1.0 GENERAL

1.1 The single-phase fault interrupting recloser shall conform to this specification.

1.2 The recloser shall be an outdoor, single-pole, self-powered, recloser incorporating a vacuum fault interrupter, a microprocessor control, an integral data transceiver, and an integral fault-current sensor.

1.3 The recloser could be supplied complete with a porcelain or polymer cutout mounting, or it could be ordered separately for retrofit into an existing S&C cutout mounting.

1.4 The recloser shall be laser-etched with voltage and current ratings, a catalog number, and a serial number.

1.5 The manufacturer shall have a minimum of 10 years' experience in the production of distribution automation and protection equipment.

1.6 The warranty of the recloser shall be 2 years from the date of shipment.

2.0 50/60 HERTZ RATINGS

2.1 The voltage and ampere ratings of the recloser shall be as follows (select the appropriate row from the following table):

kV				Amperes, RMS	
System Class	Nominal	Max	BIL	Continuous Current	Interrupting, Symmetrical
15	15	15.5	110	40	4 000
					6 300
				100	4 000
					6 300
				200	4 000
					6 300
25	25	29	125	40	4 000
					6 300
				100	4 000
					6 300
				200	4 000
					6 300
			150●	40	4 000
					6 300
				100	4 000
					6 300
				200	4 000
					6 300

● Applicable for protection of single-phase-to-neutral circuits only in solidly grounded-neutral (multi-grounded-neutral) 34.5-kV systems where the leakage distance to ground meets the user's requirements. Uses a 25-kV, 150-kV BIL mounting.

3.0 OPERATION

3.1 The recloser shall have up to three reclosing operations (four trip operations total) before dropping open. Each operation shall be configurable to any of the curve choices described in Section 3.4.

3.2 The recloser shall provide an interrupting time of 0.03 seconds when experiencing a fault while closed and carrying current. It shall not rely on an external fuse or fault clearing recloser to achieve fault clearing.

3.3 The 40-A and 100-A reclosers shall have a minimum trip current of 5 amperes. The 200-A recloser shall have a minimum trip current of 10 amperes.

3.4 The recloser shall be configurable with a comprehensive selection of fuse and recloser curves, including the K, T, QR, KS, NE, NK, S&C Standard, and S&C Coordinating fuse curves; the Cooper Form-4, -5, -6, and FX curves; the SEL, ABB, IEC, and IEEE single-phase recloser curves; and the H, 4H, V4H, L, V4L, V4E, E, 4E, and DV hydraulic recloser curves.

3.5 The recloser shall "drop open" and reset at the end of its operating sequence when the line fault is permanent, creating a visible indication of operation and an open gap while remaining supported in the cutout mounting.

3.6 The recloser shall have a Non-Reclose mode that will operate on a user-configurable standard curve. This Non-Reclose mode shall also have user-configurable curves available for cold wake-up and post-fault wake-up. Placing the recloser in Non-Reclose mode shall be readily accomplished by moving an actuating lever with a hotstick or by setting it remotely using a SCADA command when configured with a communications gateway (9.3).

3.7 The recloser shall be capable of operation similar to a sectionalizer, where it operates automatically for faults above its 6300-A (symmetrical) rating. The recloser shall have user-configurable Sectionalizing mode settings ranging from 10 A to 6500 A.

3.8 The recloser shall have an Inrush Restraint feature that is always enabled. This feature prevents nuisance tripping of the recloser caused by 2nd harmonic current when being closed into the mounting.

3.9 The recloser shall be capable of being opened under load with a loadbreak tool.

3.10 The recloser shall have a Local-Manual Open feature to allow the operator to locally initiate an Open/Drop Open operation without using a loadbreak tool. This feature shall be configured, and enabled or disabled, by the user.

3.11 When the recloser reaches 10% of its remaining vacuum-interrupter contact wear, an indicator shall appear on the LCD screen. When the recloser's vacuum interrupter is no longer capable of interrupting a fault, it shall drop open and will not reset.

3.12 The recloser shall be able to be put through a functional test simulating temporary or permanent faults when connected to the configuration software with no current through its vacuum interrupter.

3.13 The recloser shall have a Sequence Coordination feature used to coordinate with downstream reclosers. If a fault is cleared by a downstream recloser, the recloser shall shift to a user-configured (usually slower) time-current characteristic curve before fault-testing and shall maintain its Sequence Coordination setting until the Coordination Reset timer elapses.

4.0 EVENT LOGS

4.1 The recloser shall keep track of the following historical counts in its event log:

(1) Number of Forced Interrupter Closes

(2) Number of Interrupter Open Operations caused by Overcurrent

(3) Total Number of Interrupter Open Operations

(4) Number of Drop-Opens caused by Overcurrent

(5) Number of Drop-Opens caused by Overload

(6) Number of Drop-Opens caused by Sectionalizing

(7) Number of Drop-Opens caused by Local Manual Open

(8) Number of Drop-Opens caused by Gang Operation

(9) Total number of Drop-Opens

4.2 The recloser shall store the following data for trip events:

(1) Event Name

(2) Date

(3) Time

(4) Fault Duration, ms

(5) Fault Current, A

5.0 MECHANICAL AND ELECTRICAL PERFORMANCE

5.1 The recloser shall have been tested and rated for at least 2,000 mechanical Close/Open operations.

5.2 The recloser shall have been tested and rated for 300 operations at 100% of the recloser's interrupting rating for 4-kA units and 400 operations at 100% of the recloser's interrupting rating for 6.3-kA units.

5.3 The recloser shall require no regular maintenance.

5.4 The recloser shall be suitable for application in an ambient temperature range of -40°C (-40°F) to +50°C (122°F).

5.5 The recloser shall be capable of dropping open under ¾-inch (19-mm) ice formation. An ice shield shall not be required to attain this capability.

6.0 CONSTRUCTION AND COMMUNICATION

6.1 The recloser shall have a non-volatile LCD screen showing contact position and Auto/Non-Reclose status as well as other user-defined information. At a minimum, the user-defined information shall include an Operation counter, the life remaining for the unit, the contact position, the Auto/Non-Reclose position, the load current, the software version, and the last fault current. The LCD screen shall be persistent and shall not require power to maintain display of the last displayed screen.

6.2 The recloser shall be constructed of UV-resistant polycarbonate with fiberglass reinforcement, and it shall have passed the accelerated UV-exposure test. This housing shall be watertight, allowing the recloser to be left in the Dropped Open position for an extended period of time.

6.3 Control power shall be derived from an integral current transformer.

6.4 The recloser shall have an integral transceiver allowing communication directly between the recloser and a laptop using a configuration kit.

6.5 The recloser shall have integral current sensing accurate over the operating range of the unit.

6.6 It shall be possible to download setpoint files or snapshot files containing complete settings information from the unit. It shall be possible to upload setpoint files to the recloser.

7.0 DESIGN TESTS AND STANDARDS COMPLIANCE

7.1 The recloser shall comply with IEEE Standards C37.60-2012 and C37.41-2008 and IEC Standard 62271-111.

7.2 The recloser shall be manufactured in accordance with a quality system certified to ISO 9001:2000.

7.3 Fault-Interrupting Duty: IEEE C37.60-2013/IEC 62271-111

7.4 Lightning Impulse and 60-Hz Withstand: IEC 62271-111/IEEE C37.60

7.5 Surge Withstand: IEC 62271-111/IEEE C37.60

7.6 Temperature-Rise: IEC 62271-111/IEEE C37.60

7.7 Mechanical Endurance: IEC 62271-111/IEEE C37.60

7.8 Ice Loading: IEC 62271-111/IEEE C37.60

7.9 IP65 Certification: IEC 60529

8.0 MOUNTING/INSTALLATION STRUCTURE

8.1 The recloser shall mount in a standard, non-loadbreak S&C Type XS Fuse Cutout mounting.

8.2 The recloser shall be able to be installed using tools and procedures typical to those used with fuse cutouts.

9.0 OPTIONAL ACCESSORIES AND FEATURES

9.1 The recloser could be specified with an Extended Open Interval option, allowing the recloser to have an open interval between trip operations of up to 30 seconds.

9.2 The recloser could be configured with an optional tag clip on the MODE SELECTOR lever, allowing placement of a line tag. This tag clip shall not mechanically lock out the recloser.

9.3 The recloser shall allow for optional DNP 3.0 SCADA communication or IEC 60870-5-104 SCADA communication via a communications gateway. The gateway shall be contained in a waterproof, padlockable box and shall be able to be fitted with a selection of user-specified communications options.

9.4 Up to three reclosers, configured with both the Extended Open Interval option (9.1) and the communications gateway with battery (9.3) could be configured to group-operate when one member of the group trips open and drops open into the horizontal position, either because of a permanent fault, a Local Manual Open operation, or a change in orientation from vertical to horizontal in a cutout mounting.

9.5 When configured with both the Extended Open Interval option (9.1) and the communications gateway (9.3), the Remote Drop Open feature shall allow a recloser to be opened with a SCADA command sent via DNP 3.0 through the communication gateway to the recloser. (Note: If the Group Operation feature (9.4) is also enabled, other members of the operation group will also open and drop open.)

9.6 A recloser could be placed in Non-Reclose (NR) mode by a local user placing the MODE SELECTOR lever in the Down position. If the recloser is commissioned with a communication gateway (9.3), a remote DNP3 command could be sent to place the recloser in Remote Non-Reclose mode (R-NR), even though the lever is in the Up position. If the Temporary Auto mode has been enabled, closing the recloser in the cutout mounting with the MODE SELECTOR lever in the Up position should cause the recloser to be in Auto (reclose) mode for 5 minutes before reverting to R-NR mode. Conversely, a recloser closed in the cutout mounting with the lever in the Down position should remain in NR mode until the MODE SELECTOR lever is returned to the Up position and the R-NR command has been removed.