

Power Products

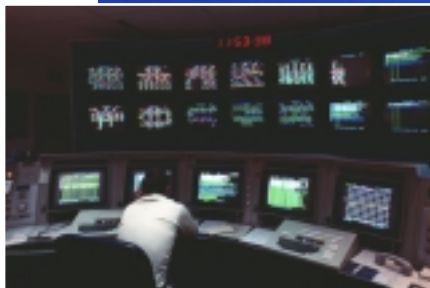
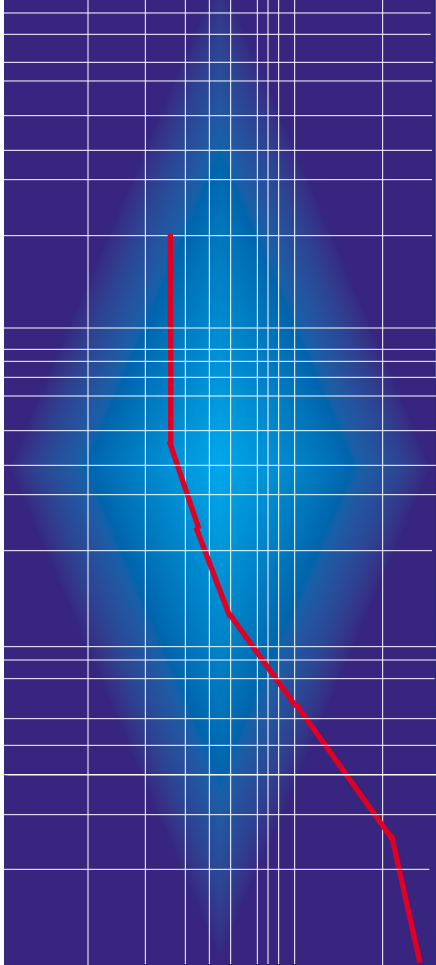


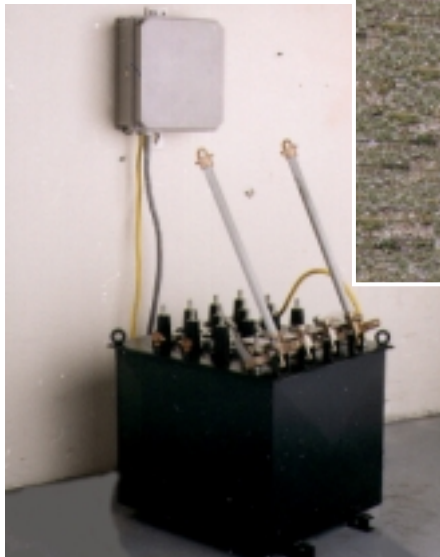
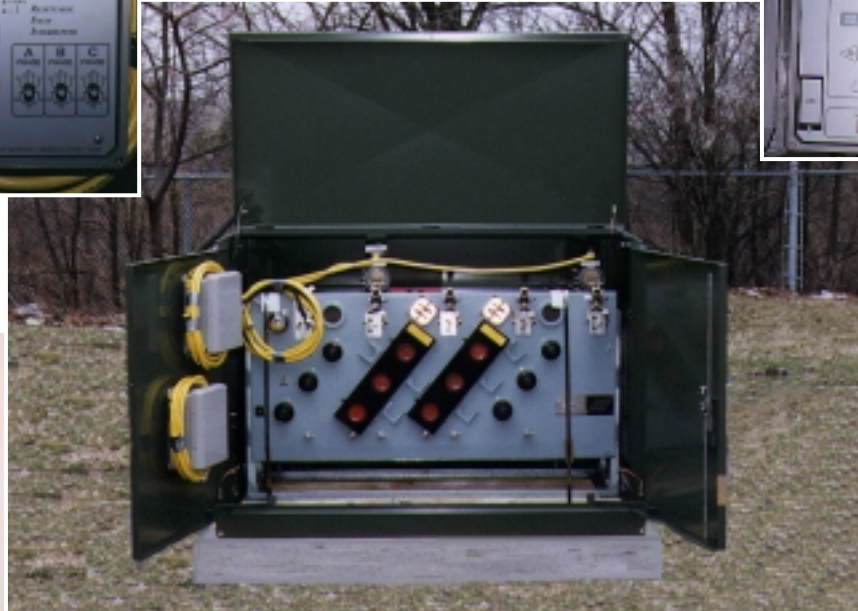
SF6 PufferPak[®] Resettable Fault Interrupters

■
15.5kV and 27kV Padmount
and Subsurface Applications

■
200 Amp or 600 Amp switches tested as
per ANSI C37.71, C37.72 and C37.60

■
12 kA SYM fault interrupting





Upper Left: Rotary Selector Control Panel.
Above: Four-way Padmounted RFI.
Above Right: VFD Control for RFI.
Left: Typical Subsurface RFI Switch and Wall-Mounted Control.

INDEX

RFI Description2

Subsurface RFI Ordering Information3

Padmount RFI Ordering Information4

Certified Tests and Performance5

Typical Specifications 6,7

Resettable Fault Interrupter from Canada Power Products

PufferPak® SF6 RFI switches combine safe, reliable source switching with microprocessor-controlled, 3-phase vacuum interruptors. Field-proven SF6 Puffer-action technology safely cools and extinguishes the arc during switch operation. Sealed switch construction, unaffected by contamination, rodents or floods minimizes maintenance.

Load-side vacuum interruptors are armed manually with an operating handle; tripping is automatic. Manual tripping is provided by the control panel, or mechanically by moving the control handle. A fault on any phase results in three-phase tripping. True rms current sensing is employed for overloads and fault current to give optimum accuracy.

User-Selectable Pre-Programmed Time Current Curves

Various time current curves are pre-programmed into the control module. Each module has the ability to store up to 64 different curves. These curves are selectable in two ways. In the VFD control module, curves are selected by a user-friendly keypad. A 6-way dip switch on the rear of the rotary dial control module selects the curves. Ground fault pickup and delay, and instantaneous trip values are also available on the VFD control module.

Resettable Fault Interrupter Vault and Subsurface Style

Switch Ratings

- 15.5 and 27 kV voltage classes
- 600 or 200 Amp continuous and load break switching
- Standard 12kA SYM momentary and fault close

Fault Interrupting Capability

- 12kA SYM fault interrupting

Styles






- 2-, 3-, 4-, 5- or 6-way circuit configurations
- 600 Amp deadbreak or 200 Amp deepwell elbow connections
- Three phase interruption

Standard Features

- All welded stainless steel switch tank,
- Factory assembled, tested, and filled with SF6.
- Self-powered electronically controlled resettable fault interrupter providing three-phase circuit protection.
- NEMA 4 electronic enclosure standard. NEMA 6P available
- Removable operating handle with padlock provisions, position indicators, provision for operation by hookstick or rope, and handle storage.
- 200 Amp deepwell or 600 Amp bushings furnished with protective shipping caps and one ground lug per set of bushings.

- Phase identification tags, nameplate with ratings and connection diagram.
- Color-coded pressure gauge with separate fill valve.
- Lifting and mounting provisions.



Switch Configuration	Catalog Number	Model Number	Max kV	W Dim. In.	H Dim. In.	D Dim. In.	Wt. Lbs. Approx.
 2 WAY	SRG6-22-15 SRG6-22-27	6T 6T	15.5 27	20	23.3	30	210
 3 WAY	SRG6-33-15 SRG6-33-27	6T6 6T6	15.5 27	25	23.3	30	320
 4 WAY	SRG6-44-15 SRG6-44-27	6TT6 6TT6	15.5 27	36.5	23.3	30	550
 5 WAY	SRG6-55-15 SRG6-55-27	6TTT6 6TTT6	15.5 27	48.5	23.3	30	700
 6 WAY	SRG6-66-15 SRG6-66-27	6TTTT6 6TTTT6	15.5 27	60.5	23.3	30	850

Notes: Consult factory for other configurations.
 Replace "6" with "2" in model number for 200A deepwell bushings.
 Replace "T" with "S" in model number for 600A apparatus bushings on RFI ways.

Resettable Fault Interrupters Padmount Style

Switch Ratings

- 15.5 and 27 kV voltage Classes
- 600 or 200 Amp Continuous and load break switching
- Standard 12kA SYM momentary and fault close

Fault Interrupting Capability

- 12kA SYM fault interrupting





Styles

- 2-, 3-, 4- or 5-way circuit configurations
- 600 Amp deadbreak or 200 Amp deepwell elbow connections
- Three phase interruption

Standard Features

- All welded mild or stainless steel switch tank, factory assembled, tested, and filled with SF6.
- Self-powered electronically controlled resettable fault interrupter providing three-phase circuit protection.
- NEMA 4 electronic enclosure standard. NEMA 6P optional.
- Removable operating handle with padlock provision, position indicators, provision for operation by hook-stick or rope, and handle storage.
- 200 Amp deep-well or 600 Amp bushings furnished with protective shipping caps and one ground lug
- Phase identification tags, nameplate with ratings and connection diagram
- Color-coded pressure gauge with separate fill valve.
- Lifting and mounting provisions.
- Optional parking stands for cable connections available.
- 12-gauge mild steel, tamper-resistant, single-side access padmount enclosure with 3-point latch double doors and hinged hood.
- Enclosure equipped with stainless steel hardware, wind stops, padlock provision and penta-head bolt. Enclosure painted dark green.



Switch Configuration	Catalog Number	Model Number	Max kV	W Dim. In.	H Dim. In.	D Dim. In.	Wt. Lbs. Approx.
 2 WAY	PRG6-22-15 PRG6-22-27	6T 6T	15.5 27	41	45	52	725
 3 WAY	PRG6-33-15 PRG6-33-27	6T6 6T6	15.5 27	53	45	52	925
 4 WAY	PRG6-44-15 PRG6-44-27	6TT6 6TT6	15.5 27	65	45	52	1175
 5 WAY	PRG6-55-15 PRG6-55-27	6TTT6 6TTT6	15.5 27	65	45	52	1175

Notes: Consult factory for other configurations.

Replace "6" with "2" in model number for 200A deepwell bushings.

Replace "T" with "S" in model number for 600A apparatus bushings on RFI ways.



Certified Tests and Performance

The following data are the result of tests on standard production PufferPak load break switches. The switches were tested per applicable portions of IEEE, ANSI, NEMA, and other industry standards including:

ANSI C37. 71 Standard for Subsurface Load Interrupting Switches.

ANSI C37.72 Standard for Padmount Load Interrupting Switches.

ANSI C37.60 Standard for Fault Interrupters.

ANSI/IEEE 386 Standard for Separable Connectors and Bushings.

IEC 265 International Standards for Load Interrupting Switches.

ASTM D-2472 Specification for Commercial Type Electrical Grade SF6.

ANSI C57.12.28 Standard for Padmount Enclosures.

Tests were conducted at recognized, independent power testing laboratories, including KEMA in Holland. Test results were verified by oscillograms

and high-speed movies. As required by ANSI standards, all tests were performed in a specific sequence without any maintenance to the switch or SF6. Tests were conducted at 15.5, 27, and 38 kV levels on approximately 75 different switches including 2-, 3-, and 4-way configurations. To simulate actual service conditions, the tests were run at various SF6 gas pressures and with switches mounted in typical subsurface and padmount applications.

Voltage Ratings					
Maximum Design Voltage	15.5 kV	27 kV	38kV	15.5 kV RFI	27 kV RFI
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
BIL Impulse withstand	95 kV	125kV	150 kV	95 kV	125 kV
One minute AC withstand	35 kV	60 kV	70 kV	35 kV	50 kV
Fifteen minute DC withstand	66 kV	96 kV	103 kV	53 kV	78 kV
Corona extinction	11 kV	19 kV	26 kV	11 kV	19 kV
Open Gap BIL Flashover withstand	200 kV	200 kV	200 kV	95 kV	125 kV

Current Ratings					
Load interrupting and loop switching	600 A	600 A	600 A	600 A	600 A
Transformer magnetizing interrupting	25 A	25 A	25 A	21 A	21 A
Capacitor or cable charging interrupting	40 A	40 A	40 A	25 A	25 A
Asymmetrical momentary and 3 operation fault close - standard. (Optional ratings)*	22,500 A (32,000 A) (40,000 A)	22,500 A (32,000 A) (40,000 A)	22,500 A (32,000 A)	19,200 A	19,200 A
Symmetrical one second rating - standard. (Optional ratings)*	15,000 A (20,000 A) (25,000 A)	15,000 A (20,000 A) (25,000 A)	15,000 A (20,000 A)	12,000 A	12,000 A
Continuous current	600 A	600 A	600 A	600 A	600 A
8 hour overload current	900 A	900 A	900 A		
Overload interrupting capability	3,000 A	2,500 A	2,000 A	12,000 A	12,000 A
Operations - 600 A load interrupting endurance	1,000	1,000	1,000		
Symmetrical 10 cycle phase to phase simulated internal fault withstand	12,500 A	12,500 A	12,500 A		

Application Information and Mechanical Ratings	
Sealing systems	10 ⁻⁷ cc/second maximum gas leakage
Ambient temperature range	-40 to +120 degrees Fahrenheit
Corrosion resistance per ASTM B-117	2000 hours minimum
Mechanical life	2000 operations
SF6 gas normal operating pressure range	2-15 PSIG

*Above ratings may be reduced due to entrances and bushings selected.

Typical Specifications

General

This specification outlines the requirements for a three-phase, group operated, 60 Hz sectionalizer using SF6 puffer switches for load interruption and SF6 insulated vacuum breaker switches for fault interruption for:

Subsurface

Padmount applications.

The switch shall be:

single phase

three phase, with

2-way

3-way

4-way

circuit configuration. The unit will include 200 Amp deepwell or 600 Amp bushings per ANSI/IEEE 386. A one-line diagram indicating the circuit configuration, number and location of switched ways number and location of ways providing fault interruption capability, and type of bushings required will accompany this specification.

Switches must be furnished factory-filled with an electrical grade of non-toxic, non-flammable SF6 gas, conforming to ASTM D-2472.

A pressure gauge that provides visual status of both the insulating and interrupting dielectric must be included. 100% production testing shall include a mass spectrometer leak test, contact resistance, AC one minute withstand and corona extinction tests.

The completed unit must be capable of withstanding internal failure without explosion or fire and shall be capable of being mounted in any position for best cable training and operation.

Switch Construction

The switch shall use dead-front, compact, sealed construction. The contact system, interconnecting bus, operating mechanisms, and bushings shall be enclosed by a corrosion-resistant stainless steel tank.

The switch must be maintenance free, all welded construction, eliminating the use of gasketed seals. The operating shafts must be sealed by a flexible metal bellows (O-ring type seals are not acceptable).

Unless otherwise specified, cable connections, handles and operating accessories shall be located so only single side access is required for operation and installation.

Operating handles shall be capable of being removed and stored or permanently attached.

Movement of the operating handles will actuate an internal spring mechanism causing the switch contacts to open or close and latch into position.

The spring operator will use compression springs for long life and will provide positive position indication. The switch contacts and interconnecting bus shall be plated copper with Belleville washers and locking fasteners to provide consistent pressure at bolted connections.

The contacts shall be self-aligning, wiping type, incorporating tungsten copper arcing tips to prevent wear.

A puffer contact system for fast arc extinction along with a special internal absorbent shall be used for improved performance and to prevent arc by-products.

Switches shall include:

Operating handles with padlock provisions in the open and closed position, capable of operation by hookstick or rope with direction of movement clearly indicated.

Stainless steel nameplate providing information including ratings, contact position indication, circuit configuration and phase identification.

Color coded pressure gauge for visual indication of normal operating range, enclosed in a sealed, protective housing to prevent damage.

Fill valve for field testing of SF6, protected and sealed with a removable cap.

Ground lugs, one for each set of bushings.

200 Amp deepwell or 600 Amp bushings, with protective shipping caps (elbows and inserts furnished by user).

Lifting and mounting provisions.

Typical Specifications

Fault interrupting Switches

The Switchgear shall incorporate a vacuum fault interrupter. The device shall interrupt all fault currents up to the rated maximum. The interrupter shall use a flux shifter for tripping and be manually resettable with no consumable parts (e.g., fuses).

As a safety precaution, the interrupter shall incorporate a trip-free mechanism to prevent the possibility of holding the interrupter closed under a faulted condition, with no reaction through the switch handle.

The RFI shall be capable of acting as a true three-phase group-operated circuit breaker with no mechanical link between phases. For a three-phase trip, an overcurrent condition on any one phase shall simultaneously trip all three phases.

The RFI shall also be capable of serving as a three-phase group-operated load-break switch. Opening and closing can be accomplished with a manual operating handle, or by optional motor operators.

A viewing window with indication of contact position shall be provided.

Trip Control

Overcurrent sensing shall be accomplished with an electronic trip control. The control shall use current transformers external to the tank to sense line currents. These CT's shall also provide power for control operation. No external power source shall be required. The CT's shall be dual ratio 600:5 A and 200:5 A. To provide immunity from system voltage problems (e.g., overvoltage transients), the control shall not be sensitive to system voltage conditions. The control shall be fully operable and meet the specified time-current curve when energized.

Trip control shall be available in two formats, VFD with keypad, and rotary switch selection.

VFD With Keypad

The vacuum fluorescent display (VFD) shall be legible at -40C without the need for a heater. The display shall be energized by the external CT's on the switch, when load current is flowing. In the event the switch is de-energized, a 9V lithium battery shall be included to allow operation of the display and keypad for gathering data and changing parameters. The keypad shall be used to select the following parameters:

- TCC fuse curve
- TCC fuse rating
- Instantaneous trip
- Ground fault Pick-Up
- Ground Fault Delay
- Protection Mode

The VFD shall display the above data in addition to cause of trip.

Control shall have ability to store 64 different TCC curves. Trip selection shall be available in 12 positions from 10 to 450.

Instantaneous trip values shall be in multiples of the CT primary rating in increments of 50% of the CT primary rating with values from 300 A to 7200 A.

Ground fault trip settings shall range from 10 - 30% of the CT primary rating in increments of 5% of the CT primary rating.

Ground Fault time delay shall be selectable in 10 settings from .05 to 1.0 secs.

A RS232 port shall be provided for communication with external devices.

A manual trip button shall be supplied to trip interrupter electrically. Provision for remote trip shall be provided.

Operating temperature of the control shall be -40C to +65C.

Rotary Selector Switch

The rotary selector switch control shall be used for 200 A maximum loads. There shall be 10 fuse selections from 30 to 200.

LED indication shall be provided to show cause of trip.

An intermittently blinking LED shall indicate "ready" status.

A RS232 communication port shall be provided to read real time current and fault current.

Status contacts for remote SCADA indication shall be provided.

A manual trip push-button shall be provided, with provision for remote trip.

Padmount Enclosure Construction

For padmount installations, a tamper-resistant housing shall be provided. The enclosure will be constructed of 12-gauge thick mild steel, stiffened and cross-kinked for watershed and rigidity. All flanges shall overlap and interlock to discourage unauthorized entry. The design shall incorporate single side access to minimize the necessary space required for operation. Access to the switch and cable compartments shall be through lightweight hinged doors and hood. The enclosure will be completely removable from the switch to facilitate installation, maintenance, and, if necessary, replacement.

Padmount enclosures shall include:

- Recessed lifting provisions.

- Padlock provision with pentahed security bolt.

- Mounting provisions using internal flange for anchoring.

300 series stainless steel hardware with the enclosure painted dark green (Munsell #7.0 GY 3.29/1.5) with a 3 MIL thick primer. The bottom edges of the unit in contact with the concrete pad coated to prevent corrosion.

Door stops and stays to prevent accidental closing.

Improve the functionality of your **Resettable Fault Interrupter** with:

Microprocessor-based Automatic Transfer Package

Automatically transfer to alternate supply upon loss of voltage on preferred feeder.

User friendly keypad for field programmable parameters.

SCADA interface

24 VDC Motor Operators

Linear actuators reliably controlled by state of the art current sensing technology.

Positive status indication for remote control.

Suitable for padmount or sub-surface applications

Remote Terminal Units

Transducerless design for direct AC inputs.

Various communication protocols available including DNP 3.0 and UCA.

Fibre, telephone or radio interface

Switch Controller

Permanently mounted NEMA4X enclosure with up to 5 controlled switch ways.

Local /Off/Remote toggle switch

Power supply, battery and charger included.

Hand-held Portable Controllers

Provides safe operation of switch in confined environment

120VAC input with or without battery/charger

Positive LED status indication