Edison™ Single-Phase Vacuum Capacitor Switch
Installation and Operation Instructions
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Safety for life

Eaton meets or exceeds all applicable industry standards relating to product safety in its Cooper Power™ series products. 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 Eaton 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

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:
• Is thoroughly familiar with these instructions.
• Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
• Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
• Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

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 may contain four types of hazard statements:

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

⚠️ WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠️ CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠️ CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

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.

⚠️ DANGER
Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high and low-voltage lines and equipment.  
G103.3

⚠️ 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
Power distribution and transmission equipment 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 power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.  
G122.2
Product information

Introduction
Service Information MN230007EN provides installation instructions, operation information, and maintenance information for Eaton's Cooper Power series Edison™ capacitor switches.

The information contained in this manual is organized into the following major categories: Safety information, Product information, Ratings and specifications, Installation procedure, Switch operation, Dimensions, 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 Eaton Cooper Power series product representative.

Acceptance and initial inspection
Each capacitor 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 capacitor switch, inspect the capacitor 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 capacitor switch is to be stored for an appreciable time before installation, provide a clean, dry storage area. Locate the capacitor switch so as to minimize the possibility of mechanical damage.

When transporting or storing the switch, the contacts should be kept in the closed position to avoid damage to the vacuum bottle contacts.

Standards
Edison capacitor switches are designed and tested in accordance with IEEE Std C37.66™-2005 standard.

Quality standards
ISO 9001 Certified Quality Management System

Description of operation
The Edison vacuum capacitor switch is a single-phase, Solenoid-operated vacuum switch. The solid polymer insulation system does not rely on gas, foam, or liquid dielectrics. Highly resistant to ozone, oxygen, moisture, contamination, and ultraviolet light, it is an environmentally safe capacitor switch. The Edison capacitor switch has polymer bushings and is suitable for operation through a temperature range of -40 °C to +60 °C.
Ratings and specifications

Check switch ratings before installation

The Edison capacitor 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. Table 1 list the ratings and specifications for the Edison capacitor switch.

Table 1. Ratings and specifications

<table>
<thead>
<tr>
<th>Voltage class</th>
<th>15 kV ECS15-95</th>
<th>ECS15-125</th>
<th>25 kV ECS25-125</th>
<th>ECS25-150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated maximum voltage, 50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ungrounded capacitor banks, L-L (kV)</td>
<td>15.6</td>
<td>15.6</td>
<td>25</td>
<td>15.6</td>
</tr>
<tr>
<td>Solidly grounded capacitor banks, L-L (kV)</td>
<td>15.6</td>
<td>27</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open contact kV (BIL)</td>
<td>95</td>
<td>95</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Line to ground (kV BIL)</td>
<td>95</td>
<td>125</td>
<td>125</td>
<td>150</td>
</tr>
<tr>
<td>Withstand voltage, 60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Frequency Dry Withstand (kV)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Power Frequency Wet Withstand (kV)</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Continuous current 50/60 Hz (A)</td>
<td>200</td>
<td>200/400</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Capacitive switching current 50/60 Hz (A)</td>
<td>200</td>
<td>200/400</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Fault making peak current (A)</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Symmetrical fault making current (A)</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Withstand peak current (A)</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Short-time symmetrical withstand current (A)</td>
<td>4,500</td>
<td>4,500</td>
<td>4,500</td>
<td>4,500</td>
</tr>
<tr>
<td>High frequency transient making peak current (A)</td>
<td>9,000</td>
<td>9,000/12,000 *</td>
<td>9,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Rated transient inrush frequency (Hz)</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Creepage distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal to terminal (mm)</td>
<td>440</td>
<td>600</td>
<td>813</td>
<td>813</td>
</tr>
<tr>
<td>Terminal to ground (mm)</td>
<td>498</td>
<td>610</td>
<td>610</td>
<td>813</td>
</tr>
<tr>
<td>Operating voltage range, 50/60 Hz **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110/120 Vac (V)</td>
<td>75 – 130</td>
<td>75 – 130</td>
<td>75 – 130</td>
<td>75 – 130</td>
</tr>
<tr>
<td>Nominal control current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110/120 Vac for 100 msec (A)</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>240 Vac for 100 msec (A)</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Weight (lb/kg)</td>
<td>32/14</td>
<td>33/15</td>
<td>33/15</td>
<td>34/16</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-40 °C to +60 °C</td>
<td>-40 °C to +60 °C</td>
<td>-40 °C to +60 °C</td>
<td>-40 °C to +60 °C</td>
</tr>
<tr>
<td>Mechanical operations</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Aux contact rating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110/120 Vac (A)</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>240 Vac (A)</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>110/120 Vdc (A)</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
</tbody>
</table>

* The 15.6 kV rated Edison Capacitor Switch is available with an optional High Frequency Transient Making Peak Current of 12 kA. Contact factory for additional information.

** Contact factory for more information regarding dc control voltages.

Note: The durability of the Edison capacitor switch was demonstrated by completing a minimum of 50,000 mechanical operations after performing the Mechanical Life Test in accordance with IEEE Std C37.66™-2005 standard. One operation is defined as one close and one open operation.
**Edison™ Single-Phase Vacuum Capacitor Switch**

**Installation procedure**

**CAUTION**

Personal injury. Sheds on epoxy encapsulation have sharp edges. Wear protective gloves when handling the unit. Failure to do so can result in cuts and abrasions.

**Check-out procedure**

1. **Check data plate.** Make sure that ratings on the data plate are correct for the planned installation.
2. **Visually inspect the switch.** Visually inspect the switch for any damage to bushing sheds, terminals, tank, or trip handle.
3. **Install the switch.** Follow locally approved installation procedures. Mounting hardware is available for pole mounting as an accessory.

**High-voltage connections**

1. **Ground the switch.** Make the ground connection to the ground connector located on the switch bracket of the switch.
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 stranded conductor.
3. **Recommended torque levels for line and load terminal hardware are 20–22 ft-lbs (27.1–29.8 N-m) not to exceed 30 ft-lbs (40.7 N-m).**

**WARNING**

Hazardous voltage. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage.

**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.

**Control wiring**

Connections to the actuating mechanism are made through the standard five-pin (or optional six-pin) receptacle at the bottom of the switch.

Mating plugs for the receptacle may be ordered separately. Maximum cable and wire sizes accommodated by the plugs are indicated in Table 2.

<table>
<thead>
<tr>
<th>Accessory mating plug</th>
<th>Number of Pins</th>
<th>Cable Range O.D.</th>
<th>Max. Wire Size AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11–14 mm (0.437–0.562 in.)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13–16 mm (0.500–0.625 in.)</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Pin orientation diagrams for the accessory receptacles are shown in Figure 1.

**Three-wire control**

Remote control of the Edison capacitor switch is supplied by a single-pole, double-throw switch (three-wire control) supplied by the customer. Any manual switch, relay contact, 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 80–100 ms for each operation. Eaton requires a 10-second cool-down period between open and close operations to ensure the switch coil does not overheat or become damaged. A connection diagram for a standard three-wire control is shown in Figure 2.
Wiring diagrams

Schematic diagrams of switch actuators wired for two- and three-wire controls are shown in Figure 2. Accessories are shown with dashed lines. These diagrams apply only for alternating current (ac) control voltage. For direct current (dc) control voltage please contact your Eaton’s Cooper Power series product representative.

A. 5-Pin
   Three-Wire Control

B. 5-Pin
   Three-Wire Control with Form A Auxiliary Switch Accessory

C. 5-Pin
   Three-Wire Control with Form B Auxiliary Switch Accessory
D. 6-Pin
Three-Wire Control
with Form C Auxiliary Switch Accessory

Figure 2. Typical connection diagrams (switch shown in OPEN position)
Switch operation

Electrical operation
The switch may be opened and closed electrically by applying rated control voltage to the proper terminals of the actuator receptacle. See “Installation procedure” on page 3 for electrical connections and operating time.

Manual hotstick operation

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.

The switch may be manually opened by using a hotstick to operate the yellow manual operating handle under the sleet hood as shown in Figure 3 and Figure 4.

WARNING
Hazardous voltage. Do not rely on the open position of the yellow operating handle; it does not ensure that the line has been de-energized. Always establish a visible disconnect. Failure to follow proper safety practices can result in contact with high voltage, which will cause death or severe personal injury.

To open the switch contacts, insert the hotstick tip into the hotstick guide of the manual operating handle and pull downward to the OPEN position. See Figure 3.

Control power is required to close the switch.

Contact position indication
The yellow operating handle is also used as a contact position indicator. The switch is closed when the operating handle is in the up position and is open when the operating handle is in the down position. See Figure 3 and Figure 4.

Figure 2. Contact position indicator (switch shown in closed position)

Figure 3. Contact position indicator (switch shown in open position)
Dimensions

Figure 4. Dimensions of Edison capacitor switch
All dimensions are inches (mm). Dimensions shown are approximate. See Table 3 on page 8 for details.
Table 3. Dimensions for Figure 5 drawings

<table>
<thead>
<tr>
<th>Switch Open Contact BIL/L-G BIL</th>
<th>Dimensions, inches (mm)</th>
<th>Creepage, inches (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A*</td>
<td>B*</td>
</tr>
<tr>
<td>95/95 kV BIL</td>
<td>27.78 (706)</td>
<td>25.89 (659)</td>
</tr>
<tr>
<td>95/125 kV BIL</td>
<td>27.78 (706)</td>
<td>25.89 (659)</td>
</tr>
<tr>
<td>125/125 kV BIL</td>
<td>30.54 (776)</td>
<td>28.81 (732)</td>
</tr>
<tr>
<td>125/150 kV BIL</td>
<td>32.54 (827)</td>
<td>30.81 (783)</td>
</tr>
</tbody>
</table>

* See Figure 5 on page 7.

Service information

Service requirements

The mechanical durability of the Edison capacitor switch was demonstrated by completing a minimum of 50,000 operations after performing the Mechanical Life Test in accordance with IEEE Std C37.66™-2005 standard. The switch requires no routine maintenance; however, the switch should be inspected on a regular basis to check for physical damage and to verify operation.

Frequency of inspection

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

**WARNING**

Hazardous voltage. The switchgear (apparatus and control) and high-voltage transformer must be in a test cage or similar protected area to prevent accidental contact with the high-voltage parts.

Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage.

**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.