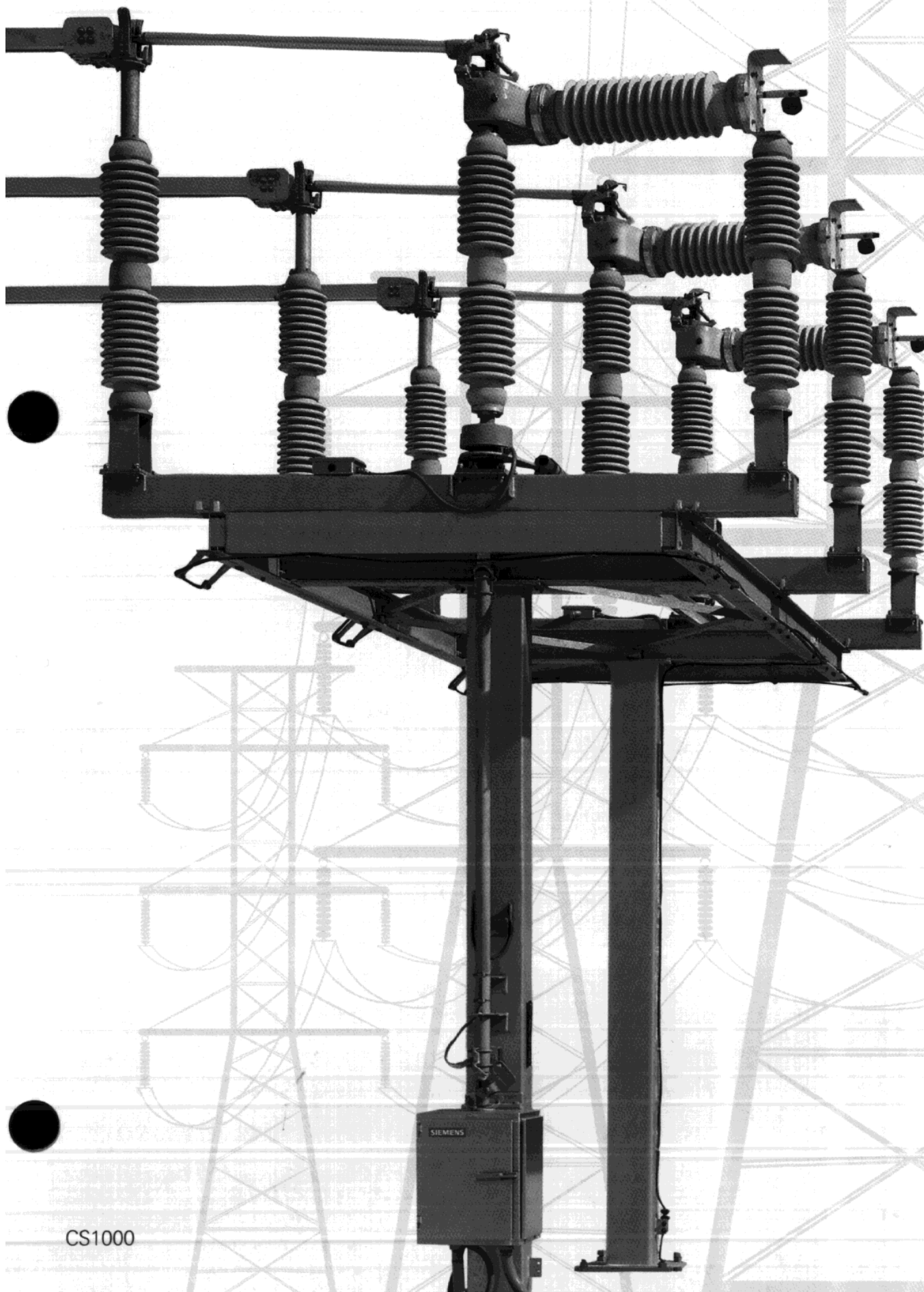


SIEMENS

Circuit Switchers

Types CPS and CPS-VB
72.5 - 242 kV



CS1000

Types CPS and CPS-VB Circuit Switchers

Siemens Circuit Switchers

Siemens Circuit Switchers are ideal for applications that do not require reclosing. By combining SF6 puffer interruption and air break isolation functions in a single compact unit, Siemens circuit switchers provide flexible and space-saving protection at an economical cost. Operation of circuit switcher units is controlled by a motor operator.

The Siemens Circuit Switcher device can switch and protect transformers, lines, cables, shunt capacitor banks, and shunt reactors. It also provides low cost medium fault interrupting service, a consistently fast interrupting time of five cycles or less, and an interrupting capability of 20 kA. For specific applications, contact the nearest Siemens sales office.

Fault closing and circuit making are fully contained within the interrupter unit. This feature provides for better protection of the equipment, and minimizes system disturbances.

Key Features

- 20 kA Primary Fault Interrupting.
 - Fault protection ratings with circuit breaker TRV capabilities.
- Fastest Industry Interrupting Speeds.
 - 5 cycles at 169 kV and below;
 - 6 cycles at 230 kV
 - Significantly reduces system disturbances
 - Minimizes damage to key system components
 - Less maintenance on disconnect contacts
- Full-Strength Interrupter Insulation.
 - Maintains full BIL insulation across open interrupter
 - Permits use of CPS non-disconnect model
 - Increases system reliability
- Advanced SF6 Puffer Interrupter.
 - More than 20 years of continuous product improvements
- Factory Pre-assembled, Timed and Tested.
 - Facilitates quicker installation
- Fault Interruption.
 - Circuit making occurs within the interrupter (**Open/Close**)



General Description and Ratings

The most commonly used interrupting and switching device in outdoor substations has been the high voltage power circuit breaker which normally uses disconnect switches for visual isolating, bypassing and tying functions.

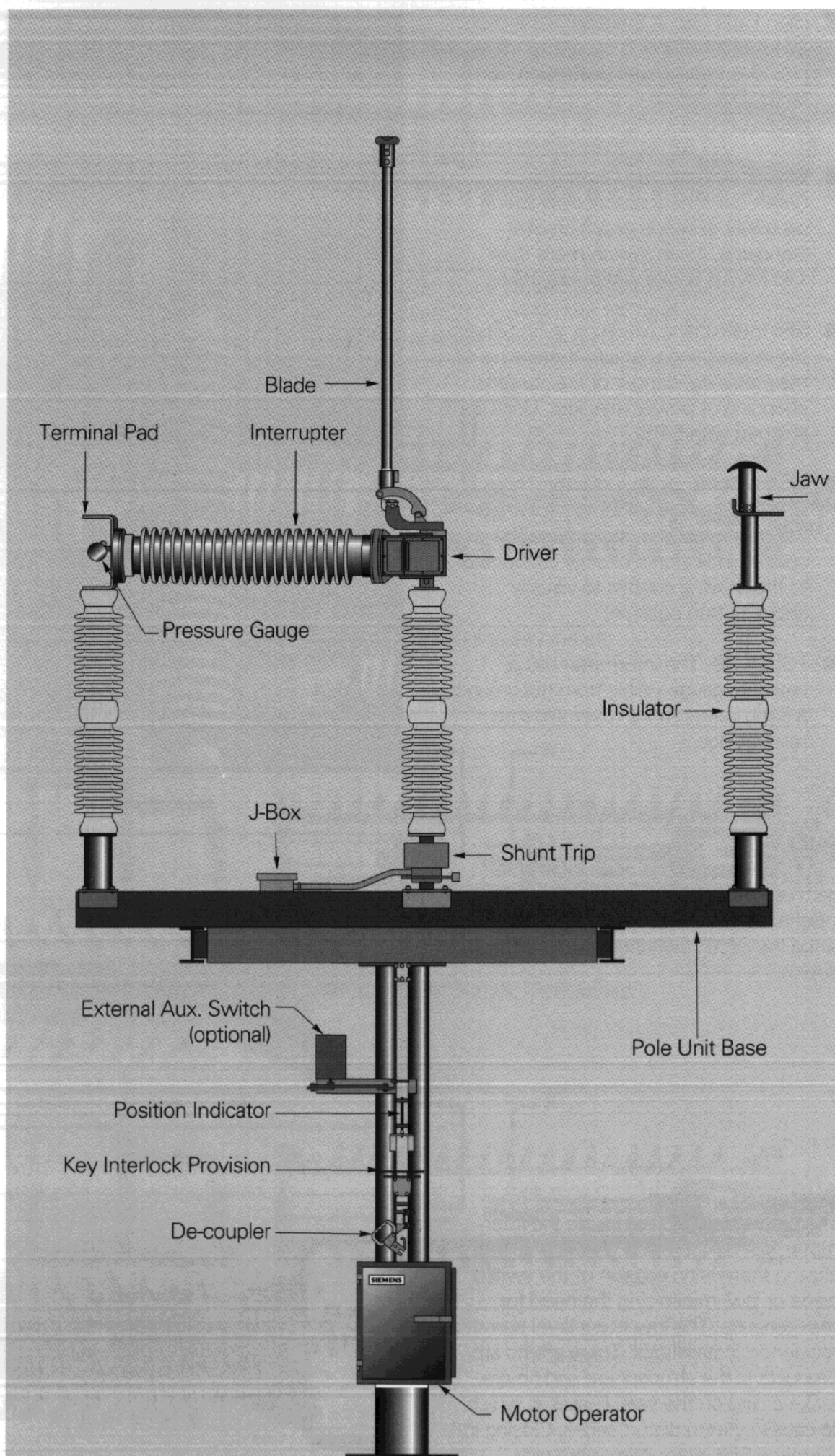
The Siemens Circuit Switcher is a 3-pole, group operated device usually installed on a galvanized steel structure. Center rotating insulators of each phase are linked mechanically via the shunt trip with an interphase pipe that assures pole simultaneity. A motor operator provides the power to rotate insulators and reset trip and close springs.

The Siemens interrupter design is the result of over 30 years experience with SF6 gas combined with current puffer technology. Through the utilization of SF6 puffer interruption, full BIL insulation is maintained with the circuit switcher. The design is first in the industry to interrupt full voltage and current on one break without use of shunt resistors or capacitors.

Group operated, center rotating insulator circuit switcher, including an SF6 interrupter, mounted in series with an integral vertical break disconnect switch. Each three-phase circuit switcher is factory assembled, timed and tested with its motor operator for the following ratings:

Circuit Switcher Ratings

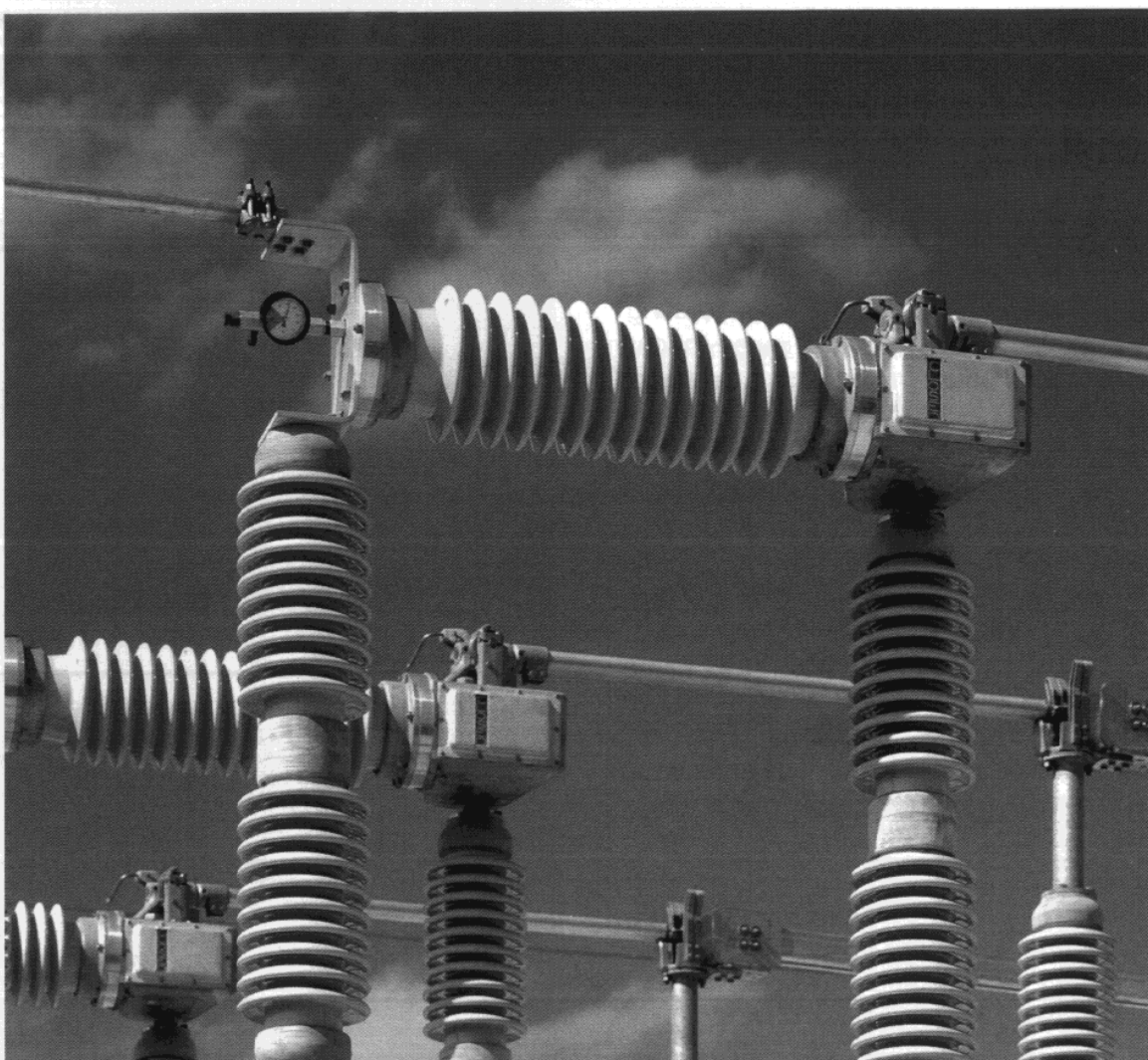
- Maximum Design Voltages—72.5, 121, 145, 169 and 242 kV
- BIL of SF6 Interrupter—550, 650, 750 and 900 kV
- BIL of Disconnect Blade (CPS-VB only)—350, 550, 650, 750 and 900 kV
- Continuous Current—1200, 1600 and 2000 amperes
- Short Circuit Interrupting Capacity—20 kA rms symmetrical
- Transformer Thru-fault—4 kA rms symmetrical
- Interrupting Time (60 Hz)—5 cycles max for 169 kV and below; 6 cycles max for 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 CPS-VB Circuit Switcher End View

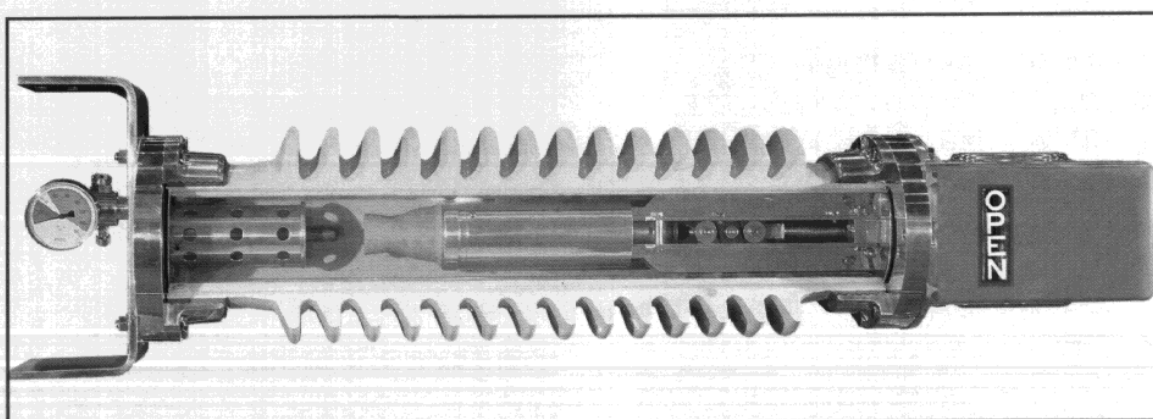
Interrupter Design Features

- **High Fault Circuit Switcher Protection.** 20 kA of interrupting capability provides transformer protection from faults. Device switches magnetizing current without restrikes.
- **Capacitor Switching Capability.** Circuit Switcher capacitor switching capability exceeds circuit breaker standards. It can switch more than 130 MVAR banks without restrikes.
- **SF6 Interrupting Medium.** With SF6 as the interrupting medium there is no oil maintenance, danger of fire, current chopping or power restrikes. Units are shipped with 5 PSI.
- **Interrupter Position Indicator.** The Driver features a window showing the position of the interrupter. The colored indicator is directly connected to the moving contact to visually show its true position.
- **PSI Gauge.** The interrupter has a pressure gauge visible from the ground, a filling valve, and an overpressure relief device.



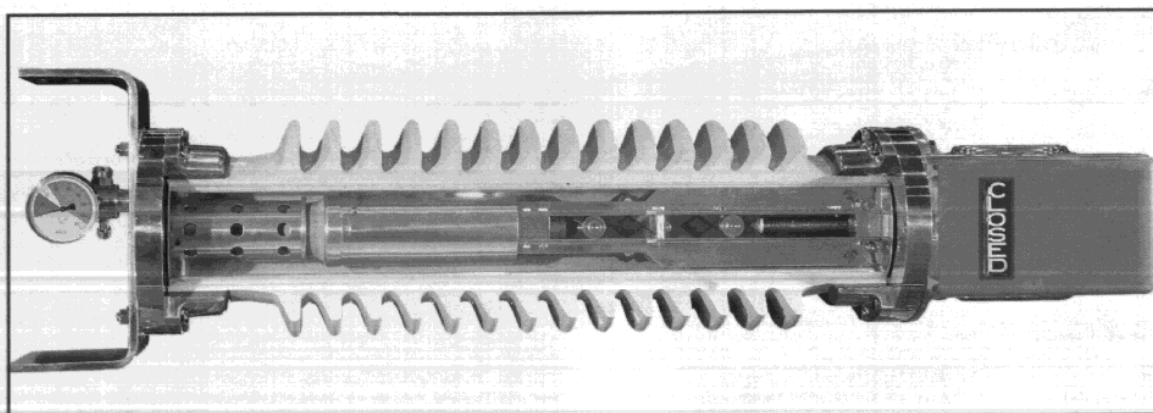
Full kV BIL

Full kV BIL across the open interrupter permits the switch blade to be left closed indefinitely. There are no dividing resistors since the circuit switcher is a single break device.



Contained Closing

The closing takes place inside the interrupter, not on the blade. With contained closing there is no erosion of the switch blade or jaw, minimizing the need for maintenance. The low noise level permits residential installations. There are no arc products in the atmosphere and no pre-strike arcing on the switch jaws in which to cause system disturbances. Closing in Siemens SF6 interrupters generally eliminates the need for closing resistors.



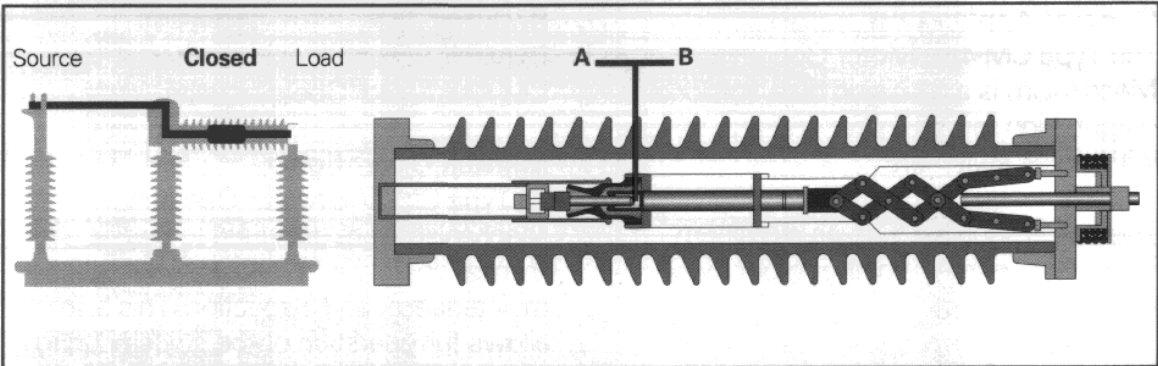
Sequence of Operation

The Siemens Circuit Switcher's operation sequence, starting from the fully closed position, is briefly illustrated in Steps 1 through 4.

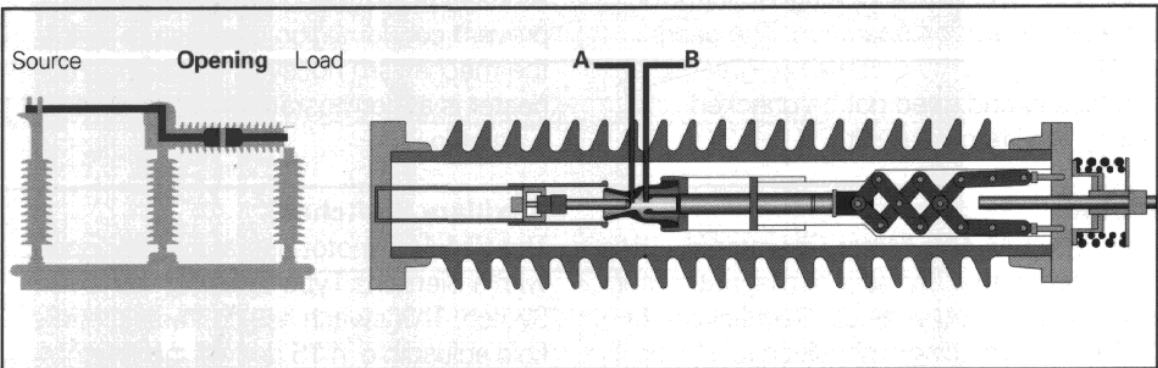
When the center insulator is rotated 12 degrees (by a shunt trip mechanism, motor operator, or hand crank) the opening springs in the driver mechanism are released, resulting in high speed opening of the interrupter contacts.

An additional 114 degrees of insulator rotation fully opens the switch blade, as depicted in Step 4. Upon reaching the full open blade position the driver is reset for a closing sequence. Charging of shunt trip equipped units will occur during the last 12 degrees of opening rotation.

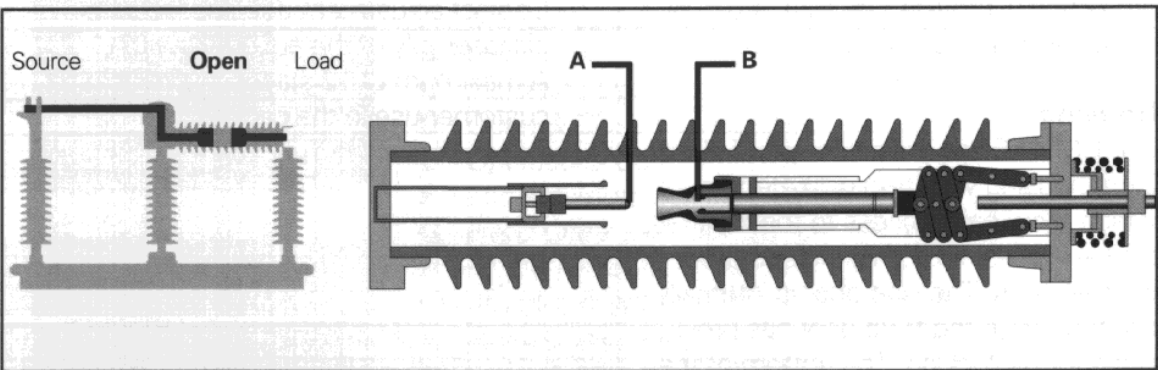
Insulator rotation to close results in blade travel and charging of the interrupter closing springs in the driver. The last few degrees of rotation release the closing springs, closing the interrupter and charging the opening springs.



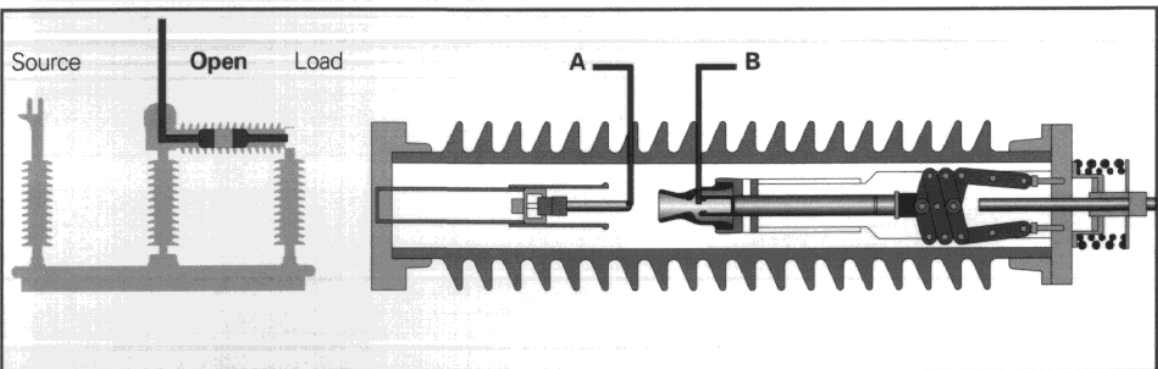
1. Interrupter trips with contacts "A" and "B" in the **closed** position. Contacts "A" and "B" remain in contact as "B" travels over "A" and compresses the gas. Gas is ready to flow when contacts part.



2. Contact parts—arcing begins—gas flows to extinguish the arc.



3. Gas divides the arc—interruption complete. Full BIL established. Blade "signalled" to **open**.



4. Switch blade now in **full open** position.

Type CM-4AE Motor Operating Mechanism

General Application

The Type CM-4AE Motor Operating Mechanism is a precision built, torsional output, high torque motor operator for use with circuit switchers.

The unit is supplied with an aluminum, maintenance-free, weather-proof, two-door cabinet.

Reduction Gears

The reduction gear unit is totally enclosed in an all aluminum cast housing. It is of the spur gear type with a wormgear shaft for manual hand crank operation. The gears and bearings in the unit are pre-greased at the factory and need not be checked during the life of the unit.

Motor

The Type CM-4AE Motor Operator is furnished with a permanent magnet motor in 48, 125, or 250 volts dc. Rectification of 120 or 240 volt single phase ac to 125 or 250 volts dc is possible. All motors are NEMA rated and are supplied with permanently greased ball bearings. Overload protection is provided by standard dual element, easily removable fuses.

Housing

The CM-4AE has a weather-proof aluminum housing with two gasketed doors which allow easy access to the controls, limit switches, motor wiring and other internal parts. The side door is internally latched, while the front door has provisions for padlocking. The bottom of the housing is removable to accommodate field drilling for precision locating of customer furnished conduit.

Braking

Dynamic braking is standard for all Type CM-4AE Motor Operator units.

Manual Operation

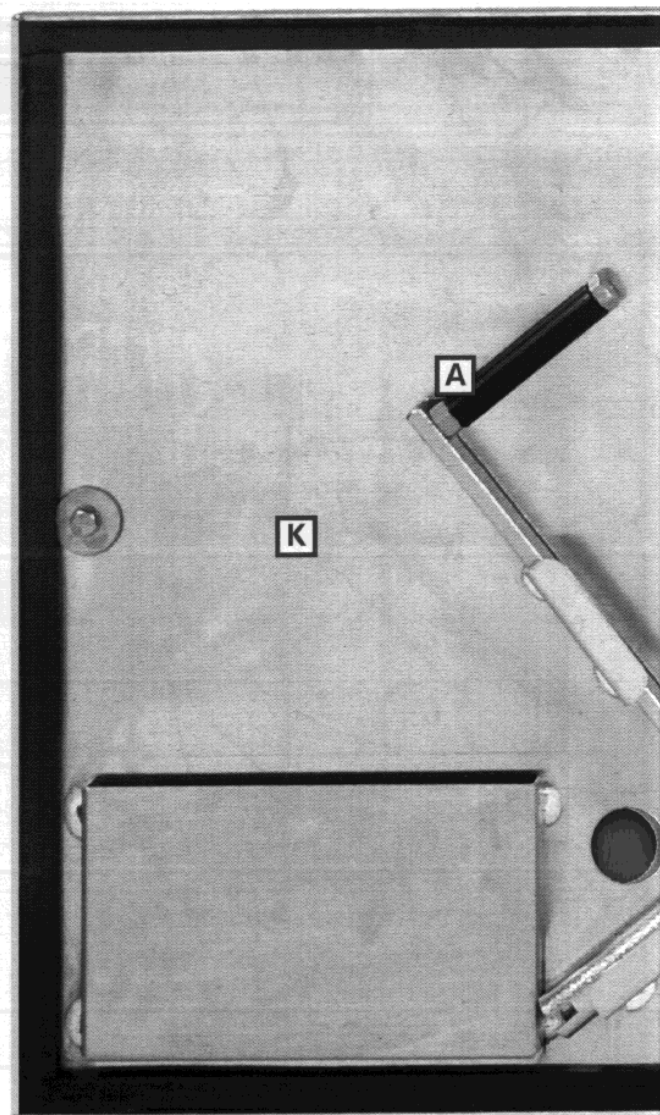
All Type CM-4AE Motor Operating Mechanisms are designed to permit manual operation to facilitate installation, maintenance, and inspection. This also allows full operation of the switch during a power failure in the motor supply circuit.

Heaters

A heater is provided within the cabinet to prevent condensation of moisture inside the mechanism housing. The standard heater is a thermostatically controlled 100 watt strip unit.

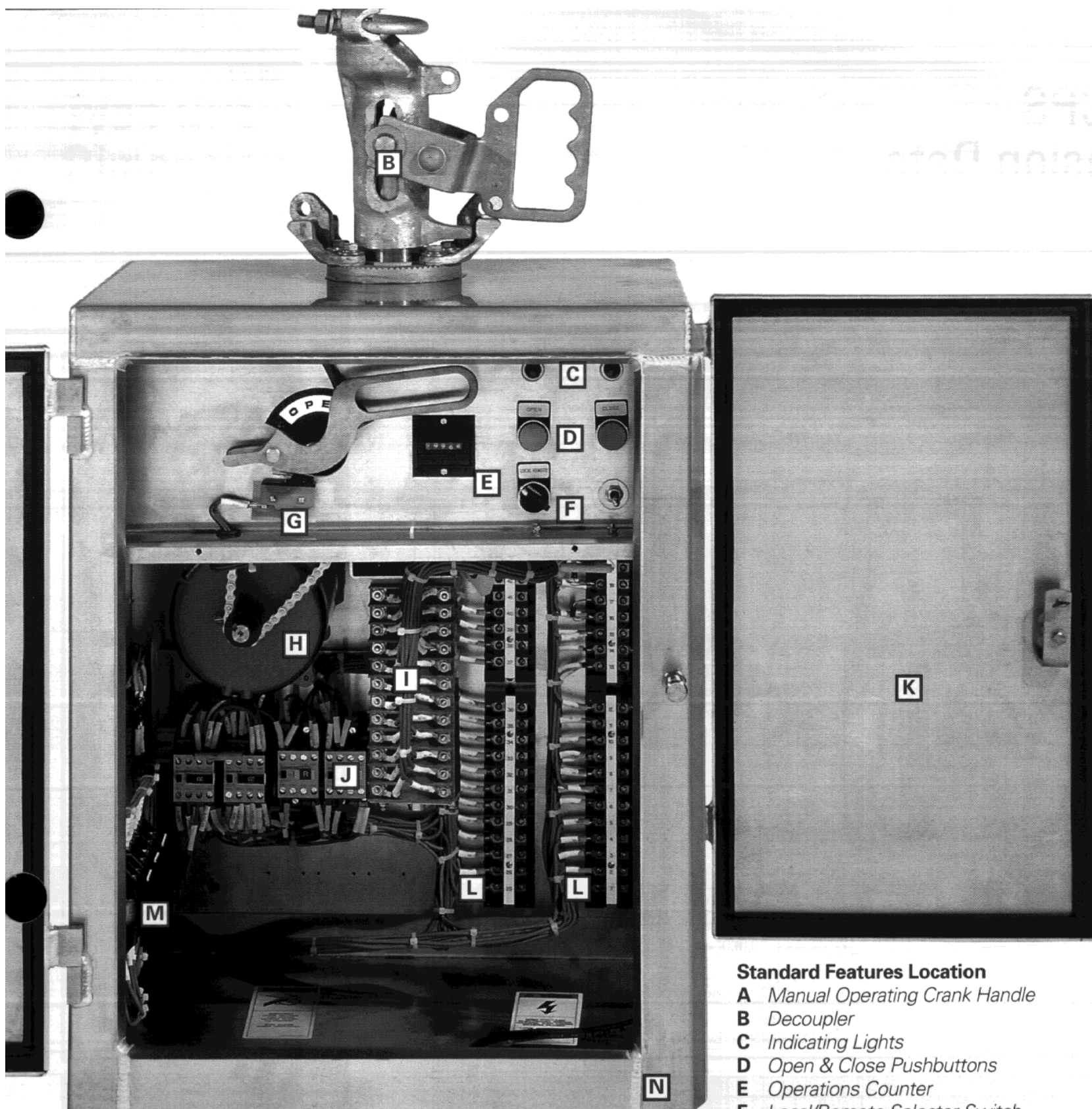
Auxiliary Switches

The CM-4AE motor operator is equipped with a Siemens Type Q-10 Auxiliary Switch. This switch has contacts that are field adjustable in 15-degree increments throughout a 360 degree of rotation to either "A" or "B" contact positions, or to any intermediate contact positions. Contact adjustment does not require disassembly of the auxiliary switch. A maximum of 12 stages is available for customer use in the cabinet.



Standard Features

- Emergency Stop Button
- Position Indicating Lights
- Dead Front Panel
- Open-Close Pushbuttons
- Decoupler for Vertical Pipe
- 12-Stage, Type Q-10 Aux. Switch
- 115/230 VAC Thermostatically Controlled 100 Watt Heater
- Operations Counter
- Fused Pull-Outs for Motor Control and Heater Circuits (Provides Visible Open Circuit)
- NEMA 56 Frame Size Motors
- Hinged, 2-Removable Doors
- Manual Crank Handle (Insertion Automatically Disconnects Control Circuit)
- Internal Cabinet Light With Toggle Switch



Optional Features

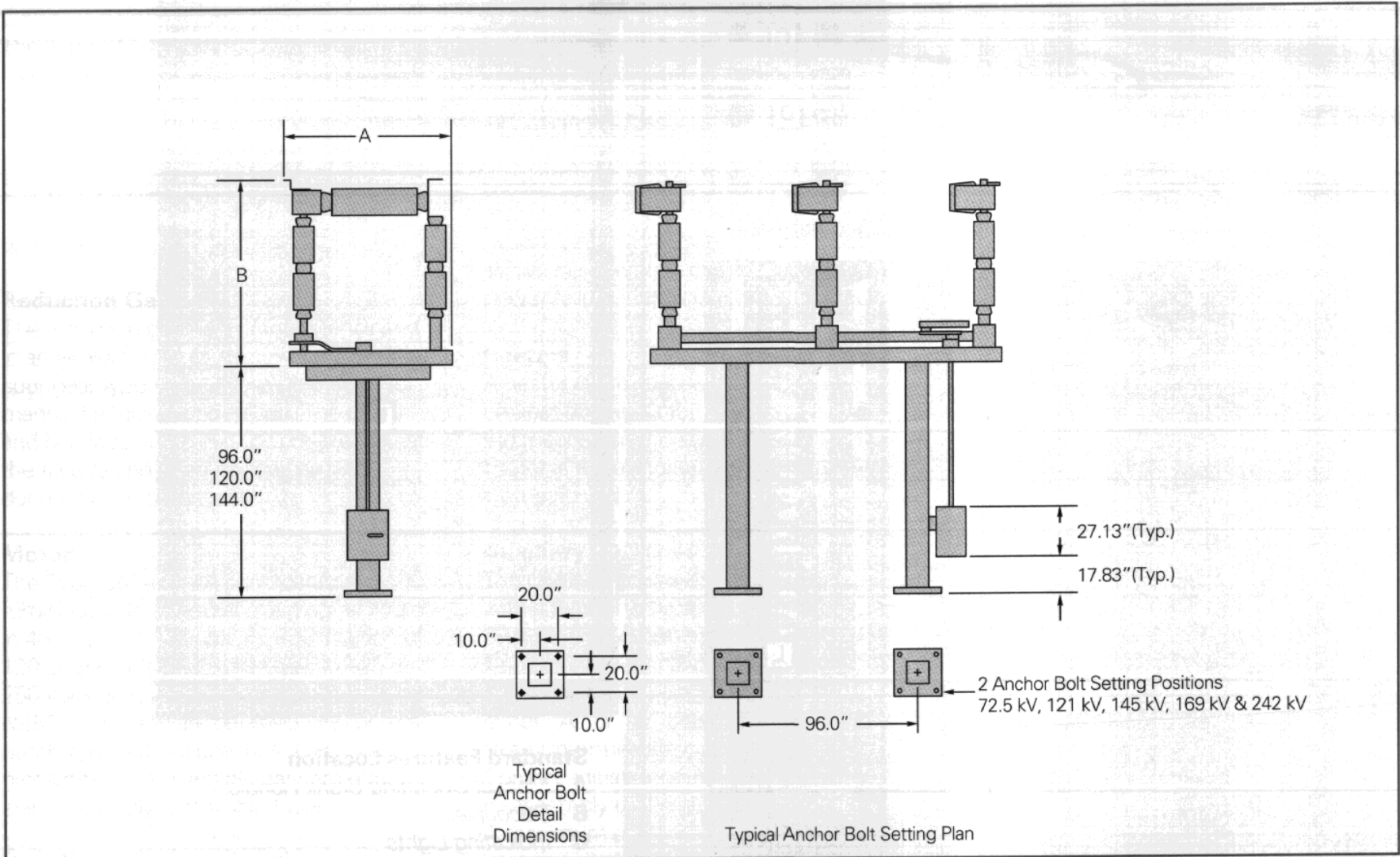
- Extra Auxiliary Switch Stages (to 16 total stages)
- View Window in Front Door
- Anodized Aluminum Cabinet
- 115/230 VAC Control Circuit (Rectified to DC)
- Local Remote Selector Switch
- Cabinet Louvers
- Fused Knife Switches
- Molded Case Circuit Breakers
- Terminal Lug for Cabinet Grounding
- Motor Overvoltage Protection
- Duplex Receptacle
- Door Actuated Light Switch

Standard Features Location

- A Manual Operating Crank Handle
- B Decoupler
- C Indicating Lights
- D Open & Close Pushbuttons
- E Operations Counter
- F Local/Remote Selector Switch
- G Hand Crank Interlock Switch
- H Motor, 48 or 125 VDC
- I Auxiliary Switches
- J Relays & Accessories
- K Hinged, Removable Door (2)
- L Terminal Blocks (2)
- M Fuses
- N Aluminum Cabinet

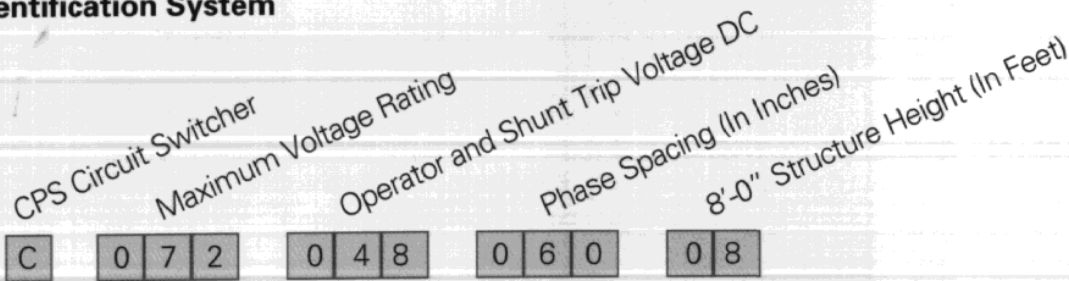
Type CPS

Dimension Data



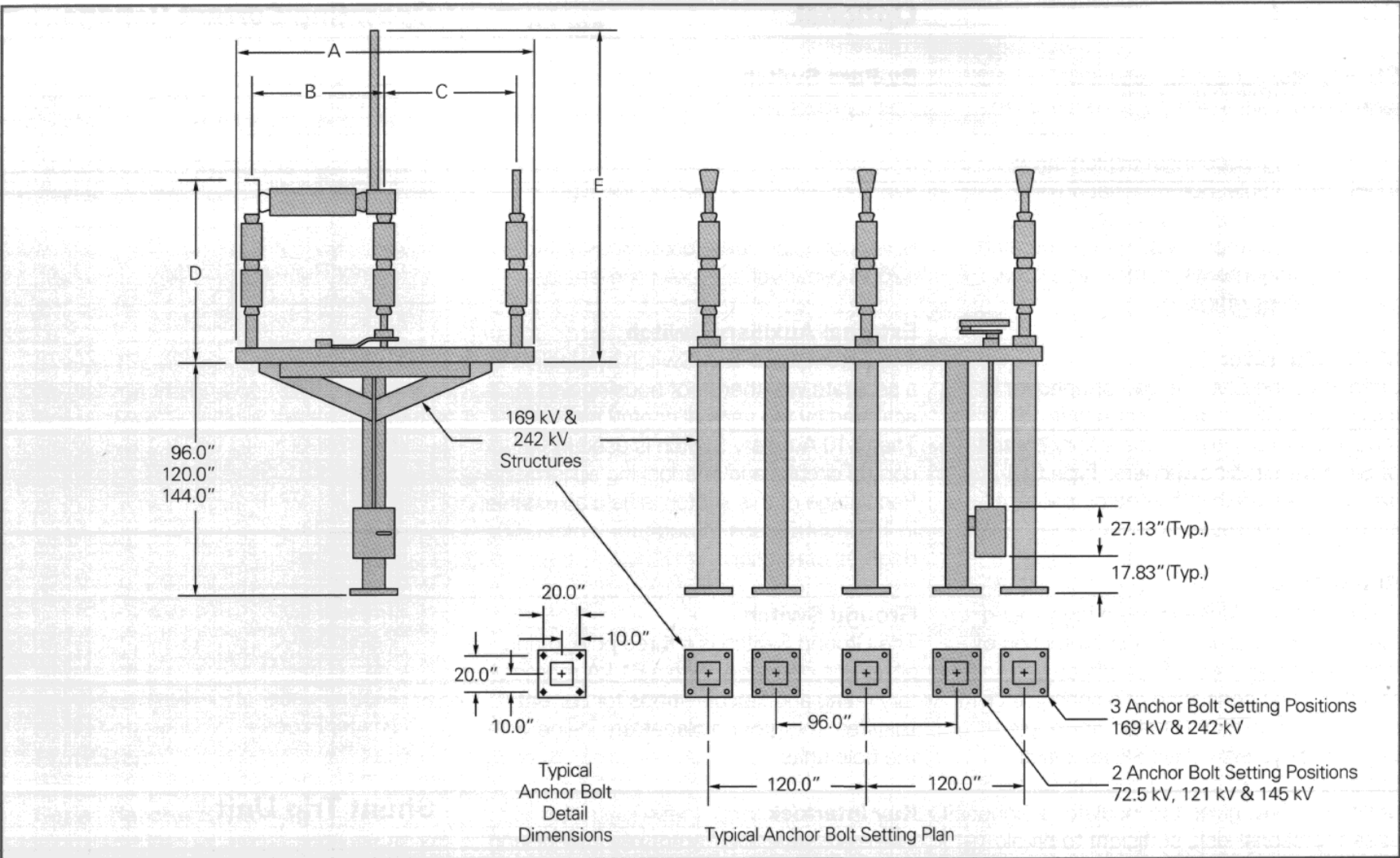
Structure Height	8'-0" (96.0")					10'-0" (120.0")					12'-0" (144.0")				
kV Rating (20 kA)	72.5	121	145	169	242	72.5	121	145	169	242	72.5	121	145	169	242
Internal kV BIL	550		650	750	900	550		650	750	900	550		650	750	900
Insul. Type (TR_ _)	276	286	288	291	304	276	286	288	291	304	276	286	288	291	304
Phase Spacing _ _ _	60	84		102		60	84		102		60	84		102	
	84	96		120		84	96		120		84	96		120	
	-	102		-		-	102		-		-	102		-	
Cat. Prefix: C_ _ _	072	121	145	169	242	072	121	145	169	242	072	121	145	169	242
48V DC	06008	08408		10208		06010	08410		10210		06012	08412		10212	
Catalog Number	08408	09608		12008		08410	09610		12010		08412	09612		12012	
C_ _ _048_ _ _ _	-	10208		-		-	10210		-		-	10212		-	
125V DC	06008	08408		10208		06010	08410		10210		06012	08412		10212	
Catalog Number	08408	09608		12008		08410	09610		12010		08412	09612		12012	
C_ _ _125_ _ _ _	-	10208		-		-	10210		-		-	10212		-	
"A" Dim. (In.)	76.0		90.25		99.0	76.0		90.25		99.0	76.0		90.25		99.0
"B" Dim. (In.)	67.4	82.4	91.4	99.4	117.4	67.4	82.4	91.4	99.4	117.4	67.4	82.4	91.4	99.4	117.4
Net Weight (Lbs.)	4992	5150	6200	6680	7369	5129	5915	6365	6991	7411	5440	6010	6460	6559	7609

Catalog Code Identification System



Type CPS-VB

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
Insul. Type (TR_ _)	276	286	288	291	304	276	286	288	291	304	276	286	288	291	304
Phase Spacing _ _ _	60	84		102		60	84		102		60	84		102	
	84	96		120		84	96		120		84	96		120	
	-	102		-		-	102		-		-	102		-	
Cat. Prefix: D_ _ _	072	121	145	169	242	072	121	145	169	242	072	121	145	169	242
48V DC	06008	08408		10208		06010	08410		10210		06012	08412		10212	
Catalog Number	08408	09608		12008		08410	09610		12010		08412	09612		12012	
D_ _048_ _ _ _	-	10208		-		-	10210		-		-	10212		-	
125V DC	06008	08408		10208		06010	08410		10210		06012	08412		10212	
Catalog Number	08408	09608		12008		08410	09610		12010		08412	09612		12012	
D_ _125_ _ _ _	-	10208		-		-	10210		-		-	10212		-	
"A" Dim. (In.)	112.0	127.0	154.5	166.5	187.5	112.0	127.0	154.5	166.5	187.5	112.0	127.0	154.5	166.5	187.5
"B" Dim. (In.)	57.3		72.5	72.5	81.5	57.3		72.5	72.5	81.5	57.3		72.5	72.5	81.5
"C" Dim. (In.)	45.0	60.0	72.0	84.0	96.0	45.0	60.0	72.0	84.0	96.0	45.0	60.0	72.0	84.0	96.0
"D" Dim. (In.)	67.4	82.4	91.4	99.4	117.4	67.4	82.4	91.4	99.4	117.4	67.4	82.4	91.4	99.4	117.4
"E" Dim. (In.)	125.0	155.0	176.0	195.0	226.0	125.0	155.0	176.0	195.0	226.0	125.0	155.0	176.0	195.0	226.0
Net Weight (Lbs.)	6161	7504	8074	9094	10531	6317	7613	8183	9197	10613	6694	7720	8284	9254	10694

Catalog Code Identification System

CPS-VB Circuit Switcher
Maximum Voltage Rating
Operator and Shunt Trip Voltage DC
Phase Spacing (In Inches)
8'-0" Structure Height (In Feet)

D 0 7 2 0 4 8 0 6 0 0 8

Accessories

Standard

Structures

Siemens circuit switchers do not require specially designed support structures. Most existing disconnect switch structures are suitable. For information on support structures, optional predesigned structures, or other 3-pole group operated control arrangements, contact your local Siemens sales office.

Motor Operator

Siemens Type CM-4AE motor operator is a torsional output, high torque unit required for remote or supervisory control of Siemens circuit switchers. Type CM-4AE features are highlighted on pages 4 and 5 of this bulletin.

Shunt Trip

A shunt trip is required where high speed tripping is necessary for fault protection of transformers and bus. Each phase has a shunt trip unit consisting of a spring, latch and solenoid within a heated housing. When the system relay senses a fault, the solenoid is energized and the spring is unlatched. This gives the insulator a high speed rotational kick, sufficient to break 3/4-inch ice. Trip coil voltages can be 48 or 125V dc, with either voltage coil drawing only 8.33 amps. Three coils in parallel draw a total of 25 amps from the time the solenoid is energized until the interrupter clears the fault, minimizing power requirements.

Auxiliary Switch

Siemens Type Q-10 Auxiliary Switch is used in control circuits and interlocking schemes. A maximum of 16 switches can be installed internally in the motor operator, with up to 12 stages considered standard. Each stage of the switch is field adjustable in 15 degree steps thru the entire 360 degrees of rotation. An external auxiliary switch is available as an option in a separate weather resistant housing, and actuated by the circuit switcher vertical control pipe.

Optional

By-Pass Switch

The By-Pass Switch allows the interrupter and disconnect switch to be opened and closed for inspection of the circuit switcher—without opening the high voltage circuit. It consists of three single pole hook stick operated devices, rated 1200A continuous, 61 kA momentary.

External Auxiliary Switch

The External Auxiliary Switch is supplied in a separate weatherproof housing and is actuated by the vertical control pipe. The Q-10 Auxiliary Switch is used in control circuits and interlocking schemes. Each stage of this switch is field adjustable in 15 degree steps through the entire 360 degrees of rotation.

Ground Switch

The Ground Switch is a three pole, manually group operated, with a 61 kA momentary rating and flexible straps for current transfer. The ground blades are in-line with the pole units.

Key Interlock

There are several different key interlocking schemes, however, the installation of two interlocking disc and lock mounting bracket is similar. The operation of the key interlock and the holes in the interlock will vary according to the protection scheme.

Technical Data

Operating Current Ratings

Device Description	48VDC (Amps)	125VDC (Amps)
Motor Inrush Current	75	33
Motor Running Current	15	7.5
Trip Coil Currents	24	24
Reversing Contactor Coil	1	0.5
Anti—Pump Relay Coil	0.2	0.1
Time Delay Relay Coil	0.2	1
Motor Fuses	30	15
Heater Fuses	30	15

Shunt Trip Unit

Description	Ohms
145 VDC Trip Coil Res.	15.5
48 VDC Trip Coil Res.	5.7
Heater Resistance	500

Circuit Switcher Application Guide

Type CPS and CPS-VB 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	Grounded reactors applied on solidly grounded systems only, thru 145 kV	600
	Current Switching	Ungrounded reactors, 72.5 kV only	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 (the secondary-side fault current as reflected on the primary side of the transformer, assuming an infinite zero impedance-source) 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.

Siemens Energy & Automation Sales Offices

Alabama

Birmingham
(205) 879-7030
Mobile
(334) 621-0822
Montgomery
(334) 271-4486

Alaska

Anchorage
(907) 346-2489

Arizona

Phoenix
(602) 944-7956

Arkansas

Little Rock
(501) 897-1385

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Fresno
(209) 264-5018
Los Angeles
(714) 979-6600
Sacramento
(916) 631-9433
San Diego
(619) 569-8015
San Francisco
(510) 429-1200

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Colorado Springs
(719) 473-7880
Denver
(303) 694-3770
Ft. Collins
(303) 223-2712

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Wallingford
(203) 265-5003

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(305) 484-3888
Fort Myers
(813) 656-3605
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(904) 363-0087
Miami
(305) 592-4106
Orlando
(407) 894-7771
Tampa
(813) 287-2450
West Palm Beach
(407) 627-7408

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(770) 458-4353
Macon
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Savannah
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Honolulu
(808) 533-7135

Idaho

Boise
(208) 342-6852

Illinois

Chicago
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Peoria
(309) 689-0823

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(812) 422-9176
Fort Wayne
(219) 490-6999
Indianapolis
(317) 848-5500
South Bend
(219) 232-6050

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Des Moines
(515) 280-1614

Kansas

Wichita
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Kentucky

Louisville
(502) 426-4647

Louisiana

Baton Rouge
(504) 387-6987
New Orleans
(504) 837-8500
Shreveport
(318) 424-0720

Maine

Portland
(207) 854-0021

Maryland

Landover
(301) 459-2044

Massachusetts

Andover
(508) 685-6077
Worcester
(508) 792-4566

Michigan

Detroit
(810) 253-6449
Grand Rapids
(616) 530-9777

Minnesota

Minneapolis
(612) 942-8888

Mississippi

Jackson
(601) 936-9360

Missouri

Kansas City
(913) 491-3740
St. Louis
(314) 567-3900

Nebraska

Omaha
(402) 397-1940

Nevada

Las Vegas
(702) 734-1022

New Hampshire

Manchester
(603) 626-0702

New Jersey

Cranford
(908) 276-7227

New Mexico

Albuquerque
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Buffalo
(716) 834-3815
Long Island
(516) 484-7560
Syracuse
(315) 453-2935

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Asheville
(704) 253-8299
Charlotte
(704) 536-1201
Greensboro
(910) 852-1758
Raleigh
(919) 782-3365
Wilmington
(910) 313-0034

North Dakota

Bismarck
(701) 258-9555
Fargo
(701) 293-7709

Ohio

Cincinnati
(513) 398-9288
Cleveland
(216) 642-0701
Columbus
(614) 766-2204
Dayton
(513) 279-0458
Toledo
(419) 893-7197
Wooster
(216) 262-3268

Oklahoma

Oklahoma City
(405) 235-7515
Tulsa
(918) 665-1806

Oregon

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(503) 635-6700

Pennsylvania

Philadelphia
(215) 646-3800
Pittsburgh
(412) 788-8060
York
(717) 854-9776

Rhode Island

Providence
(401) 732-9966

South Carolina

Columbia
(803) 359-7715
Greenville
(803) 288-3490

Tennessee

Chattanooga
(423) 267-7412
Johnson City
(423) 434-9270
Knoxville
(615) 690-5172
Memphis
(901) 761-2123
Nashville
(615) 367-9403

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