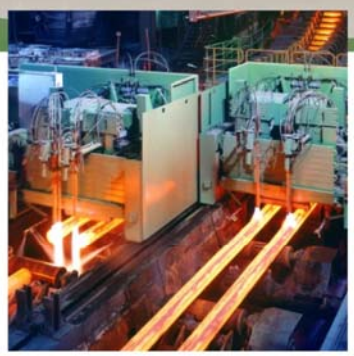
Smart solutions.
Strong relationships.

Air Insulated Indoor Medium Voltage Switchgear up to 24 kV



Contents

Air Insulated Indoor Medium Voltage Switchgear upto 24 kV

Application	Page
Types	4
Typical uses, classification	5
Requirements	
Customer benefits and features	6 to 7
Technical data	
Electrical	8 to 9
Mechanical	10
Room Planning	11
Product range	
≤ 24 kV	12 to 13
Design	
Basic panel design, operation, compartments	14 to 17
Components	
Vacuum Circuit-Breaker	18
Vacuum Contactor	19
Earthing Devices	20
Voltage Transformers	21
Current Transformers	22
Bushings & LV Compartment	23
Additional Features	24
Standards	
Standards, Specifications, guidelines	25 to 26

The products and systems described in this catalog are manufactred and sold according to a certified management system(acc.to ISO 9001, ISO 14001 and BS OHSAS 18001).

Maximum Values
12 kV / 50 kA / 3150A

Maximum Values
17.5 kV / 25 kA / 1250A

Maximum Values
24 kV / 25 kA / 1600A

Application Classification

Typical Uses

Vacuum Circuit Breaker with Panel is factory assembled, type-tested and metal-clad switchgear for indoor installation according to IEC 62271-100 & 200

Panel corresponds to the following classifications according to IEC 62271-200

Loss of Service Continuity Category and Partition class

Loss of Service Continuity Category:	LSC 2B (metal-clad)
Partition Class:	PM (metallic partition)
Internal Arc Classification:	IAC A FLR, Isc ≤ 40 kA, t = 1s arc duration

Loss of Service Continuity Category and Partition class

Loss of Service Continuity Category:	LSC 2B (metal-clad)
Partition Class:	PM (metallic partition)
Accessibility to Compartments 1. Busbar compartment 2. Switching device compartment 3. Connection compartment	 Tool-based Interlock-controlled Tool based

VCB with Panel is used in transformer and switching substations, mainly at the primary distribution level.

Application
Public Power Supply
- Power supply companies.

Application
Industry
- Power stations
- Cement industry
- Automobile industry
- Iron and steel works
- Rolling mills
- Mining industry
- Textile, paper and food industries
- Chemical industry
- Petroleum industry
- Pipeline installations
- Electrochemical plants
- Petrochemical plants
- Shipbuilding industry
- Diesel power plants
- Emergency power supply installations
- Lignite open-cast mines

Requirements

Customer Benefits and Features

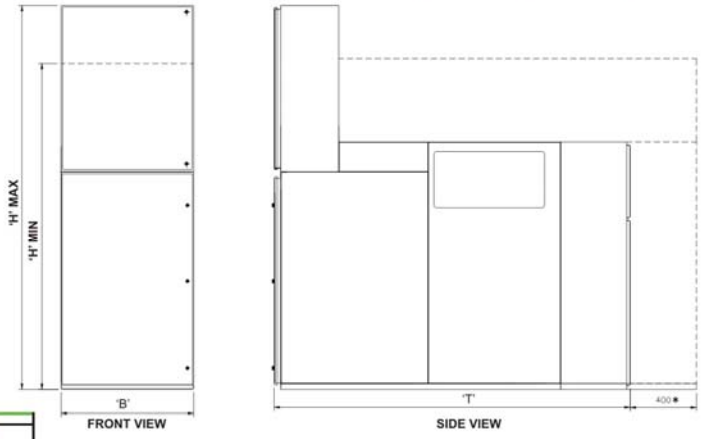
Customer Benefits	Features
◦ **Peace of Mind** For power supply companies and industrial plants, VCB switchgear has very distinct advantages: Smooth operation, exemplary availability and optimal safety.	◦ Switchgear designs are based on air clearances. Hence are highly safe since air as an insulating medium requires no monitoring. ◦ Factory-assembled, type-tested switchgear according to IEC 62271-100 & 200. ◦ Use of standardized epoxy block-type current and voltage transformers. ◦ Use of standard components available worldwide. ◦ Use of maintenance-free vacuum interrupters. ◦ Floor rolling VCB trolley for ease of operation & maintainance. No additional handling trolley needed. ◦ Thermo cycle tested epoxy components suitable to withstand drastically variable tropical temperature conditions. ◦ Specially surface treated components for better resistance to corrosion with higher salt spray withstand capacity. ◦ Naturally cooled bus bars without additional forced air flow. ◦ Highly reliable operating mechanism tested for M2 Class. ◦ Very low probability of restrike as tested for C2 Class. ◦ Ergonomically designed panels with attainable heights of bus bar and LV compartments. ◦ Pressure-resistant partitions. ◦ Flexible Low-voltage equipment compartment with plug-in wires. ◦ Quality assurance in accordance with ISO 9001.
◦ **Saves Lives** Switchgear family tested for internal arc withstand with IAC AFLR; Loss of Service Continuity category LSC 2B and partition class PM making it suitable for universal installation, meeting the highest requirements of personal safety.	◦ All operations with high-voltage door closed. ◦ Metallic enclosure, earthed shutters and partitions. ◦ Internal arc classification AFLR up to 40kA and arc duration of 0.1 S to 1 S. ◦ Loss of Service Continuity category LSC 2B with separate partitions for the busbar, connection and switching device compartments. ◦ Partition class PM with Metallic shutter gears with Padlocking facility. ◦ Unambiguous position indicators and control elements on the high-voltage door. ◦ Degree of Ingress Protection 4X as standard & optionally 5X for External enclosures & 2X for Internal compartments. ◦ Positively driven shutters. ◦ Logical mechanical interlocking system. ◦ Mechanical emergency tripping arrangement. ◦ Mechanical interlocking between various feeders based on the logic interlocks.
◦ **Saves Money** The compact design of Panel offers twice the savings to the owners – reduced building costs & maintenance free circuit breakers with modular design enables continuous operation without expensive shutdown times.	◦ Use of maintenance-free vacuum circuit-breakers. ◦ Interruption of operation reduced to a minimum by logical mechanical interlocking system. ◦ Minimized space requirements, reducing building investments, due to compact design and flexible cable connection options and flexible pressure relief systems. ◦ Top mounted Bus PT / Line PT reduces the substation space by eliminating separate BPT/LPT panel.

Customer Benefits	Features
Preserves the Environment Air used as insulating medium, use of recyclable material & long service life optimize the total energy balance.	Neutral to the environment air as insulating medium ensures pollution free operation. Service life > 35 years optimizes the energy balance. The materials used are fully recyclable without special knowledge.
Increases Productivity Properties such as modular design, type tests of the circuit breaker in the switchgear, confinement of an internal arc to the respective compartment and ensuing maximum operational reliability contributes to optimized operation and a substantial increase of productivity.	Loss of Service Continuity category LSC 2B with separate partitions for the busbar, connection and switching device compartments. Partition class PM. Positively driven shutters. Use of standardized epoxy block-type current and voltage transformers. Confinement of an internal arc to the respective compartment. Use of maintenance-free vacuum circuit-breakers. Control cables in metallic wiring ducts. Floor rolling VCB avoids the need of breaker handling trolley. Modular design. Add on compartments for additional cables, bus ducts, CT, LV Boxes. Both side extensible bus bars with ease of assembly.
Faster Heat Dissipation	VCB are equipped with patented flexible copper laminations & aluminium heat sink block for faster dissipation of heat for increased thermal reliability.
Reliability of Mechanism	Highly reliable spring – spring mechanism is type tested for M2 class Mechanical Endurance i.e. for 10,000 operations. Mechanism components are especially surface treated with ROHS compliant plating processes and painting to achieve longer service life. All mechanism components are designed to withstand 300 hours salt spray life for prolonged corrosion free operation.
Low Power Consumption Coils	Highly efficient tripping and closing coil with low power consumption of 200W each, reducing the burden & hence the capacity required of the station DC supply source.

Rated Values Voltage	kV	7.2	12	17.5
Frequency	Hz	50/60	50/60	50/60
Short-duration power-frequency withstand voltage (phase-to-phase, phase-to-earth)	kV	20(1)	28(1)	38
Lightning impulse withstand voltage (phase-to-phase, phase-to-earth)	kV	60(1)	75(1)	95
Short-circuit breaking current	Max kA	44	44	25
Short-time with stand current, 3 s	Max kA	44	44	25
Short-circuit making current 2)	Max kA	110/ 114 (2)	110/ 114 (2)	62.5 65 (2)
Peak withstand current 2)	Max kAp	110/ 114	110/ 114	62.5/ 65
Normal current of busbar)	Max A	3150	3150	3150
Normal current of feeders: With circuit-breaker With disconnector link Bus sectionalizer Busbar connection panel	 Max A Max A Max A Max A	 3150 3150 3150 3150	 3150 3150 3150 31500	 3150 3150 3150 3150

Technical Data

Rated	Unit	Voltage Level	Voltage Level	Voltage Level
Voltage	kV	7.2	12	17.5
Frequency	Hz	50/60	50/60	50/60
Short Duration Power Frequency withstand voltage (Phase to phase ,Phase to Earth)	kV	20	28/35	38
Lightening Impulse withstand voltage(Phase to phase , Phase to Earth)	kV	60	75/95	95
Short Circuit Breaking current	Max kA	44	44	25
Short Circuit withstand current , 3 sec.	Max kA	44	44	25
Peak withstand current *	Max kA	110/114	110/114	62.5
Normal current of Busbar	Max A	3150	3150	1250
Normal current of feeders	Max A	3150	3150	1250
With circuit breakers	Max A	3150	3150	1250
With contactor	Max A	400	-	-
Bus sectionalizer	Max A	3150	3150	1250
Busbar connection panel	Max A	3150	3150	1250



*400 mm Add on Rear Chamber can be Optionally provided for accomodating more Cables, Busduct entries, No. of CT etc.

All VCB & VC Panels are Naturally Cooled.

Description	Rating			IAC Ratings	H		B	T
	kV	kA	A		Max	Min		
VCB Panel	Upto 17.5	25	1250	26.3kA / 0.1Sec	2320	1970	650	2060
	Upto 12	25	2000	26.3kA / 0.1Sec	2320	1970	800	2060
	Upto 12	25	2500/ 3150	26.3kA / 0.1Sec	2320	1970	800	2150 Max
	Upto 12	31.5	Upto 3150	26.3kA / 0.1Sec	2320	1970	800	2150
	Upto 12	44 kA	Upto 3150	26.3kA / 0.1Sec	2320	1970	800	2150
	Upto 12	44 kA	Upto 3150	Upto 40kA / 1Sec	2320	1970	800	2150
VCB Panel	Upto 7.2	9 kA	400	Upto 40kA / 1Sec	2320	1970	630	2150 Max

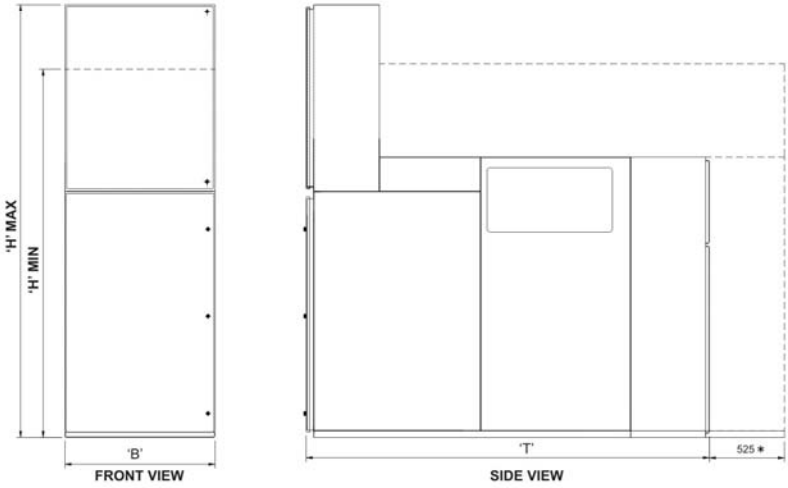
1. Higher BIL of 38 kV/ 95 kVp are available for higher altitude
2. The Making Current Values for 50 Hz : 100 kA_P
   60 Hz : 104 kA_P

Rated Values

Rated		
Voltage Frequency	kV Hz	24 50/60
Short-duration power-frequency withstand voltage (phase-to-phase, phase-to-earth)	kV	50
Lightning impulse withstand voltage (phase-to-phase, phase-to-earth)	kV	125
Short-circuit breaking current	Max.kA	25
Short-time withstand current,3 s	Max.kA	25
Short-circuit making current 2)	Max.kA	63 / 65
Peak withstand current 2)	Max.kA	63 / 65
Normal current of busbar	Max.kA	1600
Normal current of feeders: With circuit-breaker With disconnector link Bus sectionalizer	 Max.kA Max.kA Max.kA	 1600 1600 1600

Dimensions

H		B	T
H (Max)	H (Min)		
2120	2030	1000	2875



*525 mm Add on Rear Chamber can be Optionally provided for accomodating more Cables, Busduct entries, No. of CT etc.

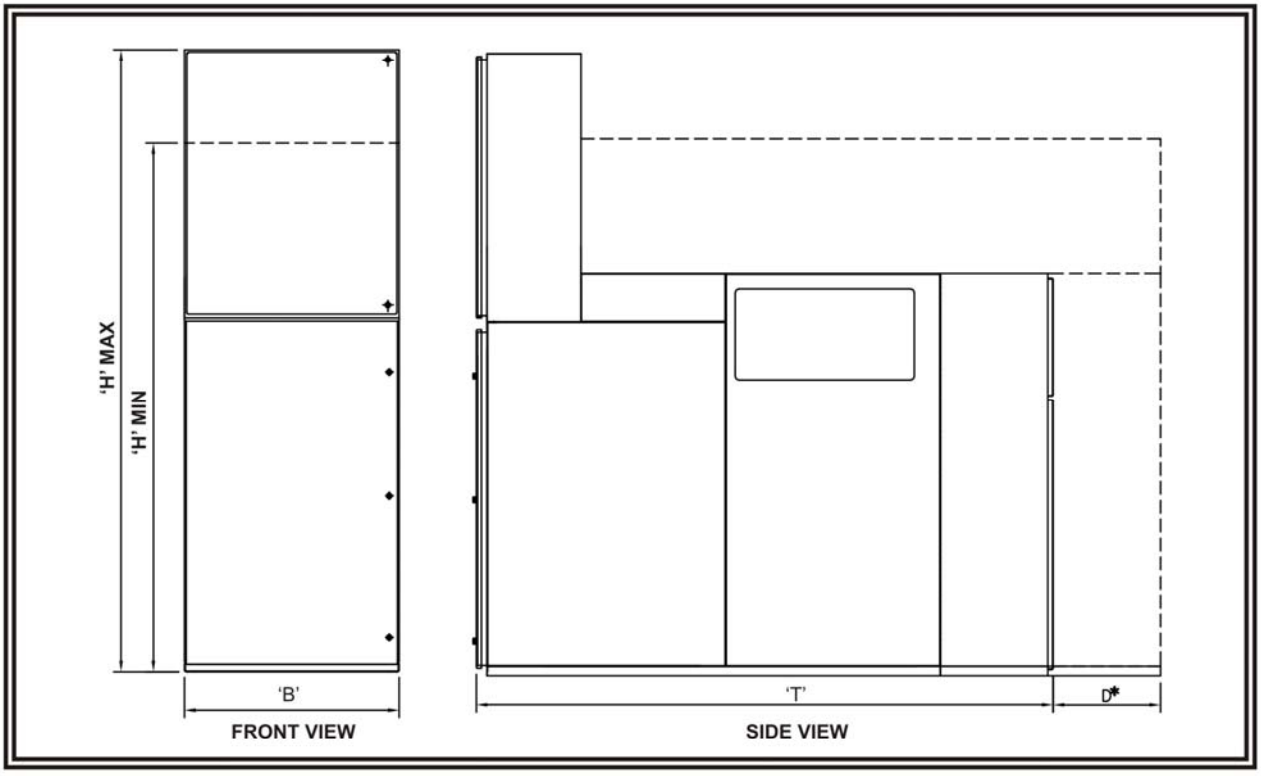
All VCB Panels are Naturally Cooled.

Description	Rating			IAC Ratings	H		B	T
	kV	kA	A		Max	Min		
VCB Panel	24	25 kA	1600	25kA / 0.1Sec	2120	2030	1000	2875

1. Higher BIL of 68 kV/ 160 kVp are available for higher altitude
2. The Making Current Values for 50 Hz : 62.5 kA_P
   60 Hz : 65 kA_P

Dimensions

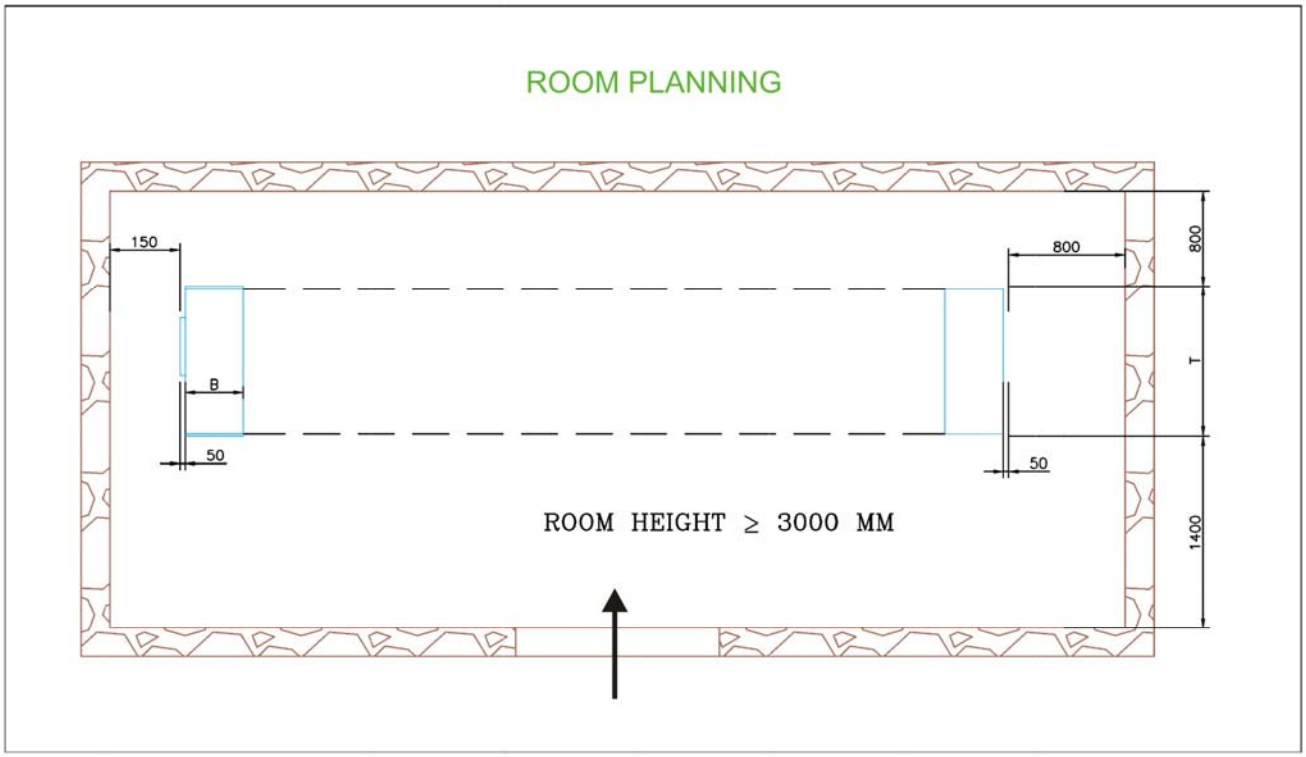
Description	Rating			IAC Ratings	H		B	T
	kV	kA	A		Max	Min		
VCB Panel	Upto 17.5	25/31.5	1250	26.3kA / 0.1Sec	2320	2000	650	2060
	Upto 12	25	2000	26.3kA / 0.1Sec	2320	2000	800	2060
	Upto 12	25	2500/ 3150	26.3kA / 0.1Sec	2320	2000	800	2150 Max
	Upto 12	31.5	2000/ Upto 3150	26.3kA / 0.1Sec	2320	2000	800	2150
	Upto 12	44 kA	Upto 3150	26.3kA / 0.1Sec	2320	2000	800	2150
	Upto 12	44 kA	Upto 3150	Upto 40kA / 1Sec	2320	2000	800	2150
VCB Panel	24	25 kA	1600A	25 / 0.1Sec	2130	2130	1000	2900 Max



D* - 400 mm Add on Rear Chamber can be Optionally provided for accomodating more Cables, Busduct entries, No. of CT etc.

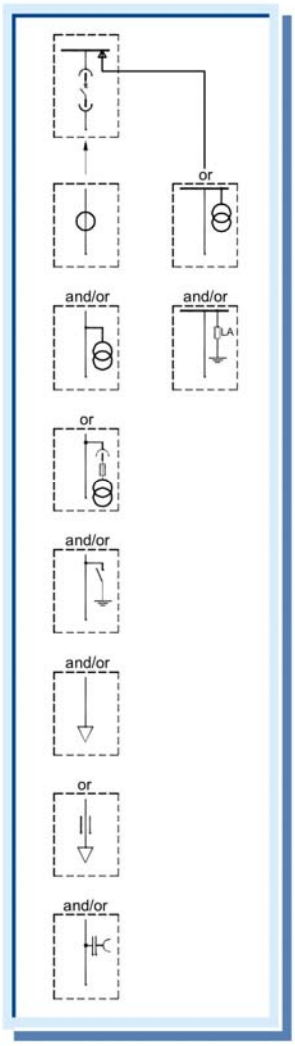
All VCB & VC Panels are Naturally Cooled.

CGL VCB Switchgear up to 24 kV
Single-row arrangement (plan view)
For single-bus bar switchgear
Dimensions B (width) and T (depth) see table on page 10

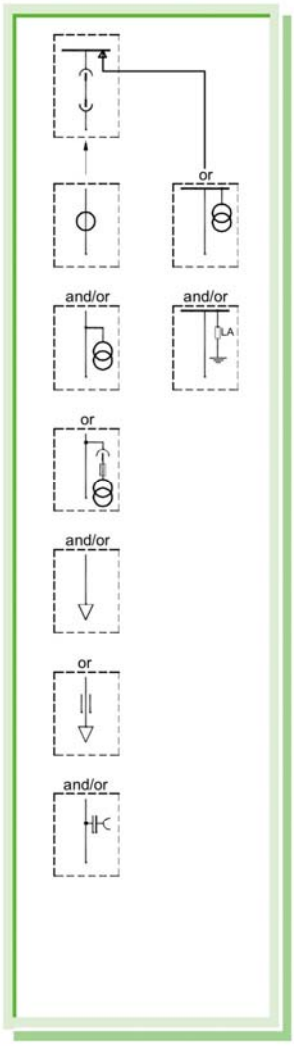


Notes –

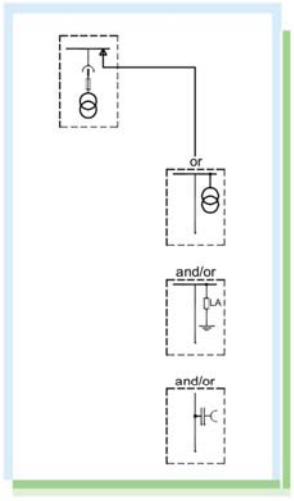
1. The above layout is for single bus bar switchgear.
2. It is presumed, the entire switchgear can be assembled in a single row arrangement.
3. Please consult us , before ordering , if the available space in the switchgear room does not permit single row arrangement. Based on the number of verticals and room dimensions, switchgear line up layout can be modified.
4. The above dimensions are for Switchgear with internal arc classification. Please consult us for non internal arc fault classification switchgear.



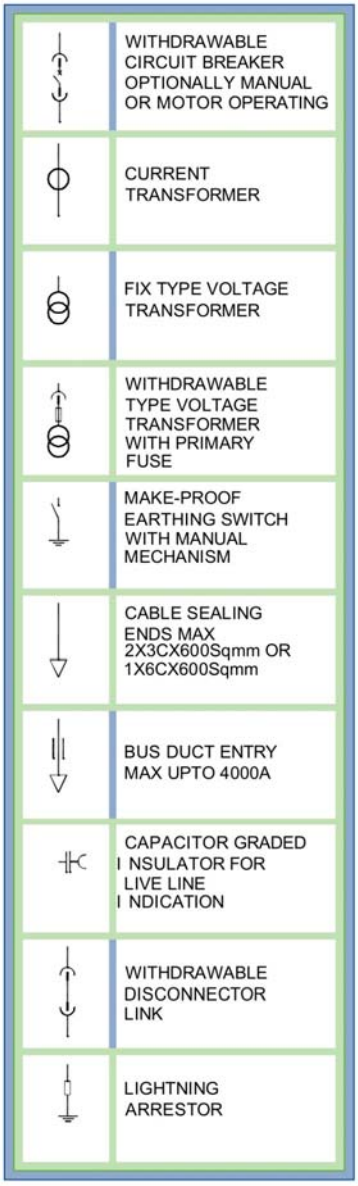
Circuit Breaker Panel



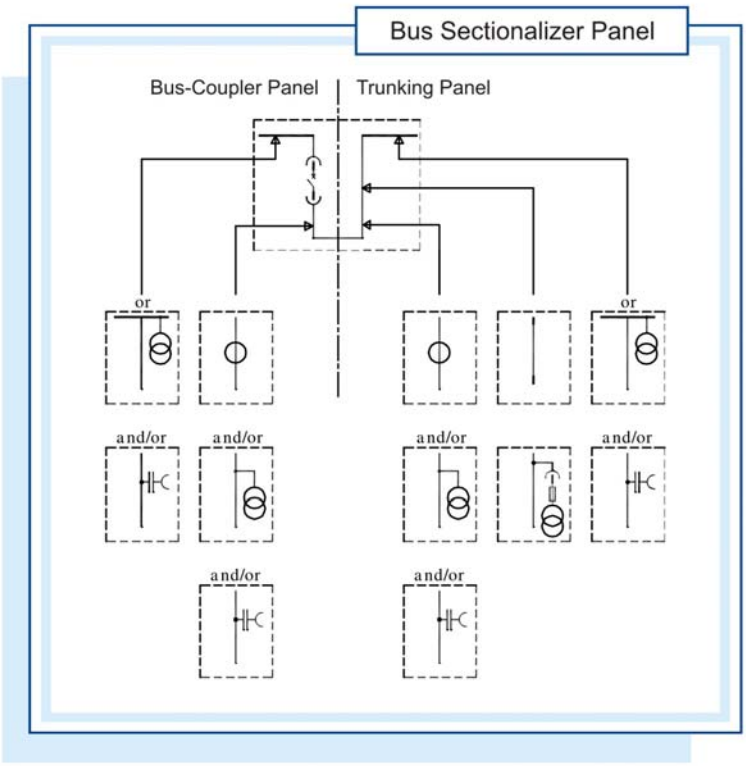
Disconnecting Panel

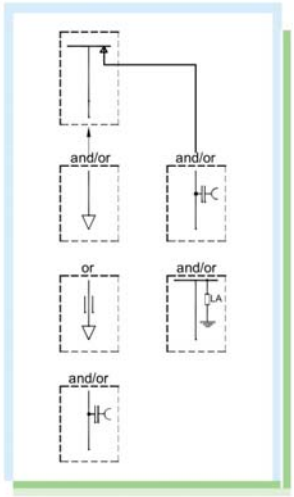


Metering Panel



Symbols & Description





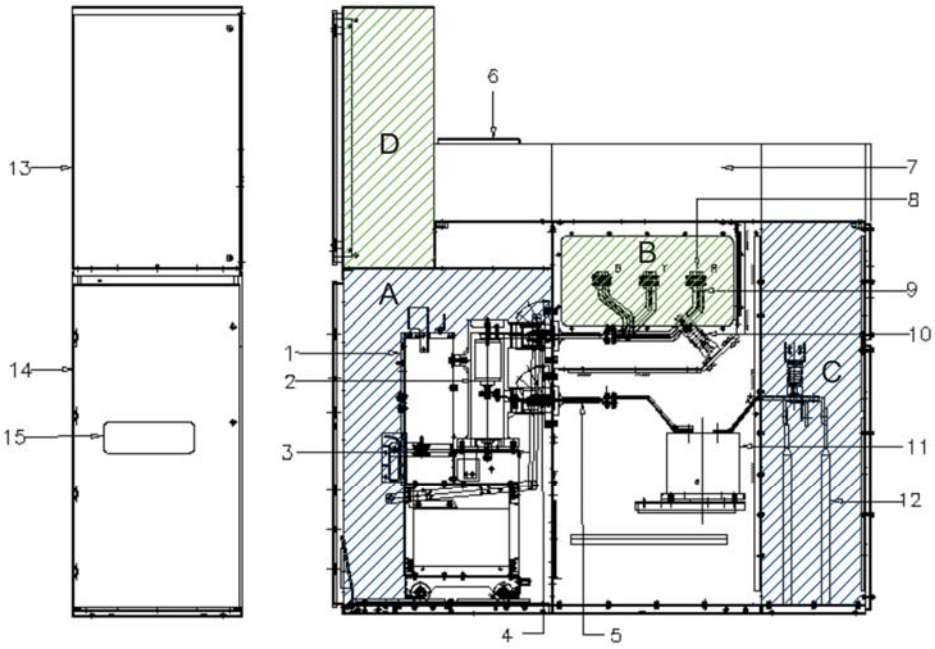
Busbar Connection Panel
(Side Cable Box)

	WITHDRAWABLE CIRCUIT BREAKER OPTIONALLY MANUAL OR MOTOR OPERATING
	CURRENT TRANSFORMER
	FIX TYPE VOLTAGE TRANSFORMER
	WITHDRAWABLE TYPE VOLTAGE TRANSFORMER WITH PRIMARY FUSE
	MAKE-PROOF EARTHING SWITCH WITH MANUAL MECHANISM
	CABLE SEALING ENDS MAX 2X3CX600Sqmm OR 1X6CX600Sqmm
	BUS DUCT ENTRY MAX UPTO 4000A
	CAPACITOR GRADED I NSULATOR FOR LIVE LINE I NDICATION
	WITHDRAWABLE DISCONNECTOR LINK
	LIGHTNING ARRESTOR

Symbols & Description

Salient Features

- All switching operations are performed with high-voltage door closed to ensure operator safety.
- Floor rolling type breaker with horizontal isolation & horizontal draw-out.
- Inaccessible live parts.
- Front / Rear multi core cable box arrangement.
- Panel designed with adequate air clearance & hence less dependency on insulation & shrouds
- Splice plate design ensures ease of assembly & does not require pre leveled flooring
- CG make highly reliable vacuum interrupters & protection relays.
- Compartmentalized Panel with built in base frame & ramp.
- Type tested for extended mechanical endurance of M2 class as per IEC 62271 – 100, ensuring 10,000 operating sequences.
- Tested for rapid auto reclosing duty with SCADA compatible control system.
- High reliability and electrical life, compliance to E2 & C2 class.
- Optional : draw-out type PT, Power pack, Integral earth switch, series trip arrangement for unmanned substation
- Internal arc tested for 26.3/40kA -1sec as per IEC 62271-200.
- Fully type tested product at renowned testing laboratories like KERI – Korea, KEMA - Netherlands, CPRI / ERDA - India.
- Optional: Verification of safe isolation from supply for feeder or busbar by means of capacitive voltage detecting system with panel front closed.
- Optional: Draw-out type top mounted PT.



A. Breaker compartment

B. Busbar compartment

C. Cable Compartment

D. Low Voltage Compartment

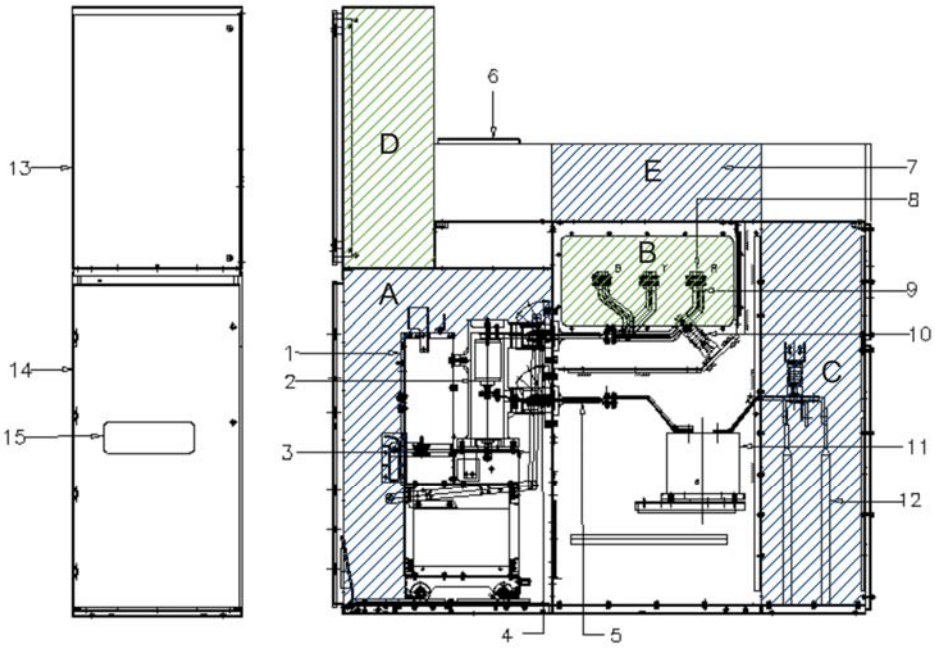
Interlocks

- Interlocking conditions specified according to IEC 62271-200.
- Auto Trip interlock trips the breaker if rackin - out attempted with breaker closed.
- Feeder earthing switch can only be operated with switching device in disconnected position.
- Switching device can only be racked in from test to service condition only when switching device & earthing switch is in OPEN condition.
- Mechanical interlocking facility to avoid accidental contact with live parts.
- It shall not be possible to insert the earthing trolley into the panel with the earth switch in closed condition.
- It shall not be possible to close the earth switch if VT has sensed the live supply on the busbar

1. Withdrawable Circuit Breaker
2. Vacuum Interrupter
3. Shutters
4. Tulip Contacts
5. Spout Bushing
6. Pressure Relief Flaps
7. Pressure Relief duct, if provided with Arc absorber
8. Busbar with Splice Plate
9. Busbar Risers
10. Insulators
11. Current Transformers
12. Cables
13. LV door
14. HV door
15. Inspection window to view close - open indicators & charged /discharged condition of switching device

Salient Features

- All switching operations are performed with high-voltage door closed to ensure operator safety.
- Floor rolling type breaker with horizontal isolation & horizontal draw-out.
- Inaccessible live parts.
- Front / Rear multi core cable box arrangement.
- Panel designed with adequate air clearance & hence less dependency on insulation & shrouds
- Splice plate design ensures ease of assembly & does not require pre leveled flooring
- CG make highly reliable vacuum interrupters & protection relays.
- Compartmentalized Panel with built in base frame & ramp.
- Type tested for extended mechanical endurance of M2 class as per IEC 62271 – 100, ensuring 10,000 operating sequences.
- Tested for rapid auto reclosing duty with SCADA compatible control system.
- High reliability and electrical life, compliance to E2 & C2 class.
- Optional : draw-out type PT, Power pack, Integral earth switch, series trip arrangement for unmanned substation
- Internal arc tested for 26.3/40kA -1sec as per IEC 62271-200.
- Fully type tested product at renowned testing laboratories like KERI – Korea, KEMA - Netherlands, CPRI / ERDA - India.
- Optional: Verification of safe isolation from supply for feeder or busbar by means of capacitive voltage detecting system with panel front closed.
- Optional: Draw-out type top mounted PT.



- A. Breaker compartment
- B. Busbar compartment
- C. Cable Compartment
- D. Low Voltage Compartment
- E. Duct (Optional)

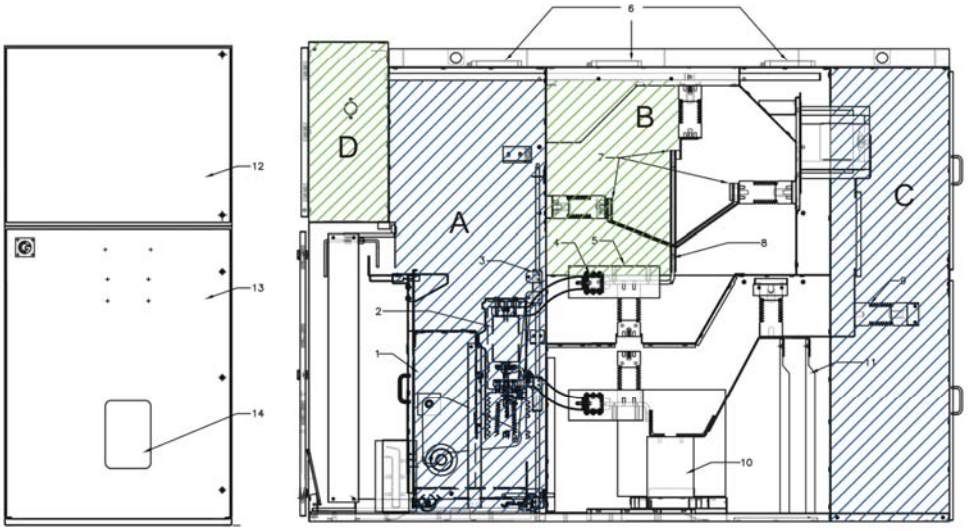
Interlocks

- Interlocking conditions specified according to IEC 62271-200.
- Auto Trip interlock trips the breaker if rackin - out attempted with breaker closed.
- Feeder earthing switch can only be operated with switching device in disconnected position.
- Switching device can only be racked in from test to service condition only when switching device & earthing switch is in OPEN condition.
- Mechanical interlocking facility to avoid accidental contact with live parts.
- It shall not be possible to insert the earthing trolley into the panel with the earth switch in closed condition.
- It shall not be possible to close the earth switch if VT has sensed the live supply on the busbar

1. Withdrawable Circuit Breaker
2. Vacuum Interrupter
3. Shutters
4. Tulip Contacts
5. Spout Bushing
6. Pressure Relief Flaps
7. Pressure Relief duct, if provided with Arc absorber
8. Busbar with Splice Plate
9. Busbar Risers
10. Insulators
11. Current Transformers
12. Cables
13. LV door
14. HV door
15. Inspection window to view close - open indicators & charged /discharged condition of switching device

Salient Features

- All switching operations are performed with high-voltage door closed to ensure operator safety.
- Floor rolling type breaker with horizontal isolation & horizontal draw-out.
- Inaccessible live parts.
- Front / Rear multi core cable box arrangement.
- Panel designed with adequate air clearance & hence less dependency on insulation & shrouds
- Splice plate design ensures ease of assembly & does not require pre leveled flooring
- CG make highly reliable vacuum interrupters & protection relays.
- Compartmentalized Panel with built in base frame & ramp.
- Type tested for extended mechanical endurance of M2 class as per IEC 62271 – 100, ensuring 10,000 operating sequences.
- Tested for rapid auto reclosing duty with SCADA compatible control system.
- High reliability and electrical life, compliance to E2 & C2 class.
- Optional : draw-out type PT, Power pack, Integral earth switch, series trip arrangement for unmanned substation
- Internal arc tested for 26.3/40kA -1sec as per IEC 62271-200.
- Fully type tested product at renowned testing laboratories like KERI – Korea, KEMA - Netherlands, CPRI / ERDA - India.
- Optional: Verification of safe isolation from supply for feeder or busbar by means of capacitive voltage detecting system with panel front closed.
- Optional: Draw-out type top mounted PT.



- A. Breaker compartment
- B. Busbar compartment
- C. Cable Compartment
- D. Swing Panel Box

Interlocks

- Interlocking conditions specified according to IEC 62271-200.
- Auto Trip interlock trips the breaker if rackin - out attempted with breaker closed.
- Feeder earthing switch can only be operated with switching device in disconnected position.
- Switching device can only be racked in from test to service condition only when switching device & earthing switch is in OPEN condition.
- Mechanical interlocking facility to avoid accidental contact with live parts.
- It shall not be possible to insert the earthing trolley into the panel with the earth switch in closed condition.
- It shall not be possible to close the earth switch if VT has sensed the live supply on the busbar

1. Withdrawable Circuit Breaker
2. Vacuum Interrupter
3. Shutters
4. Tulip Contacts
5. Contact Shroud
6. Pressure Relief Flag
7. Busbar with splice plate
8. Busbar risers
9. Insulators
10. Current Transformers
11. Cables
12. LV door
13. HT door
14. Inspection window to see close - open indicators & charged /discharged condition of switching device

Switching Device Compartment

- Enclosure - Powder-coated CRCA Steel
- Standard color RAL 7035.
- Pressure relief from Top.
- Integral ramp to rack-in the Breaker on rail.
- Spring operated shutters with positive drive.
- Switching Device can rack in – out with front door closed.
- Scribing earth contact for switching device from test to service conditions.
- Separate shutter mechanism for opening and closing the
  – Bus bar compartment
  – Cable compartment
- Metallic wiring duct for control cables.
- Low-voltage plug connector for connection of control cables between primary and secondary.
- Switching device compartment options:
  – Vacuum circuit-breaker
  – Vacuum contactor
  – Feeder and Bus bar Earthing Trucks

Busbar Compartment

- Enclosure - Powder-coated CRCA Steel
- Standard color RAL 7035.
- Pressure relief from Top.
- Sleeved Bus bar with shrouded joints & inter panel Barrier with cast epoxy sleeve.
- Separate pressure release vent & adequate air clearances.
- Splice plate design ensures ease of assembly & does not require pre leveled flooring.

Cable Compartment

- Enclosure - Powder-coated CRCA Steel
- Standard color RAL 7035.
- Pressure relief from top.
- Can accommodate two / three Current transformers per phase
- Add on chamber for more CT.
- Mechanical interlocking facility to avoid accidental contacts to live parts.
- Safety barriers to avoid accidental touch to live parts.
- Earthing bus bar
- Option: Live line voltage indicator
- Suitable for connection of:
  – Single-core XLPE cables up to 6 × 500 mm2 depending on the rated normal current and other built-in components.
  – Three-core cables 2 × 240 mm2 per panel.
- Installation of voltage transformers
  – Cast-resin insulated
  – 3 ph-3 limb / 3ph.-5 limb
  – Fixed-mounted, with primary fuses
  – Or withdraw able with primary fuses, bushings and shutters to the connection.
- Make-proof earthing switch.
  – With manual operating mechanism.
  – In addition to the standard interlock: Earthing switch optionally lockable or electromagnetically interlocked against withdraw able switching device.
- Surge arrester
  – For protecting the switchgear against external over voltages.
  – For protecting consumers against switching over voltages while operating motors.

Salient Features

- Fully type tested product at renowned testing laboratories like KERI – Korea, KEMA - Netherlands, CPRI / ERDA - India.
- Tested as per IEC 62271-100.
- Suitable for all switching duties.
- Floor rolling type breaker with horizontal isolation & horizontal draw-out..
- Inaccessible live parts
- CG make highly reliable vacuum interrupters.
- Type tested for extended mechanical endurance of M2 class as per IEC 62271 – 100, ensuring 10,000 operating sequences.
- Tested for rapid auto reclosing duty.
- High reliability and electrical life, compliance to E2 & C2 class

1. 32 Pin LV plug	6. On / Off indication
2. Spring charge / Discharge indication	7. Manual close push button
3. Mechanical counter	8. Manual trip push button
4. Opening for Rack in/out handle	9. Spring charging handle opening
5. Test & Service indication	10. Truck frame
	11. Wheel structure

Vacuum Contactor Panel

The construction of VC is compact and robust for enduring long electrical and mechanical service life. The vacuum interrupters used in the VC are totally encapsulated in epoxy resin for enhanced performance in dusty and corrosive atmosphere.

HRC fuse protection provided as standard on all VC panels.

Application Areas

DOL and soft starters for motor switching in areas like-

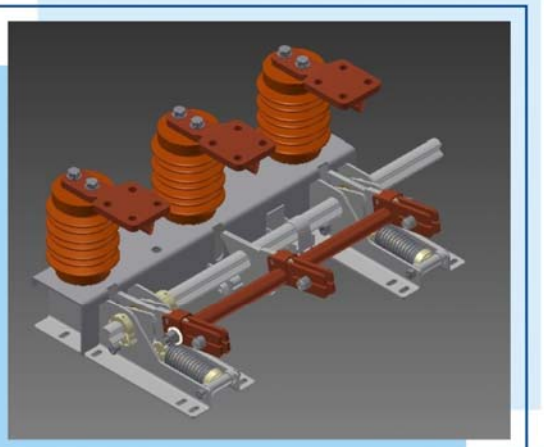
- Mining
- Steel, rolling mills, Cement, Sugar, pulp and paper, Oil Industry.
- Water Pumping Stations
- Waste water management
- Hoisting
- Food industry
- Isolators and switches

- Capacitor switching for reactive power compensation
- Switching of Reactors
- Switching of Transformers
- Resistive load switching in heaters, melting furnace, ventilation system.
- Neutral Grounding Resistors.

GUARANTEED TECHNICAL PARTICULARS FOR 12KV VACUUM CONTACTOR, Electrical Latch (Solenoid) / Mechanical Latch

1. Reference Standard	:	IEC60470
2. Ratings & Characteristics		
a) Highest System Voltage	:	7.2kV and 12kV
b) Rated Current Ith / Ie	:	400A rms / 400 (Ac4)
c) Rated Capacitive Current	:	100A
d) Rated Frequency	:	50Hz
e) Rated Short Time Current	:	9kA for 1 sec.
f) Rated Making Current (Ac4)	:	4kA
g) Rated Breaking Current (AC4)	:	3.2kA
3. Rated Insulation level		
a) Impulse withstand Voltage	:	75kVp
b) One minute power frequency withstand voltage	:	28kv
c) Dielectric material used in construction.	:	Ceramic, Epoxy
4. Ambient Conditions		
a) Storage	:	-30°C to +70°C
b) Operating.	:	-20°C to +55°C
5. Technical Details		
a) Rated voltage of operating device (Any one)	:	220V AC/DC, 110V AC/DC (+10%, -20%)
b) Mechanical endurance	:	500000 operations
c) Electrcial Service Life of the equipment	:	100000 operations
6. Construction features		
a) Type of Contactor	:	Vacuum
b) Mounting	:	Horizontal
c) Operating Mechanism	:	(i)Solenoid to Close-Open and Electrical Latch for Hold. (ii)Solenoid for Close-Open and Mechanical Latch for Hold

Earthing Switch



Earthing Truck

Switchgear can be supplied with suitable earthing devices, on request , through either an integral Earth Switch or an Earthing Truck.

Earthing Switch

- Integral earth switch is provided for operator safety during switchgear maintenance.
- The essential interlocks provided are :

1. Earth Switch can be turned on only if Circuit Breaker Truck is either in Test or Drawn out position.
2. Circuit Breaker Truck blocked from Service position if earth switch is turned on.
3. Solenoid interlock is provided on request to block Earth Switch operation if the incoming bus is live.

Earthing Truck

- Earthing Truck can be provided for isolating either incoming bus or outgoing cable.
- Based on protection scheme requirement of the substation , types of Earthing Truck can be provided.

1. Solid Link - Fulfills basic earthing function
2. Voltage Sensing - Provided with Voltage Transformer, either single phase or three phase and alarm. The voltage transformer senses the presence of voltage and gives alarm on presence. This enhances the operator safety.
3. Fault Making – This gives highest operator safety, activating the earthing circuit even in presence of a fault , during earthing operation.

- Inductive principle according to IEC 60044-2,
  – Cast-resin insulated, single-pole
  – Primary operating voltage up to 12 kV
  – Max. secondary operating voltage up to 120 V or divided by √3
  – Accuracy class 0.2; 0.5; 1, 3P
  – Rating up to 200 VA
  – Earth-fault winding optional
  – Adjusted numerical protection, control and measuring relays are available

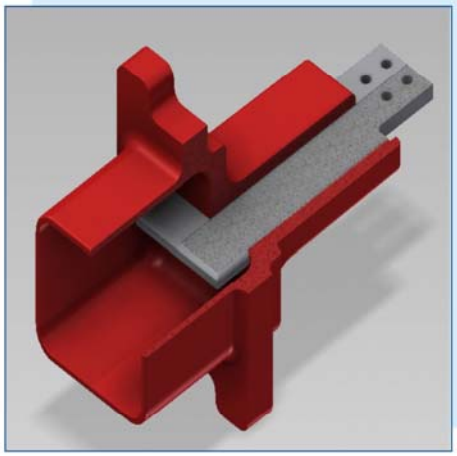
- Inductive principle according to IEC 60044-2
  – Cast-resin insulated, single-pole
  – Primary operating voltage 24 kV
  – Max. secondary operating voltage up to 120 V or divided by √3
  – Accuracy class 0.2; 0.5; 1, 3P
  – Rating up to 150 VA
  – Earth-fault winding optional
  – Adjusted numerical protection, control and measuring relays are available

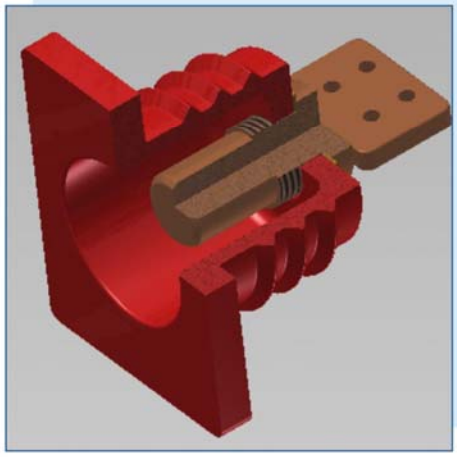
Features
Inductive block-type current transformer principle according to IEC 60044-1
– Max. rated primary current up to 3200 A
– Max. rated short-time thermal current up to 44 kA, 1 s or 3 s
– Max. rated peak withstand current up to 110/114 kAp
– Max. 3 secondary cores
– Accuracy class 0.2 - 1,or 5P/10P, rating up to 30 VA
– Secondary multi ratio possible
– Adjusted numerical protection, control and measuring relays are available

Bushing-Type Insulators

Features

- Cast-resin insulated
  – Max. operating voltage up to 24 kV
  – Max. rated primary current up to 3150 A
  – Max. short-time thermal current up to 44 kA, 1 s or 3 s
  – Max. rated peak withstand current up to 114kA.





Low-Voltage Compartment

Features

- Low-voltage compartment for accommodation of all protection, control, measuring and metering equipment
- Partitioned safe-to-touch off the high-voltage part
- Low-voltage compartment can be removed, as all bus wires and control cables are plugged in
- Option: Test sockets for capacitive voltage detecting system at the feeders or the busbar
- Option: Higher low-voltage compartment
- Option: Separation wall from panel to panel
- Low-voltage cables are flexible and protected by metal covers
- Connection of withdrawable part and panel wiring to low voltage compartment through 32 pin plug connectors
- Bus wires can be connected from panel to panel on terminal blocks .

Voltage Presence Indication with live line indicator on panel

The voltage presence detector senses the presence of voltage on the incoming cable and the indication is provided on the low voltage box.

This ensures maximum operator safety during operation and maintenance of the switchgear.

Graded capacitor bushings are mounted in the cable compartment, which detects the presence of the supply.

Internal Arc Classifications

The following internal arc classifications are fulfilled: IAC A FLR, Isc, t	
IAC	= Internal arc classification
A	= 300 mm distance of indicators for test (installation in closed electrical service location)
F	= Front arrangement of indicators for test
L	= Lateral arrangement of indicators for test
R	= Rear arrangement of indicators for test
Isc	= Test current for VCB ≤ 17.5 Kv up to 40 kA IAC t=1 sec = Test current for CGL VCB for 24 kV Switch gear up to 25 kA IAC t= 0.1 sec

Type of Service Location

The switchgear can be used as indoor installation according to IEC 61936 (Power installations exceeding AC 1 kV).

Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools
In lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively for housing electrical equipment and which is kept under lock and key. Access is restricted to authorized personnel and persons who have been properly instructed in electrical engineering. Untrained or unskilled persons may only enter under the supervision of authorized personnel or properly instructed persons.

Dielectric Strength

• The dielectric strength is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 (see table “Dielectric strength”).

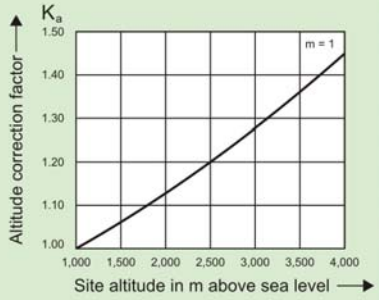
Table - Dielectric Strenght

Rated Voltage (r.m.s.)	kV	7.2	12	15	17.5	24
Rated short duration power frequency withstand voltage (r.m.s. Value))						
- Between phases and to earth		20	28	35	38	50
- Across isolating distance		23	32	39	45	60
Rated lightening Impulse withstand voltage (peak value)						
- Between phases and to earth	kV	60	75	95	95	125
- Across isolating distance	kV	70	85	105	110	145

- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m3 humidity according to IEC 60071).
- The dielectric strength decreases with increasing altitude. For site altitudes above 1000 m (above sea level) the standards do not provide any guidelines for the insulation rating, but leave this to the scope of special agreements.
- Site altitude
  –The dielectric strength of air insulation decreases with increasing altitude due to low air density. This reduction is permitted up to a site altitude of 1000 m according to IEC.
  –For site altitudes above 1000 m, a higher insulation level must be selected. It results from the multiplication of the rated insulation level for 0 to 1000 m with the altitude correction factor Ka.
  Graph – Altitude Correction Factor (Ka)

Altitude correcton factor K

For site altitudes above 1000 m, the altitude correction factor K is recommended, depending on the site altitude above sea level



Example :
3000m site altitude above sea level
17.5 kV switchgear rated voltage
95 kV rated lighting impulse withstand voltage ·
Rated lighting impulse withstand voltage to be selected
= 95 kV 1.28 = 122 kV

Results : According to the above table, a switchgear for a rated voltage of 24 kV with a rated lighting impulse withstand voltage of 125 kV is to be selected.

Rated short-dur. power-freq. withstand volt. to be selected for site altitudes > 1000m
≥ Rated short-duration power-frequency withstand voltage up to ≤ 1000 · K_a
Rated lighting impulse withstand voltage to be selected for site altitudes > 1000m
≥ Rated lighting impulse withstand voltage up to ≤ 1000m · K_a

Current carrying capacity

- According to IEC 62271-1 and IEC 62271-200 , the rated normal current refers to the following ambient air temperatures:
  – Maximum of 24-hour mean + 35 °C
  – Maximum + 40 °C
- The rated normal current of the panels and bus bars depends on the ambient air temperature outside the enclosure.

Protection against solid foreign objects, electric shock and water
Panel fulfills according to the standards
– IEC 62271-200
– IEC 60529

The following degrees of protection:

Switchgear Panel	≤ 12 kV	17.5 kV	24 kV
Degree of protection for the enclosure	IP4X	IP4X	IP4X
Degree of Protection for the partitions	IP2X	IP2X	IP2X

Climate and environmental influences

Panel are suitable for applications in indoor installations under normal operating conditions as defined in standard IEC 62271-1.

- Max. value of ambient air temperature, as per IEC : +40°C.
  JVAC panels are suitable up to 50°C without derating.
- Minimum ambient air temperature : -5°C
- Altitude of installation : ≤ 1000 m.
- Average value of relative humidity over period of 24 h : ≤ 95%.
- Average value of relative humidity over period of one month : ≤ 90%.
- Ambient air not significantly polluted by dust, corrosive gases, vapour or salt.

The switchgear may be used, subject to possible additional measures, under the following environmental influences:
– Natural foreign materials
– Chemically active pollutants
– Small animals
and the climate classes:
– 3K3
– 3K5.
The climate classes are defined according to IEC 60721-3-3.

Seismic capacity

Switchgear is tested in accordance with internationally accepted requirements:

Internal arc classification

- Objective of the Internal Arc test is for the operator safety.
- Internal arcing tests must be performed in
- Accordance with IEC 62271-200.
  JVAC comply with the internal arc classification Optionally.

Internal Arc Current (IAC) type AFLR is available up to 40 kA/1 s.

- This provides maximum personal safety of switchgear and accessible from all sides
  Definition of criteria:
  – Criterion 1
  Correctly secured doors and covers do not open, limited deformations are accepted
  – Criterion 2
  No fragmentation of the enclosure, no projection of small parts above 60 g
  – Criterion 3
  No holes in accessible sides up to a height of 2 m
  – Criterion 4
  No ignition of indicators due to hot gases
  – **Criterion 5**
  The enclosure remains connected to its earthing point
- Beyond the specifications of the above-mentioned standards, JVAC switchgear is optionally designed with confinement of internal arcs to the respective compartment.
  i.e. Cable, Breaker and Bus bar.

Standards
Our all switchgears are Type Tested in accordance with International Standard, IEC 62271- 100 for Breakers and 62271-200 for panels.

Overview of Standards

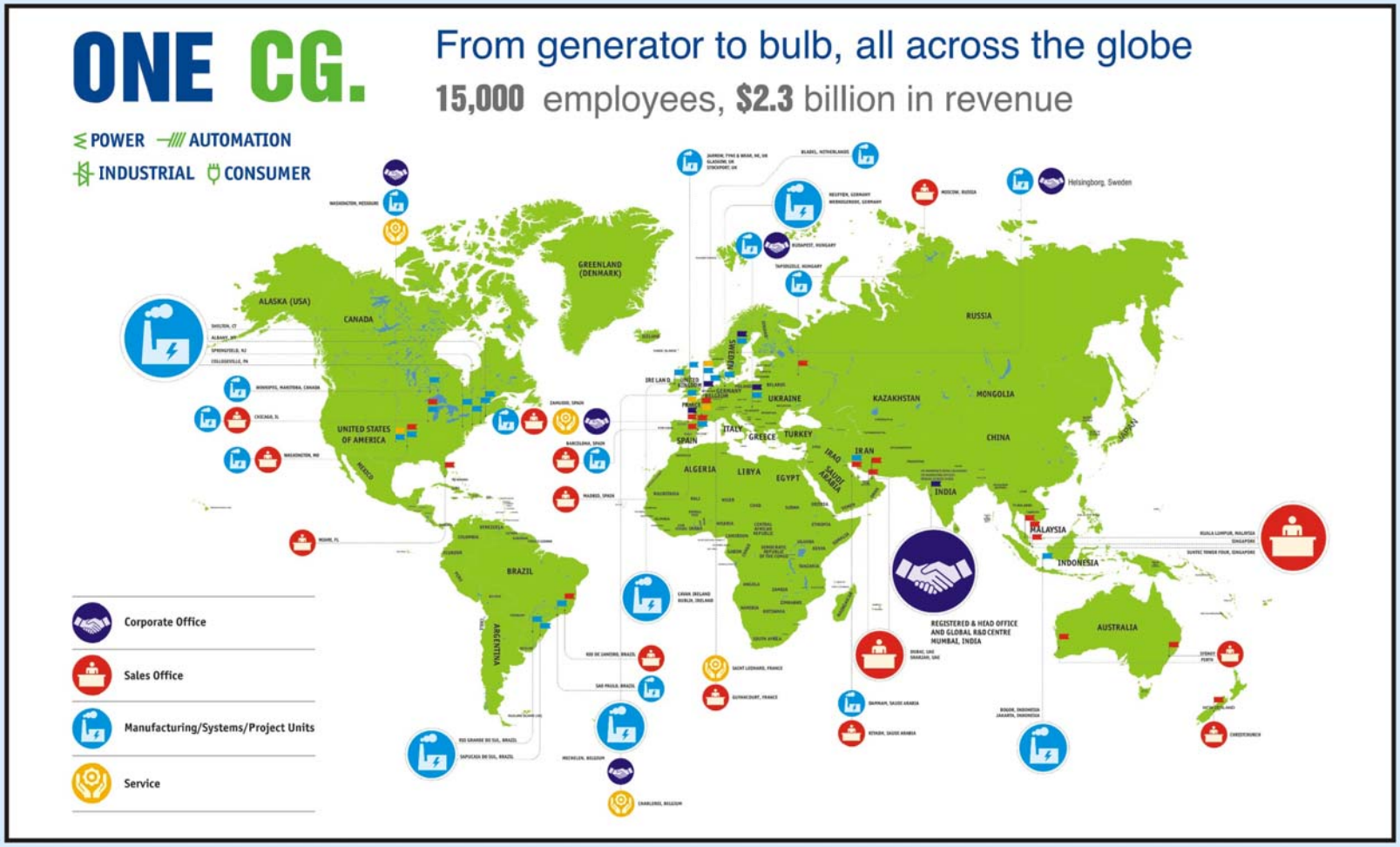
Product	IEC Standard
HV Switchgear	IEC - 62271-1
Panel	IEC – 62271-200
Circuit Breakers	IEC 62271-100
Vacuum Contactors	IEC 60470
Disconnector and earthing switches	IEC 62271-102
Switch – Disconnector	IEC 60265-1
Switch Disconnector/Fuse combination	IEC 62271 – 105
HV HRC Fuses	IEC 60282-1
Voltage Detecting Systems	IEC 61243-5
Current Transformer	IEC 60044-1
Voltage Transformer	IEC 60044-2

ONE CG.

From generator to bulb, all across the globe

15,000 employees, **$2.3** billion in revenue

POWER AUTOMATION
INDUSTRIAL CONSUMER



Crompton Greaves Ltd.,
Power Systems : M. V. Switchgear Division (S2)
A-3, MIDC, Ambad, Nashik - 422 010. India.
Tel.: + 91 253 2382271 to 75
Email : mv.switchgear@cgglobal.com

Registered Office
CG House, 6th Floor, Dr. Annie Besant Road, Worli, Mumbai - 400 030 India.
www.cgglobal.com

IDVCB / RO / Oct. 2013