EPR AUTOMATIC RECLOSER

USER’S MANUAL
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GENERAL GUIDANCE

ENTECE SOLID INSULATED AUTOMATIC VACUUM RECLOSER HEREINAFTER CALLED EPR IS DESIGNED TO OPERATE AFTER INSTALLATION ON AN OUTDOOR POLE AND SUBSTATION. THIS PRODUCT CONSISTS OF THE MINIMUM NUMBER OF COMPONENTS TO ACHIEVE MAINTENANCE FREE, MAXIMUM SAFETY AND ENDURANCE.

EPR IS MADE FROM THE LATEST TECHNOLOGY SUCH AS HYDROPHOBIC CYCLOALIPHATIC EPOXY MOLD(HCEP), VACUUM INTERRUPTER, MAGNETIC ACTUATOR ETC. EPR IS FRIENDLY TO ENVIRONMENT WITHOUT HAVING ANY GAS OR OIL INSULATION MATERIAL.

TO ENSURE THE MAXIMUM LIFE AND THE BEST QUALITY OF OPERATION, OPERATE EPR IN ACCORDANCE WITH THE INSTRUCTION MANUAL AND KEEP THE FOLLOWING GUIDANCE.

BE FULLY AWARE OF THE INSTRUCTION MANUAL BEFORE OPERATING EPR.

SAFETY CHECK IS REQUIRED BEFORE INSTALLING, OPERATING, AND MAINTENANCE EPR. AFTER INSTALLATION, CONNECT AC 110/220V FROM THE DISTRIBUTION LINE TO THE CONTROL CUBICLE AND RUN A TEST OPERATION.

IF WORKS NEED TO BE DONE AFTER OPENING THE CONTROL CUBICLE MIDDLE COVER, TURN THE MAIN CIRCUIT BREAKER (MCB) OFF TO AVOID ANY ACCIDENT DUE TO THE HIGH VOLTAGE.

DO NOT DAMAGE THE EPR FOR EPOXY BUSHING PROTECTION.
1. INTRODUCTION

This manual contains the information required for installation, operation, and maintenance of ENTEC EPR Automatic Recloser. EPR is designed to be powered from AC 110/220V low voltage distribution line. EPR complies with the international standard specifications and ratings.

EPR consists of Hydrophobic Cycloaliphatic epoxy-insulated Housing (HCEP), stainless encloser tank, control cubicle. Vacuum interrupter is installed in HCEP Housing and magnetic actuator is encapsulated in stainless steel enclosure.

Swapping parts such as Recloser tank or Control is not recommended. If replacement is required, please consult with the ENTEC E&E Co. Ltd.

The inside of HCEP Housing and stainless steel enclosure, fulfilled with dry air and the control cubicle is equipped with two of DC 12V batteries in series together. Batteries supply DC 24V control power to a control circuit after rectifying from low voltage AC source. General configuration of recloser is shown as below.

![Figure 1-1. Recloser Lay-Out](image)

Table 1-1. Dimension (mm)

<table>
<thead>
<tr>
<th>kV</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.5</td>
<td>439 (non terminal)</td>
<td>350</td>
<td>825</td>
<td>280</td>
</tr>
<tr>
<td>27</td>
<td>650</td>
<td>350</td>
<td>885</td>
<td>310</td>
</tr>
<tr>
<td>38</td>
<td>682 (non terminal)</td>
<td>350</td>
<td>965</td>
<td>350</td>
</tr>
</tbody>
</table>
2. STANDARD RATINGS

The standard ratings of EPR Series are as follows:

**Table 2-1. STANDARD RATINGS**

<table>
<thead>
<tr>
<th>Maximum system voltage</th>
<th>15.5kV</th>
<th>27kV</th>
<th>38kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated frequency</td>
<td>50/60Hz</td>
<td>50/60Hz</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Rated continuous current</td>
<td>630A</td>
<td>630A</td>
<td>800A</td>
</tr>
<tr>
<td>Rated short circuit interrupting current</td>
<td>16kA</td>
<td>12.5kA</td>
<td>16kA</td>
</tr>
<tr>
<td>Rated making current</td>
<td>41.6kA (peak value)</td>
<td>32.5kA (peak value)</td>
<td>41.6kA (peak value)</td>
</tr>
<tr>
<td>Power frequency withstand voltage</td>
<td>50kV(1 min)</td>
<td>60kV(1 min)</td>
<td>70kV(1 min)</td>
</tr>
<tr>
<td>- dry</td>
<td>45kV(10 sec)</td>
<td>50kV(10 sec)</td>
<td>60kV(10 sec)</td>
</tr>
<tr>
<td>- wet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated impulse withstand voltage</td>
<td>110 kV BIL</td>
<td>150kV BIL</td>
<td>170 kV BIL</td>
</tr>
<tr>
<td>Mechanical operation life</td>
<td>10,000 operations</td>
<td>10,000 operations</td>
<td>10,000 operations</td>
</tr>
<tr>
<td>Actuator Operation Power</td>
<td>DC120V</td>
<td>DC120V</td>
<td>DC120V</td>
</tr>
<tr>
<td>Auxiliary power supply for the control</td>
<td>AC110 to 240V</td>
<td>AC110 to 240V</td>
<td>AC110 to 240V</td>
</tr>
<tr>
<td>Control circuit voltage</td>
<td>DC 24V</td>
<td>DC 24V</td>
<td>DC 24V</td>
</tr>
<tr>
<td>Protection current transformer (CT) ratio</td>
<td>1000:1 A</td>
<td>1000:1 A</td>
<td>1000:1 A</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- main tank</td>
<td>130kg</td>
<td>160kg</td>
<td>185kg</td>
</tr>
<tr>
<td>- control cubicle</td>
<td>84kg</td>
<td>84kg</td>
<td>85kg</td>
</tr>
</tbody>
</table>
3. EPR AUTOMATIC RECLOSER CONSTRUCTION

Recloser can be mounted on outdoor pole by assembling a mounting bracket connected to the top of metal enclosure and also installed at substation with substation mounting frame. The vacuum interrupter, magnetic actuator, and current transformer (CT) are contained in circuit breaker.

The interruption of Recloser is performed by the vacuum interrupter.

Recloser interrupter is arranged as separated 3-phase with complete insulation installed in Hydrophobic Cycloaliphatic epoxy (HCEP)-insulated Housing and is operated by the same insulation Rod. The insulation Rod connected at the end of moving contact transfers a driving force of the magnetic actuator to the interrupter for close and open operation.

Three insulation Housings on the top of stainless steel enclosure is made of Hydrophobic Cycloaliphatic epoxy resin (HCEP). The current transformer (CT) is molded inside of the insulation housing and CT can monitor phase fault currents, earth fault currents and load currents, and send signals to the control electronics.

If the control cable of CT is disconnected at both-end, the CT is automatically shorted by the automatic CT protection circuit.

The manual Trip/Closing/Locking device is positioned on the front side of stainless steel encloser. The indicator points an interrupter's open/close status and the operation counter are located at the bottom of main tank.

Recloser operation sequence is performed by the microprocessor-based relay. The relay is installed in the control cubicle protected by rain-proof case. Recloser immediately performs a preset operation sequence to re-close when a phase/ground fault current is higher than the preset value.

If a fault current is not cleared at the end of full protection sequence, Recloser will be lockout and remains until the next close operation. If a fault current is cleared during the protection sequence, Recloser is closed, and then returns into sleep mode after the reset time. When a fault current is detected, Recloser operates the pre-set full protection sequence again.

EPR is powered by AC 110/220V low voltage distribution line source or DC primary battery without an additional transformer, and is designed to consume low energy to operate reclosing and
remote control. Thus EPR does not need any extra cost for installation of additional transformer, in case, low voltage source by utility is available.

In case that low voltage power source is not available, Recloser is fitted with an auxiliary voltage transformer to supply auxiliary power source to the control cubicle.
During open and close operations, the relay sends the pulse type current to the open and close coils, and the magnetic force is induced by those coils and moves the plunger of the magnetic actuator.

This driving force is transferred to the vacuum interrupter, which makes contact tripped or closed. During trip and close operations, arc is produced and rapidly extinguished in the vacuum interrupter. The relay setting in control circuit can be modified at the control panel, a PC or remotely controlled communication method. For more details, refer to Control manual.
3.1 INTERRUPTER

The vacuum interrupter of Recloser can provide versatilities to operate trip/close with the ratings and capacity based on the fully capable of interruption. The closing status of the contacts is held by contact springs that provide the required force at any condition of contact wear.

As a vacuum interrupter is fully sealed for the lifetime of Recloser and it requires only a small contact stroke and low interruption energy. It is suitable for application of magnetic actuator mechanism and also vacuum interrupter has a capability of a large number of operations, which is ideal for Recloser’s application. Thus, vacuum interrupter with magnetic actuator provides a high reliability in operation and minimum maintenance if the replacement of the vacuum interrupter is required with any reasons, please consult with manufacturer.

![Figure 3-1. Recloser Interrupter](image-url)
### 3.2 MAGNETIC ACTUATOR

The magnetic actuator designed by the newest technology delivers force to the interrupter. Since the magnetic actuator consumes low energy, actuator switching operation can be simply achieved through rectifying circuit with the low voltage AC 110 or 220V supplied from an external power sources and battery charged with the low voltage sources or DC primary battery.

The permanent magnetic actuator mechanism has just one moving part. Thus the dramatic reduction in parts gives a corresponding increase in reliability. Especially, as the actuator uses magnetic latching and uses trip and close coil separately, the actuator consists of the fewest components and can provide zero-maintenance operation.

The Rod is the high-strength insulation material and delivers force to the interrupter. When pulse current flows into the close coil, the plunger of magnetic actuator is moved by the induced magnetic force to drive the interrupter to close position, and the actuator is then held in the closed position. In contrast, when pulse current flows into the trip coil, the plunger is released from the magnetic latch and the interrupter is moved to trip position.

![Fig 3-2. The principles of magnetic actuator operation](image-url)
3.3 Insulation Housing

Insulation Housings are mounted on the top of metal enclosure and have weather resistance, hydrophobicity. Insulation housings are manufactured by APG molding method with using Hydorphobic Cycloaliphatic Epoxy resin(HCEP).

The ring core CT is molded inside of insulation housing and senses the current flow.

This current information is transmitted to the micro-processor based relay via the multi-core cable. Resistance Voltage Divider(RVD) or Capacitor Voltage Divider (CVD) is molded inside of insulation housing to measure and sense the secondary voltage for signaling use.

3.4 MANUAL TRIP/CLOSING/LOCKING DEVICE

During control circuit faults or line repair, users can locally trip/close or lock Recloser with the manual Trip/Closing/Locking device positioned on the front side of metal enclosure. It can be manually operated by Insulation Hot Stick. Manual operation is available by the manual trip lever.

If Trip/Locking device lever is in lock position, Recloser can't be operated by local/remote control due to actuator power-off.

In this lock position, the user should push the manual Trip/Locking device up to the trip position to release the locking status of Recloser and then Recloser can be operated by local or remote control. Recloser can be opened manually by using a hot stick to pull down the manual trip handle and Recloser with further pulling down can be locked.

![Figure 3-3. Manual Trip/Closing/Locking device of Recloser](image-url)
3.5 MOLECULAR SIEVE

Molecular sieve is set up in order to absorb moisture inside of insulation housing and metal enclosure.
A polyester bag containing molecular sieve beads is placed inside the enclosure and the control cubicle.
Molecular sieve is commonly used for the concurrent removal of H₂O and CO₂ from gas, air streams and removal of H₂S.
Molecular sieve can be regenerated by evacuating or purging, usually at elevated temperatures ranging from 200°C to 300°C.
Higher temperature may cause physical degradation of the molecular sieve structure.

*Typical properties shows as follows;*

<table>
<thead>
<tr>
<th>Typical properties</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pore diameter</td>
<td>9 angstrom (0.9 mm)</td>
</tr>
<tr>
<td>Type of crystal structure</td>
<td>hexagonal</td>
</tr>
<tr>
<td>Bulk density</td>
<td>680 g/ℓ</td>
</tr>
<tr>
<td>Water content (as shipped)</td>
<td>1.5% wt (max)</td>
</tr>
<tr>
<td>Heat of absorption (max)</td>
<td>4200 kJ/kg·water</td>
</tr>
<tr>
<td>Bead size (nominal)</td>
<td>2.5<del>5 mm  2</del>3 mm  1<del>2 mm  4 ×8 mesh  8 ×12 mesh  10</del>18 mesh</td>
</tr>
</tbody>
</table>
3.6 BATTERY AND BATTERY CHARGER

The battery for operating Recloser’s components and control circuit is placed in the lower part of the control cubicle and can be easily replaced. The battery life is usually 5 or 8 years, but it can be shortened depending on how it is handled. The fully charged battery is enough for 30 hours operation without an external power source. Depending on a customer’s requirements of the battery life cycle, the battery brand and specification would be different.

_Battery specification shows as follows;

Table 3-2. Battery Specification

<table>
<thead>
<tr>
<th>Battery Specification</th>
<th>ES18-12</th>
<th>EVX12170</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal Voltage</td>
<td>12V</td>
<td></td>
</tr>
<tr>
<td>Nominal Capacity</td>
<td>18 amp-hours</td>
<td>17 amp-hours</td>
</tr>
<tr>
<td>Battery Dimension</td>
<td>181 × 76 × 167mm</td>
<td></td>
</tr>
<tr>
<td>Self-discharge Versus Time</td>
<td>+20°C 3%/month, +40°C 10%/month</td>
<td></td>
</tr>
<tr>
<td>Service life Time</td>
<td>Max 5 years at +20°C</td>
<td>Max 8 years at +20°C</td>
</tr>
<tr>
<td>Battery Connector(CN11)</td>
<td>Molex Connector 3191-2R</td>
<td></td>
</tr>
</tbody>
</table>

**Battery Charger**

<table>
<thead>
<tr>
<th>Charge Voltage</th>
<th>27.5Vdc(±0.5V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge Current</td>
<td>Max 300mA</td>
</tr>
</tbody>
</table>

* Note: Battery type or capacity can be changeable depending on Customer’s request.*
3.7 CONTROL CUBICLE

Recloser control cubicle is designed for outdoor pole mounted and substation operation which is made of anti-corrosion stainless steel.

The door is locked with three position locking devise and sealed with replaceable urethane foaming packing.

All vents are screened against vermin entry and the cubicle inside is fully covered with adiabatic faming material which protects the inside components from the rapid temperature variation.

The control cubicle outside is protected with a sunshine shield cover which is required for keeping the life cycle from shortening because the temperature sensitive electronic components and battery is affected by sunshine heating.

The microprocessor based control compartment is completely sealed against water entry even though the hatch door is opened in the rain during Recloser operation.

The condensation of the cubicle inside can be expected to foam due to the temperature variation under the atmospheric conditions such as tropical and moderate climate, however, any condensation does not affect any electronic components arranged with fully insulated sealed and well vented design.

Figure 3-4. Control cubicle layout
Consequently, any condensation on metal surface will run out of the bottom and automatically dried without affecting the electronic modules by ventilation and self heating.

The standard control cubicle contains the relay, batteries for control power and mechanism driving power.

The control cubicle must not installed outdoors without the sunshine shield cover in the places of solar heating.

Detailed control and relay, Please refer to our separate EVRC2A manual.

The control cubicle is shown in “Figure 3-4. Control cubicle layout” on previous page.

### 3.8 AUXILIARY POWER SUPPLY

*Auxiliary power source is derived from either of the following;*

1. From an external power source of 110V to 240V supplied by auxiliary power transformer.
2. From low voltage supply connected to the utility distribution line.
3. In addition to above, it is preferred to use from an external DC 125V supply for substation application as option.

Actually, auxiliary supply is used to operate Recloser through rectifying circuit and maintain charge on the sealed lead-acid batteries.

The operation of Recloser is fulfilled with the auxiliary power supply through the rectifying circuit regardless of charging of the sealed lead-acid batteries. The battery is used for the back-up operation of Recloser when auxiliary power supply is lost.

The battery for operating Recloser is placed in the lower part of the control cubicle and arranged to be easily replaced.

The battery life is predicted to use for 5 or 8 years service as recommended by the battery manufacturer’s data, but it can be shortened for its life on how it is handled and fitted with the environments.

The battery is enough to operating Recloser for 30 hours and over 50 events without external power supply.

When the batteries are nearly exhausted in showing below DC 21V when battery is tested with load, please replace the batteries with new one as indicated in section 3.6 battery specification or consult with manufacturer.
Figure 3-5. Auxiliary power supply
4. PACKING, HANDLING AND STORAGE

4.1 PACKING AND DESPATCH

Each recloser is normally packed in one non returnable case or wooden crate for exporting and in home is mounted on a transit pallet.

Recloser and control cubicle are disconnected with umbilical cable connection for transportation and standard pole mounting bracket of the main Tank are dispatched as loose equipment in the wooden crate of Recloser.

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>15.5kV</th>
<th>27kV</th>
<th>38kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit breaker enclose</td>
<td>kgf</td>
<td>130</td>
<td>160</td>
<td>170</td>
</tr>
<tr>
<td>Control Cubicle with battery</td>
<td>kgf</td>
<td>84</td>
<td>84</td>
<td>85</td>
</tr>
<tr>
<td>Control cable</td>
<td>kgf</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Mounting bracket</td>
<td>kgf</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Gross weight in packing</td>
<td>kgf</td>
<td>315.8</td>
<td>345.5</td>
<td>356.5</td>
</tr>
</tbody>
</table>

4.2 UNPACKING AND HANDLING

The wooden crate should be transported by hand pallet or forklift truck.

The lifting procedures should be kept for safety and we recommend slinging as shown in “Figure 4-1. Lifting configuration of the Recloser” and ensure the following procedures.

a) The slings should be approved and in good condition.

b) The lifting hook should be placed above the level of the bushings.

c) When moving the unpacked units, please maintain the lifting level to 30 cm above ground level, if possible, to avoid the damage due to unexpected failure.

d) Please be sure to balance the main tank weight so that the rope does not touch both sides of bushings throughout the transportation.

e) When moving and lifting, special care should be taken not to damage the bushings and bushing terminals.

f) Lifting method is shown in “Figure 4-1. Lifting configuration of Recloser”.
CAUTION!!
Do not touch severely Insulation Housing or H.V Terminal during transporting the main tank of Recloser. It causes a leakage of SF6 gas or damage on the bushing which leads to a severe malfunctions of Recloser.

4.3 RECEIVING
A packing list will be attached to the packing case or Recloser if not packed.
On receipt, Recloser should be checked for the contents of deficiency or damage during transportation. Please inform within 3 days to either the carriers, supplying agent or customer services department of the ENTEC Electric & Electronic Company., Ltd., if any damage was found.

4.4 STORAGE
As Recloser is designed for outdoor use, it can be stored both outdoor and indoor but Recloser should not be stored in a wet place and should not stacked up doubled.
5. INSTALLATION

5.1 INSPECTION BEFORE INSTALLATION

5.1.1 General
Upon receipt of Recloser, a visual inspection for damage during transportation should be paid for the followings.

1) Circuit breaker
   - Insulation Housing
   - Bulkhead fitting and connectors
   - ON/OFF indicator window
   - Lifting bracket
   - Trip and lockout lever
2) Mounting bracket
3) Control cubicle
   - Door
   - Door seal/ Door handle
   - Control and relay on the front panel
   - LED normal
   - LCD normal

5.2 TESTING

5.2.1 Battery check
Please press battery load test button in the control cubicle, battery voltage is displayed on LCD panel.

- Normal voltage over 21V
- If battery voltage shows below 21V, the battery should be replaced with new one.
5.2.2 Contact life of vacuum interrupter
The life of the vacuum interrupter is dependent upon the accumulation of the number of faults interrupted and the magnitude of fault current. Consequently, it is very important to record the short circuit operations. If 10,000 operations have been exceeded or the LCD displayed in the control cubicle is indicated below 20%, the vacuum interrupters may need to be replaced. If the replacement of the vacuum interrupter is required, please consult with the manufacturer at any time.

5.2.3 Resistance test on current carrying main circuit
Ensure that Recloser is in the closed position. The electrical resistance of each phases should be determined by measuring voltage drop with a DC current of 100 Amperes passing through. The resistance measurement of any phases should not be exceeded over 20% compared with the recommended value from the manufacturer.

5.2.4 High voltage insulation test
Recloser has been routine tested at the works in accordance with IEC 62271-111(2005) [ANSI C37.60, (2003)]. It is recommended that the 50/60㎐ high voltage test should be carried out prior to energizing Recloser for the first time. One minute dry withstand voltage supply should be applied across each phase of the open position and between each phase and earth in the closed position of Recloser. The recommended site test voltage is 75% of the factory test voltage.

5.2.5 Operation test
The umbilical cable with plug-in connector should be connected between Recloser tank and control cubicle. All switches involved should be activated by powered-up control cubicle. Local mode on the front panel should be selected and then Recloser can be operated by using the open and close push buttons. If the battery is discharged, low voltage supply can be connected for charging the battery.

5.2.6 Secondary current injection test
If required, please perform secondary current injection as using Recloser test kit.
5.3 INSTALLATION

5.3.1 Standard pole mounting of Recloser

Unpack the wooden crate and clean the insulation housing and silicon bushing, please check and confirm that all items are included. The pole mounting bracket should be assembled with the tank and hanger band is mounted on the pole and should be fixed tightly with bolts between the hanger band and the supporting bracket on Recloser as shown in “Figure 5-1. Mounting Bracket and Hanger Band”.

Before lifting Recloser onto the pole, care should be taken to ensure that supporting bracket is correctly mounted with the tank and upper hanger band is mounted on the pole firstly and lower hanger band is mounted consequently.

The range of possible attachment diameter of the hanger band for the pole mounting is 200m/m to 300m/m and other diameter is optional.

Recloser should be lifted as shown in “Figure 4-1. Lifting configuration of the Recloser” and the slinging procedure, Please refer to section “4.2 UNPACKING AND HANDLING” to avoid tilting of Recloser.

The additional rope may be used to assist for lifting and mounting of Recloser.

All standard pole mounting bracket and hanger bands with bolts and nuts are provided in the standard package.

Manual Trip/Locking

If the manual trip lever is pulled approximately 45 degrees, Recloser will trip and may either be returned to the horizontal for normal operation. If the Trip lever is pulled to the latched position(locking), without releasing the trip lever to normal, no close operation occurs.
5.3.2. Control cubicle

The control cubicle should be lifted using the mounting bracket and mounted with similarities using the procedure for the tank. When the control cubicle and the tank is mounted to the pole securely, then the umbilical cable plug may be connected.

The total length of the inter-connecting multi-core cable would be 6 meters as standard and the longer cable is available upon request by client as option.

The fixing arrangement multi-core cable should be tightened by using tie band with every 1000 mm length against wind-waving.

To prevent pulling weight, loosen slightly the control cable between the cable connector and the nearest hanger band.

---

**Figure 5-1. Mounting Bracket and Hanger Band**
5.3.3 Earthing

“Figure 3-5. Auxiliary power supply” shows the earthing common to Recloser tank and the control cubicle.

To avoid the potential gradient differential among tank, control cubicle and surge arrester, Earthing path should be common and do not ground by a different path to all equipments and be sure to keep the ground cables away from the control cable by the maximum spacing available.

The earthing conductor size should be at least 60mm².

5.3.4 High voltage connection

Before installation, all terminals and connectors should be cleaned and prepared to be able to keep low resistance connection.

Please refer to high voltage connector drawings shown in “Figure 5-7. Bushing assembly”.

5.3.5 Extend Bushing

- Silicon is used to maximize creepage and the minimum creepage distance or other features are as below;

<table>
<thead>
<tr>
<th>Type</th>
<th>Creepage distance</th>
<th>Arcing Distance</th>
<th>Terminal type</th>
<th>Applicable cable size</th>
<th>Rating (Amps)</th>
<th>Housing Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPR-1</td>
<td>Max700mm Min454mm</td>
<td>Max 211mm Min 264mm</td>
<td>Any type of Terminal is available</td>
<td>25 m/m (Max.dia.)</td>
<td>630</td>
<td>HCEP</td>
</tr>
<tr>
<td>EPR-2</td>
<td>Max901mm Min680mm</td>
<td>Max 310mm Min 320 mm</td>
<td></td>
<td></td>
<td>630</td>
<td>HCEP</td>
</tr>
<tr>
<td>EPR-3</td>
<td>Max1066mm Min733mm</td>
<td>Max 377mm Min 366mm</td>
<td></td>
<td></td>
<td>800</td>
<td>HCEP &amp; Silicone</td>
</tr>
</tbody>
</table>

*Figure 5-7. Bushing assembly*
6. Recloser Operation

6.1 General

Recloser with the microprocessor-based digital control technology is designed to provide automatic distribution reclosing system for maximum continuity of electric service, please refer to EVRC2A manual in details.

6.2 Operation procedure

1) Ensure that all programmable settings of the relays meet the user's requirements. The detailed information for relay and control, Please refer to separate operation and maintenance instructions for EVRC2A.

2) Check that Recloser is properly installed and all electrical connections are made.

3) Check that any external wiring connections for control are placed in normal.

4) If Recloser does not close with electrical operation, push the manual trip lever up to reset from the lockout to the trip position.

5) If you intend to trip manually, pull the trip lever down and check whether the position indicator points off position or not.

6) If you intend to lock Recloser, then pull the manual trip lever down to the lockout position and then trip lever indicates at lockout position.

If you intend to “close” electrically when the manual lever is positioned at the lockout position, Recloser remains "open" as closing power is removed.

Consequently, you should return the manual trip lever to the trip position for normal operation.
7. MAINTENANCE

7.1 General

1) Recloser has been designed as a low maintenance unit and using single moving part as adopting magnetic actuator mechanism does not require major maintenance like overhaul.
2) The control and relay maintenance, please refer to operation and maintenance instructions for EVRC2A.
3) Each equipment maintenance for Recloser, please refer to section 3 and 4.
4) A general inspection of Recloser should be made giving attention for clean and normal condition of each equipment.

7.2 DISMOUNTING OF RECLOSER

1) Ensure that the HV system is grounded for safety.
2) Dismantle high voltage connections and prepare the slinging wire to lift Recloser.
3) Before the lifting of Recloser on the pole, with the lifting arm fitted and maintain to support the weight of Recloser with the lifting arm engaged.
4) Remove the multi-core connectors on Recloser.
5) Dismantle the lower hanger band fixing bolts and consequently the upper hanger band fixing bolts.
6) Lift Recloser and move to the ground level.
7) Dismantle the control cubicle mounting bolts.
8) Lift the control cubicle and move onto the ground level.

7.3 CONTACT LIFE OF VACUUM INTERRUPTER

The life of the vacuum interrupter is normally over 20 years or 10,000 reclosing operations with light load operations stating by manufacturer. However, it can vary depending on the magnitude of fault currents and number of reclosing operations under loaded condition.

The remaining life of the vacuum interrupter is displayed on LCD with percentage of wear-out at contact point based on calculating from magnitude of fault currents and number of trip operations. The vacuum interrupter is recommended to replace if the remaining life becomes lower than 20%.

Be sure to consult with the manufacturer for replacement in details.
Actually since most faults are considerably lower than the maximum fault current and number of faults are considerably fewer than the guaranteed number of faults. The service life is expected to be much longer than the contact life of vacuum interrupter calculated by the amount of contact wear. Thus it keeps the operation of Recloser to be satisfactory. The data of the anticipated contact life and mechanical operation shows as follows;

**Table 7-1. Contact life of vacuum interrupter**

<table>
<thead>
<tr>
<th>Model</th>
<th>Mechanical operations (times)</th>
<th>Contact life (times)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rated load</td>
</tr>
<tr>
<td>EPR-1</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>EPR-2</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>EPR-3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>