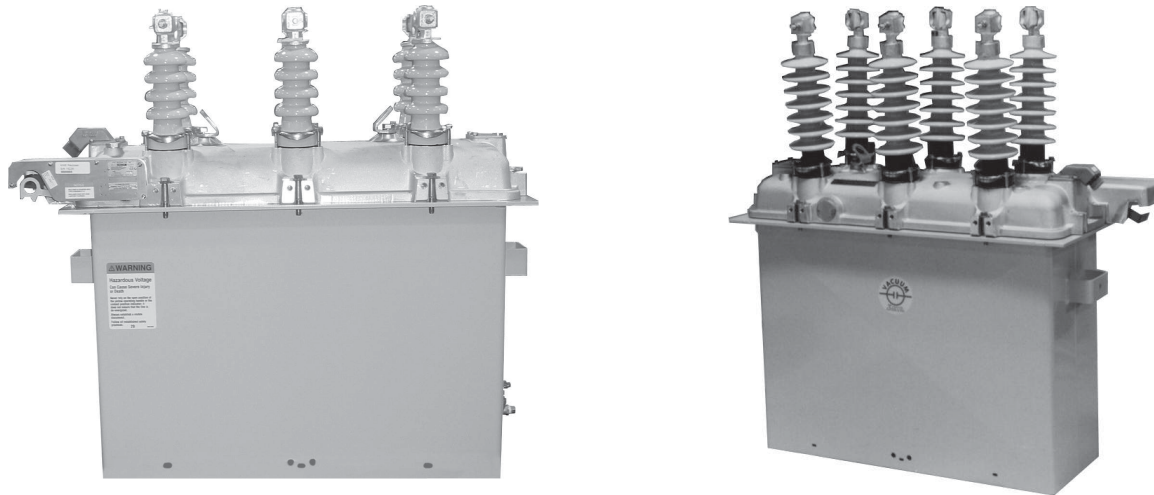


Types VWE, VWVE37, VWVE38X, WE, WVE27, and WVE38X, three-phase electronically controlled reclosers



General

The W-group electronically controlled, three-phase automatic circuit reclosers from Eaton's Cooper Power™ series provide reliable, economical overcurrent protection for distribution circuits rated through 38 kV. Compact in design, these reclosers can be easily installed on poles or in substations. The six reclosers in this group provide service-proven dependability and long operating life.

Commanded by an Eaton electronic recloser control, these automatic circuit reclosers offer superior coordination and application capability unmatched by other system protection apparatus. Their broad application capabilities permit the user to select exactly the right recloser for the protection required.

Recloser settings are configured by the electronic control with accurate, preset tripping characteristics and reclosing times. Trip times are precise and unvaried, enabling close coordination with other protective devices on the system. When system requirements change, program settings are easily altered with no sacrifice of accuracy or consistency.

When needed, application expertise backed by world-wide recloser application experience is available. Knowledgeable design capability, based on more than fifty years of recloser manufacturing experience, has made Eaton the industry leader. Progressive product development programs, using the latest technologies, have resulted in the production of modern, efficient reclosers.

W-group reclosers, like all reclosers from Eaton, are designed and manufactured in accordance with ANSI® C37.60 standard.

The six distinct reclosers in the W-group – Types VWE, VWVE27, VWVE38X, WE, WVE27, and WVE38X – offer a broad selection of ratings to fit varied system needs. Recloser and control accessories enable further tailoring of the protective program to achieve maximum system operating flexibility. Mounting equipment, available for pole or substation, eases installation of the recloser wherever system requirements demand.

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Ratings and characteristic features

Three-phase protection on systems rated 2.4 through 14.4 kV is provided by Types WE or WVE reclosers. Types WVE27 or VWVE27 can be applied on systems rated through 24.9 kV. Higher-voltage system protection (24.9 through 34.5 kV) is provided by Types WVE38X and VWVE38X reclosers. A ratings summary for this recloser group is shown in Table 1. For ratings and basic application information for other reclosers, refer to Catalog Section CA280002EN.

Operation

Sensing current transformers, mounted in the recloser, supply fault-sensing information to the electronic control. Tripping and closing signals from the control energize the operating circuits in the recloser. Due to a single CT ratio for all ratings, minimum-trip values of the electronic control are independent of the continuous-current and interrupting ratings of the recloser. Flexibility in coordination with other protective devices is provided by dual time-current characteristics from a choice of available curves, minimum trip values, reclosing and resetting time settings, and a selection of accessories.

Closing solenoid

Contact-closing energy is provided by a closing solenoid that also stores energy in the trip mechanism. High-voltage closing solenoids are connected to the system on the source-side of the recloser. Selection of solenoid voltage rating is based on the system phase-to-phase operating voltage.

Low-voltage closing solenoids can be employed. Auxiliary voltage must then be supplied to the recloser.

Oil or vacuum interruption

A choice of interrupting medium is available. Types WE, WVE27, and WVE38X reclosers use oil as the arc interrupting medium. Movable bridge-type contacts provide two breaks in series on each phase. Separate self-generating interrupter chambers at each of the two breaks provide for effective interruption of all currents, from minimum load to rated maximum fault.

Vacuum interruption, used in Types VWE, VWVE27, and VWVE38X, offers considerably longer duty cycles and long contact life. A single break on each phase is accomplished by separating contacts inside the vacuum interrupter. All arcing is contained within the vacuum envelope. Low-energy arc interruption in a vacuum results in far less shock and contact wear, extending the recloser mechanism life.

Because interruption within the vacuum envelope does not add contaminants to the insulating oil, recloser maintenance is minimized and intervals between oil changes can generally be extended.

Surge protection

Best operating results are achieved if reclosers are protected with surge arresters. On line applications, arrester protection is recommended on both sides of the recloser. (If protection is on one side only, it should be on the source-side.) In substations, arresters should be on the load-side. Eaton's Cooper Power series distribution-class arresters provide excellent protection and are available with mounting brackets to fit our reclosers. Refer to Catalog Sections CA235005EN and CA235018EN.

Ordering information

A complete electronically controlled recloser installation includes these items:

- Recloser and accessories
- Electronic control and accessories
- Interconnecting control cable
- Recloser mounting equipment (if required)

The recloser, control, and interconnecting cables are ordered and priced separately. Accessories for the recloser and the control are ordered and priced separately.

To order a recloser, electronic control, and control cable:

1. Use Tables 2 and 3 to construct a catalog number that describes the required recloser.
2. From Tables 4-15, specify the catalog numbers that describe the required recloser accessories, mounting equipment, and factory assemblies.
3. Order the required electronic recloser control (control is ordered separately from recloser).

Table 1. Summary of Ratings

| Nominal Voltage (kV) | Maximum Continuous Current (amps) | Maximum Interrupting Rating at Nominal | Interrupting Medium | Recloser Type |
|----------------------|-----------------------------------|--|---------------------|---------------|
| 14.4 | 560* | 10000 | oil | WE |
| 14.4 | 560* | 12000 | vacuum | VWE |
| 24.9 | 560* | 8000 | oil | VWE27 |
| 24.9 | 560* | 12000 | vacuum | VWVE27 |
| 34.5 | 560* | 8000 | oil | WVE38X |
| 34.5 | 560* | 12000 | vacuum | VWVE38X |

* Can be increased to 800 amps, continuous, with an 800-amp continuous current accessory.

Table 2. Basic Recloser Catalog Numbers

| Recloser Type | Catalog Number |
|---------------|----------------|
| WE | KWE* |
| VWE | KVWE* |
| VWE27 | KVWE27* |
| WVE38X | KWVEP* |
| VWVE27 | KVWVE27* |
| VWVE38X | KVWVEP* |

* Replace asterisk in catalog number with closing coil code number from Table 3.

Table 3. Closing Solenoid Coil Voltage Code Numbers

| Phase-to-Phase Closing Coil Operating Voltages $\pm 15\%$ (kV) | Code No. |
|--|----------|
| 2.4 | 1 |
| 3.3 | 10 |
| 4.16-4.8 | 2 |
| 6.0 | 6 |
| 7.2-8.32 | 3 |
| 11.0 | 9 |
| 12.0-13.2 | 4 |
| 14.4 | 5 |
| 17.0 | 12 |
| 20.0 | 11 |
| 23.0-24.9 | 13 |
| 34.5 | 14 |
| Low-Voltage Closing Coils Operating Voltage (Vdc) | |
| 48 | 16* |
| 125 | 7* |
| 250 | 8* |

* Requires either low-voltage DC closing accessory (KA631R) or low-voltage AC closing accessory (KA742R). Order separately.

Table 4. Multi-Ratio Bushing Current-Sensing Transformers Factory-Installed on Load-Side Bushings 2,4, and 6*

| Description | Catalog Number |
|---|---------------------------------|
| Types WE and VWE Three 600:5 BCTs on 13 in. creepage bushings Three 600:5 BCTs on 17 in. creepage bushings Three 1200:5 BCTs on 13 in. creepage bushings | KA804W3 KA110W3** KA827W3 |
| Types VWE27 and VWVE27 Three 600:5 BCTs on 26-1/2 in. creepage bushings Three 1200:5 BCTs on 26-1/2 in. creepage bushings | KA14WV3 KA24WVE |
| Types WVE38X and VWVE38X Three 600:5 BCTs on 26-1/2 in. creepage bushings Three 1200:5 BCTs on 26-1/2 in. creepage bushings | KA82WV3 KA83WV3 |

Note: When ordering, specify load- or source-side mounting of BCTs.

* To specify accessory BCTs on source-side bushings, include the digit 9 after the A in the catalog number and specify source-side bushings in the order description.

** Catalog number includes the extra creepage bushing.

Table 5. 600:5 Multi-Ratio Bushing Current Transformers for Field Installation

| Description | Catalog Number |
|---|----------------|
| Slip-on bushing current transformer kit: one BCT per kit | KA712L2 |
| Set of 3 BCTs | KA712L2-3 |
| Wiring kit for KA712L2-3 (one wiring kit required per recloser) | KA895R7* |

* Includes 7 ft. cable. If longer cable is required, specify length on order.

Table 6. Hardware (Service-Related)

| Description | Catalog Number |
|---|------------------|
| Manual closing tool: de-energized recloser; factory installed WE, VWE, WVE27, and VWVE27 WVE38X and VWVE38X | KA476R KA66WV |
| T-handle manual closing tool; de-energized recloser | KA90R2 |
| Oil-level sight gauge; factory-installed | KA161W |

Table 7. Low-Voltage Closing and Transfer Switch; Factory-Installed

| Description | Catalog Number |
|--|----------------|
| Three-state auxiliary switch with six independent contacts | KA369R3 |
| Low-voltage DC closing, requires that recloser be ordered with DC closing coil | |
| 48 Vdc | |
| Types WE, WVE27, WVE38X | KA631R12 |
| Types VWE, VWVE27, VWVE38X | KA631R14 |
| 125 Vdc | |
| Types WE, WVE27, VWVE38X | KA631R3 |
| Types VWE, VWVE27, VWVE38X | KA631R7 |
| 250 Vdc | |
| Types WE, WVE27, WVE38X | KA631R4 |
| Types VWE, VWVE27, VWVE38X | KA631R8 |
| Low-voltage AC closing, requires that recloser be ordered with DC closing coil | |
| 120 Vac | |
| Types WE, WVE27, WVE38X | KA742R3 |
| Types VWE, VWVE27, VWVE38X | KA742R7 |
| 240 Vac | |
| Types WE, WVE27, WVE38X | KA742R4 |
| Types VWE, VWVE27, VWVE38X | KA742R8 |

Table 8. Bushings and Terminals; Factory-Installed (set of six)

| Description | Catalog Number |
|---|----------------|
| 17 in. creepage standard-length bushings | |
| Types WE and VWE | KA25W |
| Flat-pad terminals, two-hole | |
| Types WE and VWE with 13 in. or 17 in. creepage, standard or CT-length bushings | KA82W1 |
| Types WVE27, WVE38X, VWVE27, VWVE38X with 26-1/2 in. creepage, standard-length bushings | KA62RV3 |
| Types WVE27, WVE38X, VWVE27, VWVE38X with 26-1/2 in. creepage, CT-length bushings | KA62RV4 |
| Flat-pad terminals, four-hole | |
| Types WE and VWE with 13 in. or 17 in. creepage, standard or CT-length bushings | KA156W1 |
| Types WVE27 and VWVE27 with 26-1/2 in. creepage, standard-length bushings | KA61RV3 |
| Types WVE27 and VWVE27 with 26-1/2 in. creepage CT-length bushings | KA61RV4 |
| Stud terminals, 1-1/8-12 UNF-2A | |
| Types WE, VWE with 13 in. or 17 in. creepage, standard or CT-length bushings | KA800W1 |
| Types WVE27, WVE38X, VWVE27, VWVE38X with 26-1/2 in. creepage, standard-length bushings | KA59RV3 |
| Types WVE27, WVE38X, VWVE27, VWVE38X with 26-1/2 in. creepage, CT-length bushings | KA59RV4 |

Table 9. Mounting Equipment

| Description | Catalog Number | Shipping Weight (lb) |
|--|----------------|----------------------|
| Substation mounting equipment | | |
| Basic mounting frame | KA89WV1 | 326 |
| Mounting brackets | | |
| Single-size control and/or meter trough on KA89WV1 frame | KA89WV4 | 11 |
| Double-size control and/or meter trough on KA89WV1 frame | KA89WV5 | 22 |
| Single- or double-size control on load-side of KA89WV1 frame | KA89WV9 | 17 |
| Removable tank-lifting windlass for KA89WV1 frame | KA89WV2 | 34 |
| Pole-mounting equipment | | |
| Frame with load- and source-side arrester brackets | KA146W6 | 162 |
| Single-pole mounting hanger | KA146W5* | 122 |
| End-mounted pole hanger | KA706R3 | 126 |
| Surge arrester mounting brackets | | |
| Inboard (source) | KA126H3 | 20 |
| Outboard (load) | KA847W | 20 |
| Tank-lifting windlass for single-pole hanger | KA146W2 | 50 |

* Requires KA883R BCT conduit assembly when recloser has source-side BCTs.

Table 10. Continuous Current Accessory; Factory-Installed

| Description | Catalog Number |
|--|----------------|
| 800 amp continuous current capability on recloser without accessory BCTs | |
| Type WE, eyebolt terminals, 4/0-1000 MCM | KA59WE2 |
| Type WE, stud terminals, 1-1/8-12 UNF-2A | KA59WE1 |
| Type VWE, eyebolt terminals, 4/0-1000 MCM | KRW63V2 |
| Type VWE, stud terminals, 1-1/8-12 UNF-2A | KRW63V1 |
| Types WVE27, WVE38X, eyebolt terminals, 1/0-750 MCM | KA74WE2 |
| Types WVE27, WVE38X, stud terminals, 1-1/8-12 UNF-2A | KA74WE1 |
| Type VWVE27, eyebolt terminals | KRW64V2 |
| Type VWVE27, stud terminals, 1-1/8-12 UNF-2A | KRW64V1 |
| Type VWVE38X, eyebolt terminals, 1/0-750 MCM | KRW59V2 |
| Type VWVE38X, stud terminals, 1-1/8-12 UNF-2A | KRW59V1 |
| 800 amp continuous current capability on recloser equipped with accessory BCTs | |
| Type WE, eyebolt terminals, 4/0-1000 MCM | KA59WE2 |
| Type WE, stud terminals, 1-1/8-12 UNF-2A | KA59WE1 |
| Type VWE, eyebolt terminals, 4/0-1000 MCM | KRW63V2 |
| Type VWE, stud terminals, 1-1/8-12 UNF-2A | KRW63V1 |
| Types WVE27 and WVE38X, eyebolt terminals, 1/0-750 MCM | KA74WE4 |
| Types WVE27 and WVE38X, stud terminals 1-1/8-12 UNF-2A | KA74WE3 |
| Type VWVE27, eyebolt terminals, 1/0-750 MCM | KRW64V4 |
| Type VWVE27, stud terminals, 1-1/8-12 UNF-2A | KRW64V3 |
| Type VWVE38X, eyebolt terminals, 1/0-750 MCM | KRW59V4 |
| Type VWVE38X, stud terminals, 1-1/8-12 UNF-2A | KRW59V3 |

Factory assemblies and kits

- Reclosers can be factory-assembled in mounting frames.
- External meters can be factory-wired.
- Wiring kits are available for field installation of inter-accessory wiring.

Table 11. Factory Assembly of Recloser and Accessories in KA89WV1 Substation Mounting Frame*

| Description | Catalog Number |
|--|----------------|
| Recloser and electronic control on frame; no accessories | KA800WE |

* Factory assembly only. Recloser, control, accessories, and mounting frame must be ordered separately.

Table 12. Factory Assembly of Recloser in Mounting Frames*

| Description | Catalog Number |
|--|----------------|
| Recloser in KA146W5 only; with or without BCTs | KA881R2 |
| Recloser in KA706R3; with or without BCTs | KA881R1 |

* Covers factory assembly only. Recloser and mounting must be specified separately.

Table 13. Factory Assembly of Conduit and Wiring*

| Description | Catalog Number |
|---|----------------|
| Factory installed BCT conduit for use with KA146W5 frame when BCTs are mounted on the pole-side | KA883R2 |

* Covers factory assembly only; recloser, accessories, and mounting must be specified separately.

Table 14. Conduit and Wiring Kits for Field Installation*

| Description | Catalog Number |
|---|----------------|
| Recloser in KA146W5 single-pole mounting frame Conduit kit for BCTs when recloser is to be mounted with BCTs on pole-side | KA883R1 |

* A kit includes all conduit and wire necessary to connect recloser and accessories specified. Kits are shipped disassembled.

Table 15. Training-Related; Equipment Maintenance and Operation DVDs

| Description | Catalog Number |
|---|----------------|
| General Maintenance and Inspection Procedures for Reclosers DVD (28 min.) | KSPV1A |
| Mechanical Operation, Service and Testing of Three-Phase Electronic Reclosers DVD (27 min.) | KSPV4A |
| Type MET Electronic Recloser Control Tester Operating Instructions and Testing Procedures DVD (25 min.) | KSPV7A |

Features and detailed description

W-group electronically controlled, three-phase oil reclosers protect systems operating through 34.5 kV. Refer to **Ratings and Specifications** section. These ratings, and the wide range of programmable settings provided by the electronic control, permit meeting a variety of application requirements.

Basically the same in operation as three-phase hydraulically controlled reclosers (Catalog Section CA280005EN), these reclosers possess the added operating flexibility of electronic control.

A choice of oil or vacuum as the arc interrupting medium is available:

- Types WE, WVE27, and WVE38X reclosers use oil (Figure 1). Bridge-type contacts provide two current breaks in series for each phase. Each current break employs a separate, vented, self-generating, arc-interrupting chamber for effective interruption of the recloser's full current range.
- Vacuum interruption is utilized by Types VWE, VWVE27, and VWVE38X reclosers (Figure 2). A single break on each phase is accomplished by separating a set of contacts within the vacuum chamber. Low-energy arc interruption in a vacuum extends the duty cycle and results in less shock and demonstration, extending recloser mechanism life.

Closing force is supplied by a closing solenoid, which is energized by line-to-line connections inside the recloser. This solenoid closes the main contacts of all phases while simultaneously charging the opening springs in preparation for a tripping operation. The control signals tripping and closing.

Fault currents are sensed by three 1000:1 ratio sensing current transformers, located in the recloser. These CTs provide a continuous measurement of line current, monitored by the electronic control. When current level exceeds the programmed minimum trip level, the magnitude of the overcurrent is integrated with time, using a programmed time-current curve characteristic. The control then energizes the trip coil in the recloser. This releases the tripping springs, opening the main contacts of all three phases. If reclosing is programmed, the control then activates the closing mechanism. The reclosers are self-contained; they require no external power source (except as required by certain accessories).

The electronic recloser control provides simple determination of phase- and ground-trip sequences and operations-to-lockout. Minimum phase-and ground-trip values, timing of tripping, and reclosing and resetting timing are adjustable at the control, without de-energizing the recloser.

Application flexibility is enhanced by dual-timing characteristics from a choice of time-current curves for phase and ground tripping levels.

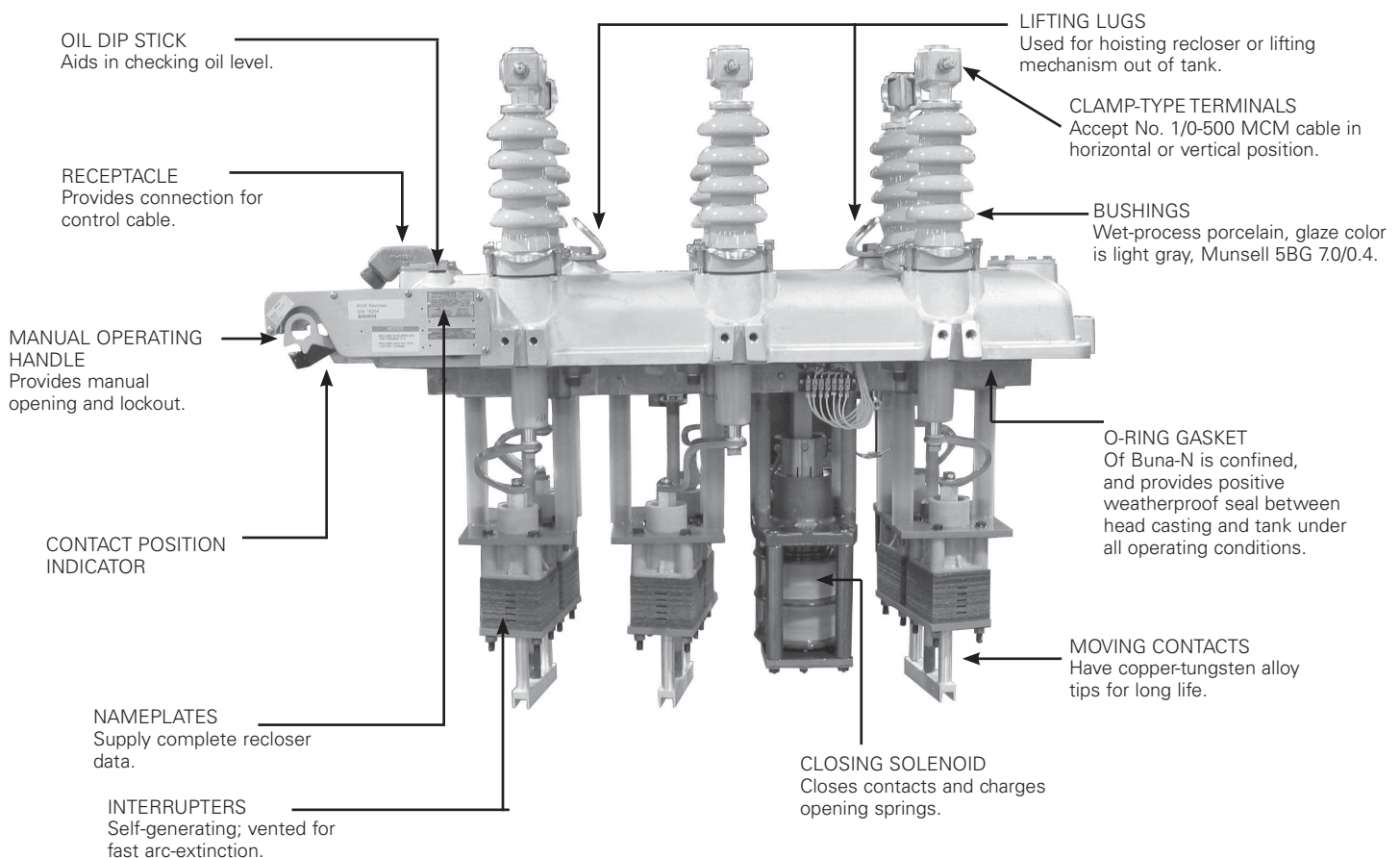


Figure 1. Untanked Type WE recloser illustrates simplified mechanism resulting from electronic control. Construction of Types WVE27, WVE38X, VWE, VWVE27, and VWVE38X is similar except for the vacuum interrupters on VWE, VWVE27, and VWVE38X

Construction

Recloser

Like other Eaton reclosers, these are designed for long service life and minimum maintenance. Heads are aluminum castings. Tanks are heavy-gauge steel, finished with polyester powder paint (Munsell 5BG 7.0/0.4; light gray is the standard color).

An "O"-ring gasket confined in a groove provides an oil-tight and weatherproof seal between the head and tank. A 1/2 in. brass oil-sampling-and-drain valve, located near the bottom of the tank, is standard.

Bolts through the head casting support the recloser, securing it to the mounting. The complete internal mechanism is suspended from the head casting, allowing tank removal without disturbing the mechanism and head assembly. Lowering the tank with a wire rope winch (available as an accessory) permits easy access to the mechanism.

Insulating supports, from which the three interrupters are suspended, are made of filament-wound glass epoxy for high electrical and mechanical strength, and moisture resistance.

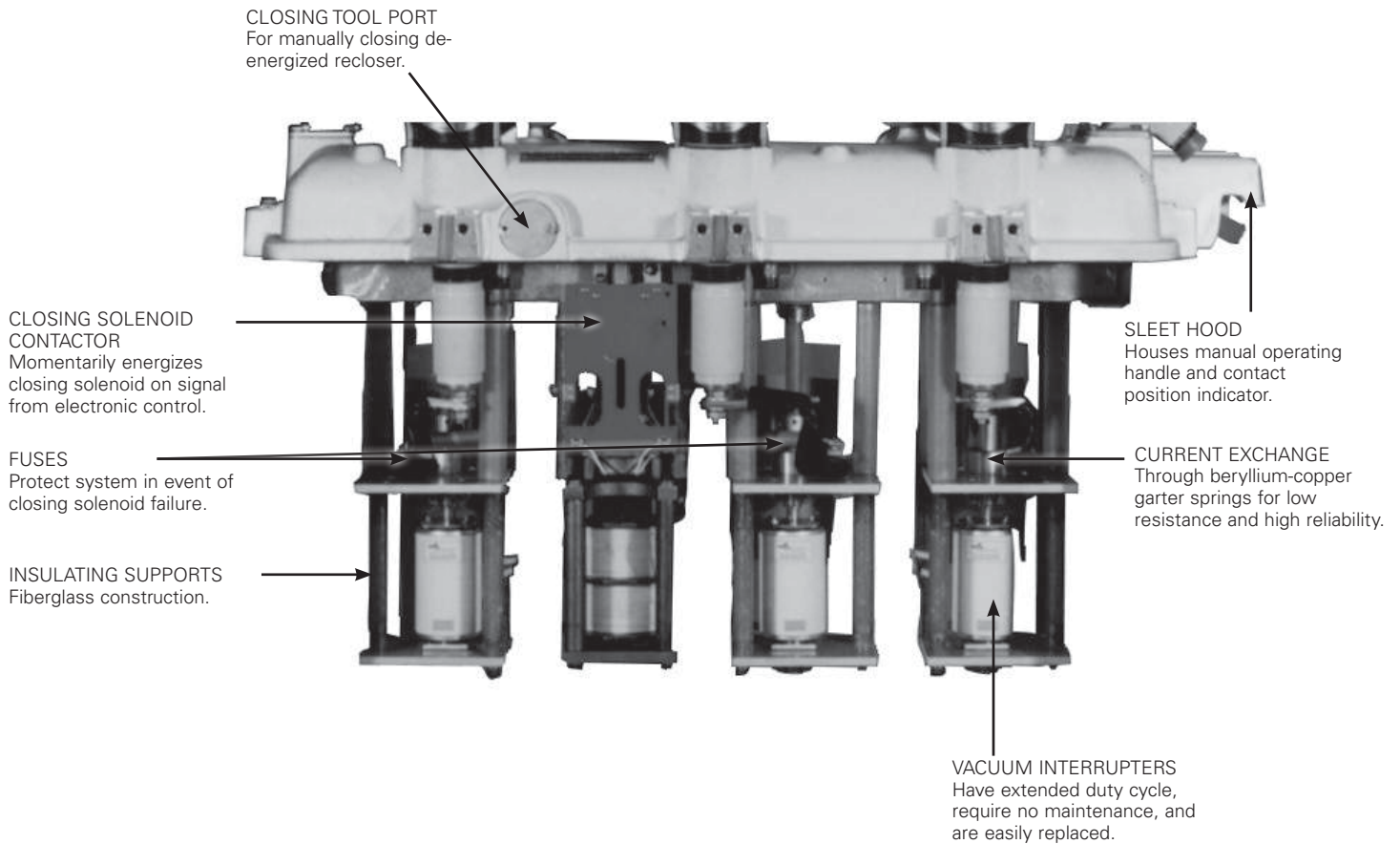


Figure 2. Untanked Type VWVE27 vacuum recloser (shown from closing contractor side)

Oil interrupters

Types WE, WVE27, and WVE38X use oil as the arc-interrupting medium.

Fast arc interruption (down to 2 1/2 cycles clearing) is furnished by bridge-type contacts (Figure 3), providing two current breaks in series per phase. The bayonet-type, silver-plated, tungsten-alloy moving contacts resist erosion and provide good conductance. The stationary-contact assemblies are tulip-type clusters of silver-plated contact fingers held by garter springs. The contacts are self-cleaning due to the wiping action of opening and closing.

Each current break has a self-generating-type arc interrupter structure including a series of vented chambers. As the contacts open, the arc generates gas pressure in the upper chamber, which blasts oil across the arc and out through the vents. As a result, arc extinction is fast, and arc energy levels do not increase as quickly at higher fault-current levels.

Vacuum interrupters

Types VWE, VWVE27, and VWVE38X use vacuum as the interrupting medium.

Vacuum interrupters (Figure 4) provide fast, low-energy arc interruption with long contact and interrupter life, low mechanical stress, and maximum operating safety. With arc interruption taking place in a vacuum, contact and interrupter life are several times greater than with interruption in oil, virtually eliminating interrupter maintenance. Because of the shorter contact stroke, mechanical stress and wear on the mechanism is substantially reduced.

Eaton's Cooper Power series vacuum interrupters are designed with a metal and ceramic housing for maximum strength and long-term vacuum integrity. The high-alumina ceramic has more than five times the strength of glass, permits a higher processing temperature to develop maximum purity of the assembly, and is impervious to helium penetration to sustain the vacuum level. Metal end-closures and the arcing chambers are of high-purity alloy to minimize contamination.

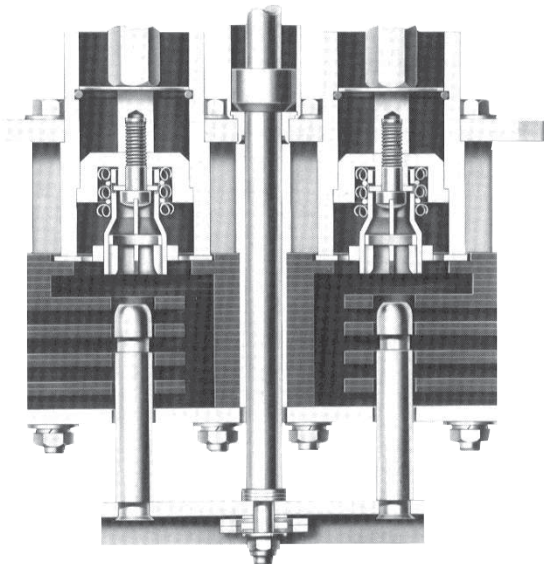


Figure 3. Cross-section of a typical self-generating interrupter used in oil interrupting reclosers

Enclosed in the interrupter is a stationary and a moving contact assembly. The moving contact has a travel of approximately one-half inch, its shaft passing through a flexible bellows that maintains vacuum integrity. Contacts consist of a special non-welding alloy.

Because the smallest amount of internal contamination can significantly shorten the life of a vacuum interrupter, a clean-room facility is used for interrupter production. Special care is taken to avoid even minute contamination from any source, including dust particles, machining oils, or human body salts.

Recloser operation

Tripping

When current flow exceeds the minimum-trip value needed to satisfy the programmed timing characteristics, the control energizes a trip solenoid in the recloser. This solenoid releases a latch, and a spring-loaded toggle assembly opens the recloser contacts.



Figure 4. Cross section of a typical vacuum interrupter used in vacuum interrupting reclosers

Closing

Closing force, and the force to charge the opening springs, is supplied by a high-voltage closing solenoid connected phase-to-phase (Figure 5). When the recloser contacts are closed, the solenoid plunger is latched in the down position. This latch is tripped simultaneously with the release of the recloser opening springs, and the solenoid plunger moves upward for a closing operation.

At the programmed reclosing time, the electronic control energizes a rotary solenoid in the recloser. Movement of the rotary solenoid allows a high-voltage contactor to close momentarily, connecting the closing solenoid to the line. The plunger is pulled into the solenoid closing the recloser contacts and charging the opening springs. Plunger movement also opens the high-voltage contactor (Figure 6), de-energizing the closing solenoid. Closing operation of the recloser mechanism activates a switch (b contact) in the recloser, disconnecting the rotary solenoid from the electronic control.

The closing solenoid is designed for repeated-momentary rather than continuous operation. If a malfunction of the solenoid plunger or the closing-coil contactor results in the closing solenoid energizing for an extended period, a closing-solenoid fuse within the recloser opens the high-voltage circuit, protecting the closing solenoid from the thermal damage.

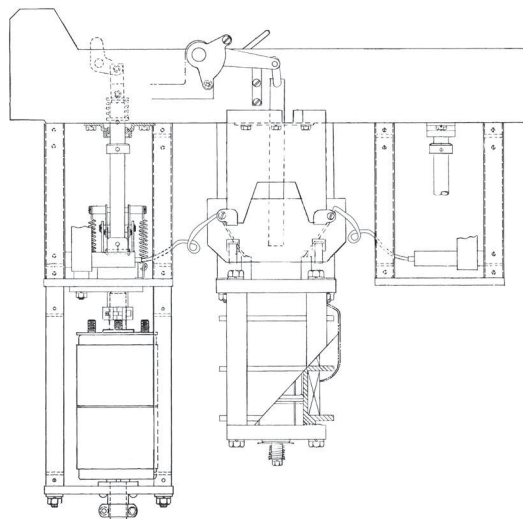


Figure 6. KA1143R double break contactor, applicable to reclosers with potential coils rated above 30 kV

Manual operation

The recloser can be manually tripped at any time by lowering the yellow manual operating handle under the sleet hood. With the handle down, the control cannot close the recloser.

Raising the yellow handle on a recloser may or may not close the recloser pending the control type.

Raising the yellow handle on a recloser controlled with a Form 4C, FXB, Form 5, Form 4D, or Form 6 control will not close the recloser. Manual closing is accomplished by raising the yellow handle and then moving the manual control switch to the close position. The recloser will close if the recloser closing coil has the proper voltage applied to it.

Raising the yellow handle on a recloser controlled with a Form 3A control will close the recloser unless the control is in the lockout position. If the control is in the lockout position when the yellow handle is raised, manual closing is accomplished by moving the manual control switch to the close position. The recloser will close if the recloser closing coil has the proper voltage applied to it. Similarly, the recloser can be operated from the manual control switch on the electronic control panel, provided the manual operating handle is up. A red contact position indicator flag, adjacent to the manual operating handle, shows recloser contact position.

Current sensing

Three 1000:1-ratio current sensing transformers are provided with the recloser, supplying both phase and ground (zero-sequence) currents. They are connected to the control cabinet by means of a plug-in cable, which can be up to 125 ft. in length, thus permitting remote mounting of the control away from the recloser.

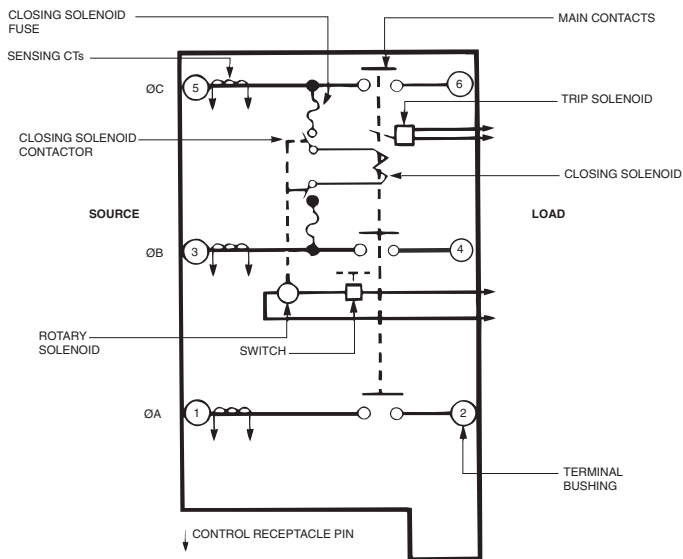


Figure 5. Diagram showing phase-to-phase connection of high-voltage closing solenoid

Electronic controls

Types VWE, VWVE27, VWVE38X, WE, WVE27, and WVE38X reclosers are controlled by electronic recloser controls. Eaton offers a choice of electronic controls to use in conjunction with these reclosers.



Figure 7. Form 6 recloser control

The Form 6 control, shown in Figure 7, provides maximum protective hardware design and simple interactive graphical interfaces for complete user customization. All standard control operating parameters including minimum trip levels, time-current curve selection, and sequences of recloser operation are keyboard programmable.

This control utilizes a powerful PC-based interface software to configure control settings, record metering information, and establish communication parameters. It also provides analysis tools that include fault locating, event recording, and oscillography functions.



Figure 8. Form 4D recloser control

The Form 4D control, shown in Figure 8, performs outstanding protection, metering, and communication functions. The control has fully modular communication (up to 2 serial or Ethernet interfaces) to meet expanded SCADA and automation applications.

The Form 4D recloser control provides phase and ground current sensing, and three-phase voltage sensing. The Form 4D control can compute power, energy, power factor, and power flow direction from these current and voltage inputs.

The standardized front panel of the Form 4D control can be used to program and interrogate the control, as well as to display metering and alarm information. Control parameters can also be programmed via personal computer using ProView® NXG interface software.

Temporary connection to the control can be made through the front panel USB port. The ProView NXG interface software includes the functionality to create and modify time-current curves (TCCs), and provides diagnostic information. The Form 4D control analysis tools include event recording, data profiling, and various metering capabilities.

Ratings and specifications

Table 16. Electrical Ratings

| Description | Types WE and VWE | Types WVE27 and VWVE27 | Type VWVE38X | Type WV38X |
|---|------------------|-----------------------------|--------------|------------|
| Nominal system voltage (kV) | 2.4-14.4 | 24.9 | 24.9-34.5 | 24.9-34.5 |
| Maximum rated voltage (kV) | 15.5 | 27 | 38 | 38 |
| Rated impulse withstand voltage (BIL) (kV crest) | 110 | VWVE27: 125** WVE27: 150 | 150 | 170 |
| 60 Hz withstand voltage (kV rms) Dry, one minute | 50 | 60 | 70 | 70 |
| Wet, ten seconds | 45 | 50 | 60 | 60 |
| Rated maximum continuous current (A) | 560* | 560* | 560* | 560* |
| Bushing creepage distance (in.) | 13 | 26-1/2 | 26-1/2 | 26-1/2 |

* Extendible to 800 amps with accessory.

** Extendible to 150 kV BIL with accessory on VWVE27 recloser only.

Table 17. Interrupting Ratings - Phase and Ground Trip

| Recloser Type | Nominal Voltage (kV) | Interrupting Rating (rms sym Amps) |
|---------------|----------------------|------------------------------------|
| WE | 4.8 | 12000 |
| | 8.32 | 10000 |
| | 14.4 | 10000 |
| VWE | 14.4 | 12000 |
| WVE27 | 24.9 | 8000 |
| VWVE27 | 24.9 | 12000 |
| WVE38X | 34.5 | 8000 |
| VWVE38X | 34.5 | 12000 |

Table 18. Duty Cycle

| Type | % of Interrupting Rating | Number of Unit Operations | Maximum Circuit X/R Value |
|---------|--------------------------|---------------------------|---------------------------|
| WE | 15-20 | 28 | 3 |
| | 45-55 | 20 | 7 |
| | 90-100 | 10 | 14 |
| | Total | 58 | |
| WVE27 | 15-20 | 28 | 4 |
| | 45-55 | 20 | 8 |
| | 90-100 | 10 | 15 |
| | Total | 58 | |
| WVE38X | 15-20 | 28 | 4 |
| | 45-55 | 20 | 8 |
| | 90-100 | 10 | 15 |
| | Total | 58 | |
| VWE | 15-20 | 88 | 4 |
| | 45-55 | 112 | 8 |
| | 90-100 | 32 | 15 |
| | Total | 232 | |
| VWVE27 | 15-20 | 88 | 4 |
| | 45-55 | 112 | 8 |
| | 90-100 | 32 | 15 |
| | Total | 232 | |
| VWVE38X | 15-20 | 88 | 4 |
| | 45-55 | 112 | 8 |
| | 90-100 | 32 | 15 |
| | Total | 232 | |

Dimensions and weights

Table 19. Dimensions of Recloser Without BCT Accessory*

| Type | Bushing Type | A (In.) | B (In.) | C (In.) | D (In.) |
|-----------------|---|------------------|------------------|------------------|------------------|
| WE VWE | 13 in. standard creepage or 17 in. extra creepage | 41-5/8 43-7/8 | 11-1/8 11-1/8 | 26-5/8 28-7/8 | 15 15 |
| WVE27 VWVE27 | 26-1/2 in. creepage | 47-3/4 50 | 11-3/4 11-3/4 | 26-5/8 28-7/8 | 21-1/8 21-1/8 |

* Dimensions configured to the nearest 1/8 in.

Table 20. Dimensions of Recloser With BCT Accessory*

| Type | Bushing Type | A (In.) | B (In.) | C (In.) | D (In.) |
|-----------------|---|------------------|------------------|------------------|------------------|
| WE VWE | 13 in. standard creepage or 17 in. extra creepage | 46-3/8 48-5/8 | 11-7/8 11-7/8 | 26-5/8 28-7/8 | 19-3/4 19-3/4 |
| WVE27 VWVE27 | 26-1/2 in. creepage | 52-1/2 54-3/4 | 12-5/8 12-5/8 | 26-5/8 28-7/8 | 25-7/8 25-7/8 |

* Dimensions configured to the nearest 1/8 in.

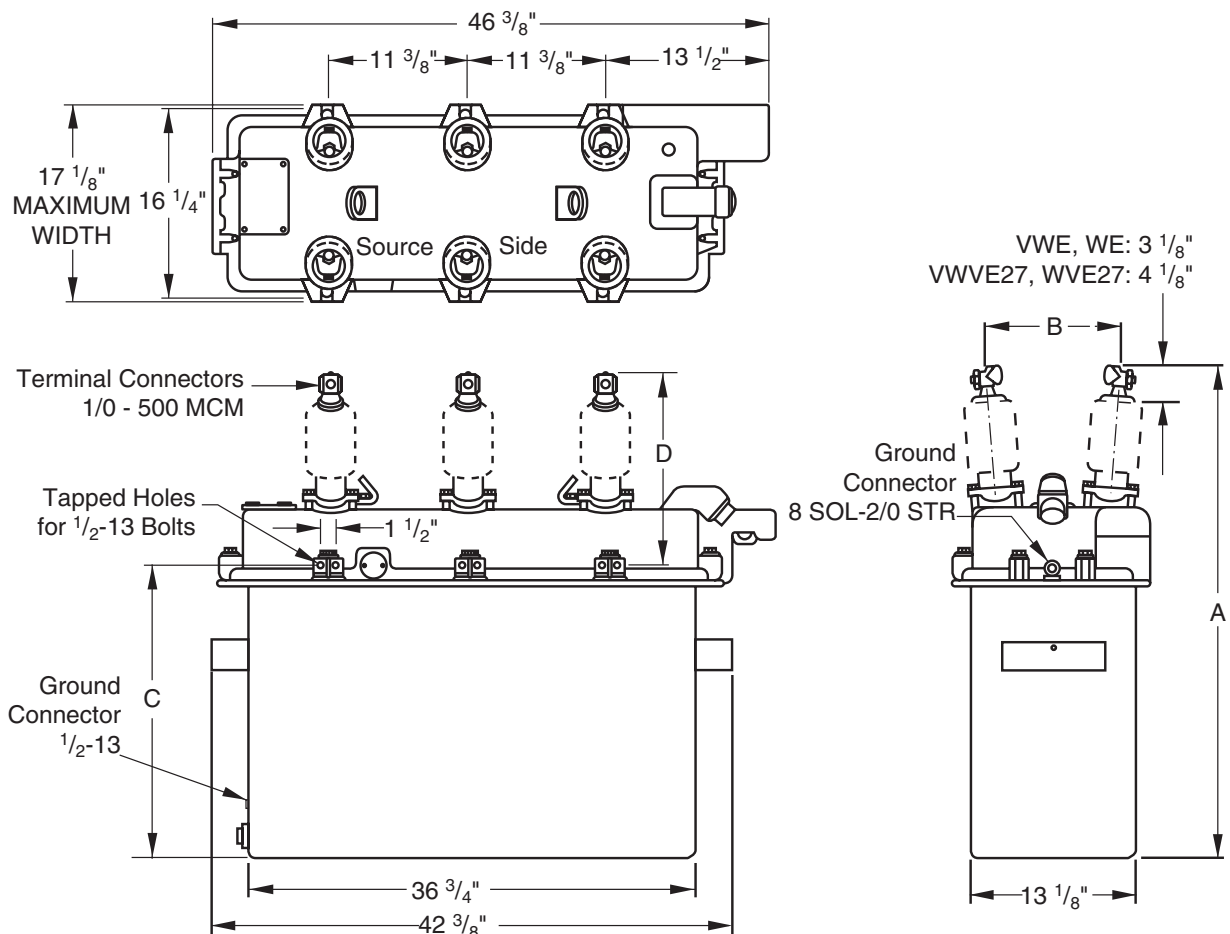


Figure 9. Dimensions of W-group 15 kV and 27 kV three-phase electronically controlled reclosers

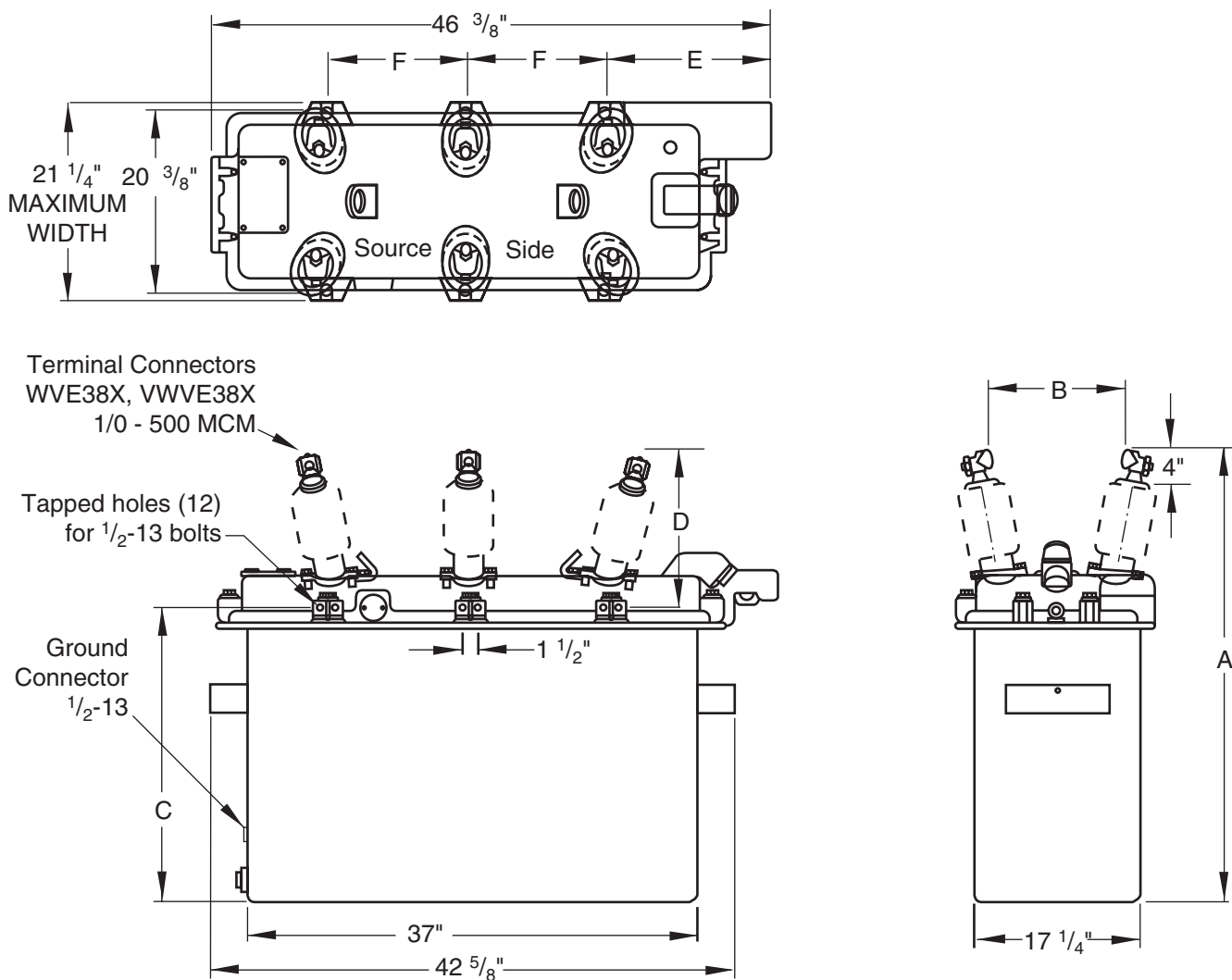


Figure 10. Dimensions of W-group 38 kV three-phase electronically controlled reclosers

Table 21. Weights and Oil Capacity

| Recloser Type | Weight with Oil* (lb) | Oil Capacity (gal) |
|---------------|-----------------------|--------------------|
| WE | 790 | 38 |
| WVE27 | 840 | 38 |
| WVE38X | 990 | 52 |
| VWE | 790 | 45 |
| VWVE27 | 830 | 45 |
| VWVE38X | 990 | 61 |

* Add 25 lbs. for each bushing current transformer.

Table 22. Dimensions of W-group 38 kV Recloser With and Without BCT Accessory*

| Type | Bushing Type | A (In.) | B (In.) | C (In.) | D (In.) | E (In.) | F (In.) |
|---------|---------------------|---------|---------|---------|---------|---------|---------|
| WVE38X | 26-1/2 in. creepage | 47-1/8 | 15 | 26-5/8 | 20-1/2 | 10 | 15-1/8 |
| VWVE38X | | 49-3/8 | 15 | 28-7/8 | 20-1/2 | 10 | 15-1/8 |
| WVE38X | 26-1/2 in. w/ BCT | 51-3/4 | 15 7/8 | 26-5/8 | 25-1/8 | 9-1/2 | 15-5/8 |
| VWVE38X | | 54 | 15 7/8 | 28-7/8 | 25-1/8 | 9-1/2 | 15-5/8 |

* Dimensions configured to the nearest 1/8 in.

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Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

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