

Tri-MEC Ring Main Units

Medium Voltage Secondary Distribution
Ring Main Units Up to 24kV, SF₆-Insulated



Electric Equipment



Ring Main Units



Technology

Safety

Durability and usefulness

Saving Cost



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Secondary Distribution
Ring Main Units
Up to 24kV,
SF₆-Insulated**

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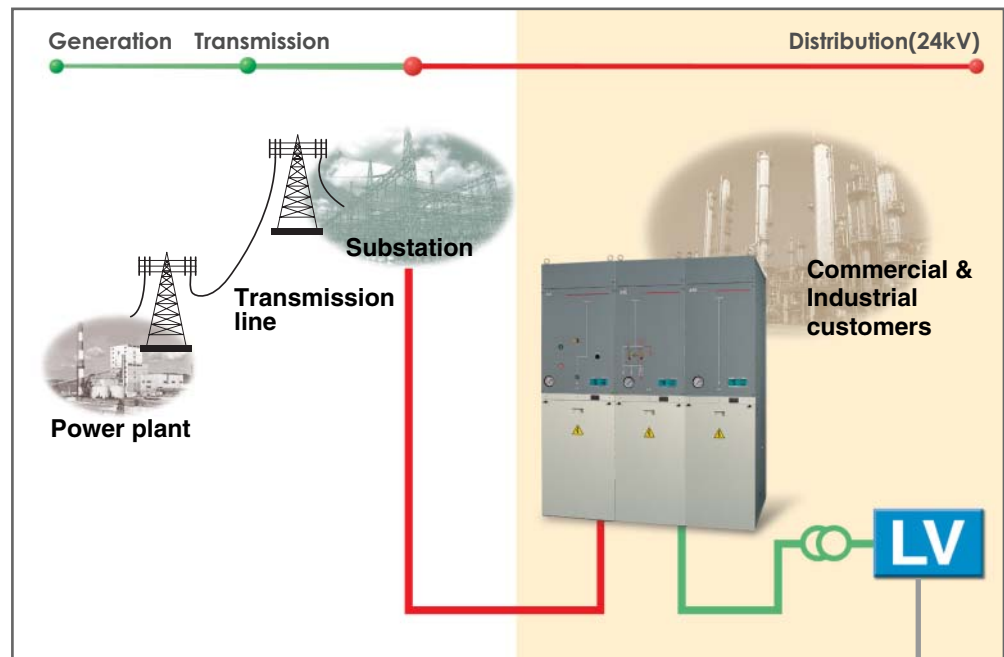


Ring Main Units

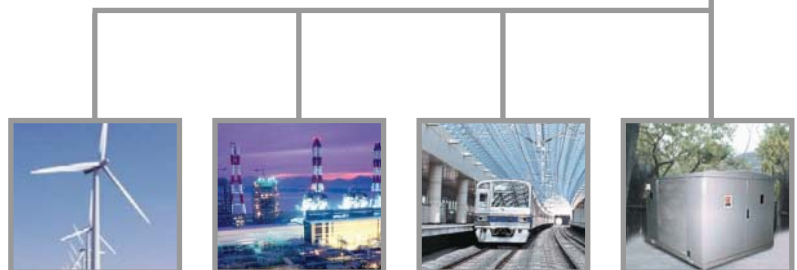
Applications Tri-MEC

Tri-MEC is designed for use in the following applications:

- Compact secondary substations
- Small industries
- Wind power plants
- Hotels, shopping centers, office buildings, business centers etc.
- Light mining applications, airports, hospitals, tunnels and underground railways



Note)  Application range.



Technology

- Metal enclosed unit for indoor installation and type tested.
- Insulated by SF₆ Gas
- Independent of climate.
- ON-OFF-EARTH, three position load break switch.

Safety

- Approachable and operable safely in the presence of power in the cables.
- Clear indication of operation status via mimic diagram on front panel.
- Fully automatic interlocking system.
- Voltage detector to check the presence of voltage in the cable.

Durability and usefulness

- Metal enclosed tank is hermetically sealed, it means this is independent of environmental effects such as dirt, small insects, and moisture and so on.
- Load break switch operating is possible in the front of Ring Main Units.
- All switching operations can be made safely to personnel because of interlocking system that operates automatically according to the switch position by the operator.
- Remote operation available in case of using motor mechanism.
- Fuse LBS will be tripped by a fuse striker pin connected to the mechanism in the event of fault happening.
- Individual panels and panel blocks can be freely combined and extended.

Saving cost

- Only a little maintenance is required except replacement of HRC Power fuse after installation.
- Compact design that requires minimum space to install and operate locally is main advantage especially where the space is limited.
- Materials can be recycled after the end of its service life.

Ring Main Units

Configurations

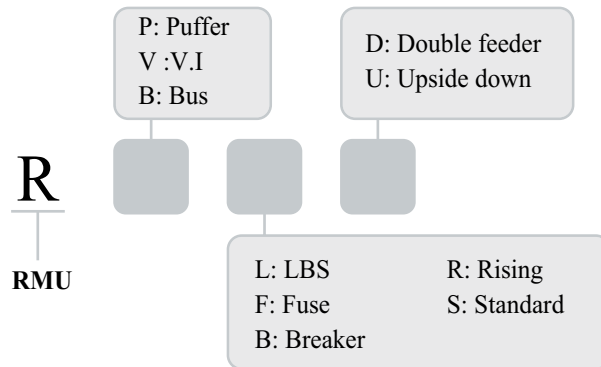
General

Tri-MEC RMU is an extensible and non-extensible ring main unit for the secondary distribution network. Tri-MEC RMU can be supplied in various different configurations suitable for most switching applications in 24 kV distribution networks.

When combined with the Tri-MEC RMU, they represent a complete solution for 24kV secondary distribution networks. Tri-MEC RMU is a completely sealed system with a stainless steel tank, gas tight metal enclosure, containing all the live parts, Switching-disconnector, earth switch, Fuse switch, the circuit breaker.

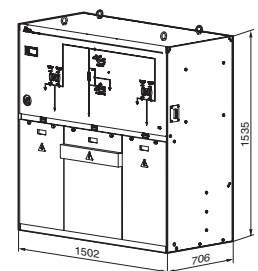
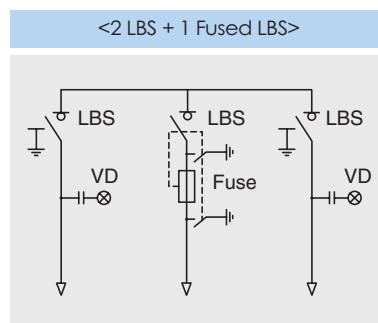
A sealed steel tank filled with SF₆ gas ensures a high level of reliability as well as safety and a maintenance-free system. The Tri-MEC RMU offers the user a choice of either a switch-disconnector combined with fuse or circuit breaker with relay for protection of the transformer. Tri-MEC RMU can be controlled completely with an feeder remote unit. Most of this switchgear exists in version that are extensible on the right or on both sides, in order to provide for future development.

Information of model name



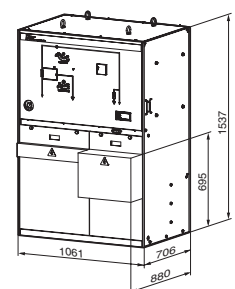
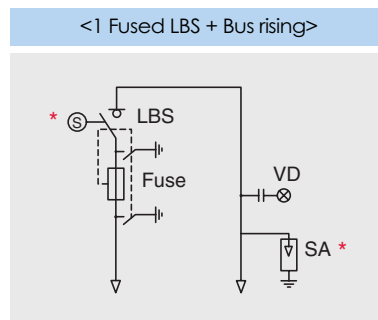
Non-Extensible type

RPS



Weight: 400kg

RPF(1R1F)



Weight: 275kg

Note) *: Option

Extensible type

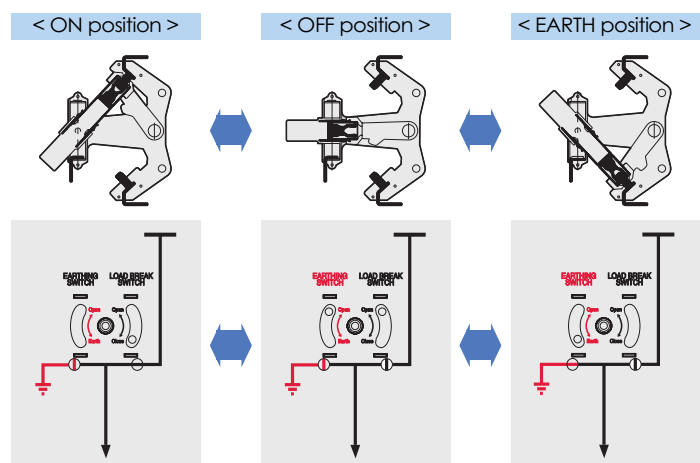
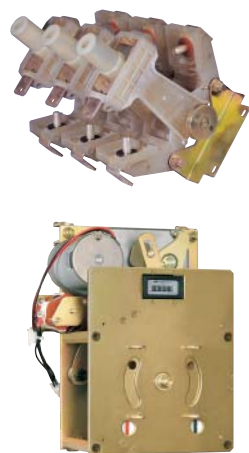
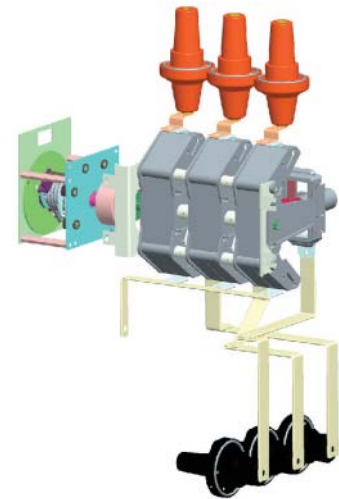
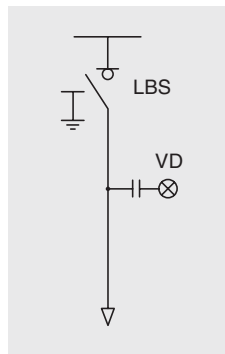
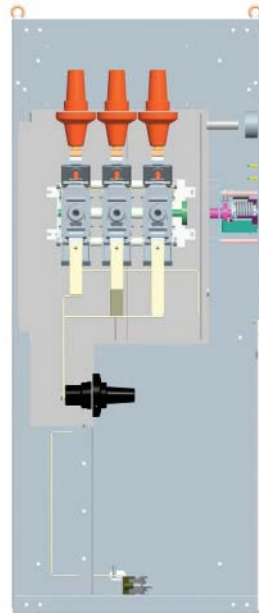
<p>RPL</p>		<p><LBS Panel></p>		<p>Weight: 210kg</p>
<p>RPF</p>		<p><Fused switch Panel></p>		<p>Weight: 275kg</p>
<p>RVB</p>		<p><Circuit Breaker Panel></p>		<p>Weight: 260kg</p>
<p>RBR</p>		<p><Bus Rising Panel></p>		<p>Weight: 160kg</p>

Note) *: Option

Ring Main Units

Modules

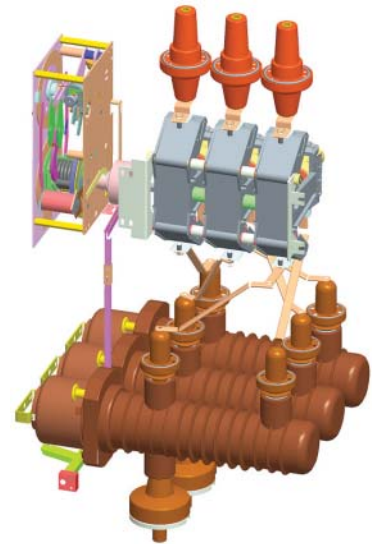
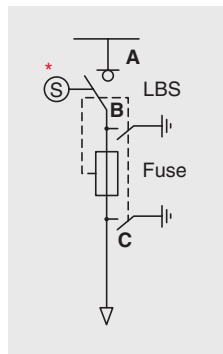
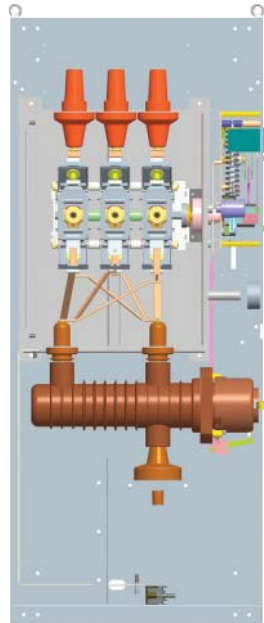
Ring switch module (RPL)



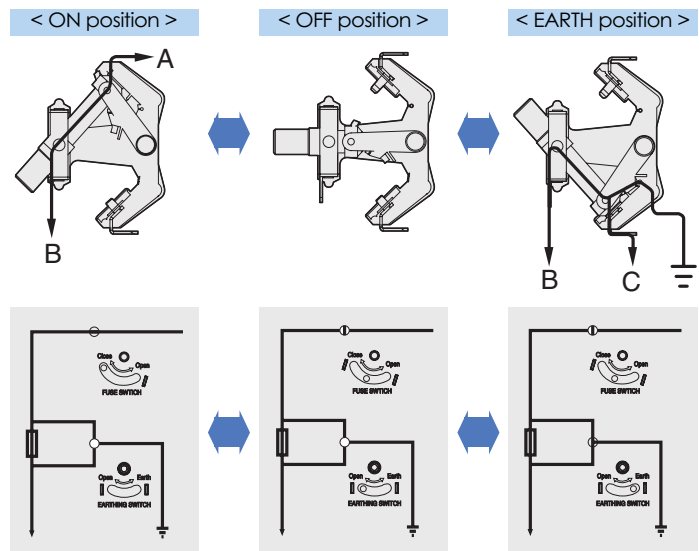
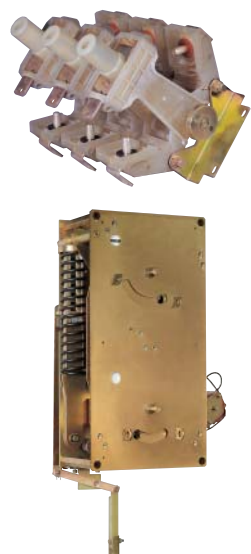
Feature

- Three position load break switch and earthing switch.
- Indicator of switch position for load break switch and earthing switch.
- Voltage indicator lamp on panel makes it possible to check the presence of voltage in the cables.
- Pressure gage indicates status of SF₆ gas tank and make it check leakage of gas.
- Intelligent interlock system
 - : To switch to Earth position, it should pass "OFF" position from "ON" position
- Applied high-speed rotary puffer type for extinction of arc.
- Dead front structure: It prevents an accident of touching because the live part is not exposed.
- Electrical (Remote/Local)operation :
 - operated by controller which can communicate with FRU (Feeder Remote Unit)
- Busbars, 630A

Fuse-switch module (RPF)



Note) *: Option



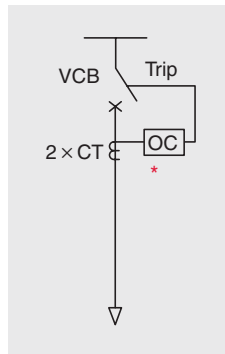
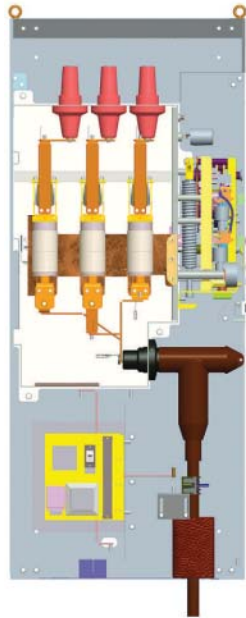
Feature

- Fuse rating: 24kV, Max 63A HRC power fuse
- Indicator of switch position for load break switch and earthing switch
- The Fuses conforming to DIN 43625 are used.
- Automatically tripped to protect from fault current when a fuse is blown
- Applied high-speed rotary puffer type for extinction of arc.
- Dead front structure: It prevents an accident of touching because the live part is not exposed.
- Busbars 200A
- Option: CTD (Condensor Trip Device)

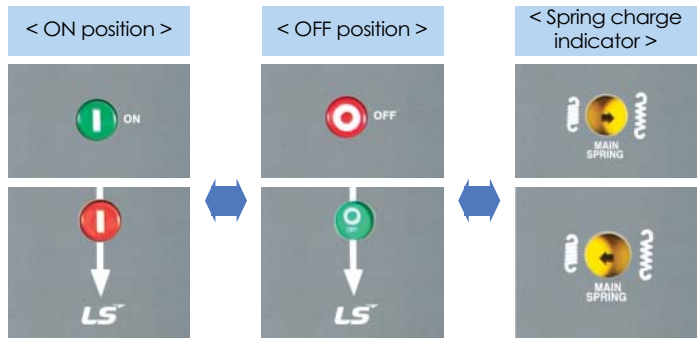
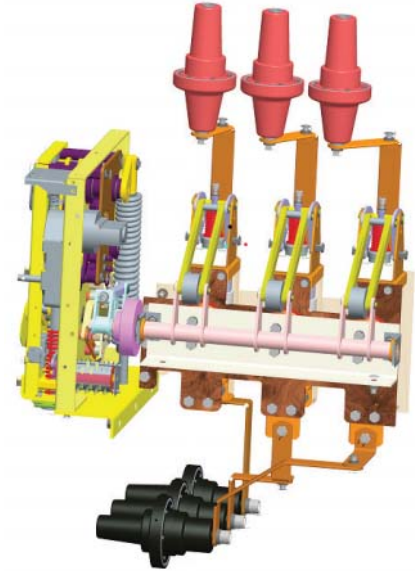
Ring Main Units

Modules

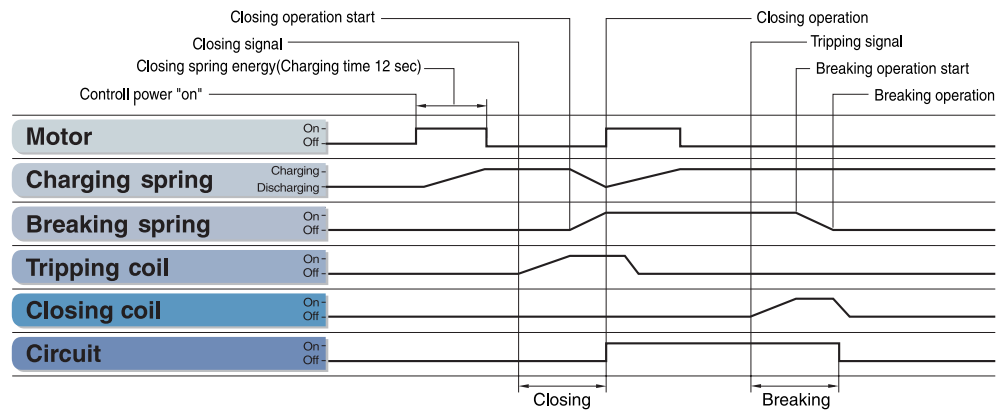
Circuit breaker module (RVB)



Note) *: Option



Mechanism operation time



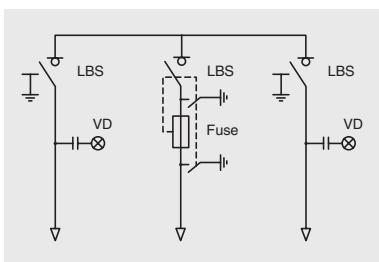
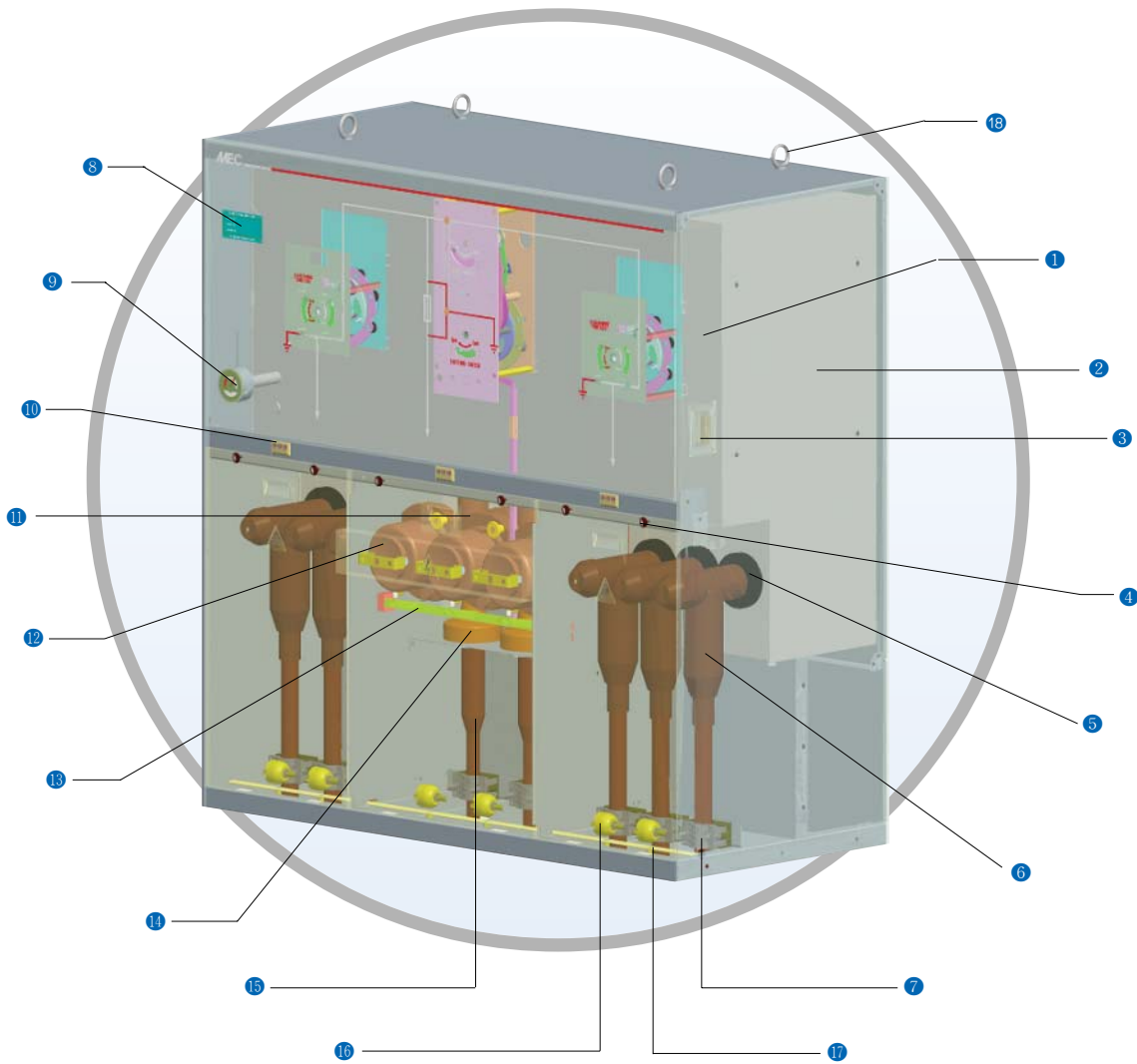
Feature

- 200A vacuum circuit breaker
- Rated breaking time: 3cycle
- Latched mechanism - close and open coil
- Protection as specified by customers
- Motor charge type and Manual charge type
- Option:CTD(Capacitor Trip Device), OCR

Outer assembly(Non-Extensible)



RPS (2LBS + 1Fuse-switch)

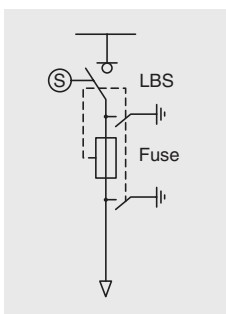
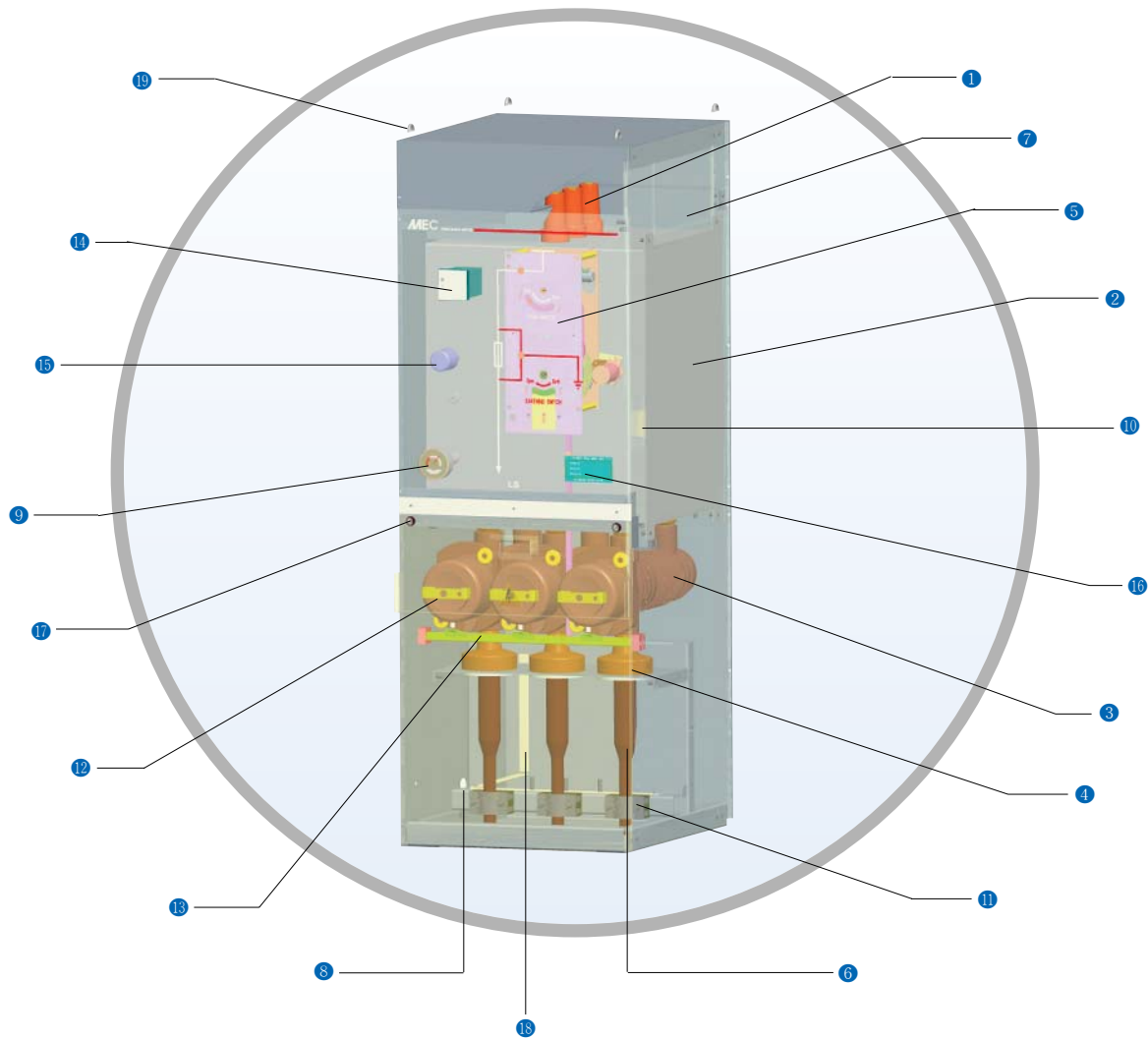


- 1 LBS operation part
- 2 Chamber
- 3 Control connector
- 4 Fixing bolt for cover
- 5 630A bushing
- 6 Elbow connector
- 7 Cable clamp
- 8 Nameplate
- 9 Gas pressure gauge
- 10 Voltage detector
- 11 Fuse holder Body
- 12 Fuse holder cap
- 13 Fuse strike link
- 14 200A bushing
- 15 Straight connector
- 16 Earth lug
- 17 Earth busbar
- 18 Lift lug

Ring Main Units

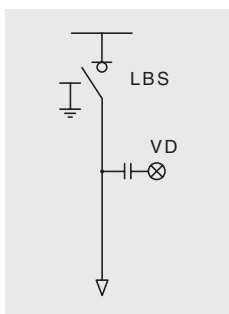
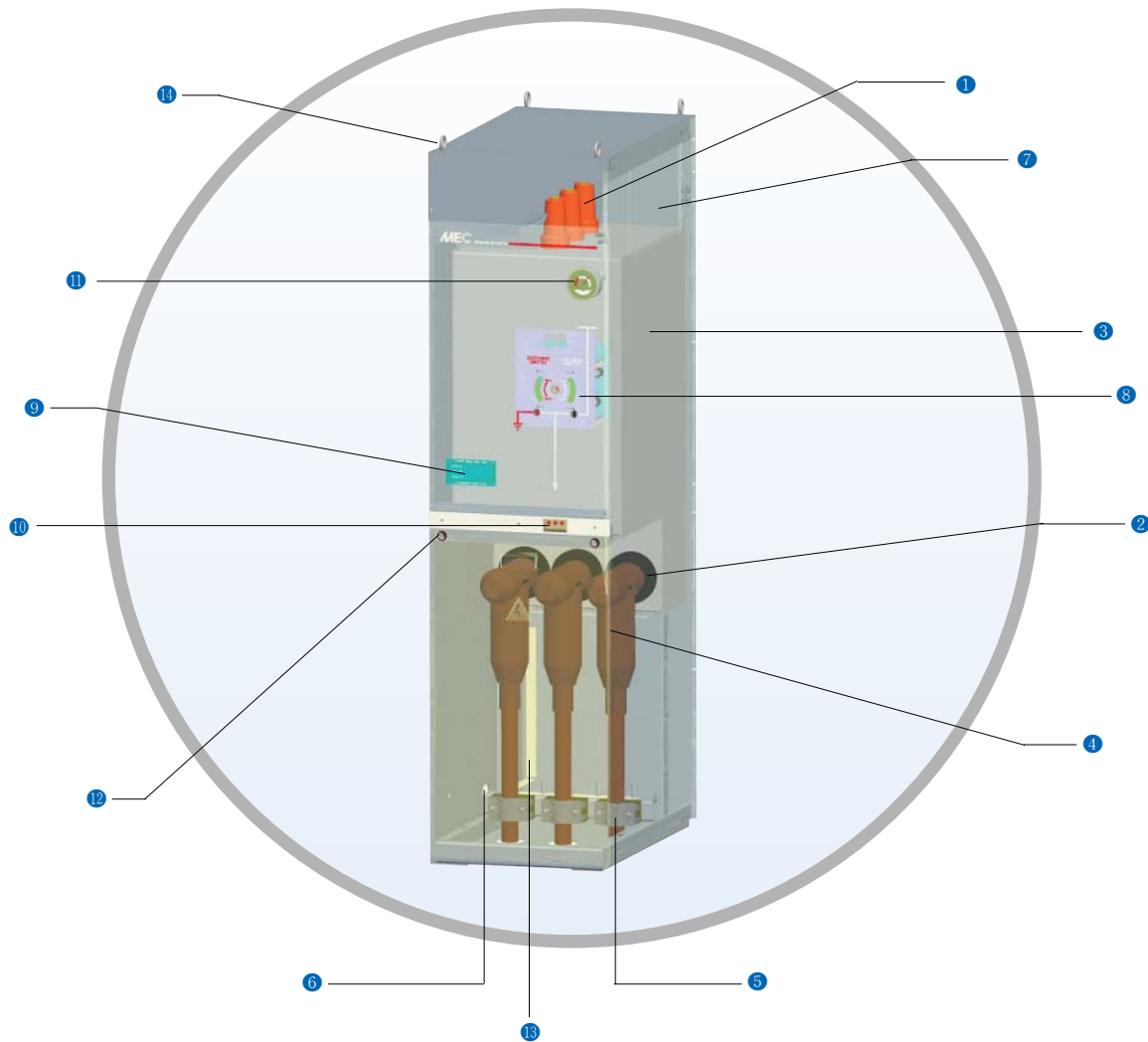
Outer assembly(Extensible)

RPF (Fuse-switch)



- | | | |
|------------------------------|-------------------------|---------------------------|
| ① 630A bushing for connector | ⑧ Earth connection hole | ⑮ Pressure switch(option) |
| ② Chamber | ⑨ Gas pressure gauge | ⑯ Nameplate |
| ③ Fuse holder body | ⑩ Control connector | ⑰ Fixing bolt for cover |
| ④ 200A bushing | ⑪ Cable clamp | ⑱ Earthing busbar |
| ⑤ Operating mechanism | ⑫ Fuse holder cap | ⑲ Lift lug |
| ⑥ Straight connector(Option) | ⑬ Fuse strike link | |
| ⑦ Upper side cover | ⑭ CTD(option) | |

RPL (Ring switch)

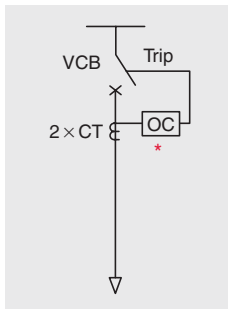
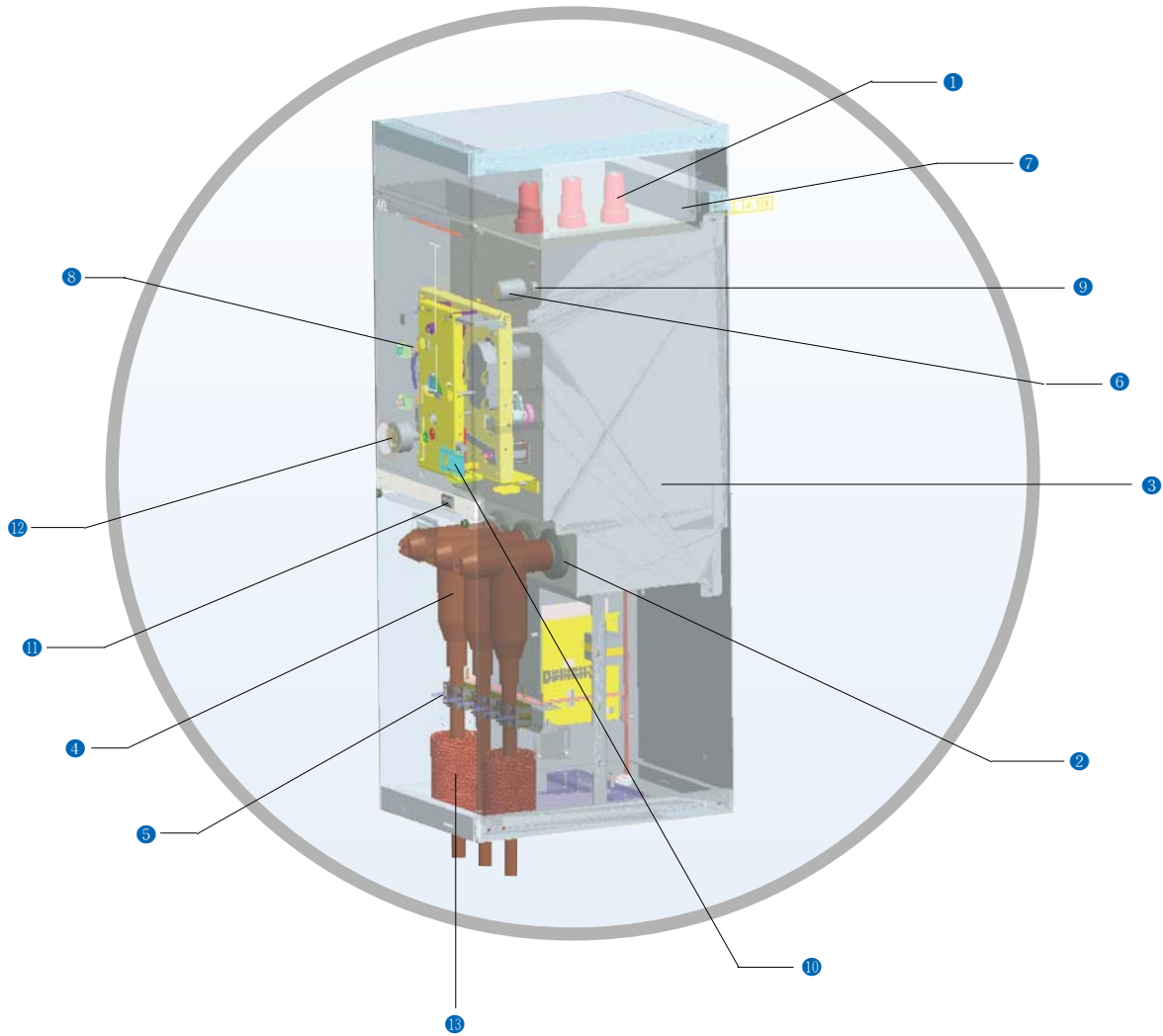


- | | | |
|------------------------------|-------------------------|-------------------------|
| ① 630A bushing for connector | ⑥ Earth connection Hole | ⑪ Gas pressure gauge |
| ② 600A bushing | ⑦ Upper side cover | ⑫ Fixing bolt for cover |
| ③ Chamber | ⑧ Operation mechanism | ⑬ Earthing busbar |
| ④ Elbow connection (option) | ⑨ Nameplate | ⑭ Lift lug |
| ⑤ Cable clamp | ⑩ Voltage detector | |

Ring Main Units

Outer assembly(Extensible)

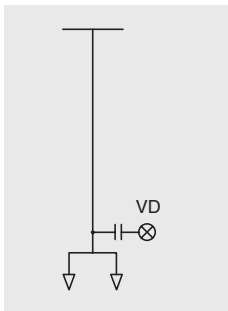
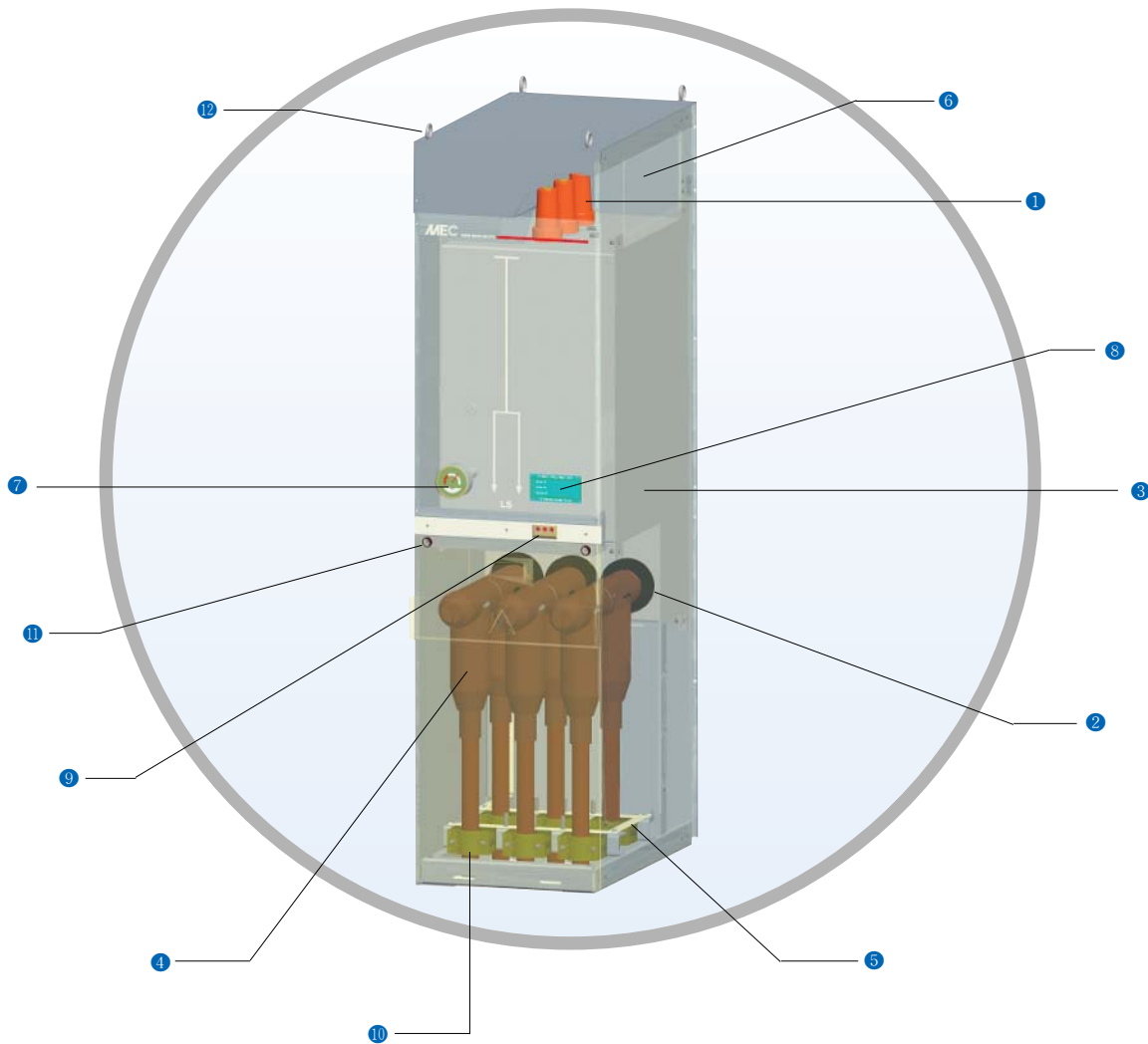
RVB (Circuit breaker)



Note) *: Option

- | | | |
|------------------------------|--------------------------------|----------------------|
| ① 630A bushing for connector | ⑥ Gas pressure switch (Option) | ⑪ Voltage detector |
| ② 630A bushing | ⑦ Upper side cover | ⑫ Gas pressure gauge |
| ③ Chamber | ⑧ Operation mechanism | ⑬ CT |
| ④ Elbow connection (Option) | ⑨ Gas filling valve | |
| ⑤ Cable clamp | ⑩ Nameplate | |

RBR (Bus rising)



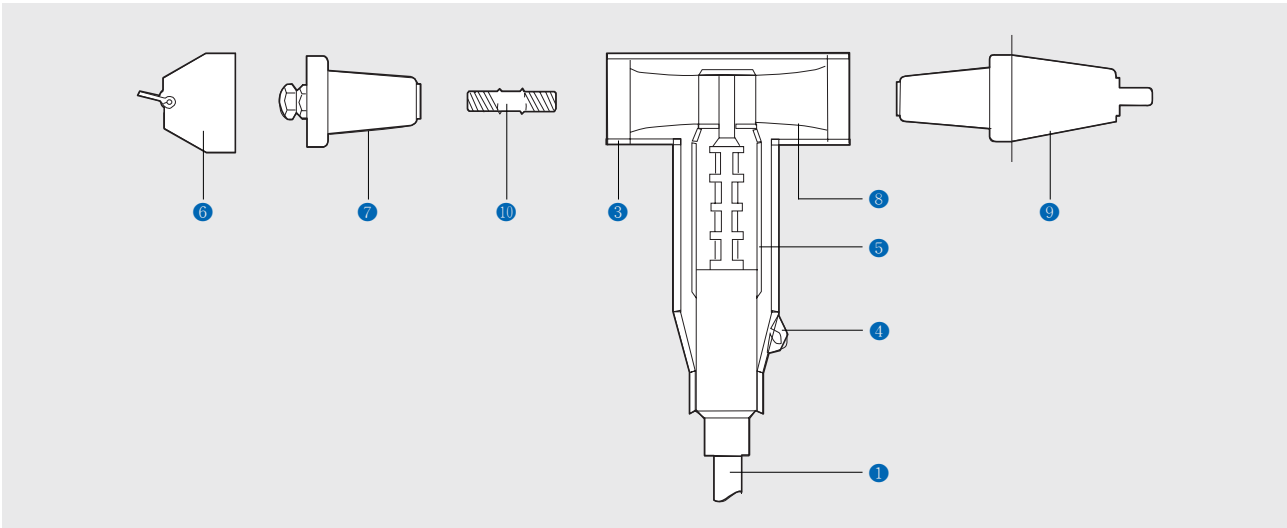
- | | | |
|------------------------------|----------------------|-------------------------|
| ① 630A bushing for connector | ⑤ Earthing busbar | ⑨ Voltage detector |
| ② 630A bushing | ⑥ Upper side cover | ⑩ Cable clamp |
| ③ Chamber | ⑦ Gas pressure gauge | ⑪ Fixing bolt for cover |
| ④ Elbow connection (Option) | ⑧ Nameplate | ⑫ Lift lug |

Ring Main Units

Cable termination

Ring switch / Circuit breaker (ANSI/IEEE Std. 386)

These connectors are designed for easy installation on extruded shield cable or metallic tape shielded cab. The connector range is from 1/0 to 1000 kcmil for aluminum and copper conductors with insulation diam from 0.640" to 1.935".



1 Stress relief adapter

Molded rubber adapter is sized to the cable insulation and provides stress relief for the terminated shield. The radial pressure exerted on the cable shield by the stress surface. Suitable for installation on both extruded-surface. Suitable for installation on both extruded-shield cable and tape-type shield cable.

2 Spade terminal

Semi-permanent, crimped-bolted connector sized for the specific conductor. Crimped on with standard tools and dies, Also used in the 650Y splice.

3 Molded conductive shield

Outer jacket of 1/8 thick molded conduction peroxide-cured EPDM provides a virtually destructible ground shield for true dead-front construction. A patented ELASTIMOLD feature.

4 Grounding eye

Hole provides a convenient point to connect a ground wire to the molded conduction shield, placing the molded shield at ground potential.

5 Wrap-around conductive inserts

Inner shield of molded conductive peroxide-cured EPDM precludes subjecting entrapped air to electrical stress. A patented ELASTIMOLD feature.

6 Voltage test point cap

Molded conduction rubber cap fits over the test point and onto the connector housing.

7 Voltage test point

The 1 hex nut located on the top of the insulation plug allows the circuit to be tested without disturbing the connection. The nut is fully insulated from the conductor and pick up capacitance voltage. A torque wrench with a 1 hex socket attachment is required during installation.

8 Interference fit

Molded insulating peroxide-cured EPDM exerts uniform con-centric-pressure on insulation of mating parts to provide required creep-path length and watermeal.

9 Apparatus bushing

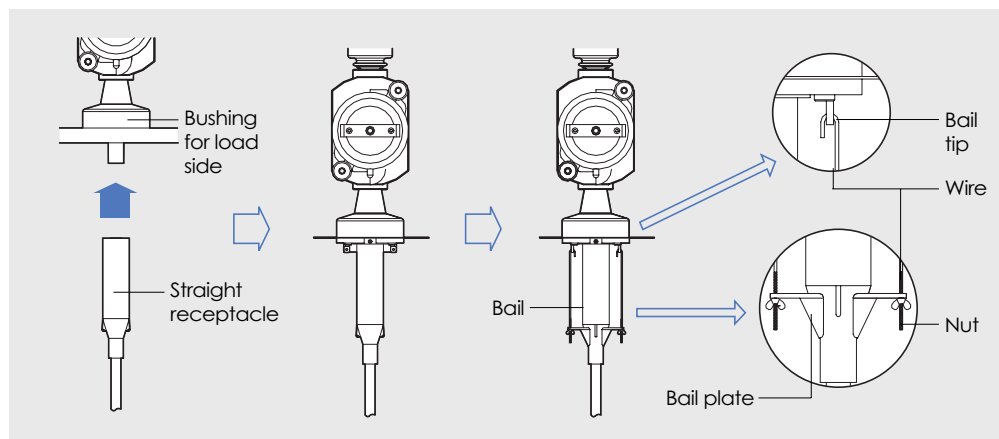
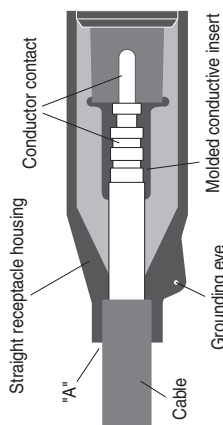
Epoxy product normally supplied on manufacturers equipment. Can be welded or clamped to the apparatus.

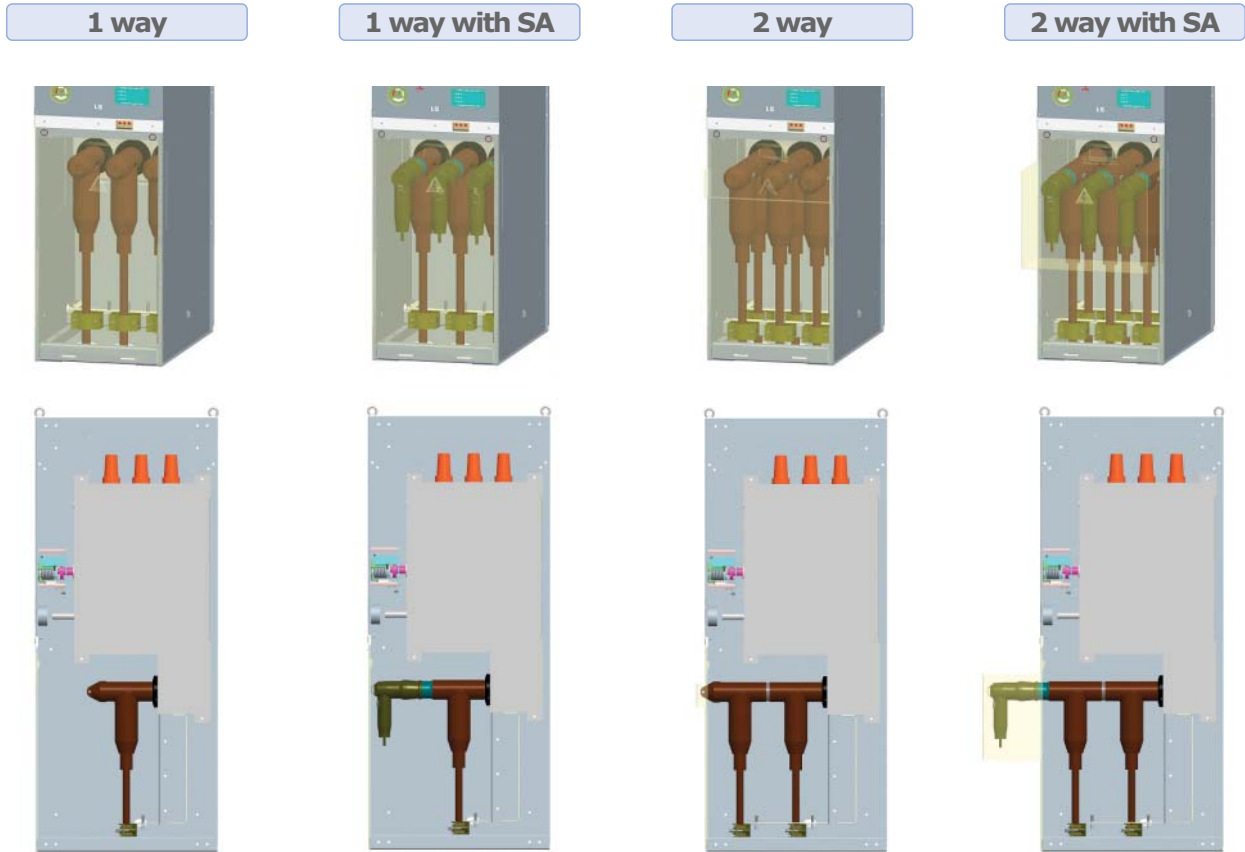
10 Threaded stud

A removable threaded stud is included with every 655LR and K655LR.

Fuse-switch

The straight receptacles are fully-shield, fully-submersible and separable insulated connectors. These will accommodate conductor sizes of No. 4 solid through 4/0 stranded and cable insulation diameters from 0.495" through 0.985".





24kV cable termination selection table

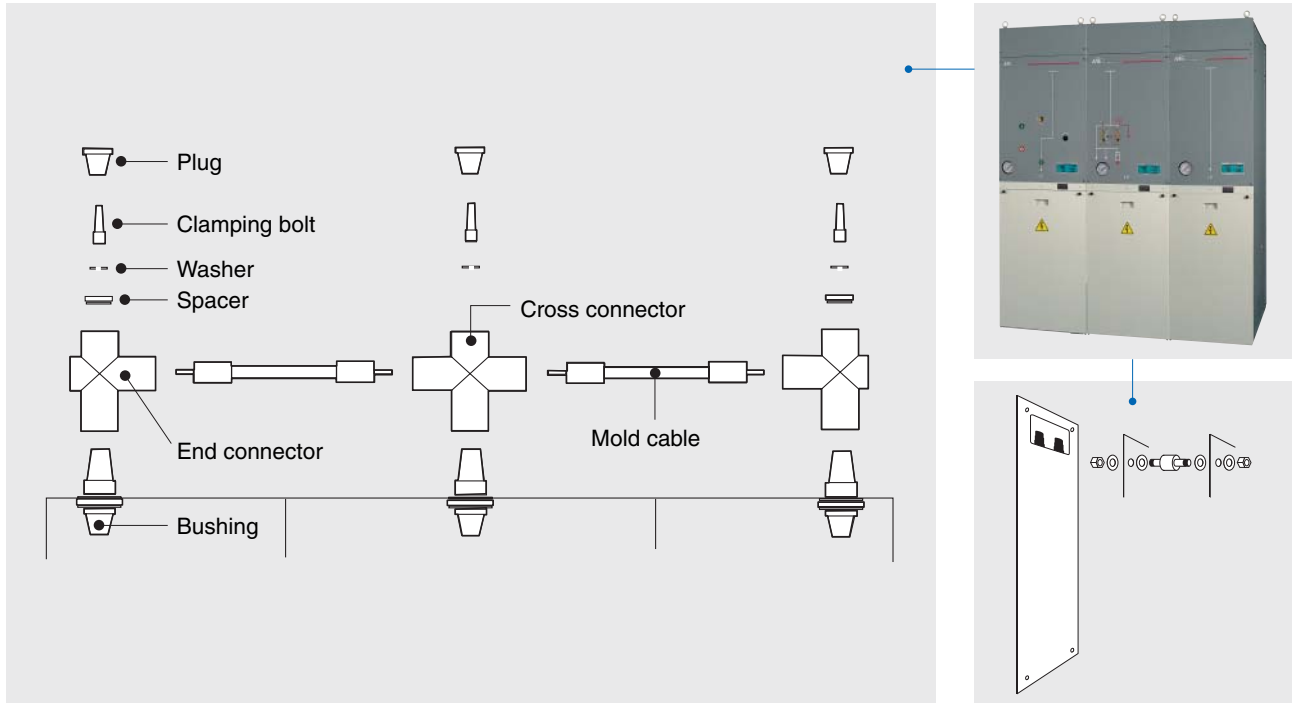
Company	Voltage class	Current	Description	Model number
Elastmold (PYUNGIL Co., Ltd)	24kV	600A	Power distribution connectors	K655BLR
				K655BIP
		200A	Straight receptacles	K650CP
				K650ETP
EUROMOLD	24kV	600A	Tee connector	K400TE
3M	24kV	600A	Modular splicing kit	5815-S
				5815-T
				5815-D
				5815-E
				5815-B
Cooper power system	24kV	600A	Bol-T connector	DT625, 635
				DIP625AS, 635AS
				CC6A-U
				CA625, 635

*SA: Surge Arrestor

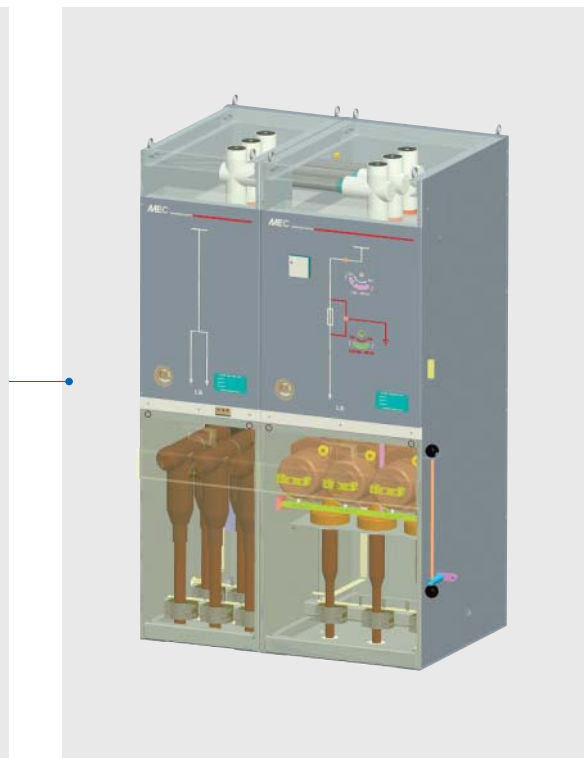
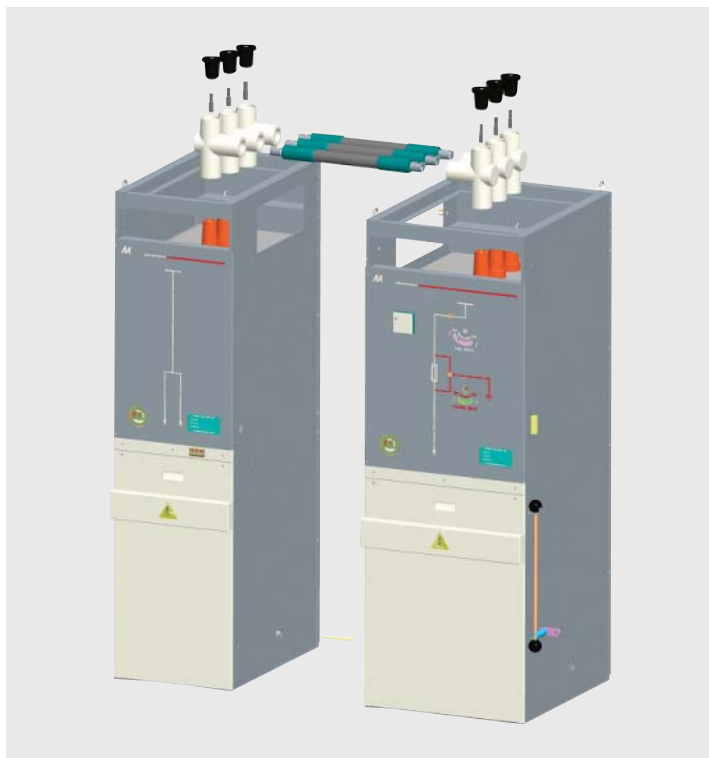
Ring Main Units

Pannel connection

Electrical connection with special connectors



Mechanical Joint Panel to Panel



Fuse

Features

1. The LS HRC Power Fuses belong to the PRIME MEC series.
It interrupts high currents before the peak value and therefore cuts down the required withstand capacity of the associated equipment on the electric system.
2. Though small in size, it has a high breaking capacity and its enclosed type is suitable for use inside of the panel board.
3. PRIME-MEC fuses are equipped with striker pins for trip indicators as well as for inflicting impulse to trip link of related load break switches.

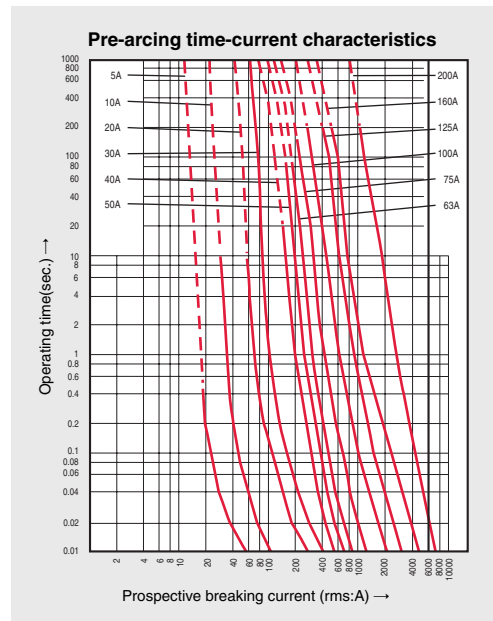
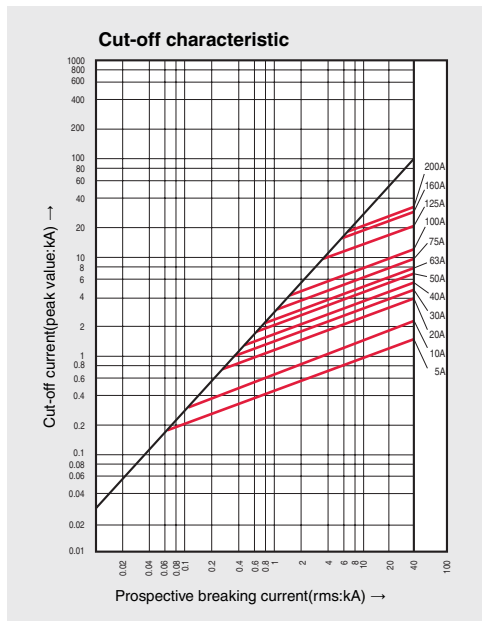


Selection of fuses: According to IEC 60787(24kV)

Power Fuse rated current(A)	Transformer rating capacity (kVA)
5	36-75
10	75-157
20	172-358
30	258-538
40	464-965
50	598-1246
63	745-1554

Note) Please ask fuse maker for optimum selection of fuses.

Power fuse characteristic curve



Vacuum Interrupter

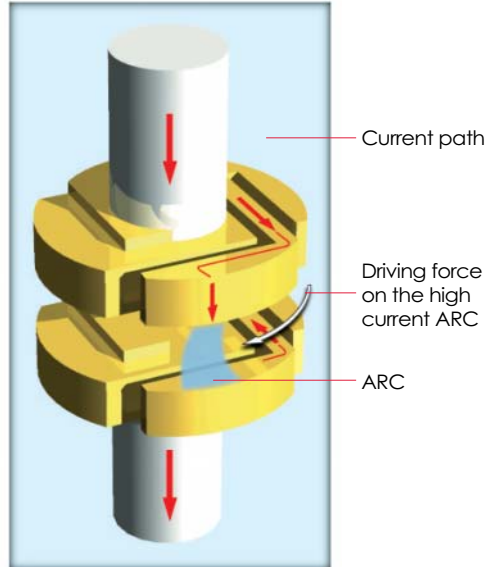


Figure 1. Current flow and driving force on arc for spiral contact

In the closed position, normal current flows through the interrupter. When a fault occurs and interruption is required, the contacts are quickly separated.

The arc drawn between the surfaces of contacts is rapidly moved around the slotted contact surface by self induced magnetic effects, preventing gross contact erosion and the formation of hot spot on the surface.

The arc burns in an ionized metal vapor, which condenses on the surrounding metal shield. At current zero the arc extinguishes and vapor production ceases.

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.

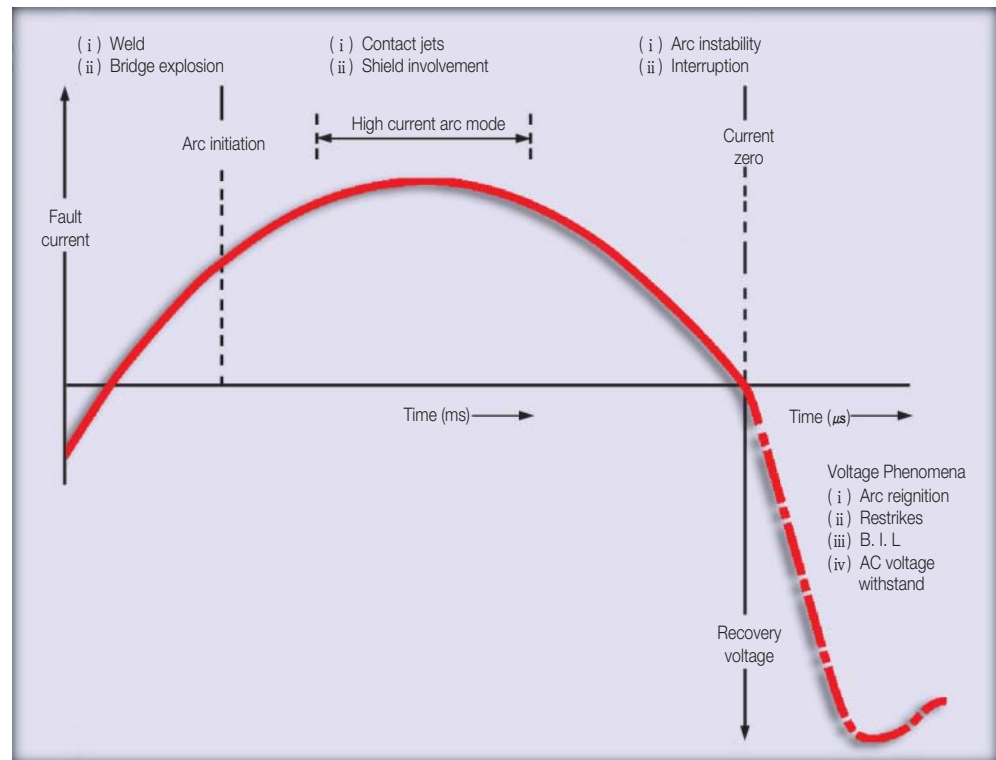


Figure 2. AC arcing and interruption phenomena in vacuum.

Relay

GIPAM



- LS Integrated Protection and Metering Device
- Integrating the other panel meter, protection relay, control switch on GIPAM
- Option
 - Transducer function
 - Sequence of event
- Special Features
 - Simplification of the equipments
 - Various display function
 - Various protection function & easy event analysis
 - Data communication function
 - High reliability with self-diagnosis function

DPR



- LS high performance Digital Protection Relay
- Various unit types
OCR, OCR/OCGR, OVR(UVR), OVR/UVR, OVGR, SGR
- Effective mutual back-up protecting. Setting range of time and current is wide and subdivided.
- Fault Recording function and SOE(Sequence of Event) function provides quickly accurate information to user that is used in analyzing causes of fault.
- High speed data communication by I-NET communication method, completely interface with SCADA

Protection/monitoring	Code	Devices						
		GIPAM	DPR-011S	DPR-111S	DPR-211S	DPR-311S	DPR-411S	DPR-511S
Three-phase overcurrent	50-51	○	○	○				
Zero-sequence overcurrent	50N-51N	○		○				
Selective zero-sequence overcurrent	67G	○			○			
Overvoltage	59	○				○	○	
Undervoltage	27	○				○	○	
Zero-sequence overvoltage	59N	○						○
Measuring		○						

Ring Main Units

Accessories

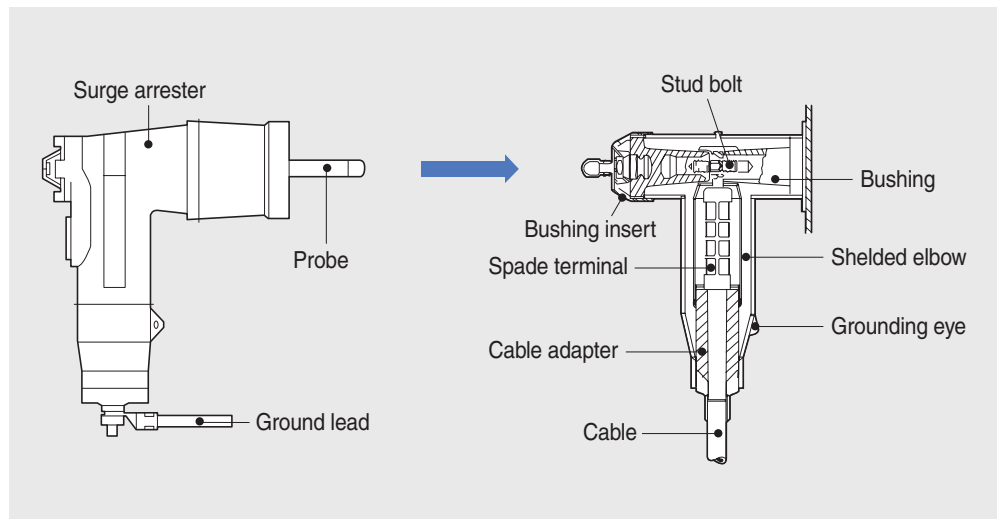
Current transformer



Max. system voltage	kV	0.6
Primary current	A	100
Secondary current	A	5
Rated burden	VA	10
Accuracy class		10P10
Short time current	kA/1s	16
Rated frequency	Hz	60
Polarity		Subtractive

Surge arrester

The 273ESA Elbow Arrester is combined with a loadbreak elbow connector interface.



Protective characteristics

	MCOV ^{Note1)} (kVrms)	Duty cycle rating (kVrms)	Maximum discharge voltage (kV crest) 8 × 20 microsecond current wave					F.O.W. protective level (kV crest) ^{Note2)}
			1.5kV	3kV	5kV	10kV	20kV	
			25kV class	8.4	10	30.5	32.5	
	10.2	12	40.0	42.5	45.0	50.0	56.5	50.0
	12.7	15	48.0	51.0	54.0	60.0	68.0	60.0
	15.3	18	56.5	60.0	64.0	71.0	80.5	71.0
	17.0	21	65.5	69.5	74.0	82.5	93.0	82.5

Note) 1. MCOV- Maximum Continuous Operation Voltage.

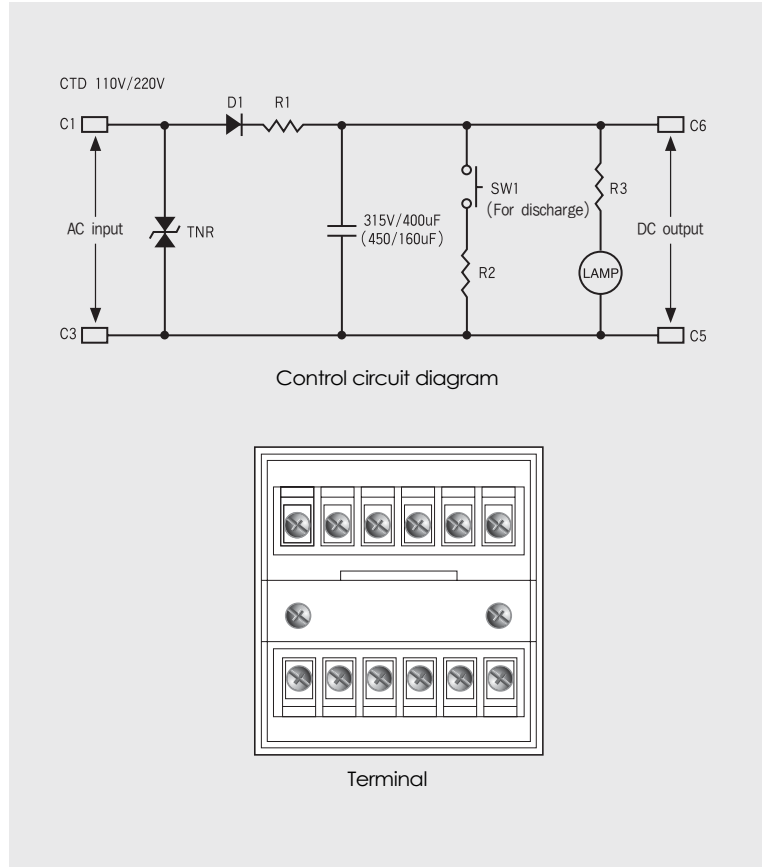
2. The front of wave (FOW) protective level is the maximum discharge for a 5kA impulse current wave producing a voltage wave cresting in 0.5 microseconds.

CTD (Condenser 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



Closing coil (C)

The coil operated only when the power is applied continuously over 45ms. It has built-in electrically anti-pumping circuit.

Rated voltage	Rated current (A)
DC 24V	10
DC 110V	2.5

Note 1) Range of the normal operating voltage: 85~110%
2) DC 24V is the underdeveloped rating.

Shunt coil (TC)

When the VCB is 'ON' position, even though the control power of a shunt coil is 'OFF', the VCB maintains the 'ON' position.

Rated voltage	Rated current (A)
DC 24V	10
DC 110V	2.5

Note 1) Range of the normal operating voltage: 70~110%
2) DC 24V is the underdeveloped rating.

GAS pressure gauge



Control connector

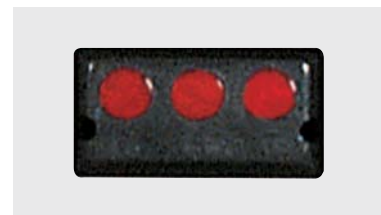
Screw type



Plug in type

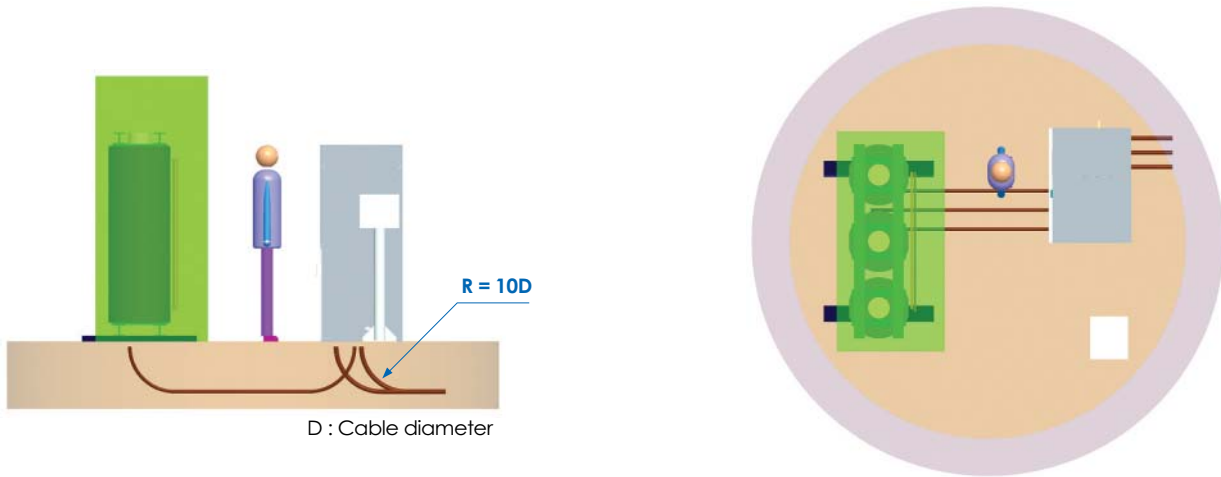


Voltage detector

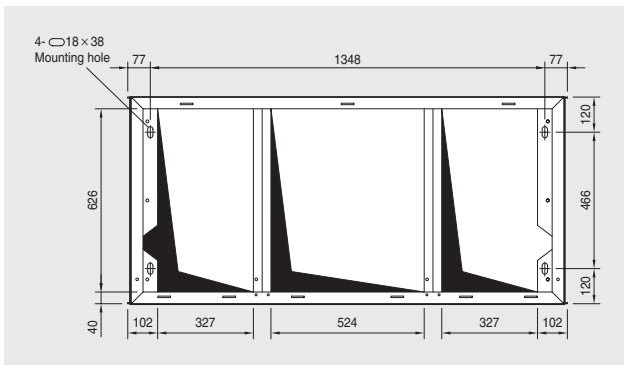


Ring Main Units

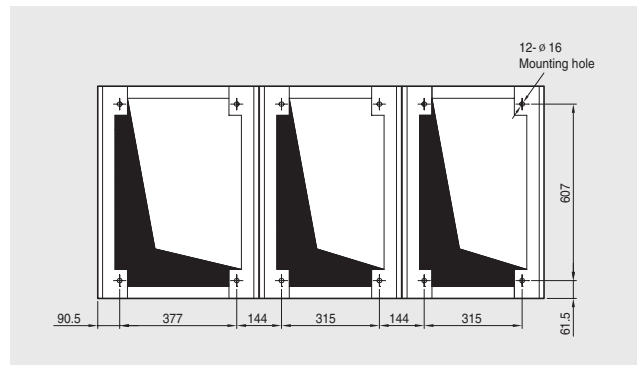
Installation



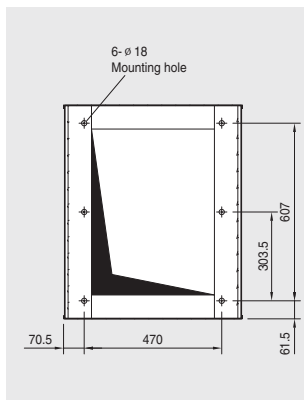
RPS



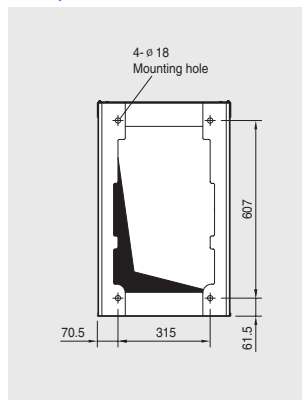
RVB + RPL + RBR



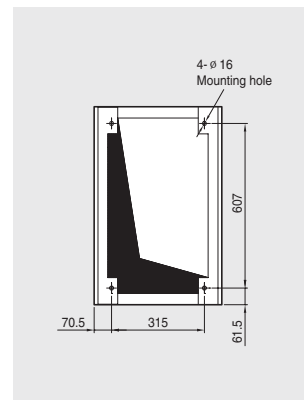
RPF



RPL, RBR



RVB



Installation type		Indoor type
Rated voltage up to	kV	24
Rated current	A	630 A
Rated current (RVB,RPF)	A	200
Rated power frequency	Hz	50 / 60
Rated short current	kA/1s	16
Rated making current	kA	41.6
Power frequency withstand voltage	kV	50
Rated impulse withstand voltage	kV	125
Operation type		electromotion / manual
Operating voltage	V	DC 110
Operating voltage (CTD Input)	V	AC 110
Insulation material		SF ₆ Gas
Rated filling pressure (20 °C)	Mpa.	0.034 (5 psi.G)
Minimum operating pressure (20 °C)	Mpa.	0.014 (2 psi.G)
Transfer current (RPF)	A	800
Electrical life		E3
Electrical life (RVB)		E1 , C1
Mechanical life		M1
Standard		IEC 60265-1, IEC 60420
Standard (RVB)		IEC 62271-100

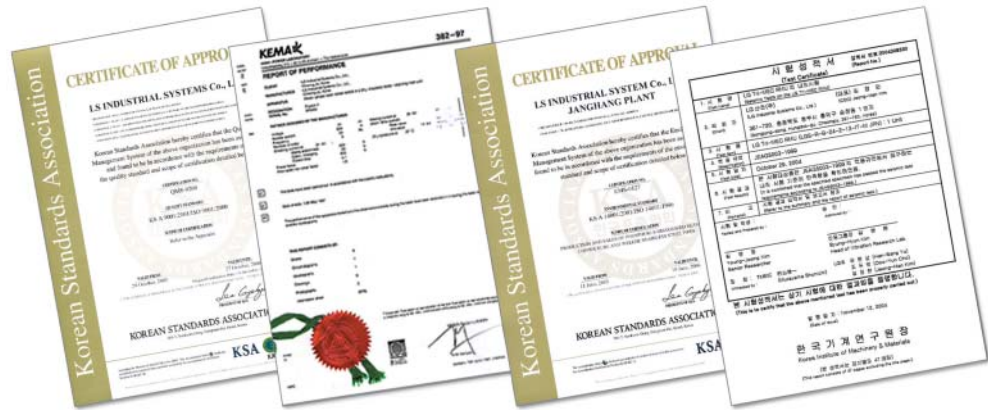


Ring Main Units

Quality assurance

Certified quality: KEMA, ISO 9001, ISO 14001

LS Industrial systems has integrated a functional organization into each of its units, the main purpose of which is to check quality and ensure the adherence to standards.



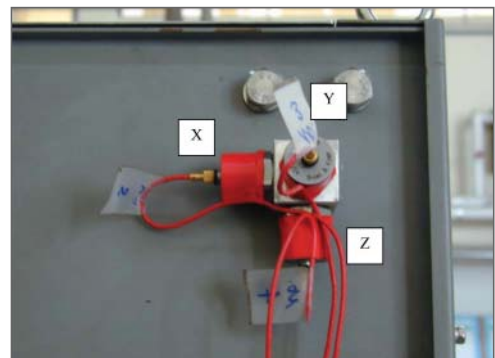
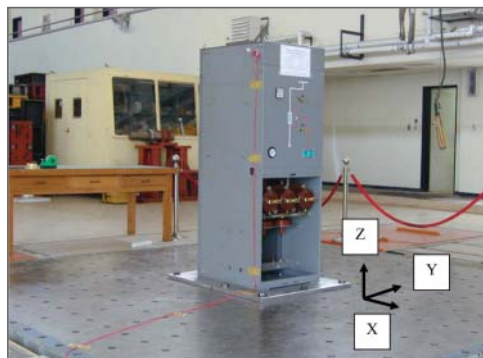
Routine quality check

While producing Tri-MEC RMU, various routine tests are taken for product capacity, which testing items are as shown follows.

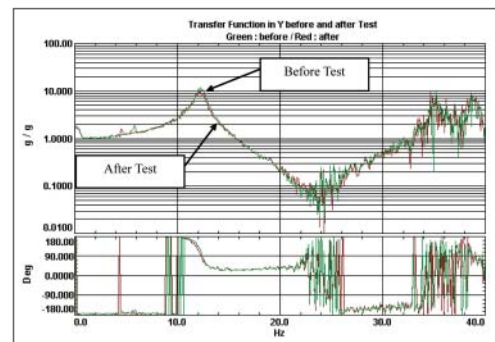
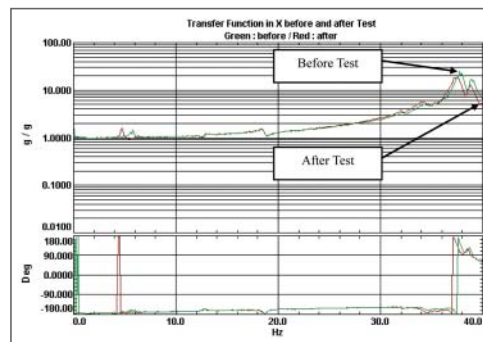
- Filling pressure check
- Tightness check
- Opening and closing speed measurement
- Dielectric check
- Contact resistance check

Seismic tests

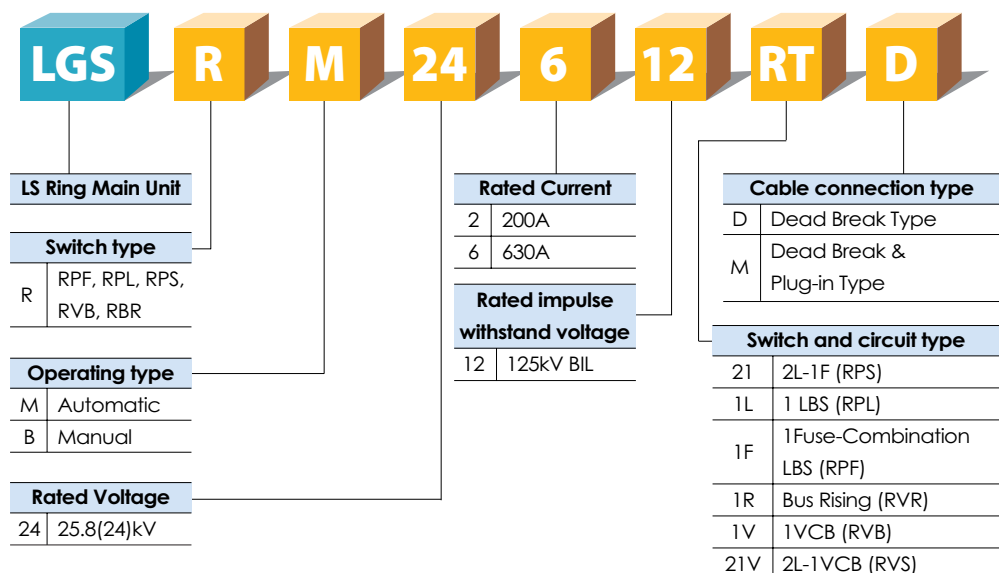
Application standard: JEAG5003-1999



Test category	Normals excitation level(g) X/Y/Z	Direction	Freq.(Hz)	Waveforms	Duration(S)	Operability	Structural integrity
Resonance search test	0.1/0.1/0.1	X	0.5-30	Random	328	N/A	N/A
		Y					
		Z					
Real earthquake test	0.3/0.3/0.15	XYZ		Kobe Earth-quake	82	OK	OK
Sine 30 waves test	0.3/0/0	X	5	Sine Wave	30 Waves	OK	OK
	0.3/0/0.15	XZ				OK	OK
	0/0.3/0	Y				OK	OK
	0/0.3/0.15	YZ	10			OK	OK
	0.3/0/0	X				OK	OK
	0.3/0/0.15	XZ				OK	OK
	0/0.3/0	Y	37.8			OK	OK
	0/0.3/0.15	YZ				OK	OK
	0.3/0/0	X				OK	OK
	0.3/0/0.15	XZ	12.2			OK	OK
	0/0.3/0	Y				OK	OK
	0/0.3/0.15	YZ				OK	OK
Resonance search test	0.1/0.1/0.1	X	0.5-30	Random	328	N/A	N/A
		Y					
		Z					



Ordering Information



Leader in Electrics & Automation



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.

LS Industrial Systems Co., Ltd.

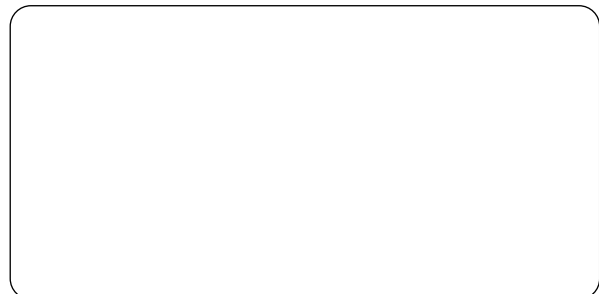
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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.

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