Vacuum Switches

COOPER Power Systems

Type VCS-1SX
Solenoid-Operated Capacitor Switch
Installation and Operation Instructions

Service Information

S260-15-3

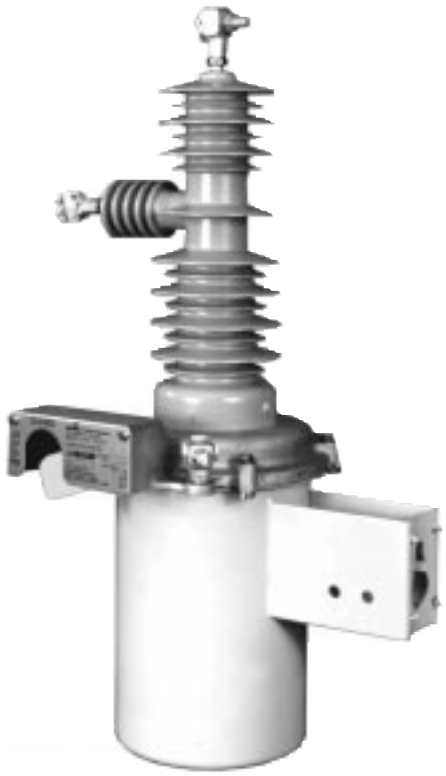


Figure 1.
Kyle® Type VCS-1SX Single-Phase Vacuum Capacitor Switch.

99029KM

Contents

SAFETY FOR LIFE

Kyle Distribution Switchgear products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Kyle employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our “Safety For Life” mission.

SAFETY INFORMATION

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual contains two types of hazard statements:

WARNING: **Refers to hazards or unsafe practices which could result in severe personal injury, or death, and equipment damage.**

CAUTION: **Refers to hazards or unsafe practices which could result in damage to equipment or in personal injury**.

Safety Instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

WARNING: Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage. G101.0

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage. G102.1

WARNING: Hazardous voltage. Contact with high voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high voltage lines and equipment. G103.2

WARNING: Hazardous voltage. This device is not a substitute for a visible disconnect. Follow all locally approved safety practices. Failure to follow proper safety practices can result in contact with high voltage, which will cause death or severe personal injury. G112.1

WARNING: Switchgear must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain switchgear can result in death, severe personal injury, and equipment damage. G122.1

PRODUCT INFORMATION

Introduction

Service Information S260-15-3 provides installation and operating instructions for Kyle Type VCS-1SX solenoid-operated vacuum capacitor switches.

The information contained in this manual is organized into the following major categories; *Safety Information, Product Information, Ratings and Specifications, Dimensions, Installation Procedure,* and *Service Information*. Refer to the table of contents for page numbers.

Read This Manual First

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional Information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Cooper Power Systems Division representative.

Acceptance and Initial Inspection

Each switch is completely assembled, inspected, tested and adjusted at the factory. It is in good condition when accepted by the carrier for shipment. Upon receipt of a switch, inspect the switch thoroughly for damage and loss of parts incurred during shipment. If damage or loss is discovered, file a claim with the carrier immediately.

Handling and Storage

If the switch is to be stored for an appreciable time before installation, provide a clean, dry storage area. Locate the switch so as to minimize the possibility of mechanical damage.

Quality Standards

The Quality System at the Cooper Power Systems Kyle Distribution Switchgear plant is certified to the following standards:

ISO 9001, 1994

CAN/CSA ISO 9001, 1994

BS EN ISO 9001, 1994

ANSI/ASQC Q9001, 1994

Description of Operation

The Kyle Type VCS-1SX solenoid-operated Vacuum Capacitor Switch is a single-phase, electrically-operated vacuum switch. The solid polymer insulation system does not rely on gaseous or liquid dielectrics. Highly resistant to ozone, oxygen, moisture, contamination, and ultraviolet light, it is an environmentally-safe capacitor switch. The VCS-1SX switch has a single, solid polymer bushing and is suitable for operation through a temperature range of -40°C to +65°C.

The switch may be opened and closed electrically by applying rated control voltage to the proper terminals of the actuator receptacle.

RATINGS AND SPECIFICATIONS

Check Switch Ratings Before Installation

The switch must be applied within its specified ratings. Check data plate ratings and compare with the system characteristics at the point of application prior to installation. Tables 1 through 6 list the specifications and ratings for the VCS-1SX switch.

TABLE 1
General Specifications

Creepage Distance, mm (in)	
Terminal to Terminal	513 (20)
Terminal to Ground	638 (25)
Mass kg (Weight lb)	16 (35)
Mechanical operations w/o maintenance (C-O)	15,000
Operating Temperature range, °C	-40° to +65°

TABLE 2
Duty Cycle (per ANSI C37.66)

200 Amps	400 operations
100 Amps	400 operations
40 Amps	400 operations

TABLE 3
Electrical Specifications

Operating Voltage, nominal	120 Vac
Operating Voltage range	95 - 127 Vac
Current, nominal	5 A
Nominal Close Time	50 ms
Nominal Open Time	50 ms

TABLE 4
Voltage Ratings

Maximum Voltage	
Solidly Grounded Capacitor Banks	12.0 kV
Ungrounded Capacitor Banks	10.0 kV
Rated Basic Impulse Voltage, line to ground	125 kV
Open Contact BIL	95 kV
Radio Noise Limit @ 16.4 kV	100 µV
60 Hz Withstand	
Dry, 1 minute	50 kV
Wet, 10 seconds	45 kV

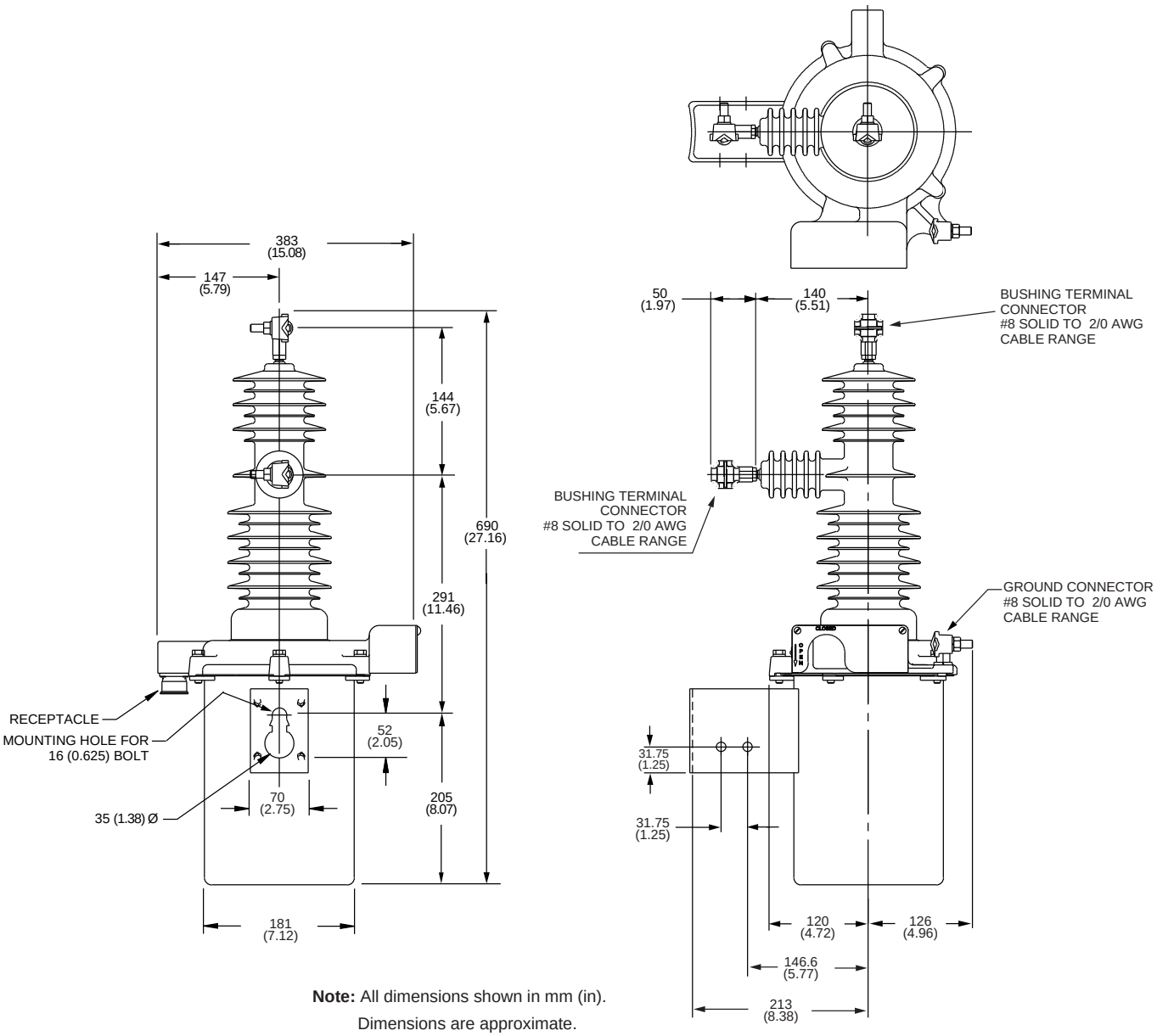
TABLE 5
Current Ratings

Rated Asymmetrical Making Current	9000 A
Rated Continuous Current	200 A
Load Interrupting Ability (Inductive)	
10 to 100% Power Factor	200 A
Capacitive Current (Max.)	200 A
Short-Time Current:	
Momentary Asymmetric (10 cycles)	9000 A
Symmetric (0.5 second)	6000 A
Symmetric (1 second)	4500 A
Rated High Frequency Peak	
Transient Making Current	12000 A
Rated Transient Inrush Frequency	6000 Hz

TABLE 6
Control Wiring Specification

Accessory Plug			
Catalog Number	**Number of Pins**	**Cable Range O.D.**	**Maximum Wire Size AWG**
KA48NR	5	11-14 mm (0.437 - 0.562 in)	12
KA98NR	6	13 -16 mm (0.500 - 0.625 in)	16

DIMENSIONS



Note: All dimensions shown in mm (in).
Dimensions are approximate.

Figure 2.
Dimensions of VCS-1SX switch.

INSTALLATION PROCEDURE

Check-out Procedure

1. **Check data plate.** Make sure that ratings on the data plate are correct for the planned installation.

> **!** CAUTION: Equipment Damage. Do not adjust or rotate bushing terminals. The bushing terminals are factory-calibrated to meet the continuous current requirement of the switchgear. Adjusting or rotating the bushing terminals can damage the encapsulated interrupter resulting in equipment damage or personal injury. T 270 .0

2. **Re-orient switch head position for optimum alignment to cable conductors if required for installation.**
   - **A.** Loosen the head-to-tank bolts.
   - **B.** Rotate the switch head to desired position.
   - **C.** Re-torque the head-to-tank bolts in an alternating pattern to 13 - 20 N-m (10 - 15 ft.-lbs).
3. **Install the switch**. Follow locally approved installation procedures. Mounting hardware is available for pole mounting as an accessory.

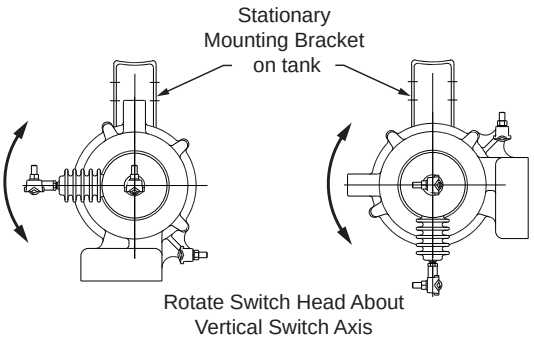


Figure 3.
Adjustment of switch head position to accomodate varying mounting requirements.

High-Voltage Connections

> **!** WARNING: Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage. T223.2

> **!** WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage. G102.1

1. **Ground the switch.** Make the ground connection to the ground connector located on the switch as shown in Figure 2.
2. **Make line connections.** Connect the primary leads to the switch terminals.The universal clamp-type terminals accommodate AWG No. 8 solid through 2/0 AWG stranded conductor.

Control Wiring

Connections

Connections to the solenoid actuating mechanism are made through the standard five-pin (or optional six-pin) receptacle on the head casting.

Mating plugs for the receptacle must be ordered separately. Maximum cable and wire sizes accommodated by the plugs are indicated in Table 6.

Pin orientation diagrams for the receptacles are shown in Figure 4.

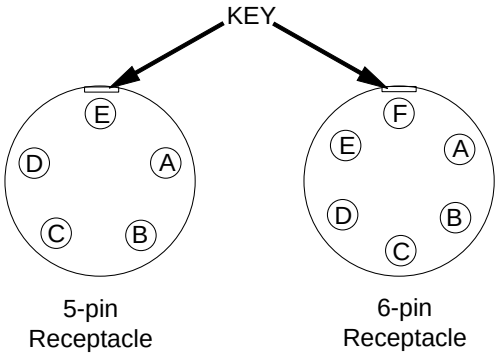


Figure 4.
Receptacle pin orientation.

Three-Wire Control

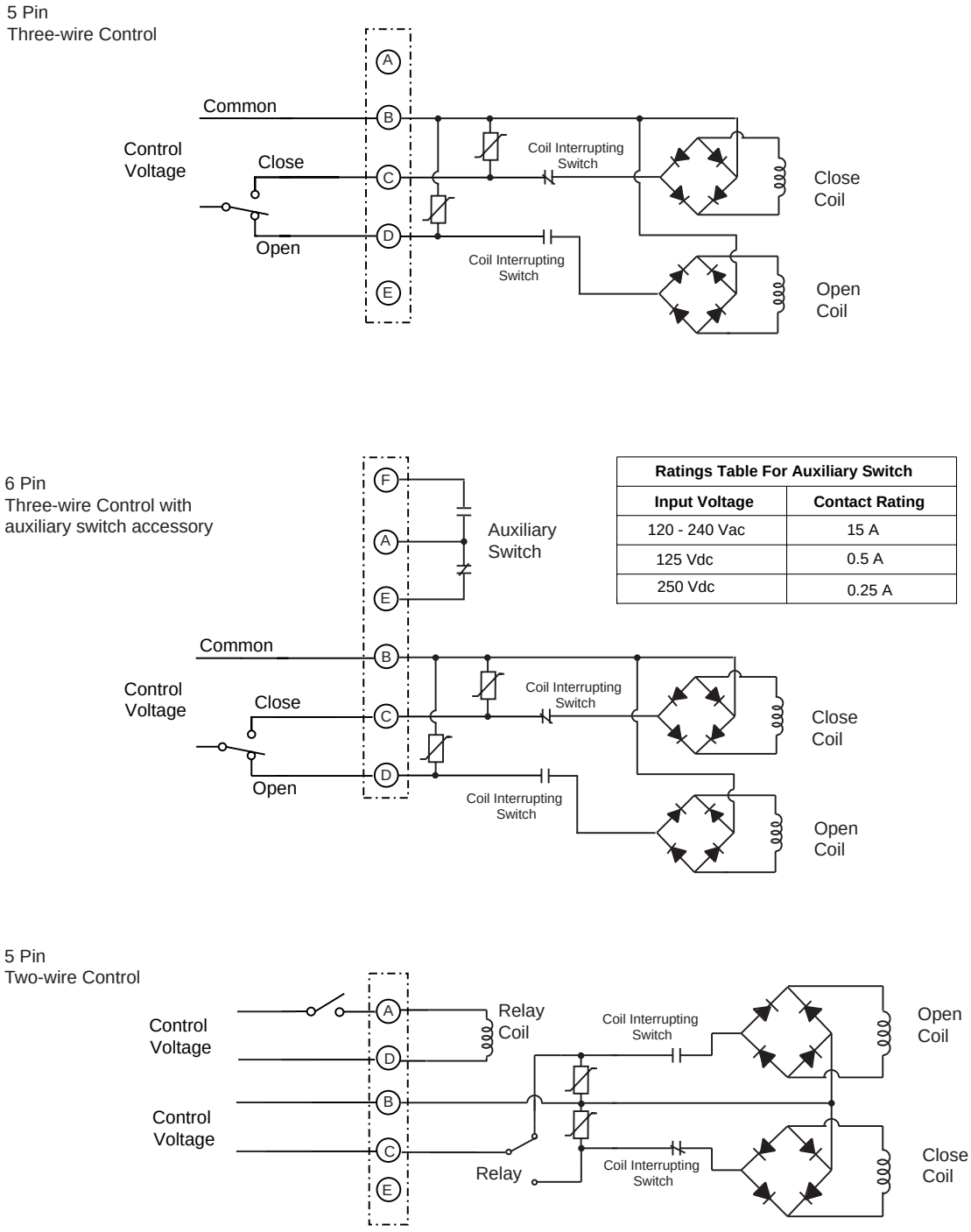
The basic device for remote control of the VCS-1SX switch is a single-pole, double-throw switch (three-wire control) supplied by the customer. Any manual switch, time switch, voltage-, current- or photo-electric controlled switch, or similar device, can be used, provided the control circuit is energized for a minimum of 50 milliseconds for each operation. A connection diagram for a three-wire control is shown in Figure 5.

Two-Wire Control With Relay

The control can also be operated by an SPST device (two-wire control). A factory-installed SPDT relay accessory is required for two-wire control operation. A connection diagram for a two-wire control is shown in Figure 5.

Wiring Diagrams

Schematic diagrams of switch actuators with various accessories wired for two- and three-wire control are shown in Figure 5.



Ratings Table For Auxiliary Switch	
Input Voltage	**Contact Rating**
120 - 240 Vac	15 A
125 Vdc	0.5 A
250 Vdc	0.25 A

Figure 5.
Typical connection diagrams (switch shown in OPEN position).

SERVICE INFORMATION

Service Requirements

The Kyle Type VCS-1SX switch has been designed with a minimum mechanical life of 15,000 operations. The switch requires routine inspection to check for physical damage and to verify operation.

Frequency of Inspection

Because these switches are applied under widely varying operation and climatic conditions, service intervals are best determined by the user based upon actual operating experience.

! WARNING: Hazardous voltage. The switchgear and high voltage transformer must be in a test cage or similar protective device to prevent accidental contact with high voltage parts. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage. T221.3

! CAUTION: Radiation. At voltages up to the specified test voltages, the radiation emitted by the vacuum interrupter is negligible. However, above these voltages, radiation injurious to personnel can be emitted. See Service Information S280-90-1, Vacuum Interrupter Withstand Test Voltage Ratings Information for further information. G109.2

High Potential Withstand Testing

Use the following procedures to perform high-potential withstand tests at 75% of the rated 60 Hz withstand voltage for one minute. See Table 4.

Closed Contacts Test

1. Close the switch contacts.
2. Ground the switch.
3. Apply proper test voltage to one of the bushing terminals. The switch should withstand the test voltage for 60 seconds.

Open Contacts Test

1. Open the switch contacts.
2. Ground the switch.
3. Ground the bushing terminal on one side of the switch.
4. Apply proper test voltage to the ungrounded bushing terminal. The switch should withstand the test voltage for 60 seconds.
5. Reverse the test and ground connections to the bushing terminals.
6. Apply proper test voltage to the ungrounded bushing terminal. The switch should withstand the voltage for 60 seconds.

Withstand Test Results

The high potential withstand tests provide information on the dielectric condition of the switch.

If the switch passes the closed-contacts test and fails the open-contacts test, the cause is likely to be in the interrupter assembly.

If the switch fails the closed-contacts test, the cause is likely to be a diminished electrical clearance or failed insulation.

Replacement Parts

Replacement parts for Kyle switches are available through the factory service department. Only factory authorized parts are to be used. Contact your Cooper Power Systems representative for additional information and ordering procedures.

Factory-Authorized Service Centers

Factory-authorized service centers are located throughout North America to provide maintenance, repair and testing services for Kyle switches. For further information, contact your Cooper Power Systems representative.

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