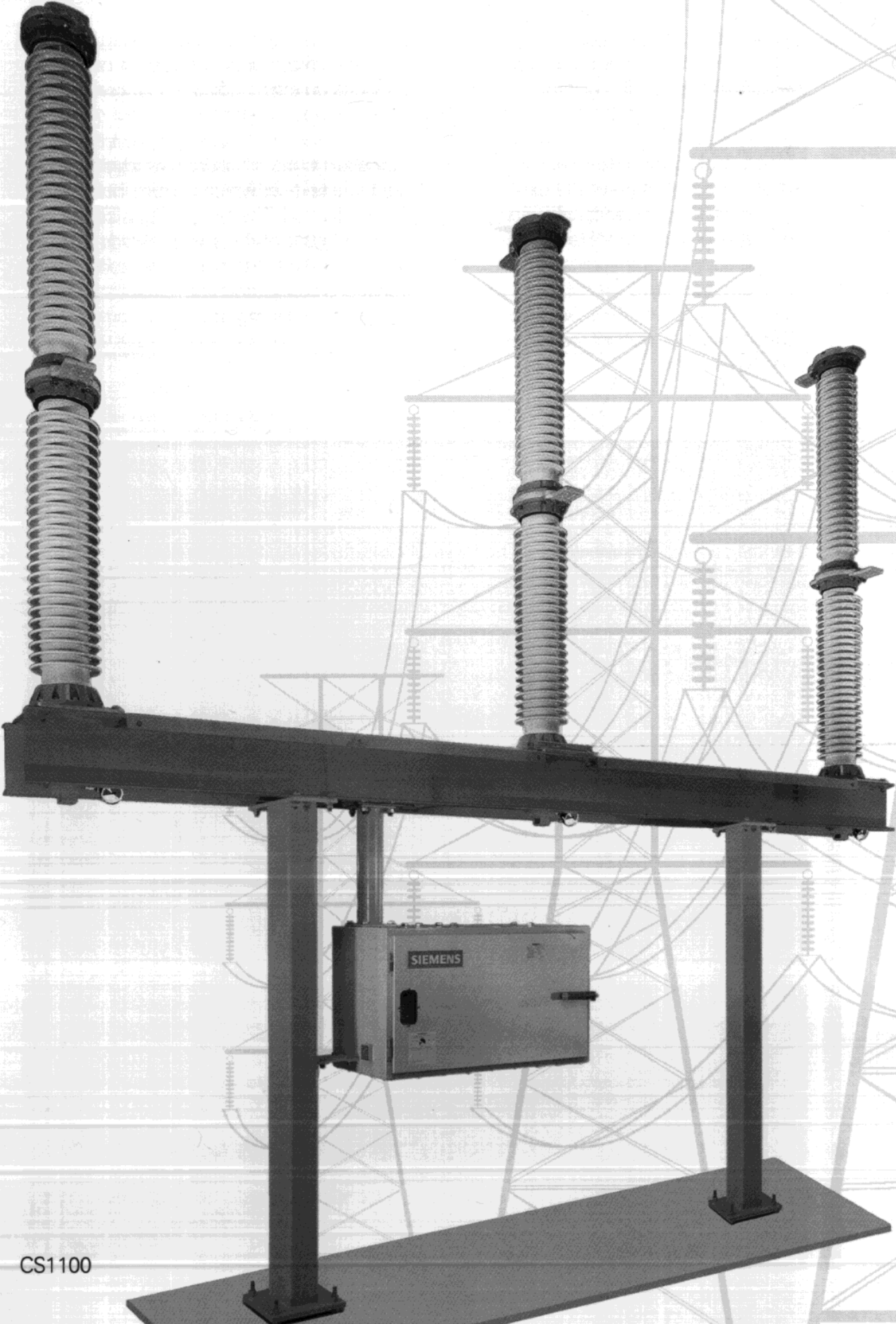


SIEMENS

Circuit Switcher
Type CPV
72.5 - 242 kV



CS1100

Type CPV Circuit Switchers

Siemens CPV Circuit Switchers

Siemens Type CPV (Circuit Protector Vertical) Circuit Switchers are ideal for applications that do not require reclosing. The CPV model provides space-saving protection at an economical cost.

Operation of the CPV is controlled by a SE-4A Spring Operator which is similar to the operating mechanism used in the SPS Circuit Breakers. There are several reasons to specify and install the CPV Circuit Switcher: excellent design, robust construction, simple installation, minimal maintenance, and low installed cost. The Siemens Type CPV Circuit Switcher device can switch and protect transformers, lines, cables, shunt capacitor banks, and shunt reactors. It also provides a low cost medium fault interrupting device. It has a consistent and fast operating time of 6 cycles or less with a high interrupting capability of 20 kA.

The Siemens Type CPV Circuit Switcher is ideal for applications where space is limited. Although this was a new substation installation the area did not allow sufficient room to install a conventional horizontal circuit switch.

For this installation, Siemens Type CPV was an ideal configuration since the vertical interrupted design permits it to fit economically into a very limited space.

The Type CPV unit is also the preferred model for retrofit installations where a circuit switcher is recommended to replace an existing fault interrupting device.

Gas Monitoring

Each pole unit is equipped with a manifold which incorporates a fill valve, a pressure gauge and rupture disc.

This manifold is located at the lower end of the pole unit, connected to the cover assembly by a union coupling. The coupling allows the pressure gauge to be rotated by the user to provide the most satisfactory view from the ground.

The pressure gauge has a color coded face for ease of reading from a distance. A label showing a picture of the gauge and an operating pressure range versus ambient temperature is located on the door of the control cabinet.

For specific applications of the Siemens Type CPV Circuit Switcher, contact the nearest Siemens sales office.

Siemens Exclusive!

As an option, the Siemens Type CPV Circuit Switcher can be equipped with a temperature compensated pressure switch to automatically monitor the status of the SF₆ gas in the pole units. This switch with gauge is located inside the control cabinet, and is connected to the pole units by stainless steel tubing. It has two sets of contacts. One set of contacts provides an alarm indication when the gas pressure approaches within 5 psi of the lockout value. The other set prevents operation if gas pressure falls (due to leakage) to a level at which current interruption is not assured. The temperature compensating feature of the switch avoids alarms and lockouts due to normal pressure variations associated with circuit switcher temperature changes.



Features and Ratings

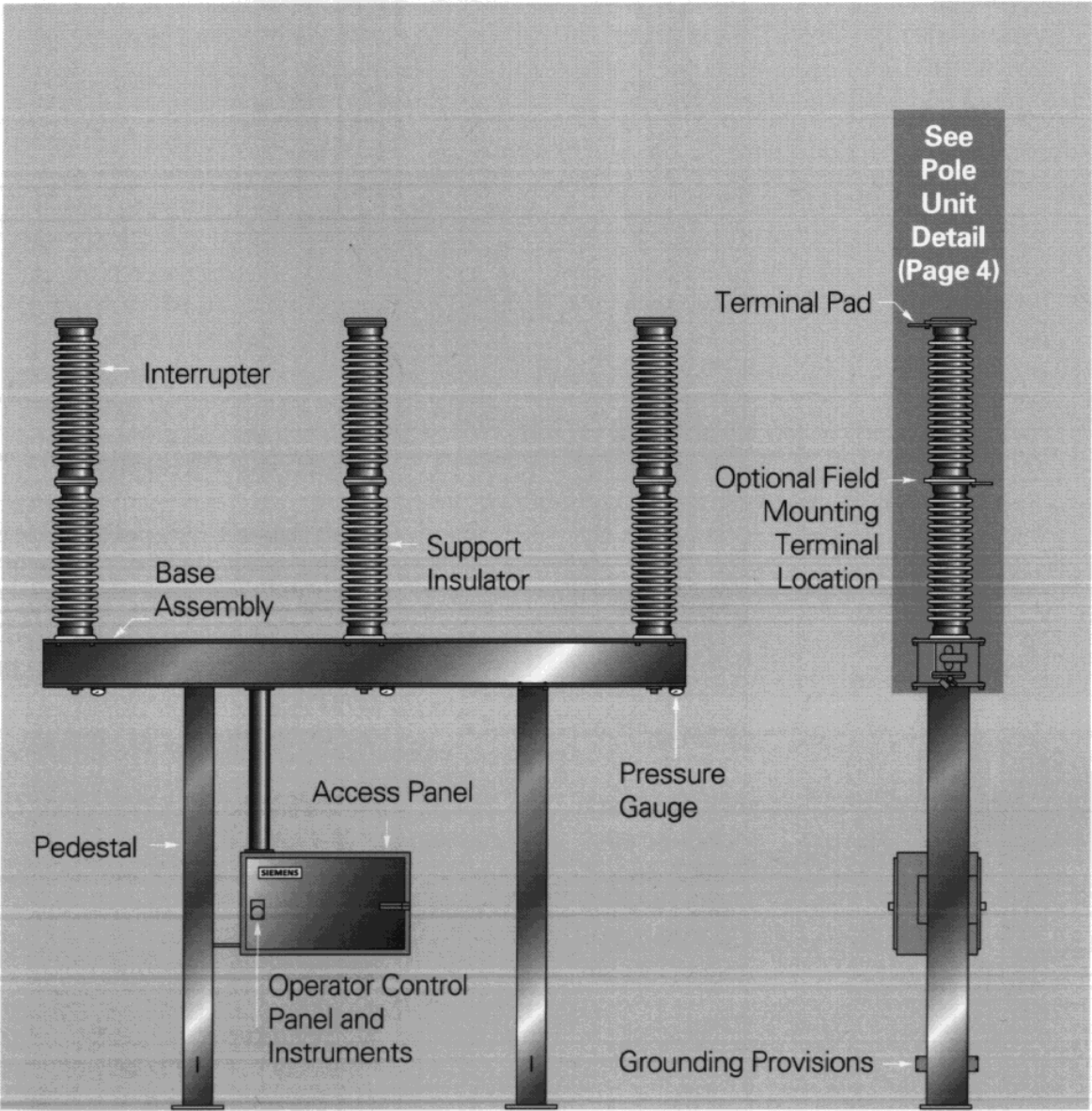
Key Features

- 72.5 thru 169 kV Shipped Assembled.
 - Factory timed and tested to save installation time and cost.
 - Pre-engineered designs facilitate reduced approval times, and quicken delivery times.
- Vertical Interrupter Design.
 - Requires minimum installation space. Ideal for retrofit applications.
- 20 kA Primary Fault Interrupting.
 - Rating is based on TRV parameters defined in Table 2 of ANSI Standard C37.06.
- Fast 6 cycle Interrupting Speed.
 - Significantly reduces system disturbances and minimizes damage to key system components.
- Full Strength Interrupter Insulation.
 - Maintains full BIL insulation across open contacts and permits use of non-disconnect models.
- Operator Mechanism.
 - SE-4A Spring Operator offers single stored energy mechanism located at ground level.
 - The operator features instantaneous trip-free capability.
- Color-coded PSI Gauge.
 - Permits easy gas pressure readings from a distance.
- Rupture Disk.
 - Protection for over-pressure conditions.

CPV Ratings

- Maximum Design Voltages—72.5, 121, 145, 169 and 242 kV
- BIL of SF6 Interrupter—550, 650, 750 and 900 kV
- Continuous Current—1200 amperes
- Short Circuit Interrupting Capacity—20 kA rms symmetrical
- Transformer Thru-fault—4 kA rms symmetrical
- Interrupting Time (60 Hz)—6 cycles maximum, 72.5 thru 242 kV.
- Close and Latch (fault closing, multiple duty)—108 kA rms crest
- Thru-fault Withstand (10 cycles momentary)—108 kA rms crest
- 3-Second Short Time Current—40 kA rms symmetrical

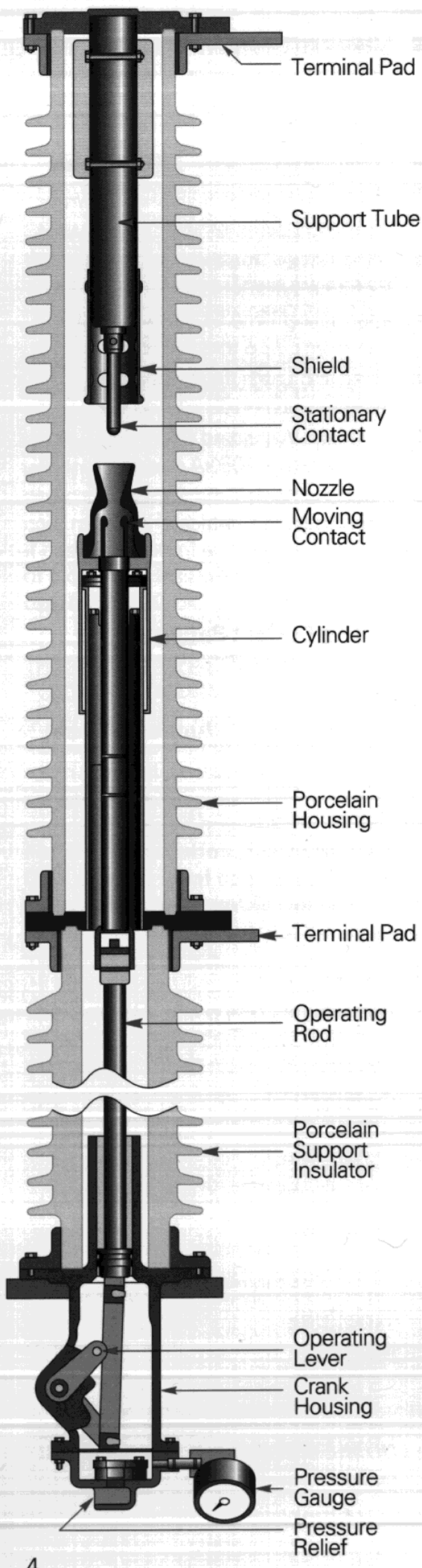
Typical Siemens Type CPV Circuit Switcher Side and End Views



Operating Current Ratings

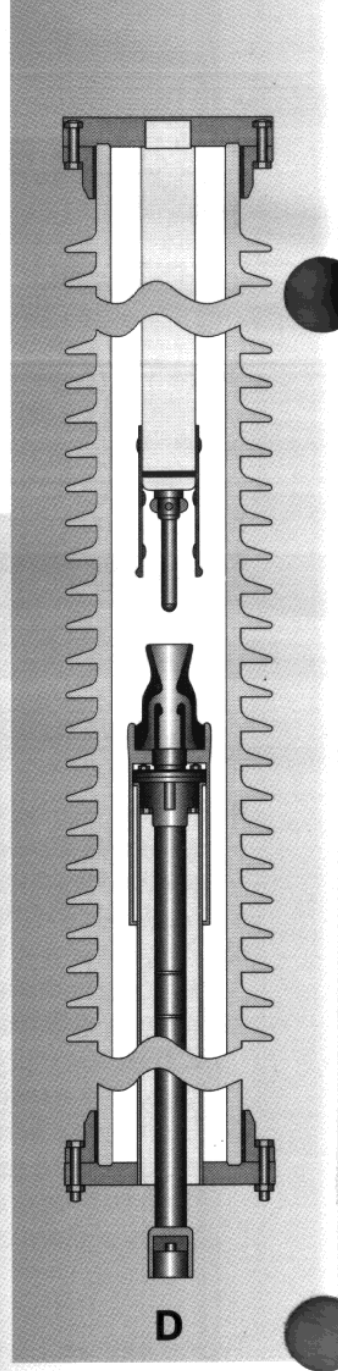
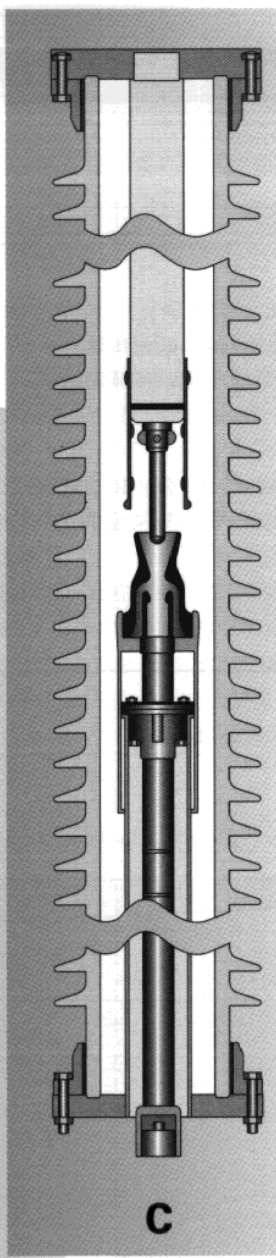
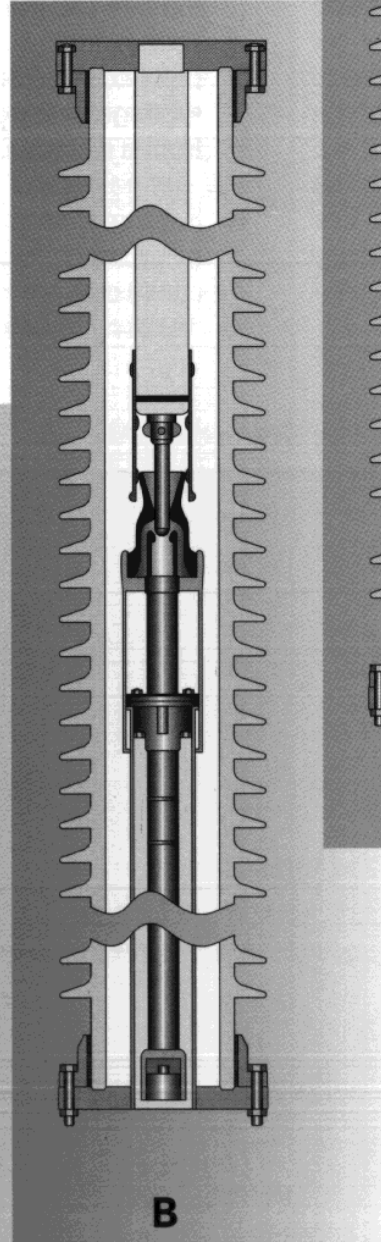
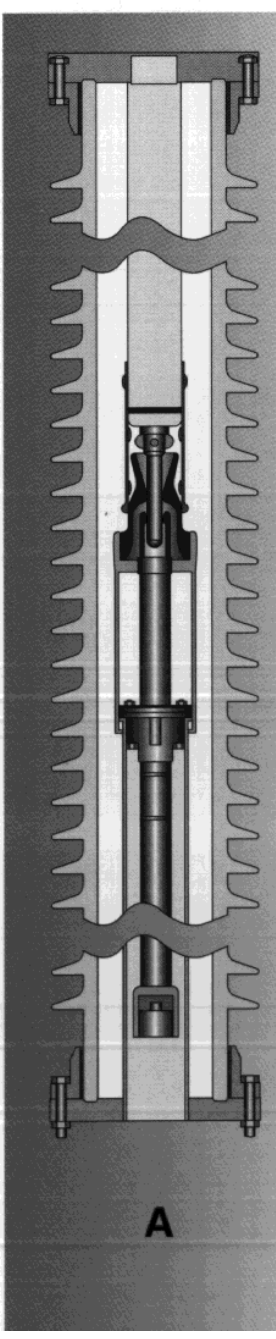
Device Description	48VDC (Amps)	125VDC (Amps)
Motor Inrush Current	75	33
Motor Running Current	15	7.5
Trip Coil Currents	12.6	4.3
Anti—Pump Relay Coil	0.2	0.1
Time Delay Relay Coil	0.2	0.1
Motor Fuses	30	15
Heater Fuses	30	15

Interrupter Operation



Type CPV Single Pole Unit
 A cross-sectional view of a CPV pole unit is shown. The interrupter is contained in the upper porcelain shell. The lower porcelain shell provides line-to-ground insulation, and houses an insulated rod which is connected to the interrupter moving contact. The lower end of the rod runs in a guide which is integral with the crank housing, and is linked to the pole unit operating crank.

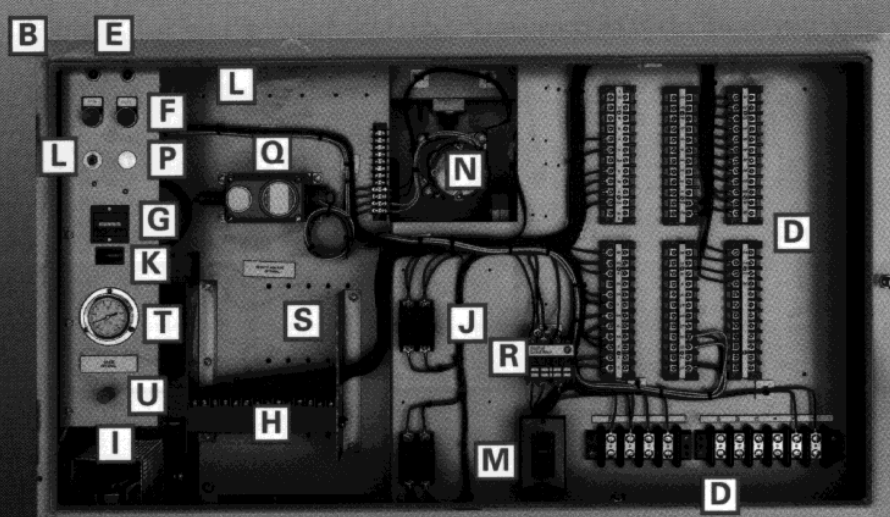
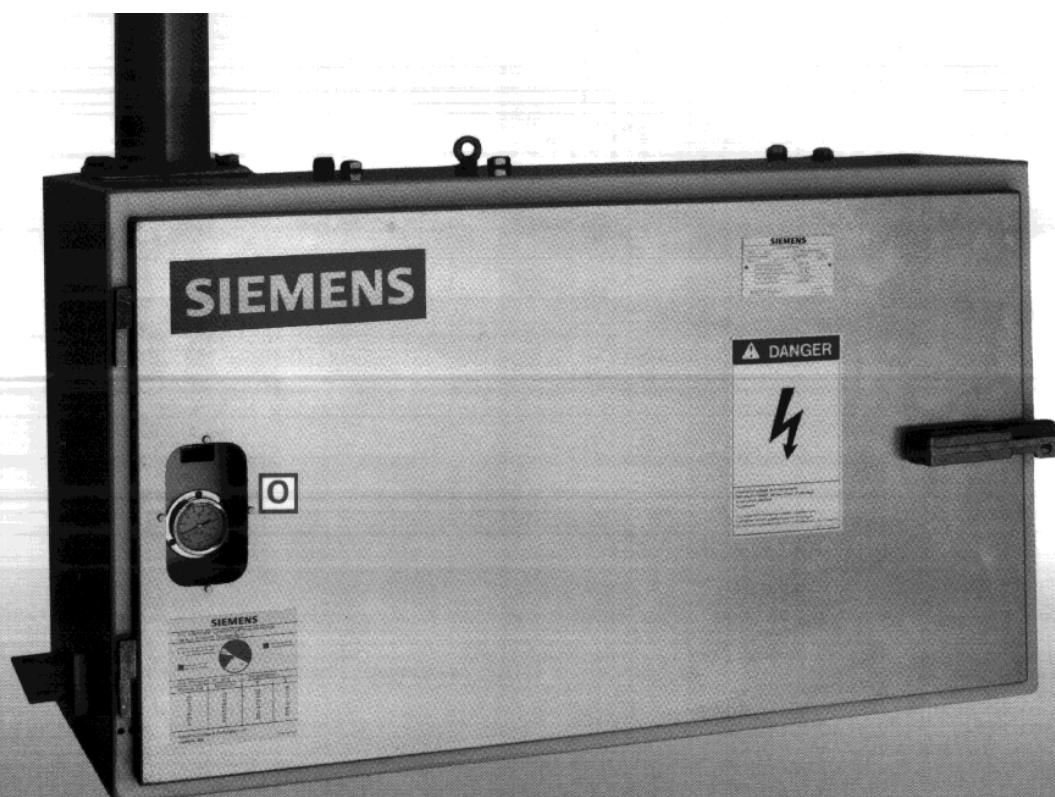
The porcelain shells, crank housing, end cover, terminal plates, and associated o-ring seals form a pressure vessel which is filled with SF6 gas.



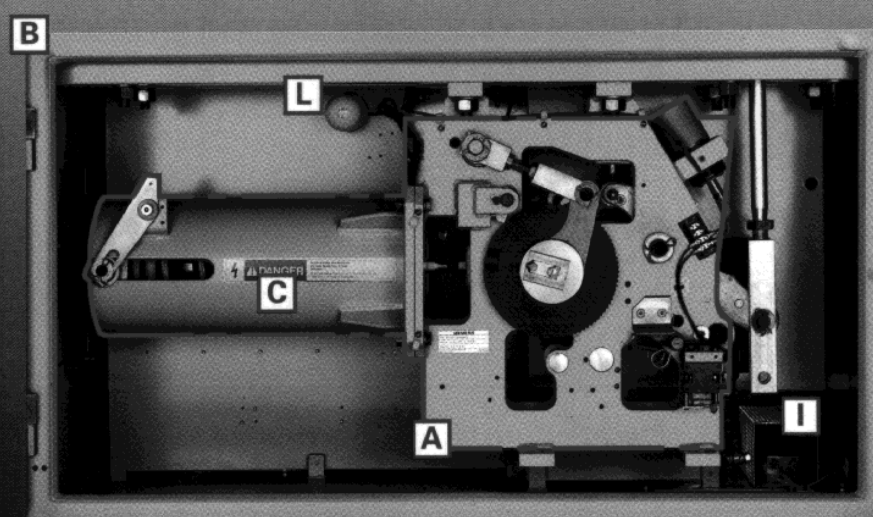
- Interrupter Operation**
- A.** Interrupter trips with contacts in the closed position. Contacts remain in contact as movable contact travels over stationary contact and compresses the gas. Gas is ready to flow when contacts part.
 - B.** Contacts part
 —arcing begins
 —gas flows to extinguish the arc.
 - C.** At current zero, gas prevents reignition.
 - D.** Interruption complete; interrupter in full open position. Full BIL established.

Type SE-4A Operating Mechanism

The Type SE-4A operator and necessary control and monitoring equipment are housed in a common cabinet. Large doors located on either side of cabinet are easily lifted from their hinges for unobstructed access to the cabinet interior.



Front View



Rear View

The SE-4A operating mechanism stores energy for use in closing the circuit switcher. This energy is stored by compressing a powerful spring. An electrical motor with an integral gear reduction set (called a gearmotor) is used to compress the operator spring. The purpose of storing the motor-supplied energy in the spring is to allow a rapid closing operation of the circuit switcher. It takes about 5 seconds for the gearmotor to compress the spring, but the spring can discharge and close the switcher in less than 0.1 seconds.

With the circuit switcher open, a close operation is initiated by energizing the gearmotor. The closing spring becomes fully compressed, and then discharges, closing the switcher and charging the opening spring. The gearmotor is automatically de-energized.

The switcher is maintained in the closed position by a latch system in the operator. A trip operation is initiated by energizing a solenoid which releases the trip latch and allows the switcher to open.

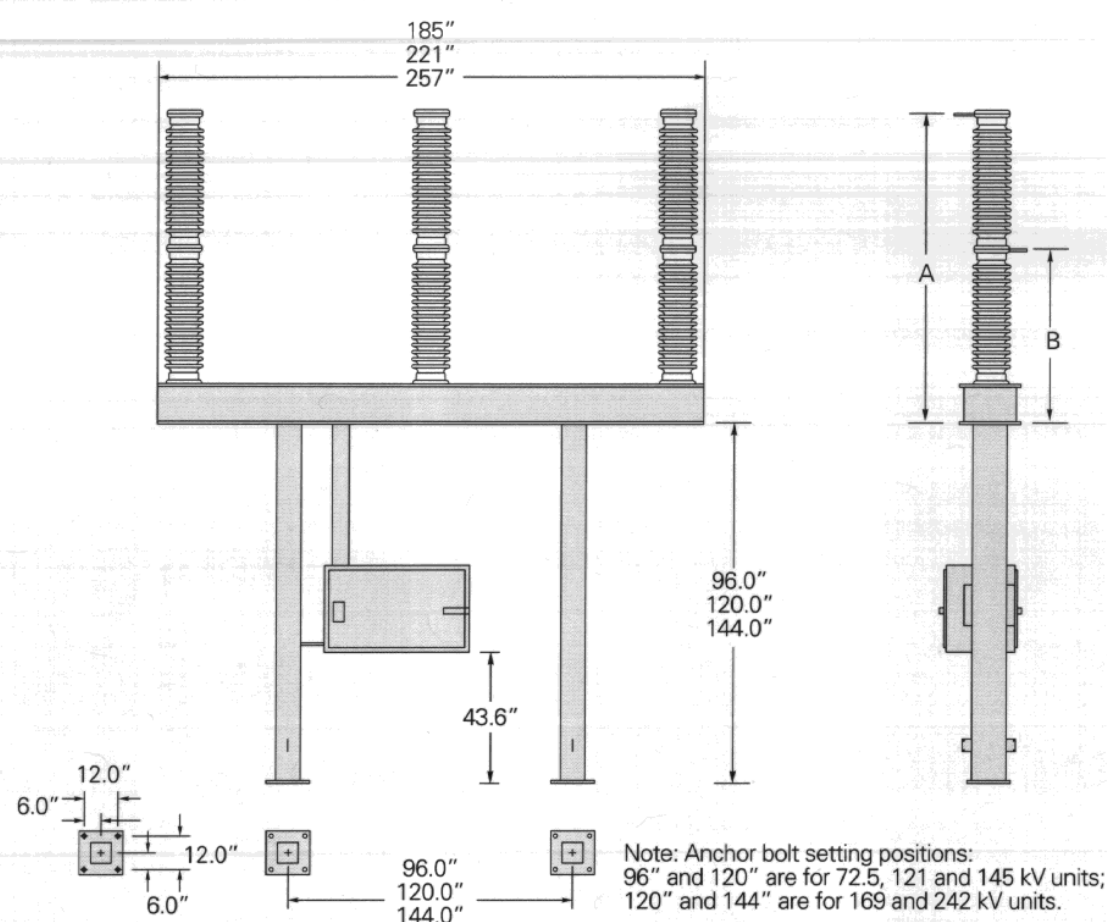
Standard and Optional Features (Shown)

- A SE-4A Spring Operator Mechanism
- B Steel Cabinet Painted ANSI Gray #70
- C Closing Spring
- D Terminal Blocks
- E Red/Green Indicating Lights
- F Trip/Close Pushbuttons
- G Non-Reset Operations Counter
- H 14-Stage Adjustable Auxiliary Switch (8 Stages for Customer)
- I 120 or 240 VAC Heater
- J Fused Pull-Outs for DC Control and Heater Circuits
- K Open/Close Position Indicator (Interrupter)
- L Internal Cabinet Lights (2) with Toggle Switch (1)
- M Duplex Receptacle (GFI)
- N 125 VDC Motor
- O View Window in Front Door
- P Local/Remote Selector Switch (Optional)
- Q Gas Monitor with Lock-Out (Optional)
- R Control Relay(s) (Optional)
- S Auxiliary Switch Stages to 28 Max. - 24 Stages for Customer (Optional)
- T Pressure Gauge (Optional with Gas Monitor System)
- U Gas Fill Port (Optional with Gas Monitor System)

Other Optional Features (Not Shown)

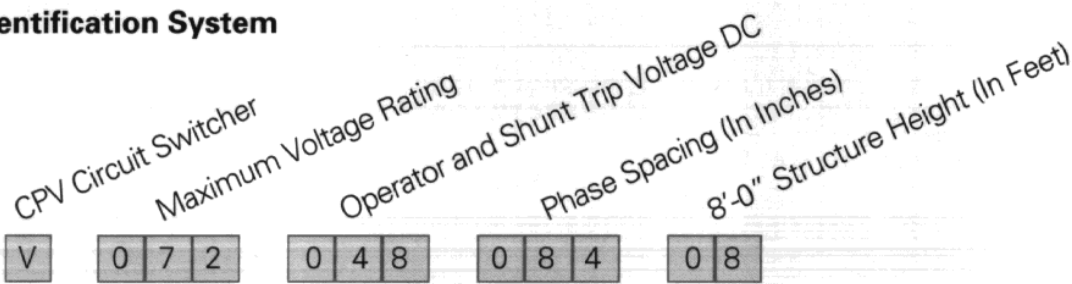
- Internal Cabinet Light with Door Actuated Switch
- Fused Knife Switches
- Molded Case Circuit Breakers
- 120/240 VAC Cabinet Heater with Thermostat Control
- 48 VDC Motor

Dimension Data



Structure Height	8'-0" (96.0")					10'-0" (120.0")					12'-0" (144.0")				
kV Rating (20 kA)	72.5	121	145	169	242	72.5	121	145	169	242	72.5	121	145	169	242
Internal kV BIL	550		650	750	900	550		650	750	900	550		650	750	900
Insulator Type kV	72.5	121	145	169	242	72.5	121	145	169	242	72.5	121	145	169	242
Phase Spacing	48	84	102	120		48	84	102	120		48	84	102	120	
Cat. Prefix: V	072	121	145	169	242	072	121	145	169	242	072	121	145	169	242
48V DC Cat. No.	04808	08408	10208			04810	08410	10210			04812	08412	10212		
V__048__	08408	10208	12008			08410	10210	12010			08412	10212	12012		
125V DC Cat. No.	04808	08408	10208			04810	08410	10210			04812	08412	10212		
V__125__	08408	10208	12008			08410	10210	12010			08412	10212	12012		
"A" Dim. (In.)	101.8	125.8	131.8	160.8		101.8	125.8	131.8	160.8		101.8	125.8	131.8	160.8	
"B" Dim. (In.)	58.5	67.5	73.5	93.5		58.5	67.5	73.5	93.5		58.5	67.5	73.5	93.5	
Net Weight (Lbs.)	3430	3760	4370			3496	3826	4436			3562	3842	4502		

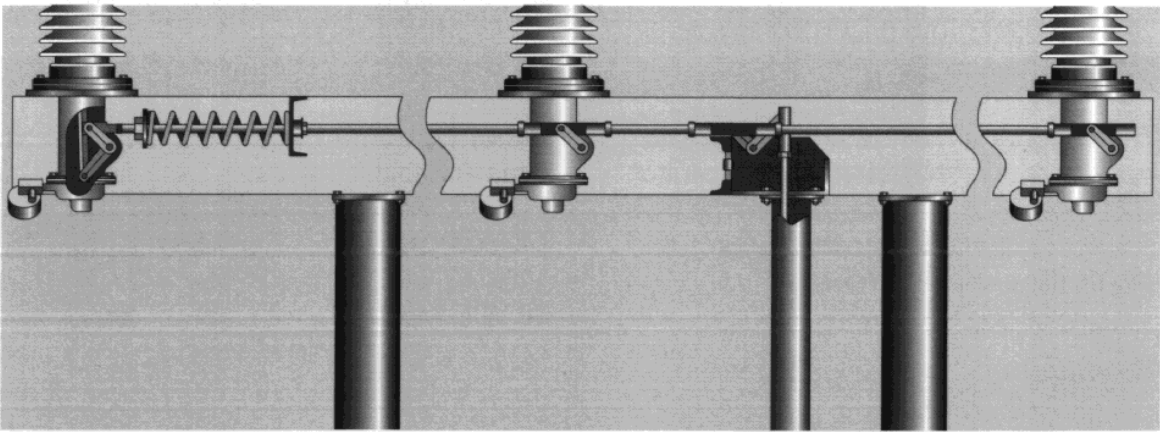
Catalog Code Identification System



Base Assembly

The base assembly provides mechanical support for the pole units and the operator/control assembly, and houses the opening spring and the operating rods which connect the bell crank to the pole unit. A cross-sectional view of the base assembly is shown.

The connecting rods have right-hand threads on one end and left-hand threads on the other. This allows easy adjustment of the rod lengths to match pole unit spacing.



Base Assembly Detail

Application Guide

Type CPV Interrupting Ratings			
Application		Qualifications	Maximum Amperes Interrupting RMS Symm.
Transformer Switching and Protection	Parallel Switching	—	1200
	Load Dropping ①	—	1200
	Fault Interrupting ②	Primary Faults Secondary Faults	20,000 ③ ④ 4,000 ⑤
Line or Cable Switching and Protection	Load Splitting (Parallel or Loop Switching)	—	1200
	Load Dropping	—	1200
	Line, Cable Dropping (Charging Current)	72.5 kV thru 145 kV 169 kV	400 320
	Fault Interrupting ②	—	20,000 ③ ④
Single Shunt Capacitor-Bank Switching and Protection	Bank Current Switching	Grounded capacitor banks applied on solidly grounded systems only, thru 145 kV Ungrounded capacitor banks thru 145 kV	550 400
	Fault Interrupting ②	—	20,000 ③ ④
Series Reactor Switching		Refer to local Siemens Sales Office	
Shunt Reactor Sw. & Protection (Line-Conn or Tertiary-Connected Reactors)	Reactor Current Switching	Grounded reactors applied on solidly grounded systems only, thru 145 kV Ungrounded reactors, 72.5 kV only	600 600
	Fault Interrupting ②	—	20,000 ③ ④

① Siemens circuit switchers can close, carry and interrupt the magnetizing current of the protected transformer.

② The interrupting ratings shown are applicable for the following duty cycles: O or CO.

③ Tripping of Siemens Circuit Switchers must be coordinated with source-side protective equipment for short-circuit currents in excess of this value.

④ Rating is based on transient-recovery-voltage parameters defined in Table 2 of ANSI standard C37.06-1987 for Siemens Circuit Switchers rated 72.5 kV and Table 3 for 121kV through 242 kV.

⑤ Siemens Circuit Switchers are suitable for transformer-primary applications where the *inherent* secondary-fault current through the secondary-side of the transformer does not exceed 4000 amperes. The *inherent* secondary-fault current may be calculated as follows. Inherent is defined as secondary-side fault current as reflected through to the primary side of the transformer:

$$I = \frac{KVA \times 100}{(\sqrt{3}) E \times Z}$$

I = Inherent Secondary Fault Current
KVA = Transformer Self-cooled 3-Phase Rating
E = System Voltage kV
Z = Impedance Primary-to-Secondary in Percent.

For applications where the *inherent* secondary-fault current exceeds the above limits, but where the maximum expected fault current, based on transformer impedance plus source impedance is within these limits, refer to your local Siemens sales office.

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		Mississippi Jackson (601) 936-9360			International TLX: 822024SEA IBU UF Fax: (404) 751-2496 Phone: (404) 751-2291

Siemens Energy & Automation, Inc.
Power Apparatus & Conditioning Division
P.O. Box 6289
Jackson, MS 39288-6289