



Susol
Super Solution

**DC switch disconnectors
up to 1500 Vdc**

Instruction manual

| UL File No. | Standard | |
|-------------|----------|---|
| E493630 | UL 489B | Switches, Molded Case, for Use in Photovoltaic Systems |
| E491572 | UL 489F | Switches, Molded Case, for Use with Battery Power Supplies |

LSIS
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Instruction manual

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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 DC only. Fatal 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.

B. Service condition

1. Normal/Special service condition

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

| Product model | Rated current | Applicable busbar size (mm) |  | | | | |  | | | | | |
|----------------|---------------|---|---|---------|---------|---------|---------|---|---------|---------|---------|---------|---------|
| | | | Horizontal type | | | | | Vertical type | | | | | |
| | | | 40°C | 45°C | 50°C | 55°C | 60°C | 40°C | 45°C | 50°C | 55°C | 60°C | |
| UDA - 25E | 800 A | 6.35T x 76.2 x 1ea (Inch : 1/4 x 3 x 1ea) | 800 A | 800 A | 800 A | 800 A | 800 A | 800 A | 800 A | 800 A | 800 A | 800 A | 800 A |
| | | 5T x 100 x 1ea | | | | | | | | | | | |
| | | 6T x 80 x 1ea | | | | | | | | | | | |
| | 1,600 A | 6.35T x 76.2 x 2ea (Inch : 1/4 x 3 x 2ea) | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A | 1,600 A |
| | | 10T x 100 x 1ea | | | | | | | | | | | |
| | | 6T x 80 x 2ea | | | | | | | | | | | |
| | 2,000 A | 6.35T x 101.6 x 2ea (Inch : 1/4 x 4 x 2ea) | - | - | - | - | - | 2,000 A | 2,000 A | 2,000 A | 2,000 A | 2,000 A | 2,000 A |
| | | 5T x 125 x 2ea | - | - | - | - | - | | | | | | |
| | | 8T x 80 x 2ea | 2,000 A | 2,000 A | 2,000 A | 2,000 A | 2,000 A | | | | | | |
| | 2,500 A | 6.35T x 127 x 2ea (Inch : 1/4 x 5 x 2ea) | - | - | - | - | - | 2,500 A | 2,500 A | 2,500 A | 2,500 A | 2,500 A | 2,500 A |
| | | 8T x 100 x 2ea | | | | | | | | | | | |
| | | 5T x 100 x 3ea | 2,500 A | 2,500 A | 2,500 A | 2,400 A | 2,300 A | | | | | | |
| 10T x 80 x 2ea | | | | | | | | | | | | | |
| UDA - 32E | 3,200 A | 6.35T x 127 x 3ea (Inch : 1/4 x 5 x 3ea) | - | - | - | - | - | 3,200 A | 3,200 A | 3,200 A | 3,120 A | 3,050 A | |
| | | 10T x 125 x 2ea | - | - | - | - | - | | | | | | |
| | | 10T x 80 x 3ea | 3,200 A | 3,200 A | 3,100 A | 3,000 A | 2,900 A | | | | | | |
| | | 8T x 100 x 3ea | | | | | | | | | | | |
| UDA - 40E | 4,000 A | 6.35T x 127 x 4ea (Inch : 1/4 x 5 x 4ea) | - | - | - | - | - | 4,000 A | 4,000 A | 4,000 A | 3,950 A | 3,800 A | |
| | | 10T x 125 x 3ea | - | - | - | - | - | | | | | | |

Table B. Power dissipation

| Type | Pole | Rated Current (A) | Fixed Type | | Draw-out Type | |
|---------|------|-------------------|-----------------|-----------------------|-----------------|-----------------------|
| | | | Resistance (mΩ) | Power Dissipation (W) | Resistance (mΩ) | Power Dissipation (W) |
| UDA-25E | 3P | 800 | 0.031 | 20 | 0.061 | 39 |
| | | 1,600 | 0.031 | 79 | 0.061 | 156 |
| | | 2,000 | 0.031 | 124 | 0.061 | 244 |
| | | 2,500 | 0.031 | 194 | 0.061 | 381 |
| UDA-32E | | 3,200 | 0.028 | 287 | 0.046 | 471 |
| UDA-40E | | 4,000 | 0.025 | 400 | 0.040 | 640 |
| UDA-25E | 4P | 800 | 0.042 | 27 | 0.082 | 52 |
| | | 1,600 | 0.042 | 108 | 0.082 | 210 |
| | | 2,000 | 0.042 | 168 | 0.082 | 328 |
| | | 2,500 | 0.042 | 263 | 0.082 | 513 |
| UDA-32E | | 3,200 | 0.038 | 389 | 0.062 | 635 |
| UDA-40E | | 4,000 | 0.034 | 544 | 0.054 | 864 |

Note) 1. Power dissipation is the value measured at each rated current for 3pole or 4pole breaker.
2. Resistance is the value measured across the terminals of connecting all poles in series.

B. Service condition

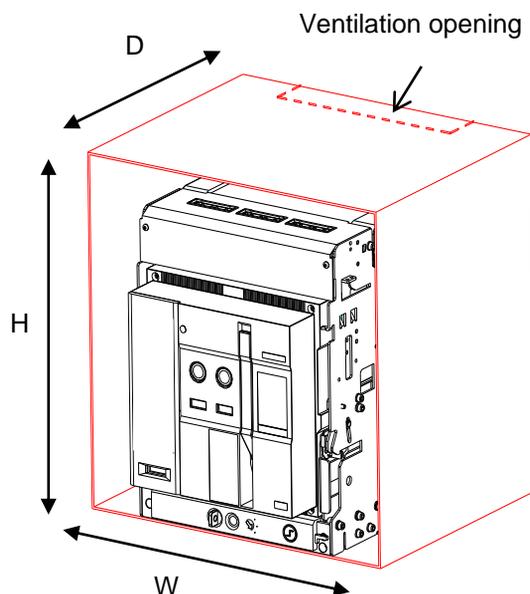
2. Altitude, and enclosure information

■ Altitude

DC products are 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 |
|--------------------------------------|--------------------|-----------------------|-----------------------|-----------------------|
| Rated voltage | 1500 V dc | 1350 V dc | 1200 V dc | 1050 V dc |
| | 1000 V dc | 900 V dc | 800 V dc | 700 V dc |
| Current compensation constant | 1 x I _n | 0.98 x I _n | 0.96 x I _n | 0.94 x I _n |

■ Enclosure Information



| Model | Frame Rating | Pole | Enclosure Dimensions mm (in.) | | | Ventilation opening mm (in.) | |
|---------|--------------|------|----------------------------------|---------|---------|---------------------------------|----------------------------|
| | | | H | W | D | Top | Bottom |
| UDA-25E | 2500AF | 3 | 500 | 500 | 340 | 55 X 350 (2.17 X 13.78) | 55 X 350 (2.17 X 13.78) |
| UDA-32E | 3200AF | | (19.69) | (19.69) | (13.39) | | |
| UDA-40E | 4000AF | 4 | 500 | 615 | 340 | | |
| | | | (19.69) | (24.21) | (13.39) | | |

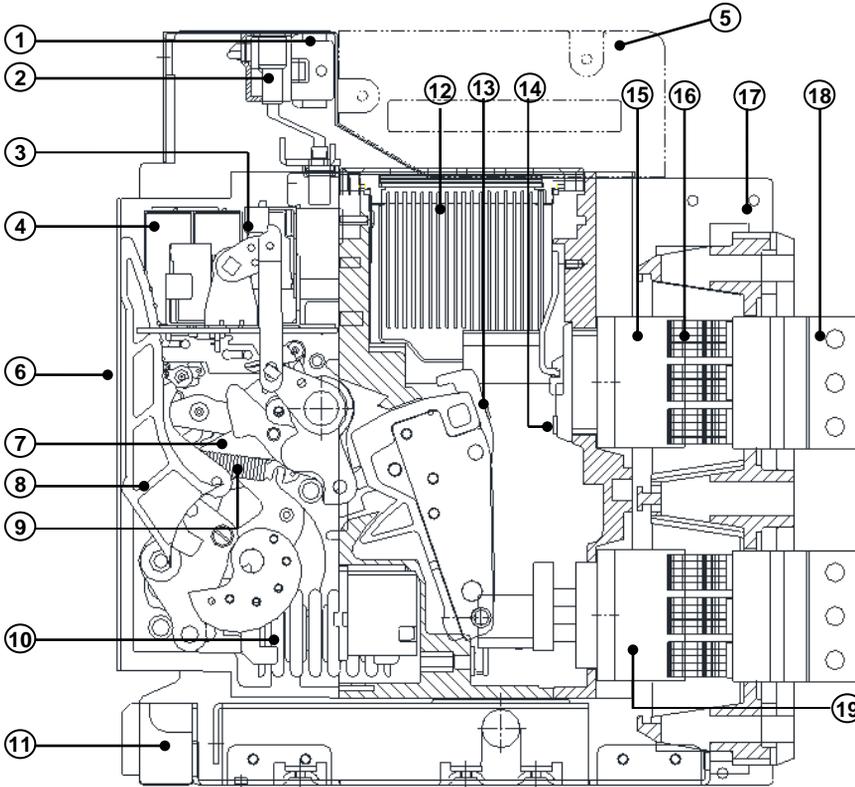
Note 1) It is minimum Enclosure Information

2) Ventilation Opening for 4000 AF only

C. Structure and operation

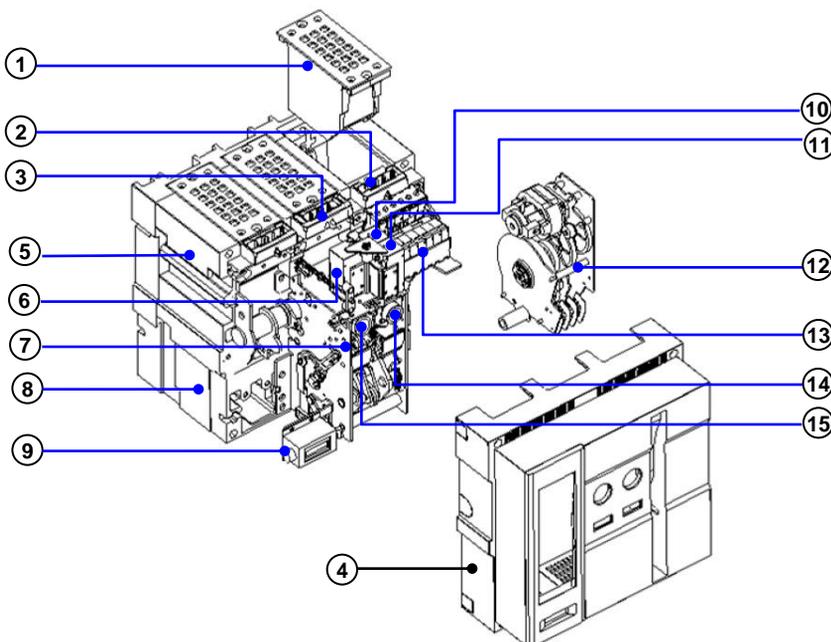
1. Internal structure and components

Internal configuration



- ① Control terminal block
- ② Control terminal
- ③ Auxiliary switches
- ④ Closing, Trip, UVT Coil
- ⑤ Arc cover
- ⑥ Front cover
- ⑦ Mechanism
- ⑧ Charge Handle
- ⑨ Trip spring
- ⑩ Closing spring
- ⑪ Draw-in/out device
- ⑫ Arc chute (DC)
- ⑬ Moving contact
- ⑭ Fixed contact
- ⑮ Conductor on line side
- ⑯ Finger of cradle
- ⑰ Cradle
- ⑱ Adaptor of circuit breaker
- ⑲ Conductor on load side

Components

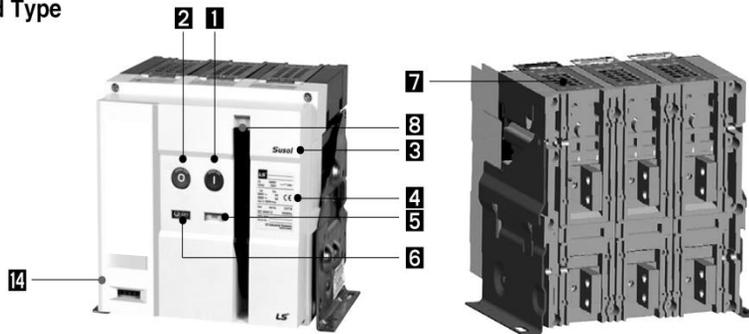


- ① Arc chute (DC)
- ② Aux. switch control terminal
- ③ Control power supply terminal
- ④ Cover
- ⑤ Carrying grip
- ⑥ Trip coil
- ⑦ Mechanism
- ⑧ Main body
- ⑨ Counter
- ⑩ UVT coil
- ⑪ Closing Coil
- ⑫ Motor Ass'y
- ⑬ Aux. switch
- ⑭ ON button
- ⑮ OFF button

C. Structure and operation

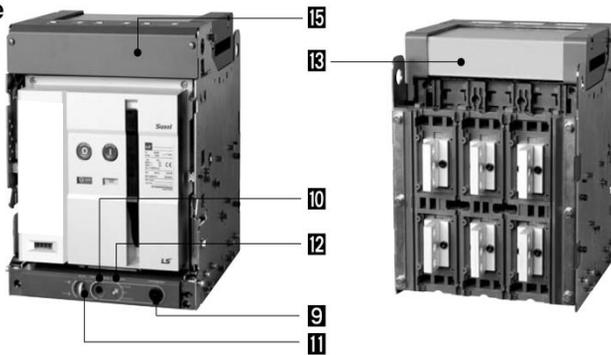
1. Internal structure and components

■ 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
- 8** Charge handle
- 9** Drawout handle
- 10** Handle storage space
- 11** Pad lock button
- 12** Position indicator
- 13** Arc Cover
- 14** Aux. Cover
- 15** Terminal cover

■ Draw-out Type



■ 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 (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.

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, it must have the structure which can withstand the high electrostatics to accept the short-circuit current while a circuit breaker or fuse in downstream is operating to break it.

3. Circuit Opening, Current Breaking

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

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) Dielectric voltage-withstand test under 1000V plus the maximum voltage
- 2) The impulse withstand test (Level : 12kV)

D. Ratings and types

1. Ratings



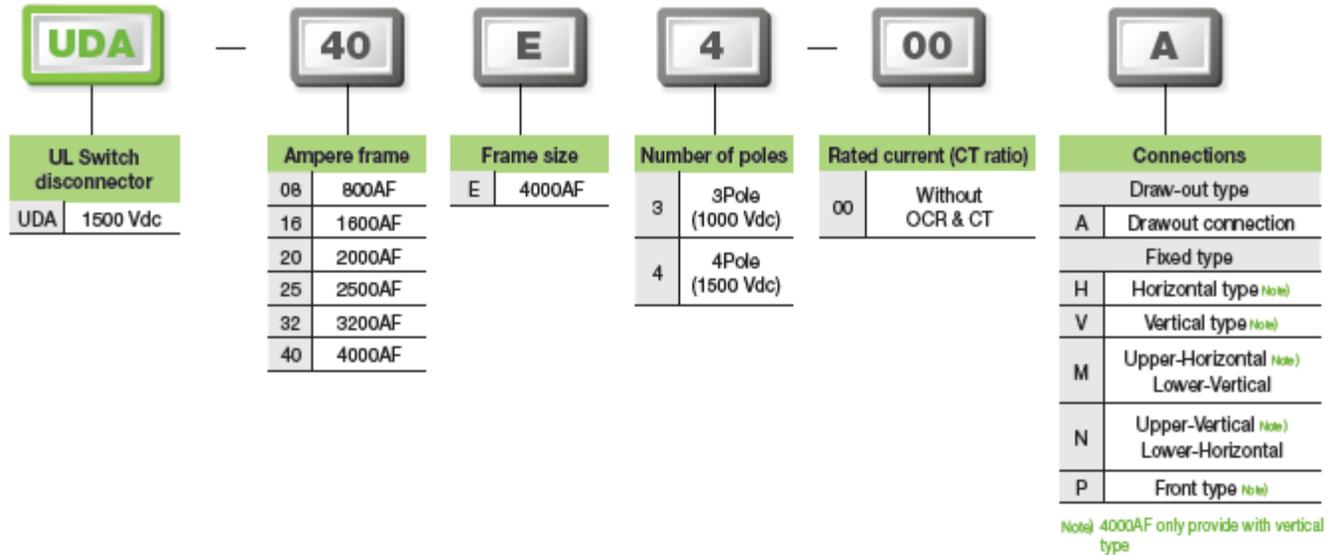
| Brand | | |
|-------------------------------------|-------------------|------------------------|
| Rated nominal voltage | Vdc | |
| Rated maximum voltage | Vdc | |
| Poles | (P) | |
| Version | | |
| Standard | | |
| Type | | |
| Ampere frame | (AF) | |
| Short circuit withstand current | (kA) | |
| Operating time (ms) | Max. opening time | |
| | Max. closing time | |
| Lift cycle (times) | Mechanical | |
| | Electrical | |
| Weight lb (kg) | Draw-out type | Main body 3P |
| | | with cradle 4P |
| | Only cradle | 3P |
| | | 4P |
| | Fixed type | Motor charging type 3P |
| | | 4P |
| External dimensions Inches (mm) | Draw-out type | H×W×D 3P |
| | | 4P |
| | Fixed type | H×W×D 3P |
| | | 4P |
| Enclosure dimensions Inches (mm) | 3P | |
| | H×W×D 4P | |

| Susol | | | | | |
|---------------------------------|---------|---------------------------------|---------|-----------|-----------|
| DC 1250 V (4P) / DC 800 V (3P) | | | | | |
| DC 1500 V (4P) / DC 1000 V (3P) | | | | | |
| 4P / 3P | | | | | |
| Fixed / Draw-out | | | | | |
| UL 489B, UL 489F | | | | | |
| UDA-08E | UDA-16E | UDA-20E | UDA-25E | UDA-32E | UDA-40E |
| 800 | 1600 | 2000 | 2500 | 3200 | 4000 |
| 100 | | | | | |
| 40 | | | | | |
| 80 | | | | | |
| 12,500 | | | | | |
| 10,000 | 8,000 | 5,000 | 3,000 | 2,000 | |
| | | 214 (97) | | 245 (111) | 326 (148) |
| | | 269(122) | | 309 (140) | 414 (188) |
| | | 99(45) | | 123 (56) | 205 (93) |
| | | 121(55) | | 152 (69) | 256 (116) |
| | | 101 (46) | | 110 (50) | 196 (89) |
| | | 126 (57) | | 137 (62) | 249 (113) |
| | | 16.93×16.22×16.02 (430×412×407) | | | |
| | | 16.93×20.75×16.02 (430×527×407) | | | |
| | | 11.81×14.88×11.61 (300×378×295) | | | |
| | | 11.81×19.41×11.61 (300×493×295) | | | |
| | | 19.69×19.69×13.39 (500×500×340) | | | |
| | | 19.69×24.21×13.39 (500×615×340) | | | |

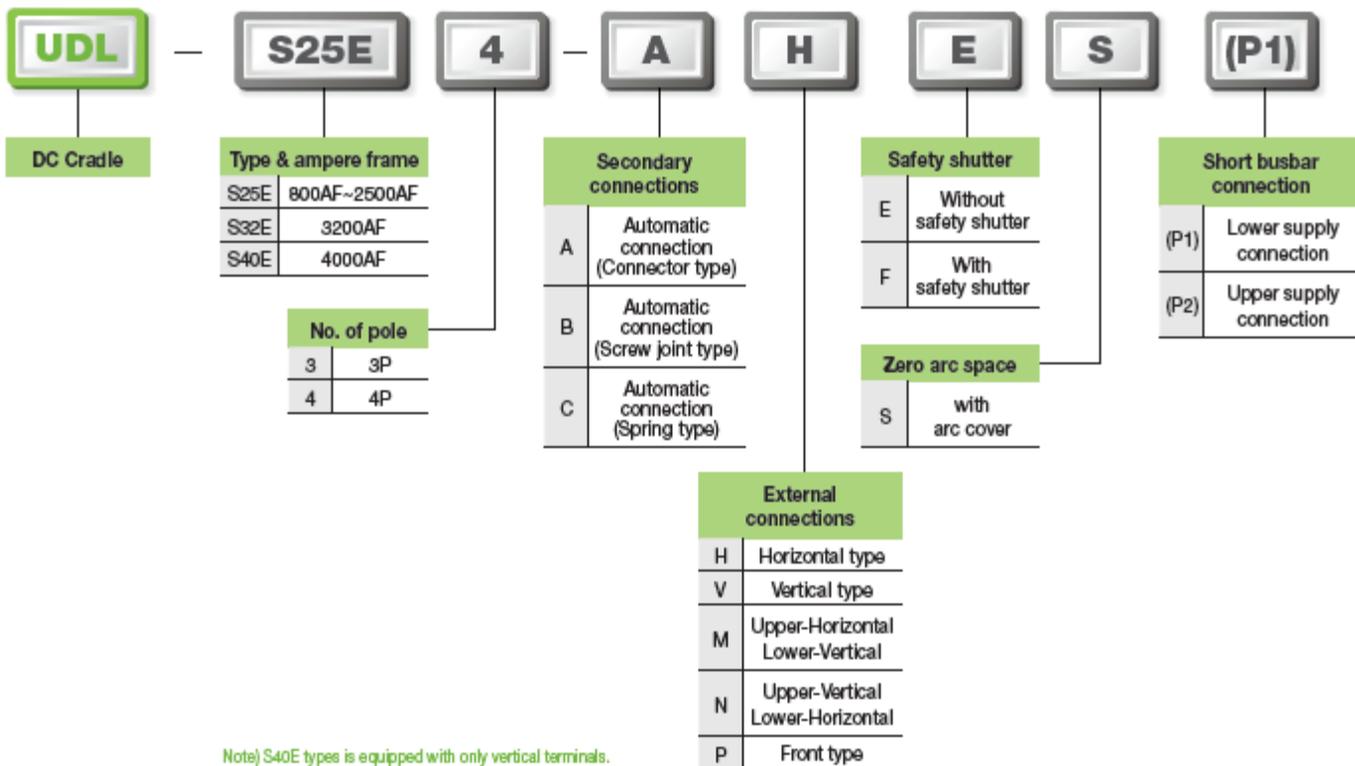
D. Ratings and types

2. Type of UDA series

Main frame



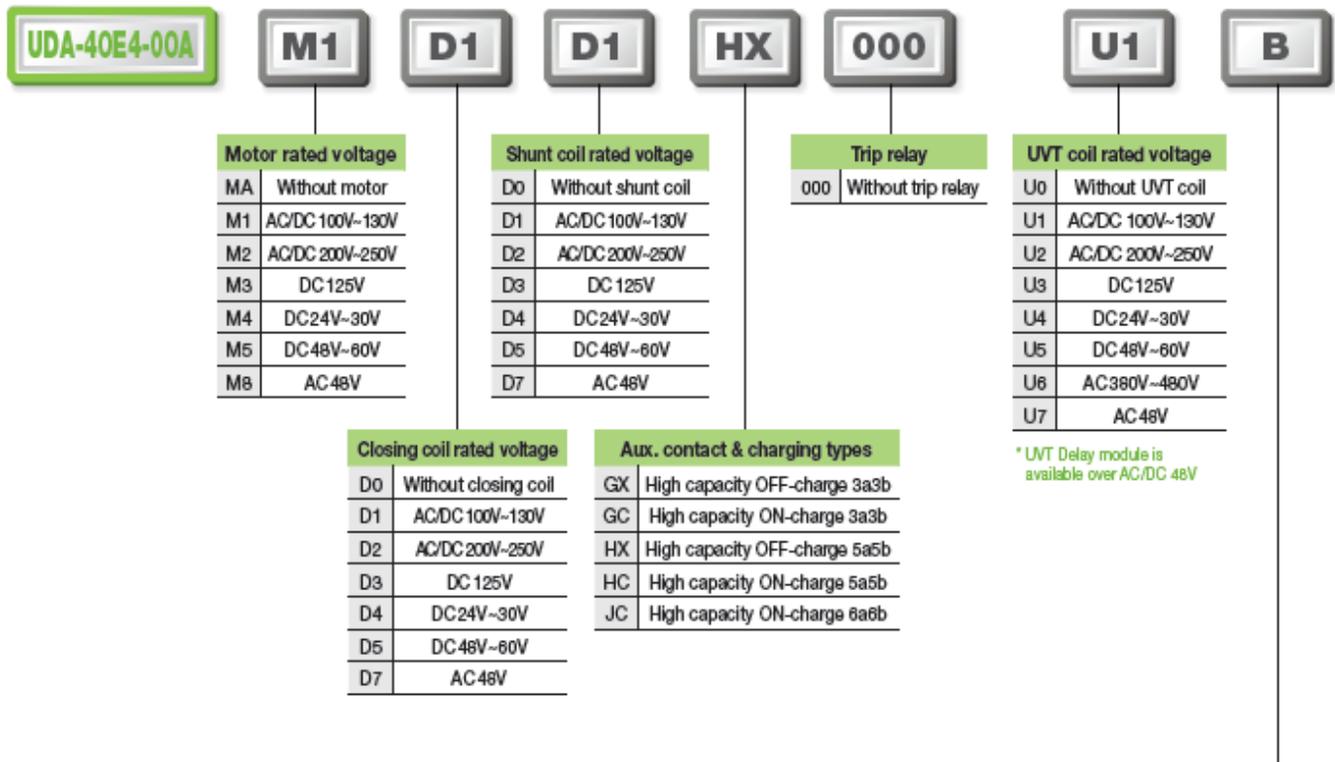
Cradle



D. Ratings and types

2. Type of UDA series

Accessories



| Option table | | | | | | |
|--------------|-------------|--|-----------|-------------|----------------|----------------------|
| Character | Option name | | Character | Option name | | |
| S | CS2 | Charge switch communication | H1 | | AC/DC 100-125V | Secondary shunt coil |
| B | B | On/Off button lock | H2 | | AC/DC 200-250V | |
| M | MI | Mechanical interlock | H3 | | DC 125V | |
| D | DI or MOC | Door interlock or MOC (Mechanism operated cell switch) | H4 | SHT2 | DC 24-30V | |
| | | | H5 | | DC 48-60V | |
| K | K1 | Key lock | H6 | | AC 380-480V | |
| K2 | K2 | Key interlock set | H7 | | AC 48V | |
| K3 | K3 | Key lock double | | | | |
| R | RCS | Ready to close switch | | | | |
| T | TM | Temperature monitoring | | | | |

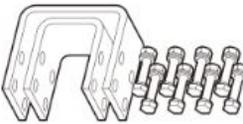
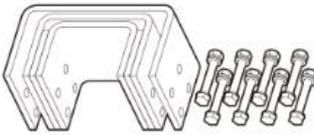
E. Weight & dimension

1. Weight

Unit : lb(kg)

| Type | 2500AF | | 3200AF | | 4000AF | |
|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | 800~2500A | | 3200A | | 4000A | |
| | 3P | 4P | 3P | 4P | 3P | 4P |
| Fixed | 101(46) | 126(57) | 110 (50) | 137 (62) | 196 (89) | 249 (113) |
| Draw-out (with cradle) | 214 (97) | 269 (122) | 245 (111) | 309 (140) | 326 (148) | 414 (188) |
| Cradle | 99 (45) | 121 (55) | 123 (56) | 152 (69) | 205 (93) | 256 (116) |

2. Specification of common busbar

| Type | AF | Ordering number | 3D configuration | Configuration |
|---------------|--------|---------------------------------------|---|---|
| UDA series | 2500AF | 70223467601 3P : 1 ea 4P : 2 ea |  | Short busbar: 75mm×10T×2ea Bolt: M12×50×4 ea Nut: M12, 4 ea Spring washer, Plain washer |
| | 3200AF | 70223467602 3P : 1 ea 4P : 2 ea |  | Short busbar: 75mm×10T×2ea Bolt: M12×50×8 ea Nut: M12, 4 ea Spring washer, Plain washer |
| | 4000AF | 70223467603 3P : 1 ea 4P : 2 ea |  | Short busbar: 125mm×10T×3ea Spacer busbar: 125mm×10T×2ea Bolt: M12×50×8 ea Nut: M12, 4 ea Spring washer, Plain washer |

F. Unpacking

1. Receiving

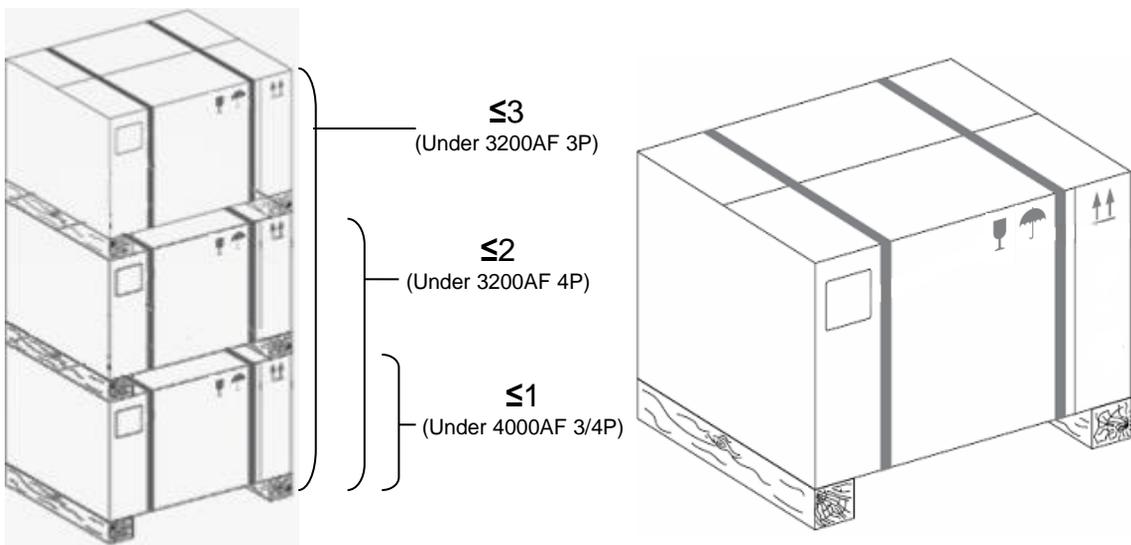
■ Receiving

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.

■ Unpacking for draw-out type

1. Keep pushing the off button, insert a draw-out handle to the body of the circuit breaker. At this time, the draw-out position indicator shows CONNECTED position.
2. Check the draw-out handle properly inserted and then push the pad lock button and turn the draw-out handle counterclockwise. The breaker reaches the TEST position.
3. Push the pad lock button and turn the draw-out handle again counterclockwise until the pad lock button projects. At this time, the draw-out operation is finished with indicator which shows DISCONNECTED position.
4. Keep pushing the lever draw button, pull the extension rails of cradle forward and lift up the breaker from cradle securely by using lifting device and put it on flat place.
5. Separate the cradle from pallet by releasing all bolts tightened on pallet to fix the cradle.

G. Handling and storage

1. Handling

1. 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.

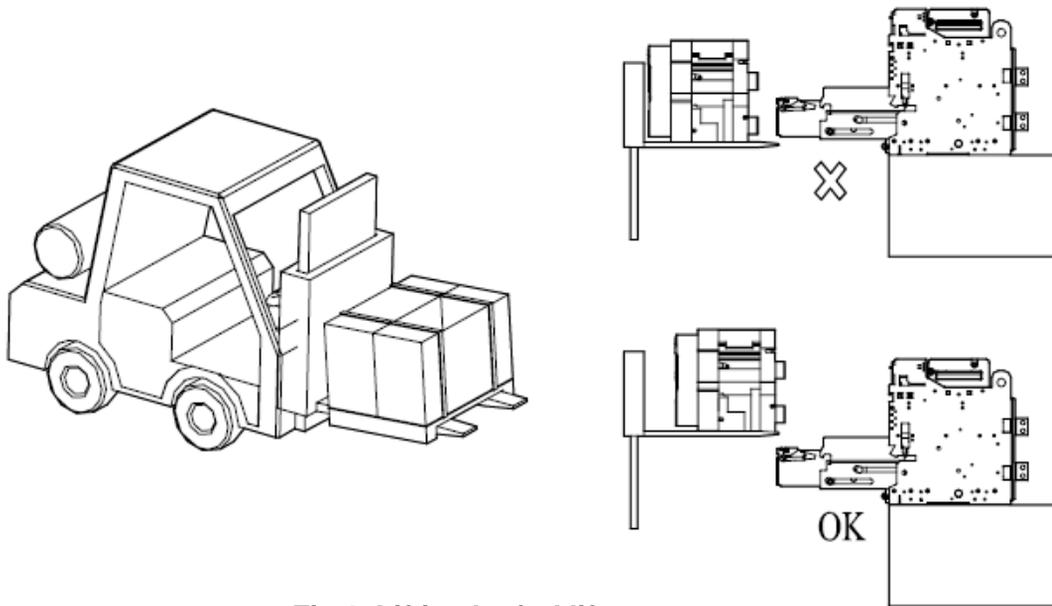


Fig 1. Lifting by forklift

2. 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.

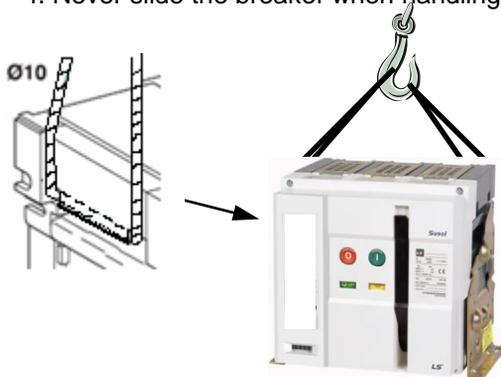


Fig. 2. Handling method of Fixed type

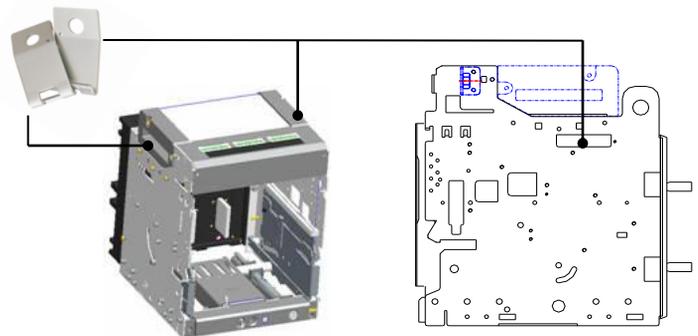


Fig. 3. Handling method of Draw-out type

G. Handling and storage

2. Storage

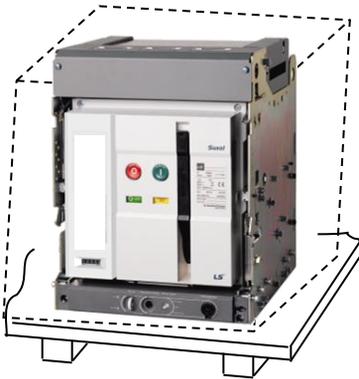
■ Precaution of storage

When storing a circuit breaker for a long term,

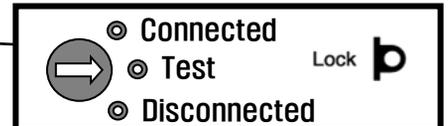
1. Keep the breaker at OFF position with the charging spring discharged.
2. Store the draw-out type breaker on the plat place after the TEST position inserted.

■ 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.



ACB open and discharge

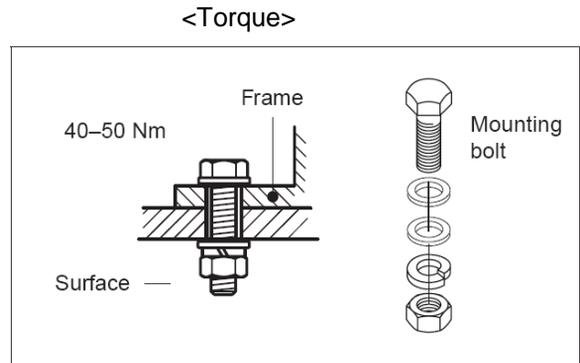
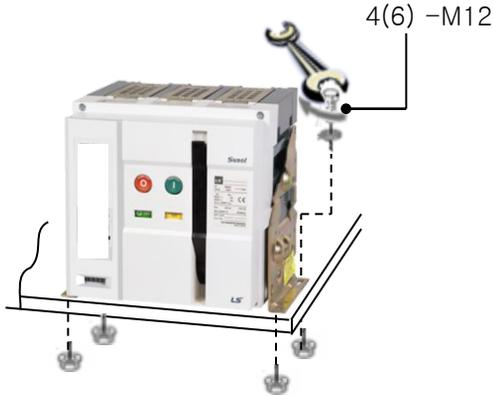


H. Installation

1. Installation of fixed type

■ Installation of fixed type

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

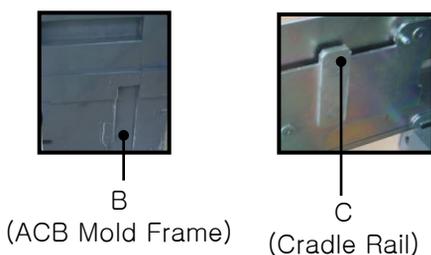
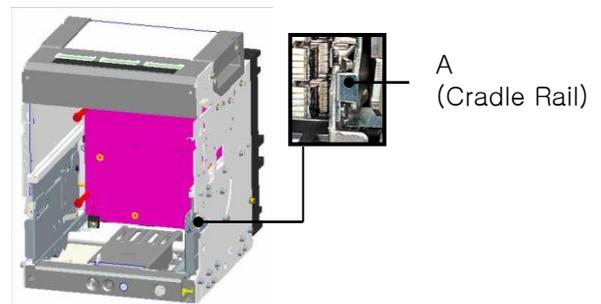
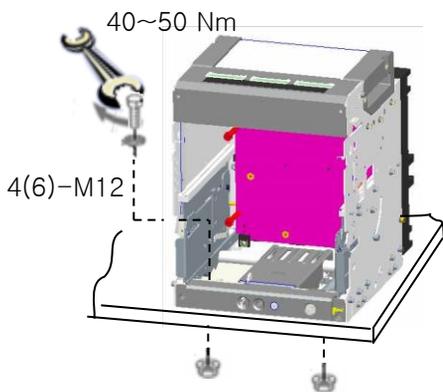


2. Installation of draw-out type

■ 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. Installation precaution

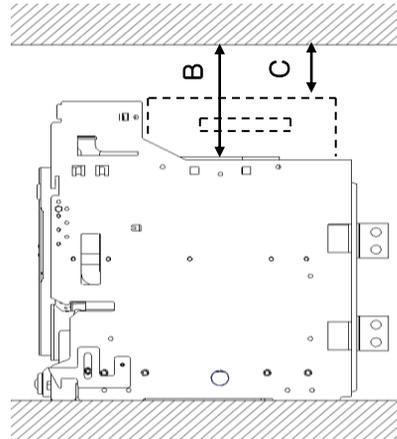
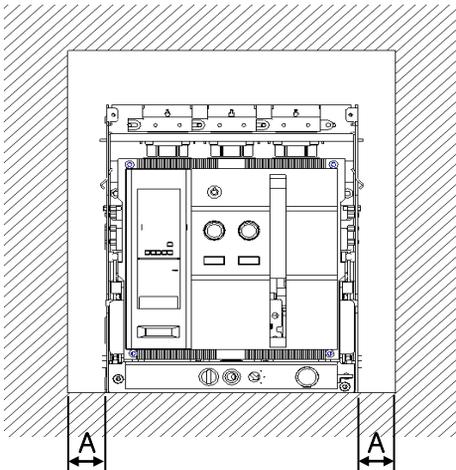
■ General Precaution

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.



■ Insulation clearance

You should keep the isolation distance between the product and panel based on the table as below.



Unit : mm

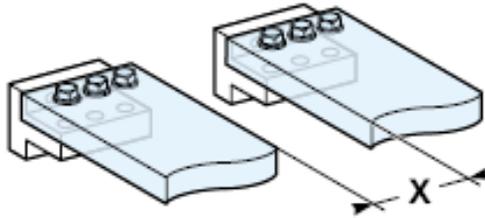
| Type | A | B | C |
|---------|----|-----|-----|
| Fixed | 50 | 150 | N/A |
| Drawout | 50 | N/A | 0 |

H. Installation

3. Installation precaution

■ Minimum spacing

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



| Voltage between parts | Minimum spacing at terminals (through air) | |
|--------------------------------|--|--|
| | Between terminals of opposite polarity (X) | Between terminals and any grounded metal |
| 131 ~ 300 V | 19.1 mm | 12.7 mm |
| 301 ~ 1000 V (or 1500 V dc) | 25.4 mm | 12.7mm |

4. Installation of insulation barrier

■ Installation of insulation barrier

1. Insert insulating barriers between the phases after installing a circuit breaker for the safety. (option)
 - The part that can not be assembled due to interference with the short busbars, Cut the part with scissors as shown in Fig.1 and assemble.
2. In case of draw-out type, direction of insertion is "C".
3. In case of fixed type, direction of insertion is "A".

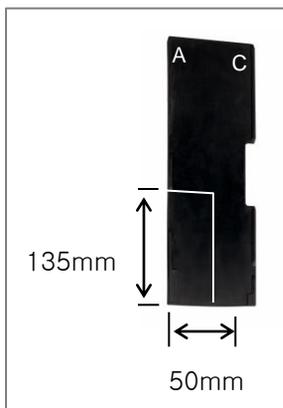
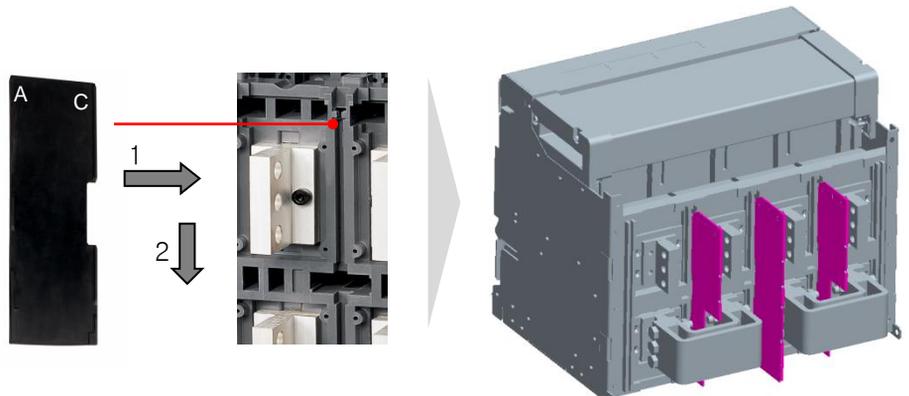


Fig.1



H. Installation

5. Busbar connection

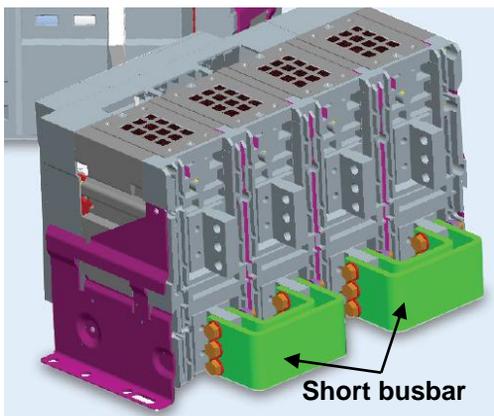
■ Operation voltage and Connection diagram of UDA Series

| Poles | 3P | 3P | 4P |
|-----------------------|----------|-----------|-----------|
| Rated maximum voltage | 500 V dc | 1000 V dc | 1500 V dc |
| Upper supply | | | |
| Lower supply | | | |

Note) If you set up connections not involved in the instruction above, ask the LSIS technical team.

■ Composition of short busbars

- Short busbars can be ordered as shown in the table below, or customers have to make short busbars in accordance with the specified busbars in section 2.
- Short busbars are configured as below according to the rated operational current.
 - 3200A below : Width 75mm x 10T x 2ea
 - 4000A : Width 125mm x 10T x 3ea
- The tightening torque for assembling short busbars is 40 ~ 50N.m



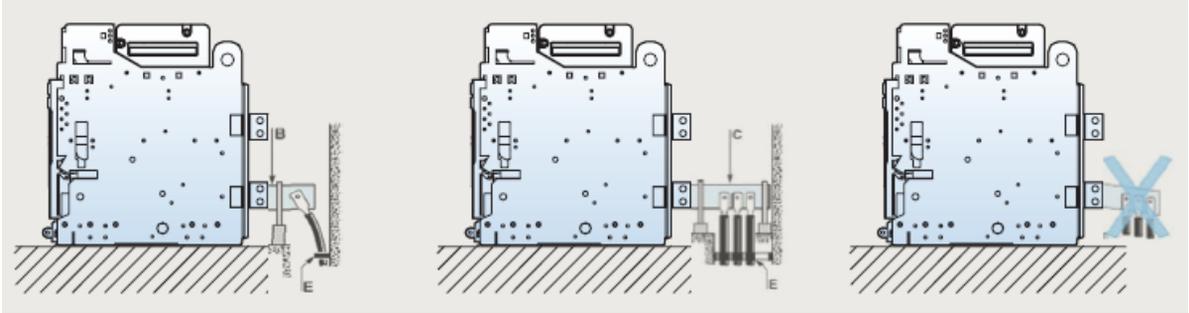
| Rated current | Ordering code | Ordering Quantity |
|---------------|---------------|----------------------|
| 800~2500A | 70223467601 | 3P : 1ea 4P : 2ea |
| 3200A | 70223467602 | 3P : 1ea 4P : 2ea |
| 4000A | 70223467603 | 3P : 1ea 4P : 2ea |

H. Installation

6. Caution of busbar connection

■ Cable connections

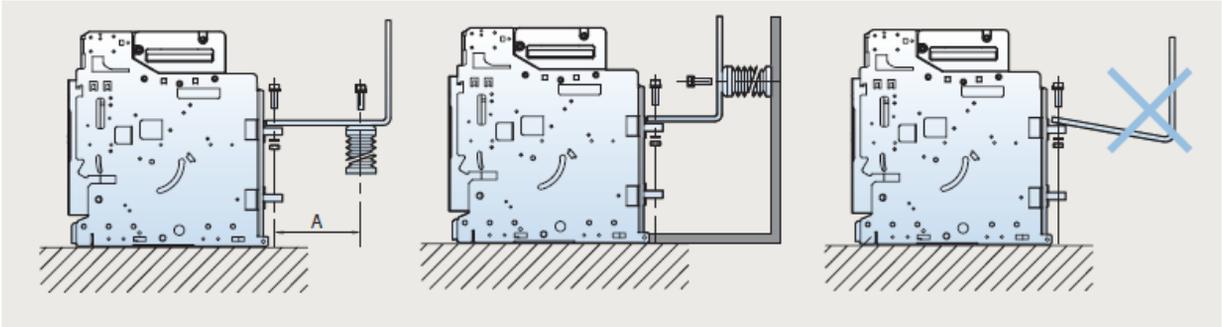
Make sure that no excessive mechanical force put on the rear terminals for cable connection. Extension terminals is fixed such as B,C and cable is to fixed to the frame such as E .



■ Busbar connections

For busbar connections, connect access parts with a provided torque and fix with parallel installing the support not to apply terminal weight to circuit breaker.

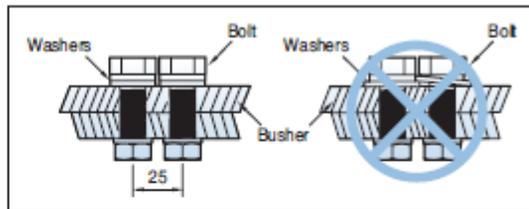
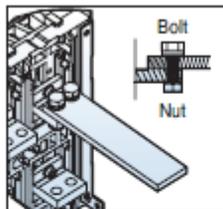
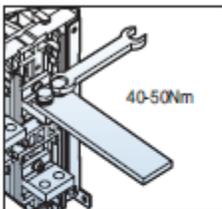
In order to prevent the spread safety or secondary accidents, seure maximum safe distance A (Table 1) from the access area to withstand the electrical force during the short circuit faults.



(Table 1) Maximum safe distance A

| | | | | | | |
|---------------------|-----|-----|-----|-----|-----|-----|
| Short capacity (kA) | 30 | 50 | 65 | 80 | 100 | 150 |
| Length A (mm) | 350 | 300 | 250 | 150 | 150 | 150 |

■ Tightening torque of assembling busbars



| Screw type | Tightening torque | | | |
|------------|-------------------|-----------|---------------|-----------|
| | Standard(kgf-cm) | Tolerance | Standard(N.m) | Tolerance |
| M8 | 135 | ±16 | 13.3 | ±1.6 |
| M10 | 270 | ±32 | 26.5 | ±3.2 |
| M12 | 480 | ±57 | 46.6 | ±5.6 |

Note) Warranty can not be applied to product damage by arbitrary alterations.

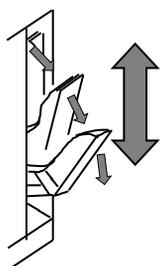
I. Operation

1. Manual operation

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

■ Manual charging

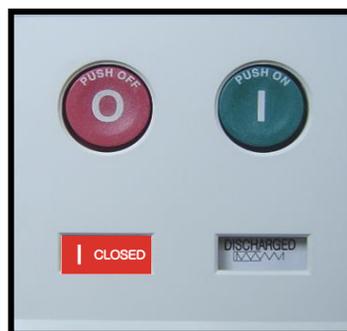
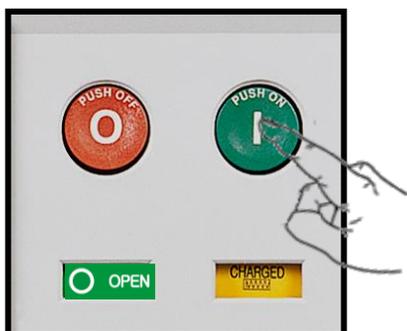
1. Charge the handle 7~ 8 times with full strokes.
2. When the closing spring is completely charged, the charging indicator shows “CHARGED”.



ACB off and charged

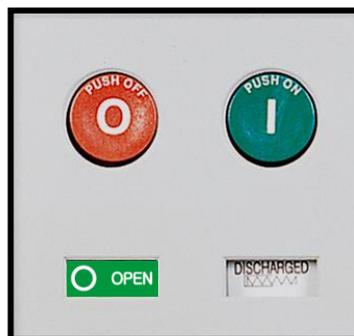
■ Manual closing

1. Push ON button.
2. The breaker will be closed.
3. The 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”.



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.

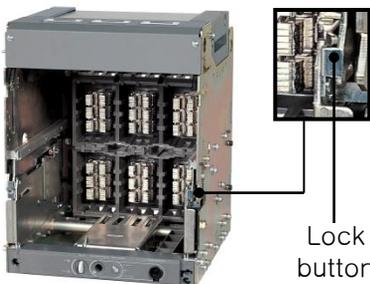
■ Electrical trip

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



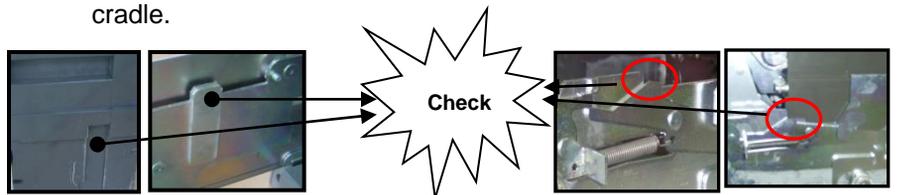
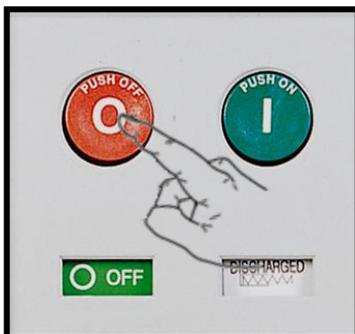
1. Pull the extension rails of cradle forward



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

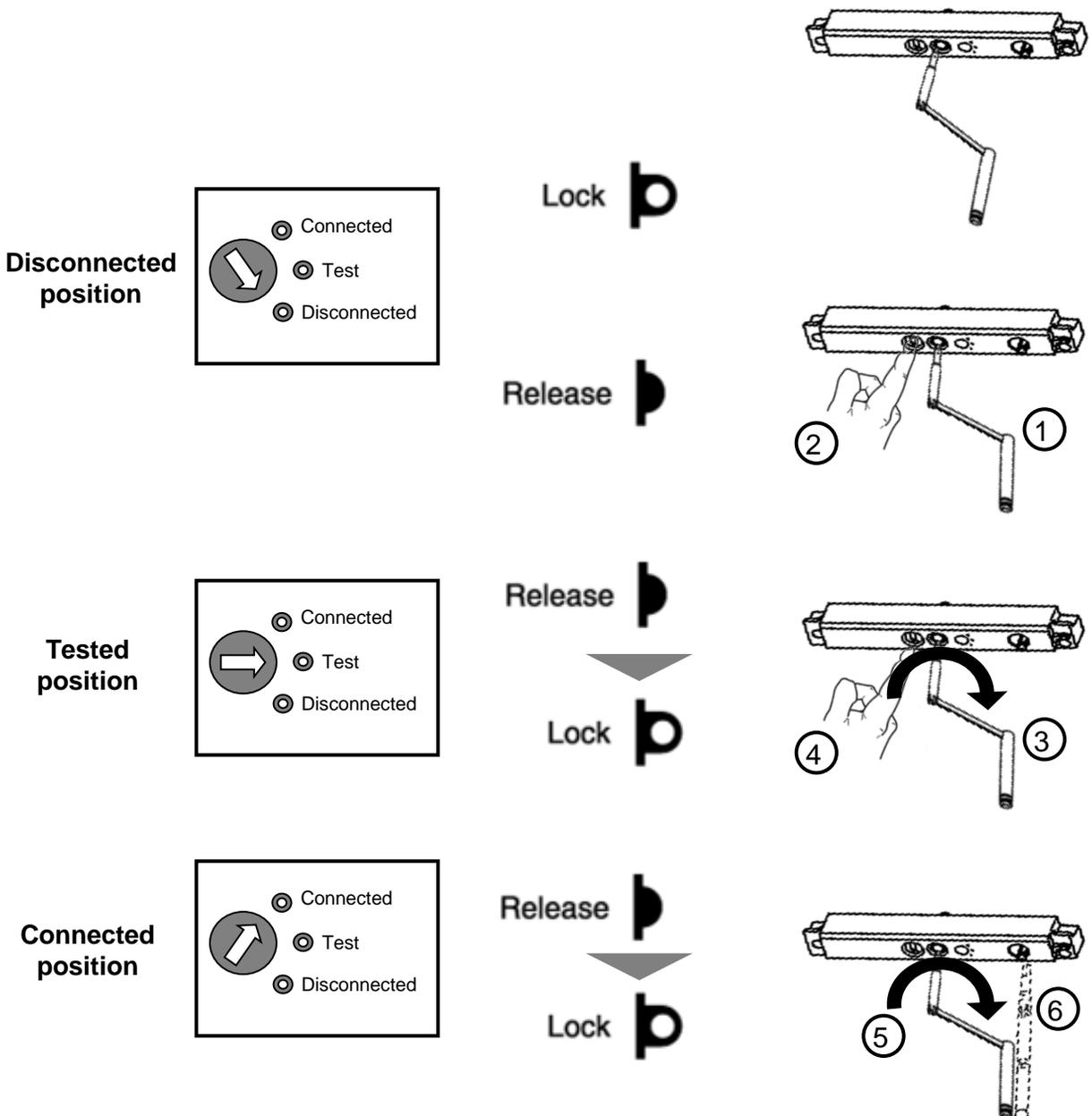
1. Operating handle of cradle only can be inserted when pushing OFF button.
2. If locking device for draw in/out protrudes, stop handle operation and move to next procedure as it indicates the complete operation of ongoing process.

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

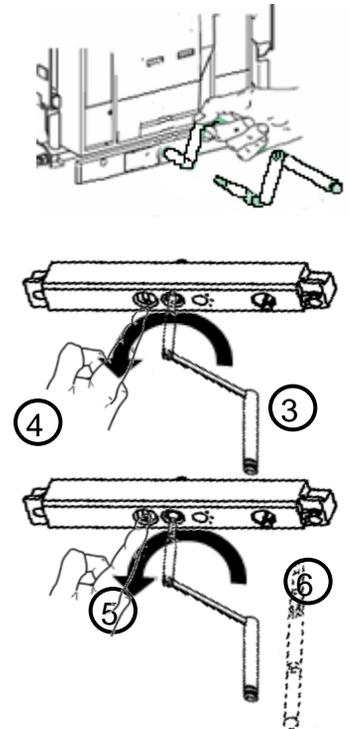
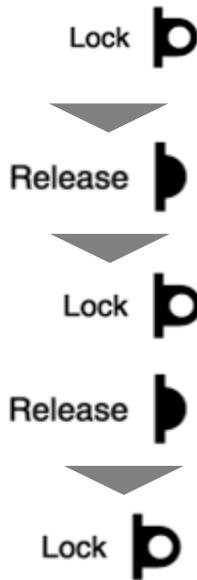
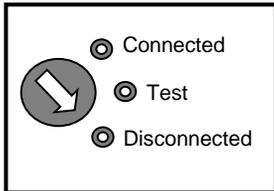
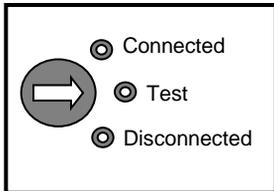
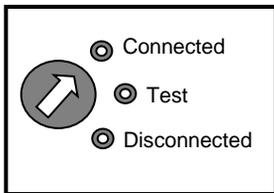
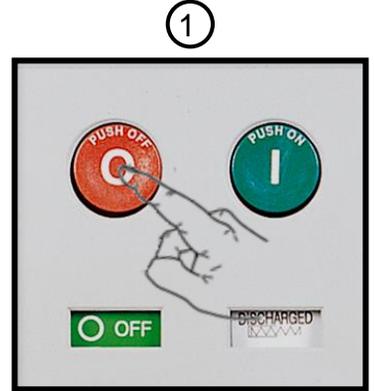


Caution

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. 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 Location without corrosive gases | Distribution panel or individual electrical room without dust proof & air conditioner | when operating after installation under the usage environment over 70 times | |
| 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 when operating after installation under the usage environment over 70 times | 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 |

* Add grease to every operational part at every maintenance cycle

J. Inspection and troubleshooting

2. Guarantee life cycle

1. Life cycle of products

| AF | Life Cycle | | Guarantee Life Cycle ** | | Number of operation (Between Servicing) *** |
|---------|------------|--------------|-------------------------|------------|--|
| | Mechanical | Electrical * | Mechanical | Electrical | |
| ~1600AF | 12,500 | 10,000 | 1,000 | 400 | 1,000 Cycle (every 2 years) |
| 2000AF | | 8,000 | | | |
| 2500AF | | 5,000 | | | |
| 3200AF | | 3,000 | | | |
| 4000AF | | 2,000 | | | |

note) * . Electrical life cycle is based on time constant 3ms.

** . Guarantee Life Cycle is according to UL489F & UL489B.

*** . Servicing shall consist of cleaning, lubricating, tightening, etc

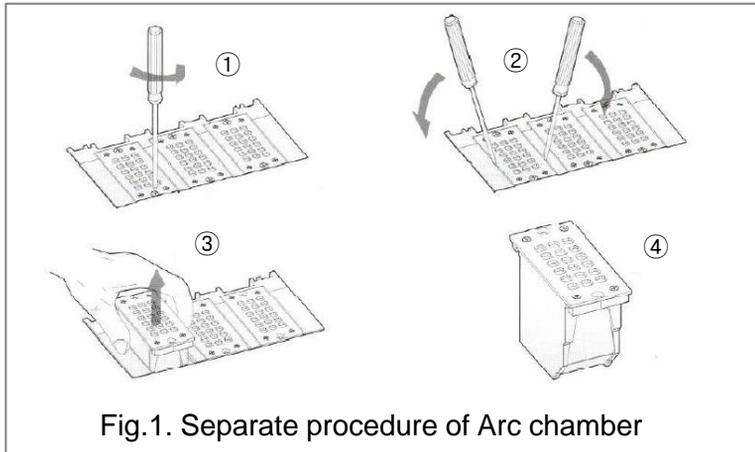
2. Service Life of Parts

| Part | Life Cycle |
|--|-----------------------|
| Arc chute | Electrical life cycle |
| Main contact | |
| Electrical parts (Closing / Shunt coil) | Mechanical life cycle |
| Charging motor | |

J. Inspection and troubleshooting

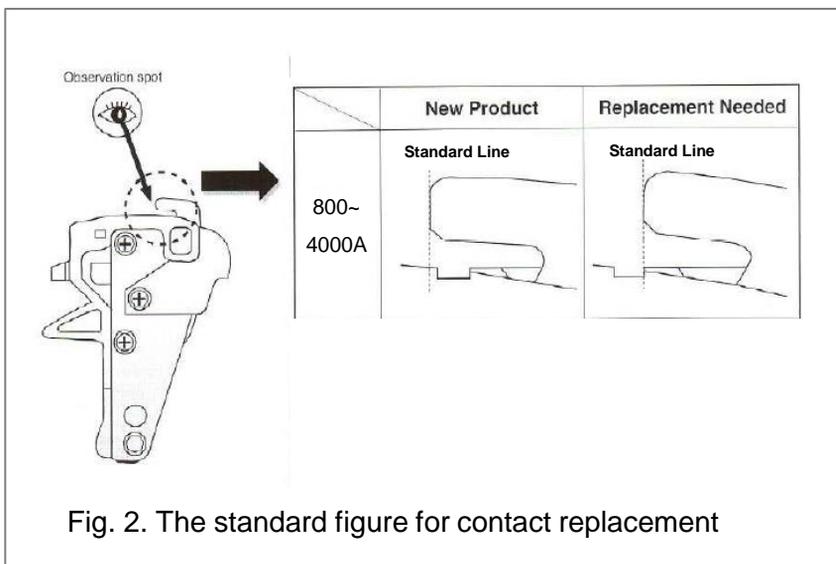
3. Inspection method of Arc chamber

1. Remove the mounting screws of the arc chamber.
 2. Separate the arc chamber by lifting it up using two screw drivers as shown in fig.1 below.
 3. Check the condition of the disassembled arc chamber.
- Check if there is any damage on grid assembly of arc chamber or parts and replace them if necessary.



4. Inspection method of main contact

1. The degree of damage of contact can be checked upon following inspection method periodically.
2. Separate arc-chamber.
3. Close the circuit breaker and compare the condition of the moving contact with the below Fig. 2.



J. Inspection and troubleshooting

5. Defects and troubleshooting guideline

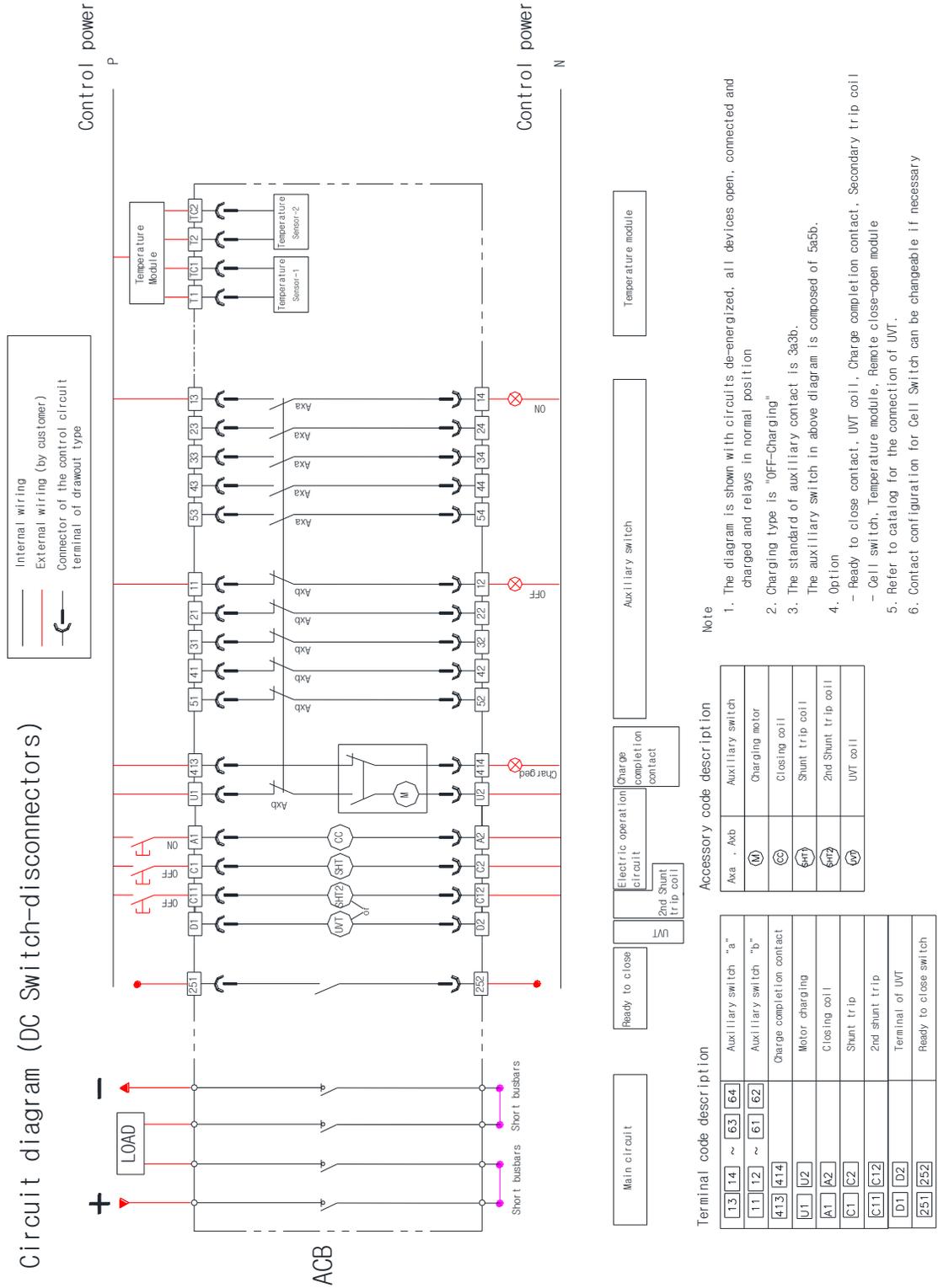
■ Troubleshooting guideline

| Types of Detect | Cause | Countermeasure |
|--|--|--|
| The breaker is opened unintended. | Voltage does not exist or UVT is damaged | Check voltage Replace damages UVT |
| The breaker is opened simultaneously with the closing operation | Short circuit | Check condition of breaker before re-closing |
| | Damage on the mechanism | Contact LSIS service center |
| Open operation cannot done automatically | Voltage supply from the trip device is too low. $V < 0.7V_n$ | Check voltage supply. (0.7~1.1Vn) |
| Open operation does not work manually | Damage on the mechanism | Contact LSIS service center |
| | Deposition of main circuit | Contact LSIS service center |
| Breaker does not close neither manually nor remotely | Closing operation at state of short circuit | Check condition on breaker |
| | Unstable draw-in/out | Check draw-in/out stage of product |
| | Anti-pumping function | Re-operate after removing power of the closing coil |
| | Spring charge of breaker is not worked | Check power supply of the charging motor. Check if manual charging works. Contact LSIS service center or replace charging motor if necessary. |
| | Power supply problem of the closing coil | Remove power supply of the closing coil . Apply power again after checking the breaker's closing availability. Contact LSIS service center if manual charging is unavailable. |
| | Power supply problem of the trip coil | Remove power supply of the trip coil |
| | Insufficient power supply of the UVT or defect | Apply voltage ($V > 0.85V_n$) to the auxiliary switch and try closing operation by closing coil |
| | Locked state of the breaker under open position | Check if the closing error state is normal |
| Close manually but does not close from remote. | Inappropriate voltage supply of the closing coil | Check voltage supply of the closing coil (0.85~1.1Vn) |
| | Defect of the closing coil is open circuit | Replace closing coil |
| Motor charging malfunction | Check condition on breaker | Check voltage supply |
| | | Check the circuit of charging motor |
| | | Try reset operation and if there is a problem or defect Please contact LSIS service center for replacement |
| Crank handle for draw-in/out cannot be inserted | No opening of the crank insertion by pressing Open button | Insert while pressing Open button |
| | Under padlock or interlock | Remove padlock or interlock |
| | Not putting the product into the cradle securely | Rush product into cradle securely |
| Breaker cannot be moved to the removable position | Crank handle is inserted | Remove crank handle |
| | Breaker is not in Disconnected position | Draw out to the Disconnected position completely |
| | Under padlock or interlock | Remove padlock or interlock |
| Breaker cannot be drawn in completely. (It is not in the connected position) | The cradle and mainframe of the breaker do not fit | Check if cradle fits with mainframe |
| | Inappropriate position of the cluster | Move cluster to the right position |
| | Safety shutter is locked | Remove the lock |

K. Wiring diagram

1. Wiring diagram

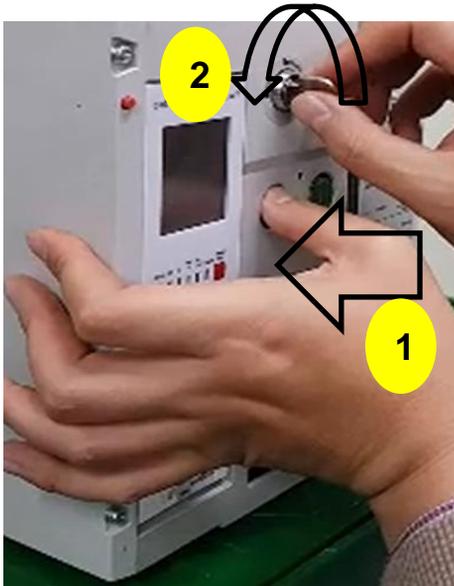
Circuit diagram (DC Switch-disconnectors)



L. Other operation

1. KEYLOCK operation

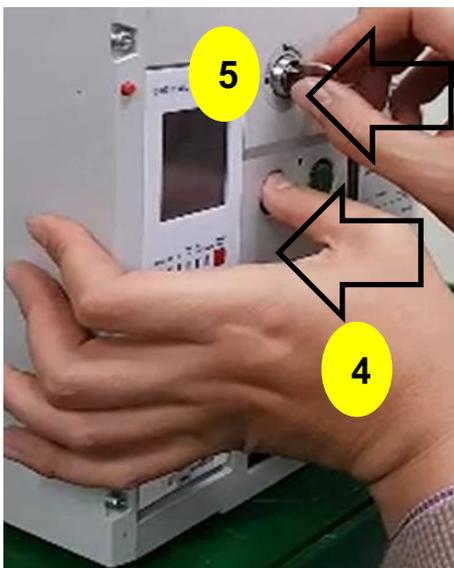
Keylock is used to prevent unintentional closing operation of the ACB by user. When the ACB is in the operation state, the ACB can operate the On/Off operation with plugged the key. If the ACB is locked, the key is unplugged and the closing operation is not possible.



- 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.

Super Solution



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LSIS Co., Ltd.

■ HEAD OFFICE

127, LS-ro, 14119, KOREA
<http://eng.lsis.com>

■ CHEONG-JU PLANT

Cheong-Ju Plant #1, Sang Jang Dong, Hung Duk Ku,
Cheong-Ju, 361-720, Korea

■ Global Network

• LSIS (Middle East) FZE >> Dubai, U.A.E.

Address: L0819 JAFZA VIC W TOWER Room 205,
Jebel Ali Freezone P.O. Box 114216, Dubai, United Arab Emirates
Tel: 971-4-886-5360 Fax: 971-4-886-5361 e-mail: jungyong@lsis.biz

• Dalian LSIS Co., Ltd. >> Dalian, China

Address: No. 15, Ligohat 3-Road, Economic and Technical
Development zone, Dalian 116600, China
Tel: 86-411-8273-7777 Fax: 86-411-8730-7560 e-mail: ld@lsis.com.cn

• LSIS (Wuxi) Co., Ltd. >> Wuxi, China

Address: 102-A, National High & New Tech Industrial Development Area,
Wuxi, Jiangsu, 214028, P.R. China
Tel: 86-510-8634-6668 Fax: 86-510-522-4678 e-mail: wuhg@lsis.com.cn

• LSIS-VINA Co., Ltd. >> Hanoi, Vietnam

Address: Nguyen Khai - Dong Anh - Ha Noi - Viet Nam
Tel: 84-4-862-0232 Fax: 84-4-862-0320 e-mail: trjo@lsivina.biz

• LSIS-VINA Co., Ltd. >> Ho Chi Minh, Vietnam

Address: 41 Nguyen Thi Minh Khai Str. Yusec Bldg 4th Floor,
Ho Chi Minh City, Vietnam
Tel: 84-9-3822-7341 Fax: 84-9-3822-7142 e-mail: abpark@lsivina.biz

• LSIS Shanghai Office >> Shanghai, China

Address: Room E-0, 12th Floor Huamin Empire Plaza, No. 758,
West Yachen Road Shanghai 200650, P.R. China
Tel: 86-21-5237-9977 (608) Fax: 86-21-5237-7191 e-mail: jeha@lsis.com.cn

• LSIS Beijing Office >> Beijing, China

Address: B-Tower 17FL, Beijing Global Trade Center B/D, No. 36,
BeiSanHuanDong Lu, DongCheng-District, Beijing 100013, P.R. China
Tel: 86-10-5825-6025.7 Fax: 86-10-5825-6026 e-mail: cuta@lsis.com.cn

• LSIS Guangzhou Office >> Guangzhou, China

Address: Room 1403-14F, New Poly Tower 2, Zhongshan 1st Road,
Guangzhou, P.R. China
Tel: 86-20-8325-6764 Fax: 86-20-8325-6787 e-mail: lsis2@lsis.com.cn

• LSIS Cheongdu Office >> Cheongdu, China

Address: Room 1701-17Floor, Jiuamshiban, Jiuamshiban Building,
No.1 Fusheng Road Cheongdu, 610041, P.R. China
Tel: 86-28-8676-3101 Fax: 86-28-8070-3200 e-mail: yangc@lsis.com.cn

• LSIS Qingdao Office >> Qingdao, China

Address: 7840, Huanan Guangchang Shenyu Building B, No. 0,
Shangrong Road Qingdao 266001, P.R. China
Tel: 86-532-8501-6668 Fax: 86-532-8671-3793 e-mail: ln@lsis.com.cn

• LSIS NETHERLANDS Co.Ltd >> Netherlands

Address: 1st Floor, Tupevoutaan 48, 1118KZ, Schiphol-Rijk, The Netherlands
Tel: 31-20-654-1420 Fax: 31-20-654-1429 e-mail: jurohickp@lsis.biz

• LSIS Gurgaon Office >> Gurgaon, India

Address: 1051 1st Floor, Park Central Sector 30, Gurgaon-122002,
Haryana, India



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

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