Revision 8
Jun 1, 2016

1. Scope

This specification covers the requirements for furnishing and delivering a 3Ø, 60Hz, outdoor, pole-mounted SCADA compatible, microprocessor-based line recloser. The recloser shall be capable of operating as a 1Ø or 3Ø trip device. The interrupting medium shall be axial-magnetic field vacuum.

2. Reference Standards

All characteristics, definitions, terminology, voltage designations and tests, except as otherwise specified herein, shall be in accordance with the following industry standards. When the following standards are superseded by an approved revision, the revision shall apply.

Industry Standards

ANSI C37.60-2003 IEEE Standard Requirements for Overhead, Pad-Mounted, Dry Vault, and Submersible Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems Up to 38kV
ANSI C37.85-1989 American National Standard for Switchgear — Alternating-Current High-Voltage Power Vacuum Interrupters — Safety Requirements for X-Radiation Limits
IEEE 1815-2010 IEEE Standards for Electric Power Systems Communications — Distributed Network Protocol (DNP3)

District Standards

Assembly Unit 12F613 7.2/12.47kV 3Ø Distribution Automation Recloser
Material Standard 482571.1 Typical Polymer-Housed Metal-Oxide Arrester

3. Material ID Numbers

Material ID	Description
5000311	Recloser, Overhead 3Ø 630A STS DA Bi-Directional
5000330	Recloser, Control Panel SEL-651R DA
5000300	Recloser, Cable Kit, 40' SEL-651R

4. Electrical Ratings

Nominal Voltage	14.4kV
Max. Voltage	15.5kV
BIL	110kV
Frequency	60Hz

60Hz Withstand Voltage Dry (1m)	50kV
60Hz Withstand Voltage Wet (10s)	45kV
Continuous Current	630A
Overload Current	787A for 8 Hours
Charging Current	10A
Interrupting Current	12,500A

5. Construction

5.1 Tank

The tank shall be manufactured in accordance with ANSI/IEEE C37.60. All external fittings and cover bolts, washers, and nuts shall be stainless steel. Clamping devices shall be of corrosion resistant material.

5.2 Finish

The tank finish shall be ANSI Z55.1, light gray No. 70, Munsell 5.0 BG 7.0/0.4.

5.3 Mounting Bracket

The tank mounting bracket shall not have braces extending over the top of the tank.

5.4 Surge Arresters

The recloser bracket assembly shall include mounted surge arresters adjacent to each source and load bushing. Surge arresters shall meet District Material Standard 482571.1

5.5 Bushings

Three source and three load bushings of cycloaliphatic epoxy shall be provided. Clamp type terminals suitable for either horizontal or vertical connection of #2 AWG to 500 kcmil stranded aluminum or copper conductor shall be provided.

5.6 Wildlife Guards

The recloser shall be equipped with wildlife guards that cover the terminal and uppermost insulator skirt on each bushing.

5.7 Limiting Overall Dimensions

Overall height shall not exceed 43 inches. Overall width shall not exceed 39 inches.

5.8 Nameplate

The nameplate shall be attached to the outside of the recloser and shall include all data required in ANSI/IEEE C37.60.

6. Recloser Switch

Each recloser shall be equipped with or feature the following:

6.1 Control Power

The recloser shall be powered by 53V DC power supplied from the recloser control's 24V DC battery supply via a DC-to-DC converter.

6.2 Vacuum Interrupters

Current interruption shall occur in vacuum interrupters, providing long contact life while eliminating the production of toxic by-products.

6.3 Dielectric Medium

Cycloaliphatic epoxy or District approved equivalent solid dielectric compound shall be used as the dielectric medium. Oil, foam or SF6 are not acceptable insulating mediums.
The solid dielectric insulation shall contain no environmentally hazardous or toxic components.

6.4 Manual Operating Handle

A yellow-coated operating handle, suitable for operation with a hot line stick, shall be provided to manually open each phase of the recloser. These handles shall be easily seen from the ground.

Once the handle is in the OPEN position, the recloser will be in a "lock-out" position and shall not accept electrical close signals from the control. Returning the handle to the CLOSED position shall not close the recloser. All close operations must be initiated by the electronic control.

When the recloser is in 3Ø lockout mode, opening any of the three operating handles will open and lockout all three phases. If the recloser is in 1Ø lockout mode, opening an operating handle will only open and lockout that phase.

6.5 Position Indicator

A red/green (open/closed) indicator flag on each phase shall be clearly visible from the ground to provide contact position indication.

6.6 Internal Current Sensors

The recloser shall include integral bushing-type current transformers for sensing load and fault current on each phase. Sensor accuracy shall be 2% or better.

6.7 Internal Voltage Sensors

The recloser shall include internal voltage sensors on all three source-side phases. PT ratio and phase angle shall be independently adjustable on each phase. Sensor accuracy shall be 2% or better.

6.8 External Voltage Sensors

As an option, external voltage sensors shall be supplied on all three load-side phases. Sensor manufacturer and model are subject to prior District approval. Sensor accuracy shall be 2% or better.

6.9 Source/Load Side Transformers

The recloser shall include a source and load side 12470 Grounded Y/7200-120V 1kVA transformer with a high-side internal weak link and primary bushing wildlife protection. The transformers shall meet District Material Standard 630253.1.

7. Control Panel Enclosure

7.1 NEMA Rating

The control panel enclosure shall be rated NEMA 4X or better. The control panel enclosure shall be equipped with a drip gutter to prevent the ingress of water when the control panel enclosure door is open in wet weather.

7.2 Mounting Provisions

The enclosure housing shall be equipped with two mounting brackets; one shall be above and the other below the enclosure. These two brackets shall be constructed to stand the panel off from the pole at least 6 inches. These brackets shall be able to accommodate 5/8" galvanized bolts mounted through the pole.

7.3 Locking Provisions

The control panel enclosure shall be equipped with a handle that is capable of being locked with District padlocks, both long and short shanks.

7.4 Grounding

The control panel enclosure shall include a ground lug capable of accepting #4-#2 solid copper wire.

7.5 Cable Terminations

All connectors and control cables shall mount to the bottom side of the control panel enclosure. The connectors shall be weatherproof and shall be a quick disconnect type that do not require tools for makeup or removal; i.e., they shall be screwed cannon or amphenol style plugs or equivalent.

7.6 Terminal Block

The control panel enclosure shall include a heavy duty terminal block with #6-32 AWG screw terminal positions for terminating the District’s wiring from the RTU. An easily readable, permanent method shall be used to identify all external connection terminal blocks.

7.7 Batteries

The control panel enclosure shall be configured to hold two 12 volt 13 Amp-Hour sealed lead acid batteries wired in parallel to provide 12 volt DC for operation. Batteries shall be Genesis G13EP, Odyssey PC545 or District approved equivalent. Batteries shall be securely mounted in the enclosure and shall be easily replaced in the field when required. Batteries shall be capable of maintaining full operation for a 25 hour minimum period at 20°C. The controls will be shipped without batteries which will be supplied by the District.

7.8 Input Power Automatic Transfer Switch

The control panel enclosure shall include an AC automatic transfer switch. Transfer switch shall take input from the source and load side transformers.

8. Control Cables

The recloser shall include factory terminated control cables for recloser control, voltage and current sensors and control power. All cables shall be properly jacketed for protection against severe atmospheric conditions including UV, oxygen, acid, salts and alkalis.

8.1 Cable Length

Control, sensor and power cables shall be 40' long unless a different length is specified by the District.

8.2 Control, Heater, and Sensor Cable Terminations

The control cable, heater cable, and/or sensor cables shall have manufacturer installed terminations on both cable ends. These terminations shall be the screwed, cannon or amphenol style plugs or aircraft type connectors. Control cable terminations shall be polarized so the male termination connects to the control panel enclosure and the female termination connects to the recloser.

8.3 Power Cable Terminations

Power cable terminations shall be polarized so the female termination connects to the control panel enclosure and the other end is unterminated, suitable for direct connection to customer supplied 120V AC secondary wires or potential transformer.

9. Control Panel

The recloser shall include and be fully compatible with a Kyle Form 6 and SEL 651R triple single pole mount control panel. No other controls are acceptable without prior District approval.

9.1 Operating Temperature

The control shall operate in a temperature range of -40°C to 85°C. All components, assemblies, sub-assemblies and customer installed equipment shall also operate in a temperature range of -40°C to 85°C. The control shall have a 15W internal heater for humidity control (ON 70°F, OFF 85°F).

9.2 Operating Power

The control shall accept two incoming 120 VAC power supply to feed an automatic transfer switch. The automatic transfer switch will tie to the power supply/battery charger board. An auxiliary power supply with battery backup rated 65W shall be included to supply District installed communications equipment. The control shall monitor battery voltage and shutdown automatically upon detection of low battery voltage. Control programming, settings, parameters and recorded events shall be stored in non-volatile memory and retained upon loss of control power. The control clock shall continue to operate for 30 days after loss of control power.

9.3 Configuration Software

The control shall use a Microsoft® Windows® based interface software to configure all setting, metering, analysis tools and SCADA inputs/outputs. Configuration and firmware upgrades shall be available through a direct connection to a dedicated RS-232 port on the control front panel.

9.4 Communications Protocol

The control shall use DNP3 communications protocol per IEEE 1815-2010.

9.5 SCADA Inputs/Outputs

The control shall include 11 control inputs and 13 status outputs. All contacts shall be configurable via software. All contacts shall accept a whetting voltage of 12-240VAC or 12-250VDC. All contacts may be set as momentary or latching.

9.6 Voltage Sensing Connections

The control shall be configured to accept three source side voltage inputs and one load side voltage input. Voltage inputs shall be supplied via factory assembled control cables connected to the internal and external PT's and the control enclosure.

9.7 Convenience Outlet

The control shall include a 120 VAC, 15A GFI duplex outlet accessible through the front door of the control enclosure.

9.8 Radio Mounting

As an option, the control shall include an accessory mounting bracket and regulated 17.25W @ 13.8 VDC power supply for installation of a District supplied radio inside the control enclosure.

9.9 Communications Ports

The control shall include one 9-pin RS-232 communications port on the front panel for user configuration. On the back panel the control shall also include a 9-pin RS-232 port as a standard and a second port as an option via an accessory communications board. These boards may be factory installed or field installed, depending on application.

Supported interfaces shall include:

- RS485 Serial
- Fiber-Optic Based Serial
- 10/100 Base-T Dual Ethernet (2*RJ-45)
- 100 Base-FX Dual Ethernet (2*MT-RJ)
- 10/100 Base-T, 100 Base-FX Ethernet (RJ-45 + MT-RJ)

If required, factory installed communications boards will be specified at time of purchase.

9.10 Status Indicator Light

The control panel shall be equipped with a downward facing indicator light configured to flash on and off when the recloser is in locked out status. The light shall be amber in color and readily visible in daytime.

10. Guarantee

The failure of any recloser due to defective design, material and/or workmanship within twelve months after being energized or eighteen months after delivery, whichever comes first, shall be repaired or replaced without cost to the District. Any defect in design, material and/or construction discovered within this period shall be corrected on all reclosers furnished on this order at the manufacturer’s expense, either by repair or by replacement.

11. Testing

The recloser, sensors and control shall be fully tested and calibrated at the factory prior to shipment.

12. Test Reports

The supplier shall furnish one certified copy of the test reports for each recloser. These tests shall be a minimum of the routine tests described in ANSI C37.60.

13. Bidders' Data

For each rating of recloser, each bidder shall supply:

- All data and information as requested on Exhibit "A", the attached bidder's data sheet.
- Pole mounting details.
- Drawings of the complete recloser assembly and control panel.
- An itemized list of all accessories in the recloser and control panel package.
- A detailed description of manufacturer’s control panel exchange program. This should include dollar values for exchange of identical panels for repair purposes.

A description of any proposed changes, additions or exceptions to the specification shall be submitted along with reasons for the departure.

14. Evaluation of Bids

The following factors will be considered in the analysis and evaluation of bids and subsequent bid award:

- Proposed delivery.
- Past performance of bidder and product.
- Conditions of warranty.
- Completeness of bidder's data.
- Construction details.
- Manufacturer's control panel exchange program.

15. Packaging

Reclosers shall be shipped in an enclosed van and shall be suitably packaged to ensure against damage.