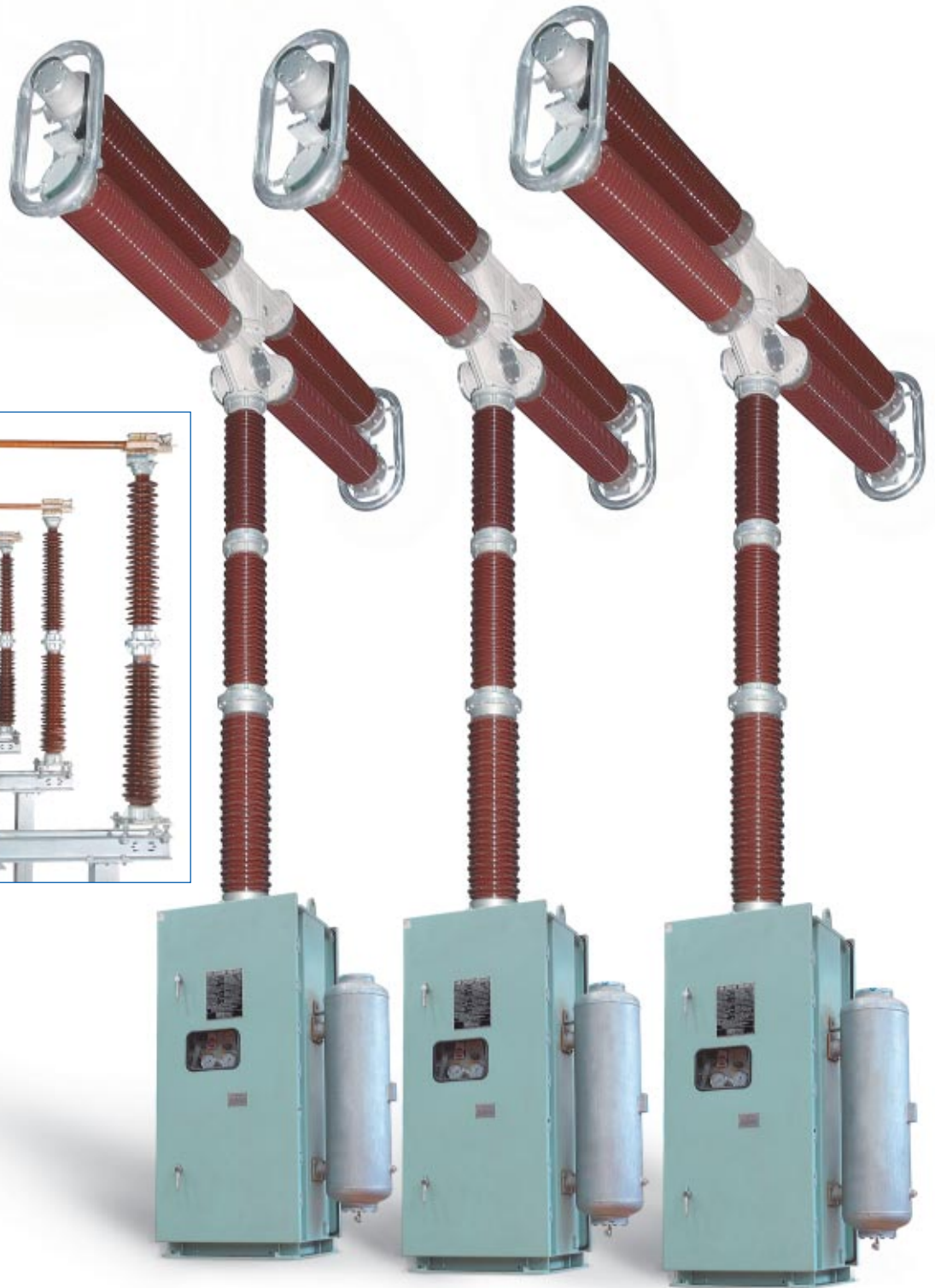
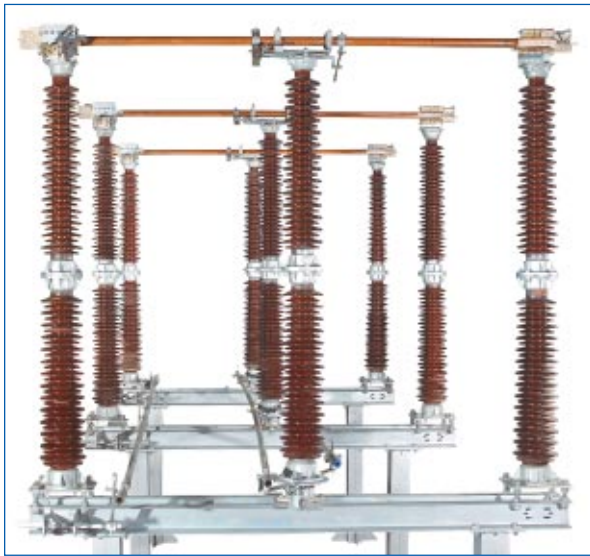




Smart solutions.  
Strong relationships.

# SF<sub>6</sub>-Gas Circuit Breakers & Disconnectors



ISO 14001:2004  
OHSAS 18001:1999  
Integrated Management System

Bureau Veritas  
Certification



ISO 9001

BUREAU VERITAS  
Certification





CG House, Mumbai

### Business Edge

The Switchgear Works of Crompton Greaves is located on a 1,32,540 sq.mtrs. plot in Nashik on the Mumbai Agra National Highway and is demarcated in four main divisions: HV & EHV SF<sub>6</sub> Gas Switchgear, HV & EHV Instrument Transformer, Medium Voltage Vacuum Switchgear and Lightning Arresters. Operations commenced in 1980 with the manufacture of Medium Voltage Switchgear, which was relocated from Kanjur Mumbai Works & extended to all range of MV, HV, EHV & UHV Products.

A specialised Business Unit spearheads the export thrust for in-house products as well as carefully out-sourced synergistic products for supply to Trade, Industry, OEMs and Power Utilities.

Our regional establishments throughout India have factory-trained personnel to provide prompt pre & after sales service, supporting our marketing & service personnel located at the factory.



SF<sub>6</sub> Breaker 245 kV



## Introduction

Crompton Greaves Ltd. is one of the leading manufacturers of SF<sub>6</sub> Gas Circuit Breakers in the world. We manufacture Gas Circuit Breakers ranging from 24kV to 800kV.

More than 30,000 Crompton Greaves make SF<sub>6</sub> Gas Circuit Breakers up to 420kV rating have been put into service in various environments in many countries since 1983 where they are operating satisfactorily.

Crompton Greaves has developed 800kV GCB with Spring-Pneumatic Mechanism indigenously with its own R&D efforts. The rating of the GCB is 800kV, 3150A, 50kA.

Crompton Greaves has also developed breakers for -40 Deg application & 60Hz frequency requirement.

Our Manufacturing units systems are certified with ISO 9001, ISO 14001 for environment control & OHSAS 18001.

At Crompton Greaves there is always a passion for quality. A quality trust mark has emerged as Crompton's biggest brand ambassador. In fact, this is reflected through quality certifications for its products and services. Further the commitment to responsible business through quality, technology and productivity.

The company has made considerable progress towards integration of the Six Sigma methodology in its manufacturing processes with the ultimate aim of achieving 'Product Quality as Perceived By Consumer'. This methodology was actively pursued for products for which Critical to Quality (CTQ) characteristics were identified based on market feedback. Regional team has also been trained in Six Sigma technology for capture of customer's voice.

In addition to this, the company has also introduced stringent control measures with suppliers to ensure that inputs support the Six Sigma quality. In fact, all these measures have resulted in manifold

improvement in the CTQs with substantial reduction in defects.

All the SF<sub>6</sub> Gas Circuit Breakers are type tested as per the IEC 62271-100 requirements in various world known testing Laboratories like CESI Italy, KEMA Netherlands, KERI South Korea & CPRI India.

Depending upon the application, type SFM GCBs are divided into two types as follows;

- A) Three phase auto re-closing circuit breaker with one common mechanism for Transformer applications.
- B) Single / Three phase auto re-closing circuit breaker with three separate spring mechanisms (for each phase) for Line applications.

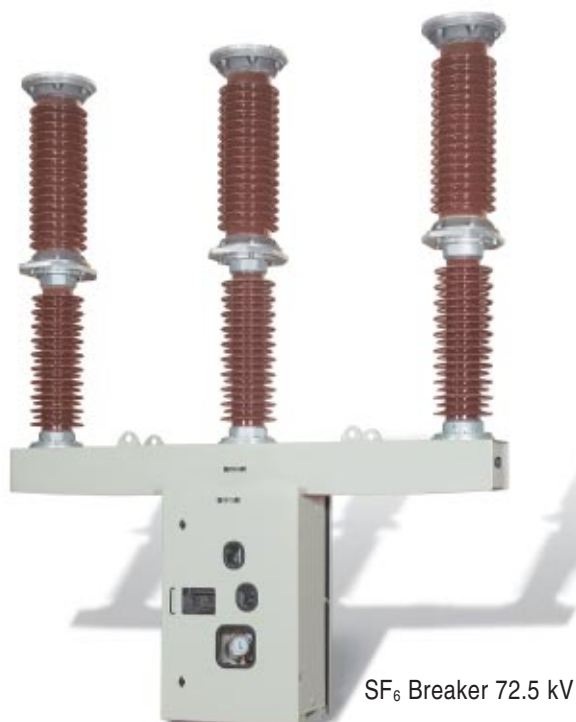
Also these breakers are categorised as per the drive mechanism used for its operation.

The breaker consists of three main parts for its Spring - Spring Mechanism type:

- 1. Vertical porcelain units containing puffer type interrupter
- 2. Spring-spring operating mechanism and control equipment in a single housing
- 3. Base Frame and support columns

The breaker consists of three main parts for its Spring - Pneumatic Mechanism type:

- 1. Vertical / Horizontal porcelain units containing puffer type interrupter
- 2. Spring-Pneumatic operating mechanism and control equipment in a single housing
- 3. Support structure.



SF<sub>6</sub> Breaker 72.5 kV



SF<sub>6</sub> Breaker 36 kV



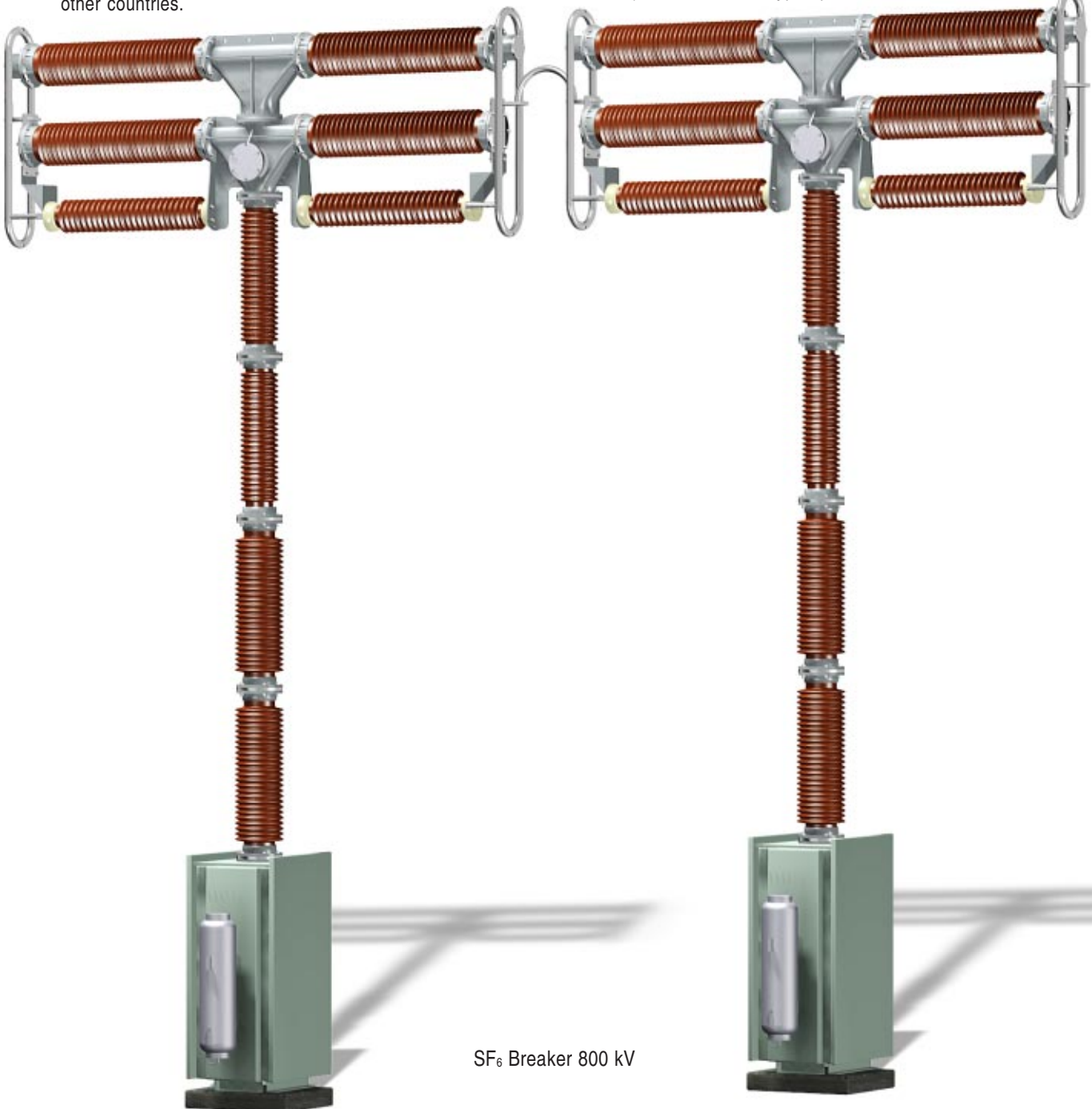
### The SF<sub>6</sub> GCB Product Features:

- Easy & convenient in installation, fault-detection and operation.
- Proven performance under extreme conditions such as in areas with seismic activity.
- In compliance with the new IEC-62271-100 and ANSI standards.
- Insulation with enhanced creepage distance allows for installation in highly polluted areas without changes in dimensions.
- Highly reliable on account of simple design & proven technology.
- Robust construction with easy-to-access mechanisms
- Type tested at recognised international laboratories- CESI Italy, KERI Korea, KEMA Netherlands.
- All range of Circuit Breakers is certified to achieve C2 & M2 class as per IEC 62271-100.
- Leader in domestic market.
- Widely exported to Italy, USA, Brazil, Chile, South Africa and other countries.

CGL is the only manufacturer in India for supply of 420kV SF<sub>6</sub> Circuit Breakers **to meet the high altitude requirement of 1600m.**

The SF<sub>6</sub> Gas Circuit Breaker (GCB) Products range is as follow:

- 1) Medium Voltage Gas Circuit Breaker (MV GCB)
  - a) 36kV outdoor type upto 3150A , 40kA
  - b) 36kV Indoor type upto 2000A, 40kA.
- 2) High Voltage Gas Circuit Breaker (HV GCB)
  - a) 72.5kV outdoor type upto 3150A, 40kA
  - b) 145kV outdoor type upto 3150A, 40kA
  - c) 170kV outdoor type upto 3150A, 40kA
- 3) Extra High Voltage Gas Circuit Breaker (EHV GCB)
  - a) 245kV Outdoor Type upto 3150A, 40kA
  - b) 420kV Outdoor type upto 3150A, 50kA.
- 4) Ultra High Voltage Gas Circuit Breaker (UHV GCB)
  - a) 800kV Outdoor type upto 3150A, 50kA.



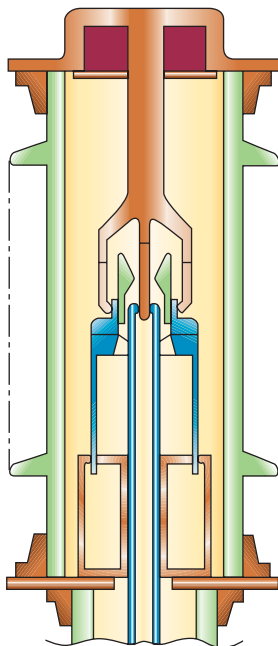


FIG. 1 : Closed position

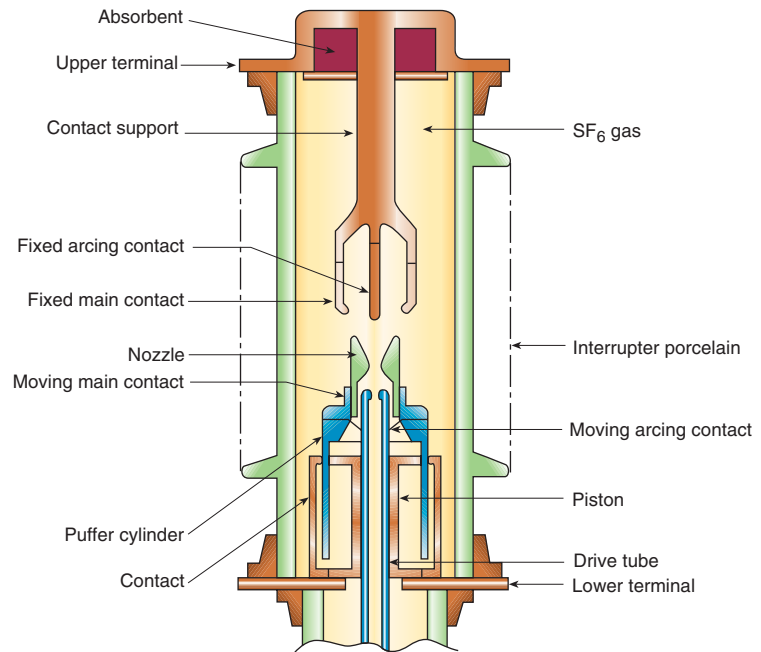


FIG. 2 : Open position

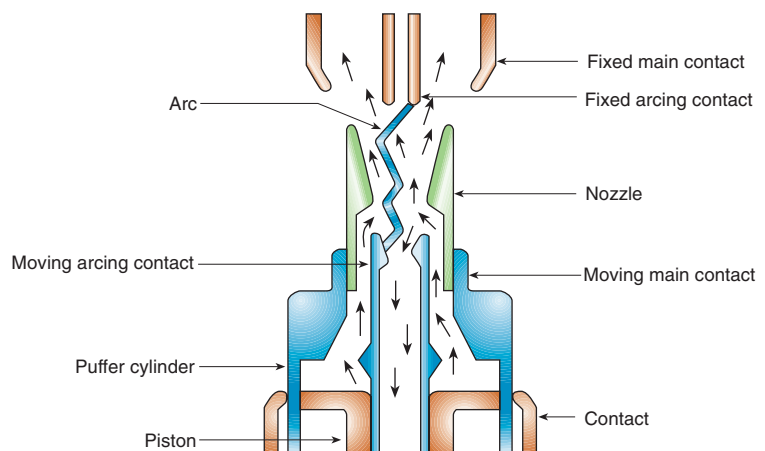
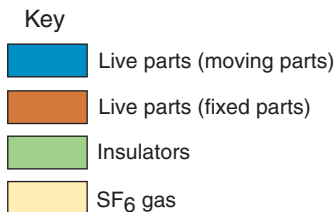


FIG. 3 : Interrupting principle

### INTERRUPTER

#### Interrupting Unit of SF<sub>6</sub> Gas Circuit Breaker Working Principle:

The interrupting unit filled with pressurized SF<sub>6</sub> gas is placed at the top of the pole and contains Stationary Contact, Nozzle, Moving Contact, Puffer Cylinder and Fixed Piston (Fig.1). During opening operation (Fig.2), the Moving Contact along with the Puffer Cylinder is pulled down. The Fixed and Moving contacts get separated and arc is formed between fixed arcing contact

and moving arcing contact. Motion of the Puffer Cylinder compresses SF<sub>6</sub> gas against the Fixed Piston thus generating a powerful SF<sub>6</sub> gas blast through the Nozzle over the arc. After travelling through some distance, the dielectric strength of the gap is raised sufficiently to extinguish the arc. The reliability of the system is further enhanced by the single pressure dual flow puffer interrupter, which reduces the number of moving parts and auxiliary systems in the circuit breaker. This principle is shown in Fig. 3.

## Spring - Spring Operating Mechanism

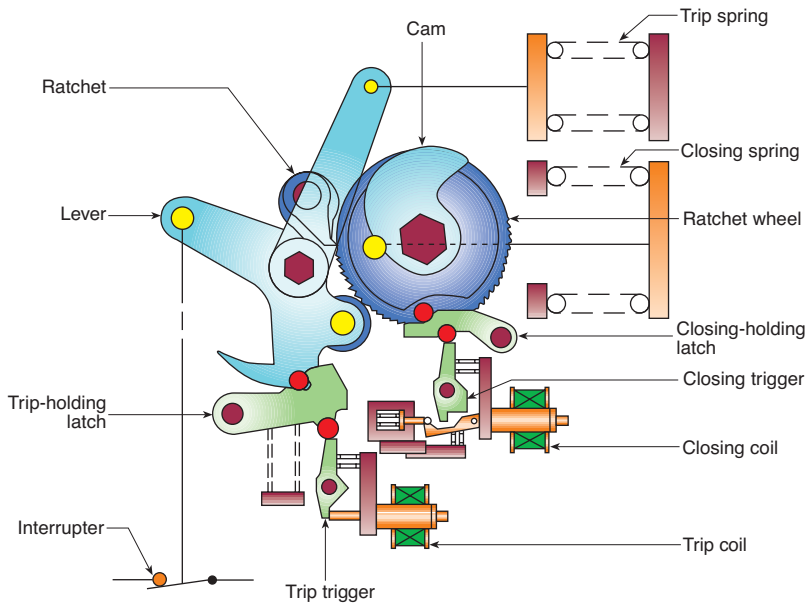


FIG. 4 : Closed position (closing spring charged)

Both closing spring and tripping spring are in charged position. The Tripping spring exerts counter clockwise torque on the lever. At this stage a locking device called 'Trip Holding Latch' avoids lever movement. When the trip coil is energized, the lever is released from locking device and rotates to attain the 'Open' position.

Fig.5 shows the Breaker in Open position

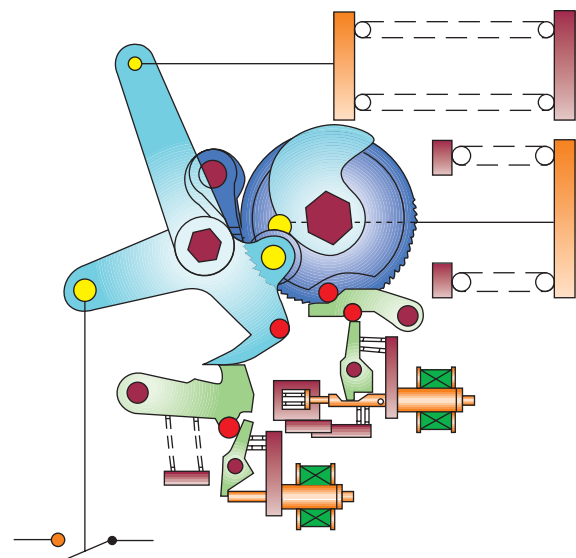


FIG. 5 : Open position (closing spring charged)

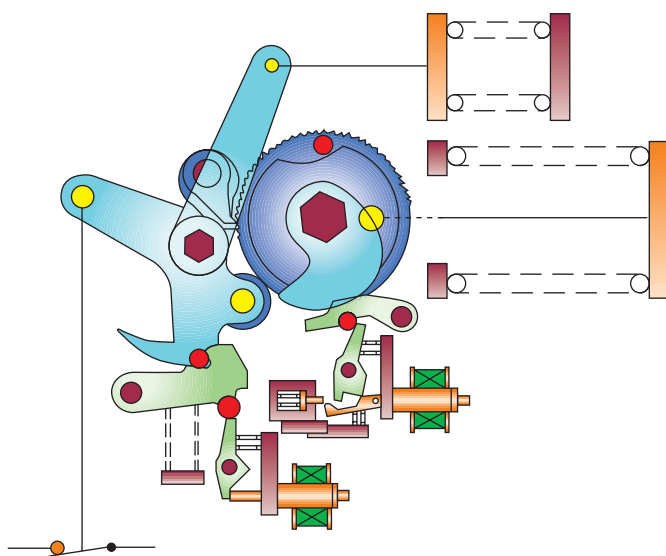


FIG. 6 : Closed position (closing spring discharged)

Tripping spring is in the relaxed condition. Closing spring exerts counter clockwise torque on the Cam and Ratchet wheel. When the Closing coil is energized, the Cam rotates in counter clockwise direction and in turn, the Lever is rotated clockwise. This lever motion closes the breaker and charges the Tripping spring at the same time.

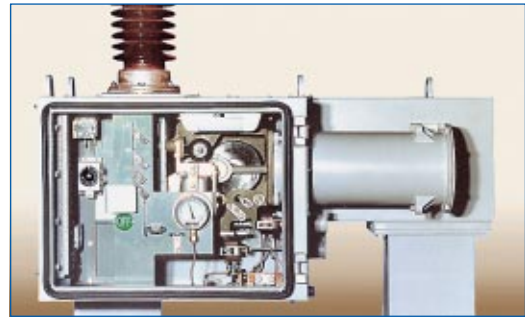
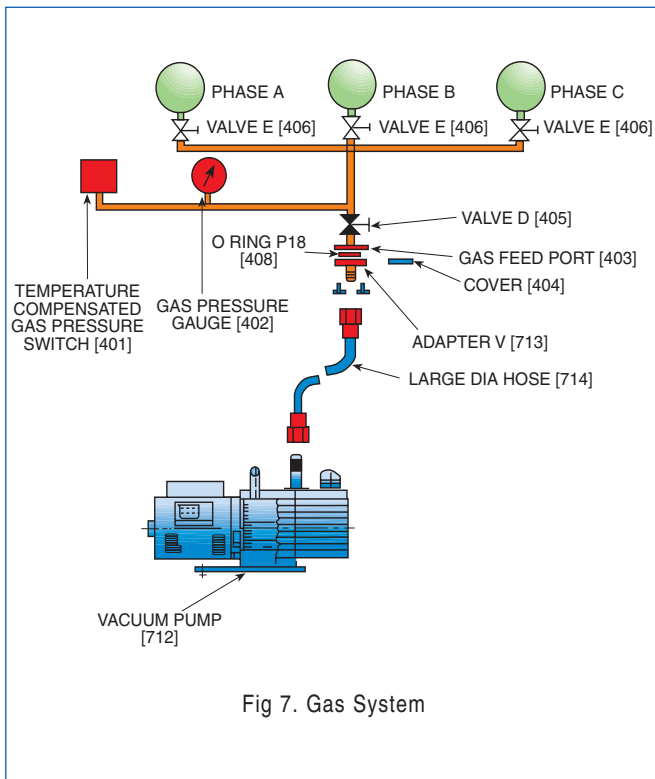
Fig.6 shows Closed position ( Closing spring discharged )

Immediately after the breaker is closed, the spring charging motor gets activated. The closing spring is charged by the ratchet, linked to the motor. When the closing spring is fully charged the Limit Switch disconnects the supply to the motor and the closing-holding latch holds the compressed spring energy till next discharge.

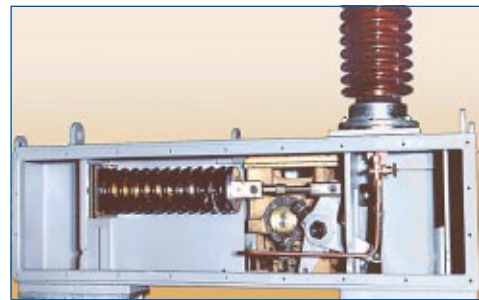


## SF<sub>6</sub>-Gas Circuit Breakers (GCB)

For Out-Door Use (24 kV To 245 kV)



Spring Mechanism 145kV - Closing Spring



Spring Mechanism 145kV - Opening Spring (Rear View)

### Gas System (Refer Fig. 7)

The gas within the pole units is connected through pipes to form a gas system which is monitored by a Gas Pressure Gauge (402) and a Temperature-compensated Gas Pressure Switch (401) located in the mechanism housing. The gas system also provides a Gas Valve

E (406) for shutting of the gauge (402) and switch (401) from the breaker as to permit their inspection and maintenance. Gas Valve D (405) also located in the mechanism housing is provided for gas filling or evacuation of the breaker during installation or maintenance.



## Pneumatic Operating Mechanism

The movement of operating mechanism is illustrated in Fig. 8. The pneumatic operating mechanism consist of opening piston air cylinder control valve tripping coil & closing coil, latch trigger closing spring, shock absorber and others.

### 1) Opening Operation :

The opening operation is affected by compressed air. When opening signal energizes trip coil, latch and cam are released by trip coil plunger and control valve is opened by spring which allows the compressed air to push down the piston of the pneumatic operating mechanism.

The movement of the opening piston is transmitted to the puffer cylinder through levers and rods and the moving contact of all

the three poles are pulled down together. The movement of the opening piston compresses the closing spring. At the final position of the opening operation, the control valve is closed by the linkage and the air in the cylinder is exhausted through the control valve to the outside atmosphere. The piston is held in opening position against force of the closing spring by holding latch.

### 2) Closing Operation :

In the open position the mechanism corresponds to latched position. Closing operation is made by the closing spring, When closing signal energizes the closing coil trigger and holding latch are released by the closing coil plunger and the closing spring closes the breaker.

## Operating Mechanism (Spring Pneumatic)

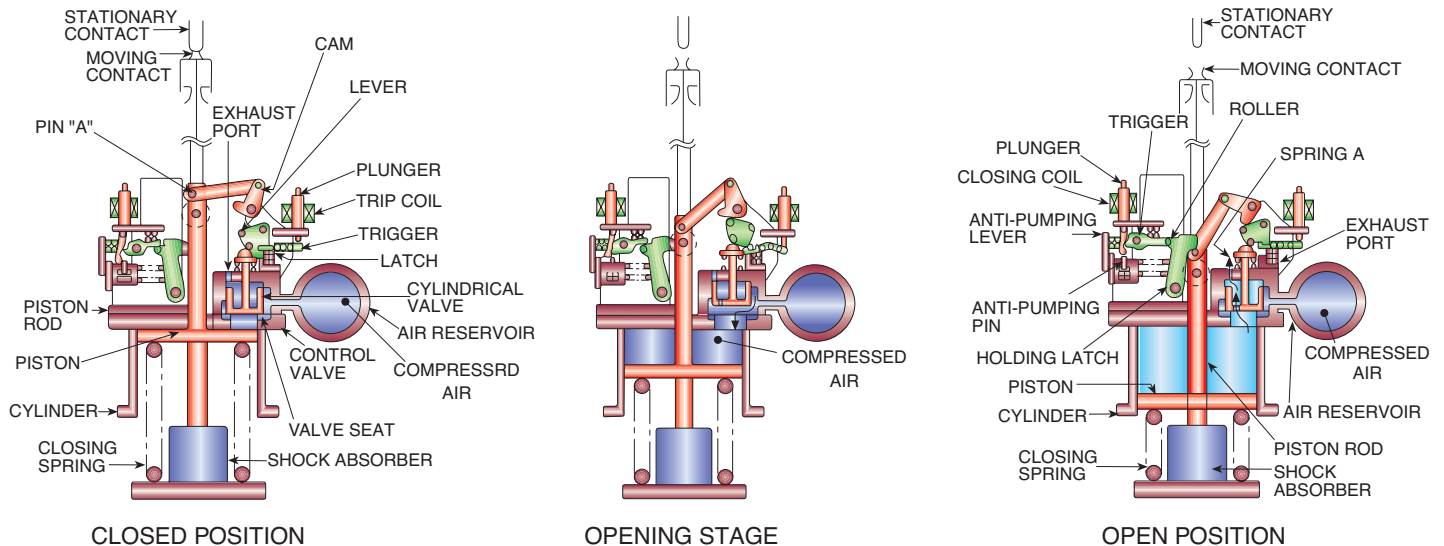
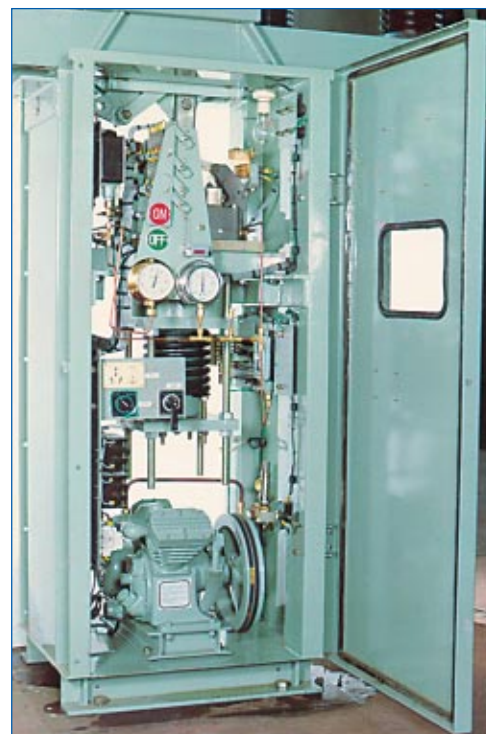


FIG. 8 : PNEUMATIC OPERATING MECHANISM





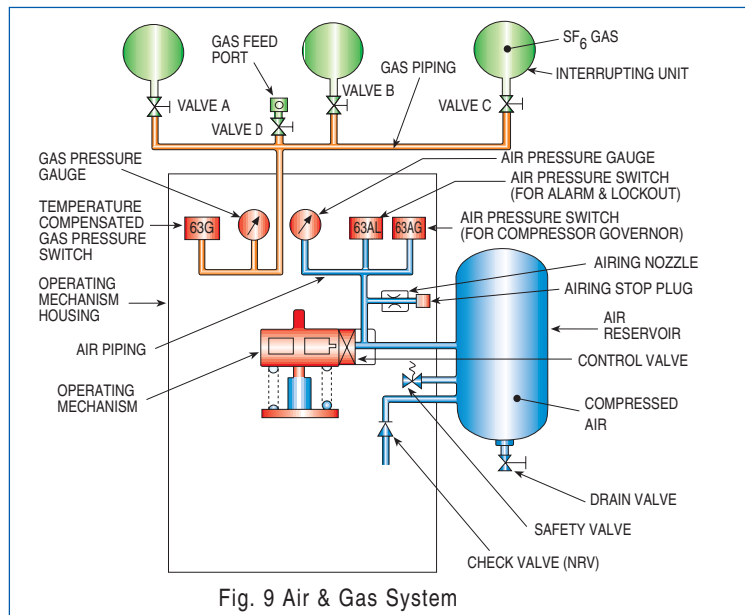
## Air And Gas System

### Gas System (Refer Fig. 9)

- Three interrupting units connected by gas piping have gas valves A, B and C individually.
- Gas piping is connected to gas pressure gauge, temperature compensated gas pressure switch and gas feed port.
- Gas valves A, B and C should be normally open.
- Gas valves D should be normally closed.
- Density of SF<sub>6</sub> Gas is monitored by gas temperature compensated pressure switch.
- Filling of SF<sub>6</sub> gas is possible from gas feed port by opening gas valve D even in energized condition.

### Air System (Refer Fig.9)

- The operating mechanism is connected to control valve, air reservoir, air pressure gauge, air pressure switches, airing nozzle & airing stop plug by air piping.
- Air reservoir is connected to compressed air supply unit through check (NRV) valve.
- Safety valve is connected to air reservoir with drain valve.
- Compressed air generated by compressed air supply unit is led to air reservoir & control valve through check valve.
- Check valve prevents compressed air inside air reservoir from returning to compressed air supply unit.
- Moisture inside air reservoir is periodically drained through the preset timer actuated automatic drain valve (optional).



## SF<sub>6</sub>-Gas Circuit Breakers (GCB)



### Quality

Quality of the final products are ensured right at the Component manufacturing stage, *Through*,

- Six sigma methodology for improving product quality as perceived by customer
- Model Cell Concept (factory within factory)
- World class test setup
- Structured Policy for supplier quality

### Routine Testing

All routine tests as specified in IEC, are conducted on the fully assembled GCBs at our factory. In addition to the specified tests as per IEC, the following tests are also carried out on each breaker.

For all Spring Spring & Spring Pneumatic Breakers.

- MECHANICAL OPERATION TESTS
- ELECTRICAL SEQUENCE TEST (CONTROL & AUXILIARY CIRCUIT CHECK)
- MEASUREMENT OF SPEED & TIME (NO LOAD OPERATING CHARACTERISTICS)
- DCRM TEST as per Customer requirement.
- MILLI VOLT DROP TEST (CONTACT RESISTANCE MEASUREMENT)
- HIGH VOLTAGE TEST ON MAIN CIRCUIT
- HIGH VOLTAGE TEST ON CONTROL & AUXILIARY CIRCUIT
- GAS LEAKAGE TESTS
- GAS DENSITY SWITCH OPERATION TESTS
- MEASUREMENT OF TRIPPING & CLOSING COIL RESISTANCE

In addition to all above tests following tests are performed on Spring Pneumatic Breakers.

- REPLENISHING TIME MEASUREMENT FOR COMPRESSED AIR
- AIR PRESSURE SWITCHES OPERATION
- SAFETY VALVE OPERATION
- AIR LEAKAGE TEST

CGL testing laboratory is fully equipped with the latest testing equipment viz:

- 700 kV Test Transformer

- PD Measurement up to 100kV
- High precision mass Spectrometer Type Gas Leak Detector (with capability to detect leaks as low as 1 ppm).
- Multi-Channel Breaker Speed / Time Analysers.
- Mechanical Endurance Controller
- Contact Resistance Meter (Static)
- Dynamic Contact Resistance (Signature)
- Primary Injection Test Set.

Full testing before despatch of breaker ensures trouble free operation at site and complete customer satisfaction

### Fabrication & Surface Treatment

All critical components & sheet metal stampings are manufactured on CNC machines ensuring high dimensional consistency. All parts coming in contact with moisture are zinc plated and passivated. All exposed ferrous parts are treated to give high corrosion resistance. They are shot blasted, zinc sprayed, epoxy primer coated and finally painted with polyurethane aliphatic based paint ensuring excellent finish & corrosion protection. All joints are secured against loosening by using torque wrenches & other suitable means. All exposed hardware are of Stainless Steel or Hot Dip Galvanised for outdoor GCBs.

### Transport & Site Installation

All the Circuit Breakers are factory tested and then depending on the type involved are partly dismantled into packing units which are dispatched. All the sub-assemblies are individually wrapped to reduce the harmful effects of atmosphere. For Exports, the breakers are dispatched with Sea Worthy Packing. The Circuit Breaker Poles are filled with a small quantity of SF<sub>6</sub> Gas for Transportation (at a gauge pressure of 0.5 kg/cm<sup>2</sup>) to avoid moisture ingress and evacuation at site. Site installation is simple and no site adjustments are required during Erection and Commissioning, all main adjustments / settings are done in the factory prior to delivery.

### Customer Support & After Sales Service

We provide solutions to all possible Technical requirements to Customer through our highly qualified Engineers having rich experience in the field. Our Service Engineers, Technicians and Authorised Representatives can provide services supervision of Erection and Commissioning and After Sales Service at site.

# SF<sub>6</sub>-Gas Circuit Breakers (GCB)

## 24 kV - 72.5 kV SF<sub>6</sub> Gas Circuit Breaker [Spring - Spring Mechanism]

### Guaranteed Technical Particulars

#### 24kV - 72.5kV SF<sub>6</sub> Gas Circuit Breaker [Spring - Spring Mechanism]

SN	DESCRIPTION	UNITS	(3 PHASE AUTO RE-CLOSING)					(1 PHASE AUTO RE-CLOSING)			
1.	TYPE REFERENCE	:	-	20-SFGP-25A	30-SFGP-25A	30-SFGP-40A	70-SFM-32B	70-SFM-40AA	70-SFM-32B	50-SFGP-20A* (52KV CLASS)	30-SFGP-25A* (52KV CLASS)
2.	RATED VOLTAGE	:	kV	24	36	36	72.5	72.5	72.5	25KV GCB (52KV CLASS)	25KV INT. (52KV CLASS)
3.	RATED LIGHTNING IMPULSE WITHSTAND	:	kVp	150	200	200	350	350	350	250	250
4.	RATED POWER FREQUENCY WITHSTAND	:	kV	60	80	80	160	160	160	95	95
5.	CREEPAGE DISTANCE [TOTAL]	:	mm	600	900	900	1815	1815	1815	1300	1300
6.	APPLICABLE STANDARDS	:	-	IEC-62271-100 / IS 13118					IEC 62271-100 / RDSO Spec.		
7.	TYPE OF MECHANISM	:	-	SPRING-SPRING							
8.	RATED NORMAL CURRENT	:	A	1250 / 1600 / 2000		3150			3150	1600	800
9.	RATED OPERATING SEQUENCE	:	-	O - 0.3sec - CO - 3min - CO/CO - 15sec - CO							
10.	RATED FREQUENCY	:	Hz	50 / 60					50 / 60	50	
11.	RATED DURATION OF SHORT CIRCUIT	:	sec.	3							
12.	RATED CLOSING/TRIPPING VOLTAGE	:	V DC	110/125/220						110	
13.	CURRENT OF CLOSING/TRIPPING COIL	:	A	6A MAX. AT 110 V DC							
14.	RATED BREAK TIME	:	</=mS	80			60	60	60	65	80
15.	RATED CLOSING TIME	:	</=mS	100			130	80	130	100	
16.	RATED SHORT CIRCUIT BREAKING CURRENT	:	kA	25	25	40	31.5	40	31.5	20	8
17.	RATED SHORT CIRCUIT MAKING CURRENT	:	kAp	62.5		100	80	100	80	50	20
19.	RATED CABLE CHARGING BREAKING CURRENT AND OVER VOLTAGE	:	A / pu	50 / < 2.5			250/<2.5	125/<2.5	250/<2.5	—	—
20.	RATED SINGLE CAPACITOR BANK BREAKING CURRENT & OVER VOLTAGE	:	A / pu	400/<2.5		400/<2.5	600/<2.5	400/<2.5	600 / < 2.5	440 / < 2.5	440 / < 2.5
21.	RATED OUT OF PHASE BREAKING CURRENT	:	kA	6.25	6.25	10	7.9	10	7.9	—	—
22.	FIRST POLE TO CLEAR FACTOR	:	-	1.5					1.5	—	—
23.	AUXILIARY CONTACTS	:	-	5 NO + 5 NC			8 NO + 8 NC		8 NO + 8 NC	6 NO + 6 NC	
24.	SF6 GAS PRESSURE [ AT 20deg C]										
	- NORMAL	:	Kg/cm²	5		6	5	6	5		
	- GAS FEED ALARM	:	Kg/cm²	4.5		5.5	4.5	5.5	4.5		
	- LOCKOUT	:	Kg/cm²	4		5	4	5	4		
25.	DIMENSIONS										
	A	:	mm	600	750	750	1100	1100	3000**	—	—
	B	:	mm	2783	3103	3103	3070	3525	3070	3533	3533
	H	:	mm	3349	3819	3819	3998	4574	3998	4579	4249
26.	WEIGHT [ APPROX ]	:	Kg	675	780	750	1100	820	2100	500	500

Standard Altitude 1000m

\* For Railway application, \*\*Adjustable

### Optionals

SN	DESCRIPTION	UNITS	(3 PHASE AUTO RE-CLOSING)				(1 PHASE AUTO RE-CLOSING)		
1.	CREEPAGE DISTANCE	mm / kV	31				—	—	
2.	CLOSING / TRIPPING COIL VOLTAGE	V DC	48 / 60 / 110/125/220				—	—	
3.	CLEARANCE OF LIVE PARTS TO GROUND	-	AS PER CUSTOMER SPECIFICATIONS				—	—	
4.	MAX. ALTITUDE ABOVE SEA LEVEL	m	2200				—	—	
5.	AUXILIARY CONTACTS	-	10 NO + 10 NC				—	—	
6.	SEISMIC ACCELERATION	g	0.3 / 0.4				—	—	



## SF<sub>6</sub>-Gas Circuit Breakers (GCB)

## 110 kV - 245 kV SF<sub>6</sub> Gas Circuit Breaker [Spring - Spring Mechanism]

## Guaranteed Technical Particulars

## 110kV - 245kV SF<sub>6</sub> Gas Circuit Breaker [Spring - Spring Mechanism]

SN	DESCRIPTION	UNITS	(3 PHASE AUTO RE-CLOSING)				(1 PHASE AUTO RE-CLOSING)					
1.	TYPE REFERENCE	:	-	120-SFM-32B	120-SFM-32B	120-SFM-32B	150-SFM-40B	120-SFM-32B	120-SFM-32B	120-SFM-32B	150-SFM-40B	200-SFM-40S
2.	RATED VOLTAGE	:	kV	123	145	145	170	123	145	145	170	245
3.	RATED LIGHTNING IMPULSE WITHSTAND	:	kVp	550	650	650	750	550	650	650	750	1050
4.	RATED POWER FREQUENCY WITHSTAND	:	kV	230	275	275	325	230	275	275	325	460
5.	CREEPAGE DISTANCE [TOTAL]	:	mm	3075	3625	3625	4250	3075	3625	3625	4250	6125
6.	APPLICABLE STANDARDS	:	-	IEC-62271-100 / IS 13118								
7.	TYPE OF MECHANISM	:	-	SPRING-SPRING								
8.	RATED NORMAL CURRENT	:	A	3150								
9.	RATED OPERATING SEQUENCE	:	-	O - 0.3sec - CO - 3min - CO/CO - 15sec - CO								
10.	RATED FREQUENCY	:	Hz	50 / 60			50	50/60			50	50/60
11.	RATED DURATION OF SHORT CIRCUIT	:	sec.	3								
12.	RATED CLOSING/ TRIPPING VOLTAGE	:	V DC	110/125/220								
13.	CURRENT OF CLOSING/TRIPPING COIL	:	A	6A MAX. AT 110 V DC								
14.	RATED BREAK TIME	:	mS	60								
15.	RATED CLOSING TIME	:	mS	130		135		130			135	150
16.	RATED SHORT CIRCUIT BREAKING CURRENT	:	kA	31.5		40		31.5		40		
17.	RATED SHORT CIRCUIT MAKING CURRENT	:	kAp	80		100		80		100		
18.	RATED LINE CHARGING BREAKING CURRENT AND OVER VOLTAGE	:	A / pu	50/<2.5				50/<2.5				125/<2.5
19.	RATED CABLE CHARGING BREAKING CURRENT AND OVER VOLTAGE	:	A / pu	160/400/<2.5		160/<2.5		160/400/<2.5		160/<2.5		250/<2.5
20.	RATED SINGLE CAPACITOR BANK BREAKING CURRENT AND OVER VOLTAGE	:	A / pu	400/<2.5				400/<2.5				
21.	RATED OUT OF PHASE BREAKING CURRENT	:	kA	7.9		10		7.9		10		
22.	FIRST POLE TO CLEAR FACTOR	:	-	1.5				1.5				1.3
23.	AUXILLIARY CONTACTS	:	-	8 NO + 8 NC				8 NO+8 NC				
24.	SF6 GAS PRESSURE [ AT 20deg C]											
	- NORMAL	:	Kg/cm²	6		7		6		7		
	- GAS FEED ALARM	:	Kg/cm²	5.5		6.5		5.5		6.5		
	- LOCKOUT	:	Kg/cm²	5		6		5		6		
25.	DIMENSIONS											
	A	:	mm	1700	1700	1700	2200	3000**	3000**	3000**	3000**	4500**
	B	:	mm	4010	4010	4010	4310	4010	4010	4010	4010	4605
	H	:	mm	5388	5388	5548	6089	5388	5388	5548	5776	7165
26.	WEIGHT [ APPROX ]	:	Kg	1450	1450	1550	2200	2360	2460	2550	3300	3775

Standard Altitude 1000m

**\*\*Adjustable**

## Optionals

SN	DESCRIPTION	UNITS	(3 PHASE AUTO RE-CLOSING)		(1 PHASE AUTO RE-CLOSING)		
1.	CREEPAGE DISTANCE	mm / kV	31				
2.	CLOSING / TRIPPING COIL VOLTAGE	V DC	110/125/220				
3.	CLEARANCE OF LIVE PARTS TO GROUND	-	AS PER CUSTOMER SPECIFICATIONS				
4.	MAX. ALTITUDE ABOVE SEA LEVEL	m	1600	–	1600	–	2000
5.	AUXILLIARY CONTACTS	-	10 NO + 10 NC				
6.	SEISMIC ACCELERATION	g	0.3 / 0.4				

# SF<sub>6</sub>-Gas Circuit Breakers (GCB)

## 245 kV - 800 kV SF<sub>6</sub> Gas Circuit Breaker [Spring - Pneumatic Mechanism]

### Guaranteed Technical Particulars

#### 245kV - 800kV SF<sub>6</sub> Gas Circuit Breaker [ Spring - Pneumatic Mechanism ]

SN	DESCRIPTION	UNITS	(3 PHASE AUTO RE-CLOSING)	(1 PHASE AUTO RE-CLOSING)		
1.	TYPE REFERENCE	:	-	200-SFM-40B	200-SFM-40A	400-SFM-40A 800-SFM-50A
2.	RATED VOLTAGE	:	kV	245	245	420 800
3.	RATED LIGHTNING IMPULSE WITHSTAND	:	kVp	1050	1050	1425 2100
4.	RATED POWER FREQUENCY WITHSTAND	:	kV	460	460	520/610 870/960
5.	CREEPAGE DISTANCE [TOTAL]	:	mm	6125	6125	10500 20000
6.	APPLICABLE STANDARDS	:	-	IEC-62271-100 / IS 13118		
7.	TYPE OF MECHANISM	:	-	Spring-Pneumatic		
8.	RATED NORMAL CURRENT	:	A	3150		
9.	RATED OPERATING SEQUENCE	:	-	O - 0.3sec - CO - 3min - CO/CO - 15sec - CO		
10.	RATED FREQUENCY	:	Hz	50 / 60		50
11.	RATED DURATION OF SHORT CIRCUIT	:	sec.	3		
12.	RATED CLOSING/TRIPPING VOLTAGE	:	V DC	110/125/220		220
13.	CURRENT OF CLOSING/TRIPPING COIL	:	A	6A MAX. AT 110VDC		
14.	RATED BREAK TIME	:	mS	60		40
15.	RATED CLOSING TIME	:	mS	140	100	150
16.	RATED SHORT CIRCUIT BREAKING CURRENT	:	kA	40		50
17.	RATED SHORT CIRCUIT MAKING	:	kAp	100		125
18.	RATED LINE CHARGING BREAKING	:	A/pu	125/<2.5		400/<2.5 900/<2.5
19.	RATED CABLE CHARGING BREAKING CURRENT AND OVER VOLTAGE	:	A / pu	250/<2.5		400/<2.5 —
20.	RATED SINGLE CAPACITOR BANK BREAKING CURRENT & OVER VOLTAGE	:	A / pu	400/<2.5	400/<2.5 —	
21.	RATED OUT OF PHASE BREAKING CURRENT	:	kA	10		12.5
22.	FIRST POLE TO CLEAR FACTOR	:	-	1.3		
23.	AUXILIARY CONTACTS	:	-	8 NO + 8 NC		
24.	SF6 GAS PRESSURE [ AT 20deg C ]					
	- NORMAL	:	Kg/cm²	6	6	7 7
	- GAS FEED ALARM	:	Kg/cm²	5.5	5.5	6.5 6.5
	- LOCKOUT	:	Kg/cm²	5	5	6 6
25.	DIMENSIONS					
	A	:	mm	2600	4500**	7000** 10000**
	B	:	mm	4605	4605	6844 8970
	H (WITHOUT CLOSING RESISTOR)	:	mm	7224	6965	7074 9184
	H (WITH CLOSING RESISTOR)	:	mm	—	—	7604 9714
26.	WEIGHT [ APPROX ]					
	WITHOUT CLOSING RESISTOR	:	kg.	2400	3900	6950 18900
	WITH CLOSING RESISTOR	:	kg.	—	—	8600 22200

Standard Altitude 1000m

\*\*Adjustable

### Optionals

SN	DESCRIPTION	UNITS	(3 PHASE AUTO RE-CLOSING)	(1 PHASE AUTO RE-CLOSING)	
1.	CREEPAGE DISTANCE	mm / kV	31		
2.	CLOSING / TRIPPING COIL VOLTAGE	V DC	110/125/220		
3.	CLEARANCE OF LIVE PARTS TO GROUND	-	AS PER CUSTOMER SPECIFICATIONS		
4.	MAX. ALTITUDE ABOVE SEA LEVEL	m	—	1600	—
5.	AUXILIARY CONTACTS	-	10 NO + 10 NC		
6.	SEISMIC ACCELERATION	g	0.3 / 0.4		

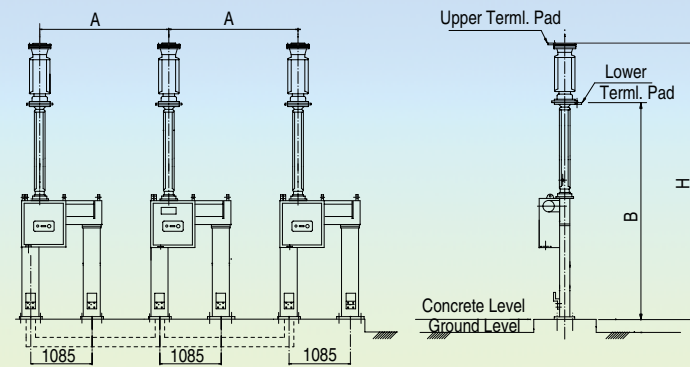
### Dimensional Details

<p><b>25kV INT/GCB Single Phase Auto Reclosing Breaker</b></p>	<p><b>Foundation Plan Details</b></p>
<p><b>24/36kV Three Phase Auto Reclosing Breaker</b></p>	<p><b>Foundation Plan Details</b></p>
<p><b>72.5kV Three Phase Auto Reclosing Breaker</b></p>	<p><b>Foundation Plan Details</b></p>
<p><b>110/145kV Three Phase Auto Reclosing Breaker</b></p>	<p><b>Foundation Plan Details</b></p>

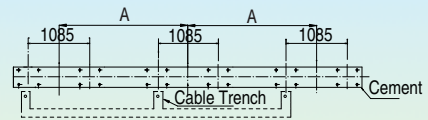


### Dimensional Details

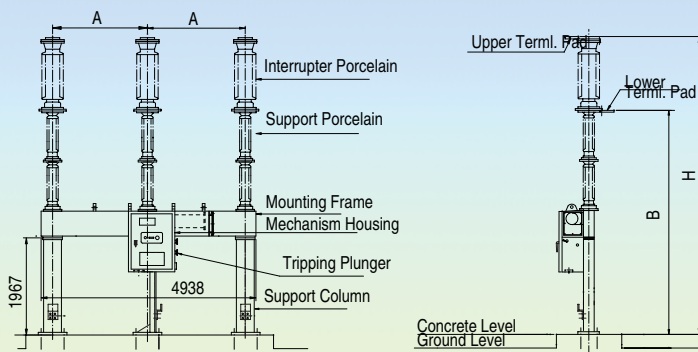
110kV / 145kV Single Phase Auto Reclosing Breaker



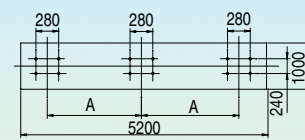
Foundation Plan Details



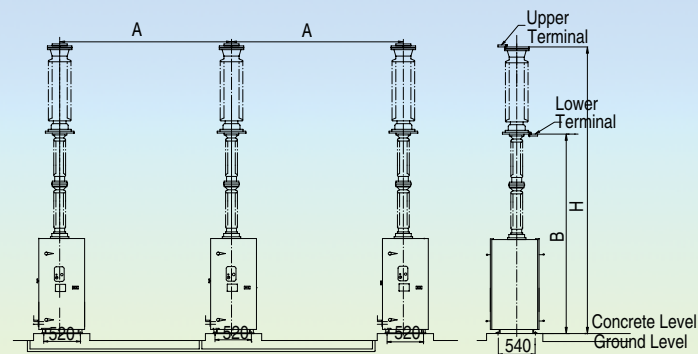
170kV Three Phase Auto Reclosing Breaker



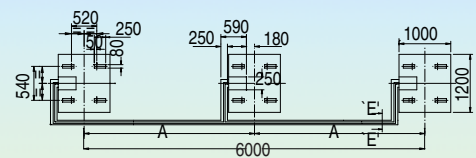
Foundation Plan Details



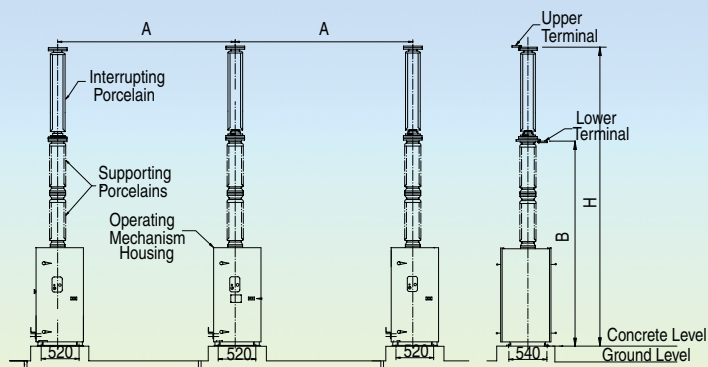
170kV Single Phase Auto Reclosing Breaker



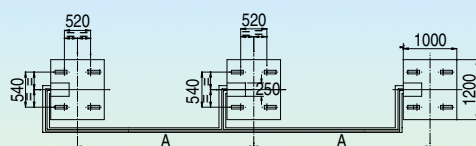
Foundation Plan Details



245kV Single Phase Auto Reclosing Breaker

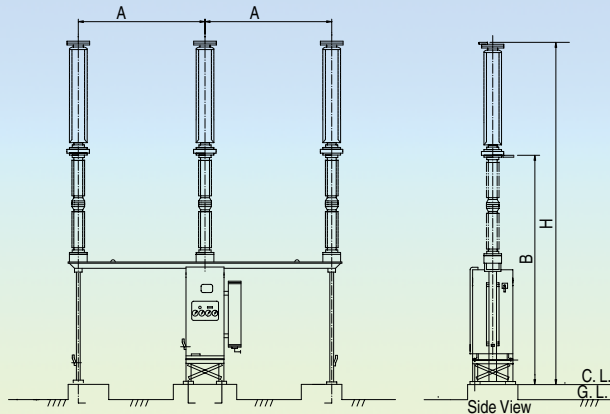


Foundation Plan Details

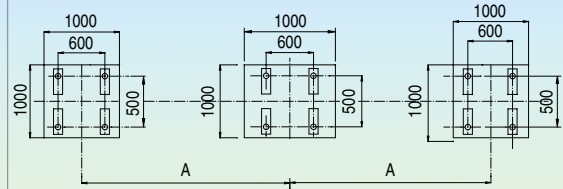


## Dimensional Details

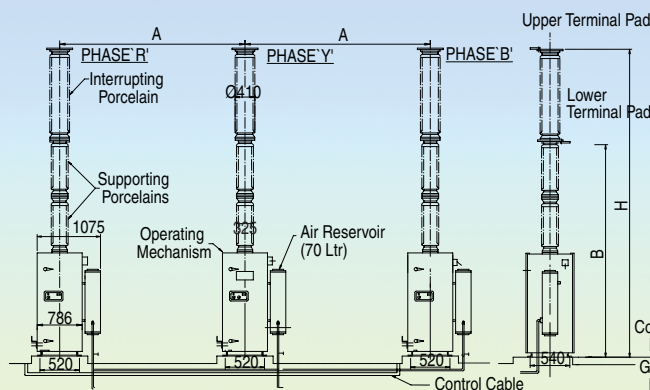
245kV Three Phase Auto Reclosing Breaker



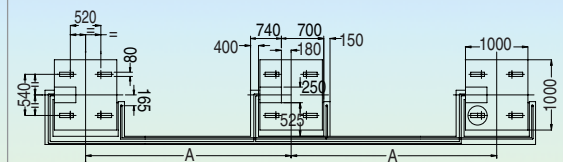
Foundation Plan Details



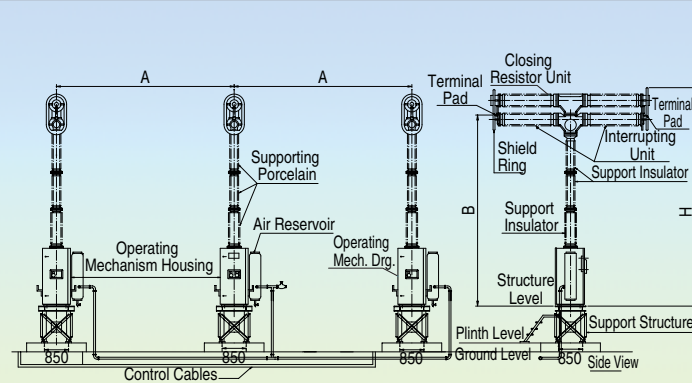
245kV Single Phase Auto Reclosing Breaker



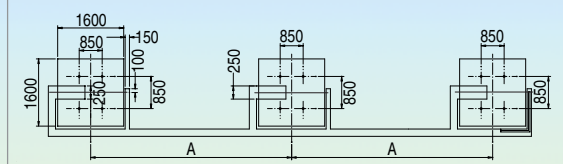
Foundation Plan Details



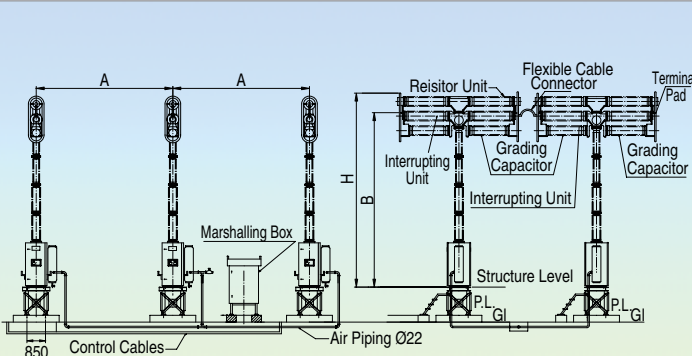
420kV Single Phase Auto Reclosing Breaker



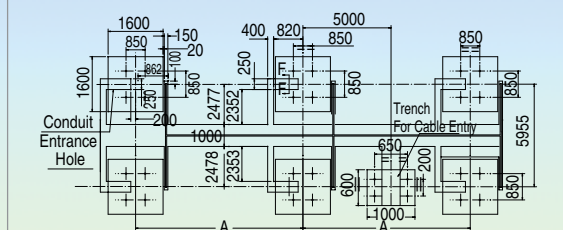
Foundation Plan Details



800kV Single Phase Auto Reclosing Breaker



Foundation Plan Details



## Horizontal Centre Break Disconnectors Type - HCB

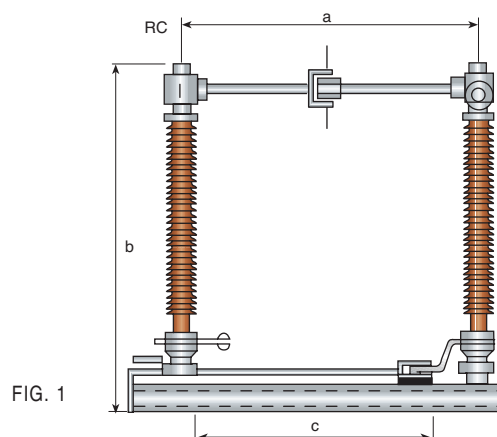


FIG. 1

Table - I

Overall Dimensions**			
kV	a	b	c
72	1100	1304	1000
145	1700	2034	1450
170	2200	2234	1600
245	2600	2873	2000
420	4100	4223	3100

\*\* R&D being continuous process, dimensions may change as per final design.

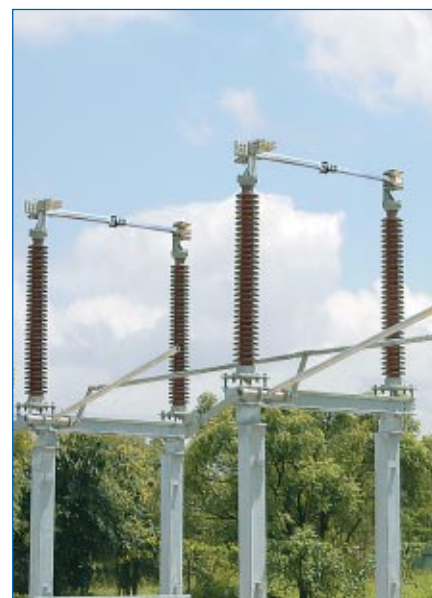
## Horizontal Centre Break Disconnectors Type - HCB

Table - III

Rated Voltage	Rated Current *	Rated short Time current	Rated peak Short Circuit current	Power Frequency Withstand Voltage r.m.s 1min.		Lighting impulse Withstand Voltage 1.2/50mS		Switching impulse Withstand Voltage 250/2500mS	
kV	A	kA	kAp	To earth kV	across isolating distance kV	To earth kVp	across isolating distance kVp	To earth kVp	across isolating distance kVp
72.5	1250/1600/2000	40	100	140	160	325	375	—	—
123	1250/1600/2000	40	100	230	265	550	630	—	—
145	1250/1600/2000/	40	100	275	315	650	750	—	—
170	1250/1600/2000	40	100	325	375	750	860	—	—
245	1250/1600/2000	40/50	100/125	460	530	1050	1200	—	—
300	4000	40/50	100/125	380	435	1050	1050(+170)	850	700(+245)
420	2000/2500	40/50	100/125	520	610	1425	1425(+240)	1050	900(+345)

\* higher current optional.

\*\* R&D being continuous process, dimensions may change as per final design.





## Horizontal Double Break Disconnectors Type - HDB

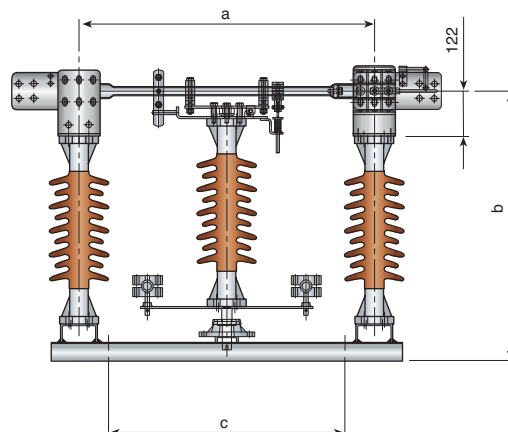
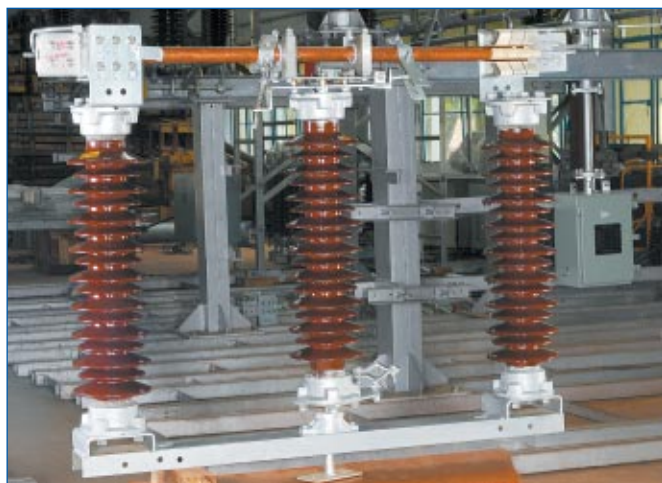


FIG. 2



Table - II

Overall Dimensions**							
kV	12	36	72.5	123	145	170	245
a	580	800	1100	1600	1600	2200	2600
b	254	730	992	1553	1833	2033	2658
c	520	650	1000	1450	1450	1600	2100

\*\* R&D being continuous process, dimensions may change as per final design.

## Horizontal Double Break Disconnectors Type - HDB



Table - IV

Rated Voltage	Rated Current *	Rated short Time current	Rated peak Short Circuit current	Power Frequency Withstand Voltage r.m.s 1min.		Lighting impulse Withstand Voltage 1.2/50mS		Switching impulse Withstand Voltage 250/2500mS	
				To earth	across isolating distance	To earth	across isolating distance	To earth	across isolating distance
kV	A	kA	kAp	kV	kV	kVp	kVp	kVp	kVp
12	400/800	13.1/25	32/62.5	28	32	70	80	—	—
36/38.5	800/1250/1600/2000	25	62.5	70	80	170	195	—	—
72.5	800/1250/1600/2000	31.5/40	80/100	140	160	325	375	—	—
123	800/1250/1600/2000	40	100	230	265	550	630	—	—
145	800/1250/1600/2000	40	100	275	315	650	750	—	—
170	1250/1600/2000	40	100	325	375	750	860	—	—
245	2000/2500	40/50	100/125	460	530	1050	1200	—	—
300	4000	40/50	100/125	380	435	1050	1050(+170)	850	700(+245)
420	2000/2500	40/50	100/125	520	610	1425	1425(+240)	1050	900(+345)

\* higher current optional.

## Switchgear Poem

There occurs a fault  
Then the current should halt  
Otherwise the fault current will increase  
& the service continuity decrease

But the relay acts quick  
& the CIRCUIT BREAKER trips

The faulty part is disconnected  
& the power system is protected

Thank you Mr. SWITCHGEAR  
Because of you there is little fear !!



## Our Major Customers :

### International Customers :

ENDESA - Spain; ENEL, TERNA - Italy; KEPCO - Korea; TNB - Malaysia; TPC - Taiwan; CEB - Sri Lanka; NPPMB, CPPMB, SPPMB, HCMCPC, PC1, PC2, PC3, PTC4 - Vietnam; PGCB, REB, DESA, BPDB - Bangladesh; NPC Transco - Philippines; TXU, ERGON, AGL, POWERCOR, ETSA, TRANSGRID, INTEGRAL, ENERGEX - Australia; ZESA - Zimbabwe; NEPA - Nigeria; PEDEEE, PEEGT - Syria; KWPA, HREC, KHREC - Iran; EPE - Argentina; PT PLN - Indonesia; PEA, EGAT - Thailand; ESKOM, SPOORNET - South Africa; VRA, ECG - Ghana; KPLC - Kenya; AMPLA, COELCE, ELECENOR, COPEL, ELETROSUL, RGE - Brazil; EDELNOR, ELECTROSUR - Peru; Chilectra, EMEL, EFE - Chile; EDENOR, EDESUR, SECHEEP, EPE, TRANSBA - Argentina

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HYUNDAI CONST - Korea.

TRAFO - Brazil

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GETCO, GSECL, MSETCL, MPPGCL, MPPTCL, CSEB,

RRVPLN, UPPCL, PSEB, HVPNL, DTL, UPPTCL, UPCL.  
J&K GPDD.

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**Note :** The features mentioned may not be a part of standard product. Product development is a continuous process.  
Consequently the data indicated is subject to change without prior notice.



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Strong relationships.

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