



Susol & **Metasol**
Super Solution Meta Solution

Air Circuit Breakers
Instruction Manual

LS Industrial Systems
www.lsis.biz

Instruction manual of Susol & Metasol ACB

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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 30 days 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°C to min. -5°C is recommended. However, the average temperature of 24 hours does not exceed +35°C.

2) Altitude

2,000m or less.

3) Environmental conditions

The air must be clean, and the relative humidity does not exceed 85% at a max. of +40°C and 90% at 20°C. Do not use and store in presence of corrosive or ammonia gas.

(H₂S ≤ 0.01ppm, SO₂ ≤ 0.01ppm, NH₃ ≤ 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°C to min. -20°C is recommended.

6) Replacement

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

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°C, reduce the continuous conducting current for a use referring to Table. A.

3) Special altitude

If it is used at the 2,000m or higher the heat radiation rate is reduced and the operating voltage, continuous current capacity and breaking capacity are decreased. Moreover the durability of the insulation is also decreased owing to the atmospheric pressure. Contact us for further detail.

Table A. The compensation of rated current according to ambient temperature

FRAME	정격전류	ACB 터미널	모선 적용 규격	수평형										수직형				
				수평형					수직형					수직형				
				40°C	45°C	50°C	55°C	60°C	40°C	45°C	50°C	55°C	60°C	40°C	45°C	50°C	55°C	60°C
2000AF AN - D AS - D	200A	15t×50×1ea	5t×30×2ea	200A	200A	200A	200A	200A	200A	200A	200A	200A	200A	200A	200A	200A	200A	200A
	400A			400A	400A	400A	400A	400A	400A	400A	400A	400A	400A	400A	400A	400A	400A	
	630A			630A	630A	630A	630A	630A	630A	630A	630A	630A	630A	630A	630A	630A	630A	
	800A			800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	
	1000A			1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	
	1250A			1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	
4000AF AN - E AS - E	800A	20t×75×1ea	5t×50×2ea	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A
	1000A			1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A		
	1250A			1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A	1250A		
	1600A			1600A	1600A	1600A	1600A	1600A	1600A	1600A	1600A	1600A	1600A	1600A	1600A	1600A		
	2000A			2000A	2000A	2000A	2000A	2000A	2000A	2000A	2000A	2000A	2000A	2000A	2000A	2000A		
	2500A			2500A	2500A	2400A	2300A	2500A	2500A	2500A	2450A	2350A	2500A	2500A	2450A	2350A		
5000AF AS - F	4000A	20t×125×2ea	10t×100×4ea	3800A	3800A	3400A	3200A	3000A	—	—	—	—	—	—	—	—	—	
	5000A			5000A	4900A	4800A	4700A	5000A	5000A	4950A	4850A	4750A	5000A	5000A	4950A	4850A		
	6300A			6300A	6200A	6100A	6000A	6300A	6300A	6250A	6152A	6050A	6300A	6300A	6250A	6152A	6050A	
	8000A			8000A	7500A	7000A	6500A	—	—	—	—	—	—	—	—	—		
	10000A			10000A	9500A	9000A	8500A	10000A	10000A	9900A	9800A	9700A	10000A	10000A	9950A	9850A		
	12500A			12500A	12000A	11500A	11000A	12500A	12500A	12400A	12300A	12200A	12500A	12500A	12450A	12350A		

B. Service condition

2. Altitude and Insulation clearance

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 I _n	0.99 x I _n	0.96 x I _n	0.94 x I _n

Insulation clearance

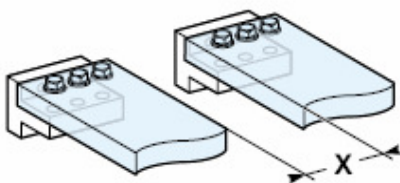
When drawing the electric power supply panel, please keep the distance of Insulation clearance between Susol ACB and panel as listed in table.

Type		A	B
Fixed	N/S	50	150
	H	50	150
Draw out	N/S	50	150 **
	H	50	0

** Option installation : "0"

Minimum insulation clearance

The dimension of all charging parts should be over the minimum insulation clearance.

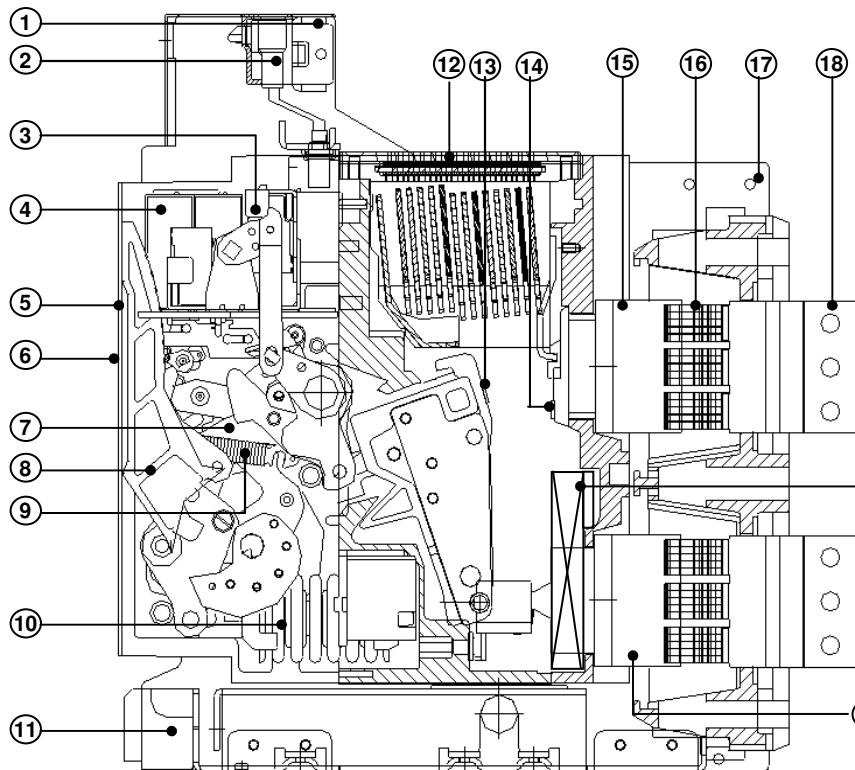


Insulating voltage (U _i)	Min. insulation clearance (X min)
600V	8 mm
1000V	14 mm

C. Structure and Operation

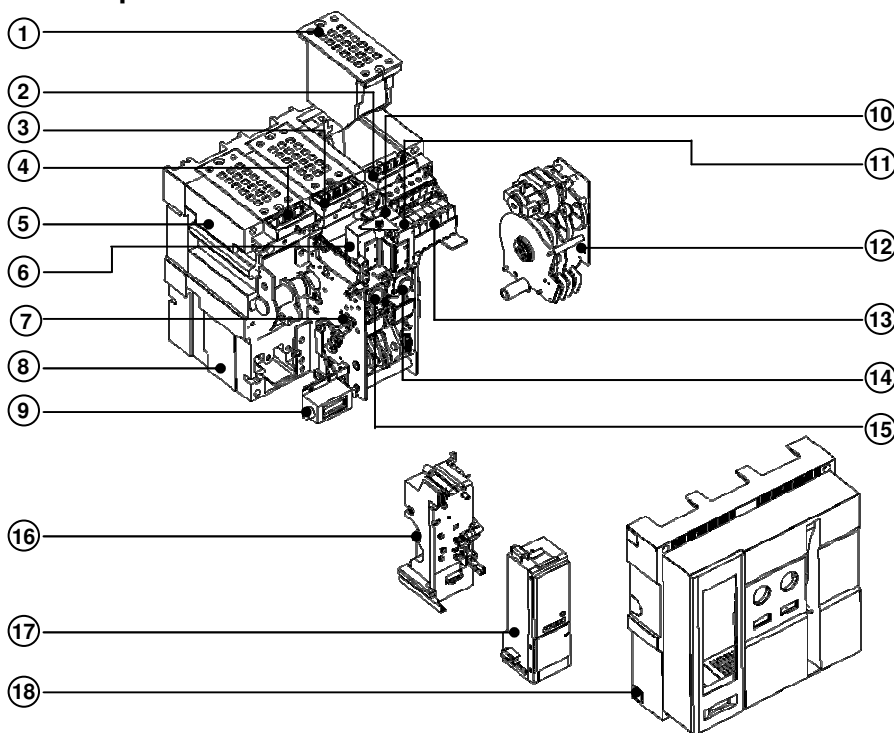
1. Internal structure and Components

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

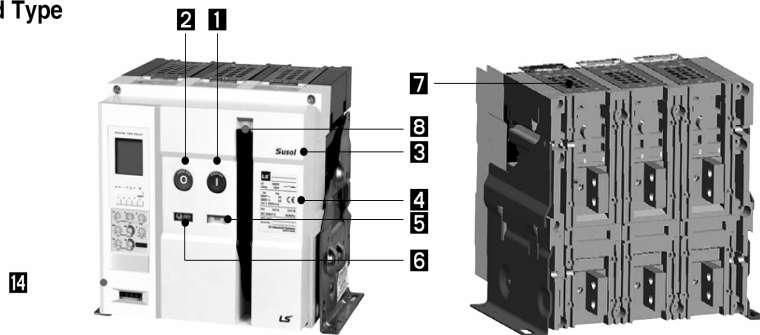


- ① Arc chute
- ② Aux. switch control terminal
- ③ Control power supply terminal
- ④ OCR control terminal
- ⑤ Carrying grip
- ⑥ Trip coil
- ⑦ Mechanism
- ⑧ Main body
- ⑨ Counter
- ⑩ UVT coil
- ⑪ Closing Coil
- ⑫ Motor Ass'y
- ⑬ Aux. switch
- ⑭ ON button
- ⑮ OFF button
- ⑯ MTD Base
- ⑰ OCR
- ⑱ Cover

C. Structure and Operation

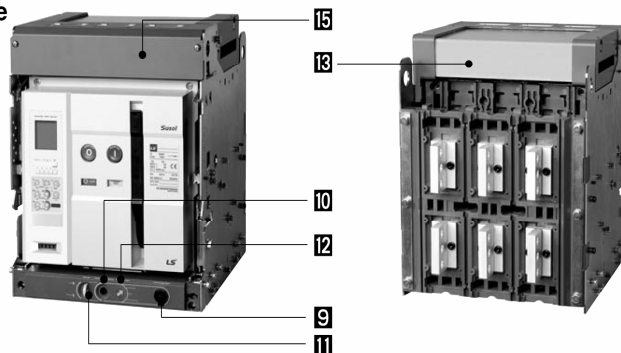
1. Internal structure and Components

■ Fixed Type



- 1** ON button
- 2** OFF button
- 3** Series name
- 4** Rated name plate
- 5** Charge Discharge indicator
- 6** ON/OFF indicator
- 7** Arc box

■ Draw-out Type



- 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.



Fig.1 Horizontal type



Fig. 2 Vertical type



Fig.3 Horizontal/Vertical type

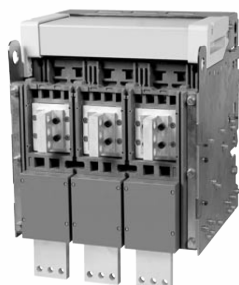


Fig.4 Vertical/plane type

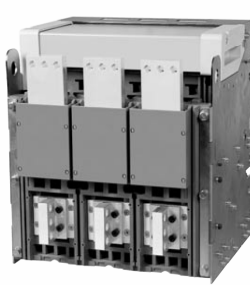


Fig.5 Plane/Vertical type

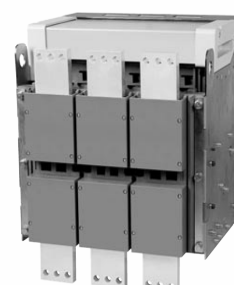


Fig.6 Plane type

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 (I_n) (e.g. Motor takes in 7~8times of I_n 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 electro-dynamics 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. U_e)
- 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.

D. Types and Ratings

1. Type of Susol Series

Susol Series

Model	M1	D1	D1	D1	AX	SC1	U1	B	C
AH-10D3-10J	Motor power supply MA Motor Not Provided M1 AC/DC 100V ~ 130V M2 AC/DC 200V ~ 280V M3 DC 125V M4 DC 24V ~ 30V M5 DC 48V ~ 60V M6 AC 380V ~ 415V M7 AC 440V ~ 480V M8 AC 48V	Closing power supply D0 C.C Not Provided D1 AC/DC 100V ~ 130V D2 AC/DC 200V ~ 280V D3 DC 125V D4 DC 24V ~ 30V D5 DC 48V ~ 60V D6 AC 380V ~ 480V D7 AC 48V	Trip power supply D0 SHT Not Provided D1 AC/DC 100V ~ 130V D2 AC/DC 200V ~ 280V D3 DC 125V D4 DC 24V ~ 30V D5 DC 48V ~ 60V D6 AC 380V ~ 480V D7 AC 48V	Auxcontact & Charging types AX Low capacity OFF charge 3a3b AC Low capacity ON charge 3a3b BX Low capacity OFF charge 5a5b BC Low capacity ON charge 5a5b HX High capacity OFF charge 5a5b HC High capacity ON charge 5a5b CC Low capacity ON charge 6a6b JC High capacity ON charge 6a6b	OCR	UVT	OPTION		
	10 AMPARE FRAME	Frame sizes & Phase array	3 No. of pole	10 Rated current (GT SPEC.)	J Installation				
	06 630AF	D : 630-2000AF 3/4P Standard type RST(N) W : 630-2000AF 4P Reverse phase type NRST	3 : 3-poles (D) 4 : 4-poles (D,W)	00 OCR & CT Not Provided 02 200A 04 400A 06 630A 08 800A 10 1000A 13 1250A 16 1600A 20 2000A	Draw-out type				
	08 800AF				J Manual connection A Automatic connection Fixed type				
	10 1000AF				H Top/Bottom horizontal type V Top/Bottom vertical type M Top horizontal/Bottom vertical type N Top vertical/Bottom horizontal type P Top/Bottom horizontal type				
	13 1250AF								
	16 1600AF								
	20 2000AF								
	25 2500AF	E : 630-4000AF 3/4P Standard type RST(N) X : 630-4000AF 4P Reverse phase type NRST	3 : 3-poles (E) 4 : 4-poles (E,X)						
	32 3200AF								
	40 4000AF								
		G : 4000/5000/6300AF 3/4P Standard type RST(N) Z : 4000/5000/6300AF 4P Reverse phase type NRST	3 : 3-poles (G) 4 : 4-poles (G,Z)						
	40 4000AF								
	50 5000AF								
	63 6300AF								

*UVT Delay is usable from AC/DC 48V

D. Types and Ratings

1. Type of Metasol Series

Metasol Series

AS-10D3-10J	M1 Motor power supply		D1 Closing power supply		D1 Trip power supply		AX Auxcontact & Charging types		NG0 OCR		U1 UVT		B OPTION	
	MA	Motor Not Provided	D0	C,C Not Provided	D0	SHT Not Provided	AX	Low capacity OFF charge 3a3b	OCR		UVT Not Provided			
	M1	AC/DC 100V ~ 130V	D1	AC/DC 100V ~ 130V	D1	AC/DC 100V ~ 130V	AC	Low capacity ON charge 3a3b			U1		AC/DC 100V ~ 130V	
	M2	AC/DC 200V ~ 280V	D2	AC/DC 200V ~ 280V	D2	AC/DC 200V ~ 250V	BX	Low capacity OFF charge 5a5b			U2		AC/DC 200V ~ 250V	
	M3	DC 125V	D3	DC 125V	D3	DC 125V	BC	Low capacity ON charge 5a5b			U3		DC 125V	
	M4	DC 24V ~ 30V	D4	DC 24V ~ 30V	D4	DC 24V ~ 30V	HX	High capacity OFF charg 5a5b			U4		DC 24V ~ 30V	
	M5	DC 48V ~ 60V	D5	DC 48V ~ 60V	D5	DC 48V ~ 60V	HC	High capacity ON charge 5a5b			U5		DC 48V ~ 60V	
	M6	AC 380V ~ 415V	D6	AC 380V ~ 480V	D6	AC 380V ~ 480V	CC	Low capacity ON charge 6a6b			U6		AC 380V ~ 480V	
	M7	AC 440V ~ 480V	D7	AC 48V	D7	AC 48V	JC	High capacity ON charge 6a6b			U7		AC 48V	

*UVT Delay is usable from AC/DC 48V

AS Metasol	10 AMPARE FRAME		D Frame sizes & Phase array		3 No. of pole		10 Rated current (GT SPEC.)		J Installation	
	-	-	D : 630-2000AF 3/4P Standard type RST(N) W : 630-2000AF 4P Reverse phase type NRST		3 : 3-poles (D) 4 : 4-poles (D,W)		00 OCR & CT Not Provided		Draw-out type	
	06	630AF					02 200A		J Manual connection	
	08	800AF					04 400A		A Automatic connection	
	10	1000AF					06 630A		Fixed type	
	13	1250AF					08 800A		H Top/Bottom horizontal type	
	16	1600AF					10 1000A		V Top/Bottom vertical type	
	20	2000AF					13 1250A		M Top horizontal/Bottom vertical type	
	20	2000AF					16 1600A		N Top vertical/Bottom horizontal type	
20	2000AF					20 2000A		P Top/Bottom horizontal type		

AS-10D3-10J	AMPARE FRAME		D		3		10		J		Option		Type name	
	20	2000AF	E : 2000~4000AF 3/4P Standard type RST(N) X : 2000~4000AF 4P Reverse phase type NRST		3 : 3-poles (E) 4 : 4-poles (E,X)		00 OCR & CT Not Provided		AL AL1+ MFB		H1		AC/DC 100V ~ 130V	
	25	2500AF					06 630		A1 AL1+ MFB+ FES(AC110~130V) * AC private use		H2		AC/DC 200V ~ 280V	
	32	3200AF					08 800		A2 AL1+ AL2+ MFB		H3		DC 125V	
	40	4000AF					10 1000		A3 AL1+ MFB+ FES(DC110~125V) * DC private use		H4		DC 24V ~ 30V	
	40	4000AF					1250		A4 AL1+ MFB+ FES(AC200~280V) * AC private use		H5		DC 48V ~ 60V	
	40	4000AF					1600		A5 AL1+ MFB+ Auto Reset		H6		AC 380V ~ 480V	
	40	4000AF					2000		A6 AL1+ AL2+ MFB+ Auto Reset		H7		AC 48V	
	40	4000AF					2500A		A7 AL1+ MFB+ FES(AC110~125V) + Auto Reset *DC private use					
	40	4000AF					2000A		A8 AL1+ MFB+ FES(AC200~280V) + Auto Reset *AC private use					
	40	4000AF					3200A		A9 AL1+ MFB+ FES(AC110~130V) + Auto Reset *AC private use					
	40	4000AF					4000A		C COUNTER					
	40	4000AF					OCR & CT Not Provided		S CS2					
	40	4000AF					4000A		B On/Off Button lock					
	40	4000AF					5000A		M MI					
	40	4000AF					OCR & CT Not Provided		D D1 or MOC					
	40	4000AF					4000A		K K1					
	40	4000AF					5000A		K2 K2					
	40	4000AF					6300A		K3 K3					
	40	4000AF					6300A		R RCS					
40	4000AF					6300A		T TM						
40	4000AF					6300A		H SHF2						

*UVT Delay is usable from AC/DC 48V

*AN Type not applied (TROU MODULE not applied)

*AN Type not applied

*AN Type not applied (TROU MODULE not applied)

*AN Type not applied

*AN Type not applied (TROU MODULE not applied)

*AN Type not applied

*AN Type not applied (TROU MODULE not applied)

*AN Type not applied

D. Types and Ratings

1. Type of Metasol Series

Metasol Series

AN-10D3-10J		M1		D1		D1		AX		NG0		U1		B		C	
		Motor power supply		Closing power supply		Trip power supply		Auxcontact & Charging types		OCR		UVT				OPTION	
MA Motor Not Provided		D0 C.C Not Provided		D0 S.H.T Not Provided		AX Low capacity OFF charge 3a3b		U0 UVT Not Provided									
M1 AC/DC 100V ~ 130V		D1 AC/DC 100V ~ 130V		D1 AC/DC 100V ~ 130V		AC Low capacity ON charge 3a3b		U1 AC/DC 100V ~ 130V									
M2 AC/DC 200V ~ 250V		D2 AC/DC 200V ~ 250V		D2 AC/DC 200V ~ 250V		BX Low capacity OFF charge 5a5b		U2 AC/DC 200V ~ 250V									
M3 DC 125V		D3 DC 125V		D3 DC 125V		BC Low capacity ON charge 5a5b		U3 DC 125V									
M4 DC 24V ~ 30V		D4 DC 24V ~ 30V		D4 DC 24V ~ 30V		HX High capacity OFF charge 5a5b		U4 DC 24V ~ 30V									
M5 DC 48V ~ 60V		D5 DC 48V ~ 60V		D5 DC 48V ~ 60V		HC High capacity ON charge 5a5b		U5 DC 48V ~ 60V									
M6 AC 380V ~ 415V		D6 AC 380V ~ 480V		D6 AC 380V ~ 480V		CC Low capacity ON charge 6a6b		U6 AC 380V ~ 480V									
M7 AC 440V ~ 480V		D7 AC 48V		D7 AC 48V		JC High capacity ON charge 6a6b		U7 AC 48V									
M8 AC 48V																	

*UVT Delay is usable from AC/DC 48V

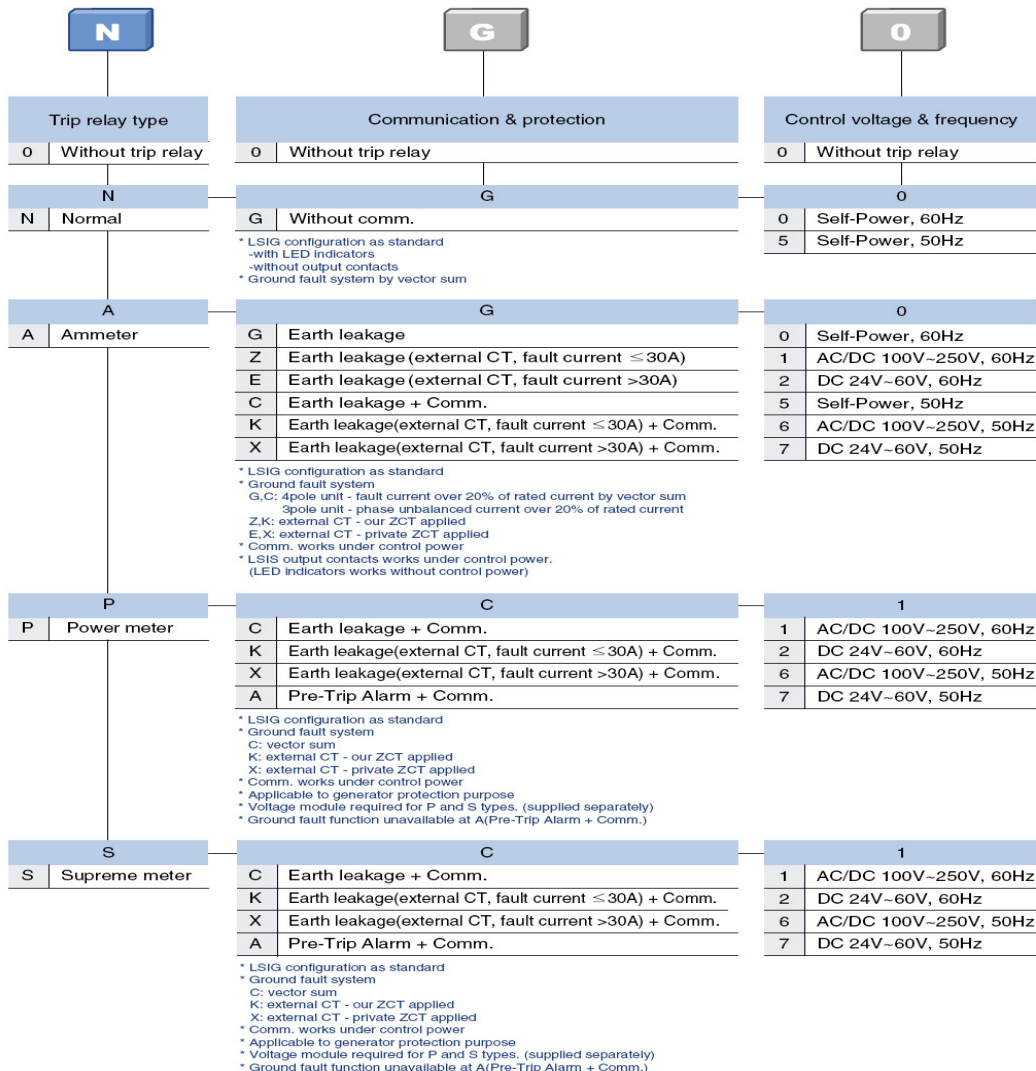
AN		10		3		10		J	
Metasol		AMPARE FRAME		No. of pole		Rated current (CT SPEC.)		Installation	
						00 OCR & CT Not Provided		Draw-out type	
06		630AF		3 : 3poles(D) 4 : 4poles(D,W)		02 200A		J Manual connection	
08		800AF				04 400A		A Automatic connection	
10		1000AF				06 630A		Fixed type	
13		1250AF				08 800A		H Top/Bottom horizontal type	
16		1600AF				10 1000A		V Top/Bottom vertical type	
						13 1250A		M Top horizontal/Bottom horizontal type	
						16 1600A		N Top vertical/Bottom horizontal type	
								P Top/Bottom horizontal type	

				OCR & CT Not Provided	
20		2000AF		00	
25		2500AF		06 630	
32		3200AF		08 800	
				10 1000	
				13 1250	
				16 1600	
				20 2000	
				25 2500A	
				32 3200A	

D. Types and Ratings

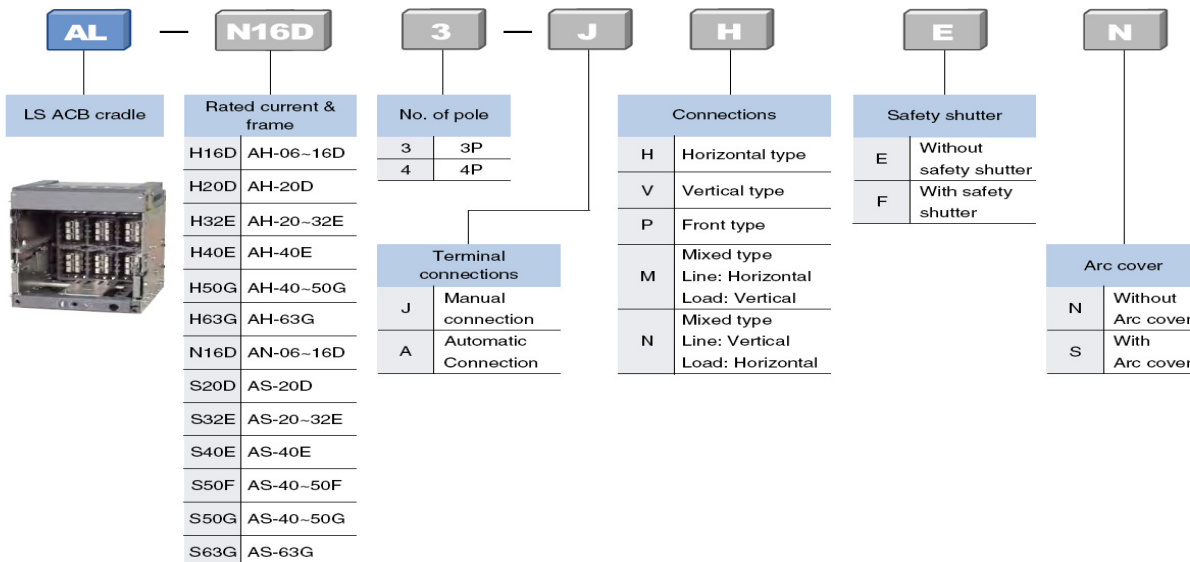
2. Type of OCR/Cradle Series

OCR



Note) The functions like Metering, Communication, ZSI, Remote Reset and DO control are not available only under Self-Power condition.

Cradle



D. Types and Ratings

3. Ratings

■ Ratings of Susol Series

Type	Susol				Susol				Susol	
	AH-06D	AH-08D	AH-10D	AH-13D	AH-16D	AH-20D	AH-25E	AH-32E	AH-50G	AH-63G
Ampere frame (AF)	630	800	1000	1250	1600	2000	2500	3200	5000	6300
Rated current (A)	200	400	630	1000	1600	2000	2500	3200	5000	6300
Rated current (A) (In max)	400	800	1250	1600	2000	2500	3200	4000	5000	6300
Rated current (A) (In max) at 40°C	400	800	1250	1600	2000	2500	3200	4000	5000	6300
Setting current (A)*	(0.4 ~ 1.0) × In max									
Rated current of neutral pole (A)	(0.4 ~ 1.0) × In max									
Rated insulation voltage (V) (Ui)	1000									
Rated operating voltage (V) (Ue)	690									
Rated impulse withstand voltage (kV)(Uimp)	12									
Frequency (Hz)	50/60									
Number of poles (P)	3, 4									
Rated breaking capacity (kA sym) (Icu)	85									
AC 50/60Hz	85									
	65									
Rated service breaking capacity (kA) (Ics) ... % × Icu	100%									
Rated making capacity (kA peak) (Icm)	187									
AC 50/60Hz	187									
	143									
Rated short-time withstand current (kA) (Icw)	65									
	60									
	50									
Operating time (ms)	40									
	80									
Life cycle (time)	20,000									
	30,000									
	5,000									
	10,000									
Connections**	●	○	○	○	○	○	●	○	○	○
	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○
Weight (kg) (3P/4P)	63/74	70/85	87/103	85/101	104/147	102/145	58/70	63/100	61/98	186/230
Fixed type	32/42	38/47	44/55	44/55	42/53	430×334×375	430×419×375	300×300×295	300×385×295	460×785×375
External dimensions (mm) (H×W×D)	430×334×375	430×419×375	300×300×295	300×385×295	430×527×375	460×1015×375	300×751×295	300×981×295	N. A. P. S type	KEMA / KERI / CE
Tripping relay	N. A. P. S type									
Certificate & Approval	KEMA / KERI / CE									

* Refer to trip relay specification. ** ● : Standard, ○ : Option

D. Types and Ratings

3. Ratings

■ Ratings of Metasol AN,AS Series

Type	Metasol								Metasol		Metasol			
	AN-06D	AN-08D	AN-10D	AN-13D	AN-16D	AS-20D	AS-20E	AS-25E	AS-32E	AS-40E	AS-50F	AS-40G	AS-63G	
Amperage frame (AF)	630	800	1000	1250	1600	2000	2000	2500	3200	4000	4000	4000	6300	
Rated current(A) (In max)	200	400	630	1000	1600	2000	2000	2500	3200	4000	4000	4000	6300	
Setting current (A)*	630	800	(0.4 - 1.0) × In max								(0.4 - 1.0) × In max		(0.4 - 1.0) × In max	
Rated current of neutral pole (A)	400	400	1000	1000	1600	2000	2000	2500	3200	4000	4000	4000	6300	
Rated insulation voltage(V) (Ui)	400	630	800	1000	1600	2000	2000	2500	3200	4000	4000	4000	6300	
Rated operating voltage(V) (Ue)	630	800	1000	1250	1600	2000	2000	2500	3200	4000	4000	4000	6300	
Rated impulse withstand voltage (kV)(Uimp)	12	12	12	12	12	12	12	12	12	12	12	12	12	
Frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60	50/60	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	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	
Rated breaking capacity (kA sym)	65	65	70	70	70	70	70	70	70	70	70	70	70	
AC 50/60Hz (Icu)	65	65	70	70	70	70	70	70	70	70	70	70	70	
Rated service breaking capacity (kA) (Ics)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
AC 50/60Hz (Icm)	143	143	154	154	154	154	154	154	154	154	154	154	154	
AC 50/60Hz (Ics C 4620)	105	105	143	143	143	143	143	143	143	143	143	143	143	
Rated short-time withstand current (kA) (Icw)	50	50	65	65	65	65	65	65	65	65	65	65	65	
Operating time (ms)	1 sec	2 sec	3 sec	40	80	20,000	30,000	5,000	10,000	10,000	40	80	100	
Life cycle (time)	Maximum total breaking time		40	80	20,000	30,000	5,000	10,000	10,000	40	80	10,000	10,000	
Connections **	Maximum closing time		80	80	20,000	30,000	5,000	10,000	10,000	40	80	10,000	10,000	
	Without maintenance		20,000	30,000	5,000	10,000	10,000	10,000	10,000	40	80	10,000	10,000	
Weight (kg) (3P/4P)	With maintenance		5,000	10,000	10,000	10,000	10,000	10,000	10,000	40	80	10,000	10,000	
	With maintenance		10,000	10,000	10,000	10,000	10,000	10,000	10,000	40	80	10,000	10,000	
External dimensions (mm) (H×W×D)	Without maintenance		40	80	20,000	30,000	5,000	10,000	10,000	40	80	10,000	10,000	
	With maintenance		40	80	20,000	30,000	5,000	10,000	10,000	40	80	10,000	10,000	
Trip relay Certificate & Approval	Horizontal connection		●	○	○	○	○	○	○	○	○	○	○	
	Vertical connection		○	○	○	○	○	○	○	○	○	○	○	
Fixed type	Front connection		○	○	○	○	○	○	○	○	○	○	○	
	Mixed connection		○	○	○	○	○	○	○	○	○	○	○	
Draw-out type (Main body (With cradle) Cradle only)	Motor charging type		○	○	○	○	○	○	○	○	○	○	○	
	Manual charging type		○	○	○	○	○	○	○	○	○	○	○	
Draw-out type (3P/4P)	Motor charging type		○	○	○	○	○	○	○	○	○	○	○	
	Manual charging type		○	○	○	○	○	○	○	○	○	○	○	
Fixed type	Motor charging type		○	○	○	○	○	○	○	○	○	○	○	
	Manual charging type		○	○	○	○	○	○	○	○	○	○	○	
Draw-out type (H×W×D)	Motor charging type		63/74	70/85	87/103	87/103	87/103	87/103	87/103	87/103	104/147	145/173	181/223	
	Manual charging type		61/72	68/83	85/101	85/101	85/101	85/101	85/101	85/101	102/145	143/171	179/221	
Fixed type	Motor charging type		29/32	33/40	33/40	33/40	33/40	33/40	33/40	33/40	58/70	78/90	97/117	
	Manual charging type		34/44	38/47	38/47	38/47	38/47	38/47	38/47	38/47	63/100	76/94	98/123	
Draw-out type	Motor charging type		32/42	36/45	36/45	36/45	36/45	36/45	36/45	36/45	74/92	96/121	101/128	
	Manual charging type		430×334×375	430×412×375	430×412×375	430×412×375	430×412×375	430×412×375	430×412×375	430×412×375	460×785×375	460×785×375	460×785×375	
Fixed type	Motor charging type		430×419×375	430×527×375	430×527×375	430×527×375	430×527×375	430×527×375	430×527×375	430×527×375	460×1015×375	460×1015×375	460×1015×375	
	Manual charging type		300×300×295	300×378×295	300×378×295	300×378×295	300×378×295	300×378×295	300×378×295	300×378×295	300×751×295	300×751×295	300×751×295	
Draw-out type	Motor charging type		300×385×295	300×493×295	300×493×295	300×493×295	300×493×295	300×493×295	300×493×295	300×493×295	300×981×295	300×981×295	300×981×295	
	Manual charging type		N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	
Fixed type	Motor charging type		N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	N, A, P type	
	Manual charging type		KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	KEMA / KERI / CE	

* Refer to trip relay specification. ** ● Standard, ○ Option

E. Weight & Dimension

1. Weight

1) AH Type (Susol ACB)

Unit : kg

Type	2000AF				4000AF				6300AF	
	1600A		2000A		3200A		4000A (Fork-type)			
	3P	4p	3P	4P	3P	4P	3P	4P	3P	4P
Fixed	34	44	38	47	44	55	63	100	103	130
Draw-out (With cradle)	63	74	70	85	87	103	104	147	186	230
Cradle	29	32	33	40	44	50	58	70	102	124

2) AN,AS Type (Metasol ACB)

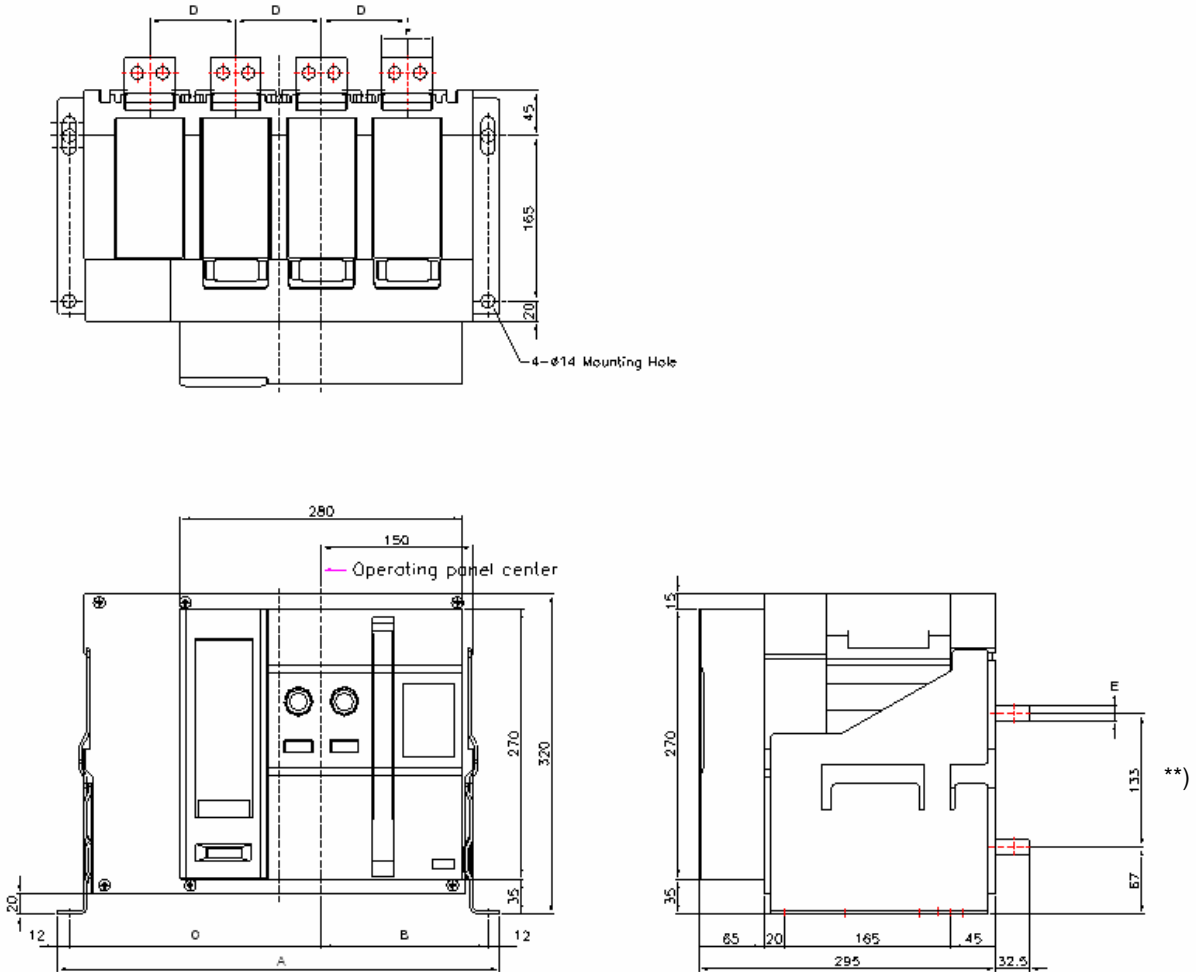
Unit : kg

Type	2000AF				4000AF				5000AF		6300AF	
	1600A		2000A		3200A		4000A (Fork-type)					
	3P	4p	3P	4P	3P	4P	3P	4P	3P	4P	3P	4P
Fixed	34	44	38	47	44	55	63	100	76	94	103	130
Draw-out (With cradle)	63	74	70	85	87	103	104	147	145	173	186	230
Cradle	29	32	33	40	44	50	58	70	78	90	102	124

E. Weight & Dimension

2. Dimension

■ Fixed type



** See the catalogue distance of pole to pole(over 4000A) and dimension of F/G frame.

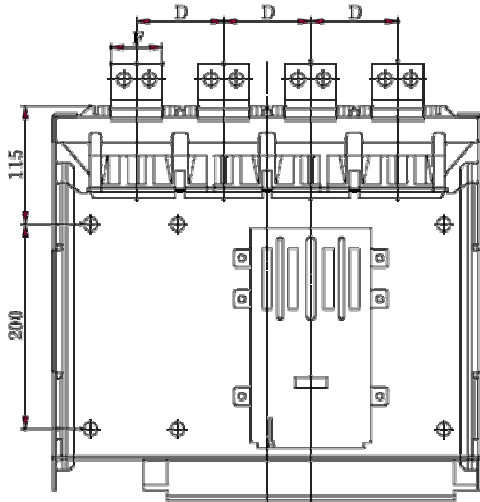
구분	2000AF 1600A 3P	2000AF 1600A 4P	4000AF 3200A 3P	4000AF 3200A 4P	4000AF 4000A 3P	4000AF 4000A 4P
A	354	439	432	547	432	547
B	165	165	204	204	204	204
C	165	250	204	319	204	319
D	85	85	115	115	140	140
E	15	15	20	20	12.5*2,10	12.5*2,10
F	50	50	75	75	100	100

구분	5000AF 5000A 3P	5000AF 5000A 4P	6300AF 4/5000A 3P	6300AF 4/5000A 4P	6300AF 6300A 3P	6300AF 6300A 4P
A	649	819	805	1035	805	1035
B	165	165	204	204	204	204
C	460	630	577	807	577	807
D	190	190	244	244	244	244
E	20	20	20	20	20	20
F	125	125	125	125	150	150

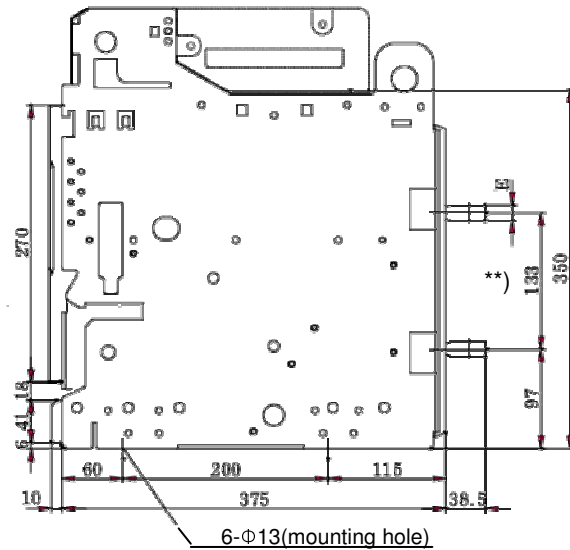
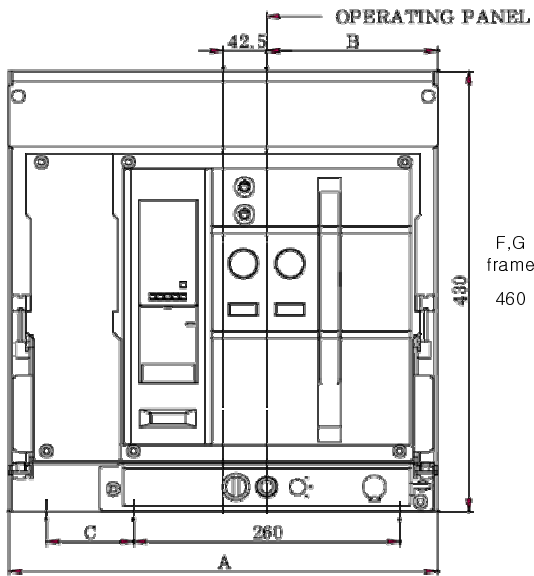
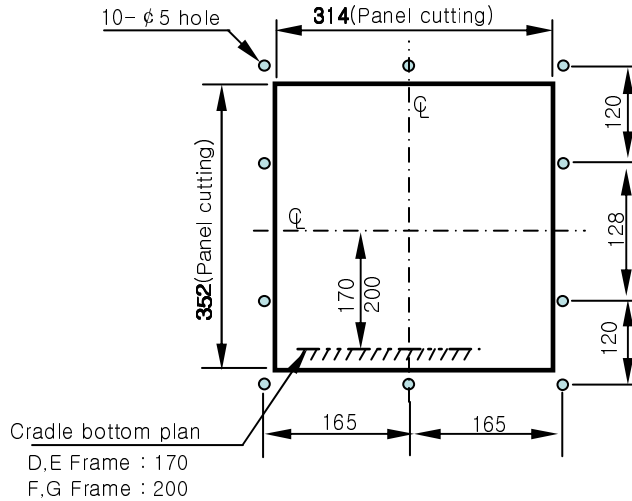
E. Weight & Dimension

2. Dimension

■ Draw-out type



■ Panel cut



** See the catalogue distance of pole to pole(over 4000A).

구분	2000AF 1600A 3P	2000AF 1600A 4P	4000AF 3200A 3P	4000AF 3200A 4P	4000AF 4000A 3P	4000AF 4000A 4P
A	334	419	785	1015	785	1015
B	167	167	206	206	206	206
C	-	85	-	115	-	115
D	85	85	115	115	140	140
E	15	15	20	20	12.5*2,10	12.5*2,10
F	50	50	75	75	100	100

구분	5000AF 5000A 3P	5000AF 5000A 4P	6300AF 4/5000A 3P	6300AF 4/5000A 4P	6300AF 6300A 3P	6300AF 6300A 4P
A	629	799	785	1015	785	1015
B	167	167	206	206	206	206
C	35	205	113	343	113	343
D	190	190	244	244	244	244
E	20	20	20	20	20	20
F	125	125	125	125	150	150

F. Unpacking

1. Receiving

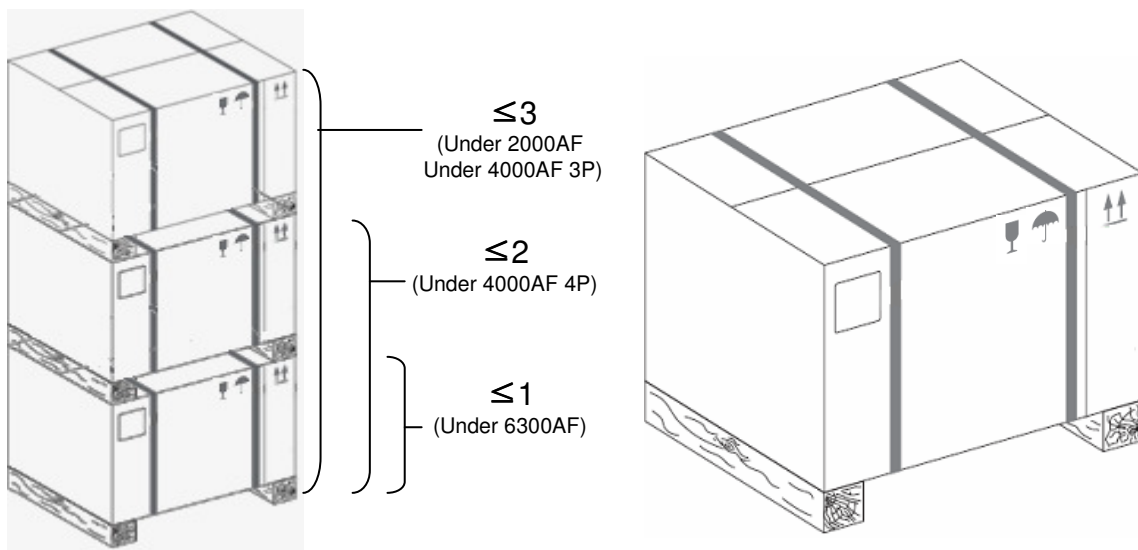
■ Receiving

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°C 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.



F. 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°C 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.

G. 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.

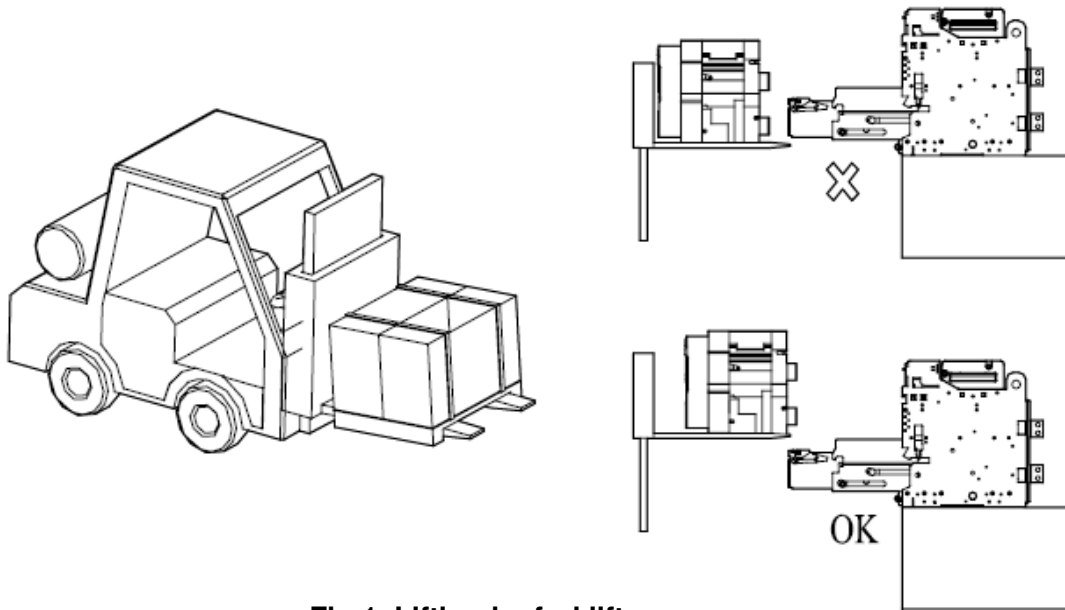


Fig 1. Lifting by forklift

-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.

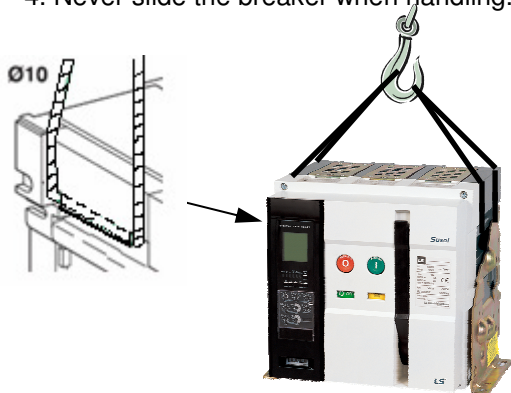


Fig. 2. Handling method of Fixed type

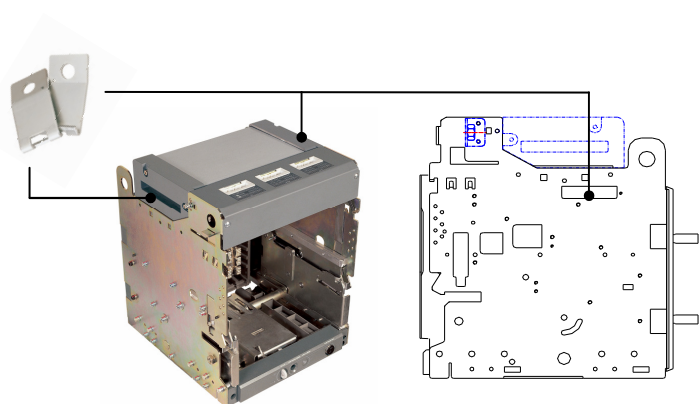


Fig. 3. Handling method of Draw-out type

G. Handling and Storage

2. Storage

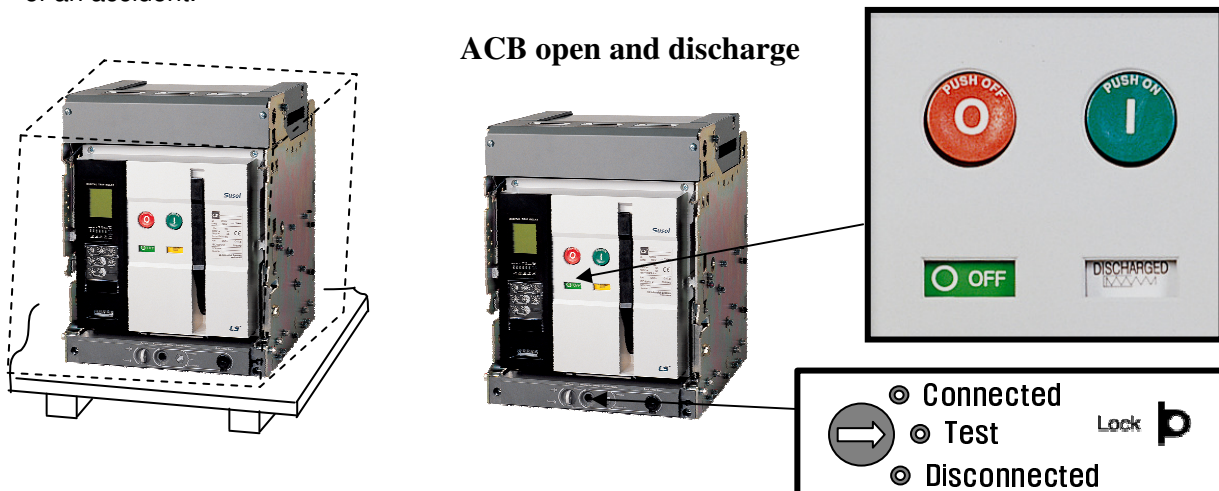
■ Precaution of Storage

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°C 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.

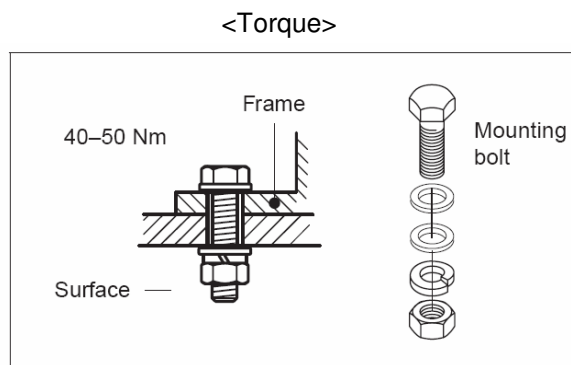
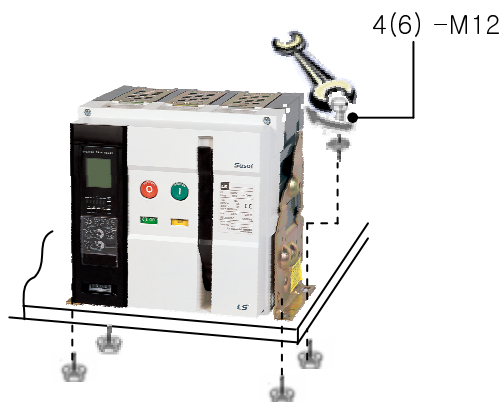


H. Installation

1. Fixed type

■ Installation of Fixed type

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

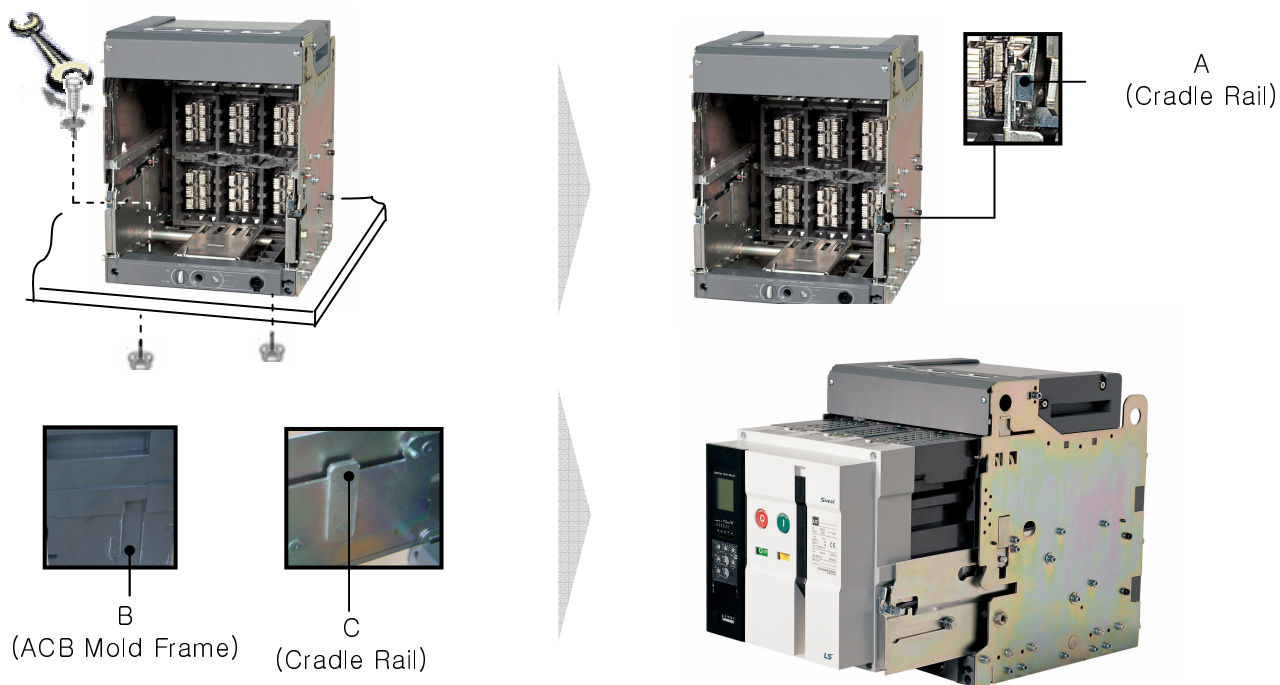


2. Draw-out type

■ 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.

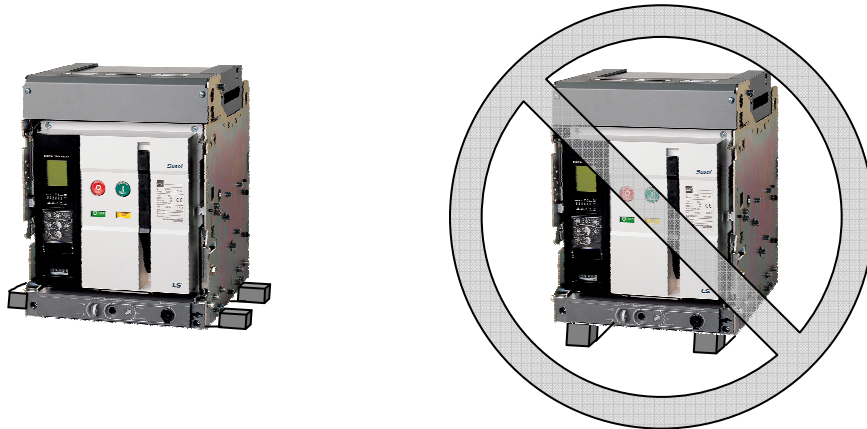


H. Installation

3. Precaution and Installation of insulation barrier

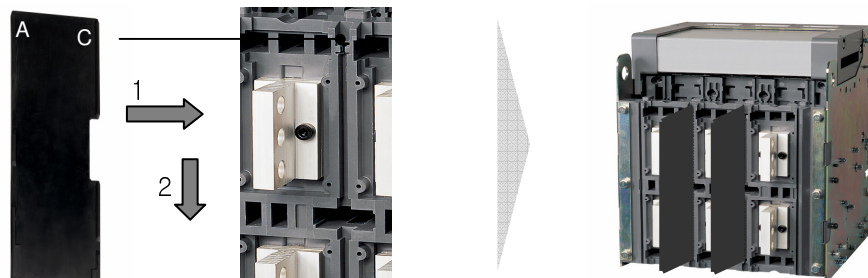
■ Precaution

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.



■ Installation of insulation barrier

1. Insert insulating barriers between the phases after installing of a circuit breaker for the safety. (option)
2. In case of draw-out type, direction of insertion is "C".
3. In case of fixed type, direction of insertion is "A".



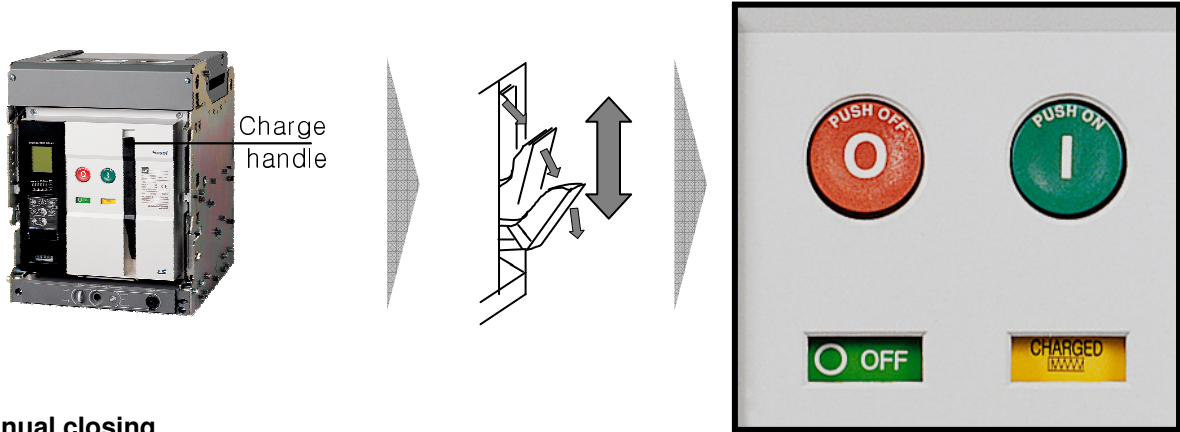
I. Operation

1. Manual Operation

Caution : Before opening or closing the breaker equipped with an under voltage tripping device, control voltage should be applied.

Manual charging

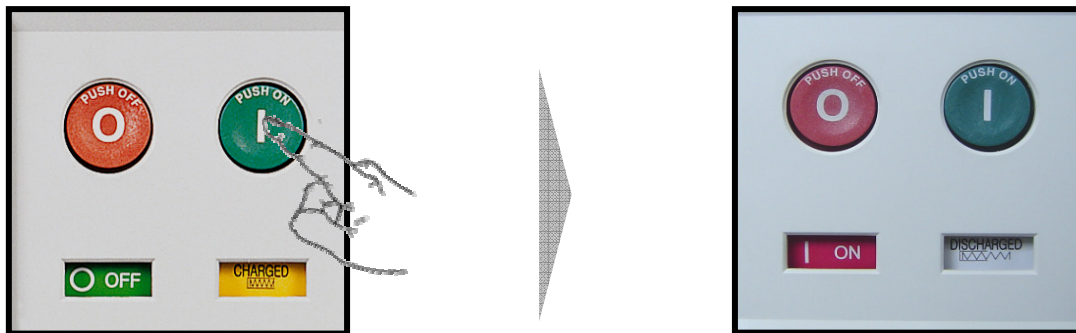
1. Charge the handle 7~ 8 times with full strokes.
2. When the closing spring is completely charged, the charging indicator shows "CHARGED".



ACB off and charged

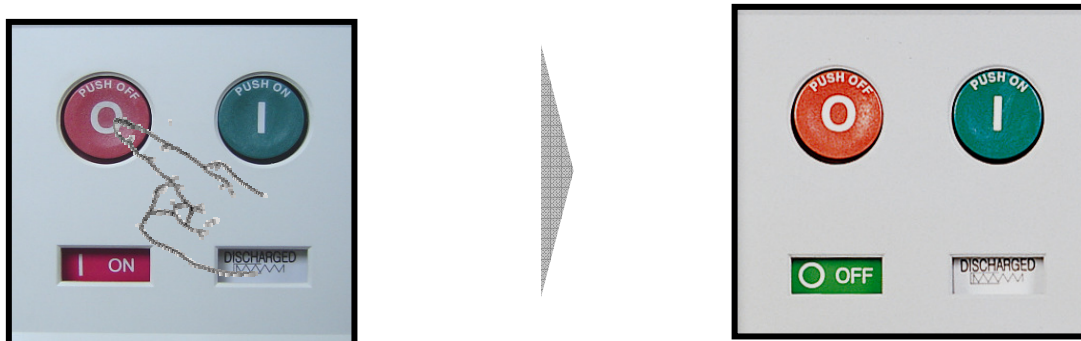
Manual closing

1. Push ON button.
2. The breaker will be closed.
3. The ON/OFF indicator shows "ON" and the charging indicator shows "DISCHARGED".



Manual tripping

1. Push the OFF button and breaker will be tripped.
2. The ON/OFF indicator shows "OFF".



I. Operation

2. Electrical operation

■ Electrical operation

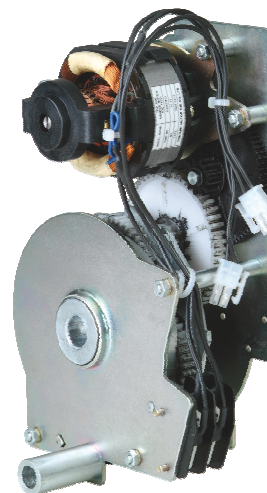
Closing operation is done by charging the closing spring from remote control. If pushing trip button, closing spring is automatically charged by a geared motor and a circuit breaker is closed by closing button.

■ 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.

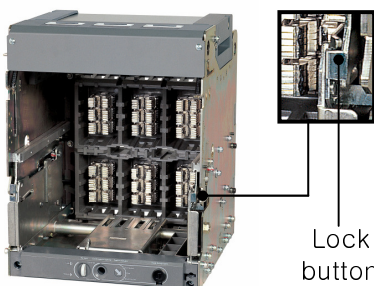
■ Electrical trip

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



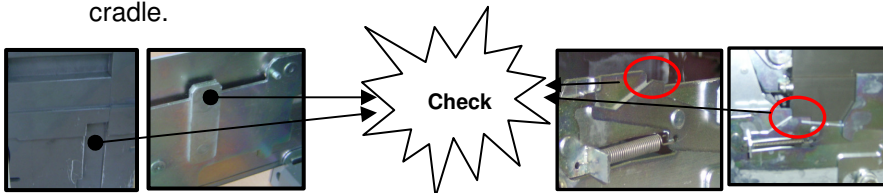
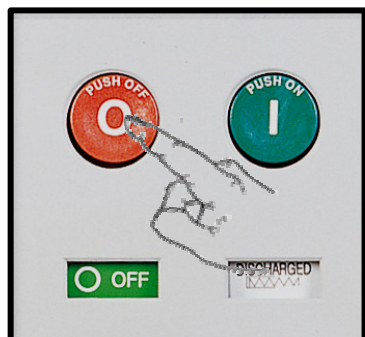
1. Pull the extension rails of cradle forward



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

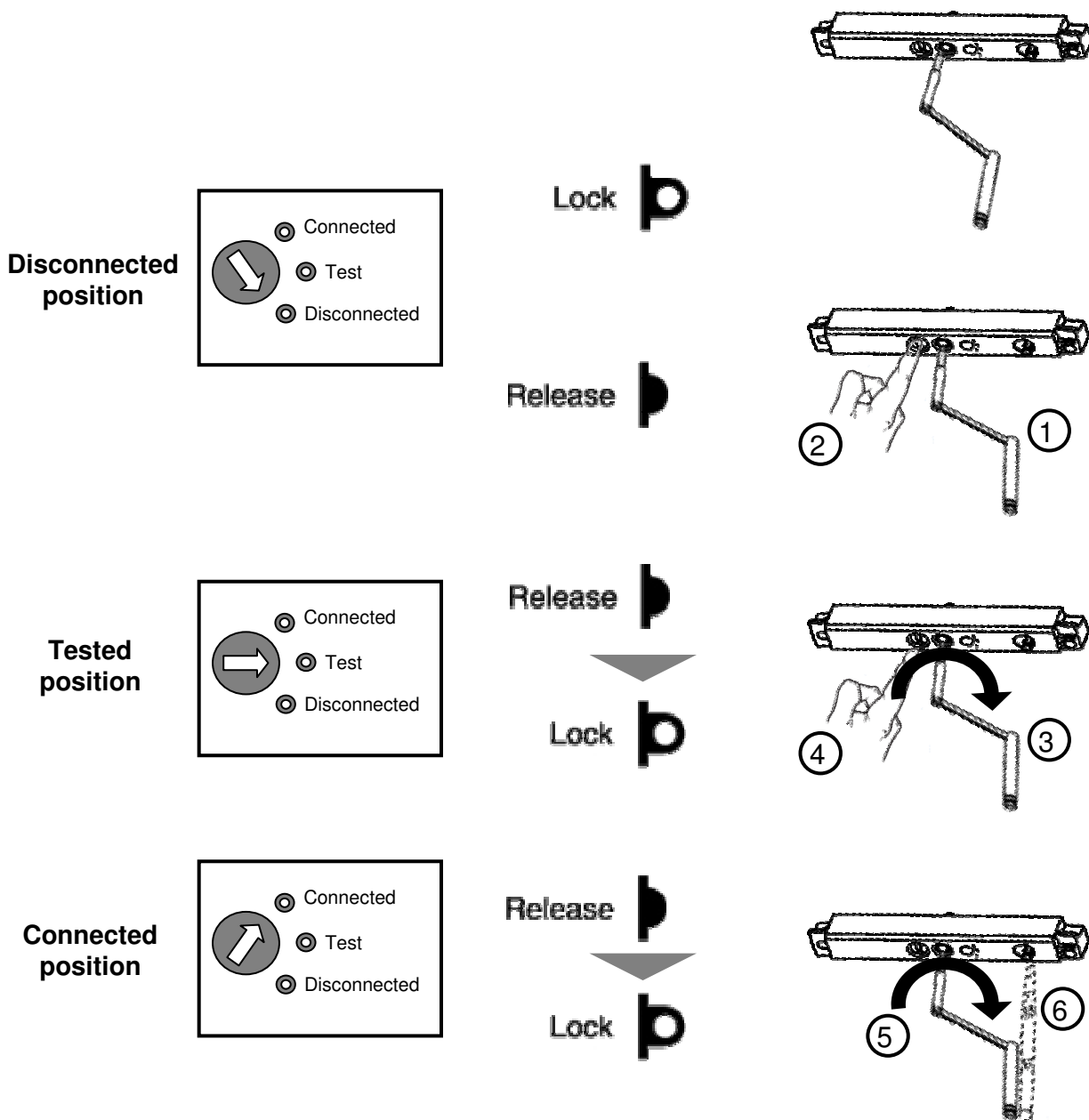
1. Operating handle of cradle only can be inserted when pushing OFF button.
2. If locking device for draw in/out protrudes, stop handle operation and move to next procedure as it indicates the complete operation of ongoing process.

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.

I. 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.



I. Operation

4. Draw-out operation

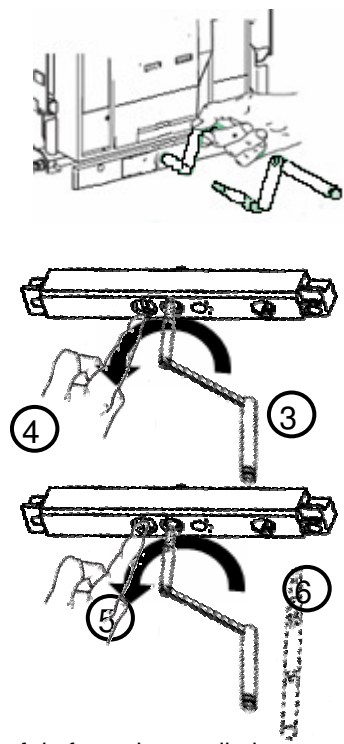
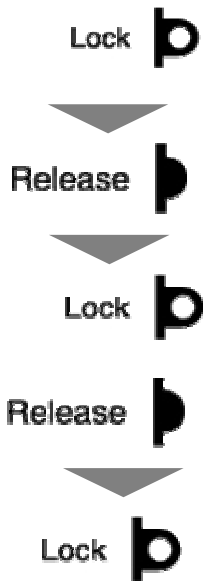
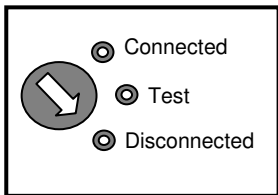
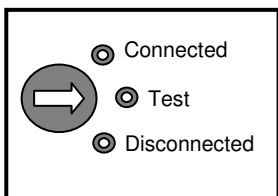
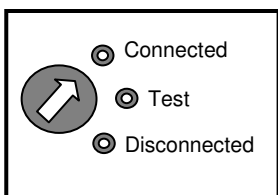
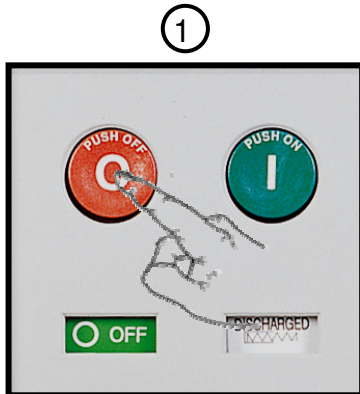


Caution

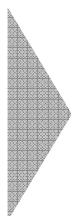
1. Please stop handle operation when draw in/out locking device protrudes.
2. Draw in or out by moving handle right or left side when draw in/out locking device can not be inserted.

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.



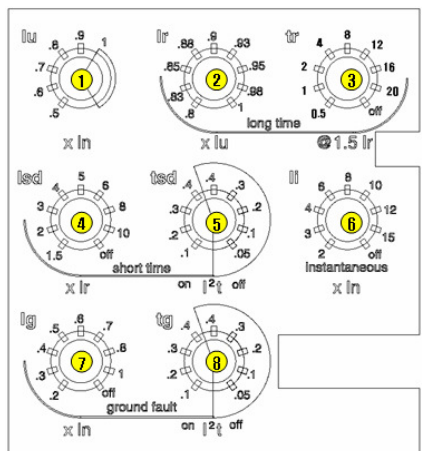
5. The circuit breaker indicated with 'DISCONNECTED' can be separated safely from the cradle by removing a draw in/out handle and releasing right and left locks.
6. Use a lifting hook to separate a circuit breaker from a cradle.



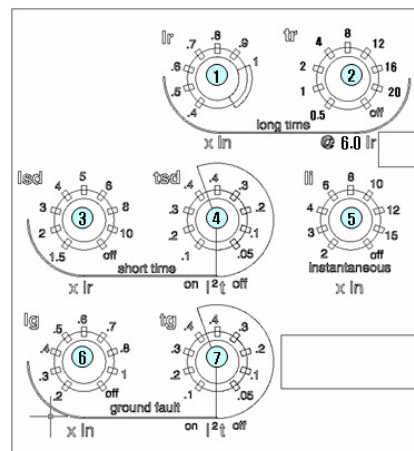
J. Trip relay externals and configuration

1. Knob Setting

■ N, A type Knob Configuration



■ S type Knob Configuration



■ N, A type Knob Information

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

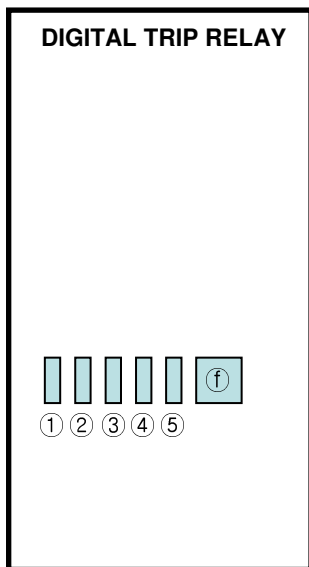
■ S type Knob Information

No	Type of knob	Mode	setting step
①	Long-time current setting	lr	(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 lr
③	Short-time current setting	ls	(1.5-2-3-4-5-6-8-10-off) × lr
④	Short-time tripping delay	tsd	2t off : (0.05-0.1-0.2-0.3-0.4), sec 2t on : (0.1-0.2-0.3-0.4), sec
⑤	Instantaneous pick-up	li	(2-3-4-6-8-10-12-15-off) × In
⑥	Ground-fault pick-up	lg	(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1-off) × In
⑦	Ground-fault tripping delay	tg	2t off : (0.05-0.1-0.2-0.3-0.4) 2t on : (0.1-0.2-0.3-0.4)

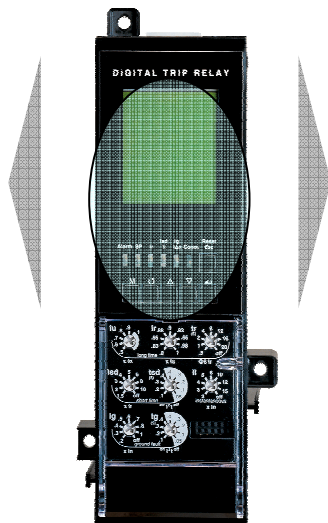
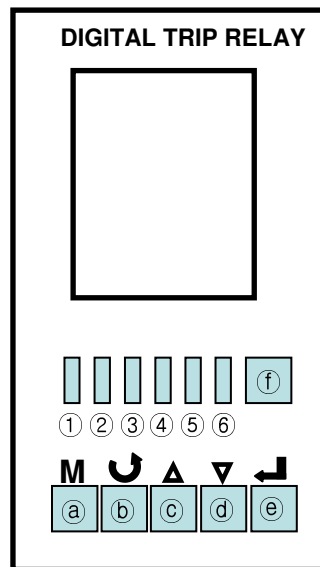
J. Trip relay externals and configuration

2. Key and LED Configuration

■ N type Key / LED



■ A, P, S type Key / LED



■ LED Information

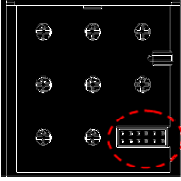
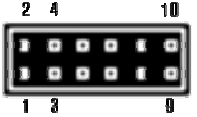
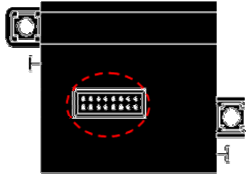
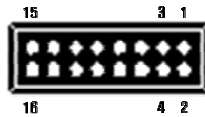
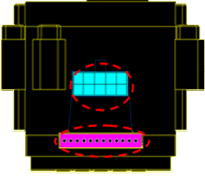


No	LED type	Operational mode
①	Alarm	LED Indicating an overload (Turn on above 90%, Blink above 105%)
②	Batt/SP	Self-Protection LED and Battery test LED
③	Ir	LED Indicating long-time delay
④	Isd/li	LED indicating short-time or instantaneous tripping
⑤	Ig/I△n	LED indicating ground-fault
⑥	COMM	LED indicating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

■ Key Configuration

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

J. Trip relay externals and configuration

3. Connector

Division	CN1	CN2	CN3	CN4
Figure	<p>FRONT</p>  	<p>REAR</p>  	<p>TOP</p>  	
NO				
1	TTL TX (OCR side)	CT-Ir	ZSI OUT (+)	RS485 (+)
2	Current signal-Ir	Power CT (-), GND	ZSI OUT (-)	DO Relay #1
3	TTL RX (OCR side)	CT-Is	ZSI IN (+)	RS485 (-)
4	Current signal-Is	Power CT (+), 24V	ZSI IN (-)	DO Relay #2
5	Power (+), 24V	CT-It	Remote reset (+)	Spare
6	Current signal-It	Delay Contact (-), GND	Remote reset (-)	DO Relay #3
7	Power (-),GND	CT-In	RCD (+)	Spare
8	Current signal-In	Delay Contact (+)	RCD (-)	DO Relay COM
9	Power (-),GND	CT-Ir, Override	Vr	Power (+)
10	Current signal COM	MTD (+),24V	Vs	Power (-)
11		CT-Is, Override	Vt	
12		MTD (-)	V COM	
13		CT-It, Override		
14		CT-COM		
15		In Override		
16		Spare		

K. TRIP Relay Setting

1. Protection

■ N Type

Long time											
Current setting (A)	$I_u = I_n \times \dots$	0.5	0.6	0.7	0.8	0.9	1.0				
	$I_r = I_u \times \dots$	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0	
Time delay (s)	$t_r @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off	
Accuracy: $\pm 15\%$ or below	$t_r @ (6.0 \times I_r)$	0.5	1	2	4	8	12	16	20	Off	
100ms	$t_r @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off	
Short time											
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off	
Accuracy: $\pm 10\%$											
Time delay (s) @ $10 \times I_r$	tsd	I^2t Off	0.05	0.1	0.2	0.3	0.4				
		I^2t On		0.1	0.2	0.3	0.4				
	$(I^2t$ Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off	
Tripping time		below 50ms									
Ground fault											
Pick-up (A)											
Accuracy: $\pm 10\%$ ($I_g > 0.4 I_n$) $\pm 20\%$ ($I_g \leq 0.4 I_n$)	$I_g = I_n \times \dots$		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ $1 \times I_n$	tg	I^2t Off	0.05	0.1	0.2	0.3	0.4				
		I^2t On		0.1	0.2	0.3	0.4				
	$(I^2t$ Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				

K. TRIP Relay Setting

1. Protection

■ A Type

Long time											
Current setting (A)	$I_u = I_n \times \dots$	0.5	0.6	0.7	0.8	0.9	1.0				
	$I_r = I_u \times \dots$	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0	
Time delay (s)	$t_r @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off	
Accuracy: $\pm 15\%$ or below	$t_r @ (6.0 \times I_r)$	0.5	1	2	4	8	12	16	20	Off	
100ms	$t_r @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off	
Short time											
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off	
Accuracy: $\pm 10\%$											
Time delay (s) @ $10 \times I_r$	tsd	1 st Off	0.05	0.1	0.2	0.3	0.4				
		1 st On		0.1	0.2	0.3	0.4				
(1 st Off)		Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off	
Tripping time		below 50ms									
Ground fault											
Pick-up (A)											
Accuracy: $\pm 10\%$ ($I_g > 0.4I_n$) $\pm 20\%$ ($I_g \leq 0.4I_n$)	$I_g = I_n \times \dots$		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) @ $1 \times I_n$	tg	1 st Off	0.05	0.1	0.2	0.3	0.4				
		1 st On		0.1	0.2	0.3	0.4				
(1 st Off)		Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Earth leakage (Option)											
Current setting (A)	I_g	0.5	1	2	3	5	10	20	30	Off	
Time delay (ms)											
Accuracy: $\pm 15\%$	tg	Alarm Time(ms)	140	230	350	800	950				
		Trip Time(ms)	140	230	350	800					

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

K. TRIP Relay Setting

1. Protection

■ P,S Type

Long time											
Current setting (A)	$I_r = I_n \times \dots$	0.4	0.5	0.6	0.7	0.8	0.9	1.0			
Time delay (s)	$tr @ (1.5 \times I_r)$	12.5	25	50	100	200	300	400	500	Off	
Accuracy: $\pm 15\%$ or below	$tr @ (6.0 \times I_r)$	0.5	1	2	4	8	12	16	20	Off	
100ms	$tr @ (7.2 \times I_r)$	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off	
Short time											
Current setting (A)	$I_{sd} = I_r \times \dots$	1.5	2	3	4	5	6	8	10	Off	
Accuracy: $\pm 10\%$											
Time delay (s) @ $10 \times I_r$	tsd	I st Off	0.05	0.1	0.2	0.3	0.4				
		I st On		0.1	0.2	0.3	0.4				
(I st Off)	(I st Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Instantaneous											
Current setting (A)	$I_i = I_n \times \dots$	2	3	4	6	8	10	12	15	Off	
Tripping time		below 50ms									
Ground fault											
Pick-up (A)											
Accuracy: $\pm 10\%$ ($I_g > 0.4I_n$) $\pm 20\%$ ($I_g \leq 0.4I_n$)	$I_g = I_n \times \dots$	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off	
Time delay (s) @ $1 \times I_n$	tg	I st Off	0.05	0.1	0.2	0.3	0.4				
		I st On		0.1	0.2	0.3	0.4				
(I st Off)	(I st Off)	Min. Trip Time(ms)	20	80	160	260	360				
		Max. Trip Time(ms)	80	140	240	340	440				
Earth leakage (Option)											
Current setting (A)	I_g	0.5	1	2	3	5	10	20	30	Off	
Time delay (ms)											
Accuracy: $\pm 15\%$											
Time delay (ms)	tg	Alarm Time(ms)	140	230	350	800	950				
		Trip Time(ms)	140	230	350	800					
PTA(Pre Trip Alarm)											
Current setting (A)	$I_p = I_r \times \dots$	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1	
Time delay (s)	$tp @ (1.2 \times I_p)$	1	5	10	15	20	25	30	35	Off	
Accuracy: $\pm 15\%$											

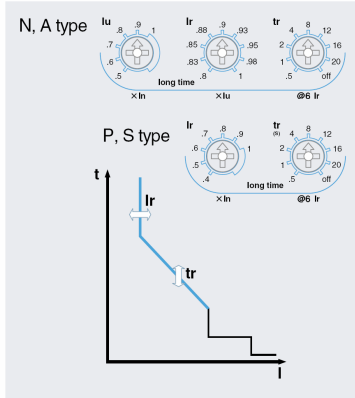
Note) Earth leakage function is available with ZCT or external CT

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

K. TRIP Relay Setting

2. Operation Characteristic

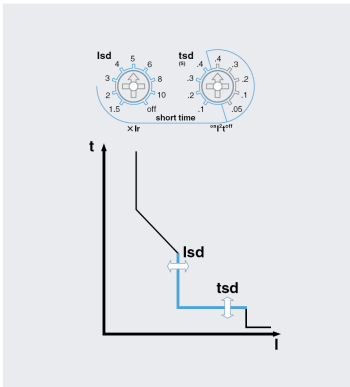
Long-time delay (L)



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

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

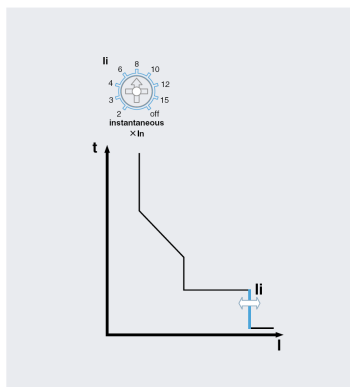
Short-time delay (S)



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

- Standard current setting knob: I_{sd}
 - Setting range: $(1.5-2-3-4-5-6-8-10-Off) \times I_r$
- Time delay setting knob: t_{sd}
 - Standard operating time is based on the time of $10 \times I_r$.
 - 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
- Relay operates basing on the largest load current among R/S/T/N phase.
- Relay can operate at instantaneous current through ZSI.

Instantaneous (I)



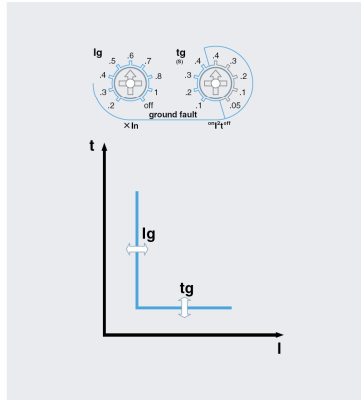
The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.

- Standard current setting knob: I_i
 - Setting range: $(2-3-4-6-8-10-12-15-Off) \times I_n$
- Relay operates basing on the largest load current among R/S/T/N phase.
- Total breaking time is below 50ms.

K. TRIP Relay Setting

2. Operation Characteristic

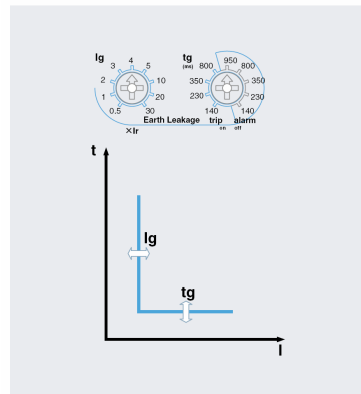
■ Ground Fault (G)



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

- Standard setting current knob: I_g
 - Setting range: $(0.2-0.3-0.4-0.5-0.6-0.7-0.8-1.0-Off) \times I_n$
- Time delay setting knob: t_g
 - Inverse time (I^{st} On): 0.1-0.2-0.3-0.4 sec
 - Definite time (I^{st} Off): 0.05-0.1-0.2-0.3-0.4 sec
- Ground fault current = $R+S+T+N$ (Vector Sum)
- Relay can operate at instantaneous current through ZSI.
- The protection for ground fault is a basic function of Trip relay (Internal CT type)

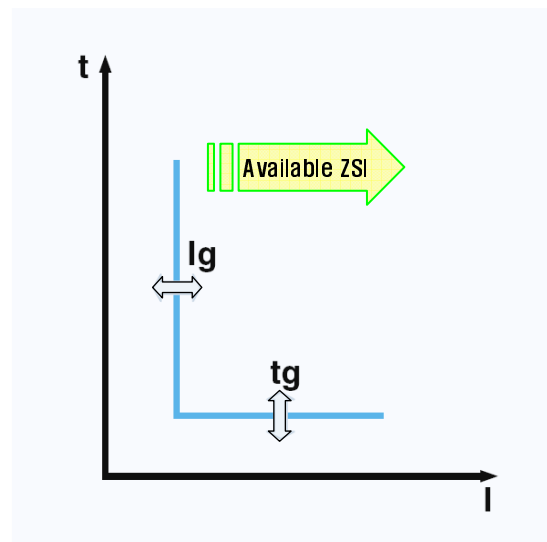
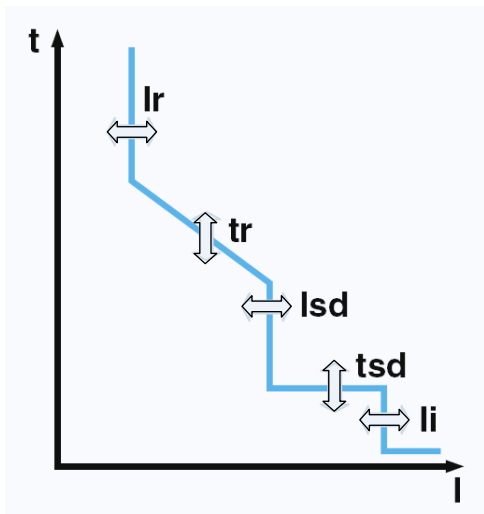
■ Earth Leakage (G) – Option



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

- Standard setting current Knob : I_g
 - ZCT provided Susul ACB (OCR Z,K Type)
 - Setting range : 0.5-1-2-3-4-5-10-20-30-Off(A)
 - Private ZCT (OCR E,X Type)
 - Setting range : 0.5-1-2-3-4-5-Off(A)
- Time delay setting knob : t_g
 - Alarm time : 140-230-350-800ms
 - Trip time : 60-140-230-350-800ms
- It is only available with private ZCT or general purpose external CT.

* Notice in setting range
In case of using our ZCT all setting points from 0.5 to 30A, the secondary current of ZCT are available.
However if private ZCT is selected the setting range is limited to 0.5~5A.

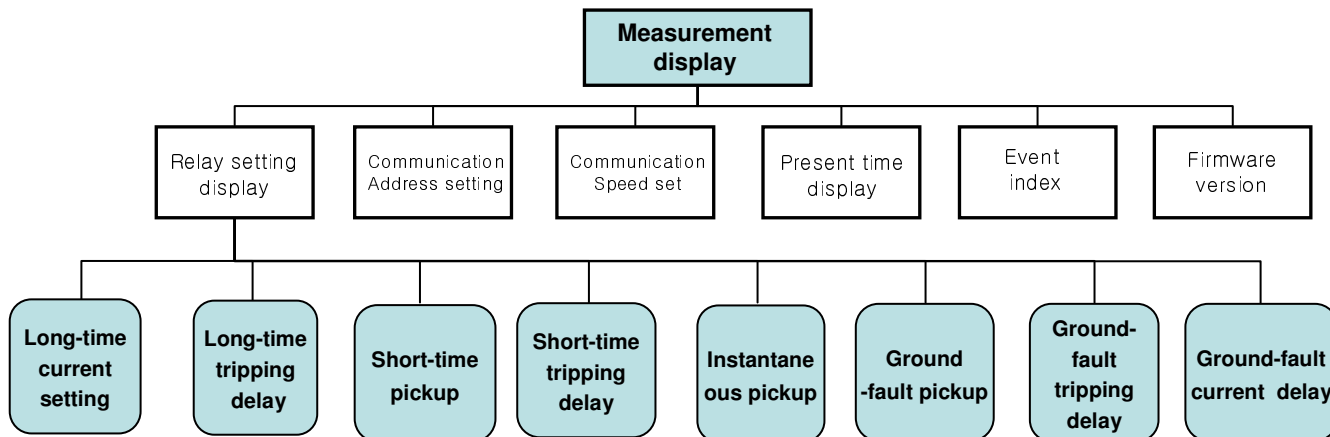


L. The Operation of A type TRIP RELAY

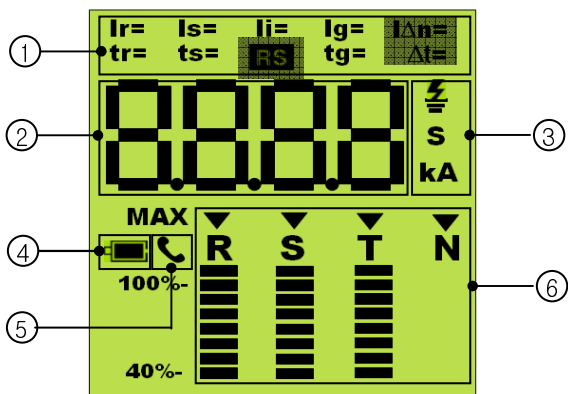
1. Menu Tree

⚠ 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

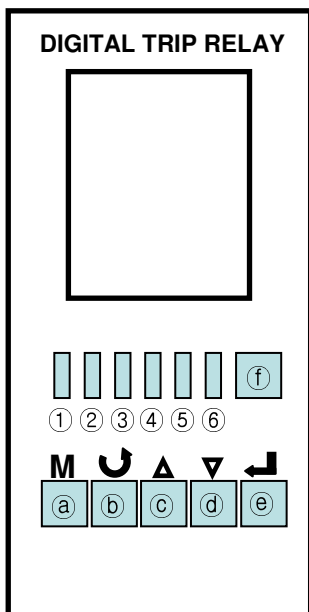


NO	Contents
①	Segment that displays the types of relay current and time - Display of Setting values or Event
②	Segment that displays numbers or characters - Current, Time, and Simple character
③	Segment that displays the unit of current and time.
④	Low Battery Segment -LED flickers at 2~3 second interval 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

When OCR is plugged in for the first time, all segments will be shown for approximately a second, and then return to Measurement Display.

L. The Operation of A type TRIP RELAY

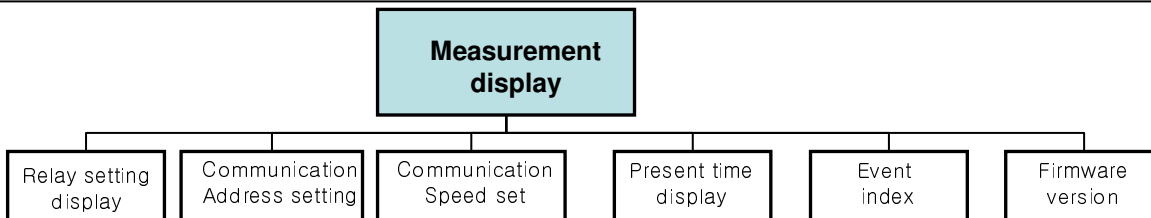
3. Button Configuration



Caution

- OCR A type is composed of 6 buttons, and its LCD Back Light comes on for 30s if it sensing any button pressed during its operation.
- After 30 seconds under Idle condition, it moves back to Measurement Display page.
- 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. .

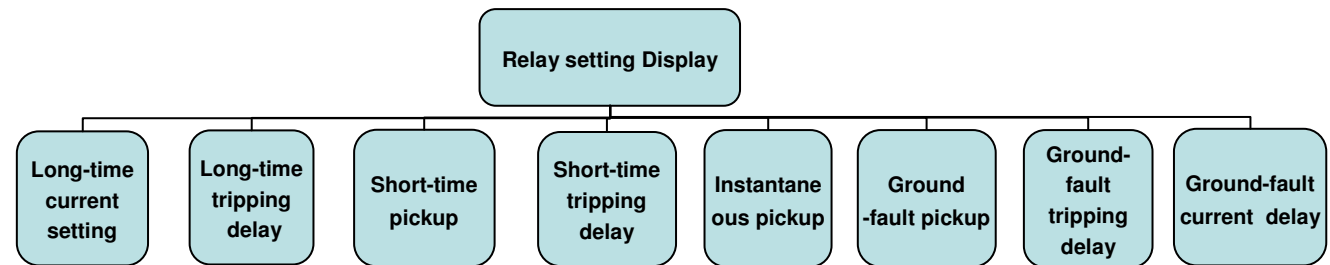
4. Measurement Display



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, and the below bar graphs represent each phase's load rate in scale (40%~110%).
		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.
		The phase which will be displayed exclusively can be selected by pressing Up / Down cursor.

L. The Operation of A type TRIP RELAY

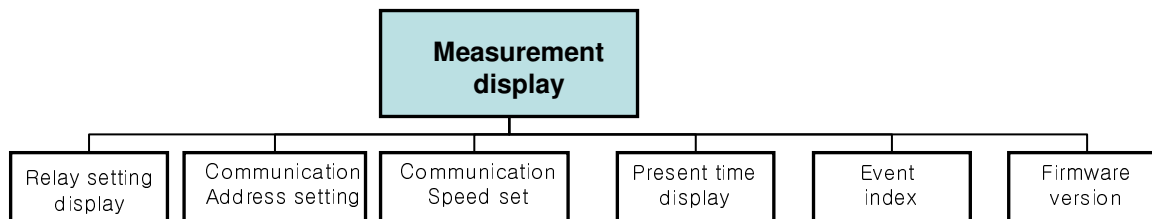
3. Relay Setting Display– Long-time Delay, Short-time Delay













		Display	Button	Contents
Long-time	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	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	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	pick up		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
	current delay		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 I _n will be displayed and other values out of this range will be indicated as " _ _ _ _ "

L. The Operation of A type TRIP RELAY

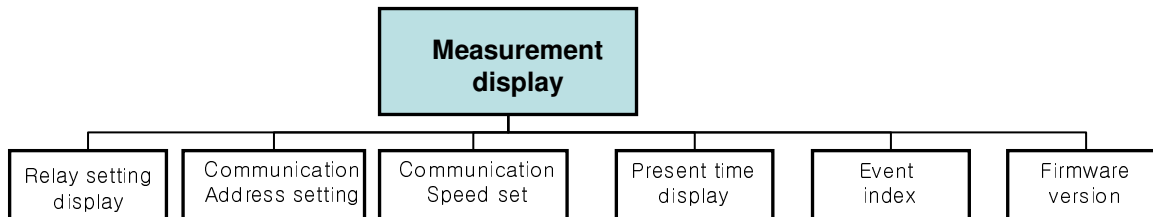
3. Relay Setting Display



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 1minute 1 second January 1st, 2000'.
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. "1600" : 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.

L. The Operation of A type TRIP RELAY

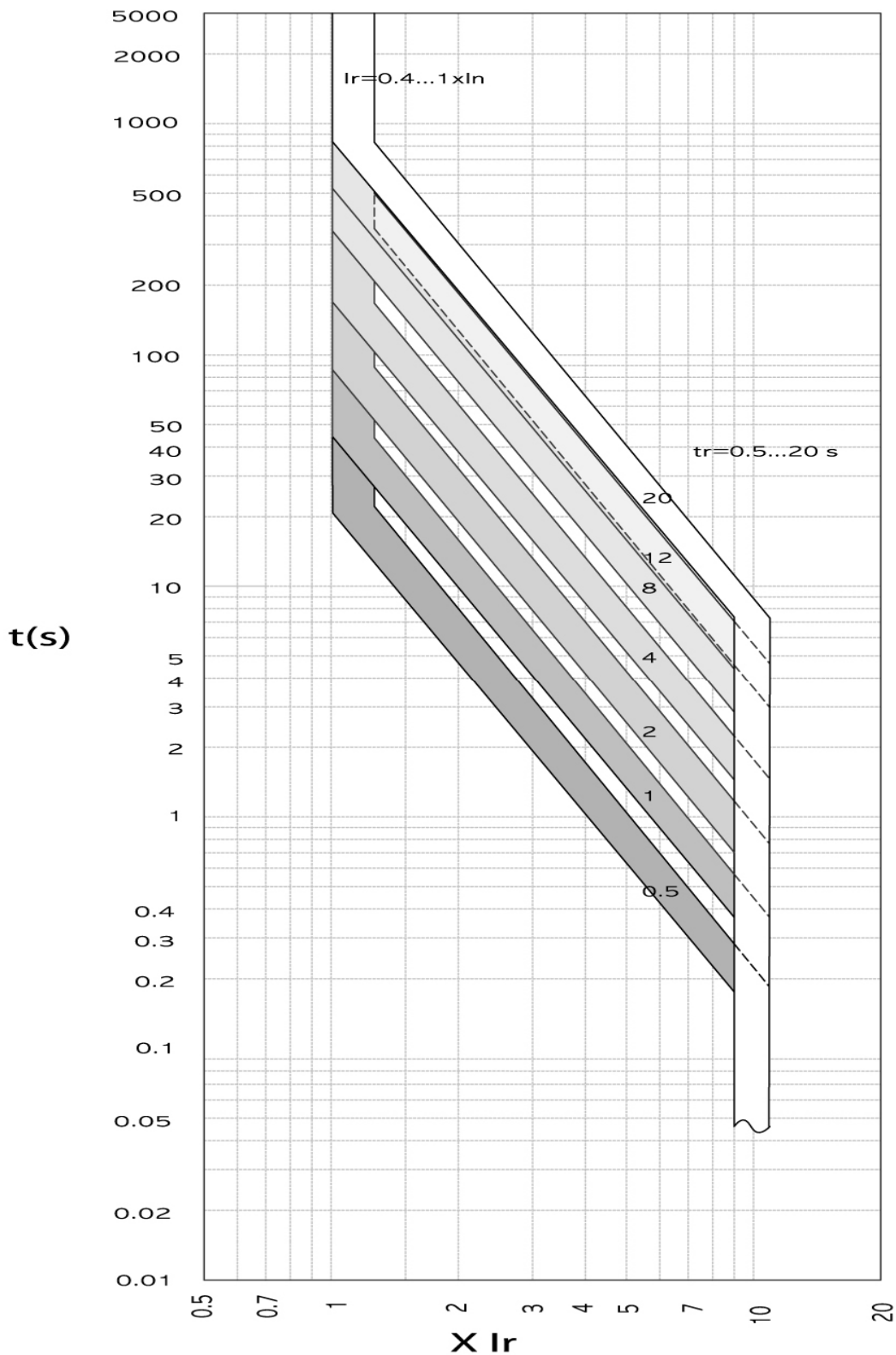
3. Relay Setting Display



	Display	Button	Contents
Event		③ ② ①	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"
		↵ x 2 ④ ⑤ ⑥	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
		↵ x 3 ⑦ ⑧ ⑨	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 firmware Version

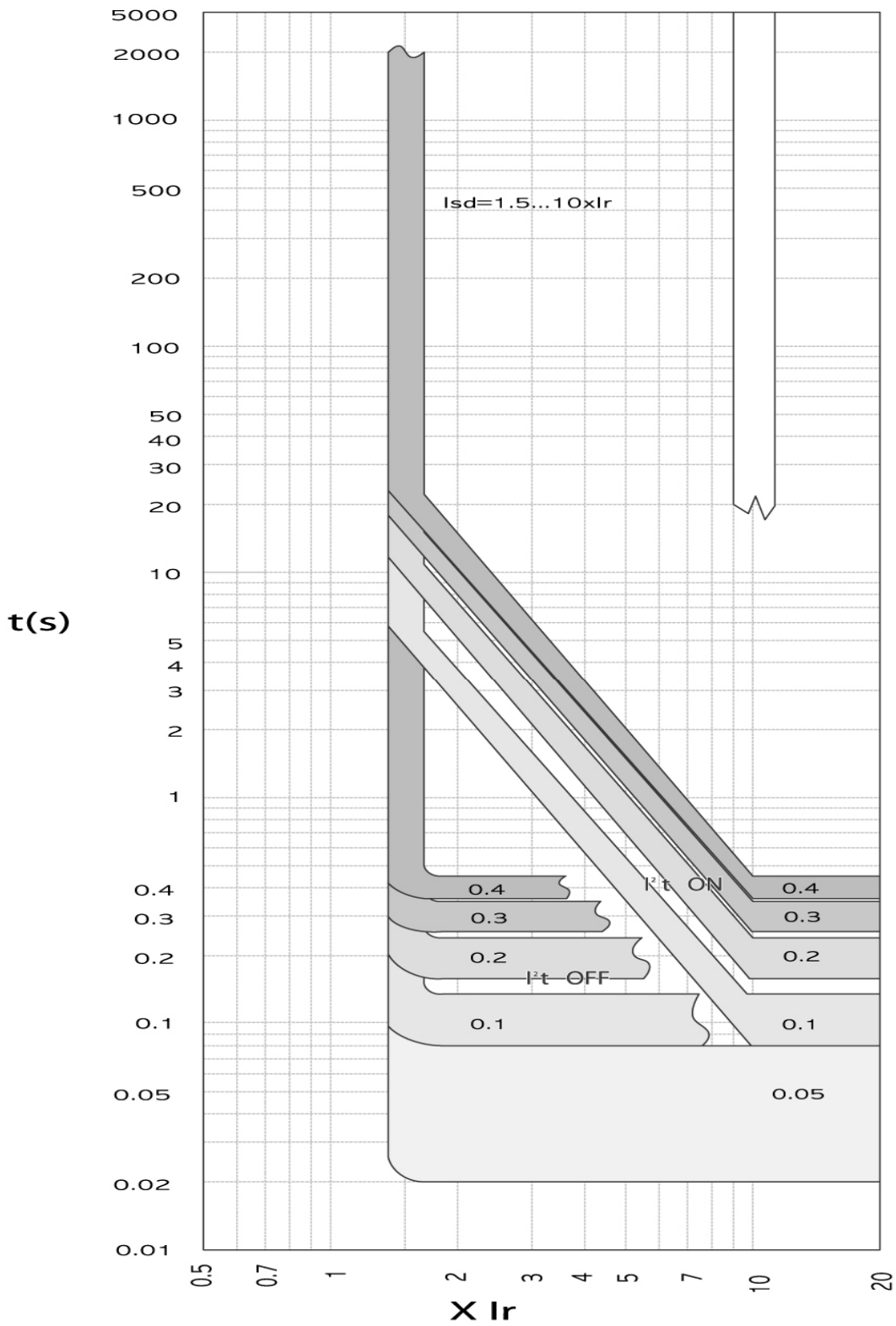
M. Tripping curves

1. Long-time protection



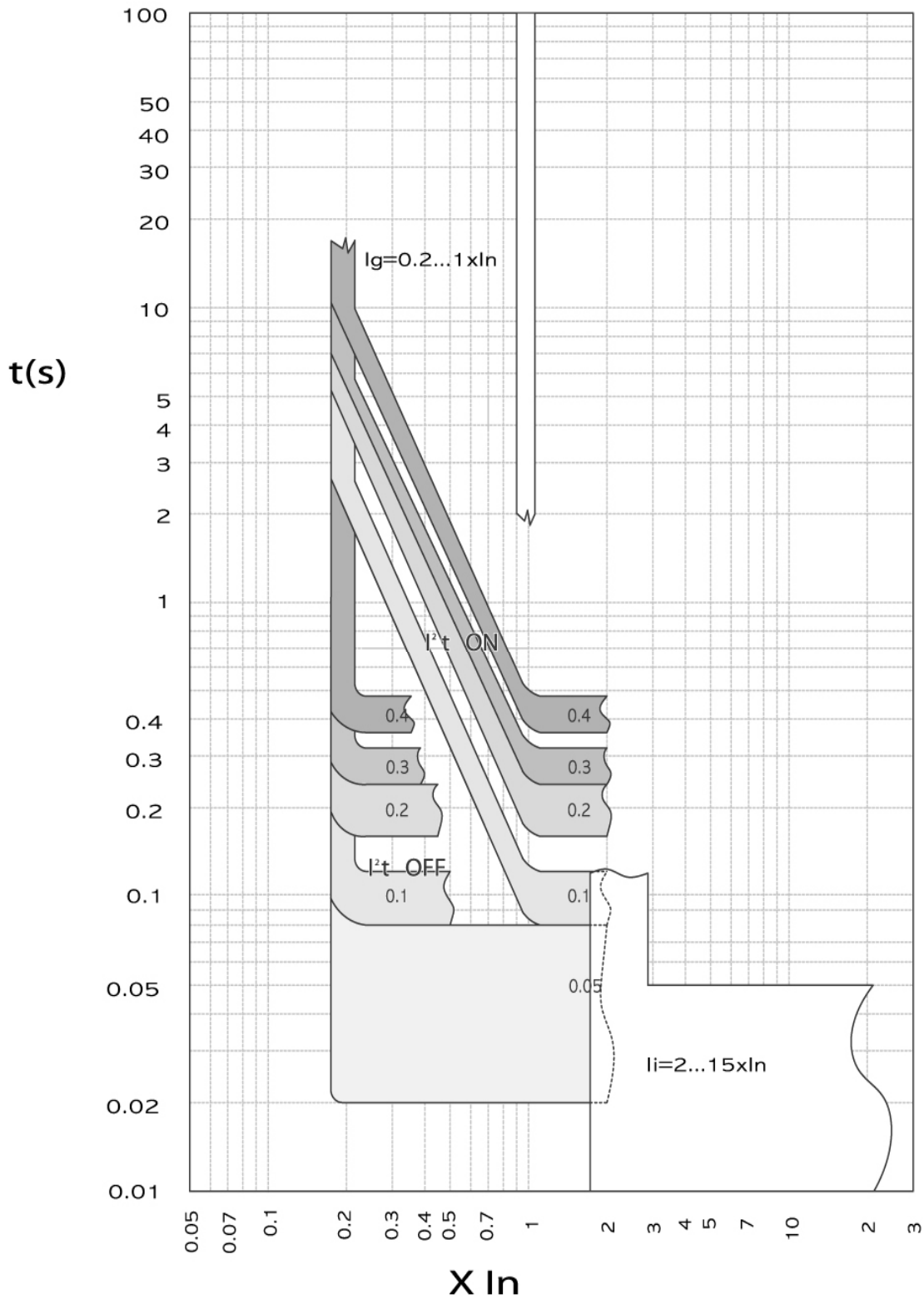
M. Tripping curves

2. Short-time protection



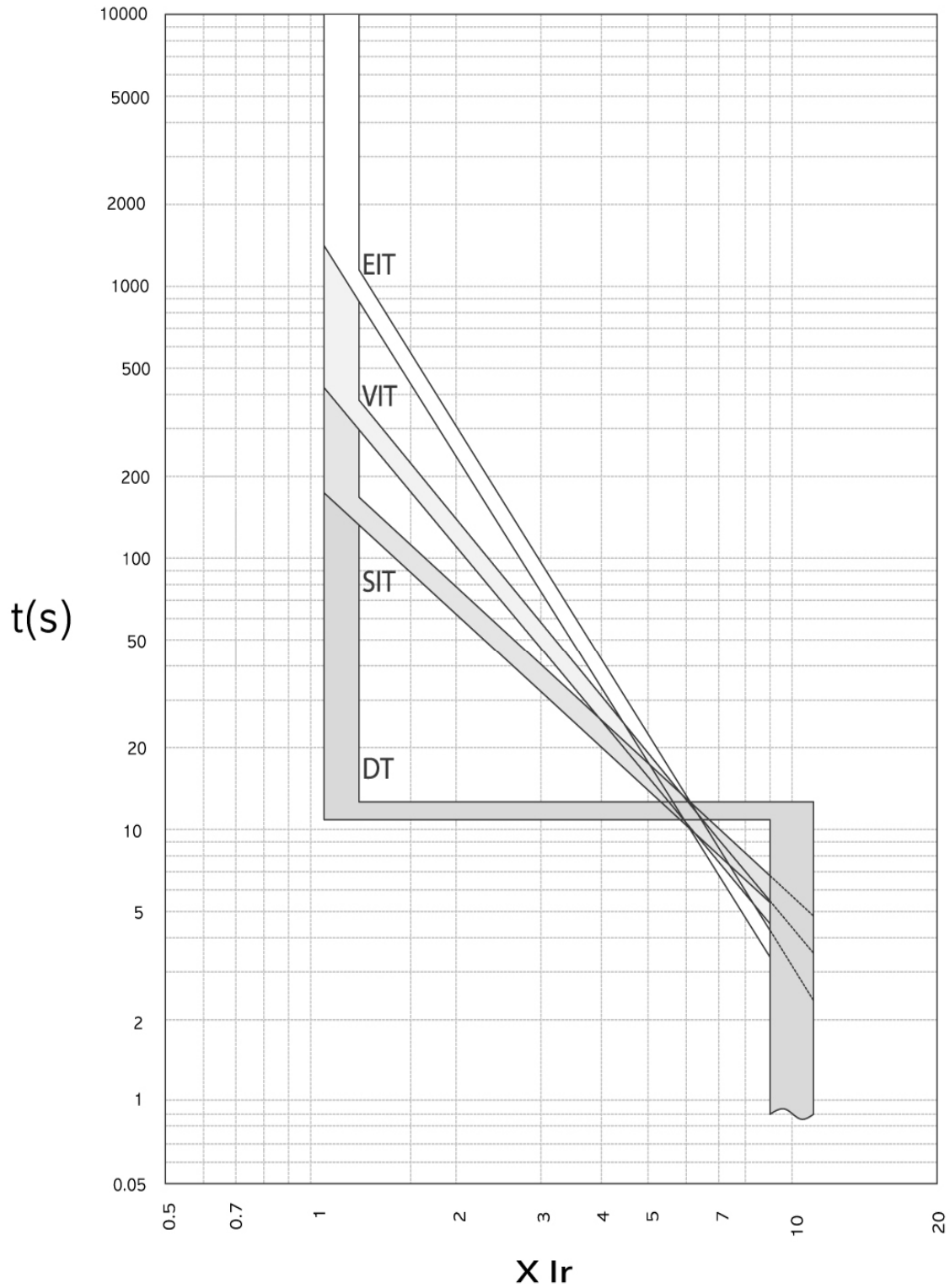
M. Tripping curves

3. Instantaneous / Ground-fault protection



M. Tripping curves

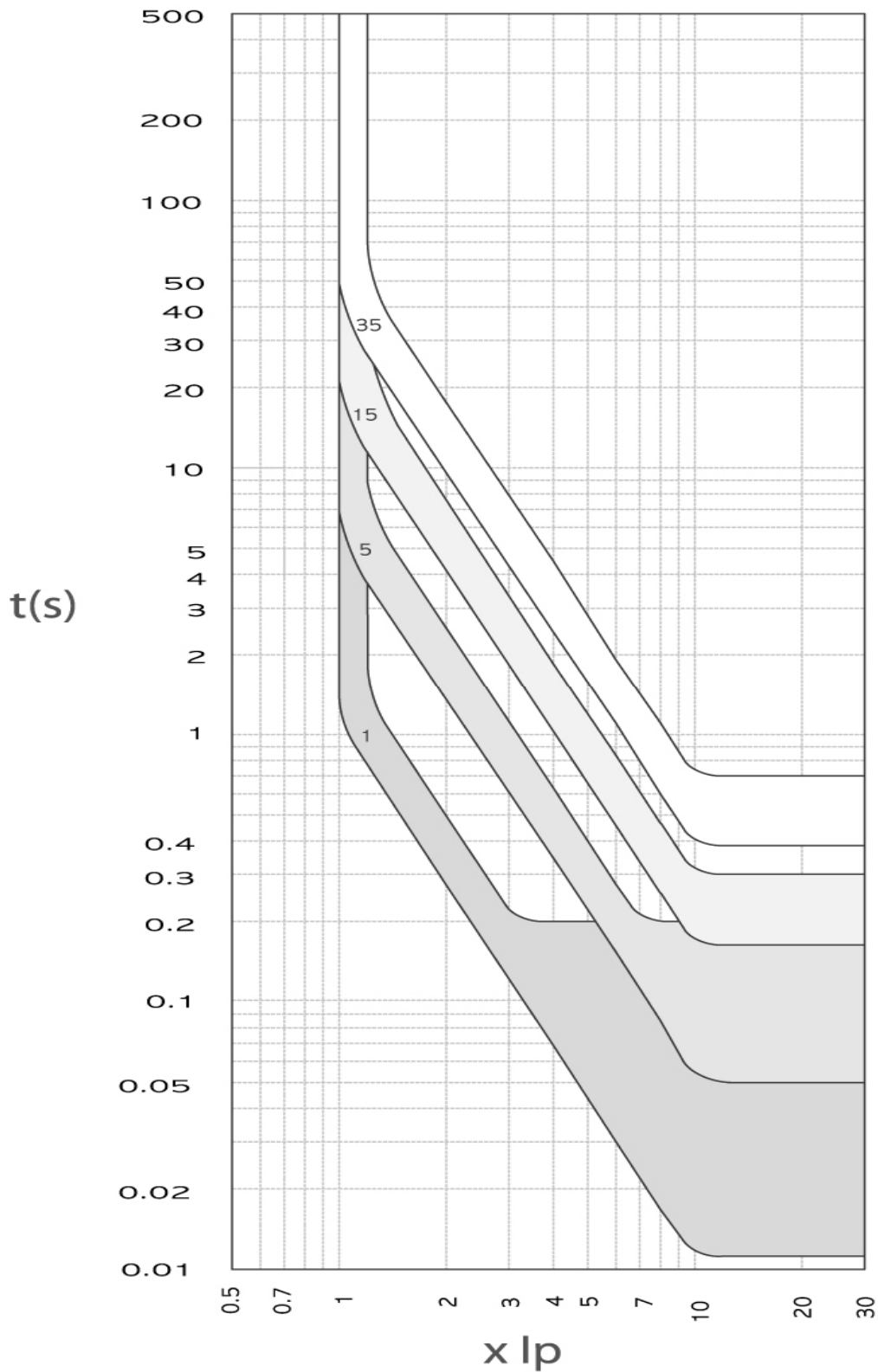
4. IDMTL



M. TRIP RELAY 특성곡선

5. Pre Trip Alarm

■ Ground-fault ■ IDMTL



N. 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	Replace ment 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	Distribution panel or individual electrical room without dust proof & air conditioner		
	Location without corrosive gases			
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

N. Inspection and Troubleshooting

2. Defects and Troubleshooting guideline

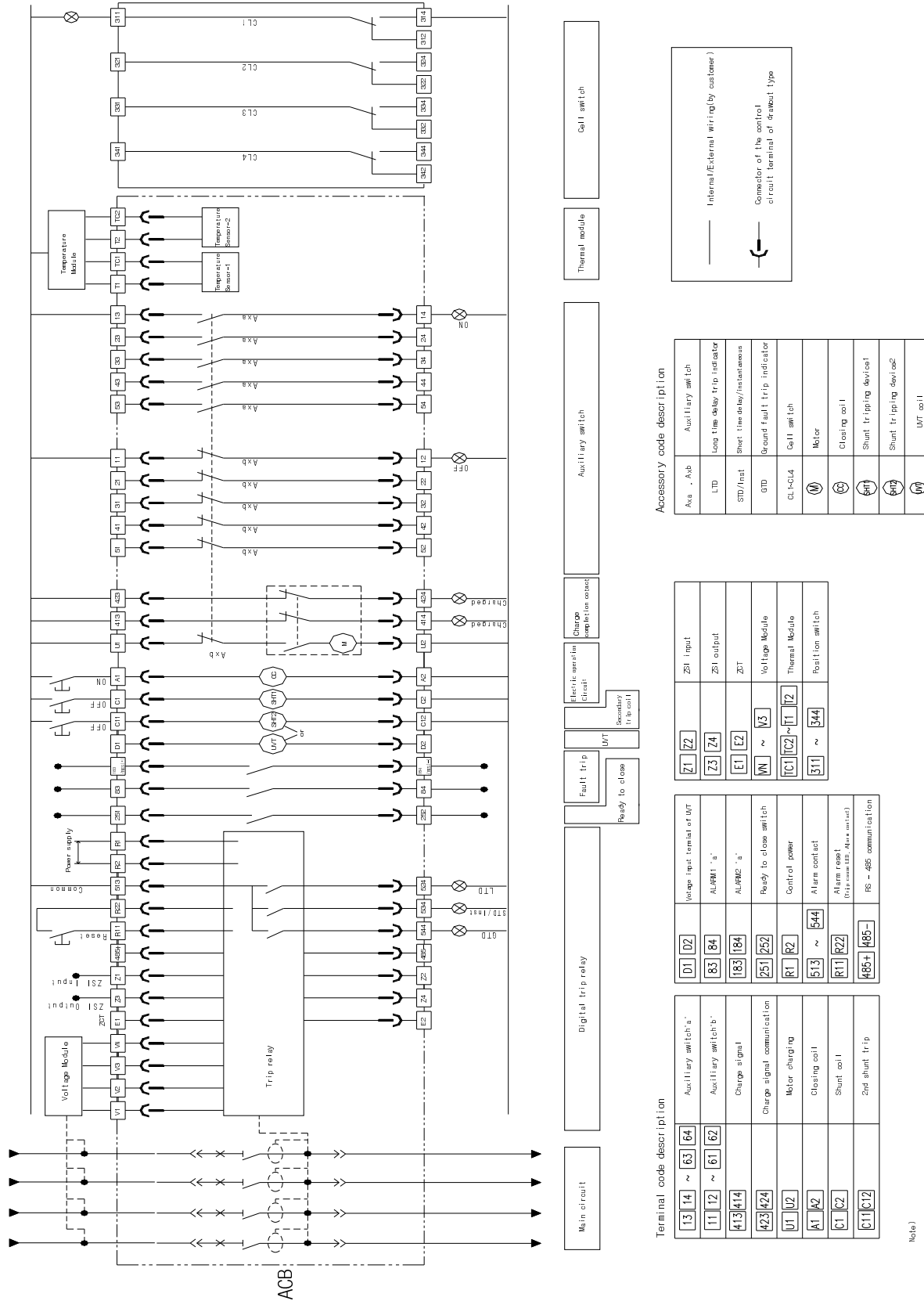
■ Troubleshooting guideline

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. $V < 0.7V_n$	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 ($V > 0.85V_n$) 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.

O. Wiring diagram of Control circuit

1. Wiring diagram

This diagram is based on 'CONNECTED' position of a circuit breaker and Opening, Motor charging, Releasing of locking plate should be normal condition.



Terminal	Terminal	Terminal	Terminal
13	14	63	64
11	12	61	62
413	414		
423	424		
U1	U2		
A1	A2		
C1	C2		
C11	C12		

Terminal	Terminal	Terminal	Terminal
17	18	27	28
19	20	29	30
31	32	39	40
41	42	49	50
51	52	59	60
61	62	69	70
71	72	79	80

Terminal	Terminal	Terminal	Terminal
71	72		
73	74		
E1	E2		
V1	V3		
T1	T2		
S1	~ 344		

Terminal	Terminal	Terminal	Terminal
D1	D2		
83	84		
183	184		
251	252		
R1	R2		
513	~ 544		
R11	R22		
465+	465-		

Terminal	Terminal	Terminal	Terminal
Z1	Z2		
Z3	Z4		
E1	E2		
V1	~ V3		
T1	T2		
S1	~ 344		

Main circuit, Digital trip relay, Fault trip, Ready to close, UVT, Ready to close, UVT, Electric operation circuit, Charge completion contact, Auxiliary switch, Thermal module, Coil switch

Terminal code description
 Auxiliary switch
 Auxiliary switch
 Long time delay trip indicator
 Short time delay/trip sensor
 Ground fault trip indicator
 Coil switch
 Motor
 Closing coil
 Shunt tripping device
 Shunt tripping device
 UVT coil

Accessory code description
 Aux. Sub
 LTD
 STD/Inst
 STD
 CL T-C14
 Motor
 Closing coil
 Shunt tripping device
 Shunt tripping device
 UVT coil

- Note)
- The diagram is shown with circuits deenergised, all devices open, connected and charged and relays in normal position
 - Relay is normal condition and charging type is 'OFF' charging
 - The standard of auxiliary contact is S2b. The auxiliary switch in above diagram is composed of S5b.
 - Option
 - Ready to close contact, Trip alarm contact, UVT coil, Fully charged contact, secondary trip coil.
 - Coil switch, Thermal Module, Voltage Module, Remote close/open Module, ZST, ZSI.
 - Please consult us for the use of ZSI (Zone selective Interlocking).
 - Refer to the catalogue for the connection of Trip relay and UVT.

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

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Instruction Manual for Susol&Metazol ACB 2007.07/(01) 2007.07 JUNG ANG