Vacuum-Break Switches

COOPER Power Systems

Types DAS15, DAS27, and DAS38 Three-Phase; Vacuum-Break Distribution Automation Switch Installation and Operation Instructions

Service Information

S260-60-1

Applicable to Serial Numbers A101 and above or beginning with CP57.

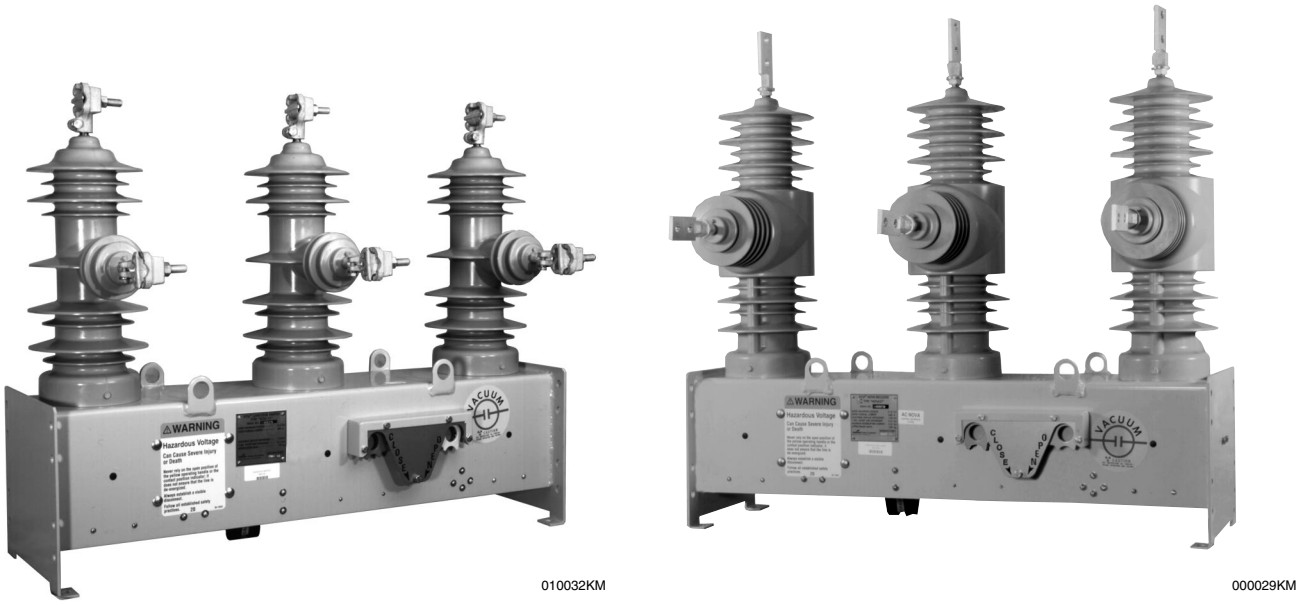


Figure 1.
Kyle® Type DAS Three-Phase Vacuum-Break Distribution Automation Switch. Shown: DAS15 without CT (left) and DAS27 with internal CT (right, optional flatpad terminals).

Contents

SAFETY FOR LIFE

Cooper Power Systems 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 Cooper Power Systems 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 flash clothing, safety glasses, face shield, hard hat, rubber gloves, 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 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 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 prodedures. 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 equipment can result in death, severe personal injury, and equipment damage. G122.2

PRODUCT INFORMATION

Introduction

Service Information S260-60-1 provides installation, operation, and maintenance instructions for the Kyle™ Type DAS Distribution Automation Switch. Before installing and operating this switch, carefully read and understand the contents of this manual.

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 representative.

Acceptance and Initial Inspection

Each switch is completely assembled, tested, and inspected at the factory. It is in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the shipping container for signs of damage. Unpack the switch and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.)

Handling and Storage

Be careful during handling and storage of the switch to minimize the possibility of damage. If the switch is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Standards

Kyle switches are designed and tested in accordance with IEC-265-1.

Quality Standards

ISO 9001:2000 Certified Quality Management System

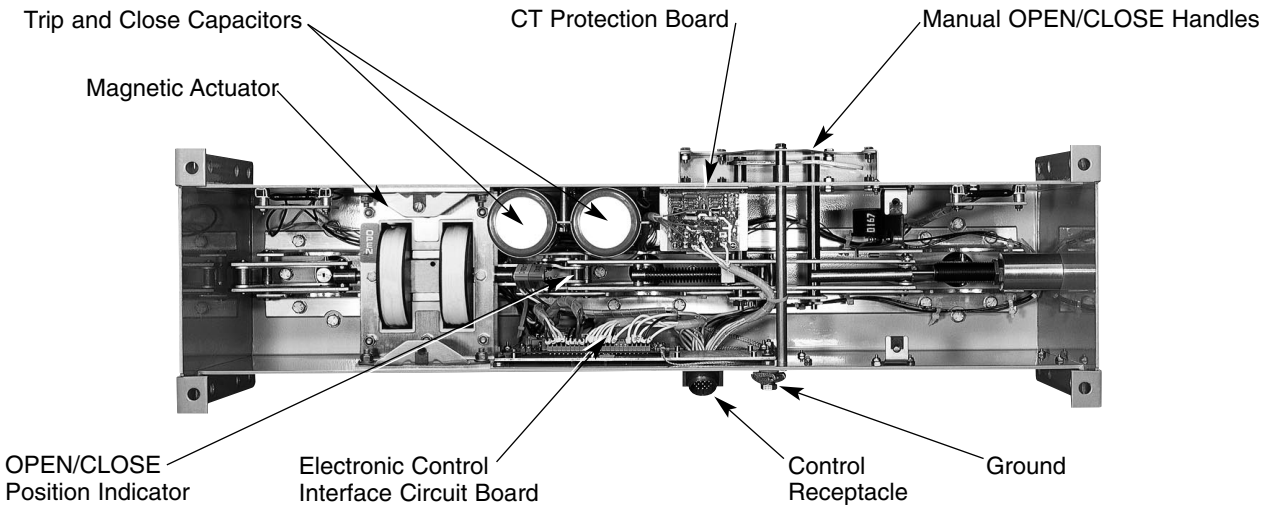
Description of Operation

The Kyle Type DAS Distribution Automation Switch is a three-phase, electronically controlled, vacuum switch with a mechanism that provides close and latch capability for electrical operation. The DAS Distribution Automation Switch can be ordered with an embedded CT option for current-sensing applications. This option is available at 15 kV and 27 kV; for 38 kV, the embedded CT is standard.

The solid polymer insulation system does not rely on gaseous or liquid dielectric. The DAS switch is highly resistant to ozone, oxygen, moisture, contamination, and ultraviolet light. The DAS switch has three, solid-polymer interrupter modules and is suitable for operation through a temperature range of -40°C to +65°C. This results in an environmentally safe switch for general purpose, distribution automation, and distribution switching applications.

Fusing Requirements

A 16 amp Wickman TCC 195-16.00A slow-blow fuse or equivalent is recommended for applications requiring fuse protection between the DAS switch and connected circuits.



99026KM

Figure 2.
Type DAS Distribution Automation Switch mechanism (view from bottom of switch with bottom cover removed).

RATINGS AND SPECIFICATIONS

Check Switch Ratings Prior To 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 4 list the ratings and specifications for the Type DAS switch.

TABLE 1
Voltage Ratings

Description	DAS15	DAS27	DAS38
Maximum Voltage	15.5 kV	27.0 kV	38.0 kV
Rated Basic Impulse Voltage	110/125* kV	125/150* kV	150.0 kV
Rated Basic Impulse Voltage (Open Contacts)	125.0 kV	145.0 kV	150.0 kV
Radio Noise Limit (microvolts)	100 @ 9.4 kV	100 @ 16.4	100@ 23.0 kV
Power Frequency Withstand	38.0 kV	50.0 kV	70.0 kV
Power Frequency Withstand (Open Interrupters)	45.0 kV	60.0 kV	60.0 kV

*Optional BIL ratings available with internal CT option.

TABLE 2
Current Ratings

Description	DAS15	DAS27	DAS38
Rated Continuous Current	630/800* A	630/800* A	630/800* A
Three-Hour Overload	950/1200* A	950/1200* A	950/1200* A
Rated Loadbreak Capability	630/800* A	630/800* A	630/800* A
Short Circuit Current, 1 Second Symmetrical.	12.5 kA	12.5 kA	12.5 kA
Making Current, Asymmetrical Peak	31.0 kA	31.0 kA	31.0 kA
Making Current, Asymmetrical RMS.	20.0 kA	20.0 kA	20.0 kA

*Available optional ratings.

TABLE 3
Mechanical Ratings

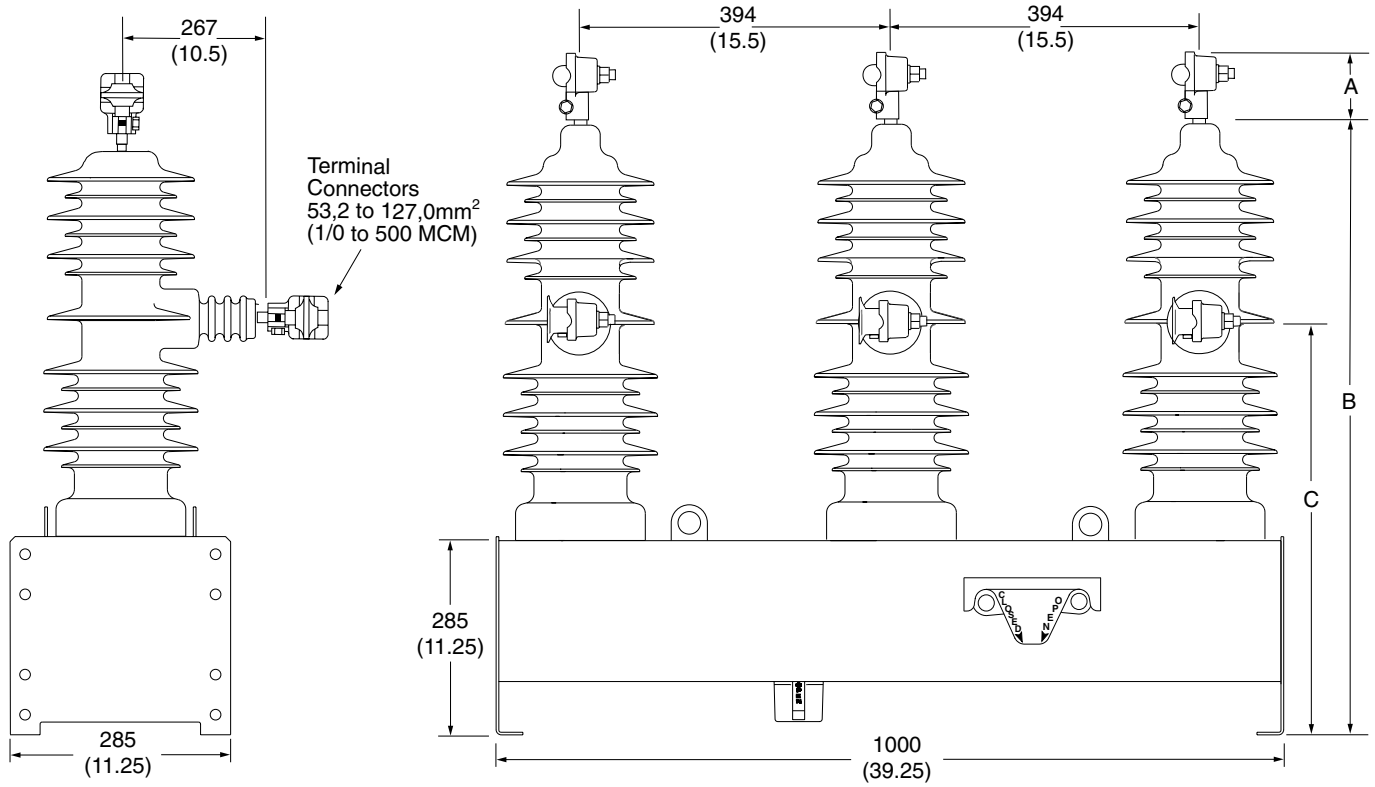
Description	DAS15	DAS27	DAS38
Mechanical Operations without Maintenance (opening/closing operations)	10,000	10,000	10,000

TABLE 4
Power Consumption

Description	DAS15	DAS27	DAS38
Operating Voltage	48v dc	48 vdc	48 vdc
Inrush Switching Current	250 A	250 A	250 A
Inrush Switching Current Duration	2 cycles	2 cycles	2 cycles
Quiescent Power Consumption	20 mA	20 mA	20 mA

DIMENSIONS AND WEIGHTS

Dimensions and Weights for DAS without Internal CT



NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.

	B	C
DAS15	730 (28.75)	508 (20)
DAS27	787 (31)	572 (22.5)

Terminal Options	A
Eyebolt, 1/0 - 500 mcm Cable Range (630 A maximum)	80 (3.25)
Eyebolt, 4/0 - 1000 mcm Cable Range (800 A maximum)	108 (4.25)
Flat Pad, 2-hole (630 A)	114 (4.5)
Flat Pad, 4-hole (800 A)	121 (4.75)
Stud Type, 1.125 - 12 threads (800 A maximum)	82 (3.25)

Creepage Distances (without CT)

Description	DAS15	DAS27
Terminal to terminal*	673 (26.5)	673 (26.5)
Terminal to ground/earth	668 (26.25)	833 (32.75)

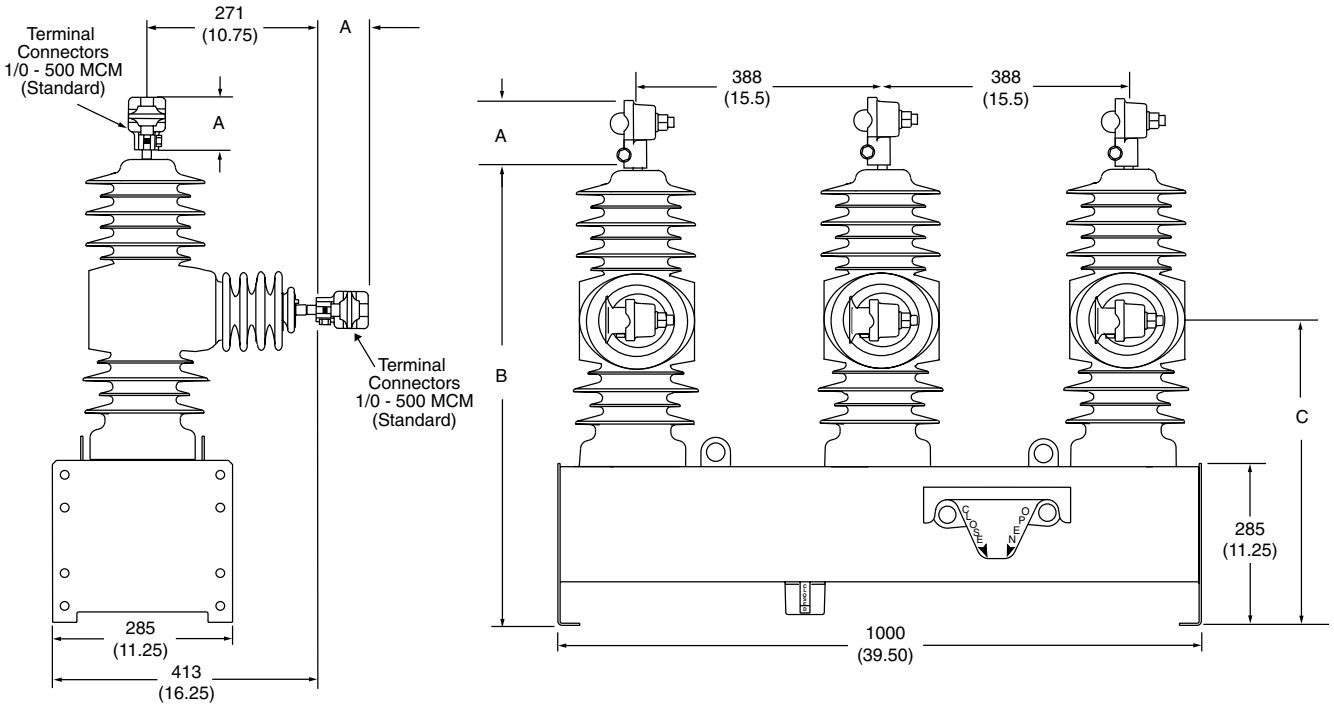
*On the same phase.

Figure 3.
Type DAS switch dimensions (27 kV switch without CT shown).

TABLE 5
Type DAS Switch Weights (without CT)

Description	DAS15	DAS27
DAS switch - kilograms (pounds)	73 (160)	75 (165)

Dimensions and Weights for DAS with Embedded CT



NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.

Terminal Options	A
Eyebolt, 1/0 - 500 mcm Cable Range (630 amps maximum)	80 (3.25)
Eyebolt, 4/0 - 1000 mcm Cable Range (800 amps maximum)	108 (4.25)
Flat Pad, 2-hole (630 amps)	114 (4.5)
Flat Pad, 4-hole (800 amps)	121 (4.75)
Stud Type, 1.125 - 12 threads (800 amps maximum)	82 (3.25)

	B	C
15 kV 110 kV BIL	791 (31.25)	508 (20)
15 kV 125 kV BIL	847 (33.25)	564 (22.25)
27 kV 125 kV BIL	847 (33.25)	564 (22.25)
27 kV 150 kV BIL	946 (37.25)	663 (26.0))
38 kV 150 kV BIL	946 (37.25)	663 (26.0)

Creepage Distances (with internal CT'S)

Description	15 kV 110 kV BIL	15 kV 125 kV BIL	27 kV 125 kV BIL	27 kV 150 kV BIL	38 kV 150 kV BIL
Terminal to terminal, on the same phase	1052 (41.5)	1052 (41.5)	1052 (41.5)	1052 (41.5)	1052 (41.5)
Lower terminal to ground/earth	678 (26.5)	775 (30.5)	775 (30.5)	950 (37.5)	950 (37.5)

Figure 4.
Type DAS switch dimensions (27 kV switch with internal CT shown).

TABLE 6
Type DAS Switch Weights (with internal CT)

Description	DAS15 110 kV BIL	DAS15 125 kV BIL	DAS27 125 kV BIL	DAS27 150 kV BIL	DAS38 150 kV BIL
DAS switch - kilograms (pounds)	86 (190)	91 (200)	91 (200)	101 (223)	101 (223)

TESTING OPERATION

When installing the switch, refer to the applicable switch mounting frame instructions. Installation instructions are included with the mounting frame.

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. Always use a hotstick when working with this equipment. Failure to do so could result in contact with high voltage, which will cause death or severe personal injury. G108.1

1. **Check the name plate ratings.** Make sure the ratings and settings on the switch name plate are correct for the planned installation. See Figure 7.

2. **Test manual open and close.** Using a hotstick, pull the yellow manual OPEN handle down to open the switch contacts. Confirm that the contacts are open as follows:
   - By the OPEN/CLOSE position indicator, or
   - By a continuity check between the switch terminals.

   To close the switch contacts:

   A. Raise the yellow OPEN handle.

   B. Pull the red manual CLOSE handle.

INSTALLATION PROCEDURE

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. **Check the name plate ratings.** Make sure the ratings and settings on the switch name plate are correct for the planned installation. See Figure 7.

CAUTION: Follow all locally approved safety practices when lifting and mounting the equipment. Use the lifting lugs provided. Lift the unit smoothly and do not allow the unit to shift. Improper lifting can result in equipment damage. G106.2

CAUTION: Personal injury. Bushings have sharp edges. Wear protective gloves when handling the unit. Failure to do so can result in cuts and abrasions. T258.0

2. **Install the switch.** Kyle mounting frames should always be used. See Figure 5 for lifting instructions.

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

3. **Ground the switch.** Make the ground connection to the ground connector. The ground connector is located on the back of the mechanism housing. The ground clamp accepts #10 to #2 stranded cables.

4. Make all cable connections prior to energizing control device.

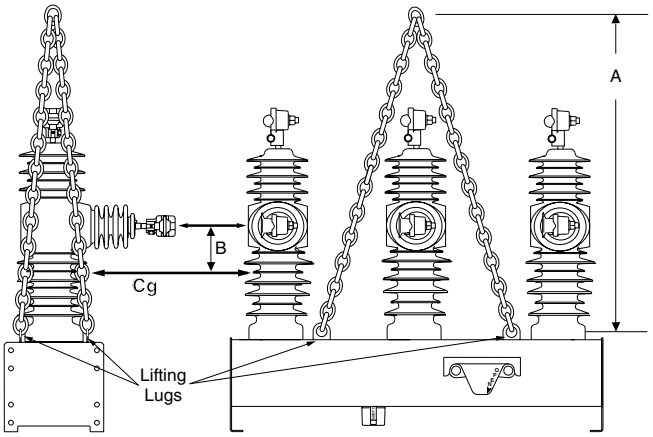
Moving the Switch

Type DAS switches are shipped palletized (bolted onto a pallet). When moving with a fork truck/lift, the switch must remain bolted to the pallet to avoid damage to the OPEN/CLOSE contact position indicator.

Lifting the Switch

Follow all approved safety practices when making hitches and lifting the equipment. Lift the unit smoothly and do not allow the unit to shift.

CAUTION: Tip-over Hazard. High center of gravity. Use a 4-point hitch to prevent switchgear from overturning during lifting operations. Improper lifting can result in person injury or equipment damage. T297.0



A: Sling height for 15 kV and 27 kV with 125 BIL units: 914 mm (36 in)
Sling height for 27 kV with 150 BIL and 38 kV units: 1067 mm (42 in)

B: Center of gravity (Cg) is approximately 100 mm (4 in) below plane of lower terminals.

Figure 5.
Moving and lifting instructions for the Type DAS switch.

4. Make high-voltage line connections (Figure 6).

Note: The six disconnect switches and bypass switches are not required, but they do facilitate switching and isolation.

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. T270.0

A. Connect high-voltage lines to switch bushing terminals.

B. Provide surge arrester protection. Surge arrester protection should be provided on both sides.

Refer to Figure 7 for terminal identification of the Type DAS switch.

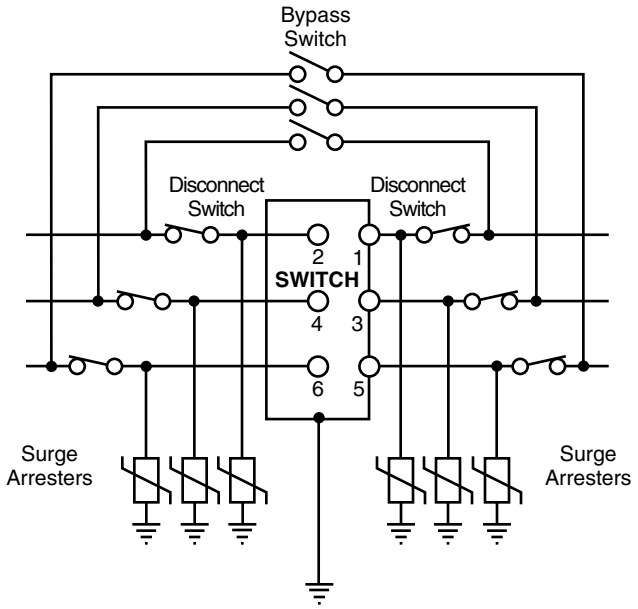


Figure 6.
Connection diagram shows complete surge protection and illustrates Bypass and Disconnect switches to facilitate maintenance.

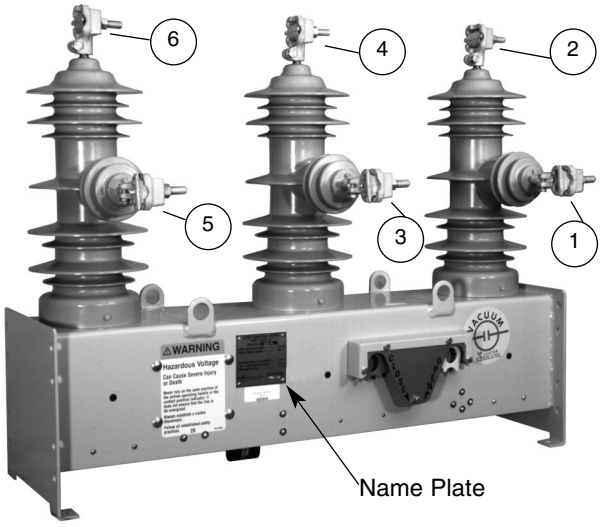


Figure 7.
Terminal identification of Type DAS switch.

OPERATION

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. Do not rely on the open position of the yellow operating handle or the contact position indicator; 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 wil cause death or severe personal injury. G114.1

Electrical Operation

With 53 Vdc applied to Pin T (positive) and Pin N (negative), the switch may be opened and closed electrically by making momentary contact between P-B or P-E. The DAS switch is available only in 53 Vdc (actual range 47.7–56 Vdc).

If the trip and close signals are maintained, the DAS will operate correctly without damage to the unit. If the trip signal is maintained, applying the close signal will not close the unit. The unit will not close if the trip signal is removed while the close signal is maintained. To close the unit, the close signal must be reapplied without an asserted trip signal. A momentary close signal of 100 milliseconds is required to properly close the DAS switch.

The switch has a 19-pin receptacle (see Figure 8), which provides current outputs (from the CT), position indication outputs, close input signal, open input signal, heater, and battery input power.

Heater

A heater is included for the switch mechanism housing. Available in either 120 Vac or 240 Vac, chosen at time of order, the heater minimizes humidity within the housing.

OPEN-CLOSE Position Indicator

The OPEN-CLOSE contact position indicator consists of a red CLOSED and a green OPEN indicator located on the bottom of the mechanism housing (see Figure 2).

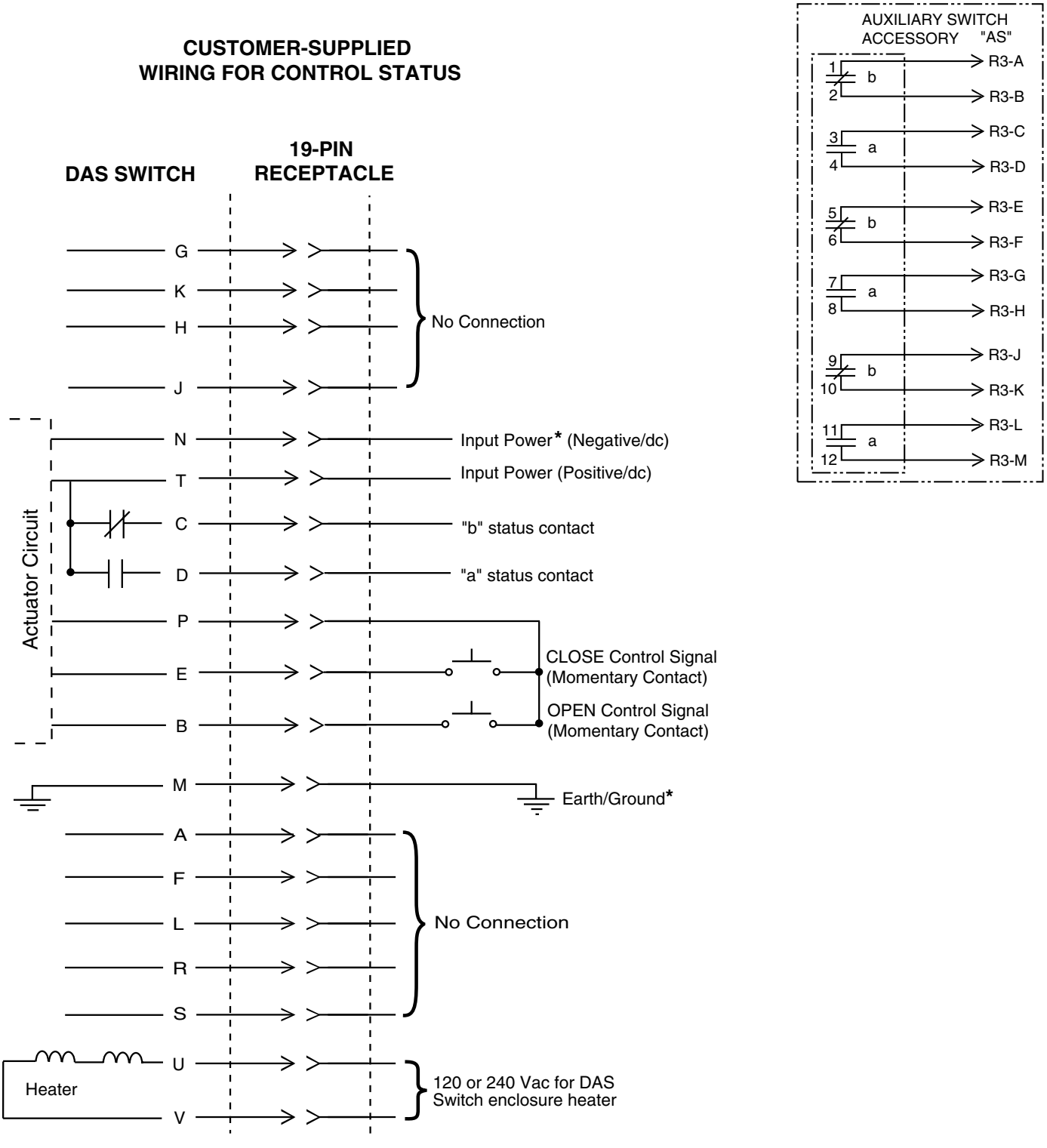
Hotstick Operation

WARNING: Hazardous voltage. Always use a hotstick when working with this equipment. Failure to do so could result in contact with high voltage, which will cause death or severe personal injury. G108.1

The switch may be opened manually by using a hotstick to pull down the yellow manual OPEN handle, located on the side of the switch (see Figures 3 and 4). To close the switch, first, push the yellow manual open handle up. Then, pull down the red manual CLOSE handle, located on the side of the switch (see Figures 3 and 4).

When the red manual CLOSE handle is pulled down after the switch has been opened manually (yellow handle still down), the handle linkage will first cause the yellow handle to return to the up position and will then complete the CLOSE. However, a CLOSE command from the control is blocked when the yellow manual OPEN handle is in the open (down) position. The yellow OPEN handle must be manually returned to the up position to allow an electronic CLOSE.

IMPORTANT: If the yellow manual OPEN handle remains in the down position, the switch cannot be closed electrically.



***IMPORTANT: Do not connect pin N (negative/dc) to pin M (earth ground). Doing so will disable surge isolation protection.**

Figure 8.
DAS Switch 19-pin receptacle and auxiliary switch accessory diagram.

ACCESSORIES

Auxiliary Switch

A three-stage auxiliary switch can be provided as an accessory. Each stage has two independent contacts that permit any desired combination of “a” (follow state of switch main contacts) and “b” (opposite switch main contacts) positions. The switch contacts are insulated for 600 V and have a continuous current rating of 10 A. Their interrupting ratings are shown in Table 7.

TABLE 7
Auxiliary Switch Interrupting Ratings

Volts	Inductive ac (amps)	Non-Inductive ac (amps)	Inductive dc (amps)	Non-Inductive dc (amps)
24	–	–	15.0	20.0
48	–	–	7.5	10.0
120	60	80	–	–
125	–	–	1.5	2.0
240	30	60	–	–
250	–	–	0.45	0.5

Pole-Mounting Hanger

A simple pole-mounting hanger (see Figure 9), that bolts directly to the switch frame, provides a strong, clean, and uncluttered pole-mounting installation.

Mating Plugs

Mating plugs for factory-wired 19-pin receptacle assemblies are available as an accessory.

Terminals

The standard terminal is an eyebolt, 1/0–500 mcm (630 A). Eyebolt 4/0–1000 mcm (800 A), 2-hole (630 A) and 4-hole (800 A) flat pad and stud type (800 A) terminals are available as an accessory.

NOTE: All dimensions are mm (inches). Dimensions shown are approximate.

Terminal Options	A
Eyebolt, 1/0 - 500 mcm Cable Range (630 A maximum)	80 (3.25)
Eyebolt, 4/0 - 1000 mcm Cable Range (800 A maximum)	108 (4.25)
Flat Pad, 2-hole (630 A)	114 (4.5)
Flat Pad, 4-hole (800 A)	121 (4.75)
Stud Type, 1.125 - 12 threads (800 A maximum)	82 (3.25)

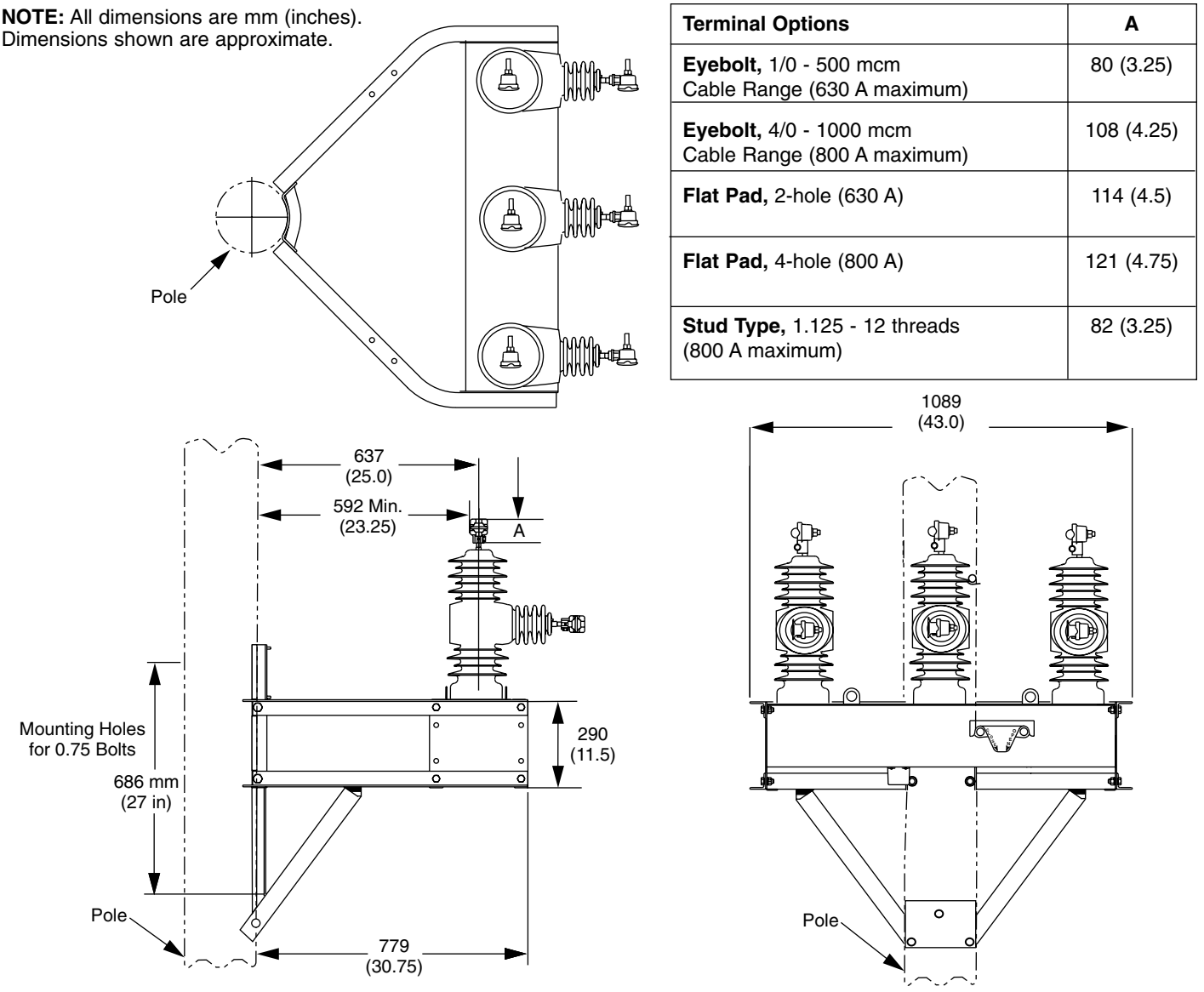
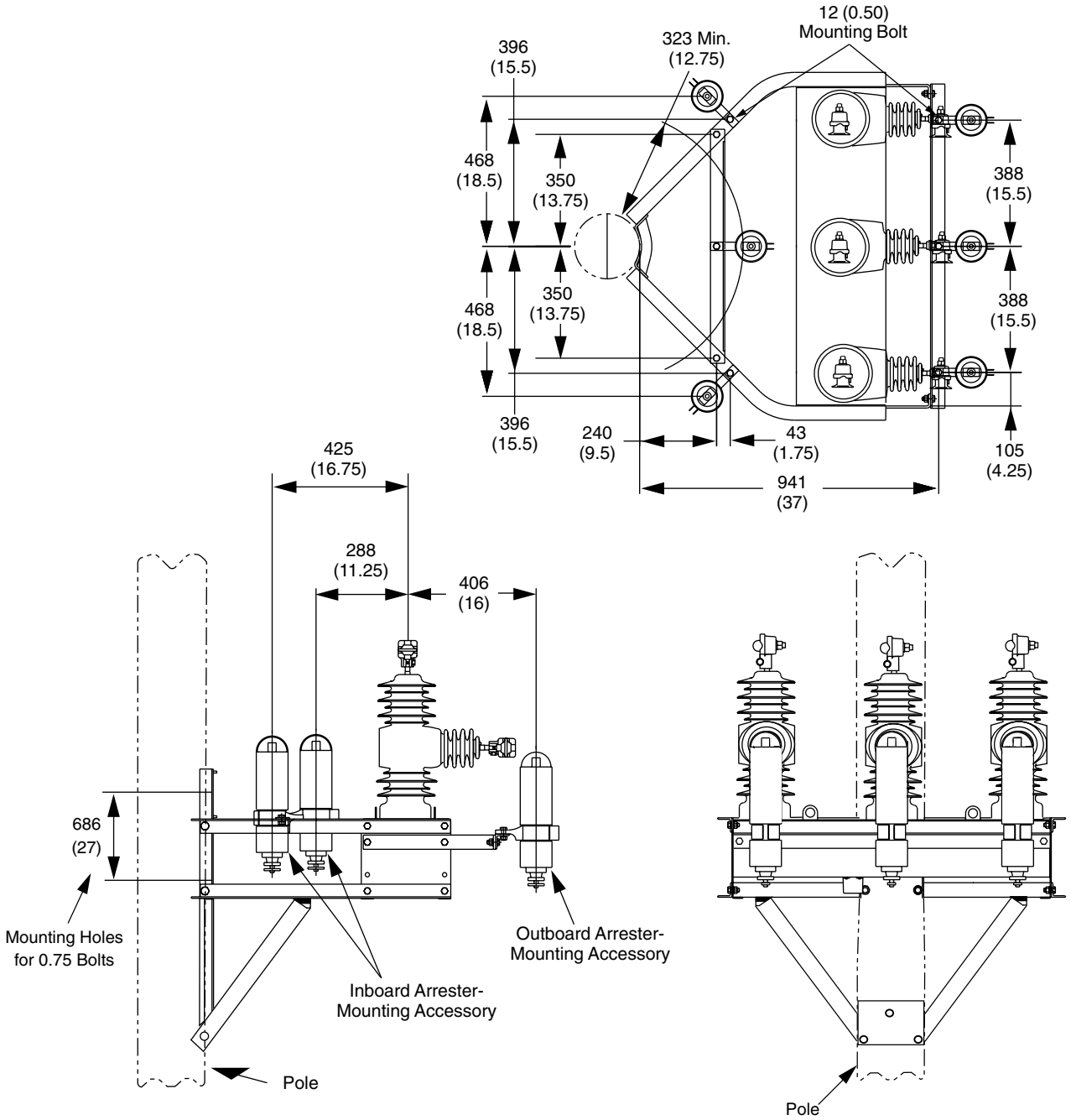


Figure 9.
Dimensions of Type DAS switch with pole-mounting hanger accessory. (Shown with internal CT’s.)

Arrester Mounting Frame

The arrester mounting bracket accessory (Figure 10) can be bolted to the switch frame and pole-mounted hanger for the addition of inboard and outboard arresters. The arresters are not included with the brackets.

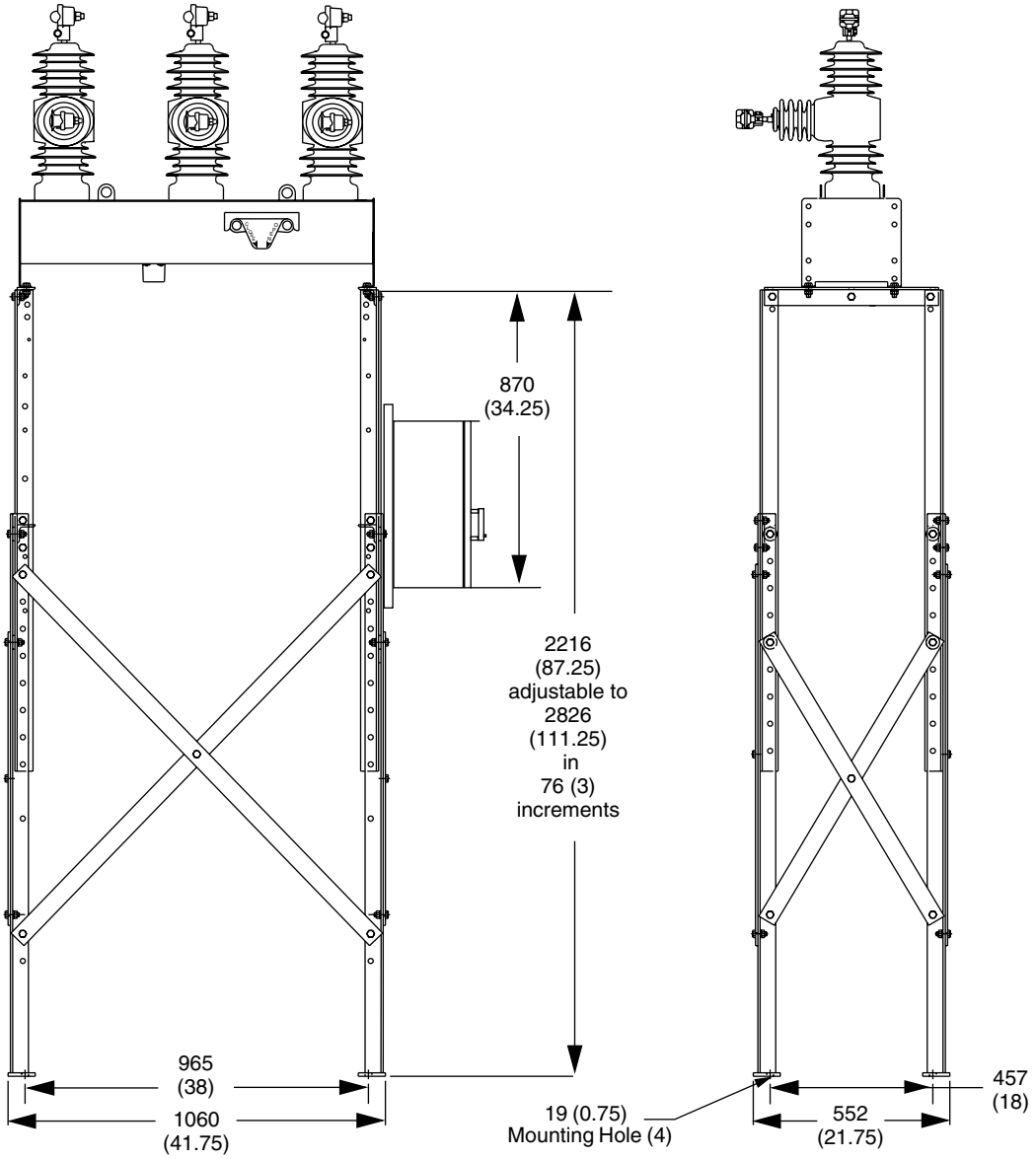


NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.

Figure 10.
Dimensions of Type DAS switch with pole-mounting hanger and arrester mounting bracket accessories. (Shown with internal CT's.)

Substation Mounting Frame

A substation mounting frame accessory (Figure 11) is available for substation mounting applications.



NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.

Figure 11.
Dimensions of Type DAS switch with substation mounting frame accessory. (Shown with internal CT's.)

SERVICE INFORMATION

Service Requirements

The Kyle Type DAS switch has been designed with a minimum mechanical life of 10,000 operations. The DAS switch requires routine inspection to check for physical damage and verify proper operation.

Frequency of Inspection

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

High-Potential Withstand Testing

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 Rating Information* for further information. G109.2

Use the following procedures to perform high-potential withstand tests at 75% of the rated low-frequency withstand voltage voltage for 60 seconds. See Table 8 for test voltages.

TABLE 8
Type DAS Switch Vacuum Interrupter Withstand Test Voltage Ratings Information

Description	75% of Rated Low-Frequency Withstand Voltage (1 minute dry) (kV rms)
DAS15	37.5
DAS27	45.0
DAS38	52.5

Test 1

1. Close the switch contacts.
2. Ground the switch.
3. Connect terminals 2, 4, and 6 (see Figure 7) together.
4. Apply proper test voltage (see Table 8) to terminals 2, 4, and 6.
5. The switch should withstand the test voltage for 60 seconds.

Test 2

1. Close the switch contacts.
2. Ground the switch.
3. Ground Phase A (terminal 2) and Phase C (terminal 6).
4. Apply proper test voltage to Phase B (terminal 3).
5. The switch should withstand the test voltage for 60 seconds.

Test 3

1. Open the switch contacts.
2. Ground the switch.
3. Connect and ground terminals 1, 3, and 5 (see Figure 7).
4. Connect terminals 2, 4, and 6.
5. Apply proper test voltage to terminals 2, 4, and 6.
6. The switch should withstand the test voltage for 60 seconds.
7. Reverse the connections: ground terminals 2, 4, and 6.
8. Apply test voltage to terminals 1, 3, and 5 for 60 seconds.
9. The switch should withstand the test voltage for 60 seconds.

Withstand Test Results

The high-potential withstand tests provide information on the dielectric condition of the switch and the vacuum integrity of the interrupters.

If the switch passes the closed-contacts tests (Tests 1 and 2), but fails the open-contacts test (Test 3), the cause is likely to be in the interrupter assembly. Retest each phase individually to determine the failed phase or phases.

If the switch fails the closed-contacts tests (Tests 1 or 2), the cause is likely to be a diminished electrical clearance or failed insulation. Retest each phase individually to determine the failed phase or phases.

Inspection of DAS Module

If the DAS module was exposed to an external flashover, an inspection process is recommended to assure proper operation of the switch. Should the DAS module exhibit external flashover attributes (carbon tracking or discoloration), the following procedure is recommended to restore the encapsulation back to its original condition:

1. Remove device from service.
2. Inspect module for damage to the terminals. Remove any damaged terminals and replace.
3. Inspect module for damage to the module rods. If there is damage to the module rods, the module must be replaced.
4. Verify through careful inspection that there is no damage to the housing that could inhibit proper operation. Check the integrity of the lifting lugs.

5. Clean the damaged module with isopropyl alcohol and a scratch-free, nylon scouring pad to remove any carbon deposit.
6. With a clean rag, apply a thin coat of dielectric silicone grease to the cleaned areas.
7. Confirm the dielectric strength of the module by performing high-potential withstand testing. Confirm both phase-to-ground and phase-to-phase conditions. See the **High-Potential Withstand Testing** section of this manual.

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