



Vacuum Switches and Controls

Product Catalog





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Vesco, LLC was originally founded as Vacuum Electric Switch Co. in 1996. Our company specializes in new and replacement vacuum switchgear, controls, and field services of existing Vesco and Joslyn Hi-Voltage (now owned by ABB) and other electrical utility equipment.

As you will see in this catalog, Vesco manufactures a wide array of new vacuum switches, PLC and microprocessor-based controls for switching electric arc furnace transformers, capacitor banks, harmonic filter banks, reactors for steel making, electric utility, and renewable energy applications. Our vacuum switches and replacement parts incorporate many design enhancements and improved methods of manufacturing over the original product designs.

Additionally, Vesco can supply replacement parts which are suitably interchangeable for vacuum switches of the same ratings manufactured by Joslyn Hi-Voltage. Field services are also offered by Vesco, delivering a wide array of options from new product installation, on-site repairs, and upgrades for both existing switches and controls.

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Vesco, LLC, formerly The Vacuum Electric Switch Co., manufactures vacuum switches which are suitably interchangeable with Joslyn Hi-Voltage's vacuum switches of the same rating. The Joslyn designations VBM, VBT*, and VBU* are abbreviations for the descriptive phrases vacuum breaker miniature, vacuum breaker transformer, and vacuum breaker up-right respectively. Vesco switches and parts are of their own design and methods of manufacture, which may not be the same as employed by Joslyn. Where product performance is reported, it is from testing of Vesco products and is not necessarily indicative of the performance of comparable products wholly manufactured by Joslyn. Vesco, LLC is not endorsed or associated with Joslyn Hi-Voltage or Joslyn Holding Co., a subsidiary of ABB.

* VBM, VBU, and VBT are Joslyn trademarks which are owned by ABB.



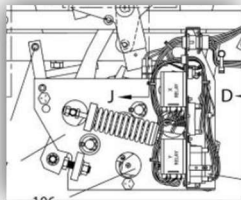
Switches and Controls Description

Vesco manufactures a variety of switches and controls that can be used in a wide range of applications. There are many variations based on the application, the voltage and current ratings, the operating control voltage and other system requirement parameters.



Switches are configured in a single mechanism/three phase arrangement or in a single mechanism/single phase arrangement. Switches that are of the single mechanism/three phase style can be operated with an internal motor operated mechanism or an internal solenoid operated mechanism. Switches that are configured in a single mechanism/single phase arrangement, so one mechanism per phase, can only be operated with a solenoid mechanism.

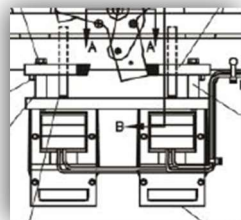
Motor Operated Mechanisms



Motor operated mechanisms have an expected operating life of about 30,000 operations. They can have simple, self-contained control systems with a control current demand of less than six amperes. Motor operated switches are configured with 15 or 35 pin connectors and have two each form A (normally open) and B (normally closed) or six each form A and B contacts respectively.

Motor operated switches are typically used for capacitor bank switching and sectionalizing but not for arc furnace switching applications. The motor mechanism cannot be used for single mechanism/single phase arrangements, since each phase needs to open and close near simultaneously, which is not possible with independent motor operators on three phase systems.

Solenoid Operated Mechanisms

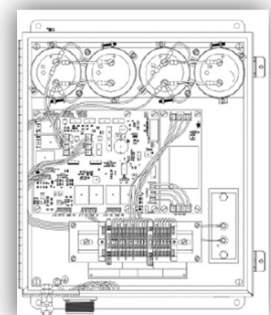


The solenoid operated mechanisms provide high speed operation and a long operating life and can typically achieve 100,000 operations and even up to 200,000 with minimal maintenance. The solenoid operated mechanism do require an external interface control with interposing relays because each solenoid requires a current in the range of 60 to 65 amperes peak for 1½ cycles. Therefore, it is very important that the power source and wiring are sized appropriately for the switch to operate properly and to recognize the expected long life.

If the proper power cannot be achieved, then controls with a stored energy option (Page 13) can be supplied that will reduce the power source and larger size wiring requirements. For existing installations with inadequate current supply, the Vesco Boost Box (Page 23) can be used between the existing switch and control.

Controls

Vesco controls are designed for various applications including capacitor switching, electric arc furnace switching, distribution sectionalizing and more. These controls can take a variety of input voltages and can be set to precisely control the closing of the switches in applications where that is desirable, such as capacitor switching and arc furnace switching. Details can be found in the control section on Page 13



Vacuum Switches



15kV, 600A Three Pole – Page 7



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34kV or 46kV 600A Single Pole -Page 12



46kV 300A Single Pole -Page 14



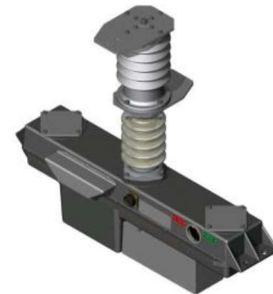
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15kV, 600A Single Pole – Page 16



34kV, 600A 3- Pole Sectionalized– Page 17

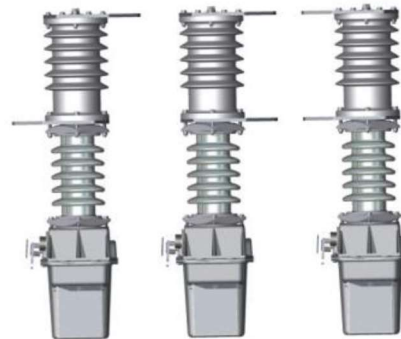


34kV, 600A Resistor Shorting Switch Pg. 17



34kV 600A Harmonic Filter Switch – Pg. 18

15kV, 600A Three Pole Switch



A B C
Alternate Terminal Pad
Arrangements

The common uses of this switch are for electrical distribution line sectionalizing and arc furnace or capacitor bank switching. This switch may have either a self-contained motor or solenoid operated mechanism. These two mechanisms differ in the complexity of the required control systems, control current demand, available operating voltages, mechanical life, and the precision of the timing of switch contact closing.

Solenoid operated switches are commonly used for capacitor switching and arc furnace switching. For special applications, two or more of these switches may be used along with three resistor modules to form a resistor insertion switch. The solenoid operated switch can be configured and operated with three modules connected in parallel. Each module's current rating is de-rated to 500A when connected in parallel for a total current of 1500A per phase. Three separate switches are then required to make a three-phase set. Solenoid operated switches have one form A (normally open) and one form B (normally closed) contact and is packaged with an external interface control that matches the option and application requirements.

Repair parts for this switch can be found beginning on Page 48.

Common Models and Configurations:

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
3 POLE	110-150	15	600	SOLENOID	120VAC	1001057	1001055G1
3 POLE	110-150	15	600	15 PIN MOTOR	48VDC/120VAC	1001057	1002520G1
3 POLE	110-150	15	600	15 PIN MOTOR	125VDC	1001057	1002520G2
3 POLE	110-150	15	600	35 PIN MOTOR	48VDC/120VAC	1001057	1003308G1
3 POLE	110-150	15	600	35 PIN MOTOR	125VDC	1001057	1003308G2

25kV, 300A Three Pole Switch



The common use of the 25 kV switch is for ungrounded capacitor switching. This switch may have either a motor or solenoid operated mechanism. These two mechanisms differ in the complexity of the required control systems, control current demand, available operating voltages, mechanical life, and the precision of the timing of switch contact closing.

The six vacuum interrupters on this switch require the power of double opening and closing solenoids. When installing a solenoid operated switch the voltage drop from the station power transformers or batteries must be considered for the switch to operate properly. The current of the two solenoids can be instantaneously as high as 120 amperes. Vesco control cables include 16 AWG wire, but some other manufacturers can have a lesser gauge wire. Even with 16 AWG wire there can be substantial voltage drop in a surprisingly short length of cable. The best way to compensate for this large voltage drop and eliminate any potential operating issues is to install a stored energy control shown on page 13.

Repair parts for this switch are found beginning on page 48.

Common Models and Configurations:

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
3 POLE	200-150	25	300	SOLENOID	48VDC/120VAC	1004271	1004269G1
3 POLE	200-150	25	300	SOLENOID	125VDC	1004271	1004269G2
3 POLE	200-150	25	300	15 PIN MOTOR	48VDC/120VAC	1004271	1004267G1
3 POLE	200-150	25	300	15 PIN MOTOR	125VDC	1004271	1004267G2
3 POLE	200-150	25	300	35 PIN MOTOR	48VDC/120VAC	1004271	1004265G1
3 POLE	200-150	25	300	35 PIN MOTOR	125VDC	1004271	1004265G2



34kV, 300A Three Pole Switch



The common uses of this 34kV switch are capacitor switching, reactor switching, and distribution line sectionalizing. This switch may have either a motor or solenoid operated mechanism. These two mechanisms differ in the complexity of the required control systems, control current demand, available operating voltages, mechanical life, and the precision of the timing of switch contact closing.

The six vacuum interrupters on this switch require the power of double opening and closing solenoids. When installing a solenoid operated switch the voltage drop from the station power transformers or batteries must be considered for the switch to operate properly. The current of the two solenoids can be instantaneously as high as 120 amperes. Vesco control cables include 16 AWG wire, but some other manufacturers can have a lesser gauge wire. Even with 16 AWG wire there can be substantial voltage drop in a surprisingly short length of cable. The best way to compensate for this large voltage drop and eliminate any potential operating issues is to install a stored energy control shown on page 13.

Vesco offers this switch in three different versions – Standard Vacuum Interrupter Gap (0.160 inch), Standard Vacuum Interrupter Gap (0.160 inch) with grading capacitors, and an extended Interrupter Vacuum Gap (0.320) with grading capacitors. Adding grading capacitors and using a larger vacuum interrupter gap can improve operating performance for capacitor switching applications by eliminating the negative impact of stray capacitance due to external components being in close proximity of the series connected vacuum interrupters in this configuration.

Various factors can cause unequal recovery voltage distribution over the two vacuum interrupters in series which are designed and configured to equally share the interrupting duty of the switching application. This is most likely to occur when the switch is used on poles where objects closer than 32 inches in proximity may cause a larger portion of the recovery voltage to appear across the upper module. This may cause the capacitor switching capability to be reduced. Grading capacitors tend to equalize the capacitance across each vacuum interrupter diminishing the effect of parasitic or stray capacitance. The recovery voltage withstand capability is further improved by increasing the contact open gap from 0.160 to 0.320 inches. The larger gap requires more energy than is available from a solenoid mechanism, so it is only possible with motor operated switches.

Switch repair parts are shown starting on page 48. Replacement modules for this 34kV 300A switch are available both with and without grading capacitors. Modules with and without grading capacitors cannot be installed on the same switch.



Common Models and Configurations:

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
3 POLE	200-200	34	300	15 PIN MOTOR	24VDC	1003256	1003315G1
3 POLE	200-200	34	300	15 PIN MOTOR	48VDC/120VAC	1003256	1002521G1
3 POLE	200-200	34	300	15 PIN MOTOR	125VDC	1003256	1002521G2
3 POLE	200-200	34	300	15 PIN MOTOR	220VAC	1003256	1003315G6
3 POLE	200-200	34	300	35 PIN MOTOR	24VDC	1003256	1003316G1
3 POLE	200-200	34	300	35 PIN MOTOR	48VDC/120VAC	1003256	1003252G1
3 POLE	200-200	34	300	35 PIN MOTOR	125VDC	1003256	1003252G2
3 POLE	200-200	34	300	35 PIN MOTOR	220VAC	1003256	1003316G2
3 POLE	200-200	34	300	SOLENOID	120VAC	1003256	1002201G1

Grading Capacitors included in the Vacuum Module

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
3 POLE	200-200	34	300	15 PIN MOTOR	24VDC	1003256	1003315G5
3 POLE	200-200	34	300	15 PIN MOTOR	48VDC/120VAC	1003256	1002521G5
3 POLE	200-200	34	300	15 PIN MOTOR	125VDC	1003256	1002521G6
3 POLE	200-200	34	300	15 PIN MOTOR	220VAC	1003256	1003315G2
3 POLE	200-200	34	300	35 PIN MOTOR	24VDC	1003256	1003316G5
3 POLE	200-200	34	300	35 PIN MOTOR	48VDC/120VAC	1003256	1003252G5
3 POLE	200-200	34	300	35 PIN MOTOR	125VDC	1003256	1003252G6
3 POLE	200-200	34	300	35 PIN MOTOR	220VAC	1003256	1003316G6
3 POLE	200-200	34	300	SOLENOID	120VAC	1003256	1002201G2

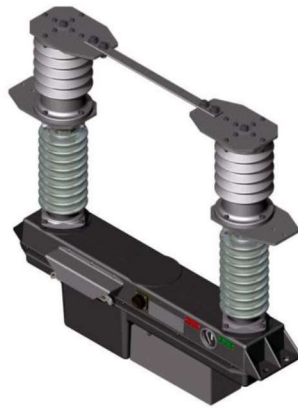


34kV, 300A Three Pole Switch (continued)

Switches with 0.320 Inch Gap with Grading Capacitors							
SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
3 POLE	200-200	34	300	15 PIN MOTOR	24VDC	1003256	1003315G7
3 POLE	200-200	34	300	15 PIN MOTOR	48VDC/120VAC	1003256	1002521G7
3 POLE	200-200	34	300	15 PIN MOTOR	125VDC	1003256	1002521G8
3 POLE	200-200	34	300	15 PIN MOTOR	220VAC	1003256	1003315G8
3 POLE	200-200	34	300	35 PIN MOTOR	24VDC	1003256	1003316G7
3 POLE	200-200	34	300	35 PIN MOTOR	48VDC/120VAC	1003256	1003252G7
3 POLE	200-200	34	300	35 PIN MOTOR	125VDC	1003256	1003252G8
3 POLE	200-200	34	300	35 PIN MOTOR	220VAC	1003256	1003316G8



34kV, 600A Single Pole Switch



This switch is used for both capacitor and arc furnace switching. It is solenoid operated because it is used in three phase sets requiring near simultaneous contact closure. Based on its fast and consistent speed, it can close at zero voltage for capacitor switching or at peak voltage for arc furnace switching. Its solenoid operating current is 60 to 65 amperes peak for 1½ cycles. If the solenoid operating time exceeds 1½ cycles, generally the power being supplied to the system is not adequate to maintain reliable and proper operations and needs to be verified.

When this switch is used for capacitor switching and does not have 32 inches of free space surrounding it, the switch requires grading capacitors to assure proper operation. The grading capacitors assure that the recovery voltage is equally distributed over its two vacuum interrupters in series. Repair parts for this switch can be found starting on Page 48.

This switch can be operated from a variety of AC and DC sources and is best operated by selecting from the controls shown beginning on page 13. This switch has one form A (normally open) and one form B (normally closed) auxiliary contact and is packaged with an external interface control that matches the option and application requirements.

Multiple switches in this configuration are used in parallel for arc furnaces with up to 4000A primary current. The switch current rating is de-rated to 500A when used in parallel. Arc furnace controls that can operate from one to six switches per phase are shown starting on page 26. An arc furnace transformer control can optionally be operated using either resistor insertion or peak voltage closing to reduce in-rush currents.

Accessories available for this switch include both current limiting reactors and resistor modules. The 30 microhenry reactor replaces the buss bar between the two modules. The reactor is used to limit in-rush currents when two capacitor banks are installed in parallel on a single buss. This switch also can be adapted as a resistor insertion switch by installing two 80 ohm resistor modules, one each, on top of the two vacuum interrupter modules. The two resistor modules are then series connected with the buss bar and have a total series resistance of 160 ohms. The controls required are shown starting on page 13. The reactors and resistors are shown on page 20.

Common Models and Configurations

SWITCH CONFIG.	BIL KV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	200-200	34	600	SOLENOID	120VAC	1001565	1000776G1
1 POLE	200-200	34 w/ grading capacitors.	600	SOLENOID	120VAC	1001565	1004355G1

46kV, 600A Single Pole Switch



This switch is principally used for arc furnace switching but also can be used for solidly grounded neutral capacitor switching applications. When the switch is used for capacitor switching and is not surrounded by 32 inches of free space, it must have grading capacitors to assure that the recovery voltage is equally distributed over the two vacuum interrupters in series.

The switch is solenoid operated because it is used in three phase sets requiring near simultaneous contact closure. Capacitor switching is limited to switching solidly grounded 46kV systems having maximum currents of 200 amperes.

The switch can be used to switch an arc furnace at 46kV with multiple switches of this configuration used in parallel for up to 4000A primary current capability. Switches connected in parallel are de-rated to 500A. This switch has one form A (normally open) and one form B (normally closed) auxiliary contact. Capacitor switching is best done with a stored energy control shown starting on page 13. An arc furnace control is shown on page 22. This switch's repair parts are shown beginning on page 48.

Common Models and Configurations:

SWITCH CONFIG.	BIL KV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING Amperes	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	200-250	46	600	SOLENOID	120VA	1002862	1002861G1
1 POLE	200-250	46 w/grading capacitors	600	SOLENOID	120VA	1002862	1002861G3



46kV & 69kV, 300A Single Pole Switch

The 46 and 69kV switches shown below are commonly used for capacitor bank switching in substations. They may also be used for switching induction furnaces and reactor banks. When the switch is used for capacitor switching and is not surrounded by 32 inches of free space, the switch must have grading capacitors to assure that the recovery voltage is equally distributed over the three or four vacuum interrupters in series. Otherwise, the switch's performance will be degraded.

This switch is used for both capacitor and arc furnace switching. It is solenoid operated because it is used in three phase sets requiring near simultaneous contact closure. Based on its fast and consistent speed, it can close at zero voltage for capacitor switching or at peak voltage for arc furnace switching. Its solenoid operating current is 60 to 65 amperes peak for 1½ cycles. If the solenoid operating time exceeds 1½ cycles, generally the power being supplied to the system is not adequate to maintain reliable and proper operations and needs to be verified.

Repair parts are shown beginning on page 48.



SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	220-250	46	300	SOLENOID	120VAC	1002859	1002858G1
1 POLE	220-250	46 w/ grading capacitors	300	SOLENOID	120VAC	1002859	1002858G3



SWITCH CONFIG.	BIL KV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	280-350	69	300	SOLENOID	120VAC	1002341	1002865G1
1 POLE	280-350	69 w/ grading capacitors	300	SOLENOID	120VAC	1002341	1002865G3

VES-U Vacuum Switch



This switch is used for both arc furnace and capacitor switching and is similar to the Joslyn™ VBU*. This switch was designed specifically for high duty applications such as capacitor switching and electric arc furnace switching. At 69kV and above, this switch may be the only switch available with a practical operating life for switching arc furnaces with minimal maintenance.

Vesco manufactures new VES-U switches, replacement VBU vacuum modules and switch operating mechanisms as shown on page 15. Vesco offers both capacitor and an arc furnace switch controls for this switch.

The VES-U switch can be used to reduce overvoltage transient with zero voltage closing capability for capacitor banks or to reduce in-rush currents by peak voltage switching for arc furnace-applications. It can be used as a resistor insertion switch for arc furnaces as well.

72kV 600A Single Pole

SWITCH CONFIG.	VOLTAGE MAX RATING kV	PRIMARY USE	CURRENT RATING A	INTERRUPTERS PER PHASE	OPERATING MECHANISM TYPE	BIL kV (L-G)	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	72	T, G, U	600	4	Solenoid	350	1001513	1001513G1
1 POLE	121	T, G	600	5	Solenoid	550	1001513	1001513G2
1 POLE	121	U	600	7	Solenoid	550	1001513	1001513G3
1 POLE	145	T	600	6	Solenoid	750	1001513	1001513G4
1 POLE	145	G	600	7	Solenoid	750	1001513	1001513G5
1 POLE	145	U	600	8	Solenoid	750	1001513	1001513G6
1 POLE	169	T	600	7	Solenoid	750	1001513	1001513G7
1 POLE	169	G	600	8	Solenoid	750	1001513	1001513G8
1 POLE	169	U	600	9	Solenoid	750	1001513	1001513G9
1 POLE	242	T, G	600	9	Solenoid	900	1001513	1001513G10

T = Transformer Switching and Fault Protection [Grounded or Ungrounded]

G = Shunt Capacitor or Reactor Switching [Grounded Source & Load]

U = Shunt Capacitor or Reactor Switching [Ungrounded Source or Load]

Vacuum Switches for Special Applications

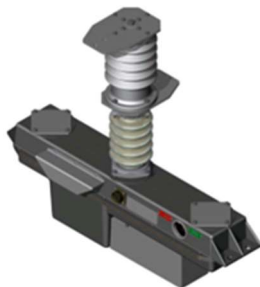
15kV, 600A Two Pole Switch



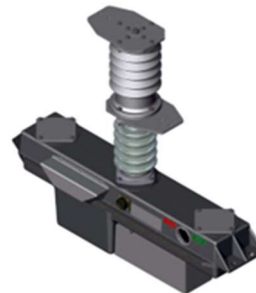
This solenoid operated two pole switch has two applications. The first is to achieve 1000 amperes of current capacity at 15kV by connecting the two modules in parallel with buss bars. In this configuration it is used for arc furnace switching. When the modules are connected in parallel, three separate switch mechanisms are required to make a three-phase set. Arc Furnace controls for this switch are shown starting on page 26. The second application is in conjunction with the transverse single pole switch shown below for switching ungrounded neutral capacitor banks at zero voltage. The control required for this application is found on page 13. Repair parts are the same as for a 15kV three pole switch and are found starting on page 48.

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	150	15	600	SOLENOID	120VAC	1000641	1000579G1

15kV, 600A Single Pole Switch



Transverse



Longitudinal

This single pole switch is used for zero voltage closing of capacitor banks to reduce in-rush currents and associated transient overvoltage conditions. It is available with two terminal pad orientations as shown above. With the terminal pads perpendicular to the length of the switch, it is used with the two-pole switch above to switch ungrounded neutral capacitor banks at zero voltage. The longitudinal form above is used in three phase sets to switch capacitor banks at zero voltage. These switches contain one form A (normally open) and one form B (normally closed) auxiliary contact. The required controls are shown on page 13. The repair parts are the same as for the three pole 15kV switch and are found beginning on page 48.

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE T	150	15	600	SOLENOID	120VAC	1003374	1001178G3
1 POLE L	150	15	600	SOLENOID	120VAC	1001182	1001178G1

34kV, 600A Three Pole Sectionalized



This switch is used for 34kV distribution line sectionalizing on solidly grounded systems only. The switch utilizes the self-contained motor operator because it is used as a sectionalizing switch in remote locations where a limited current supply is available, and a simple control is an advantage. The operating current is only 6 amperes for this switching configuration. Switches with 15 or 35 pin connectors have two each form A (normally open) and form B (normally closed) or six each form A and form B contacts respectively.

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
3 POLE	200-200	34	600	15 PIN MOTOR	24VDC	1002870	1003313G1
3 POLE	200-200	34	600	15 PIN MOTOR	48VDC/120VAC	1002870	1002867G1
3 POLE	200-200	34	600	15 PIN MOTOR	125VDC	1002870	1002867G2
3 POLE	200-200	34	600	15 PIN MOTOR	220VAC	1002870	1003313G2

34kV, 600A Single Pole Switch – Extended Creep



This switch is a 34kV switch is supplied with 350kV BIL line-to-ground insulators commonly used on 69kV systems. The extra creepage is useful where atmospheric contamination is a problem. This switch is also used to short insertion resistors on an arc furnace having a 69kV primary voltage. This switch contains one form A (normally open) and one form B (normally closed) auxiliary contact. A control for operating this switch is shown on page 24. The repair parts except for the pull rods and the line-to-ground insulators are the same as for the 34kV switch shown starting on page 48.

SWITCH CONFIG.	BIL kV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	200 -350	34	600	SOLENOID	120VAC	1002864	1002863G1

15/34kV Laboratory Switch



The above switch is solenoid operated for use in special applications such as in laboratory or electrical test needs where versatility is an advantage. The switch can be either a 34kV 600A or a 15kV 1000A switch by removing or installing the lower buss bar respectively. The double solenoid version of this switch has twice as many solenoids to increase the speed of contact closure. This switch contains one form A (normally open) and one form B (normally closed) auxiliary contact. The controls for these switches are shown on page 13. The repair parts except for the modules are the same as for the 34kV switch shown on page 48.

SWITCH CONFIG.	BIL KV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE	110/200-200	15/34	1000/600	SOLENOID	120VAC	1002860	1002831G1
1 POLE	110/200-200	15/34	1000/600	DOUBLE SOLENOID	120VAC	1002860	1002831G2

Harmonic Filter Switch

Left Hand Configuration



Right Hand Configuration



This 34kV switch is for switching harmonic filters up to and including the 12th. harmonic. This switch configuration is also ideal standardization for windfarm applications where there is a potential for higher-than-normal harmonic content that could negatively impact performance on traditional rated and configured switches. Unlike the other switches of a similar design, the modules on the Vesco harmonic filter switch contain grading capacitors to assure even distribution of the recovery voltage over the three modules. Modules with and without grading capacitors cannot be combined on the same switch and are special for this switch. The switch is solenoid operated. It comes with the buss bars on either the left or right hand sides so that switches connected in parallel on a single phase can be nested together. Having the switches close together makes the current divide more equal between switches connected in parallel. This switch contains one form A (normally open) and one form B (normally closed) auxiliary contact. A control for operating this switch is shown on page 13. The repair parts except for the modules are the same as for the 34kV switch shown on page 48.

SWITCH CONFIG.	BIL KV (T:T-T:G)	VOLTAGE RATING kV	CURRENT RATING A	OPERATING MECHANISM TYPE	CONTROL VOLTAGE	OUTLINE DRAWING	VESCO SWITCH PART NO.
1 POLE RH	200-200	34	600	SOLENOID	120VAC	1003377	1003355G1
1 POLE LH	200-200	34	600	SOLENOID	120VAC	1003376	1003354G1



Ratings for Vesco Switches

Design Voltage Nominal/Maximum (kV)	15/15.5 ³	25 ³	34.5/38 ³		46/48.5 ³		69/72.5 ³
Continuous current (RMS Amperes)	600 ⁵	300	600 ^{5, 3}	300	600 ^{4, 5}	300	300
Fault Interrupting Current (RMS Amperes) Max.	4000	3000	4000	3000	4000	3000	3000
Momentary Current (RMS Amperes, Asymmetric)	20,000	15000	20,000	15,000	20,000	15,000	15,000
Frequency (Hz) ³	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Two-Second Current (RMS Amperes)	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Four-Second Current (RMS Amperes)	9000	9000	9000	9000	9000	9000	9000
Impulse Withstand, Terminal-to-Terminal (kV) Line-to-Ground (1.2 X 50 Positive Wave)	110 ¹ / 150	200 ¹ / 150	200 ¹ / 200	200 ¹ / 200	200 ¹ / 250	250 ¹	280 ¹ / 350
Maximum 60-Cycle Withstand Line-to-Ground (kV) One Minute Dry Ten Seconds Wet	101 74	101 74	138 119	138 119	178 176	178 176	245 198
Maximum High Frequency Inrush Current (RMS Amperes)	10,000 ²	8,000 ²	10,000 ²	8,000 ²	10,000 ²	8,000 ²	8,000 ²

1. The terminal-to-terminal BIL is not established by a visible open gap and therefore the switch cannot be used to establish safety clearance for personnel.
2. When switches are used for capacitor bank switching, in-rush current levels need to be taken into consideration. Using reactors to reduce in-rush current reduces restrike probability. In back-to-back capacitor switching applications peak currents should be limited by reactors to a switch's high frequency inrush current rating. Excessive contact welding will occur, and operating performance negatively impacted if the in-rush currents are not limited below the switch ratings.
3. Switching a harmonic filter requires special considerations. Consult the factory about these applications.
4. For capacitor bank switching only, this switch is limited to being used on solidly grounded systems and solidly grounded capacitor banks with currents of less than 200 amperes.
5. When switches are used in parallel, the continuous current rating is reduced to 500 amperes to account for unequal current distribution between switches.

Switch Accessories

Resistor Module

The 80 Ohm resistor module is used on resistor insertion switches for reducing in-rush currents. The resistor module contains eight 10 Ohm, 10 kV resistor elements. These resistor elements have aluminum contact surfaces to reduce corrosion and the resulting increase in resistance.

The module is supplied with an arc horn to protect it from over voltages in the event the in-rush current is so large that the withstand voltage was exceeded.



80 Ohm Resistor Module

Vesco Part No.
1002256G2

The prior and obsolete resistor module design with the brass contact surface has part No. 1002256G1. When ordering a replacement, use Part No. 1002256G2.

30 Microhenry Reactor

The 30 microhenry reactor is used to limit in-rush current when switching back-to-back (two or more capacitor banks installed in parallel on the same bus) capacitor banks. It is designed to be installed in place of the buss bar on the 34kV switch shown on page6.



30 Microhenry Reactor

Vesco Part No.
1004478G1

Vesco Control Cable

The below cable has a 15-pin connector for connecting to a Vesco or Joslyn switch. The opposite end has a connector for connecting to a Vesco control. This cable is rated for indoor or outdoor use.



Number of Pins	Length (feet)	Part Number
15	15	1000775G8
15	20	1000775G2
15	25	1000775G1
15	30	1000775G3
15	35	1000775G4
15	40	1000775G5

Joslyn™ Replacement Cable

The below cable is for use with a Joslyn™ switch. The cables are made with either a 15 or 35 pin connector on one end and loose wires on the other for connecting to a terminal strip. Cables with the 90-degree connector that orients the cable upwards can only be used indoors, since they could be susceptible to hold moisture in that position.



Number of Pins	Length (feet)	Connector angled up (Indoor Use Only)	Connector angled down
15	20	1000415G1	1000576G1
15	25	1000415G4	1000576G4
15	30	1000415G2	1000576G2
35	20	1004504G1	1002156G1
35	25	1004504G2	1002156G2
35	30	1004504G3	1002156G3

Controls

Capacitor Bank Switch Controls

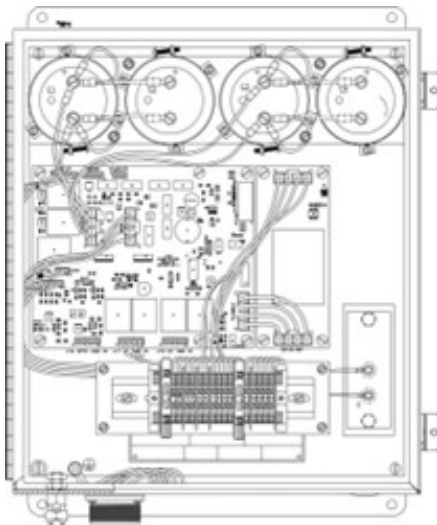
The capacitor switch controls shown on these pages are different from other controls commonly used to operate Joslyn™ switches. First, they have extremely low power demands. Second, the control is very precise in timing switch contact opening and closing. Third, the controls are connected to the switches with cables having connectors on both ends to significantly improve installation time and eliminate the potential for wiring errors during installation.

The power demand is low because both the single and multiple switch controls are powered by switching power supplies with either 10, 25, or 60 watts. At these low power levels, the peak current demand is easily under 3 amperes and the maintenance charging current is minimal. Since the power demand is so low, voltage drops in long runs of wire to the control are eliminated along with any operating performance issues. The controls can accept 48VDC, 120VAC, 125VDC, or 220VAC inputs.

These controls are very precise in controlling switching time because the basic electronic circuitry used in all the controls was designed for closing switches at zero voltage. The precision is achieved both by electronic switching and having a closely regulated voltage on the stored energy capacitors. The zero voltage close switching feature is optional on three switch controls.

The controls are easy to diagnosis and repair. They are a modular assembly of circuit boards, wiring harnesses, and cables all of which can be quickly unplugged and replaced. This enables a person who is not familiar with the details of the circuitry and operation of the control to quickly isolate and determine what components are not working properly by substituting whole assemblies.

Universal Single Switch Control



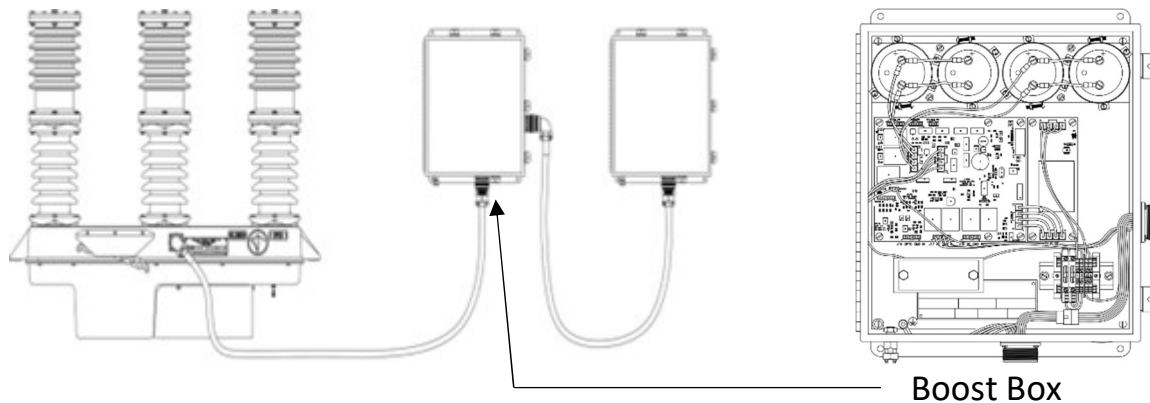
This control is called the universal control because it has field selectable options which permit it to be used in several different applications. The universal control can be used with 15 kV or 34 kV single switches. The control can be powered from either 120 VAC or 125 VDC. The trip and close command voltage can be either 120 VAC or 125 VDC. It also has an opto-isolated trip and close inputs which can be used to precisely time the closing of the switch.

The control has four energy storage capacitors but as delivered only two are connected. Switches with a single close or trip solenoid only require two capacitors. Switches with two close and two trip solenoids require four capacitors.

Control Voltage	Part Number	Capacitors
120 VAC or 125 VDC	1004489G1	4
120 VAC or 125 VDC	1004489G2	2*

*Single Solenoid Switches only

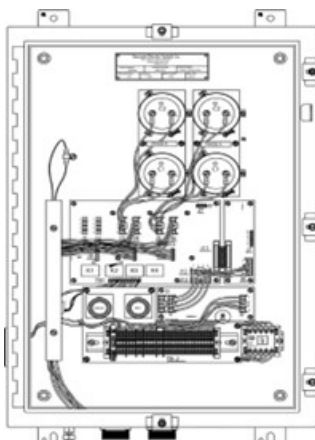
Boost Box Control for Three Pole Solenoid Operated Switches



The Boost Box Control is designed to assure adequate power for reliable operations of solenoid operated switches involving only a single switch mechanism. Some substation layouts have long distances between the switch and the 120VAC station transformer or 125VDC battery bank. The line impedance combined with high current demand may result in an excessive voltage drop to the switch. If that occurs, the switch may operate too slowly or fail to operate.

A boost box is a practical and simple way to offset the undesired voltage drop. The boost box contains energy storage capacitors and is inserted in series with the existing switch pendant cable going from the control to the switch. The capacitors in the boost box then supply power to operate the switch. Another option is to replace the older control with a new Vesco control with stored energy.

Multiple Switch Capacitor Bank Controls



Two Switch Zero Voltage Control

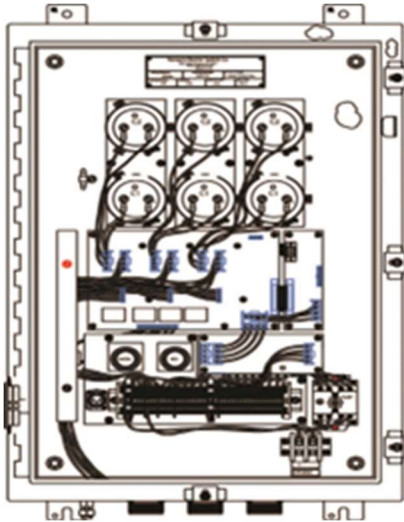
The two-switch control shown to the left is for switching unground neutral capacitor banks at zero voltage using the two-pole switch along with one single pole transverse switch as shown on page 16.

This control is calibrated using Vesco calibration test kit part No. 1004054G1. During calibration, test leads are connected to the de-energized switch pole high voltage terminal pads to measure the switch timing. A laptop computer with a special program is connected to the control and is used to measure and set the switch timing.

Control Type	Control Voltage	Control Part No.
Zero Voltage	48VDC	1003370G1
Zero Voltage	120VAC	1003370G2
Zero Voltage	125VDC	1003370G3
Zero Voltage	220VAC	1003370G4

Three Switch Control

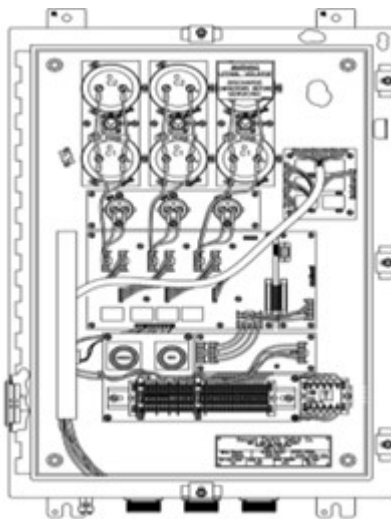
The three-switch control shown can operate a three-phase set of any single pole solenoid operated switch in this catalog except the VES-U switch. It can be ordered with either zero voltage close logic or as a regular control depending on the firmware installed. The three switches will achieve simultaneous contact closure within 2 milliseconds with minimal adjustment effort. The use of this control will substantially reduce the effort required to adjust switches for simultaneous operation when operated on 125VDC.



Control Type	Control Voltage	Part Number
Zero Voltage	48VDC	1003365G1
Zero Voltage	120VAC	1003177G1
Zero Voltage	125 VDC	1003177G2
Zero Voltage	220 VAC	1003177G3
Conventional	48 VDC	1003365G2
Conventional	120 VAC	1003369G1
Conventional	125 VDC	1003278G1
Conventional	220 VAC	1003369G2

VES-U Capacitor Bank Control

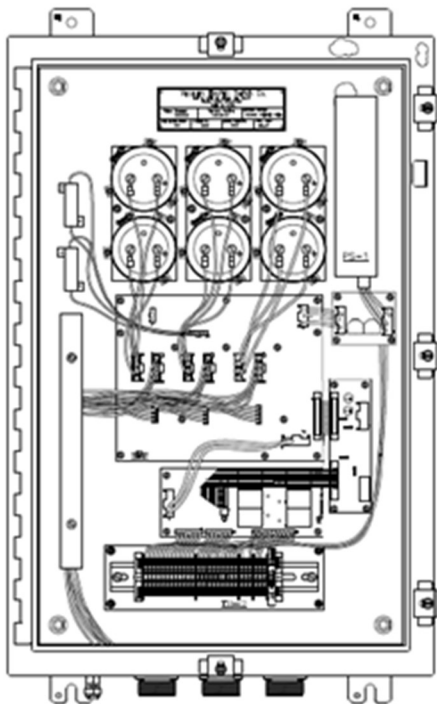
The three-switch control can operate a three-phase set of VES-U poles shown on page 15. It can be ordered for either a zero voltage closing logic or as a regular control depending on the firmware installed. The three switches will achieve near simultaneous contact closure within 2 milliseconds with minimal adjustment effort. The use of this control will substantially reduce the effort required to adjust switches for simultaneous operation when operated on 125VDC.



Control Type	Control Voltage	Control Part Number
Zero Voltage	120VAC	1004557G1
Zero Voltage	125VDC	1004557G2
Zero Voltage	220VAC	1004557G3
Zero Voltage	120VAC/125VDC	1004557G4



Wind Farm Switch Control

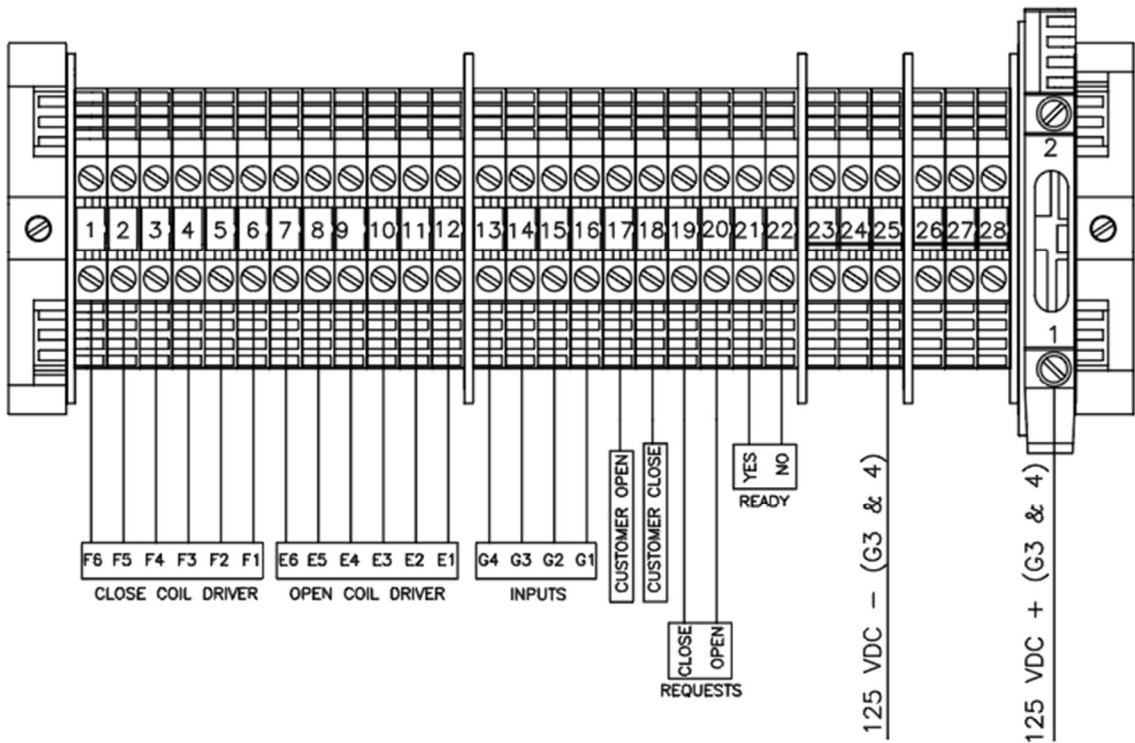


This wind farm control is used for dynamic VAR compensation at wind farm applications. This control can operate three poles of any single pole solenoid operated switch in this catalog except the VES-U switch. The control can switch the poles with precision independently of each other at a frequency of every fifteen seconds. The control is powered by 125 VDC and requires a 5kW power source with 3½% maximum impedance.

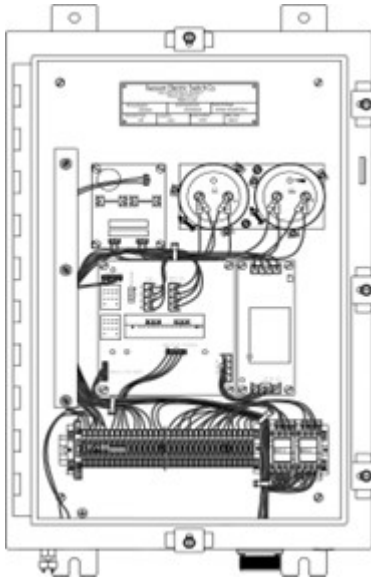
This control’s interface is designed to mate with Vizimax SynchroTeq™ control module.

Control Voltage	Control Part Number
125 VDC	1004455G1

SynchroTeq Control Interface



Arc Furnace Control for 15kV Single -Mechanism Switches (15MVA and below)



This control is for arc furnaces that are operated by one 15kV 600A three-pole switch. It is a stored energy control with a fast-charging circuit to enable frequent operation of the furnace switch.

The use of this control prevents problems caused by an inadequate current source to operate the control.

Control Voltage	Control Part No.
120VAC	1003154G1

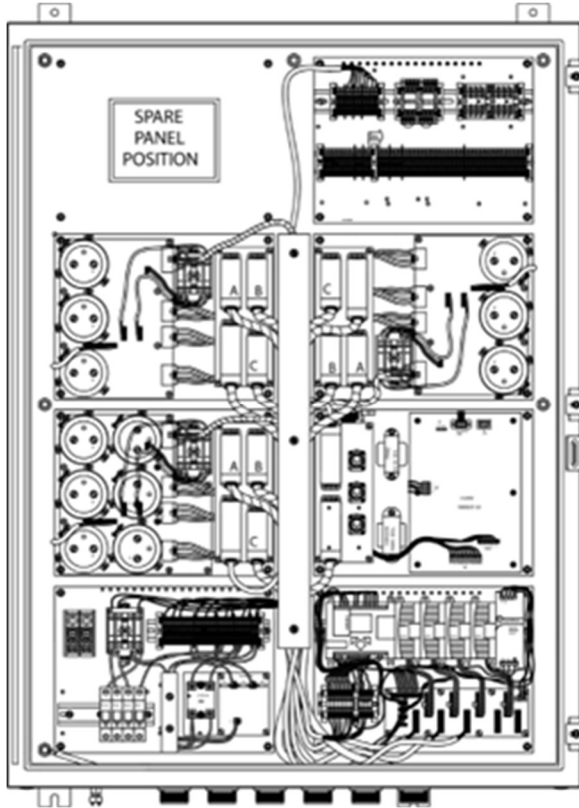
Important Application Note

The fault interrupting rating of the Vesco arc furnace switch is 4,000 A. On small transformers, the normal switch currents are less than 600 amperes, and the available short circuit current may be less than the vacuum switch 4,000 A rating. In this case, the switch can be used for overcurrent protection in conjunction with an overcurrent relay. If the available short circuit current is over 4000A, and the switch is open in an attempt to clear the fault, significant damage can occur to the switch and the switch may not clear the fault. In this scenario, using another device for overcurrent protection is required.

Another precaution is to install overcurrent relay as part of the control scheme. The intelligence in these relays can recognize whether a fault current is within the capability of the switch. If the current is too large, the relay prevents the vacuum switch from opening and allows an upstream protection device to clear the fault.

Arc Furnace Control for 15 to 46kV Multiple -Mechanism Switches (Greater than 15MVA)

This control is for an arc furnace with 3,000 amperes primary current at 15kV or 1500 amperes at 34/46kV. It can operate nine switches total which equates to three switch mechanisms per phase. It is a direct



replacement for a Joslyn™ arc furnace control. The control shown is representative of a whole range of controls available which are capable of operating from three to eighteen switch mechanisms. The control is modular for easy diagnosis and repair.

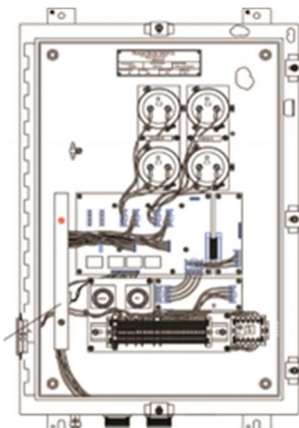
This control can minimize transient in-rush current either with resistor insertion switches or synchronous closing logic in which the switches are programmed to close at the peak voltage point on system's voltage sine wave.

The control is operated by an Allen Bradley™ PLC. The PLC has diagnostics built into its program. The control can detect a switch mechanical malfunction and initiate an emergency trip to prevent single phasing of the furnace transformer. Single phase power on a furnace transformer is a frequent cause of arrestors failures.

The PLC has an ethernet connection for remote monitoring with a PanelView™ monitor. The PanelView™ monitor graphically displays individual switch open or closed status and maintains a date and time stamped log of any potential switch malfunctions which resulted in the control being reset.

Number of Switches Per Phase	Control Transformer Requirement	Control Voltage	Control Part Number.
1	5kVA at 3.5% max impedance or 10kVA at 7% max impedance	120VAC	1001711G13
2	10kVA at 3.5% max impedance or 20kVA at 7% max impedance	120VAC	1001712G13
3	15kVA at 3.5% max impedance or 30kVA at 7% max impedance	120VAC	1001713G13
4	20kVA at 3.5% max impedance	120VAC	1001714G13
5	25kVA at 3.5% max impedance	120VAC	1001715G1
6	30kVA at 3.5% max impedance	120VAC	1001716G1

Induction Furnace Resistor Insertion Switch Control

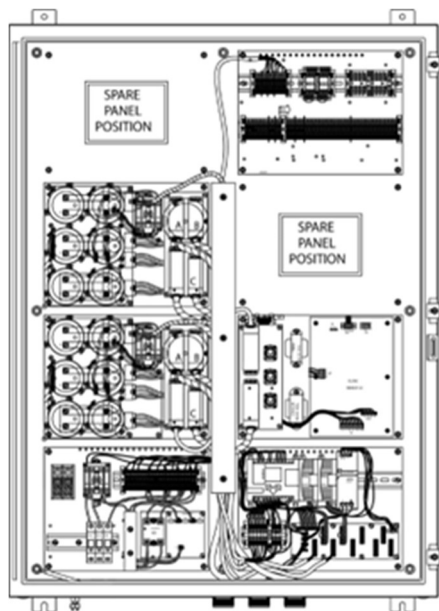


This control operates two 15kV 600A three pole switches in a resistor insertion switch arrangement for transient in-rush control. The control first closes one switch through 80 Ohm resistor modules. One hundred milliseconds later the control closes a second switch bypassing the resistors.

Control Voltage	Control Part Number
120VAC	1003248G1

Arc Furnace Control for VES-U or Joslyn™ VBU

The control operates Vesco VES-U switches and is a direct replacement for a Joslyn™ VBU control. VES-U switches shown on page 15 can be used at primary voltages of 69kV to 145kV. The control shown operates two poles per phase, but it can be expanded to operating up to five poles per phase.



The control is modular in design for easy diagnosis and repair. A person who does not know all the details of the control can diagnose problems by substitution. The control is connected to the switch by a cable with a connector on both ends to reduce wiring at installation. An adaptor kit is provided to install a receptacle on each VES-U or VBU pole.

This control can minimize transient in-rush current either with a resistor insertion switch or by synchronous closing logic in which the switches are programmed to close at the peak voltage point on system's voltage sine wave.

The control operates on stored energy for both closing and opening. It is operated by an Allen Bradley™ PLC which has diagnostics built into its program. The control can detect a switch mechanical malfunction and initiate an emergency trip to prevent single phasing of the furnace transformer. Single phase power on a furnace transformer is a frequent cause of arrestors failures.

The PLC has an ethernet connection for remote monitoring with a PanelView™ monitor. The PanelView monitor graphically displays individual switch open or closed status and maintains a date and time stamped log of switch malfunctions.

Poles per Phase	Control Voltage	Control Part Number
1	120VAC	1003223G3
2	120VAC	1003223G1
3	125VAC	1003223G5

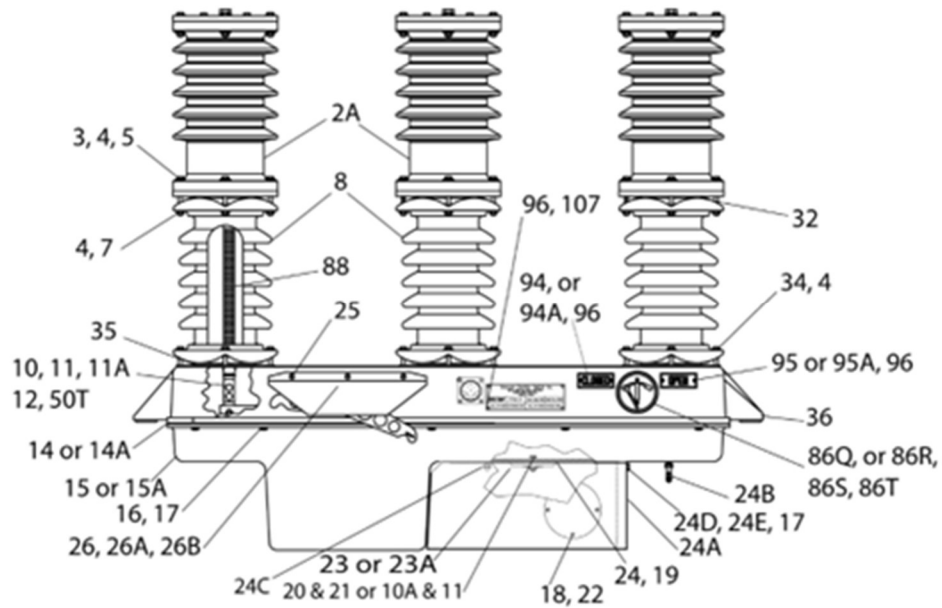


Calibration Cable & Software Set

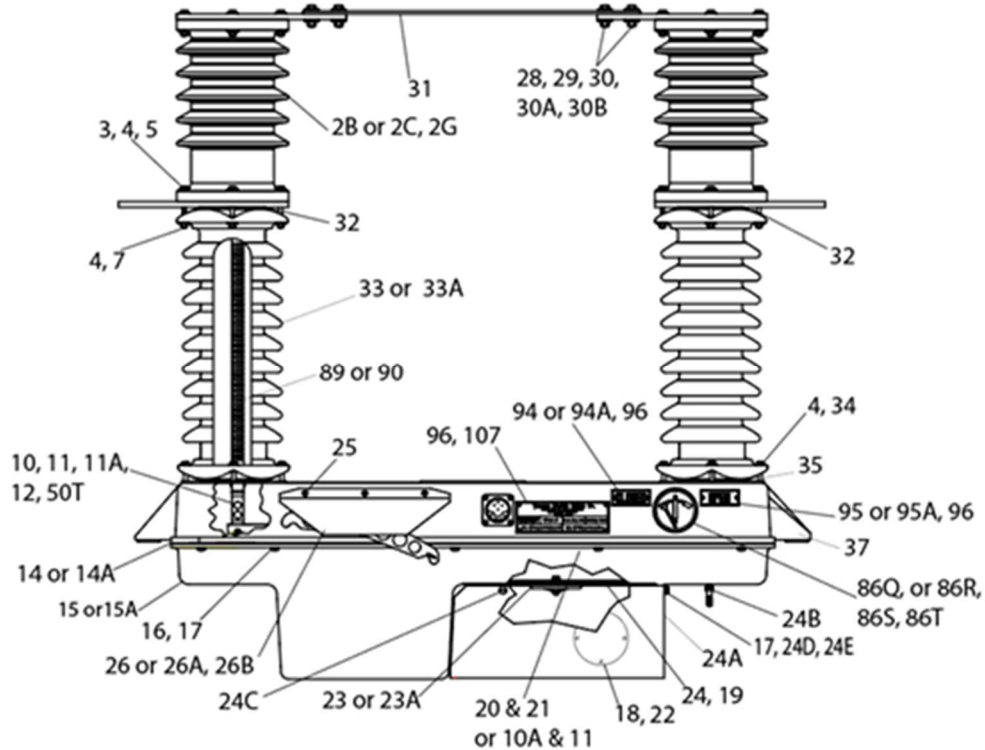
The Calibration cable and software set are used to calibrate Vesco controls for zero voltage closing (for capacitor bank switching) or for peak voltage closing (transformer switching).



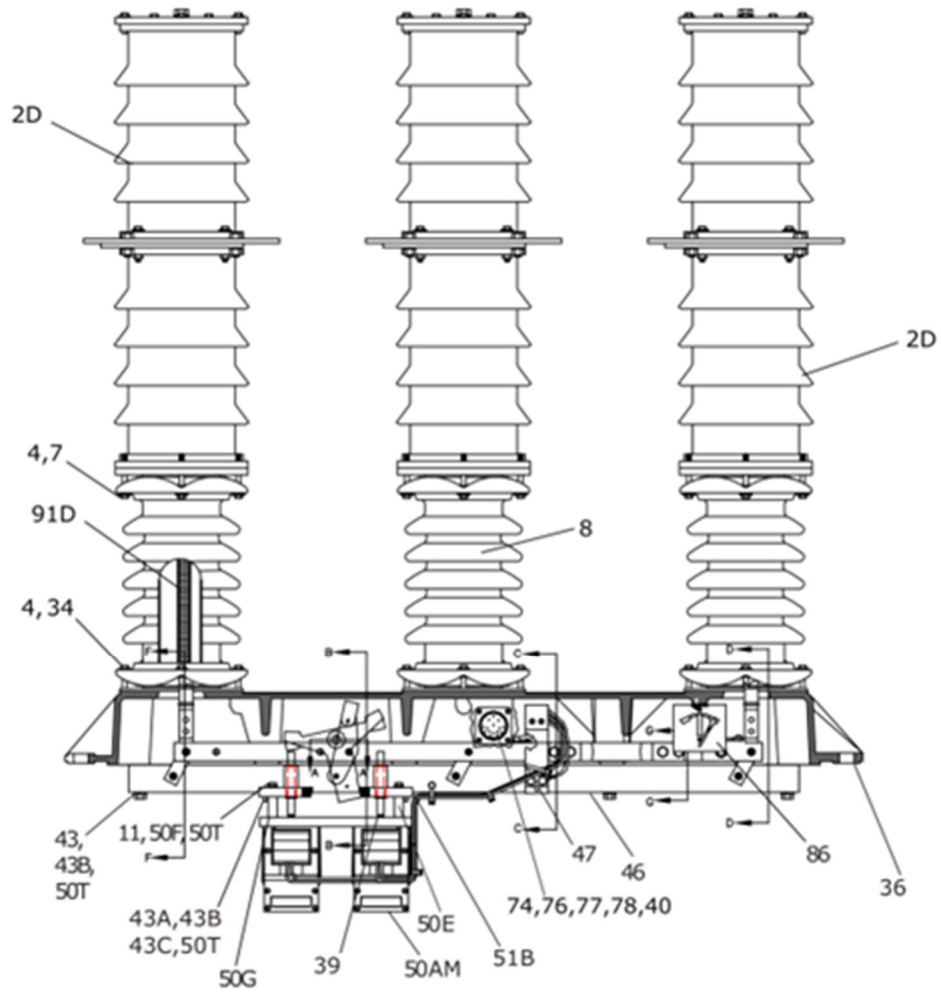
Vesco Kit Part No. 1004054G1



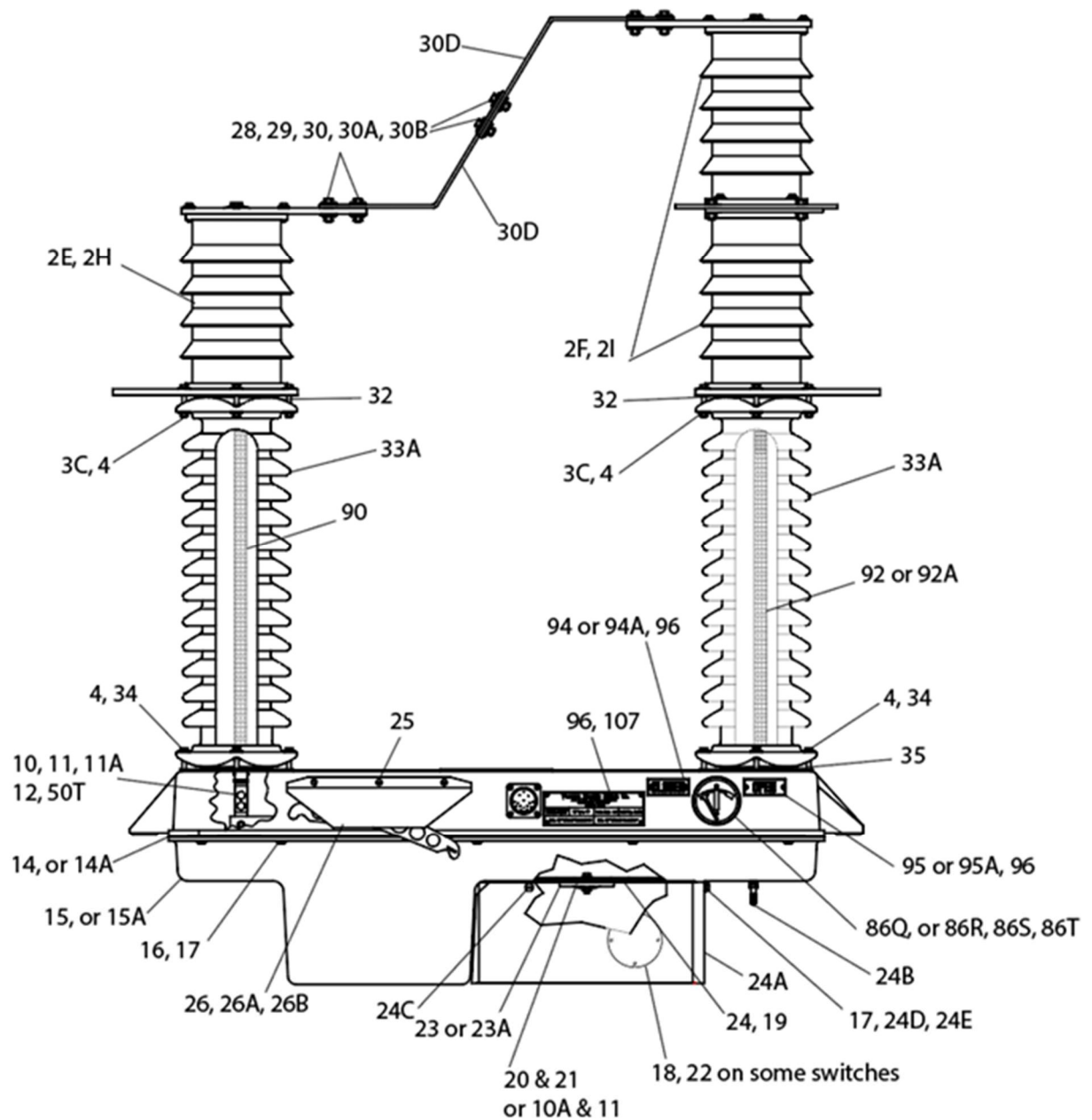
15kV, 600A Three-Pole



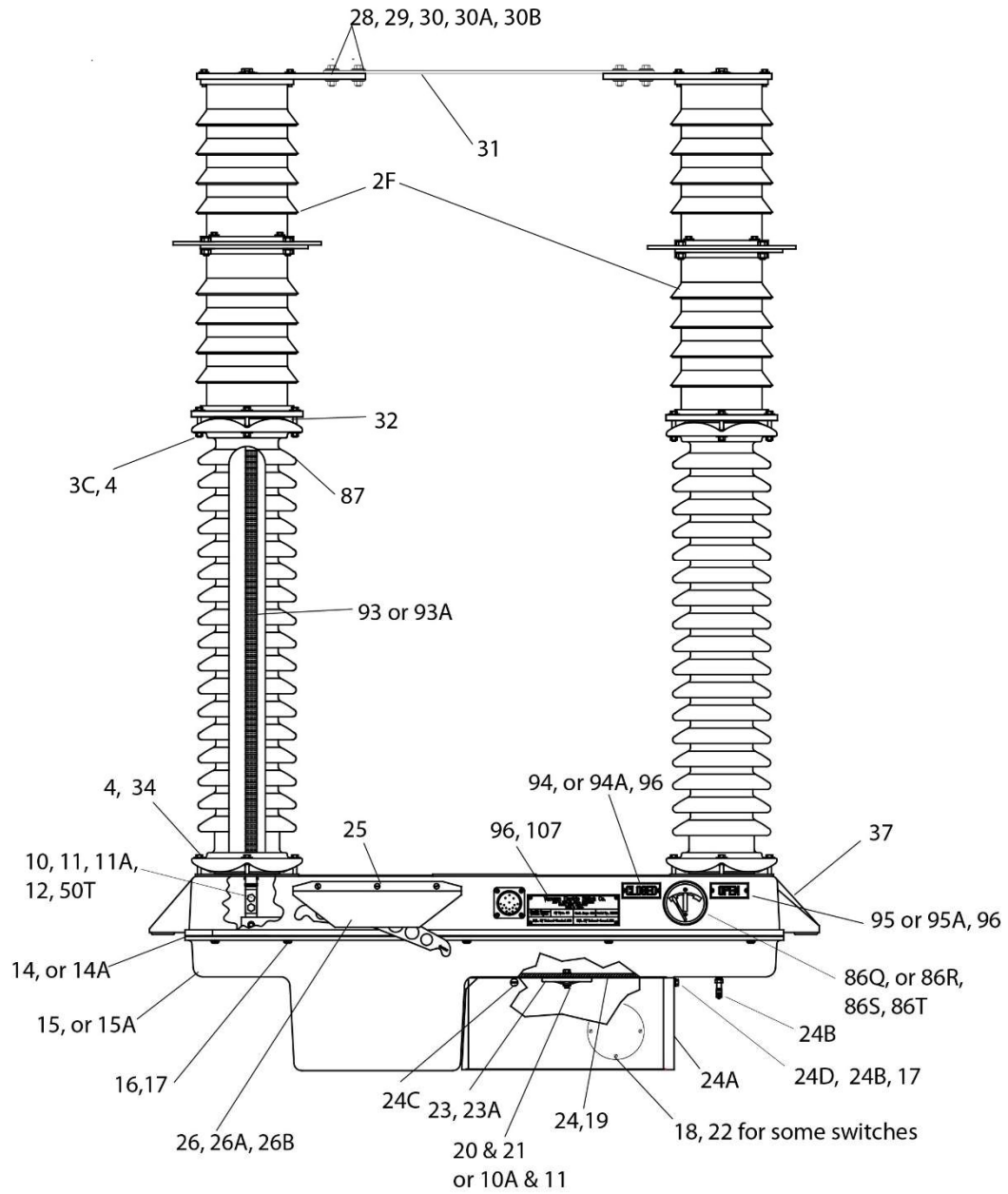
34kV, 600A Single-Pole



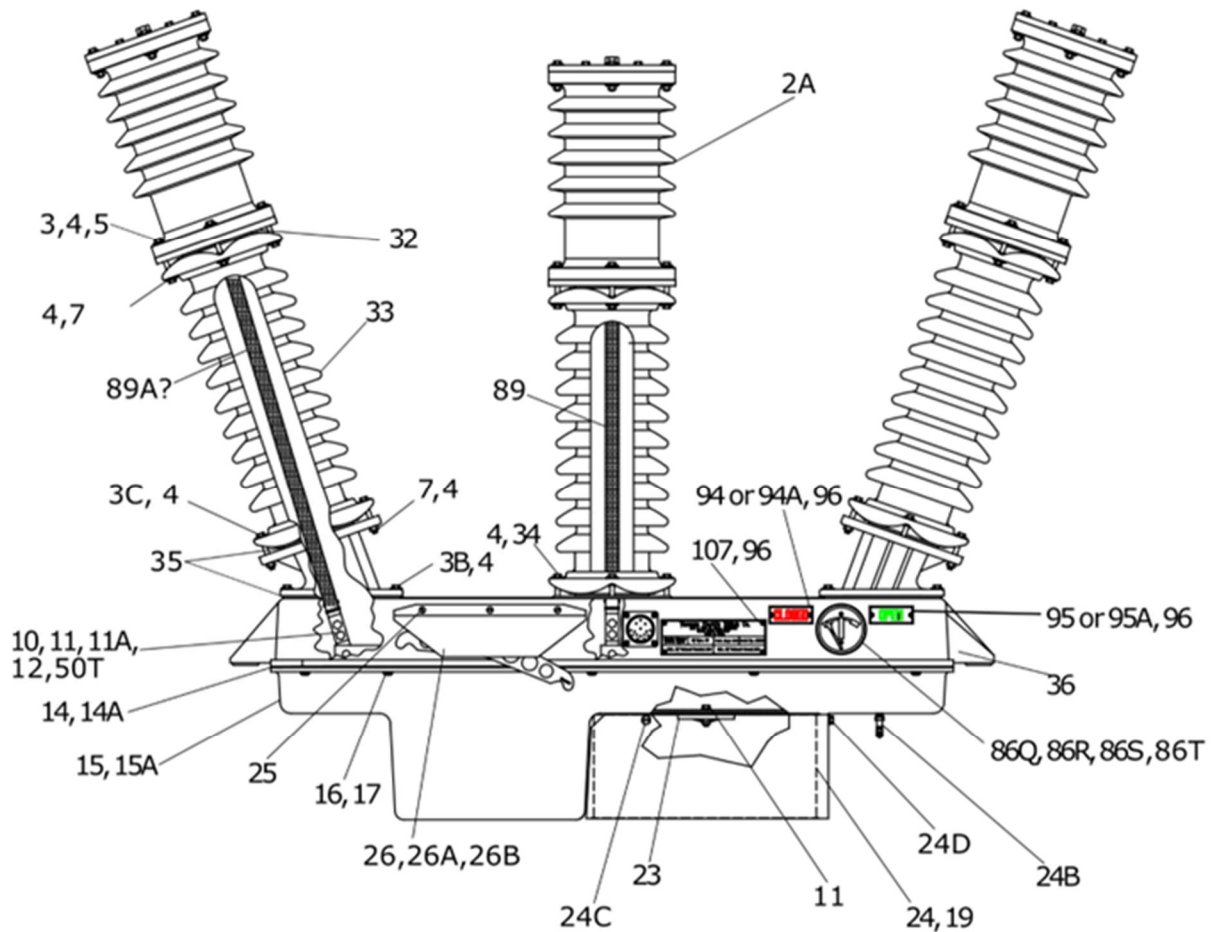
25kV, 300A Three-Pole



46kV, 300A Single-Pole



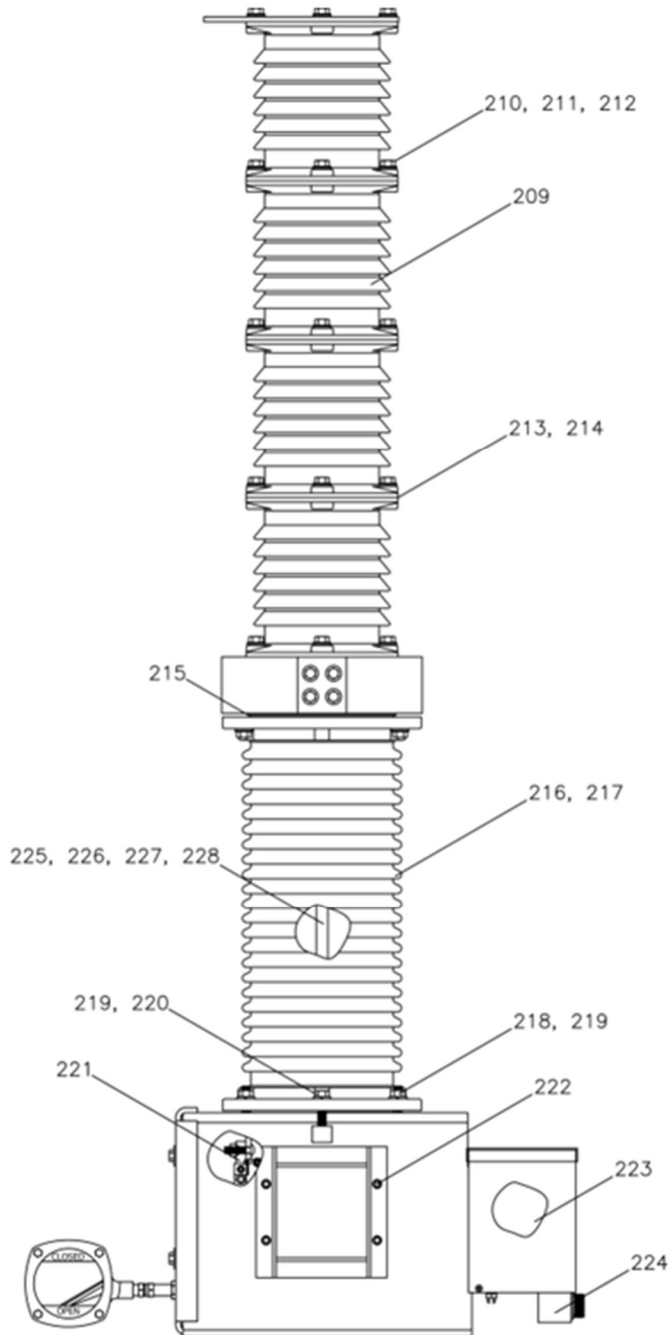
69kV, 300A Single-Pole



34kV 600 Ampere Three Pole Sectionalizer



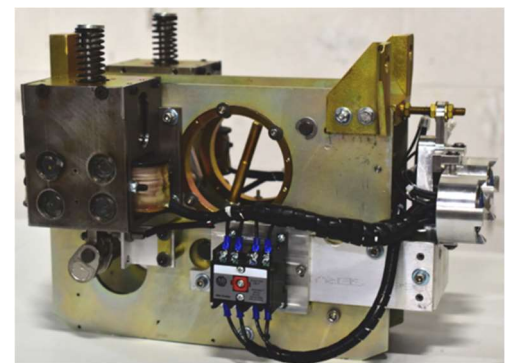
The VES-U mechanism is designed to provide a very long life and incorporates improvements over the similar Joslyn™ mechanism. Improvements have been made to many parts, such as the operating cams, the contact blocks, bearings, and various other components. These changes enabled the mechanism to achieve over 75,000 operations. Those changes, along with vacuum module improvements, result in an extremely reliable switch system.



VES-U / VBU Switch

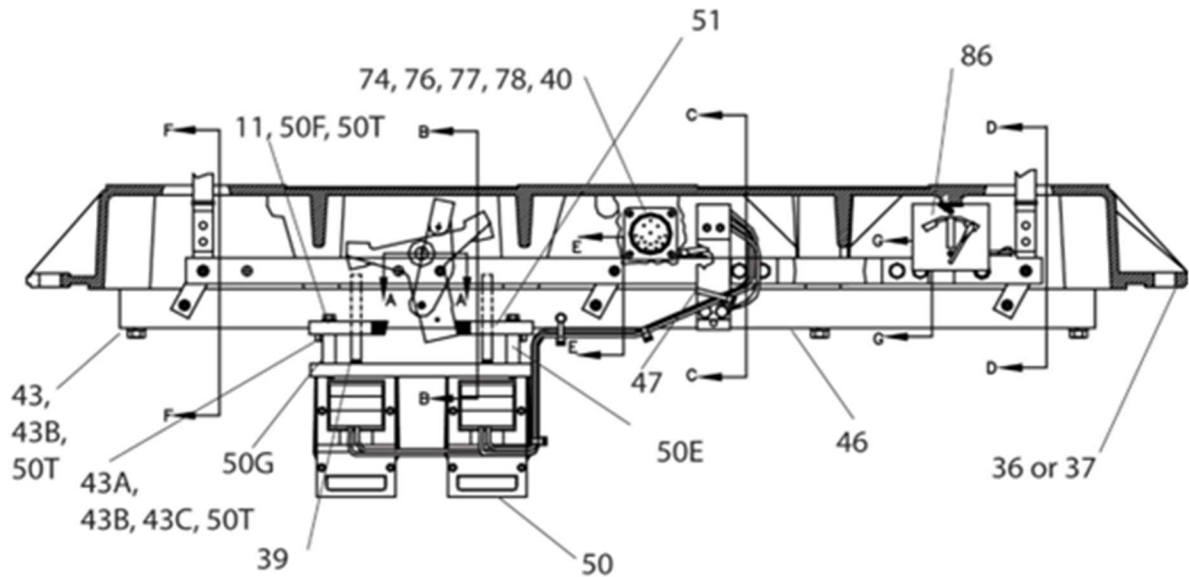


VES-U Vacuum Module
1002719G2

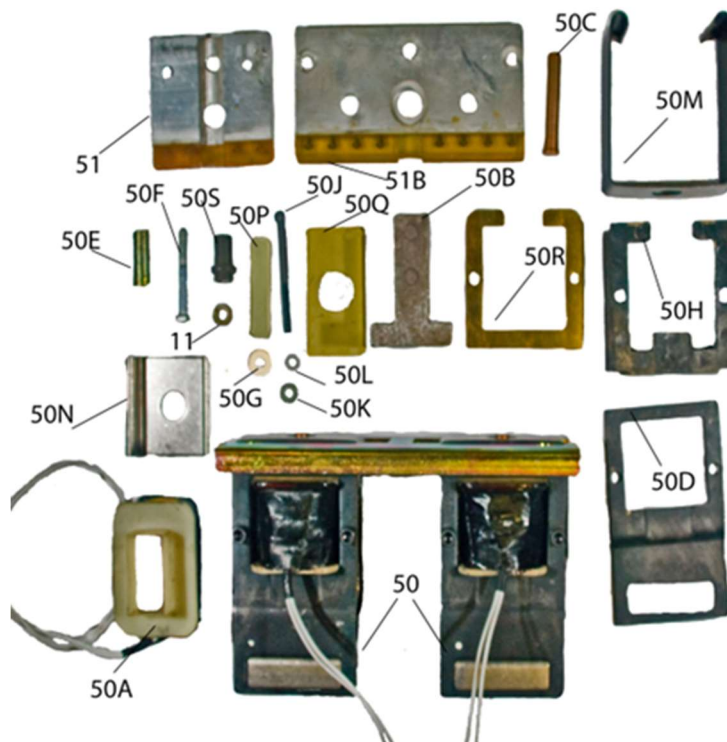


VES-U Mechanism
1004429G1

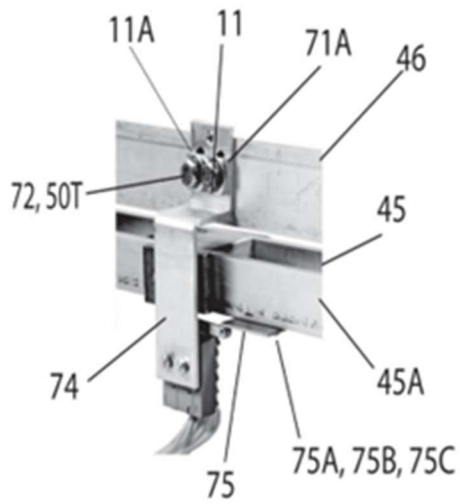
Mechanism for 15kV or 34kV Single-Pole and 46kV or 69kV Switches with DECCO™ Solenoids



Exploded DECCO™ Solenoid and Associated Installation Parts

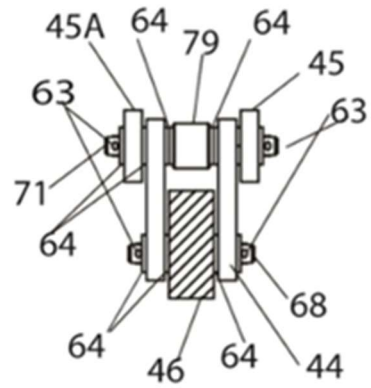


Cross Section Details from Views on Page 36 & Page **Error! Bookmark not defined.**

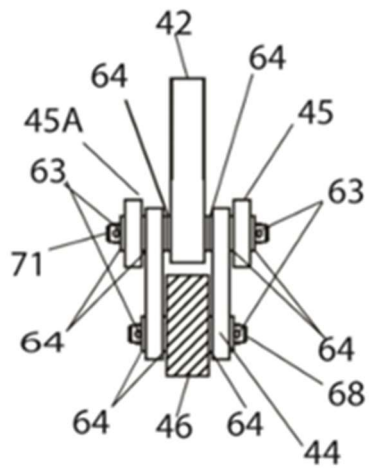


Section C-C

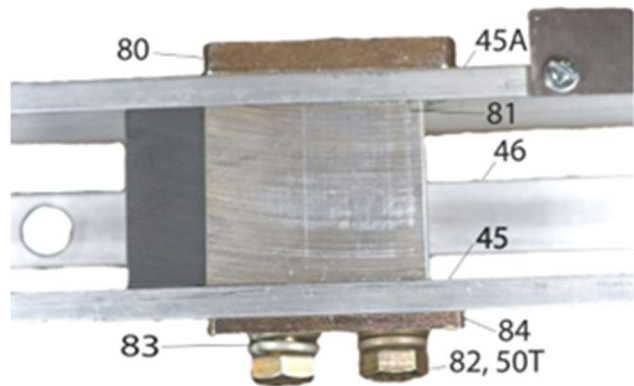
Only for switches with no center pole.



Section E-E

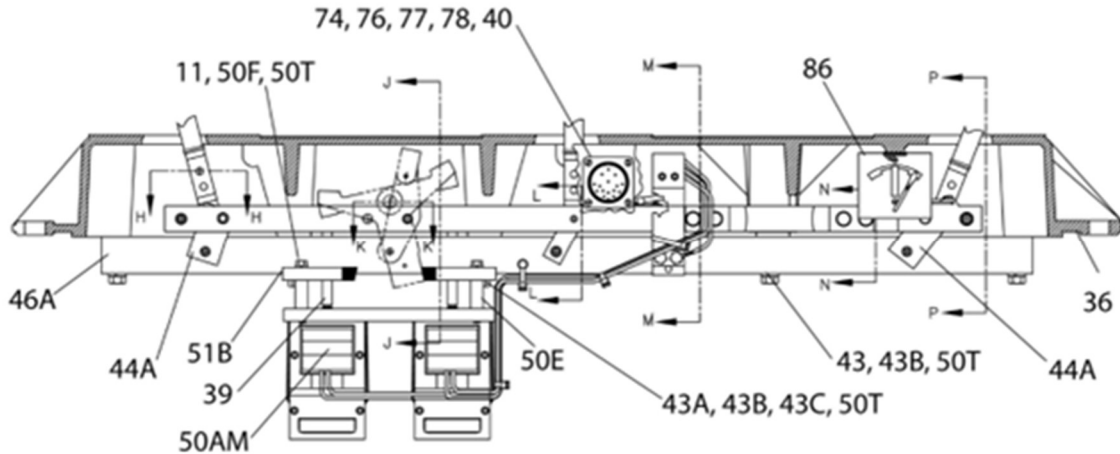


Section D-D & F-F

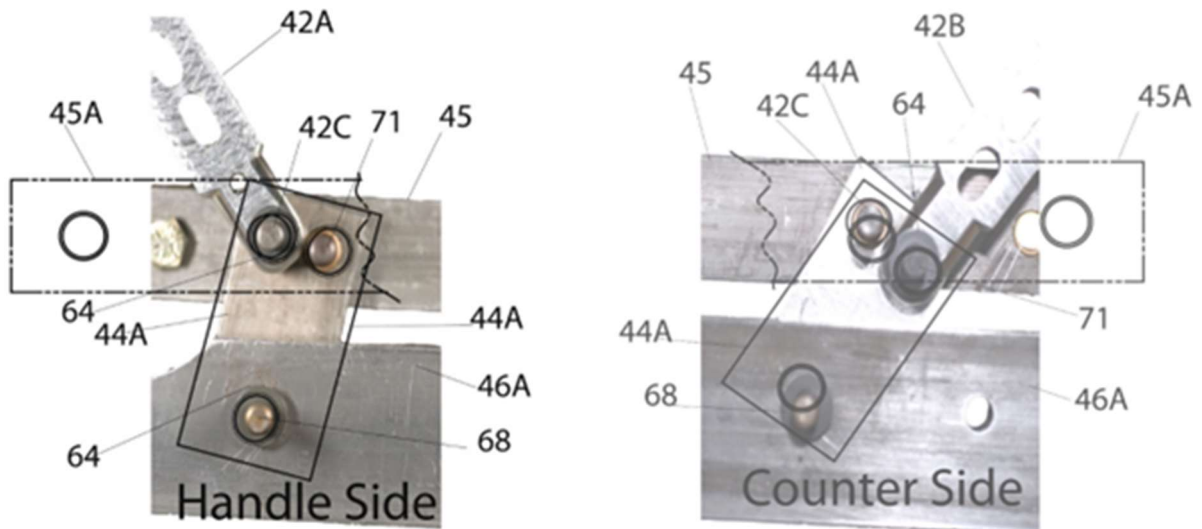


Bumper Assembly Section G-G

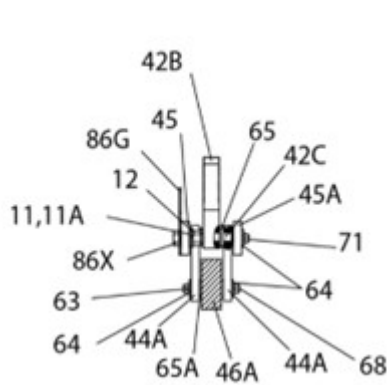
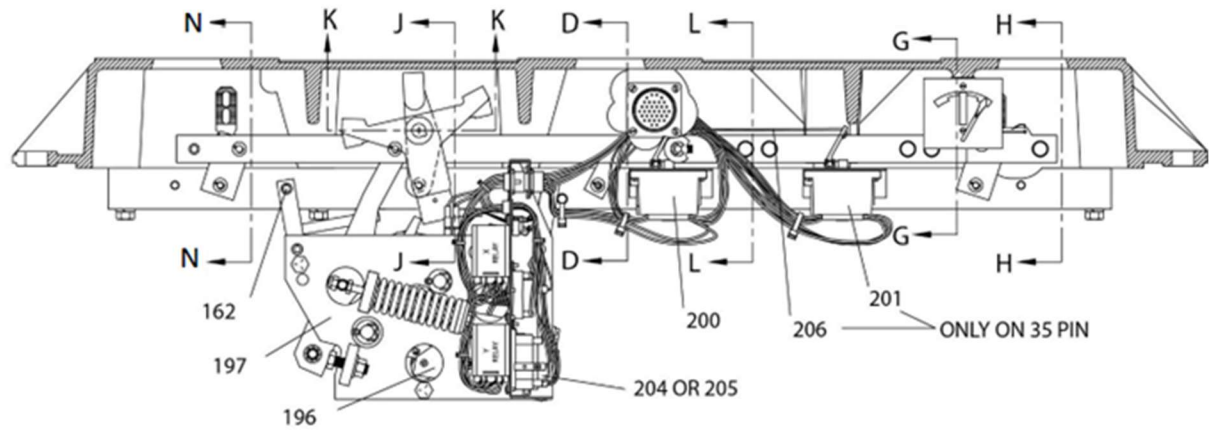
Mechanism for 34kV Three-Pole Switch with DECCO™ Solenoids



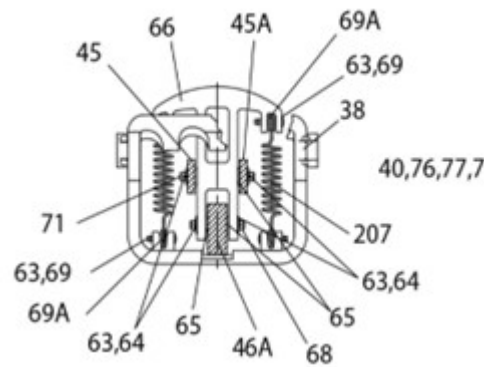
Linkage Assemblies for a 34 kV Three Pole Switch with Removed Parts Shown in Phantom



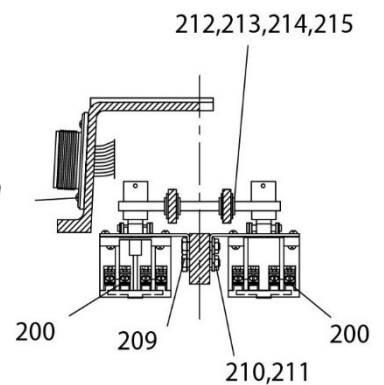
Mechanism for 34kV Three-Pole Switch with Motor Operator



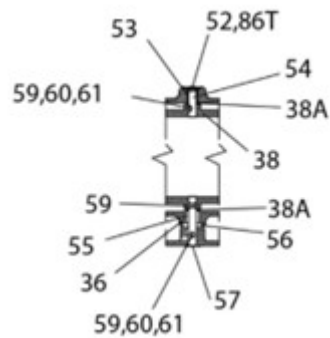
Section H-H



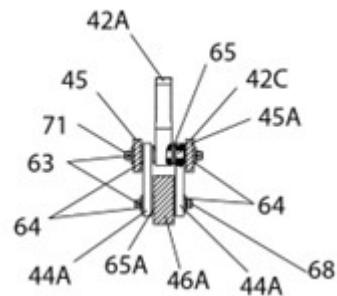
Section J-J



Section L-L

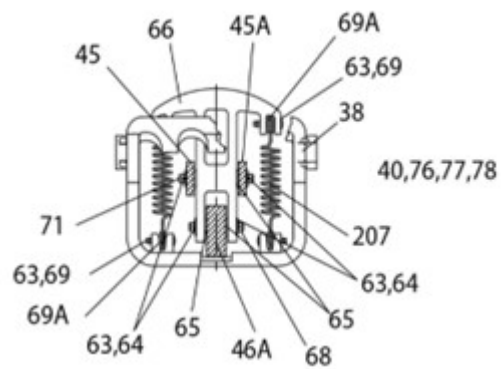
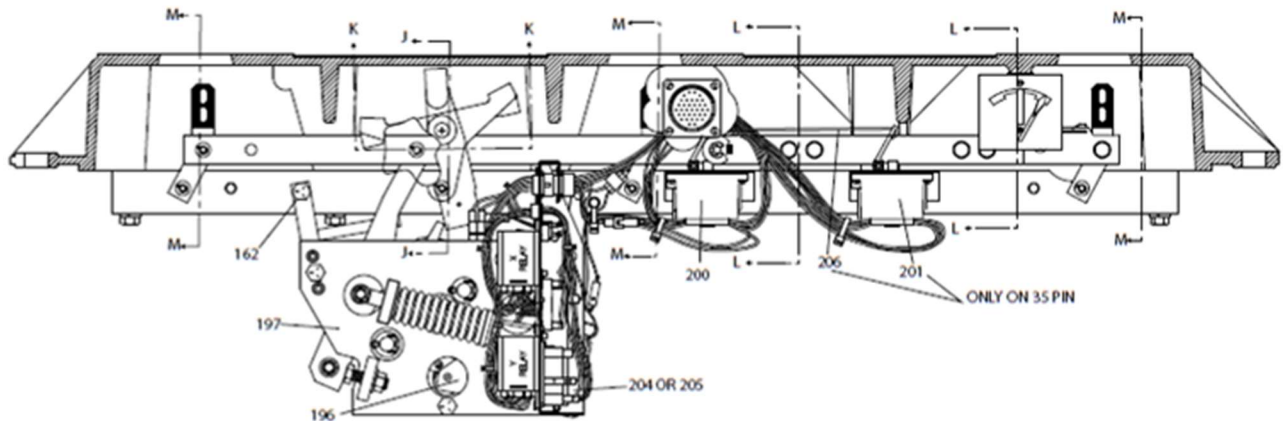


Section K-K

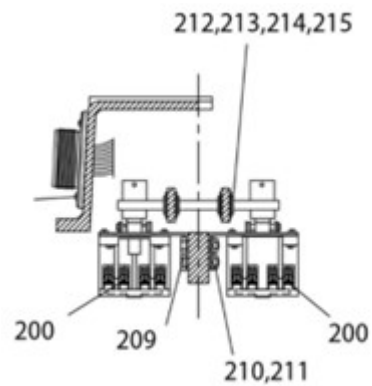


Section N-N

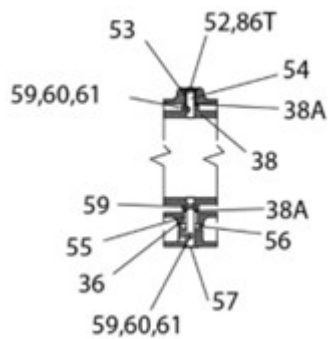
Mechanism for 15 & 25 kV Three-Pole Switch with Motor Operator



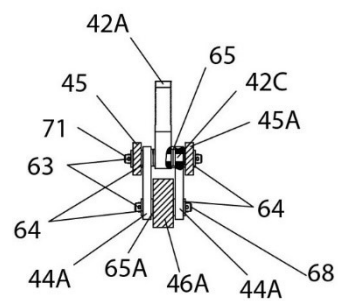
Section J-J



Section L-L

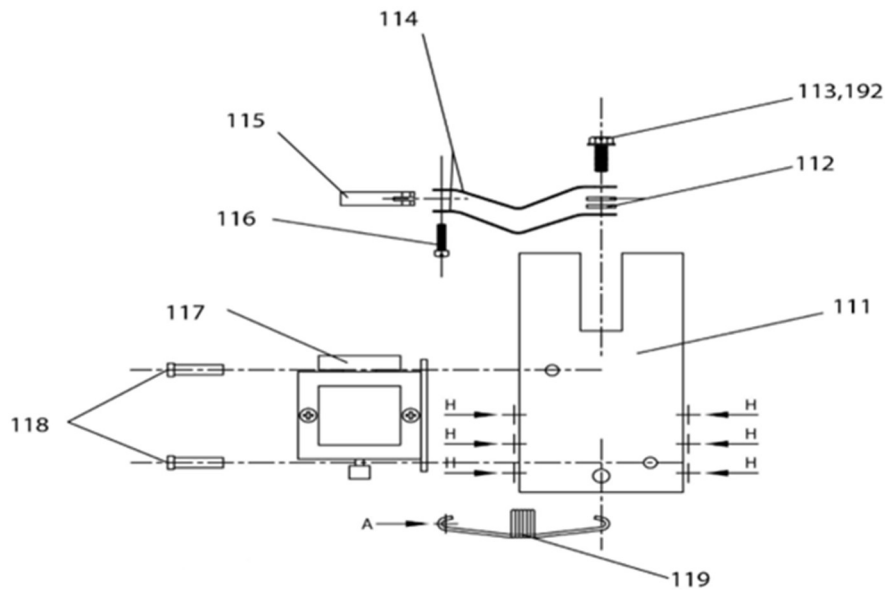


Section K-K

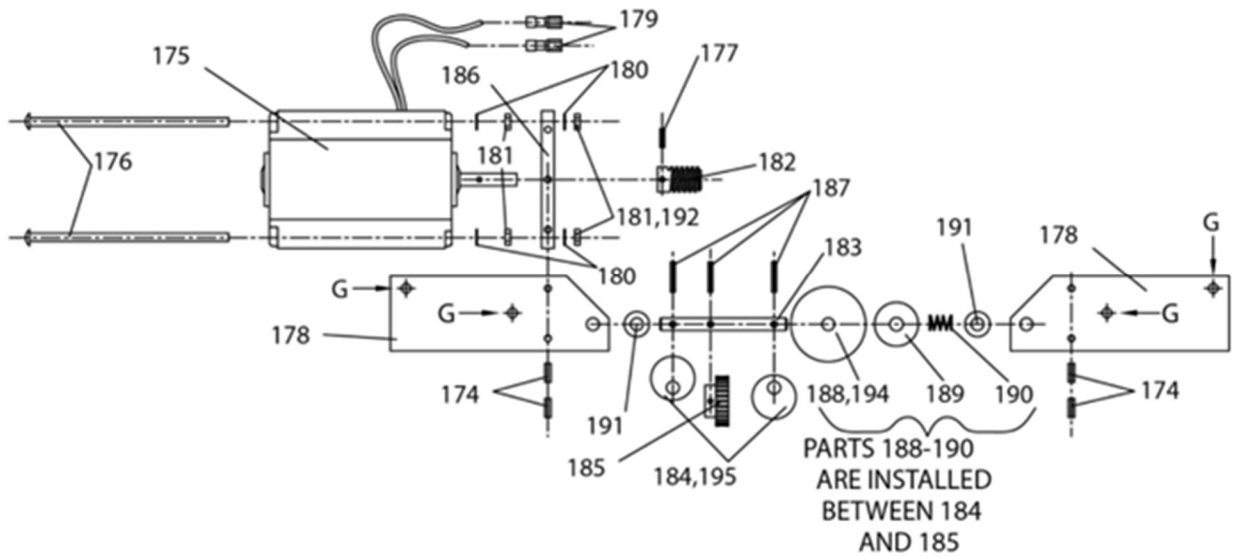


Section M-M

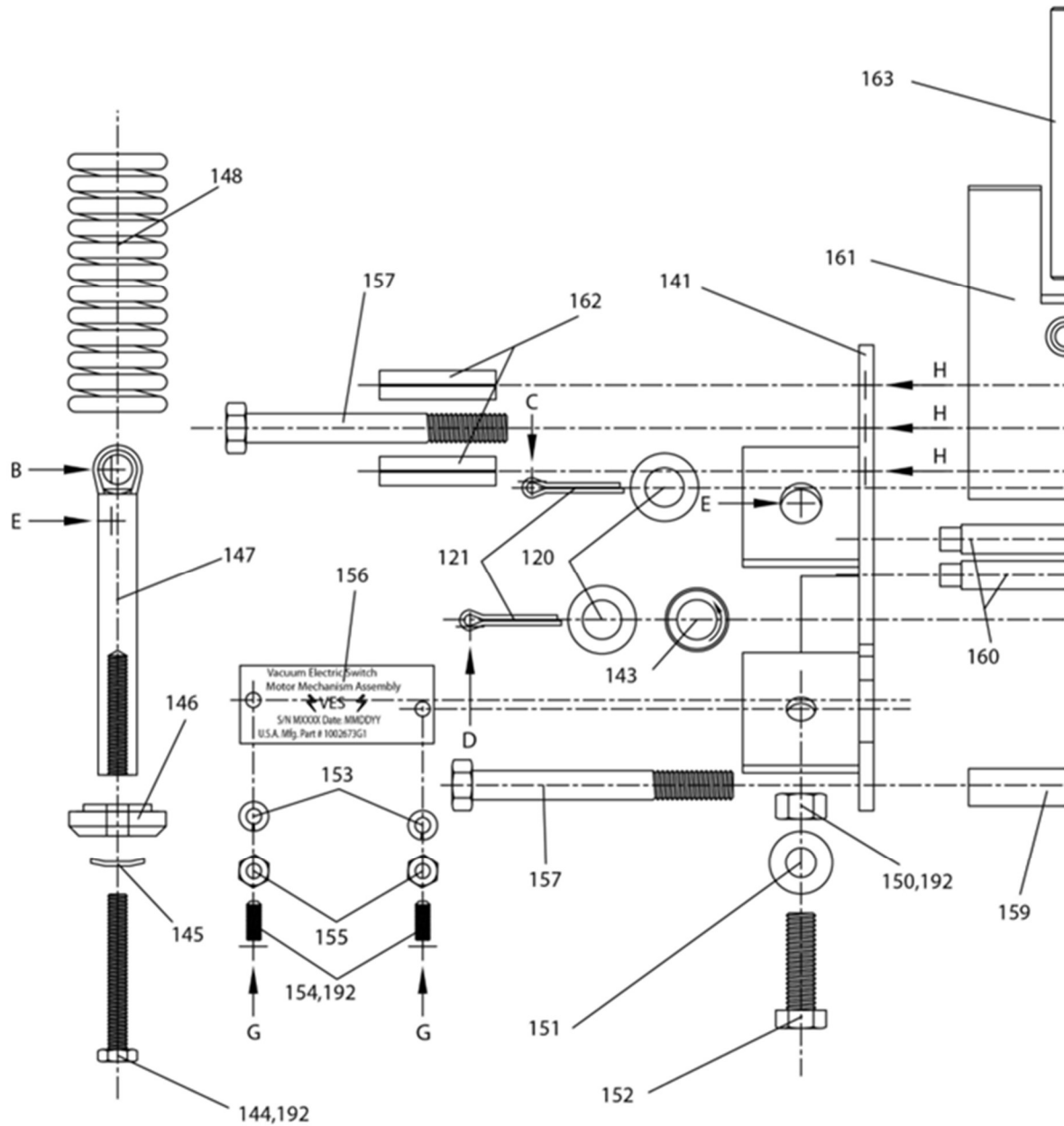
Motor Operator Rear Mounting Bracket Assembly



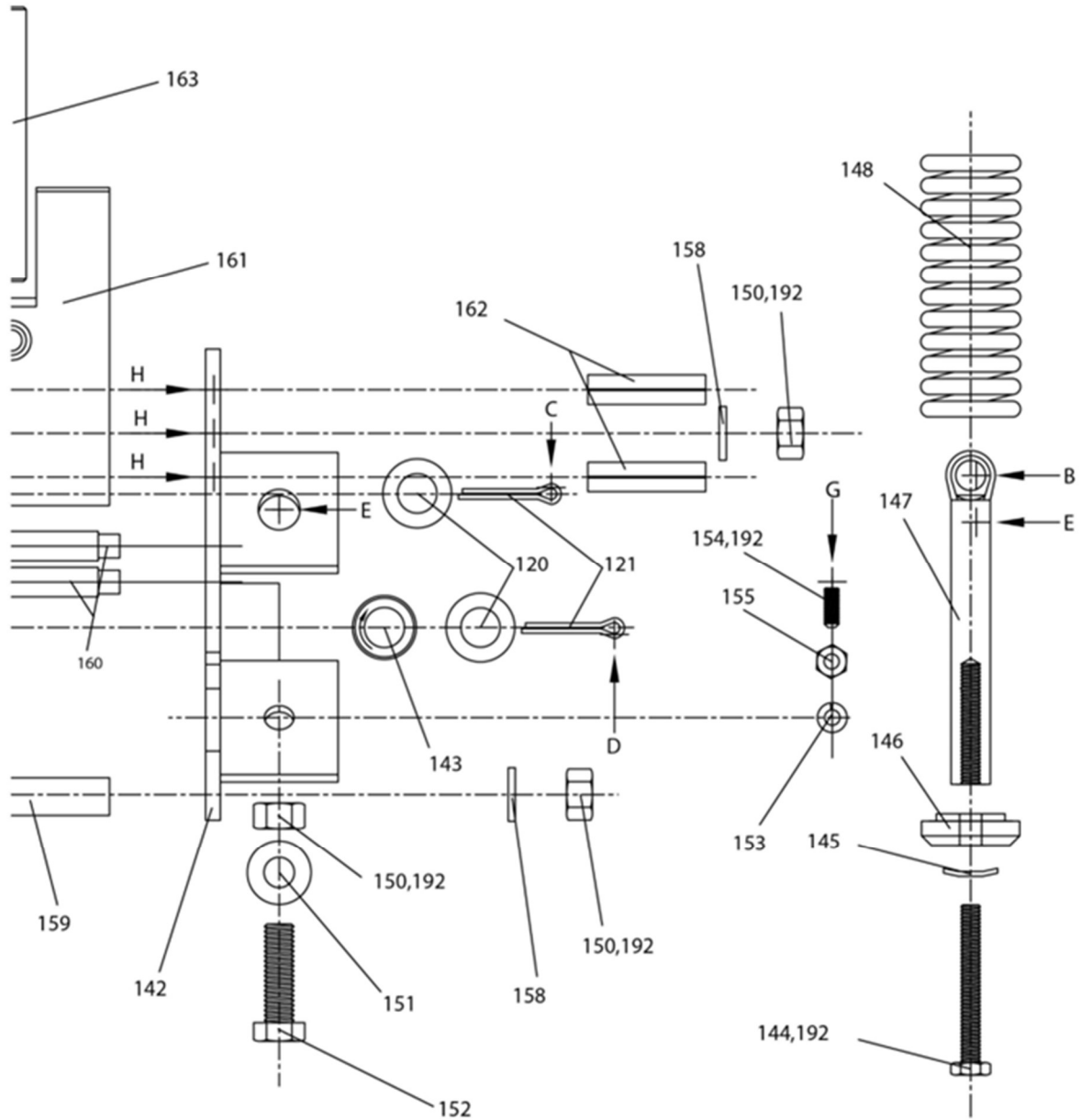
Motor Operator Standard Motor Assembly



Motor Operator Left Side Motor Plate Assembly



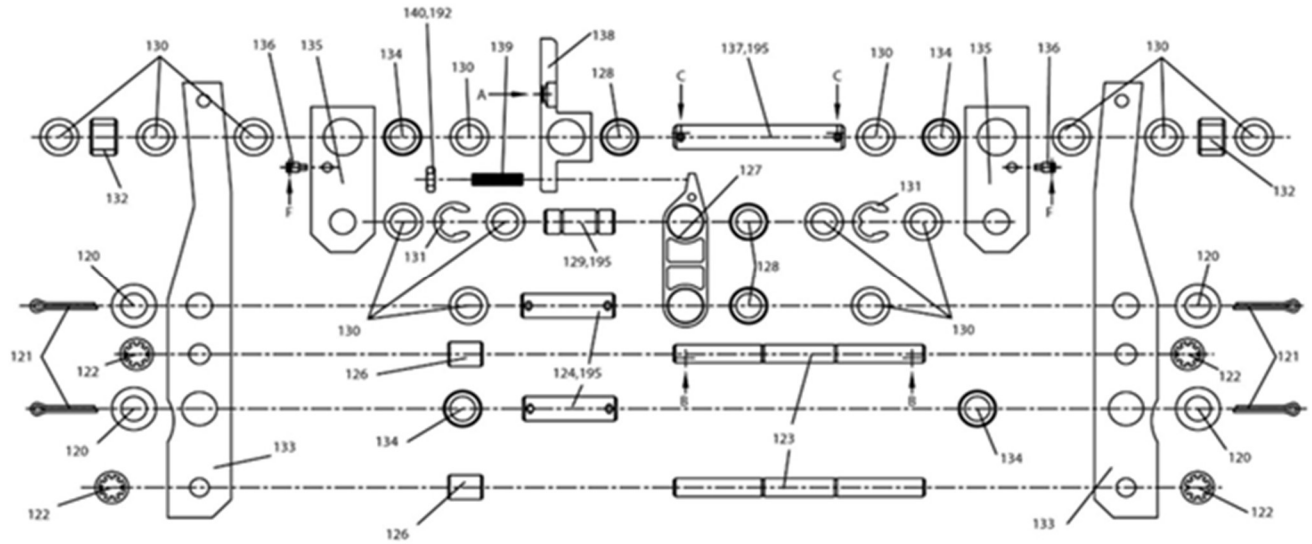
Motor Operator Right Side Motor Plate Assembly



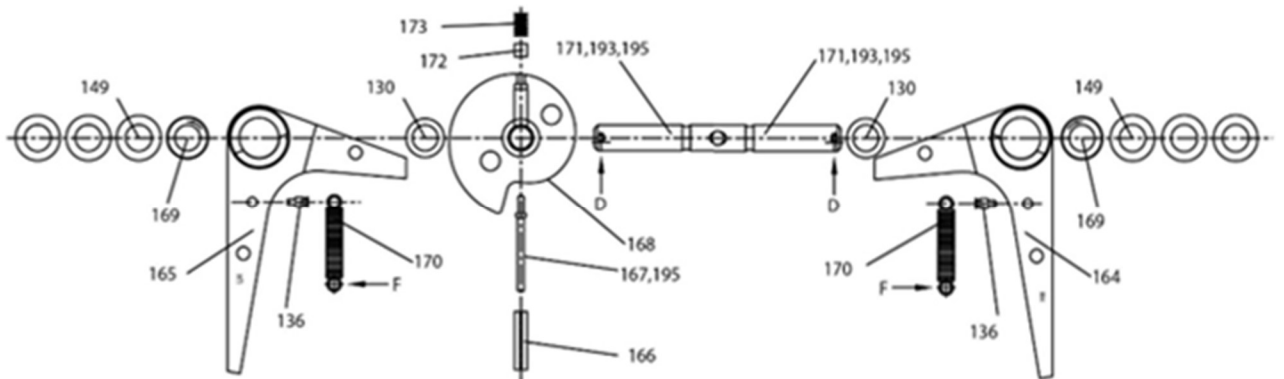
LEGEND



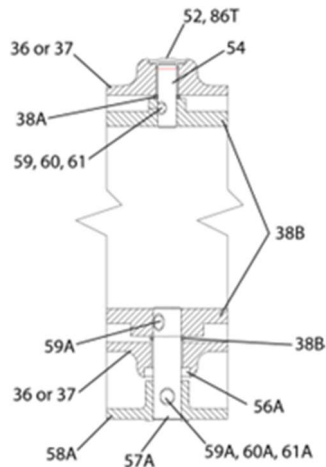
Toggle Link Components in Motor Mechanism Assembly



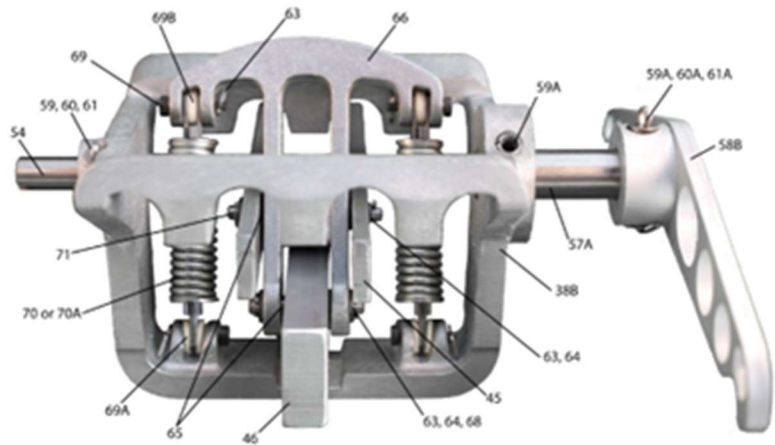
Clutch Arm Cam Motor Mechanism Assembly



Vesco Control Yoke Assembly (with machined aluminum handle & 3/4" shaft)

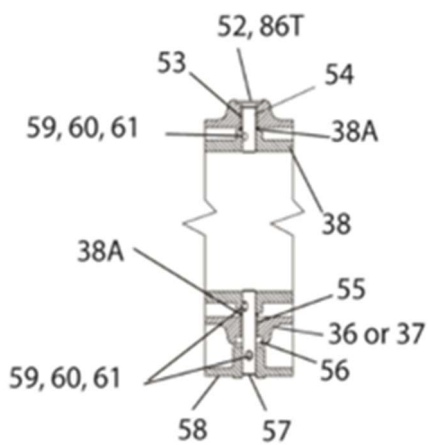


Section A-A

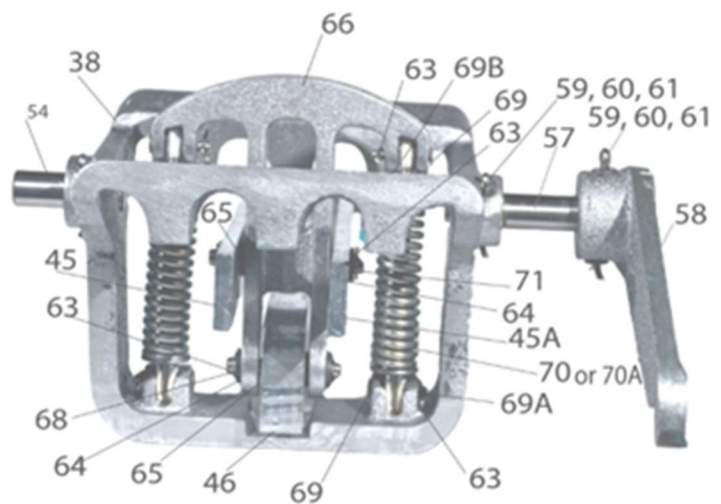


Section B-B

JOSLYN™ Design of Control Yoke Assembly (with cast aluminum handle & 1/2" shaft)



Section A-A

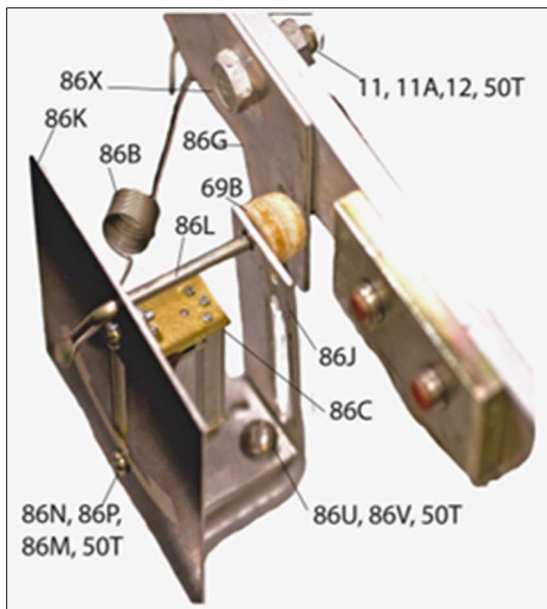


Section B-B

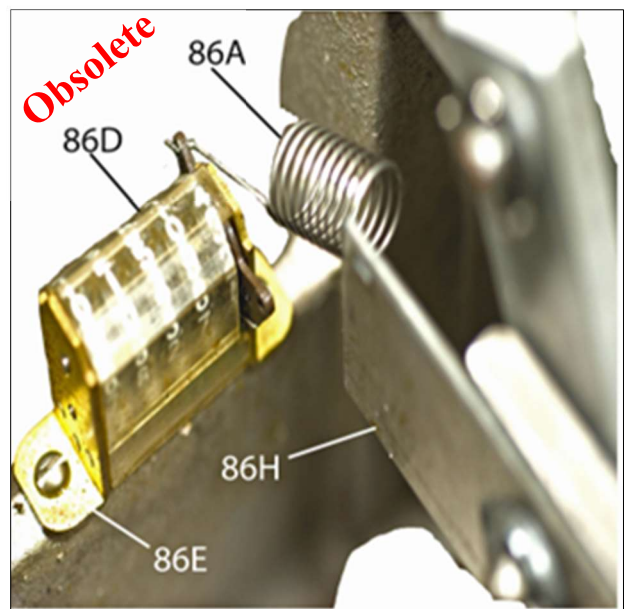
Counters & Position Indicators

Vesco switches are manufactured with a six-digit operations counter located within the position indication assembly. There have been varying types of counters used in Joslyn type switches. Counters can be attached to the manual operating handle cover, internal to the switch, and an externally visible six-digit version. The five-digit and six-digit counters are shown below. The five digit and handle cover counters are not available.

During switch overhauls old switches without externally visible counters are modified to use the new externally visible six-digit counter with a position indicator. This upgrade makes it easier to track switch operations for purposes of scheduling maintenance. The modification can only be done in the factory because it requires welding and re-machining of the switch mechanism casting. The window for the new counter and position indicator is sometimes located where the existing name plate is located. In this instance, Vesco replaces the old name plate with a new name plate having the old serial number.



6 Digit Counter & Position Indicator



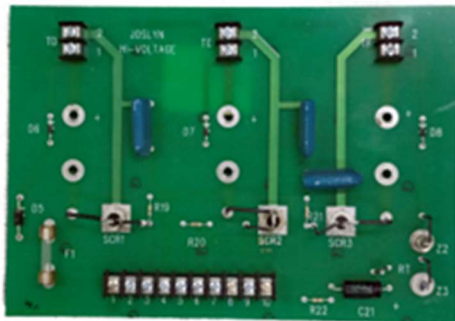
5 Digit Counter

Obsolete

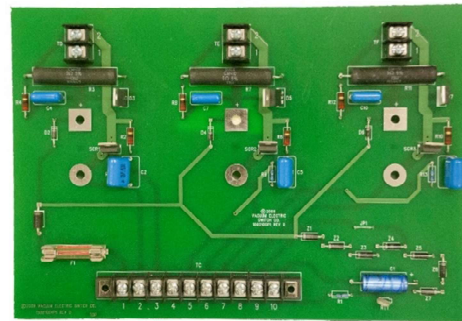
Replacement Parts for Joslyn™ Controls

The two Joslyn™ circuit boards shown below are used by Joslyn in both their zero-voltage control for capacitor banks and also their Point-of-Wave™ controls for arc furnaces. Shown opposite the Joslyn boards are the Vesco plug-for-plug compatible replacement board. The SCR boards are functionally equivalent except that the Vesco board has transient suppression components on the board whereas the Joslyn board requires that surge suppression be installed at the terminal connections during the board installation.

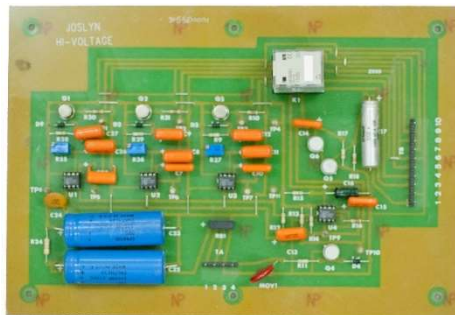
While functionally equivalent, the timing boards are designed using different concepts. The Joslyn timing board has analog circuitry to control the timing. The timing adjustments are made by turning three trip potentiometers on the board. The Vesco timing board has digital circuitry. The timing is controlled with a crystal oscillator, and the switch timing can be digitally set in increments of 25 microseconds. The Vesco digital board has an RS232 connection which can be connected to a computer and used to measure and set switch timing.



Joslyn SCR Board



Vesco Replacement SCR Board
Vesco Part No. 1002100G1



Joslyn Timing Board



Vesco Replacement Timing Board

Vesco Timing Boards

Voltage	Vesco part No.
120VAC	1002121G1
125VDC	1002121G2
24VDC	1002121G4



Replacement Parts List

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
1	Mechanism assembly, 15kV solenoid operated three pole switches	3021X0242 P001	1002796G1
1A	Mechanism assembly, 34, 46, & 69kV solenoid operated two pole switches		1002795G1
1B	Mechanism assembly 34kV solenoid operated three pole switches		1002276G1
2A	Fracture resistant vacuum interrupter module, 15kV 600A without pull rod	3021X0242 P003	1000674G1
2B	Fracture resistant vacuum interrupter module, 34kV 600A without pull rod	3021X0242 P005	1000674G1
2C	Fracture resistant vacuum interrupter module, 46kV 600A without pull rod	3021X0242 P007	1000674G1
2D	Double stack module, silicone rubber sheds, 300A	3021X0242 P401	1001184G1
2E	Single module with silicone rubber sheds, 300A		1001989G1
2F	Double stack module for 46 & 69kV 300A switch	3021X0242 P401	1001184G6
2G	Module with grading capacitors, 34kV 600A, without pull rod		1000674G6
2H	Single module with grading capacitors with silicone rubber sheds, 300A, for 46kV switch		1001184G9
2I	Double stack module with grading capacitors with silicone rubber sheds, 300A, for 46 & 69kV switch		1001184G10
2J	Double stack module with grading capacitors with silicone rubber sheds, 300A for 34kV 3- pole switch		1001184G5
3	Bolt, hex head, 1/4-20 x 2½" SST	3021X0242 P008	1000587
3A	Bolt, hex head, 1/4-20 x 2" SST		1001242
3B	Bolt, hex head, 1/4-20 x 1" SST		1001225
3C	Bolt, hex head, 1/4-20 x 1½" SST		1000120
4	Washer, Belleville SST	3021X0242 P009	1000640
5	Washer, flat, 9/32 ID x 5/8" OD x 1/16" alum.	3021X0242 P010	1000635
6	Gasket, obsolete	3021X0242 P011	Obsolete
7	Nut, hex, 1/4-20 SST	3021X0242 P012	1000583
8	Insulator, 15kV, skirted	3021X0242 P014	1000662
9	Bolt, hex head, 1/4-20 x 1¼" SST	3021X0242 P015	1000106
10	Bolt, hex head, 1/4-20 x 1¼" L, Gr. 8	3021X0242 P016	1000601
10A	Bolt, hex head, 1/4-20 x 1" L, Gr. 8		1000018
11	Washer, split lock, 1/4" standard, Gr. 5 & 8	3021X0242 P017	1000008
11A	Washer, SAE flat, 1/4"		1000013
12	Nut, hex head, 1/4-20 standard, Gr. 8	3021X0242 P018	1000027
14	Mechanism gasket, 10 hole	D63293P1	1000107P1
14A	Mechanism gasket, 12 hole	3021D0422P1	1000107P2
15	Mechanism cover, 10 hole	3021X0242 P021	1000568P1
15A	Mechanism cover, 12 hole		1001809P1
16	Screw, pan head, Phillips, 1/4-20 x 1" SST	3021X0242 P022	1000595
17	Washer, split lock, 1/4" standard, SST	3021X0242 P023	1000110
18	Screw, indented hex head, 6-32 x 3/8" L, SST	3021X0242 P024	1000931
19	Desiccant 2 oz. calcium sulfate in sealed bag	3021X0242 P025	1000924
20	Bolt, hex head, 3/8-16 x 1" L	3021X0242 P026	1000111
21	Washer, split lock, 3/8" standard	3021X0242 P027	1000112
22	Closure plate	3021X0242 P101	1001996P1

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
23	Clamping plate, 1/4-20 tapped hole (use with parts 10A & 11)	3021X0242 P102	1000644P1
23A	Clamping plate, 3/8-16 tapped hole (use with parts 20 & 21)		1000644P1
24	Breather bag	3021X0242 P103	1000114P1
24A	Sheet metal shroud covers breather bag	3021D0113P2	1000580P1
24B	Valve, Schrader		1000534
24C	Screw, pan head, 1/4-20 x 5/8" plastic, black		1000414
24D	Bolt, hex head, 1/4-20" x 1/2" SST		1001821
24E	Washer, flat, 1/4" ID x 1/2" O D, SST		1001823
25	Screw, slotted head, 10-32 x 3/8" L, SST	3021X0242 P104	1000507
26	Handle cover with three screw holes	3021X0242 P105	1000578P2
26A	Handle cover with two screw holes		1000578P3
26B	Counter for handle cover, 5-digit Obsolete		1000925
27	Mechanism assembly 34 & 46kV	3021X0242 P106	1002795G1
28	Bolt, hex head, 1/2-13 x 1 1/4" L, SST	3021X0242 P107	1000029
29	Washer, Belleville, 1/2" SST	3021X0242 P108	1000055
30	Nut, hex, 1/2-13 standard, SST	3021X0242 P109	1000030
30A	Washer, flat, 1/2" thick SST		1000054
30B	Noalox™ 8 oz.		1000021
30C	Connecting bar for 34kV harmonic filter switch		1000544P1
30D	Connecting bar for 46kV double stack switch		1001983P1
31	Connecting buss bar for 34, 46 & 69kV 600A switches	3021X0242 P110	1000508P2
32	O -ring, 3 1/2" ID x 3 3/4" O D x 1/8", dash 238	3021X0242 P111	1000638
33	Insulator, 34kV skirted	3021X0242 P112	1000661
33A	Insulator, 46kV skirted	3021X0242 P113	1001940
34	Bolt, hex head, 1/4-20 x 1 3/4" L, SST	3021X0242 P114	1000684
35	Gasket, Teflon	3021X0242 P115	1000121P1
36	Mechanism housing for 15kV or 34kV three pole	3021X0242 P116	1000564P2
37	Mechanical housing for 34, 46, or 69kV two hole	3021X0242 P117	1000563P2
38	Control yoke	3021X0242 P118	1000500P2
38A	Washer, Nylatron, 1/2" ID x 0.031"		1000610
38B	Washer, Nylatron, 1.125" O D x 0.753" ID x 0.030" thick		1002080
38C	Control Yoke, 3/4"		1002068P1
39	Nylon pin	3021X0242 P119	1000376P1
40	Dust cap	3021X0242 P120	1000124
41	Connector obsolete	3021X0242 P121	Obsolete
42	Pull rod, clevis	3021X0242 P122	1000023G1
42A	Pull rod, clevis, for handle side of 34kV three pole switch		1001125G1
42B	Pull rod, clevis, for position indicator counter side of 34kV 300A three pole switch		1001122G1
42C	Clevis shaft for use with 42A & 42B		1001121P1
43	Bolt, hex head, 3/8-16 x 2 1/4" L, Gr. 8, SST	3021X0242 P123	1000602
43A	Bolt, hex head, 3/8-16 x 2 1/2" L, Gr. 8		1000997
43B	Washer, split lock, 3/8", Gr. 8		1000112

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
43C	Screw lock, Helicoil, 3/8-16 (used with 43A)		1000012
44	Actuator bar link	3021X0242 P124	1000514G1
44A	Actuator bar link for 34kV three pole switch		1001119G1
45	Actuator bar without screw holes for aux switch plate	3021X0242 P125	1000513G1
45A	Actuator bar with screw holes for aux switch actuator plate	3021X0242P125	1000513G2
46	Support bar assembly universal	3021X0242 P126	1001987G1
47	Ty-wrap	3021X0242 P127	1000607
48	Bolt, hex head, 3/8-16 x 1¾" L, obsolete	3021X0242 P201	Obsolete
49	Nut, hex, standard, obsolete	3021X0242 P202	Obsolete
50	Solenoid assembly, DECCO™	3021X0242 P203	1000685G1
50A	Solenoid coil, DECCO™	3021B0511 P7	1000515P15
50B	Plunger, DECCO™ (replace as matched set with 50C)		1000515P7
50C	Push pin, DECCO™ (replace as matched set with 50B)		1000515P13
50D	Side plate, DECCO™ (replace all four at one time)		1000515P3
50E	Solenoid spacer for 1/4" hex cap screw, DECCO™, 1/2" dia. x 1¼" L		1000502P1
50F	Screw, hex cap, 1/4-20 x 2", Gr. 5		1000603
50G	Washer, shim, 1/4" ID, 0.010" thick, brass		1000745P1
50H	Field stack, DECCO™		1000515P2
50J	Screw		1000515P4
50L	Washer, lock		1000515P6
50M	Spring Clip		1000515P8
50N	Stop plate		1000515P9
50P	Shock absorbers		1000515P10
50Q	Mounting pad		1000515P11
50R	Solenoid shim		1000705
50S	Bushing		1000515P14
50T	Vibra-Tite Formula 3™ thread locker		1000074
50AM	Double solenoid, DECCO™, for 34kV 300A three pole switch		1001156G1
51	Yoke bumper stop (all rubber) for DECCO™ solenoid only	3021X0242P204	1000516G1
51B	Yoke bumper stop (all rubber) for DECCO™ double solenoid only		1001066G1
52	Expansion plug, aluminum	3021X0242 P205	1000158
53	Bushing, 1/2" ID x 5/8" OD x 3/4" L	3021X0242 P206	1000385
54	Shaft (SHORT) 1/2" dia.	3021X0242 P207	1000511P1
55	Bushing, 1/2" ID x 5/8" OD x 1" L	3021X0242 P208	1000609
56	Seal for 1/2" dia. shaft	3021X0242 P209	1000386
56A	Seal, spring loaded double lip, for 3/4" dia. shaft		1002064
57	Shaft (LONG) 1/2" dia.	3021X0242 P210	1000510P1
57A	Shaft (LONG) 3/4" dia.		1002062P1
58	Actuating arm, Joslyn™ design for 1/2" dia. shaft	3021X0242 P211	1000498P2
58B	Operating handle, 0.5" dia. shaft		1002090P2
58C	Operating handle, 0.751" dia. shaft		1002090P1
59	Pin, Sel-lock, 1/4" dia.	3021X0242 P212	1000051

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
59A	Spring pin, 3/8" dia. x 1½"		1002289
59B	Spring pin, 3/8" dia. x 2"		1002288
60	Cotter pin, (MONEL) 1/8" x 1½"	3021X0242 P213	1000681
60A	Cotter pin, 1/8" x 2 L, zinc plated steel		1002147
61	Washer, flat, 0.156" ID x 0.375" OD x 0.036-.065" thick	3021X0242 P214	1000730
61A	Washer, 0.438" OD x 0.188" ID, 18/8 SST		1002590
62	Lockwire, 0.032 dia., 1/8 hard, 303 SST	3021X0242 P215	1000387
63	Cotter pin, (MONEL) 1/16" x 1/2"	3021X0242 P216	1000446
64	Washer, Nylatron spacer, 0.062" thick	3021X0242 P217	1000098
65	Washer, Nylatron spacer, 0.015" thick	3021X0242 P218	1000096
65A	Washer, Nylatron spacer, 0.032" thick		1000097
66	Toggle link	3021X0242 P219	1000499G1
67	Plain bearing, 1/4" x 3/8" x 1/4" L	3021X0242 P220	1000002
68	Link pivot pin (SHORT PIN) 1/4" dia.	3021X0242 P221	1000057P1
69	Clevis pin, spring retaining 1/8" dia. x 7/8"	3021X0242 P222	1000024P3
69A	Washer, wool felt, 0.062" thick		1000725
69B	Washer, wool felt, 0.125" thick		1000724
70	Spring assembly for 15, 34, 46kV 600A switch and 46 & 69kV 300A	3021X0242 P223	1000390G1
70A	Spring assembly for 34kV 300A three pole switch		1000390G2
71	Clevis pin, 1/4" dia.	3021X0242 P224	1000058P1
71A	Locking plate, 1.25" x 0.0625" x 0.125"		1000606P1
72	Bolt, hex head, 1/4-20 x 3/4", Gr. 8	3021X0242 P225	1000391
73	Washer, flat, 1/4" nom. x 9/16" OD, zinc plated steel	3021X0242 P226	1000392
74	Wiring harness with auxiliary switch, environmental connector with bracket, crimp connectors on wires	3021X0242 P227	1000521G1
75	Plate, switch actuating	3021X0242 P301	1000530P1
75A	Screw, slotted round head, 6-32 x 3/8" L		1000460
75B	Washer, internal tooth, #6		1000604
75C	Loctite 290™, green		1000605
76	Screw, Fillister head	3021X0242 P302	1000395
77	Washer, split lock, standard, #6	3021X0242 P303	1000594
78	Gasket (RECEPTACLE)	3021X0242 P304	1000148P1
79	Spacer	3021X0242 P305	1000398
80	Tapped bar	3021X0242 P306	1000589P1
81	Bumper assembly	3972X0062 P307	1000016G1
82	Bolt, hex head, 5/16-18 x 2¼" L, Gr. 8	3021X0242 P308	1000400
83	Washer, split lock, 5/16" standard	3021X0242 P309	1000323
84	Spacer bar	3021X0242 P310	1000588P1
85A	Insertion resistor, 80 ohms	3021X0242P413	1002256G1
86	Six-digit counter & position indicator assembly	3021X0242 P415	1000527G1
86A	Counter spring for 5-digit counter OBSELETE	3021X0242 P321	1000146
86B	Counter spring for 6-digit counter		1000147P1
86C	Counter, 6 digits		1000436

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
86D	Counter, 5 digit OBSOLETE	3021X0242P320	1000437
86E	Screws for attaching 5-digit counter OBSOLETE		1000479
86G	Counter actuator plate, 6 digits		1000509P1
86H	Counter actuator plate, 5 digit OBSOLETE	3021X0242P322	1000758P1
86J	Bracket, position indicator		1000526P1
86K	Faceplate, position indicator		1000193P1
86L	Pointer, position indicator		1000192P1
86M	Screw, round head, 4-40 x 3/8" L, zinc plated steel		1000283
86N	Nut, hex, 4-40, standard, zinc plated steel		1000299
86P	Washer, split lock, #4, standard, zinc plated steel		1000279
86Q	Window retaining ring, 5/8" for thin wall casting		1000125P1
86R	Window retaining ring, 3/4" for thick wall casting		1000125P2
86S	Glass	3021X0242 P414	1000153
86T	RTV sealant		1000245
86U	Washer, internal shake proof, #10		1000608
86V	Screw, round head, #10, 3/8" L, zinc plated steel		1000293
86W	Washer, split lock, 1/4", zinc plated steel		1000304
86X	Bolt, hex head, 1/4- 20 x 3/4", Gr. 8		1000391
86Y	Nut, hex, 1/4- 20, Gr. 2, zinc plated steel		1000308
87	Insulator, 69kV	3021X0242 P402	1001152
88	Pull rod assembly, 15kV 600A module	3021B0403G1	1000402G1
89	Pull rod assembly, 34kV 600A module	3021B0403G2	1000403G1
90	Pull rod assembly, 46kV 600A module	3021B0403G3	1000404G1
90A	Pull rod assembly, 69kV 600A module		1001995G1
91	Pull rod, outer, 34kV 300A three pole with Joslyn™ module	3021B0403G6	1001062G1
91A	Pull rod, outer, 34kV 300A three pole with VES™ module		1001251G2
91B	Pull rod, inner, 34kV 300A three pole with Joslyn™ module	3021B0403G4	1001062G2
91C	Pull rod, inner, 34kV 300A three pole with VES™ module		1001251G1
92	Pull rod for 46kV 300A double module Joslyn™ design	3021B0403G7	1001988G1
92A	Pull rod for 46kV 300A double module VES™ design		1001656G3
92B	Pull rod for 46kV 300A single module	3021B0403G3	1000404G1
93	Pull rod for 69kV 300A double module Joslyn™ design	3021B0403G8	1000993G1
93A	Pull rod for 69kV 300A double module VES™ design		1001656G4
94	Plate, closed red, 1" wide		1000540P1
94A	Plate, closed red, 3/4" wide		1001400P1
95	Plate, open green, 1" wide		1000541P1
95A	Plate, open green, 3/4" wide		1001401P1
96	Screw, sheet metal, #4 x 1/4" SST		10000479
97	Cable assembly, standard 15 pin, 40 ft.		1000576G3
98	Cable assembly, standard 15 pin, 30 ft.		1000576G2
99	Cable assembly, standard 15 pin, 25 ft.		1000576G4
101	Shipping crate, one switch, 15 & 34kV		1000817G1

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
102	Shipping crate, two switch, 15 & 34kV		1000646G1
103	Shipping crate, three switch, 15 & 34kV		1000818G1
104	Shipping crate, one switch, 46kV		1000819G1
105	Shipping crate, two switch, 46kV		1000820G1
106	Shipping crate, three switch, 46kV		1000821G1
107	Nameplate		1000592P1
110	Insulator pedestal, 34kV for 34 kV three pole switch		1001978P1
111	Rear mounting bracket		1002040P2
112	Washer, flat, 0.44" OD x 0.20" ID		1002405
113	Screw, hex head, 10-32		1002450
114	Motor operator trip spring		1002664P1
115	Plastic bumper		1002670P1
116	Screw, Fillister head, 5-40		1002451
117	Trip solenoid		1001581
118	Semi tubular rivet		1002437
119	Spring, trip coil		1000789P1
120	Washer, flat, Durlin, 0.5" shaft		1002428
121	Cotter Pin, (MONEL), 3/4" L		1002218
122	Retaining ring, self-locking, 3/8" shaft		1002429
123	Toggle link stop shaft		1002420P1
124	Toggle link shaft		1002418P1
125	Toggle link spring shaft		1002421P1
126	Tight fit spacer, alum.		1002423P1
127	Middle linkage, motor mechanism		1002031P2
128	Bearing, needle, 5/8" thick		1000787
129	Inner bearing shaft		1002419P1
130	Washer, vinyl shim, 0.5" shaft		1002427
131	Retaining ring, e-style, 0.375" shaft		1002488
132	Spacer, large, alum.		1002424P1
133	Linkage arm		1002030P1
134	Bearing, needle, 5/16" thick		1000786
135	Double linkage		1002029P1
136	Clutch arm spring pin		1002203P1
137	Motor mechanism to toggle link shaft		1002417P1
138	Trip linkage		1002032P1
139	Screw, set, 1/4-20		1002415
140	Nut, hex jam, 1/4-20		1002416
141	Side plate, non-handle side		1002182P1
142	Side plate, handle side		1002183P1
143	Bearing, one way roller clutch		1002244
144	Screw, 1/4-20 x 3/4" L		1000230
145	Washer, Belleville, 1/4" ID		1000640

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
146	Spring washer, motor mechanism		1002220P1
147	Spring rod end, motor mechanism		1002219P2
148	Spring, motor mechanism		1002447P1
149	Nylatron, 0.5" shaft		1000610
150	Nut, hex jam, 3/8-16		1002226
151	Washer, Belleville, 0.386" ID x 0.813" OD		1000218
152	Screw, hex head, 3/8-16		1000480
153	Washer, split lock, #10		1000282
154	Screw, set, 10-32 x 1/2" L		1001979
155	Nut, hex, 10-32		1000302
156	Motor mechanism nameplate		1003305P1
157	Screw, hex head cap, 3/8-16		1002439
158	Washer, spring lock, 3/8"		1002474
159	Tube guard, alum.		1002479P1
160	Nylon support pin, motor mechanism		1002467P1
161	Front mounting bracket, plated		1002045P2
162	Spring pin, 3/8" dia. x 1½" L		1002289
163	Pin, Nylon, 0.375" dia. x 3.5" L		1000376P1
164	Clutch arm, right-hand		1002003P1
165	Clutch arm, left-hand		1002022P1
166	Spring pin, 1/4" dia.		1002445
167	Actuator pin		1002442P1
168	Motor cam		1002007G1
169	Bell crank clutch		1000785
170	Spring, Bell spring		1000790P1
171	Cam shaft, motor mechanism		1002422P1
172	Stop lever		1002452P1
173	Mini spring, motor mechanism		1002446P1
174	Spring pin, 1/8" dia.		1000802
176	Stud, threaded rod, 8-32		1001580P1
177	Spring pin, 3/32" dia. x 3/8" L		1000792
178	Motor side plate		1000781P2
179	Connector, quick disconnect, female		1002512
180	Washer, split lock, #8		1000281
181	Nut, hex, 8-32		1000301
182	Worm, modified		1001584P1
183	Mini cam shaft		1001583P1
184	Mini nylon cam		1001582P1
185	Worm gear modified		1001585P1
186	Motor front plate		1002663P1
187	Spring pin, 3/32" dia. x 5/8" L.		1000793
188	Washer, felt, 1/4" ID x 1.5" OD		1002999

Item No.	Description	Joslyn™ Part No.	Vesco Part No.
189	Washer, steel, 1/4" ID x 7/8" OD		1003000
190	Worm gear spring, 1/4" shaft, 11/16		1003001
191	Washer, Nylatron, 0.25" shaft		1000096
192	Vibra-tite, formula 3		1000074
193	Loctite 272, red		1002682
194	Motor oil 10W30		1000754
195	Moly fortified grease		1000755
196	Standard motor assembly		1002399G1
197	Motor mechanism assembly		1002673G1
198	Cable harness, 15 connector assembly		1002817G1
199	Cable harness, 35 connector assembly		1002801G1
200	VES-M contact block assembly, handle side		1003241G1
201	VES-M contact block assembly, non-handle side		1003241G2
202	Contact block mounting kit, 15 Pin		1003360G1
203	Contact block mounting kit, 35 Pin		1003360G2
204	Relay panel assembly, 120/48V		1002823G1
205	Relay panel assembly, 125V		1002823G2
206	Transfer bar, contact block, 35 Pin		1003261P1
207	Spring, motor operator		1000788P1
208	Spring pin, 1/8" dia. x 1½" L		1002289P1
209	VES-U 600 A Module		1002719G2
210	Hex HD Bolt 5/8-11 X 2-1/4 LG SST		1003608
211	Flat washer 5/8 SST 17-4-PH		1002151
212	Belleville Washer 5/8 17-4-PH		1002152
213	O-ring 10" ID X 10-1/4" OD X 1/8" Buna N for Joslyn module		1003607
214	O-ring 1/4" dash No. 445 for VES module		1004478
215	VES-U insulator gasket Teflon		1003823P1
216	18" insulator with flanges 200 kV BIL		1003560G1
217	30" insulator with flanges 350 kV BIL		1004278G1
218	Hex nut 5/8-11 galvanized Steel		1001486
219	split washer 5/8" galvanized steel		1001487
220	Hex head cap screw 5/8-11 X 3" galvanized steel		1001484
221	VES-U mechanism		1004429G1
222	Stud 3/8-16 X1-1/2" LG vibration resistant stud		1004561
223	VES-U bladder		1001514P1
224	VES-U Receptacle Block Assembly		1003866G3
225	Pull rod assembly for 30" line-to-ground insulator 350 kV BIL & four modules		1002654G1
226	Pull rod for 30" + 18" line-to-ground insulators 550 kV BIL & 5 to 7 mod-		1002654G2
227	Pull rod for 30" + 30 " line-to-ground insulators 750 kV BIL & 6 to 9		1002654G3
228	Pull rod for 30" + 30 " + 18" line-to-ground insulators 900 kV BIL & 9 modules		1002654G4

Vesco, LLC, formerly Vacuum Electric Switch Co., manufactures new vacuum switches, PLC and microprocessor-based controls for switching electric arc furnace transformers, capacitor banks, harmonic filter banks, reactors for steel making, electric utility, and renewable energy applications.

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