Instruction Manual

Susol
Super Solution

c UL us
LISTED

Low voltage power Circuit breakers

LS IS
www.lsis.com

CONTENTS

A. Safety Precaution

1. Safety precaution

■ Outline for safety operation

This manual does not cover all possible contingencies, variations and details that may arise during installation, operation or maintenance of this equipment. If the user has questions regarding a particular installation, contact the local LSIS sales office. For application information, consult your nearest LSIS sales office.

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. LSIS's reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. If a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence

■ Qualified person

For the purpose of this manual and product labels, a qualified person with suitable knowledge of installation, construction, operation, or maintenance of the equipment and the hazards involved. In addition, this person has the following qualifications:

(a) is trained and authorized to energize, de-energize, clear, ground, and connect circuits and equipment in accordance with established safety practices.

(b) is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with safety practices.

(c) is trained in rendering first aid.

These instructions do not cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. In case particular problems arise which are not covered sufficiently for the purchaser's purposes further information should be desired or the matter should be referred to the local LSIS's sales office. The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship.

■ Danger, warning, caution

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, or maintain it.. The following special messages may appear throughout this manual to warn of potential hazard and to call attention to additional information which clarifies or simplifies a procedure.

Safety precaution is classified by danger, warning, caution and the meaning is as follows.

Danger	**Not following the instruction may result in serious injury and even death**
Warning	**Not following the instruction may result in serious injury and even death**
Caution	**Not following the instruction may result in minor or moderate injury, or property damage**

■ Dangerous Procedures

In addition to other procedures described in this manual as dangerous, user personnel must adhere to the following:

1. Always work only on de-energized equipment. Always de-energize a contactor, and remove it from the equipment before performing any tests, maintenance or repair.

2. Always let an interlock device or safety mechanism perform its function without forcing or defeating the device.

A. Safety Precaution

2. Caution

Caution

1. Be sure to tighten the terminal screws to the torque specified in the instruction manual.
2. Do not install in areas subject to high temperature, high humidity, dust, corrosive gas, vibrations, and shocks. To do so may result in malfunction or fire.
3. To get ACB tripped automatically, always clear the source of the malfunction before closing the ACB again. Failure to do so may result in fire.
4. Terminal screws should be checked and tightened periodically. Failure to do so may result in fire.
5. Use the ACB in 50/60Hz. Failure to do so may result in malfunction or fire.

3. Danger

Danger

■ HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE

1. Only qualified electrical workers with training and experience on high voltage circuits should perform work described in this set of instructions. These workers must understand the hazards involved in working with or near high voltage equipment. Such work should be performed only after reading this complete set of instructions.
2. The successful operation of Susol ACBs depends upon proper handling, installation, operation, and maintenance. Neglecting fundamental installation and maintenance requirements may lead to personal injury as well as damage to electrical equipment or other property.
3. Susol ACBs have features designed to prevent unsafe operation, but it is not possible to eliminate every hazard with these features. Therefore, the person using this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
4. Do not make any adjustment to the equipment or operate the system with safety features removed. Contact your local LSIS representative for additional instructions if the Susol ACB does not function as described in this manual.
5. Before performing visual inspections, tests, or maintenance on this device, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and connected. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back feeding.
6. Before replacing covers or closing doors, carefully inspect the bus work area for tools and objects left inside the equipment. Use care while removing or installing panels so that they do not extend into energized bus.
7. Before making any electrical connection, take every precaution to see that all connections are de-energized and grounded.
8. Introducing foreign objects into this equipment can cause a short circuit which can result in severe damage, personal injury, or death. Short circuits can release large amounts of energy due to a rapid expansion of super-heated, ionized gases. Products of this instantaneous expansion can quickly engulf and burn personnel before preventive action can be taken. The short circuit source can cause additional injuries by propelling personnel or objects several feet from the equipment. Some foreign objects that can cause short circuits are tools, test leads and instruments not designed for high voltage circuits, wire, and other conducting or semi conducting materials. Workers must also be careful to keep clothing and body parts out of the equipment. Failure to observe these precautions could result in severe personal injury, death, or equipment

A. Safety Precaution

4. Warning

Warning

■ Receiving

A visual inspection – inside and out – should be performed immediately upon receipt of the ACB and before removing it from the truck. Shipping papers should be checked to ensure all boxes or other accompanying pieces have been received. If any damage or shortages are evident, a claim should be filed at once with the carrier, and the nearest LSIS sales office. Claims for shortages or other errors must be made in writing to LSIS within 30days after receipt of ACB. Failure to do so constitutes unqualified acceptance and a waiver of all such claims by the purchaser.

■ Handling

Removable lifting plates are provided on the top of the Susol ACB structure for insertion of hooks to lift the complete structure. This is the only recommended method of moving the Susol ACB structure. Extreme care should be used not to damage or deform the unit if other moving methods are employed.

■ Storage

If it is necessary to store the equipment before installation, keep it in a clean, dry location with ample air circulation and heat to prevent condensation. Like all electrical apparatus, these units contain insulation that must be protected against dirt and moisture. Outdoor units may be stored outside only if roof caps are installed, space heaters energized and any openings are enclosed.

■ Lifting Instructions

1. Do not pass cables or ropes through support holes.
2. Always use load rated shackles or safety hooks in support holes.
3. Rig so that legs of sling are no less than 45 degrees from horizontal.

■ Moving

A crane or hoist can also be used to handle the breaker, if the lifting device is not available. If a forklift is utilized, the following precautions should be taken when moving circuit breakers:

1. Keep the breaker in an upright position only.
2. Make sure the load is properly balanced on the forks.
3. Place protective material between the breaker and the forklift to prevent bending or scratching.
4. Securely strap the breaker to the forklift to prevent shifting or tipping.
5. Excessive speeds and sudden starts, stops, and turns must be avoided when handling the breaker.
6. Lift the breaker only high enough to clear obstructions on the floor.
7. Take care to avoid collisions with structures, other equipment, or personnel when moving the breaker.
8. Never lift a breaker above an area where personnel is.

B. Service condition

1. Normal/Special service condition

■ Normal service conditions

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

1) Ambient temperature
   A range of max. +40℃to min. -5℃ is recommended. However, the average temperature of 24 hours does not exceed +35℃.
2) Altitude
   2,000m or less.
3) Environmental conditions
   The air must be clean, and the relative humidity does not exceed 85% at a max. of +40℃and 90% at 20℃. Do not use and store in presence of corrosive or ammonia gas.
   ($H_2S \leq 0.01$ppm, $SO_2 \leq 0.01$ppm, $NH_3 \leq$ a few ppm)
4) Installation conditions
   When installing Susol ACB, refer to catalogue or the installation instructions in the instruction manual.
5) Storage temperature
   A range of max. +60℃ to min. -20℃ is recommended.
6) Replacement
   Approx. 15 years (depends on number of breaking of over current or service condition). Please see maintenance and inspection for further detail.

2. Special service conditions

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

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

B. Service condition

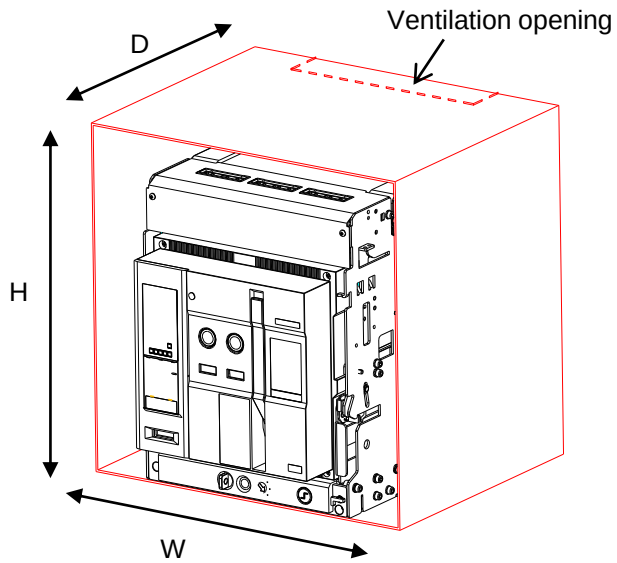
2. Altitude and enclosure

■ Altitude

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

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

■ Enclosure Information



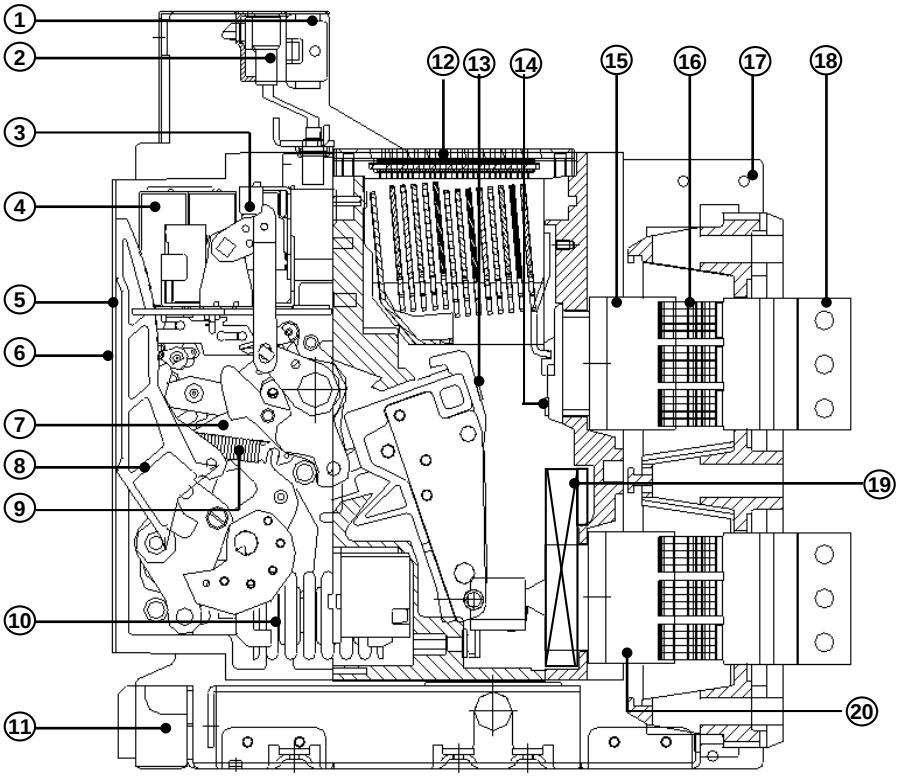
Minimum enclosure information

Frame Rating	Pole	Enclosure Dimensions mm (in.)			Ventilation opening mm (in.)	
		H	W	D	Top	Bottom
1600AF	3	500 (19.69)	400 (15.75)	340 (13.39)	-	-
	4	500 (19.69)	500 (19.69)	340 (13.39)	-	-
2000AF 2500AF 3200AF	3	500 (19.69)	500 (19.69)	340 (13.39)	※ Ventilation Opening for 3200 AF only	
	4	500 (19.69)	615 (24.21)	340 (13.39)	55 X 350 (2.17 X 13.78)	55 X 350 (2.17 X 13.78)
5000AF	3	800 (31.50)	825 (32.48)	340 (13.39)	80 X 700 (3.15 X 27.56)	64 X 700 (2.52 x 27.56)
	4	800 (31.50)	1055 (41.54)	340 (13.39)		

C. Structure and Operation

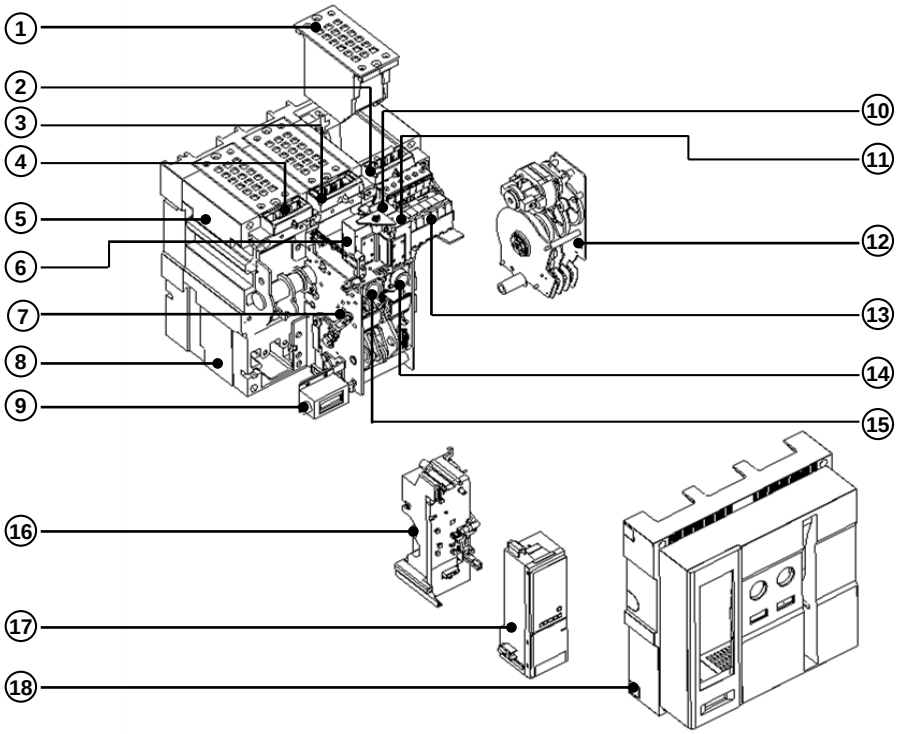
1. Internal structure and components

■ Internal configuration



1. Control terminal block
2. Control terminal
3. Auxiliary switches
4. Closing, Trip, UVT Coil
5. Trip Relay
6. Front cover
7. Mechanism
8. Charge Handle
9. Trip spring
10. Closing spring
11. Draw-in/out device
12. Arc extinguishing part
13. Moving contact
14. Fixed contact
15. Conductor on source side
16. Cradle Finger
17. Cradle
18. Connecting conductor to circuit breakers
19. Power supply CT
20. Conductor on load side

■ Components

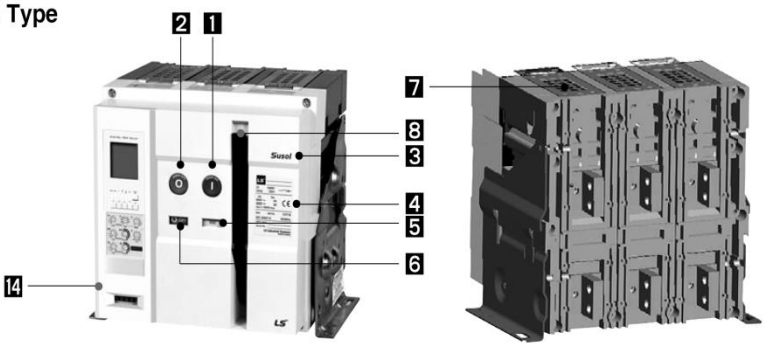


1. Arc chute
2. Aux. switch control terminal
3. Control power supply terminal
4. OCR control terminal
5. Carrying grip
6. Trip coil
7. Mechanism
8. Main body
9. Counter
10. UVT coil
11. Closing Coil
12. Motor Ass'y
13. Aux. switch
14. ON button
15. OFF button
16. MTD Base
17. OCR
18. Cover

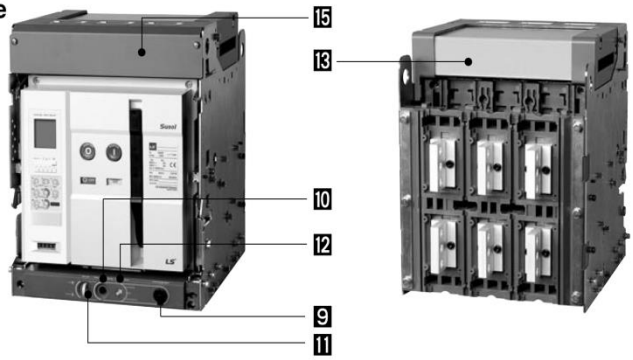
C. Structure and operation

1. Internal structure and components

■ Fixed Type



■ Draw-out Type



1 ON button
2 OFF button
3 Series name
4 Rated name plate
5 Charge Discharge indicator
6 ON/OFF indicator
7 Arc box
8 Charge handle
9 Drawout handle
10 Handle storage space
11 Pad lock button
12 Position indicator
13 Arc Cover
14 Digital trip relay
15 Terminal cover

Terminal Configuration

There are many possible terminal configurations when connecting bus bar of distribution panel, vertical, horizontal plane type, etc.


Horizontal type


Vertical type


Horizontal / Vertical type


Vertical / Front type


Front / Horizontal type


Front type

C. Structure and operation

2. Basic function and breaking operation

■ **ACB prevents a fire, a property damage, the breakage of an electrical equipment on load side by protecting a circuit from the fault currents.**

1. Circuit Closing

The closing operation of mechanism applies the current to the load. When energized, some loads makes inrush current much greater than rated current (In) (e.g. Motor takes in 7~8times of In for a few seconds). To prevent these over current which causes the dangerous phenomena for contacts (Erosion by arcs), closing operation should be prompt. If a circuit breaker is in accordance with all standard cases, it should be able to endure 15~20 times of the rated current and be opened promptly for the faults occurred during closing operation or after it has closed.

2. Current Conducting

A circuit breaker must not be exceeding an acceptable temperature rise under normal current conducting and there must be safe current conducting within specified breaking time under over current.

Furthermore, if a circuit breaker is of the discriminated type, it must has the structure which can withstand the high electrodynamics to accept the short-circuit current while a circuit breaker in downstream is operating to break it.

3. Circuit Opening, Current Breaking

1) Current can be broken manually or remotely by voluntary operation on mechanism.

2) A circuit breaker opens a circuit automatically under condition of current which may has any values at this time by an auxiliary trip unit (Under voltage, Ground fault, etc.)

3) A circuit breaker opens a circuit automatically against the over current because it is operated by OCR (the trip unit) even if it is in the closed position.

4. Isolation

When a circuit breaker is open, a certain isolation level is required between charging and non-charging parts. The Isolation Level is decided by following tests.

1) A maximum leakage current test under rated using voltage (Max. Ue)

2) An impulse voltage

■ **There are following breaking principles regarding over current.**

1. Instantaneous trip

When short-circuit current flows in, ACB trips instantly to minimize side effect due to the accident on load side. It is called instantaneous trip.

2. Time delay breaking

When abnormal current flows in such as inrush current of transformer or condenser, and starting current of motor, ACB keeps the conducting condition for a regular time and break the current if it is continuously remained. In case of short-circuit, ACB minimizes the damage from accident by keeping the circuit for the time previously set concerning the operating time of branch breakers under selective discrimination. However, it breaks the circuit after the delayed time in case abnormal current continuously flows in due to the breaking failure of branch breakers. It is called as Time delayed breaking.

3. Overload trip

If the current which exceeds the rated current flows in continuously, the cable is getting hotter and it causes the big fire. Therefore, ACB breaks the current before the temperature of cable reaches the dangerous level. It is called overload trip.

4. Ground-fault trip

Ground fault defines as current flows into the ground from circuit or charging part of load due to breakdown. If ground fault current flows, it is inducted to other cables nearby owing to electronic induction, voltage level is risen and it finally cause severe effects or damage on other device. Furthermore, in case personnel hands are touched, it may result in electrical shock. Ground fault breaking is to prevent any possible accident occurred from ground fault.

Susol series

UAS-10D3-10A –

M1	
Charge Motor	
MA	None
M1	AC/DC 100V ~ 130V
M2	AC/DC 200V ~ 250V
M3	DC 125V
M4	DC 24V ~ 30V
M5	DC 48V ~ 60V

D1	
Closing coil	
D0	None
D1	AC/DC 100V ~ 130V
D2	AC/DC 200V ~ 250V
D3	DC 125V
D4	DC 24V ~ 30V
D5	DC 48V ~ 60V

D1	
Shunt coil	
D0	None
D1	AC/DC 100V ~ 130V
D2	AC/DC 200V ~ 250V
D3	DC 125V
D4	DC 24V ~ 30V
D5	DC 48V ~ 60V

AX	
Auxiliary switch	
AX	Stadard /OFF charge/3a3b
AC	Stadard /ON charge/3a3b
BX	Stadard /OFF charge/5a5b
BC	Stadard /ON charge/5a5b
HX	High Capa. /OFF charge/5a5b
HC	High Capa. /ON charge/5a5b
CC	Stadard /ON charge/6a6b
JC	High Capa. /ON charge/6a6b
TX	High Capa./OFF charge/4a4b (TCS)
TC	High Capa./ON charge/5a5b (TCS)

* TCS : Trip coil supervision

AG1
OCR

U1	
UVT Coil	
U0	None
U1	AC/DC 100V ~ 130V
U2	AC/DC 200V ~ 250V
U3	DC 125V
U4	DC 24V ~ 30V
U5	DC 48V ~ 60V
U6	AC 380V ~ 480V
U7	AC 48V

*UVT Delay controller is available except for U4 (DC 24V~30V)

AL	C
OPTION	

UAS
Type
UAA : No OCR& CT UAN : Normal UAS : Standard
UAA : No OCR& CT UAN : Normal UAS : Standard UAH : High Capa.
UAA : No OCR& CT UAS : Standard UAH : High Capa.

10	
Max. rated current	
02	200AF
04	400AF
06	630AF
08	800AF
10	1000AF
13	1250AF
16	1600AF
04	400AF
06	630AF
08	800AF
10	1000AF
13	1250AF
16	1600AF
20	2000AF
25	2500AF
32	3200AF
32	3200AF
40	4000AF
50	5000AF

* UA : Susol ACB Series certified by UL

D
Frame size
D : 630~1600AF, 3/4P Normal : RSTN W : 630~1600AF, 4P Reverse : NRST
E : 1600~3200AF 3/4P Normal : RSTN X : 1600~3200AF 4P Reverse : NRST
G : 3200~5000AF 3/4P Normal : RSTN Z : 3200~5000AF 4P Reverse : NRST

* N : Neutural Phase

3
Poles
3 : 3 Pole 4 : 4 Pole

–

10	
**) Rating Plug (Rated current)	
00	No OCR& CT
02	200 A
04	400 A
04/05/06	400 ~ 630 A
04/05/06/08	400 ~ 800 A
05/06/08/10	600 ~ 1000 A
05/06/08/10/12/13	600 ~ 1250 A
08/10/12/13/16	800 ~ 1600 A
00	No OCR& CT
04	400 A
04/05/06	400 ~ 630 A
04/05/06/08	400 ~ 800 A
05/06/08/10	600 ~ 1000 A
05/06/08/10/12/13	600 ~ 1250 A
08/10/12/13/16	800 ~ 1600 A
10/12/13/16/20	1000 ~ 2000 A
12/13/16/20/25	1200 ~ 2500 A
16/20/25/30/31/32	1600 ~ 3200 A
00	No OCR& CT
16/20/25/30/31/32	1600 ~ 3200 A
20/25/30/31/32/36/40	2000 ~ 4000 A
25/30/31/32/36/40/50	2500 ~ 5000 A

A	
Terminal Connection	
A	Drawout type
Stationary type	
H	Horizontal type
V	Vertical type
M	Line/Load – Vertical/Horizontal
N	Line/Load – Horizontal/Vertical
P	*) Front type

* Frame size "E,X" is avaliable max. 2000A.

**) Type of Rating plug

Rating Plug	Rated current
02	200A
04	400A
05	600A
06	630A
08	800A
10	1000A
12	1200A
13	1250A
16	1600A
20	2000A
25	2500A
30	3000A
31	3150A
32	3200A

Susol series

UAS-10D3-10A	–	M1	D1	D1	AX	NG0	U1	AL	C
		Charge Motor	Closing coil	Shunt coil	Auxiliary switch	OCR	UVT Coil	OPTION	

N		G		0			0		
OCR TYPE		Additional function			External power	Self power			
0	Without Trip unit	0	Without Trip unit	0	Without Trip unit				
N	Normal	G	Without communiction / Ground fault	0	None	60 Hz			
				5	None	50 Hz			

*There is no LSIG Alarm contacts, LED indicators work without external power.

A	Ammeter	G	Without communiction / Ground fault	0	None	60 Hz
		Z	Without communiction / Earth leakage	1	AC/DC 110V~220V	60 Hz
		E	Without communiction / External CT	2	DC 24V~48V	60 Hz
		C	With communiction / Ground fault	5	None	50 Hz
		K	With communiction / Earth leakage	6	AC/DC 110V~220V	50 Hz
		X	With communiction / External CT	7	DC 24V~48V	50 Hz

* Communication works under external power
* LSIG Alarm contacts works under external power
(LED indicators work without external power)

P	Power meter	C	With communiction / Ground fault	1	AC/DC 110V~220V	60 Hz
		K	With communiction / Earth leakage	2	DC 24V~48V	60 Hz
		X	With communiction / External CT	6	AC/DC 110V~220V	50 Hz
		A	With communiction / Pre-Trip Alarm	7	DC 24V~48V	50 Hz

* Communication works under external power
* LSIG Alarm contacts works under external power
(LED indicators work without external power)
* Applicable to generator protection purpose.
* The voltage module is rquired for P, S type in order to measuring voltage and power

S	Supreme meter	C	With communiction / Ground fault	1	AC/DC 110V~220V	60 Hz
		K	With communiction / Earth leakage	2	DC 24V~48V	60 Hz
		X	With communiction / External CT	6	AC/DC 110V~220V	50 Hz
		A	With communiction / Pre-Trip Alarm	7	DC 24V~48V	50 Hz

* Communication works under external power
* LSIG Alarm contacts works under external power
(LED indicators work without external power)
* Applicable to generator protection purpose.
* The voltage module is rquired for P, S type in order to measuring voltage and power

Mark	Options	
AL	AL1 + MRB	
A1	AL1 + MRB + RES(AC110~130V) * AC power exclusive use	
A2	AL1 + AL2 + MRB	
A3	AL1 + MRB + RES(DC110~125V) * DC power exclusive use	
A4	AL1 + MRB + RES(AC200~250V) * AC power exclusive use	
A5	AL1 + MRB + Auto Reset	
A6	AL1 + AL2 + MRB + Auto Reset	
A7	AL1 + MRB + RES(DC110~125V) + Auto Reset * DC power exclusive use	
A8	AL1 + MRB + RES(AC200~250V) + Auto Reset * AC power exclusive use	
A9	AL1 + MRB + RES(AC110~130V) + Auto Reset * AC power exclusive use	
C	C	COUNTER
S	CS2	Charge switch communication * Order the TRIOU module additionally
B	B	On/Off Button lock
M	MI	Mechanical interlock
D	DI or MOC	Door Interlock or MOC(Mechanism operated cell switch)
K	K1	Key Lock
K2	K2	Key Interlock Set
K3	K3	Key Interlock Double
R	RCS	Ready to Close switch
T	TM	Temperature Monitoring sensor * Order the TRIOU module additionally
H1	SHT2	Double Shunt coil , AC/DC 100V ~ 130V
H2		Double Shunt coil , AC/DC 200V ~ 250V
H3		Double Shunt coil , DC 125V
H4		Double Shunt coil , DC 24V ~ 30V
H5		Double Shunt coil , DC 48V ~ 60V
H7		Double Shunt coil , AC 48V

* UVT and SHT2 are alternative.
* Other accessories should be ordered seperately.

* Additional Optional group

Mark	Options
Z01	A4 + C(Counter)+ B(ON/OFF button lock) + K(Key Lock) +R(Ready to close switch) +M(Mechanicl Interlock)
Z02	AL+ K(Key Lock)+ R(Ready to close switch)+D(Door Interlock or MOC) +H1(Double shunt coil)
Z03	C (Counter) +B(ON/OFF button lock)+K2(Key Interlock Set) +R(Ready to close switch) +T(Temperature sensor)
Z04	A4 +B(ON/OFF button lock) +K(Key Lock) +M(Mechanical Interlock) +T(Temperature sensor)
Z05	A1 +B(ON/OFF button lock) +K(Key Lock) +R(Ready to close switch) +M(Mechanical Interlock) +T(Temperature sensor)
Z06	A2 +C(Counter) +K(Key Lock) +R(Ready to close switch) +T(Temperature sensor)

■ Special Specifications

F1 ~ F8	low-level contacts of Motors charge switch (Rating : Reference of M1~M8, ex) F1 : AC/DC 100V~125V)
VL~V9	low-level contacts of Trip Alarm Contacts (Component : Like AL ~ A9)
Z2	AL1+AL2 (1a1b) + MRB
Z6	AL1+AL2 (1a1b) + MRB + Auto Reset
Y2	AL1+AL2 (2b) + MRB
Y6	AL1+AL2 (2b) + MRB + Auto Reset
W2	AL1+AL2+MRB (low-level contacts of Alarm_1a1b)
W6	AL1+AL2+MRB+Auto Reset (low-level contacts of Alarm_1a1b)
X2	AL1+AL2+MRB (low-level contacts of Alarm contacts_2b)
X6	AL1+AL2+MRB+Auto Reset (low-level contacts of Alarm contacts_2b)
low-level contact : Min_24Vdc 3mA Max_24Vdc 300mA	

Susol series

UAL	–	S16		D		3	–	A		H		E		S	
Type		Current Rating		Frame size		Poles		Secondary connection type		Primary Connection type		크래들 형태		형태	
UL Adaptor		S16	1600 A	D	1600AF	3	3 Pole	A	connector type	H	Horizontal type	E	without safety shutter	S	ARC COVER
		S20	2000 A	E	3200AF	4	4 Pole	B	Screw joint type	V	Vertical type	F	with safety shutter		
		S25	3200 A	G	5000AF			C	Tension spring type	M	Line/Load – Horizontal /Vertical				
		S32	3200 A							N	Line/Load – Vertical / Horizontal				
		S50	5000 A							P	Front type (~ 2000A)				

* S32 is available only vertical type.

TYPE						UAN- □□ D UAS- □□ D		UAN- □□ E UAS- □□ E UAH- □□ E					UAS- □□ G UAH- □□ G		
AF						08D	16D	08E	16E	20E	25E	32E	32G	40G	50G
Rated current (In max)		(A)			at 40℃	800	1600	800	1600	2000	2500	3200	3200	4000	5000
Rated current		(A)			at 40℃	200~800	800 ~1600	400~800	800 ~1600	1000 ~2000	1250 ~2500	1600 ~3200	1600 ~3200	2000 ~4000	3000 ~5000
Rated Maxium Voltage		(Ue)			(V)	254V / 508V / 635V									
Frequency		(Hz)				50/60									
Number of poles		(P)				3 P / 4 P									
Type of Trip relay (Electronic trip device)						N , A , P , S (4 type)									
Interrupting Rating Code H : High (more than 100kA) / S : Standard (85kA) / N : Normal (65kA)						N / S		N / S / H					S / H		
Rated short circuit current (Sym.) ANSI C37.13, 16, 17, 20.1, 50 UL 1066 EED 1200		(kA)	**With instantaneous**	AC	635V	65 / 65		65 / 85 / 85					100 / 100		
					508V	**65 / 85**		**65 / 85 / 100**					**100 / 130**		
					254V	65 / 85		65 / 85 / 100					100 / 130		
			Without instantaneous	AC	635V	65		65 / 85 / 85					100		
					508V	65		65 / 85 / 85					100		
					254V	65		65 / 85 / 85					100		
Rated short Time current		(kA)				65		65 / 85 / 85					**100**		
Operating time (t)		(ms)	Maximum total breaking time			50ms									
			Maximum closing time			80ms									
Life cycle	ACB	(time)	Mechanical	Without maintenance		12,500		12,500					5,000		
				With maintenance											
			Electrical	Without maintenance		2,800		2,800					1,000		
				With maintenance											
Weight (3P/4P)		(kg)	Drawout type	Main Body with Cradle		70/85		94/118			111/141	146/186	202/258		
				Cradle only		31/37		44/53			54/67	89/112	100/125		
			Fixed type	Motor charging type		42/51		53/68			60/77	103/133	110/140		
External dimension	Draw-out type	(mm)	**H:430(460), D:407**	W (3P/4P)		334/419		412/527					785/1015		
	Fixed type	(mm)	**H:300, D:295**	W (3P/4P)		300/385		378/493					751/981		
Enclosure dimension		(mm)	**D:340**	W*H (3P/4P)		400/500 * 500		500/615 * 500					**825 / 1055 * 800**		
Bus-bar Connection type						Horizontal / Vertical / Front						Vertical	Horizontal / Vertical / Front		
Charging type						Motor charging type / Manual charging type									

E. Unpacking

1. Receiving

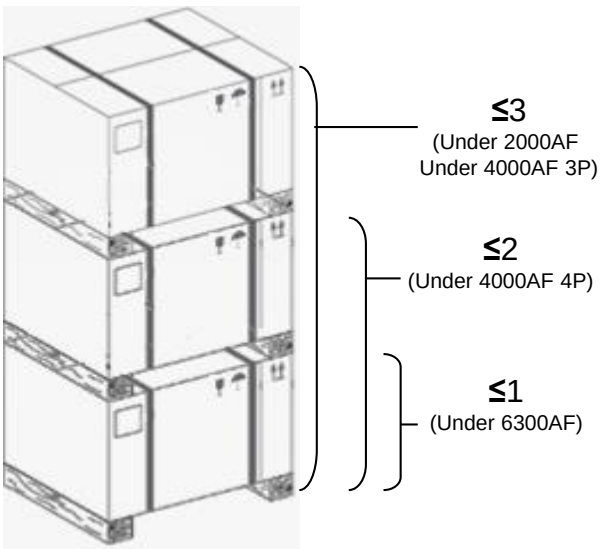
■ Receiving

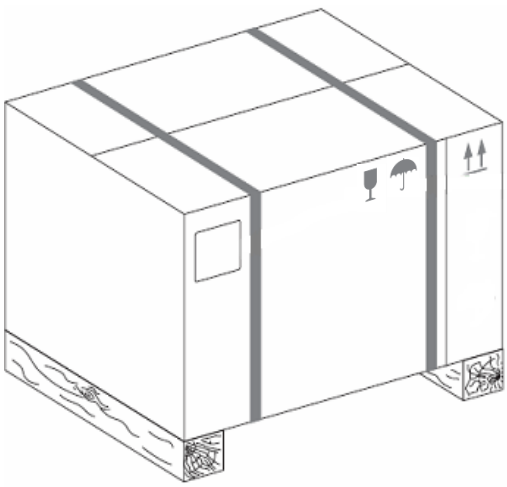
A visual inspection – inside and out – should be performed immediately upon receipt of the ACB and before removing it from the truck. Shipping papers should be checked to ensure all boxes or other accompanying pieces have been received. If any damage or shortages are evident, a claim should be filed at once with the carrier, and the nearest LSIS sales office. Claims for shortages or other errors must be made in writing to LSIS within 30 days after receipt of ACB. Failure to do so constitutes unqualified acceptance and a waiver of all such claims by the purchaser.

2. Unpacking

■ Unpacking

1.Before unpacking the breaker, check that all boxes and packing are in good condition.
2.While unpacking, check the breaker is in good condition.
3.Check that the information given on the rating /accessory nameplates corresponds to the purchase order.
4.Care about the unpacking to avoid damaging the products. Unpacking them attentively to avoid dropping the products from carrying components and pallets.
5.Install the products to the final installation place after unpacking as soon as possible. If you cannot install the products immediately, you had better not unpacking them. Keep the products indoor around 15℃ and under 50% of humidity. Standard packing condition for domestic portage is not suited to outdoor storage. If you cannot keep the maintenance above, you should inspect a degree of the damages before you install the products. Unsuitable keeping does not guarantee good qualities of the products and could occur additional danger of an accident.





E. Unpacking

3. Check point and caution

Please read the following check points and caution carefully as they imply the critical contents which should be confirmed before performing the unpacking, inspection, or installation, etc.

■ Check points upon receiving

1. A visual inspection – inside and out – should be performed immediately upon receipt of the ACB and before removing it from the truck. If any damage or shortages are evident, a claim should be filed at once with the carrier to the nearest LSIS sales office.

2. Unpacking them attentively to avoid dropping the products from carrying components and pallets.

3. Install the products to the final installation place after unpacking as soon as possible. If you cannot install the products immediately, you had better not unpacking them. Keep the products indoor around 15℃ and under 50% of humidity. Standard packing condition for domestic portage is not suited to outdoor storage. If you cannot keep the maintenance above, you should inspect a degree of the damages before you install the products. Unsuitable keeping does not guarantee good qualities of the products and could occur additional danger of an accident.

■ Caution for installation inspection

1. Confirm all power sources are completely de-energized first.
2. Disconnect all electrical switches which may operate during inspection.
3. Disconnect all plugs connected to operating part of product (Shunt coil, OCR, etc.)
4. In case of Draw-out type, pull out the product until guideline comes to TESTED position from cradle. (Basic inspection is available under TEST position.)
5. In case of detailed inspection, remove the product form cradle securely and put it to the even stand.
6. Inspect product.

F. Handling and storage

1. Handling

- This breaker and cradle are designed to move easily by overhead lifting devices such as hoisters. You can use lifting hooks which is optional to move them without difficulty. All the carrying devices should be suited to the product's permissible weight which is presented in Table.1. In case of using forklift, refer to figure.1.

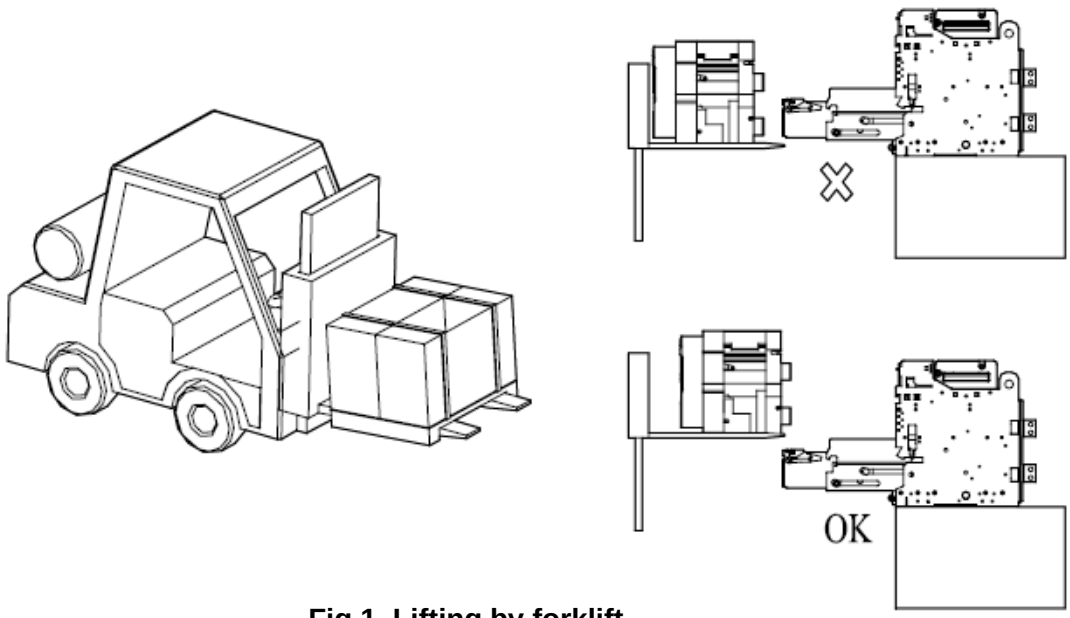


Fig 1. Lifting by forklift

-When lifting products with forklift, be careful with the bottom plane not to exceed the rear side of products. (Refer to fig.1)

■ Precaution of handling

1.To lift the breaker (Fixed type), use the lifting hooks on the sides of the breaker, and lift with rope or something similar.
2. When placing the breaker on the ground, be careful not to drop or to impact the breaker.
3. When the draw-out breaker is lifted with the cradle, lift it in the connected position.
4. Never slide the breaker when handling.

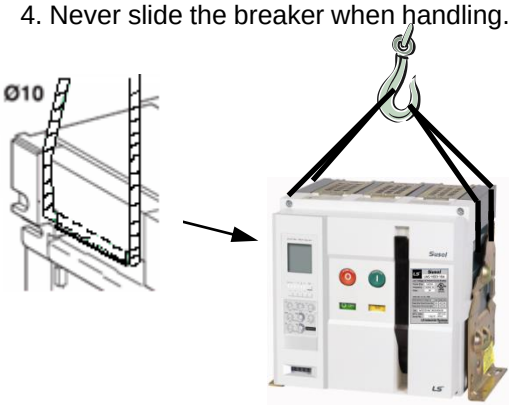


Fig. 2. Handling method of fixed type

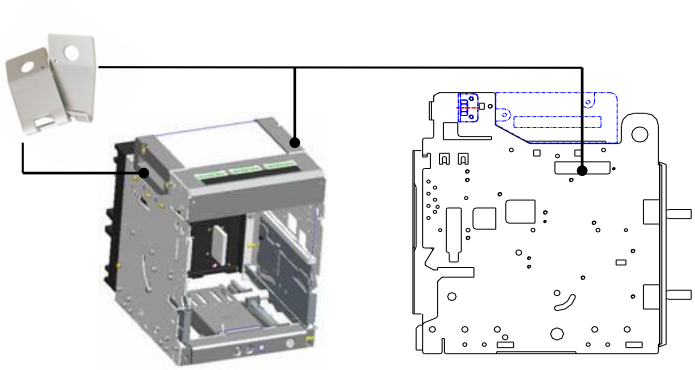


Fig. 3. Handling method of draw-out type

F. Handling and Storage

2. Storage

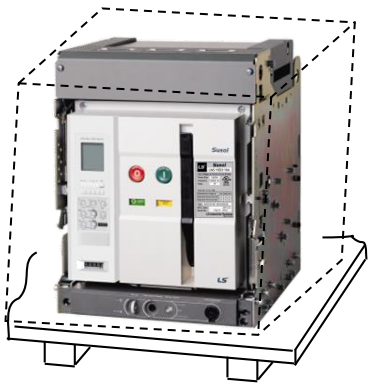
■ Precaution of storage

When storing a circuit breaker for a long term,

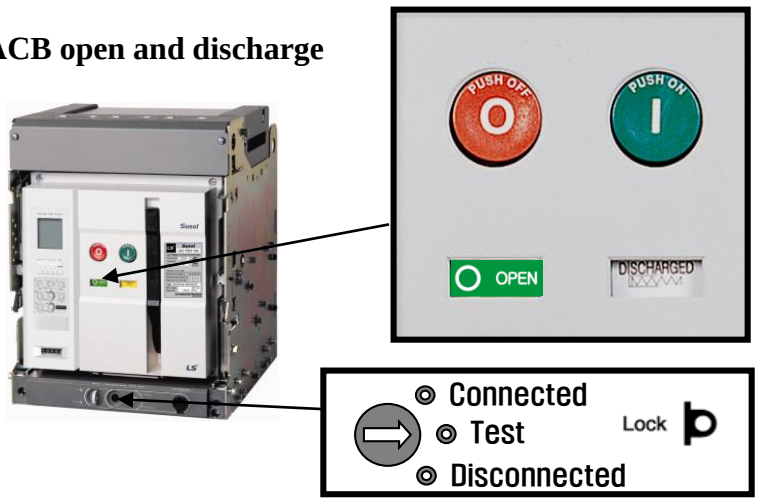
1. Keep the breaker at OFF position with the charging spring discharged.
2. Store the draw-out type breaker on the plat place after the TEST position inserted.

■ Storage method

1. Store the breaker in a dust free and dry environment.
2. Keep the breaker in OFF position with the charging spring discharged.
3. Cover the breaker with a vinyl sheet or a similar cover. When putting the breaker into service after long term storage, it is unnecessary to lubricate the parts of the breakers.
4. Keep the breaker indoor as it was packaged around 15℃ and under 50% of humidity.
5. Standard packing condition for domestic portage is not suited to outdoor storage. If you cannot keep the maintenance above, you should inspect a degree of the damages before you install the products.
6. Unsuitable keeping does not guarantee good qualities of the products and could occur additional danger of an accident.



ACB open and discharge

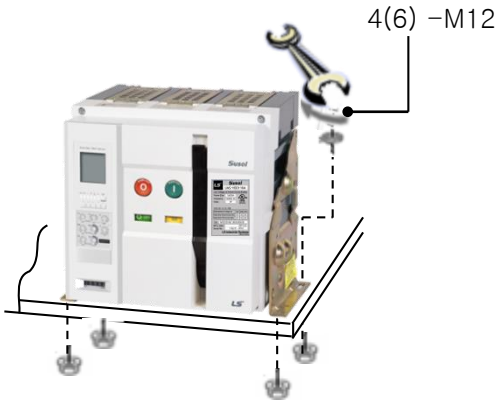


G. Installation

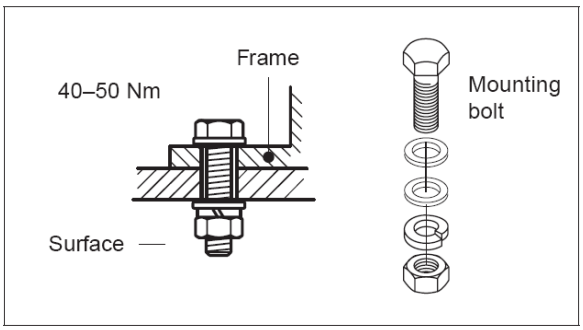
1. Fixed type

■ Installation of fixed type

Securely install the left and right mounting frames with M12 bolts (4ea).



<Torque>

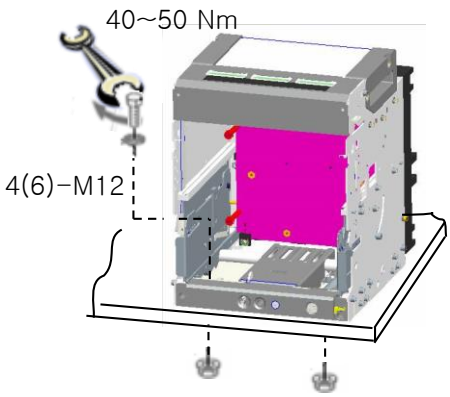


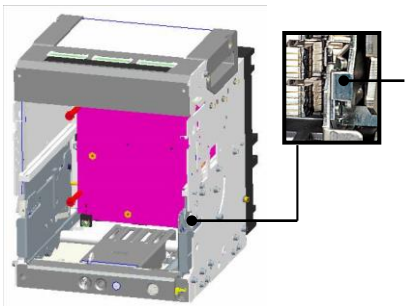
2. Draw-out type

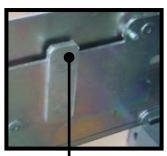
■ Installation of draw-out type

Install draw-out type according to the instruction given below.

1. Securely install the cradle at the bottom with M12 bolts (4EA).
2. Pull the extension rails of cradle forward.
3. Put the breaker on the rail as shown in picture by using lifting device.
4. Please check if the circuit breaker fits well to the cradle.
5. Slowly push the circuit breaker by moving the rail handle.



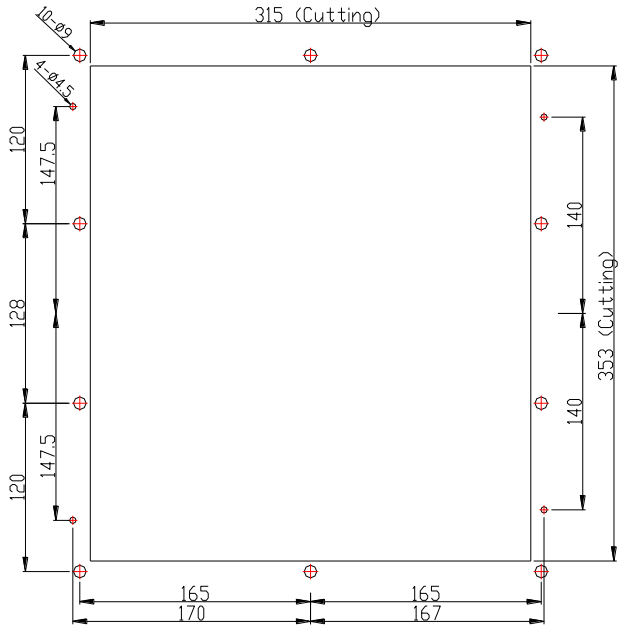




G. Installation

3. Dust cover

■ Panel cutting



4. Precaution

■ Precaution

1. Do not lay down a breaker on the side or stand with the side of it.
2. Install a circuit breaker on perfect even ground. (Within 2mm of the level difference)
3. Do not install a circuit breaker with same direction of a rail when you use an angle.
4. Install a circuit breaker at a right angle to the direction of a rail to decentralize weight of the circuit breaker.

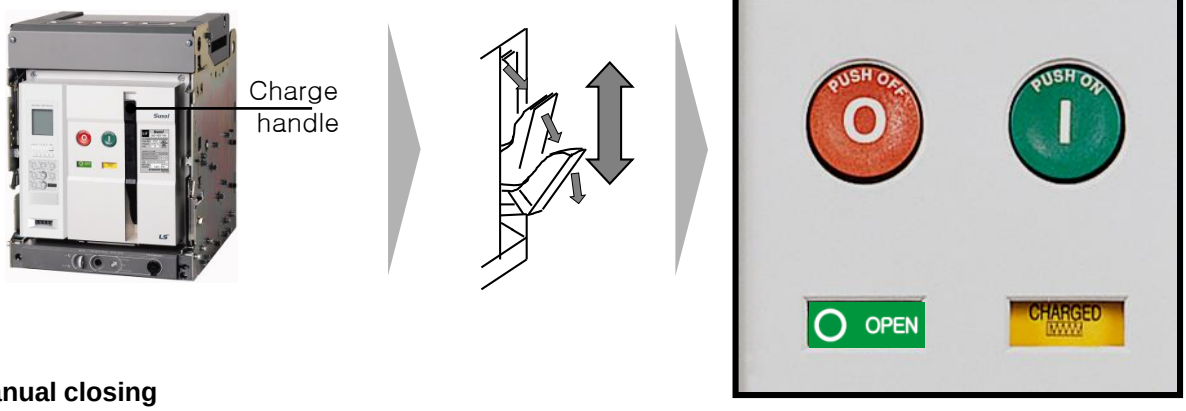
H. Operation

1. Manual operation

⚠ **Caution** : Before opening or closing the breaker equipped with an under voltage tripping device, control voltage should be applied. Please operate only in the disconnected position.

■ Manual charging

1. Charge the handle 7~ 8 times with full strokes.
2. When the closing spring is completely charged, the charging indicator shows “CHARGED”.



ACB off and charged

■ Manual closing

1. Push ON button.
2. The breaker will be closed.
3. The CLOSED/OPEN indicator shows “CLOSED” and the charging indicator shows “DISCHARGED”.

■ Manual tripping

1. Push the OFF button and breaker will be tripped.
2. The CLOSED/OPEN indicator shows “OPEN”.

H. Operation

2. Electrical operation

■ Electrical operation

Closing operation is done by charging the closing spring from remote control. If pushing trip button, closing spring is automatically charged by a geared motor and a circuit breaker is closed by closing button.

■ Electrical closing

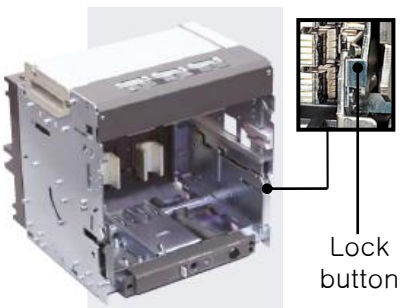
1. Remote closing can be made by energizing the closing coil (CC). Apply the rated voltage to the control terminals A1 and A2 and close the breaker.

■ Electrical trip

1. Remote opening can be made by energizing the shunt trip device or under voltage trip device.
2. In the case of SHT, apply the rated voltage to the terminal C1 and C2.
3. In the case of UVT, remote opening is also possible by applying a short - circuit across terminals D1 and D2 of the UVT controller.

3. Draw-in operation

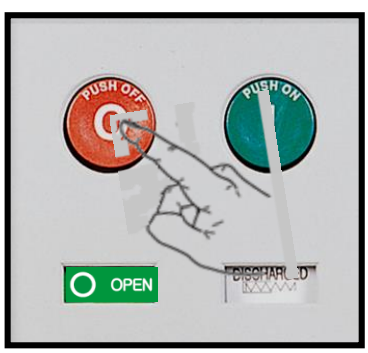
■ Draw-in operation procedure

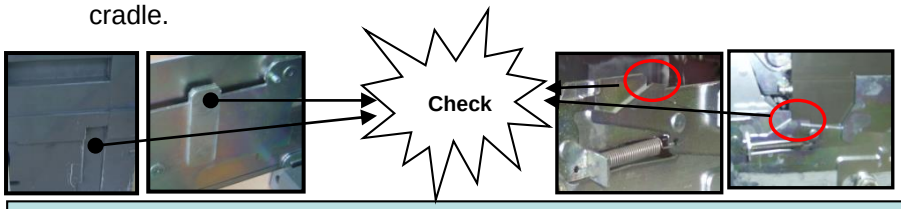


1. Pull the extension rails of cradle forward

2. Put the breaker on the rail by using lifting device. Please check if the circuit breaker fits well to the cradle.

3. Slowly push the circuit breaker by moving the rail handle until it stops.





Caution

1. Operating handle of cradle only can be inserted when pushing OFF button.
2. If locking device for draw in/out protrudes, stop handle operation and move to next procedure as it indicates the complete operation of ongoing process.

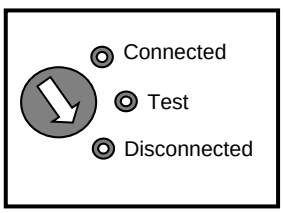
4. Keep pushing the OFF button when the circuit breaker in a trip condition, and insert a handle to the body of the circuit breaker.

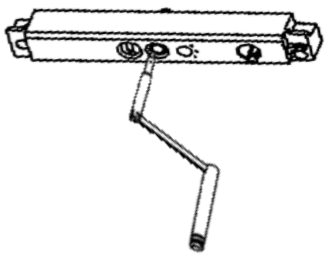
H. Operation

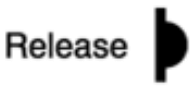
3. Draw-in operation

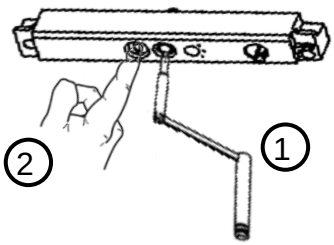
5. Check the draw-out handle properly inserted and then push the lock plate and turn the draw-out handle clockwise in order to insert the breaker.
6. When the breaker reaches the TEST position, the lock plate automatically projects and the draw-out handle is locked.
7. Push in the lock plate and turn the draw-out handle again clockwise until the lock plate projects, the inserting operation is finished. At this time, the draw-out position indicator shows CONNECTED position.

Disconnected position

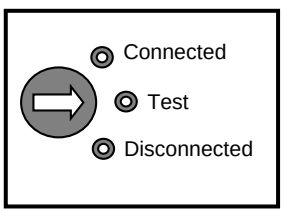


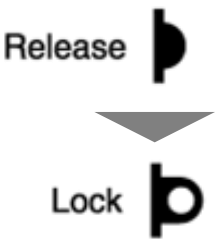


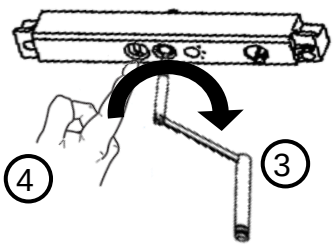




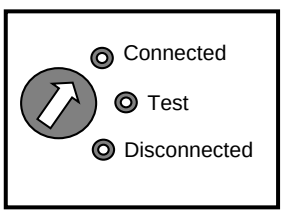
Tested position

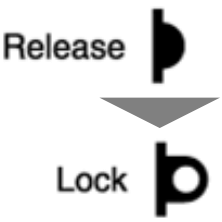


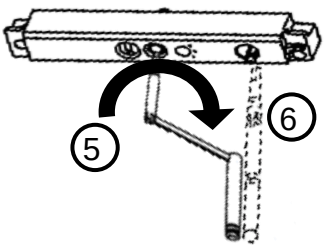




Connected position







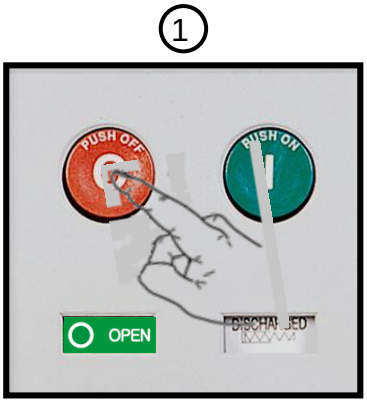
H. Operation

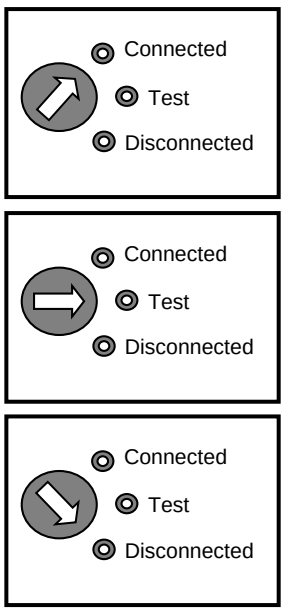
4. Draw-out operation

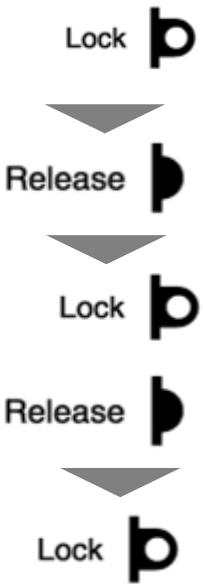
Caution
1. Please stop handle operation when draw in/out locking device protrudes.
2. Draw in or out by moving handle right or left side when draw in/out locking device can not be inserted.

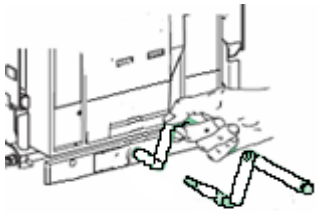
■ Draw-out operation procedure

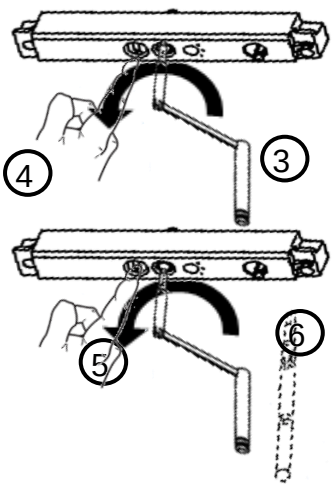
1. Keep pushing the OFF button when the circuit breaker in a trip condition, and insert a handle to the body of the circuit breaker.
2. Check the draw-out handle properly inserted and then push the lock plate and turn the draw-out handle counterclockwise in order to insert the breaker.
3. When the breaker reaches the TEST position, the lock plate automatically projects and the draw-out handle is locked.
4. Push in the lock plate and turn the draw-out handle again counterclockwise until the lock plate projects, At this time, the draw-out operation is finished with indicator which shows DISCONNECTED position.









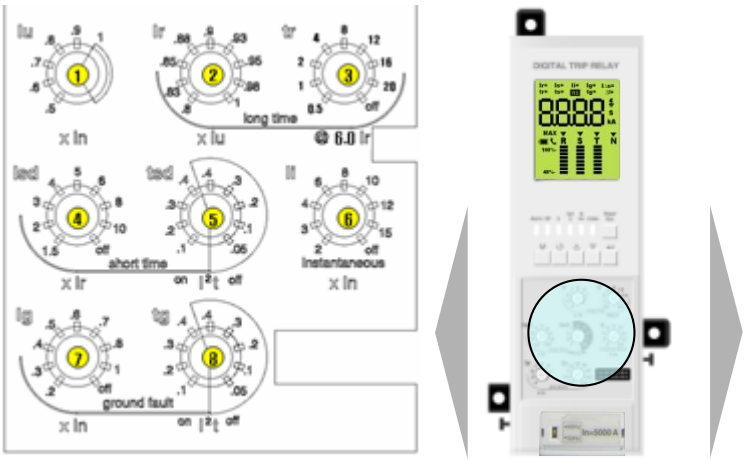


5. The circuit breaker indicated with ‘DISCONNECTED’ can be separated safely from the cradle by removing a draw in/out handle and releasing right and left locks.
6. Use a lifting hook to separate a circuit breaker from a cradle.

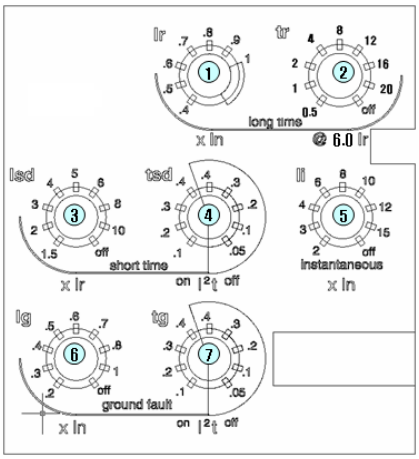
I. Trip unit externals and configuration

1. Knob setting

■ N, A type Knob Configuration



■ P,S type Knob Configuration



■ N, A type knob information

No	Type of knob	Mode	setting step
①	Continues current setting	Iu	(0.5-0.6-0.7-0.8-0.9-1.0) × In
②	Long-time current setting	Ir	(0.8-0.83-0.85-0.88-0.89-0.9-0.93-0.95-0.98-1.0) × Iu
③	Long-time tripping delay	tr	(0.5-1-2-4-8-12-16-20-off), sec @ 6 Ir
④	Short-time current Setting	Is	(1.5-2-3-4-5-6-8-10-off)× Ir
⑤	Short-time tripping delay	tsd	I²t off : (0.05-0.1-0.2-0.3-0.4), sec I²t on : (0.1-0.2-0.3-0.4), sec
⑥	Instantaneous pick-up	Ii	(2-3-4-6-8-10-12-15-off)× In
⑦	Ground-fault pick-up	Ig	(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1-off)× In
⑧	Ground-fault tripping delay	tg	I²t off : (0.05-0.1-0.2-0.3-0.4) I²t on : (0.1-0.2-0.3-0.4)

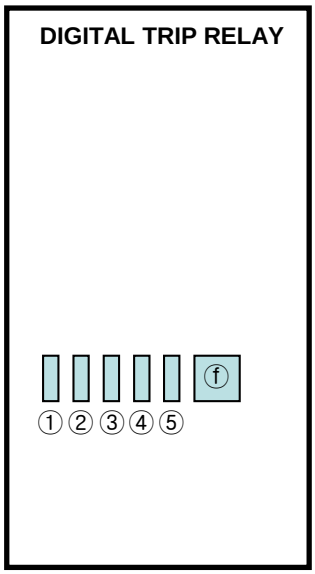
■ P, S type knob information

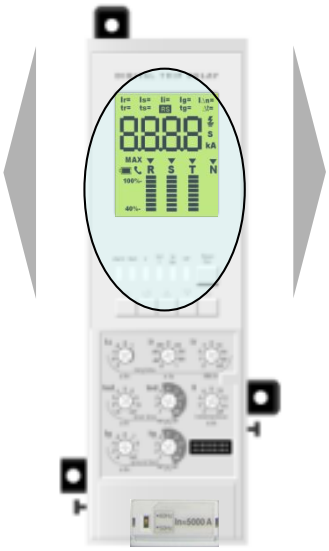
No	Type of knob	Mode	setting step
①	Long-time current setting	Ir	(0.4-0.5-0.6-0.7-0.8-0.9-1.0) × In
②	Long-time tripping delay	tr	(0.5-1-2-4-8-12-16-20-off), sec @ 6 Ir
③	Short-time current setting	Is	(1.5-2-3-4-5-6-8-10-off)× Ir
④	Short-time tripping delay	tsd	I²t off : (0.05-0.1-0.2-0.3-0.4), sec I²t on : (0.1-0.2-0.3-0.4) , sec
⑤	Instantaneous pick-up	Ii	(2-3-4-6-8-10-12-15-off)× In
⑥	Ground-fault pick-up	Ig	(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1-off)× In
⑦	Ground-fault tripping delay	tg	I²t off : (0.05-0.1-0.2-0.3-0.4) I²t on : (0.1-0.2-0.3-0.4)

I. Trip unit externals and configuration

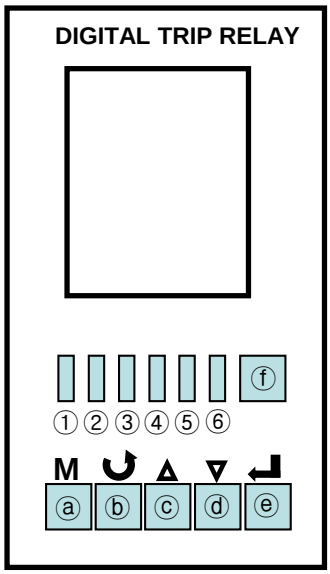
2. Key and LED configuration

■ N tpye key / LED





■ A, P, S type key / LED



■ LED information

No	LED type	Operational mode
①	Alarm	LED Indicating an overload (Turn on above 90%, Blink above 105%)
②	Batt/SP	Self-Protection LED and Battery test LED
③	Ir	LED Indicating long-time delay
④	Isd/Ii	LED indicating short-time or instantaneous tripping
⑤	Ig/I△n	LED indicating ground-fault
⑥	COMM	LED indicating Communication

■ Key configuration

No	Type of button		Function
ⓐ	M	Menu	Measurement display → Menu Display, Menu display→ Measurement Display
ⓑ	↻	TAP	Maintain the active display
ⓒ	△	Up cursor	Move the cursor up on screen or increment a setting value
ⓓ	▽	Down cursor	Move the cursor down on screen or decrement a setting value
ⓔ	↵	Enter	Enter into secondary menu or setting input
ⓕ		Reset/ESC	Reset errors or ESC from menu

J. Trip unit setting

1. Protection

■ N type

Long time										
Current setting (A)	Iu = In×...		0.5	0.6	0.7	0.8	0.9	1.0		
	Ir = Iu×...		0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or	tr@(6.0×Ir)		0.5	1	2	4	8	12	16	20	Off
below 100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time										
Current setting (A)	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Time delay (s)	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4				
Accuracy: ±10% or		I²t On @(10×Ir)		0.1	0.2	0.3	0.4				
below 50ms	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous										
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			below 50ms								
Ground fault										
Pick-up (A)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s)	tg	I²t Off	0.05	0.1	0.2	0.3	0.4				
Accuracy: ±10%(Ig≥0.4In)		I²t On @(1×In)		0.1	0.2	0.3	0.4				
±20%(Ig<0.4In)	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360				
or below 50ms		Max. Trip Time(ms)	80	140	240	340	440				

J. Trip unit setting

1. Protection

■ A type

Long time										
Current setting (A)	Iu = In×...		0.5	0.6	0.7	0.8	0.9	1.0		
	Ir = Iu×...		0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or	tr@(6.0×Ir)		0.5	1	2	4	8	12	16	20	Off
below 100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time										
Current setting (A)	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Of
Time delay (s)	tsd	I²t Off	0.05	0.1	0.2	0.3	0.4			
Accuracy: ±10% or		I²t On @(10×Ir)		0.1	0.2	0.3	0.4			
below 50ms	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360			
		Max. Trip Time(ms)	80	140	240	340	440			
Instantaneous										
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			below 50ms								
Ground fault										
Pick–up (A)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s)	tg	I²t Off	0.05	0.1	0.2	0.3	0.4			
Accuracy: ±10%(Ig≥0.4In)		I²t On @(1×In)		0.1	0.2	0.3	0.4			
±20%(Ig<0.4In)	(I²t Off)	Min. Trip Time(ms)	20	80	160	260	360			
or below 50ms		Max. Trip Time(ms)	80	140	240	340	440			
Earth leakage (Option)										
Current setting (A)	I△n		0.5	1	2	3	5	10	20	30	Off
Time delay (ms)	△t	Alarm Time(ms)	140	230	350	800	950			
Accuracy: ±15%		Trip Time(ms)	140	230	350	800				

Note) Current setting values are secondary current of the external CT.
Recommend : not to use current setting values more than 5A.

J. Trip unit setting

1. Protection

■ P,S type

Long time										
Current setting (A)	Ir = In×...		0.4	0.5	0.6	0.7	0.8	0.9	1.0	
Time delay (s)	tr@(1.5×Ir)		12.5	25	50	100	200	300	400	500	Off
Accuracy: ±15% or	tr@(6.0×Ir)		0.5	1	2	4	8	12	16	20	Off
below 100ms	tr@(7.2×Ir)		0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off
Short time										
Current setting (A)	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Time delay (s)	tsd	I^2t Off	0.05	0.1	0.2	0.3	0.4				
Accuracy: ±10% or		I^2t On @(10×Ir)		0.1	0.2	0.3	0.4				
below 50ms	(I^2t Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous										
Current setting (A)	Ii = In×...		2	3	4	6	8	10	12	15	Off
Tripping time			below 50ms								
Ground fault										
Pick-up (A)	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s)	tg	I^2t Off	0.05	0.1	0.2	0.3	0.4				
Accuracy: ±10%(Ig≥0.4In)		I^2t On @(1×In)		0.1	0.2	0.3	0.4				
±20%(Ig<0.4In)	(I^2t Off)	Min. Trip Time(ms)	20	80	160	260	360				
or below 50ms		Max. Trip Time(ms)	80	140	240	340	440				
Earth leakage (Option)										
Current setting (A)	I△n		0.5	1	2	3	5	10	20	30	Off
Time delay (ms)	△t	Alarm Time(ms)	140	230	350	800	950				
Accuracy: ±15%		Trip Time(ms)	140	230	350	800					

Note) Current setting values are secondary current of the external CT.
Recommend : not to use current setting values more than 5A.

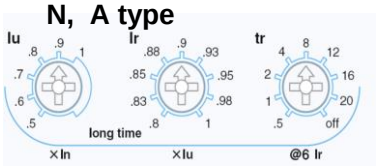
PTA(Pre Trip Alarm)										
Current setting (A)	Ip = Ir x ···	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1
Time delay (s)	tp@(1.2×Ip)	1	5	10	15	20	25	30	35	Off
Accuracy: ±15%										

Other protection		Pick-up			Time delay(s)		
		Setting range	Step	Accuracy	Setting range	Step	Accuracy
Under voltage		80V ~ 0V_Pick-up	1V	±5%	1.2~40sec	0.1sec	±0.1sec
Over voltage		UV_Pick-up ~ 980V	1V	±5%			
Voltage unbalance		6% ~ 99%	1%	±2.5% or (*±10%)			
Reverse power		10~500 kW	1kW	±10%	0.2~40sec		
Over power		500~5000 kW	1kW	±10%			
Current unbalance		6% ~ 99%	1%	±2.5% or (*±10%)	1.2~40sec		
Over frequency	60Hz	UF_Pick-up ~ 65	1Hz	±0.1Hz			
	50Hz	UF_Pick-up ~ 55	1Hz	±0.1Hz			
Under frequency	60Hz	55Hz ~ OF_Pick-up	1Hz	±0.1Hz			
	50Hz	45Hz ~ OF_Pick-up	1Hz	±0.1Hz			

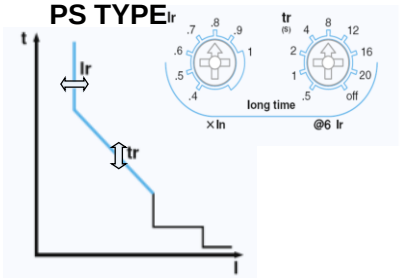
2. Operation characteristic

■ Long-time delay (L)

N, A type



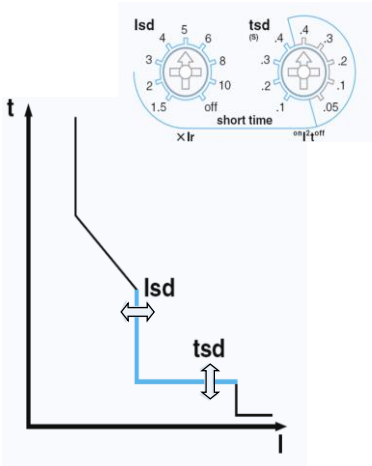
PS TYPE



The function for overload protection which has time delayed characteristic in inverse ratio to fault current.

1. Standard current setting knob: Ir
   1) Setting range in P type and S type: (0.4-0.5-0.6-0.7-0.8-0.9-1.0)×In
   2) Setting range in N type and A type: (0.4 ~1.0)×In
      - Iu: (0.5-0.6-0.7-0.8-0.9-1.0)×In
      - Ir: (0.8-0.83-0.85-0.88-0.9-0.93-0.95-0.98-1.0)×Iu
2. Time delay setting knob: tr
   - Standard operating time is based on the time of 6×Ir
   - Setting range: 0.5-1-2-4-8-12-16-20-Off sec (9 modes)
3. Relay pick-up current
   - When current over (1.15)×Ir flows in, relay is picked up.
4. Relay operates basing on the largest load current among R/S/T/N phase.

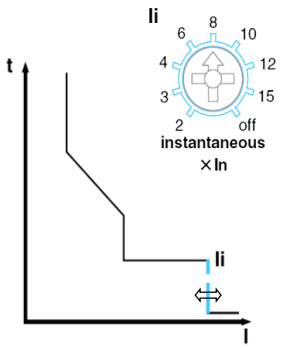
■ Short-time delay (S)



The function for fault current (over current) protection which has definite time characteristic and time delayed in inverse ratio to fault current.

1. Standard current setting knob: Isd
   - Setting range: (1.5-2-3-4-5-6-8-10-Off)×Ir
2. Time delay setting knob: tsd
   - Standard operating time is based on the time of 10×Ir.
   - Inverse time (I^2t On): 0.1-0.2-0.3-0.4 sec
   - Definite time (I^2t Off): 0.05-0.1-0.2-0.3-0.4 sec
3. Relay operates basing on the largest load current among R/S/T/N phase.
4. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.

■ Instantaneous (I)

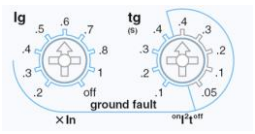


The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.

1. Standard current setting knob: Ii
   - Setting range: (2-3-4-6-8-10-12-15-Off)×In
2. Relay operates basing on the largest load current among R/S/T/N phase.
3. Total breaking time is below 50ms.
4. When using the ERMS function, Instantaneous setting value is applied as 2*In (N type OCR does not apply)

2. Operation characteristic

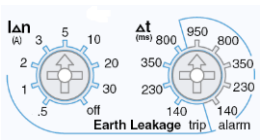
■ Ground Fault (G)

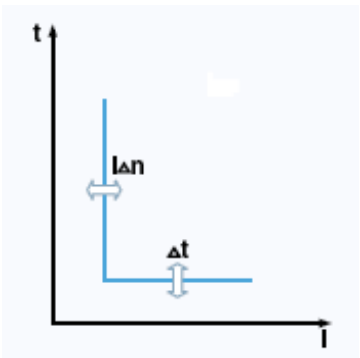


The function for breaking ground fault current above setting value after time-delay to protect the circuit from ground fault.

1. Standard setting current knob: Ig
   - Setting range: (0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off)×In
2. Time delay setting knob: tg
   - Inverse time (I^2t On): 0.1-0.2-0.3-0.4 sec
   - Definite time (I^2t Off): 0.05-0.1-0.2-0.3-0.4 sec
3. Ground fault current is vector sum of each phase current. Therefore, 3Pole products may operate under its phase-unbalance including ground fault situations.(R+S+T+(N) Phase)
4. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.
5. Ground-fault functions are basically provided with products equipped with a trip relay through its internal CT that is embedded in each phase.(But, it can't be used with earth-leakage protection function at the same time)

■ Earth Leakage (G) – Option





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

1. Standard setting current knob: IΔn
   - Setting range: 0.5-1-2-3-5-10-20-30-Off (A)
2. Time delay setting knob: Δt
   - Trip time: 140-230-350-800 ms
   - Alarm time: 140-230-350-800-950 ms
3. Settings within its alarm range will prevent its breaker from tripping but activating its alarm.
4. This function is enabled and can be used only with private external CT(secondary output 5A) selected by customers.
5. When ZSI function was set, the protection operation will take place instantaneously with input absence by downstream devices. It is advised to disable its ZSI function on the last downstream device.

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

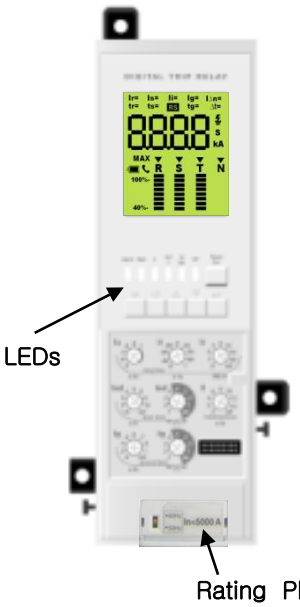
- When using other CT selected by customers, the setting range is from 0.5 to 5A based on its secondary current.(Secondary output rating : 5A)
  Hence, under 100:5A CT, if trip relay is set to 0.5A, earth-leakage exceeding 10A will activate its operation (0.5A×20 = 10A)

※ **Guideline for the external CT usage**

- Earth-leakage protection characteristics using the standard CT which is installed inside of ACB can protect currents from 20 to 100% range on its rated current.
- As rated currents on ACB increases, current that is covered by its standard CT increase as well. This can not protect against small leakage currents.
  ex) 400A ACB Min. Earth-leakage current 400A×20% =80A
  4000A ACB Min. Earth-leakage current 4000A×20% =800A
- Therefore, customers are advised to install an external CT in accordance with its rated currents within its systems. And choose trip relay(E, X type) which is required with external CT usage in order to provide earth-leakage functions.

J. Trip unit setting

3. Rating plug



Caution

1. . Rating plug is available to about 50% of Ampere Frame (CT ratio) of circuit breaker.

2. In case of wrong rating plug for the circuit breaker., Alarm message shall indicate. (All Leds of trip unit lighting)

3. The circuit breaker shall be de-energized and open before changing the rating plug.

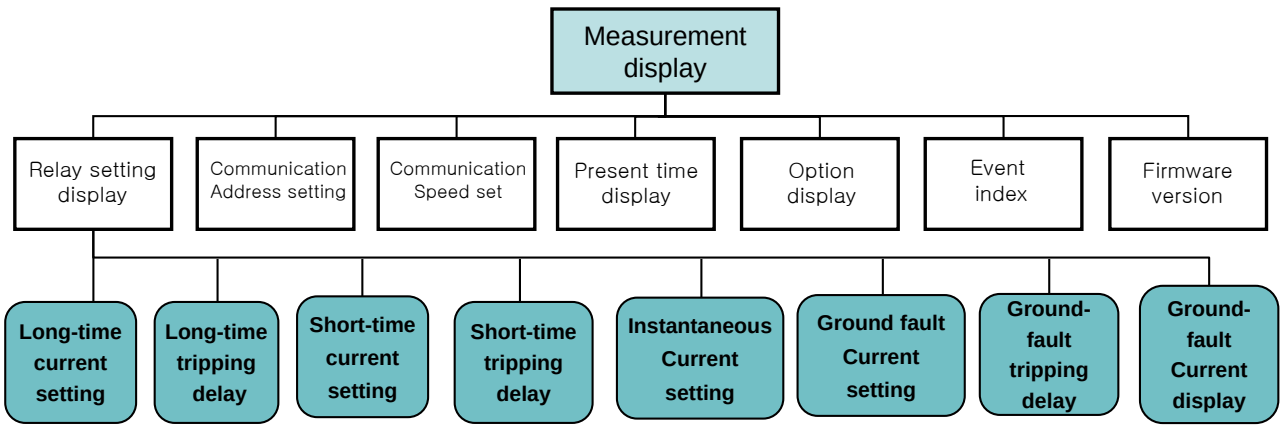
Type of circuit breaker	UAS		UAH							
	D		E					G		
AF / Rated current (In)	800A	1600A	800A	1600A	2000A	2500A	3200A	3200A	4000A	5000A
400A	■		■							
600A	■		■							
630A	■		■							
800A	■	■	■	■						
1000A		■		■	■					
1200A		■		■	■	■				
1250A		■		■	■	■				
1600A		■		■	■	■	■	■		
2000A					■	■	■	■	■	
2500A						■	■	■	■	■
3000A							■	■	■	■
3200A							■	■	■	■
3600A									■	■
4000A									■	■
5000A										■

K. The operation of trip unit

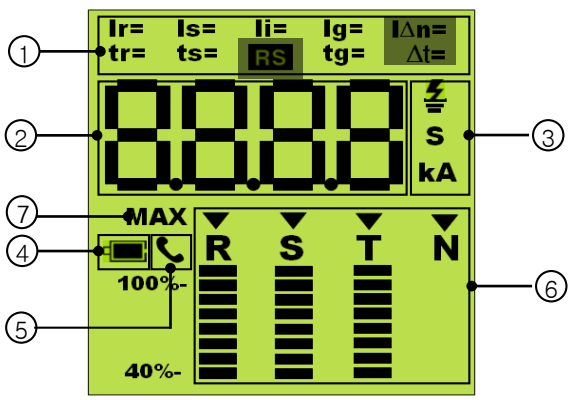
1. Menu tree

Caution

- Each movement within Menu Tree can be done by using Menu and ESC button.
- Use UP(△)/Down(▽) button to move around each setting information under Relay Setting Display.
- If not pressing any button for 30seconds after moving to other screens, the screen moves back to Measurement Display and any relevant data will not be saved.



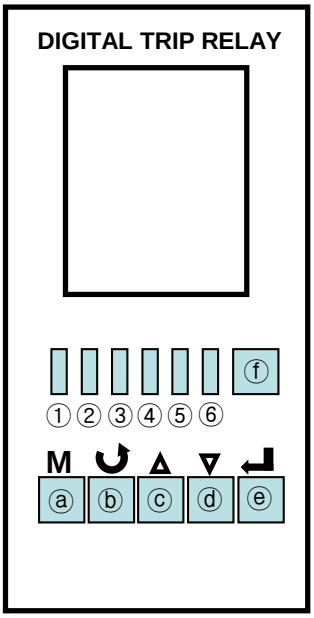
2. LCD segment



NO	Contents
①	Segment that displays the types of relay current and time - Display of Setting values or Event
②	Segment that displays numbers or characters - Current, Time, and Simple character
③	Segment that displays the unit of current and time.
④	Low Battery Segment -LED flickers at 2~3 second interval if the voltage of 3.6V Lithium battery built in OCR is discharged below 2.5V.
⑤	Communication Segment - Upon answering to communication, it is displayed on the screen of Address and Speed Setting.
⑥	Segment which displays the measured current and the load rate of each phase - Inverted triangle indicates the current of phase which is being displayed on Measurement Display. - Load rate of R/S/T phase in proportion to Ir
⑦	Segment which displays the phase having the biggest current value - Each phase current appears at one-second intervals. - When the phase having the biggest current value appears, MAX segment displays.
When OCR is plugged in for the first time, all segments will be shown for approximately a second, and then return to Measurement Display.	

K. The operation of trip unit

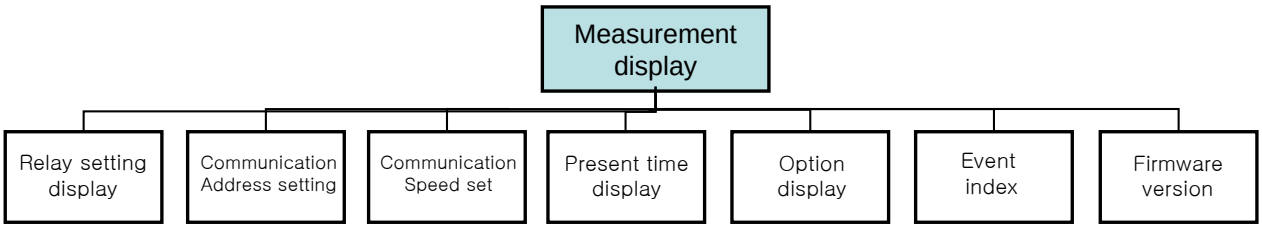
3. Button configuration

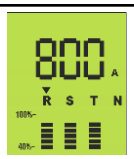
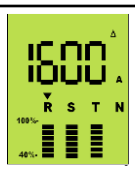


Caution

- After 90 seconds under idle condition, it moves back to Measurement Display page. And data doesn't save.
- If pressing 'ESC/Reset' button in case of no power supply with OCR, BATT LED will come on to indicate the residual quantity of battery.
- If pressing 'ESC/Reset' button in case of existing power supply with OCR, the status of LED only can be checked, not checking residual quantity of battery
- Only BATT LED turns on while pressing 'ESC/Reset' button and other LEDs will turn on for 1~2 seconds after releasing 'ESC/Reset' button.
- If ACB breaking the fault current normally, the information of cause for accident will be informed to users by turning on Indication LED.
- At this time Indication LED is operated by a separate battery built in OCR. Therefore, turn it off by pressing 'ESC/Reset' button when discovering the cause of fault.

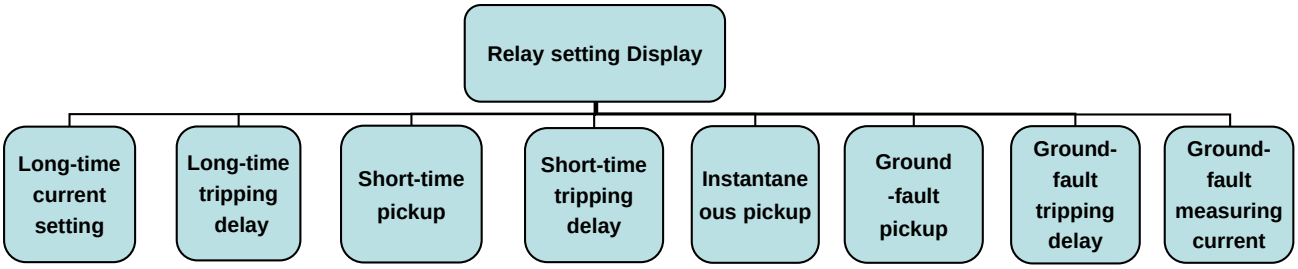
4. Measurement display

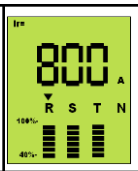
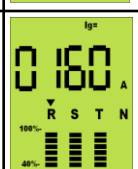
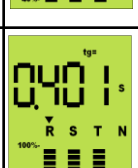
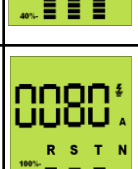


Display	Button	Contents
		1. The current of R, S, T, N phase are displayed in rotation at 3 second interval. 2. At this very moment, the inverted triangle is moving sideways from left to right to show which phase is being displayed on LCD currently. 3. Bar graphs represent each phase's load rate in scale (40%~110%).
	↻	1. If pressing TAP button to display only one phase value exclusively on the screen without displaying each phase's current in rotation,. the triangle sign(Δ) will appear at the top-right side of LCD screen. ※ This screen-freeze can be apply at other screens as well.
	↻ △ ▽	1. The phase which will be displayed exclusively can be selected by pressing ' Up / Down' button.

K. The operation of Trip unit

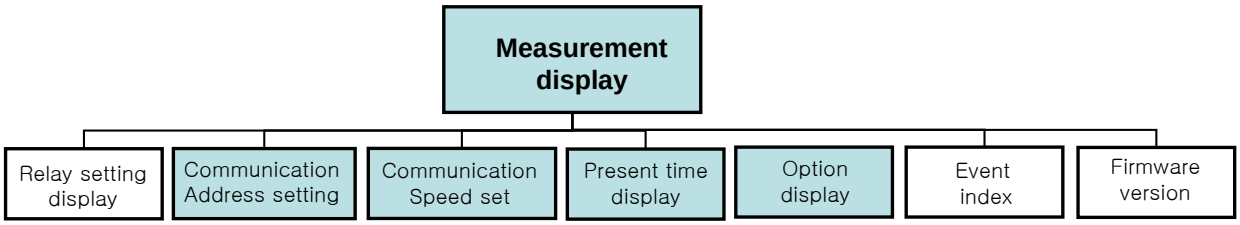
5. Relay Setting Display– Long-time Delay, Short-time Delay



Display			Button	Contents
Long-time	set current		M ▲ ▼	If pressing a Menu button once from its normal Measurement Display will switch to the screen that displays relay setting values. An initial screen of Measurement Setting Display is arranged for long-time delay current setting, and other setting values can be seen by pressing Up/Down cursor.
	delay time		M ▲ x 1	If pressing 'Up cursor' once from the Relay setting Display, the setting value of long-time tripping delay will be displayed.
short-time	set current		M ▲ x 2	If pressing 'Up cursor' two times on the Relay setting display, the setting value of short-time tripping delay will be displayed
	delay time		M ▲ x 3	If pressing 'Up cursor' three times on the Relay setting Display, the setting time of short- time tripping delay will be displayed At this time, one larger value than the initial one will be displayed because LSB of time setting value is set in case of I2t is On. For example, if it is of I2t 0.400sec on setting, 0.401 will be displayed
Instantaneous	set current		M ▲ x 4	If pressing 'Up cursor' four times on the Relay setting Display, Instantaneous pick up setting value will be displayed.
ground fault	set current		M ▲ x 5	If pressing 'Up cursor' five times on the Relay setting Display, the setting value of Ground-fault pickup will be displayed.
	tripping delay		M ▲ x 6	If pressing 'Up cursor' six times on the Relay setting Display, the setting value of Ground- fault tripping delay will be displayed. At this time, one larger value than the initial one will be displayed because LSB of time setting value is set in case of I2t is On. For example, if it is of I2t 0.400sec on setting, 0.401 will be displayed
	measuring		M ▲ x 7	If pressing 'Up cursor' seven times on the Relay setting Display, the setting current of ground fault will be displayed. At this time, the 10~100% of In will be displayed and other values out of this range will be indicated as "_ _ _ _"

K. The operation of Trip unit

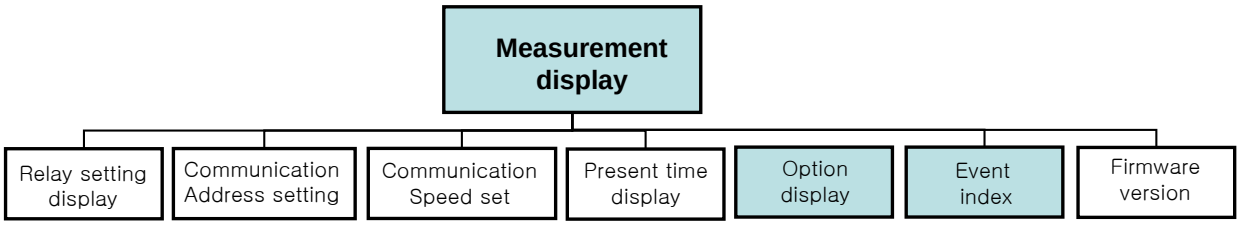
5. Relay Setting Display



Display			Button	Contents
Communication	address		**M** x 2 ▲▼	If pressing MENU' button 3 times from the measurement Display, move to Communication Address Setting screen. Communication Address can be set from 1 to 247.
			↵	Press Enter button to save the setting, otherwise press ESC/RESET button to move back to Measurement Display. If successfully saved, "SAVE" is displayed on screen and move to Measurement Display and if pressing ESC/RESET button, move to Measurement Display without saving.
	Speed		**M** x 3 ▲▼	If pressing 'MENU' button 3 times from measurement Display screen, move to Communication Speed Setting screen. Communication speed can be set through Baud rate 38400 / 19200 / 9600. If pressing 'Up / Down' cursor, the value of Baud rate rolling over will be displayed
			↵	Press Enter button to save the setting, otherwise press ESC/RESET button to move back to Measurement Display. If successfully saved, "SAVE" is presented on screen and move to Measurement Display and if pressing ESC/RESET button, move to Measurement Display without saving.
Present	time		**M** x 4	If pressing 'MENU' button 4 times from Measurement Display, move to Present Time Display. The present time is displayed with 'hour' and 'minute' by 24H type and Dot between hour and minute turns on and off every second. Unless present time is set, present time will be set '1 hour 1minute' as initial time is set as '1hour 1minite 1 second January 1st, 2000'.
Option	Blocking		**M** x 5	If pressing 'MENU' button 5 times from Measuring Display, move to Option Index. An initial screen of Option display is 'OCGR blocking time setting'. -Setting range : 0 ~ 60s -Default value : 0s Press the Enter button and change to the up-down button.
	OCGR OP.		**M** X 5 ▲X 1	If pressing 'UP' button once from Option Display, move to OCGR operation mode setting screen. -Mode : Trip / Alram -Default : Trip Press the Enter button and change to the up-down button.
	Thermal		**M** X 5 ▲X 2	If pressing 'UP' button two times from Option Display, move to Thermal operation mode setting screen. -Default : 49 Press the Enter button and change to the up-down button.

K. The operation of Trip unit

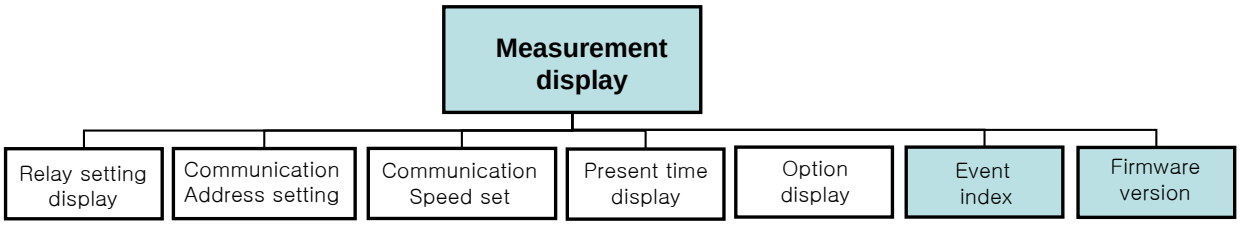
5. Relay Setting Display

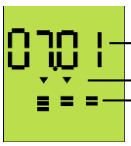
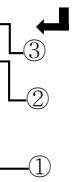
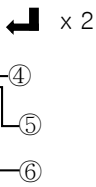
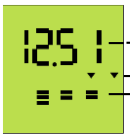
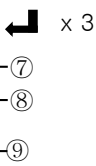


Display			Button	Contents
Option	Thermal mode		**M** X 5 ▲X 3	If pressing 'UP' button 3 times from Option Display, move to Thermal mode setting screen. -Thermal mode : Cold / Hot -Default value : Cold Press the Enter button and change to the up-down button.
	ZSI		**M** X 5 ▲X 4	If pressing 'UP' button 4 times from Option Display, move to ZSI operation mode setting screen. -Mode : Disable / Enable -Default : Disable Press the Enter button and change to the up-down button.
	Frequency		**M** X 5 ▲X 5	If pressing 'UP' button 5 times from Option Display, move to Frequency check screen. -Frequency : 60Hz / 50Hz -Only frequency identification is possible.
	Save			After changing the values in all screens above, press 'Enter' button to save the value and move to measurement screen.
Event			**M** X 5	If pressing 'MENU' button 5 times from Measuring Display, move to Event Index. on the Event Index, The information of fault events is shown on screen up to 10 faults and each information displays fault current, a type of fault, fault phases, occurring time which includes second, minute, hour, date, month, and year.
				1. "Ii=" : Fault : long time/short time/instantaneous/ground fault 2. "1600A" : fault current 3."▼" : Fault phase : R, S, T, N ACB OCR N / A type can save 10 events and Event Index indicates events order. When displaying the latest event, only one Segment will be showed on the Event Index and if pressing 'Up' cursor, Segment will be increased and the former saved event will be displayed.
				If there is no data in Event Index, 'Empty' will be displayed.

K. The operation of Trip unit

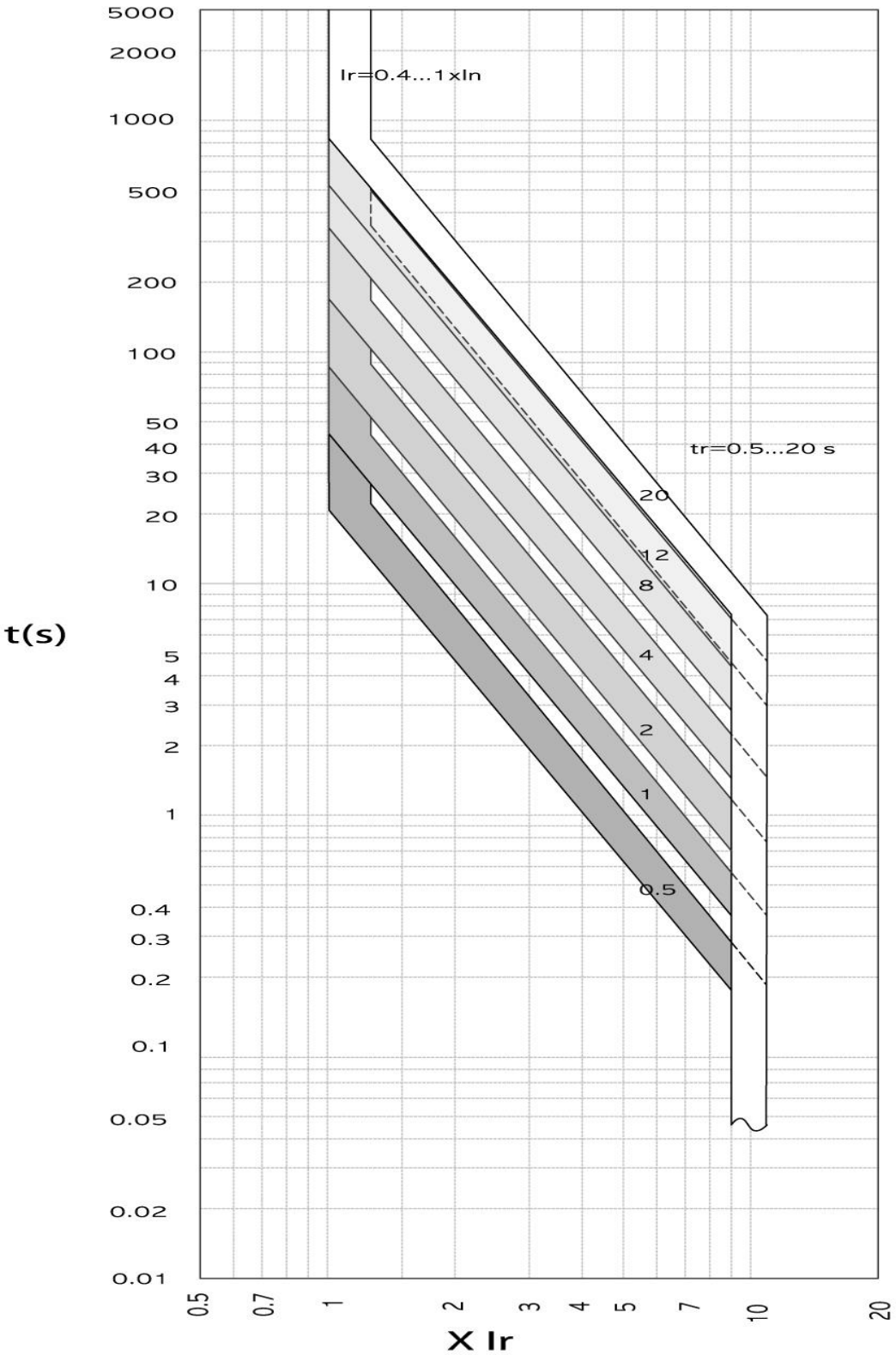
5. Relay Setting Display



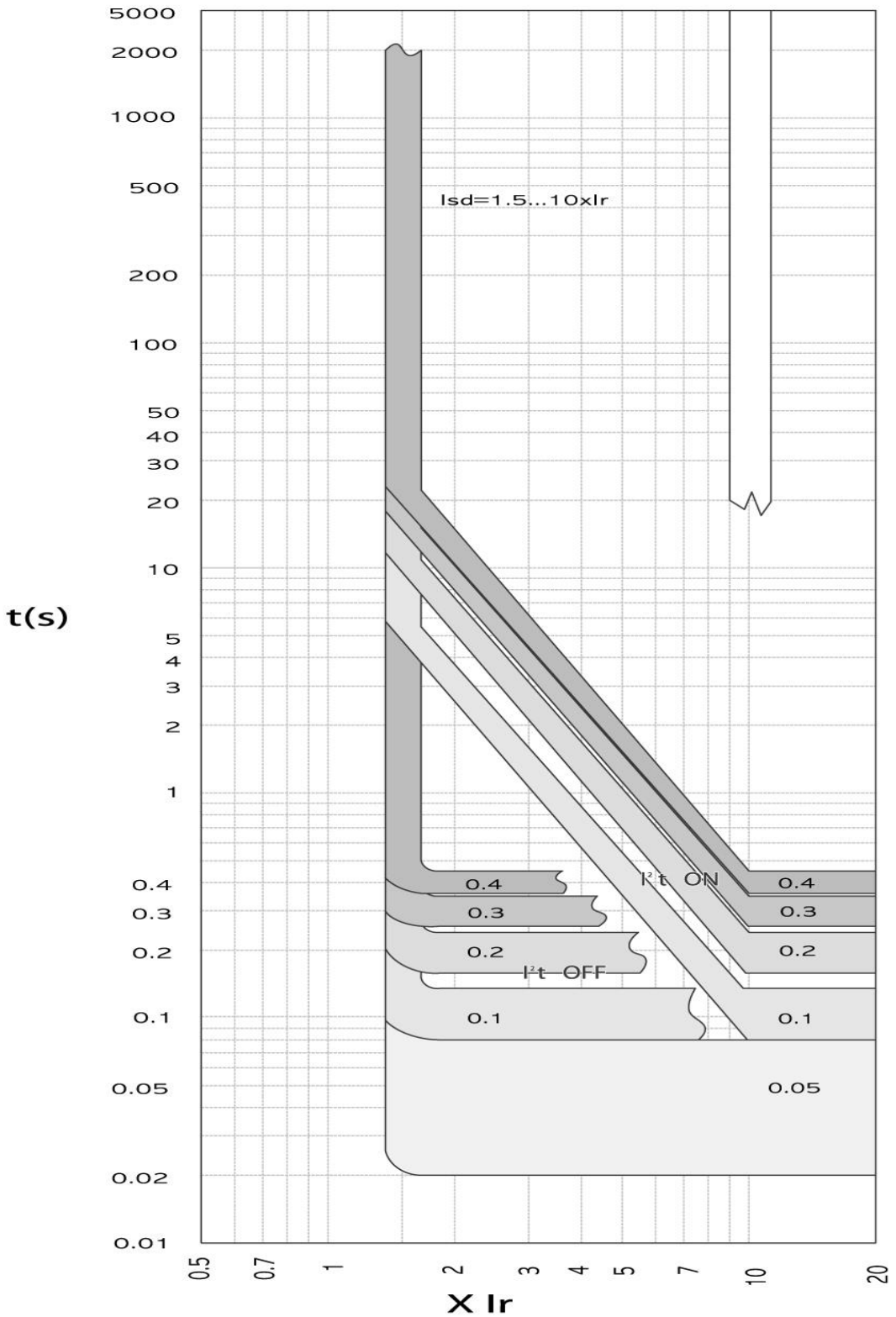
Display		Button	Contents
Event			1. If pressing' Enter' from Event Index, the time information of relevant events is displayed. ① : Displaying the 7th Event (Event Index) ② ▼▼ : Displaying Event Year/Month ③ If pressing 'Enter' once, the information of Year/month will be displayed. Left screen indicates "January, 2007
			1. If pressing 'Enter' 2 times, the information of Date/Time will be displayed. ④ : The current screen indicates '1 o'clock, 8th" . ⑤ : Displaying Event Date/Time ⑥ : Event Index : Displaying the 7th Event
			1. If pressing 'Enter' 3 times, the information of minute/second will be displayed. . ⑦ : The current screen is to indicate "12 minutes 51seconds". ⑧ : Displaying Event Minute/Second ⑨ : Event Index : Displaying the 7th Event
Firmware version		**M** x 6	1. If pressing 'MENU' button 6 times from Measurement Display, move to irmware Version

L. Characteristic curves

1. Long-time protection

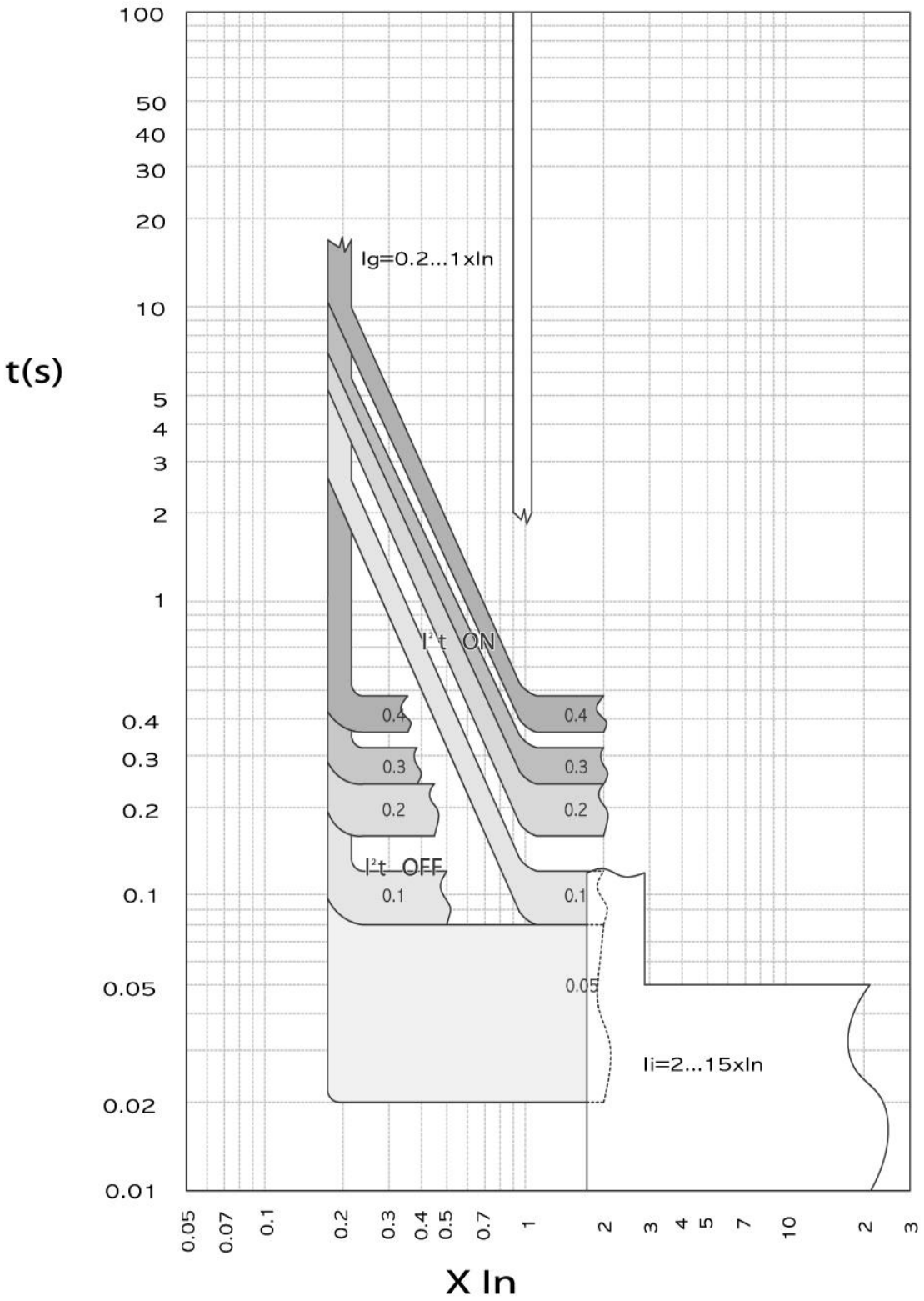


2. Short-time protection



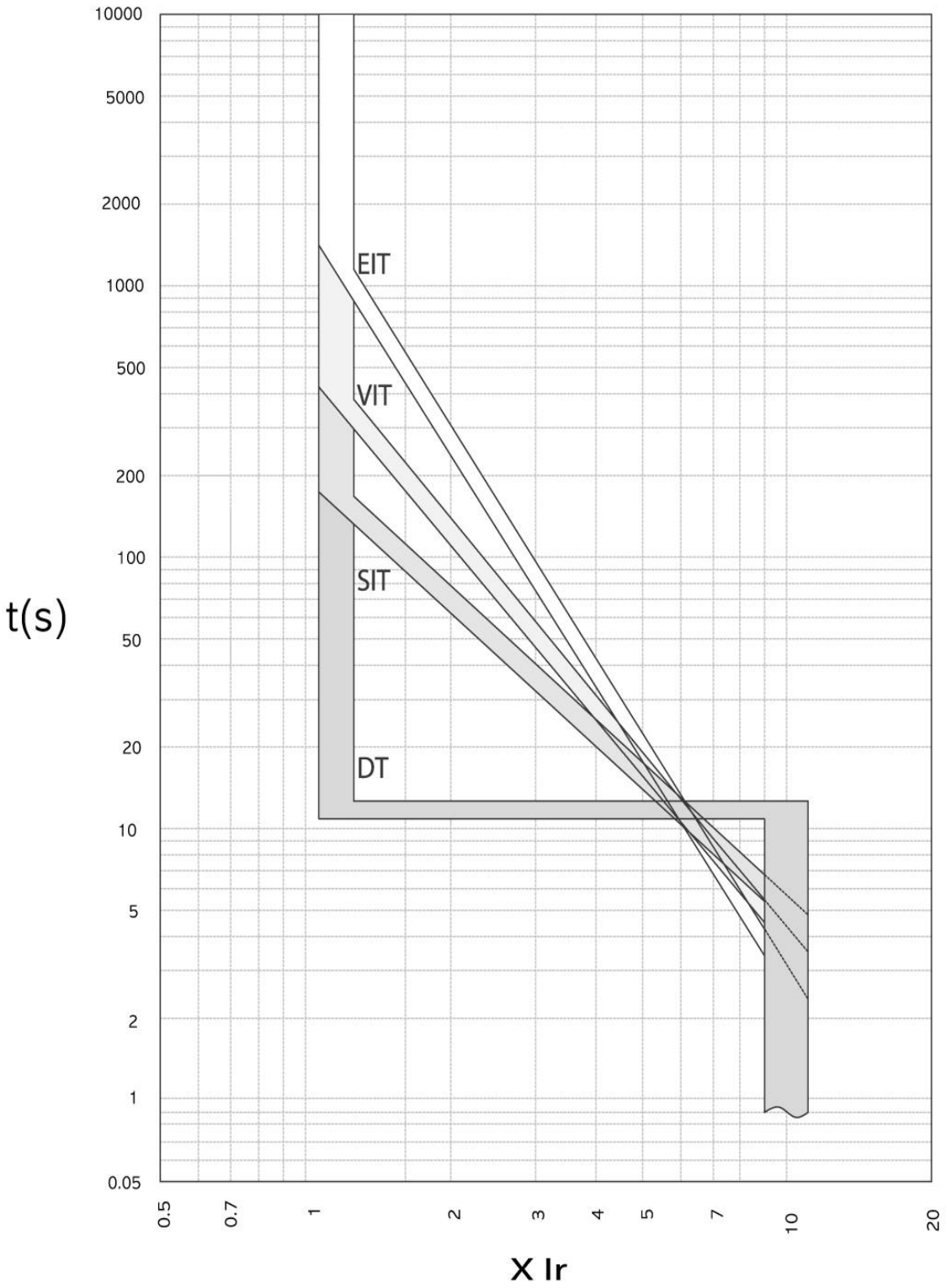
L. Characteristic curves

3. Instantaneous / Ground-fault protection



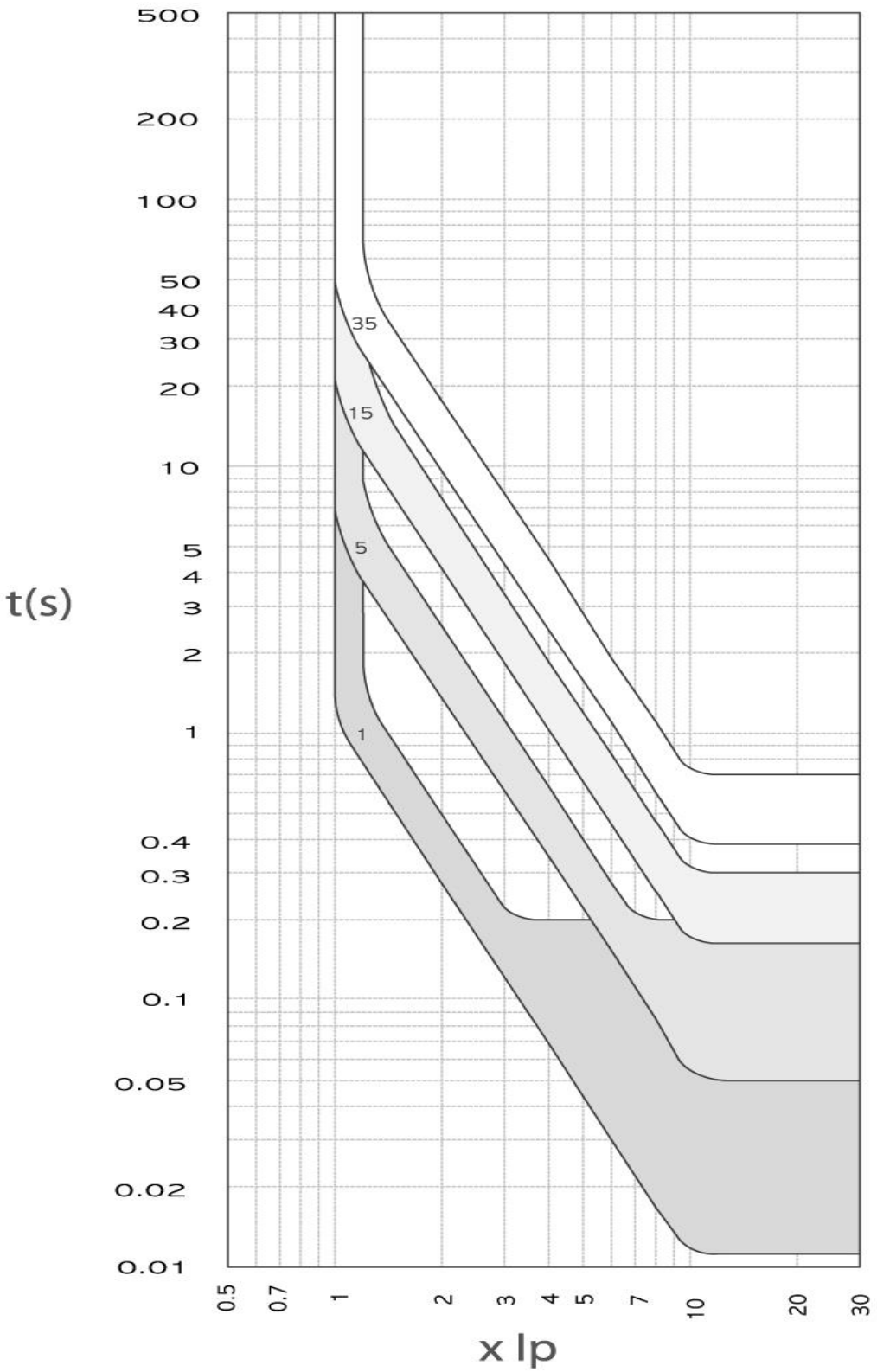
L. Characteristic curves

4. IDMTL



L. Characteristic curves

5. Pre-trip alarm



M. Inspection and troubleshooting

1. Inspection and maintenance cycle

The purpose of inspection for ACB is to prevent the accidents in advance and maintain the performance of it by changing timely the consumable and deteriorative parts. Please make sure the following guideline specified the method for inspection & cycles before using of the equipment.

■ Maintenance cycle upon using condition

Using condition	Environments	Specific examples	Inspection cycle	Replacement cycle
General environment for a use	Location with clean & dry air	Electrical rooms with dust proof & air-conditioner	Once every 2 years	Within approx. 10 years
	Indoor location with little dust Location without corrosive gases	Distribution panel or individual electrical room without dust proof & air conditioner		
Special environment for a use	Location with salinity, high temperature gases such as sulphur dioxide and hydrogen sulphide	Geothermal power plants, waste water treatment plants, steel mills, paper factories, pulp factories, etc.	Once every 1 year	Within approx. 7 years
	Locations with harmful or corrosive gases where humans cannot stay for a long time	Chemical factories, quarries, mining areas, etc.	Once every half a year	Within approx. 5 years

M. Inspection and troubleshooting

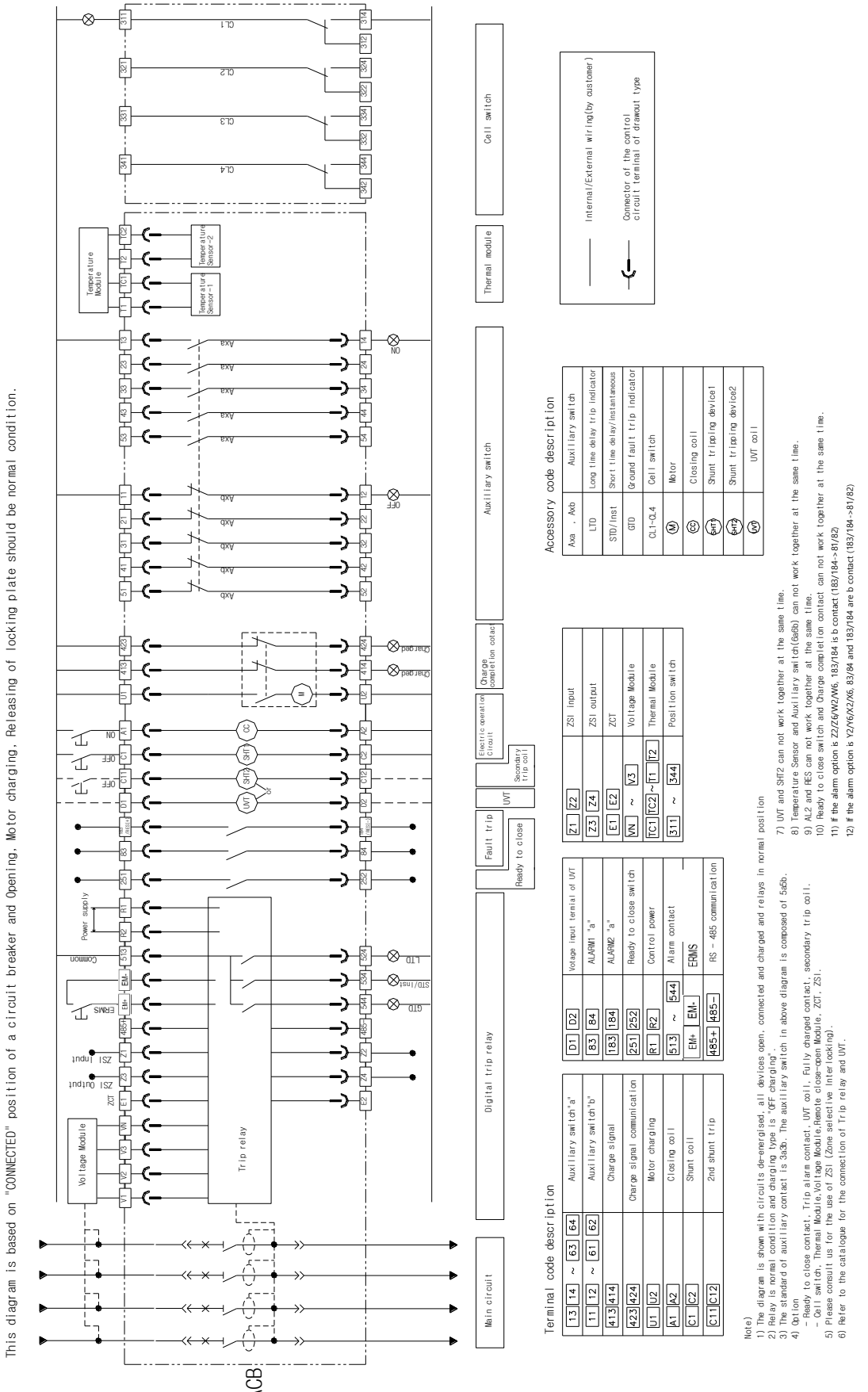
2. Defects and troubleshooting guideline

■ Troubleshooting guideline

Types of Defect	Cause	Countermeasure
The breaker is opened but Fault Trip Reset button does not come out.	1. Voltage does not exist or UVT is damaged.	1. Check voltage. Replace damaged UVT.
	2. Voltage disturbance occurred to the trip device.	2. Check voltage supply part.
The breaker is opened simultaneously with the closing operation and the Fault Trip Reset button comes out.	1. In state of short-circuit	1. Remove cause; Check condition of breaker before re-closing.
	2. Excess current is too high at closing operation.	2. Revise network or change setting of trip device.
OPEN operation is done manually but not from remote.	1. Voltage supply from the trip device is too low. V<0.7Vn	1. Check voltage supply. (0.7~1.1Vn)
	2. Defect on UVT circuit	2. Replace UVT.
OPEN operation does not work manually.	1. Damage on the mechanism	1. Contact AS center.
	2. Deposition of main circuit.	2. Contact AS center.
Breaker does not close neither manually nor remotely.	1. Closing operation at state of short-circuit.	1. Remove cause; Check condition of breaker.
	2. Fault Trip Reset button does not reset.	2. Reset Fault Trip Reset button.
	3. Unstable draw-in/out state of the product.	3. Check product's draw-in/out state.
	4. Anti-pumping function	4. Re-operate after removing power of the closing coil.
	5. Closing spring of breaker is not charged.	5. Check power supply of the charging motor. Check if manual charging works. Contact AS center or replace charging motor if necessary.
	6. Power supply problem of the closing coil.	6. Remove power supply of the closing coil. Apply power again after checking the breaker's closing availability. Contact AS center if manual charging is unavailable.
	7. Power supply problem of the trip coil.	7. Remove power supply of the trip coil.
	8. Insufficient power supply of the UVT or defect.	8. Apply voltage (V>0.85Vn) to the auxiliary switch and try closing operation using the closing coil.
	9. Locked state of the breaker under open position	9. Check if the closing error state is normal.
	10. In case breaker is interlocked.	10. Release interlock.
Closes manually but does not close from remote.	1. Inappropriate voltage supply of the closing coil.	1. Check voltage supply of the closing coil. (0.85~1.1Vn)
	2. Defect of the closing coil's open circuit.	2. Replace closing coil.
Does not charge electrically.	Wrong voltage supply to spring charging motor.	1. Check voltage supply.
		2. Check the circuit of charging motor.
		3. Try reset operation and if there is a problem or defect, contact local AS center and replace charging motor.
Crank handle for draw-in/out does not get inserted.	1. No opening of the crank insertion by pressing Open button.	1. Insert while pressing Open button.
	2. Under Padlock or interlock	2. Remove padlock or interlock.
	3. Not putting the product into the cradle securely.	3. Push product into cradle securely.
Breaker does not get drawn out.	1. Crank handle is inserted.	1. Remove crank handle.
	2. Breaker is not in Disconnected position.	2. Draw out to the Disconnected position completely.
	3. Under Padlock or interlock	3. Remove padlock or interlock.
Breaker is not drawn in completely. (It is not in the Connected position)	1. The cradle and main frame of the breaker do not fit.	1. Check if cradle fits with main frame.
	2. Inappropriate position of the cluster.	2. Move cluster to the right position.
	3. Safety shutter is under interlock.	3. Remove interlock.

N. Wiring diagram of control circuit

1. Wiring diagram



Terminal code description

13 14 ~ 63 64	Auxiliary switch"a"	D1 D2	Votage input tennial of UVT	Z1 Z2	ZSI input
11 12 ~ 61 62	Auxiliary switch"b"	83 84	ALARM1 "a"	Z3 Z4	ZSI output
413 414	Charge signal	183 184	ALARM2 "a"	E1 E2	ZCT
423 424	Charge signal communication	251 252	Ready to close switch	VN ~ V3	Voltage Module
U1 U2	Motor charging	R1 R2	Control power	TC1 TC2 ~ T1 T2	Thermal Module
A1 A2	Closing coil	513 ~ 544	Alarm contact	311 ~ 344	Position switch
C1 C2	Shunt coil	EM+ EM-	ERMS		
C11 C12	2nd shunt trip	485+ 485-	RS - 485 communication		

Accessory code description

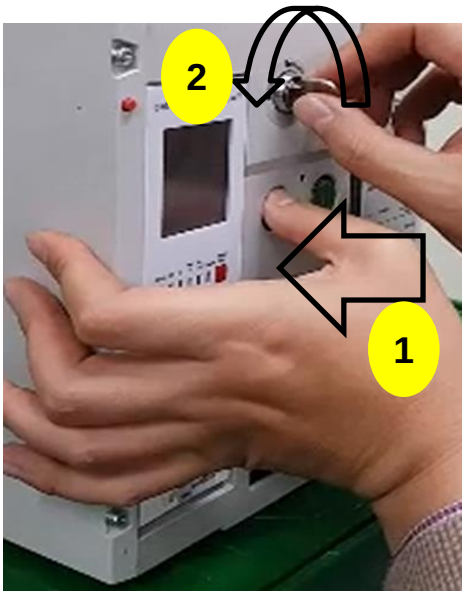
Axa . Axb	Auxiliary switch
LTD	Long time delay trip indicator
STD/Inst	Short time delay/instantaneous
GTD	Ground fault trip indicator
CL1-CL4	Cell switch
M	Motor
CC	Closing coil
SHT1	Shunt tripping device1
SHT2	Shunt tripping device2
UVT	UVT coil

Note)
1) The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position
2) Relay is normal condition and charging type is "OFF charging".
3) The standard of auxiliary contact is 3a3b. The auxiliary switch in above diagram is composed of 5a5b.
4) Option
 - Ready to close contact, Trip alarm contact, UVT coil, Fully charged contact, secondary trip coil.
 - Cell switch, Thermal Module,Voltage Module,Remote close-open Module, ZCT, ZSI.
5) Please consult us for the use of ZSI (Zone selective interlocking).
6) Refer to the catalogue for the connection of Trip relay and UVT.
7) UVT and SHT2 can not work together at the same time.
8) Temperature Sensor and Auxiliary switch(6a6b) can not work together at the same time.
9) AL2 and RES can not work together at the same time.
10) Ready to close switch and Charge completion contact can not work together at the same time.
11) If the alarm option is Z2/Z6/W2/W6, 183/184 is b contact (183/184->81/82)
12) If the alarm option is Y2/Y6/X2/X6, 83/84 and 183/184 are b contact (183/184->81/82)

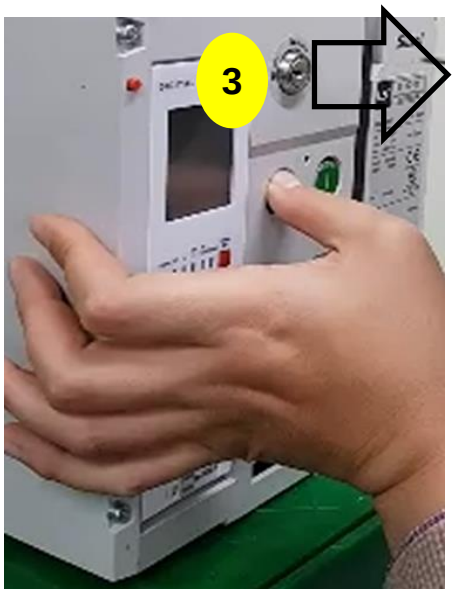
O. Other operation

1. KEYLOCK operation

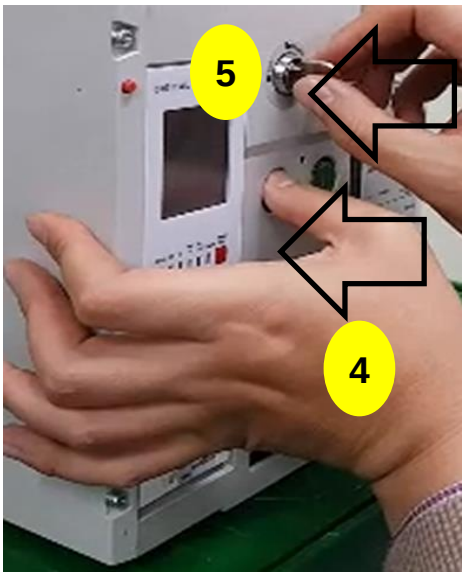
Keylock is used to prevent unintentional closing operation of the ACB by user. When the ACB is in the operation state, the ACB can operate the On/Off operation with plugged the key. If the ACB is locked, the key is unplugged and the closing operation is not possible.



➢ **Turn the key CCW with keeping after pushing the off button**



➢ **When the key is rotated to lock position, remove the key with pulling it**



➢ **Push the off button and Insert the key**

➢ **Turn the key slightly to the lock position and Turn to the opposite direction.**

O. Other operation

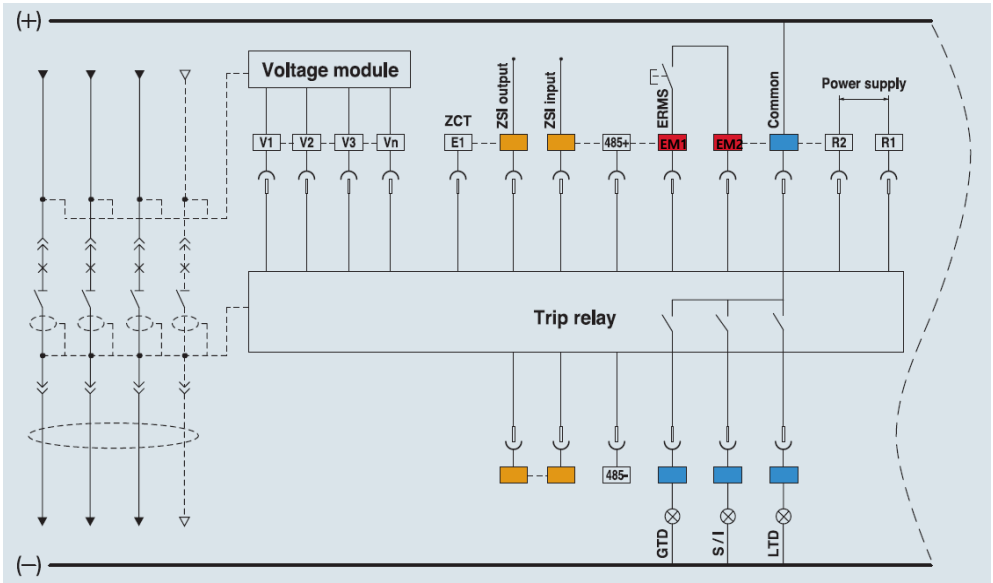
2. ERMS(Energy reduction maintenance settings) function

-ERMS(Energy Reduction Maintenance Setting) is a function to reduce the ARC energy to ensure workers' safety. When using the ERMS function, the instantaneous setting value is set to the minimum setting value(2*In) regardless of the real setting.

-ERMS function is available via digital input.

-ERMS function is available only when there is external power.(A,P,S type OCR)

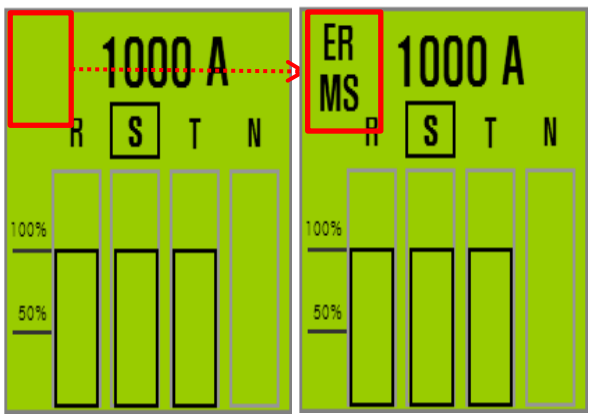
■ Diagram



-To use the ERMS fuction, short both ends of ERMS terminal(EM1,EM2)

■ ERMS display screen in OCR

[P/S Type OCR]

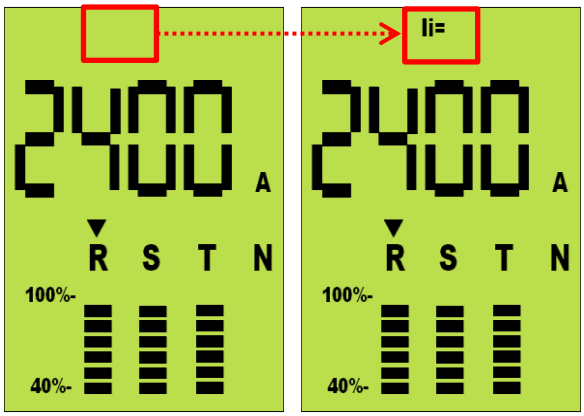


[Normal status] **[ERMS application status]**

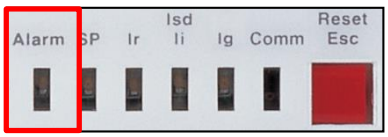
■ **'ERMS' is displayed on the LCD during ERMS operation.**

■ **LCD backlight blinks every 1 seconds during ERMS operation**

[A Type OCR]



[Normal status] **[ERMS application status]**



■ **'ERMS' is displayed on the LCD during ERMS operation.**

■ **During ERMS operation, 'Alram LED' blinks 7 times per second at the same interval.**

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