Specifications for

SOLID DIELECTRIC, TRIPLE OPTION RECLOSERS

PART 1- GENERAL

1.1 DESCRIPTION

This specification covers the requirements for an electronically controlled, solid dielectric vacuum recloser with triple option trip/close capabilities for use on distribution systems through 38 kV.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: The chosen manufacturer shall have at least 15 years' experience in manufacturing solid dielectric reclosers. The manufacturer of the reclosers shall be completely and solely responsible for the performance of the recloser as well as the complete integrated system as rated.

B. The manufacturer shall be ISO certified ISO 9001 and 14001 and provide certifications upon request.

C. The manufacturer shall furnish certification of ratings of the recloser(s) upon request.

D. The recloser shall comply with requirements of the latest revisions of applicable industry standards, including:
   (a) EEE C37.60 / IEC 62271-111 Automatic Circuit Reclosers for Alternating Current Systems Up to and Including 38kV
   (b) IEEE 386 Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
   (c) IEC 62217 Subclause 9.3.3, 1000h Energized Salt Fog Standard
   (d) IEEE/ANSI C37.85: 2002 Alternating-Current High-Voltage Power Vacuum Interrupters – Safety Requirements for X-Radiation Limits
   (e) ASTM D4169-14: Performance Testing of Shipping Containers and System

1.3 DELIVERY, STORAGE, AND HANDLING

A. Reclosers shall be shipped site-ready from the factory. No major field assembly shall be required.

B. The contractor, if applicable, shall handle, transfer and move the reclosers in accordance with the manufacturer's recommendations.

PART 2- PRODUCTS

2.1 RECLOSER CONFIGURATION

Recloser configuration shall be, but not limited to:

- Pole mount, center
- Pole mount, Alley Arm
- Pole mount, cluster
- Substation, 90°
- Substation, 45°
- Padmount, front access
- Padmount, front / back access
- Site-ready with options including lightning arresters, primary/secondary connections, Accusense

voltage sensors, and voltage transformers preassembled
- Pole mount, 24” spacing
- Pole mount, Cross Arm, center
- Pole mount, Phase over Phase
- Pole mount, Independent Mount

2.2 RECLOSER CONSTRUCTION

A. Mechanism Enclosure
The magnetic actuator and corresponding linkage assembly shall be housed within a high impact, UV stable, air insulated, poly-carbonate enclosure. A contact position indicator and air vent shall be provided. Lifting provisions shall be provided.

B. Operating Mechanism
The operating mechanism shall utilize a magnetic actuator for opening and closing of the vacuum interrupters. The magnetic actuator shall be powered by capacitors located within the control cabinet. The manual trip and lockout handle shall be made of stainless steel for maximum corrosion resistance. A mechanical block device shall automatically engage within the operating mechanism, prohibiting accidental closing, when the manual trip handle is operated. Vacuum interrupter contact position indication shall be accomplished using green (open) and red (closed) indicators located on the bottom of the individual phase mechanism enclosure and through local and remote indication located within the control.

C. Vacuum Interrupters
Interruption of the fault or load current shall be accomplished through vacuum interrupters located inside solid dielectric modules.

D. Solid Dielectric Modules
The solid dielectric modules shall utilize a time proven EPOX solid dielectric insulation to fully encapsulate each of the three vacuum interrupters. The solid dielectric modules shall be fully shielded and incorporate a high impact polycarbonate, track resistant, UV stable jacket. The modules shall be dead-front technology and shall conduct a fault to ground through the external surface in case of a flash over. The operating temperature range shall be -50° to +65°C. A dual ratio, 500/1000:1 current transformer or optional dual ratio, 400/200:1 current transformer shall be integrally molded into each module. Source and Load side Voltage sensor(s) shall be integrally molded into each module. Include modules shall be capable of mounting external current transformers directly onto to recloser. Module bushings shall be molded with IEEE 386 bushing interface

E. Insulators shall be removable and field replaceable. Insulators shall be made from silicone material for long life and superior insulating characteristics.

F. Smart Grid / Distribution Automation
The recloser shall be automation ready, enabling rapid deployment of any future automation requirements. The recloser shall have an option for up to six (6) integral LEA (Low Energy Analog) capacitive voltage sensors that are encapsulated within each recloser module, permitting voltage sensing for network reconfiguration. The integral voltage sensing accuracy shall be +/-2% at -20°C through +40°C and +/-4% at -60°C through +65°C when tested as a system. The phase angle accuracy of the integral voltage sensors shall be +/-1°. The recloser shall have an option for external voltage sensors with 0.5 accuracy class (±0.5% Magnitude, ±0.344° Phase) at -40°C to + 65°C temperature range. These external voltage sensors shall have a 5000:1 ratio and Low Energy Analog (LEA) outputs. A dual-ratio current transformer shall be encapsulated within the module. The current transformer ratio shall be field changeable. CT accuracy shall be +/-1%. Integrated communication options can be provided.

G. Electronic Control
The recloser shall be compatible with but not limited to the following controllers:

- Schweitzer 651R2
- ABB RER620
- Beckwith 7679

H. The recloser shall be equipped with a visible open for field maintenance personnel.

2.3 DESIGN RATINGS

A. Reclosers

The recloser shall meet or exceed the following ratings

SELECTION OF RATINGS	
Maximum Design Voltage, kV	**15**
Impulse Level (BIL) Voltage, kV	**110**
Continuous and Load Break Current, Amperes	**630/800**
8-hour Overload, Amperes	**756/960**
60 Hz Withstand, kV rms: One minute (dry)	**50**
60 Hz Withstand, kV rms: 10 seconds (wet)	**45**
60 Hz Withstand, kV rms: 60 seconds (wet)	
Interrupting Current, kA rms sym. Short Circuit Current, kA sym. 3 seconds	**16****
Making Current: Peak, asym, kA	**40**
First Pole to Clear Factor (kpp)	**1.5**
Mechanical Endurance, Operations	**10k**

B. IEEE C37.60 Fault Interrupting Duty

Percent of Maximum: Interrupting Rating	Approx. Interrupting: Current Amps	No. of Fault: Interruptions
15-20%	2000	44
45-55%	6000	56
90-100%	12000	16
Total Number of Fault Interruptions: 116		

2.4 BUSHINGS

Bushings shall be (choose one):

- Air insulated, removable silicone insulators mounted to an IEEE 386 deadbreak apparatus bushing

For Padmount design:

- 600 amp deadbreak apparatus bushing
- 200 amp loadbreak deepwell bushing
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2.5 FACTORY PRODUCTION TESTS

Each individual recloser, including the integrated control, shall undergo the following factory production test:

- Mechanical Operation Check to verify contact, travel profile, timing and phase synchronicity
- AC Hi-pot
- Circuit Resistance
- Overcurrent Timing to verify TCC performance

2.6 STANDARD COMPONENTS

The following shall be included as standard:

- Aluminum pole mount center bracket
- Lifting provisions
- Grounding provisions
- Operations counter for each phase located in the control
- Manual trip and lockout handle(s) with mechanical block
- SEL-651R control and associated control cable
- 3 phase close option close capabilities
- Solid dielectric epoxy modules with 3 internal voltage sensors and dual-ratio 1000/500:1 CT's
- Arrester mounting provisions (overhead applications only)
- Field changeable silicone insulators
- Junction box with all strain relief connections and a "quick-connect" connection for control cable

2.7 OPTIONS

The following options shall be supplied: (check as appropriate):

- L-shaped vacuum interrupter modules
- Six (6) 800A deadbreak Apparatus Bushing per IEEE 386 interface 13
- Three (3) 15.5kV screw-on silicone insulators on the Y-side
- Three (3) 38kV screw-on silicone insulators on the Z-side
- Six (6) NEMA 2-hole pads
- Six (6) LEA capacitively coupled voltage sensors, encapsulated within the solid dielectric insulation, exclusively for use with the recloser control (2500:1 ratio)
- 50-foot 32 pin control cable connectorized on both ends
- Aluminum 15-inch phase spacing center mount frame, with provisions for lightning arrester mounting
- Six (6) 9kV, 7.65 kV MCOV lightning arresters, factory installed and grounded
- Transformer mounting provisions included
- Two (2) Oil potential transformers, suitable for phase to ground connection on a 4160V phase to phase system included and factory installed (for control power)
  - No primary potential transformer fusing included
- Two (2) 50-foot, 3 pin PT cables

- Three externally mounted current transformers including stainless steel mounting bracket. External CTs will be mounted on the Z-side and include the following specifications:
  - CT Style: Single
  - CT Ratio: 600:5
  - CT Relay Accuracy: C100
  - CT Metering Accuracy: 0.3 B0.9

Externally mounted junction box with integral shorting block to land metering CT secondaries.

2.8 LABELING

A. Hazard Alerting Signs
Appropriate hazard signs shall be applied to each unit, frame or enclosure (if applicable). A Danger sign shall warn of hazardous voltage and the need for qualified operating personnel. Warning signs shall warn against product misapplication in excess of fault ratings and the hazards when accessing moving components inside the mechanism housing. Caution signs shall warn of harmful X-ray potential.

B. Nameplates, Ratings Labels, and Connection Diagrams
Each recloser shall be provided with a nameplate label indicating the manufacturer's name, catalog number, date of manufacture, serial number, and ratings. Ratings listed on nameplate shall indicate the following: voltage rating, BIL, continuous current, and interrupting current.