

## Reclosers

Functional Specification Guide

NOVA Three-Phase Recloser

**PS280002EN**

### Functional specification for NOVA three-phase recloser

#### 1. Scope

This specification describes the features and ratings of the NOVA recloser. The NOVA recloser shall be a three-phase electronically controlled recloser suitable for pole or substation mounting. It shall utilize shatter-resistant outdoor cycloaliphatic epoxy encapsulated axial-field vacuum interrupters. Current sensing shall be provided by three internally encapsulated current transformers. The NOVA recloser shall be available with optional Internal Voltage Sensing. The Form 6 or Form 4D electronic control, coupled with the NOVA recloser, constitute the NOVA recloser system.

#### 2. Applicable Standards

2.1. The Quality Management System shall be ISO 9001 Certified.

The NOVA Recloser shall be designed and tested in accordance with the following standards as applicable:

**IEEE Std C37.60™-2003 standard** – IEEE Standard Requirements for Overhead, Pad-Mounted, Dry Vault and Submersible Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems

**ANSI C37.61-1973/IEEE Std 321™-1973 standard** - IEEE Standard Guide for the Application, Operation, and Maintenance of Automatic Circuit Reclosers.

**ANSI C37.85-2002** - American National Standard Safety Requirements for X-Radiation Limits for AC High-Voltage Power Switchgear.

#### 3. Ratings

3.1. The NOVA Recloser shall be designed in accordance with this specification and shall be rated as follows:

##### 3.1.1. Weight (Base units, no accessories)

NOVA Recloser	kg (lbs)
NOVA15	89 (196)
NOVA27	94 (206)
NOVA38	104 (229)

Pole Mounting Hanger	kg (lbs)
NOVA Pole Mounting Hanger	22 (48)

Substation Frame	kg (lbs)
NOVA Substation Frame	41 (90)

## 3.1.2. Voltage

Rating	NOVA15	NOVA27	NOVA38
Maximum Design Voltage (kV)	15.5	27.0	38.0
Nominal Operating Voltage (kV)	14.4	24.9	34.5
Basic Insulation Level (kV)	110/125	125/150	170
60 Hertz Withstand Voltage (kV)			
Dry, one minute	50	60	70
Wet, ten seconds	45	50	60
Radio Influence Voltage (RIV)			
100 $\mu$ V Maximum (kV)	9.4	16.4	23.0

## 3.1.3. Current

Rating	NOVA15	NOVA27	NOVA38
Continuous Current (A)	630/800	630/800	630/800
Load Break Capability (A)	630/800	630/800	630/800
Symmetrical Interrupting Current kA, RMS	12.5 (16)	12.5 (16)	12.5
Symmetrical Three Second Current kA, RMS	12.5 (16)	12.5 (16)	12.5
Symmetrical Making Current kA, RMS	12.5 (16)	12.5 (16)	12.5
Asymmetric Making Current kA, RMS	20 (25.6)	20 (25.6)	20
Asymmetric Peak Making Current kA, RMS	31 (40)	31 (40)	31
Overload Capability (A)			
630A (125% - 8Hrs.)	787	787	787
800A	NO OVERLOAD RATING		
Magnetizing Current (A)	22	22	22
Line Charging Current (A)	2	5	5
Cable Charging Current (A)	10	25	40

NOTE: Values in ( ) applicable for 16 kA Interrupting Rating

## 3.1.4. Mechanical Life

Rating	NOVA15	NOVA27	NOVA38
Minimum Operations	10,000	10,000	10,000

## 3.1.5. Frequency

Rating	NOVA15	NOVA27	NOVA38
Rated Frequency (Hz)	50/60	50/60	50/60

## 3.1.6. Duty Cycle

Duty per ANSI C37.60

Percent of Maximum Circuit Interrupting Rating	Minimum X/R Ratio	Number of Unit Operations at 12.5 kA	Number of Unit Operations at 16.0 kA
15-20	4	88	44
45-55	8	112	56
90-100	15	32	16
		<b>Total 232</b>	<b>Total 116</b>

### 3.1.7. Creepage

Rating	NOVA15	NOVA27	NOVA38
Creepage Distances	mm (in)	mm (in)	mm (in)
Terminal to Terminal	1052 (41.5)	1052 (41.5)	1052 (41.5)
Lower Terminal to Ground	673 (26.5)	760 (30.0)	950 (37.5)

## 4. Construction

- 4.1. The recloser manufacturer shall have no less than 10 years experience in the design and fabrication of reclosers.
- 4.2. The NOVA recloser system shall consist of one NOVA recloser with one Form 6 or Form 4D recloser control.
- 4.3. The recloser cabinet shall be constructed of painted aluminum or painted stainless steel and equipped with lifting lugs.
  - 4.3.1. The recloser cabinet shall consist of a mechanism housing that contains a magnetic actuator, which provides linear trip-and-close motion to three encapsulated vacuum interrupter modules
  - 4.3.2. The mechanism cabinet shall be equipped with heaters to minimize condensation and corrosion in the mechanism cabinet.
  - 4.3.3. The mechanism cabinet shall be designed to permit access for service.
- 4.4. The recloser shall be electrically trip free. Any applied close signal shall not inhibit the recloser from tripping on the programmed time-current curve.
- 4.5. The reclosers shall utilize environmentally friendly cycloaliphatic epoxy as the dielectric insulating medium. The use of SF<sub>6</sub> gas or oil for insulation or interruption is prohibited. Foam or Polyurethane insulation systems are not allowed.
  - 4.5.1. There shall be no porcelain on the external portion of the recloser.
- 4.6. A sensing bushing current transformer, 1000:1 ratio, for use with the recloser control, shall be an integral part of the recloser.
- 4.7. A 4-digit mechanical counter shall be provided on the bottom panel of the recloser housing.
- 4.8. A manual operating handle shall be provided under the sleet hood.
- 4.9. Pulling the yellow handle down when in the closed position shall result in a manual opening operation. With the handle in the OPEN position, the recloser is in a "lock-out" position and shall not accept an electrical close signal from the control.
- 4.10. Returning the yellow operating handle to the CLOSED position shall not close the recloser. The yellow operating handle must be returned to the CLOSED position for the recloser to respond to a close signal from the Form 6 or Form 4D control. All close operations shall be initiated by the control.
- 4.11. A red/green (closed/open) indicator flag shall be visible on the bottom panel of the recloser housing to provide contact position indication.
- 4.12. The recloser shall have an operating temperature range of -40 °C to +55 °C.

## 5. Mechanism

- 5.1. The recloser mechanism shall consist of a bi-stable magnetic actuator capable of fast opening and closing operations with no recharging delay. Bi-stable means that no operating power is required to hold the unit open or closed.
- 5.2. Close and trip capacitors shall be used to store the necessary energy for operating the magnetic actuator.
- 5.3. The recloser mechanism shall have provisions for operating from the following sources:
  - 5.3.1. 120 or 240 Vac auxiliary power
  - 5.3.2. 48, 125, or 250 Vdc auxiliary power
  - 5.3.3. 48 Vdc control power
- 5.4. When operating from auxiliary power, the recloser shall permit for at least one open and close operation after loss of primary control voltage for dead line operation. The battery must be in good condition and not off-charge for an extended period of time.
- 5.5. When operating from control power, the recloser shall permit for at least one four-shot sequence of operations after loss of primary control voltage for dead line operation. The battery must be in good condition and not off-charge for an extended period of time.
- 5.6. The recloser shall contain no high voltage closing coils. The recloser shall be capable of operating fully from either 120/240 Vac or 48/125/250 Vdc and 24 Vdc internal control battery.
- 5.7. The recloser mechanism shall be 3-phase gang operated.

## 6. Solid Dielectric Insulation

- 6.1. Cycloaliphatic epoxy shall be utilized as the dielectric insulating medium and be highly resistant to ozone, oxygen, moisture, contamination and ultraviolet light. No coatings or UV protective covers are acceptable.
  - 6.1.1. The cycloaliphatic epoxy shall provide high resistance to damage.
  - 6.1.2. The cycloaliphatic epoxy shall provide complete encapsulation of the internal vacuum interrupter. The encapsulation shall also be completely bonded to the source and load side bushing terminals.
- 6.2. The recloser bushings shall be designed utilizing alternating minor and major skirts to increase creepage distance.

## 7. Vacuum Interrupters

- 7.1. The recloser shall make use of Kyle Axial-Magnetic vacuum interrupters to ensure high fault-interrupting capability, provide fast low energy arc interruption and minimize heat generation.
  - 7.1.1. Current interruption shall occur in vacuum interrupters, providing minimum and even contact wear, long life and maximum reliability and quality.

## 8. Current Transformers (CTs)

- 8.1. The current transformers shall be an integral part of the cycloaliphatic epoxy bushings. The CTs shall be a 1000:1 sensing CT used for all overcurrent protection, general metering and event history.
- 8.2. The current transformers shall be protected by a CT clamping circuit internal to the recloser to minimize the possibility of hazardous voltage entering the control compartment or exposed due to the control cable being disconnected.

## 9. Mounting Frame

- 9.1. When specified, the recloser shall be provided with an optional single pole-mount frame. The frame shall have options for supports to be mounted either above or below the frame, and for mounting on either a wooden or concrete pole.
- 9.2. When specified, the recloser shall be provided with an optional substation mounting frame.

## 10. Optional Features

### 10.1. Internal Voltage Sensors

- 10.1.1. When specified, the recloser shall include internal voltage sensors to provide source side voltage sensing.
- 10.1.2. The internal voltage sensors shall utilize a high-voltage resistor within each interrupter module with source-side connections.
- 10.1.3. The internal voltage sensors and recloser control shall support a magnitude accuracy of 2% or better and a phase degree accuracy of  $\pm 1.5^\circ$ .
- 10.1.4. The internal voltage sensing option shall be compatible with Eaton's Cooper Power series controls.

### 10.2. Optional Recloser Accessories

10.2.1. When specified, items checked below shall be included in the proposal:

- Source side internal voltage sensing, NOVA15, NOVA27 or NOVA38
- Bushing terminals, selectable from the following:
  - Eye-bolt bushing terminals
  - NEMA 2-hole flat pad bushing terminals
  - NEMA 4-hole flat pad bushing terminals
- Pole-mounting hanger to include the following:
  - Source side arrester mounting provisions
  - Load side arrester mounting provisions
  - Source side potential transformer mounting provision
  - Load side potential transformer mounting provision
  - Load side external voltage sensor mounting provisions
  - NOVA recloser factory-installed in pole mounting hanger
- Substation mounting frame
- Three-stage auxiliary switch
- Bushing terminal animal guards

## 11. Finish Performance Requirements

- 11.1. The recloser tank shall be painted Munsell Notation 5BG7.0/0.4, ANSI 70 Gray.
- 11.2. The coating system shall meet or exceed IEEE Std C57.12.31™-2010 standard coating system requirements for pole-mount equipment.
- 11.3. Certified test data shall be furnished upon request.

## 12. Recloser Production Testing

- 12.1. The recloser shall be subjected to the following production tests:
  - 12.1.1. Functional test to assure unit is operating.
  - 12.1.2. Electrical TCC trip test.
  - 12.1.3. High-potential withstand test to determine dielectric strength of the unit.
  - 12.1.4. Partial discharge test to verify integrity of the insulation.
  - 12.1.5. Contact resistance test.

## 13. Certified Test Data

- 13.1. Certified test data shall be available upon request for the following:
  - 13.1.1. Interrupter ratings per IEEE Std C37.60™-2003 standard
  - 13.1.2. Load current, line charging and cable charging interruptions per IEEE Std C37.60™ -2003 standard
  - 13.1.3. Dielectric ratings (BIL, Dry and Wet withstand, and Partial Discharge) per IEEE Std C37.60™ -2003 standard
  - 13.1.4. Continuous current heat run per IEEE Std C37.60™ -2003 standard
  - 13.1.5. Mechanical Life per IEEE Std C37.60™ -2003 standard

## 14. Approved Recloser Manufacturers

- 14.1. Eaton

## 15. Approved Recloser Control Manufacturers

- 15.1. Eaton

## 16. Service

- 16.1. The manufacturer of the recloser shall have regional service centers located within two hours flight time of all contiguous 48 states.
- 16.2. Service personnel shall be factory trained in commissioning and routine service of quoted reclosers.