Susol Super Solution

DC Compact DSU

DC Switch-disconnectors

INSTRUCTION MANUAL

LSIS

Instruction manual of DC Compact DSU

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Instruction manual of DC Compact DSU

I. Operation

J. Inspection and troubleshooting

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:

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

2) 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.

3) 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.

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 Main body tripped automatically, always clear the source of the malfunction before closing the product 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 Main body 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 product 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) Product 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 product 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.

4. Warning

Warning

Receiving

A visual inspection - inside and out - should be performed immediately upon receipt of the product and before removing it from the truck. Shipping papers should be checked to ensure all boxes or other accompanying pieces have been received. If any damage or shortages are evident, a claim should be filed at once with the carrier, and the nearest LSIS sales office. Claims for shortages or other errors must be made in writing to LSIS within 30days after receipt of Compact 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 product structure for insertion of hooks to lift the complete structure. This is the only recommended method of moving the product 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.

1. Normal / Special service condition

Normal service conditions

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

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

Special service conditions

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

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

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

Product model	Rated current	Apply BUS-BAR										
Switch-Disconnecors (IEC60947-3)			Horizontal					Vertical				
			40°C	45°C	50°C	55°C	60°C	40°C	45°C	50°C	55°C	60°C
DDH/DDV - 08~16C	800A	6T×50×2ea	800A	800A	800A	800A	800A	800A	800A	800A	800A	800A
		10T×60×1ea										
	1000A	8T×50×2ea	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A	1000A
	1250A	6T×75×2ea	N/A	N/A	N/A	N/A	N/A	1250A	1250A	1250A	1250A	1250A
		8T×60×2ea	1250A	1250A	1250A	1175A	1100A					
		10T×50×2ea										
	1600A	6T×75×3ea	N/A	N/A	N/A	N/A	N/A	1600A	1600A	1600A	1525A	1450A
		8T×60×3ea	1600A	1525A	1450A	1375A	1300A					
		10T×60×2ea										

2. Altitude and insulation clearance

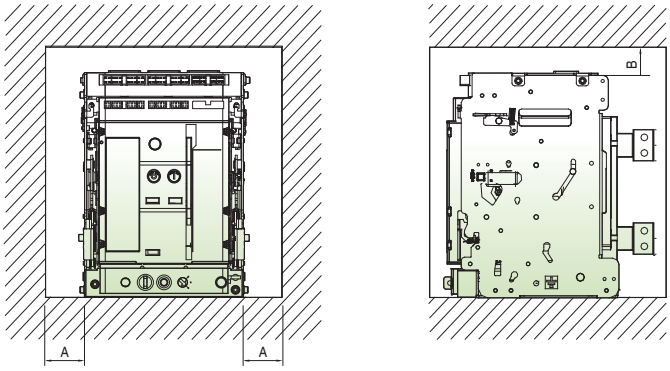
Altitude

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

Item \ Altitude (m)	Source type	2000	3000	4000	5000
Rated operating voltage (Vdc)	DC	1500 V	1350 V	1200 V	1050 V
	DC	1200 V	1080 V	960 V	840 V
	DC	1000 V	900 V	800 V	700 V
	DC	750 V	675 V	600 V	525 V
Current compensation constant	AC/DC	1×In	0.98×In	0.96×In	0.94×In

Insulation clearance

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

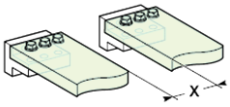


(Unit : mm)

Type	A	B
Fixed	50	150
Fixed (When installing Arc Screen)	5	50
Draw out	5	50

Minimum insulation clearance

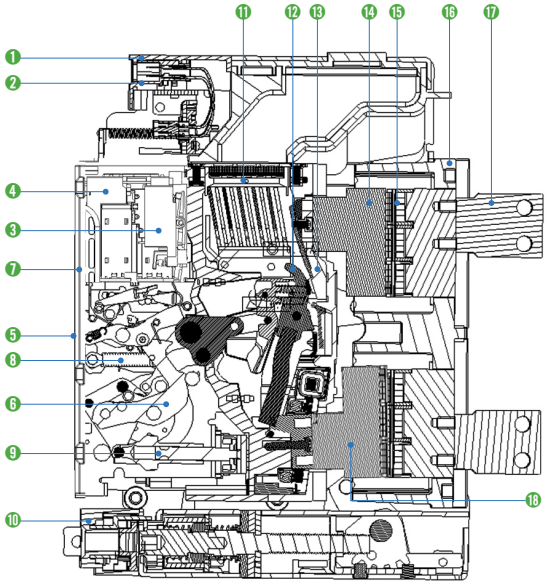
The dimension of all charging parts should be over the minimum insulation clearance.



Insulating voltage (Ui)	Min. insulation clearance (X min)
1000 Vdc or less	14 mm
~ 1500V	16 mm

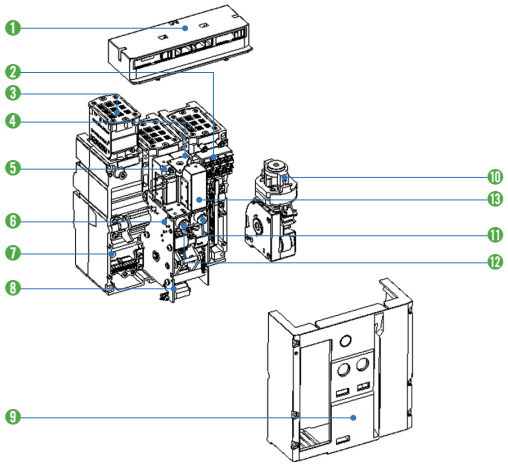
1. Internal structure and components

Internal configuration



1. Control terminal block
2. Control terminal
3. Auxiliary switch
4. Closing, Tripping, UVT coil
5. Front cover
6. Mechanism
7. Charging handle
8. Tripping spring
9. Closing spring
10. Draw-out device
11. Arc extinguishing part
12. Moving contact
13. Fixed contact
14. Current carrying part on line
15. Cradle finger
16. Cradle
17. Current carrying part in circuit breaker
18. Current carrying part on load

Components

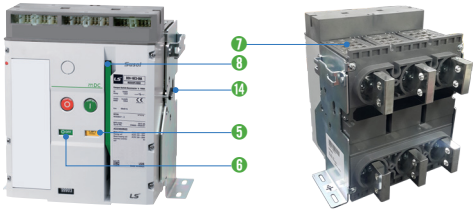


1. Control terminal block
2. Auxiliary switch
3. Arc chute
4. Tripping coil
5. UVT coil
6. Mechanism
7. Main body
8. Counter
9. Front cover
10. Motor assembly
11. Button ON
12. Button OFF
13. Closing coil

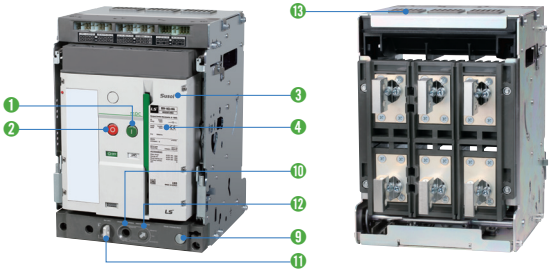
1. Internal structure and components

External configuration

• **Fixed type**



• **Draw-out type**



1. ON button
2. OFF button
3. Series name
4. Rated name plate
5. Charge/Discharge indicator
6. ON/OFF indicator
7. Arc chute
8. Charge handle
9. Draw-out handle
10. Handle inserting hole
11. Pad lock button
12. Position indicator
13. Arc cover
14. Mechanical interlock

Terminal Configuration

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


Vertical type


Horizontal type


Upper-Horizontal /Lower-Vertical type


Upper-Vertical/ Lower-Horizontal type


Plane type


Spread type


Plane spread type


Plane vertical type


Cable lug type

2. Basic function and breaking operation

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

1. Circuit closing

The closing operation of mechanism applies the current to the load. When energized, some loads makes inrush current much greater than rated current (In) (e.g. Motor takes in 7~8times of In for a few seconds).

To prevent these over current which causes the dangerous phenomena for contacts (Erosion by arcs), closing operation should be prompt. If a circuit breaker is in accordance with all standard cases, it should be able to endure 15~20 times of the rated current and be opened promptly for the faults occurred during closing operation or after it has closed.

2. Current conducting

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

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

3. Circuit opening, Current breaking

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) A maximum leakage current test under rated using voltage (Max. Ue)
2) An impulse voltage

D. Types and ratings

1. Types of Susol series

DC Compact Switch Disconnector

DDV – 16 C 3 – 00 J

Switch–disconnectors	
DDH	1200Vdc
DDV	1500Vdc

Ampere Frame	
08	800AF
10	1000AF
13	1250AF
16	1600AF

Frame size	
C	800~1600AF

Poles	
3	3P (DDH 750V)
	3P (DDV 1000V)
4	4P (DDH 1200V)
	4P (DDV 1500V)

Rated current	
00	None

Connections	
Drawout	
A	Bottom operating (Auto connect)
J	Bottom operating
Fixed	
H	Horizontal terminals
V	Vertical terminals
M	Horizontal for line. Vertical for load
N	Vertical for line. Horizontal for load
P	Front terminals
Z	Horizontal with spreaders
R	Vertical with spreaders
T	Front connection via vertical connection adapters fitted with cable-lug adapter
X	Cable lug

M1 D1 D1 FX 000 U1 C

Motor operator	
MA	None(Manual operated)
M1	AC/DC 100V~130V
M2	AC/DC 200V~250V
M3	DC 125V
M4	DC 24V~30V
M5	DC 48V~60V
M6	AC 380V~415V
M7	AC 440V~480V
M8	AC 48V

Closing coil	
D0	None
D1	AC/DC 100V~130V
D2	AC/DC 200V~250V
D3	DC 125V
D4	DC 24V~30V
D5	DC 48V~60V
D6	AC 380V~480V
D7	AC 48V

Shunt trip	
D0	None
D1	AC/DC 100V~130V
D2	AC/DC 200V~250V
D3	DC 125V
D4	DC 24V~30V
D5	DC 48V~60V
D6	AC 380V~480V
D7	AC 48V

Aux.contact & charging types	
FX	Standard OFF-Charge 4C
FC	Standard ON-Charge 4C
LC	Standard ON-Charge 3C TCS

※ TCS (Trip Circuit Supervision)
※ Auxiliary switch for micro load (Order No. 83011176209)

Trip relay
No trip relay

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

* UVT Delay consists of AC/DC 48V

Accessories

1. Types of Susol series

Options

Code	Description	Option description
C	C	COUNTER
B	B	On/Off Button lock
K	K1	Key lock
K2	K2	Key interlock set
R	RCS	Ready to close switch
H1	SHT2 (Note)	AC/DC 100V ~ 130V, Double shunt coil
H2		AC/DC 200V ~ 250V, Double shunt coil
H3		DC 125V, Double shunt coil
H4		DC 24V ~ 30V, Double shunt coil
H5		DC 48V ~ 60V, Double shunt coil
H6		AC 380V ~ 480V, Double shunt coil
H7		AC 48V, Double shunt coil

*Note) UVT & SHT2 can be not applicable together.

2. Types of Cradle series

Cradle

Type	
LS ACB CRADLE	
AL	Bottom operating cradle

Type ampare frame	
H16C	AH 800~1600A

Poles	
3	3poles
4	4poles

Secondary connection type	
J	Manual connection type
A	Auto connection type

Terminal configuration	
H	Horizontal type
V	Vertical type
M	Upper-Horizontal/ Lower-Vertical type
N	Upper-Vertical/ Lower-Horizontal type
P	Plane type
Z	Plane spread type
R	Spread type
T	Plane vertical type
X	Cable lug type

Shutter	
E	Without shutter
F	With shutter

Arc cover	
S	With arc cover

3. Ratings

Susol DC Compact DSU

Main Rating									
Rated operational voltage (Ue)			(V)	DC 750V (3P) , DC 1200V (4P)				DC 1000V (3P) , DC 1500V (4P)	
Rated insulation voltage (Ui)			(V)	1500					
Rated impulse withstand voltage (Uimp)			(kV)	12					
Number of poles			(P)	3, 4					
Provided model				Fixed type / Draw-out type					
Reference standard				IEC 60947-3 (DEKRA CB), GB 14048.3 (CCC)					
Type				DDH				DDV	
				DDH-08C	DDH-10C	DDH-13C	DDH-16C	DDV-08C	DDV-10C	DDV-13C	DDV-16C
Ampere Frame (AF)				800AF	1000AF	1250AF	1600AF	800AF	1000AF	1250AF	1600AF
Usage Category (IEC 60947-3)				DC-22A				DC-23A			
Rated making capacity (Icm)	(kA peak)		DC	50							
Rated Short-time capacity (Icw)	(kA/1s)		DC	50							
Operating time	(ms)		Total breaking time	max. 40							
			Closing time	max. 80							
BUS-BAR connection method	Fixed type		Horizontal type	○							
			Vertical type	● (Default)							
	Draw-out type		Horizontal type	○							
			Vertical type	● (Default)							
Durability											
Opening and closing duration (times) (Unpaid)	Mechanical			12,500							
	Electrical			Conduction current	Time constant			Conduction current	Time constant		
					2ms	7.5ms			2ms	7.5ms	
				~ 800A	2,000	-		~ 800A	4,000	2,000	
				~ 1600A	500	-		~ 1600A	1,000	500	
Common Dimension and Weight											
Weight (3P/4P)	(kg)	Draw-out type	Without Cradle	15.5(3P)/19(4P)				15.5(3P)/19(4P)			
			With Cradle	22(3P)/26(4P)				22(3P)/26(4P)			
		Fixed type		15.5(3P)/19(4P)				15.5(3P)/19(4P)			
Dimension (W×H×D)	(mm)	Draw-out type		361.3×267×255.4(3P), 361.3×267×326(4P)							
		Fixed type		283×219.5×272.4(3P), 283×219.5×342.4(4P)							

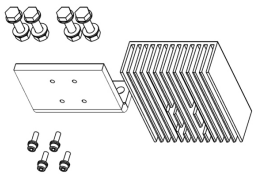
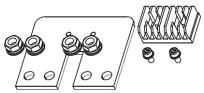
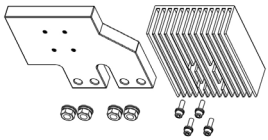
1. Weight and Short busbar dimensions

1. Weight

(Unit : kg)

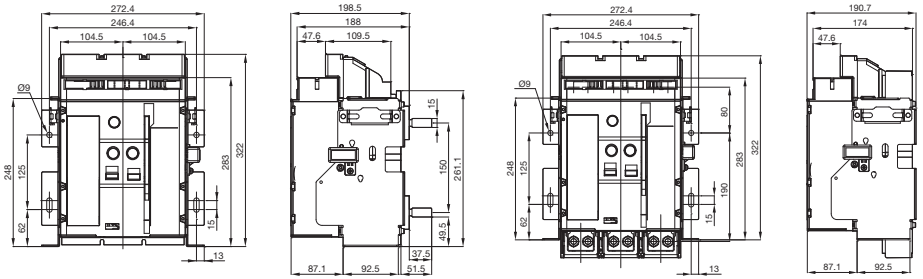
Type	DDH/DDV type	
Poles	3P	4P
Fixed type	16	19.5
Draw-out type	16	19.5
Cradle	22	26

2. Short busbars weight

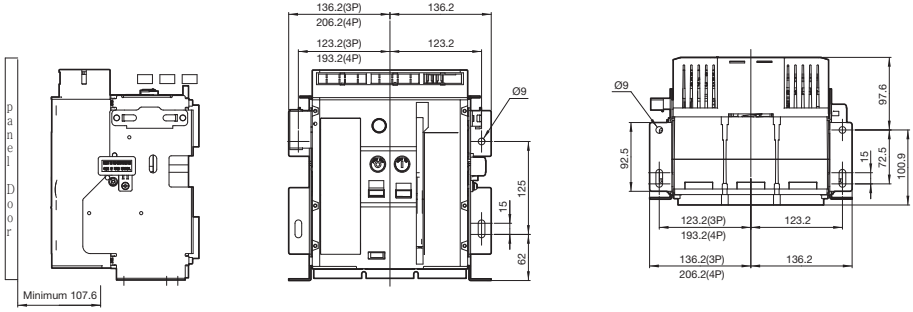
Type	Rated current	Busbar connection	Order code	Edifice	Order quantity	Weight (kg/set)
Fixed / Draw-out type	800-1600A	Vertical / Horizontal	70223472600	Short busbar : 1ea/unit, Heatsink : 1ea/unit M10 Bolt Set : 4ea/unit, M6 Bolt: 4ea/unit M4 Screw : 1ea/unit 	3P : 1 unit 4P : 2 unit	2kg/unit
Fixed type	800~1250A	Front	70223472601	Short busbar : 1ea/unit, Heatsink : 1ea/unit M10 Nut Set : 4ea/unit, M6 Bolt: 2ea/unit 	3P : 1 unit 4P : 2 unit	0.7kg/unit
	1600A	Front	70223472602	Short busbar : 1ea/unit Heatsink : 1ea/unit, Barrier Pad : 1ea/unit M10 Nut Set : 4ea/unit, M6 Bolt: 4ea/unit 	3P : 1 unit 4P : 2 unit	5kg/unit

2. Dimension

1) Fixed type



2) Mounting (Fixed type)

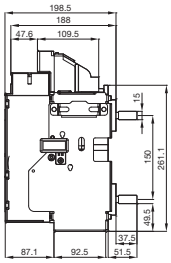


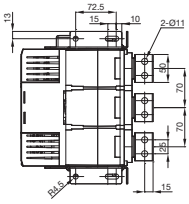
Rear Mounting

Bottom Mounting

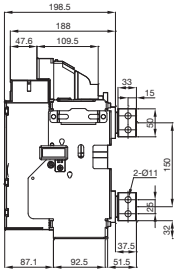
2. Dimension

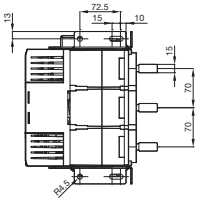
a. 3P Horizontal type (H)



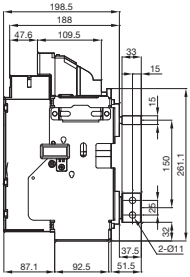


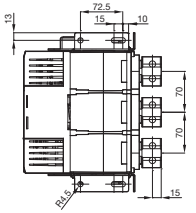
b. 3P Vertical type (V)





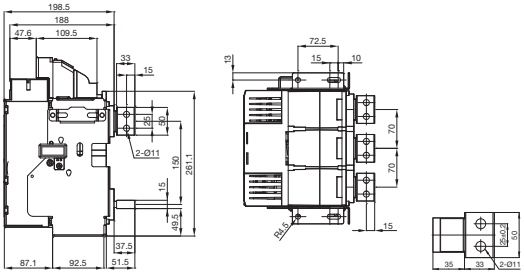
c. 3P Upper-Horizontal/Lower-Vertical type (M)



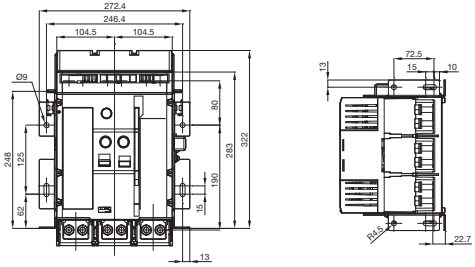


2. Dimension

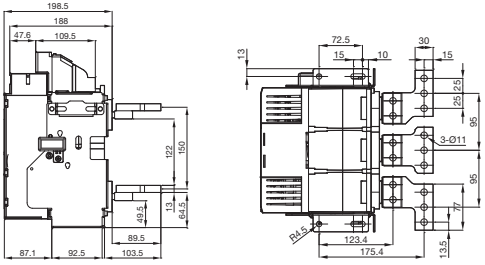
d. 3P Upper-Vertical/Lower-Horizontal type (N)



e. 3P Plane type (P)

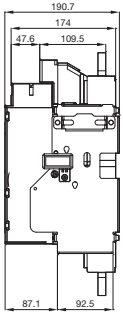


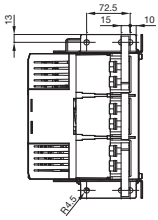
f. 3P Spread type (R)



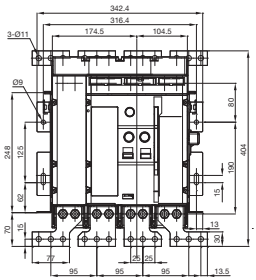
2. Dimension

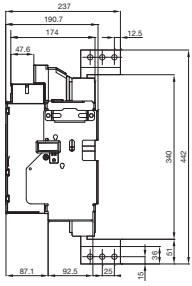
g. 3P Plane spread type (Z)

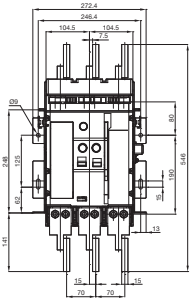


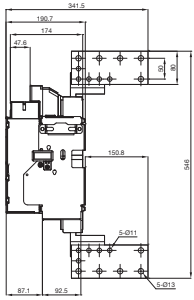
h. 3P Plane vertical type (T)



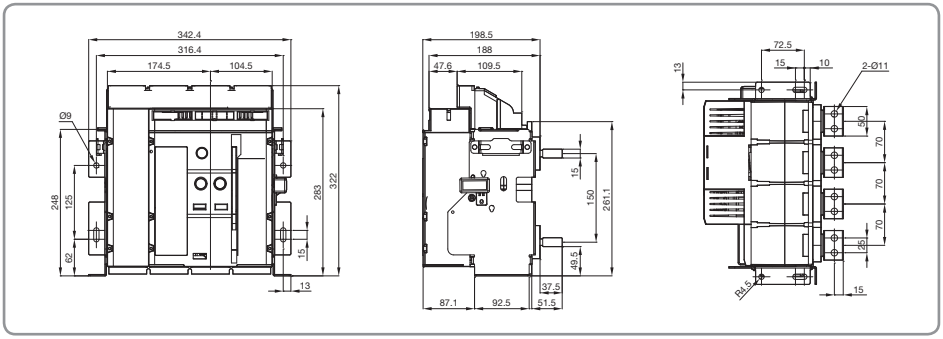
i. 3P Cable Lug type (X)

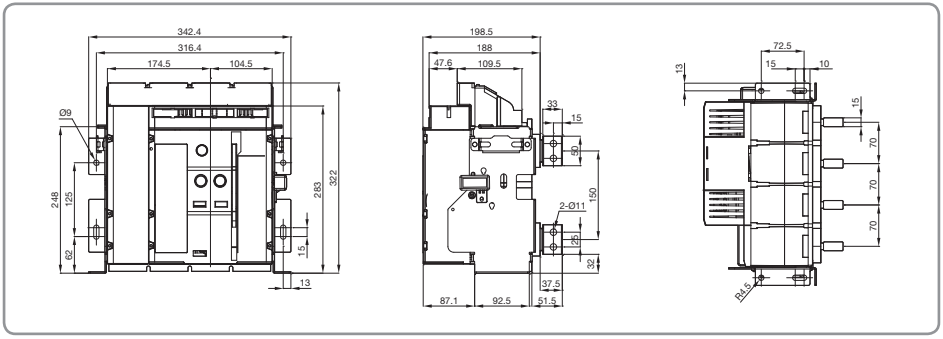


2. Dimension

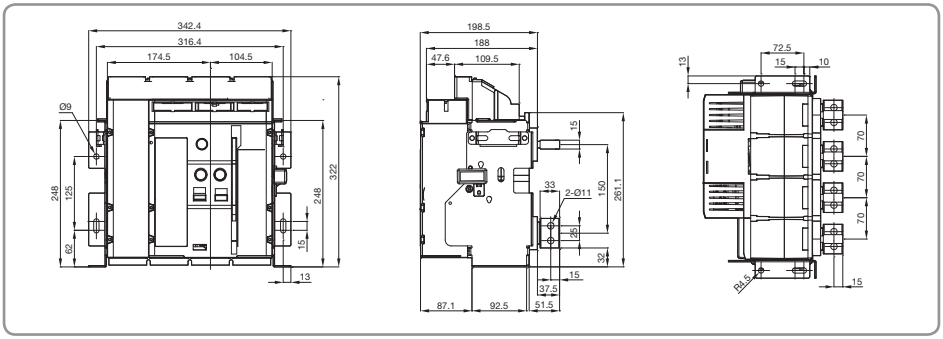
j. 4P Horizontal type (H)



k. 4P Vertical type (V)

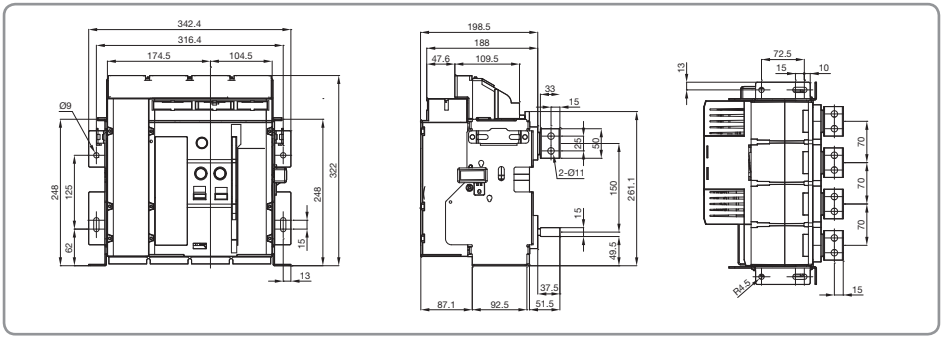


l. 4P Upper-Horizontal/Lower-Vertical type (M)

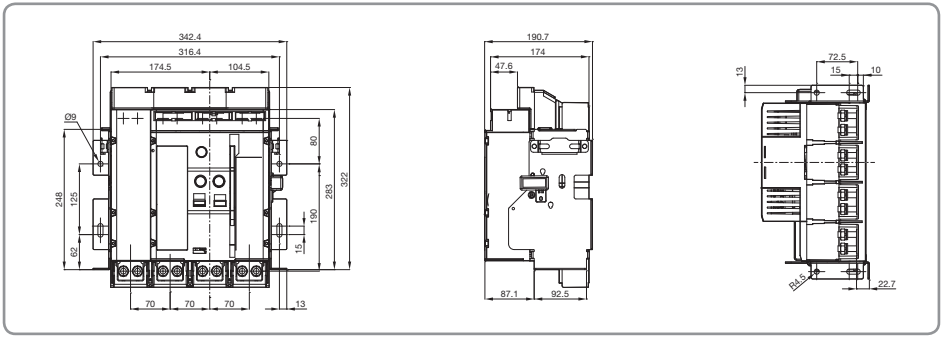


2. Dimension

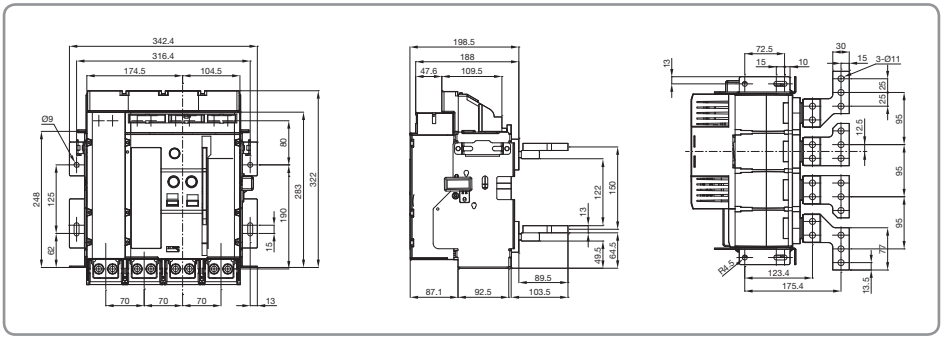
m. 4P Upper-Vertical/Lower-Horizontal type (N)



n. 4P Plane type (P)

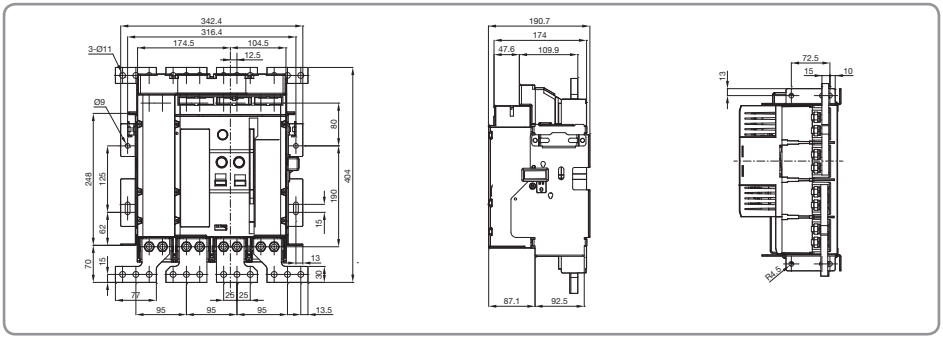


o. 4P Spread type (R)

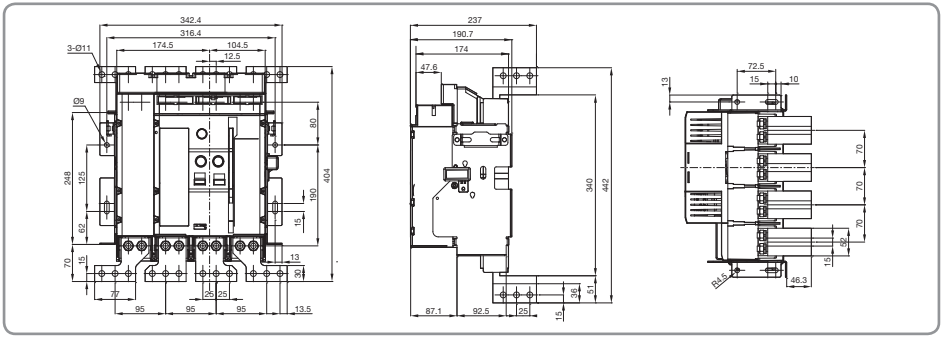


2. Dimension

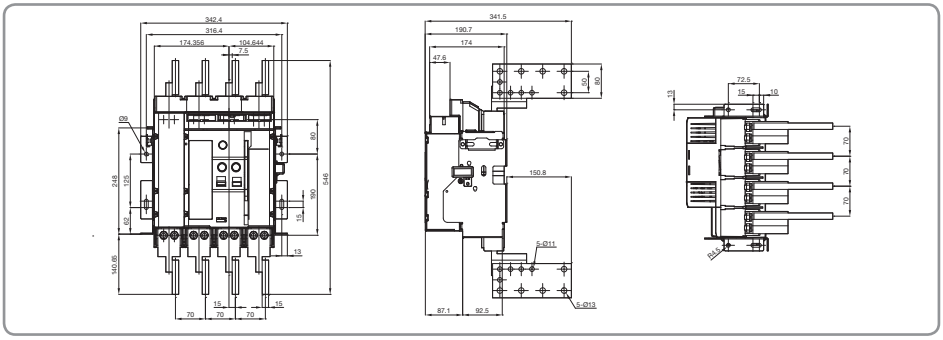
p. 4P Plane spread type (Z)



q. 4P Plane vertical type (T)

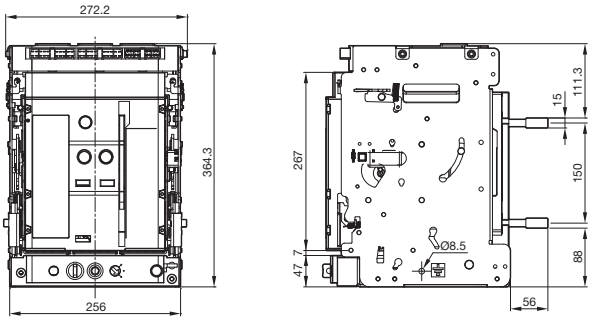


r. 4P Cable Lug type (X)

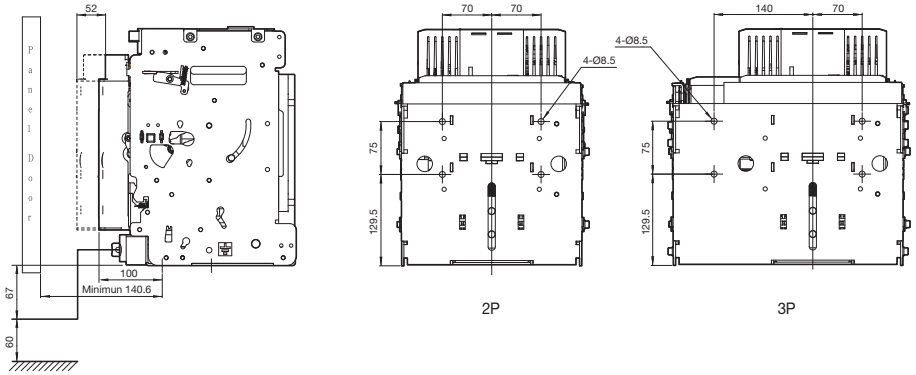


2. Dimension

4) Draw-out type

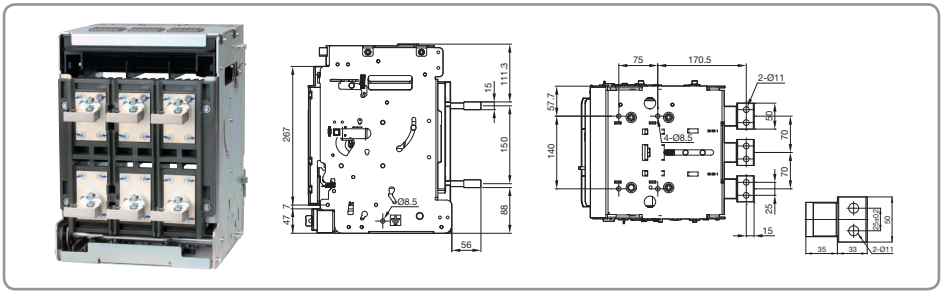


5) Mounting (Draw-out type)



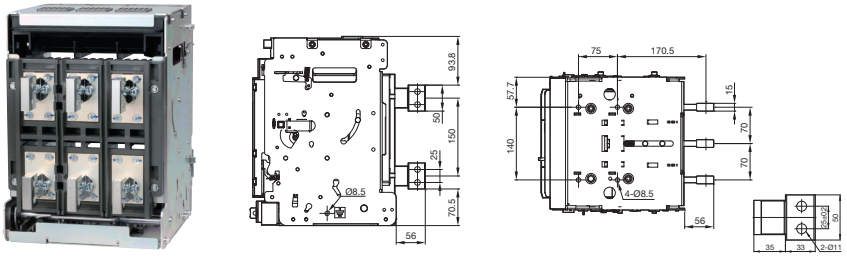
6) Connections (Draw-out type)

a. 3P Horizontal type (H)

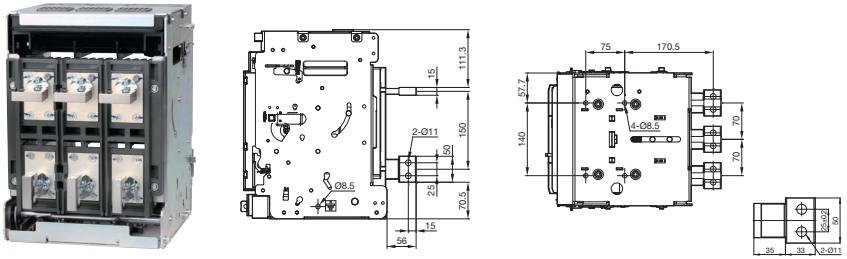


2. Dimension

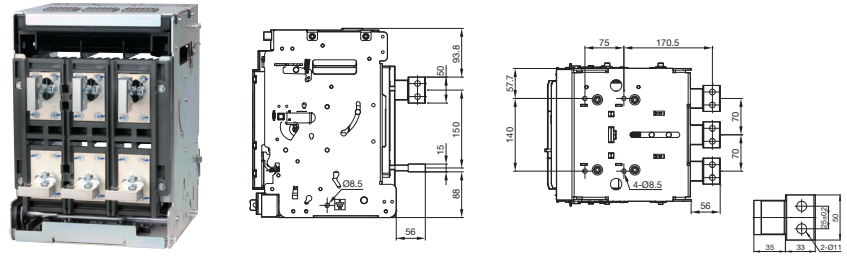
b. 3P Vertical type (V)



c. 3P Upper-Horizontal/Lower-Vertical type (M)

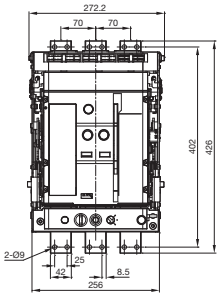


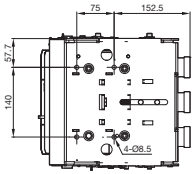
d. 3P Upper-Vertical/Lower-Horizontal type (N)



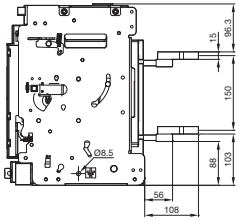
2. Dimension

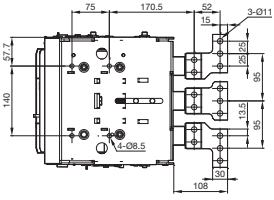
e. 3P Plane type (P)



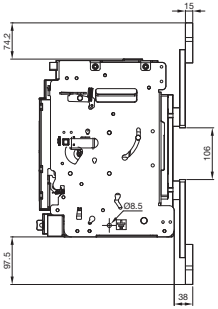


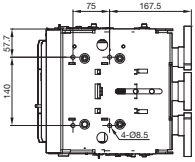
f. 3P Spread type (R)





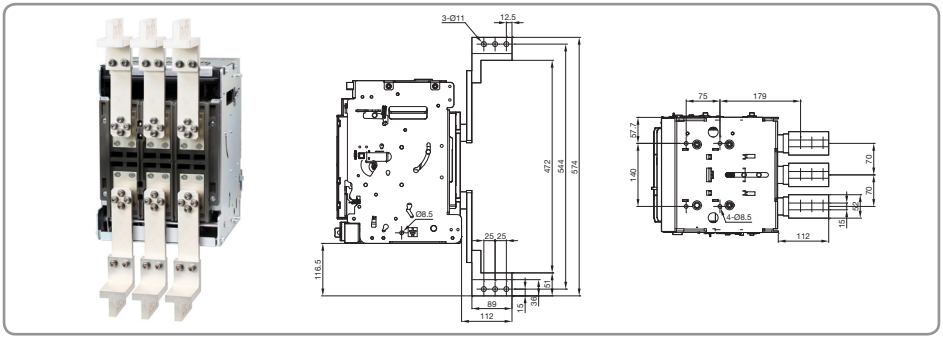
g. 3P Plane spread type (Z)



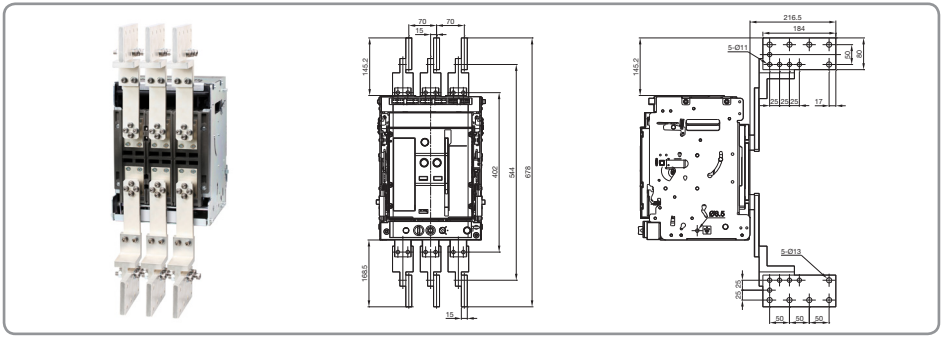


2. Dimension

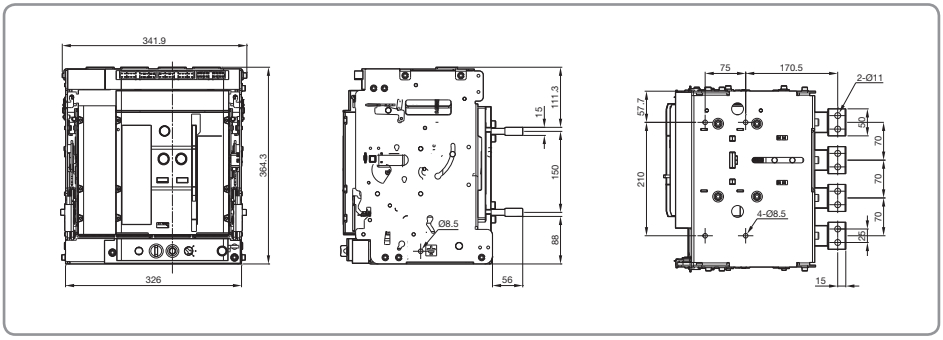
h. 3P Plane vertical type (T)



i. 3P Cable Lug type (X)

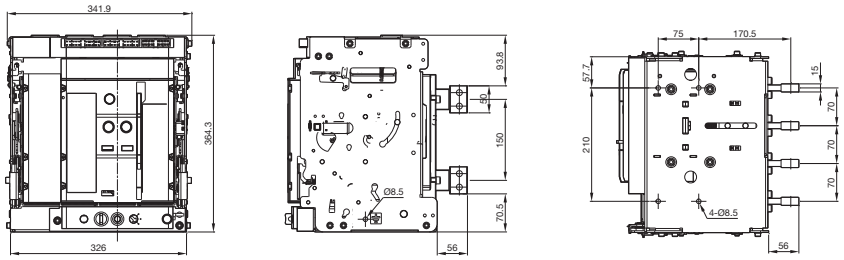


j. 4P Horizontal type (H)

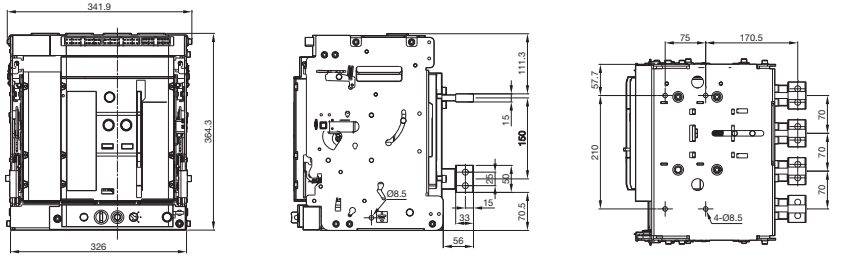


2. Dimension

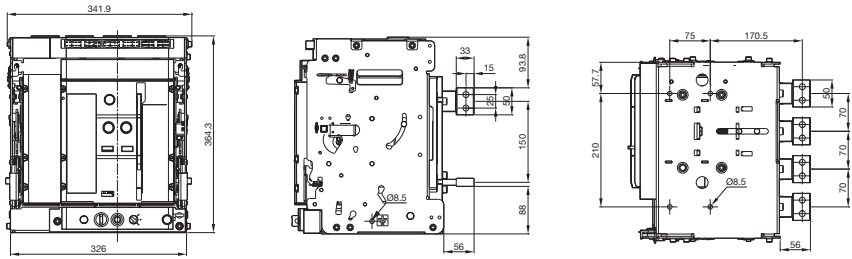
k. 4P Vertical type (V)



l. 4P Upper-Horizontal/Lower-Vertical type (M)

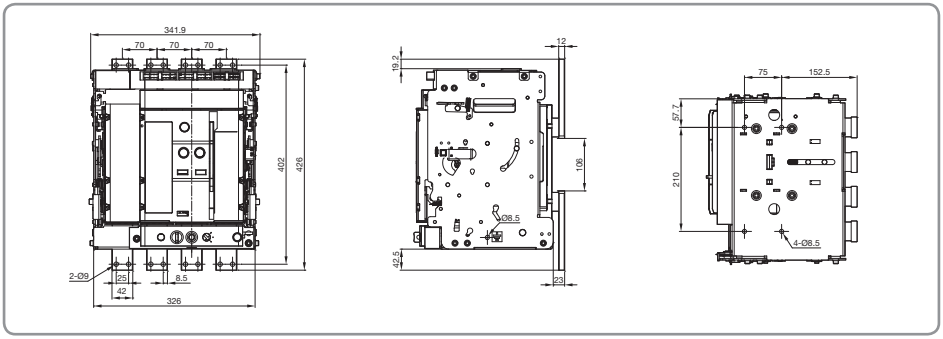


m. 4P Upper-Vertical/Lower-Horizontal type (N)

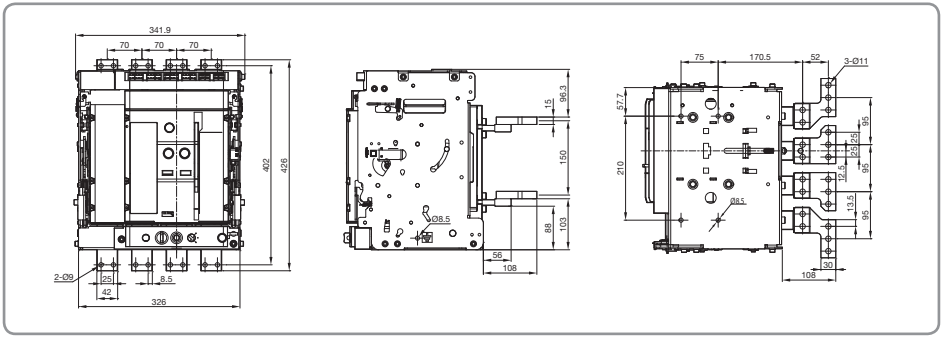


2. Dimension

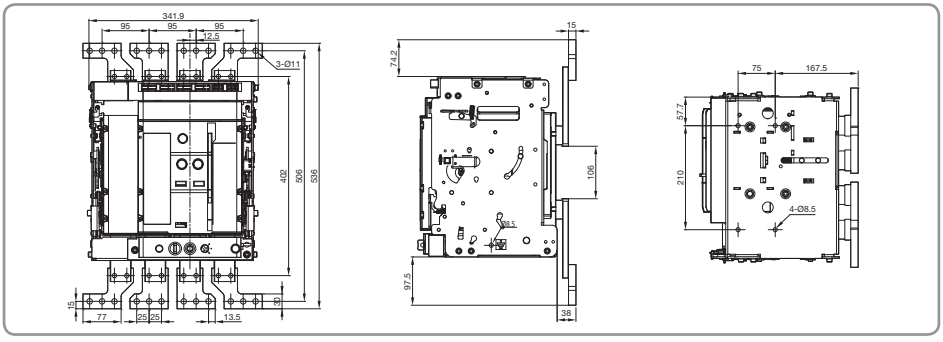
n. 4P Plane type (P)



o. 4P Spread type (R)

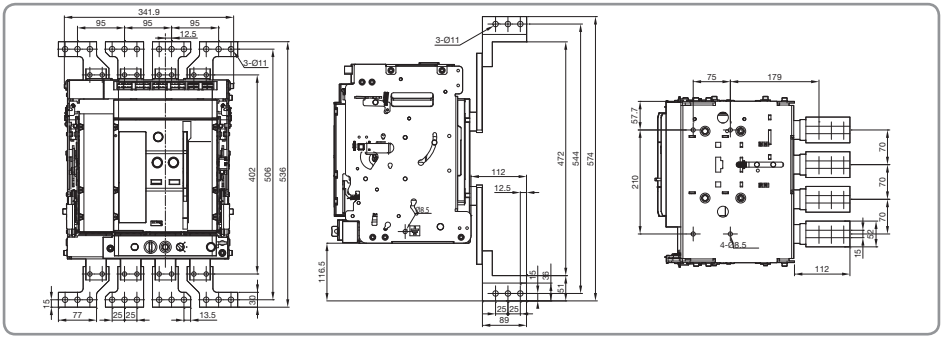


p. 4P Plane spread type (Z)

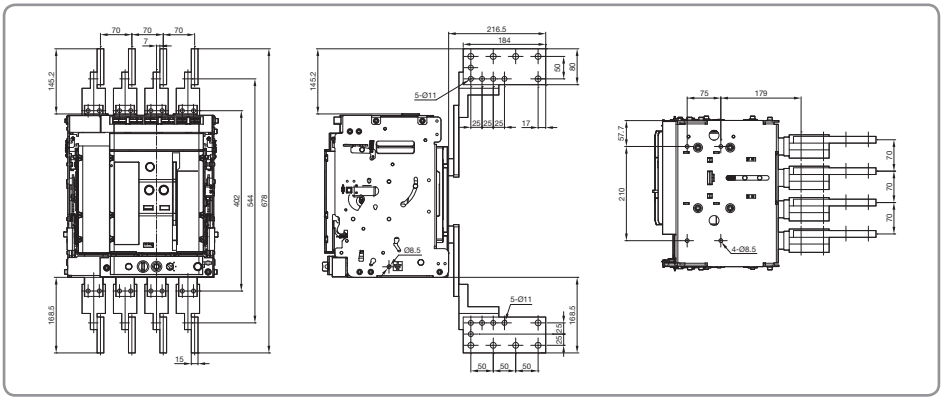


2. Dimension

q. 4P Plane vertical type (T)

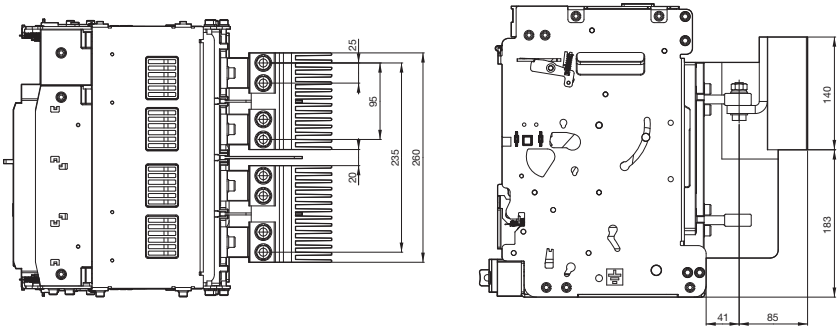


r. 4P Cable Lug type (X)

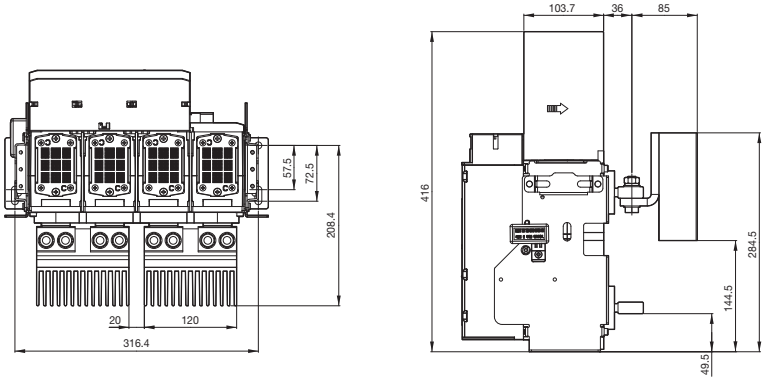


3. Dimension (With short busbar)

a. 4P Horizontal type(H), Vertical type(V) *Draw-out type(Up to 1600A)

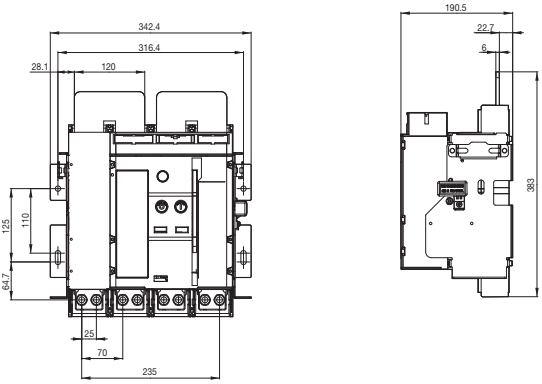


b. 4P Horizontal type(H), Vertical type(V) *Fixed type(Up to 1600A)

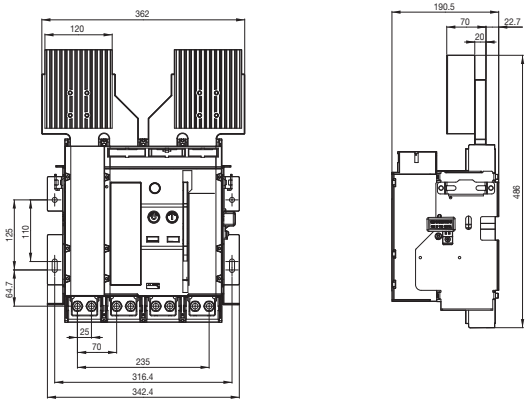


3. Dimension (With short busbar)

c. 4P Plane type(P) *Fixed type(Up to 1250A)



d. 4P Plane type(P) *Fixed type(Up to 1600A)



1. Receiving

Receiving

A visual inspection - inside and out - should be performed immediately upon receipt of the product 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 product. Failure to do so constitutes unqualified acceptance and a waiver of all such claims by the purchaser.

2. Unpacking

Unpacking

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

* Do not load Susol/Metasol ACBs on the product

Unpacking

1) After unpacking the Cradle, As shown in Figure.1, make sure the bottom of the cradle faces the ground.
2) Hold the bottom of the cradle and remove it from the box.
3) When removing the cradle from the box, do not hold the control terminal block. If the product is damaged, it is the responsibility of the customer.

Fig 1. How to unpack the Cradle

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 product and before removing it from the truck. If any damage or shortages are evident, a claim should be filed at once with the carrier to the nearest LSIS sales office.
2) Unpacking them attentively to avoid dropping the products from carrying components and pallets.
3) Install the products to the final installation place after unpacking as soon as possible. If you cannot install the products immediately, you had better not unpacking them. Keep the products indoor around 15℃ and under 50% of humidity. Standard packing condition for domestic portage is not suited to outdoor storage. If you cannot keep the maintenance above, you should inspect a degree of the damages before you install the products. Unsuitable keeping does not guarantee good qualities of the products and could occur additional danger of an accident.

Caution for installation inspection

1) Confirm all power sources are completely de-energized first.
2) Disconnect all electrical switches which may operate during inspection.
3) Disconnect all plugs connected to operating part of product (Trip coil, UVT coil, etc.)
4) In case of draw-out type, pull out the product until guideline comes to TEST 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 the product.

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.5-1.

Precaution of Handling

1) To lift the product(Fixed type), use the lifting hooks on the sides of the breaker, and lift with rope or something similar.
2) When placing the product on the ground, be careful not to drop or to impact the product.
3) When the Draw-out product is lifted with the cradle, lift it in the connected position.
4) Do not slide the product when handling.

Fig 1. Handling method of Fixed type

Fig 2. Handling method of Draw-out type

2. Storage

Precaution of Storage

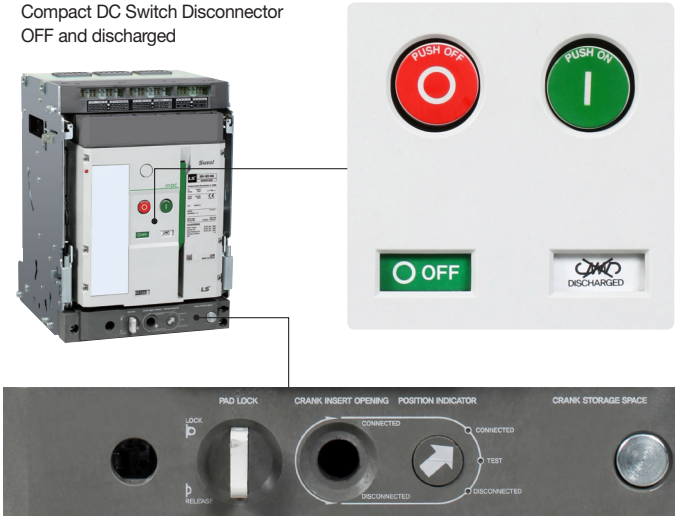
When storing a circuit breaker for a long term,

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

Storage method

1) Store the product in a dust free and dry environment.
2) Keep the product in OFF position with the charging spring discharged.
3) Cover the product 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 product indoor as it was packaged around 15℃ and under 50% of humidity.
5) Standard packing condition for domestic portage is not suited to outdoor storage. If you cannot keep the maintenance above, you should inspect a degree of the damages before you install the products.
6) Unsuitable keeping does not guarantee good qualities of the products and could occur additional danger of an accident.

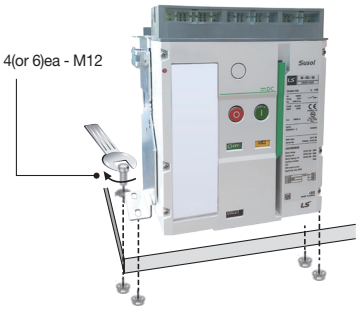
Compact DC Switch Disconnector
OFF and discharged



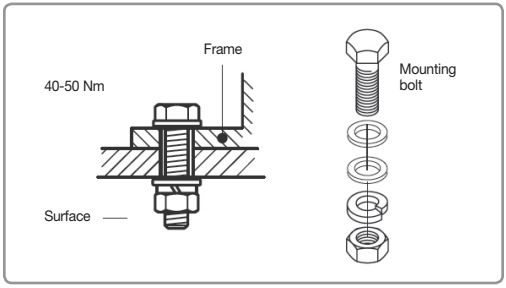
1. Fixed type

Installation of fixed type

Securely install the left and right mounting frames with M12 bolts (3P: 4ea, 4P: 6ea)



<Torque>

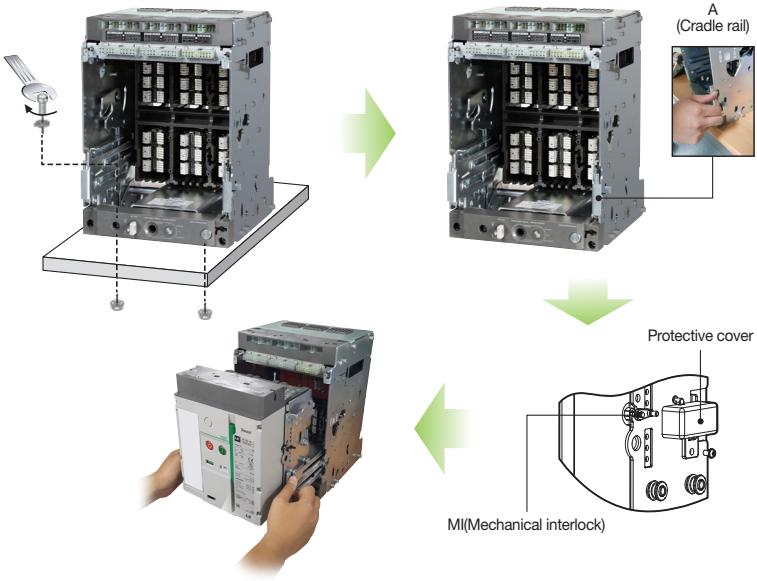


2. Draw-out type

Installation of draw-out type

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

1) Securely install the cradle at the bottom with M8 bolts (4ea).
2) Pull the extension rails of cradle forward.
3) Remove the MI protective cover on the right side of the main body.
4) Put the breaker on the rail as shown in picture by using lifting device.
5) Please check if the circuit breaker fits well to the cradle.
6) Slowly push the circuit breaker by moving the rail handle.
7) For how to operate the cradle, see How to operate the cradle on page I-2.



3. Precaution and installation of insulation barrier

Precaution

1) Do not lay down a product on the side or stand with the side of it.
2) Install a circuit product 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 product at a right angle to the direction of a rail to decentralize weight of the product.

Install insulation barrier between poles

1) In case of Draw-out product, insulation barrier shall be installed on the rear side of cradle for your safety.
2) Insert the insulation barrier to groove between poles where the rear side of cradle.
3) In case of install short busbar on product, insulation barrier shall be cut like figure 1.
4) Information of short busbar install represent page H-3.

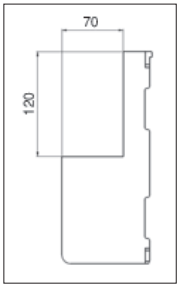
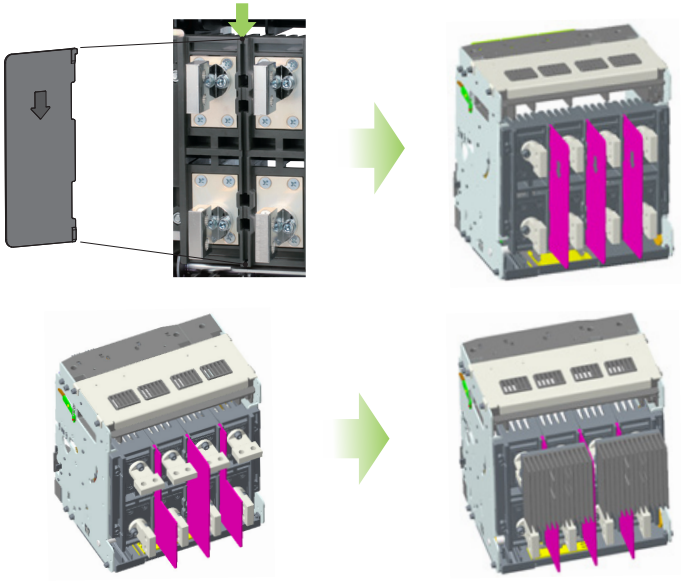


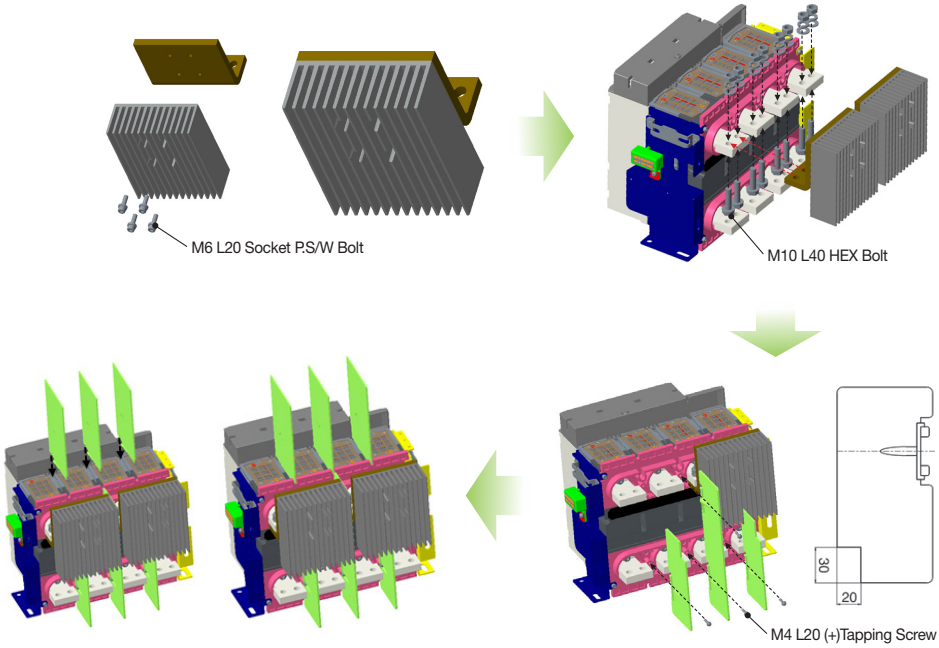
Fig 1



3. Precaution and installation of insulation barrier

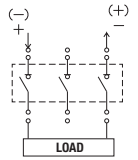
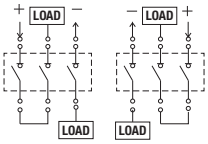
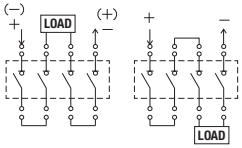
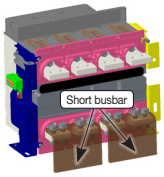
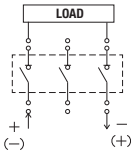
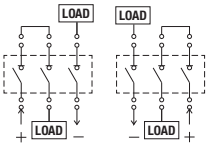
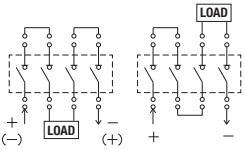
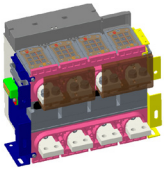
Install of short busbar and, insulation barrier

1) Install of short busbar(Accessary) shall be performed like below.
2) Rear side of insulation barrier shall be cut(3P: 1ea, 4P: 2ea), because it interference with short busbar. After that, it assemble using tapping screw.
3) Upper side of insulation barrier insert groove of between poles, where they placed upper side of product.



4. Product connection

Operation voltage and connection diagram of DC Compact DSU series

Poles	3P	3P	4P	Each supply types (4P Product)
DDH type	500 Vdc	750 Vdc	1200 Vdc	
DDV type	500 Vdc	1000 Vdc	1500 Vdc	
Connection diagram				 Upper Supply
				 Lower Supply

Note) If different circuit configurations are needed, please contact LS.

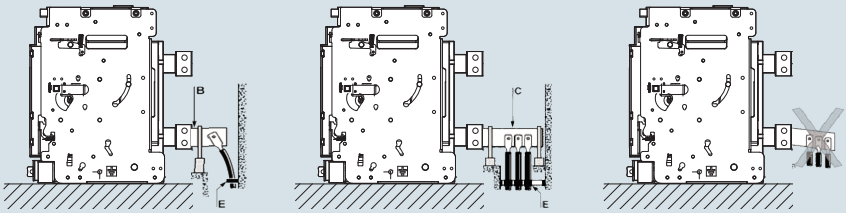
Composition of short busbars

1) If you want to know short busbar type as DC Compact DSU installation method,
   please refer Page E-1 of this manual.
2) Connection diagrams of product are represent upper chart on this page.
3) Torque of bolt or nut for assemble of short busbar and, heatsink as bellows.
   - Short busbar : 26.5 N*m(M10 torque standard)
   - Heatsink : 5.6 N*m(M6 torque standard)

5. Busbar Connection

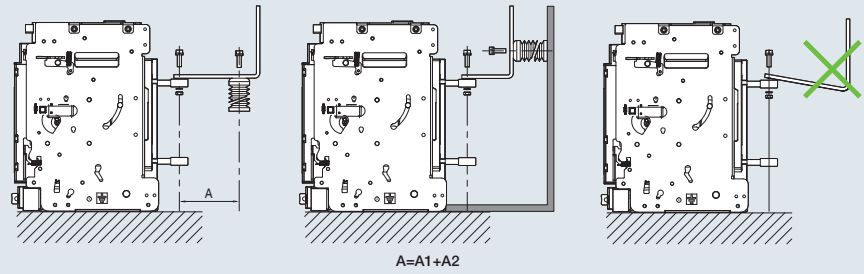
Cable connection

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



Bus-bar connection

For bus-bar connection, 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, secure maximum safe distance A(The maximum safety distance of product is 250mm) from the access area to withstand the electrical force during the short circuit faults. (Support strength: base of Insulator, bending load 720kg or more, tensile strength 3000kg or more)



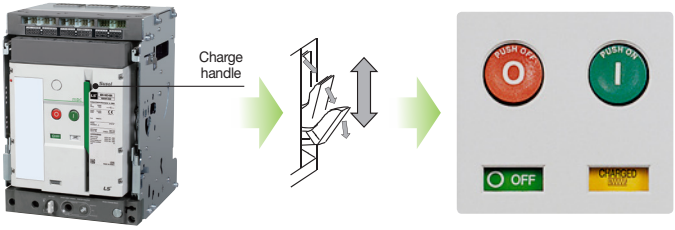
* Warranty can not be applied to product damage due to arbitrary alterations.

1. Manual operation

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

Manual charging

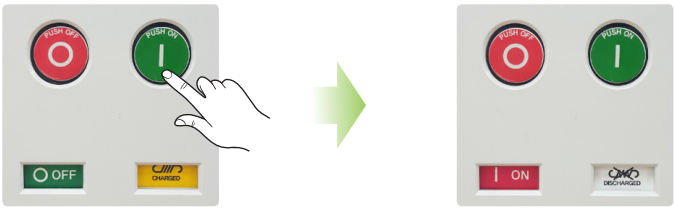
1) Charge the handle 7~ 8 times with full strokes.
2) When the closing spring is completely charged, the charging indicator shows "CHARGED".



Off and charged

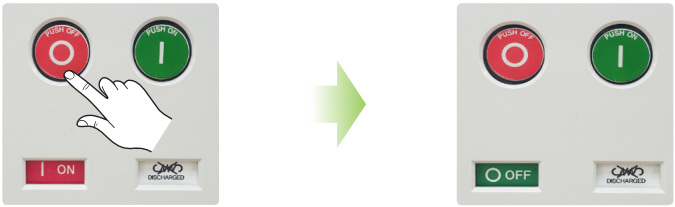
Manual closing

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



Manual tripping

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



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 product is closed by closing button.

Electrical closing

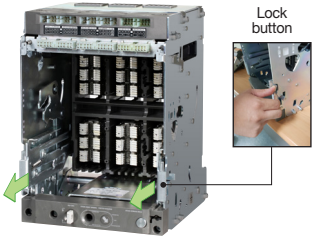
Remote closing can be made by energizing the closing coil (CC). Apply the rated voltage to the control terminals A1 and A2 and close the product.

Electrical trip

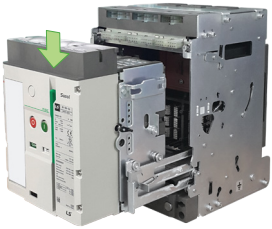
1) Remote opening can be made by energizing the shunt trip device or under voltage trip device.
2) In the case of SHT, apply the rated voltage to the terminal C1 and C2.
3) In the case of UVT, remote opening is also possible by applying a short - circuit across terminals D1 and D2 of the UVT controller.

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 Main body fits well to the cradle

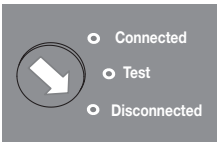
3) Slowly push the Main body by moving the rail handle until it stops.

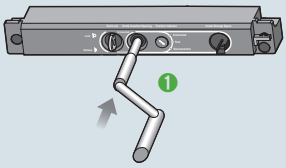
4) Keep pushing the OFF button when Main body in a trip condition, and insert a handle to the body of the circuit product.
5) Check the Draw-out handle properly inserted and then push the lock plate and turn the Draw-out handle clockwise in order to insert the product.
6) When the breaker reaches the 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.

3. Draw-in operation

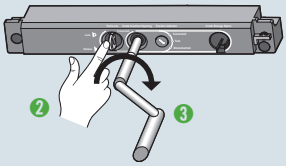
Lock

Disconnected





2 Release

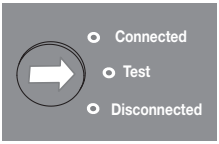


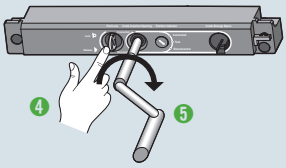
Release

Lock

4 Release

Test

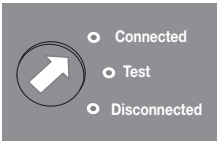


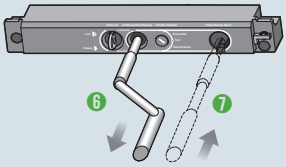


Release

Lock

Connected





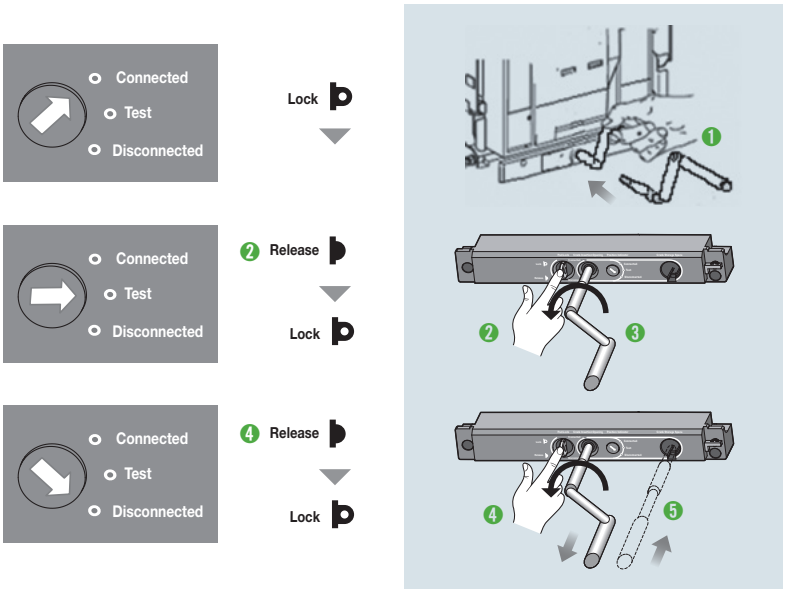
4. Draw-out operation

Caution

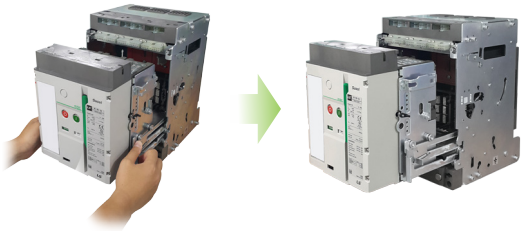
1) Please stop handle operation when draw in/out locking device protrudes.
2) Draw in or out by moving handle right or left side when draw in/out locking device can not be inserted.

Draw-out operation procedure

1) Pushing the OFF button and the circuit breaker in a trip condition, and insert a handle to the body of the Main body.
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 Main body 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 Main body 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 Main body from a cradle.



5. Mechanism operation by draw in/out section

Mechanism operation by mechanical interlock

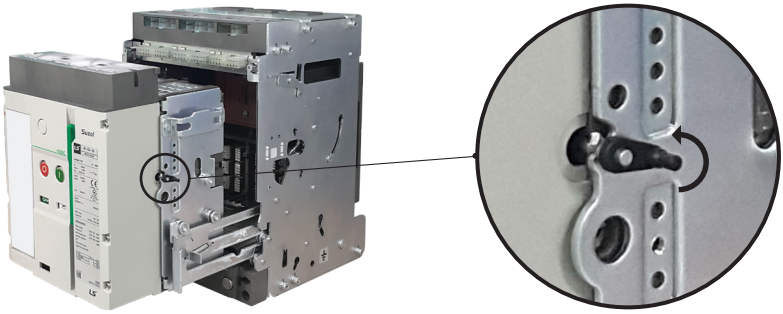


Fig 1. Mechanical Interlock (Automatic off)

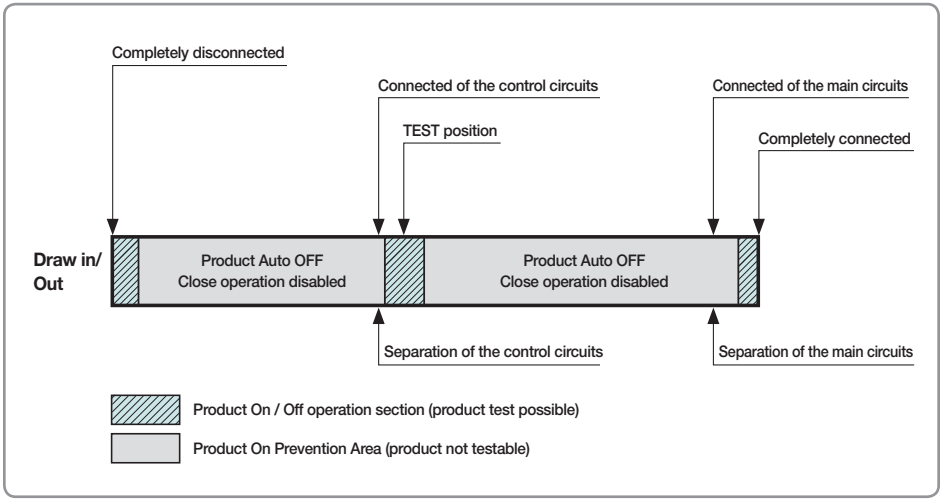


Fig2. Mechanism operation status by draw in/out section

1. Inspection and maintenance cycle

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

Maintenance cycle upon using condition

Using condition	Environments	Specific examples	Inspection cycle	Replacement cycle
General environment for a use	Location with clean & dry air	Electrical rooms with dust proof & air-conditioner	Once every 2 years when operating after installation under the usage environment over 70 times	Within approx. 10 years
	Indoor location with little dust Location without corrosive gases	Distribution panel or individual electrical room without dust proof & air conditioner		

Using condition	Environments	Specific examples	Inspection cycle	Replacement cycle
Special environment for a use	Locations with salinity, high temperature and 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 years 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

2. Life cycle of products

Durability							
Opening and closing duration (times) (Unpaid)	Mechanical	12,500					
	Electrical	Conduction current	Time constant		Conduction current	Time constant	
			2ms	7.5ms		2ms	7.5ms
		~ 800A	2,000	-	~ 800A	4,000	2,000
		~ 1600A	500	-	~ 1600A	1,000	500

Service life of parts

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

3. Inspection method of arc chamber

Arc chute Inspection

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.

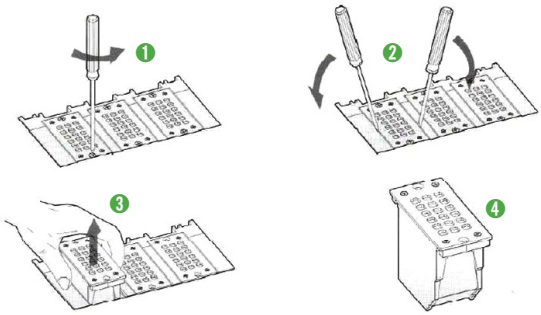


Fig1. Separate procedure of Arc chamber

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 product and compare the condition of the moving contact with the below fig.2.

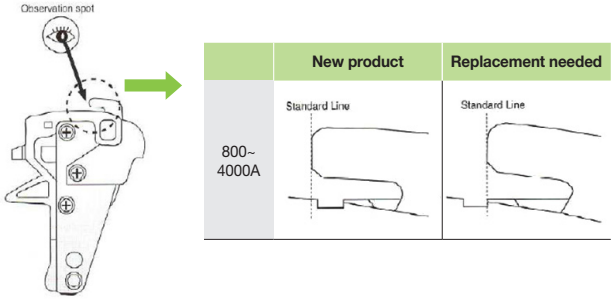


Fig2. The standard figure for contact replacement

4. Defects and troubleshooting guideline

Troubleshooting guideline

Types of defect	Cause	Countermeasure
The product is opened but Fault Trip Reset button does not come out.	Voltage does not exist or UVT is damaged.	Check voltage. Replace damaged UVT.
	Voltage disturbance occurred to the trip device.	Check voltage supply part.
The product is opened simultaneously with the closing operation and the Fault Trip Reset button comes out.	In state of short-circuit	Remove cause; Check condition of breaker before re-closing.
	Excess current is too high at closing operation.	Revise network or change setting of trip device.
OPEN operation is done manually but not from remote.	Voltage supply from the trip device is too low. V<0.7Vn	Check voltage supply. (0.7~1.1Vn)
	Defect on UVT circuit	Replace UVT.
OPEN operation does not work manually.	Damage on the mechanism	Contact AS center.
	Deposition of main circuit.	Contact AS center.
Product does not close neither manually nor remotely.	Closing operation at state of short-circuit.	Remove cause; Check condition of breaker.
	Fault Trip Reset button does not reset.	Reset Fault Trip Reset button.
	Unstable draw-in/out state of the product.	Reset Fault Trip Reset button.
	Anti-pumping function	Re-operate after removing power of the closing coil.
	Closing spring of breaker is not charged.	Check power supply of the charging motor. Check if manual charging works. Contact AS 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 AS center if manual charging is unavailable.
	Power supply problem of the trip coil.	Remove power supply of the trip coil.
	8. Insufficient power supply of the UVT or defect.	Apply voltage (V>0.85Vn) to the auxiliary switch and try closing operation using the closing coil.
	Locked state of the breaker under open position	Check if the closing error state is normal.
	In case breaker is interlocked.	Release interlock.
Closes 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's open circuit.	Replace closing coil.
Does not charge electrically.	Wrong voltage supply to spring charging motor.	Check voltage supply.
		Check the circuit of charging motor.
		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.	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.	Push product into cradle securely.
Product does not get drawn out.	Crank handle is inserted.	Remove crank handle.
	Product is not in Disconnected position.	Draw out to the Disconnected position completely.
	Under Padlock or interlock.	Remove padlock or interlock.
Product is not drawn in completely. (It is not in the Connected position)	The cradle and main frame of the breaker do not fit.	Check if cradle fits with main frame.
	Inappropriate position of the cluster.	Move cluster to the right position.
	Safety shutter is under interlock.	Remove interlock.

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 code description

11 12 ~ 41 42	Auxiliary switch "b" contact	
11 14 ~ 41 44	Auxiliary switch "a" contact	
U3 U2	Charge completion signal	
U1 U2	Motor charging	
A1 A2	Closing coil	
C1 C2	Shunt trip	
C11 C12	2nd shunt trip	
D1 D2	Voltage input terminal of UVT coil	
311 ~ 344	Cell switch	
251 252	Ready to close switch	

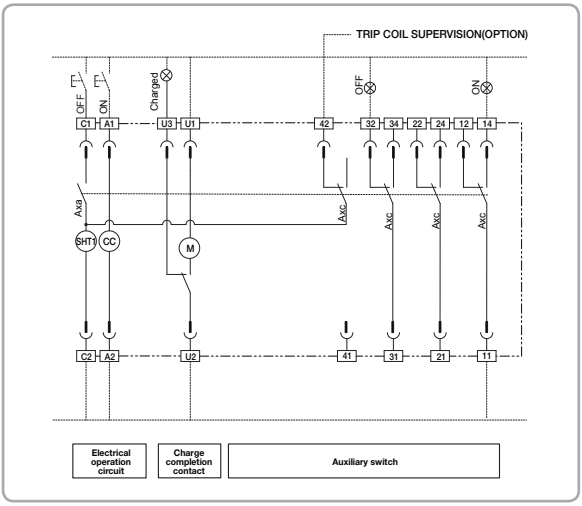
Accessory code description

Axc	Auxiliary switch
CL1~CL4	Cell switch
M	Motor
CC	Closing coil
SHT	1st Shunt coil
SHT	2nd Shunt coil
UVT	UVT coil

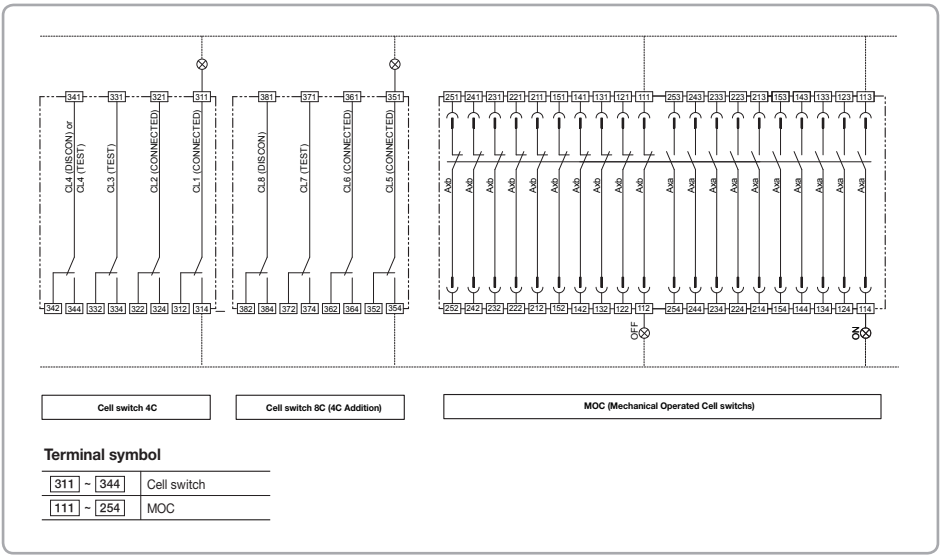
Note) 1. The diagram is shown with circuit de-energized, all devices open and charged and relays in normal position
2. Relay is normal condition and charging type is "Off-Charging"
3. The standard of auxiliary contact is 4C.
4. Option
-- Ready to close contact, UVT coil, Fully charged contact, secondary trip coil
5. Contact configuration for Cell Switch can be changeable if necessary

1. Wiring diagram

SC (Standard with "ON" charging type for TCS)



Options



Terminal symbol

311 ~ 344	Cell switch
111 ~ 254	MOC

Memo

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

LSIS

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