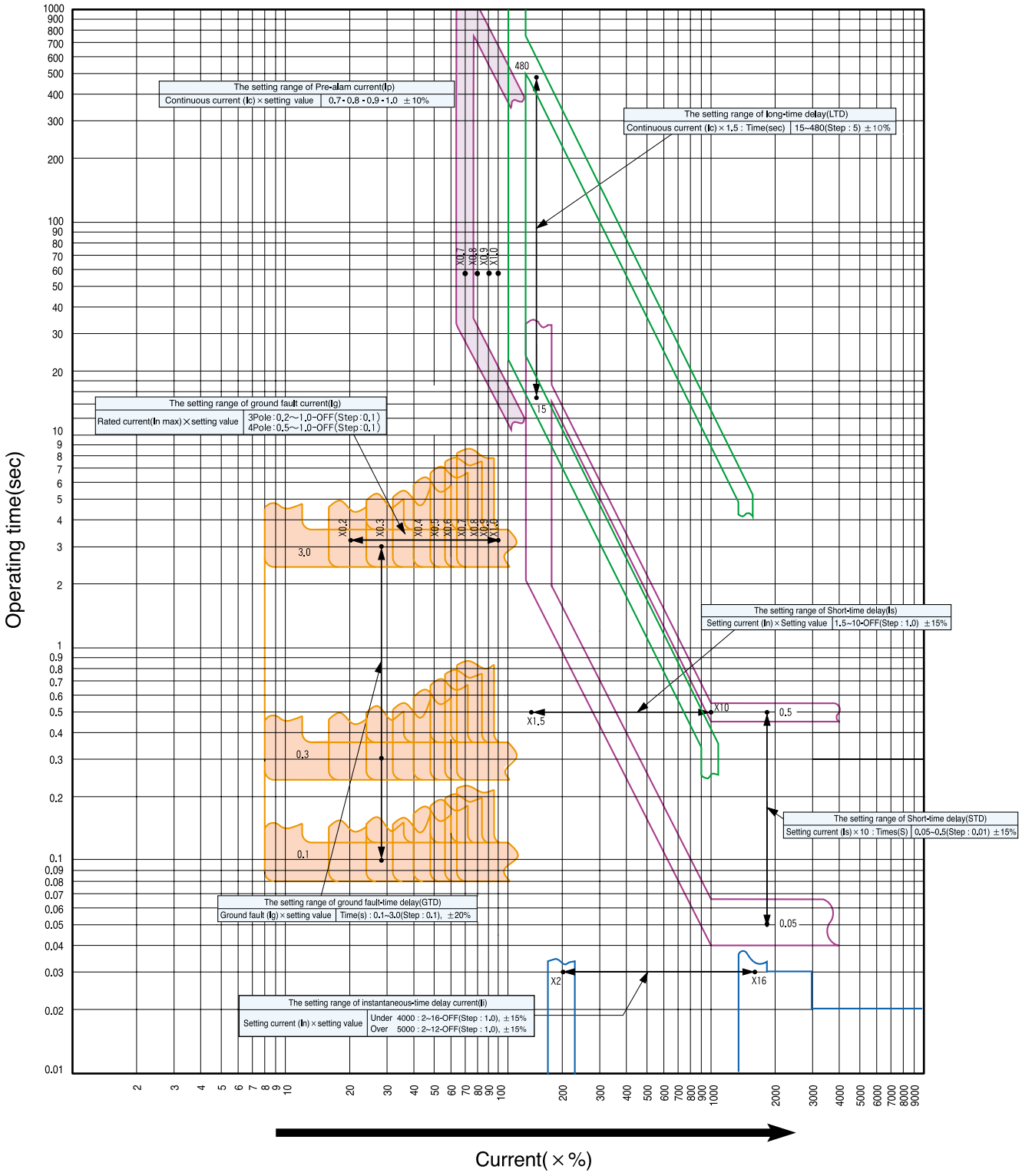
LS6, LS5(For industry)



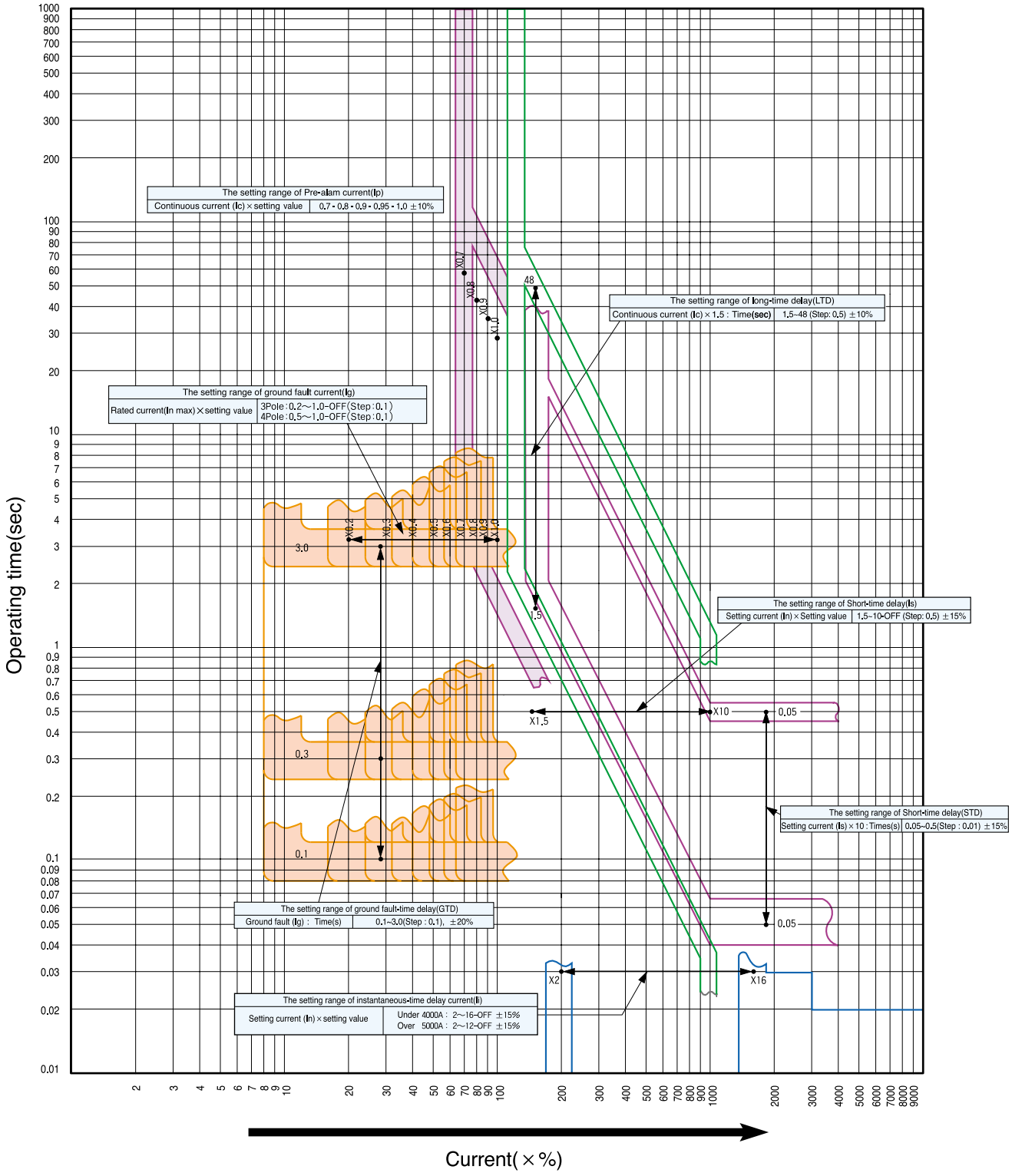
LF6, LF5, LN6, LN5(For industry)



N□6, C□6, N□5, C□5 (For industry)



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 In: (0-30)x$I_{n\,max}$ ⟶ It corresponds to the signal of the OCR (Ex. If you set In to 30, 6V turns out.)
Type of output voltage	o, g, e Note1)
Stop signal	OCR, a-contact, b-contact
Trip time Check	TC: Detect only the operation state of OCR regardless of the time delay 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 (In, In 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

OCR- II

OCR- III

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

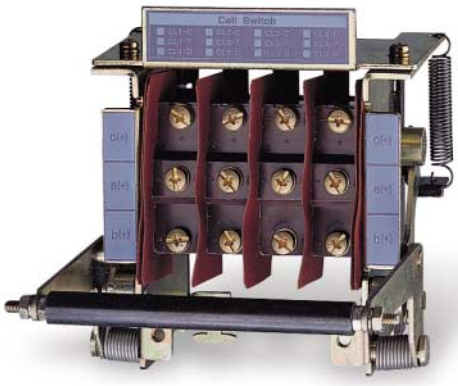
Cell switch(C)

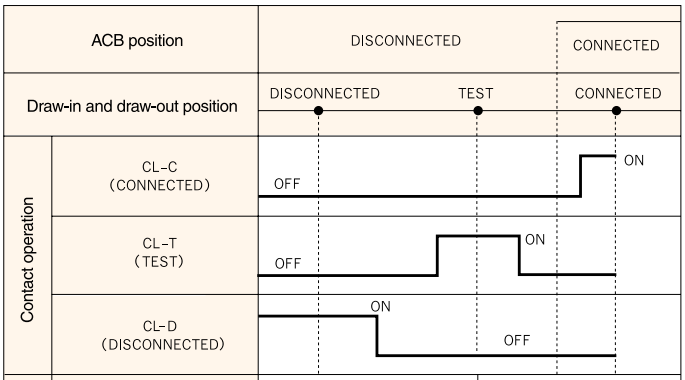
To indicate the position (connected, test, dis-connected) of a ACB
It is installed in the upper and back side of a cradle.
(Common use 630~5000A)

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





Contact capacity	Voltage (V)		Resistive load	Inductive load
	AC	460	5	2.5
		250	10	10
		125		
	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)

Optional accessories

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 70% of the rated voltage
	V2	AC 220V				
	V3	AC 380V				
	V4	AC 460V				
	E1	DC 24V				
	E2	DC 48V				
	E3	DC 110V				
	E4	DC 125V				
Time delay type	T1	AC 110V	0.5sec over	1c		
	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				

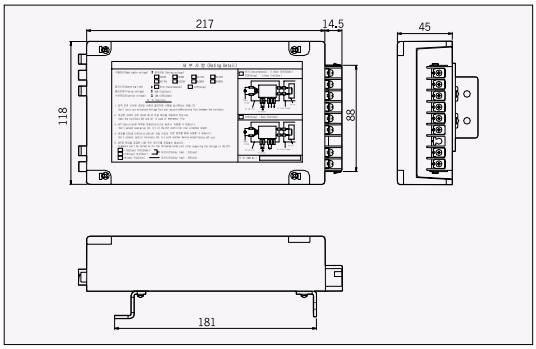
⚠ Caution In case of resetting or testing UVT device, please do not maintain 'ON' status of push button for a long time, and besides do not operate often ON/OFF. It can be cause of damage. (Maintenance duration of 'ON' status : Under 1 second, ON/OFF Cycle : Under 30 Seconds)

Ratings of UVT output contact

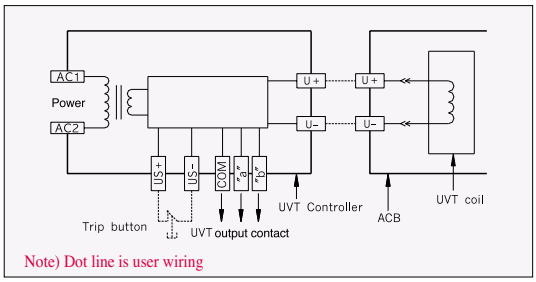
Type		Resistance load	Inductive load	Remark
Voltage	AC 125V	5A	2.5A	Magnetic maintenance type
	DC 30V	5A	2.5A	

Dimension & Circuit diagram of UVT

• UVT controller outline dimension



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



Note) Dot line is user wiring

• How to use US+, US-

1) Test Function

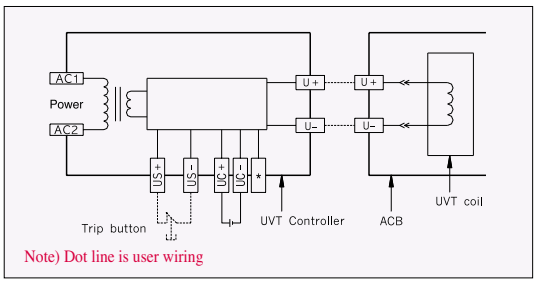
As shown in above circuit diagram, please organize push button.

During the operation in normal status, UVT unit will operate in a normal way if push button will be On. And, user can check the normal operation of UVT unit.

2) Reset (Initialization Function)

A Formation of Circuit diagram and an operation method is as same as instruction explained in Test Function clause. It is a function for initialize function of UVT when user draws out ACB and then put it in original position in the status of normal operation.

• UVT circuit of 3 sec time delay type



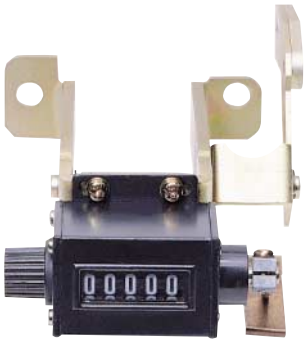
Note) Dot line is user wiring

Key lock(K1)

To compulsorily prevent specific breaker from charging(ON) or trip(OFF) when two or more breakers are used together by interlocking
-K1: Mechanical ON protection

Counter (C)

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

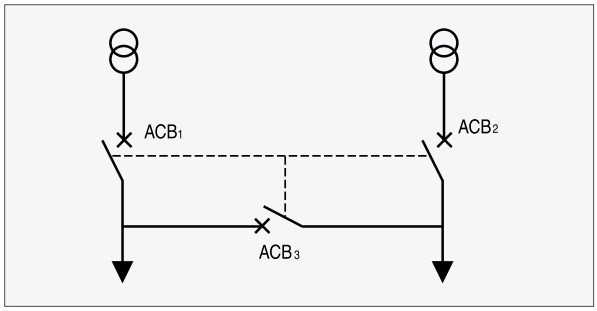


Dust Cover (DC)

Dust cover let us see the front side of air circuit breaker due to transparency cover and protect from various pollutions.

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

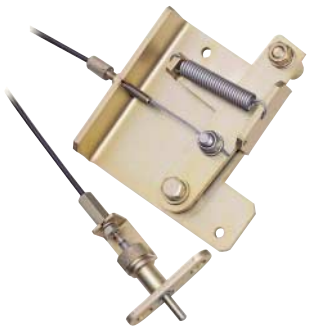


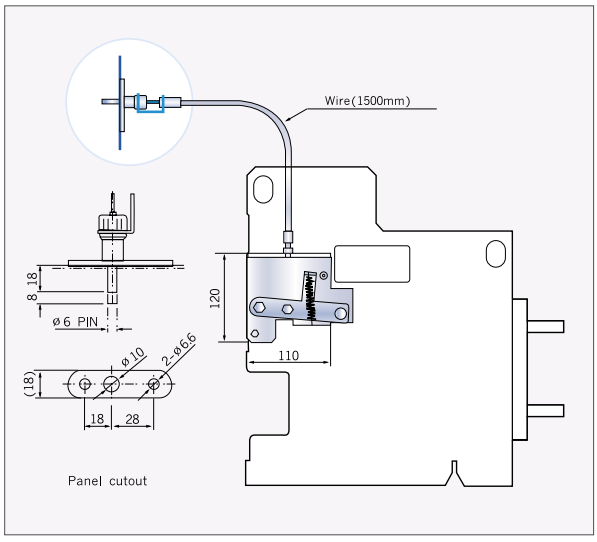
• **Operational condition**

ACB1	ACB2	ABC3
ON	ON	OFF
OFF	ON	ON
ON	OFF	ON

Door interlock(DI)

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





Optional accessories

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.

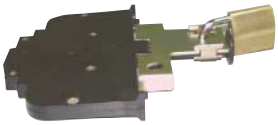
The number of shorting b contact is the same with the number(5b) of the auxiliary contact Axb of air circuit breaker.

• B6~B10 contacts(Linkage between Axb and short "b")

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

Safety shutter lock(STL)

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



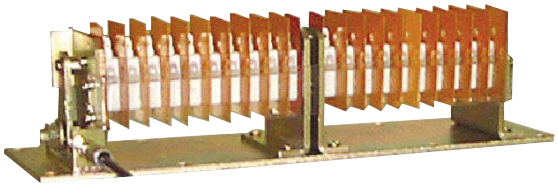
Door frame (DF)

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, 42, 45, 46page.

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)

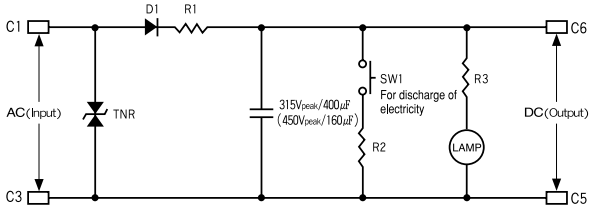
To trip the breaker electrically within regular time when the control power source is off. It is used with Shunt Coil(SHT).

If there isn't DC power,it is possible to supply the power to ACB by rectifying the AC power.

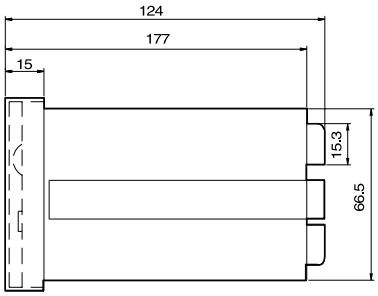
• Ratings

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
Condenser capacity	400㎌	160㎌

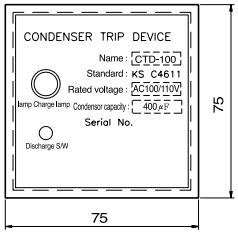
• Circuit diagram



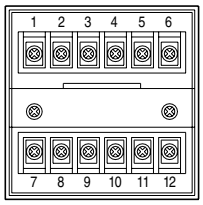
• Outline dimension



<Side view>



<Front view>



<Rear view>

ATS with ACBs

Interlock can be composed only of an electric driven charge type circuit break 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	■	■	■	■
Time setting(T1~T6)	■	■	■	■
Fault function(OCR/Circuit breaker trouble)	■	■	■	■
Output contact(auto, load)	■	■	■	■
Communication function (RS-485)	-	■	-	■

- T_1 : At the time when EPCO UN is OFF the delayed time until Generation start-up signal is closed (t_1 : 0.1, 0.5, 1, 2, 4, 8, 15, 30, 40, 50 seconds)
- T_2 : At the time when EPCO UN is ON the delayed time until ACB_2 is tripped (OFF) (t_2 : 0.1, 1, 2, 4, 8, 15, 30, 60, 120, 240 seconds)
- T_3 : At the time when ACB is tripped(OFF) the delayed time until ACB_2 is inputted(ON) (t_3 : 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40 seconds)
- T_4 : At the time when ACB2 is tripped(OFF) the delayed time until ACB_2 is inputted(ON) (t_4 : 0.5, 1, 2, 5, 10, 15, 20, 25, 30, 40 seconds)
- T_5 : At the time when ACB_2 is tripped(OFF) the delayed time until Generation start-up signal contactor is opened (t_5 : 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 ACB_1(EPCO Circuit breaker) and ACB_2 (The Power Station circuit breaker) are tripped (OFF).
- N-mode : In a state that UN (EPCO power) is usable a mode that ACB_1(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 ACB_2(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).

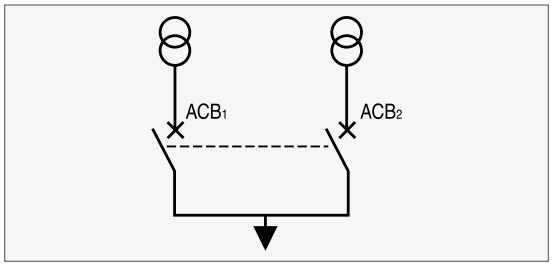
Note) EPCO: Electric Power Co.

Operational condition

In case of using 2 ACBs ATS Controller

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

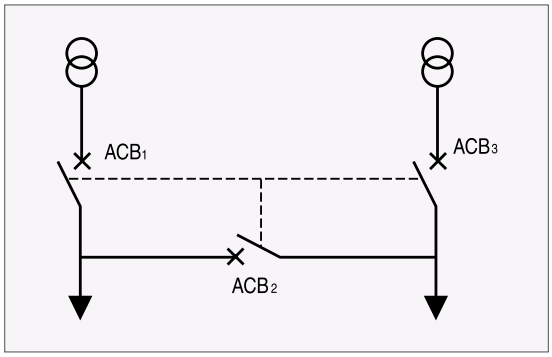
ACB_1	ACB_2
OFF	OFF
ON	OFF
OFF	ON



In case of using 3 ACBs Non-ATS Controller

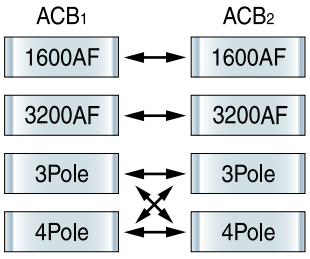
- If 2(two) of 3(three) connected ACBs are ON simultaneously, the other is not ON electrically and mechanically by interlock.
- Operational condition

ACB_1	ACB_2	ACB_3
OFF	OFF	OFF
ON	OFF	OFF
ON	ON	OFF
OFF	ON	ON
OFF	OFF	ON
ON	OFF	ON



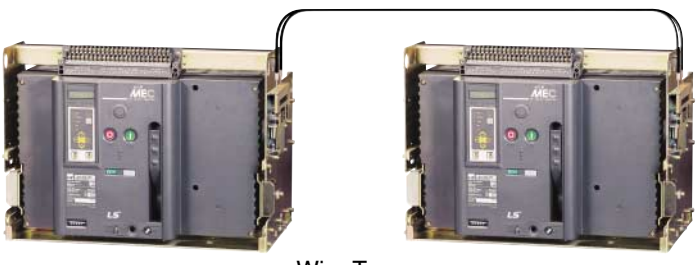
Interlock method

Bar type



Wire type

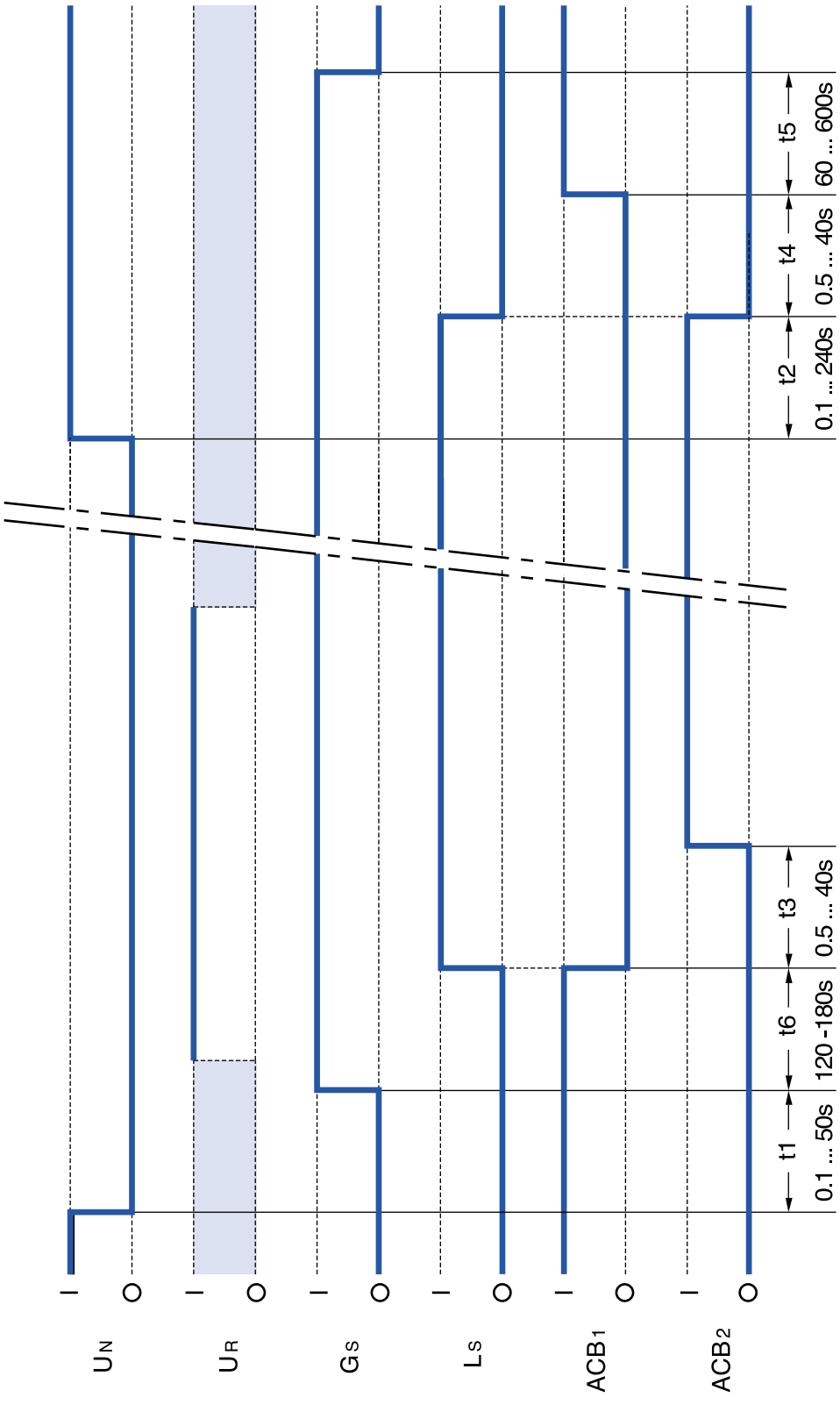
Interlock is possible regardless of the Ampere Frame sizes and the number of poles. Standard length of wires are 1.8 meters



<Wire Type>

<Bar Type>

Time chart

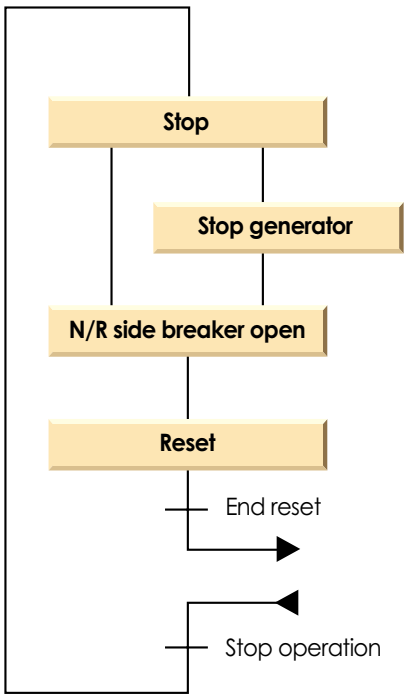


* **UN:** Main power(normal power)
* **UR:** Emergency power (standby power)
* **GS:** Generator start-up signal
* **LS:** Load shedding
* **ACB1:** N-side breaker(normal breaker)
* **ACB2 :** R-side breaker(stand-by breaker)

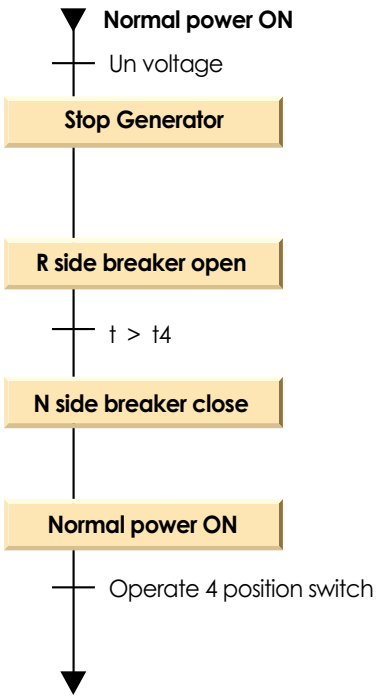
* **symbol explanation**
  - **I position:** circuit close
  - **O position:** circuit open
  - : there is no effect whether the condition is ON or OFF

A flow chart of operation

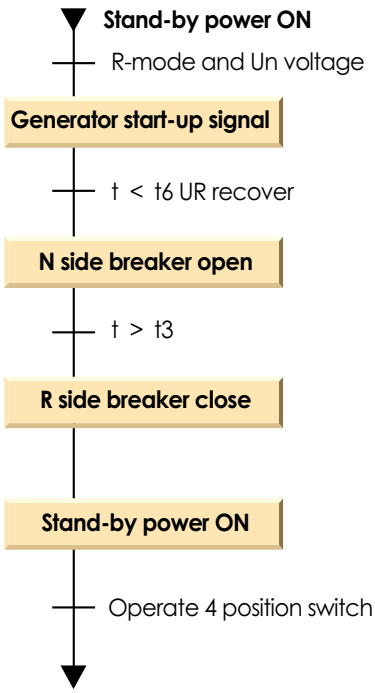
STOP mode



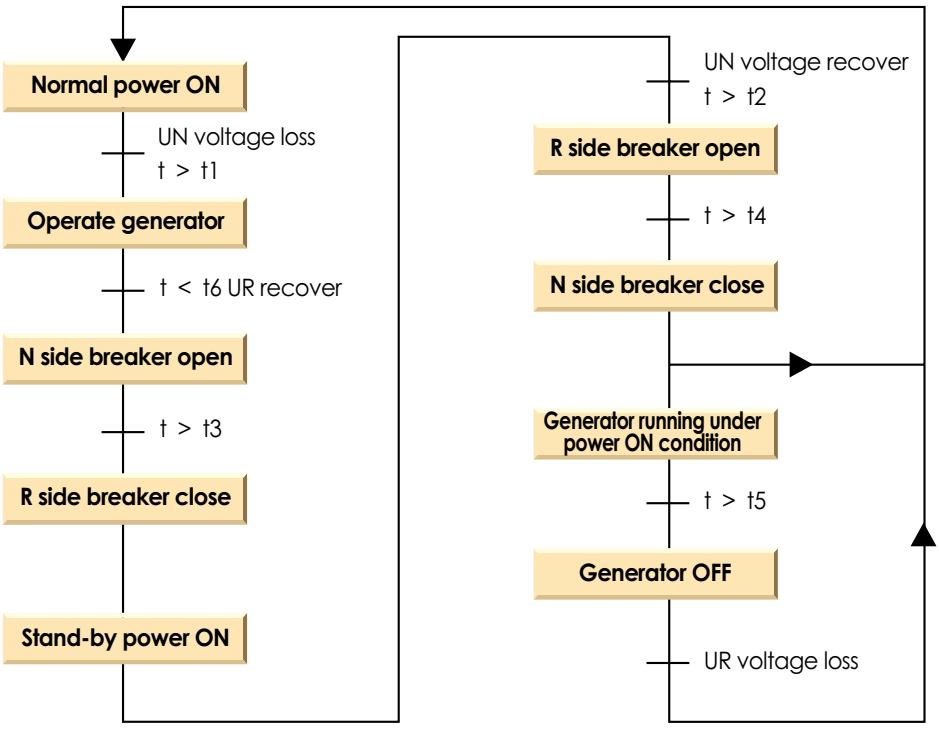
N mode



R mode

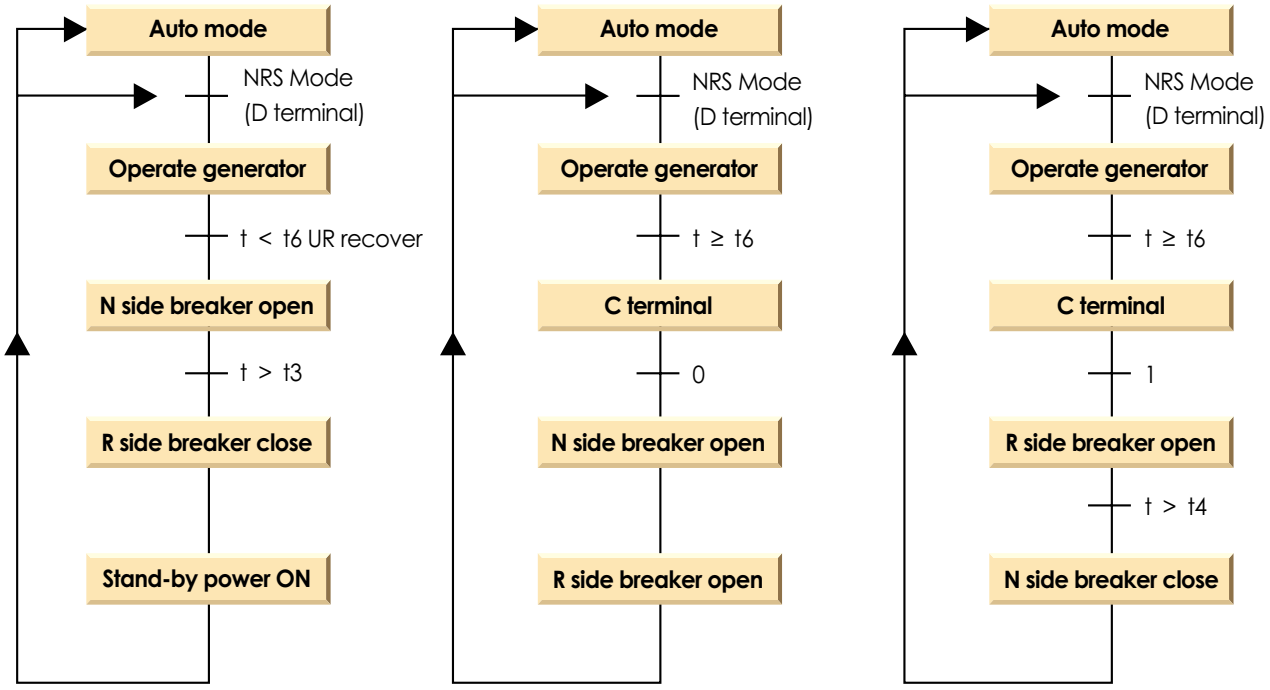


AUTO mode

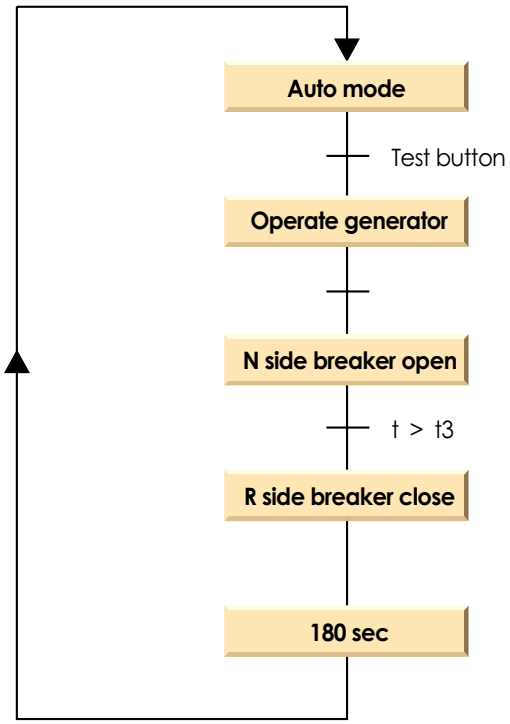


A flow chart of operation

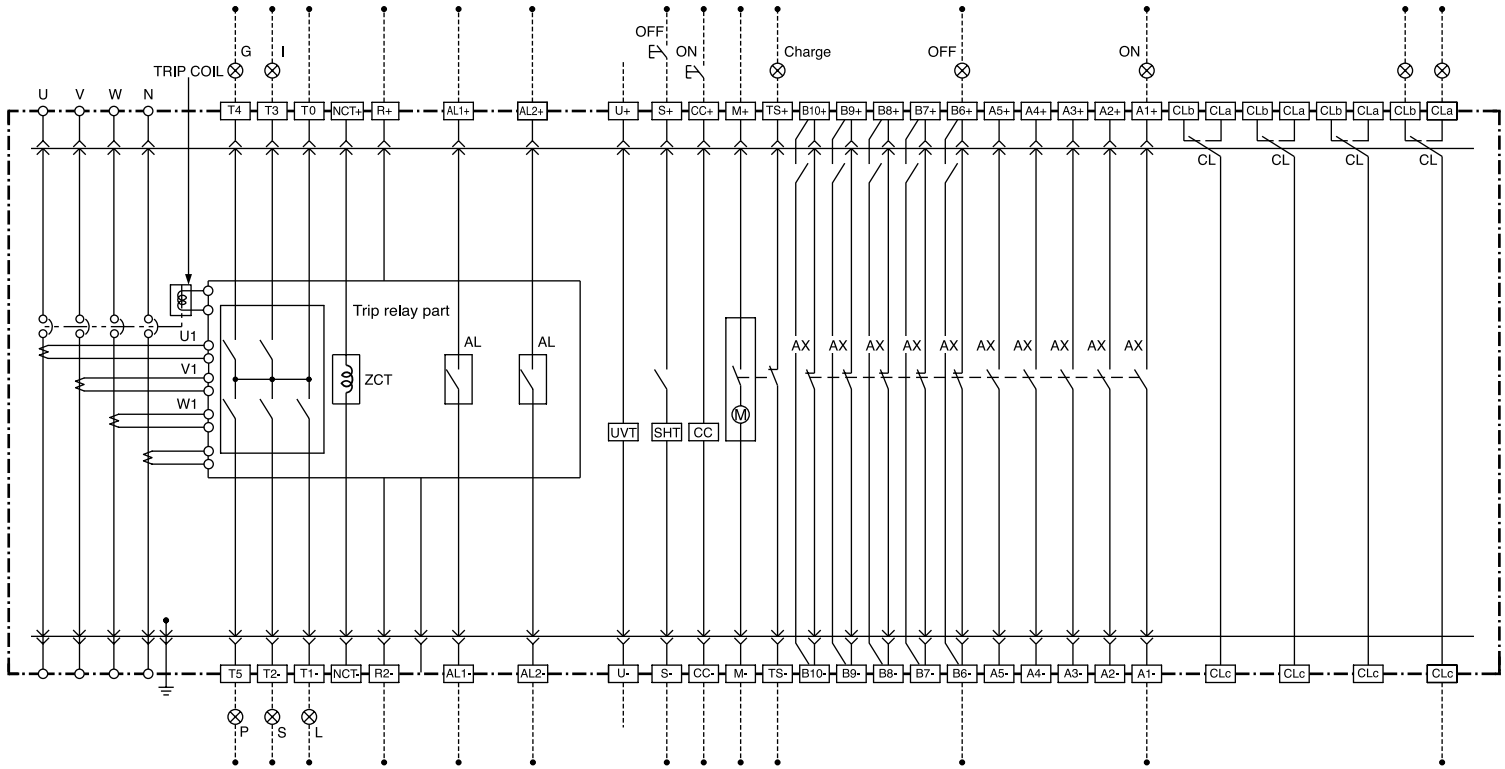
NRS mode



Test mode



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



Main circuit | Trip relay | Undervoltage trip device (UVT) | Electric operating circuit | Charge complete contact | Auxiliary switch | Cell switch

Terminal code description

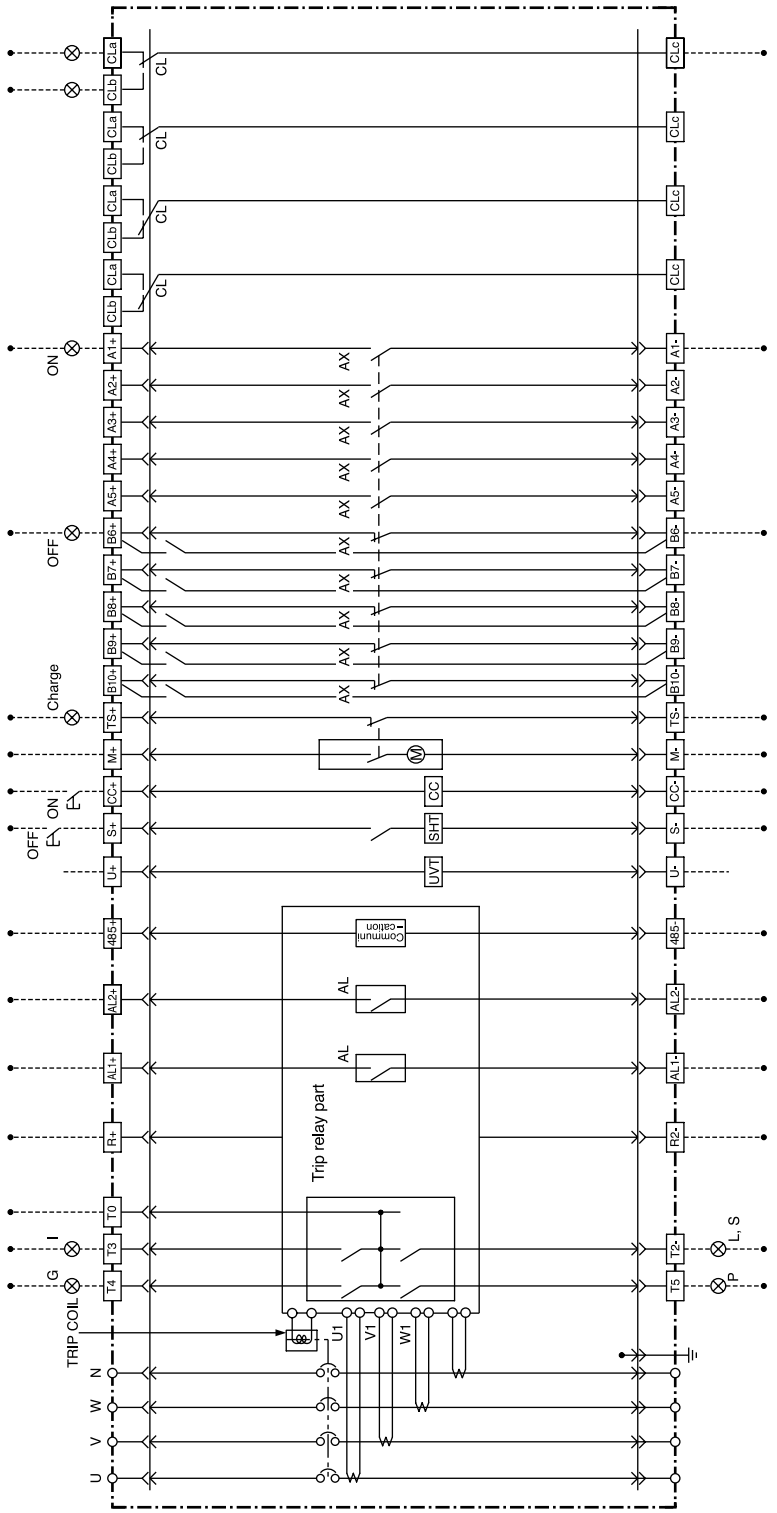
A1 ~ A5	Auxiliary switch a-contact terminal	AL1+ AL1−	OCR signal contact terminal (Operational , 15ms under)
B6 ~ B10 Note1)	Auxiliary switch b-contact terminal	AL2+ AL2−	
TS + TS −	Charge complete contact terminal	T0 ~ T4	Trip indication contact terminal
M + M −	Motor charging power input terminal	T5	Pre-alarm indication contact terminal
CC+ CC−	Closing coil power input terminal	CLa CLb CLc	Cell Switch
S + S −	Trip coil power input terminal	R+	Trip relay power input terminal ("+")
U + U − Note2)	Undervoltage tripping coil terminal	R2−	Trip relay power input terminal ("-")
NCT+ NCT- Note3)	Neutral CT signal input terminal	Ⓜ	Motor for charging

Accessory code description

CC	Closing coil	⊗ P	Pre-alarm indication contact
SHT	Shunt trip coil	———	Factory wiring
UVT	Undervoltage tripping coil	------	User wiring
AL	OCR signal contact		
⊗ L	Long-time delay tripping indication contact		
⊗ S	Short-time delay tripping indication contact		
⊗ I	Instantaneous-time delay tripping indication contact		
⊗ G	Ground-fault delay tripping indication contact		

Note) 1. In case of auxiliary contact is high capacity, B10+ and B10- 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. The secondary output value of NCT should 5A.
4. Above circuit diagram shows ACB locates on "Connected" position and ACB status will be trip or motor charging completion.

OCR-III



Main circuit | Trip relay | Undervoltage trip device (UVT) | Electric operating circuit | Charge complete contact | Auxiliary switch | Cell switch

Terminal code description

A1 ~ A5	Auxiliary switch a-contact terminal	AL1+	AL1-	OCR signal contact terminal	Ⓜ	Motor for charging
B6 ~ B10 (Note1)	Auxiliary switch b-contact terminal	AL2+	AL2-	(Operational , 15ms under)	CC	Closing coil
TS +	Charge complete contact terminal	T0	T4	Trip indication contact terminal	SHT	Shunt trip coil
M +	Motor charging power input terminal	T5		Pre-alarm indication contact terminal	UVT	Undervoltage tripping coil
CC+	Closing coil power input terminal	CLc	CLb CLc	Cell Switch	AL	OCR signal contact
S +	Trip coil power input terminal	R+		Trip relay power input terminal("+")	L, S	Long-time, Short-time delay tripping indication contact
U +	Undervoltage tripping coil terminal	R2-		Trip relay power input terminal("-")	I	Instantaneous-time delay tripping indication contact

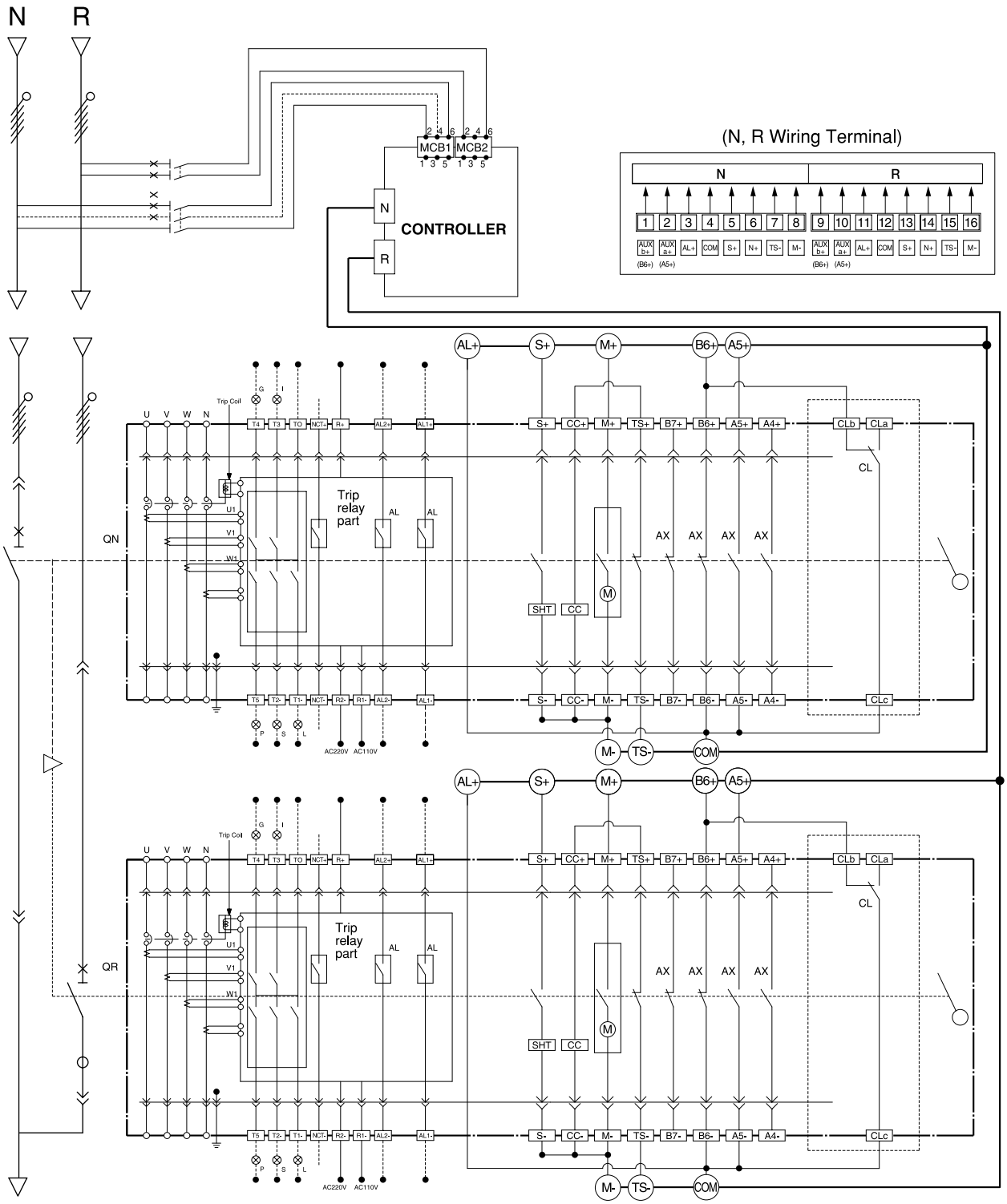
Accessory code description

G	Ground-fault delay tripping indication contact
P	Pre-alarm indication contact
———	Factory wiring
- - - - - -	User wiring

Note) 1. In case of auxiliary contact is high capacity, B10+ and B10- 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. Above circuit diagram shows ACB locates on "Connected" position and ACB status will be trip or motor charging completion.

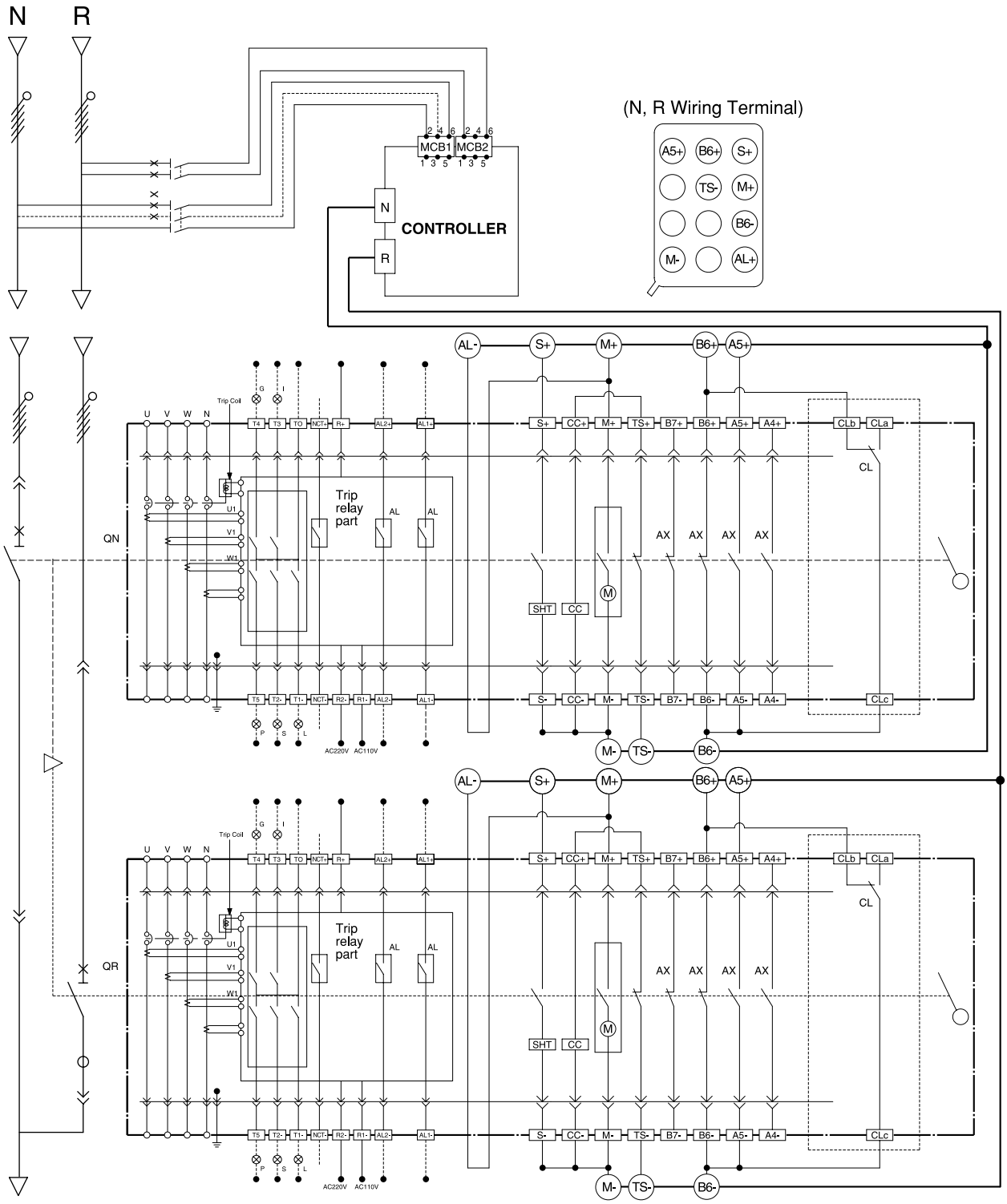
Control circuit

ATS with ACBs (LS controller circuit)



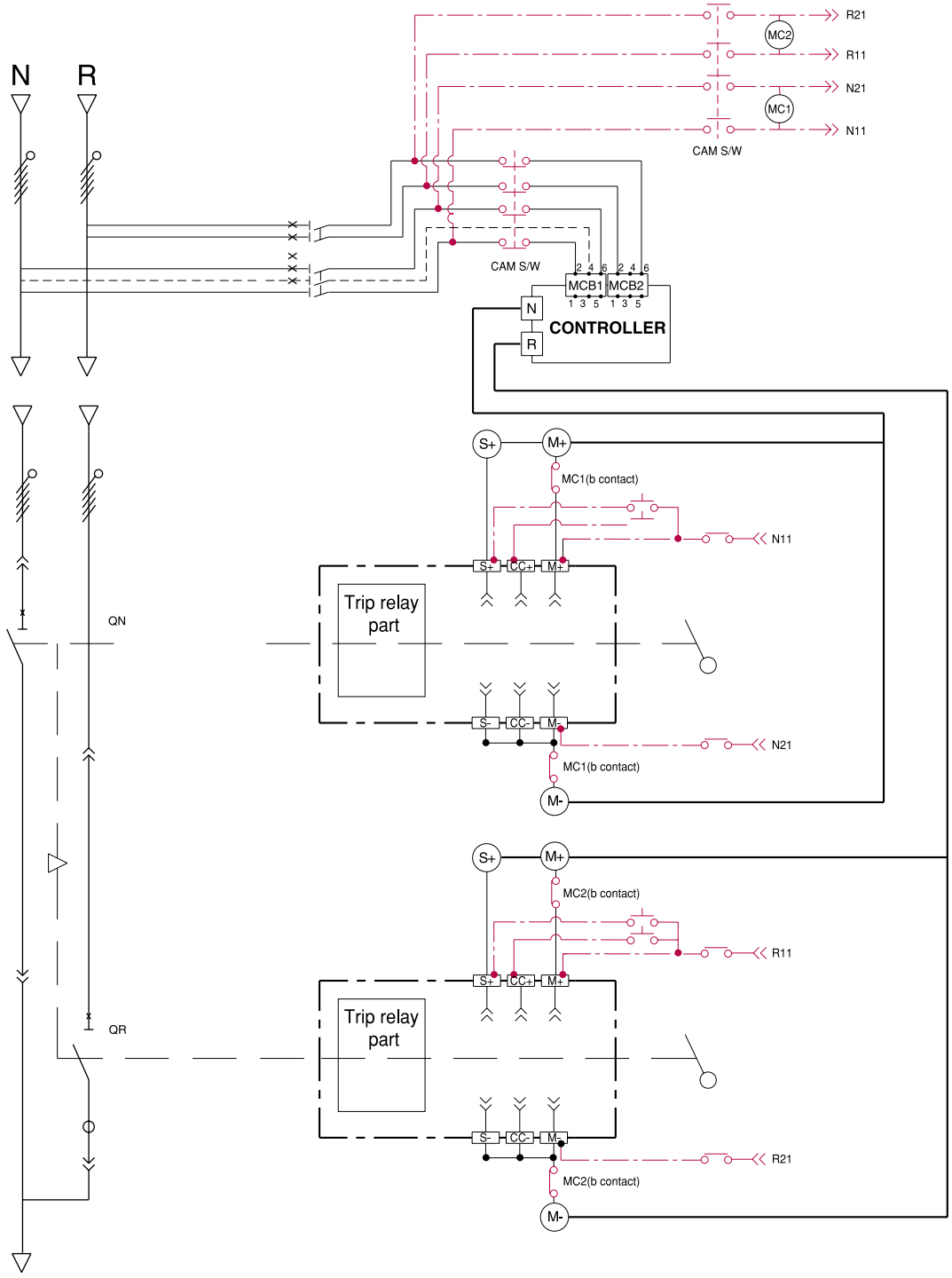
Note) 1. [ ] part shows optional feature "N" and "R" distributing wires are in same condition and applied OCR-II.
2. In case of connecting the trip relay (OCR-II) Control power R+/R1-: AC110V, R+/R2-: AC220V common
3. In case of connecting the trip relay (OCR-III) Control power R+/R2-: AC/DC110V~220V 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 transfered 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.

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.
2. In case of connecting the trip relay (OCR-II) Control power R+/R1-: AC110V, R+/R2-: AC220V common
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 transfered 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.

ATS with ACBs (Manual)



Caution

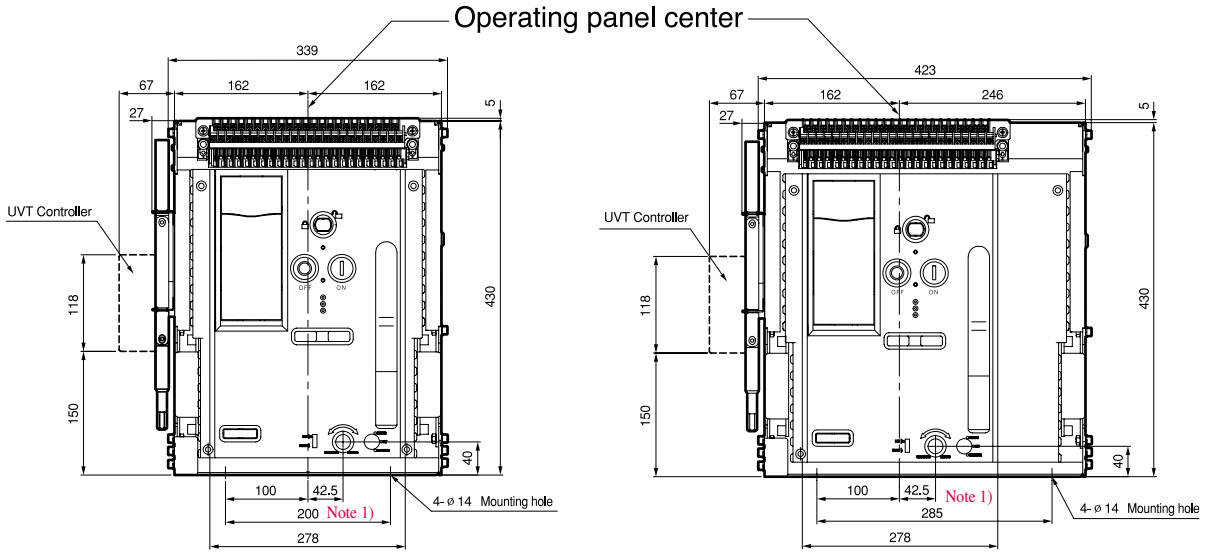
1. ATS Controller will be damaged when MC1 or MC2 is missing. Please compose it essentially.
2. If application of connection wire is required, please compose M+ and M- of Auto mode wiring which shall open when transfer from Auto mode to manual mode.

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)

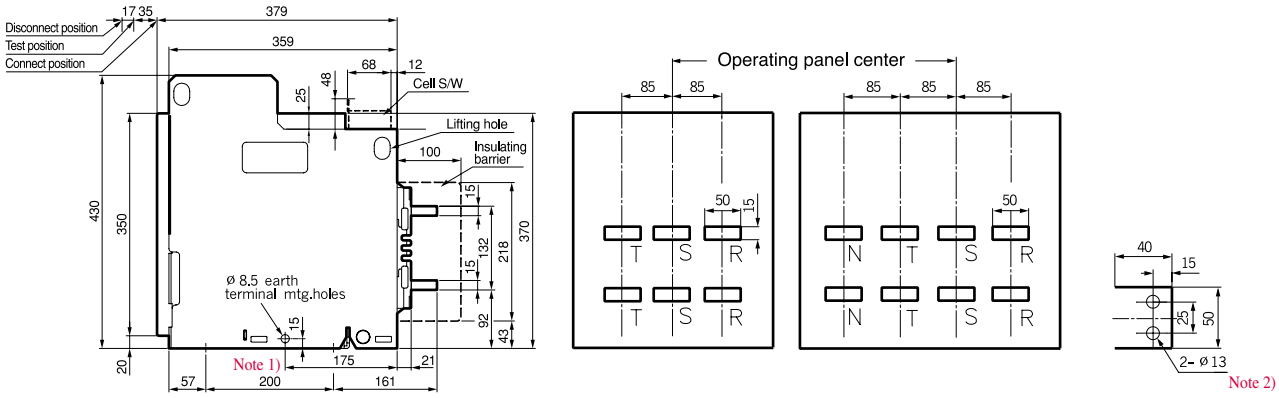
External dimensions (Draw-out type)

Horizontal terminal type (630~1600A)

(Unit: mm)



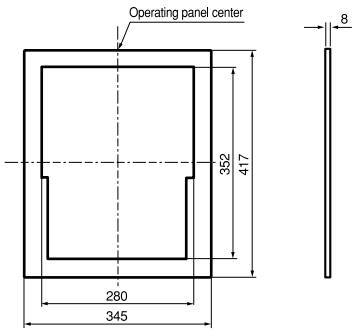
[3Pole] [Front view] [4Pole]



[Side view] [Rear view] [Connection conductor]

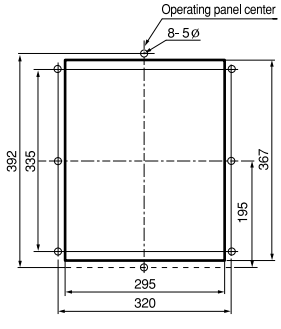
Note) 1. Size of mounting hole
2. Size of connection conductor of Ace-MEC ACB.

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



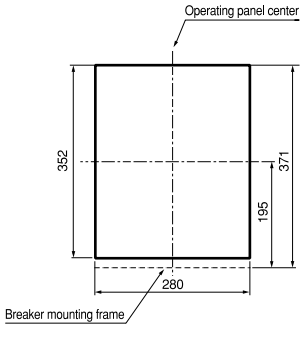
External size

[In case of using DF]



Dimension of cutting panel

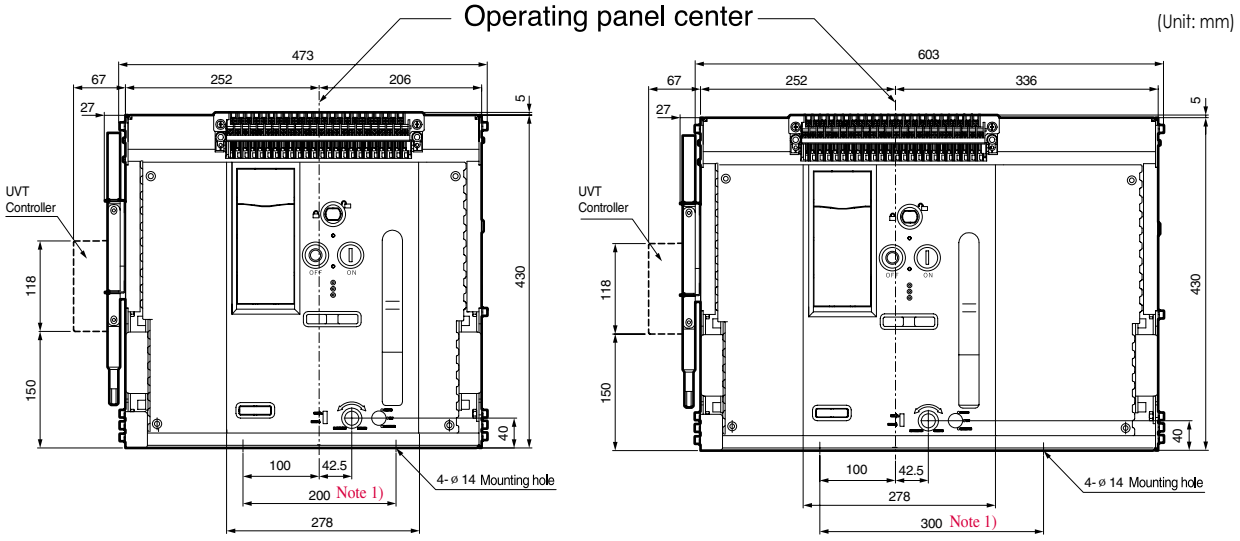
[In case of not using DF]



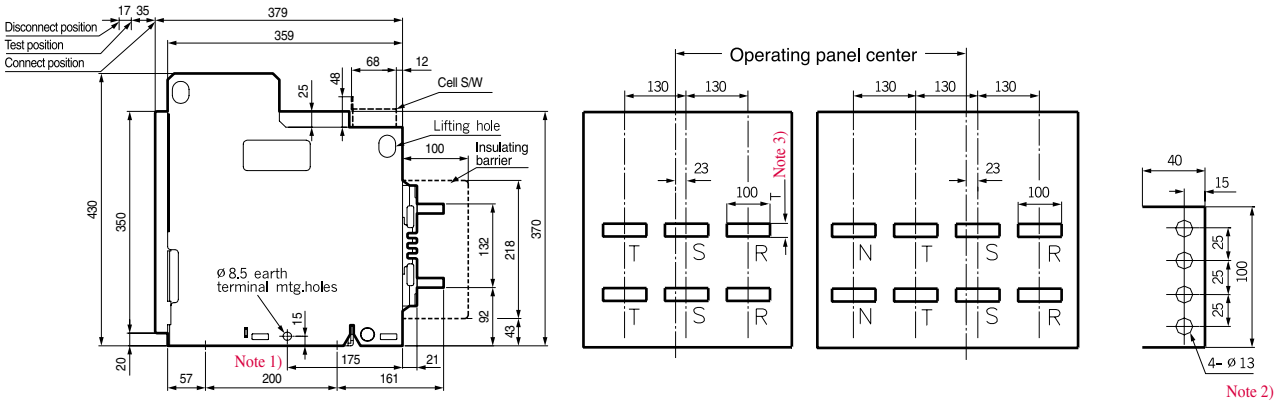
Cutting panel

External dimensions (Draw-out type)

Horizontal terminal type (2000~3200A)



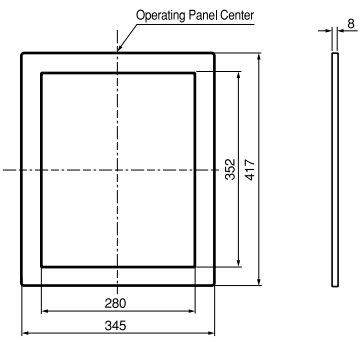
[3Pole] [Front view] [4Pole]



[Side view] [Rear view] [Connection conductor]

Note) 1. Size of mounting hole
2. Size of connection conductor of Ace-MEC ACB.
3. Please refer to "T"dimension in 43 page.

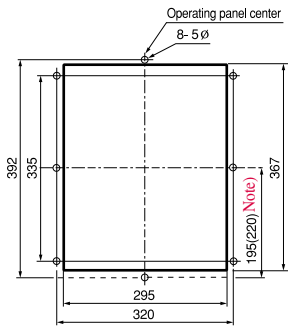
Door frame (DF): (2000~3200A, 4000~5000A/3,4Pole)



External size

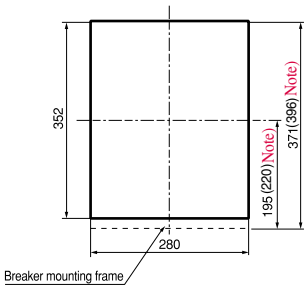
Note) ( ) value is for 4000~5000A/3, 4pole type.

[In case of using DF]



Dimension of cutting panel

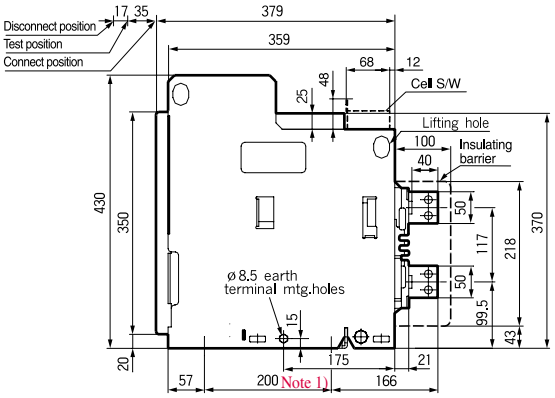
[In case of not using DF]



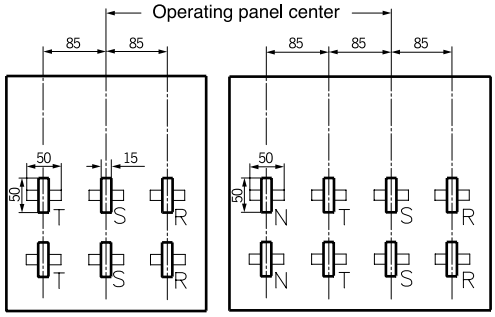
Cutting panel

Vertical terminal type (630~1600A)

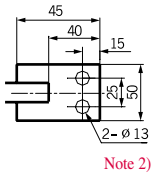
(Unit: mm)



[Side view]

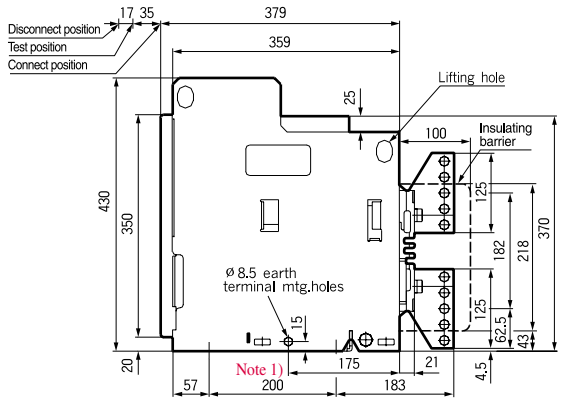


[Rear view]

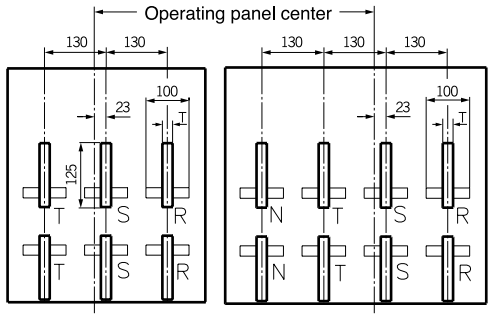


[Connection conductor]

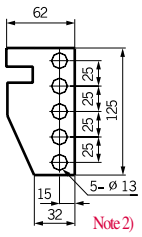
Vertical terminal type (2000~3200A)



[Side view]



[Rear view]



[Connection conductor]

• "T" Size

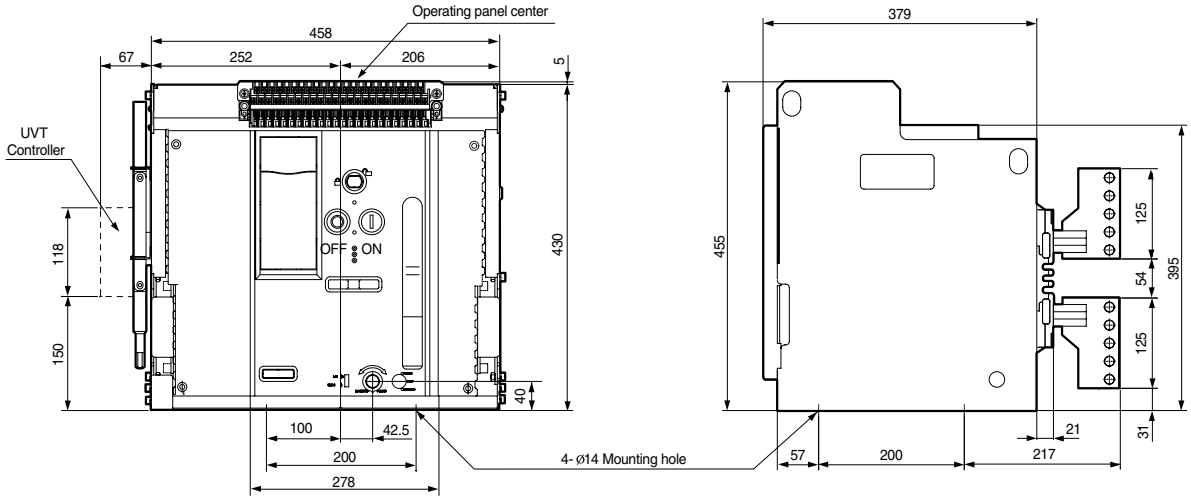
Rated current	T
2000A, 2500A	20
3200A	25

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

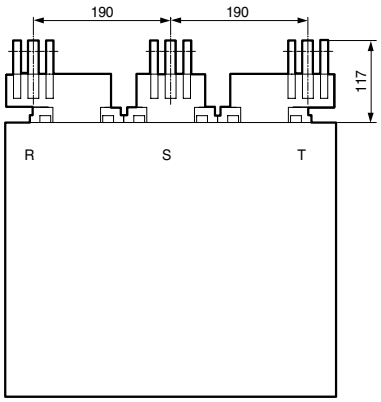
External dimensions (Draw-out type)

Slim type (4000A)

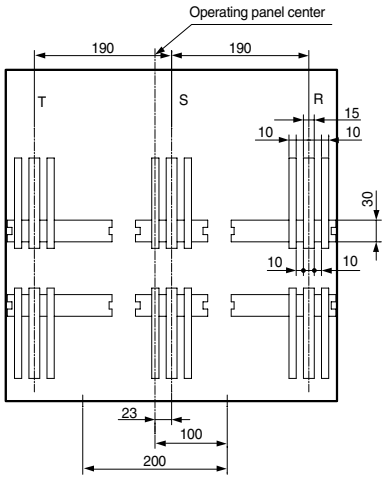
(Unit: mm)



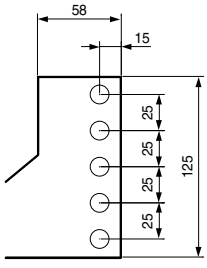
[Front view] [3Pole] [Side view]



[Plane view]

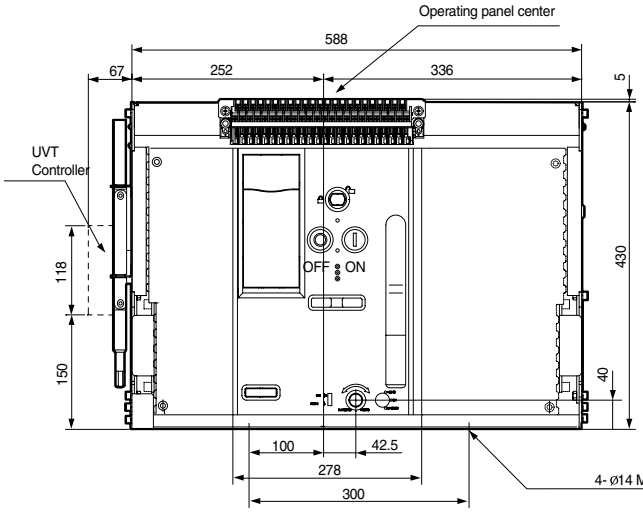


[Rear view]

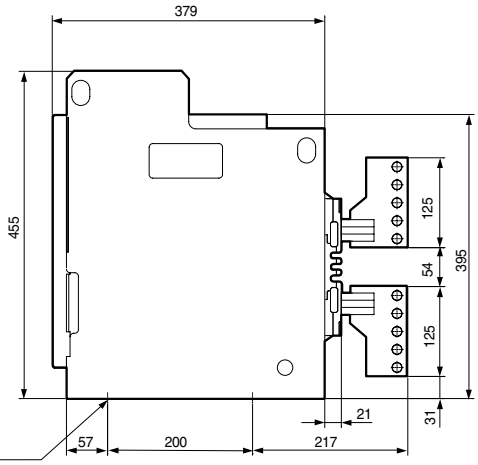


[Connection conductor]

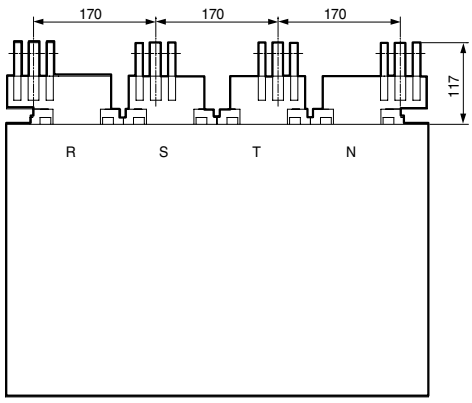
(Unit: mm)



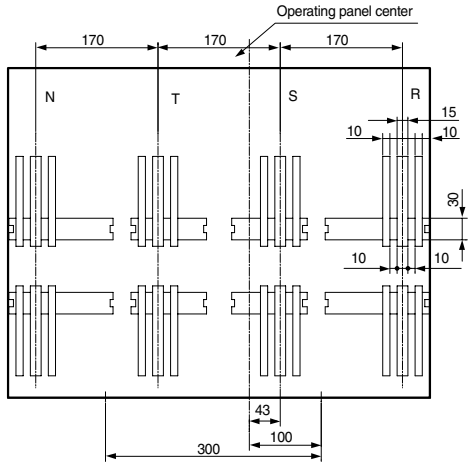
[Front view] [4Pole]



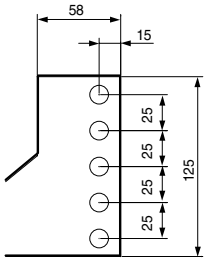
[Side view]



[Plane view]



[Rear view]

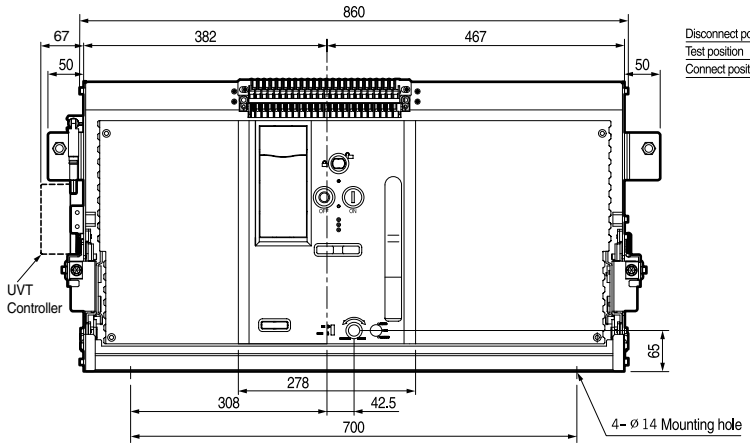


[Connection conductor]

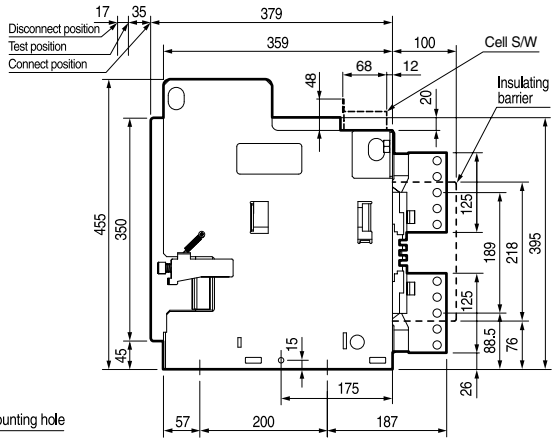
External dimensions (Draw-out type)

Vertical terminal type (4000~5000A)

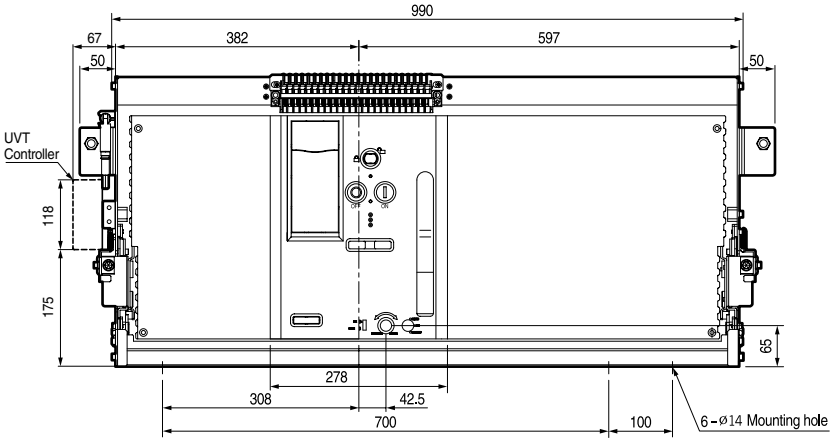
(Unit: mm)



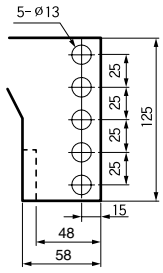
[Front view] [3Pole]



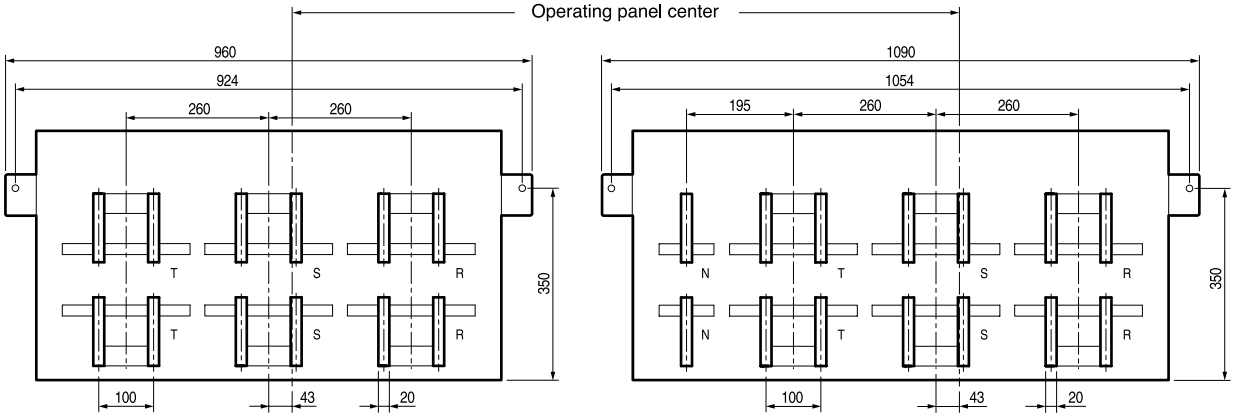
[Side view]



[Front view] [4Pole]



[Connection conductor]



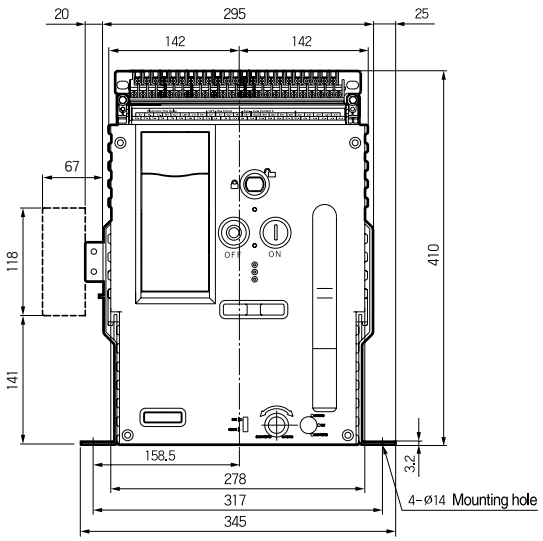
[Rear view]

• Door Frame (DF): (4000~5000AF/3,4Pole): The 2000~3200A of page42 is common use.

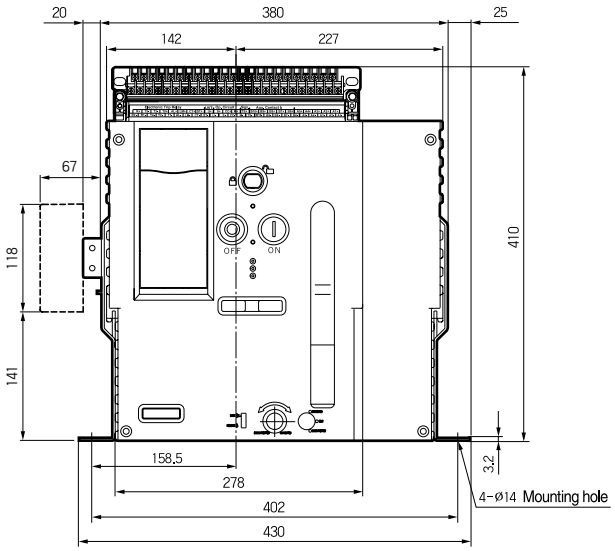
External dimensions(Fixed type)

Horizontal terminal type (630~1600A)

(Unit: mm)

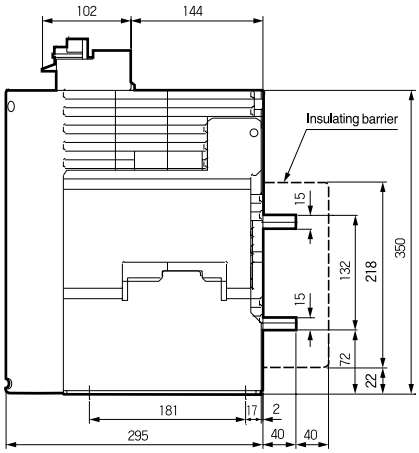


[3Pole]

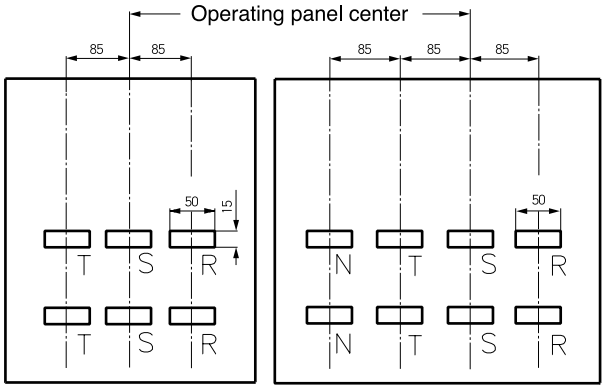


[4Pole]

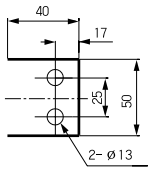
[Front view]



[Side view]

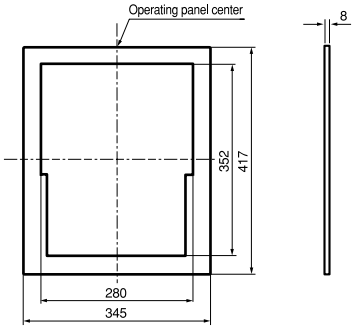


[Rear view]



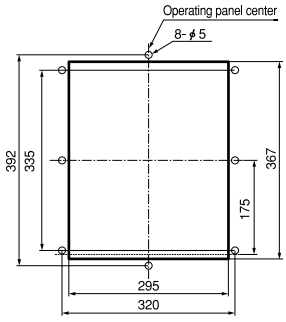
[Connection conductor]

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



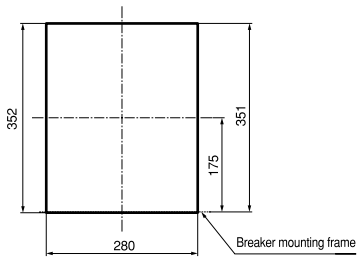
External size

[In case of using DF]



Dimension of cutting panel

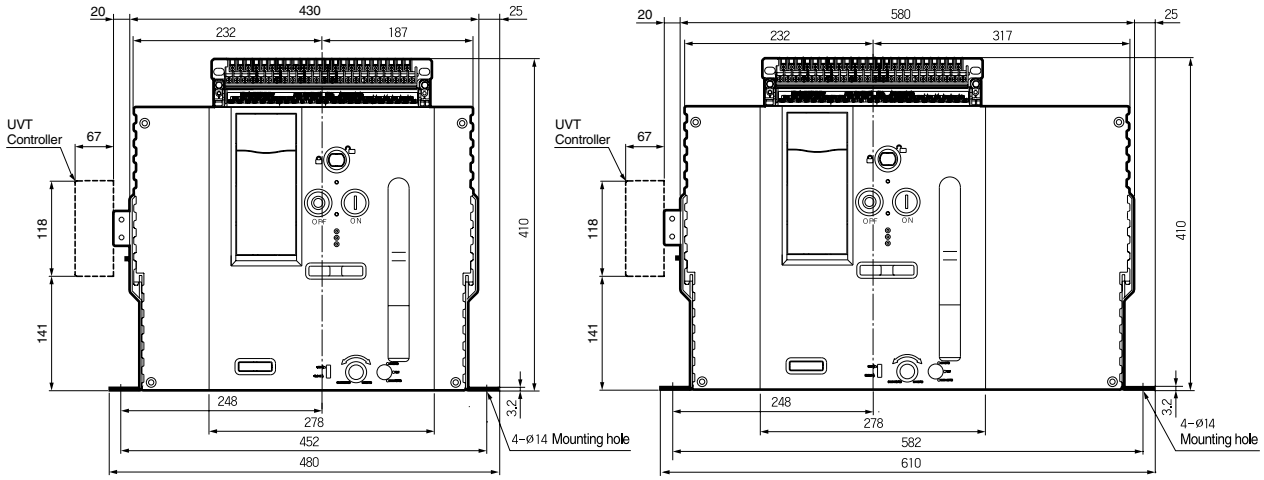
[In case of not using DF]



Cutting panel

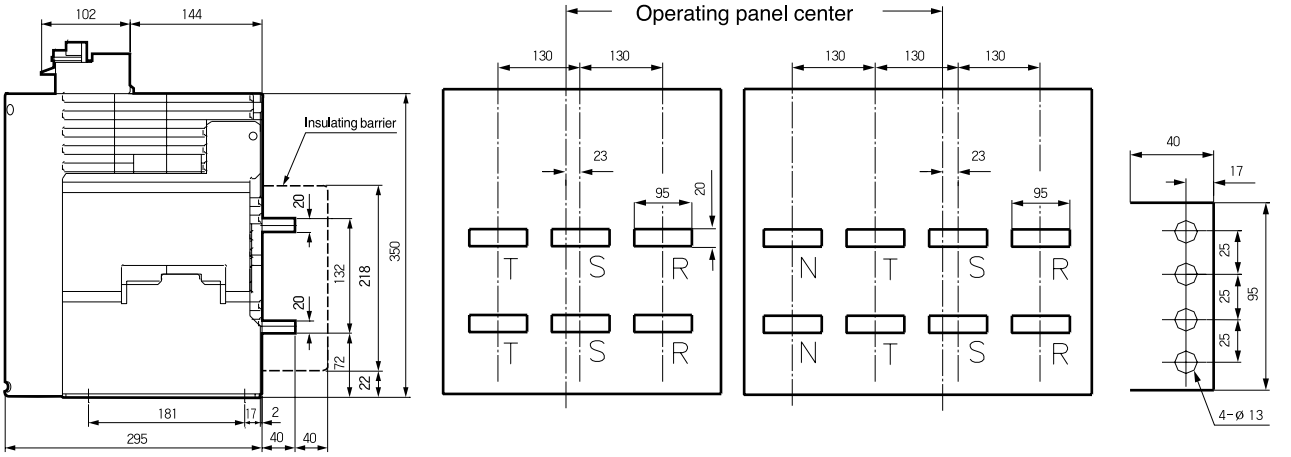
External dimensions(Fixed type)

Horizontal terminal type (2000~3200A)



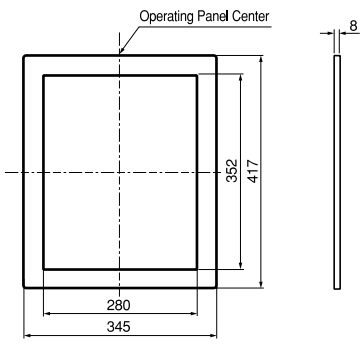
[3Pole] [4Pole]

[Front view]



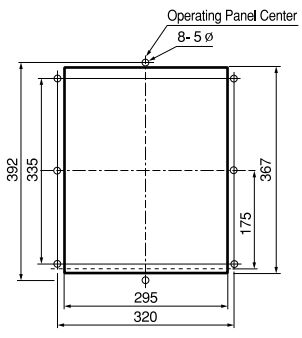
[Side view] [Rear view] [Connection conductor]

Door Frame (DF) : (2000~3200A, 4000~5000A/3,4Pole)



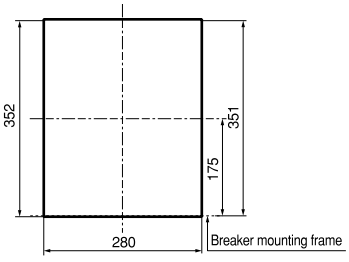
External size

[In case of using DF]



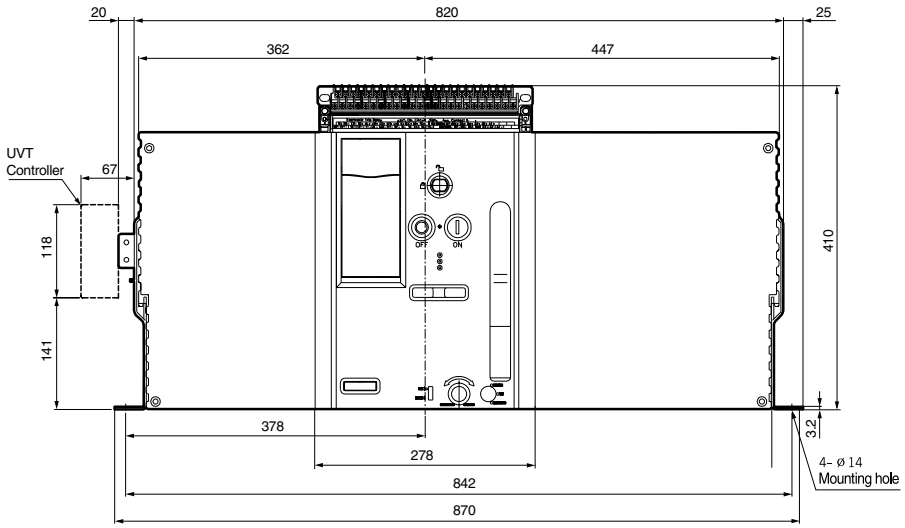
Dimension of cutting panel

[In case of not using DF]

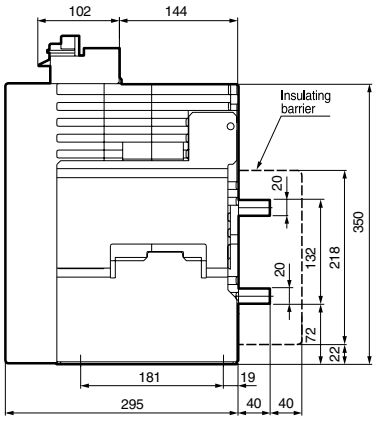


Cutting panel

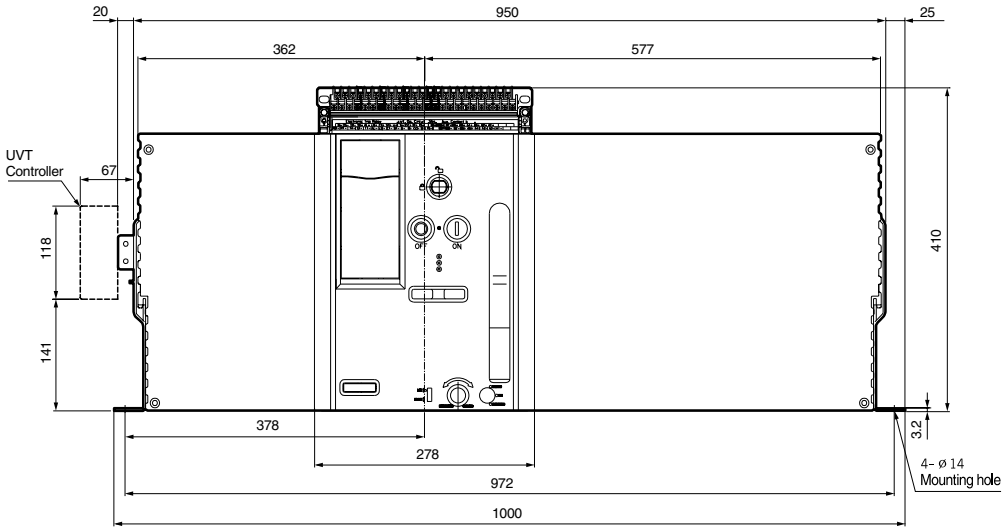
Horizontal terminal type (4000~5000A)



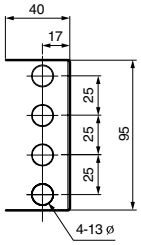
[Front view] [3Pole]



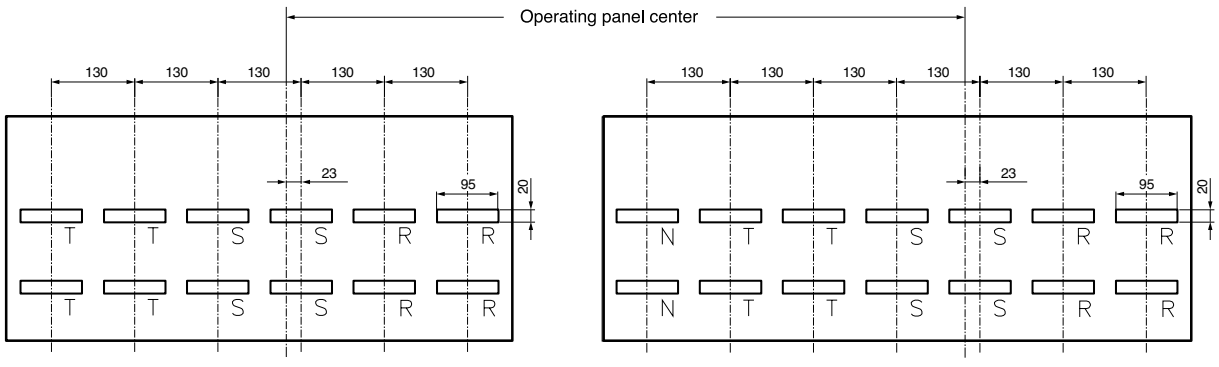
[Side view]



[Front view] [4Pole]



[Connection conductor]



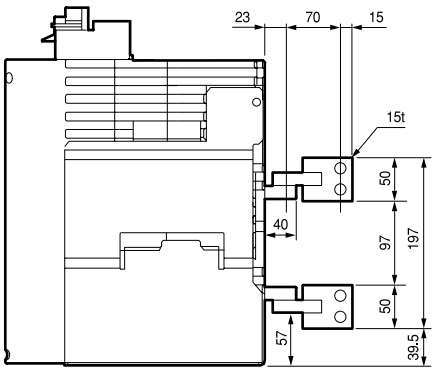
[Rear view]

External dimensions

Vertical adapter attachable type

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

Fixed type (630~1600A)

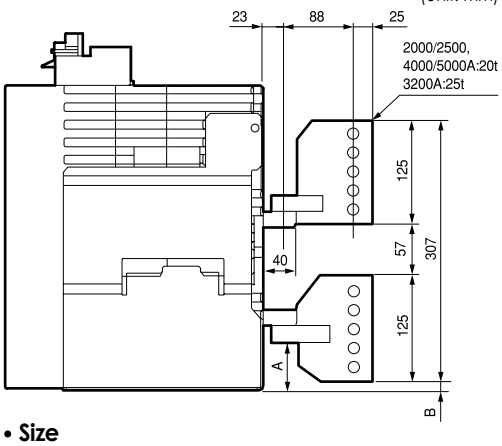


• **Needed units of vertical adopter**

Ampere	Pole	Top	Lower	Common	Total
630~1600A	3pole	-	-	6	6
	4pole	-	-	8	8
2000~3200A	3pole	3	3	-	6
	4pole	4	4	-	8
4000~5000A	3pole	6	6	-	12
	4pole	7	7	-	14

Fixed type (2000~5000A)

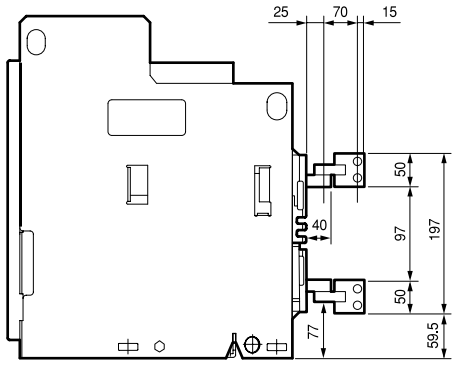
(Unit: mm)



• **Size**

Ampere	A	B
2000, 2500 **4000, 5000**	52	9
3200	47	4

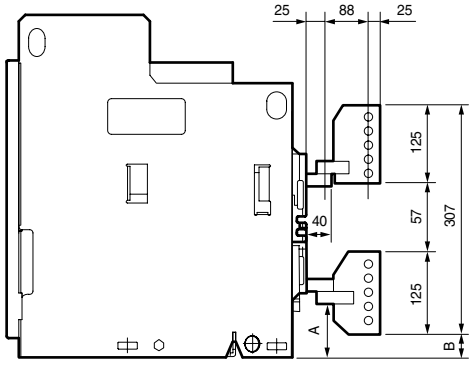
Draw-out type (630~1600A)



• **Needed units of vertical adopter**

Ampere	Pole	Top	Lower	Common	Total
630~1600A	3pole	-	-	6	6
	4pole	-	-	8	8
2000~3200A	3pole	3	3	-	6
	4pole	4	4	-	8

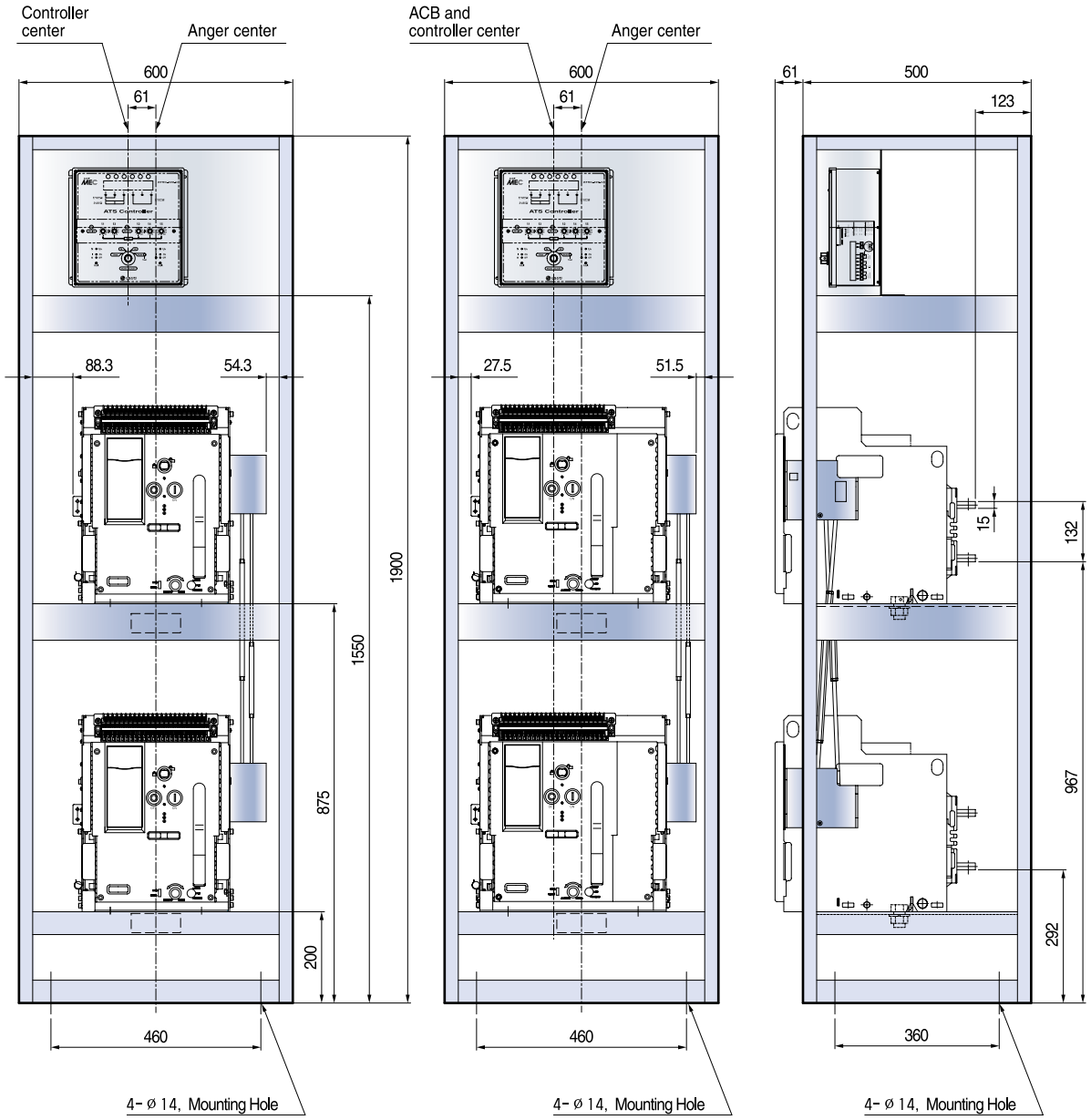
Draw-out type (2000~3200A)



• **Size**

Ampere	A	B
2000, 2500	72	29
3200	67	24

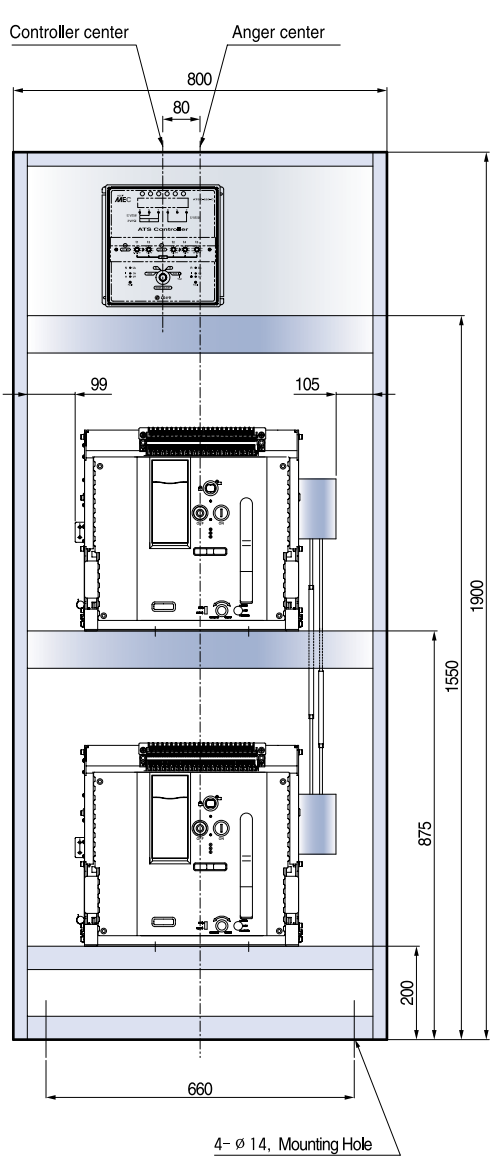
ATS with ACBs(630~1600A)



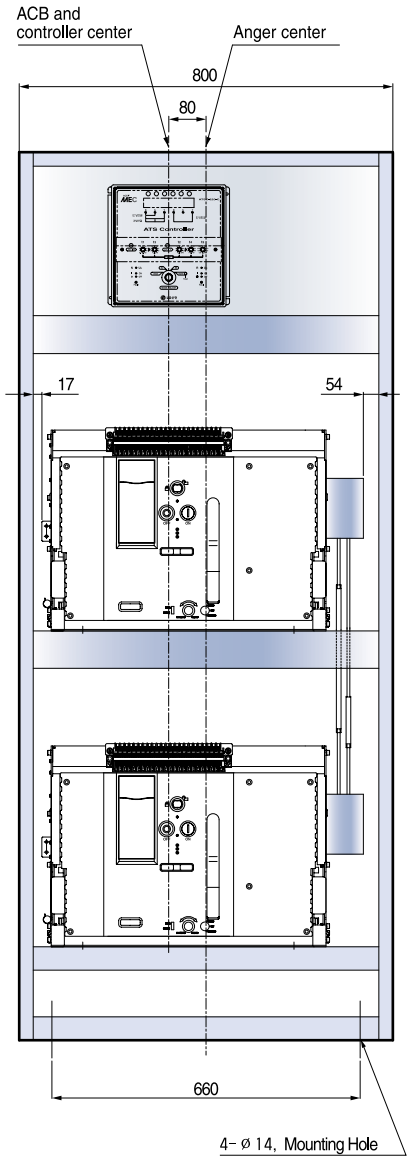
Note) Above size is the standard size of our company. If you need other size, Please contact to us.

External dimensions

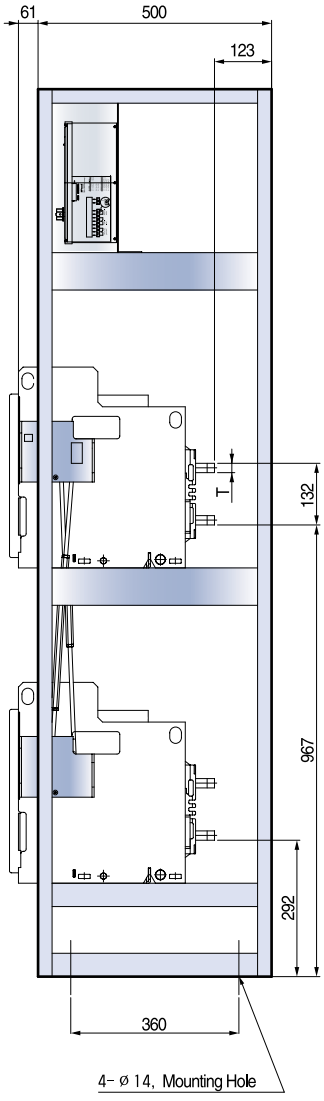
ATS with ACBs(2000~3200A)



[3Pole type]



[4Pole type]



[Side view]

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
3200A	25

Technical information

Deratings by ambient temperature

- **Ambient temperature:** -5℃~±40℃ (Only applicable when the 24 hours average temperature is below ±35℃)
- **Altitude:** Below 2000m
- **Environmental condition**
  -Below 85% in humidity with ±40℃ maximum temperature
  -Within the flammable, ammonia and corrosive gas environment can not be used and stored
  ($H_2S \leq 0.01$ppm, $SO_2 \leq 0.01$ppm, $NH_3 \leq$ a few ppm)
- **Safekeeping temperature:** -20℃~±60℃ below ±35℃ degree of 24 hours average temperature

Applicable current of breaker in temperature

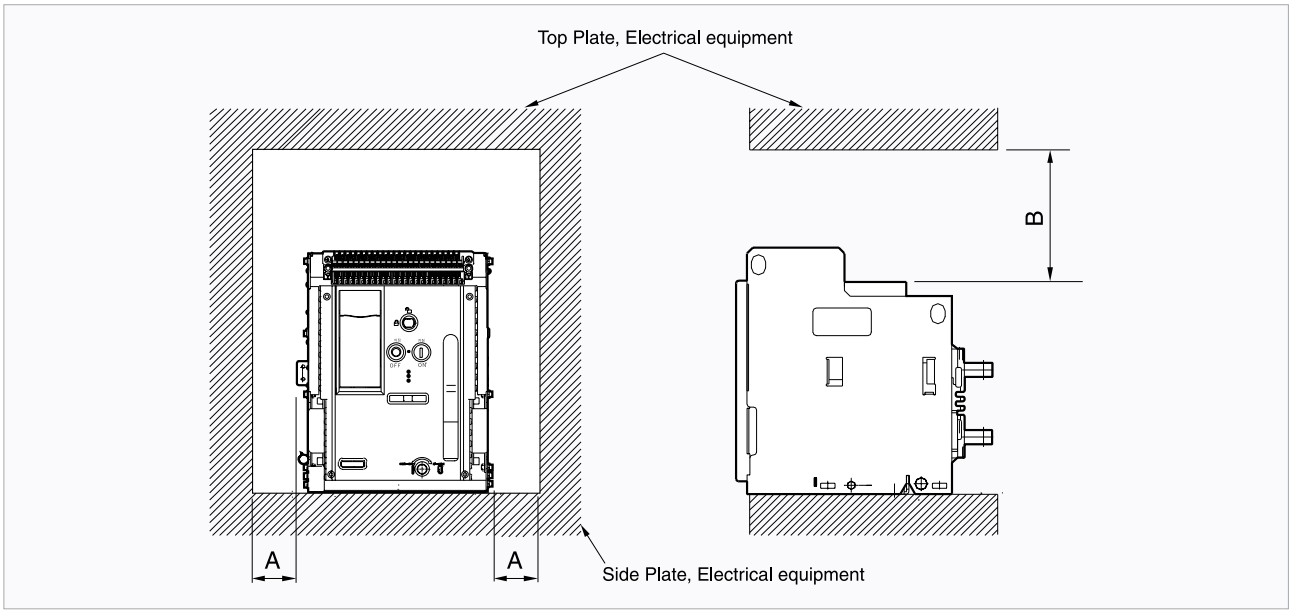
In case of use of over 40℃ in ambient temperature, please refer to below table as adjusting the rated currents

Type	Ambient temperature	LBA-06	LBA-08	LBA-10	LBA-13	LBA-16	LBA-20	LBA-25	LBA-32	LBA-40	LBA-50
IEC60947-2 (Standard temp: 40℃)	40℃	630	800	1,000	1,250	1,600	2,000	2,500	3,200	4,000	5,000
	45℃	630	800	1,000	1,250	1,600	2,000	2,500	3,200	4,000	5,000
	50℃	630	800	1,000	1,250	1,600	2,000	2,500	3,200	4,000	5,000
	55℃	630	800	1,000	1,250	1,550	2,000	2,450	3,000	3,900	4,850
	60℃	630	800	1,000	1,200	1,500	2,000	2,350	2,900	3,750	4,700
	> 60°℃ and < 100°℃	315	400	500	630	800	1000	1250	1575	2000	2500

Note) The data at 40℃ are according to IEC 60947-2

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.

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.

LS Industrial Systems Co., Ltd.

www.lsis.biz

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CHEONG-JU PLANT

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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.

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