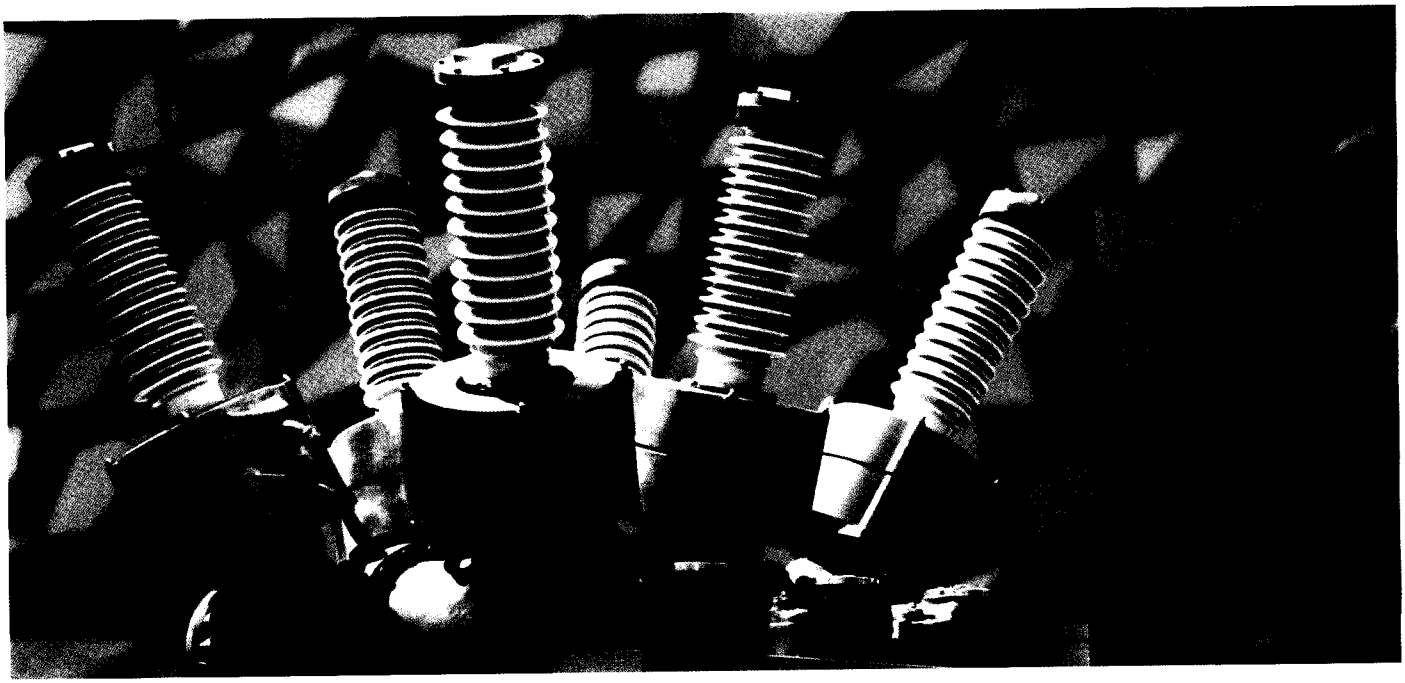
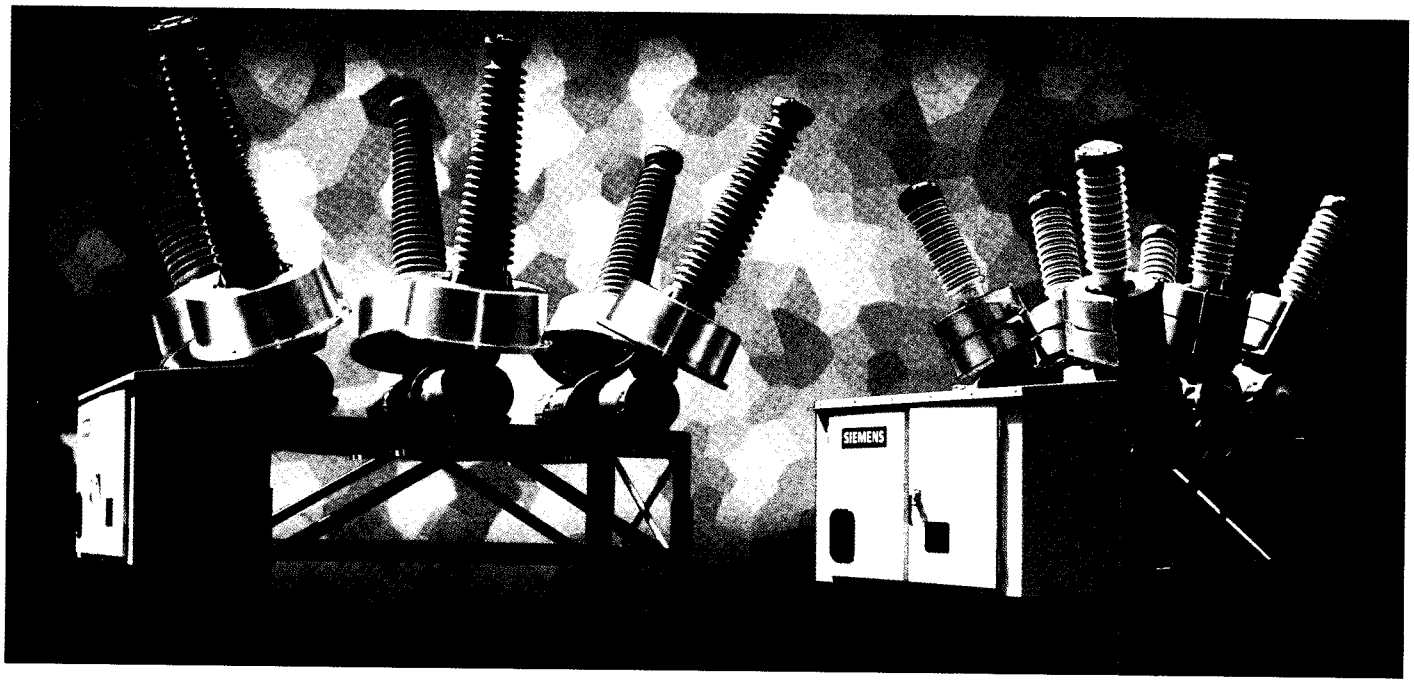
SIEMENS

The SPS2 Circuit Breaker

(15-170kV)
Longer Operating Life—Lower Maintenance Costs



SPS2—A New Generation of Circuit Breakers



The new SPS2 is not just another circuit breaker, it's a better circuit breaker. With the ability to handle 40kA without capacitors, three-cycle interruption, -40° C/F without tank heaters at 69kV and a simple one-time adjustment—SPS2 is the result of combined global engineering and major product improvements.

A Family Of Circuit Breakers Designed To Your Specifications

Siemens took the best of what breaker technology has to offer and brought them together into one circuit breaker to offer reliable performance for a wide range of voltage requirements. Whether you need 15kV right up through 170kV, the SPS2 can meet your requirements.

Each component of the SPS2 is made in our state-of-the-art manufacturing facility which is quality certified to ISO 9001 standards. This precision manufacturing allows Siemens to make quality products which are used in thousands of installations worldwide.

Siemens combines the latest in circuit breaker technology with the economies of a streamlined, closely monitored production process at the Siemens Power Transmission & Distribution plant

in Jackson, MS to ensure both measurable quality improvements and cost containment. And to ensure product performance and customer satisfaction, the SPS2 is tested to ANSI and IEC standards in the world's largest laboratory.

Siemens Quality Inside And Out

The durable dead-tank construction of the SPS2 circuit breaker means reliable, long-lasting performance in demanding operating conditions. Seismically qualified with a leak rate of less than 1% annually, the SPS2 has been tested to 6,000 mechanical operations and 3,000 operations at 6kA. Global components include the FA2 mechanism, 3AP arc-assist interrupter, rupture disks for each interrupter, porcelain or composite bushings with provision for two CT's per bushing — all factory assembled and tested with no field adjustments necessary.

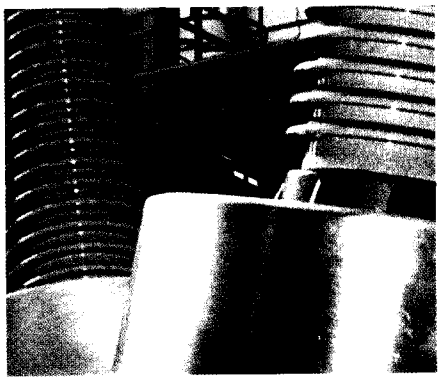
Why SPS2 Outperforms The Rest

The SPS2 circuit breaker uses arc-assist interrupter technology—the second generation of this latest technology developed as a result of the successful arc-assist interrupters used in Siemens circuit breakers worldwide. Instead of the standard puffer mechanism that utilizes compression only, arc-assist uses temperature build-up to quench the arc. With fewer moving parts your maintenance costs are reduced while increasing the operational life of your circuit breaker.

The SPS2—Circuit Breaker Technology To See You Through Deregulation

At a time when the utility industry is taking a cautious stance in the face of deregulation, Siemens is planning for the future. It's a position you'd expect from a company that has been there through the ups and downs of the power industry.

Siemens is investing in research and development in order to manufacture the products you need now and will want in years to come. The SPS2 is more than just a better breaker. It's designed to perform more reliably under the most demanding specifications — yours.



Ratings and Specifications–(15-72kV)

Identification	Ratings								Related Capabilities		
	Voltage			Insulation		Current			Current Values — Amperes		
Type	Nominal kV Class	Rated Max kV	Rated Voltage Range Factor	Low Freq. (kV, rms)	Impulse (kV, Crest)	Rated Continuous Current (kA, rms)	Rated Short Circuit Current at Rated Max. kV	Interrupting Time (Cycles)	Maximum Symmetrical Interrupting Capability	3-Sec. Short Time Current Carrying Capability	Closing and Latching Capability
SPS2 – 15.5-31.5	14.4	15.5	1.0	50	110	1200/4000	31,500	3	31,500	31,500	85,000
SPS2 – 15.5-40	14.4	15.5	1.0	50	110	1200/4000	40,000	3	40,000	40,000	108,000
SPS2 – 25.8-20	23.0	25.8	1.0	60	150	1200/4000	20,000	3	20,000	20,000	54,000
SPS2 – 25.8-31.5	23.0	25.8	1.0	60	150	1200/4000	31,500	3	31,500	31,500	85,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Supplementary Specifications

Voltage

DESCRIPTION	UNIT	SPS2 15.5	SPS2 25.8	SPS2 38	SPS2 48.3	SPS2 72.5
Lightning Impulse Withstand Voltage						
Chopped Wave 2µs	kV	142	194	258	322	452
Chopped Wave 3µs	kV	126	172	230	288	402
Rated Normal Current (10[4])	A	12/20/31.5/40	12/20/31.5/40	12/20/31.5/40	12/20/31.5/40	12/20/31.5/40
Normal Frequency	Hz	60	60	60	60	60
Optional Frequency	Hz	50	50	50	50	50
Rated Permissible Tripping Delay (Y)	s	2	2	2	2	2
Auxiliary Voltage	Vac	115/230				
Operating Mechanism	—	Spring ("OCO")				
Trip Coils		Single (standard) – Dual (optional)				
Trip and Close Coil Rating	Vdc	48/125/250				
Breaks Per Phase	—	1				
Contact Gap	in	3.5				
Phase Spacing	in	37.0				
Seismic Withstand Standard	g	0.3 Dynamic				
Optional	g	0.5 Dynamic				
Rated Voltage Range Factor	(k)	1.0				
RIV at 1000 kHz	µV	<<500				

Current

DESCRIPTION	UNIT	20kA	31.5kA	40kA
Rated Short Circuit Current	kA	20	31.5	40
Rated Making Current	kA	20	31.5	40
Closing and Latching Capability				
rms	kA	32	50	64
peak	kA	54	85	108
Capacitance Switching				
General Purpose				
Overhead Line	A		100	
Isolated Current	A		250	
Definite Purpose				
Overhead Line	A		100	
Isolated Current	A		630	
Asymmetrical Int. Capability Ratio (S)	—		1.2	
Normal Operating Temperature Range				
Standard	°C		-40°C to 55°C	
Special	°C		-50°C to 55°C	
Closing Time (total)	ms		100	
Rated Reclosing Time	Cycles		12	
Rated Duty Cycle	—		OCO-10S-CO (No derating)	
External Creep				
Standard	in	50.5	50.5	50.5
Special	in	73	73	73
External Strike To Ground				
Standard	in	23	23	23
Special	in	27	27	27
Qty. SF_6	lbs		28	
SF_6 Pressure	psig		65 @ 68° F/20° C	

Ratings and Specifications–(121-145-170kV)

Identification	Ratings								Related Capabilities		
	Voltage			Insulation		Current			Current Values — Amperes		
Type	Nominal kV Class	Rated Max kV	Rated Voltage Range Factor	Rated Withstand Test Voltage Low Freq. (kV, rms)	Rated Withstand Test Voltage Impulse (kV, Crest)	Rated Continuous Current (kA, rms)	Rated Short Circuit Current at Rated Max. kV	Interrupting Time (Cycles)	Maximum Symmetrical Interrupting Capability	3-Sec. Short Time Current Carrying Capability	Closing and Latching Capability
SPS2 – 121-20	115	121	1.0	260	550	1200/4000	20,000	3	20,000	20,000	54,000
SPS2 – 121-31.5	115	121	1.0	260	550	1200/4000	31,500	3	31,500	31,500	85,000
SPS2 – 121-40	115	121	1.0	260	550	1200/4000	40,000	3	40,000	40,000	108,000
SPS2 – 121-50	115	121	1.0	260	550	1200/4000	50,000	3	50,000	50,000	135,000
SPS2 – 121-63	115	121	1.0	260	550	1200/4000	63,000	3	63,000	63,000	170,000
SPS2 – 145-20	138	145	1.0	310	650	1200/4000	20,000	3	20,000	20,000	54,000

Supplementary Specifications

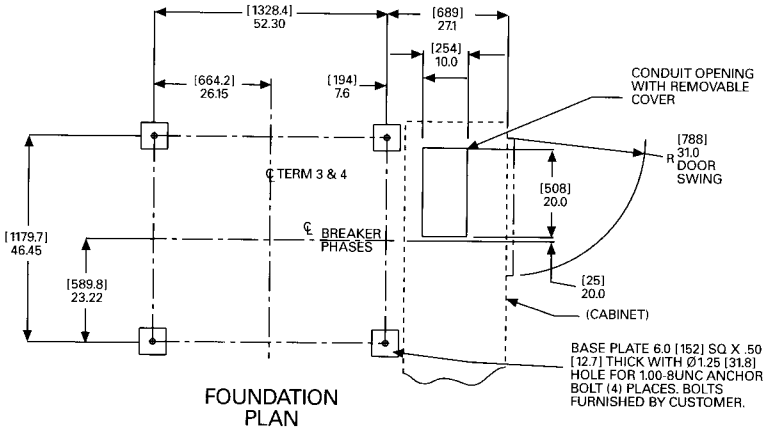
Voltage

DESCRIPTION	UNIT	SPS2 121	SPS2 145	SPS2 170
Lightning Impulse Withstand Voltage				
Chopped Wave 2µs	kV	710	838	968
Chopped Wave 3µs	kV	632	748	862
Rated Normal Current (10²)	A	12/20/31.5/40	12/20/31.5/40	12/20/31.5/40
Normal Frequency	Hz	60	60	60
Optional Frequency	Hz	50	50	50
Rated Permissible Tripping Delay (Y)	s	1	1	1
Auxiliary Voltage	Vac	115/230		
Operating Mechanism	—	Spring ("OCO")		
Trip Coils		Single (standard) – Dual (optional)		
Trip and Close Coil Rating	Vdc	48/125/250		
Breaks Per Phase	—	1		
Contact Gap	in	3.5		
Phase Spacing	in	68.4		
Seismic Withstand				
Standard	g	0.3 Dynamic		
Optional	g	0.5 Dynamic		
Rated Voltage Range Factor	(k)	1.0		
RIV at 1000 kHz	µV	<<500		

Current

DESCRIPTION	UNIT	20kA	31.5kA	40kA	50kA	63kA
Rated Short Circuit Current	kA	20	31.5	40	50	63
Rated Making Current	kA	20	31.5	40	50	63
Closing and Latching Capability						
rms	kA	32	50	64	80	101
peak	kA	54	85	108	135	170
Capacitance Switching						
General Purpose						
Overhead Line	A			100		
Isolated Current	A			250		
Definite Purpose						
Overhead Line	A			100		
Isolated Current	A			315		
Asymmetrical Int. Capability Ratio (S)	—			1.2		
Normal Operating Temperature Range						
Standard	°C			-30°C to 55°C		
Special	°C			-40°C/-50°C to 55°C		
Closing Time (total)	ms			100		
Rated Reclosing Time	Cycles			12		
Rated Duty Cycle	—			OCO-10S-CO (No derating)		
External Creep						
Standard	in	131	131	131	131	131
Special	in	144	144	144	144	144
External Strike To Ground						
Standard	in	46	46	46	46	46
Special	in	53	53	53	53	53
Qty. SF_6	lbs			75		
SF_6 Pressure	psig			87 @ 68° F/20° C		

Dimension Data – 15-72kV



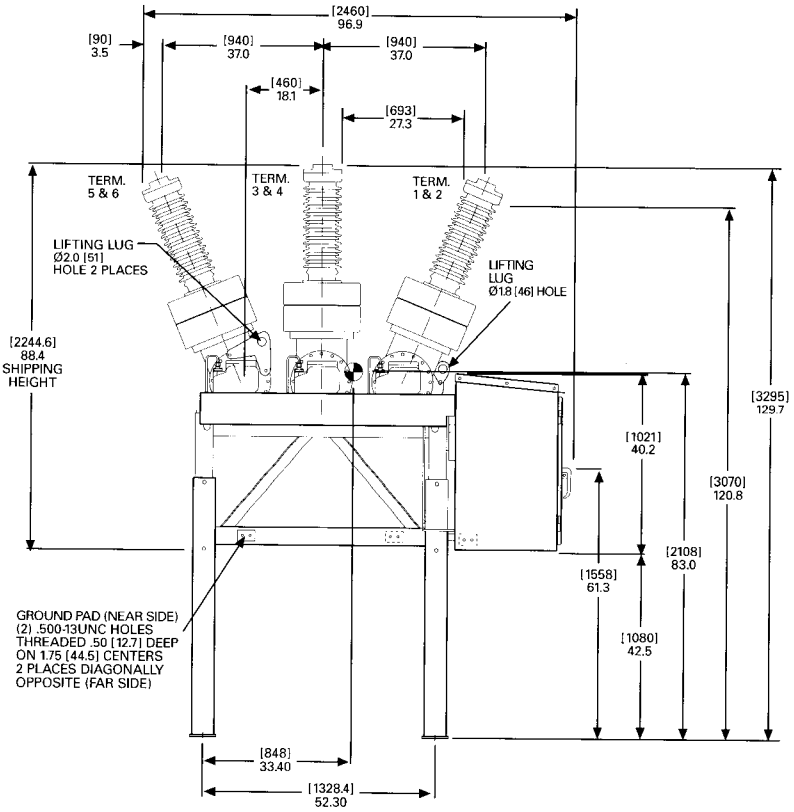
FOUNDATION
PLAN

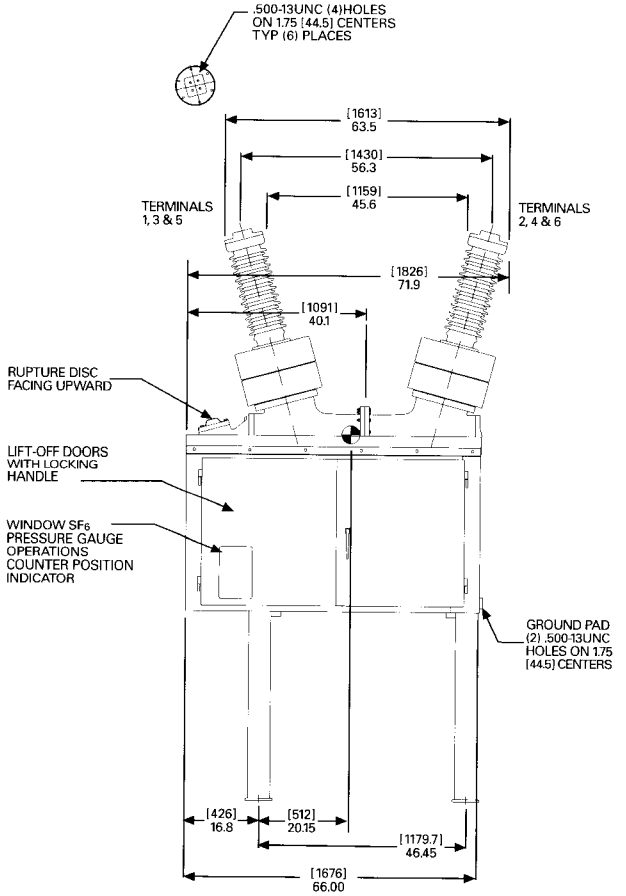
NOTES:

1. Metric Dimensions [XX.X] in millimeters.
2. Center of gravity is calculated with an equal number of CT's on each of six bushings.

APPROXIMATE WEIGHTS

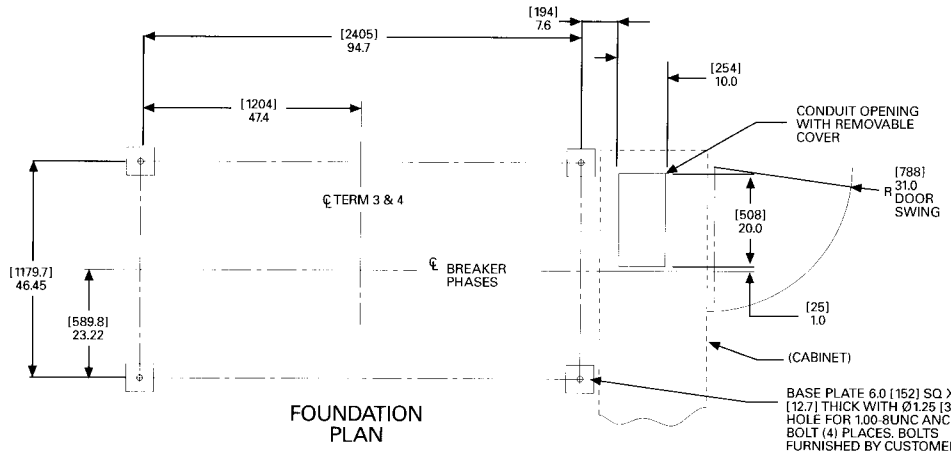
Breaker Complete .....4000lb [1814kG]
SF_6.....28lb [13kG]
Foundation Reaction .....Negligible
Porcelain Bushings, 50.5" [1282] Creep Minimum





Dimensions only for reference, not for construction purposes.

Dimension Data – 121, 145kV-40kA



FOUNDATION
PLAN

NOTES:

1. Metric Dimensions [XX.X] in millimeters.

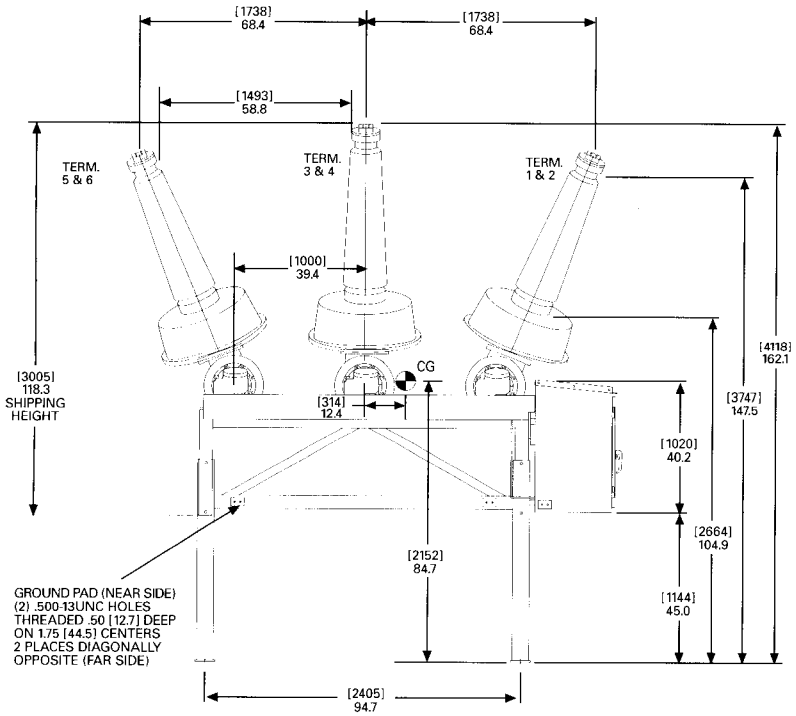
APPROXIMATE WEIGHTS

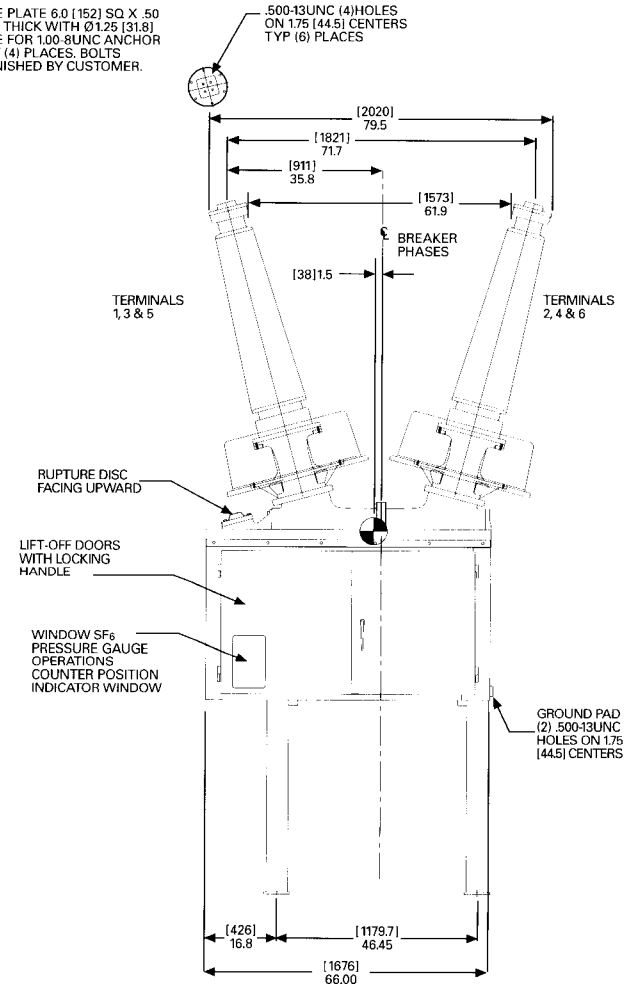
Breaker Complete .....7200lb [3266kG]

SF_6.....58lb [34kG]

Foundation Reaction .....Negligible

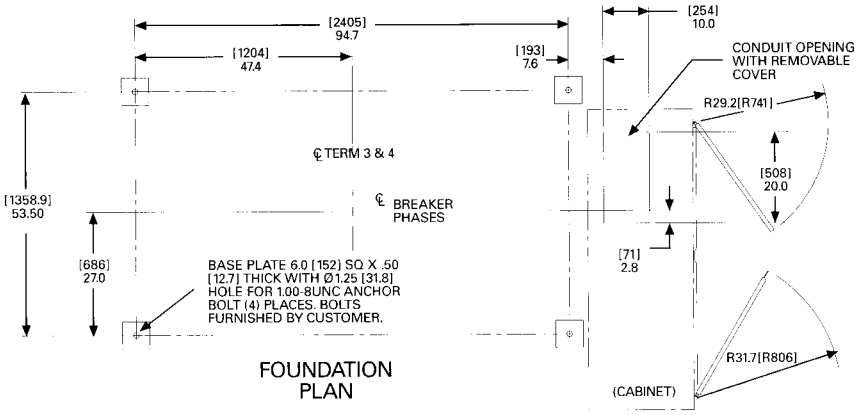
Porcelain Bushings, 131" [3327] Creep Minimum





Dimensions only for reference, not for construction purposes.

Dimension Data – 121, 145, 170kV-50/63kA



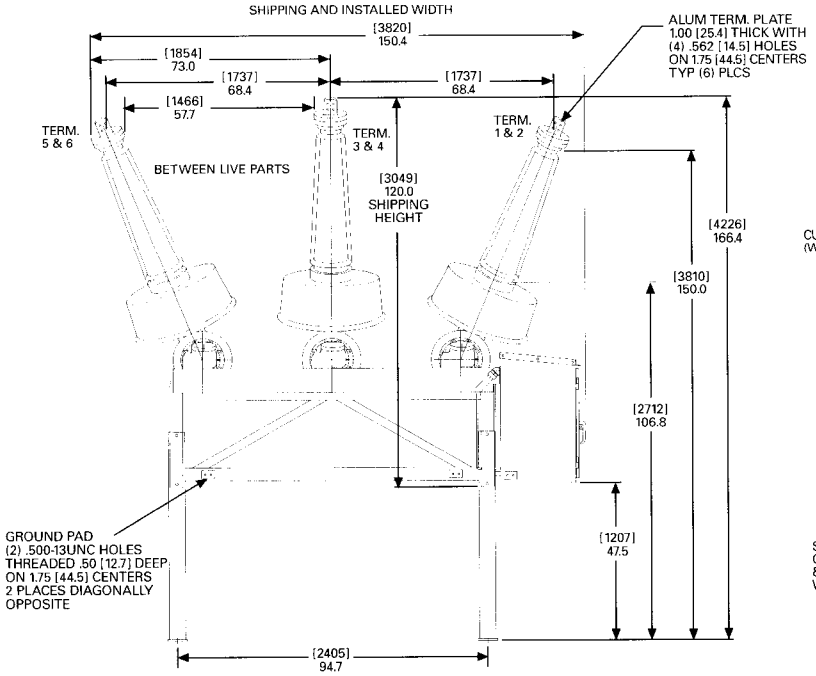
FOUNDATION
PLAN

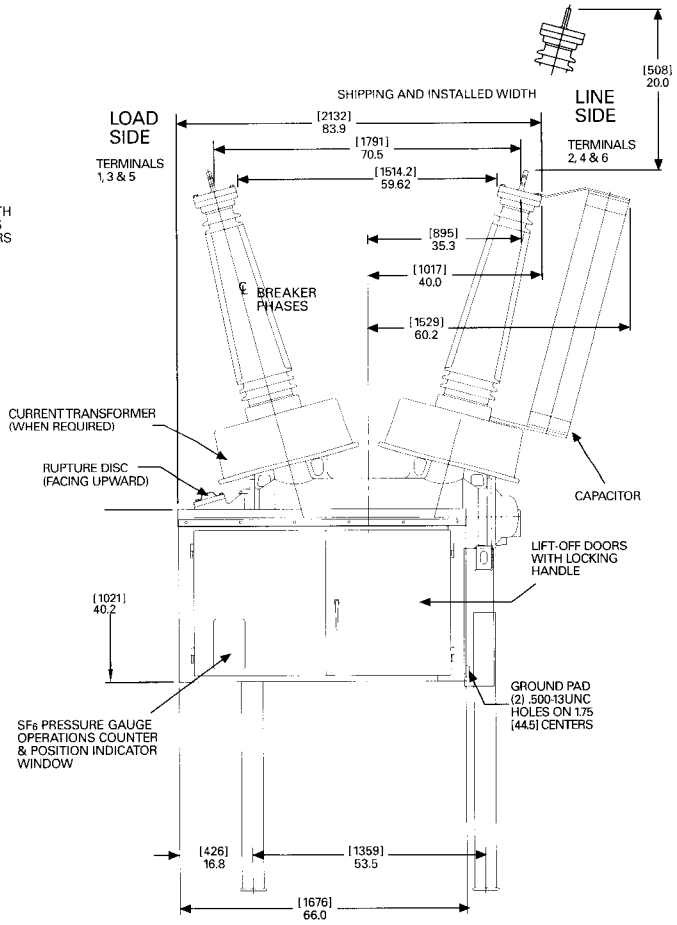
NOTES:

1. Metric Dimensions [XX.X] in millimeters.
2. Clearance required for insulator removal.

APPROXIMATE WEIGHTS

Breaker Complete .....7200lb [3266kG]
SF_6.....75lb [34kG]
Foundation Reaction .....Negligible
Porcelain Bushings, 131" [3327] Creep Minimum





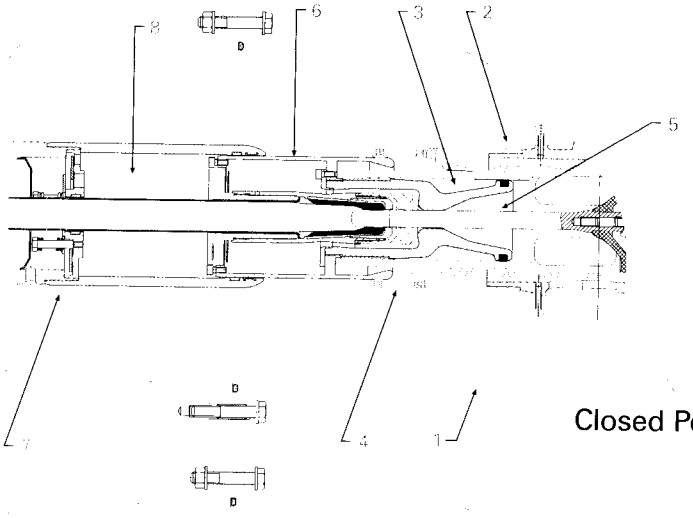
Dimensions only for reference, not for construction purposes.

Interrupter Unit – Arc Quenching

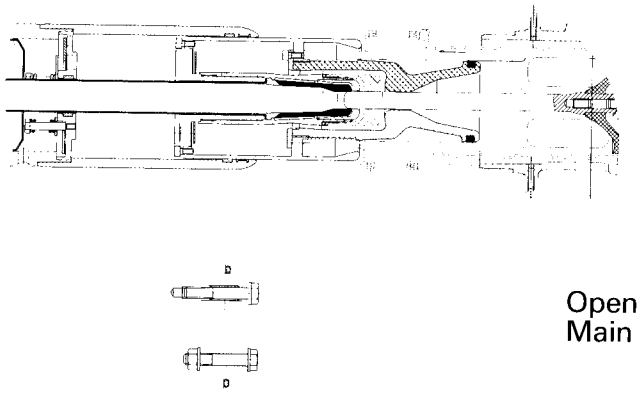
The durable construction of the SPS2 circuit breaker includes the field proven 3AP arc-assist interrupter. Each interrupter consists of a stationary contact assembly and a moving contact assembly mounted inside a pole unit housing.

During the opening operation the puffer action in the compression cylinder of the 3AP interrupter is sufficient for low current faults and switching operations. During high current interruptions, heat from the arc causes the pressure to rise in the heating volume chamber. The resulting high pressure gas, from the heating volume, extinguishes the arc.

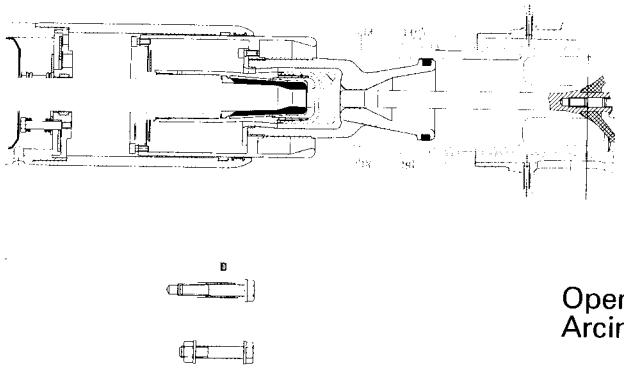
This arc-assist technology coupled with our FA2 spring-stored energy operator assures that the components are subjected to less stress which results in optimal operating reliability.



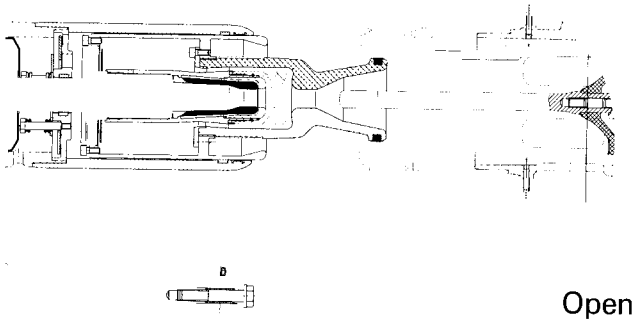
Closed Position



Opening
Main contact open



Opening
Arcing contact open



Open Position

KEY:

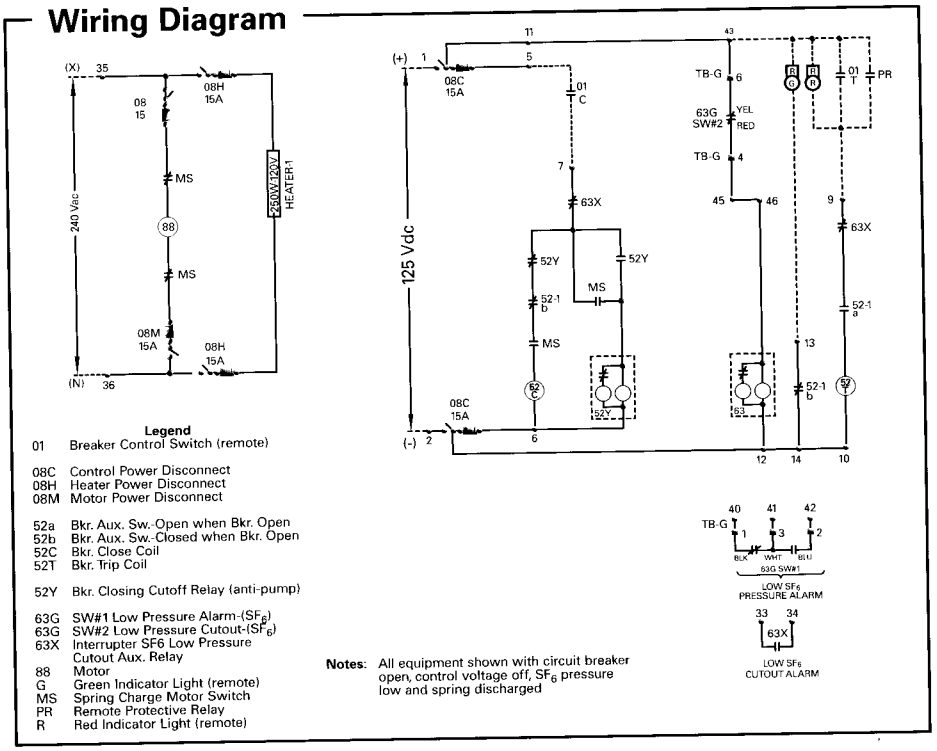
1 Aluminum Housing
2 Stationary Contact Support
3 Nozzle
4 Main Contact
5 Arcing Contact
6 Heating Volume
7 Moving Contact Support Base
8 Compression Cylinder

Spring Charged Operating Mechanism

The SPS2 is the product of tried and proven performance in the field. Our reputation for quality and extensive global experience are captured in the design principles of this circuit breaker. For starters, more than 2,000 installations worldwide are up and running testimonies to the reliability of the spring-stored-energy FA2 mechanism. This mechanism is fully equipped with a closing and opening spring fitted inside a common housing.

The operating mechanism incorporates roller bearings that allow wear-free transmission of forces and thus ensures a long service life. The charging gear, with its long-wearing spur wheels and its principle of no-load decoupling, is another component that ensures maintenance-free operation. Low operating mechanism force assures that the transmission elements are subjected to less stress resulting in optimal operating reliability.

Wiring Diagram



Legend

01	Breaker Control Switch (remote)
08C	Control Power Disconnect
08H	Heater Power Disconnect
08M	Motor Power Disconnect
52a	Bkr. Aux. Sw.-Open when Bkr. Open
52b	Bkr. Aux. Sw.-Closed when Bkr. Open
52C	Bkr. Close Coil
52T	Bkr. Trip Coil
52Y	Bkr. Closing Cutoff Relay (anti-pump)
63G	SW#1 Low Pressure Alarm-(SF_6)
63G	SW#2 Low Pressure Cutout-(SF_6)
63X	Interrupter SF6 Low Pressure Cutout Aux. Relay
88	Motor
G	Green Indicator Light (remote)
MS	Spring Charge Motor Switch
PR	Remote Protective Relay
R	Red Indicator Light (remote)

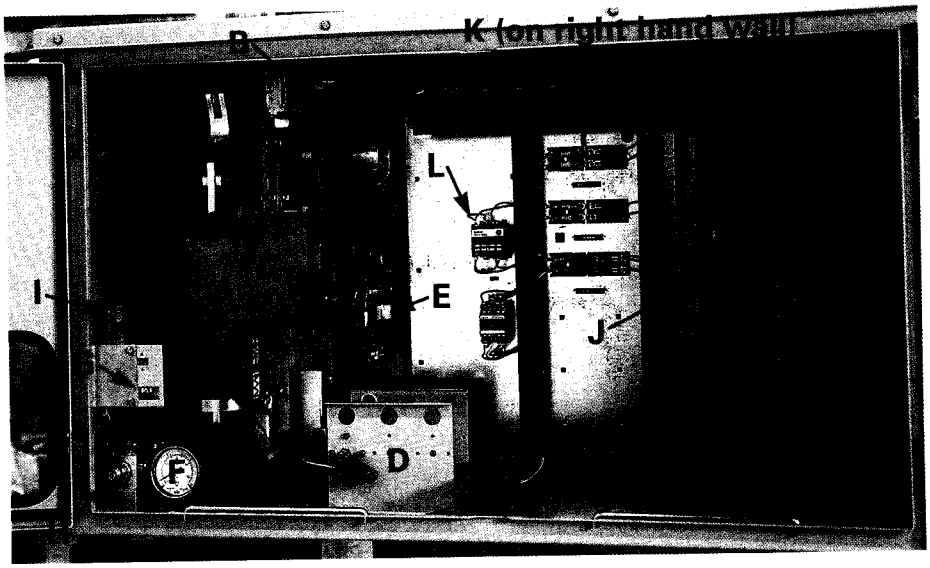
Notes: All equipment shown with circuit breaker open, control voltage off, SF_6 pressure low and spring discharged

Control Power Requirements

Rated Voltage	48 VDC	125 VDC	250 VDC	115 VAC	230 VAC
Trip Coil Current (amps)	20	12.0	6.7	12.0	6.7
Close Coil Current (amps)	4.6	1.9	6.7	2.5	6.7

Spring Charged Operating Mechanism.....

- **A.** Opening Spring
- **B.** Close Coil
- **C.** Trip Coil
- **D.** Auxiliary Switches
- **E.** Motor (125VDC/120VAC)
- **F.** SF_6 Pressure Gauge
- **G.** Open/Close Indicator
- **H.** SF_6 Fill Connection
- **I.** SF_6 Density Switch
- **J.** Control Terminal Blocks
- **K.** Transformer Terminal Blocks (on right hand wall)
- **L.** Control Relay (on back panel)



Getting the Best Breaker For Your Needs

In considering any circuit breaker, today's utilities must be concerned not only with initial price and installation, but also with the ongoing costs of ownership. The Siemens SPS2 wins in every category. It's relatively low price tag, simple installation, and easy maintenance will continue to pay dividends decades into the future.

In addition to the reliable performance you can expect from your SPS2 breaker, you'll also find it can handle a number of special requirements, such as:

- Switching capacitors, cables and reactors
- Environmentally restricted sites requiring oil sumps
- System stability problems requiring three-cycle interrupting
- Reclosing duty without de-rating interrupting capability
- High contamination zones that require extra creep and low contamination weather sheds
- High altitude application up to 10,000 feet without de-rating

Basic Breaker

The standard basic breaker includes:

1. Three-pole SF_6-filled outdoor power circuit breaker with three SF_6 interrupters
2. Set of four galvanized steel legs
3. Light gray standard color
4. Six light gray SF_6 filled bushings
5. Six relaying accuracy bushing current transformers
6. Trip-free spring operating mechanism
7. Instrumentation to monitor SF_6 gas pressure and provide low pressure alarm
8. Twelve stage auxiliary switch; eight stages for customer use
9. Trip coil and close coil
10. Cabinet heater to prevent condensation
11. Necessary terminal blocks and wiring
12. Operations counter
13. Fused knife switches (3)
14. Grounding pads (3)
15. Mechanical position indicator
16. Provision for travel recorder attachment
17. SF_6 gas for initial filling
18. Set of special hand tools required for installation

Operational Modifications

1. Extra BCTs
2. Metering accuracy BCTs
3. Extra creepage bushings
4. Capacitor trip
5. Relays for reclosing or non-reclosing breaker application
6. External pull to trip handle
7. Cabinet light and convenience outlet
8. Special heaters and cabinet insulation for operation down to -50°C
9. One or two additional 12-pole auxiliary switches
10. Dual trip coils
11. Control switch
12. Local/remote switch

Bushing Current Transformers

External bushing current transformers are mounted in weatherproof housings on both sides of the breaker. Their leads terminate in the control cabinet at short circuiting type terminal blocks. Space is available for mounting two current transformers per bushing. Up to three CT's can be supplied at 121kV and above.

How To Order

When ordering a Type SPS2 breaker, specify the following:

1. Breaker type and rating
2. Trip voltage (see Ratings Section)
3. Close voltage (see Ratings Section)
4. Motor voltage: 120 Vac/125 Vdc, 240 Vac/250 Vdc
5. Heater voltage: 115, 230 Vac
6. BCTs: type, ratio, number, location
7. Terminals: specify in detail if desired
8. Include customer specifications covering special equipment, accessories, test, etc.

	Accuracy ②	
Ratio ①	ANSI	IEC
600:5 MR	C-100	5P10@15VA
600:5 MR	C-200	10P20@50VA
1200:5 MR	C-200	CLASS0.5@30VA
1200:5 MR	C-400	CLASSX
2000:5 MR	C-400	10P20@50VA
2000:5 MR	C-800	CLASS0.5@30VA
3000:5 MR	C-800	CLASS0.5@30VA
300:5 SR	0.6B-0.5	CLASS0.25@20VA
600:5 SR	0.3B-0.5	5P20@20VA
600/1200:5 DR	0.3B-0.5/0.3B-1.0	10P20@50VA
1200:5 SR	0.3B-1.0	CLASS0.2@15VA
2000:5 SR	0.3B-2.0	CLASS0.2@15VA

① Ratio
MR = Multiple Ratio
SR = Single Ratio
DR = Dual Ratio

② Accuracy
C = Relay Accuracy
B = Meter Accuracy

③ Typical Ratios
Special Ratios Available Upon Request

SIEMENS

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