Tri-MEC

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

Technology

Safety

Durability and usefulness

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

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.
**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**

<table>
<thead>
<tr>
<th>P</th>
<th>V : V.I</th>
<th>B: Bus</th>
<th>D: Double feeder</th>
<th>U: Upside down</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Non-Extensible type**

**RPS**

- **<2 LBS + 1 Fused LBS>**

**RPF(1R1F)**

- **<1 Fused LBS + Bus rising>**

**Note** *: Option

**Weight**

- 400kg
- 275kg
Extensible type

- **RPL**
  - <LBS Panel>
  - Weight: 210kg

- **RPF**
  - <Fused switch Panel>
  - Weight: 275kg

- **RVB**
  - <Circuit Breaker Panel>
  - Weight: 260kg

- **RBR**
  - <Bus Rising Panel>
  - Weight: 160kg

*Note: *: Option
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)

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)
Circuit breaker module (RVB)

**Mechanism operation time**

- Closing operation start
- Closing signal
- Closing spring energy (Charging time 12 sec)
- Control power “on”
- Motor
- Charging spring
- Charging
- Breaking spring
- Breaking
- Tripping coil
- Breaking signal
- Breaking operation start
- Breaking operation
- Closing coil
- Circuit

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

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

- 630A bushing for connector
- 630A bushing
- Chamber
- Elbow connection (Option)
- Cable clamp
- Gas pressure switch (Option)
- Upper side cover
- Operation mechanism
- Gas filling valve
- Nameplate
- Voltage detector
- Gas pressure gauge
- CT

Note): Option
RBR (Bus rising)

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

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

<table>
<thead>
<tr>
<th>Company</th>
<th>Voltage class</th>
<th>Current</th>
<th>Description</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastmold (PYUNGIL Co., Ltd)</td>
<td>24kV</td>
<td>600A</td>
<td>Power distribution connectors</td>
<td>K655BLR,K655BIP,K650CP,K650ETP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200A</td>
<td>Straight receptacles</td>
<td>K151SR</td>
</tr>
<tr>
<td>EUROMOLD</td>
<td>24kV</td>
<td>600A</td>
<td>Tee connector</td>
<td>K400TE</td>
</tr>
<tr>
<td>3M</td>
<td>24kV</td>
<td>600A</td>
<td>Modular splicing kit</td>
<td>S815-S,S815-T,S815-D,S815-E,S815-B</td>
</tr>
<tr>
<td>Cooper power system</td>
<td>24kV</td>
<td>600A</td>
<td>Bolt connector</td>
<td>DT625, 635,DIP625AS, 635AS,CC6A-U,CA625, 635</td>
</tr>
</tbody>
</table>

*SA: Surge Arrestor
Ring Main Units

Panel 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)

<table>
<thead>
<tr>
<th>Power Fuse rated current (A)</th>
<th>Transformer rating capacity (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>36-75</td>
</tr>
<tr>
<td>10</td>
<td>75-157</td>
</tr>
<tr>
<td>20</td>
<td>172-358</td>
</tr>
<tr>
<td>30</td>
<td>258-538</td>
</tr>
<tr>
<td>40</td>
<td>464-965</td>
</tr>
<tr>
<td>50</td>
<td>598-1246</td>
</tr>
<tr>
<td>63</td>
<td>745-1554</td>
</tr>
</tbody>
</table>

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

Power fuse characteristic curve
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.

---

**Vacuum Interrupter**

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

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

<table>
<thead>
<tr>
<th>Protection/monitoring</th>
<th>Code</th>
<th>GIPAM</th>
<th>DPR-011S</th>
<th>DPR-111S</th>
<th>DPR-211S</th>
<th>DPR-311S</th>
<th>DPR-411S</th>
<th>DPR-511S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-phase overcurrent</td>
<td>50-51</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero-sequence overcurrent</td>
<td>50N-51N</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selective zero-sequence overcurrent</td>
<td>67G</td>
<td>○</td>
<td></td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overvoltage</td>
<td>59</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervoltage</td>
<td>27</td>
<td>○</td>
<td></td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero-sequence overvoltage</td>
<td>59N</td>
<td>○</td>
<td></td>
<td></td>
<td>○</td>
<td></td>
<td></td>
<td>○</td>
</tr>
<tr>
<td>Measuring</td>
<td></td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>MCOV (kVrms)</th>
<th>Duty cycle rating (kVrms)</th>
<th>Maximum discharge voltage (kV crest) 8 x 20 microsecond current wave</th>
<th>F.O.W. protective level (kV crest) (μs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25kV class</td>
<td></td>
<td>1.5kV</td>
<td>3kV</td>
</tr>
<tr>
<td>8.4</td>
<td>10</td>
<td>30.5</td>
<td>32.5</td>
</tr>
<tr>
<td>10.2</td>
<td>12</td>
<td>40.0</td>
<td>42.5</td>
</tr>
<tr>
<td>12.7</td>
<td>15</td>
<td>48.0</td>
<td>51.0</td>
</tr>
<tr>
<td>15.3</td>
<td>18</td>
<td>56.5</td>
<td>60.0</td>
</tr>
<tr>
<td>17.0</td>
<td>21</td>
<td>65.5</td>
<td>69.5</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>CTD-100</strong></td>
</tr>
<tr>
<td>Rated input voltage(V)</td>
<td>AC 100/110</td>
</tr>
<tr>
<td>Frequency(Hz)</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated impulse voltage(V)</td>
<td>140/155</td>
</tr>
<tr>
<td>Charging time</td>
<td>Within 5 sec.</td>
</tr>
<tr>
<td>Trip command possible time</td>
<td>Max. 30 sec.</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>85%~110%</td>
</tr>
<tr>
<td>Capacitor rating(μF)</td>
<td>400</td>
</tr>
</tbody>
</table>

**Closing coil (C)**

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

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 24V</td>
<td>10</td>
</tr>
<tr>
<td>DC 110V</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 24V</td>
<td>10</td>
</tr>
<tr>
<td>DC 110V</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**GAS pressure gauge**

**Control connector**

- **Screw type**
- **Plug in type**

**Voltage detector**
Ring Main Units

Installation

RPS

RVB + RPL + RBR

RPF

RPL, RBR

RVB

R = 10D

D : Cable diameter
### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation type</strong></td>
<td>Indoor type</td>
</tr>
<tr>
<td>Rated voltage up to kV</td>
<td>24</td>
</tr>
<tr>
<td>Rated current A</td>
<td>630 A</td>
</tr>
<tr>
<td>Rated current (RVB, RPF) A</td>
<td>200</td>
</tr>
<tr>
<td>Rated power frequency Hz</td>
<td>50 / 60</td>
</tr>
<tr>
<td>Rated short current kA/1s</td>
<td>16</td>
</tr>
<tr>
<td>Rated making current kA</td>
<td>41.6</td>
</tr>
<tr>
<td>Power frequency withstand voltage kV</td>
<td>50</td>
</tr>
<tr>
<td>Rated impulse withstand voltage kV</td>
<td>125</td>
</tr>
<tr>
<td><strong>Operation type</strong></td>
<td>electromotion / manual</td>
</tr>
<tr>
<td>Operating voltage V</td>
<td>DC 110</td>
</tr>
<tr>
<td>Operating voltage (CTD Input) V</td>
<td>AC 110</td>
</tr>
<tr>
<td>Insulation material</td>
<td>SF6 Gas</td>
</tr>
<tr>
<td>Rated filling pressure (20 °C) Mpa</td>
<td>0.034 (5 psi.G)</td>
</tr>
<tr>
<td>Minimum operating pressure (20 °C) Mpa</td>
<td>0.014 (2 psi.G)</td>
</tr>
<tr>
<td>Transfer current (RPF) A</td>
<td>800</td>
</tr>
<tr>
<td>Electrical life</td>
<td>E3</td>
</tr>
<tr>
<td>Electrical life (RVB) E1, C1</td>
<td></td>
</tr>
<tr>
<td>Mechanical life</td>
<td>M1</td>
</tr>
<tr>
<td>Standard</td>
<td>IEC 60265-1, IEC 60420</td>
</tr>
<tr>
<td>Standard (RVB)</td>
<td>IEC 62271-100</td>
</tr>
</tbody>
</table>
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
## Ordering Information

<table>
<thead>
<tr>
<th>Test category</th>
<th>Nominals excitation level(g) X/Y/Z</th>
<th>Direction</th>
<th>Freq.(Hz)</th>
<th>Waveforms</th>
<th>Duration(S)</th>
<th>Operability</th>
<th>Structural integrity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resonance search test</td>
<td>0.1/0.1/0.1</td>
<td>X</td>
<td>0.5-30</td>
<td>Random</td>
<td>328</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Real earthquake test</td>
<td>0.3/0.3/0.15</td>
<td>XYZ</td>
<td>82</td>
<td>Kobe Earthquake</td>
<td></td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>Sine 30 waves test</td>
<td></td>
<td></td>
<td>5</td>
<td>Sine Wave</td>
<td>30 Waves</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>Resonance search test</td>
<td>0.1/0.1/0.1</td>
<td>X</td>
<td>0.5-30</td>
<td>Random</td>
<td>328</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### LS Ring Main Unit
- **Switch type**: R, RPF, RPL, RPS, RVB, RBR
- **Operating type**: M (Automatic), B (Manual)
- **Rated Voltage**: 24 (25.8[24]kV)

### Rated Current
- 2 - 200A
- 6 - 630A

### Rated Impulse withstand voltage
- 12 - 125kV BIL

### Cable connection type
- D (Dead Break Type)
- M (Dead Break & Plug-in Type)

### Switch and circuit type
- 21 - 2L-1F (RPS)
- 1L - 1 LBS (RPL)
- 1F - 1Fuse-Combination LBS (RPF)
- 1R - Bus Rising (RVR)
- 1V - 1VCB (RVB)
- 21V - 2L-1VCB (RVS)
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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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.