

RVAC, vacuum-break switchgear, oil-insulated or SF₆-insulated



General

RVAC pad-mounted vacuum switchgear from Eaton's Cooper Power Systems is designed for applications including industrial parks and shopping malls where frequent 600-amp main line switching plus fuse protection are required. It incorporates vacuum switching, which has an excellent field performance record since 1983; and a mechanism designed specifically for repetitive switching duty.

RVAC pad-mounted vacuum switchgear features deadfront construction for optimum safety. Oil, E200™ fluid, Envirotemp™ FR3™ fluid* or SF₆ insulation provides a compact, low-profile design that is unobtrusive in commercial and industrial / office park applications. A wide range of current-limiting fusing options provides simple, easy coordination with system requirements.**

Available in single- or three-phase units, RVAC switchgear is offered in 15, 25 and 35 kV ratings as listed in Table 1.

* Application of Envirotemp™ FR3™ fluid is limited to minimum ambient temperatures of 0 °C (32 °F) or higher.

** Cannot provide fuses with SF₆ insulation.

**Cooper
Power Systems**
by **EAT•N**

Ordering information required

To order an RVAC vacuum-break switch use the catalog number noted in Table 3. Modify the last two digits, as required, to adapt the unit to the specific application.

- From Table 3, choose the applicable base catalog number; select the operating voltage and circuit configuration.

Note: To order a Single-Phase unit, change the second-to-last digit from a "3" to a "1" (i.e. KPRV931, three-phase; KPRV911, single-phase). Consult factory for price and availability.

- From Table 2 identify the required bushing arrangement. Change the last digit of the catalog number to the number identified in the table (i.e. KPRV931 identifies 15 kV with 600 A on both source and tap, KPRV935 identifies 25 kV with 600 A source and 200 A tap).
- From Table 3 specify the catalog number for any optional bushing inserts required for the given pad-mounted unit.
- From Tables 4-10 specify the catalog numbers of all required accessories and options.

Constructing catalog numbers

To order a basic 15 kV, RVAC Model 9 switch; 600-Amp source side bushings, 200-Amp tap wells only, the catalog number would be:

KPRV932 Basic RVAC Model 9 vacuum break switch, three-phase, 15 kV, with 600 A source bushings and 200 A tap wells.

Table 1. Ratings of RVAC Pad-mounted Switchgear

Nominal Voltage	15 kV	25 kV	35 kV
Maximum Design Voltage	15.5	27	38
BIL	95	125	150
1-minute Withstand Switch* and Terminators	35	60	70
Continuous Current, amps	600	600	600
Load Switching, amps	600	600	600
Momentary Current 10 Cycles, amps (asym.)	20,000	20,000	20,000
1 Sec., amps (sym.)	12,500	12,500	12,500
Fault Making (sym./asym.), kA	12.5/20.0	12.5/20.0	12.5/20.0
Interrupting Rating**, (kA)	50	20-50	12.2-50

* The withstand rating of the switch is higher than that of the connectors (IEEE Std C37.74™-2003 standard)

** Interrupting rating for fused units depends on the selected fuses and the application voltage.

Table 2. Bushing Guide

Voltage Rating	Amperage Rating (Source/Tap)		
	600 A/600 A	600 A/200 A*	200 A*/200 A*
15 kV	1	2	3
25 kV	4	5	6
35 kV	7	8	9

* RVAC's ordered with 15 or 25 kV voltage rating are equipped with wells only on the 200-amp side.

Table 3. RVAC Selection and Ordering Guide*

Model	One-Line Diagram	Nominal Voltage** (kV)	BIL (kV)	H/W/D***	Oil Insulated Catalog No.	SF6 Insulated Catalog No.
3		15	95	48/40/66	KPRV331	KPSRV331
		25	125	48/40/66	KPRV334	KPSRV334
		35	150	48/40/78	KPRV337	KPSRV337
5		15	95	44/32/64	KPRV533	N.A.
		25	125	44/40/75	KPRV536	N.A.
		35	150	44/40/75	KPRV539	N.A.
6		15	95	42/62/70	KPRV632	N.A.
		25	125	44/70/81	KPRV635	N.A.
		35	150	44/70/81	KPRV638	N.A.
6B		15	95	42/62/70	KPRV6B32	N.A.
		25	125	44/70/81	KPRV6B35	N.A.
		35	150	48/70/81	KPRV6B38	N.A.
7		15	95	42/62/70	KPRV732	N.A.
		25	125	44/70/81	KPRV735	N.A.
		35	150	44/70/81	KPRV738	N.A.
7B		15	95	42/62/70	KPRV7B32	N.A.
		25	125	44/70/81	KPRV7B35	N.A.
		35	150	48/70/81	KPRV7B38	N.A.
8		15	95	42/62/70	KPRV832	N.A.
		25	125	44/70/81	KPRV835	N.A.
		35	150	44/70/81	KPRV838	N.A.

* Contact factory for information on configurations not listed.

** For models using fuses: The 15 kV rated units are provided with 15 kV ELSG fuse holders; 25 kV rated units are provided with 25/35 kV ELSG fuse holders; 35 kV rated units are provided with 35/35 kV ELSG fuse holders. Consult catalog section 240-82 for fuse ratings and catalog numbers. Fuses are not included with the unit and should be ordered separately.

***Approximate overall dimensions for typical units. For footprint, reduce dimension "D" by 2 inches.

Table 3. RVAC Selection and Ordering Guide* (continued)

Model	One-Line Diagram	Nominal Voltage** (kV)	BIL (kV)	H/W/D***	Oil Insulated Catalog No.	SF6 Insulated Catalog No.
8B		15	95	42/62/70	KPRV8B32	
		25	125	44/70/81	KPRV8B35	N.A.
		35	150	48/70/81	KPRV8B38	N.A.
9		15	95	42/62/70	KPRV932	N.A.
		25	125	44/70/81	KPRV935	N.A.
		35	150	44/70/81	KPRV938	N.A.
9B		15	95	42/62/70	KPRV9B32	N.A.
		25	125	44/70/81	KPRV9B35	N.A.
		35	150	48/70/81	KPRV9B38	N.A.
10		15	95	48/70/76	KPRV1031	KPSRV1031
		25	125	48/70/76	KPRV1034	KPSRV1034
		35	150	48/70/84	KPRV1037	KPSRV1037
10T		15	95	48/84/76	KPRV10T32	KPSRV10T31
		25	125	48/84/76	KPRV10T34	KPSRV10T34
		35	150	48/84/84	KPRV10T37	KPSRV10T37
11		15	95	42/62/76	KPRV1132	N.A.
		25	125	44/70/87	KPRV1135	N.A.
		35	150	44/70/87	KPRV1138	N.A.
11B		15	95	42/62/76	KPRV11B32	N.A.
		25	125	44/70/87	KPRV11B35	N.A.
		35	150	48/70/87	KPRV11B38	N.A.
12		15	95	44/62/91	KPRV1232	N.A.
		25	125	44/70/104	KPRV1235	N.A.
		35	150	44/70/104	KPRV1238	N.A.
12B		15	95	44/62/91	KPRV12B32	N.A.
		25	125	44/70/104	KPRV12B35	N.A.
		35	150	48/70/104	KPRV12B38	N.A.
13		15	95	48/70/76	KPRV1331	N.A.
		25	125	48/70/76	KPRV1334	N.A.
		35	150	48/70/84	KPRV1337	N.A.
13A		15	95	48/70/76	KPRV13A31	KPSRV13A31
		25	125	48/70/76	KPRV13A34	KPSRV13A34
		35	150	48/70/84	KPRV13A37	KPSRV13A37
14		15	95	42/62/70	KPRV1432	N.A.
		25	125	44/70/81	KPRV1435	N.A.
		35	150	44/70/81	KPRV1438	N.A.
15B		15	95	44/62/91	KPRV15B32	N.A.
		25	125	44/70/104	KPRV15B35	N.A.
		35	150	44/70/104	KPRV15B38	N.A.

* Contact factory for information on configurations not listed.

** For models using fuses: The 15 kV rated units are provided with 15 kV ELSG fuse holders; 25 kV rated units are provided with 25/35 kV ELSG fuse holders; 35 kV rated units are provided with 35/35 kV ELSG fuse holders. Consult catalog section 240-82 for fuse ratings and catalog numbers. Fuses are not included with the unit and should be ordered separately.

*** Approximate overall dimensions for typical units. For footprint, reduce dimension "D" by 2 inches.

Table 4. Optional Bushings

Current Rating	Nominal kV Class	Description*	Catalog Number
200-Amp Loadbreak	15	3 Bushing inserts	KPA1033
200-Amp Loadbreak	25	3 Bushing inserts	KPA1034
600-Amp Deadbreak	15 or 25	3 PUSH-OP bushings **	KPA1151-3
600-Amp Deadbreak	35	3 PUSH-OP bushings **	KPA1153
600-Amp Deadbreak	15 or 25 †	3 U-OP systems with aluminum VBJ's & U-Connectors ††, †††	KPA1052-1-1
600-Amp Deadbreak	15 or 25 †	U-OP provisions ††††	KPA1053-1

* Eaton's Cooper Power Systems bushings and bushing wells provided. Contact an Eaton's Cooper Power Systems representative for alternatives.

** PUSH-OP™ bushings include PUSH-OP 600 A deadbreak bushing and front plate latch assembly.

† 35 kV is not available.

†† Includes installation of mounting provisions for U-OP™ systems, KPA1053-1, on the tank.

††† U-OP is added for each bushing of a three-phase position. When ordering, customer to specify which three-phase positions will be equipped with U-OP.

†††† Installation of mounting provisions for U-OP systems for all 600 A bushings on the tank.

Table 5. Construction and Finish

Description	Catalog Number
304L Stainless steel construction (in lieu of standard mild steel construction)	*
Special paint color, top coat on external surfaces only, (specify at time of ordering)	KPA-1044-X**

* Contact an Eaton's Cooper Power Systems representative.

** "X" will be replaced with proper number. Standard paint is bell green Munsell 7GY.

Table 6. Ground Options*

Description	Catalog Number
1/2" Copper ground rod	KPA-1037-X**
3" Stand-off bracket for 1/2" Rod	***
Copper flat ground bus	KPA-1047-X**

* Standard construction units have source and cable compartments; order optional ground accessories in quantities of two per unit.

** "X" will be replaced with proper assembly number.

*** Contact an Eaton's Cooper Power Systems representative.

Table 7. Fault Indicators

Description	Catalog Number
RCR fault indicator provisions*	**
S.T.A.R.™ fault indicator provisions, small remote*	KPA-110-1
S.T.A.R. fiber optic remote display*	KPA-110-2
S.T.A.R. Fisheye™ display*	**

* Fault indicator provisions are located in the source or tap compartment sill. Six required.

** Contact an Eaton's Cooper Power Systems representative.

Table 8. Accessories Available on RVAC units with Switches Only

Description	Catalog Number
Two-stage auxiliary switch	*
Motor operator provisions, one-way	*
Motor operators one way	*
additional motor operated way	*
Semaphore, for one way	*

* Contact an Eaton's Cooper Power Systems representative.

Table 9. Service Items

Description	Catalog Number
1" drain valve with 3/8" sampler (in lieu of standard 1" drain plug and 3/8" sampler)*	KPA1051*
Spare fuse storage rack	**
SF ₆ refill kit; hoses, valves, regulator	KPA-1043-1
SF ₆ refill kit; hoses and valves (without regulator)	KPA-1043-2
Hex head door bolt accessory***	KPA1056-1
Operation Counter	KPA113-4
Kirk key interlock provision (specify location at time of ordering)	KPA-1067-1

* Non applicable to SF₆ switchgear.

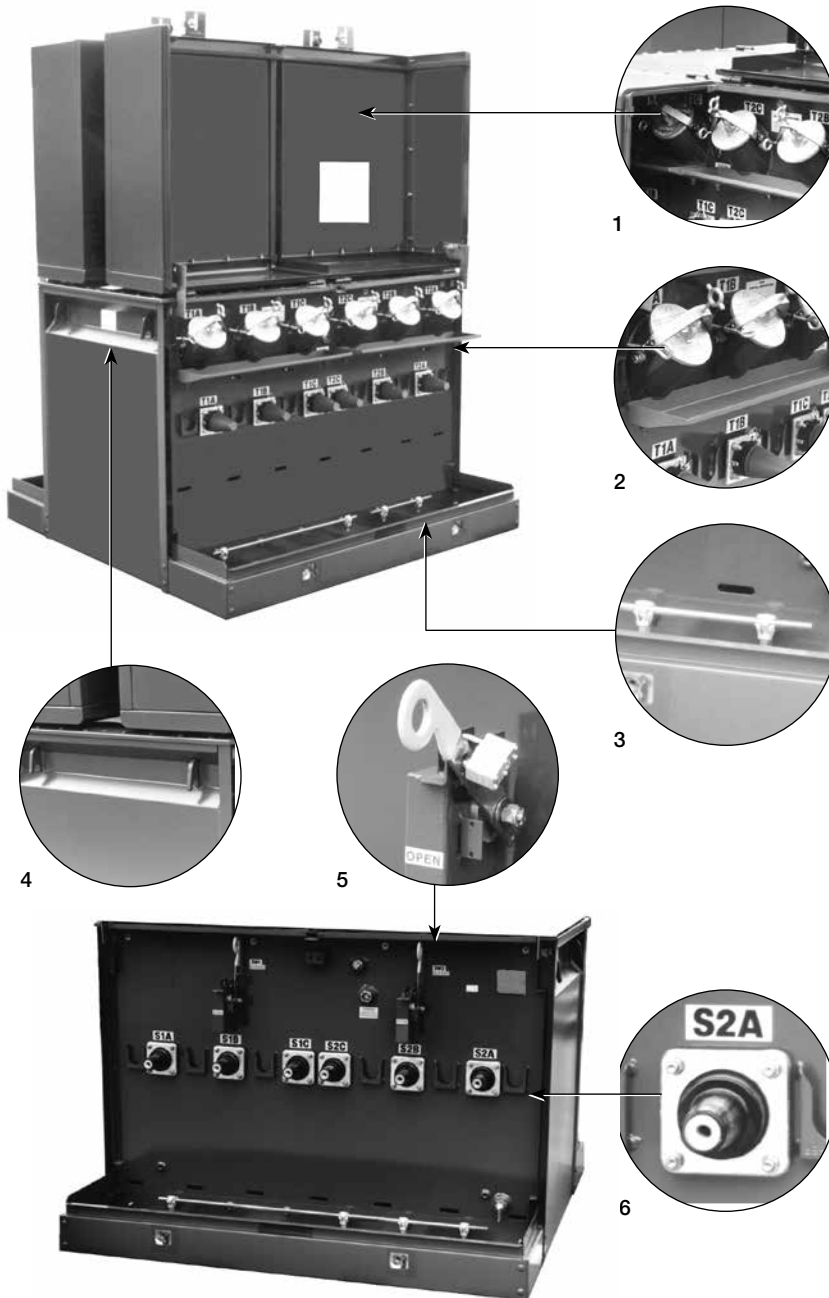
** Contact an Eaton's Cooper Power Systems representative.

*** One per cable compartment.

Table 10. Miscellaneous

Description	Catalog Number
Decals	
Danger High Voltage	KPA1063-4
Internal Mr. Ouch, bi-lingual	KPA1046-3
External Mr. Ouch, bi-lingual	KPA1046-4
Non PCB	KPA1040-1

Features and detailed description



RVAC pad-mounted switchgear offers the superior performance of vacuum loadbreak interruption for switching underground distribution systems. Service-proven vacuum interrupters combine with an interrupting mechanism designed specifically for repetitive switching duty to provide a unit ideally suited to such applications as industrial parks and shopping malls where frequent switching is required. Vacuum interrupters offer the further advantages of long life in repetitive service, low maintenance, quiet operation, and high interrupting ratings.

To further serve these loads, RVAC pad-mounted switchgear offers 600 amp main line switching capability and current-limiting fuse protection. RVAC vacuum pad-mounted switchgear is available in single- and three-phase units in ratings of 15, 25 and 35 kV.

The low profile of RVAC pad-mounted switchgear blends into landscaping and is unobtrusive. Deadfront construction is tamper-resistant, and provides a high margin of safety for utility personnel and the general public.

All internal energized parts are insulated in either oil, SF₆ gas or the more environmentally desirable and less flammable Envirotemp™ FR3™ and E200 fluid alternatives.* Prior to shipment, the switchgear is filled with the specified insulating medium, eliminating both field filling and the resultant danger of contamination.

RVAC switchgear and components are designed in conformance with IEEE Std C37.74™-2003 standard.

Switching is easily accomplished with a simple push-pull operating lever that moves in and out. The lever can be padlocked in the open or closed position.

A wide selection of current-limiting fuse options is available with amperage ratings and coordination curves to meet your system requirements.

* Application of Envirotemp™ FR3™ fluid is limited to minimum ambient temperatures of 0 °C (32 °F) or higher.

Figure 1. RVAC pad-mounted switchgear, with field-proven components and protective devices, is designed for fast installation and easy operation.

1. Split doors on both source and tap sides enable simple, one-man operation.
2. Fuse oil drip tray.
3. Optional solid copper grounding rod makes grounding simple and convenient.
4. Recessed lifting provisions are located for a balanced lift.
5. Switch lever provides simple push/pull operation for closing and opening; can be padlocked in either position.
6. Component bushings from Eaton's Cooper Power Systems assure dependable operation. Standoff brackets are provided for each bushing.

Vacuum interrupter

Vacuum interruption offers a number of advantages in service, reliability and maintenance. The RVAC interrupter offers many times the number of switching operations in a lifetime compared to an air or oil interrupter. Contacts are hermetically sealed, eliminating any source of contamination. Vacuum interruption is fast—on the first current zero. Arcing is minimized. The RVAC interrupter is restrike-free. The dielectric strength of the contact gap recovers much more rapidly than the recovery voltage can rise, therefore eliminating restriking.

Vacuum interrupters from Eaton's Cooper Power Systems (see Figure 2) have been in service since 1983 and have established a superior record of field performance.

Interrupter mechanism

The advantages of vacuum interruption extend to the interrupter mechanism. The short contact stroke minimizes the mass being moved and therefore mechanical shock. This in turn permits a substantial reduction in the size and total weight of the interrupter assembly.

As a result, the interrupter mechanism for RVAC switchgear is simple, dependable and easy to operate. The operating lever (Figure 3) requires only an easy push or pull action to close or open, and the switch can be padlocked in either position. A key interlock is available for added security.

Current-limiting fuse protection

For fault protection with RVAC oil-insulated units, Eaton's Cooper Power Systems offers a complete line of fuses available for pad-mounted switchgear. Consult *Catalog Section 240-82, ELSG Full-Range Current-Limiting Fuse* for fuse ratings and catalog numbers.



Figure 2. Vacuum switching provides many times the service life of air switches and is ideal for applications requiring repetitive switching operations.

Cabinet construction

The deadfront, non-ventilated, tamper-resistant construction of RVAC switchgear makes it suitable for operation in areas subject to excessive moisture, occasional flooding* and blowing snow. Additional sealing is provided by the Buna-N rubber gasket in the bolted cover (liquid-filled units only-SF₆ covers are welded in place.) RVAC pad-mounted switchgear consists of a sealed insulation tank which houses energized components, and separate main and tap compartments. The main compartment, located at the front of the tank, houses the source bushings and source switches, and has a minimum depth of 22 inches when provided with 600 A bushings. At the rear of the tank, the tap compartment contains tap bushings, tap switches if specified, and fuses. It has a minimum depth of 16 inches when provided with 200 A bushing wells.

Split side-hinged doors are provided for both compartments, with door stops for each section. Fused units have swing-up doors in lieu of the standard side-hinged door. Door hinges are equipped with stainless steel pins. A door extender allows both source and tap doors to be opened at the same time. Doors are secured with recessed stainless steel pentahead bolts, with provisions for padlocking.

Recessed lifting provisions are provided for a balanced lift.

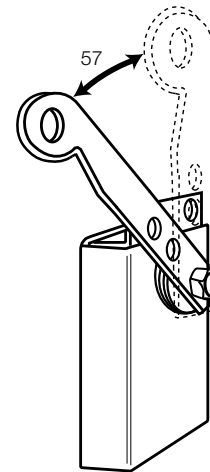


Figure 3. The RVAC switch is simple and easy to operate, requiring only a push to close or pull to open. The switch can be padlocked in either position, and a key interlock is available for added security.



Figure 4. ELSG fuses provide current-limiting protection in series with an expulsion fuse, mounted in the wet-well holder.

* Occasional flooding applies only to the RVAC unit and not any controls or motors attached to the unit. Per IEEE Std C37.74™-2003 standard, submersible units are able to operate at their standard ratings provided the water head does not exceed 3 m above the top of the switchgear during occasional submersion.

Finish

RVAC switchgear is finished in a green color which conforms to Munsell 7GY 3.29/1.5 Green.

The coating meets the following specifications: IEEE Std C57.12.28™-2005 standard, ASTM B1117 1000-hour humidity test, ASTM G53 500-hour ultraviolet accelerated weathering test, and ASTM D2794 impact test. Certified test data is available upon request.

Bushings

600-amp bushings furnished on RVAC pad-mounted switchgear are Eaton's Cooper Power Systems deadbreak aluminum type, and conform to IEEE Std 386™-1995 standard.

200-amp interfaces are either Eaton's Cooper Power Systems 200-amp bushing wells or Eaton's Cooper Power Systems 200-amp one-piece 35 kV bushings and conform to IEEE Std 386™-1995 standard.

Bushings are mounted in-line and located a minimum of 24 inches above the pad.

Pressure-relief valve

For oil-insulated units only, an automatic pressure-relief valve, operated by clampstick, is mounted above the liquid level on the switchgear.

UL® Listed and Labeled

For **non-fused** RVAC switchgear, the UL® listing and labeling is available for units where required with the following features considered to be UL® listed and labeled:

- 15 kV and 25 kV voltage ratings
- Fluid Dielectrics (mineral oil, E200, and Envirotemp™ FR3™ fluids)
- Visible-breaks (two- and three-position)
- Mild and stainless steel construction

Standard features

- Removable sill
- Oil sight gauge/SF₆ pressure gauge
- Door lifting handles
- Pressure-relief valve for oil tanks
- Oil fill plug/SF₆ fill port
- Stand-off brackets for each bushing
- Removable oil fuse drip tray
- Door stop
- Split doors
- Designed for use with Eaton's Cooper Power Systems M.O.V.E. surge arresters
- Stainless steel hinges

- Recessed pentahead bolts
- Recessed lifting provisions
- Bolted cover
- Switch padlock provisions
- Complete operating, maintenance and installation instructions
- ANSI® 1/2-13 ground nut mounted beneath each bushing
- Oil drain plug with sampler

Optional accessories

- 200-amp bushing inserts
- 200-amp one-piece bushings
- Drain valve with sampler
- 1/2-inch copper ground rod on source and tap sides
- Fault indicator provisions
- Spare fuse storage rack
- Type 304L stainless steel construction
- SF₆ refill hoses, valves and regulator
- Auxiliary switch, 2 stage
- Control position semaphore
- PUSH-OP bushings
- U-OP bushings
- Envirotemp™ FR3™ and E200 fluids options*
- Motor actuator and control
- Low pressure alarm for SF₆ units
- Externally-replaceable bushings

Production testing

Before shipping, RVAC switchgear is fully assembled, filled with selected insulating medium, and subjected to the following factory tests:

- Continuity testing to ensure correct internal connections
- Hi-pot testing to ascertain dielectric integrity
- Leak tested to ensure that tank is completely sealed
- Resistance testing to ensure positive electrical connections
- Mechanical operations test of RVAC switches to ensure problem-free operation

* Application of Envirotemp™ FR3™ fluid is limited to minimum ambient temperatures of 0 °C (32 °F) or higher.

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