Power Capacitors
Catalog Data
CA230007EN

Effective August 2015
Supersedes 230-60 October 2013

COOPER POWER SERIES

Electrically operated Type NR oil switch

General

Eaton offers its Cooper Power™ series Type NR oil switch for switching inductive and capacitor currents, to meet the requirements of a wide range of applications. This switch is an electrically operated, single-phase switch. The switch also includes an operating handle for switch position indication or manual operation. The normal operation of this switch is managed with an electric motor requiring low-voltage input. Eaton offers two options for the electric motor, either 120 Vac, 60 Hz or 240 Vac, 60 Hz. The switch operation can be managed remotely, via electrical or electronic controls, or manually at the installation site when needed.

Powering Business Worldwide

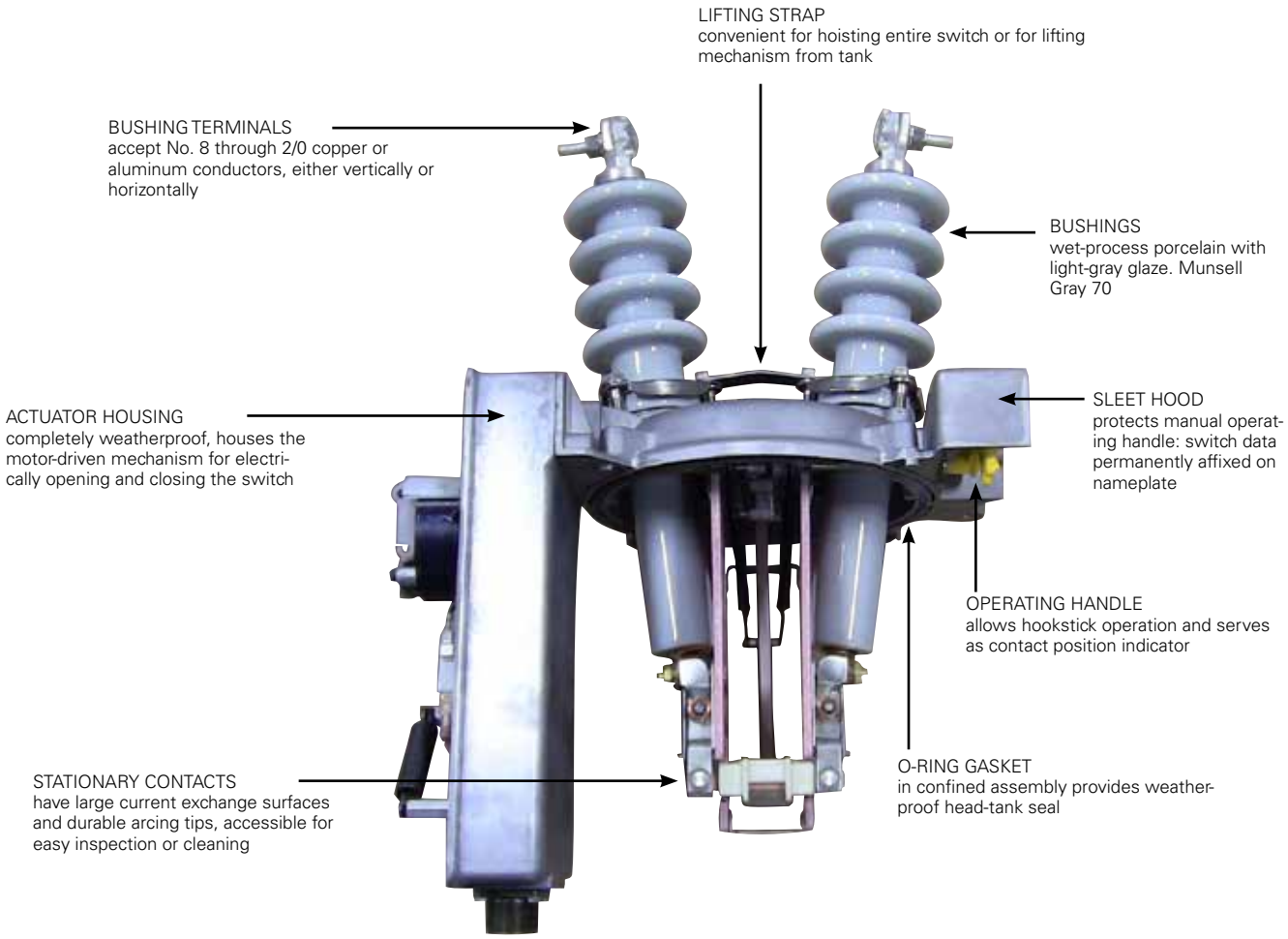

Figure 1. Untanked Type NR oil switch.

Description

The Type NR oil switch is a single-phase device for use on distribution circuits. Compact design makes these switches ideal for use on capacitor banks, especially pole-top installations. These switches are electrically operated and can be controlled by various electrical or electronic devices. An operating handle, which also serves as a contact position indicator, is provided for manually opening and closing the switch.

Note: The Type NR oil switch may not be manually closed into a faulted line. The making current rating to these switches applies to electrical operation only.

Capacitor bank switching

The standard Type NR single-phase oil switch is rated at 15.0 kV / 95 kV BIL and is capable of switching three-phase capacitor banks up to 3600 kVAR on 14.4 kV systems; with three (3) switches controlled by customer. Choosing the 125 kV BIL option enables switching solidly grounded capacitor banks up to 6400 kVAR on multigrounded wye systems up to 14.4 / 24.9 kV; with three (3) switches controlled by customer.

The 22.0 kV / 125 kV BIL version of the Type NR oil switch can switch solidly grounded three-phase capacitor banks up to 2700 kVAR on 20 / 34.5 kV multigrounded-wye systems; with three (3) switches controlled by customer.

Table 1. Summary of Ratings

Switch Type	Application	Maximum Operating Voltage (kV)	Rated Switching Current (A)
NR	General Purpose Duty	15.0	200*
NRV		22.0	60

* General purpose duty switches are rated for both capacitive and inductive current switching applications.

Operation

With switch contacts closed, selecting the "OPEN SWITCH", or similar, position in the switch controls energizes the switch open contacts on the electric motor. Through a gear and lever system, this releases a toggle which allows pre-loaded opening springs to snap open the switch contacts; loads a heavy spring in preparation for a closing operation; positions selector switch contacts so that only the closing circuit can subsequently be energized; and interrupts the electric motor operating current when the first three functions have been completed. The opening circuit must remain energized for 4.0 seconds.

Similarly, selecting the "CLOSE SWITCH", or similar, position in the switch controls energizes the switch close contacts on the electric motor. This releases the closing spring to close switch contacts and load opening springs; positions selector switch contacts for the subsequent opening signal, then interrupts the operating electric motor current. The closing circuit must remain energized for 0.5 seconds.

Table 2. Ratings and Specifications

Description	Standard	15 kV with 17" Creepage	15 kV with 125 kV BIL	22 kV
Maximum Design Voltage, kV	15.0	15.0	15.0	22.0
Nominal Operating Voltage, kV	2.4-14.4	2.4-14.4	2.4-14.4	20.0
Basic Insulation Level (BIL), kV	95	95	125	125
60 Hertz Withstand Voltage, kV				
Dry, One Minute	35	35	42	60
Wet, Ten seconds	30	30	36	50
Continuous Current Rating, Amps	200	200	200	60
Load Interrupting Ability (Inductive), Symmetric Amps				
75-100% power factor	200	200	200	60
50-75% power factor	100	100	100	60
< 50% power factor	50A	50A	50A	60
Maximum Capacitive Current, Amps (parallel bank-max)	200	200	200*	60*
High Frequency Transient Current, Amps	12000	12000	12000	12000
Transient Frequency, Hz	6000	6000	6000	6000
High Frequency Damping Factor	.40-.55	.40-.55	.40-.55	.40-.55
Momentary Rating, Amps asym.	9000	9000	9000	9000
Short Time Current Amps				
1/2 second,sym.	6000	6000	6000	6000
1 second, sym.	4500	4500	4500	4500
Close and Latch Rating, Amps asym.	9000	9000	9000	9000

*The 125 kV BIL switch and the 22.0 kV switch are rated for single bank switching only.

Table 3. Electrical Data (Control)

Description	Rating	
Nominal operating voltage (50/60 Hz only) (Vac)	120	240
Operating voltage range (Vac)	95-130	190-260
Closing-motor current (A)	1.9	.7
Switch response time, opening (sec)	4.0	4.0
Switch response time, closing (sec)	0.5	0.5

Ordering information

When ordering the Type NR electrically operated oil switch specify the Voltage Rating from Table 4. The basic Type NR oil switch is designed with a maximum operating voltage of 15.0 kV L-L with a continuous current rating of 200 A. The Type NRV oil switch is designed with a maximum operating voltage of 22.0 kV with a continuous current rating of 60 A.

Table 4. Basic NR and NRV Oil Switches

Description	Nominal/ Maximum Voltage (kV)	Continuous Current (A)	Switch BIL (kV)
Type NR Oil Switch	14.4/15.0	200	95*
Type NRV Oil Switch	20.0	60	125

* 125 kV BIL option available for standard NR oil switch

Control voltage requirements

Specify the Type NR motor control voltage from Table 5. The Type NR oil switch is supplied with a 120 Vac motor control voltage as standard.

Table 5. NR / NRV Motor Control Voltage

Description
120 Vac Actuating Motor (Standard)
240 Vac Actuating Motor

Insulation and creep requirements

Specify the NR oil switch insulation level and porcelain insulator creep using Table 6. The NR oil switch is designed with 95 kV BIL insulation level as a standard option with a porcelain bushing having 12 inches of creep. The 95 kV BIL insulation level is only available in the NR oil switch. The NRV oil switch has an insulation level of 125 kV BIL and a porcelain bushing with 17.0" of creep as a standard offering.

Table 6. NR / NRV Switch BIL & Bushing Creep*

Description	Rating (kV)	BIL (kV)	Bushing Creep (in)
NR Oil Switch	15.0	95	12.0
NR Oil Switch	15.0	95	17.0
NR Oil Switch	15.0	125	16.0
NRV Oil Switch	22.0	125	17.0

*Reference Figure 4 on page 9 for outline dimensions of the extra creep bushing"

Specialized tank requirements

Specify the required NR tank option from Table 7. The standard tank is manufactured from a mild formed steel and painted to protect against the environment. There are available options for zinc plating and stainless steel tanks for highly corrosive and salt-fog contaminated environments.

Table 7. NR / NRV Tank Options

Description	Switch Rating (kV)
Standard Tank	15.0
	22.0
Stainless Steel Tank	15.0
	22.0
Zinc Plated Tank	15.0
	22.0

Surge protection requirements

There is an available option for a factory-installed 120 Vac low voltage surge arrester to protect the motor control circuit from damaging effects of lightning. The arrester rating is determined by the motor control voltage. Contact the factory if a 240 Vac low voltage arrester is required.

Table 8. NR / NRV Low Voltage Arrester

Description
None (Std)
120 Vac Surge Arrester (Factory Installed)

* Determined by motor control voltage

Auxiliary switch requirements

Specify the Auxiliary switch from Table 9 if necessary for the switching application. The Auxiliary switch is a SPDT switch, which allows the user to remotely obtain the close or open position of the Type NR oil switch.

Table 9. NR / NRV Auxiliary Switch

Description
None (Std)
Auxiliary Switch

Hold switch requirements

Specify the Hold switch from Table 10 if necessary for the application. The close or open signals supplied to the Type NR oil switch must be applied for a minimum of 4.5 seconds. Specify the Hold switch option from Table 10 if the capacitor switching application requires a signal for less than 4.5 seconds. The close or open signal has to be applied for 1 second for proper operation of the Type NR oil switch.

Table 10. NR / NRV Hold Switch

Description
None (Std)
Hold Switch

Receptacle assembly requirements

Specify the type of receptacle from Table 11 for the switching application. The receptacle assemblies are mounted in the bottom of the actuator housing and provide a convenient, weather-proof connection to switch the control circuits. Receptacles are supplied with 5-pin. 3-conductor or 6-pin, 6-conductor configurations. Reference Figure 2 for 5-pin or 6-pin receptacle orientations. Consult the factory for additional receptacle options.

Table 11. Factory-wired Receptacles

Description
5-pin/3-conductor receptacle for standard three-wire control
6-pin/6-conductor receptacle for auxiliary switch

* Consult factory for available receptacle options

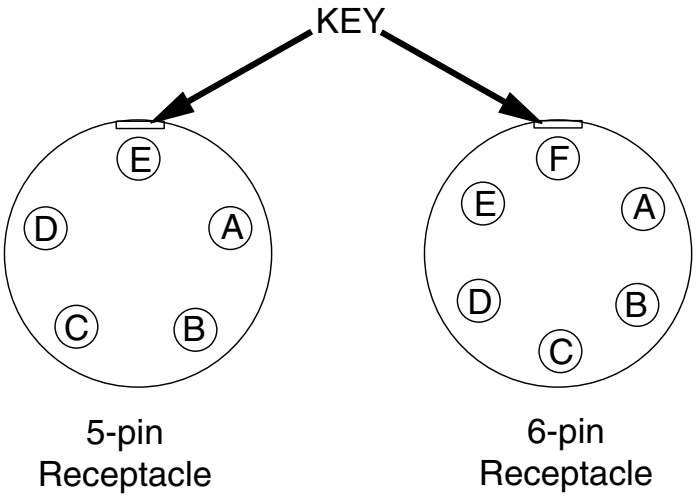

Figure 2. Receptacle assembly schematic.

Mating plug & conductor cable requirements

Specify the type of mating plug and conductor cable configuration and length from Table 12 if required for the switching application.

5-pin plugs accommodate up to 12 AWG wire and 0.375-0.500 inch O.D cables to allow connection to the 5-pin receptacle.

6-pin plugs accommodate up to 16 AWG wire and 0.500-0.625 inch O.D cables to allow connection to 6-pin receptacles. The number of conductors tabulated for the receptacles in Table 12 above indicates the number of pins wired to the actuator terminal strip. Mating plugs are available as an accessory and should be ordered separately. Consult the factory for additional mating plug and conductor cable options.

Table 12. Mating Plug and Conductor Cable Options

Description	Catalog Number
5-Pin Mating Plug	CCR010P1
5-Pin / 3-Conductor Cable (6 ft)	CCR003P6
5-Pin / 3-Conductor Cable (8 ft)	CCR003P8
5-Pin / 3-Conductor Cable (10 ft)	CCR003P10
5-Pin / 3-Conductor Cable (12 ft)	CCR003P12
5-Pin / 3-Conductor Cable (14 ft)	CCR003P14
5-Pin / 3-Conductor Cable (16 ft)	CCR003P16
5-Pin / 3-Conductor Cable (18 ft)	CCR003P18
5-Pin / 3-Conductor Cable (20 ft)	CCR003P20
5-Pin / 3-Conductor Cable (22 ft)	CCR003P22
5-Pin / 3-Conductor Cable (24 ft)	CCR003P24
5-Pin / 3-Conductor Cable (26 ft)	CCR003P26
5-Pin / 3-Conductor Cable (28 ft)	CCR003P28
5-Pin / 3-Conductor Cable (36 ft)	CCR003P36
6-Pin Mating Plug	CCR009P1
6-Pin / 6-Conductor Cable (6 ft)	CCR006P6
6-Pin / 6-Conductor Cable (8 ft)	CCR006P8
6-Pin / 6-Conductor Cable (10 ft)	CCR006P10
6-Pin / 6-Conductor Cable (12 ft)	CCR006P12
6-Pin / 6-Conductor Cable (14 ft)	CCR006P14
6-Pin / 6-Conductor Cable (16 ft)	CCR006P16
6-Pin / 6-Conductor Cable (18 ft)	CCR006P18
6-Pin / 6-Conductor Cable (20 ft)	CCR006P20
6-Pin / 6-Conductor Cable (22 ft)	CCR006P22
6-Pin / 6-Conductor Cable (24 ft)	CCR006P24
6-Pin / 6-Conductor Cable (26 ft)	CCR006P26
6-Pin / 6-Conductor Cable (28 ft)	CCR006P28
6-Pin / 6-Conductor Cable (36 ft)	CCR006P36

* Consult factory for additional Conductor Cable options

Wildlife protector requirements

Select required wildlife protectors based on the Type NR switch being ordered for the application. Wildlife protectors protect the energized terminals of the Type NR switch from incidental contact from wildlife, tree branches or line crews performed routine maintenance of overhead equipment. Wildlife protectors must be ordered in a quantity of 2.

Table 13. Wildlife Protectors for Terminal Bushings

Description	Catalog Number
None (Std)	–
Wildlife Protectors (95 kV BIL Only)*	CCM32A1
Wildlife Protectors (125 kV BIL only)*	CCM33A1

* Must be ordered in a quantity of (2)

Mounting option requirements

Select the Type NR oil switch mounting method from Table 14. The standard Type NR switch is supplied with an integral bracket, which is used for pole-mounting or capacitor rack applications. A NEMA®-style bracket is available for cross-arm applications.

Table 14. Mounting Options

Description	Catalog Number
None (Std)	–
NEMA® X-Arm Brkt	HA00039

Standard Type NR Oil Switch Catalog Number Configuration

The standard Type NR and NRV configurations are provided below. If you need Engineered To Order (ETO) models, please contact your Eaton representative for details.

Type NR (15.0 kV)
CCM17B2-G

Table 4-Switch Type
▸ NR (15 kV)

Table 5-Control Motor
▸ 120 Vac (Std)

Table 6-BIL & Creep*
▸ 95 kV BIL (15.0 kV Only)

Table 7-Tank Options
▸ Standard Tank

Table 8-LV Surge Arrester
▸ None (Std)

Table 9-Auxiliary Switch
▸ None (Std)

Table 10-Hold Switch
▸ None (Std)

Table 11-Receptacle
▸ 5 -Pin / 3-Conductor (Std)

Table 12-Plug & Cable
▸ None (Std)

Table 13-Bird Guards
▸ W/O Bird Guards (Std)

Table 14-Mounting Options
▸ None (Std)

*Reference Figure 3 on page 8 for NR oil switch outline dimensions

Type NRV (22.0 kV)
CCM75B2-G

Table 4-Switch Type
▸ NRV (22.0 kV)

Table 5-Control Motor
▸ 120 Vac (Std)

Table 6-BIL & Creep*
▸ 125 kV BIL

Table 7-Tank Options
▸ Standard Tank

Table 8-LV Surge Arrester
▸ None (Std)

Table 9-Auxiliary Switch
▸ None (Std)

Table 10-Hold Switch
▸ None (Std)

Table 11-Receptacle
▸ 5 Pin / 3-Conductor (Std)

Table 12-Plug & Cable
▸ None (Std)

Table 13-Bird Guards
▸ W/O Bird Guards (Std)

Table 14-Mounting Options
▸ None (Std)

*Reference Figure 5 on page 10 for NRV outline dimensions

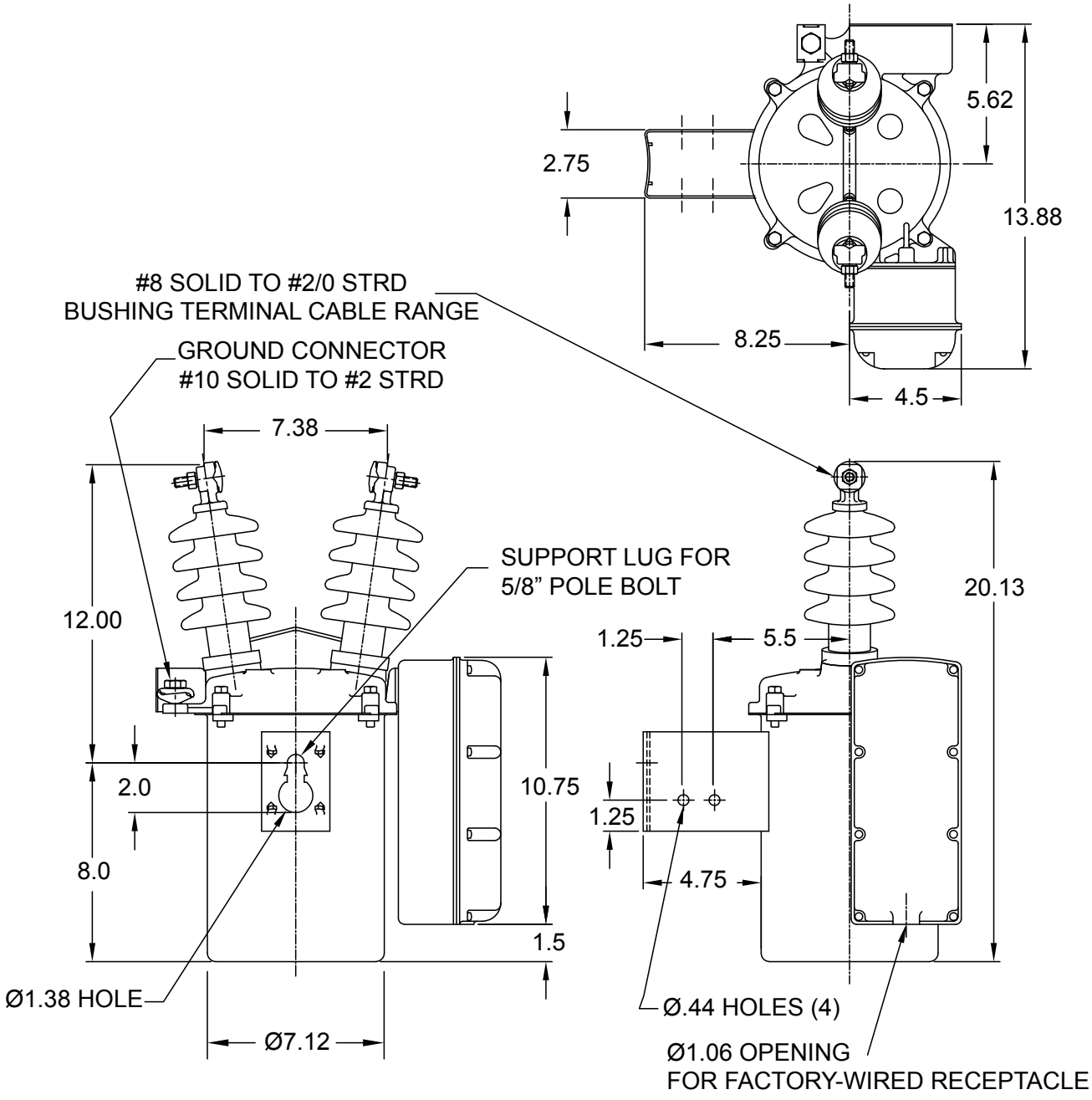

Figure 3. Outline dimensions of 95 kV BIL Type NR oil switch with standard bushings, (15.0 kV Rating ONLY).

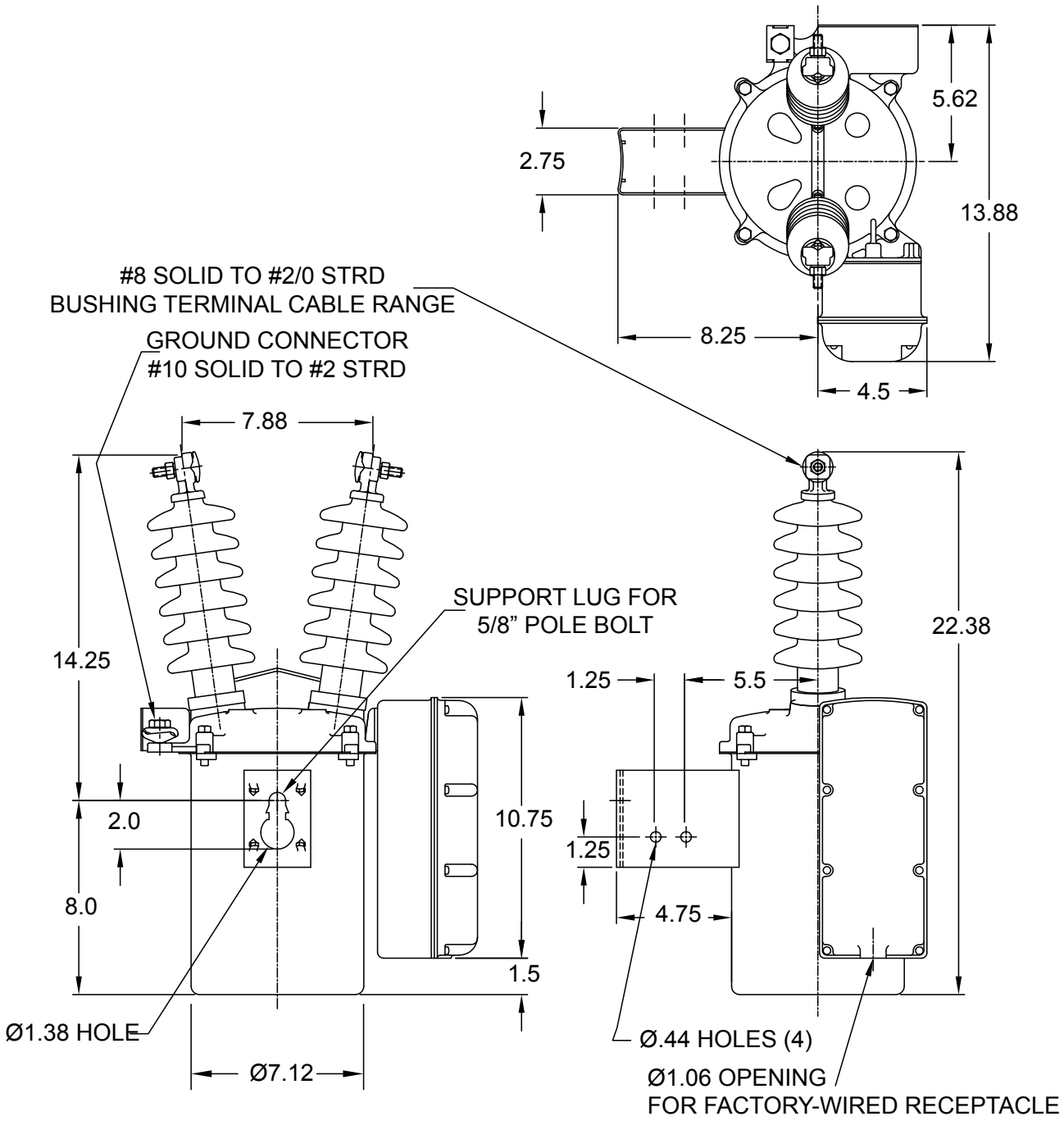

Figure 4. Outline dimensions of 95 kV BIL Type NR oil switch with 17" creepage bushings, (15.0 kV Rating ONLY).

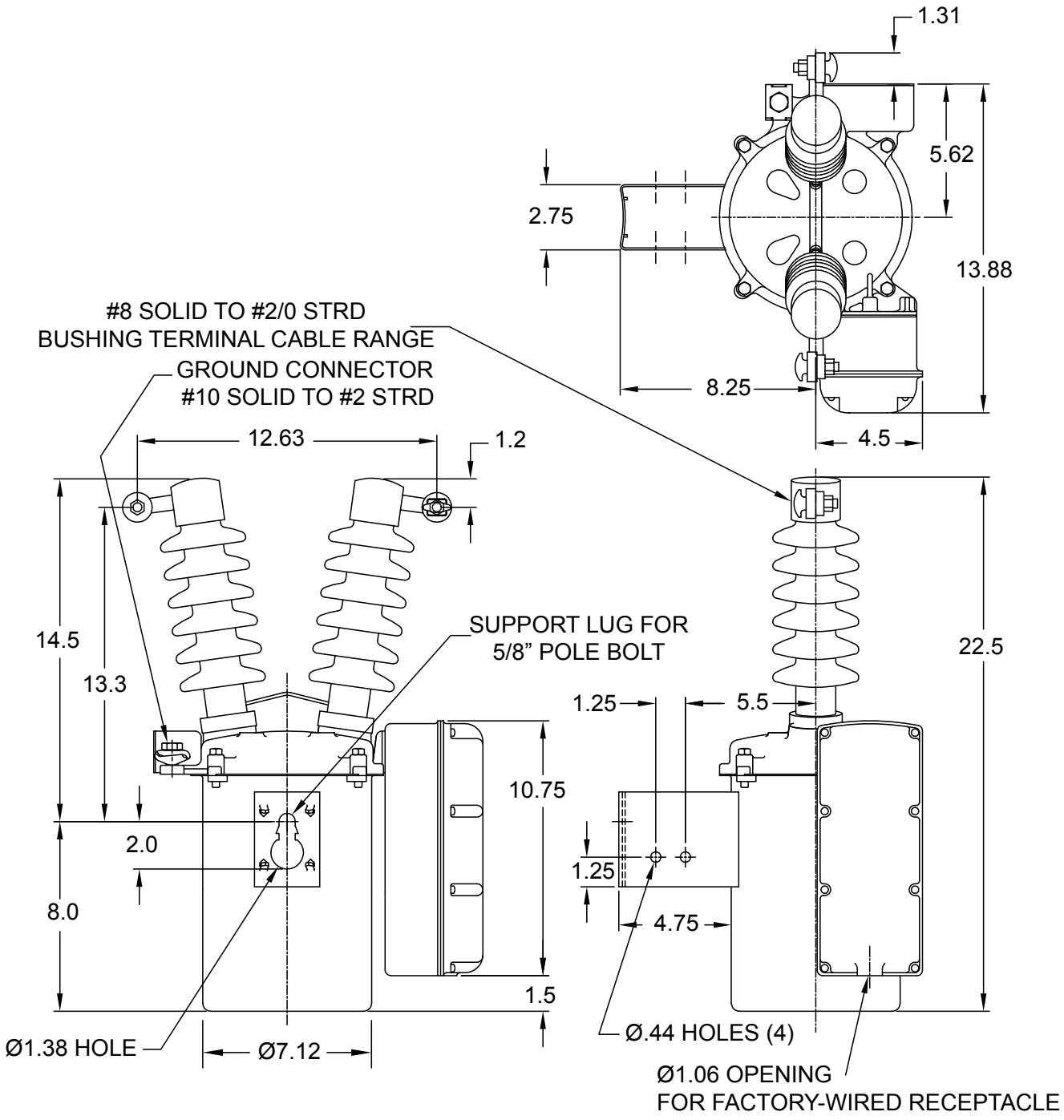

Figure 5. Outline dimensions of 125 kV BIL Type NR oil switch (15.0 and 22.0 kV).

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Powering Business Worldwide

Printed in USA
Publication No. CA230007EN

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