



Susol
Super Solution

LS Medium Voltage Vacuum Contactors

LS IS

Customer satisfaction through quality and service - LS Susol medium voltage vacuum contactors

LS Susol medium voltage vacuum contactors using LS vacuum interrupters manufactured with worldclass technology are type tested in LS PT & T that is accredited high power test lab by worldclass KOLAS.



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LS Susol Vacuum Contactors

We have the major technology that others can not catch up.
LS Susol vacuum contactors provide high withstand - current strength and switching capacity as well as versatile auxiliary functions.

Susol Super Solution



Fixed Type

Combination Fixed Type

Drawout Type

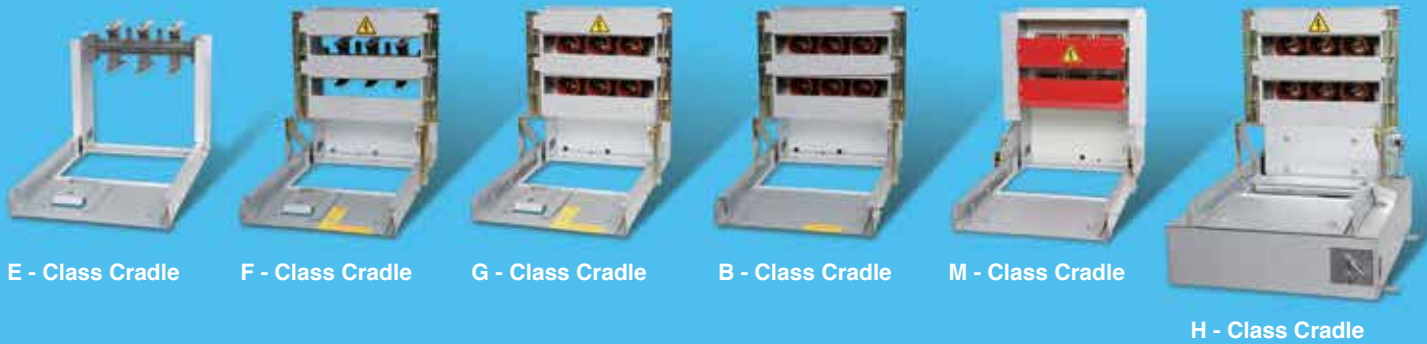
General Description



LS Susol vacuum contactors are mainly used for the switching of motors, transformers, capacitors in AC power lines. They can be installed in multi - stack cubicles.

A vacuum contactor comprises several assemblies such as switching mechanism including vacuum interrupters, magnetic actuator, high strength molded front cover and auxiliary devices. Stable and high operating cycle is executed by the vacuum interrupters made of high alumina ceramic tube which makes it possible to degas in a high temperature with excellent mechanical strength.

Actuating is available either at instantaneous or continuous excitation. Functions for safety in connecting and disconnecting are also provided.

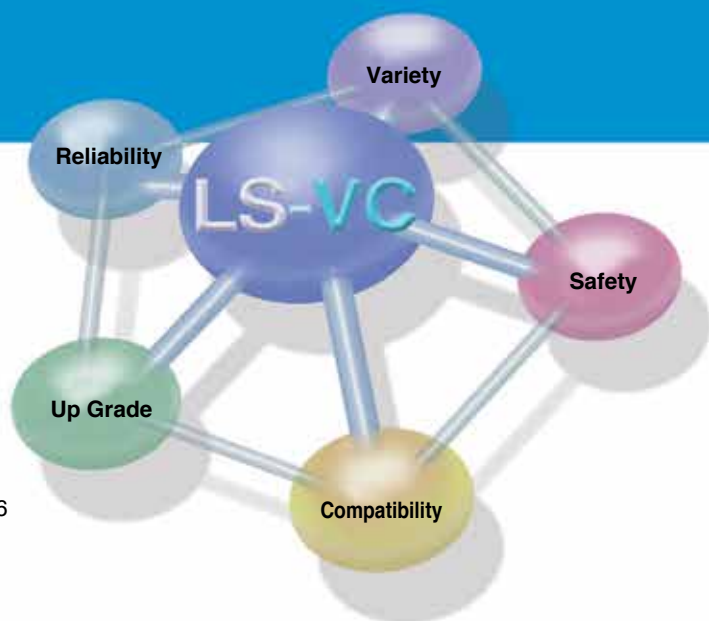


Operation conditions

Ambient temperature : - 5 to 40°C
 Maximum temperature of 24 - hour mean : 35 °C
 Altitude : 1000m
 Humidity : 24 - hour measured average - max. 95% RH
 1 month measured average - max. 90% RH

Applied standards

IEC 62271 - 106, IEC 60282 - 1, JEM 1167, KEMC 1126

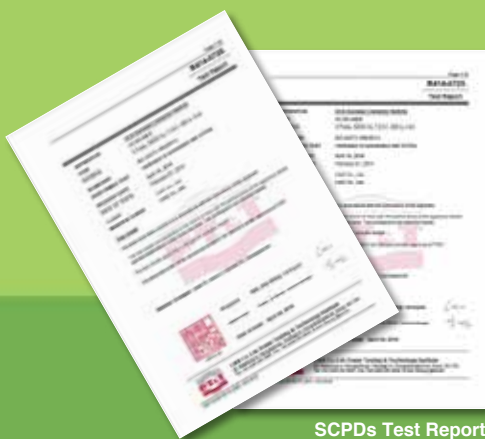


Up – Graded performance
by the new standard

Short Circuit Protective Device (SCPDs)

[7.2kV 400A]

IEC 62271 - 106 in KOLAS certification authority by the new standard
7.2kV 400A Fuse has a combination of blocking performance verification.



SCPDs Test Report



Vacuum Interrupter & Fuse



Vacuum Interrupter

High performance, high reliability and long service life

LS vacuum interrupters that comply with IEC, ANSI and NEMA standards are manufactured by the process of brazing and degassing together in a high vacuum furnace to assure high reliability.

High speed interruption and short arcing time

It has fast recovering characteristic of vacuum insulation. When opening it breaks the current at the first current - zero point to minimize the wearing of contacts.

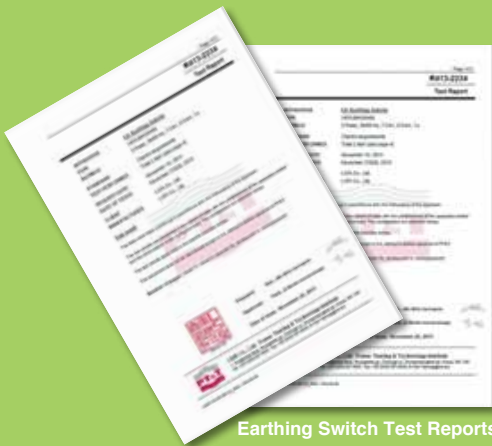
Superior mechanical strength and degasing

Providing long service life and suited for frequently operating purpose due to using high alumina ceramic tube and degasing in a high temperature.

Earthing Switch Short time withstand current

[6.3kA]

Verify the Short-time current performance by developing Earthing Switch of Susol VCS



Earthing Switch Test Reports



V-Check certificate by KAS



Korea Electrical Safety Corporation

What is the V-Check Mark?

It is a integration certification mark that has been certified on the basis of KAS(Korea Accreditation System) in accordance with the national standard basic law and ISO/IEC Guide 65

Development test and certification by public institution

- Public institution development test according to IEC62271-106
- Verify the short circuit coordination with power fuse
 - Breaking test : success the 40kA short circuit breaking
 - Making test : success the 40kA short circuit making
- Certified V-Check mark by KAS

Reliable breaking on accident current

LS limited power fuse can break accident current very fast(0.5cycle) by occurring big resistance due to internal nonconducting phenomenon.

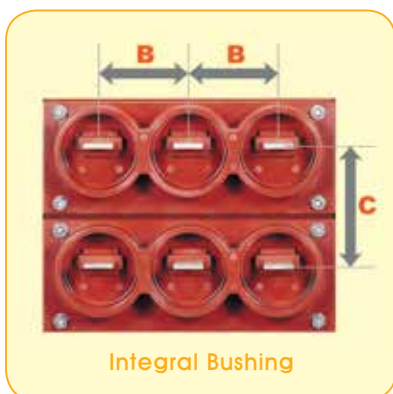
Compatibility with existing product

[1 : 1]

Maintenance is easy to use compatible with existing product



Alternation



Compatibility with existing product

New product Susol VCS is a customer-oriented product considering convenience and economy of maintenance.

In particular, distance between rails, phase segregation, distance between statue of main body and cradle of old and new products are the same, so it is easy to replace the products.

A ; Distance between rails

B : Phase segregation

C : Distance between same statue

[Safety]

LS Susol vacuum contactors provide several auxiliary functions for safe and comfortable use.

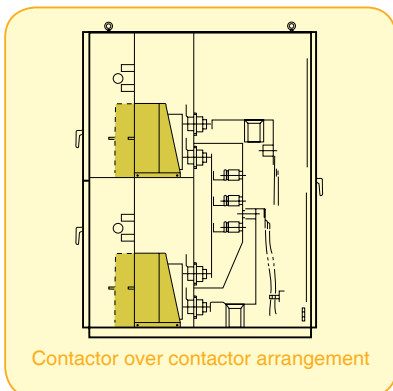


Mechanical Interlock Type

- Interlock device
- Drawout cradle for MCSG
- One-molded fuse holder
- Various dual protection device
- Fuse checker and micro switch



Additional Equipment



Contacter over contactor arrangement

Suitable for Metal Clad Switchgear

The structure of B type cradle unification bushings and single - molded fuse - holder barrier enables vacuum contactors to build Metal Clad Switchgears.

Interlock

For the safety of a operator interlock is equipped as standard.

Mechanical Interlock Type

It is easy to use and stable to run motor, to switch commercial power and standby power by connecting with a mechanical interlock device with two VC.

Directly withdrawable equipment

This enables the withdrawing of a vacuum contactor from a panel without opening a door to prevent any possibility of electric shock.

Technical Data

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Single type			Fixed (Z) type				Drawout (D) type				Direct - Drawout (K) type			
Type	Continuous Excitation (E)		VC-3Z	VC-6Z	VC-3Z	VC-6Z	VC-3D	VC-6D	VC-3D	VC-6D	VC-3K	VC-6K	VC-3K	VC-6K
	Instantaneous Excitation (L)		- 42□E	- 42□E	- 44□E	- 44□E	- 42□E	- 42□E	- 44□E	- 44□E	- 42□E	- 42□E	- 44□E	- 44□E
Rated operation voltage	[kV]		3.3	6.6	3.3	6.6	3.3	6.6	3.3	6.6	3.3	6.6	3.3	6.6
Rated voltage	Ur[kV]		3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2
Rated operational current	Ie[A]		200		400		200		400		200		400	
Rated frequency	fr[Hz]		50/60											
Rated breaking current (kA, O - 3min - CO - 2min - CO)			4											
Rated short - time withstand current (kA - sec)			2.4kA-30s, 4kA-10s, 6kA-2s, 6.3kA-1s											
Rated short - time peak current (kApeak - 0.5Cycle)			60											
Switching frequency(AC3)	[op./hr]		E : Continuous 1200, L : Instantaneous 300											
Lifetime	Mechanical [×10, 000operations]		E : Continuous 300, L : Instantaneous 50											
	Electrical [×10, 000operations]		30											
Impulse withstand voltage	Up[kV]		60											
Power-frequency withstand voltage	Ud[kV/1min]		20											
Excitation method			E : Continuous, L : Instantaneous											
Control voltage	[V]		DC/AC 110V, 125V, 220V											
Auxiliary contact	Current	[A]	10 (AC)											
	Voltage	[V]	600max ~ 48min											
	Arrangement		Continuous 3NO3NC, Instantaneous 2NO2NC				2NO2NC							
Max. Applicable (3 phase)	Motors	[kW]	750	1, 500	1, 500	3, 000	750	1, 500	1, 500	3, 000	750	1, 500	1, 500	3, 000
	Transformers	[kVA]	1, 000	2, 000	2, 000	4, 000	1, 000	2, 000	2, 000	4, 000	1, 000	2, 000	2, 000	4, 000
	Capacitors	[kVA]	750	1, 500	1, 200	2, 000	750	1, 500	1, 200	2, 000	750	1, 500	1, 200	2, 000
Weight	[kg]		24				41				56			

Power fuse

Power fuses can be installed into combination(G, B, F) type contactors for the protection of equipments and systems from short - circuit.

Fuse ratings are selected properly after system analysis and some accessories such as fuse link clips should be selected by the fuse rating.





Combination(PF) type			Combination Drawout(G) Type				Combination Direct-Drawout(B) Type				Combination Fixed(F) Type			
Type	Continuous Excitation (E)		VC-3G	VC-6G	VC-3G	VC-6G	VC-3B	VC-6B	VC-3B	VC-6B	VC-3F	VC-6F	VC-3F	VC-6F
	Instantaneous Excitation (L)		- 42□E	- 42□E	- 44□E	- 44□E	- 42□E	- 42□E	- 44□E	- 44□E	- 42□E	- 42□E	- 44□E	- 44□E
Rated operation voltage	[kV]		3.3	6.6	3.3	6.6	3.3	6.6	3.3	6.6	3.3	6.6	3.3	6.6
Rated voltage	Ur[kV]		3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2	3.6	7.2
Rated operational current	Ie[A]		200		400		200		400		200		400	
Rated frequency	fr[Hz]		50/60											
Rated breaking current	(kA, O - 3min - CO - 2min - CO)		4kA (40kA with fuse)											
PF Combination	Making		40kA											
Rated breaking current	Breaking		40kA											
	Take over(O - 3min - O - 3min - O)		4kA											
Rated short - time withstand current	(kA - sec)		2.4kA-30s, 4kA-10s, 6kA-2s, 6.3kA-1s											
Rated short - time peak current	(kApeak - 0.5Cycle)		60											
Switching frequency(AC3)	[op./hr]		E : Continuous 1200, L : Instantaneous 300											
Lifetime	Mechanical	[x10, 000operations]	E : Continuous 300, L : Instantaneous 50											
	Electrical	[x10, 000operations]	30											
Impulse withstand voltage	Up[kV]		60											
Power-frequency withstand voltage	Ud[kV/1min]		20											
Excitation method			E : Continuous, L : Instantaneous											
Control voltage	[V]		DC/AC 110V, 125V, 220V											
Auxiliary contact	Current	[A]	10 (AC)											
	Voltage	[V]	600max ~ 48min											
	Arrangement		2NO2NC											
Weight ^(Note)	[kg]		46				62				46			

Note) Load capacity is different from ratings of Power Fuse

* Load capacity varies depending on the power rating of the fuse

Power fuse ratings combination type

Standard	Type	Rated voltage(kV)	Rated current(A)	Diameter (mm)	Length (mm)	
DIN Type	LFL - 3/6G - □B	3.6/7.2	5, 10, 20, 30, 40, 50, 63, 75, 100	45	192	
	LFL - 3/6G - □B	3.6/7.2	125		292	
	LFL - 3G - □B	3.6	160, 200		292	
	LFL - 6G - □B	7.2	160, 200		292	
KS Type	General use	LFL - 3/6G - □	5(T1.5), 10(T3), 20(T7.5), 30(T15), 40(T20), 50(T30), 60(T30)	50	261	
			75(T50), 100(T75)	60	311	
		LFL - 3G - □	150(T100), 200(T150)	60	311	
			300(T250), 400(T300)	77	311	
	LFL - 6G - □	7.2	150(T100), 200(T150)	77	311	
	For motors	LFL - 3M - □	3.6	M20, M50, M100	60	200
				M150, M200	77	200
				M300, (M400)	87	250
		LFL - 6M - □	7.2	M20, M50	60	311
				M100, M150, M200	77	350
M300, (M400)				87	450	

* LFL - 6G - 300, 400 is not possible to combine with VC

Ordering Information

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■ Contactor

VC		3		Z		4		2		E		E		D1		ABGH	
Unique Symbol		Rated Voltage(kV)		Installation		Breaking Current(kA)		Rated Current(A)		Control Method		Modification		Control Voltage		Accessory	
VC	Vacuum Contactor	3	3.6	Z	Fixed Type	4	4	2	200	E	Continuous Excitation	E	SUSOL	D1	DC 110V	A	Pad Lock
		6	7.2					4	400	L	Instantaneous Excitation			D2	DC 220V	B	Button Pad Lock
														D3	DC 125V	C	Button Cover
														A1	AC 110V	D	Lead Wire Ass'y(3M)
														A2	AC 220V	E	Plug, Pin(21Pin)
														A3	AC 125V	G	Blue Plenem Wire(VC, Lead Wire)
																H	Yellow Plenem Wire(VC, Lead Wire)
																I	Position S/W
																J	3a3b Auxiliary Contact
																K	3 Position S/W
																L	CTD

VC		3		G		4		2		E		E		D1		C1	
Unique Symbol		Rated Voltage(kV)		Installation		Breaking Current(kA)		Rated Current(A)		Control Method		Modification		Control Voltage		Fuse Checker	
VC	Vacuum Contactor	3	3.6	D	Drawout Type	4	4	2	200	E	Continuous Excitation	E	SUSOL	D1	DC 110V	C0	Without
		6	7.2	G	Combination Drawout Type (Fuse connectable)			4	400	L	Instantaneous Excitation			D2	DC 220V	C1	With General Type
				F	Combination Fixed Type									D3	DC 125V	C2	With SIBA Type
				K	Direct - Drawout Type (For MCSG)									A1	AC 110V		
				B	Combination Direct - Drawout Type (Fuse connectable and for MCSG)									A2	AC 220V		
														A3	AC 125V		

P2		T1		F01		ABGH		
PT		Truck		Fuse		Accessory		
P0	Without	T0	Without	F01	LFL3/6G - 5-60	3.3/6.6kV 200/400A Common	A	Pad Lock
P1	100Var, 1EA	T1	Earthing Switch	F02	LFL3M - 20-100	3.3kV 200/400A	B	Button Pad Lock
P2	100Var, 2EA	T2	Metal Shutter	F03	LFL3/6G - 75-100	3.3/6.6kV 200/400A Common	C	Button Cover
P3	200Var, 1EA				LFL3G - 150-200			D
P4	100Var, 2EA			F04	LFL6M - 20-50		E	Plug, Pin(21Pin)
				F05	LFL3M - 150-200	3.3kV 200/400A	G	Blue Plenem Wire(VC, Lead Wire)
					LFL3G - 300-400	3.3/6.6kV 200/400A Common	H	Yellow Plenem Wire(VC, Lead Wire)
					LFL6G - 150-200			I
				F06	LFL6M - 100-200	6.6kV 200/400A Only	J	3a3b Auxiliary Contact
				F07	LFL3M - 300-400	3.3kV 400A Only	K	3 Position S/W
				F08	LFL6M - 300-400	6.6kV 400A Only	L	CTD
				F09	LFL3/6G - 5-100B	3.3/6.6kV 200/400A Common		
				F10	LFL3/6G - 125B-200B	3.3/6.6kV 200/400A Common		

■ Cradle

VCL	-	3/6	42/44	E	EI
Unique Symbol	Rated Voltage(kV)	Ratings		Cradle TYPE	Accessory
VCL VCS Cradle	3/6 3.6/7.2	42/44	Breaking Current 4kA Rated Current 200/400A	E E Class F F2 Class G G(Bushing Type) M Metal Shutter Direct - Drawout Type(K, B) B Direct - Drawout Type(K, B) H Earthing S/W Direct - Drawout Type(K, B)	- Without A 1NO1NC B 2NO2NC C 3 Position S/W D ES(Earthing S/W)With Option E Earthing S/W(2NO2NC) F Earthing S/W(4NO4NC) G Earthing S/W With Key Lock H ES with Locking Magnet(DC 110V) I ES with Locking Magnet(DC 220V) J ES with Locking Magnet(DC 125V) K ES with Locking Magnet(AC 110V) L ES with Locking Magnet(AC 220V) M ES with Locking Magnet(AC 125V) N Shutter Lock

■ MI(With Only VC)

VC	MI	-	62E	D1	-	62E	D1		
Unique Symbol	Product Name	Vacuum Contactor(VC1)		Control Voltage(V)	Vacuum Contactor(VC2)		Control Voltage(V)		
VC VC	MI MI(With Only VC)	32E	VC - 3Z - 42EE	D1	DC 110V	32E	VC - 3Z - 42EE	D1	DC 110V
		34E	VC - 3Z - 44EE	D2	DC 220V	34E	VC - 3Z - 44EE	D2	DC 220V
		62E	VC - 6Z - 42EE	D3	DC 125V	62E	VC - 6Z - 42EE	D3	DC 125V
		64E	VC - 6Z - 44EE	A1	AC 110V	64E	VC - 6Z - 44EE	A1	AC 110V
		32L	VC - 3Z - 42LE	A2	AC 220V	32L	VC - 3Z - 42LE	A2	AC 220V
		34L	VC - 3Z - 44LE	A3	AC 125V	34L	VC - 3Z - 44LE	A3	AC 125V
		62L	VC - 6Z - 42LE			62L	VC - 6Z - 42LE		
		64L	VC - 6Z - 44LE			64L	VC - 6Z - 44LE		

External View

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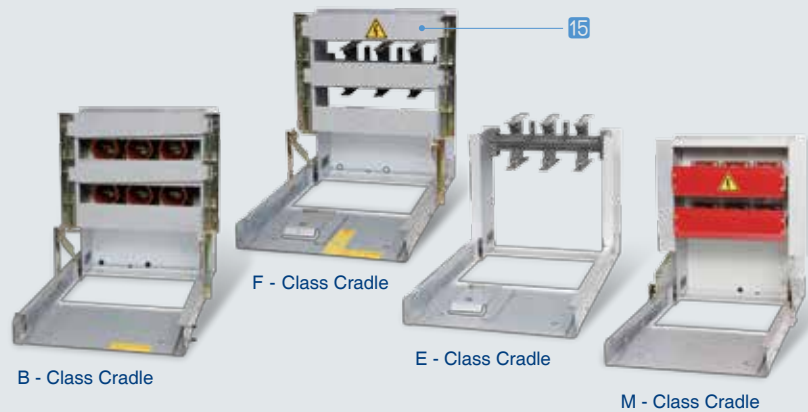
Combination Drawout Type



Combination Direct - Drawout Type



- 1 Front Cover
- 2 Fuse Checking Window
- 3 Auxiliary Switch
- 4 ON/OFF Indicator
- 5 Operation Counter
- 6 Manual Trip Button
- 7 Drawout Carrier
- 8 Direct - Drawout Carrier
- 9 Drawout Handle
- 10 Interlock Lever
- 11 Hole for Drawout Handle Insertion
- 12 TEST/RUN Indicator
- 13 Cradle
- 14 Fuse Case
- 15 Shutter



Internal Structure

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Main contact part

Consists of vacuum interrupters, main terminals and moving shunts that are supported by a one - moulded frame that maintains insulation between phases. Vacuum interrupters are operated by means of the actuating mechanism that is connected to movable parts of a vacuum interrupter with a insulation rod.

Actuating mechanism

Designed simply without any linkage to be suited for frequent - operation and long service life. The actuating lever connected to a moving core of a actuating magnet that carries out the function of a actuating shaft moves up and down to control the contact pressure for stable operations.

Control method

Continuous excitation - During a contactor is closed the control coil is required to be excited continuously to pull the moving core magnetically. In case of discontinuing the control power the moving core is to be returned by a spring because of the disappearance of magnetic force, which causes the opening of a contactor.

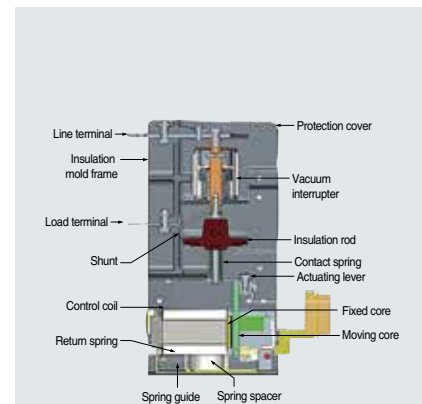
Instantaneous excitation - In this method the continuous exciting of a control coil to maintain the closing of a contactor is not required as the latch built in it holds the mechanism. In case of manual tripping, a contactor will be tripped by releasing the latch when turn on the manual trip button.

Type	Control method	Control voltage (V)	Closing current(A) / time(ms)	Trip current(A) / time(ms)	Holding current(A) / time(ms)
VC - 3/6 - 42/44 - E/L	Continuous Excitation(E)	DC/AC 110V	3/100	-	0.6/40
		DC/AC 125V	3/100	-	0.6/40
		DC/AC 220V	2/100	-	0.6/40
	Instantaneous Excitation(L)	DC/AC 110V	5/100	3/35	-
		DC/AC 125V	5/100	3/35	-
		DC/AC 220V	10/100	6/35	-
	Instantaneous Excitation(L) (With CTD)	AC 110V	5/100	5/35	-
		AC 125V	5/100	5/35	-
		AC 220V	10/100	10/35	-

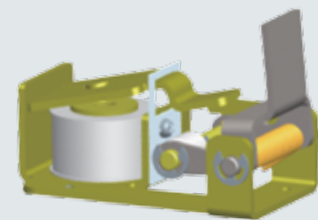
Vacuum interrupters

In the closed position, normal current flows through the interrupter. When a fault occur and interruption is required, the contacts are quickly separated. The arc which is oriented between surfaces of contact shall diffuse at the contact structure of flat shape. It prevents local heating and damage. The arc burns in an ionized metal vapor, which condenses on the surrounding metal shield.

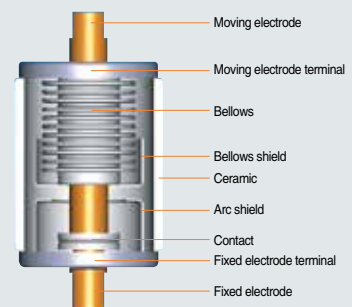
The arc is extinguished and vapor production is ceased at current zero. The metal vapor plasma is very rapidly dispersed, cooled, recombined, and deionized, and the metal vapor products are quickly condensed so that the contacts withstand the transient recovery voltage.



Main contact part



Latch mechanism



Internal structure

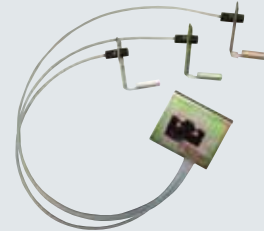
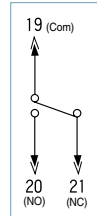
Accessories

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Fuse checker / Micro switch

Fuse checker is operated in case of fuse blowing and output mechanical signal at same time. A micro switch is a part of fuse checker. The mechanical input signal is changed to electrical out signal by micro switch.

Note) 19 - 20 : NO contact, 19 - 21 : NC contact



Fuse checker / Micro switch

PT(Potential transformer)

2 each of PTs can be mounted on drawout type contactors and fuse combination type.

These are 100VA and 200VA PTs rated 3.6/7.2kV.

Rated voltage(V)	Secondary voltage(V)	Class	Burden(VA)	Frequency(Hz)
3300/6600	110/220	1	100/200	50/60



PT(Potential transformer)

Fuse clip

It is used to install or uninstall a fuse link to the holder. Its dimensions depend on ratings.



Fuse clip

Auxiliary switch

Auxiliary switches are 2NO+2NC as standard and additional 3NO+3NC can be added on request.

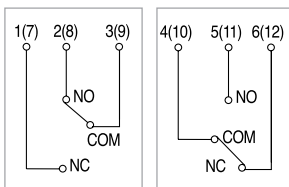


Auxiliary switch

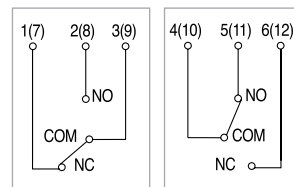
Position switch

This enables checking contactor positions when draw - in and draw - out. Remote checking is also possible through signaling via micro switches in each position.

Test Position



Run Position



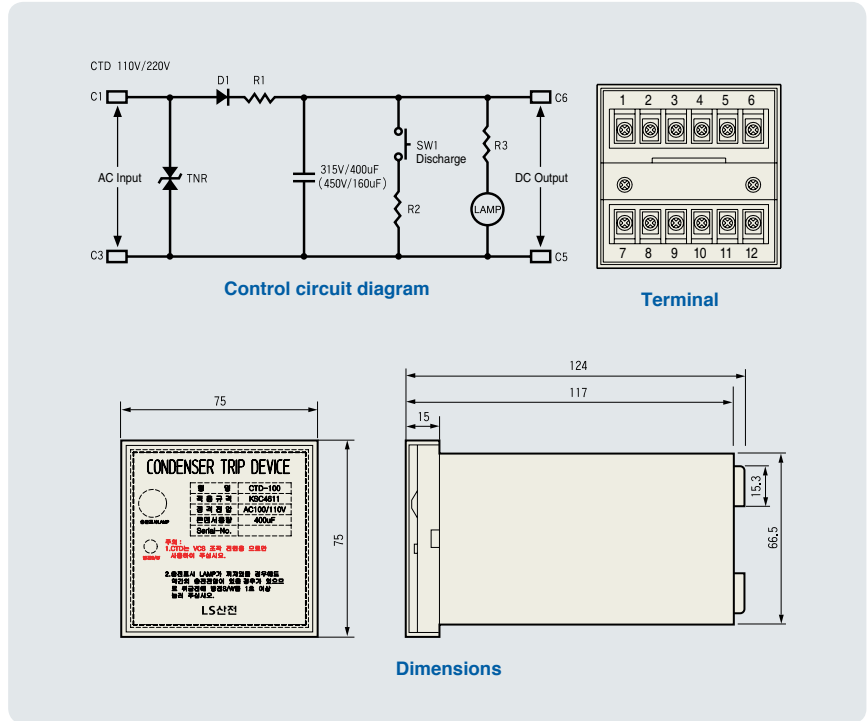
Note) () is contact point in case of PS 2

CTD(Condensor Trip Device)



CTD is built as standard in the contactor with AC control of instantaneous excitation so that the contactor can be tripped within 30 seconds in the event of an electricity failure. The automatic trip circuit in the event of an electricity failure is to be built by a customer.

Rating	Description	
Type	CTD - 100	CTD - 200
Rated input voltage(V)	AC 100/110	AC 200/220
Frequency(Hz)	50/60	50/60
Rated impulse voltage(V)	140/155	280/310
Charging time	Within 5 sec.	Within 5 sec.
Trip command possible time	Max. 30 sec.	Max. 30 sec.
Input voltage range	85%~110%	85%~110%
Capacitor rating(μF)	400	160



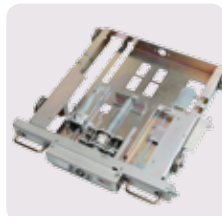
Fuse case

Made of high strength BMC resin to offer superior insulation and safety.
 (Note) Applied fuse combination type.



Bushing

It is mono - block bushing to be used in the cradles of G, B, M, H - type drawout contactors. It provides high insulation level, so recommended to use in contactors for MCSG.
 (Note) Applied G, B, M, H - Class Cradle.



Direct - drawout carrier

It is a screw - sliding type drawout equipment to draw - in and draw - out a contactor directly out of a panel for personal safety. It is built in K and B type contactors.



Handle

It is a bent - lever to actuate a direct - drawout carrier by inserting and turning in K and B type contactors



Counter

This is a ON/OFF operation counter by using 5 digit.



Test/Run position indicator

This enables checking contactor positions visibly when connecting or disconnecting a contactor.
 (Note) Applied direct drawout type only.



ON/OFF indicator

To visibly check whether power is supplied or not



Fuse checking window

Enables the visible check of a fuse like its outside status and temperature - rise in a fuse combination type contactor.
 (Note) Applied G, B, F type

Accessories

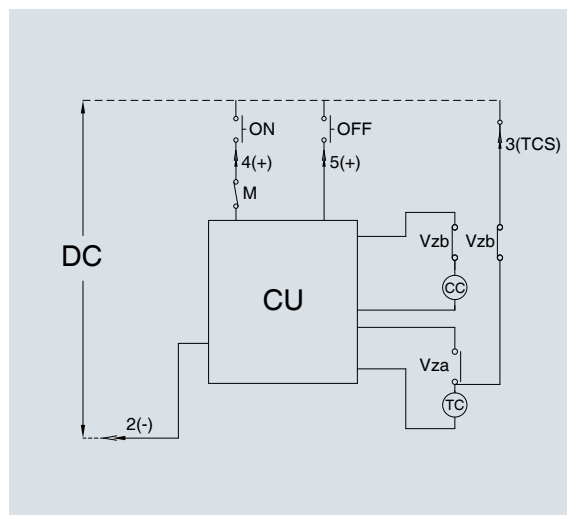
Susol

Padlock and Door racking interlock



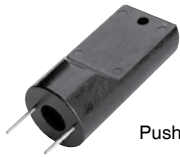
- With this door options for H type cradle draw - in/out is allowed only when the door is closed.
- If draw - in /out is necessary when the door is open, use the operation lever put in the slot of the breaker handle. Insert it into the hole in the bottom of door interlock.
- Padlock is also optional, which can lock to prevents the draw - in/out of the breaker in the position of TEST and SERVICE.

Trip coil monitoring contact



- Device for monitoring the functions of the trip coils.
- To monitor the trip coils connect its terminals with the trip coil monitoring relay as shown on the circuit diagram.
 - If the trip coil is normal : closed - circuit consisting
 - If the trip coil is damaged : open circuit
- 1) monitor the trip coils in closed position of the breaker.
- 2) monitor the trip coils in trip position of the breaker.
- Coil Test Unit is optional, which enable monitoring the coils by connecting in parallel with the trip coil operation switch.

Button Cover



Push Bar

Button Padlock



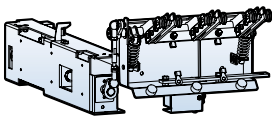
- It is a protection cover to prevent an accident due to unintended operation of ON/OFF button.

- Use the push - bar to operate the ON/OFF button.

- It is to prevent manual operation of ON/OFF button due to user's wrong handling.

- It is not possible to handle ON/OFF operation under the "Button lock" status.

Earthing Switch



- For the safety during the maintenance of switchgear in the position of TEST/ Drawout discharge the charging current in the load side of a VCS with this earthing switch. It is available only for K, B type Earthing Truck.

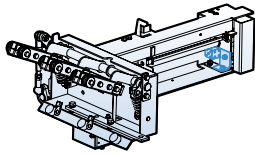
* Regarding the operations of earthing switch and related accessories see the instruction manual.

* Applicable Standards : IEC 62271 - 102

Accessories

Susol

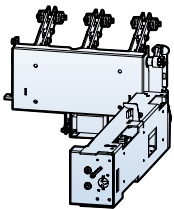
Locking Magnet for Earthing Switch



ES Locking magnet

- In case of using earthing switch it can be added to prevent the earthing switch from opening or earthing before it is energized.
- Verify if the locking magnet is energized before opening or earthing the earthing switch.
- Control voltage
 - DC 24V / DC 48V / DC 110V / DC 125V / DC 220V
 - AC 48V / AC 110V / AC 220V

Keylock for Earthing Switch



- In case of using earthing switch it can be added for two types of interlocking.
 - 1) Interlock to keep opening
 - 2) Interlock to keep earthing



Earthing Switch Keylock

Drawing Operations

Susol

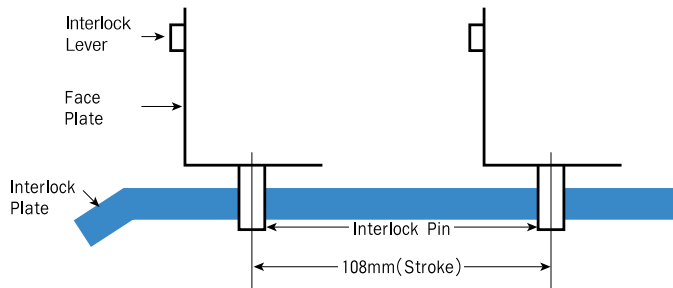
For standard draw - out types (D, G)

■ When draw - in a contactor into a cradle.

1. Check that the contactor is in the state of open (TEST Position).
2. While lifting the interlock lever, insert the contactor about 50mm into the cradle.
3. Release the interlock lever and push the contactor into the cradle by the RUN position.

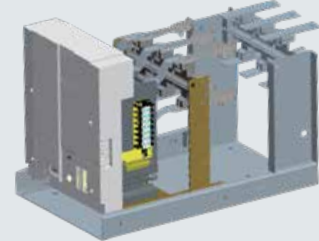
■ When draw - out a contactor from a cradle.

1. Check that the contactor is in the state of open (RUN Position).
2. While lifting the interlock lever, draw the contactor about 50mm out of the cradle.
3. Release the interlock lever and pull the contactor from the cradle by the TEST position.

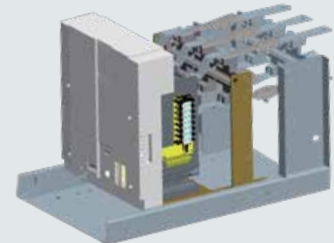


Details of TEST/RUN Position

<TEST Position>



<RUN Position>



For direct draw - out types (K, B)

■ When draw - in a contactor into a cradle.

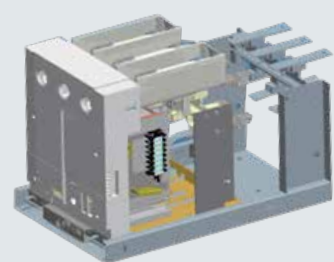
1. Check that the contactor is in the state of open (TEST Position).
2. Hold both knobs at the bottom of the contactor.
3. Pull the knobs towards the inside and push them towards the front.
4. Mount the handle.
5. Turn the handle clockwise and move the contactor forward. (About 11 turns)
6. When it reaches the contact point, the handle operates in idle and the contactor does not lead in anymore.

■ When draw - out a contactor from a cradle.

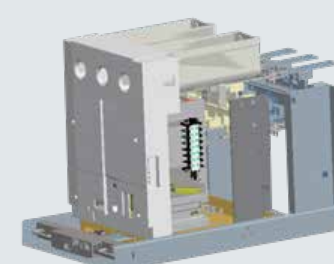
1. Check that the contactor is in the state of open (RUN Position).
2. Insert the handle into the hole for drawout handle insertion.
3. Turning the handle counterclockwise until the contactor reaches in the TEST position.
4. When the contactor reaches in the TEST position, handle operates in idle.

Note) Check the power before connecting or disconnecting.

<TEST Position>



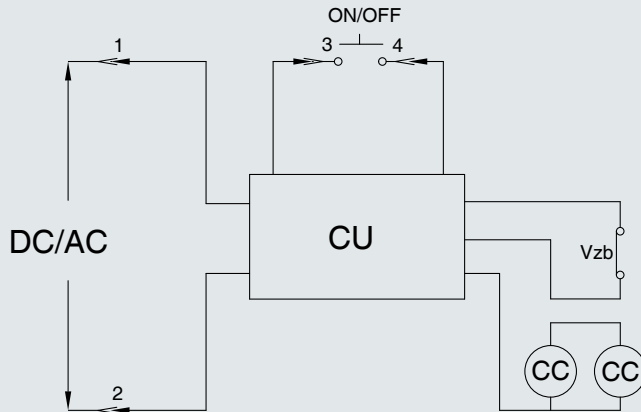
<RUN Position>



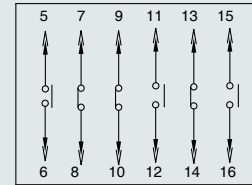
Electrical Circuit Diagram

Susol

Continuous Excitation(DC/AC, 110V~220V): Fixed Type



1	12
2	13
3	14
4	15
5	16
6	
7	
8	
9	
10	
11	

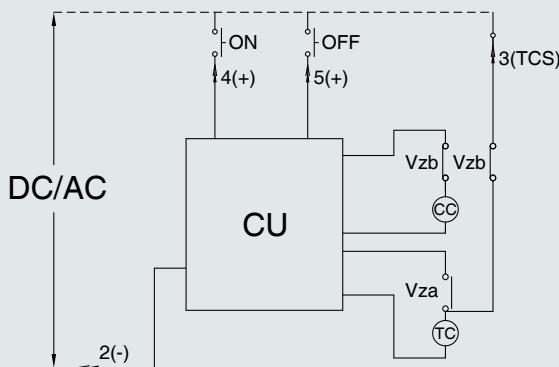


[Auxiliary:3a3b]

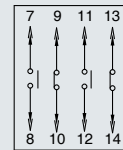
- CU : Control Unit
- CC : Closing Coil
- VZb : Auxiliary Switches Contact "b"

Apply the power source at terminals of 1 - 2.
Switch it using contacts of No.3 - 4 terminal.

Instantaneous Excitation(DC/AC, 110V~220V): Fixed Type



	12
2	13
3	14
4	
5	
6	
7	
8	
9	
10	
11	

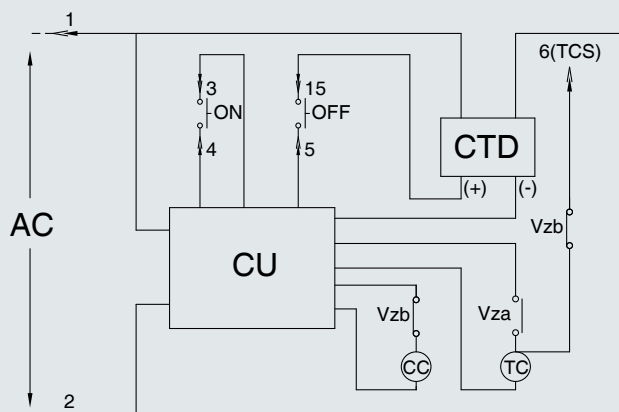


[Auxiliary:2a2b]

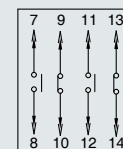
- CU : Control Unit
- CC : Closing Coil
- TC : Tripping Coil
- VZb : Auxiliary Switches Contact "b"
- VZa : Auxiliary Switches Contact "a"

When closing : Switch it using a contact of No. 4(+), 2(-) terminal
When tripping : Switch it using a contact of No. 5(+), 2(-) terminal
→ Contactor does not operate when reverse connected

Instantaneous Excitation_CTD(AC, 110V~220V): Fixed Type



1	12
2	13
3	14
4	15
5	
6	
7	
8	
9	
10	
11	

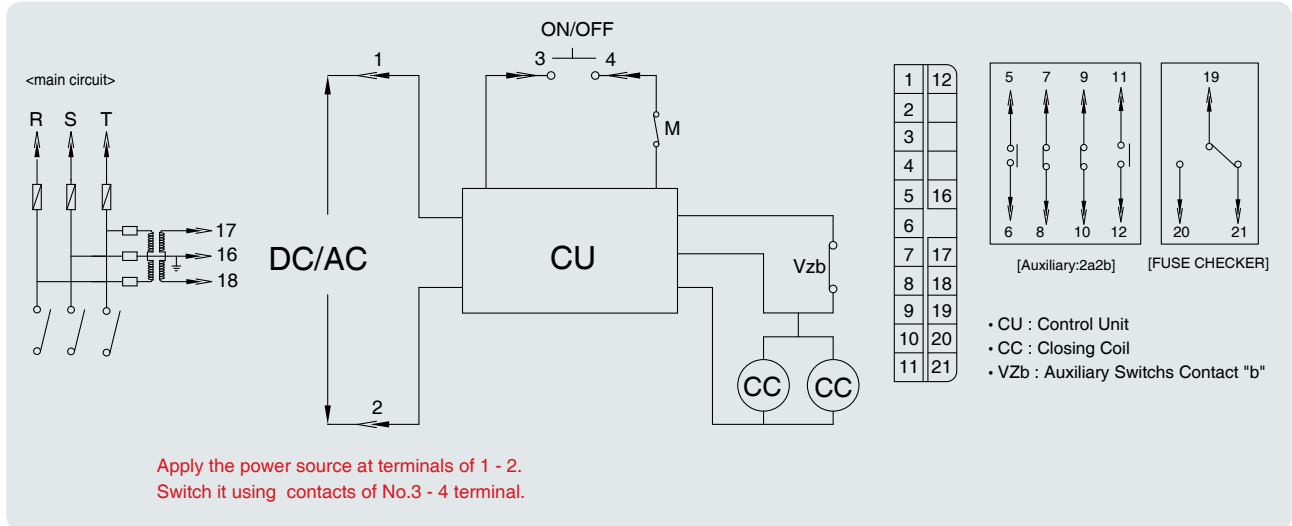


[Auxiliary:2a2b]

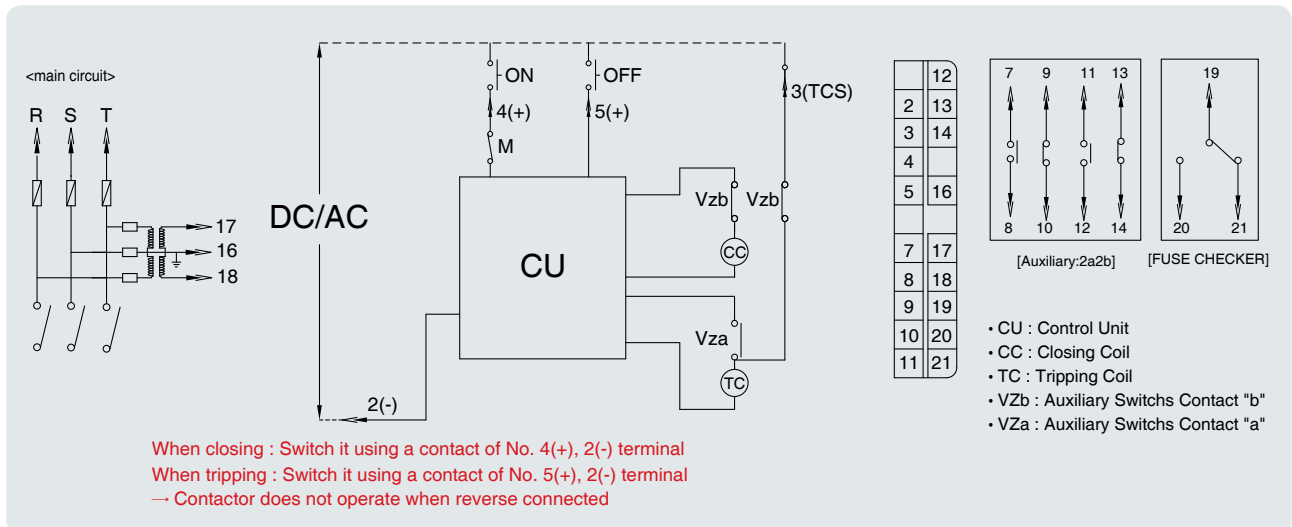
- CU : Control Unit
- CC : Closing Coil
- VZb : Auxiliary Switches Contact "b"

Apply the power source at terminals of 1 - 2
When closing : Switch it using contacts of No.3, 4 terminal
When tripping : Switch it using contacts of No.5, 15 terminal

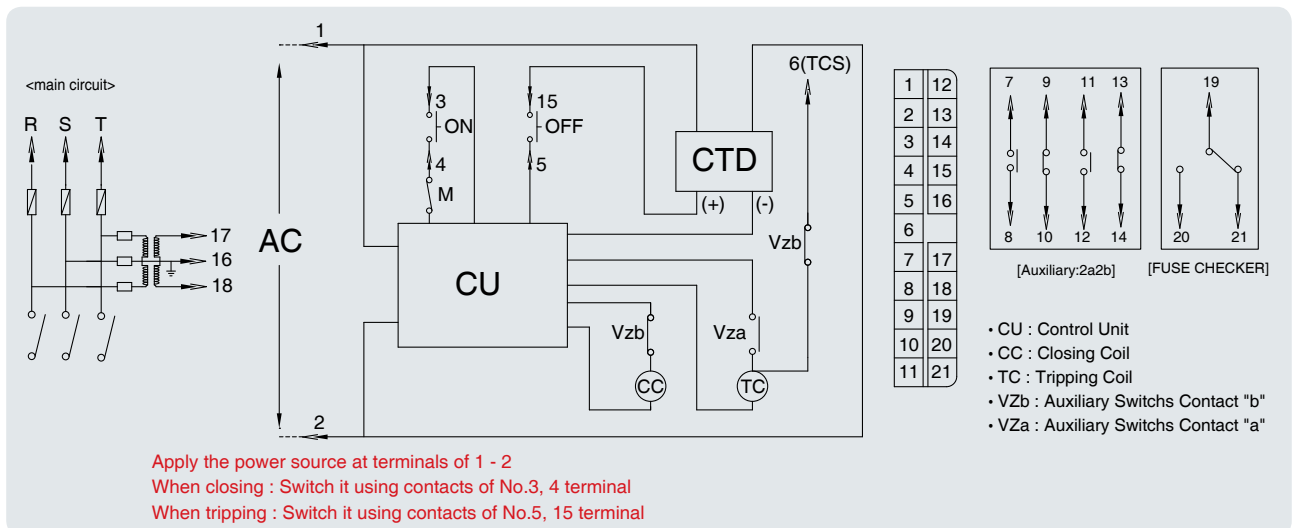
Continuous Excitation(DC/AC, 110V~220V): Drawout Type



Instantaneous Excitation(DC/AC, 110V~220V): Drawout Type



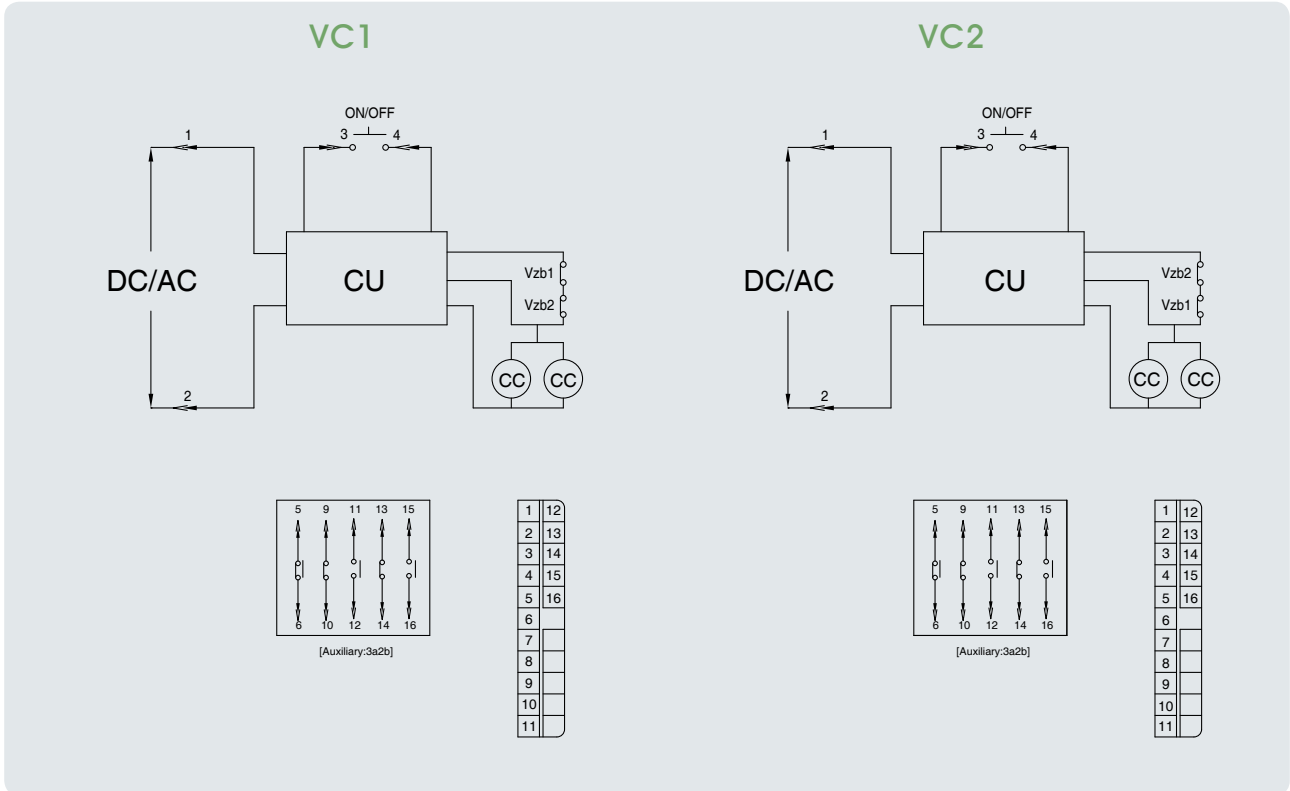
Instantaneous Excitation_CTD(AC, 110V~220V): Drawout Type



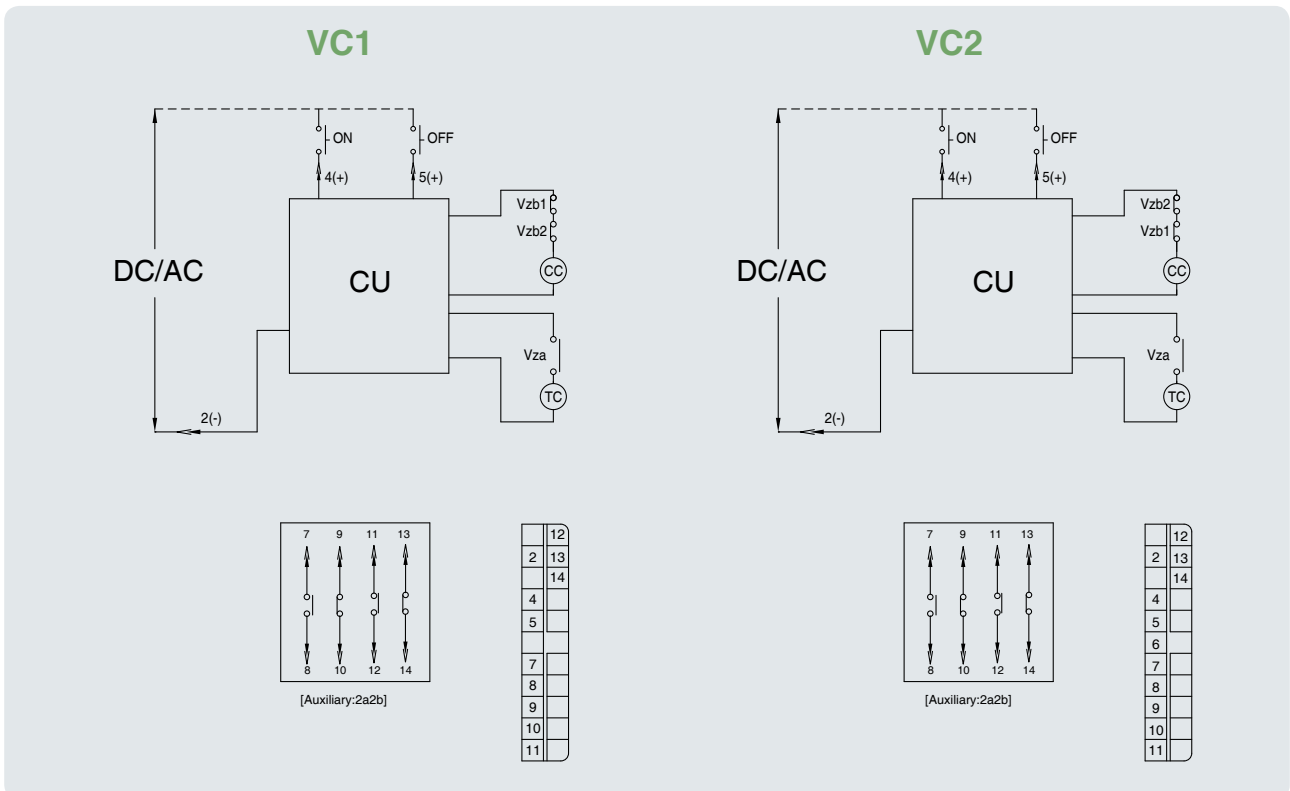
Mechanical Interlock Type Electrical Circuit Diagram

Susol

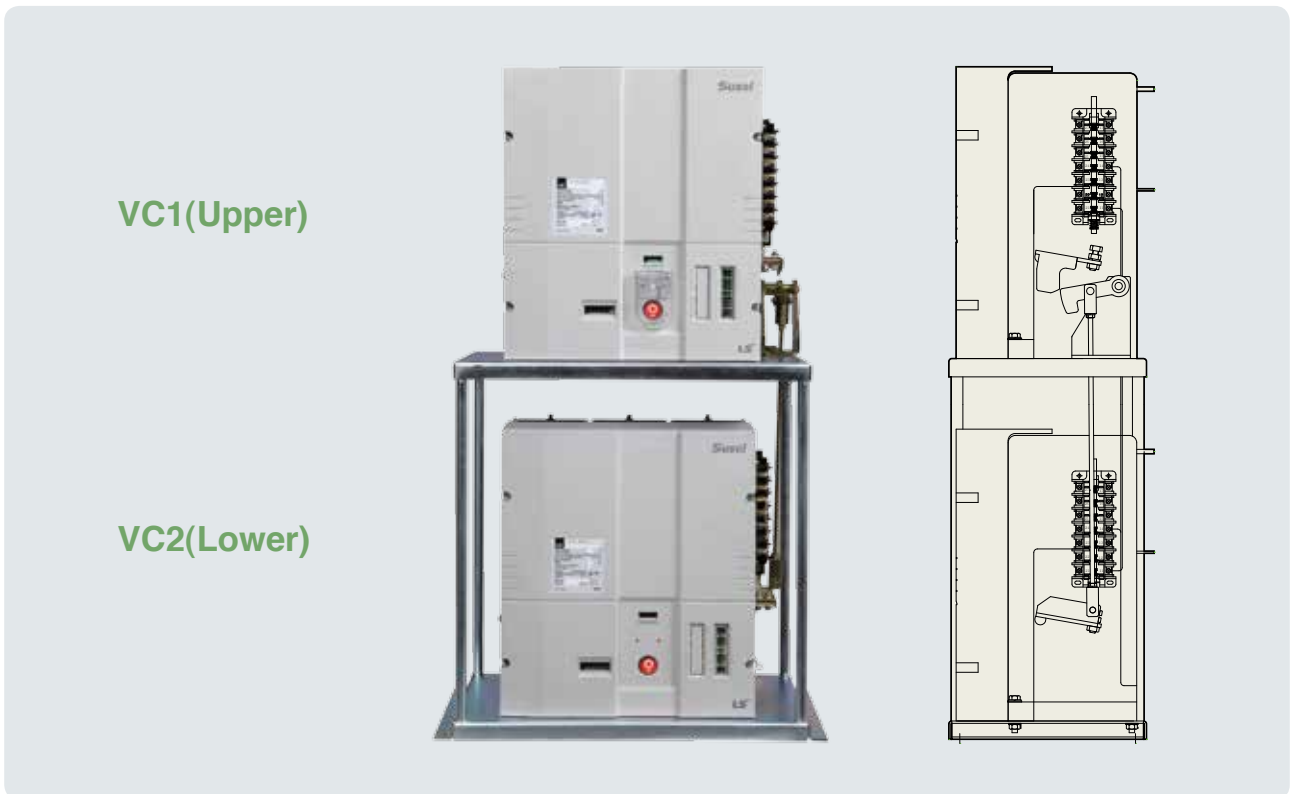
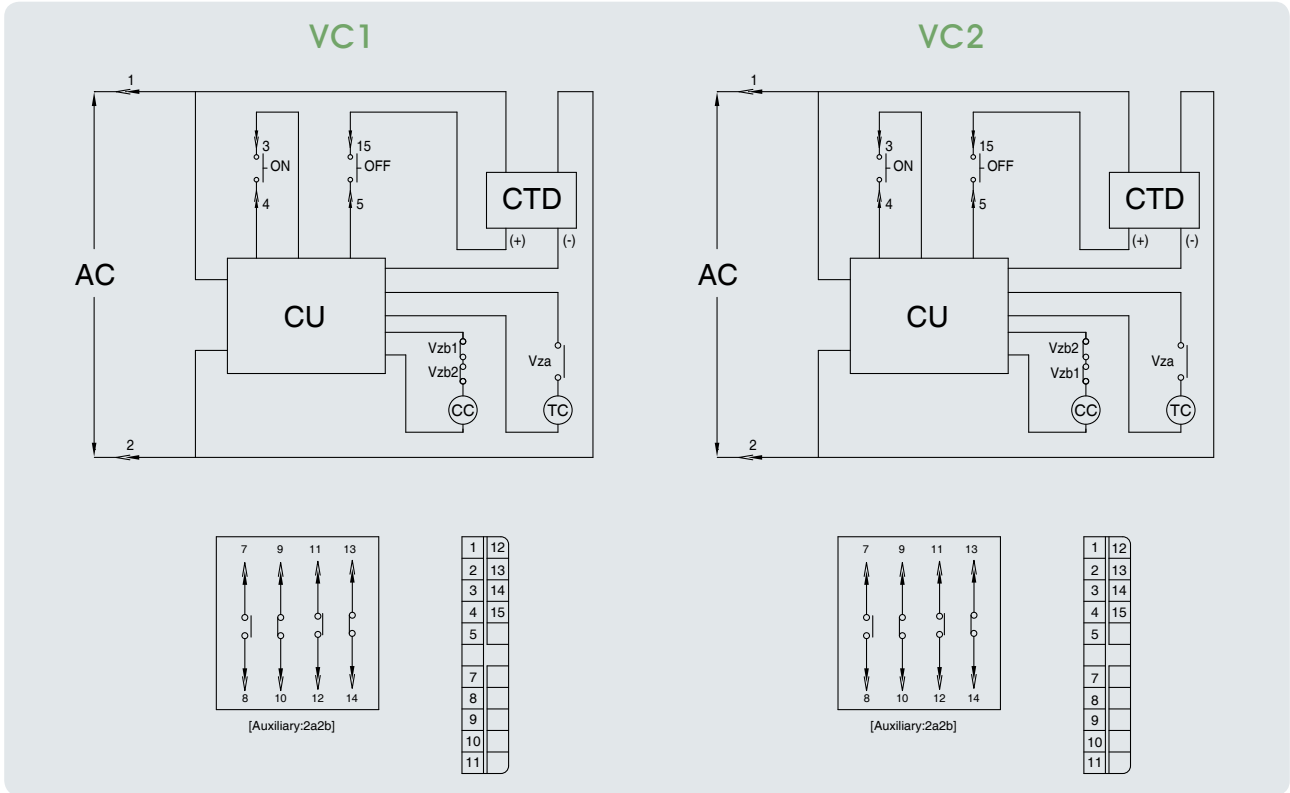
Continuous Excitation(DC/AC, 110V~220V): Fixed Type



Instantaneous Excitation_CTD(AC, 110V~220V): Fixed Type



Instantaneous Excitation_CTD(AC, 110V~220V): Fixed Type



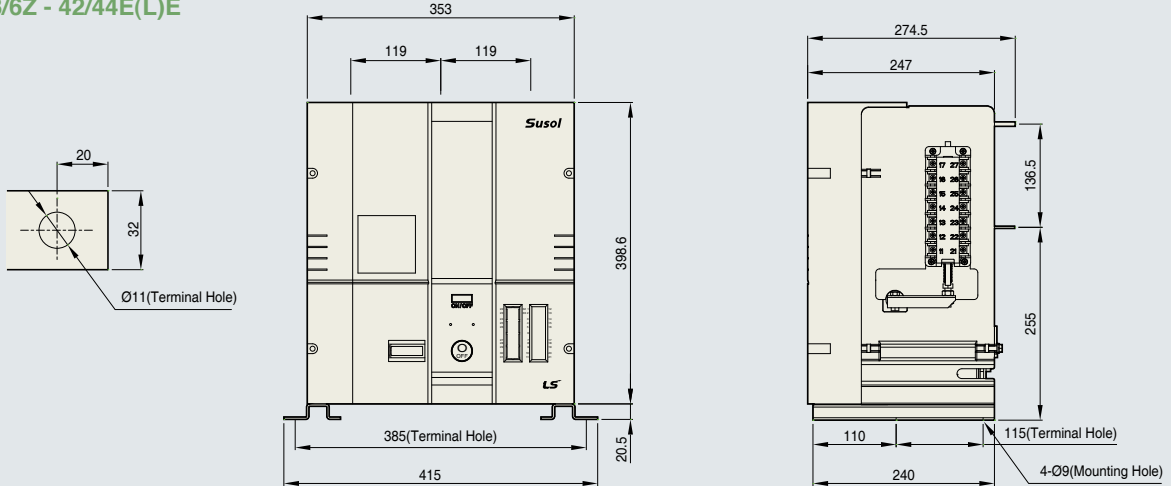
External Dimensions

Susol

Fixed Type

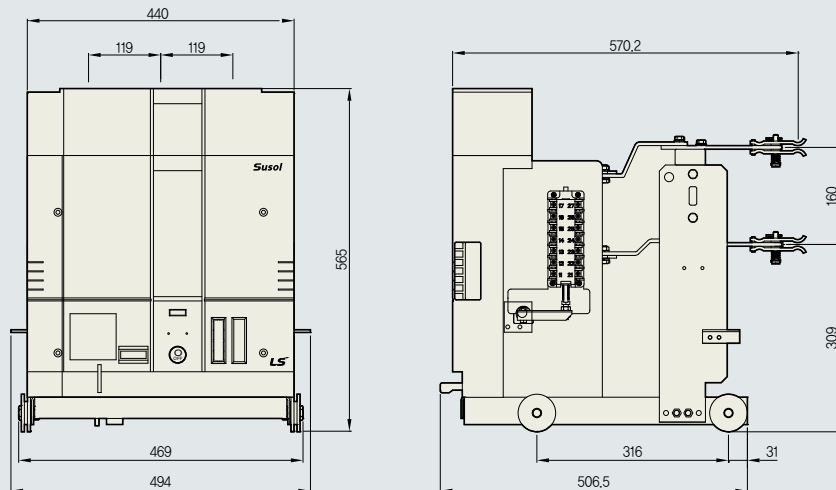
(Unit : mm)

VC - 3/6Z - 42/44E(L)E



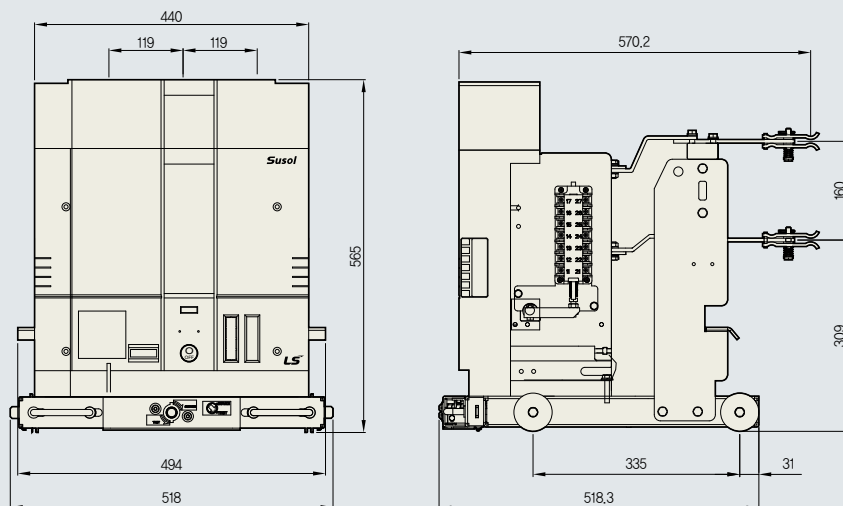
Drawout Type

VC - 3/6D - 42/44E(L)E



Direct - Drawout Type

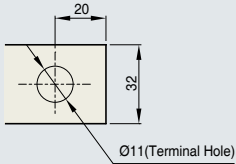
VC - 3/6K - 42/44E(L)E



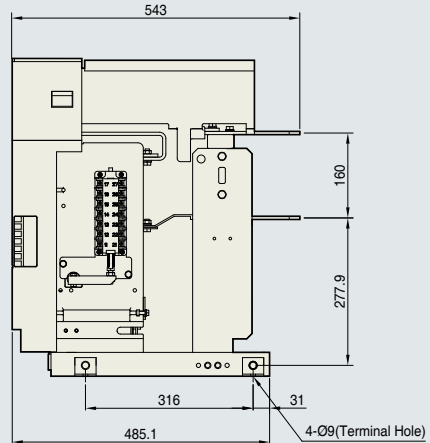
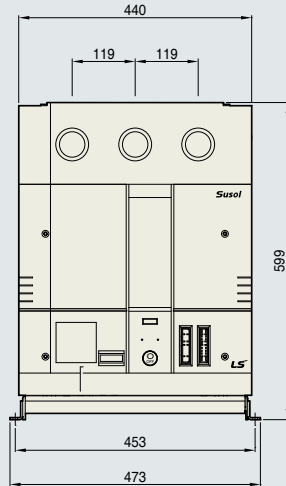
Combination Fixed Type

(Unit : mm)

VC - 3/6F - 42/44E(L)E



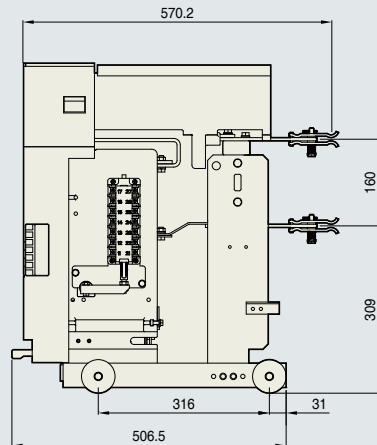
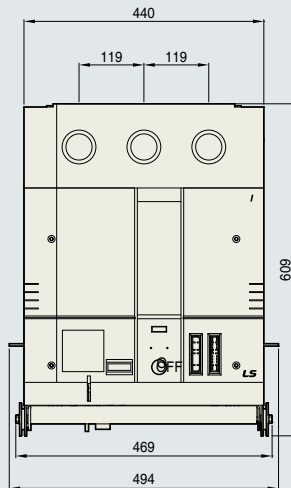
* In case of applying 6M - 300/400, changes 543mm to 613mm



Combination Drawout Type

VC - 3/6G - 42/44E(L)E

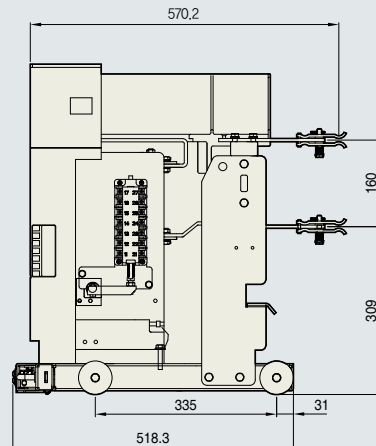
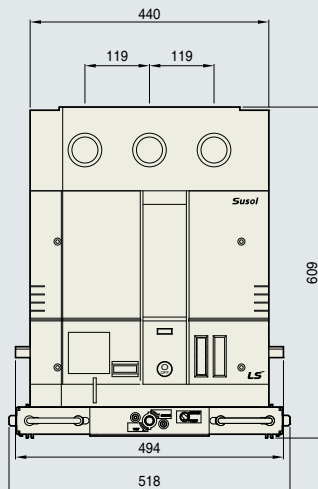
* In case of applying 6M - 300/400, changes 570.2mm to 640.2mm



Combination Direct - Drawout Type

VC - 3/6B - 42/44E(L)E

* In case of applying 6M - 300/400, changes 570.2mm to 640.2mm

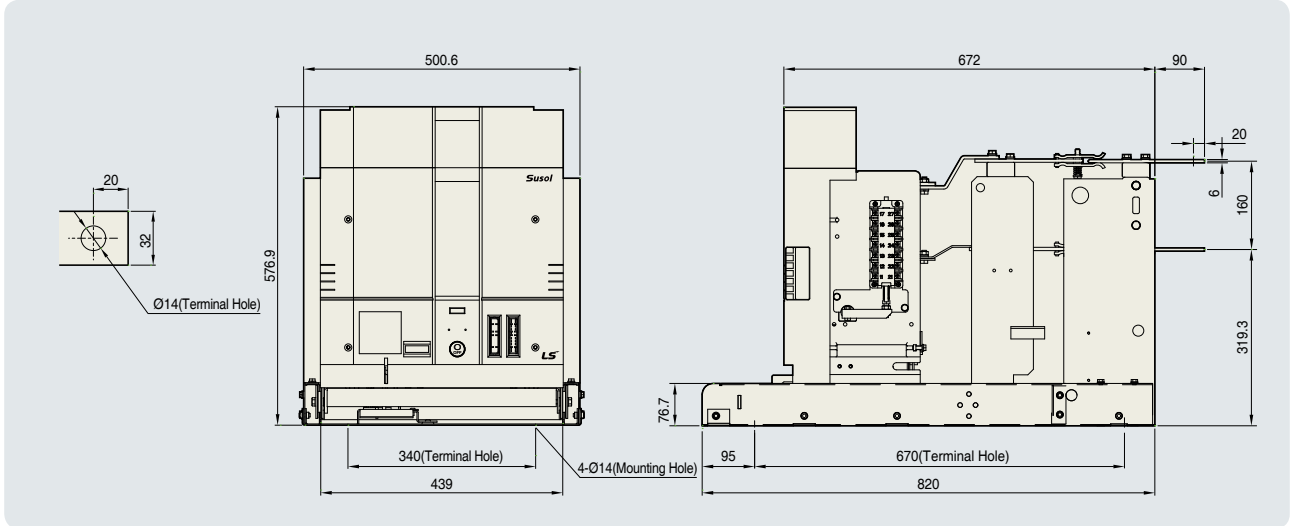


External Dimensions

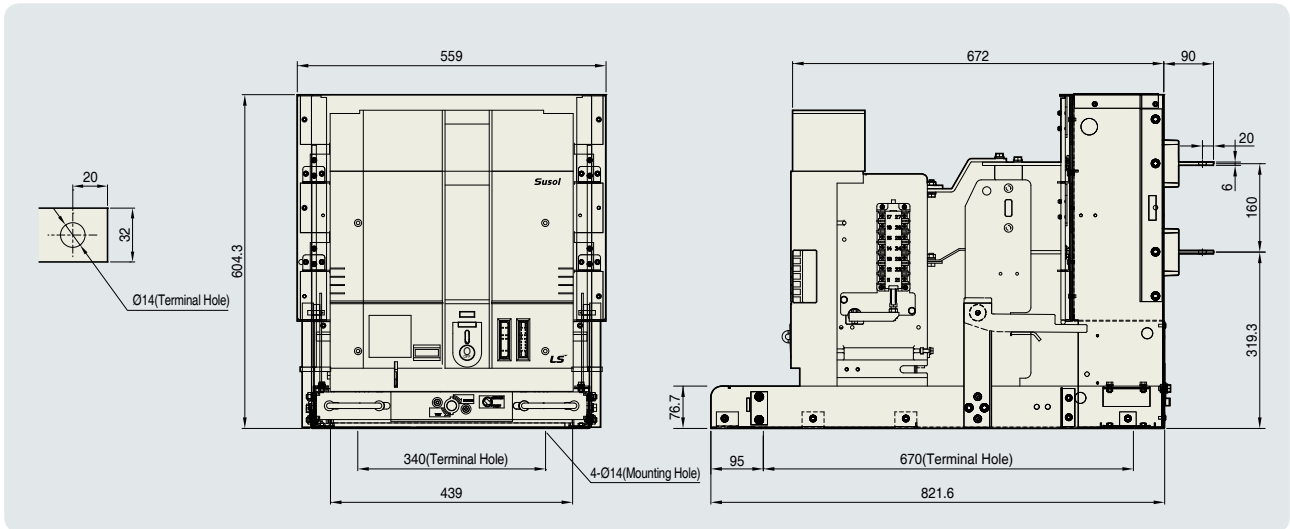
Susol

E Class Cradle(Drawout Type)

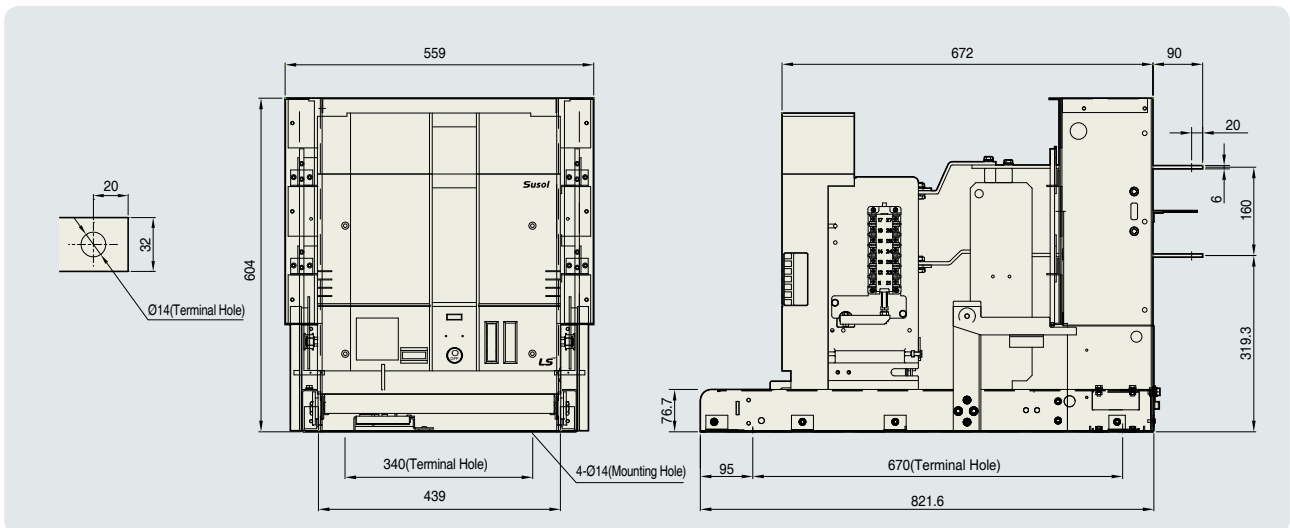
(Unit : mm)



B Class Cradle(Drawout Type)

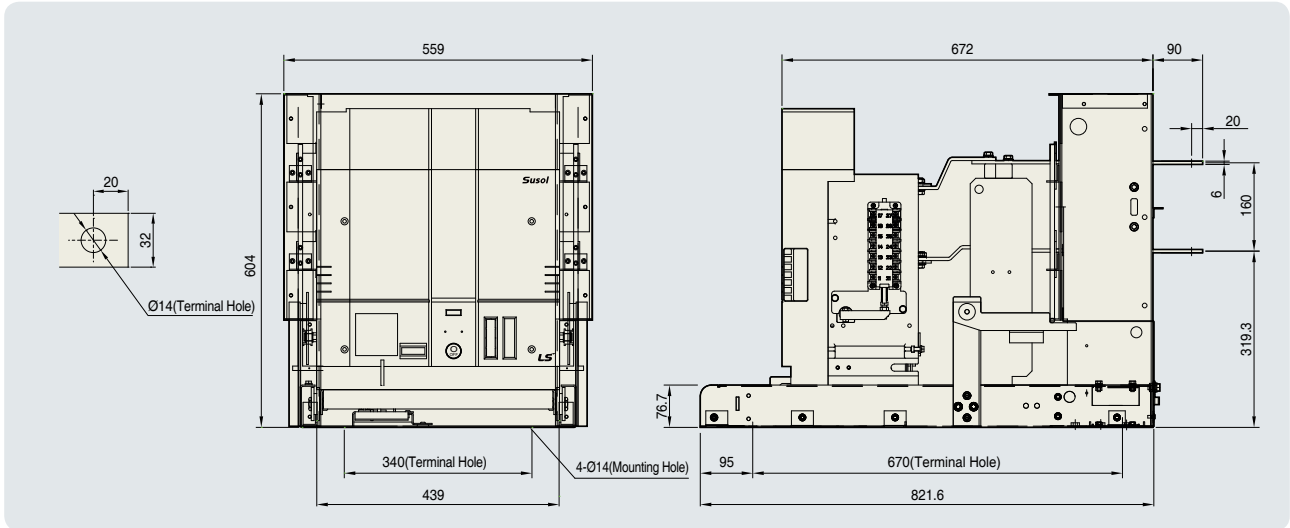


F Class Cradle(Drawout Type)

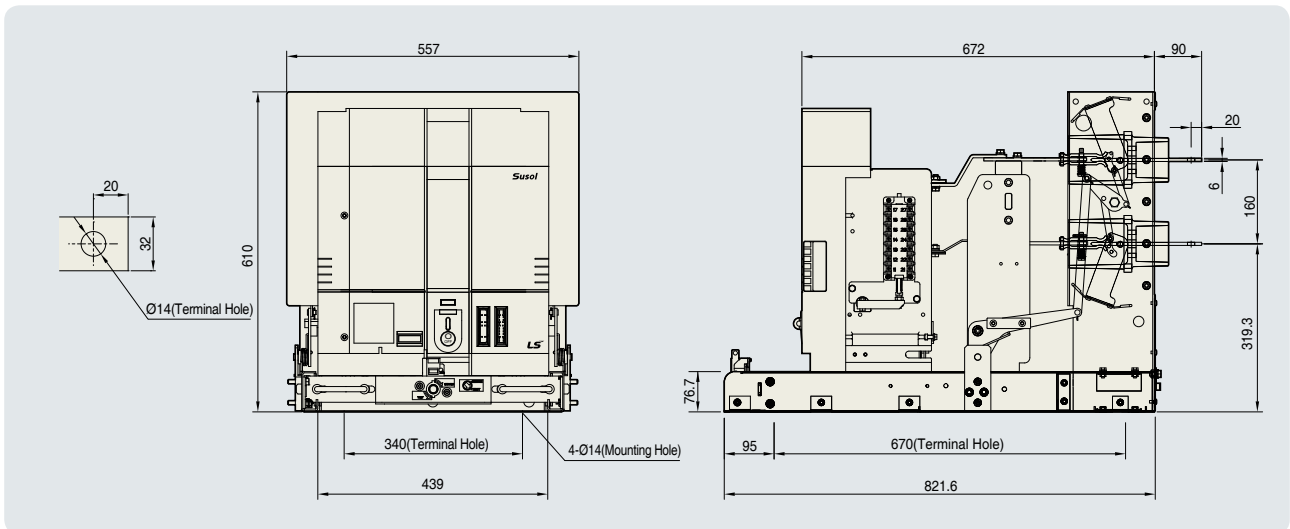


G Class Cradle(Drawout Type)

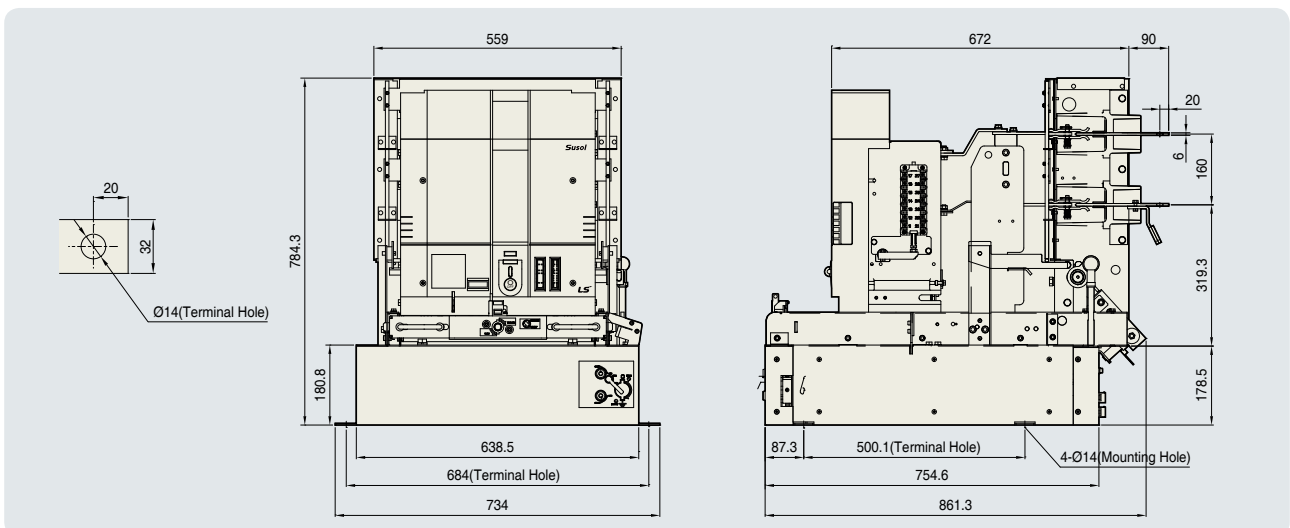
(Unit : mm)



M Class Cradle(Drawout Type)



H Class Cradle(Drawout Type)

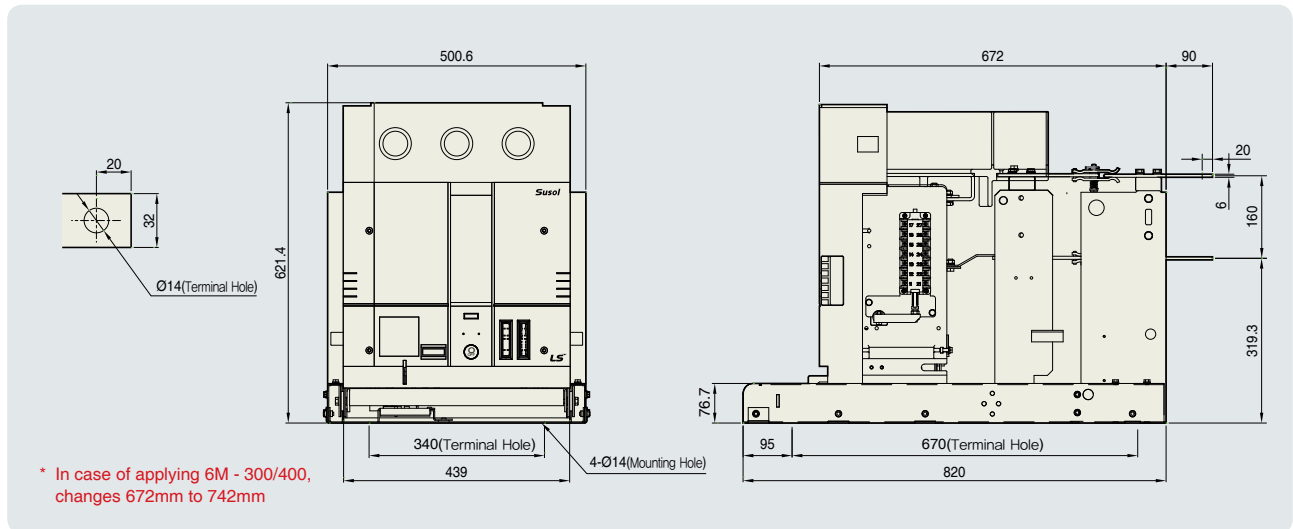


External Dimensions

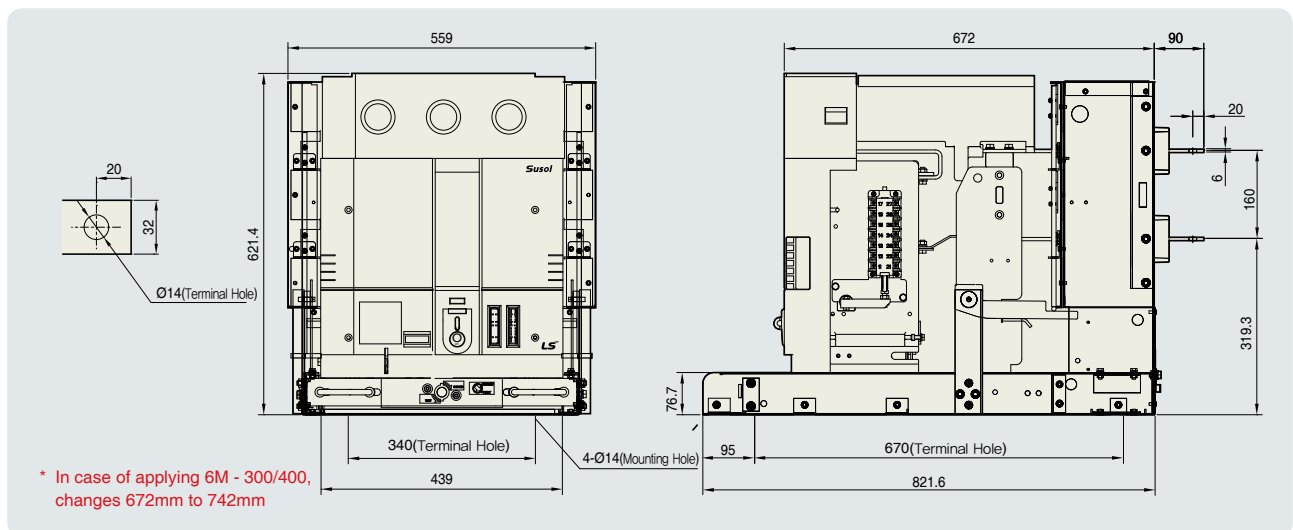
Susol

E Class Cradle(Combination Drawout Type)

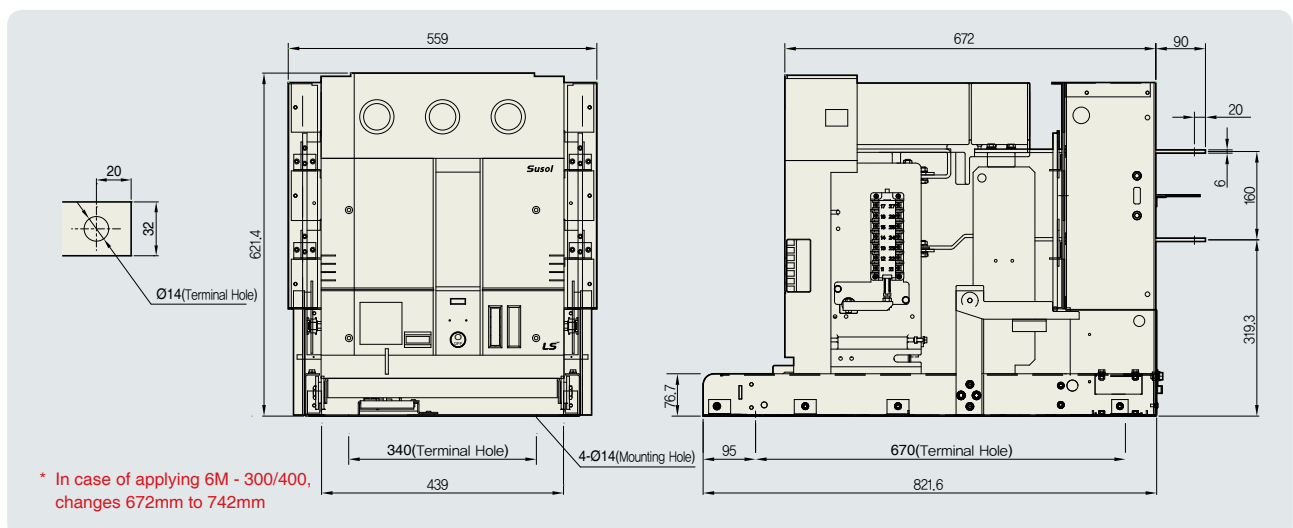
(Unit : mm)



B Class Cradle(Combination Drawout Type)

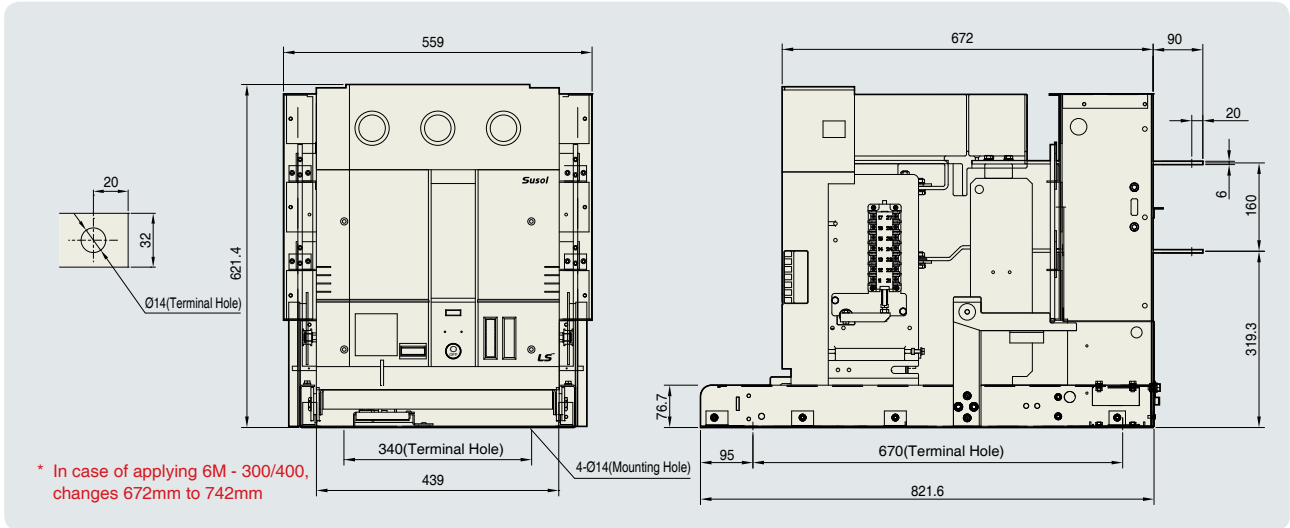


F Class Cradle(Combination Drawout Type)

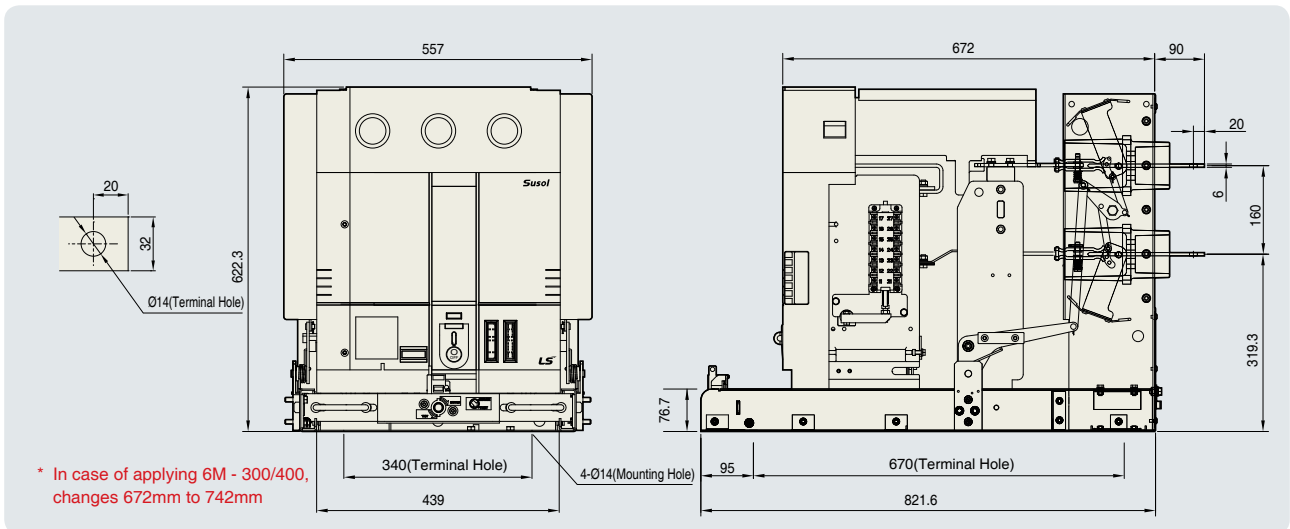


G Class Cradle(Combination Drawout Type)

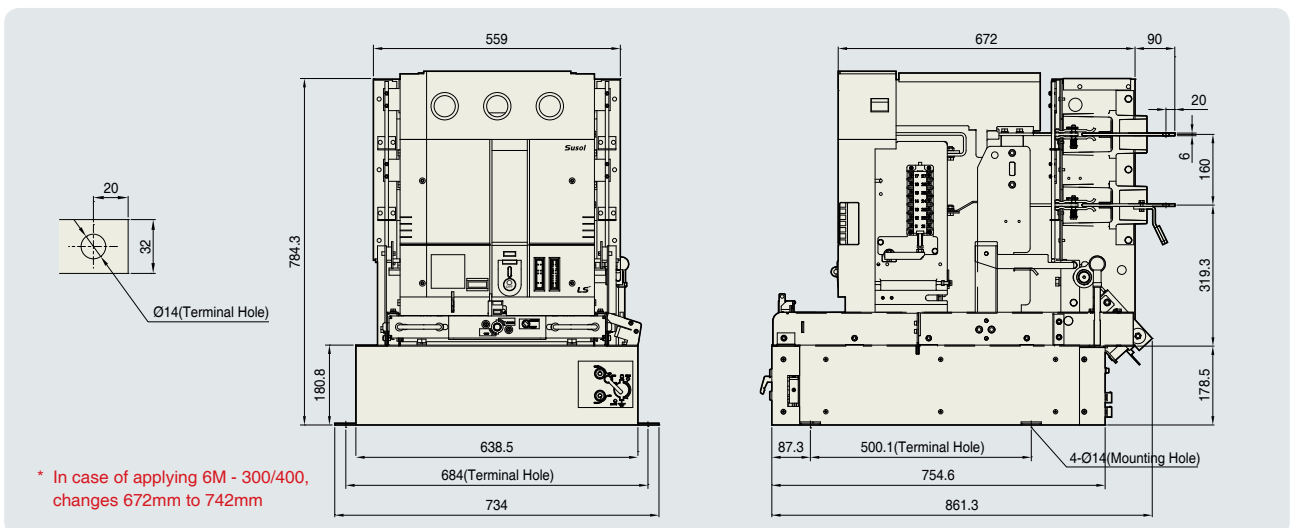
(Unit : mm)



M Class Cradle(Combination Drawout Type)



H Class Cradle(Combination Drawout Type)

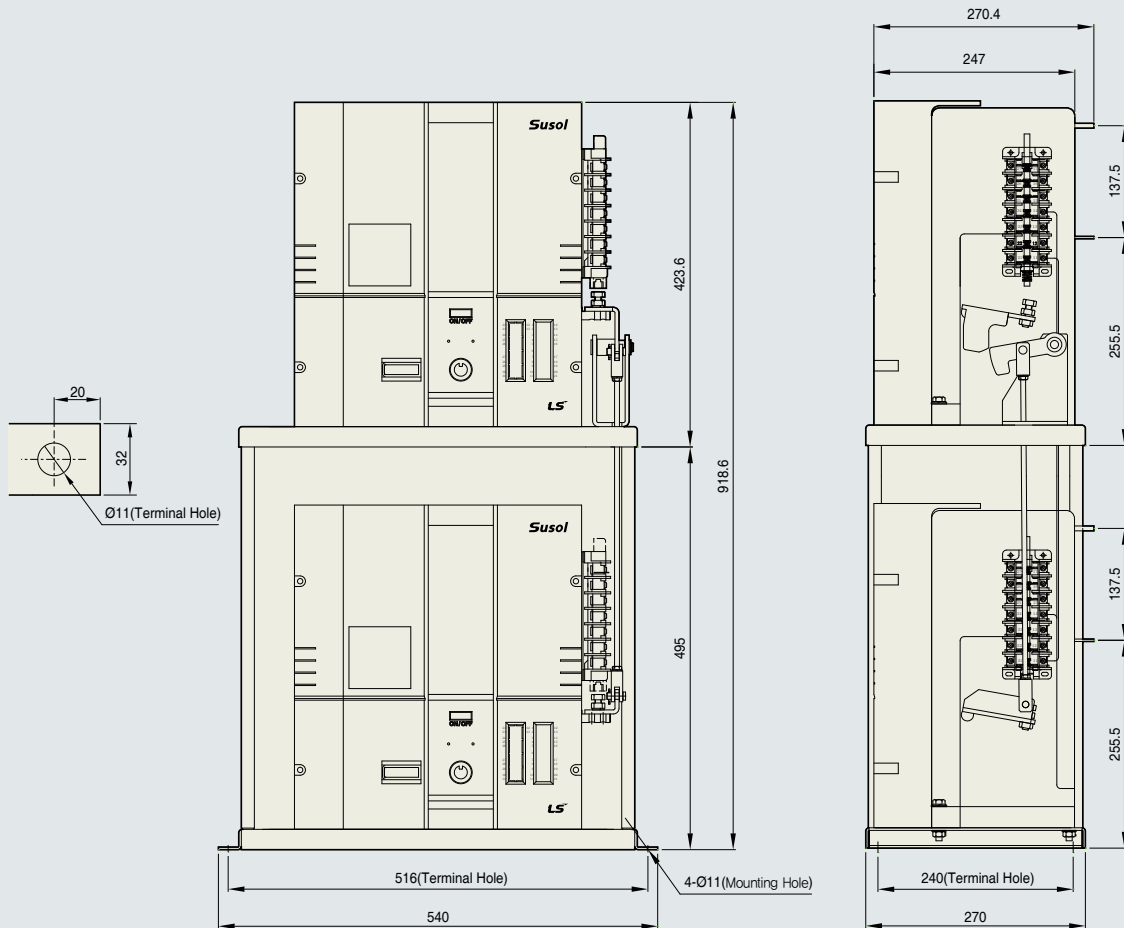


External Dimensions

Susol

Mechanical Interlock Type

(Unit : mm)



Power Fuse

Susol

Power fuse

LS Prime - MEC power fuses are designed to protect equipments from fault current such as short - circuit, and generally used for the protection the circuits of transformers, capacitors and motors.

Considerations in application

- Power fuses are suitable for the protection from a short - circuit, not overload current.
- Fuse reset or re - use is not possible after fused are blown out.
- When the fuses are selected, their usage and circuit requirements should be considered.
- For the purpose of protection from the fault current below the lowest interrupting current of the fuse it is desirable to replace it with a fuse having lower interrupting rate or add other overcurrent relay in series
- Withstand voltage of the circuit should be higher than that of a fuse that protects it.
- Replace all three fuses in case of blowing in a fuse.

Considerations by the type of load

1. Power fuses for transformer loads

- The fuse with sufficient rated current must be selected to avoid the deterioration of the fuse element due to permissible overload in the long term.
- The fuse's current/time characteristic should cover the inrush current/time of the transformer.

Fuse rated current \geq Transformer rated current

- In case of protection of two or more transformers
 - Fuse rating should be selected on the basis of the phase condition where maximum current flows.
 - In the event of short - circuit in the secondary of the transformer
The lowest interrupting current of the fuse < Short circuit current in the primary of the transformer
The lowest interrupting current of the fuse < Short circuit current in the primary of the fuse
- In case of potential transformers
 - When the fuses are selected do not consider the short - circuit happening in the secondary of the PT, but protecting PT itself and the circuit against the fault in the primary side.
 - Select the fuse with higher rated current than the load current so as not to be damaged by overcurrent.
 - The withstand strength such as permissible let - through current, I^2t of the equipments to be protected must be higher than that of a fuse.

2. Power fuses for motor loads

- The fuse with sufficient rated current must be selected to avoid the deterioration of the fuse element due to permissible overload in the long term.
- The fuse's current/time characteristic should cover the inrush current/time of the motor.
 - The inrush current of the motor must be within 5 times of the fuse rating and the fuse should withstand at least 10 seconds under the condition.

Fuse rated current \geq Motor full load current

Note) Refer to the general considerations other than the above mentioned.

3. Power fuses for capacitor loads

- The fuse with sufficient rated current must be selected to avoid the deterioration of the fuse element due to permissible overload in the long term.
- The fuse's current/time characteristic should cover the inrush current/time of the capacitor.
- The size of inrush current depends on whether or not the serial reactors and parallel capacitors exist.



KERI(24kV)



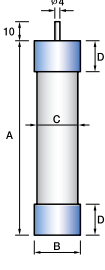
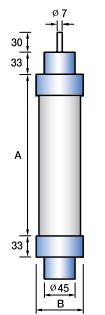
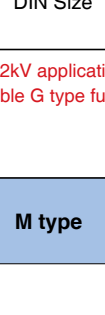
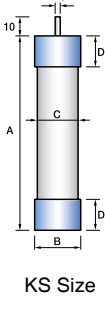
Power fuses for transformer loads



Power fuses for motor loads

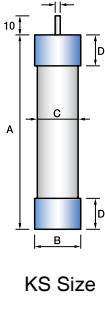
Selection Tables

Susol

G type	Application Model	Rated voltage	Rated current	Rated interrupting current	Lowest interrupting current	Transformer load (kVA)		Capacitive load (kVA)		
		(kV)	(A)	(kA)	(A)	Single phase	Three phase	Three phase		
 <p>KS Size</p>	LFL - 3/6G - 5	3.6 (7.2)	5	40	5In	- ※ (up to 5)	up to 5 ※ (up to 15)	- ※ (-)		
	LFL - 3/6G - 10		10			up to 10 (up to 15)	up to 15 (up to 30)	up to 10 (up to 25)		
	LFL - 3/6G - 20		20			up to 20 (up to 50)	up to 30 (up to 75)	up to 30 (up to 50)		
	LFL - 3/6G - 30		30			up to 30 (up to 75)	up to 75 (up to 150)	up to 50 (up to 100)		
	LFL - 3/6G - 40		40			up to 50 (up to 100)	up to 100 (up to 200)	up to 75 (up to 150)		
	LFL - 3/6G - 50		50			up to 75 (up to 150)	up to 150 (up to 300)	up to 100 (up to 200)		
	 <p>DIN Size</p>	LFL - 3/6G - 60	3.6	63	40	5In	- (-)	- (-)	- (-)	
		LFL - 3/6G - 75		75			up to 150 (up to 200)	up to 200 (up to 400)	up to 200 (up to 400)	
		LFL - 3/6G - 100	100	7.2	40	5In	up to 200 (up to 400)	up to 375 (up to 750)	up to 300 (up to 600)	
		LFL - 3G - 150	150				up to 300 (-)	up to 500 (-)	up to 400 (-)	
		LFL - 3G - 200	200				up to 400 (-)	up to 750 (-)	up to 600 (-)	
		LFL - 3G - 300	300				up to 625 (-)	up to 1,000 (-)	up to 1,000 (-)	
		 <p>DIN Size</p>	LFL - 3G - 400	3.6	40	5In	up to 750 (-)	up to 1,500 (-)	- (-)	
			LFL - 6G - 150				150	- (up to 500)	- (up to 1,000)	- (up to 800)
			LFL - 6G - 200	200	7.2	40	5In	- (up to 750)	- (up to 1,500)	- (up to 1,200)
			LFL - 6G - 300	300				- (up to 1,250)	- (up to 2,000)	- (-)
LFL - 6G - 400	400		- (-)	- (up to 2,500)				- (-)		
LFL - 3/6G - 5B	5		3.6 (7.2)	40				4In	4 ~ 8 (8 ~ 16)	6.7 ~ 14 (13 ~ 28)
LFL - 3/6G - 10B	10				6 ~ 13 (13 ~ 25)	11 ~ 22 (21 ~ 44)	9.8 ~ 12 (19 ~ 24)			
LFL - 3/6G - 20B	20				15 ~ 31 (30 ~ 62)	25 ~ 53 (51 ~ 107)	12 ~ 31 (24 ~ 61)			
LFL - 3/6G - 30B	30				21 ~ 42 (40 ~ 84)	35 ~ 73 (70 ~ 145)	31 ~ 46 (61 ~ 92)			
LFL - 3/6G - 40B	40				40 ~ 82 (80 ~ 165)	69 ~ 143 (137 ~ 286)	46 ~ 64 (92 ~ 128)			
LFL - 3/6G - 50B	50	49 ~ 102 (98 ~ 204)			85 ~ 117 (170 ~ 354)	64 ~ 81 (128 ~ 163)				
LFL - 3/6G - 60B	63	66 ~ 137 (132 ~ 275)			114 ~ 238 (229 ~ 476)	181 ~ 105 (163 ~ 210)				
LFL - 3/6G - 75B	75	68 ~ 165 (134 ~ 330)			117 ~ 285 (233 ~ 571)	105 ~ 150 (210 ~ 300)				
LFL - 3/6G - 100B	100	128 ~ 220 (256 ~ 440)			222 ~ 381 (443 ~ 762)	150 ~ 222 (300 ~ 445)				
LFL - 3/6G - 125B	125	151 ~ 275 (302 ~ 550)			261 ~ 476 (522 ~ 952)	222 ~ 275 (445 ~ 550)				
 <p>DIN Size</p>	LFL - 3G - 160B	3.6	40	4In	211 ~ 352 (-)	365 ~ 610 (-)	275 ~ 370 (-)			
	LFL - 3G - 200B				200	265 ~ 440 (-)	495 ~ 762 (-)	370 ~ 550 (-)		
	LFL - 6G - 160B	160	7.2	40	4In	- (425 ~ 704)	- (735 ~ 1,220)	- (550 ~ 742)		
	LFL - 6G - 200B	200				- (437 ~ 880)	- * (755 ~ 1,520)	- (742 ~ 1,000)		

※ () is 7.2kV application

It is possible G type fuse for motor loads but recommend the M type fuse

M type	Application Model	Rated voltage	Rated current	Rated interrupting current	Lowest interrupting current	Transformer load(kVA)	Capacitive load(kVA)
		(kV)	(A)	(kA)	(A)	Three phase	Three phase
 <p>KS Size</p>	LFL - 3M - 20	3.6	20	40	7In	37 ~ 75	up to 50
	LFL - 3M - 50		50			90 ~ 200	up to 150
	LFL - 3M - 100		100			220 ~ 400	up to 300
	LFL - 3M - 150		150			450 ~ 630	up to 400
	LFL - 3M - 200		200			710 ~ 800	up to 800
	LFL - 3M - 300		300			900 ~ 1,250	up to 1,000
	LFL - 3M - 400		400			1,500	-
	LFL - 6M - 20	20	7.2	40	7In	75 ~ 160	up to 100
	LFL - 6M - 50	50				185 ~ 400	up to 300
	LFL - 6M - 100	100				450 ~ 800	up to 600
	LFL - 6M - 150	150				900 ~ 1,250	up to 800
	LFL - 6M - 200	200				1,500	-
	LFL - 6M - 300	300				2,500	-
	LFL - 6M - 400	400				3,000	-

	Dimensions (mm)				Applicable holder
	A	B	C	D	
	261	50	47	25	LFH-6G-D60
	311	60	57	30	LFH-6G-D1H
	311	77	73	43	LFH-6G-D2H
	350	110	108	55	LFH-6G-D4H
	195	55	-	-	LFH-6G-D1HB
	192	77	-	-	
	292	77	-	-	LFH-6G-D2HB

	Dimensions(mm)				Applicable holder
	A	B	C	D	
	200	60	58	30	LFH-3M-100
	200	77	73	43	LFH-3M-200
	250	87	84	50	LFH-3M-400
	311	60	58	30	LFH-6M-50
	350	77	73	43	LFH-6M-200
	450	87	84	50	LFH-6M-400

Selecting conditions and warning

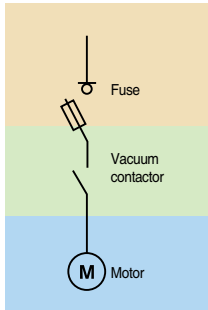
- ※ The values in () apply to the loads of 7.2kV.
- It is assumed that the inrush current of a transformer is 10 times of the full load current of a motor for 0.1 second.
 - The rated current of a fuse is selected to carry continuously the current of 1.5 times of rated current of a transformer.(1.3 times in the case of *)
 - In the transformer load table it is assumed that the interruption will be made at 25 times of rated current within 2 seconds.
- It is assumed that the inrush current of a motor is 5 times of full load current for 10 seconds.
- In the case of using the M(motor protection) type fuses for the purpose of the short - circuit protection of a motor or a starter select the proper rating in addition refer to the characteristic curves on the catalog to make the device protected from overload by a circuit breaker or a contactor.
- It is assumed that the inrush current of a capacitor is 71 times of its rated current for 0.002 second.
 - The rated current of a fuse is selected to carry continuously the current of 1.43 times of rated current of a capacitor.
 - In case service life of more than 1000 operations is required select in the M(motor protection) type fuse table.
- The above mentioned comments are according to KS(Korean Industrial Standard) and subject to the real situation.



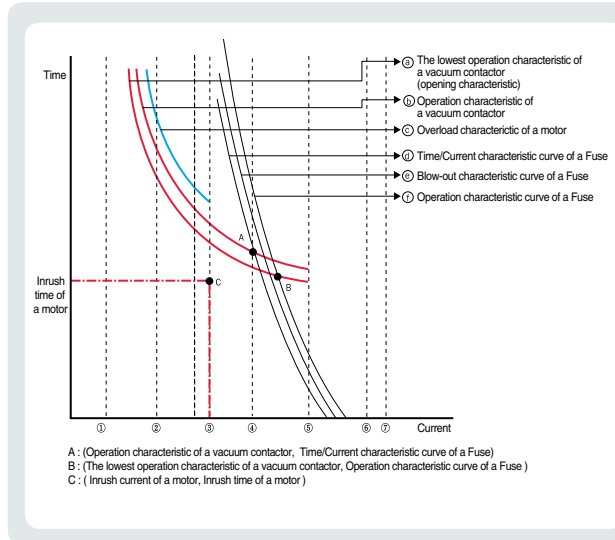
Coordination Graph

Susol

Coordination between fuse and motor circuit



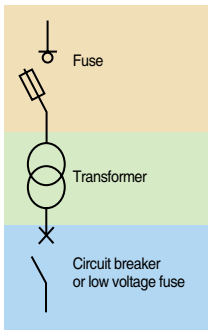
- ① Full load current of a motor
- ② Rated current of a fuse
- ③ Inrush current of a motor (Locked rotor current)
- ④ Lowest interrupting current of a fuse
- ⑤ Rated interrupting current of a vacuum contactor
- ⑥ Short-circuit current
- ⑦ Rated interrupting current of a fuse



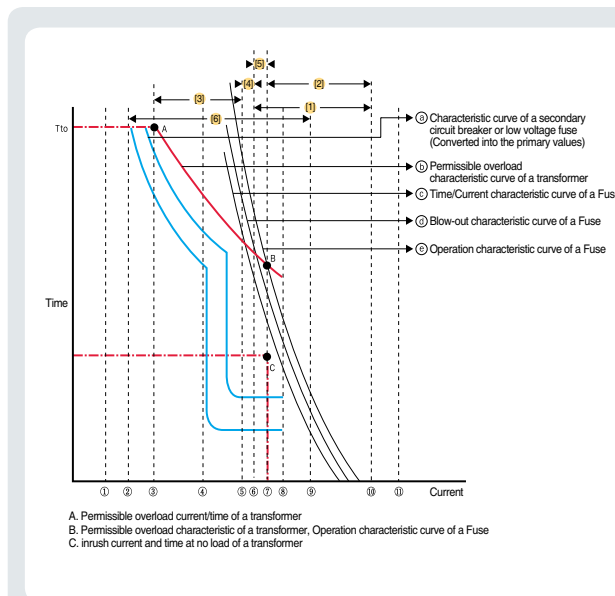
- Full load current of a motor① ≤ Rated current of a fuse②
- Operation characteristic of a vacuum contactor② must lie to the left of ③(Overload characteristic of a motor)
- Point A must lie to the right of ④ Lowest interrupting current of a fuse.
- Point B must lie to the left of ⑤ Rated interrupting current of a vacuum contactor.

Note) The current less than point A can be protected by a vacuum contactor, and the current greater than point B is to be protected by a fuse.

Coordination between fuse and transformer circuit



- ① Full load current of a transformer
- ② The lowest interrupting current of the secondary circuit breaker
- ③ Permissible overload current of a transformer
- ④ Rated current of a fuse
- ⑤ Lowest blow-out current of a fuse
- ⑥ Lowest interrupting current of a fuse
- ⑦ Inrush current at no load of a transformer
- ⑧ Secondary short-circuit current
- ⑨ Rated interrupting current of a secondary circuit breaker
- ⑩ Primary short-circuit current
- ⑪ Rated interrupting current of a fuse



When any protection device is not installed in the secondary of a transformer

- Permissible overload current of a transformer (point ③) must lie to the left of the curve ③ (time/current characteristic curve of a Fuse)
- Full load current of a transformer ① ≤ Rated current of a fuse ④
- Point C (inrush current and time at no load of a transformer) must lie to the left of the point ③ (time/current characteristic curve of a Fuse)
- Secondary short - circuit current⑧ > Lowest interrupting current of a fuse ⑥

When a circuit breaker or fuse is installed in the secondary of a transformer

- Must meet the requirements above mentioned in ①
- The characteristic curve of a secondary circuit breaker or low voltage fuse ② must lie to the left of permissible overload characteristic curve of a transformer ③ and under the point B
- The characteristic curve of a secondary circuit breaker or low voltage fuse ② must lie to the Time/Current characteristic curve of a Fuse and under the Secondary short - circuit current ⑧.

※ Coordination in the graph

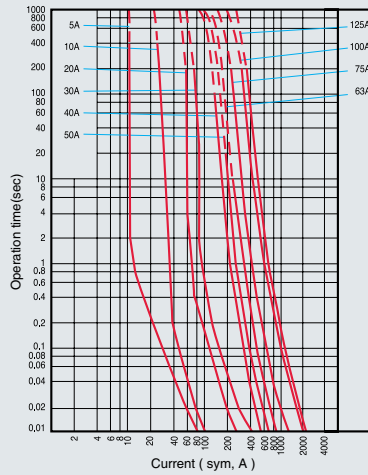
- Zone of [1] : Protection of primary side from short - circuit by a fuse
- Zone of [2] : Protection of a transformer
- Zone of [3] : Out of the scope of fuse operation
- Zone of [4] : Interruption is not ensured even though the fuse blows.
- Zone of [5] : Protection of a transformer is not ensured even though the fuse interrupts the circuit.
- Zone of [3]+[4]+[5] : No protection zone of a transformer Circuit breaker or low voltage fuse required for the transformer protection

Operation Curves

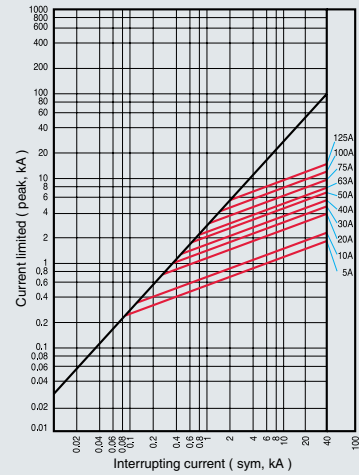
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DIN Type

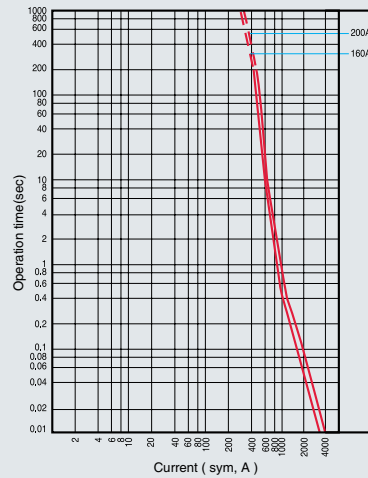
3.6/7.2kV blowing characteristic



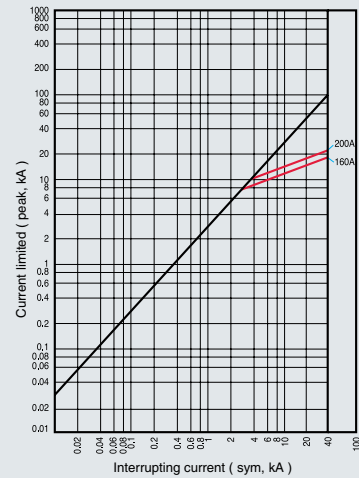
3.6/7.2kV current limiting characteristic



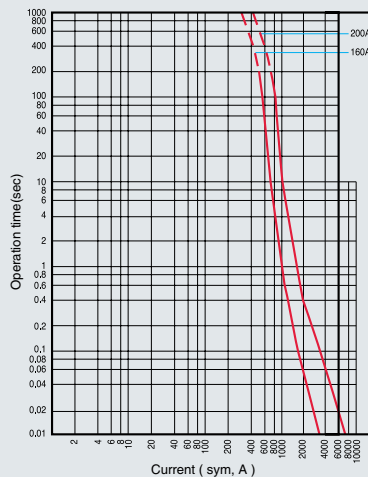
3.6kV blowing characteristic



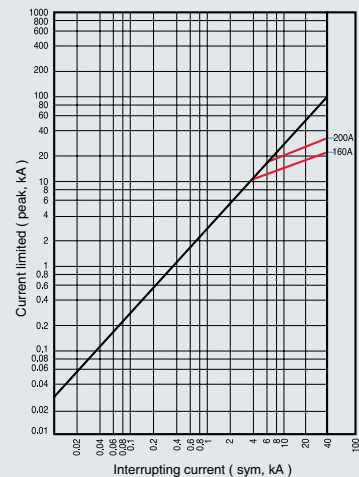
3.6kV current limiting characteristic



7.2kV blowing characteristic



7.2kV current limiting characteristic



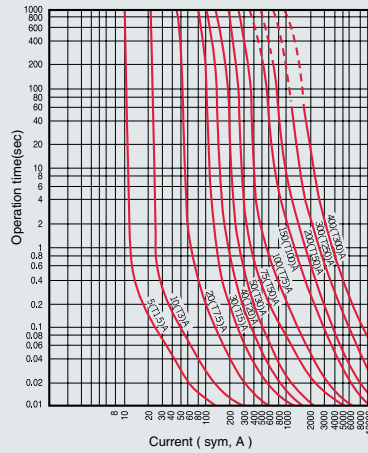
Operation Curves

Susol

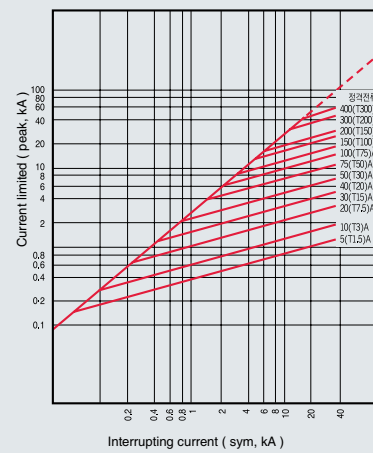
KS Type

G type fuse
(General use)

3.6/7.2kV blowing characteristic

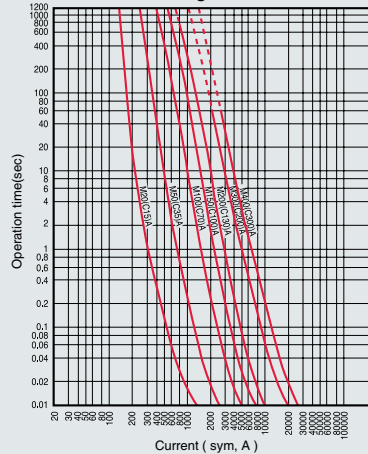


3.6/7.2kV current limiting characteristic

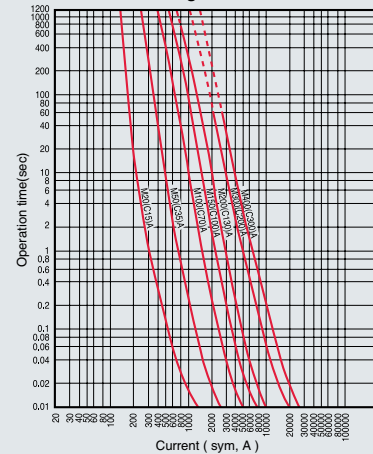


M type fuse
(Motor protection)

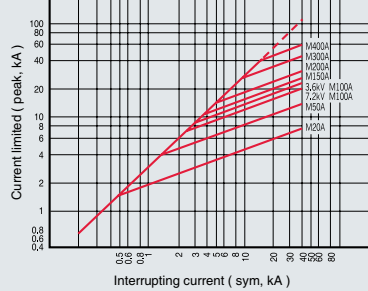
3.6kV blowing characteristic



7.2kV blowing characteristic



3.6kV, 7.2kV current limiting characteristic



Green Innovators of Innovation



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.

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■ HEAD OFFICE

LS - ro 127 (Hogye - dong) Dongan - gu Anyang - si
Gyeonggi - do Korea
Tel. (82 - 2)2034 - 4840, 4911, 4914
Fax. (82 - 2)2034 - 4648

■ CHEONG - JU PLANT

Cheong - Ju Plant #1, 95 Baekbong - ro Heungdeok - gu
Cheongju - si Chungcheongbuk - do 361 - 720 Korea

■ Global Network

- **LSIS USA Inc.** > **Chicago, America**
Address : 2000 Millbrook Drive, Lincolnshire, Chicago, IL 60069, United States of America
Tel : 847 - 941 - 8240 Fax : 847 - 941 - 8259 e - mail : seungheonc@lsis.com
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Address : LOB 19 JAFZA VIEW 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 : hschoib@lsis.com
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Address : 1st. Floor, Tupolevlaan 48, 1119NZ, Schiphol - Rijk, The Netherlands
Tel : 31 - 20 - 654 - 1420 Fax : 31 - 20 - 654 - 1429 e - mail : junshickp@lsis.biz
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Address : Nguyen Khe - Dong Anh - Ha Noi - Viet Nam
Tel : 84 - 4 - 882 - 0222 Fax : 84 - 4 - 882 - 0220 e - mail : sjbaik@lsis.biz
- **LSIS - VINA Co., Ltd.** > **Hochiminh, Vietnam**
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Tel : 84 - 8 - 3822 - 7941 Fax : 84 - 8 - 3822 - 7942 e - mail : hjchoid@lsis.biz
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Tel : +0091 - 124 - 493 - 0070 Fax : 91 - 1244 - 930 - 066 e - mail : hwyim@lsis.biz
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Address : Toykokurakubu Bldg. 13th floor, 3 - 2 - 6, Kasumigaseki, Chiyoda - ku, Tokyo, 100 - 0013 Japan
TEL : +81 - 3 - 6268 - 8241 FAX : +81 - 3 - 6268 - 8240 e - mail : jschuna@lsis.biz
- **LSIS Shanghai Office** > **Shanghai, China**
Address : Room 32 floors of the Great Wall Building, No. 3000 North Zhongshan Road, Putuo District, Shanghai, China
Tel : 86 - 21 - 5237 - 9977 Fax : 89 - 21 - 5237 - 7189 e - mail : mkleea@lsis.com
- **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 : sunmj@lsis.com.cn
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Address : Room 1403, 14 / F, New Poly Tower, No.2 Zhongshan Liu Road, Guangzhou 510180, P.R. China
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- **LSIS Chengdu Office** > **Chengdu, China**
Address : Room 1701 17Floor, huamin hanjun international Building, No1 Fuxing Road Chengdu, 610016, P.R. China
Tel : 86 - 28 - 8670 - 3201 Fax : 86 - 28 - 8670 - 3203 e - mail : yangcf@lsis.com.cn
- **LSIS Qingdao Office** > **Qingdao, China**
Address : Room 2001, 20 / F, 7B40, Galaxy Building, No.29 Shandong Road, Shinan District, Qingdao 266071, P.R. China
Tel : 86 - 532 - 8501 - 6058 Fax : 86 - 532 - 8501 - 6057 e - mail : htroh@lsis.biz
- **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 - 8534 - 6666 Fax : 86 - 510 - 522 - 4078 e - mail : wangzy@lsis.com.cn
- **Dalian LSIS Co., Ltd.** > **Dalian, China**
Address : No.15, Liaoheji 3 - Road, Economic and Technical Development zone, Dalian 116600, China
Tel : 86 - 411 - 8273 - 7777 Fax : 86 - 411 - 8730 - 7560 e - mail : tangyh@lsis.com.cn

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