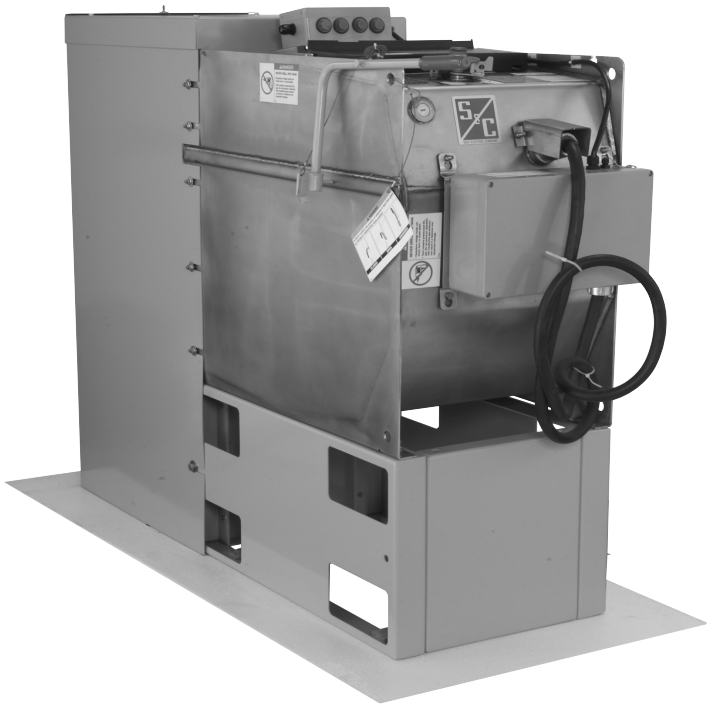
Instructions for Operation

Table of Contents



October 2, 2017

Qualified Persons

⚠ WARNING

The equipment covered by this publication must be installed, operated, and maintained by qualified persons who are knowledgeable in the installation, operation, and maintenance of overhead electric power distribution equipment along with the associated hazards. A qualified person is one who is trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read this Instruction Sheet

Thoroughly and carefully read this instruction sheet before installing or operating your Wind Turbine Style Vista switchgear. Familiarize yourself with Safety Information and Safety Precautions on pages 3 through 5. The latest version of this publication is available online in PDF format at **sandc.com/en/support/product-literature/.**

Retain this Instruction Sheet

This instruction sheet is a permanent part of your Wind Turbine Style Vista switchgear. Designate a location where you can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the equipment. Ratings for this gear are listed on a ratings label at the front of the switchgear.

Warranty

The warranty and/or obligations described in S&C's Price Sheet 150 "Standard Conditions of Sale – Immediate Purchasers in the United States" (or Price Sheet 153, Standard Conditions of Sale – Immediate Purchasers Outside the United States) plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute the immediate purchaser's or end user's exclusive remedy and a fulfillment of the seller's entire liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to immediate purchaser's or end user's claim. All other warranties, whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150, (or Price Sheet 153) and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 (OR PRICE SHEET 153) IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150 (or PRICE SHEET 153.)

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels attached to the Wind Turbine Style Vista switchgear. Familiarize yourself with these types of messages and the importance of these various signal words:

⚠ DANGER

"DANGER" identifies the most serious and immediate hazards that *will likely* result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ WARNING

"WARNING" identifies hazards or unsafe practices that *can* result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION

"CAUTION" identifies hazards or unsafe practices that *can* result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE

"NOTICE" identifies important procedures or requirements that *can* result in product or property damage if instructions are not followed.

Following Safety Instructions

If you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website, **sandc.com**, or call S&C headquarters at (773) 338-1000; in Canada, call S&C Electric Canada Ltd. At (416) 249-9171.

NOTICE

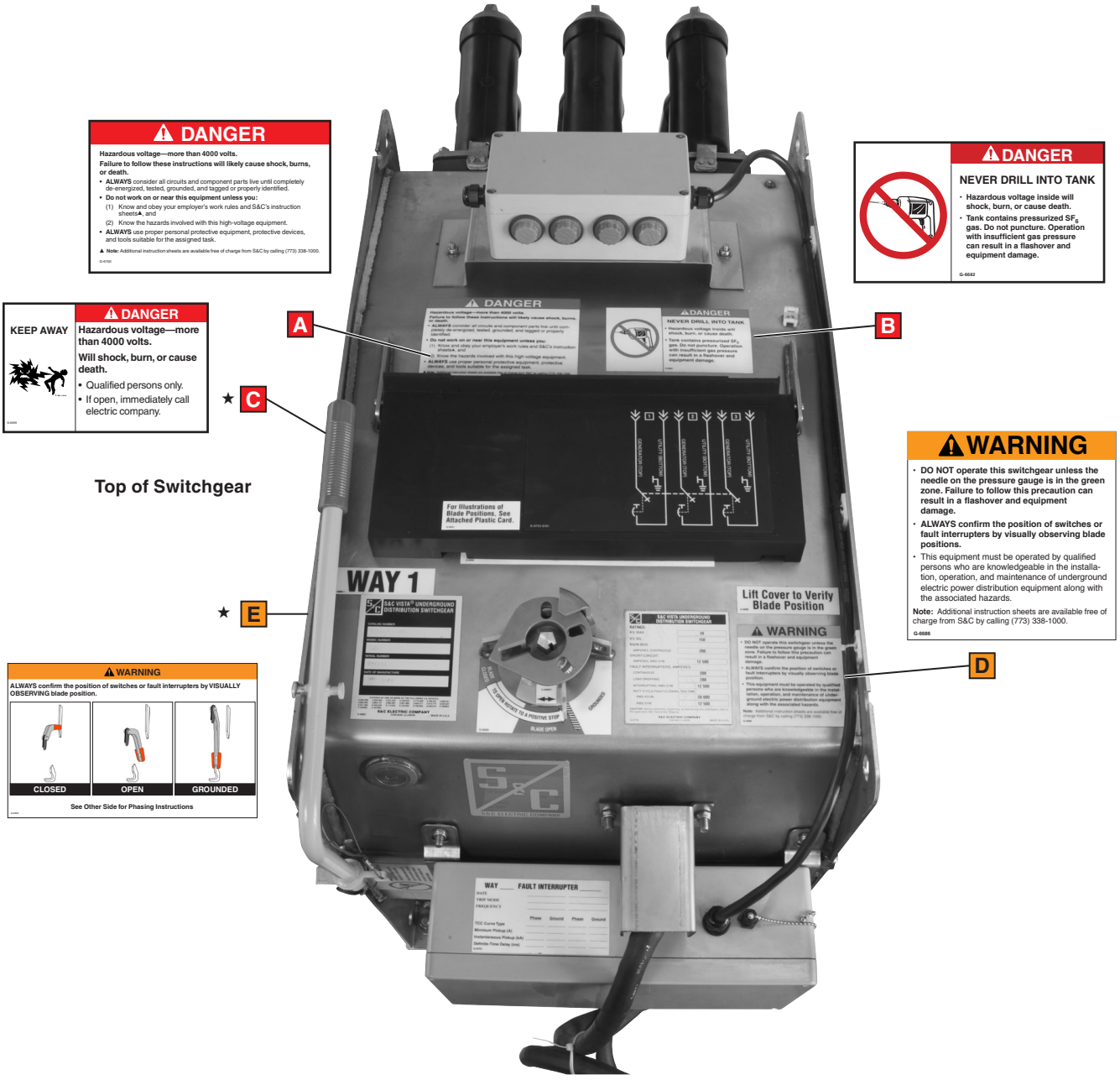
Thoroughly and carefully read this instruction sheet before operating your Wind Turbine Style Vista switchgear.

Replacement Instructions and Labels

If you need additional copies of this instruction sheet, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd. Instruction Sheets can also be viewed on S&C's website: **sandc.com**.

It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

Location of Safety Labels



Reorder Information for Safety Labels			
Location	**Safety-Alert Message**	**Description**	**Number**
A	DANGER	Hazardous Voltage—Always Consider Circuits and Components Live . . .	G-6700
B	DANGER	Never Drill Into Tank—Hazardous Voltage, Contains Pressurized SF_6 Gas	G-6682
C	DANGER	Keep Away—Hazardous Voltage (“Mr. Ouch”)★	G-6699
D	WARNING	Check Gas Pressure Before Operating Switchgear	G-6686
E	WARNING	Always Visually Confirm Blade Position★	G-6693

★ This label is located on the side of the gear and is not visible in this photo.

⚠ DANGER

S&C Vista Underground Distribution Switchgear operates at high voltage. Failure to observe the precautions below will result in serious personal injury or death.

Some of these precautions may differ from company operating procedures and rules. Where a discrepancy exists, users should follow their company's operating procedures and rules.

1. QUALIFIED PERSONS. Access to switchgear must be restricted only to qualified persons. See "Qualified Persons" on page 2.

2. SAFETY PROCEDURES. Always follow safe operating procedures and rules. Always maintain proper clearance from energized components.

3. PERSONAL PROTECTIVE EQUIPMENT. Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.

4. SAFETY LABELS. Do not remove or obscure any of the "CAUTION," "WARNING," or "DANGER" labels.

5. CLOSING AND LOCKING ENCLOSURES. The pad-mounted enclosure (if furnished) must be securely closed with padlocks in place at all times unless work is being performed inside the enclosure.

6. ENERGIZED BUSHINGS. Always assume the bushings are energized unless proved otherwise by test, by visual evidence of an open-circuit condition at the load-interrupter switch or fault interrupter, or by observing that the load-interrupter switch or fault interrupter is grounded.

7. BACKFEED. Bushings, cables, load-interrupter switches, and fault interrupters may be energized by backfeed.

8. DE-ENERGIZING, TESTING, AND GROUNDING. Before touching any bushings or components inside the switchgear tank that are to be inspected, replaced, serviced, or repaired, always disconnect load-interrupter switches and fault interrupters from all power sources (including backfeed), test for voltage, and properly ground.

9. TESTING. Test the bushings for voltage using the voltage-indication feature (if furnished) or other proper high-voltage test equipment before touching any bushings or components inside the switchgear tank that are to be inspected, replaced, serviced, or repaired.

10. GROUNDING.

- Make sure the switchgear tank and pad-mounted enclosure (if furnished) are properly grounded to the station or facility ground.
- After the switchgear has been completely disconnected from all sources of power and tested for voltage, properly ground the load-interrupter switches and fault interrupters before touching any bushings or components inside the switchgear tank that are to be inspected, replaced, serviced, or repaired.

11. FAULT-INTERRUPTER POSITION.

- Always confirm the **Closed/Open/Grounded** position of load-interrupter switches and fault interrupters by visually observing the position of the blades.
- The fault interrupters may be energized by backfeed.
- The fault interrupters may be energized in any position.

12. MAINTAINING PROPER CLEARANCE. Always maintain proper clearance from energized bushings.

Overview of Components

Wind Turbine Style Vista switchgear features a microprocessor-controlled, resettable, vacuum fault interrupter for switching and protection of 600-ampere or 200-ampere circuits. It is enclosed in a submersible, SF_6-insulated, welded-steel tank. See Figures 1 and 2.

The 200-ampere or 600-ampere fault interrupter features resettable vacuum interrupters in series with manually operated three-position (CLOSED/OPEN/GROUNDED) disconnects for isolation and internal grounding of each phase. The fault interrupter provides three-pole load switching and fault interruption through 25 kA symmetrical. Fault interruption is initiated by a programmable overcurrent control. See Instruction Sheet 681-515 for instructions on programming the control.

When the optional Potential Indication with Test Feature (suffix "-L1" or "-L2") is specified, all routine operating tasks—switching, voltage testing, and grounding—can be accomplished by a single person without cable handling or exposure to high voltage. Cable testing for faults can be performed through the back of a user-supplied elbow with insert or feedthru bushing insert, eliminating the need for cable handling or parking stands.

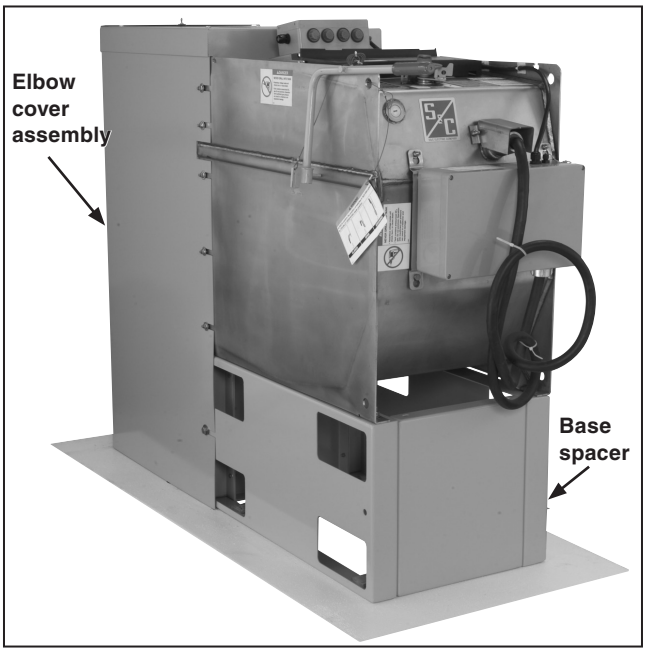


Figure 1. Operation side of switchgear.

Figure 2. Termination side of switchgear. (Elbow cover assembly removed.)

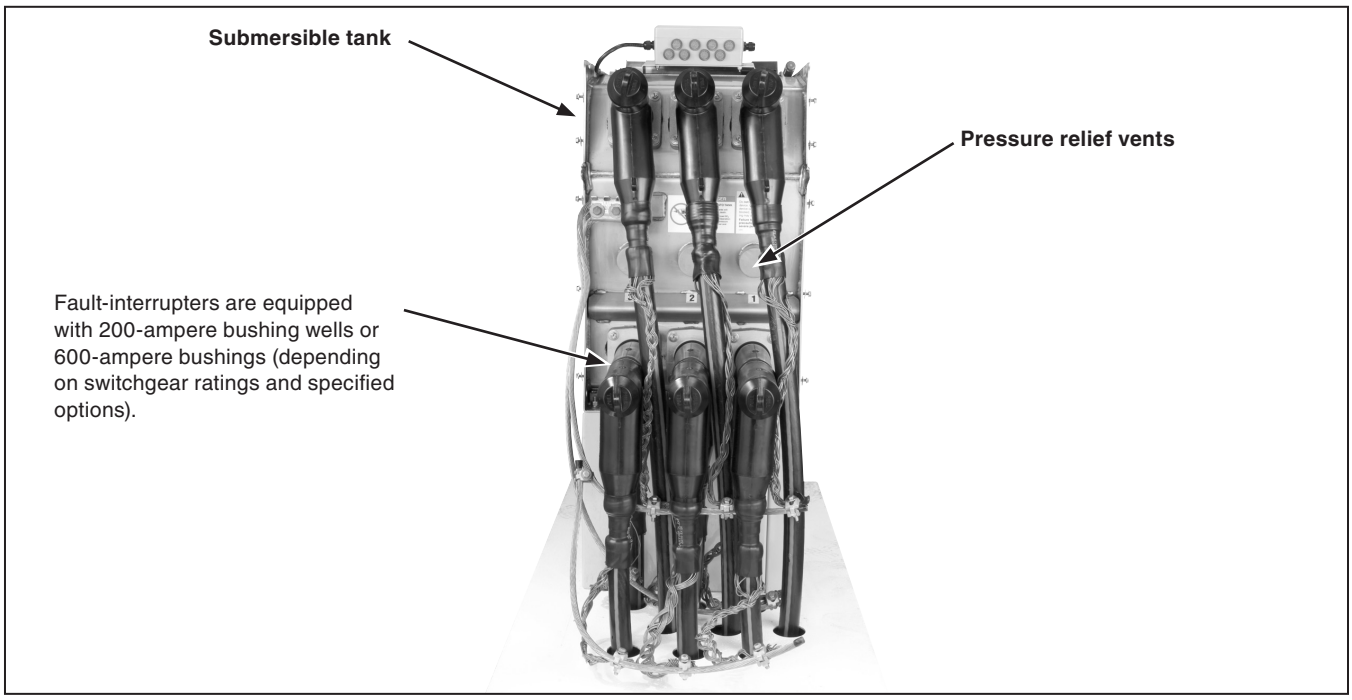


Figure 3. Termination side of switchgear. (Elbow cover assembly removed for clarity.)

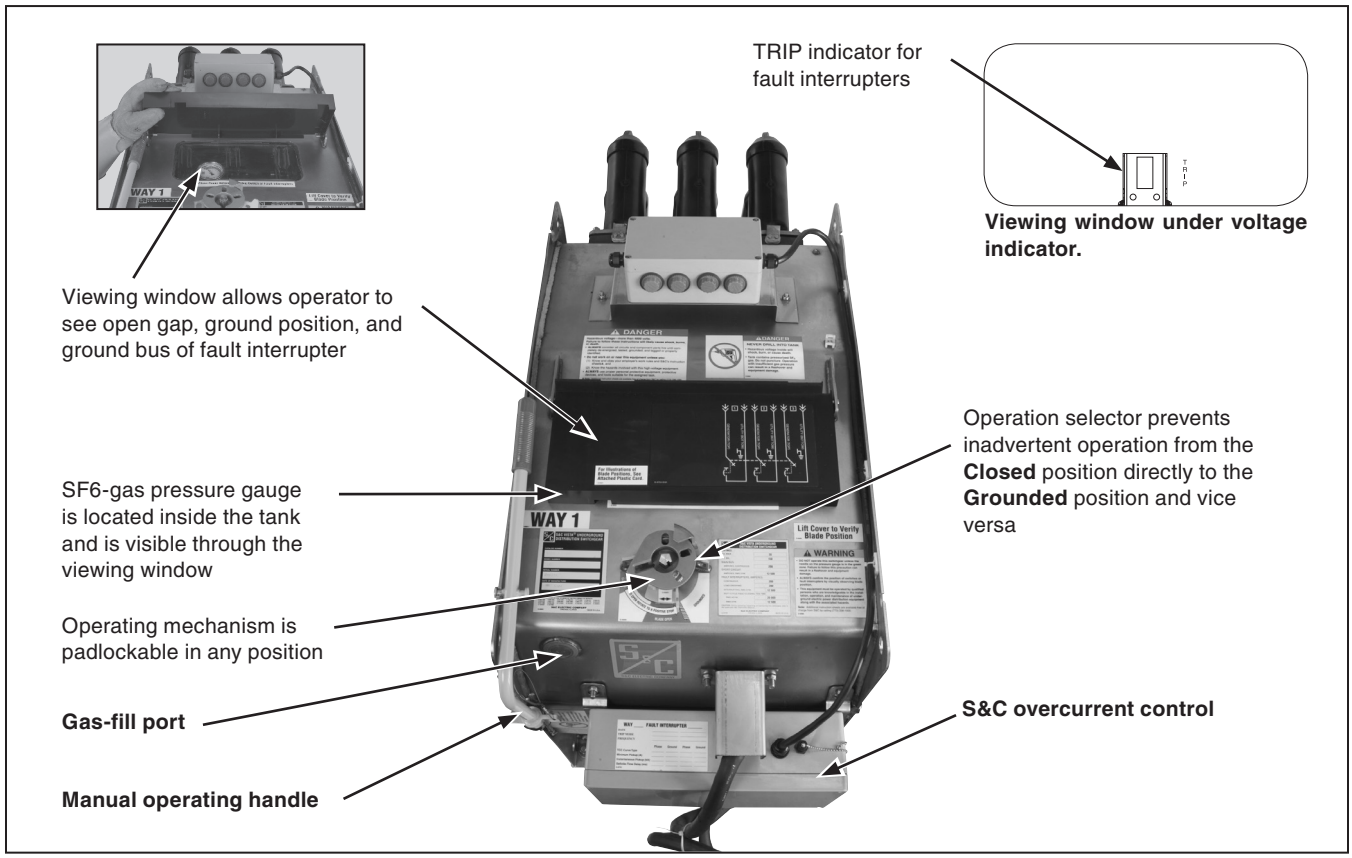


Figure 4. Top of switchgear.

Understanding the Gas Pressure Gauge

Vista switchgear incorporates a temperature-compensated gas pressure gauge inside the tank to provide indication of the SF_6 gas pressure. The gas pressure gauge includes four distinct color-coded zones. See Figure 5.

If the needle is within a particular zone as described below, it indicates the following:

Green zone:

The Vista unit is OK to operate.

Green/Yellow zone:

The Vista unit may have lost some gas but is still OK to operate. The unit should be evaluated to determine whether it needs to be refilled with SF_6 gas and repaired accordingly. Contact S&C for assistance.

Red zone:

The SF_6 gas may be below the minimum operating pressure for the gear. **Vista switchgear should not be operated if the needle is in the Red zone.** Contact S&C for assistance.

Orange zone:

The Vista unit has been overfilled in the field or has a defective pressure gauge. An external gauge can be used instead to verify the gas pressure before operation of the device. Contact S&C for assistance.

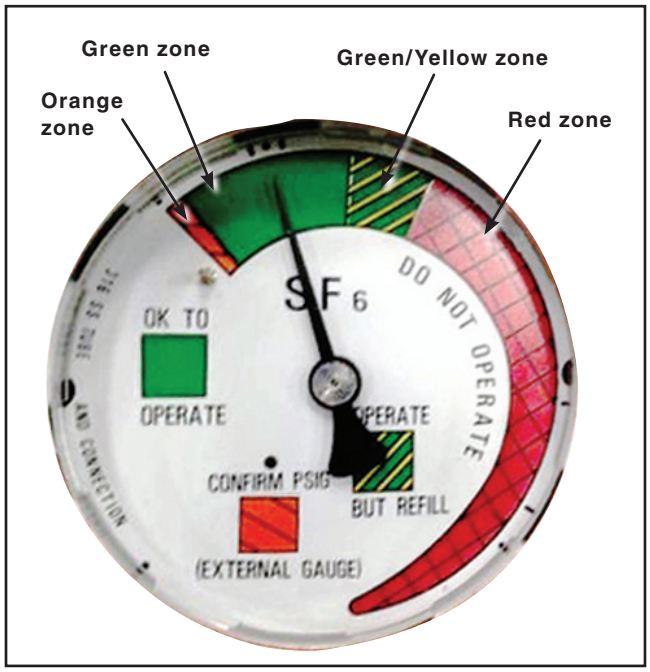


Figure 5. Internal gas-pressure gauge for most Vista models.

Gauge Needle Fluctuations from Rapid Ambient Temperature Changes

When the Vista tank experiences rapid changes in ambient temperature, the gas pressure gauge needle may temporarily move to indicate a higher gas pressure when the tank is rapidly cooled or a lower gas pressure when the tank is rapidly heated. This phenomenon may occur, for instance, with sudden, direct exposure to intense sunlight.

The gas pressure gauge uses a small reference gas chamber filled with helium to compensate for ambient temperature and altitude without applying correction factors. The gauge indicates tank pressure by measuring the pressure differential between the gas in the tank and the gas in the gauge. When the tank experiences rapid ambient temperature changes, the smaller volume of gas inside the gauge can change temperature more quickly than the larger volume of gas in the tank, which can lead to temporary movement of the needle. When the temperature stabilizes, the needle will return to its previous position within 1-2 hours.

If a sudden drop or increase in pressure is seen on the gauge, S&C recommends checking with an external gauge or waiting for ambient temperature conditions to stabilize to confirm that the needle has returned to its nominal position.

Opening, Closing, or Grounding

⚠ WARNING

DO NOT operate this switchgear if the SF_6-gas pressure gauge is in the red zone. **Failure to follow this precaution can result in a flashover and equipment damage.**

STEP 1. Make sure that the SF_6-gas pressure gauge is in the green zone (or the green and yellow striped zone). See Figure 6.

Note: If the SF_6-gas pressure gauge is in the green and yellow striped zone, the switchgear can be operated but the tank must be repaired (if necessary) and refilled with SF_6 gas as soon as possible.

STEP 2. Open the viewing window cover and confirm the position of the fault interrupter by visually observing the position of the blades. See Figures 7 and 8.

Also, inspect the current-carrying components inside the tank for any signs of abnormalities, but specifically for proper disconnect blade alignment, proper contact finger position, and dislodged hardware.

⚠ WARNING

DO NOT operate the load energized interrupter switch or fault interrupter if it has dislodged hardware, or obvious signs of arcing or blade misalignment. Equipment damage and personal injury may result.

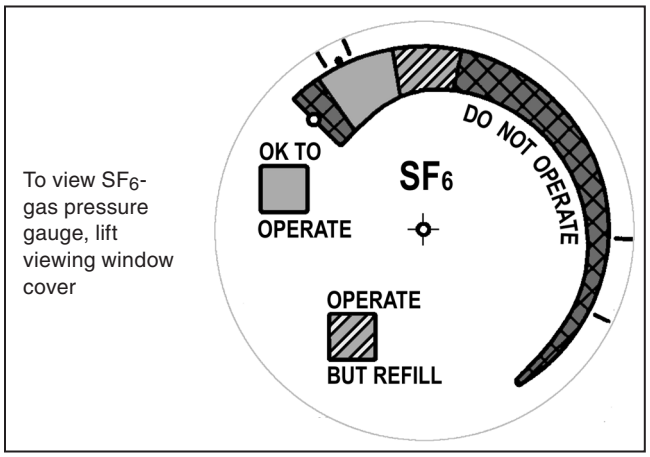


Figure 6. Gas pressure gauge.

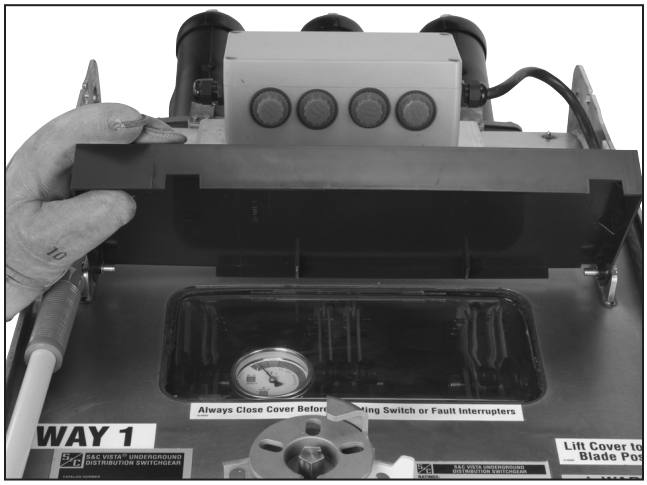


Figure 7. Window cover lifts for viewing of fault-interrupter blade positions.

⚠ WARNING

ALWAYS confirm the position of switches or fault interrupters by VISUALLY OBSERVING blade position.

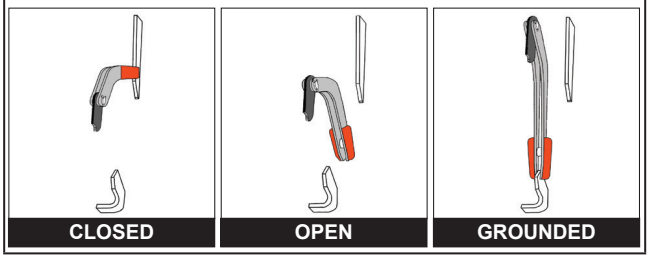


Figure 8. Blade positions.

STEP 3. If the operation selector is blocking the operation, rotate the selector out of the way. The operation selector prevents inadvertent operation directly from the **Closed** position to the **Grounded** position, and vice versa. See Figures 9, 10, and 11.

Figure 9. In the far right position, operation selector allows operation between the Closed and Open positions.

Figure 10. Rotating operation selector out of the way.

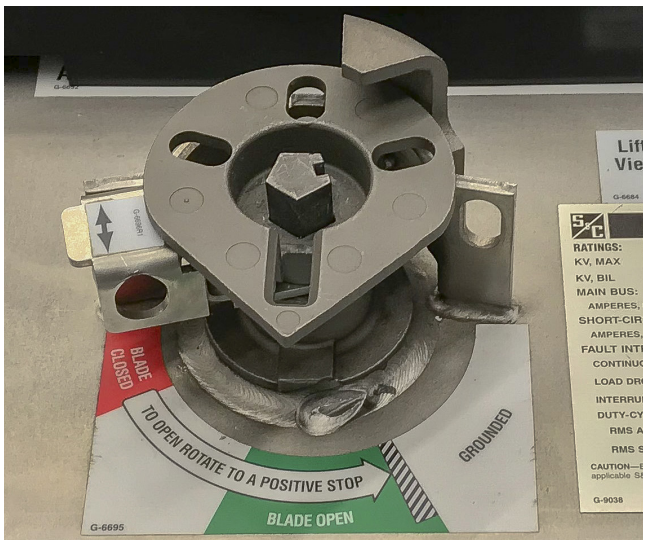


Figure 11. In the far left position, operation selector allows operation between the Open and Grounded positions.

STEP 4. Insert the manual operating handle into the notch of the operating mechanism. See Figure 12.

STEP 5. Rotate the manual operating handle in the appropriate direction to open, close, or ground the fault interrupter. (Operation to the **Open** position is shown.)

STEP 6. When operating from the **Closed** to **Open** position, the operating handle must be rotated all the way to the line, as shown on the label, to recharge the mechanism. See Figure 13. The operating handle cannot be removed until the mechanism is fully charged. Figure 14 shows the fault interrupter in the **Open** position.

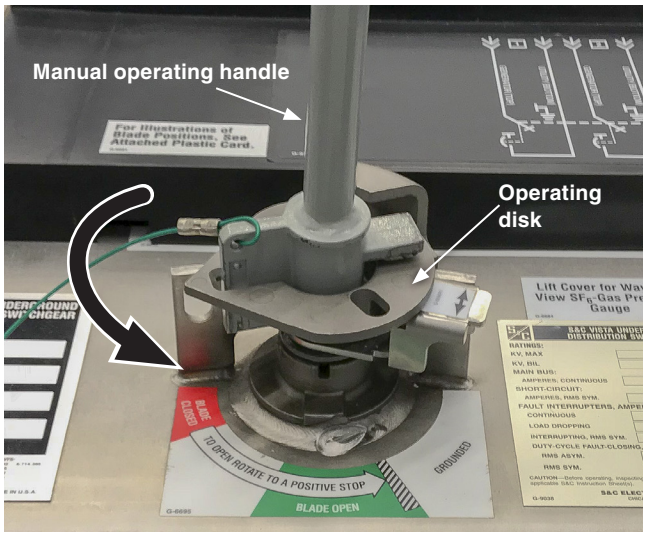


Figure 12. Opening the fault interrupter.

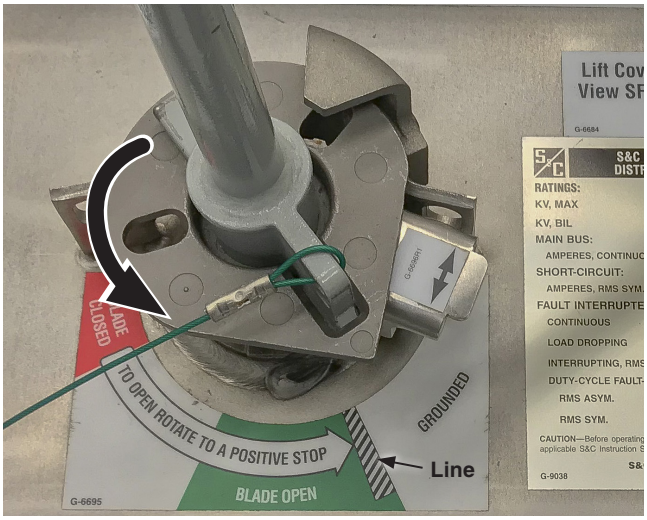


Figure 13. Rotate all the way to the line on the label.

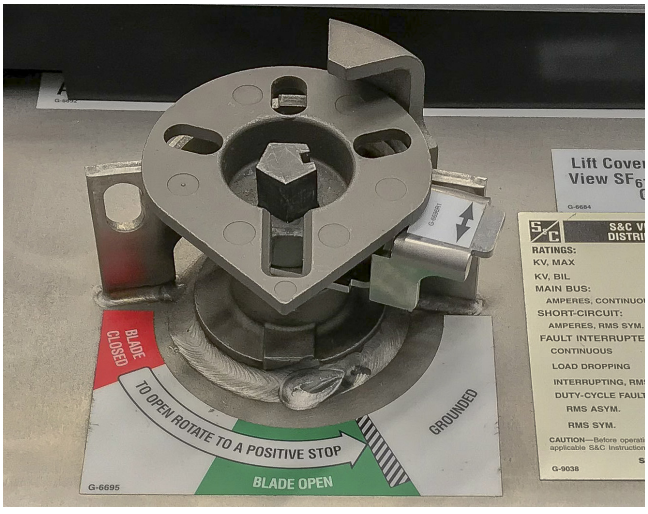


Figure 14. The fault interrupter in the Open position.

⚠ WARNING

ALWAYS make sure the cables connected to the fault interrupter are de-energized before grounding the switchgear. **Failure to follow this precaution can result in a flashover and equipment damage.**

STEP 7. If the operation is to the **Grounded** position, make sure the cables connected to the fault interrupter are de-energized. See Figures 15 and 16. Check for voltage using the optional Potential Indication with Test Feature (suffix "-L1" or "-L2") as instructed under the "Checking for Voltage Using Optional Voltage Indication" section on page 14, or use an alternate method.

STEP 8. Open the viewing window again and confirm the position of the fault interrupter by visually observing the position of the blades.

Locking Out of Grounded Position

To prevent operation of the fault interrupter into the **Grounded** position, insert a padlock through the operation selector and the right-hand hole of the locking collar. See Figure 17.

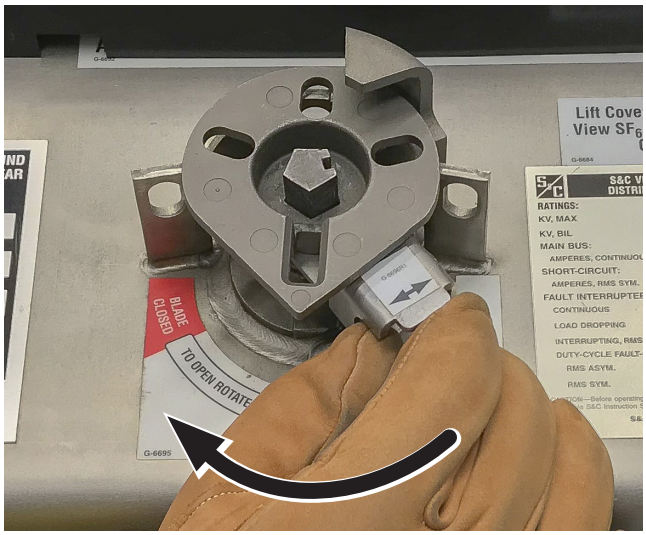


Figure 15. Rotating the operation selector to the far left enables operation to the Grounded position.

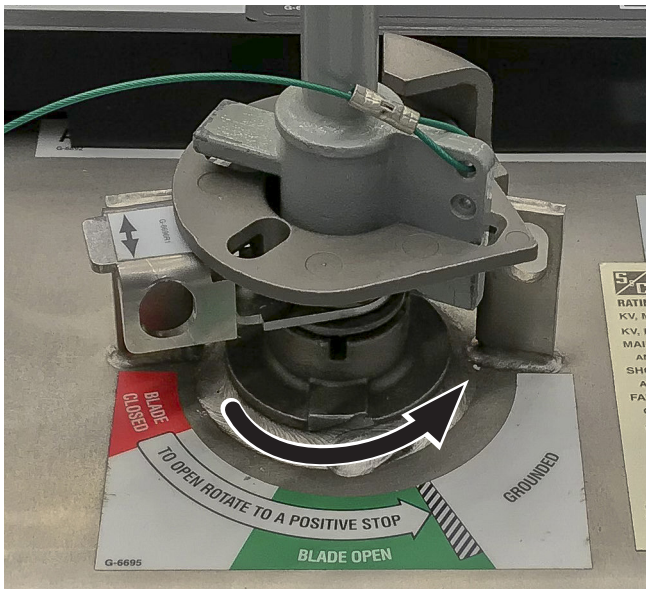


Figure 16. Grounding the fault interrupter.

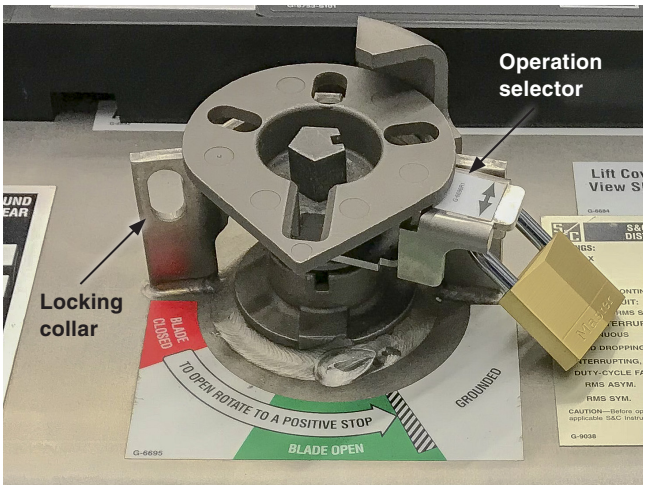


Figure 17. Locked out of the Grounded position.

Locking In Closed, Open, or Grounded Position

To lock the fault interrupter into position, insert a padlock through the operating mechanism and the center hole in the locking collar. See Figures 18, 19, and 20.

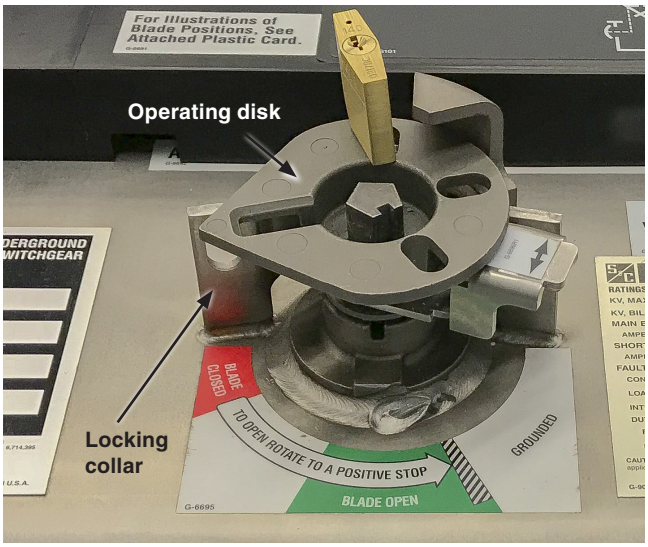


Figure 18. Locked in the Closed position.

Figure 19. Locked in the Open position.

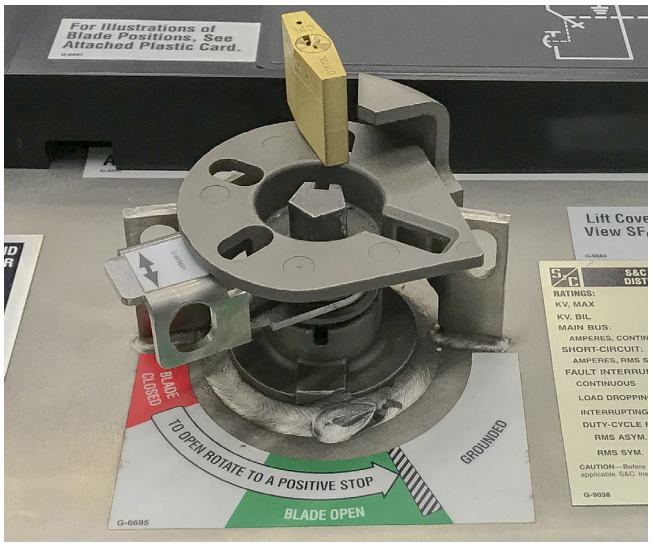


Figure 20. Locked in the Grounded position.

Checking for Voltage Using Optional Voltage Indication

⚠ WARNING

Before using a Voltage indicator, **ALWAYS** test for proper operation. If the Voltage indicator is not operating properly, test for voltage using an alternate method.

NOTICE

When cleaning the surface of the **Voltage** indicator, make sure the test button is thoroughly cleaned of dirt and debris. If light is blocked from the photoreceptor and the sun is bright enough to power the test circuit, the voltage indicator will be in the **Test** mode and may give a false indication that all three phases of the associated load-interrupter switch or fault interrupter are energized. The **Test** mode is indicated by a dot ⊡ in the test window.

STEP 1. Clean the surface of the **Voltage** indicator of dirt and debris. See Figure 21.

STEP 2. Check the **Phase** indicators for the desired phases of the fault interrupter to determine if there is any voltage at the associated bushings. See Figures 22 and 23. A flashing lightning bolt ⚡ in the **Phase** indicator means that voltage is present at the bushing. A blank means either:

(a) There is no voltage at the bushing or

(b) The **Voltage** indicator is malfunctioning.

If any of the phase indicators are blank, proceed to Step 3 on page 15 to test the **Voltage** indicator for proper operation.

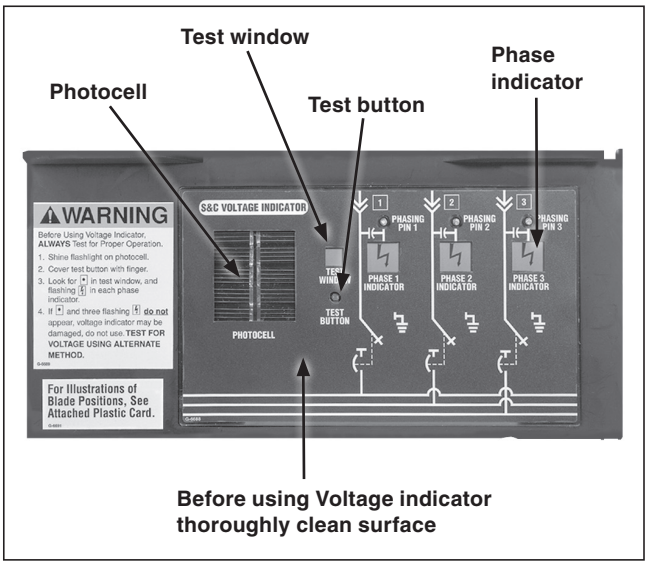


Figure 21. Voltage indicator with test feature.

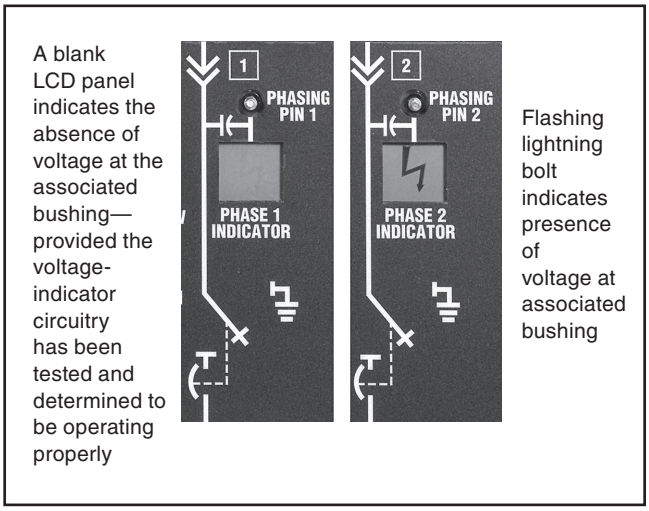


Figure 22. Phase indicators.

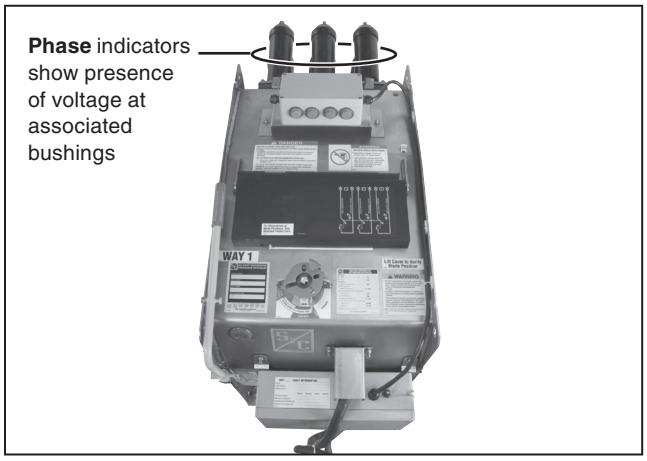


Figure 23. Each voltage indicator is provided with three phase indicators—one for each phase. (Voltage indication with Test feature not shown.)

STEP 3. Test the **Voltage** indicator for proper operation as follows:

(a) Shine a flashlight approximately 4 inches (102 mm) above the photocell, and simultaneously cover the test button with a gloved finger. **Please Note**: When using an LED flashlight to test the photocell, it must be of high brightness. Lower brightness LED flashlights will not power the solar cell. See Figure 24. When the sun is shining brightly, it can be used to power the test circuit.

(b) If a dot ⊡ appears in the test window and a flashing lightning bolt ϟ in each of the three phase indicators, then the **Voltage** indicator is operating properly. See Figure 25.

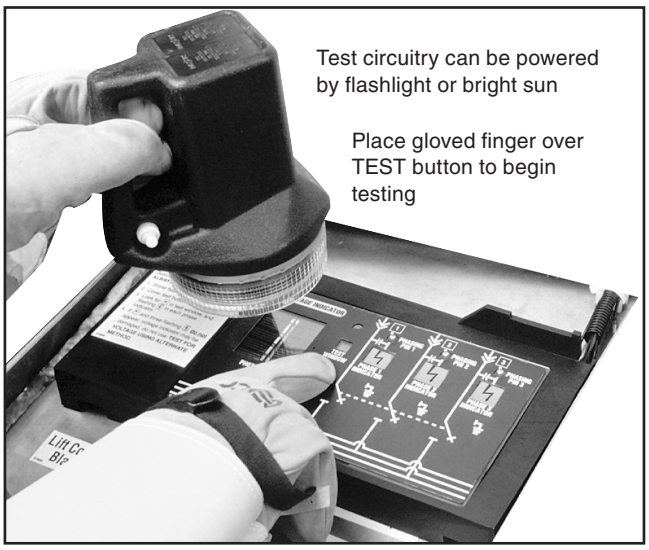


Figure 24. Testing the Voltage indicator.

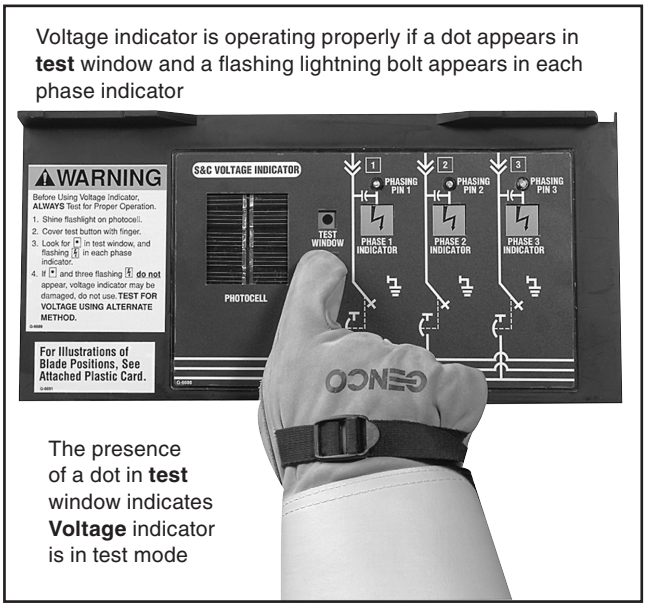


Figure 25. Verify dot appears in test window.

(c) If the dot ⊡ or any of the flashing lightning bolts ⚡ do not appear, make sure the test button is completely covered with a gloved finger so that no light shines on the photoreceptor. Also make sure there is adequate light (provided either by a flashlight or the sun) to power the test circuit. See Figures 26 and 27. If the dot ⊡ or any of the flashing lightning bolts ⚡ still do not appear, the **Voltage** indicator may be damaged. Test for voltage using an alternate method.

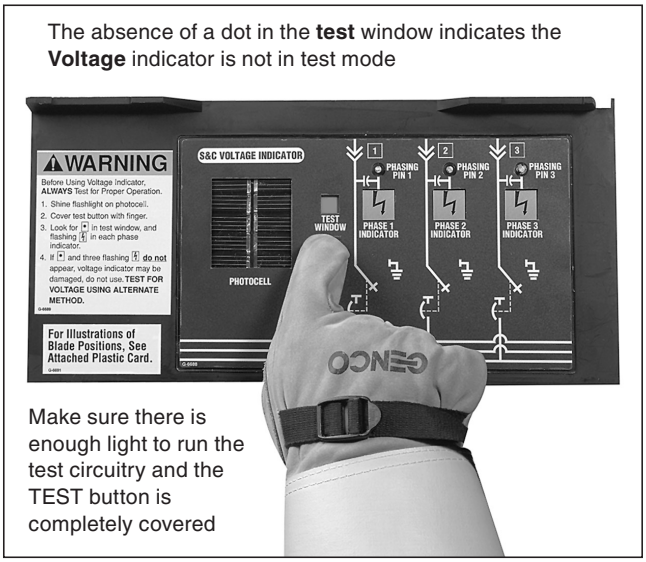


Figure 26. No dot in Test window.

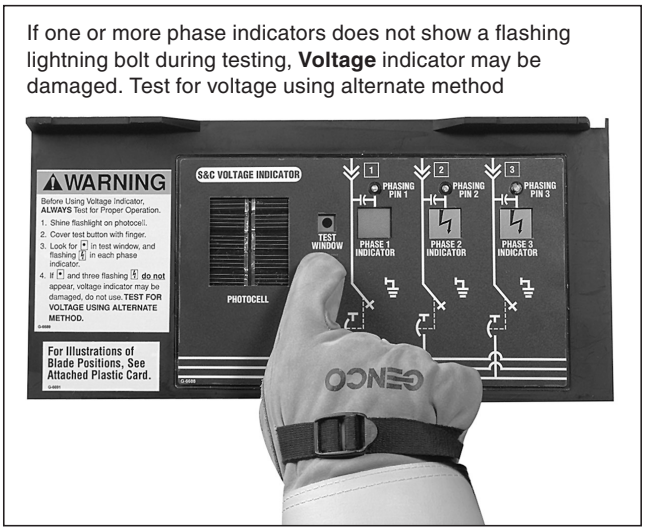


Figure 27. No lightning bolt in Phase 1 indicator.

Components

No mechanical maintenance is required for Wind Turbine Style Vista switchgear. However, occasional inspection of the switchgear and exercising of the fault interrupter is recommended.

⚠ DANGER

When access to the bushings is required for inspection, service, or repairs, always observe the precautions below. **Failure to observe these precautions will result in serious personal injury or death.**

1. Access to switchgear must be restricted only to a qualified person. See “Qualified Persons” on page 2.
2. Always follow safe operating procedures and rules.
3. Before touching any bushings, always disconnect the fault interrupter from all power sources (including backfeed), test for voltage, and properly ground.
4. Always assume the bushings are energized unless proved otherwise by test, by visual evidence of an open-circuit condition at the fault interrupter, or by observing that the interrupter is grounded.
5. Test the bushings for voltage using the **Voltage-Indication** feature (if furnished) or other proper high-voltage test equipment.
6. After the switchgear has been completely disconnected from all sources of power and tested for voltage, ground the fault interrupter.
7. Make sure the switchgear tank is properly grounded to the station or facility ground. Do not return equipment to service unless such grounds are properly made.

▲ These recommendations may differ from company operating procedures and rules. Where a discrepancy exists, users should follow their company’s operating procedures and rules.

Returning Equipment to Service

When returning the equipment to service, the following procedures should be observed:

STEP 1. Make sure the fault-interrupter grounding means is removed.

STEP 2. Make certain the fault interrupter is in the correct position (**Open** or **Closed**).

Elbow Cover Assembly

The elbow cover assembly provided with the Wind Turbine Style Vista switchgear is finished with the S&C Ultradur® Finishing System, which provides lasting protection. The responsibility for ensuring a finish protects the elbow cover assembly lies with both the manufacturer and the user. To retain this protection, the user should take periodic corrective action as follows:

STEP 1. Touch-up any penetration of the finish to bare metal—such as scratches and abrasions due to shipping or vandalism—to maintain the original integrity. S&C touch-up finish and primer are available in aerosol spray cans. See S&C Specification Bulletin 681-31 for ordering information. No other finish or primer is approved. The area to be touched up should be cleaned to remove all oil and grease. Sand the area, removing any traces of rust that may be present, and make sure all edges are feathered before applying primer.

STEP 2. Provide an occasional simple washdown—such as an automobile would be given—to remove surface contaminants. Use any ordinary mild household detergent solution.

In those cases where the elbow cover assembly must be refinished by the user before the finish has weathered—for example, to match other equipment—a special precaution must be taken. The entire surface must be sanded to provide a tooth to bond the new coat to the S&C Ultradur Finish.

Routine Switchgear Testing

For the convenience of users who normally perform electrical tests on system components such as switchgear, appropriate withstand test values for Wind Turbine Style Vista switchgear are given in Table 1. These test values are significantly greater than the normal operating voltage of the switchgear and are near the flashover voltage of the gear. They should be applied only when the switchgear is completely de-energized and disconnected from all power sources.

⚠ WARNING

When performing electrical withstand tests on Wind Turbine Style Vista Switchgear, always observe the following precautions. **Failure to observe these precautions can result in a flashover, injury, and equipment damage.**

1. Completely de-energize the switchgear and disconnect it from all power sources.

2. Terminate bushings with an insulated cap or other appropriate cable termination capable of withstanding the test voltage.

3. Verify that the SF_6-gas pressure gauge is in the green zone.

Table 1. Maximum insulation test voltages

Vista Switchgear Rating, kV			Withstand Test Voltage, kV	
50 Hertz	60 Hertz	Impulse (BIL)	Power Frequency①	Dc②③
12	15.5	95	27	42
24	27	125	40	62
36	38	150	50	82

① The listed power-frequency withstand test voltages in Table 1 are approximately 80% of the design values for new equipment.

② The listed dc withstand test voltages in Table 1 are approximately 80% of the design values for new equipment.

③ Dc withstand test voltages are given for reference only for those users performing dc withstand tests. The presence of these values does not imply a dc withstand rating or performance requirements for the switchgear. A dc withstand design test is specified for new equipment because the switchgear may be subjected to dc test voltage when connected to the cable. The dc withstand test values listed in the table are approximately equal to the ac peak test voltage.

Fault-Interrupter Testing

When performing dielectric tests on Wind Turbine Style Vista switchgear, the vacuum fault interrupter will not be subject to voltage across the open gap because the disconnect switch will isolate the vacuum interrupter from the test voltage. Because the vacuum interrupter will not be energized across the open gap, there is no exposure to X-rays normally associated with high-voltage testing of vacuum devices. Routine testing of the vacuum fault interrupter is not recommended. For those users who desire to test the vacuum interrupter, contact the nearest S&C Sales Office for specific instructions.

Cable Testing and Fault Locating

Dc testing of installed cables is performed to determine the condition of the cables and to locate faults. Industry standards, like IEEE 400, "IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field," describe such testing and should be referenced for selection of the test procedures.

Dc testing also includes cable "thumping," i.e., the sudden application of dc voltage from a large capacitor for the purposes of fault locating, which causes transients and voltage doubling at the end of the open cable. When the cables are attached to the switchgear, the gear will also be subjected to the dc test voltages.

⚠ WARNING

The dc withstand capability of the switchgear may be reduced because of aging, damage, gas leakage, or electrical or mechanical wear. Therefore, the dc test voltage must be selected so it does not exceed the withstand limits of the switchgear. **Application of dc test voltages greater than the withstand capability of the switchgear can result in a flashover, injury, and equipment damage.**

In addition, always verify that the SF_6-gas pressure gauge is in the green zone before proceeding with any testing.

⚠ DANGER

Do not exceed the test voltages given in Table 1. Exceeding the test voltages can cause a flashover of the isolating gap or phase-to-phase insulation of the switchgear. **This can lead to a power-frequency fault in the gear or of the dc test source and result in severe personal injury or death.**

Cables connected to Wind Turbine Style Vista switchgear may be dc tested as follows:

- **With the switchgear energized and the switch blade in the Open position.** The maximum test voltage should not exceed the "Dc Cable Thumping Voltage" indicated in Table 2 on page 20. *Cables must be de-energized before connecting them to the dc fault-locating equipment.*
- **With the switch blade in the Grounded position, grounding the cables connecting the wind turbine generator to the switchgear.** The maximum test voltage should not exceed the "Dc Cable Test Voltage" indicated in Table 2 on page 20. *Cables must be de-energized before connecting them to the dc test equipment.*

After testing, the dc fault-locating or test equipment should be used to discharge any stored charge on the cables before regrounding the cables.

⚠ WARNING

When testing cables connected to energized switchgear, proper isolation of the power-frequency source and dc test source must be maintained. Follow the recommendations of the dc fault-locating or test equipment.

The user's operating and safety procedures should be followed for grounding a cable, connecting the dc test source, isolating the dc test source (in case of flashover), ungrounding the cable, applying the dc test source, discharging the cable, and regrounding the cable.

Table 2. Maximum cable test and cable thumping voltages

Vista Switchgear Rating, kV			Dc Cable Test Voltage, kV	Dc Cable Thumping Voltage, kV①
50 Hertz	60 Hertz	Impulse (BIL)		
12	15.5	95	30	15
24	27	125	40	20
36	38	150	40	20

①The dc cable thumping voltage is 50% of the dc cable test voltage because of voltage doubling that will occur at the open end of the cable that is assumed to be a unit of Wind Turbine Style Vista switchgear. If the open end of the cable is grounded, the dc cable thumping voltage applied to the cable and switchgear can be increased to the dc cable test voltage.

Resistance Measuring

Resistance measurements are used to look for areas of the gear that may exhibit poor contact between current carrying parts.

⚠ DANGER

Resistance measurements are taken using a four-terminal measuring device that provides at least 100 amperes of current to the main circuit. Resistance measurements should be taken from the bushing conductor across each Way to the same phase on each Way of the unit. For example, a measurement would be taken from Way 1 Phase A to Way 2 Phase A, from Way 2 Phase A to Way 3 Phase A, from Way 1 Phase A to Way 3 Phase A, from Way 1 Phase B to Way 2 Phase B, etc.

To measure resistance, perform the following procedure:

STEP 1. Clamp the two current-carrying probes of the resistance measuring device to the bushing conductors of the current-carrying path to be measured. See Figure 28. In this example the resistance is being taken between Way 1 Phase A and Way 2 Phase A.

STEP 2.

NOTICE

DO NOT take resistance measurements from the threaded area of the bushing stud. Resistance measurements taken through the threads of the bushing stud will be inaccurate. See Figure 29.

Clamp or touch the voltage-carrying probes of the resistance measuring device to the flat conductive surface of the bushings that make up the current carrying path. Make sure the measurement probe is in contact with the current-carrying flat face of the bushing conductor rod. If using clamp-style probes, slide the clamp all the way up against the current carrying face to get a good connection. See Figure 29.

▲ Resistance measurements shown without safety gloves. Please adhere to your company's standards in regards to using and PPE when taking resistance measurements.

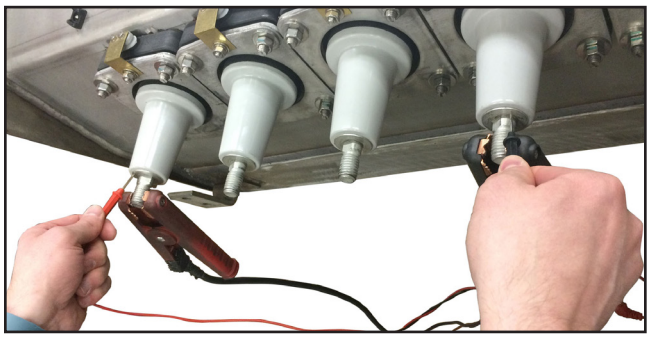


Figure 28. Connecting the resistance measuring device.▲

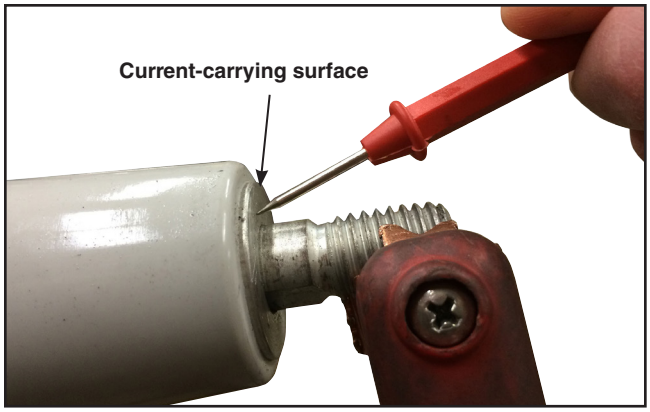


Figure 29. Take the measurement from the flat current-carrying surface of the bushing. ▲