

# Dead Tank Outdoor Vacuum Circuit Breaker, Type VOX

**Class 6065**

Instruction Bulletin

6065-13

11/2011

Retain for future use.



by **Schneider** Electric

## Hazard Categories and Special Symbols



Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

**DANGER** indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

### **WARNING**

**WARNING** indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

### **CAUTION**

**CAUTION** indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

### **CAUTION**

**CAUTION**, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

**NOTE:** Provides additional information to clarify or simplify a procedure.

## Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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## Section 1—Introduction

This bulletin contains instructions for the installation, operation, and maintenance of the Type VOX circuit breaker from Schneider Electric.

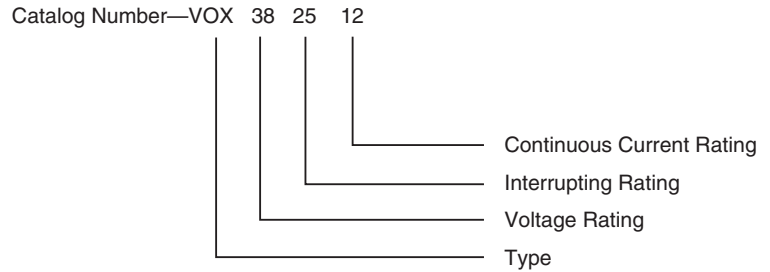
The Type VOX circuit breaker is designed for outdoor substation applications and provides interrupting capability for medium voltage systems up to 38 kV. The circuit breaker is designed and tested to ANSI C37.04, C37.06, and C37.09.

Circuits in which Type VOX circuit breakers are placed are capable of overvoltages. Complex medium voltage systems may require a detailed overvoltage system analysis and the addition of overvoltage protection.

Read and understand this bulletin completely before performing the installation, operation, and maintenance steps provided. Electrical equipment should be installed and serviced only by qualified personnel. Qualified personnel should establish procedures that ensure the safety of personnel and equipment.

## Catalog Numbers

The following are an example and an explanation of the catalog numbering system:



**Table 1: Catalog Numbering System**

Circuit Breaker Type	Voltage Rating	Interrupting Rating	Continuous Current Rating
VOX	38 = 38 kV	25 = 25 kA 31 = 31.5 kA 40 = 40 kA	12 = 1200 A 20 = 2000 A

## Section 2—Safety Precautions

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. These personnel must understand the hazards involved in working with or near medium voltage circuits and perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- All maintenance must be performed by qualified personnel in accordance with local codes and under the following conditions:
  - The circuit breaker must be isolated from all power sources.
  - Control voltage must be removed from the control circuits.
  - The circuit breaker must be in the open (O) position.
  - All circuit breaker springs must be discharged.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to electrical equipment or other property.
- Do not make any modifications to the equipment or operate the system with interlocks or panels removed. Contact your local Schneider Electric sales representative for additional instructions if the equipment does not function as described in this manual.
- Use lock-out/tag-out tags and padlocks when working on equipment. Leave tags in place until the work is completed and the equipment is ready to be put back into service.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

**Failure to follow these instructions will result in death or serious injury.**

## Sulphur Hexafluoride (SF6) Information

### **▲ WARNING**

#### **HAZARD OF ASPHYXIATION**

Operate the Type VOX circuit breaker in a well-ventilated area.

**Failure to follow these instructions can result in death or serious injury.**

The dead tank of the VOX circuit breaker is a sealed-for-life unit containing a small volume of sulphur hexafluoride (SF6) gas at low pressure—22 psi (1.5 bar), absolute pressure. SF6 is a dense (about five times denser than air), colorless, and odorless gas. It is inert under normal atmospheric conditions.

**NOTE:** Under normal circumstances, operators should never come into contact with the SF6 gas, but it is important to ensure that adequate ventilation is provided.

## Section 3—Receiving, Handling, and Storage

The Type VOX circuit breaker is shipped in a single box containing:

- the complete circuit breaker with low voltage (LV) control compartment
- a base frame (the support structure on which the circuit breaker is mounted)

The weight of the components depends on the circuit breaker rating, but it is in the range of:

- circuit breaker: 1322–2866 lbs. (600–1300 kg)
- base frame: 330–440 lbs. (150 to 200 kg)

### Receiving

Upon receipt, inspect the equipment for damage that may have occurred in transit. Check all items against the packing list provided. Immediately notify the carrier and Schneider Electric of any damages or shortages.

For details concerning claims for equipment shortages and other errors, refer to Schneider Electric “Terms and Conditions of Sale.”

### Handling

#### Lifting

Lifting eyes are provided on the tank of the Type VOX circuit breaker for lifting by crane (Figure 1 and Figure 2 on page 9). Spreader bars are not required.

**NOTE:** Protect the high voltage (HV) bushings from rough treatment to avoid damage.

Figure 1: Lifting Label

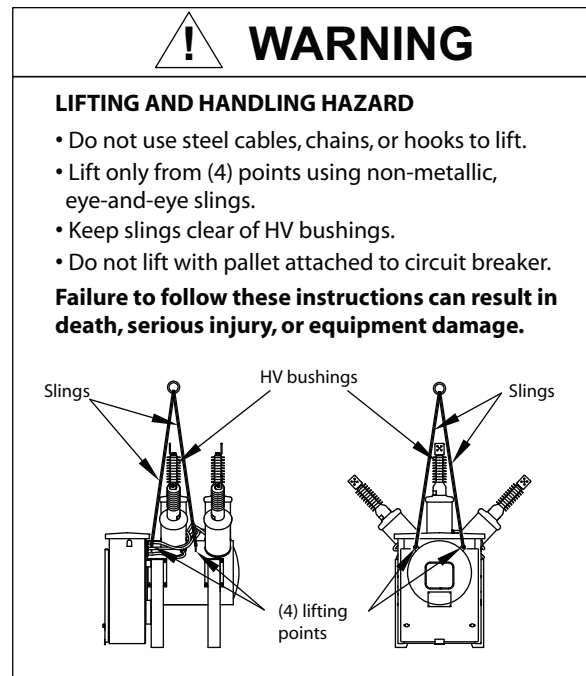
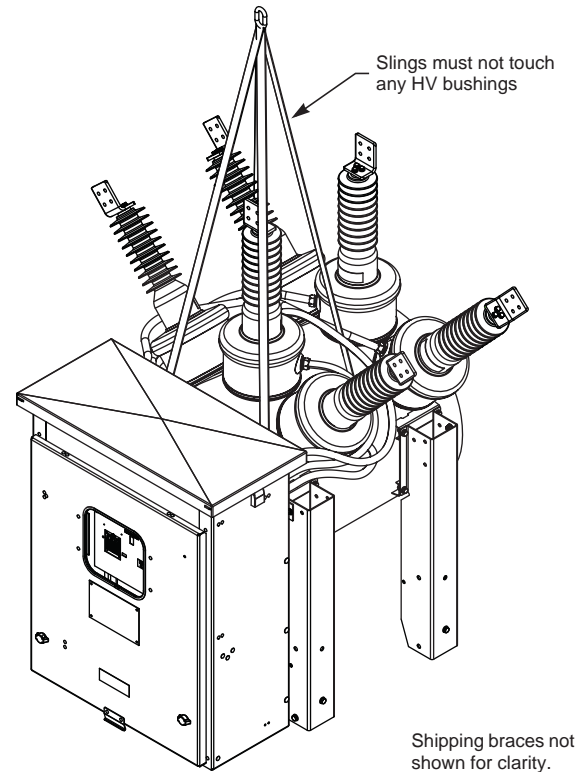


Figure 2: Lifting with Slings



## Storage

- If the circuit breaker is stored prior to installation, keep it in an area that provides protection from damage.
- Two space heaters are furnished with each breaker; energize them from an external source. (Refer to the schematic and wiring diagrams located in the LV control compartment for the connection point and for voltage and power requirements.)
- Verify that the heater thermostat is set at 75 °F (24 °C).
- Inspect the circuit breaker regularly when it is stored for prolonged periods.

## Section 4—Description

The Type VOX circuit breaker is designed for outdoor applications with a system voltage not exceeding 38 kV. The circuit breaker is supplied fully assembled and equipped with a spiral spring operating mechanism.

The normal service conditions for operation of the circuit breaker are described in Table 2. For dimensions, refer to the outline drawings located in the LV control compartment.

**Table 2: Normal Service Conditions**

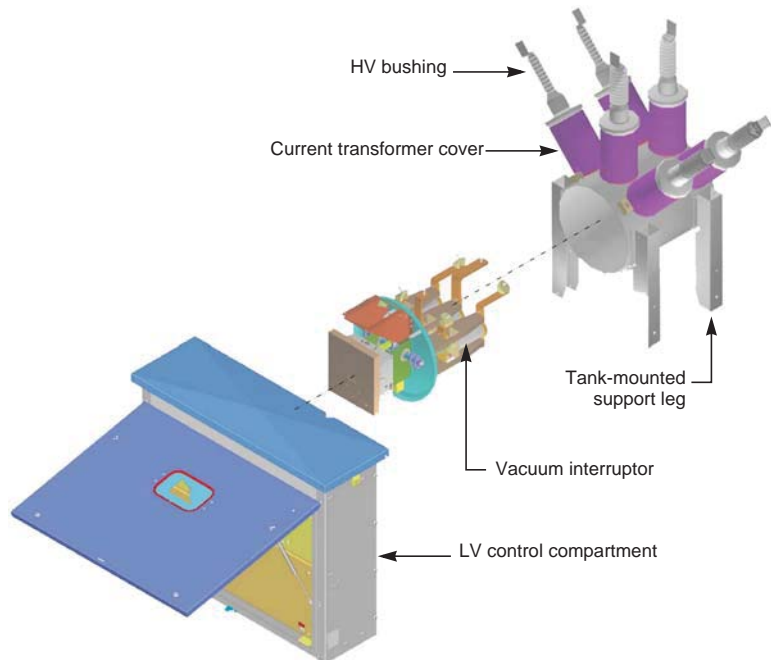
Condition	Range
Operating temperature	-22 to +104 °F (-30 to +40 °C)
Relative humidity	0–100%
Altitude	10,000 ft. (3048 m) or less

## Construction

### Tank

The main tank houses the vacuum interrupters in a sealed SF6 gas environment. Since the pressure and the pressure-to-volume ratio are low; the container is not classified as a pressure vessel. Because the SF6 gas is used for dielectric insulation only, it will not become contaminated due to arcing under normal service conditions. Consequently, special gas handling precautions are not required. See page 7 for information on SF6 gas.

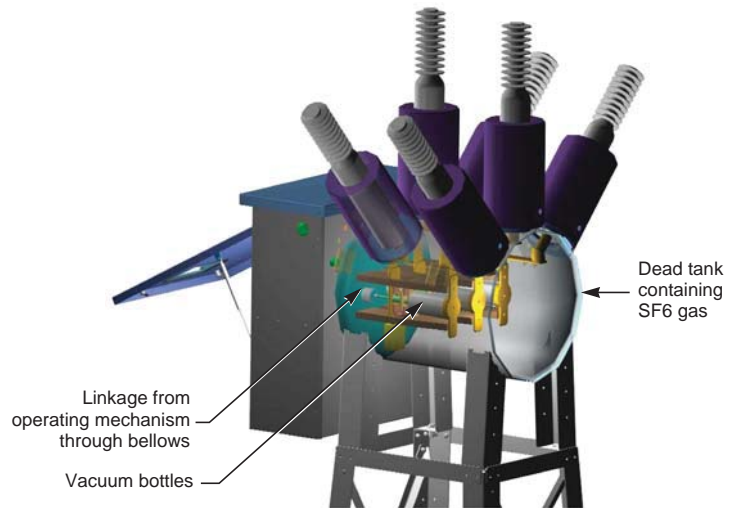
**Figure 3: Primary Components of Type VOX Circuit Breaker**



The dead tank (Figure 4) is constructed of fully welded, stainless steel. An optional gas density monitor on the front of the tank provides an alarm signal at 19 psi (1.3 bar) and a detected fault signal at 16 psi (1.1 bar).

The HV bushings are welded onto the tank. Current transformers (CTs) are provided, as required, on each of the HV bushings. The CT secondary terminals are located in the LV control compartment.

**Figure 4: Circuit Breaker**



### Low Voltage Control Compartment

The LV control compartment (see Figures 5 and 6 on page 12) houses the operating mechanism, vacuum interrupter linkage, fuses, control switches, auxiliary switches, control wiring, and other ancillary equipment.

The linkage into the tank is sealed through metallic bellows. The LV control compartment is designed to act as a chimney to direct any hot gases from the dead tank to the atmosphere.

The LV control compartment is secured to the tank by six bolts. A double gasket is used to ensure weather proofing of all the equipment while securing the LV control compartment to the tank. This provides an IP-55 degree of protection.<sup>1</sup>

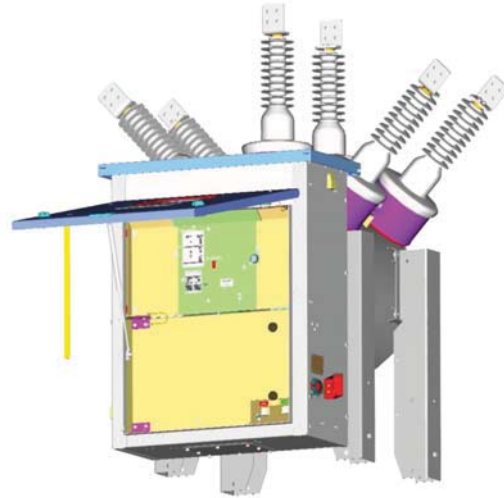
An inspection window is provided on the door of the LV control compartment for viewing the status of the circuit breaker and closing springs. The door is lifted with the help of gas-filled struts. These struts also keep the door from closing accidentally.

<sup>1</sup> IP stands for ingress protection. The -55 rating means:  
1st 5—Complete protection against contact with live or moving parts. Protection against harmful deposits of dust.  
2nd 5—Protection against water jets from any direction.

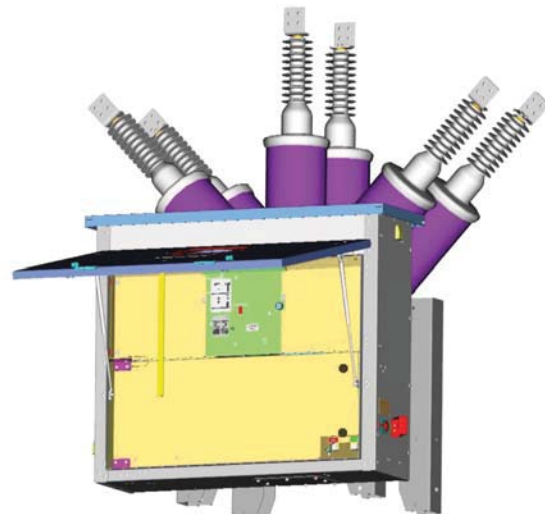
The LV control compartment is available in two widths:

- The standard compartment is 39 in. (990 mm) wide
- The extra wide compartment is 57 in. (1450 mm) wide

**Figure 5: Standard LV Control Compartment**



**Figure 6: Extra Wide LV Control Compartment**



### Operating Mechanism

A Type M5S operating mechanism is used on the VOX circuit breaker (Figure 7). The drive shaft arrangement with a spiral spring for closing and tripping provides exceptional reliability and security.

The spiral spring (item 14 in Figure 7) stores the energy necessary to perform a fast OPEN-CLOSE-OPEN reclosing cycle. It accelerates the main shaft (item 6) and the cam (item 5), which pushes the moving contact of the vacuum interrupter to the closing position.

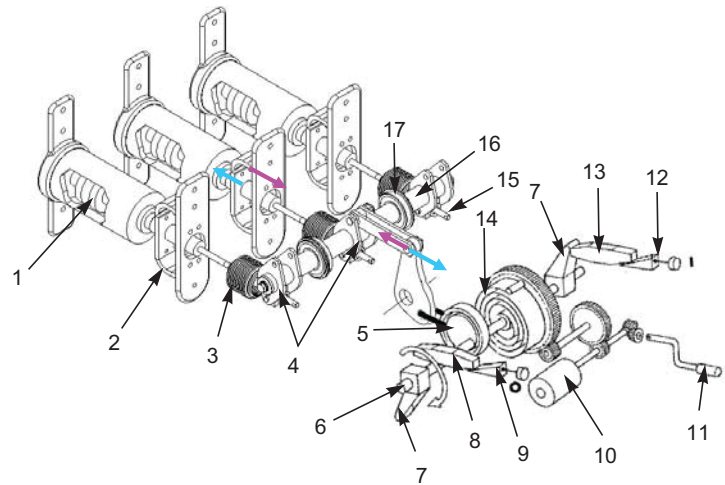
This transmission takes place through bellows which are welded on to the tank. In the resting position, the drive shaft roller levers (item 7) bear on either the closing latch (item 13) or the tripping latch (item 8).

The circuit breaker is closed and opened by applying an electrical signal to the corresponding coil, or by operating the closing button (item 12) or tripping button (item 9). At the end of each closing operation, the spiral spring will be rewound so that the necessary energy to perform a complete reclosing cycle is always available. The standard duty cycle is:

- O -15s - C - O (open - 15-second spring charge - close - open)
- O - 0.3s - C - O - 15s - C - O (open - 0.3-second pause - close - open - 15-second spring charge - close - open)

The operating mechanism is equipped with a closing coil, trip coil, and an auxiliary contact block for remote indication of circuit breaker operations. The operating mechanism and the drive shaft are protected with a metal enclosure.

**Figure 7: Operating Mechanism**



**Legend**

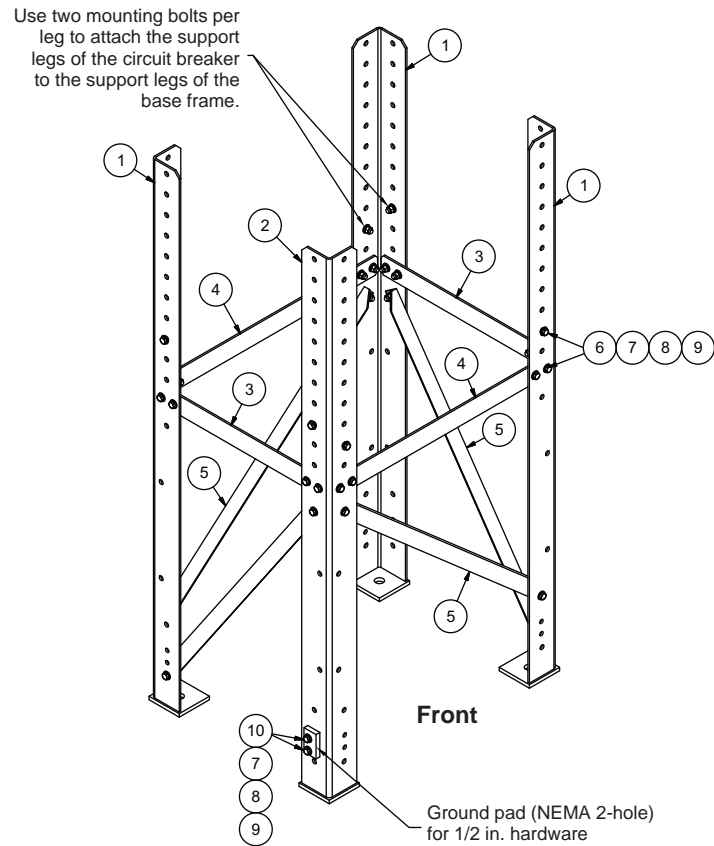
1	Vacuum interrupters	10	Motor
2	Flexible connectors	11	Spring winding handle
3	Bellows	12	Closing button (coil)
4	Levers	13	Closing latch
5	Cam	14	Spiral spring
6	Main shaft	15	Adjustable spacers
7	Roller levers	16	Shaft
8	Tripping latch	17	Ball bearings
9	Tripping button (coil)		Transmission direction of travel

**Base Frame**

The base frame (Figure 8) supports the complete circuit breaker assembly. It is a galvanized structure with predrilled pads for anchoring to a concrete foundation. It has ground pads for connecting the equipment ground to the substation ground.

Pre-drilled holes in the support legs allow the installation height of the circuit breaker to be adjusted in 2.95 in. (75 mm) increments. The base frame is supplied with stainless steel hardware.

**Figure 8: Base Frame**

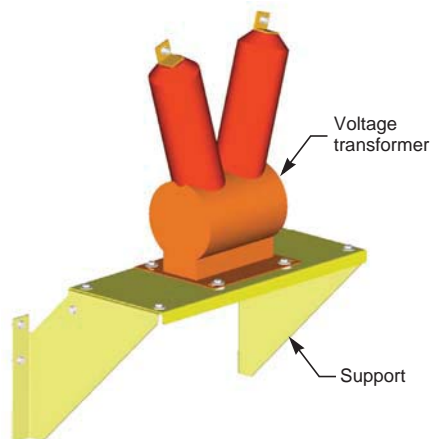


Item	Quantity	Part No.	Description
1	3	VOX2100	Support leg
2	1	VOX2100GND	Support leg with ground pad
3	2	VOX2102	Horizontal leg brace #1
4	2	VOX2103	Horizontal leg brace #2
5	4	VOX2104	Diagonal leg brace
6	32	21406-28481	1/2-13 x 1-1/2 in. stainless steel hex bolt
7	68	23606-00280	1/2 in. stainless steel flat washer
8	34	23713-00280	1/2 in. stainless steel lock washer
9	34	23011-00280	1/2-13 stainless steel hex nut
10	2	21406-28681	1/2-13 x 2-1/2 in. stainless steel tap bolt

### Voltage Transformer (optional)

A voltage transformer with a galvanized support (Figure 9) is available as a factory-installed option. When installed, it will be referenced on the outline drawings located in the LV control compartment.

**Figure 9: Voltage Transformer (optional)**



## Section 5—Installation

The Type VOX circuit breaker and its support structure are packed together and consist of:

- the complete breaker with LV control compartment (assembled)
- the base frame and hardware (not assembled)

See “Section 3—Receiving, Handling, and Storage” on page 8 for information on the approximate component weights.

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

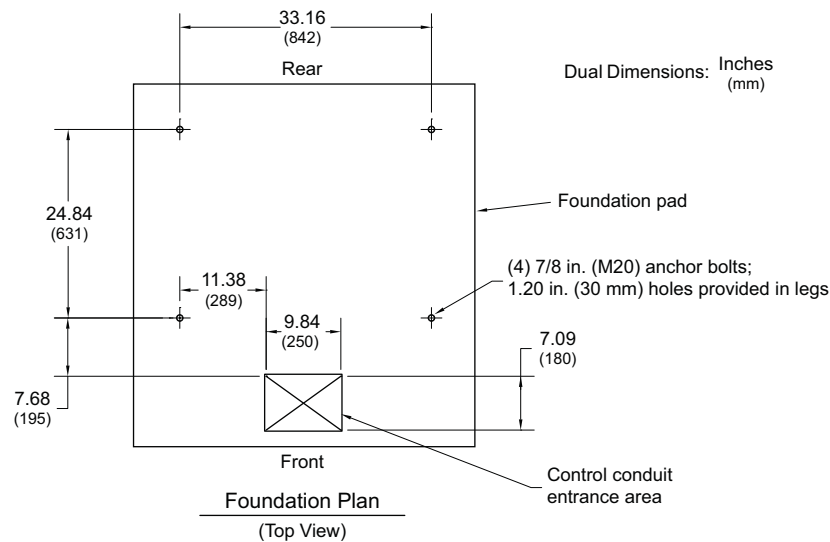
**Failure to follow these instructions will result in death or serious injury.**

## Preparing the Foundation

The Type VOX circuit breaker is designed for installation on a concrete pad. The finished floor area of the pad should be level (not sloping by more than 1/8 in. (3 mm) for every 8 ft. (2.5 m) of run) and should extend a minimum of 8 in. (200 mm) beyond the foundation anchor points in all directions.

The following diagram shows the plan view of the Type VOX circuit breaker. Refer to the outline drawings located in the LV control compartment for detailed information on the location of the foundation anchor points.

**Figure 10: Plan View for Type VOX Circuit Breaker**



## Assembling the Base Frame

Figure 8 on page 14 illustrates a fully assembled base frame.

**NOTE:** Prior to installing stainless steel hardware, coat the threads of each bolt with general purpose grease.

1. Following the assembly drawings located in the LV control compartment, assemble the base frame with the provided 1/2-13 in. hardware. Do not fully tighten this hardware until the circuit breaker has been attached to the base frame.
2. Anchor the base frame to the 7/8 in. (M20) bolts embedded in the concrete foundation. If necessary, place shims under the feet of the support legs to ensure the base frame is level in all directions.
3. Once the base frame is level, tighten the 7/8 in. (M20) anchoring hardware to 192 ft lbs (260 N•m).

## Attaching the Circuit Breaker to the Base Frame

1. Determine the desired height of the middle-phase HV bushings. Nine height positions are provided in 2.95 in. (75 mm) increments. See Table 3 for minimum and maximum heights.

**Table 3: Distances Between Foundation Pad and Top of Middle-Phase HV Bushings**

HV Bushing Type	Minimum	Maximum
Short	123.0 in. (3124 mm)	149.5 in. (3797 mm)
Long	133.5 in. (3391 mm)	160.0 in. (4064 mm)

### **WARNING**

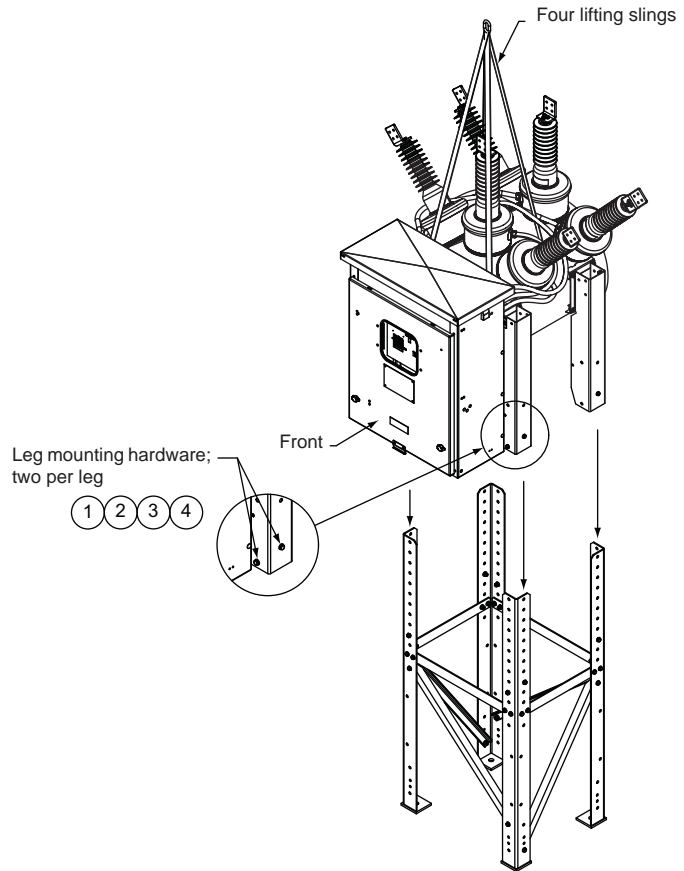
#### **TIPPING HAZARD**

Ensure the base frame is fully anchored to the foundation pad before attaching the circuit breaker to the base frame.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

2. Using the lifting procedures which begin on page 8, carefully move the circuit breaker into position over the installed base frame (see Figure 11 on page 18 and the assembly drawings located in the LV control compartment).

Figure 11: Attaching Circuit Breaker to Base Frame



Item	Quantity	Part No.	Description
1	8	21406-28481	1/2-13 x 1-1/2 in. stainless steel hex bolt
2	16	23606-00280	1/2 in. stainless steel flat washer
3	8	23713-00280	1/2 in. stainless steel lock washer
4	8	23011-00280	1/2-13 stainless steel hex nut

**NOTE:** Before installing stainless steel hardware, coat the threads of each bolt with general purpose grease.

3. Connect the support legs of the circuit breaker assembly to the legs of the base frame using two 1/2-13 in. bolts per leg.
4. Tighten all 1/2-13 in. mounting hardware (including the hardware installed in step 1 on page 17) to 37 ft lbs (50 N•m).
5. After all hardware has been fully tightened, detach the lifting slings.

## Section 6—Start-Up

**NOTE:** Perform the tests outlined in this section after the circuit breaker has been installed, but before it is energized.

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Isolate and ground both the line and the load side of the circuit breaker.
- Make sure the circuit breaker is in the OPEN position before inspecting this equipment or connecting the circuit breaker to your system.
- Replace all devices, doors, and covers before turning on the power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

### Low Voltage Wiring

Connect all control circuits and secondary connections of CTs according to the wiring diagram located in the LV control compartment.

**NOTE:** If the ambient temperature is under 14 °F (-10 °C), turn on the equipment heaters a minimum of two hours before performing any mechanical tests on the circuit breaker.

### Mechanical Operation Test

Operate the equipment several times to ensure the operating mechanism, trips, auxiliary switches, circuit breaker, and linkage operate satisfactorily (see "Operation" on page 23).

1. Charge the spring electrically using the spring charging motor or manually by turning the spring winding handle (Figure 13 on page 23).
2. Close and open the circuit breaker one time using the mechanical push buttons (Figure 13 on page 23).
3. Electrically close and open the circuit breaker five times using local and/or remote controls.

## Electrical Test

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

When performing the hi-pot (dielectric) test:

- Do not exceed the voltages specified in Table 4 on page 20.
- Keep all persons at least 6 ft (1.8 m) away from the circuit breaker being tested.
- Discharge the HV bushings to ground after each test. These areas can retain a static charge after a hi-pot test.

**Failure to follow these instructions will result in death or serious injury.**

### **⚠ WARNING**

#### **HAZARD OF RADIATION (X-RAY) EXPOSURE**

This device may emit X-rays if voltage higher than the rated maximum is applied across the open contacts. In such a case, personnel must be protected with appropriate shielding.

**Failure to follow these instructions can result in death or serious injury.**

Schneider Electric recommends performing the electrical tests described in this section before placing the VOX circuit breaker into service. Tests should only be carried out by qualified personnel in accordance with local requirements.

- Before performing any tests, disconnect the spring charging motor and rectifier of the circuit breaker mechanism and any relaying devices. Short circuit the secondary windings of the current transformer(s). Under no circumstances should the current transformer secondaries be open with the primary circuit under load. Refer to the electrical drawings located in the LV control compartment.
- After testing, discharge all conductors to ground and reconnect all components.

## High Voltage Test—Primary Insulation

Perform a hi-pot (dielectric) test as follows:

1. With the circuit breaker in the open position, perform a hi-pot test across each pole.
2. With the circuit breaker in the closed position, perform a phase-to-ground and phase-to-phase hi-pot test for each pole.
3. Gradually increase the voltage to the levels indicated in Table 4.

**Table 4: Hi-Pot Test Voltages**

Equipment Rating	Field Test Voltage	
	AC	DC
38 kV	60 kV	85 kV

4. Verify that the circuit breaker withstands the specified voltage without flashover for one minute. If it does not, inspect the insulators for leakage paths. If necessary, clean the surface of each insulator and repeat steps 1–3. If test results continue to differ from the specified voltage, DO NOT place the equipment into service. Contact your local Schneider Electric sales representative.
5. After each hi-pot test, discharge the HV bushings to ground.

**Contact Resistance Measurement**

With the circuit breaker closed, measure the contact resistance of the primary path from the top of the line side bushings to the top of the load side bushings (cable connections are not included). Using a DC current source with the current not less than 10 A, the contact resistance should not exceed the values shown in Table 5. Repeated unacceptable test results may be due to a loose connection or may indicate the vacuum interrupter is at the end of its life and should be replaced. Contact Schneider Electric for the replacement procedure.

**Table 5: Resistance Measurement Values**

HV Bushing Type	Continuous Current Rating	Short Circuit Rating	Maximum Resistance Measurement (as new)
Short	1200 A	25 kA	< 100 μohms
		31.5 or 40 kA	< 97 μohms
	2000 A	25 kA	< 55 μohms
		31.5 or 40 kA	< 52 μohms
Long	1200 A	25 kA	< 110 μohms
		31.5 or 40 kA	< 107 μohms
	2000 A	25 kA	< 65 μohms
		31.5 or 40 kA	< 62 μohms

**Cable Connection**

**⚠ WARNING**

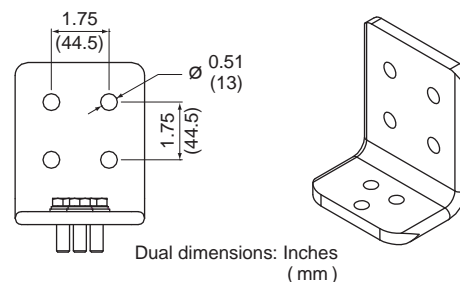
**HAZARD OF HIGH VOLTAGE BUSHING DAMAGE**

- To prevent damage to the HV bushings, do not remove or dismantle the factory-installed lug pads.
- Mechanical (cantilever) force applied to HV bushings not to exceed 145 lbs. (65 kg).

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Connect the incoming and outgoing electrical connectors to the factory-installed lug pads on the HV bushings.

**Figure 12: Lug Pad**



## Final Inspection

Perform a final inspection of the equipment before placing it into service.

1. Reconnect any control wiring disconnected during testing.
2. Make sure all covers are in place and properly secured.
3. Check ground bars for continuity.
4. Make sure all fuses and links are inserted.
5. Verify that padlocks are in place and locked.
6. Make sure all insulation surfaces in the LV control compartment are clean and dry.
7. Operate the circuit breaker electrically and manually to ensure it is functional.
8. Place the circuit breaker in the OPEN position.

## Inspection/Maintenance Records

Written records are valuable in establishing the frequency of inspection/maintenance. Therefore, take careful note of relevant items each time inspection/maintenance procedures are performed. Records should be started immediately after putting the circuit breaker in service and should include:

- date of inspection/maintenance
- operations counter reading
- record of any work carried out

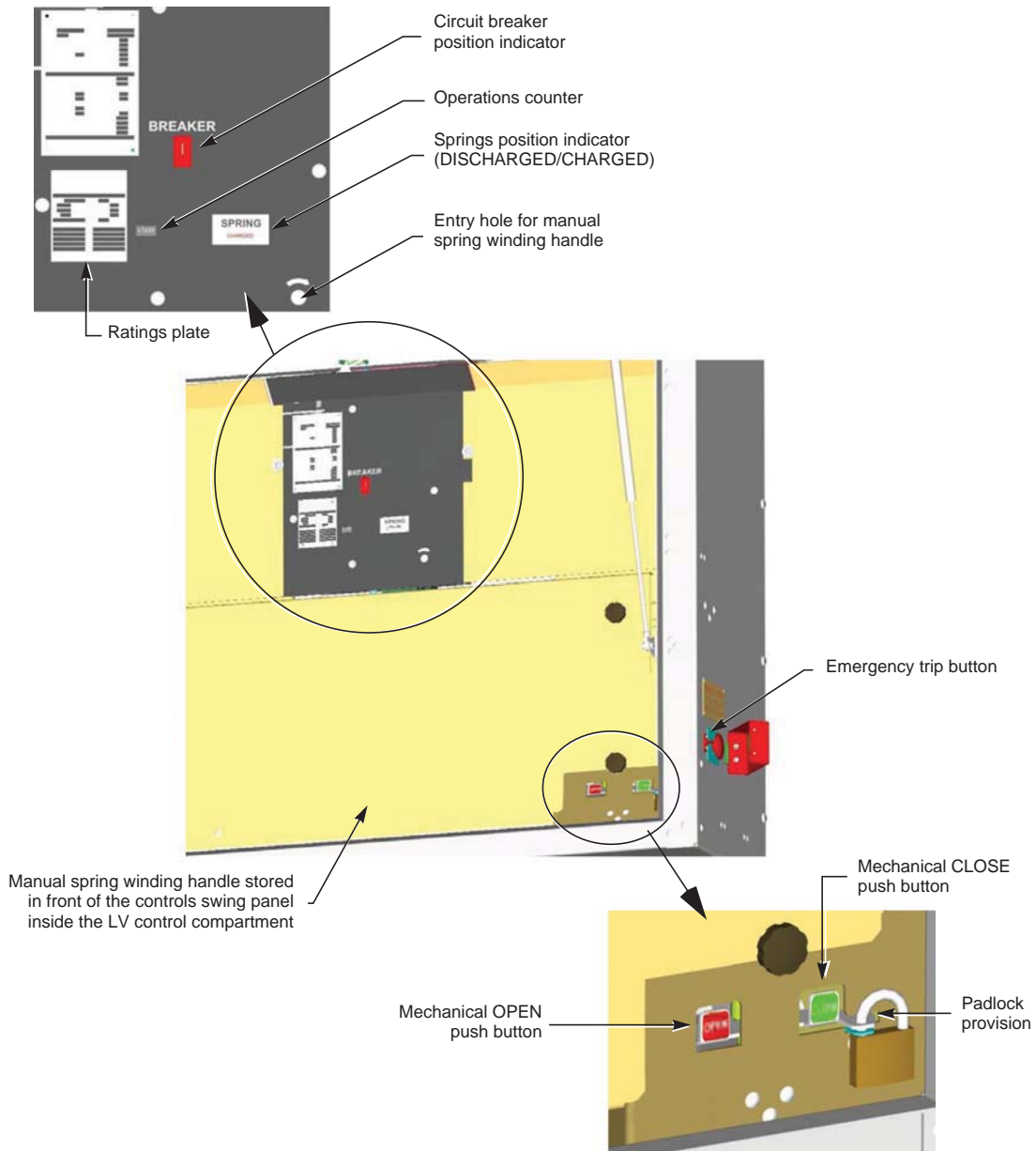
See Table 6 on page 27 for recommended inspection/maintenance procedures, and the Maintenance Log on page 35.

## Section 7—Operation

The motor charged spring operating mechanism can be operated manually or electrically; electrical operations can be performed locally or remotely.

Padlocking provisions are provided as described in “Padlocking” on page 25. Any padlock(s) must be removed to perform closing operations, and should be put back in place and locked once operations are complete.

Figure 13: External Circuit Breaker Indicators and Controls



## Closing the Circuit Breaker

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel who are familiar with medium voltage circuits.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

### Manual Operation

Open the LV control compartment door and press the CLOSE (I) push button to close the circuit breaker.

### Electrical Operation

#### Local

1. Open the LV control compartment door
2. Turn the LOCAL/REMOTE selector switch<sup>1</sup> on the LV control compartment panel to the LOCAL position.
3. Turn the TRIP/CLOSE control switch on the LV control compartment panel to the CLOSE position to release the charged springs and close the circuit breaker.
4. Close the LV control compartment door.

#### Remote

1. Open the LV control compartment door.
2. Turn the LOCAL/REMOTE selector switch<sup>1</sup> on the LV control compartment panel to the REMOTE position.
3. Close the LV control compartment door.
4. Turn the remote TRIP/CLOSE control switch to the CLOSE position to release the charged springs and close the circuit breaker.

**NOTE:** The motor will automatically recharge the mechanism springs after each closing operation.

<sup>1</sup> The LOCAL/REMOTE selector switch is an optional device. If it is left in the LOCAL position, remote operation of the circuit breaker will not be permitted.

## Opening the Circuit Breaker

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel who are familiar with medium voltage circuits.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

**Failure to follow these instructions will result in death or serious injury.**

### Manual Operation

Open the LV control compartment door and press the OPEN (O) button to open the circuit breaker.

### Electrical Operation

#### Local

1. Open the LV control compartment door
2. Turn the LOCAL/REMOTE selector switch<sup>1</sup> on the LV control compartment panel to the LOCAL position.
3. Turn the TRIP/CLOSE control switch on the LV control compartment panel to the TRIP position to energize the trip coil and open the circuit breaker.
4. Close the LV control compartment door.

#### Remote

1. Open the LV control compartment door.
2. Turn the LOCAL/REMOTE selector switch<sup>1</sup> on the LV control compartment panel to the REMOTE position.
3. Close the LV control compartment door.
4. Turn the remote TRIP/CLOSE control switch to the TRIP position to re-energize the trip coil and open the circuit breaker.

### Padlocking

Padlocking provisions provide additional operational protection. There are padlocking provisions for:

- the LV control compartment door. This provision will accommodate up to two padlocks with a shackle diameter of 5/32 to 3/16 in. (4 to 8 mm) each.
- the manual CLOSE button (Figure 13 on page 23). This provision will accommodate a single padlock with a shackle diameter of 5/32 to 3/16 in. (4 to 8 mm).

### Emergency Trip Button

The emergency trip button provides additional operator protection.

- Push to trip—the mechanism is locked (blocking electrical operations)
- Pull to reset—the mechanism is unlocked

<sup>1</sup> The LOCAL/REMOTE selector switch is an optional device. If it is left in the LOCAL position, remote operation of the circuit breaker will not be permitted.

## Section 8—Inspection and Maintenance

This section contains the inspection and maintenance procedures recommended by Schneider Electric.

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Only qualified personnel familiar with medium voltage equipment are to perform work described in this set of instructions. These personnel must understand the hazards involved in working with or near medium voltage circuits and perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Open the circuit breaker and discharge all springs by pressing the OPEN and CLOSE pushbuttons in the order OPEN-CLOSE-OPEN.
- Always use a properly rated voltage sensing device to confirm power is off.
- All maintenance must be performed by qualified personnel in accordance with local codes and under the following conditions:
  - The circuit breaker must be isolated from all power sources.
  - Control voltage must be removed from the control circuits.
  - The circuit breaker must be in the open (O) position.
  - All circuit breaker springs must be discharged.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to electrical equipment or other property.
- Do not make any modifications to the equipment or operate the system with interlocks and barriers removed. Contact your local Schneider Electric sales representative for additional instructions if the equipment does not function as described in this manual.
- Use lock-out/tag-out tags and padlocks when working on equipment. Leave tags in place until the work is completed and the equipment is ready to be put back into service.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

**Failure to follow these instructions will result in death or serious injury.**

Vacuum circuit breakers are considered low inspection/maintenance equipment. The vacuum interrupters are sealed units which do not require maintenance during their operating life.

The circuit breaker operating mechanism and ancillary components are designed to have an operating life similar to that of the vacuum interrupters. They do not require routine maintenance.

**NOTE:** Do not use abrasive cleaners or any cleaning product containing chloride on the circuit breaker.

## Inspection/Maintenance Plan

Under normal service conditions, Schneider Electric recommends performing inspection and maintenance procedures according to the schedule defined in Table 6.

**Table 6: Inspection/Maintenance Schedule**

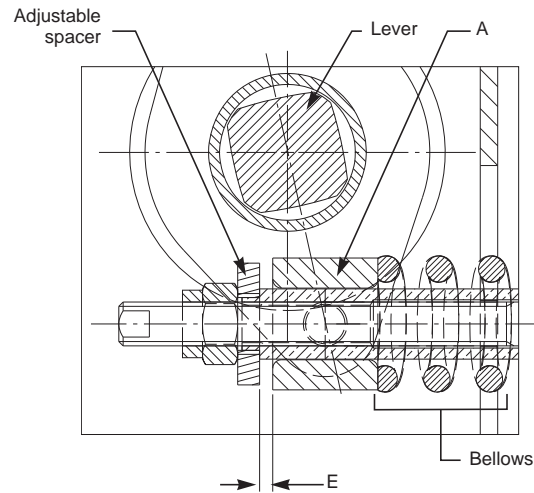
Frequency <sup>1</sup>	Inspection Type	Actions
After first year	Visual inspection of the circuit breaker. Visual and functional inspection of the operating mechanism.	Clean insulating components if contaminated. Perform ten OPEN/CLOSE operations.
Every year	Visual inspection of the circuit breaker. Visual and functional inspection of the operating mechanism.	Clean insulating components if contaminated. Perform at least one OPEN/CLOSE operation.
Every 3 years	Visual inspection of the circuit breaker. Visual and functional inspection of the mechanism.	Clean insulating components if contaminated. Perform ten OPEN/CLOSE operations.
After 10 years	Check contact wear of vacuum interrupters.	See "Checking Contact Wear" on page 28.
After 20 years or 10,000 operating cycles	Check contact wear of vacuum interrupters. General inspection of circuit breaker and operating mechanism.	See "Checking Contact Wear" on page 28. Contact your local Schneider Electric representative.

<sup>1</sup> Adverse conditions may require more frequent inspection/maintenance intervals.

## Checking Contact Wear

Contact wear is checked with the circuit breaker in the CLOSED position. Wear is measured on the linkage system behind the operating mechanism (Figure 7 on page 13 and Figure 14). The measurement does not require any special tools; it can be made, for example, using a set of feeler gauges.

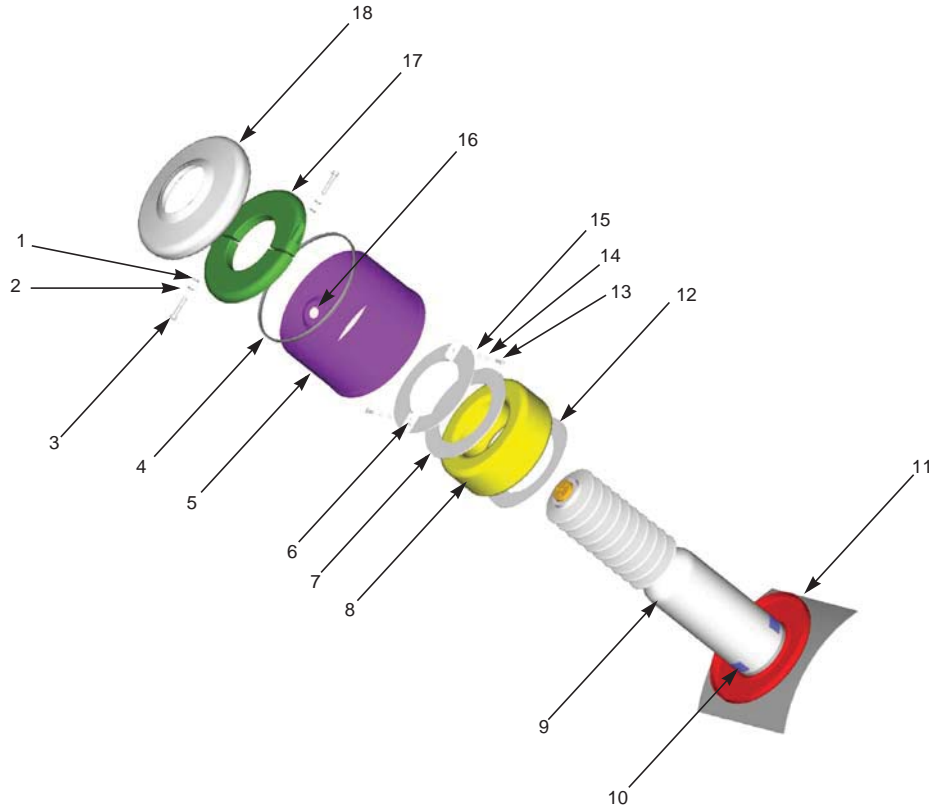
**Figure 14: Measuring Contact Wear**



- The dimension E is measured between the lower surface of part A and the upper surface of the adjustable spacer.
- No action is required when E is greater than 0.04 in. (1 mm).
- When E decreases to about 0.04 in. (1 mm), schedule maintenance time to change the interrupter and contact your local Schneider Electric representative. When E is approximately 0.02 in. (0.5 mm), change the interrupter as soon as possible.

## Replacing the Current Transformer (CT)

Figure 15: Current Transformer Components



### Legend

1	Washer, M8 (2x)	10	Wedge (3x)
2	Spring lock washer, M8 (2x)	11	Support
3	Screw, M8 x 50 (2x)	12	Lower shock absorber (2x)
4	PBC isolating joint	13	Screw, M6 x 20 (2x)
5	Cap	14	Spring lock washer, M6 (2x)
6	Lower half strap (2x)	15	Washer M6 (2x)
7	Upper shock absorber (2x)	16	Cable gland
8	Current transformer	17	Upper half strap (2x)
9	Bushing	18	Upper gasket

**NOTE:** Items in parentheses ( ) in the removal and installation procedures on page 30 correspond to the components in Figure 15.

## ▲ CAUTION

### HAZARD OF FALLING OBJECTS

Current transformers can weigh more than 55 lb (25 kg) each; use appropriate lifting equipment.

**Failure to follow these instructions can result in personal injury or equipment damage.**

## Removal

1. Follow the local utility company's procedure for placing the Type VOX circuit breaker out of service and install the ground cables.
2. Disconnect the primary bushing cables.
3. Short circuit the secondary leads of the CTs to the shorting block by inserting shorting pins.
4. Disconnect the secondary wiring of the CTs in the LV control compartment (on the terminal block).
5. Disconnect the CT cable gland (item 16) from both ends: at the cap (item 5) and at the LV control compartment.
6. Attach a string (or wire) to the CT secondaries to assist in pulling the new CT secondaries from the LV control compartment.
7. Remove the secondary wiring of the CT from the flexible tube.
8. Remove the upper gasket (item 18) and PBC isolating joint (item 4), and store them flat.
9. Remove the fastening hardware (items 1–3) from the two half straps (items 6 and 17).
10. Remove the cap (item 5).  
**NOTE:** Do not damage the secondary wiring of the CT when passing it through the hole.
11. Remove the upper shock absorber (item 7) and store it flat.
12. Carefully remove the CT from the bushing and tighten.

## Installation

1. Slide in the new CT. See the wiring diagram located in the low voltage control compartment for correct position and polarity of the CT.
2. Mount the upper shock absorber (item 7).
3. Mount the two half straps (items 6 and 17).
4. Install the cap (item 5) and carefully pull the secondary wiring through the hole.
5. Install the PBC insulating joint (item 4).  
**NOTE:** Make sure there is no contact between the half straps (items 6 and 17) and the cap (item 5).
6. Insert the fastening hardware (items 1–3) into the two half straps (items 6 and 17) and tighten.
7. Install the upper gasket (item 18).
8. Pull all the secondary wiring through the flexible conduit.
9. Install the CT cable gland at the cap (item 5) and in the low voltage control compartment.
10. Connect the secondary wiring of the CT in the LV control compartment (on the terminal block; see the wiring diagram provided with the equipment).
11. Remove the shorting pins used to short circuit the secondary leads of the CTs to the shorting block.

12. Reconnect the primary bushing cables.
13. Remove the ground cables.
14. Test the equipment before reenergizing it. See the Electrical Test section starting on page 20.

## Lubrication

The Type VOX circuit breaker operating mechanism and related components have been factory lubricated for the life of the unit under normal operating conditions. If for any reason lubrication must be removed and reapplied, specific lubrication must be applied in specific areas.

The following lubricants are approved for use in Type VOX circuit breakers:

- Dow Corning Molykote® PG-54 Plastislip silicone grease
- Klüber Unimoly® GL 82 high-performance grease
- Klübersynth® LI 44-22 synthetic, low-temperature grease

**NOTE:** Do not mix any of the lubricants.

Figure 16: Lubricate with Dow Corning Molykote PG-54

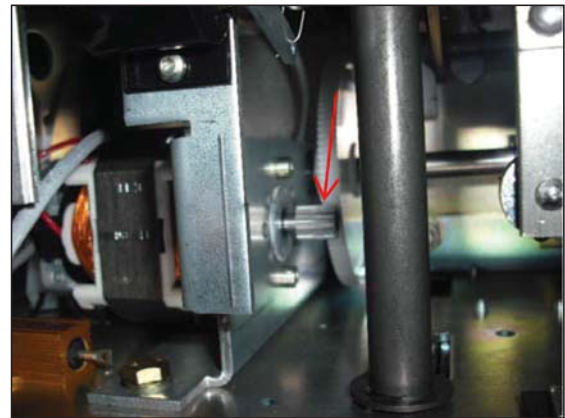
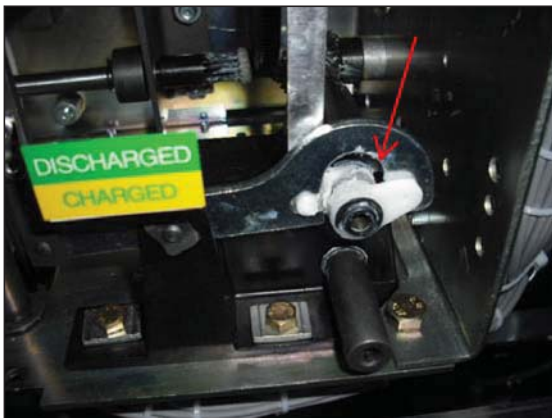


Figure 17: Lubricate with Klüber Unimoly GL 82

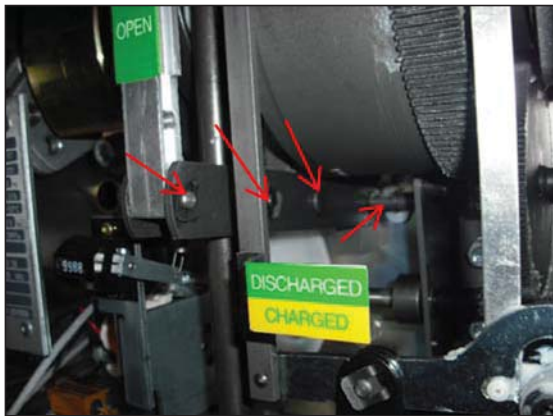
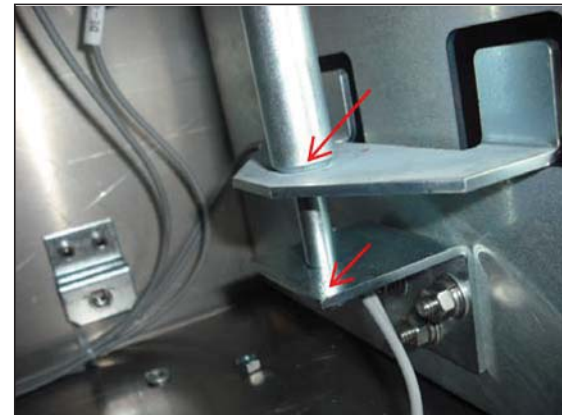
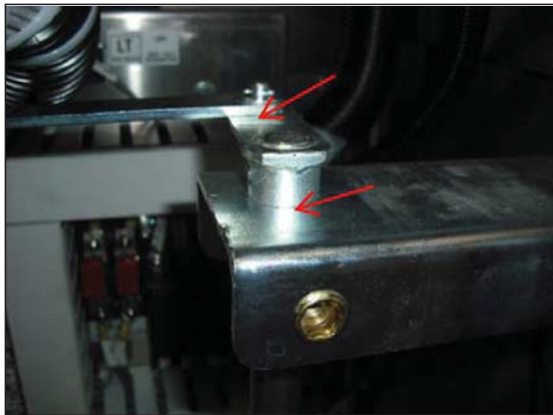
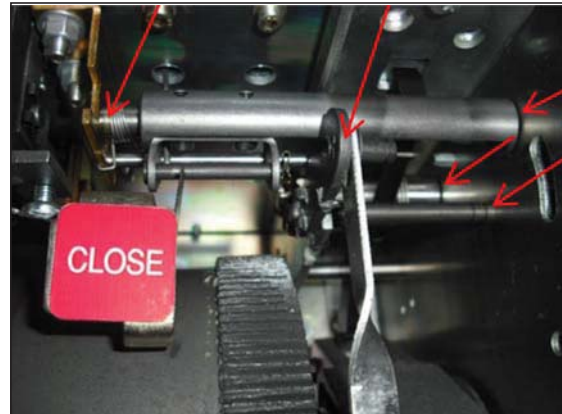
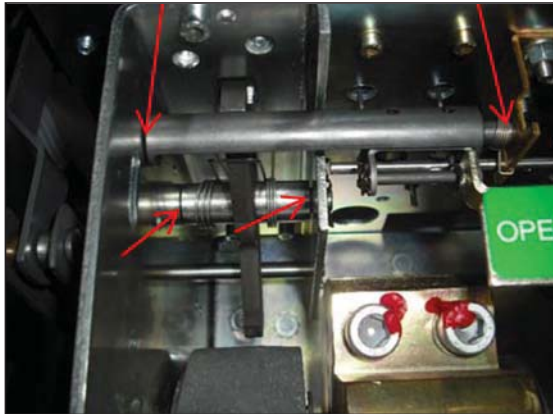


Figure 18: Lubricate with Klüber Unimoly GL 82 (continued)

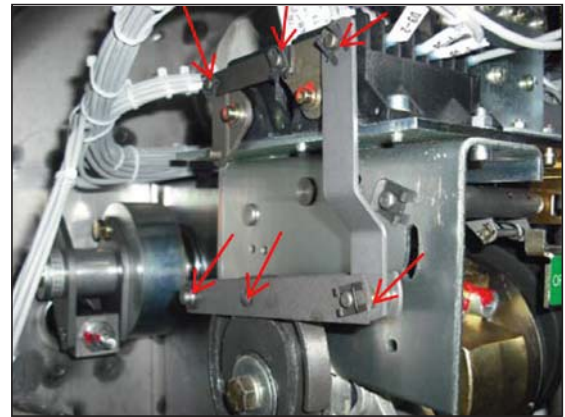
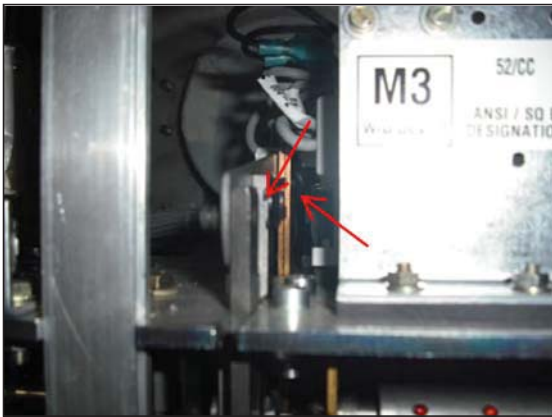
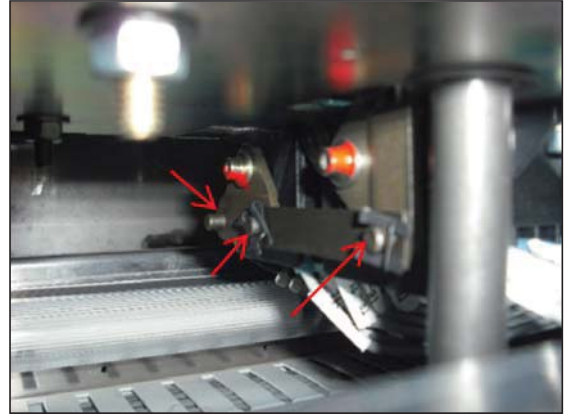


Figure 19: Lubricate with Klübersynth LI 44-22

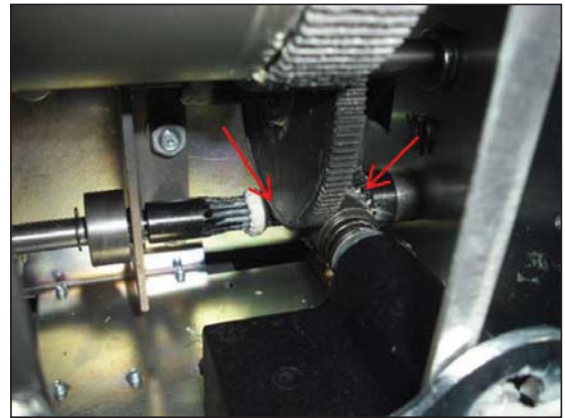
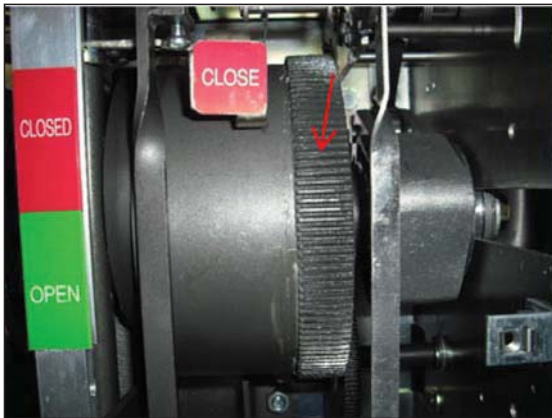
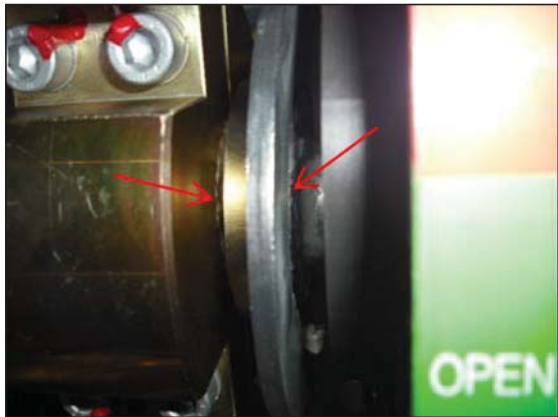
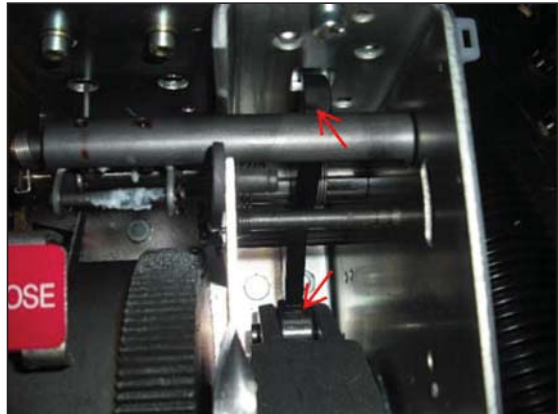
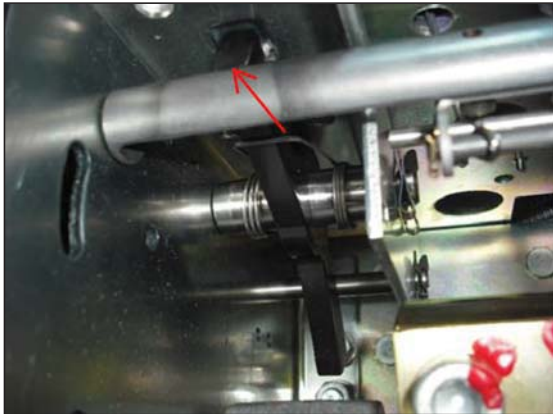
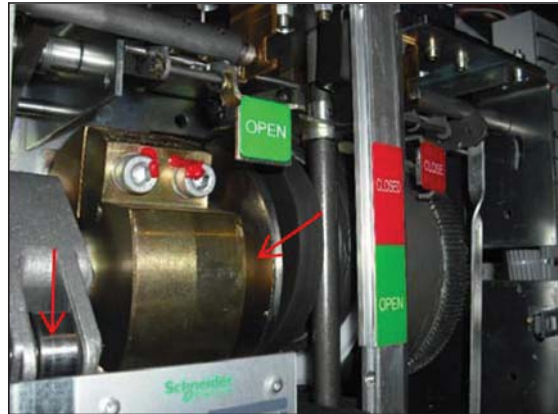
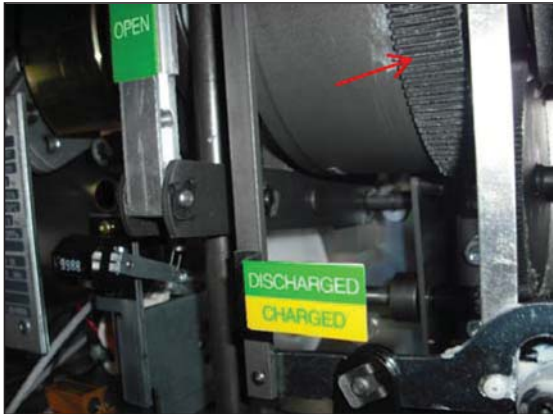


Figure 20: Lubricate with Klübersynth LI 44-22 (continued)





**Dead Tank Outdoor Vacuum Circuit Breaker, Type VOX  
Instruction Bulletin**

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