

# **Crompton Greaves Ltd.**



Vacuum Circuit Breaker



Gas Circuit Breaker



Porcelain Clad VCB



Metal Clad VCB (KIOSK)



Ring Main Unit



Unitized Substation



On-Load Tap Changer



Numerical Relay

# **Medium Voltage Switchgear Products**







Products	Rated Voltage	Rated Current	Breaking Capacity
	Indoor Vacuum Circuit Breakers		
Calix	12 kV	upto 4000 A	upto 50 kA
Felix	36 kV	upto 2000 A	upto 40 kA
Vertical Isolation	12 kV	upto 1250 A	upto 20 kA
	Indoor SF <sub>6</sub> Gas Circuit Breaker		
GCB	36 kV	upto 2000 A	upto 40 kA
		•	•
	Indoor Gas Insulated Switchgear		
CG Antarix	36 kV	upto 1600 A	26.3 kA
	·		•
	Out door Vacuum Circuit Breakers		
Porcelain Clad VCB (PCVCB)	12 kV	upto 1600 A	upto 26.3 kA
Porcelain Clad VCB (PCVCB)	36 kV	upto 2000 A	upto 40 kA
Metal Clad VCB (KIOSK) - Line up	12 kV	upto 2000 A	upto 40 kA
Metal Clad VCB (KIOSK) - Roof Bushing	12 kV	upto 1250 A	upto 26.3 kA
Metal Clad VCB (KIOSK) - Roof Bushing	36 kV	upto 2000 A	upto 26.3 kA
	·		
	Ring Main Unit		
SABRE Range (SF <sub>6</sub> Insulated Vacuum RMU)	12 kV	upto 630 A	upto 21 kA
SABRE Range (SF <sub>6</sub> Insulated Vacuum RMU)	24 kV	upto 630 A	upto 16 kA
MCR Range (SF₅ Insulated Vacuum RMU)	12 kV	upto 630 A	upto 21 kA
TRIDENT Range (Oil Insulated RMU)	15.5 kV	upto 630 A	upto 21.9 kA
		•	
	On - Load Tap Changers		
F 33	36 kV	upto 300 A	upto 17 position
F 66	72 kV	upto 300 A	upto 17 position
		•	
	Unitized Substation		
HV Compartment		Upto 12 kV	
Transformer Compartment		12 kV, upto 1600 kVA	
LT Compartment		440 V, upto 2000 A	
	Protection Relays & IED		
Over Current & Earth Fault Relay			
Under Voltage, Over Voltage & Neutral Displacement Relay			
Self Powered Relay			
Circuit Breaker Manager			
	Distribution Automation		
Primary Distribution Automation using HMI, SCADA, Protecti	on Relays & Bay Control Units		
Secondary Distribution Automation using Remote Terminal U	Inits (RTU's) & Wireless communicatio	n	

The 'Calix' series was designed to provide compact, reliable switching & protection solutions for MV distribution network. With over 50,000 VCB's in operation globally, this time tested product is in service from 1986. Needless to mention, the product had several design upgrades & comply to the quality standards as per IEC 62271 - 100, 200.

The Calix truck is of same pedigree for the entire range that ensures standardisation & ease for operator. The performance & reliability of the VCB has increased many folds with the compliance of M2 Class-extended mechanical endurance. The aesthetically designed & compact product guarantees maximum operator safety, with a combination of mechanical & electrical interlocks.

#### **Vacuum Contactor**

When the application demands for frequent switching operation, Vacuum contactors are used in place of VCB Truck. These can be used for protection & control of Motor feeders & Capacitor bank.

#### **Salient Features**

- Floor rolling type breaker with horizontal isolation & horizontal draw-out.
- Inaccessible live parts & rack in/out with door closed condition ensures operator safety.

- Compartmentalized Panel with built in base frame & ramp.
- ▶ CG make highly reliable vacuum interrupters & protection relays.
- ► Type tested for extended mechanical endurance of M2 class as per IEC 62271 100, ensuring 10,000 operating sequences.
- Stringent Electrical parameter compliance (E2 & C2) can be provided on demand.
- Tested for rapid auto reclosing duty with SCADA compatible control system.
- ► The optional features like draw-out type PT, Powerpack, Integral earth switch, series trip arrangement for unmanned substation (without auxiliary supply) can be provided.
- ▶ Internal arc tested as per IEC 62271-200.
- ► Fully type tested product at renowned testing laboratories like KEMA-Netherlands, KERI-Korea, CPRI/ERDA- India.

#### **Earthing Device**

The following variants are available:

- Integral Earth Switch
- ▶ Portable earthing truck



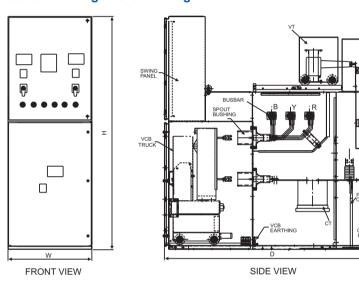


Characteristics	Units		VCB					
Rated Voltage	kV		Upto 12 (Calix)*					
Rated Current	Amp	Upto 800 Upto 1250 Upto 2000 Upto 2500 Upto 3150 Upto 4000						
No of poles	nos		•		3			
Frequency	Hz			50	)/60			
Symmetrical Breaking Capacity	kA rms for 3sec	13.1 20 26.3 31.5 40 50						
Making Capacity	kApk	32.75 50 65.75 78.75 100					125	
Power Frequency Withstand Voltage	kV rms		•	28 (std) / 3	35 (optional)	•	•	
Impulse Withstand	kVpk			75 (std) / 9	95 (optional)			
Operating Duty	cycles		O-0.3s	ec-CO-3min-0	CO (Rapid Au	toreclosing D	uty)	
Total Break Time	cycles			3		3	3.5	
Make Time	cycles				3	•		
DC Component	%	< 50%						
Degree of protection		IP 4X (std) / IP 5X (optional)						
Applicable Standard		IS 13118, IEC 62271-100 / 200						
* Rated Voltage : 15 / 17.5 kV avaliable for export market								

# **Technical data for Vacuum Contactor**

Parameters Value		ue		
Rated Voltage kV	Upto 7.2	12		
Rated Current A	400	400		
Short Time Current kA *	9	9		
Rated P.F withstand Voltage	20	28		
Impulse Withstand	60	75		
* For higher kA level suitable HT HRC Fuses can be provided				

# **General Arrangement Drawing**



### **Dimensions**

СВ Туре	Variant	W x D x H (mm)
	Fault Level: upto 26.3 kA, Rated Current : upto 1250 A BIL: 28/75 kV/kVp	705 x 1805 x 1830
Calix	Fault Level: 26.3 to 31.5 kA, Rated Current : upto 1250 A BIL: 35/95 kV/kVp	650 x 2060 x 2220
	Fault Level: Upto 50 kA Rated Current : 1600 to 4000 A	800 x 2060 x 2220

# **Ordering Information**

# Please furnish the following details while making an enquiry / order

Parameters	Value				
Application	Feeder / Transformer / Motor / Capacitor / Generator Protection				
Site Conditions	Altitude / Pollution / Reference ambient temperature				
Rated Voltage	(Range: 3.6 to 12 kV)				
Symmetrical Breaking Capacity	(Range: 13.1 to 50 kA)				
Rated current	(Range: 400 to 4000 A)				
Frequency	50/60 Hz				
System Earthing	m Earthing Effectively Earthed/ Unearthed/ Non effectively Earthed				
Bus bar Type	Copper / Aluminium				
CT Details	Ratio / Burden / Class Accuracy				
PT Details	letails Ratio / Burden / Class Accuracy / Fixed or Draw-out type				
Protection Relay	Function - Provide ANSI code				
	Electromechanical / Numerical				
	If Communicable, please provide protocol				
Meters	A / V / F / PF / kWH / TVM etc.				
Control Supply Voltage	Control Supply Voltage 24/30/48/110/220 V or Power Pack				
Note: All other accessories shall be	be provided as per our standard. Please specify for any specific accessory requirement.				

### 36 kV Indoor Vacuum Circuit Breaker

The "Felix" is a highly reliable product combined with positive safety interlocks. The product comes with compartmentalized construction and uses non hygroscopic epoxy mould for a long life.

Felix delivers trouble free operation with M2 class compliance. It also houses a draw-out type PT Compartment in the VCB trolley without compromising the compactness. Fixed type PT variant is also available on request.

#### 36 kV Indoor SF, Gas Circuit Breaker

The GCB is a time tested product – a unique dead tank design which offers highly safe operation. The product is suitable for installation at high altitude. The SF $_{\!\scriptscriptstyle 6}$  GCB is best suitable for low inductive & capacitive currents. It employs continuous supervision of SF $_{\!\scriptscriptstyle 6}$  gas pressure.

#### **Salient Features**

- Floor rolling type breaker with horizontal isolation & horizontal draw-out.
- ▶ Inaccessible live parts & rack in/out with door closed condition

- ▶ Compartmentalized Panel with built in base frame & ramp.
- ▶ CG make highly reliable vacuum interrupters & protection relays.
- Tested for extended mechanical endurance of M2 class ensuring 10,000 operating sequences.
- ▶ SCADA compatible control system.
- The optional features like draw-out type PT, Powerpack, Integral earth switch, series trip arrangement for unmanned substation (without auxiliary supply) shall be provided.
- Internal arc tested as per IEC 62271-200.
- Fully type tested product at renowned testing laboratories like KEMA-Netherlands, KERI-Korea, CPRI/ERDA-India.

### **Earthing Device**

The following variants are available:

- Integral Earth Switch
- Portable earthing truck





**Felix Truck** 

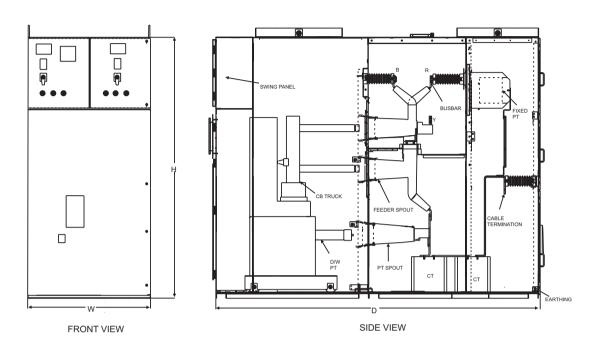




**Technical Data** 

Characteristics	Units	VCB GCB		
Rated Voltage	kV	Upto 36 (Felix) Upto 36		
Rated Current	Amp	630 to	2000	
No of poles	nos	3	3	
Frequency	Hz	50/	/60	
Symmetrical Breaking Capacity	kA rms for 3 sec	26.3 / 31.5 / 40		
Making Capacity	kApk	65.75 / 78.75 / 100		
Power Frequency Withstand Voltage	kV rms	70		
Impulse Withstand	kVpk	170 / 195	(Optional)	
Operating Duty	cycles	O-0.3sec-CO-3min-CO	O-3min-CO-3min-CO	
TotalBreak Time	cycles	4	1	
Make Time	cycles	4		
DC Component	%	< 50%		
Degree of protection		IP 4X (std) / IP 5X (optional)		
Applicable Standard		IS 13118, IEC 6	52271-100 / 200	

# **General Arrangement Drawing**



# **Dimensions**

CB Type	Variant	W x D x H (mm)
Felix	Fault Level: upto 40 kA Rated Current : upto 2000 A	1200 X 3170 X 2650
GCB	Fault Level: upto 40 kA Rated Current : upto 2000 A	1300 X 3130 X 2400

# **Ordering Information**

# Please furnish the following details while making an enquiry / order

Parameters	Value
Application	Feeder / Transformer / Motor / Capacitor / Generator Protection
Site Conditions	Altitude / Pollution / Reference ambient temperature
Rated Voltage	(Range: 22 to 36 kV)
Symmetrical Breaking Capacity	(Range: 26.3 to 40 kA)
Rated current	(Range: 630 to 2000 A)
Frequency	50/60 Hz
System Earthing	Effectively Earthed/ Unearthed/ Non effectively Earthed
Bus bar Type	Copper / Aluminium
CT Details	Ratio / Burden / Class Accuracy
PT Details	Ratio / Burden / Class Accuracy / Draw-out ( only in VCB)
Protection Relay	Function - Provide ANSI code
	Electromechanical / Numerical
	If Communicable - pls provide protocol
Meters	A / V / F / PF / kWH / TVM etc
Control Supply Voltage	24/30/48/110/220 V or Power Pack
Note: All other accessories shall to	be provided as per our standard. Please specify for any specific accessory requirement.

The legendary Indoor Vertical Isolation VCB is a preferred product in various Utilities & Indian Railways. The vertical isolation & horizontal draw-out truck ensures more ground space & provides higher degree of compactness than horizontal isolation trucks. The product comes with high rigidity & best in class control solutions.

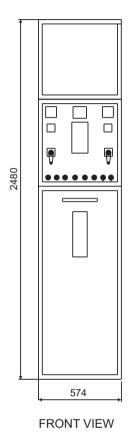
### **Salient Features**

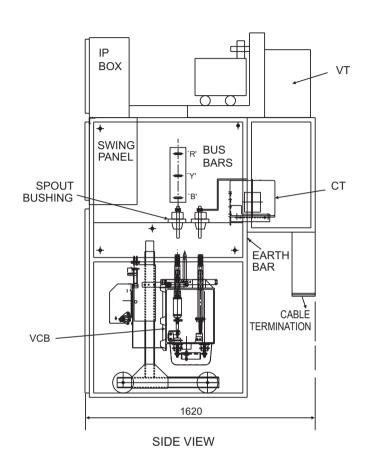
- ▶ A time tested product for high reliability
- Motorized spring charging mechanism.
- Cost effective solution by add-on protective devices like Series tripping coils.
- ▶ Portable earthing device for busbar feeder earthing.
- ▶ Comprehensive range of electrical & mechanical interlocks.



Characteristics	Units	VC	В	
Rated Voltage	kV	3.6 to 12		
Rated Current	Amp	400 to	1250	
No of poles	nos	3		
Frequency	Hz	50	)	
Symmetrical Breaking Capacity	kA rms	13.1	20	
Making Capacity	kApk	32.75	50	
Power Frequency Withstand Voltage	kV rms	28		
Impulse Withstand	kVpk	75		
Operating Duty	cycles	O-0.3sec-CO-3min-CO		
Total Break Time	cycles	3		
Make Time	cycles	3		
DC Component	%	< 50%		
Degree of protection		IP 4X		
Applicable Standard		IS 13118, IEC 62271-100 / 200		

### **Dimensions (mm) - Vertical Isolation VCB**





### **Retrofit Solution**

The legendary CG make Bulk Oil Circuit Breaker (BOCB) was a highly reliable product with world wide installations. The technology advancement has taken the power system protection & reliability factors to a new level. Over the years, BOCB was slowly discarded from the industry due to their high maintenance cost. There is a need to modify the existing BOCB and offer a fresh lease of life to cope up with the modern day demands for reliability & safety.

# **Product Overview**

CG offer economical solution for upgrading BOCB to VCB technology by interchanging the BOCB truck with a VCB truck in the existing panel. There is no need to modify the associated Relays, Current Transformer / Potential Transformer, busbar chamber & Instrument cubicle on the existing panel.

The vertical isolation & horizontal drawout VCB truck provides the best solution for switching from BOCB to Vacuum technology. The VCB

truck is designed to resemble the BOCB truck by general arrangement with appropriate dimensions to ensure direct replacement without any hassle.

The burden on economical & operational front is very minimal to an extent that even the day to day production schedule will not be affected by the replacement process.

#### **Salient Features**

- ▶ Superior operational performance by interrupting the arc in vacuum.
- Very high reliability with bare minimal maintenance.
- Motorized spring charging mechanism.
- Cost effective solution by add-on protective devices like Series tripping coils.
- Portable earthing device for busbar feeder earthing.

#### **Technical Data for CGL make VCB**

Characteristics	Units	VCB		
Rated Voltage	kV	3.6 to 12		
Rated Current	Amp	400 to	1250	
No of poles	nos	3	3	
Frequency	Hz	5	0	
Breaking Capacity	kA rms	13.1	20	
Making Capacity	kApk	32.75	50	
Power Frequency Withstand Voltage	kV rms	2	8	
Impulse Withstand	kVpk	75		
Operating Duty	cycles	O-0.3sec-C	O-3min-CO	
Total Break Time	cycles	3	3	
Make Time	cycles	3		
DC Component	%	< 50%		
Degree of protection		IP 4X		







**Vertical Isolation VCB truck** 

### Solutions for other than CG make Oil Circuit Breakers

CG has harvested the expertise over the years by providing value solution not only for CG BOCB's, but also for other makes of equipment. A few of the major orders executed are

- M/s. Neyveli Lignite Corporation for Russian make MOCB (Fault level: 40 kA & Rated current: 1250 A)
- M/s. Maharashtra State Electricity Distribution Co. for Voltas make SF<sub>6</sub> GCB (Fault level: 40 kA & Rated current: 1600 A)
- M/s.Indian Oil Corporation for Drecher Panikar Ltd make MOCB (Fault level: 40 kA & Rated current: 1250 A)
- ► M/s.Hindusthan National Glass for NGEF make MOCB (Fault level: 26.3 kA & Rated current: 1250 A)
- We have also provided retrofit solutions for Kirloskar & Siemens make MOCB.

With over 50,000 PCVCB in operation globally, this time tested product is in service for over 3 decades. CG is the largest manufacturer of PCVCB in India and the same has been accredited by renowned market research firms like Frost & Sullivan. It is a highly sought product in the utilities distribution segment. The product is specially designed for outdoor application with rated voltage of 12 kV to 36 kV. Over the years, the product has undergone a frequent design improvement that brings you a sense of satisfaction over reliability & safety.

#### **Salient Features**

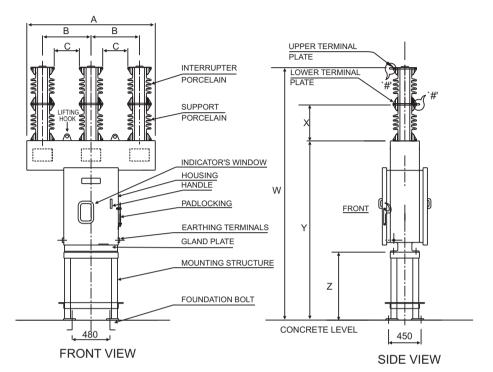
- Artful combination of compactness, simplicity & ruggedness.
- This all-weather product comes with adequate clearances & sufficient creepage to suit highly polluted environment.
- The CB system inside the pole is completely isolated from the atmosphere & filled with nitrogen gas to avoid ingress of moisture.

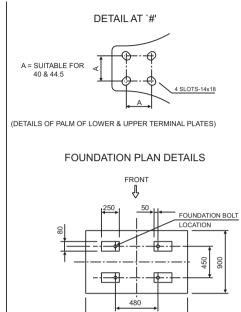
- CG make highly reliable vacuum interrupters & protection relays are used.
- ▶ Highly reliable spring-spring mechanism.
- 'Slow closing' facility shall be provided to close the CB in emergency.
- Low operating noise level and requires very little maintenance with no special tools & techniques.
- Type tested for extended mechanical endurance of M2 class as per IEC 62271 – 100, ensuring 10,000 operating sequences with minimal maintenance.
- Suitable for auto reclosing duty with SCADA compatible control systems.
- Fully type tested product at renowned testing laboratories like KEMA-Netherlands, KERI-Korea, CPRI/ERDA- India.



Characteristics	Units	PCVCB					
Rated Voltage	kV	Upto 12* 36					
Rated Current	Amp	Upto 800	Upto 1250	Upto 1600	Upto :	2000	
No of poles	nos		•	3			
Frequency	Hz			50			
Symmetrical Breaking Capacity	kA rms for 3sec	13.1 20 26.3 26.3				40	
Making Capacity	kApk	32.75 50 65.75		65.75	65.75	100	
Power Frequency Withstand Voltage	kV rms	28 (std) / 35 (optional) 70 (std) / 95 (optional)				(optional)	
Impulse Withstand	kVpk	75 (std) / 95 (optional) 170 (std) / 210 (optional)					
Operating Duty	cycles	O-0.	3sec-CO-3mir	n-CO (Rapid A	Autoreclosing	Duty)	
Total Break Time	cycles		3		4		
Make Time	cycles		3		4		
DC Component	%			< 50%			
Degree of protection		IP 55					
Applicable Standard		IS 13118, IEC 62271-100					
* Rated Voltage : 15 / 17.5 kV avaliable for export market							

# **General Arrangement Drawing**





1100

### **Optional Accessories**

- ▶ Control & Relay panel (Indoor / Outdoor)
- ▶ Terminal connector
- ▶ Current transformer mounting structure
- ▶ Potential transformer mounting structure

### **DIMENSIONS (mm)**

	TYPES OF PCVCB	(A)	(B)	(C)	(W)	(X)	(Y)	(Z)
1	12kV,13.1/20kA,LEON	1250	472	290	2790	370	2050	755
2	12KV,26.3KA	1400	549	300	2910	370	2156	1010
3	36kV,26.3kA	1800	700	420	3485	530	2411	1135
4	36kV,40kA	1800	740	420	3485	530	2411	1135

# **Ordering Information**

Please furnish the following details while making an enquiry / order.

Parameters	Value		
Application	Feeder / Transformer etc.		
Site Condition	Altitude / Pollution / Reference ambient temperature		
Rated Voltage	Range 3.6kV to 36kV		
Symmetrical Breaking Capacity	Range 13.1 to 40kA		
Rated Current	Range 400 to 2000 A		
Motor Voltage	110 / 220 AC or DC		
Control Supply Voltage	24/30/48/110/220 V		
Auxiliary Switch	If not specified 6 NO + 6 NC shall be provided		

The KIOSK is specially designed for unmanned substations in the Outdoor distribution network. It is a standalone vacuum switchgear system with built in self driven independent control supply for self tripping & closing of CB. The product is well equipped for metering, control, protection & SCADA compatibility.

### The product is available in two basic designs -

Roof bushing type with incoming & outgoing through roof bushings (Rated Voltage: 12 & 36 kV)

Line up type with incoming through bottom, rear / side cable entry & outgoing through busbar / cables (Rated Voltage:  $12\,kV$ )



12kV Roof Bushing KIOSK

#### **Salient Features**

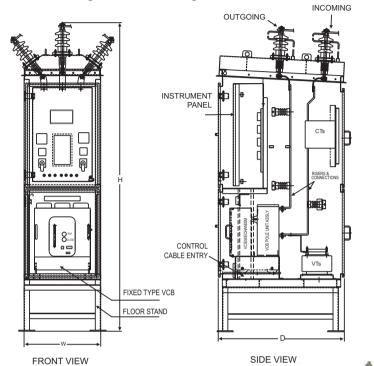
- ► Compact fixed / draw-out type (optional) VCB truck.
- SCADA Compatible with rapid autoreclosure duty.
- Remote metering option with multifunction communicable Tri Vector Meter.
- ► Tested for extended mechanical endurance of M2 class as per IEC 62271 100, ensuring 10,000 operating sequences.
- Pedestal mounting to avoid rusting of bottom base & ease of control cable wiring.
- ▶ Usage of non hygroscopic solid insulations.
- ▶ Type tested as per IEC: 62271 100, 200.



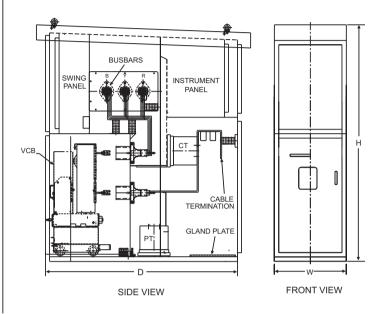
12kV Line up KIOSK

Characteristics	Units	Roof Bushing		Line up		Roof Bushing
Rated Voltage	kV		12			36
Rated Current	Amp	Upto 1250	Upto 1250	Upto 1600	Upto 3150	Upto 2000
No of poles	nos		3			
Frequency	Hz			50		
Symmetrical Breaking Capacity	kA	upto 26.3	20	26.3	40	26.3
Making Capacity	kApk	32.75	50	65.75	100	65.75
Power Frequency Withstand Voltage	kV rms	28			70	
Impulse Withstand	kVpk	75			170	
Operating Duty	cycles	O-0.3sec-CO-3min-CO (Rapid Autoreclosing Duty)			•	
Total Break Time	cycles	3			3.5	
Make Time	cycles	3			3	
DC Component	%	< 50%			•	
Degree of Protection		IP 54				
Applicable Standard		IS 13118, IEC 62271-100 / 200				

# **Roof Bushing Kiosk GA Drawing**



### **Line-up Kiosk GA Drawing**





36kV Roof Bushing KIOSK

# **Dimensions (mm)**

Variants	w	D	Н
Line-Up - 12kV			
Fault level 20kA & Rated Current 1250 A	707	1840	2030
Fault level 26.3kA & Rated Current 1600 A	857	1840	2030
Fault level 31.5kA & Rated Current 1250 A	707	1960	2424
Fault level 40kA & Rated Current 2000 A	857	1960	2424
Roof Bushing - 36kV			
Fault level 26.3kA & Rated Current 1250 A	1310	1675	3020
Roof Bushing - 12kV			
Fault level 20kA & Rated Current 800 A	707	1165	2435
Fault level 26.3kA & Rated Current 1250 A	707	1665	2850

As the world is moving towards highly compact and reliable power distribution equipment,GIS is emerging as the best solution for M.V. Primary Power Distribution. ANTARIX GIS offer latest technology with only incremental cost over Air Insulated Switchgear. The product comes with flexible SF $_{\!\scriptscriptstyle 6}$  gas insulated plug-in compartments to suit various network configurations.

The cubicles are robotically welded hermetically sealed stainless steel enclosure and are safe from internal arc. The circuit breaker cubicle includes a vacuum circuit breaker with three position disconnector switch connected in series with it. The gases generated during internal arc are vented through a relief duct provided at the rear side. The plug-in busbar and cable connectors allow easy termination of busbar and power cables with circuit breaker cubicle. The control and cable termination are front accessible along with plug-in instrument transformers ensuring ease of approach to all the equipments.

#### **Salient Features**

- ▶ Compact design & reduced space requirement.
- Sealed for life breaker compartment.
- ▶ High degree of reliability and safety.
- Virtually maintenance free equipment.
- Easy future extensibility of the network through flexible plug-in connectors.
- Ring type Current Transformers.
- ▶ Touch proof cable connectors & bus bars.
- Reduced total cost considering space requirement & long trouble free product life.

Characteristics	Value
Rated Voltage	36 kV
Rated Current	
General Busbars	1600 A
Outgoing lines	1250 A
Rated Short circuit current	
Breaking Capacity	26.3 kA
Making Capacity	66 kAp
Short time current withstand	26.3 kA - 3 sec
Lightening Impulse	
Between phase & phase to earth	170 kVp
Isolating distance	195 kVp
Power frequency for 1 min	
Between phase & phase to earth	70 kV
Isolating distance	80 kV
Frequency	50 / 60 Hz
Internal Arc withstand	26.3 kA - 1sec
IP Rating	
Tank	IP 67
Cubicile assembly	IP 3X
SF <sub>6</sub> gas pressure	0.4 bar G
Dimension	
Width	600 mm
Depth	1400 mm
Height	2400 mm



# SABRE Range SF<sub>6</sub> Gas Insulated Vacuum RMU

#### **Product Overview**

The SABRE range of RMU combines the most advanced Vacuum &  $SF_{\epsilon}$  technologies to meet the modern day requirements. It is fully extensible and highly flexible unit used in a wide range of applications including distribution switchboards, transformer substations, ring distribution networks and HV Connections to industrial & commercial sites. The units are developed to suit customer requirements for connection, supply, protection and sectionalising with remote operation.

The SABRE RMU's ensure protection in the form of a circuit breaker being monitored & controlled by a self powered numerical relay. The sectionalising is enabled through ring switches.

#### **Circuit Breaker**

The CB comprises of 3 vacuum interrupters, which have a fault-make, fault-break rating. Earthing of the outgoing cable is achieved by the use of CB in series with the off-load disconnector / selector switch. This will enhance the making capacity of the Earth switch.

#### **Ring Switch**

These are fault-make load break switches utilising a single break 3 position switches viz., 'ON', 'OFF' & 'Earth' functions.

#### **Operation & Safety**

All operating positions and instructions are indicated on the main panel at the front of the unit. Both manual & automated versions are available in SABRE range.

Live Parts are contained within an earthed stainless steel enclosure with positive safety interlocks on all switch / selector positions ensure operator safety & prevent incorrect operation. The system is fully internal arc tested as per IEC requirement.

With the most advanced vacuum switching technology in an  $SF_6$  gas filled enclosure, the units are compact and are easy to install & operate. Characterized by their reliability and operational safety, they are fully weatherproof with virtually zero maintenance.

#### **Salient Features**

- ▶ Stainless steel enclosure fabricated by automatic robotic welding.
- ▶ Isolation in clean SF, gas for Ring switch & in vacuum for CB.
- ▶ Suitable for Indoor & Outdoor application.
- ▶ Common Switching chamber with Vacuum Tee off circuit breaker.
- ▶ Enhanced duty in excess of IEC requirement.
- All switch positions have pad-locking & Castell interlocking facilities.
- Internal arc protection including cable boxes.
- ▶ Extensible from both the sides.
- ▶ Fully SCADA compatible unit with remote switching.

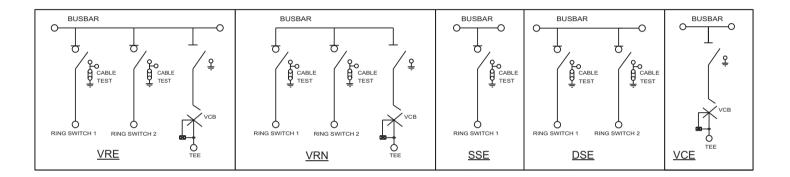






# **Product Variants**

Code	Product Description		
VRN	Vacuum Ring Main Unit - Non Extensible		
VRE	Vacuum Ring Main Unit – Extensible		
VCE	Vacuum Circuit Breaker - Extensible		
SSE	Single Switch – Extensible		
DSE	Double Switch – Extensible		



# **Optional Accessories**

- ▶ Earth Fault indicators / Fault passage indicators
- ▶ Metering module
- ▶ Motorized kit for automation.

Characteristics	SABRE - VRE	VRE - 6A	SABRE
Rated Voltage kV	12 / 15.5		24
Dated CompatA	604	0	630 for Ring Switch &
Rated Current A	630	U	400 for CB
Symmetrical Breaking Capacity kA / sec	21 /	3	16 / 3
Making Current kAp	52.	5	40
Impulse Withstand kVp	75 / 110 (d	optional)	125
Min Gas Pressure Bar	0		·
Filling Pressure Bar	0.4		0.5
Index of protection	IP 54		
Cable termination			
Incoming	Side Bottom		Side Bottom
Tee off	Rear Bo	ottom	Rear Bottom
Cable Tests	Bottom Bottom		Bottom
Dimensions			•
Width	935 948		935
Depth	1030 1085		1078
Height	1333 1750		1470
Weight kg	410 350		450

MCR is a versatile  $SF_6$  insulated Vacuum Ring Main Unit – a combination of vacuum circuit breaker unit and fault-make load break switches (Ring switch / Isolators). With front cable terminations, the system is highly compact and well protected with Pad-lock, interlock & earthing facilities.

The unit is suitable for both indoor & outdoor applications and can be used either as a free standing unit or installed in compact minisubstation. The product can accommodate further extension of breakers & Isolators depending on application.

With the most advanced vacuum switching technology in an  $SF_6$  gas filled enclosure, the units are compact and are easy to install & operate. Characterized by their reliability and operational safety, they are fully weatherproof with virtually zero maintenance.

## **Salient Features**

- Front entry cable box & all controls in the front facia.
- ▶ Fully SCADA compatible unit with remote switching.
- Pre-wired for motor actuation.
- ▶ Safety interlocks on all switch positions to prevent mal-operation.
- ▶ Padlockable switch & selector positions.
- ▶ Compliance with IEC standards.

### **Optional Accessories**

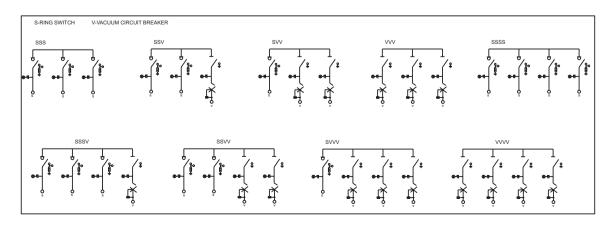
- ▶ Earth Fault indicators / Fault passage indicators
- Metering module
- Motorized kit for automation

#### **Product Variants**

As the product is a combination of Ring Switch (S) & Vacuum Circuit Breaker (V), the variants are indicated as shown below:



lechnical Data	
Characteristics	MCR
Rated Voltage kV	12
Rated Current A	630
Symmetrical Breaking Capacity kA / sec	21 / 3
Making Current kAp	52.5
Impulse Withstand kVp	75 / 95 (optional)
Min Gas Pressure Bar	0
Filling Pressure Bar	0.4
Index of protection	IP 54
Cable termination	
Incoming	Front Bottom
Tee off	Front Bottom
Cable Tests	Тор
Dimensions	
Width	1300
Depth	900
Height	1400
Weight kg	540 (3way)



With over 10,00,000 units world wide, the TRIDENT range of Oil RMU has a service history of 35 years with trouble free operation. The product is designed to provide a compact arrangement with all control operations at the front facia. The circuit is protected by using HT HRC fuses immersed in oil. The basic product comprises of two (ring) oil switches in a common chamber at the top and one fused (tee-off) switch in a separate chamber underneath. The switches are fully interlocked to prevent any possible mal-operation and subsequent dangerous operations.

#### **Salient Features**

- Suitable for both indoor & outdoor application.
- Rugged construction with shot blasting, zinc sprayed & epoxy powder coated enclosure.
- Remote control & Signalling.
- ▶ Earth fault indication.
- Interlocked cable test facility.
- All switch positions have pad-locking & Castell interlocking facilities.



3 Way FRMU

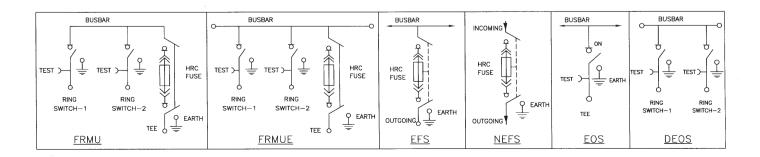


Metering Cubicle + EFS + Transformer Assembly

#### **Product Variants**

Code	Product Description	
FRMU	Fused Ring Main Unit	
FRMUE	Fused Ring Main Unit – Extensible	
EFS	Extensible Switch Fuse Unit	
NEFS	Non Extensible Switch Fuse Unit	
EOS	Extensible Oil Switch	
DEOS	Double Extensible Oil Switch	

Characteristics	FRMU / NEFS / EFS / EOS / DEOS			
Characteristics	Ring Switch	Fuse Switch		
Rated Voltage kV	12 /	15.5		
Rated Current A	630	400		
Breaking Capacity Main / Earth kA	0.63	20		
Making Capacity Main / Earth kAp	55 / 55	50 / 7.8		
Impulse Withstand kVp	110	110		
Index of protection	IP	54		



A unitized substation (USS) is a nutshell product comprising of various substation equipments housed inside a metal enclosure. The USS comprises of -

- HV compartment consisting of a Vacuum Circuit Breaker (VCB) or a Ring Main Unit (RMU).
- Astep down Transformer (X'MER).
- Low Voltage (LV) compartment consisting of LV distribution panel.

#### **Salient Features**

- Protection from unauthorized access.
- Protection from environmental hazards.
- Compact design with enhanced safety aspects.
- SCADA compatibility.
- Appealing aesthetics with long Product life.
- Ease of operation & maintenance.
- Ready to charge.
- Fully type tested as per IEC.

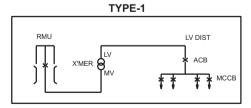


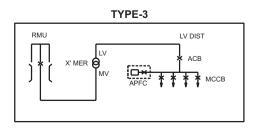
LT Panel (12 Feeders) + APFC Panel

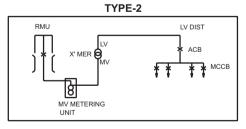
# **Technical Data**

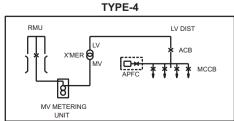
Degree of Protection	IP 23D*
Duty	Outdoor
Type of Ventilation	Natural
Standard Colour #	CG Blue
Rated Voltage	12 kV
Rated Power Frequency withstand Voltage 28 kV	
Rated lightening Impulse withstand Voltage 75 kV	
* Higher degree of protection shall be provided on request	 t.

# **Standard Variants**









<sup>#</sup> Any other colour shades shall be provided on request.

#### **Enclosure**

- All equipments mounted on a common galvanized GI base with fabricated enclosure.
- Painted with polyurethane rust proof paint.
- Completely detachable side walls, ensuring ease of access to all equipments.
- Louvers are provided for cross ventilation to allow natural cooling inside enclosure.
- Enclosure doors are individually pad lockable from outside and are interlocked to secure all doors by bolting LT Compartment door.
- All busbars inside the cubicle are sleeved using heat shrinkable sleeves.
- Enclosure lifted directly from base frame by means of specially designed detachable lifting arrangement ensures no distortion/damage to the enclosure during lifting/handling.
- Compact layout of Transformer, LT & RMU inside enclosure and yet without compromising access for maintenance.

## **HV Compartment**

#### SF, Gas filled Vacuum RMU

 CG make RMU with side cable entry & rear Tee-off bushings helps in direct & easy coupling of RMU with Transformer.

- Optional Metering Unit (MU).
- SCADA compatibility.
- ▶ Fault passage / Earth Fault indicators.

#### Vacuum Circuit Breaker

- ▶ CG make horizontal draw out type VCB.
- ▶ Complete SCADA Compatible solutions.
- ▶ CG make relay & Circuit Breaker Manager.

#### **Transformer Compartment**

- ▶ Choice of Oil cooled or Dry type transformer.
- ▶ Rating: Upto 1600kVA with Voltage: 12 kV.
- ▶ Optional Off Circuit / On Load tap changer arrangement.
- ▶ Oil filled transformer Hermetically sealed / Corrugated tank.
- Primary connection from transformer by XLPE cable & secondary connections by solid flats with expansion joints ensures proper joints and avoids stress / impact on transformer bushings.

#### **LV Compartment**

- Rating upto 2000 A, 440 V.
- LV Switchgear: ACB / MCCB feeder board upto 12 feeders.
- Optional APFC panel with capacitor bank.

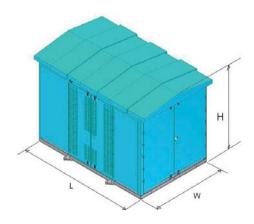


Handling of a fully assembled unit

#### **Dimensions**

DIMENSIONS (mm)*			
COMBINATION	L	W	Н
RMU + X'MER + LT	3400	1900	2275
RMU+MU+X'MER+LT	3900	2200	2450
RMU+X'MER+LT+APFC	3550	2200	2575

\* The mentioned dimensions are indicative as they are subject to change based on equipment ratings and layout.



The 'CGI 14N/C' Numerical Protection Relay is a fully digital relay based on microprocessor technology with analogue to digital conversion of the measured values and subsequent numerical processing. It uses specialized digital signal processor (DSP) as the computational hardware, along with associated software.

The relay has feature of IDMT as well as instantaneous protection for both over current & earth elements with breaker failure protection (50BF). The relay can be field programmed as 3O/C + 1E/F or 2 O/C + 1E/F + 1SE/F or 1RE/F (optional). The front panel features a 6-button keypad & a 16x2 LCD display that provides an easy user interface.

#### **Salient Features**

- ▶ Breaker Failure detection.
- ▶ Communication port: RS485 / RS232 (optional).
- ▶ Programming through local Key pad.
- ▶ Selectable Definite Time or IDMT curves as per IEC standards.
- ▶ Rated input current selectable 1A or 5A.
- ▶ Password protection to guard against unauthorized access & editing of settings.
- ▶ Recording of ten last fault records with time stamping.
- Parameterization & downloading of records through "CG View" software (optional).



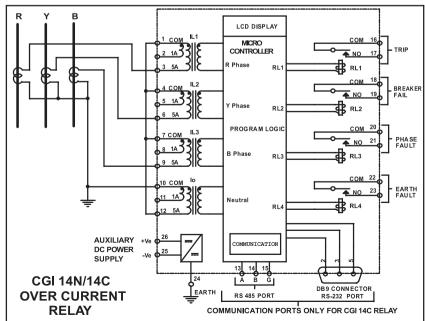
#### **Application**

- ▶ Primary circuit protection on distribution networks at any voltage
- Backup/auxiliary protection for transformers, generators and motors.

#### **Protection Functions**

IEEE/ANSI Code	IEC Symbol	Function Name
50/51	3I>, 3I>>	Over current protection
50N/51N	lo>, lo>>	Earth fault protection
50N (S)	IEE>, IEE>>	Sensitive earth fault protection
87N	IREF>	Restricted earth fault protection
50BF	CBFP	Breaker failure protection

# **Typical Wiring Diagram**

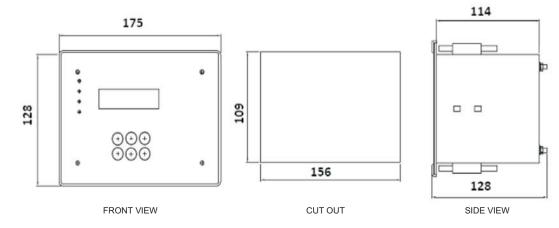


# **Technical Specification**

Rated Current (In)	1A or 5A(Programmable), 50Hz	
Auxiliary Power Supply	18V to 52V DC or 75V to 250V DC	
Relay Settings		
Phase Fault I> (51)	5% to 200%, in steps of 1%	
Phase Fault I>> (50)	50% to 1600%, in steps of 1%	
Earth Fault lo> (51N)	5% to 200%, in steps of 1%	
Earth Fault Io>>(50N)	50% to 1600%, in steps of 1%	
Current/Time	a) Standard Inverse (SI) 3s @ 10 times	
Characteristics	b) Standard Inverse (SI) 1.3s @ 10 times	
	c) Very Inverse (VI) 1.5s @ 10 times	
	d) Extremely Inverse (EI) 0.8s @ 10 times	
	e) Long Time Inverse(LTI) 13.33s @ 10 times	
	f) Definite Time (DT) upto 99.9s	
Instantaneous Delay	0 sec to 2 sec in steps of 0.05sec	
Pick up current	110% of set current	
Reset Current	90% of set current	
Reset Delay	0 to 2sec in steps of 0.5 sec	
Breaker failure time	200ms to 1000ms insteps of 100ms	

Burden	Less than 0.2 VA/ phase at CT input Less than 6 W at Auxiliary Power supply	
Indications	4 LED Indications for Power on, Alarm, Trip & Error	
	16x2 character LCD for parameter display and Setting	
Output Relay Contacts	4 relay outputs (RL1, RL2, RL3, RL4)	
	Trip relay(self or manual reset)	
	Breaker Fail Indication Relay (self or manual reset)	
	Annunciation-1 Relay for PF (self or manual reset)	
	Annunciation-2 Relay for EF (self or manual reset)	
Output contact rating		
Rated voltage	250 VAC/30 V DC	
Rated current	16A for Trip relay and 5A for other relays	
Rated Breaking		
Capacity	2000 VA	
Over Load capacity	2 times rated current continuously	
	20 times rated current for 1 sec	

# Dimensions (mm)



The 'CGV 24C' Numerical Protection Relay is a fully digital relay based on microprocessor technology with analogue to digital conversion of the measured values and subsequent numerical processing. It uses specialized digital signal processor (DSP) as the computational hardware, along with associated software.

The relay has feature of Definite Time Lag (DTL) characteristic. The relay can be field programmed for Under voltage / Over Voltage and Neutral Displacement protection functions. The front panel features a 6-button keypad & a 16x2 LCD display that provides an easy user interface.

#### **Salient Features**

- ▶ Communication port: RS485 / RS232 (optional).
- ▶ Programming through local Key pad.
- ▶ Password protection to guard against unauthorized access & editing of settings.
- ▶ Recording of ten last fault records with time stamping.
- ▶ Parameterization & downloading of records through "CG View" software (optional).



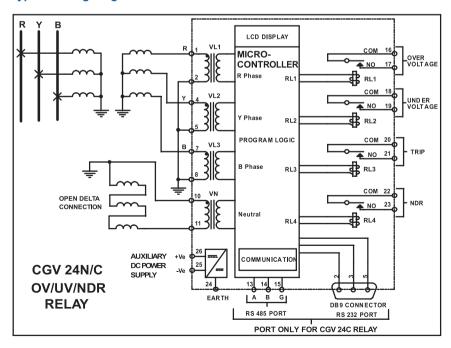
#### **Application**

- Primary circuit protection on distribution networks at any voltage level.
- ▶ Backup/auxiliary protection for transformers, generators, motors & capacitor protection.

#### **Protection Functions**

IEEE / ANSI Code	IEC Symbol	Function Name
27	U<	Under Voltage protection
59	U> Over Voltage protection	
60	U <sub>o</sub>	Neutral Displacement protection

### **Typical Wiring Diagram**



#### Note:

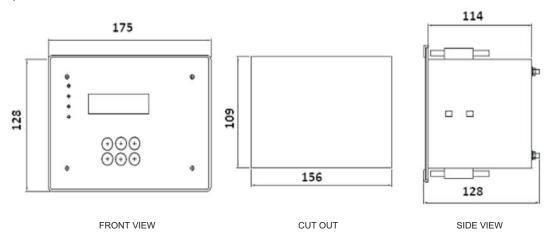
Open Delta winding if available shall be connected as shown. In case the open delta winding is not available the relay can calculate the same internally through vector summation of the secondary voltages

# **Technical Specifications**

Auxiliary Power Supply	18V to 52V DC or 75V to 250V DC	
Relay Settings		
U/V Settings	45% to 90% of line to	
	neutral in step of 1%	
O/V Settings	105% to 170% of line to	
	neutral in step of 1%	
NDR	1 V to 20 V of line to	
	neutral (Secondary)	
No Voltage Settings	3 V to 20 V of line to	
	neutral (Secondary)	
Definite Time Trip	0.0 to 600 sec in step of 0.1 sec	
Characteristics		
Relay contact	Self / Hand reset	
OV Pick up	5% above setting	
OV Dropout	10% below setting	
UV Pick up	5% below setting	
UV Dropout	10% above setting	

Less than 0.5 VA/phase
at VT inputs
Less than 6 W at
Auxiliary Power supply
4 LED Indications for
Power on, Alarm, Trip & Error
16x2 character LCD for
parameter display and Setting
4 relay outputs (RL1, RL2, RL3, RL4)
Under Voltage Trip
Over Voltage Trip
Trip
Neutral Displacement Trip
250 V AC / 30 V DC
16A for Trip relay and 5A for other relays
2000 VA

# Dimensions (mm)



The 'CGI 14S' Self Powered Numerical Protection Relay is designed for use in unmanned substation where dependable auxiliary power source is not available. The relay derives power for its operation from main current transformers. It also comprises integrated communication protocols for SCADA compliance.

The relay has feature of IDMT, as well as, instantaneous protection for both over current & earth elements. It accomplish Digital filtering of measured quantities by using discrete Fourier analysis to suppress high frequency harmonics and transient DC components induced by faults or system operations.

The front panel features a 8-button keypad & a 16x2 LCD display that provides an easy user interface.

#### **Salient Features**

- ▶ Self-powered relay, auxiliary power supply not required.
- ▶ Communication port: RS485 / RS232.
- ▶ Remote tripping via external voltage.
- ▶ Programming through local Key pad.
- ▶ Selectable Definite Time or IDMT curves as per IEC standards.
- ▶ Password protection to guard against unauthorized access & editing of settings.
- ▶ Trip indication via external flag indicator with mechanical reset.
- ▶ Two potential free alarm contacts, latched type (bi-stable relay).
- ▶ Recording of ten last fault records with time stamp.
- ▶ Parameterization & downloading of records through "CG View" software (optional).



### **Application**

- > Primary circuit protection on distribution networks.
- ▶ Auxiliary protection for transformers, generators, motors.

#### **Protection Functions**

IEEE/ANSI Code	IEC Symbol	Function Name
50/51	3 >, 3 >>	Over current protection
50N/51N	lo>, lo>>	Earth fault protection

#### **Technical Specification**

Burden	< 5VA	
IDMT	5 Settings Curves as per	
	IEC Standard: SI/VI/EI/LTI/DT	
Indications	4 LED Indications:	
	Power on	
	Alarm	
	Trip	
	Error	
Frequency	50Hz	
CT Secondary	1 Amps	
Over Current setting	20 – 200%	
Earth Fault setting	20 – 200%	

High Set Features	
High Set Over Current	50 – 1600%
High Set Earth Fault	50 – 1600%
Pick up Current	110% of Set Current
Re Set Current	90% of Set Current
Over Load Capacity	2 times rated current continuously 20 times rated current for 3 sec.
Out Put Contacts	Impulse O/p for tripping coil: 12-24 V DC ( Energy < 0.1W/Sec) Potential free O/p contact: Two Change over contact for trip.
Auxiliary Power Supply	Self Powered
Battery	3.7V/2000 mAH Li-ion
Digital Inputs	4 DI for Remote trip, Fast trip & 2 spare.

A new concept for increased reliability of Circuit Breaker operation - CBM provides an integrated solution for control, monitoring & metering of a CB. The design is based on latest state of art technology using 16 bit digital signal controller which ensures error free operation, enhancing the system reliability. CBM is user friendly equipment with all programming & control functions through the front facia.

#### **Salient Features**

- ▶ Six digital fault inputs & four relay outputs plus two separate solid state outputs for trip & close operation.
- ▶ Field Programmable control logic between fault inputs & relay outputs.
- ▶ Field Programmable Current & Potential Transformer ratios.
- ▶ Local / Remote mode selection.
- ▶ Inbuilt Anti pumping logic.
- ▶ Inbuilt Master trip relay logic.
- ▶ Inbuilt trip circuit supervision logic.
- ▶ Inbuilt operation counter & fault counter.
- ▶ Inbuilt 3phase Under & Over voltage protection (Optional).
- ▶ Front panel keyboard for programming with LCD display.
- ▶ Replaces all electromechanical switches
- ▶ Replaces analog / digital meters

#### **Key Advantages**

- ▶ Reduction in wiring.
- ▶ Reduction in panel space.
- ▶ High reliability.



#### **Control functions**

- ▶ CB Close / Trip along with Master trip relay function.
- ▶ Anti pumping.
- ▶ Trip Circuit Supervision.

#### **Monitoring functions**

▶ Common alarm Scheme & 6 window annunciater.

#### **Measurement functions**

- ▶ 3ph Voltage & Current.
- ▶ Power factor.
- ▶ kW, kVA & kVAR.
- ▶ Operation Counter & Fault Counter.

#### Indications

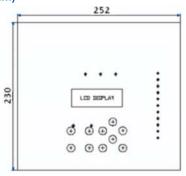
The following indications are provided in CB Manager - VCB ON, VCB Off, Spring Charge Indication, VCB in test, VCB in service, Six Fault indications & R Y & B ph healthy indication.

### **Technical Specification**

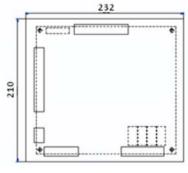
Auxiliary Power Supply	18V to 52V DC or 75V to 250V DC	
Rated Current	(In) 1A or 5A(Programmable), 50Hz	
Rated Voltage	(In - In) 110 V AC	
Over Voltage U> (59)	110% to 160%, in steps of 1%	
Over Voltage Trip Time	1 sec - 10 sec, in steps of 1 sec	
Under Voltage U< (27)	45% to 90%, in steps of 1%	
Under Voltage Trip Time	1 sec - 10 sec, in steps of 1 sec	
Burden	Less than 0.20 VA/ phase at CT/PT inputs Less than 6 W at Auxilliary Power Supply	

Output Relay Contacts	4 General Purpose configurable relay outputs (Relay1, Relay2, Relay3, Relay4,	
Output Contact Rating:		
Rated Voltage	250 V AC / 30 V DC	
RatedCurrent	5A	
Rated Breaking Capacity	2000VA	
Over Load capacity	2 times rated current continuously	
	20 times rated current for 1 sec	

#### **Dimensions (mm)**



FRONT VIEW





CG is one of the first companies which started manufacturing OLTC from late 60's. The product started with "F" series tapchangers in collaboration with M/s.Fuller Electric Co – UK. As being the latest technology of their times, they are satisfying the needs of present day customer's too. Even today, the F33 & F66 are highly familiar names in the OLTC market.

However, over the years the product has undergone various design upgradation satisfying the new challenges & requirements of the customers.

The product, a high speed resistor type is designed for use with 3 ph distribution substation transformer. It can be bolted directly to a port flange on the transformer.

### **Salient Features**

- ▶ Housed in a single tank of current diversion & tap selection.
- ▶ Suitable for limited power flow in reverse direction.
- ▶ Transformer is separated through an insulating terminal barrier.
- ▶ SCADA compatible control operations.
- ▶ Designed for long service with an absolute minimum maintenance.



36 kV OLTC

Characteristics	F33	F66
System Voltage	36kV	72kV
Max Number of Positions	17	17
Max Step Voltage :		
At rated current of 100 A	1250V	1250V
At rated current of 200 A	1250V	1250V
At rated current of 300 A	625V	625V
Rated Current	300A	300A
Power Frequency Withstand	70kV	140kV
Rated Lightening Impulse Withstand	200kV	350kV
Power Frequency Withstand between contacts	25kV	37kV
Power Frequency Withstand between phases	70kV	140kV
Max Impulse Withstand over the tapping range	100kV	220kV
Max Impulse Withstand between phases	200kV	350kV
Contact life at rated current	100000 operations	100000 operations
Time per tap change	5 sec	5 sec
Actual tap change transition time	65 milli sec.	65 milli sec.

# **Ordering Information**

Parameters	Value	
Remote Tap Changer Control Cubicle (RTCC)	Yes / No	
Type of Control	Manual / Motorised / Automatic, Independent / Group simultaneous	
Transformer Particulars		
MVA Rating	To be specified	
Voltage Ratio	To be specified	
Tapping Range	% to % No. of Steps	
No. of positions	To be specified	
Tapping on	HV / LV for variation of HV / LV	
Connection of tapped winding	Star / Delta	
Whether tapped winding fully insulated / graded	To be specified	
Maximum Step Voltage	To be specified	
Maximum tap change through current	To be specified	
Direction of power flow	HV to LV / LV to HV (Incase of bidirectional powerflow, indicate normal power flow direction and also the extent of reverse power flow)	
Paralleling details (if any)	To be specified	
Confirmation of operating voltages		
Motor	415V AC / 3 phase	
Control	110V AC / 1 phase	
Heating	230V AC / 1 phase	
Any other extras / special features if required	To be specified	

# **Primary Distribution**

#### **Control & Automation**

The market place demand has multiplied many folds in a very short span for substation automation. The automation improves the system reliability & optimizes the operations of a substation.

The success of distribution automation lies in proper selection of equipment & integrating the same with protection scheme & communication solutions. Appropriately planned & targeted automation capabilities will greatly enhance data analysis, operational efficiency & provide optimal economic returns.

CG offers the following automation solution based on IEC 60870-5-101/103/104 and IEC 61850 protocol.

#### **Data Monitoring**

- ► Feeder data monitoring function (Electrical parameters like V,I,P,Q, kVA, PF, F)
- Circuit Breaker Status Data (Close/Open, Remote/Local, health status etc)
- ▶ Isolator & Earth Switch status data (Close/Open status data etc)

#### Data Logging, Events & Alarm

- ▶ Data Logging and report generation function
- ▶ Alarm generation & event logging function
- ▶ Data disturbance recording function

#### **Circuit Breaker Control**

- ▶ Close/Open Control
- ▶ Acknowledgement
- ▶ Interlocks
- ▶ Security

#### **System Integration**

System integration covers the networking and exchange of information among multiple disparate systems.

The automation solutions are integrated using CG make Relays, IEDS, RTU's, Data Concentrators & SCADA Software on multiple protocols.

#### **Data Security**

- ▶ Login Password Facility
- Database backup

#### **Data management**

It covers all aspects of collecting, analyzing, storing and providing data to users and applications including the issues of data identification, validation, accuracy, up dating, time-tagging, consistency across databases etc.

#### **Customized Control and protection schemes**

CG offers a wide range of tailor made protection schemes like Auto changeover schemes, various interlocks between the panels, Fast Bus transfer, Slow Bus transfer schemes, Synchronization & Load Shedding features etc.

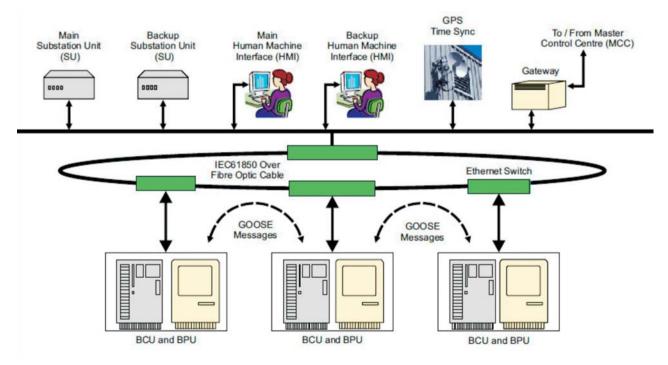
#### **Key Features**

- ▶ Operational Simplicity
- ▶ High Stability (due to LINUX)
- ▶ Immunity to virus attack (due to LINUX)
- ▶ Time synchronization with GPS clock

#### The major benefits of primary distribution automation are

- ▶ Increased revenue by achieving high system availability
- ▶ Higher reliability by proactive problem detection & fault resolution
- Increased customer satisfaction by complying to power quality requirements
- ▶ Cost reduction by reduced manual operations

#### **Automation Architecture**



# **Secondary Distribution**

#### **Control & Automation**

With today's increased focus on operational efficiencies, the level of interest in automation has significantly grown. CG Lucy provides you with effective integrated switchgear automation solutions yielding maximum benefits in terms of enhanced network management.

RMU's can be equipped with modern automation equipments that responds to the changing customers demand for modern, fully automated and remote controlled switchgear. Both Oil / SF6 RMU's can be fully automated by using a combination of linear motor driven actuators, auxiliary relays along with Remote Terminal Units (RTU) integrated with communication device which supports various standard protocols. The integrated RMU with RTU can communicate through a wide range of available communication protocol as per the system requirements.

Automation sequences can also be embedded within the RTU to perform user defined automation functions such as Auto-Changeover or Auto-Open. The schemes can be initiated by loss of HV or LV voltage, fault current detection or by combination of both. The status following the initiation of automation sequence is reported to the control centre for diagnostics and analytical purposes

The automation can be either cost effective stand alone secondary control system or integrated with existing SCADA systems for remote reconfiguration and real time data analysis.

# The automation system enables the following functions in the $\ensuremath{\mathsf{RMU}}$

#### **Control function**

- ▶ Control function
- ▶ Remote closing / tripping of Circuit Breaker / Fuse switch.
- ▶ Remote closing / opening of Ring switch / Load break switch.

#### **Monitoring function**

- ▶ Circuit Breaker & Ring Switch status indication
- ▶ Earth fault indication
- Low gas pressure

#### Salient Features

- ▶ Local / Remote operation
- Flexible Communications interface: Wireless, GSM, CDMA, PSTN and Fiber Optic
- Uses DNP 3.0 protocol as standard (IEC: 60870 shall be offered on request)
- ▶ Fault passage processing
- ▶ Uses 24 V battery for continuous operation
- ▶ Condition monitoring of battery and Gas pressure.

#### The major benefits reaped by DAS are

- Increased operator safety
- Reduced lag time to diagnose, locate & isolate the faulty section of the network
- ▶ Increased response time & network reconfiguration resulting in reduced number of customer minutes lost and supply interruptions (SAIDI & SAIFI performance statistics)
- Optimization of asset management through customized automation schemes
- ▶ Reduced operational cost for routine network switching.

RMU's can be made "automation ready" by pre-wiring the actuator circuits and auxiliary indications. This allows the purchaser to upgrade for a full automation on a later date to meet the evolving operational needs & reduce operational cost. The system can also be installed on the existing network RMU's without interrupting the power supply.



# **Regional Head Quarters**

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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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