SecoGear

3.3kV-27kV
Medium Voltage

GEIS

About GEIS

GEIS

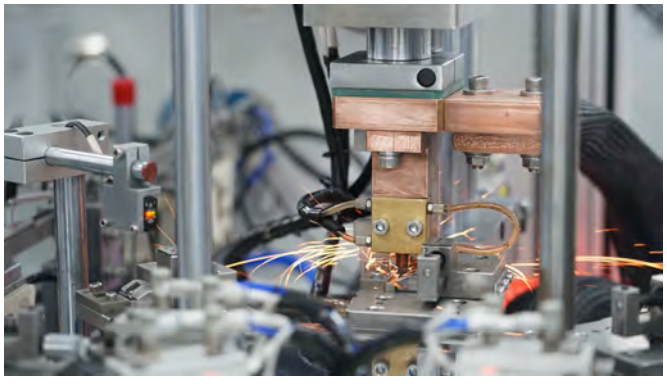
GEIS Electric came from the acquisition of GE Electrical Distribution's China Operations in December 2019, followed by GE's divestiture of its global Industrial Solution business in 2018.

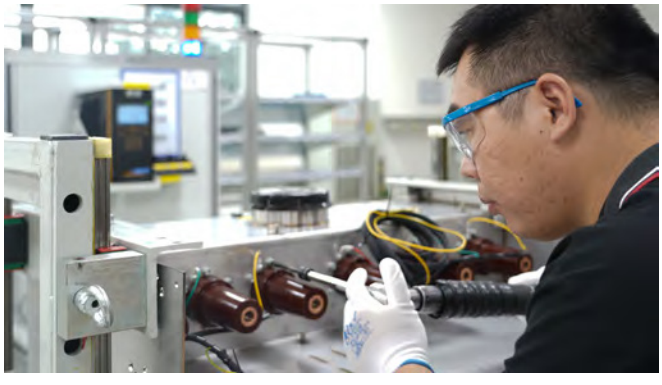
Our Products

GEIS consists of former GE China's all electrical distribution business, including circuit breaker, control product, switchgear, switchboard, MCC, cast coil transformer, up to 40.5kV.

Our Factory

GEIS Electric's headquarter was GE's Shanghai Operation hub, once a GE "Global Star" facility. The factory is upgraded to latest MES system.





Contents

SecoGear Series
Up to 27kV Switchgear

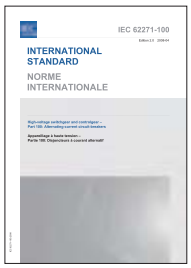
- Indoor metal-enclosed (According to IEC 62271-200, loss of service continuity category (LSC) 2B and partition class is PM -metallic partition) switchgear designed for the MV section of HV/MV and MV/MV substation
- Air insulated switchgear with a compact design
- Safe and Reliable switchgear for universal indoor applications
- Designed with full metallic segregation of its internal compartments
- Equipped with the latest design embedded pole SecoVac vacuum circuit breaker
- Cable compartments with ample space for ease of power cable connection
- Fully arc-proof unit up to 50kA for 1 second AFLR
- Tested in accordance with the IEC international standards
- Tested to UBC zone 4 IBC 2012 intensity 9 for Seismic
- Front panel features easy operation and low maintenance
- Complete interlocking system to prevent incorrect operation and to improve safety

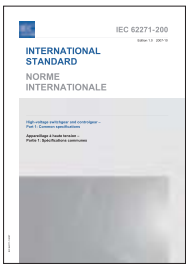
Innovative in its design, SecoGear is compact air insulated switchgear and leads the industry in safety, reliability, performance and sustainability. Fully IEC certified at the KEMA, IPH and TUV test labs to IEC 62271-100 and IEC 62271-200, meeting the requirements of LSC2B. SecoGear Switchgear is suited to provide control and protection for cables, transformers, capacitors and motors used across many industries. SecoGear excels anywhere that medium voltage power has to be switched, controlled and protected.

SecoGear Front Access
Unit compartment

SecoGear
Unit compartment

A. Apparatus compartment
B. Busbar compartment
C. Cable compartment
D. Low voltage compartment





Built to highest quality standards

SecoGear is designed and fully third- party type tested to the latest IEC 62271-200 standards. It is fully isolated by earthed metal partitions for all the major compartments. It is equipped with very latest series of IEC vacuum circuit breakers type SecoVac, which are fully third party type tested in accordance with IEC 62271-100. Using state of the art technology, and manufactured in accordance with the highest quality standards; our engineers have integrated core technol-ogies. These technologies such as circuit breaker and mechanism design, vacuum arc control technology, insulation technolog and electrical field control and analysis combine to build a highly reliable and compact system. SecoGear benefits from best practices incorporated in our current medium voltage.

The typical rated voltage of SecoGear is 3.3/7.2/12/13.8/15/17.5/24/27kV and rated current ranges for SecoGear up to 17.5 is from 630A to 4000A (4000A force cooling), cooling), for SecoGear 24/27kV the rated current is up to 2500A. All SecoGear with a switching device is equipped with SecoVac vacuum circuit breaker or fuse contactor with corresponding specifications.

Fully type tested to latest IEC standards

The switchgear is type tested to the latest IEC 62271-200 and has the third party certification to rove internal arc containment classfication of AFLR from 31.5kA for 1 second and up to 50kA for 1 second. This means protection against harm to personnel in the unlikely event of an internal arc in the cable compartment, vacuum circuit breaker compartment and the bus bar compartment in any direction: front, rear and sides of the switchgear.

Fused Contactor

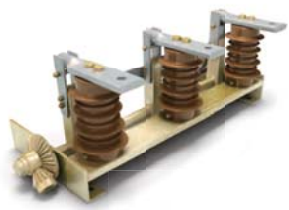
Vacuum Contactors are designed and manufactured for frequent switchings, especially taking into account safety and quality assurance. They are suitable for switching and controlling squirrel cage and wound rotor motors, medium voltage resistive loads, and capacitors and transformers. The fuse provides protection against short-circuit currents.
SecoVac fuse contactor rated current is 400A. HV fuse ratings are 160A for 12kV, 315A for 7.2kV rated voltage.

Circuit breaker making and breaking capacity

The SecoVac vacuum circuit breaker is subjected to the rated current and short-circuit current breaking tests.
Furthermore, it is also subjected to the opening and closing of capacitive and inductive loads, capacitor banks and/or cable lines.

Intelligent embedded pole vacuum c ircuit breaker iVB

SecoVac series 12kV Intelligent vacuum circuit breaker designed is a three-phase AC indoor embedded pole breaker with 12kV rated voltage and can be coupled sensor, monitoring, controlling and protection technology, provides an intelligent, compact and high reliable solution electrical equipment in light industry, commercial building, residential house and other infrastructure fields.



Earthing switch making capacity

The earth switch of the SecoGear switch-gear can be closed under short- circuit up to 50kA. The eartth switch is interlocked to avoid being operated on circuits which are still live. However, should the switch be accidentally closed then safety of the operating personnel is assured by arc fault containment.

Mechanical operations

The mechanical endurance tests on all the operating parts ensure the reliability of the circuit breaker. General experience in the electro-technical sector shows that mechanical faults are one of the most common causes of a fault in an installation.
The circuit breaker is tested by carrying out a high number of operations far in excess of those which are normally carried out whilst actually in service.
Furthermore, the switchgear components are part of a quality control program and samples are regularly taken from the production lines and subjected to total mechanical life tests to verify that the quality is identical to that of the components subjected to the type tests.

Full Front Access

SecoGear FA 17.5kV provides state of the art design principles to allow for complete operation and installation from the front of the swicthgear. It allows for back to wall installation thus optimising space within the switchroom. An optional base frame solution is available for up to 5 panels reducing installation work and commissioning time. SecoGear FA 17.5kV is 100% compatible with standard SecoGear 17.5kV panels.

Base Frame

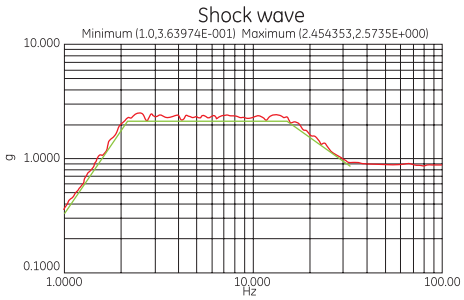
An optional 75mm height base frame can be provided with SecoGear. The base frame can be used on up to 5 panels to provide modular concept for the switchgear. Use of the base frame decreases field ork for mechanical and electrical assembly hence decreases the total commissioning time by up to 80%. Base frame usage is highly recommended for marine and E-House applications.

IP degree

The IP protection degree is the resistance offered by SecoGear against penetration of solid objects and liquids. This degree of resistance is indicated by the pre ix IP followed by two characters IP 4X is for the enclosure and IP 2X for the partitions. The irst number identi ies the degree of protection against the entrance of solid objects, the second one is related to liquids. IP41, IP42, IP43 and IP 44 are available by customer request.

High ambient temperatures

The service conditions for the electrical circuit breaker in marine installations are generally more severe than those in normal land applications. Temperatures are a main factor and for this reason the shipping register regulations require the switchgear to be able to operate at higher ambient temperatures of 40 °C or higher.



Marine application Approvals

- American Bureau of Shipping (ABS) 17.5k SecoGear
- Russian Maritime Register of Shipping (RMRS) 12kV SecoGear 550
- Seimic Certification - UBC Zone 4
- Seimic Certification - IBC 2012

Inclination

The Inclination test proved that SecoGear can continue operating as intended, even when inclined at an angle up to 25 degrees on all four sides and with an ambient temperature of 50°C, up to IP44. The exposure to these severe service conditions con irms the suitability of SecoGear to marine unstable conditions.

Vibration

The operating conditions on marine platforms and shipping installation require the capability to work in environments affected by vibrations. SecoGear was exposed to a resonance search and endurance testing, which consists of a random vibration test according to IACS E10.
Vibration Sweep Test

- From 2 to 13.2 Hz displacement 1.0 (peak value)
- From 13.2 to 100 Hz acceleration amplitude of 0.7 g

Vibration Endurance Tests 90 minutes

Minimal costs during service due to:

- Robust maintenance-free design with minimum number of parts
- SecoVac VB2 Plus vacuum circuit breaker has a along life up to 15,000 operations without the need for active maintenance
- An advanced vacuum interrupter contact design prevents hot spots, creates less heat and minimizes electrode erosion to yield longer life
- Low end of life disposal costs due to:
  - Vacuum switching technology
  - Air insulation
  - Recycling or re-use of all materials possible
  - No special decommissioning procedures necessary

User interface friendly

- Cable connection and user interfaces for operation on the same side of the unit
- Up to 8 cables per phase with standard compression lug for ease of cable connection
- Secondary cable entry points on both sides of the low voltage compartment top plate
- Secondary cable wiring runs over the length of the switchgear to help with inter-unit wiring
- Secondary cable terminals positioned at a good reachable height within the low voltage compartment
- Clear and simple, straightforward operation, panels combined with an active LED mimic diagram
- Base frame for up to 5 panels decreases the commissioning time and site works

Low lifetime cost

Low initial costs due to:

- Compact footprint
- Cable access from front or rear
- Cable entry from either top or bottom
- Bus Duct entry from top or bottom
- Easy-access cable compartment for ease of cable connection
- Integrated arc release system, there are arc skirt, arc duct and arc roof as optional solutions
- Back to wall configuration with front cable access

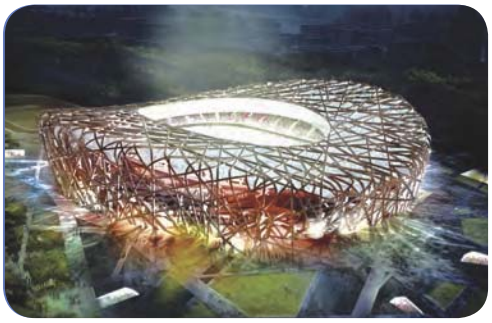
Applications

Utilities and power plants
Power generation stations
Transformer stations
Switching stations
Main and auxiliary switchgear
E-House
Generator Circuit Breaker

Industry
Oil and Gas
Mining
Pulp and Paper
Cement
Textiles
Chemicals
Automotive
Petrochemical
Data Center
Metallurgy

Transport
Airports
Ports
Railways
Underground transport

Services
Supermarkets
Shopping malls
Hospitals
Large infrastructure and civil works



Marine
Drilling and Exploration
Merchant
Cruise
FPSO
Naval

Applications

Safety

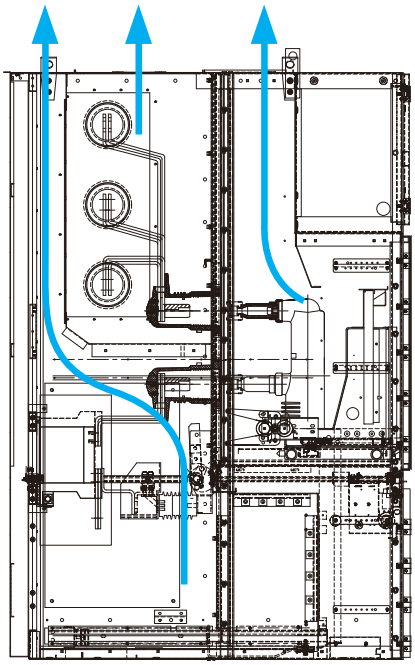
Internal Arc Containment

When developing modern medium voltage switchgear, personnel safety must take priority. This is why the SecoGear switchgear has been designed and tested to withstand an internal arc due to a short-circuit current of the same current level as the maximum shorttime withstand level.

The tests show that the metal housing of SecoGear switchgear provides an enhanced degree of protection for personnel near the switchgear in the case of an internal arcing fault.

SecoGear up to 17.5kV passes the 50kA/1s IAC test. SecoGear up to 27kV passes the 31.5kA/1s test.

- All high voltage primary compartment are provided with pressure relief flaps located on the topside of the switchgear
- Any overpressure inside the compartment caused by internal arcing will be released through the pressure relief flaps



Arc release channel

Arc Release System

The Arc Release System is the perfect solution for an E-house, marine and other restricted area, where do not allow hot particles and gases can not be vented within the switchroom. It guarantees safety for all personnel.

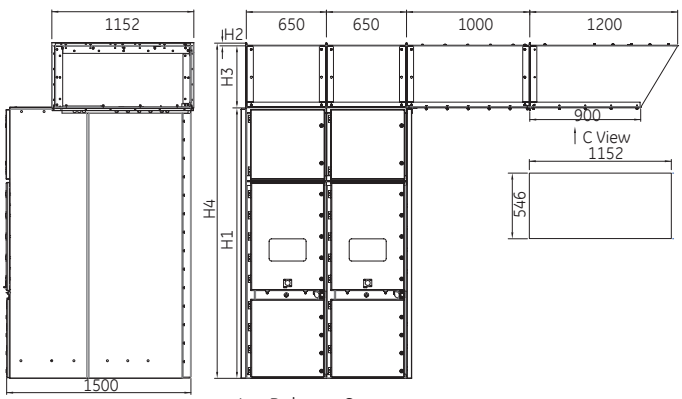
The top of each panel is fitted with two metal mesh panels. The pressure generated by arc fault causes these panels to open, allowing the gas and particles into the arc tunnel and are then evacuated to the outside of the room.

Switchgear with standard arc release system can be used where the room height is greater than 3000mm. At the location of the exhaust exits from the switchroom, personal access should be restricted.

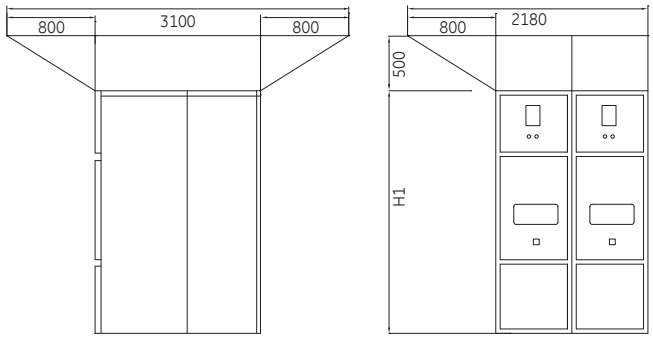
For SecoGear FA 17.5kV, a reduced arc release system height is available with the tunnel having a height of 400mm, the the ceiling height being a minimum of 2700mm.

The switchgear units have been tested according to IEC 62271-200:2003 for the following Internal Arc Classification. The SecoGear have pass type test IAC AFLR 50kA/1s for 17.5kV and for 27kV 31.5kA/1s with skirt as below.

	Arc Duct
H1	2200
H2	20
H3	400
H4	2620



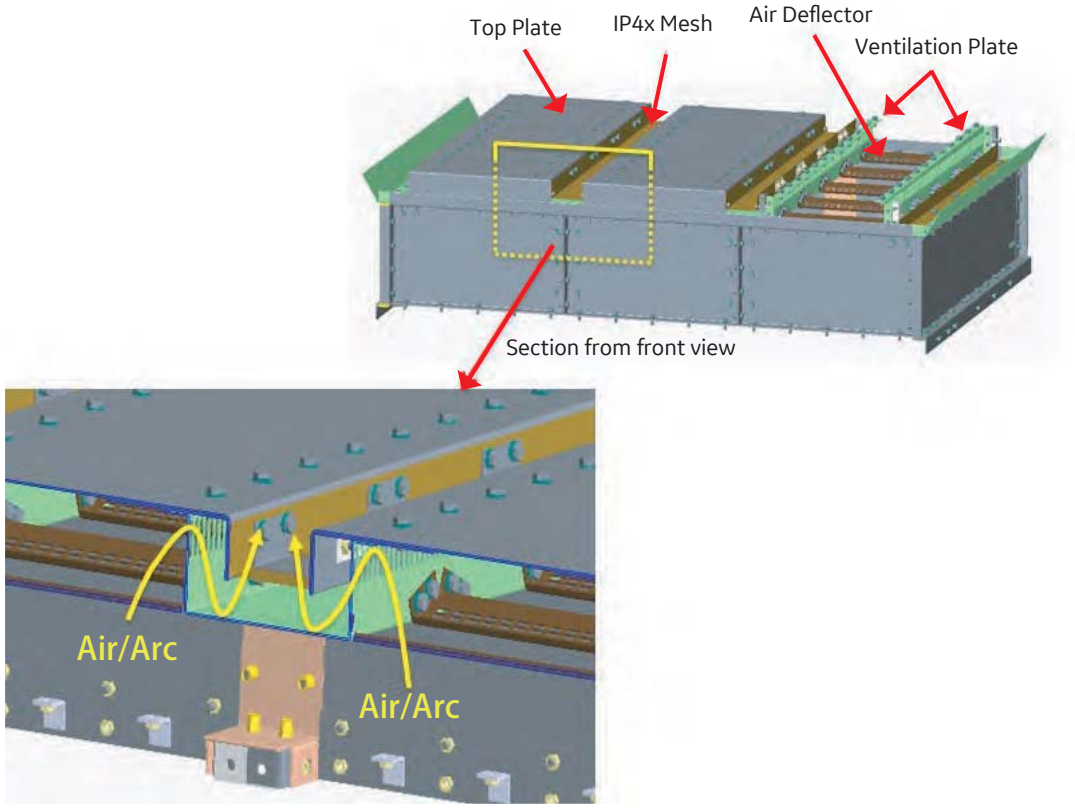
Arc Release System

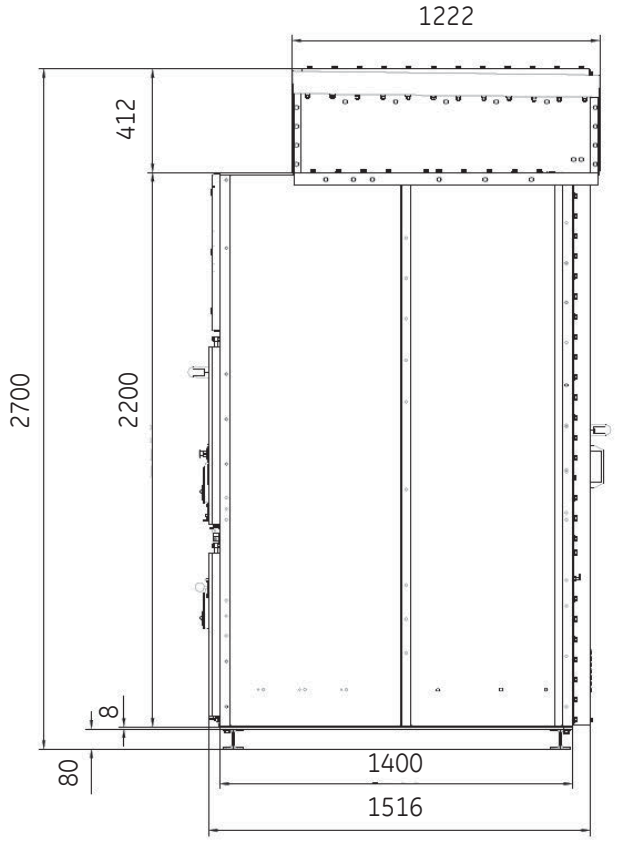


Arc skirt (optional)

Arc roof (optional)

For installations where installation of the arc duct or arc skirt could be physically or economically difficult GE can provide an alternative arc release system. The Arc Roof uses arc energy absorption technology to contain the arc and its by products in the roof mounted assembly. The Arc Roof is type tested for IAC ALFR 40kA/1sec according to IEC62271. The Arc Roof is standard for the Secogear 550/750 panels.



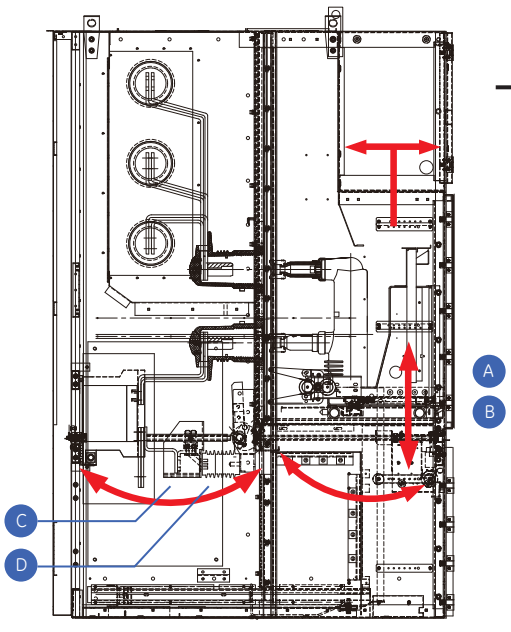


Interlock

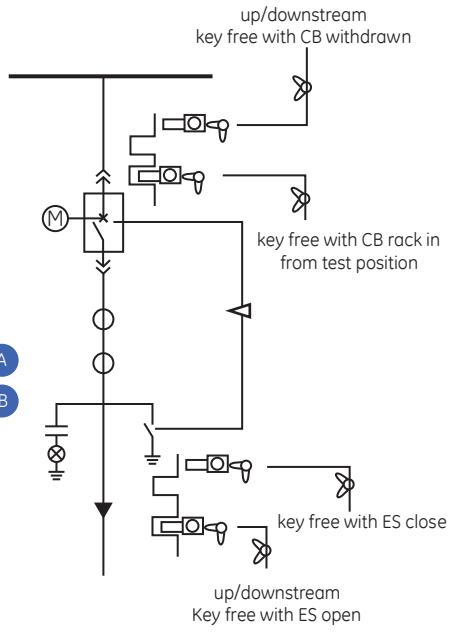
safety interlock systems guarantee the highest level of personnel safety preventing operator errors from occurring. SecoGear is designed with a number of interlocking systems to prevent mis-operation:

- The apparatus can only be moved from test to connected position and vice versa when apparatus is opened
- The earthing switch cannot be closed when the apparatus is in the connected position and in the traveling position between test and connected
- The cable compartment door can be opened only when the earthing switch i s closed
- The earthing switch can be opened only when the cable compartment door is closed
- The secondary plug can be inserted or removed only when the apparatus is in the test position
- The apparatus can only be closed when the circuit breaker is positively located in the connected position
- When the apparatus is removed from connected position, the metal shutters will close automatically preventing access to live connections

	Description of the interlock system	Key Condition
A	Functional truck racking-out lock	Key will be free when the truck in the connected position
		Key will be trapped when the truck in the test position
B	Functional truck racking-in lock	Key will be free when the truck in the test position
		Key will be trapped when the truck in the connected position
C	Earthing switch closing lock	Key will be free when the earthing switch is open
		Key will be trapped when the earthing switch in closed position
D	Earthing switch opening lock	Key will be free when the earthing switch closed
		Key will be trapped when the earthing switch in open position



Interlock



Safety

Safety

SecoGear FA Interlocking

SecoGear Interlocking											
Category	Condition		Interlocking type	SecoGear 550/750		SecoGear 17.5kV		SecoGear FA 17.5kV		SecoGear27kV	
				Standard	Optional	Standard	Optional	Standard	Optional	Standard	Optional
Apparatus Closing & Opening	**Apparatus could be closed only when:**										
	1	Apparatus in connected or test position and not in any intermediate position	Mechanical	✓		✓		✓		✓	
			Electrical		✓		✓		✓		✓
	Apparatus could be opened without conditions.										
	Padlocks allowance:										
	1	Access to Open Button	Padlock		✓		✓		✓		✓
	2	Access to Close Button	Padlock		✓		✓		✓		✓
Apparatus racking in/out locking from connected to test positions	**Apparatus could be Rack-Out from connected to test position only when:**										
	1	Apparatus is open	Mechanical	✓		✓		✓		✓	
			Electrical		✓		✓		✓		✓
	2	Key-lock A for VCB rack in is turned captive	key		✓				✓		
	Apparatus could be Rack-In from test to connected position only when:										
	1	Apparatus is open	Mechanical	✓		✓		✓		✓	
			Electrical		✓		✓		✓		✓
	2	Apparatus Control Plug is connected	Mechanical						✓		
			Electrical				✓		✓		✓
	3	Earthing Switch is open	Mechanical	✓		✓		✓		✓	
			Electrical		✓		✓		✓		✓
	4	Apparatus compartment door is closed	Mechanical		✓		✓		✓		✓
			Electrical		✓		✓		✓		✓
	5	Key-lock B for VCB rack in is turned captive	key		✓		✓		✓		✓
	Padlocks allowance										
	1	Access to insert crank lever	Padlock		✓		✓		✓		✓
Apparatus pulling in/out locking from test to extracted positions	**Apparatus could be pulled-out from test position to service trolley only when:**										
	1	Service Trolley is attached to the Panel and locked to it	Mechanical						✓		
			Electrical						✓		
	2	Apparatus Control plug is disconnected	Mechanical						✓		
			Electrical						✓		
	Apparatus could be pulled-in from service trolley to test position only when:										
	1	Service Trolley is attached to the Panel and locked to it	Mechanical						✓		
			Electrical						✓		
Earthing Switch Closing & Opening	**Earthing switch could be closed only when:**										
	1	Apparatus in test position	Mechanical	✓		✓		✓		✓	
			Electrical		✓		✓		✓		✓
	2	Permisive blocking magnet is energized	Electrical		✓		✓		✓		✓
	3	Key-lock C for Earthing switch is turned captive	key		✓		✓		✓		✓
	Earthing switch could be open only when:										
	1	Cable compartment door closed	Mechanical	✓		✓		✓		✓	
			Electrical		✓		✓		✓		✓
	2	Rear cover is assembled	Mechanical	✓		✓				✓	
	3	Key-lock D for Earthing switch is turned captive	key		✓		✓		✓		✓
	Padlocks allowance:										
	1	Access to insert operation lever	Padlock		✓		✓		✓		✓
Apparatus compartment door Closing & Opening	**Apparatus compartment door could be opened only when:**										
	1	Apparatus in test position	Mechanical		✓		✓		✓		✓
			Electrical						✓		
	2	Shutter Closed	Mechanical								
			Electrical						✓		
	Apparatus compartment door could be closed without conditions.										
Cable compartment door Closing & Opening	**Cable compartment door could be opened only when:**										
	1	Earthing Switch is closed	Mechanical	✓		✓		✓		✓	
			Electrical						✓		
	Cable compartment door could be closed without conditions.										
Shutters	**Shutters could be opened only when:**										
	1	Activated by Apparaturs Undercarriage	Mechanical						✓		
			Electrical								
	Shutters could be closed without conditions.										
Control Plug	**Padlocks allowance:**										
	1	Padlock Opening or Closing	Padlock	✓		✓		✓		✓	
	Apparatus Control plug could be connected / disconnected only when:										
	1	Apparatus is in test position	Mechanical	✓		✓		✓		✓	
			Electrical								

Environment

Increasing global legislation concerning the use of green - house gases such as SF_6 gas and their related disposal costs, makes vacuum technology with its reliability, low maintenance, and low environmental impact the choice for now and the future.

As the world strives to reduce the amount of SF_6 gas used in all applications there is a responsibility on the users of electrical switchgear to find, where appropriate, alternatives to SF_6 gas as an insulation and switching medium. Air and solid insulation switchgear systems incorporating vacuum switching technologies are a reliable, safe and economic alternative for use in electrical systems below 36kV and therefore should be used instead of SF_6 gas insulated systems.

Modern medium voltage switchgear employing vacuum technology together with air and epoxy resin insulation provides:

- Minimum number of parts and components
- No special requirements for the end-of-life disposal of the switchgear
- Environmentally-friendly materials used in the design
- No use of SF_6-gas for switching and insulation
- No risk of damaging leaks of SF_6 gas or of toxic byproducts
- Energy-efficient production and assembly, with environmentally friendly energy sources
- Minimal number of transition points in the primary design enables low energy loss during operation
- Only re-usable and/or recyclable materials used

Environmentally friendly design

production plants act entirely in accordance with the rules and procedures of the ISO 14001 environmental certificate during development and production processes.

Material selection and the number of parts that are used to manufacture the SecoGear are critical to determining how environmentally friendly the manufacturing process is. selects its materials to ensure that they have the lowest possible impact on the environment. It is essential that they are equally safe for people not just during use, but at the end of service life too. Within SecoGear and the SecoVac vacuum circuit breaker, a combination of solid (cast-resin) and air is used as insulation. The cast-resin technology, in combination with electrical eld calculations, provides a very compact, environmentally friendly design for the circuit breaker and the switchgear. Because the switching medium used is vacuum, SecoGear can be completely recycled at the end of its life without any issues relating to safety procedures, special handling or safe disposal.

Environmentally friendly

From the very beginning GE made a fundamental choice not to use SF_6 as a switching and insulation medium for primary medium voltage equipment. SF_6 is on the list of greenhouse gasses in the Kyoto protocol and is the most potent of the six main greenhouse gasses, with a Global Warming Potential (GWP) of 23,000. Many other medium voltage switchgear systems use SF_6 gas as the insulating medium. Leakage of SF_6 gas from switchgear contributes significantly to the threat of the greenhouse effect and associated climate change. They also require additional safety measures and special handling requirements at the end of life.

Minimum service checks on site

SecoGear is designed for a lifetime of at least 20 years; therefore the energy usage for maintenance activities during this long period is minimal. Due to the green insulation and switching technology, there is also no leakage of the harmful SF_6 gas during its lifetime and no need for performing extra maintenance activities on SF_6 gas pressure checks.

Minimal energy loss during operation

The number of electrical contact or changeover points within the SecoGear system has been kept to an absolute minimum. This reduces the potential number of "hot spots" and prevents additional energy loss associated with contact surfaces.

Energy efficient assembly

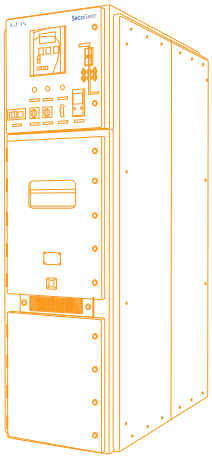
SecoGear is produced in an energy efficient environment. Standard processes and materials are used in the design and require no special handling or manufacturing processes, thus reducing the amount of energy required to manufacture and assemble the switchgear.

Efficient use of materials

Besides the energy sources, special focus is placed on the efficient use of material during assembly. For example by using advanced nesting tools the hot dipped galvanized steel plates are cut with the least amount of waste, and similar principles are followed in the design and manufacture of other product components

Re-use or recycling of materials

All materials of SecoGear and SecoVac can be reused, all materials are not any impact on the environment, it fully reflects the corporate social responsibility to design and produce products.



Product Introduction

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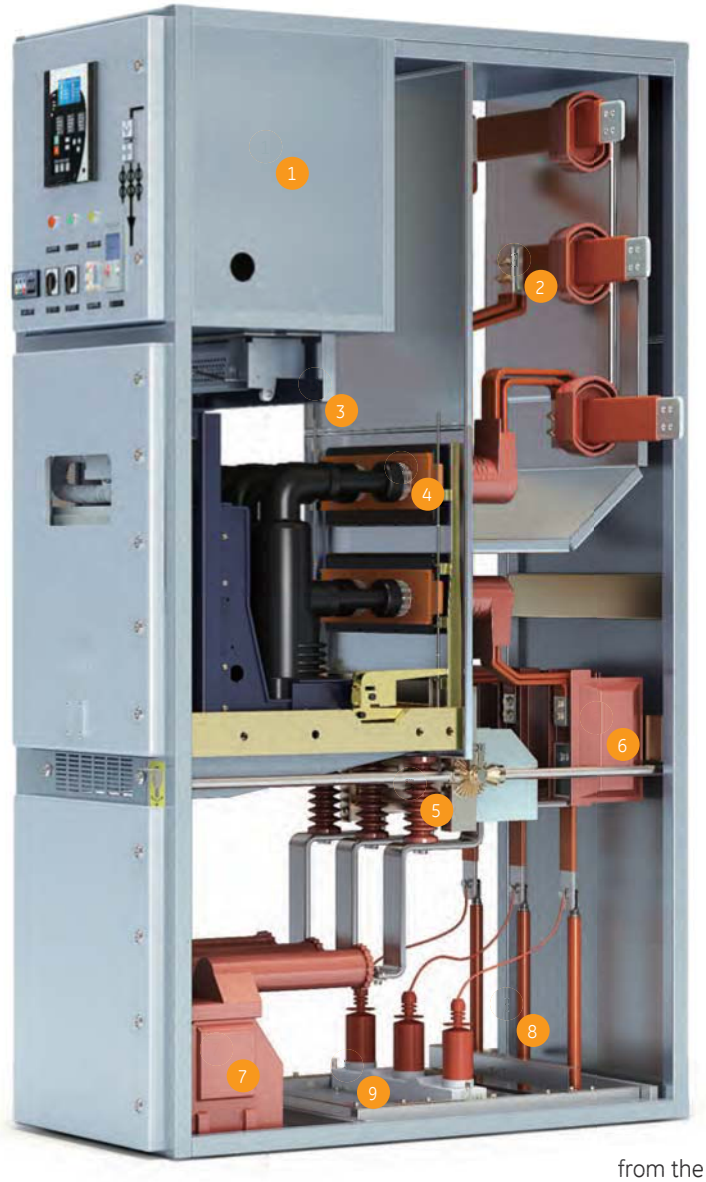


1 Low voltage compartment

The compartment is isolated with earthed metal partitions and has ample space for control and protection devices.
A fully isolated metal wire way is mounted at the top of each switchgear panel; this connects together to form a continuous low voltage wire way that runs along the entire length of the switchgear.

2 Busbar compartment

Busbars are totally enclosed in their own earthed metal compartment which vents into the arc chamber. Fully insulated along their entire length, the busbars for up to 17.5kV SecoGear are type tested for ratings up to 4000A, 50kA for 3 seconds, up to 27kV SecoGear are type tested for rating up to 2500A, 31.5kA for 3 seconds. For 24/27kV SecoGear, the busbars are type tested for rating up to 2500A, 31.5kA for 3 seconds. Epoxy moldings separate switchgear sections.

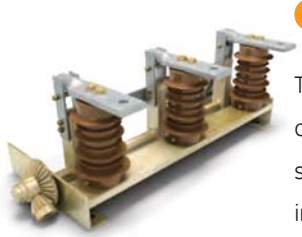
3 Apparatus compartment

Fully isolated by earthed metal partitions, with its own pressure relief channel into the arc chamber. The compartment provides all the safety interlocking mechanisms required for safe and reliable operation of the vacuum apparatus. Manual operation buttons allow for full operation of the vacuum apparatus from the front of the switchgear with the door fully closed. The apparatus is mechanically interlocked with the compartment door so that the door cannot be opened until the apparatus is switched off and racked out into the Test position.

4 Automatic shutters

When the apparatus is in Test position, the shutters automatically close to isolate the fixed contact from any live parts. Shutters can be individually and automatically operated for bus side and feeder side connection in close position.

5 Earth switch



The earthing switch can be operated from the front of the switchgear. It is mechanically interlocked with the apparatus truck so that the earthing switch can only be operated when the apparatus is open in Test position as well. The switch is also mechanically interlocked with the cable compartment for additional safety.

6 Current transformers

Current transformers are cast in resin, and totally enclosed. This provides superior protection against pollutants and moisture. It can be equipped with one or more independent magnetic cores with equal or different characteristics for measuring, metering and protection purposes.

7 Voltage transformers

Voltage transformers are cast in resin, and totally enclosed. This provides superior protection against pollutants and moisture. It can be equipped with one or more independent magnetic cores with equal or different characteristics for measuring, metering and protection purposes.

8 Cable compartment

Cable supports are provided to secure cables. Cable clamps are applied for fix the cables. And the metal floor cover is removable. Infrared sight glass window can be offered.

9 Earth bar

Earth bar is made of copper and installed in the bottom of cable compartment. The earth bar system has been fault tested and runs vertically and horizontally with each panel section and is connected to the earth switch.

10 Surge arrester

Surge arrester is used to protect electric equipment against transient operating or lightning over-voltage. It is connected between primary conductor and ground for protecting protective load from damage effect. When the operating or lightning over-voltage occurs, surge arrester immediately limits over-voltage amplitude and protects the insulation of device.

Control and Operation

1 Low voltage control and protection compartment
Panel with all controls and indicators clearly visible and easy to operate

2 Protection relay
GEIS has a range of Multilin relay options that can be fitted as standard. However, customer specific protection relays from any manufacturer can be fitted to the compartment door

3 Mimic diagram
Easy to understand mimic diagram of each circuit

4 Apparatus position indicator
Apparatus position indication shows the apparatus in the connected or test position

5 Electrical operation with apparatus status indicator
Apparatus open/closed status indicator.
Apparatus open/closed command switch.
Optional LED indication of spring charge mechanism “charged” status

6 Voltage detection system
Each panel can be equipped with an optional standard three phase voltage detection system for voltage detection to IEC 61243-5

7 Viewing windows
The apparatus compartment door viewing window provides visual indication of the position of the apparatus indicating:
- The status of the apparatus
- The status of the spring charged mechanism

8 Apparatus racking operate hole
Apparatus racking in/out operate hole
Electrical operation for racking in/out available

9 Earthing switch operate hole
Earthing switch open/close
Electrical operation for Earthing switch available

10 Viewing windows and IR glass
Optional viewing windows on the cable compartment door. Optional IR glass for cable compartment

Technical Characteristics

		For VCB				For FC	
Product Type		SecoGear 550	SecoGear 17.5	SecoGear 27		SecoGear FC	
Rated voltage	kV	up to 12	up to 17.5	24~27		up to 12	
Rated power frequency (1min)	kVp	38	38	50	65	20	28
Rated lightning impulse (1.2/50μs)	kV	75	95	125	125	60	75
Rated frequency	Hz	50/60	50/60	50/60		50/60	
Rated current	A	630/1250/1600/2000	630/1250/1600/2000/2500/3150/4000*	630/1250/1600/2000/2500		400**	
Rated short time withstand	kA	25/31.5/40	25/31.5/40/50	31.5		4**	
Rated peak value withstand current	kAp	65/82/104	65/82/104/130	82		10.4	
IP level for weather protection	Enclosure	up to IP44	IP4X/41/42/43				

* Forced cooling
** Only for contactor

Protection

- IP4X for the enclosure
- IP2X between each compartment
- IP41 / IP42 / IP43 optional

Construction

- Internal arc withstand (classification IAC): AFLR up to 50kA/1sec
- 3 compartments (classification LSC2B according to IEC 62271-200)
- All the metal surfaces in the panels are corrosion proof
- Panels are produced using hot dipped galvanized steel sheet
- Busbar fully insulated for 7.2kV, 12kV, 13.8kV, 15kV, 17.5kV, 24kV, 27kV

Connections

- Front and/or rear access
- Cable entry from bottom or top
- Bus Duct entry bottom or top

Operating Conditions

Normal operating conditions

The switchgear is fundamentally designed for the normal service conditions for indoor switchgear to IEC Publication 62271-1. The following limit values, among others, apply.

- Ambient temperature
  - Maximum +40°C
  - 24h-Medium +35°C
  - Minimum -15°C
- Humidity
  - Highest average value measured over 24 hours
  - Relative humidity 95%
  - Highest average value measured over 1 month
  - Relative humidity 90%
- The maximum site altitude is 1000 m above sea level
- Seismic Rating up to Uniform Building Code (UBC) 1997 Zone 4
- Seismic Rating up to IBC 2012 for 27kV SecoGear

Special operating conditions

SecoGear is suitable for indoor type installations according to IEC standard. Special operating conditions must be discussed with GEIS in advance.
For example: At site altitudes above 1000 m, the effects of the reduction in density of the air on the dielectric properties must be taken into account.
Increased ambient temperatures must be compensated for in the design of the busbar and the branch conductors as well as the withdrawable parts; otherwise the current carrying capacity will be reduced. Fitting additional ventilation facilities can assist heat dissipation in the switchgear panel.

High altitude application

The insulating capacity of the switchgear with rated values of short-time power-frequency withstand voltage and impulse withstand voltage according to IEC 62271-1.

Note on any special climatic operating conditions

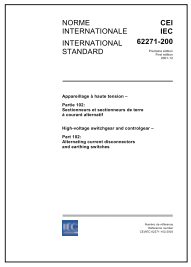
When the switchgear is operated in areas with high humidity and/or major rapid temperature fluctuations, there is a risk of condensation. Preventative action (e.g. fitting an electric heater) must be taken in consultation with the manufacturer to avoid the condensation and any resulting corrosion or other adverse effects.

Storage Conditions

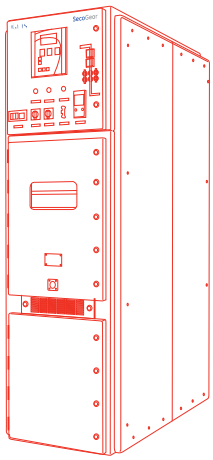
In order to retain all of the functional unit's qualities when stored for prolonged periods, we recommend that the equipment is stored in its original packaging, in dry conditions sheltered from the sun and rain at a temperature of between –15°C and + 40°C. For storage: -30°C.

IEC Standards

SecoGear complies with the standards and specifications for factory assembled metal enclosed switchgear and has been type tested in accordance with the IEC publications as given below.



IEC 62271-100	High-voltage alternating current circuit breakers.
IEC 62271-200	AC Metal enclosed switchgear and control gear for rated voltages above 1kV and up to 52kV.
IEC 62271-102	High-voltage alternating current disconnector and Earth Switches.
IEC 62271-1	The common specification for high voltage switchgear and control gear Standards.
IEC 60529	Degrees of protection as provided by enclosures (IP Code).
IEC 62271-106	High-voltage Alternating Current Contactors and Contactor-based Motor-Starters.



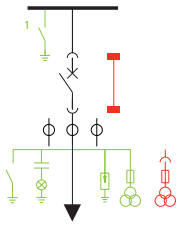
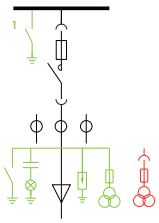
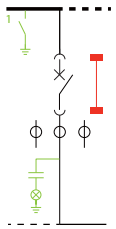
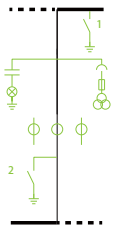
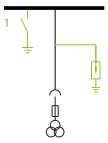
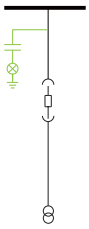
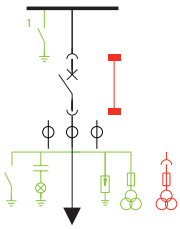
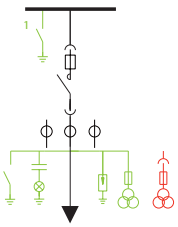
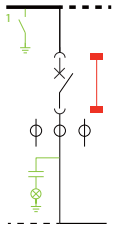
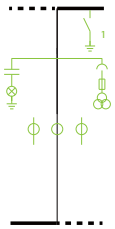
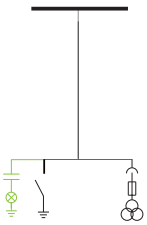
Configurations

Typical Panels

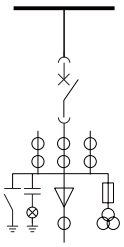
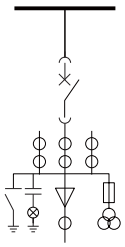
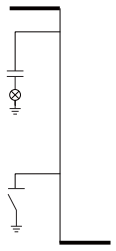
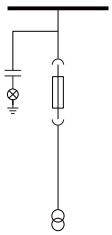
The SecoGear 550 series comprises 6 basic configuration applications.

The SecoGear standard series comprises 11 basic configuration applications The table below can be used to link requirements to functional units and gives basic information on the general composition of each unit.

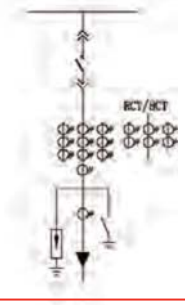
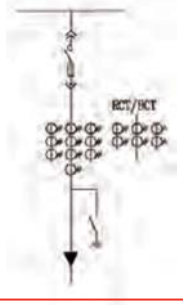
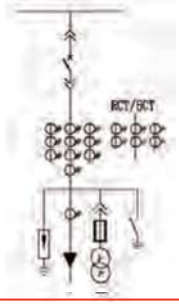
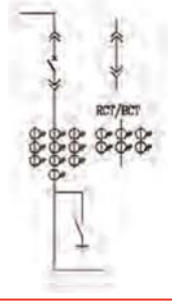
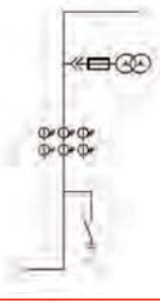
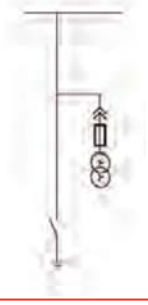
SecoGear

Incoming/Feeder	Fuse Contactor	Bus Tie	Riser	VT Panel	CPT Panel
					
Incoming / Feeder Front Access	**Fuse Contactor Front Access**	**Bus Tie Front Access**	**Riser Front Access**	**VT Panel with ESW Front Access**	
					

SecoGear 24kV-27kV

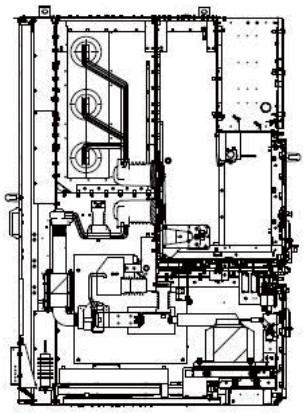
Incoming with ES & VT (24kV)	Incoming with ES & VT (27kV)	Riser with ES	CPT	
				

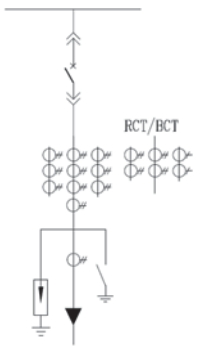
SecoGear 550/750 12kV

Income/Feeder	Feeder with Fuse contactor	Feeder with VT	Busbar Tie with VCB	Riser with VT	Measuring with ESW
					

SecoGear 550 / 750
Incoming / Feeder

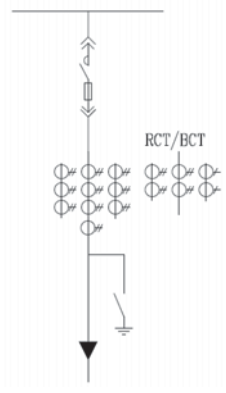
Rated Voltage (kV)			
		7.2/12	
Rated Insulation Level			
Power frequency withstand voltage (kV)		20	28
Lighting impulse withstand voltage (kV)		60	75
Rated Current (A at 40°C)	400		
	630	■	■
	1250	■	■
	1600		■
	2000		■
Breaking capacity (kA)	25	■	■
	31.5	■	■
	40		■
Short time withstand current (kA/3s)	25	■	■
	31.5	■	■
	40		■
Dimensions (mm)			
Width (W)		550	750
Height (H)		2200	2200
Depth (D)	Top access	1900	1900
	Bottom access	1400	1400
Weight (kg)		800~900	850~950
Apparatus			
SecoVac iVB		■	
SecoVac VB2 Plus			■

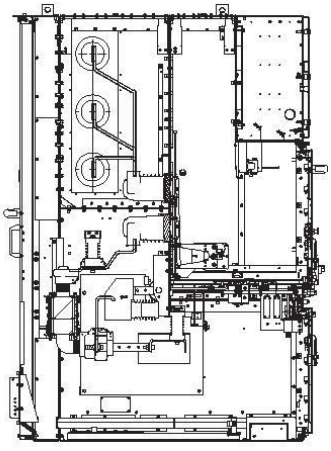




SecoGear 550 /750 12kV
Feeder with Fuse contactor

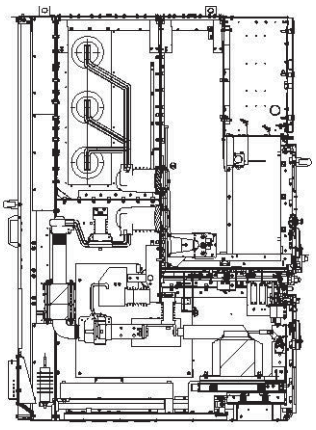
Rated Voltage (kV)			
		7.2/12	
Rated Insulation Level			
Power frequency withstand voltage (kV)		20	28
Lighting impulse withstand voltage (kV)		60	75
Rated Current (A)	200	■	■
	400	■	■
	630		
	1250		
	1600		
	2000		
Breaking capacity (kA)	25	■	■
	31.5	■	■
	40	■	■
	50	■	■
Short time withstand current (kA/3s)	25	■	■
	31.5	■	■
	40	■	■
	50	■	■
Dimensions (mm)			
Width (W)		550	550
Height (H)		2200	2200
Depth (D)		1400	1400
Weight (kg)			
Estimated weight (kg)		800	
Apparatus			
SecoVac FC		■	■

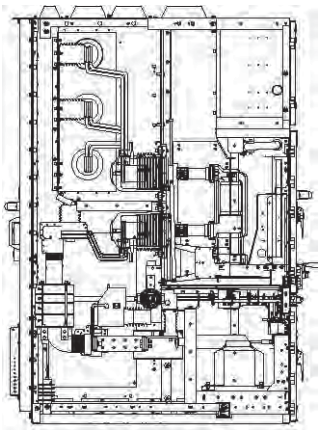


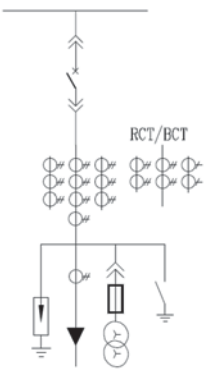


SecoGear 550 /750 12kV
Feeder with VT

Rated Voltage (kV)			
		7.2/12	
Rated Insulation Level			
Power frequency withstand voltage (kV)		20/28	
Lighting impulse withstand voltage (kV)		60/75	
Rated Current (A)	630	■	
	1250	■	
	1600		■
	2000		■
Breaking capacity (kA)	25	■	
	31.5	■	
	40		■
Short time withstand current (kA/3s)	25	■	
	31.5	■	
	40		■
Dimensions (mm)			
Width (W)		550	750
Height (H)		2200	2200
Depth (D)		1400	1400
Weight (kg)			
Estimated weight (kg)		800	900
Apparatus			
SecoVac iVB		■	
SecoVac VB2 Plus			■

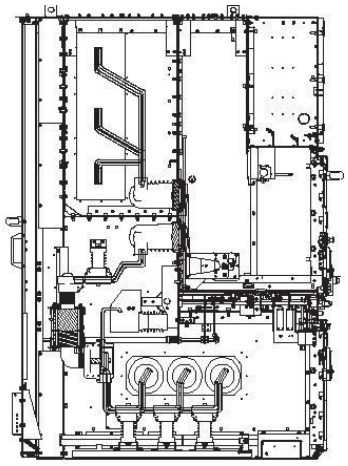


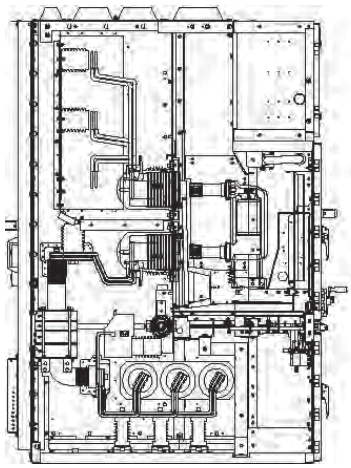


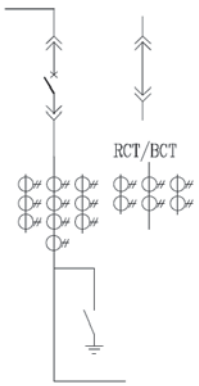


SecoGear 550 /750 12kV
Bus Tie with VCB

Rated Voltage (kV)			
		7.2/12	
Rated Insulation Level			
Power frequency withstand voltage (kV)		20/28	
Lighting impulse withstand voltage (kV)		60/75	
Rated Current (A)	630	■	
	1250	■	
	1600		■
	2000		■
Breaking capacity (kA)	25	■	
	31.5	■	
	40		■
Short time withstand current (kA/3s)	25	■	
	31.5	■	
	40		■
Dimensions (mm)			
Width (W)		550	750
Height (H)		2200	2200
Depth (D)		1400	1400
Weight (kg)			
Estimated weight (kg)		800	900
Apparatus			
SecoVac iVB		■	
SecoVac VB2 Plus			■

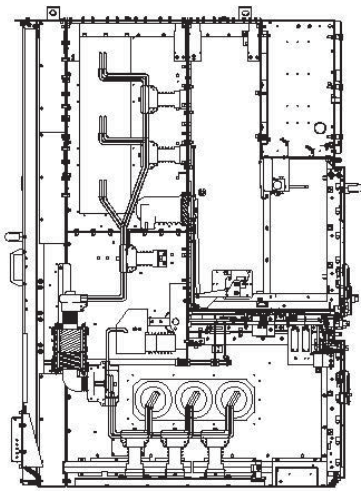


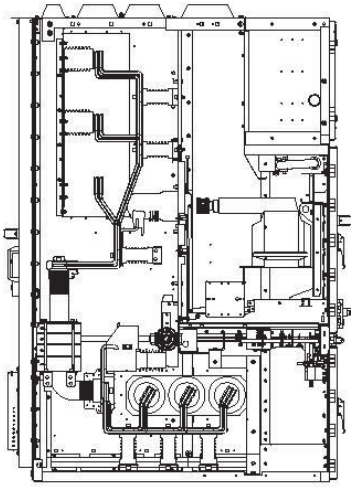


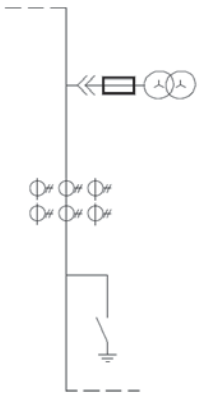


SecoGear 550/750 12kV
Riser Panel with Measuring

Rated Voltage (kV)			
		7.2/12	
Rated Insulation Level			
Power frequency withstand voltage (kV)		20/28	
Lightning impulse withstand voltage (kV)		60/75	
Rated current(A)	630		
	1250	■	■
	1600		■
	2000		■
Breaking capacity (kA)	25		
	31.5	■	■
	40		■
Short time withstand current (kA/3 s)	25		
	31.5	■	■
	40		■
Dimensions (mm)			
Width (W)		550	750
Height (H)		2200	2200
Depth (D)		1400	1400
Weight (kg)			
Estimated weight (kg)		800	900

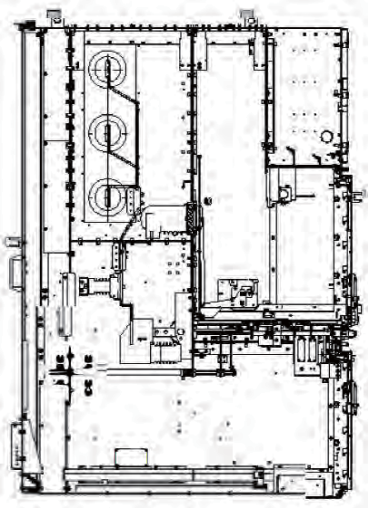


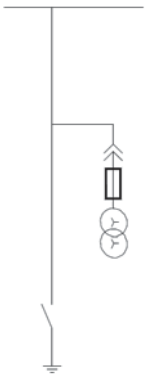




SecoGear 550/750 12kV
Measuring panel with Earthing switch

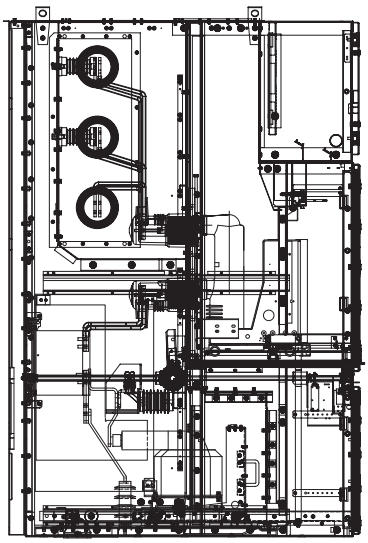
Rated Voltage (kV)			
		7.2/12	
Rated Insulation Level			
Power frequency withstand voltage (kV)		20/28	
Lightning impulse withstand voltage (kV)		60/75	
Rated current(A)	630		
	1250	■	■
	1600		■
	2000		■
Breaking capacity (kA)	25		
	31.5	■	■
	40		■
Short time withstand current (kA/3 s)	25		
	31.5	■	■
	40		■
Dimensions (mm)			
Width (W)		550	550
Height (H)		2200	2200
Depth (D)		1400	1400
Weight (kg)			
Estimated weight (kg)		800	900



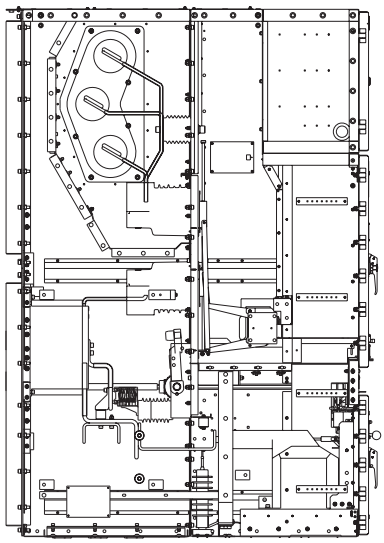


Standard SecoGear
Incoming/Feeder

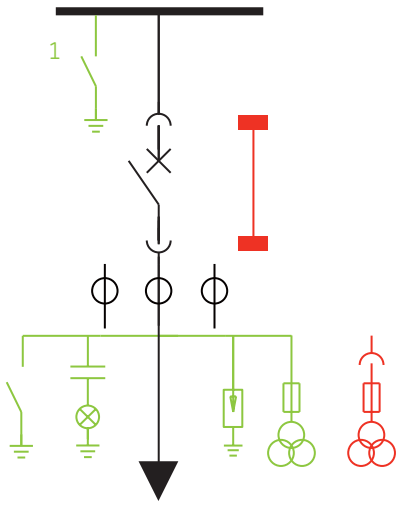
Rated Voltage (kV)							
			7.2/12/15/17.5			24/27	
Rated Insulation Level							
Power frequency withstand voltage (kV)			20/28/36/38			50/65	
Lighting impulse withstand voltage (kV)			60/75/95/95			95/125	
Rated Current (A at 40°C)		400					
		630	■	■		■	
		1250	■	■		■	
		1600		■			■
		2000		■			■
		2500			■		■
		3150			■		
		4000			■		
Breaking capacity (kA)		25	■			■	
		31.5	■	■	■	■	■
		40		■	■		
		50		■	■		
Short time withstand current (kA/3s)		25	■			■	
		31.5	■	■	■	■	■
		40		■	■		
		50		■	■		
Dimensions (mm)							
Width (W)			650	800	1000	800	1000
Height (H)	Standard		2200	2200	2200	2400	2400
	Top Mounted ESW		2600	2600	2600	-	-
Depth (D)	Top Access		1900	1900	1900	-	-
	Bottom Access		1400	1400	1400	1800	1800
Weight (kg)							
Estimated weight			900-950			1100-1200	
Apparatus							
SecoVac VB2 Plus			■	■	■	■	■
SecoVac VB2 Plus-G					■		



40kA



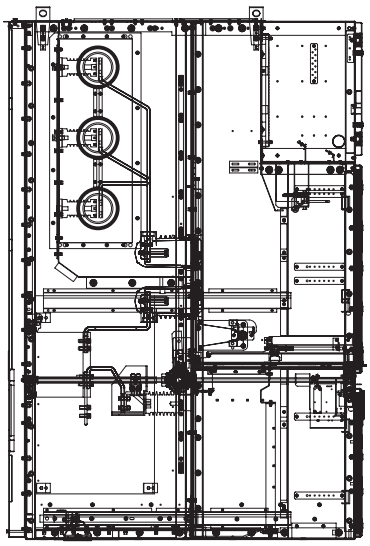
50kA

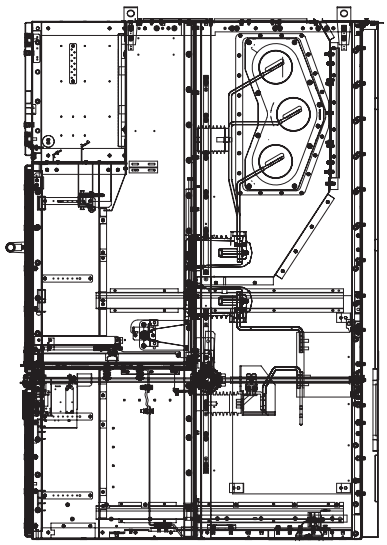


Notes:
1. Only Available for SecoGear 17.5kV, up to 40kA.

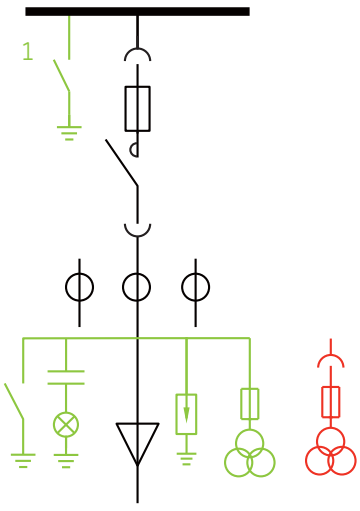
Standard SecoGear
Fuse Contactor

Rated Voltage (kV)							
			7.2/12			24/27	
Rated Insulation Level							
Power frequency withstand voltage (kV)			20/28			50/65	
Lighting impulse withstand voltage (kV)			60/75			95/125	
Rated Current (A at 40°C)		400	■				
		630					
		1250					
		1600					
		2000					
		2500					
		3150					
		4000					
Breaking capacity (kA)		25	■				
		31.5	■				
		40	■				
		50	■				
Short time withstand current (kA/3s)		25	■				
		31.5	■				
		40	■				
		50	■				
Dimensions (mm)							
Width (W)			650				
Height (H)	Standard		2200				
	Top Mounted ESW		2600				
Depth (D)	Top Access		1900				
	Bottom Access		1400				
Weight (kg)							
Estimated weight			900-950				
Apparatus							
SecoVac FC			■				





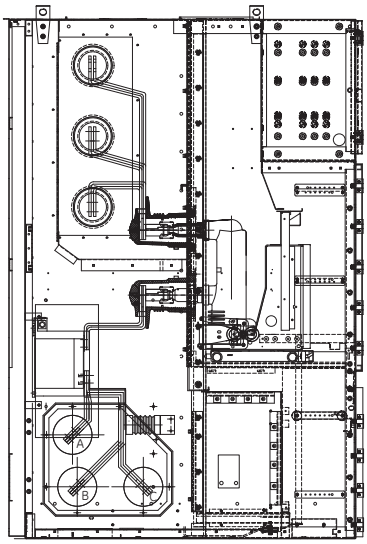
40kA 50kA



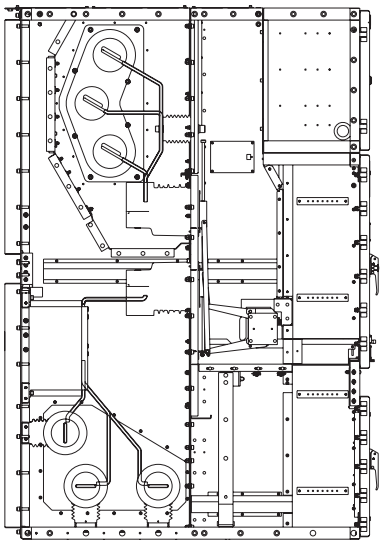
Notes:
1. Top Mounted Bus Earthing Switch only available for Secogear 17.5kV, up to 40kA.
   Only Available for SecoGear 17.5kV, up to 40kA.

Standard SecoGear
Bus Tie

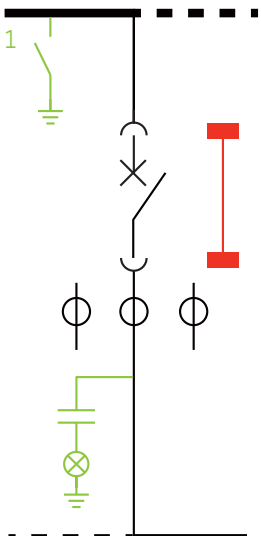
Rated Voltage (kV)							
			7.2/12/15/17.5			24/27	
Rated Insulation Level							
Power frequency withstand voltage (kV)			20/28/36/38			50/65	
Lighting impulse withstand voltage (kV)			60/75/95/95			95/125	
Rated Current (A at 40°C)		400					
		630	■	■		■	
		1250	■	■		■	
		1600		■			■
		2000		■			■
		2500			■		■
		3150			■		
		4000			■		
Breaking capacity (kA)		25	■			■	
		31.5	■	■	■	■	■
		40		■	■		
		50		■	■		
Short time withstand current (kA/3s)		25	■			■	
		31.5	■	■	■	■	■
		40		■	■		
		50		■	■		
Dimensions (mm)							
Width (W)			650	800	1000	800	1000
Height (H)	Standard		2200	2200	2200	2400	2400
	Top Mounted ESW		2600	2600	2600	-	-
Depth (D)	Top Access		1900	1900	1900	-	-
	Bottom Access		1400	1400	1400	1800	1800
Weight (kg)							
Estimated weight			900-950			1100-1200	
Apparatus							
SecoVac VB2 Plus			■	■	■	■	■
SecoVac VB2 Plus-G					■		



40kA



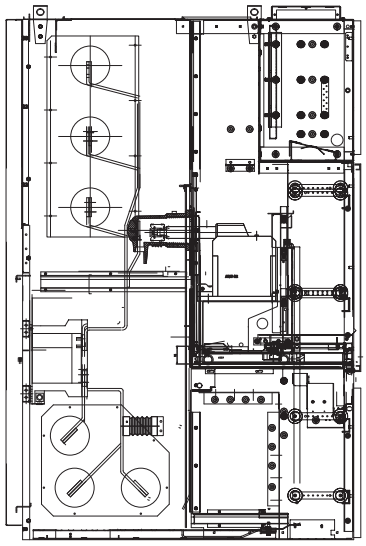
50kA



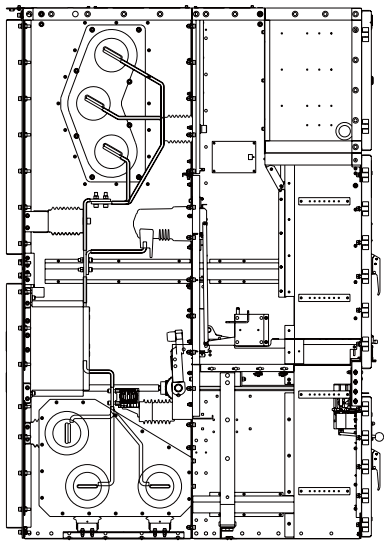
Notes:
1. Top Mounted Bus Earthing Switch only available for Secogear 17.5kV, up to 40kA.
   Only Available for SecoGear 17.5kV, up to 40kA.

Standard SecoGear
Riser

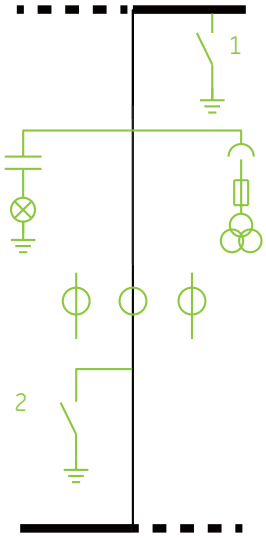
Rated Voltage (kV)							
			7.2/12/15/17.5			24/27	
Rated Insulation Level							
Power frequency withstand voltage (kV)			20/28/36/38			50/65	
Lighting impulse withstand voltage (kV)			60/75/95/95			95/125	
Rated Current (A at 40°C)		400					
		630	■	■		■	
		1250	■	■		■	
		1600		■			■
		2000		■			■
		2500			■		■
		3150			■		
		4000			■		
Breaking capacity (kA)		25					
		31.5					
		40					
		50					
Short time withstand current (kA/3s)		25	■			■	
		31.5	■	■	■	■	■
		40		■	■		
		50		■	■		
Dimensions (mm)							
Width (W)			650	800	1000	800	1000
Height (H)	Standard		2200	2200	2200	2400	2400
	Top Mounted ESW		2600	2600	2600	-	-
Depth (D)	Top Access		1900	1900	1900	-	-
	Bottom Access		1400	1400	1400	1800	1800
Weight (kg)							
Estimated weight			900-950			1100-1200	
Apparatus							
SecoVac VB2 Plus			■	■	■	■	■
SecoVac VB2 Plus-G					■		



40kA



50kA

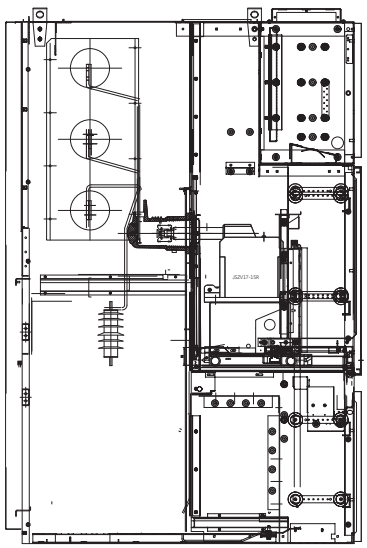


Notes:
1. Top Mounted Bus Earthing Switch only available for Secogear 17.5kV, up to 40kA. Only Available for SecoGear 17.5kV, up to 40kA.
2. Only Available for SecoGear 27kV and SecoGear 17.5kV 50kA

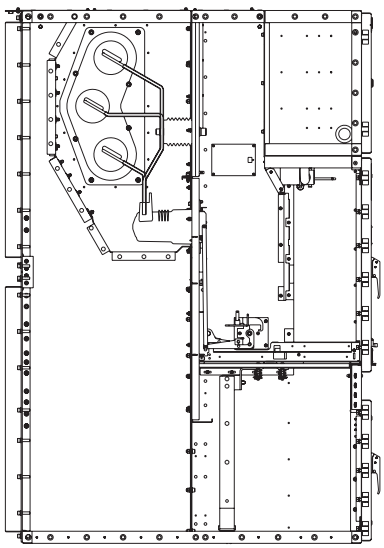
Standard SecoGear

VT Panel

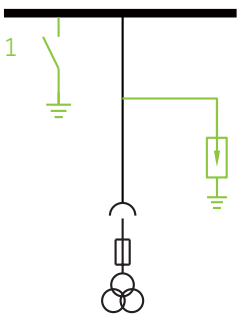
Rated Voltage (kV)								
			7.2 / 12 /15 / 17.5			24 / 27		
Rated Insulation Level								
Power Frequency Withstand Voltage (kV)			20 / 28 / 36 / 38			50 / 65		
Lightning Impulse Withstand Voltage (kV)			60 / 75 / 95 / 95			95 / 125		
Rated Current (A at 40°)		400						
		630						
		1250						
		1600						
		2000						
		2500						
		3150						
		4000						
Breaking Capacity (kA)		25						
		31.5						
		40						
		50						
Short time withstand current (kA/3s)		25	■	■		■		
		31.5	■	■		■		
		40	■	■				
		50		■				
Dimensions (mm)								
Width [W]			650	800		800		
Height [H]	Standard		2200	2200		2400		
	Top Mounted ESW		2600	2600		-		
Depth [D]	Top Access		1900	1900		-		
	Bottom Access		1400	1400		1800		
Weight (kg)								
Estimated weight			900-950			1100-1200		



40kA



50kA

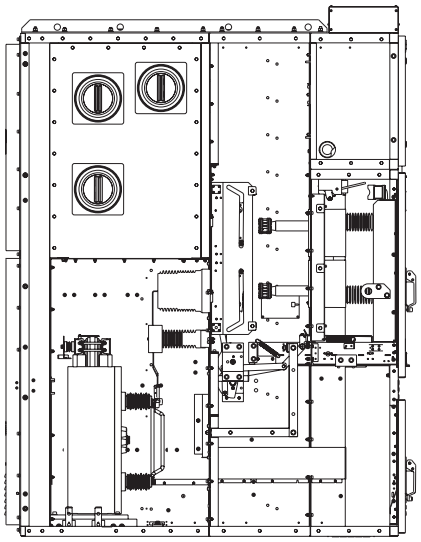


Notes:
1. Only Available for SecoGear 17.5kV, up to 40kA.

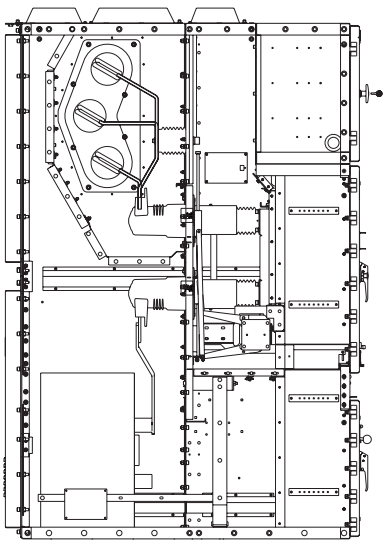
Standard SecoGear

CPT Panel

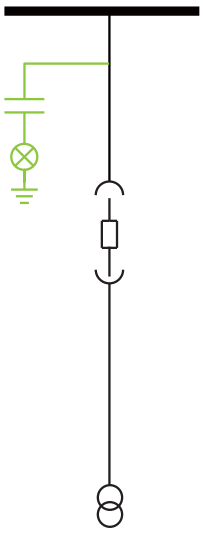
Rated Voltage (kV)							
			7.2 / 12 /15 / 17.5			24 / 27	
Rated Insulation Level							
Power Frequency Withstand Voltage (kV)			20 / 28 / 36 / 38			50 / 65	
Lightning Impulse Withstand Voltage (kV)			60 / 75 / 95 / 95			95 / 125	
Rated Current (A at 40°)		400					
		630				■	
		1250			■	■	
		1600			■		■
		2000			■		■
		2500			■		■
		3150			■		
		4000			■		
Breaking Capacity (kA)		25					
		31.5					
		40					
		50			■	■	■
Short time withstand current (kA/3s)		25				■	
		31.5				■	■
		40					■
		50			■	■	■
Dimensions (mm)							
Width [W]			650	800	1000	800	1000
Height [H]	Standard		2200	2200	2200	2400	2400
	Top Mounted ESW		2600	2600	2600	-	-
Depth [D]	Top Access		1900	1900	1900	-	-
	Bottom Access		1400	1400	1400	1800	1800
Weight (kg)							
Estimated weight			900-950			1100-1200	



40kA

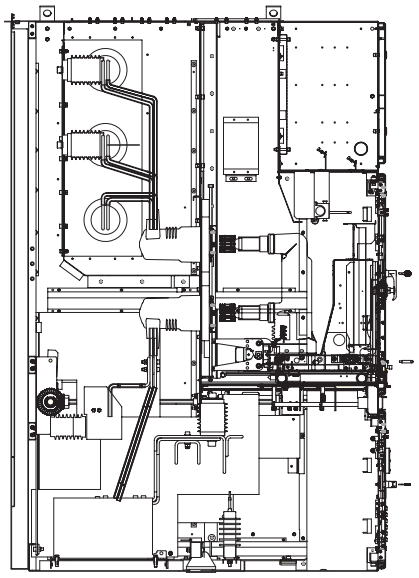


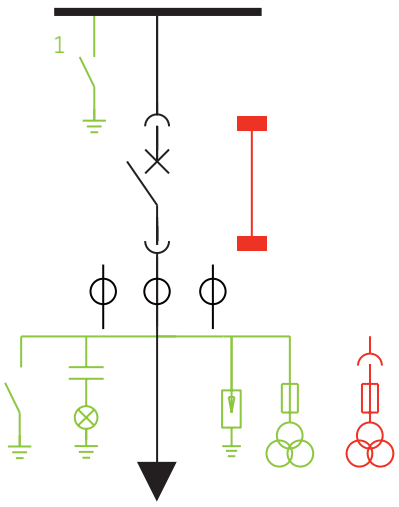
50kA



Incoming / Feeder Front Access

Rated Voltage (kV)							
			7.2/12/15/17.5			24/27	
Rated Insulation Level							
Power frequency withstand voltage (kV)			20/28/36/38			50/65	
Lighting impulse withstand voltage (kV)			60/75/95/95			95/125	
Rated Current (A at 40°C)		400					
		630	■	■			
		1250	■	■			
		1600		■			
		2000		■			
		2500			■		
		3150			■		
		4000					
Breaking capacity (kA)		25	■				
		31.5	■	■	■		
		40		■	■		
Short time withstand current (kA/3s)		25	■				
		31.5	■	■	■		
		40		■	■		
Dimensions (mm)							
Width (W)			650	800	1000		
Height (H)	Standard		2200	2200	2200		
	Top Mounted ESW		2600	2600	2600		
Depth (D)	Top Access		1900	1900	1900		
	Bottom Access		1400	1400	1400		
Weight (kg)							
Estimated weight			900-950				
Apparatus							
SecoVac VB2 Plus			■	■	■		
SecoVac VB2 Plus-G					■		

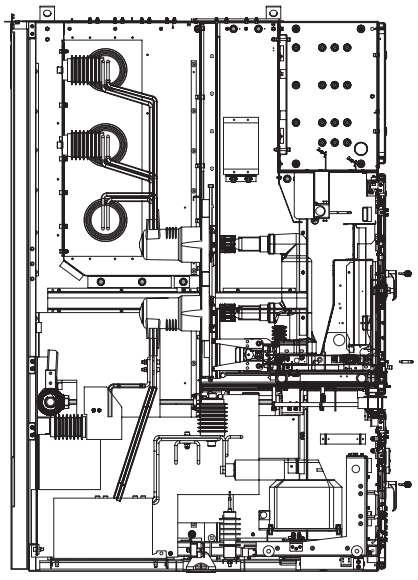


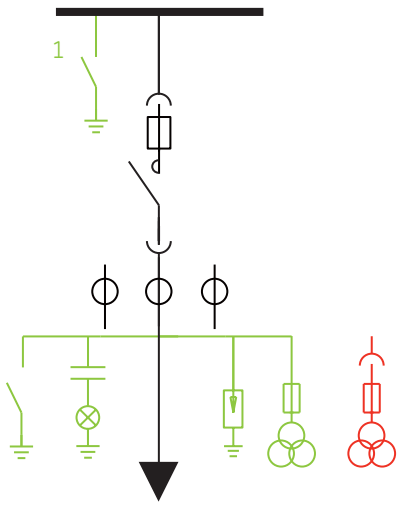


Notes:
1. Top Mounted Bus Earthing Switch only available for Secogear 17.5kV, up to 40kA.
   Only ailable for SecoGear 17.5kV, up to 40kA.

Fuse Contactor Front Access

Rated Voltage (kV)								
			7.2 / 12			24 / 27		
Rated Insulation Level								
Power Frequency Withstand Voltage (kV)			20 / 28			50 / 65		
Lightning Impulse Withstand Voltage (kV)			60 / 75			95 / 125		
Rated Current (A at 40°)		400	■					
		630						
		1250						
		1600						
		2000						
		2500						
		3150						
		4000						
Breaking Capacity (kA)		25	■					
		31.5	■					
		40	■					
Short time withstand current (kA/3s)		25	■					
		31.5	■					
		40	■					
Dimensions (mm)								
Width [W]			650					
Height [H]	Standard		2200					
	Top Mounted ESW		2600					
Depth [D]	Top Access		1900					
	Bottom Access		1400					
Weight (kg)								
Estimated weight			915					

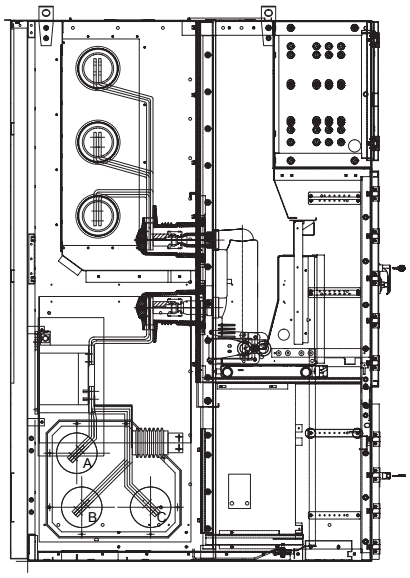


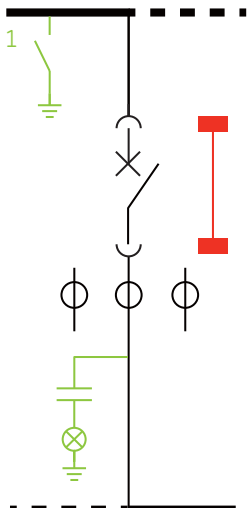


Notes:
1. Top Mounted Bus Earthing Switch only available for Secogear 17.5kV, up to 40kA.
   Only ailable for SecoGear 17.5kV, up to 40kA.

Bus Tie Front Access

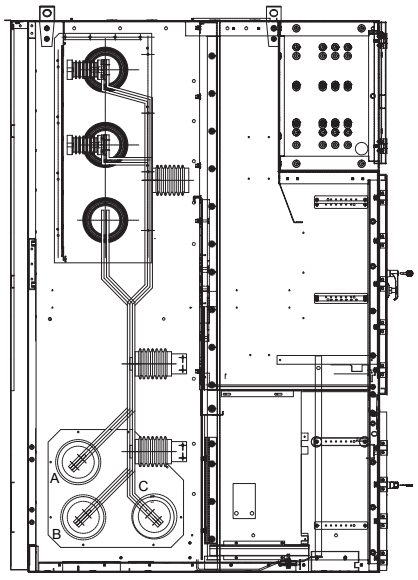
Rated Voltage (kV)								
			7.2 / 12 /15 / 17.5			24 / 27	
Rated Insulation Level								
Power Frequency Withstand Voltage (kV)			20 / 28 / 36 / 38			50 / 65	
Lightning Impulse Withstand Voltage (kV)			60 / 75 / 95 / 95			95 / 125	
Rated Current (A at 40°)		400					
		630	■	■	■		
		1250	■	■	■		
		1600		■	■		
		2000		■	■		
		2500			■		
		3150			■		
		4000			■		
Breaking Capacity (kA)		25	■		■		
		31.5	■	■	■		
		40		■	■		
Short time withstand current (kA/3s)		25	■		■		
		31.5	■	■	■		
		40		■	■		
Dimensions (mm)								
Width [W]			650	800	1000		
Height [H]	Standard		2200	2200	2200		
	Top Mounted ESW		2600	2600	-		
Depth [D]	Top Access		1900	1900	1800		
	Bottom Access		1400	1400	1400		
Weight (kg)								
Estimated weight			900-1100				

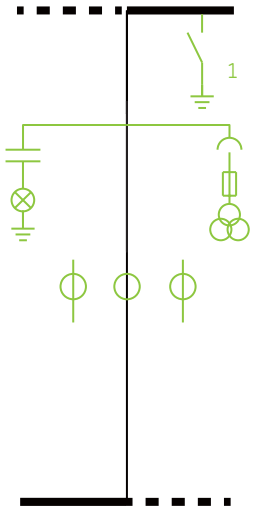




Riser Front Access

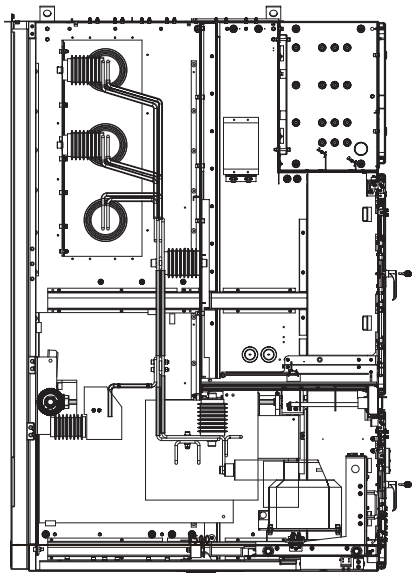
Rated Voltage (kV)							
			7.2 / 12 /15 / 17.5			24 / 27	
Rated Insulation Level							
Power Frequency Withstand Voltage (kV)			20 / 28 / 36 / 38			50 / 65	
Lightning Impulse Withstand Voltage (kV)			60 / 75 / 95 / 95			95 / 125	
Rated Current (A at 40°)		400					
		630	■	■	■		
		1250	■	■	■		
		1600		■	■		
		2000		■	■		
		2500			■		
		3150			■		
		4000			■		
Breaking Capacity (kA)		25					
		31.5					
Short time withstand current (kA/3s)		25	■		■		
		31.5	■	■	■		
		40		■	■		
Dimensions (mm)							
Width [W]			650	800	1000		
Height [H]	Standard		2200	2200	2200		
	Top Mounted ESW		2600	2600	2600		
Depth [D]	Top Access		-	-	-		
	Bottom Access		1400	1400	1400		
Weight (kg)							
Estimated weight			900-1100				

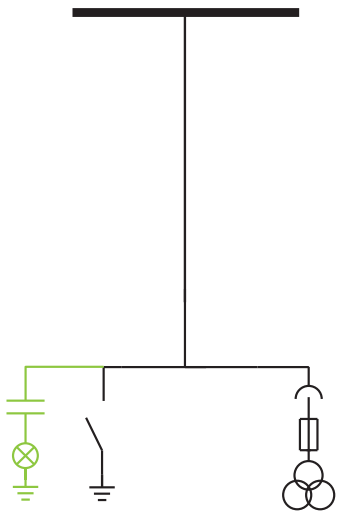




VT Panel with ESW Front Access

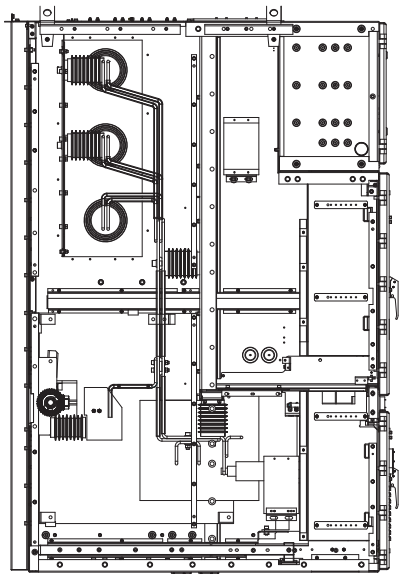
Rated Voltage (kV)								
			7.2 / 12 /15 / 17.5			24 / 27		
Rated Insulation Level								
Power Frequency Withstand Voltage (kV)			20 / 28 / 36 / 38			50 / 65		
Lightning Impulse Withstand Voltage (kV)			60 / 75 / 95 / 95			95 / 125		
Rated Current (A at 40°)		400						
		630	■	■				
		1250	■	■				
		1600		■				
		2000		■				
		2500						
		3150						
		4000						
Breaking Capacity (kA)		25	■					
		31.5	■	■				
		40		■				
Short time withstand current (kA/3s)		25	■					
		31.5	■	■				
		40		■				
Dimensions (mm)								
Width [W]			650	800				
Height [H]	Standard		2200	2200				
	Top Mounted ESW		2600	-				
Depth [D]	Top Access		1900	-				
	Bottom Access		1400	1400				
Weight (kg)								
Estimated weight			900-1100					

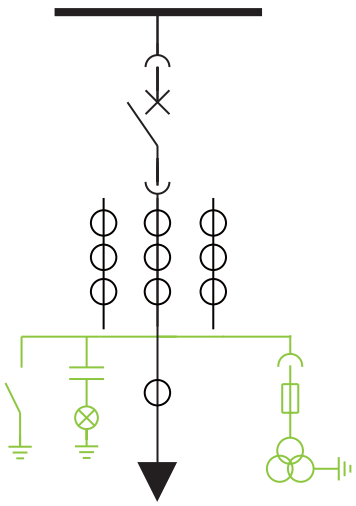




Incoming Panel with VT and Earthing Switch Front Access

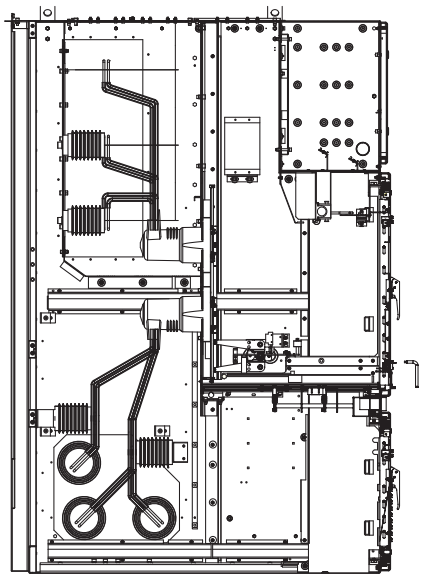
Rated Voltage (kV)								
			7.2/12/15/17.5			24/27		
Rated Insulation Level								
Power Frequency Withstand Voltage (kV)								
Lightning Impulse Withstand Voltage (kV)								
Rated Current (A at 40°)		400						
		630	■	■				
		1250	■	■				
		1600		■				
		2000		■				
		2500			■			
		3150			■			
		4000			■			
Breaking Capacity (kA)		25	■					
		31.5	■	■				
		40		■	■			
Short time withstand current (kA/3s)		25	■					
		31.5	■	■				
		40		■	■			
Dimensions (mm)								
Width [W]			650	800	1000			
Height [H]	Standard		2200	2200	2200			
	Top Mounted ESW		-	-	-			
Depth [D]	Top Access		1900	1900	1900			
	Bottom Access		1400	1400	1400			
Weight (kg)								
Estimated weight			1000-1200					

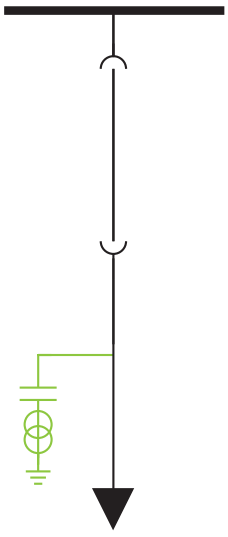




Disconnect Panel Front Access

Rated Voltage (kV)							
			7.2/12/15/17.5			24/27	
Rated Insulation Level							
Power Frequency Withstand Voltage (kV)							
Lightning Impulse Withstand Voltage (kV)							
Rated Current (A at 40°)		400					
		630	■				
		1250	■				
		1600		■			
		2000		■			
		2500			■		
		3150			■		
		4000			■		
Breaking Capacity (kA)		25	■				
		31.5	■	■	■		
		40		■	■		
Short time withstand current (kA/3s)		25	■				
		31.5	■	■	■		
		40		■	■		
Dimensions (mm)							
Width [W]			650	800	1000		
Height [H]	Standard		2200	2200	2200		
	Top Mounted ESW		-	-	-		
Depth [D]	Top Access		1900	1900	1900		
	Bottom Access		1400	1400	1400		
Weight (kg)							
Estimated weight			900-950				





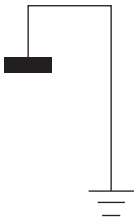
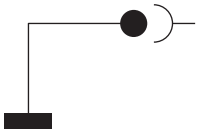
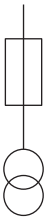
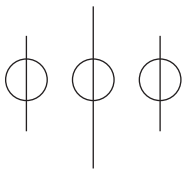
Notes and Legends

Black: Standard Scope of Supply

Red: Alternative Supply

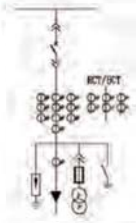
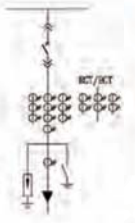
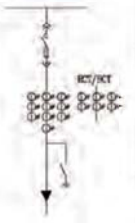
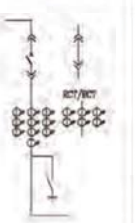
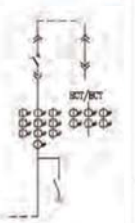
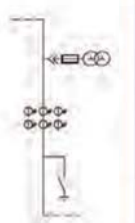
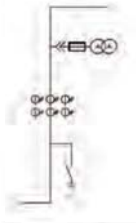
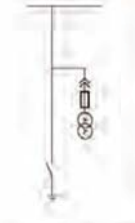
Green: Optional Scope

Symbol Legend

			
Circuit Breaker	Fuse Contactor	Disconnector Truck	Earthing Truck Bus Side
			
Earthing Truck Cable Side	Cable Test Truck	Earthing Switch	Voltage Transformer
			
Current Transformers	Cable Connection	Withdrawable Connection	

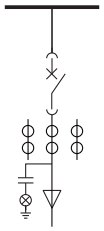
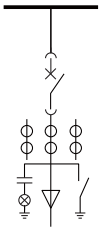
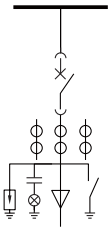
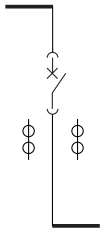
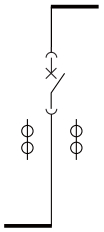
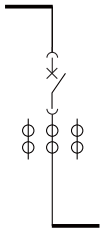
Configurations scheme

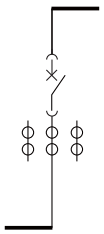
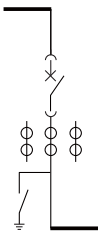
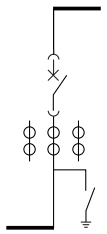
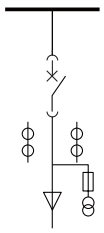
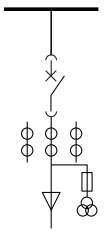
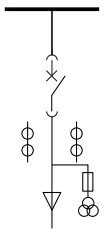
Secogear 550/750 12Kv

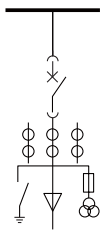
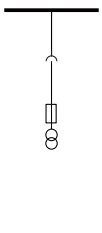
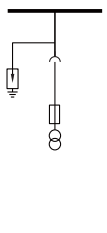
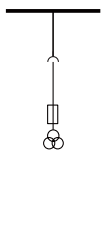
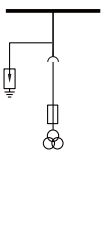
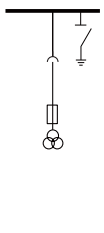
Scheme Number		A01	A02	A03	A04	A05	A06
Primary Scheme							
Rated Current(A)		630-2000	630-1250	160	1250-2000	1250-2000	1250-2000
Main Circuit Breaker	Vacuum Circuit Breaker	1	1		1	1	
	Fuse Contactor			1			
	Current Transformer	3	3	3	3	3	3
	Voltage Transformer	2					2
	High Voltage Fuse	2					2
	Earthing Switch	1	1	1	1	1	1
	Arrester	3	3	3			
Application		Incomer/Feeder	Incomer/Feeder	Feeder	Bus Tie with VCB	Bus Tie with VCB	Riser with Measuring
Switchgear Width(mm)		550/750	550	550	550/750	550/750	550/750
Scheme Number		A07	A08				
Primary Scheme							
Rated Current(A)		1250-2000	1250-2000				
Main Circuit Breaker	Vacuum Circuit Breaker						
	Fuse Contactor						
	Current Transformer	3					
	Voltage Transformer	2	2				
	High Voltage Fuse	2	2				
	Earthing Switch	1	1				
	Arrester						
Application		Riser with Measuring	Measuring panel with ES				
Switchgear Width(mm)		550/750	550				

Standard SecoGear

3.3kV-27kV

Scheme Number		01	02	03	04	05	06
Primary Scheme							
Rated Current (A)		630~4000	630~4000	630~4000	630~4000	630~4000	630~4000
Main Circuit Breaker	Vacuum Circuit Breaker	1	1	1	1	1	1
	Current Transformer	3	3	3	2	2	3
	Voltage Transformer						
	High Voltage Fuse						
	Earthing Switch		1	1			
	Arrester			3			
Application		Incomer/Feeder	Incomer/Feeder	Incomer/Feeder	Bus Tie	Bus Tie	Bus Tie
Switchgear Width (mm)		650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000

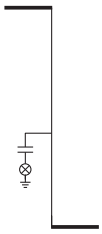
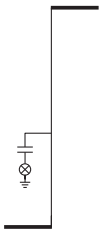
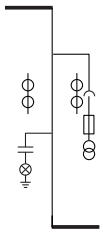
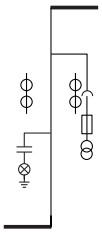
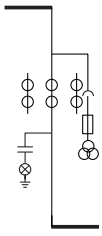
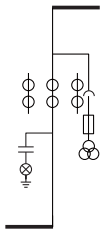
Scheme Number		07	08	09	10	11	12
Primary Scheme							
Rated Current (A)		630~4000	630~4000	630~4000	630~4000	630~4000	630~4000
Main Circuit Breaker	Vacuum Circuit Breaker	1	1	1	1	1	1
	Current Transformer	3	3	3	2	3	2
	Voltage Transformer				2	3	3
	High Voltage Fuse				2	3	3
	Earthing Switch		1	1			
	Arrester						
Application		Bus Tie	Bus Tie	Bus Tie	Incomer/Feeder	Incomer/Feeder	Incomer/Feeder
Switchgear Width (mm)		650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000

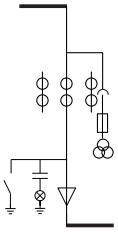
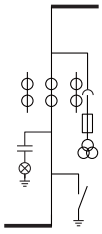
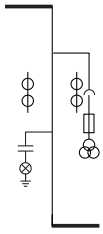
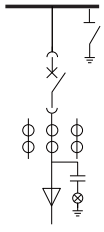
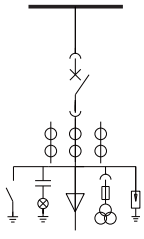
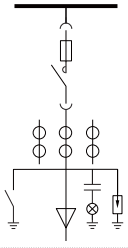
Scheme Number		13	14	15	16	17	18
Primary Scheme							
Rated Current (A)		630~4000	630~4000	630~4000	630~4000	630~4000	630~4000
Main Circuit Breaker	Vacuum Circuit Breaker	1					
	Current Transformer	3					
	Voltage Transformer	3	2	2	3	3	3
	High Voltage Fuse	3	3	3	3	3	3
	Earthing Switch	1					1
	Arrester			3		3	
Application		Incomer/Feeder	VT	VT	VT	VT	VT
Switchgear Width (mm)		650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000

Remark: for up to 17.5kV SecoGear, special requirement for 6 CT is available. Please contact GE for details.

Standard SecoGear

3.3kV-27kV

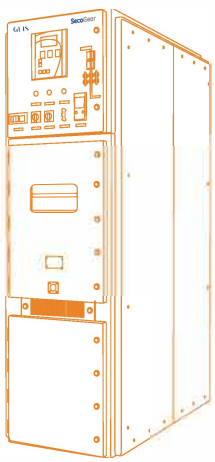
Scheme Number		19	20	21	22	23	24
Primary Scheme							
Rated Current (A)		630~4000	630~4000	630~4000	630~4000	630~4000	630~4000
Main Circuit Breaker	Vacuum Circuit Breaker						
	Current Transformer			2	2	3	3
	Voltage Transformer			2	2	3	3
	High Voltage Fuse			2	2	3	3
	Earthing Switch						
	Arrester						
Application		Riser	Riser	Riser/Metering	Riser/Metering	Riser/Metering	Riser/Metering
Switchgear Width (mm)		650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000

Scheme Number		25	26	27	28	29	30
Primary Scheme							
Rated Current (A)		630~4000	630~4000	630~1250	630~4000	630~4000	400A*
Main Circuit Breaker	Vacuum Circuit Breaker				1	1	
	Current Transformer	3	3	2	3	3	3
	Voltage Transformer	3	3	3		3	
	High Voltage Fuse	3	3	3		3	3
	Fuse Contactor						1
	Earthing Switch	1	1		1	1	1
	Arrester					1	3
Application		Riser/Metering	Riser/Metering	Riser/Metering	Incomer/Feeder	Incomer/Feeder	Feeder
Switchgear Width (mm)		650/800/1000	650/800/1000	650/800/1000	650/800/1000	650/800/1000	650

* 400A is rated current of contactor. Fuse selection will define the actual rated current.

** Rating and class of CT & VT may affect number that can be accommodated in the panel. Check with Local GE representative.

Generator Circuit Breaker



Generator circuit breaker and generator switchgear

Generator Faults

The fault conditions in the proximity of a generator source are more demanding than those in normal distribution circuits. These special fault characteristics require specifically designed and tested circuit breakers.

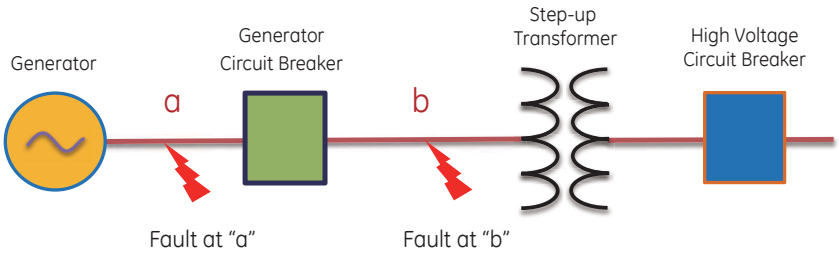
The critical points to be considered are:

Generator Circuit Configuration

As a result of the circuit configuration, two key unique fault current conditions are encountered by generator circuit breakers (figure 1)

System-source short-circuit current

The short circuit fed by the transformer (point "a", figure 1) on the generator side leads to high thermal and mechanical stresses on the vacuum interrupters because the full energy of the power system feeds the fault. To clear these faults, Generator Circuit Breakers are capable to interrupt not only the symmetrical fault but also the higher asymmetrical fault currents with a DC component of up to 75%. This will be the maximum short circuit current the breaker needs to interrupt with peak making and withstand capacity of 2.74 times the RMS current

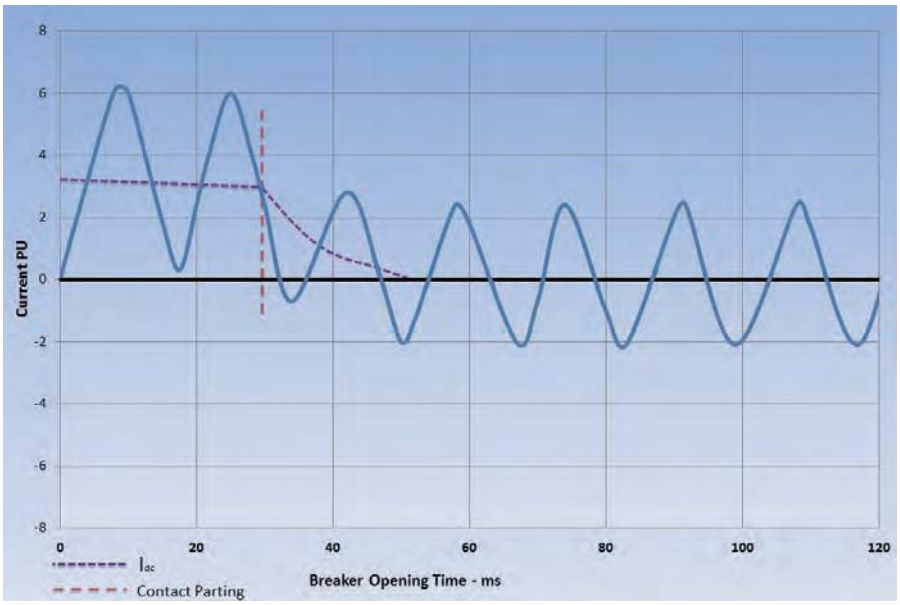


Generator-source short-circuit current

If there is a short circuit (point "b", figure 1) the current is fed by the generator on the transformer side. The fault currents, while relatively smaller in magnitude, are subject to a phenomenon called Delayed Current Zero. This unique characteristic is a result of the very high X/R ratio of the circuit and the operating conditions of the generator, which can combine to produce a DC component of the fault current exceeding 100%. The asymmetrical fault current peak becomes so high and its decay becomes so slow, that the current zero can be delayed for several cycles.

As vacuum interrupters rely on a current zero to break the current, the delay it results in longer arcing time with extreme thermal stress on the interrupter.

The generator circuit breakers are tested according to IEC/IEEE 62271-37-013 to withstand the high electrical, thermal and mechanical stress during the interruption of fault currents with a DC component of up to 130 %. Normally this short circuit current will be 50% of system source short circuit current with very high DC component.



Unique Voltage Conditions

Generator circuits are typically designed for high efficiency in order to minimize the power loss of the system. Therefore, the generator circuit breaker may be located very close to both the generator and transformer, connected by short conductors with a large cross-section, resulting in a very low resistance and low stray capacitance. These characteristics combine to produce very high natural circuit frequencies resulting in extreme Transient Recovery Voltages (TRV) with high Rates of Rise of Recovery Voltage (RRRV).

Transient Recovery Voltages (TRV)

The circuit produces the peak value of TRV, which is nearly double the line-to-line system voltage, across the contacts within microseconds following the current zero. The Vacuum Interrupter must re-establish dielectric strength across the open contacts gap in order to withstand this fast rising TRV. If the interrupter is able to withstand that voltage, then the interruption is successful.

Very fast Rate of Rise of Recovery Voltage (RRRV)

An important factor is how fast the TRV rises across the recovering gap after current zero. This is measured by the RRRV, which is proportional to the peak value of the transient voltage in kV, divided by the time it takes the voltage to reach that peak value in microseconds.

Values for standard Medium Voltage distribution circuits are in the range of 0.4 to 1 kV /microsecond, while RRRV values for generator circuits are about 3.5 kV / microsecond.

These characteristics where tested for the for the first time at the KEMA laboratories in Netherlands using a Direct on Line connection with GE's SecoVac VB2+G Generator Vacuum Circuit Breaker.

Out of phase switching

The out-of-phase voltage conditions can occur during normal start-up when the generator and power system voltages are not in sync. Initially, the generator is off and the generator circuit breaker is in the open position with the power system operating. The voltage across the open circuit breaker contacts is equal to the normal power system voltage. When additional or emergency power is desired, the generator is started and begins to produce voltage. As the generator comes up to speed, the generator output voltage and frequency slowly increase. This causes the voltage across the open contacts of the circuit breaker to vary.

IEC/IEEE 62271-37-013 requires that the generator circuit breaker can switch off under out-of-phase conditions (out-of-phase angle 90°) while the voltages across the open contacts can be as high as twice the rated line-to ground voltage of the system.

SecoVac VB2+G

Performance requirements for Generator Circuit Breakers are specified in the IEC/ IEEE 62271-37-013 standard. This is a combined standard intended to replace the IEEE C37.013 and fill the gap of the IEC which has never had a generator breaker standard previously.

The new SecoVac VB2+G 15kV have passed all the Type Tests as per the new IEC/IEEE combined standard, becoming the first Generator Circuit Breaker of the SecoVac family.

The standard SecoVac VB2+ breaker and the SecoVac VB2+G generator circuit breaker can be used in all SecoGear IEC switchgear panels. With the same functionality and footprint of conventional IEC Switchgear while getting all the benefits from a fully proven Generator Circuit Breaker.

SecoVac VB2+G can also be installed in SecoBloc modules, producing the perfect combination for OEM manufacturers building generator switchboards.

Applications

A properly protected generator unit increases its levels of reliability, availability and safety, and by extension the same for the complete electrical system where is being operated. Even the smaller generator units can produce high DC component or Transient Overvoltage levels requiring special breakers intended to protect such fault conditions.

With this new addition to the SecoVac family, SecoGear is perfectly set to protect Generators. Applications up to 60MVA, 31.5kA, 15kV can be operated with SecoVac VB2+G. These power output ranges are commonly used on:

- Distributed Power Generation
  - -Diesel/Gas Engines
  - -Small Frame Gas Turbines
  - -Aero Derivative Turbines
- Marine Diesel-Electric Generators
- Oil and Gas Start-up/Back-up Generator units
- Mining Power Plants
- Small Hydro
- Small Steam Turbines

Benefit

The SecoVac VB2+G generator circuit breaker is based upon the same design principles as our distribution type SecoVacVB2+ breaker this results in advantages for electrical designers, operating personnel and maintenance staff .

The SecoVac VB2+G is designed to be fitted into GE's SecoGear range of medium voltage type tested IEC panels. The SecoGear range can accommodate generator, distribution circuit breakers and fuse contactors within the same standard panel design offering industry leading safety, reliability and performance features to meet the requirements for all Medium Voltage Distribution in Power Plant applications.

In addition to being able to be supplied as part of a complete switchgear lineup, SecoVac VB2+G can be supplied as part of GEs SecoBloc OEM modules. SecoBloc is designed specifically to allow OEM panel builders to incorporate a type tested circuit breaker and cable compartment into their customer built switchboard arrangement. VB2+G modules are available in various configurations to suit specific generator applications.

SecoVac VB2 Plus G Electrical Parameters

Rated short-circuit breaking current	kA	31.5		40		50	
Rated Voltage	kV	15		15		15	
Rated Current	A	2500/3150/4000*		2500/3150/4000*/5000*		2500/3150/4000*	
Rated Frequency	Hz	50/60		50/60		50/60	
Rated power Freq withstand voltage (1 min)	kV	38		38		38	
Rated lightening impulse withstand voltage	kVp	95		95		95	
Operation sequence		CO – 30min - CO		CO – 30min - CO		CO – 30min - CO	
Generator Circuit Class		G2		G2		G2	
Location of fault		**'a' – System supplied fault**	**'b' – Generator supplied fault**	**'a' – System supplied fault**	**'b' – Generator supplied fault**	**'a' – System supplied fault**	**'b' – Generator supplied fault**
Rated short-circuit breaking current:	kA	31.5	15.8	40	25	50	25
Rated short-circuit making current: Ipeak	kAp	86.3	34.1	110	54	137	54
Interrupting Time	ms	50		50		50	
Minimum Opening Time	ms	24.3		24.3		24.3	
Degree of Asymmetry	%	75	130	75	130	75	130
Rated short time withstand current:	kA	31.5	N/A	40	N/A	50	N/A
Rated duration time for short-circuit	s	3	N/A	3	N/A	3	N/A
Rate of Rise of Recovery Voltage (RRRV)	kV/ μ s	3.5	3.5	3.5	3.5	3.5	3.5
Peak Recovery Voltage	kV	27	27	27	27	27	27
Out-of-Phase Current Switching							
Duty Voltage	kV	21.2	N/A	21.2	N/A	21.2	N/A
Breaking Current	kA	15.8	N/A	20	N/A	25	N/A
Max. Making Current (V~0)	kAp	31.5	N/A	40	N/A	40	N/A
Rate of Rise of Recovery Voltage (RRRV)	kV/μs	3.3	N/A	3.3	N/A	3.3	N/A
Peak Recovery Voltage	kV	39	N/A	39	N/A	39	N/A
Mechanical life operations	Number	10000		10000		10000	
Center distance between phase	mm	275		275		275	

*is VCB with force cooling.

IEC/IEEE 62271-37-013 Combined Standard

Up until the development of a common IEC / IEEE standard for generator circuit breakers there was no IEC standard to cover the special needs of circuit breakers being used in generator application. Commonly users were referring to the IEEE standard for generator application.

History

The IEC proposed to have a standard covering the generator circuit breakers in November 2008, and started activities to develop it after approval of the proposal in April 2009.

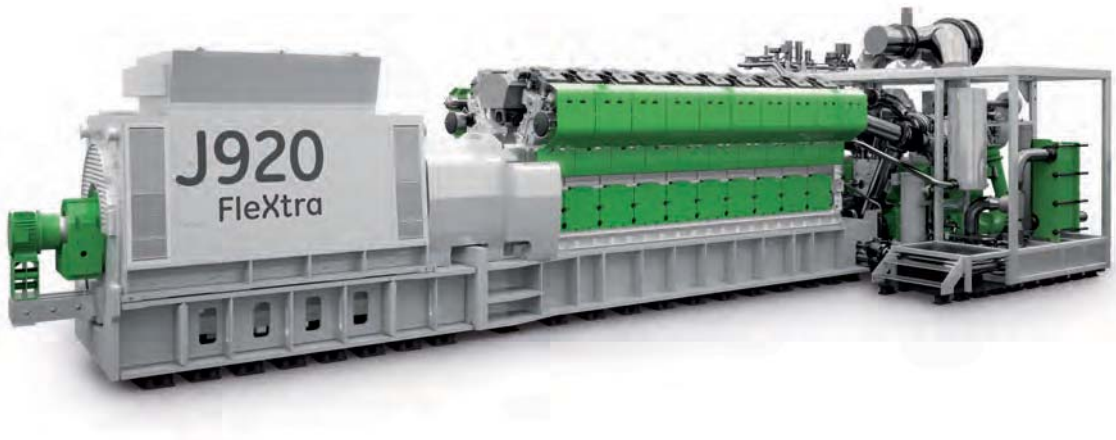
Firstly the Standard was named IEC 62271-112, and later on moved to IEC 62271-37-013 and target of the project broaden to jointly revise IEEE Std C37.013 with IEEE under the IEC/IEEE Dual Logo -Joint Development Agreement- Liaison with IEEE Switchgear Committee.

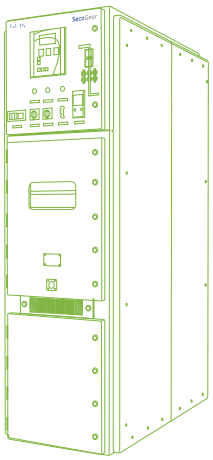
The document is pending to be officially released in the first months of 2015 with the official title: IEC/IEEE 62271-37-013 Ed. 1.0 High-voltage switchgear and Controlgear - Part 37-013: Alternating current generator circuit-breakers

Improvements to IEEE C37.013

The new IEC/IEEE dual standard has several improvements compared to the previous IEEE standard.

- It has included the definition of several concepts in Clause 3.1, helping both IEEE and IEC users of this document to have same understanding of terms as they are used in this document readily available
- Included explanations of why certain requirements are needed in generator circuit-breaker applications that may not be needed for standard distribution circuit-breakers page 13
- The clauses covering generator-source fault current requirements have been greatly expanded in section 8.103.5.3 to explain how to treat the extremely high degrees of asymmetry that may occur under certain conditions
- Expanded the application section, clause 8, in order to make the selection of a generator circuit-breaker easier for users, will enable the user to be sure he has chosen the right circuit-breaker to protect their particular generator circuit





Switchgear Compartments

Switchgear Apparatus

SecoVac iVB Intelligent Embedded Pole Vacuum Circuit Breaker

SecoVac iVB coupling with sensor, monitoring, controlling and protection technology, provides an intelligent, compact and high reliable solution for power distribution systems.

The product conforms to the IEC 62271 standard, especially suitable for conditions which require frequent operation. It is the optimum choice for the control and protection of MV power distribution systems.

Electrical Charateristic		
Product Type		SecoVac iVB-12
Rated voltage	kV	12
Rated power frequency withstand voltage(1 min)	kV	28
Rated lighting impulse withstand voltage	kV	75
Rated frequency	Hz	50/60
Rated current	A	630,1250
Single capacitor bank breaking capacity	A	400
Rated shortcircuit breaking current	kA	31.5
Rated short circuit making current(peak)	kA	82
Rated short time withstand current and endurance time	kA/s	31.5/3s
Rated peak withstand current	kA	82
Electrical endurance	times	72 (E2,list 3)
Operating Sequence		O-0.3S-CO-180s-CO
		O-0.3S-CO-15s-CO
Mechanical Charateristic		
Closing time (Rated operating voltage)	ms	<60
Opening time (Rated operating voltage)	ms	<35
Mechanical endurance	times	10000(Class M2)
Opening speed	m/s	0.9~1.5
Closing speed	m/s	0.6~0.9
Clearance between open contacts	mm	8±1
Bouncing time during closing	ms	≤2
Asynchronous time during closing/opening	ms	≤2
Center distance between phase	mm	150
Circuit resistance	μΩ	≤45

The Secogear panels are capable of accepting different switching apparatus as shown in the following table.

Apparatus	12kV Secogear		17.5kV Secogear			17.5kV Secogear FA			Secogear 24/27kV	
Panel Width(mm)	550	750	650	800	1000	650	800	1000	800	1000
SecoVac iVB	■									
SecoVac FC	■		■			■				
SecoVac VB2 Plus		■	■	■	■	■	■	■	■	■
SecoVac VB2 Plus-G					■			■		

Closing / Opening Coil

Rated Voltage (V)	Normal Operation Voltage Scope (Closing)	Normal Operation Voltage Scope (Opening)
DC 24/48	85% ~ 110% AC 90% ~ 110% DC	65% ~ 120% AC 60% ~ 120% DC * The minimum supply voltage for operation of shunt releases shall not be less than 30 % of the rated supplyvoltage.
AC/DC 110 (actual 110~130V)		
AC/DC 220		

Under Voltage Trip Coil (Optional)

Rated Voltage (V)	Normal Operation Voltage Scope (Closing)	Normal Operation Voltage Scope (Opening)
DC 24/48	VCB cannot close when the supply voltage lower to 35% of the rated supply voltage. VCB cannot close until the supply voltage back to 65% of the rated value.	VCB will open when the supply voltage lower to 35% of the rated supply voltage.
AC/DC 110		
AC/DC 220		

Undercarriage Position Switch (Standard)

Rated Voltage (V)
DC 48/110/220V
AC 110/220V

iTU Human Machine Interface

Trip unit has a graphic LCD display, the panel is similar to that shown as follows. The device interface language is usually set in English with Chinese language optional.

Current sensor

Current sensors use Rogowski coils to measure the primary circuit current, and this module is installed on the lower arm of circuit breaker. Current signals may be detected by current sensors, which are directly offered to trip unit on the circuit breaker.

Primary Current	630A	1250A
Secondary Voltage Output	400mV	400mV
Accuracy	Class 1 (IEC60044-8)	Class 1 (IEC60044-8)

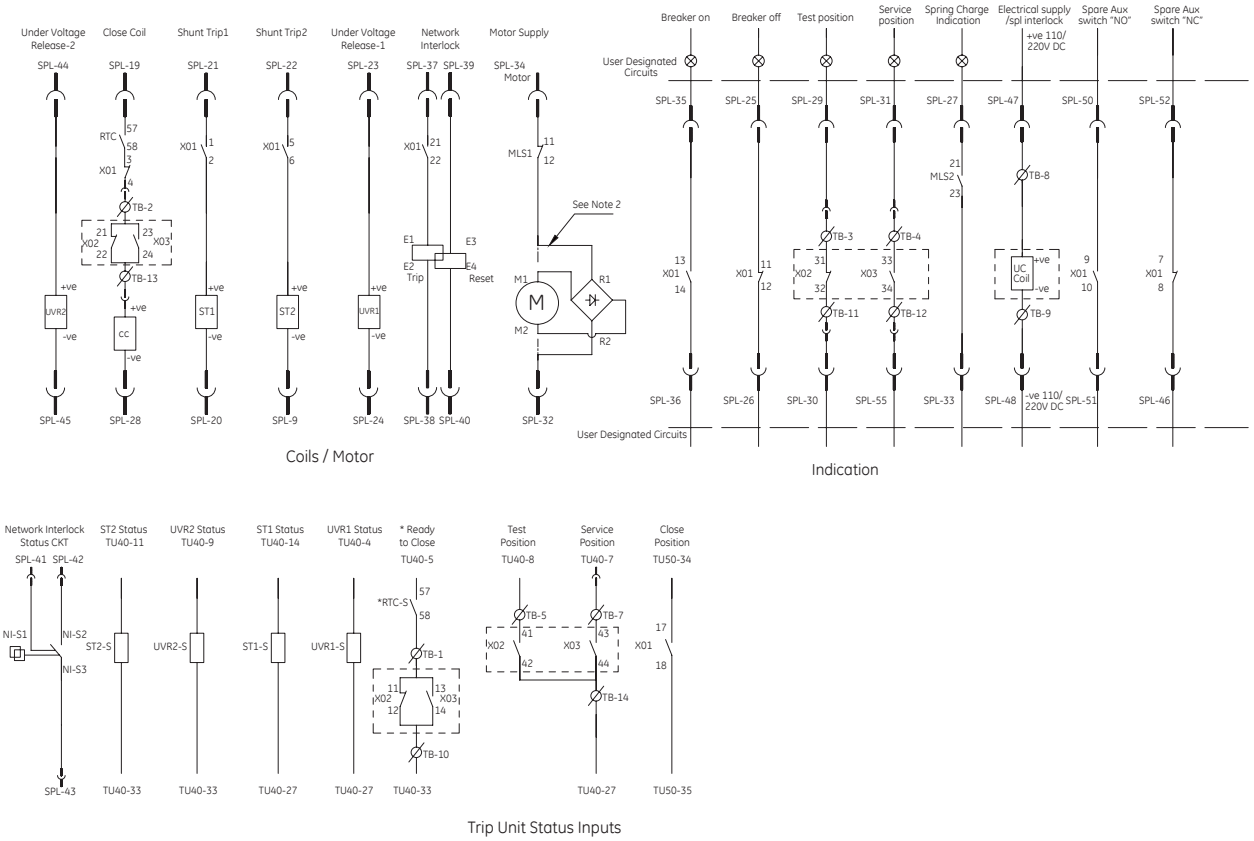
iTU Intelligent Protection and Control Device

iTU type	ANSI Code	C3-ADV1	C3-ADV6	C5-ADV8
Protection Features Required				
Long Time (overcurrent)	51PL	■	■	■
Short Time	51PL	■	■	■
Instantaneous	51P	■	■	■
Ground Fault Trip	51N/51N	■	■	■
Ground Fault CT	87R			■
Ground Fault Alarm				■
Thermal Memory	49	■	■	■
RELT		■	■	■
Communications				
RS232/ front port to issue modbus commands. Setup to rear portalso possible with communications option and modbus.		■	■	■
RS485 Modbus			■	■
Protective Relays				
Voltage Unbalance	47			■
Under Voltage	27			■
Over Voltage	59			■
Current Unbalance	46			■
Power Reversal	32			■
Power Quality				
Waveform Capture (4 pre/4post)			■	■
Metering				
Current (PHA/L1, PHB/L2, PHC/L3, N)	31		■	■
Voltage (L1-N, L2-N, L3-N)**	3Upe			■
Energy (kWh) Total Real	PQf			■
Real Power (PHA/L1, PHB/L2, PHC/L3)	PQf			■
Apparent Power (PHA/L1, PHB/L2, PHC/L3)	PQf			■
Reactive Power (PHA/L1, PHB/L2, PHC/L3)	PQf			■
Power (kW) Demand (total)				■
Power (kW) Peak (total)				■
Demand Power (kW) (total)				■
I/O (Physical I/O)				
OUTPUTS		■	■	■
Assignable output (2 avail)		■	■	■

Inputs	■	■	■
Shunt trip status input (2 inputs)	■	■	■
UVR trip status input (2 input)	■	■	■
General Inputs (2 avail)	■	■	■
Spring Charged Indication	■	■	■
Breaker Closed and Connected	■	■	■
Test Position	■	■	■
Disconnect Indication	■	■	■
Contact Position Switch	■	■	■
Status and Diagnostics:			
Trip Target	■	■	■
Trip Info (Magnitude / Phase)	■	■	■
Trip Counter	■	■	■
Event Logger (trips)	■	■	■
Alarm based on current level	■	■	■
Relay based on current level (load shedding)	■	■	■
Health indication alarms.	■	■	■
Health indication relay.	■	■	■
Hardware Test Interfaces			
24V DC and Voltage injection interface	■	■	■
Miscellaneous			
Settings lock / unlock	■	■	■
Frequency	■	■	■

Schematic Drawing

Withdrawable type iVB with Trip unit



Notes:

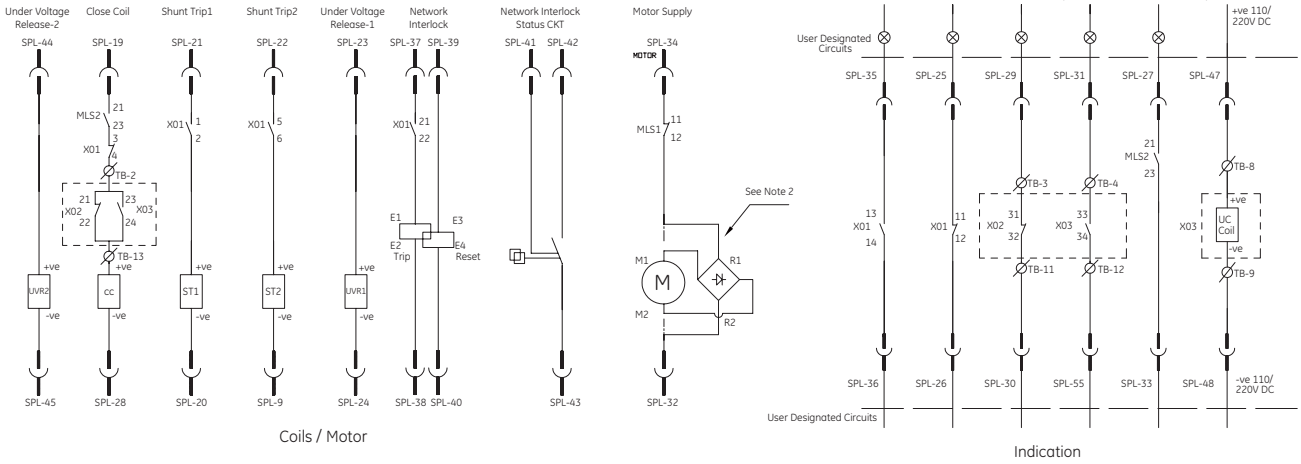
1. SPL-34, SPL-32 is always connected to auxiliary rated supply of motor.
2. For AC motor: Suppliy is connected to motor directly, rectifier mounted on motor gear box.
3.*RTC-S is signal rated RTC and is optional.
4. Dotted rectangle is a part of under carriage.

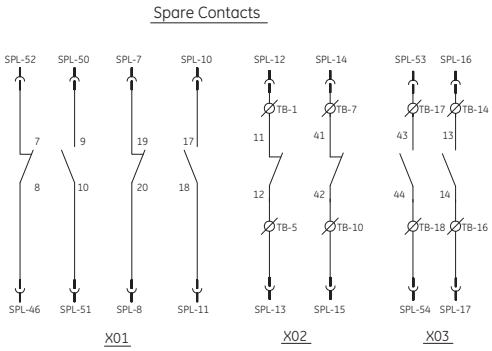
Legend	
X01	Breaker Auxiliary Switch
X02	Test Position Auxiliary Switch
X03	Serviece Position Auxiliary Switch
TU40	Trip Unit 40 Pin Details
TU50	Trip Unit 50 Pin Details
MLS	Motor Limit Switch
SPL	Secondary Plug Details

REL	24V DC Relay 4NO/4NC
UVR1/UVR2 :	Under Voltage Release Coil 1/2
ST1/ST2	Shunt Trip 1/2
CC	Close Coil
NI	Network Interlock
RTC	Ready to Close Switch
RTC-S	Ready to Close Switch Signal Rated

Schematic Drawing

Withdrawable type iVB without Trip unit





S.No.	Various coil combinations			
1	NI	NI	CC	UVR1
2	ST1	ST2	CC	UVR1
3	ST1	UVR2	CC	UVR1
4	NI	NI	CC	ST1

Notes:

1.SPL-34,SPL-32 is always connected to rated auxiliary supply of motor.

2.SPL-47, AND SPL-48 shall be connected to 110/220 VDC +VE,-VE respectively for secondary plug interlock.

3.For AC motor supply is connected to motor directly where as for DC motor supply is connected through rectifier mounted on motor gear box.

4.Dotted rectangle is a part of under carriage.

Legend	
X01	Breaker auxiliary switch
X02	Test position auxiliary switch
X03	Service position auxiliary switch
MLS	Motor limit switch
SPL	Secondary plug details
TB	Terminal Block
UVR1/UVR2	Under voltage release coil1/2
ST1/ST2	Shunt trip 1/2
CC	Close coil
NI	Network Interlock
RTC	Ready to close switch
UC COIL	Under carriage coil for interlock
MLS	Motor limit switch

Switchgear Apparatus

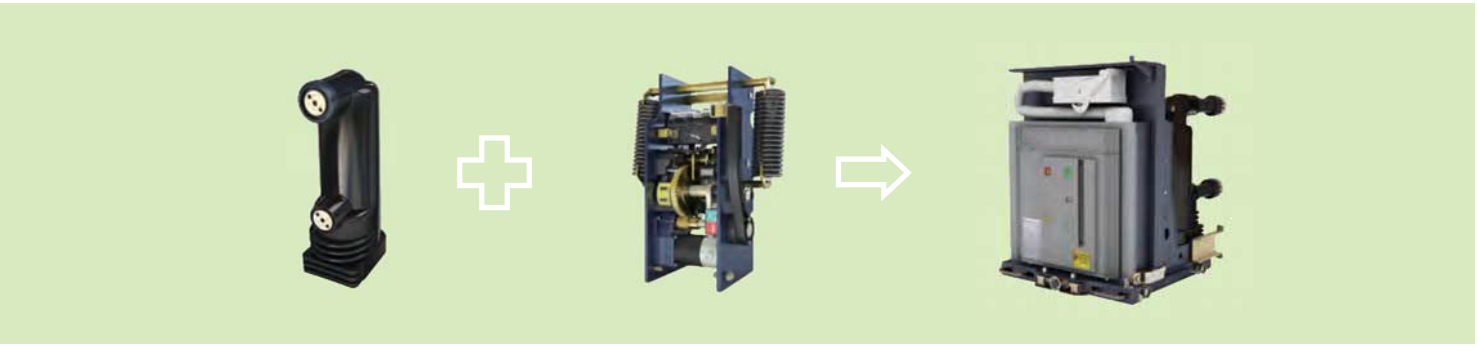
SecoVac VB2 Plus embedded pole vacuum circuit breaker 7.2kV, 12kV, 17.5kV, 24kV and 27kV

Safety, more reliability and High performance in a compact package

The range of Apparatus available for SecoGear Medium Voltage switchgears includes:

- Withdrawable vacuum circuit breakers: SecoVac VB2+
- Withdrawable vacuum generator circuit breakers: SecoVac VB2+ G
- Withdrawable vacuum contactors with fuses
- Disconnector trucks
- Voltage transformer trucks
- Earthing trucks

SecoVac VB2 Plus of Modular design



Features and benefit

Industry leading vacuum and solid insulation technology

- Fixed and withdrawable versions available
- Environmentally friendly design - no SF_6 gas
- Conformance to the latest IEC standards - IEC 62271-100 IEC/IEEE 62271-37-031 and IEC 62271-1
- Numerous safety features for maximum personnel protection
- User friendly operation with easy access and minimal inspection
- Compact and cost effective
- Flexible with a full line of accessories and OEM Solution
- Standard distribution breakers and generator circuit breakers with compatible accessories

Applications

- Serving global 50 Hz and 60 Hz
- Segments of the electrical industry: industrial, commercial, utility, mining, marine and off-shore
- Protecting transformers, capacitor banks, motors, busbar sections and cables
- Suitable for special environment conditions: shock, vibration and high ambient temperature
- Suitable for Marine and Sub Sea applications
- Suitable for generation protection

Circuit Breaker Characteristics

Rated Voltage	kV	7.2	12	15	17.5	24	27
Rated power frequency withstand (1min)	kV	20	28	36	38	50	65
Rated lightning frequency impulse withstand voltage (1.2/50μs)	kVp	60	75	95	95	125	125
Rated Frequency	Hz	50/60				50/60	
Rated Current	A	630/1250/1600/2000/2500/3150/4000*				1250, 2500	
Rated short-circuit breaking current	kA	25/31.5/40/50				31.5	
Percentage of DC component		Up to 50%				52%	
Rated short-circuit closing current	kAp	65/82/104/130				82	
Rated short time withstand current	kA	25/31.5/40/50				31.5	
Rated peak value withstand current	kAp	65/82/104/130				82	
Rated duration time for short-circuit	s	3				3	
Opening Time	ms	20~50				20~50	
Closing Time	ms	30~70				30~70	
Rated auxiliary control voltage	V	36/48/60/110/220 V DC 110/220 V AC					
Mechanical life operations	Quantity	15,000 (M2)				10,000 (M 2)	
Electrical Endurance class		E2				E2	
Single capacitor bank Switching current	A	400**				400	
Rating for Earthing Switch short time withstand current		40kA 1s				31.5/40/50kA 1s	

* Force cooling
** 3 phase back to back capacitor bank switching current 630A only for 17.5kV 3150A 40kA breaker

Main circuit resistance of SecoVac

Item	Unit	Value	
Rated Current	A	630~1600	2000~4000
Resistance	μΩ	⩽ 45	⩽ 25

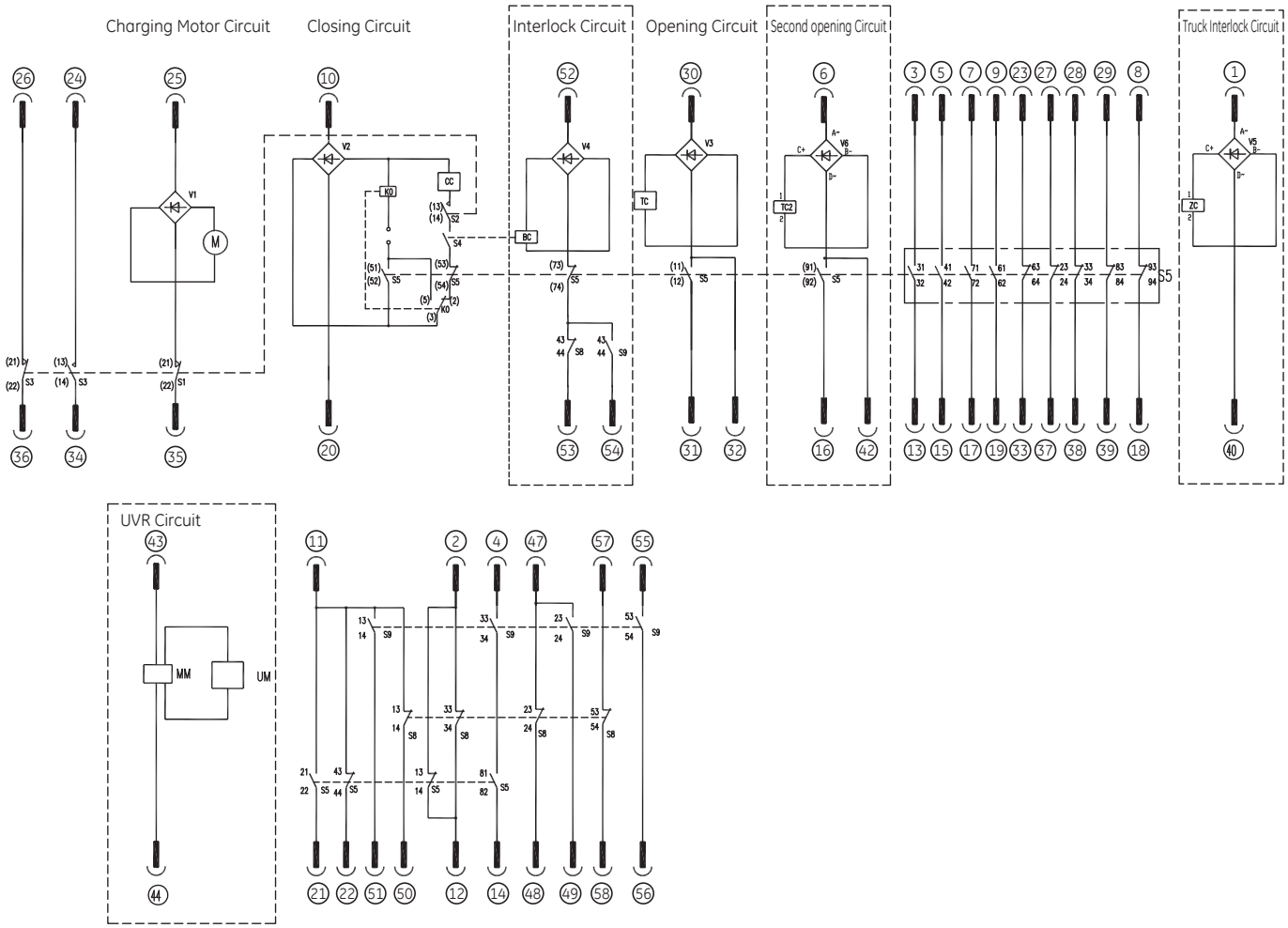
Coil Characteristics

Type Name (GE)	Rated Voltage (DC.V)	Resistance Value (Ω)	Rated Current (A)	Inrush Current (A)	Maximum Power (W)
P-C1X	110 (DC/AC)	51	2.2	12.9	237.3
P-C2X	220 (DC/AC)	198	1.1	6.7	244.4
P-C3X	24	1.8	13.3	80	320
P-C3L	24	1.3	18.5	110.8	443.1
P-C4X	30	1.6	18.8	112.5	562.5
P-C5X	36	3.1	11.5	69.2	415.4
P-C6X	48	3.1	15.5	92.9	743.2
P-C7X	60	10.8	5.6	33.4	334
P-C8X	125 (DC/AC)	45	2.8	16.7	347.2
P-C9X	230-240 (DC/AC)	320	0.7-0.8	4.3-4.5	165.9-180

Motor Characteristics

Rated voltage (V)	Normal operation voltage range	Charging time at rated voltage (s)	Input Power (W)
DC 24	85%-110%	<15s	150
DC 30	85%-110%	<15s	150
DC 48	85%-110%	<15s	150
DC 60	85%-110%	<15s	150
DC 110	85%-110%	<15s	150
DC 125	85%-110%	<15s	150
DC 220	85%-110%	<15s	150
DC 230-240	85%-110%	<15s	150
AC 110	85%-110%	<15s	150
AC 125	85%-110%	<15s	150
AC 220	85%-110%	<15s	150
AC 230-240	85%-110%	<15s	150

SecoVac Vacuum Circuit Breaker Internal wiring diagram (AC) 17.5kV/27kV



S9: Limit switch (working position)	CC: Closing coil	KO: Anti-pumping relay (optional)
S8: Limit switch (testing position)	TC: Opening coil	SC: Over current release coil (optional)
S4: Electromagnet for locking's auxiliary switch	M: Energy storing motor	BC: Electromagnet for locking (optional)
S5: Auxiliary switch	TC2: Second opening coil	UM, MM: UVR coil
S1~S3: Energy storing travel switch	V1~V6: Rectitier	

Note:
1. This wiring diagram describes that a breaker is uncharged and is in an opening state, and the handcart is in the testing position.
2. The dotted box for optional feature

Vacuum Contactor

SecoVac fuse contactors are provided in withdrawable type and includes high voltage fuses.

Features

- Withdrawable type
- Conformance to the latest IEC standards. I EC 62271-1 and IEC 62271-106
- Comformance to IEC 60282-1 for high voltage fuse
- With/without mechanical latch
- HV fuse protection
- Interlocking features for safety
- Compact and robust

Applications

- Serving for global 50 Hz and 60 Hz
- Segments of industry: Power generation, marine, water treatment, mining
- Medium voltage motor control applications
- Suitable for special environment conditions: Shock, vibration, high ambient temperature
- Suitable for marine application

Fuse Contactor Characteristics

Item	Unit	Value
Rated Voltage	Kv	12
Rated Frequency	Hz	50/60 Hz ± 5%
Rated power freq withstand voltage (1min)	kV	28
Rated lightning impulse withstand voltage	kV	75
Rated Currents for contactor	A	400
Rated short-time withstand current (3s)	kA	4
Rated making current	kA	4
Rated peak withstand current	kA	10.4
Maximum rated breaking current	A	3200
Minmum rated breaking current	A	80
Use type		AC3/AC4
Latch type both latched & non latched required		Mechanical
Mechanical life	Times	300k
Number of auxiliary contacts		5a/5b
Minimum Auxillary contacts rating		AC 110V/10A, AC 220V/5A or DC
Control voltage		48/110/125/220/230 VDC 110/125/220/230 VAC
Under voltage and tripping coil for Mechanical La tched type contactor		Required
Anti-pumping relay		Required
The drop-out voltage of contactor		AC 85%/DC 70%
SC breaking capacity for fuse	kA	50
Rated take-over current	A	3200

High Voltage Fuse Characteristics

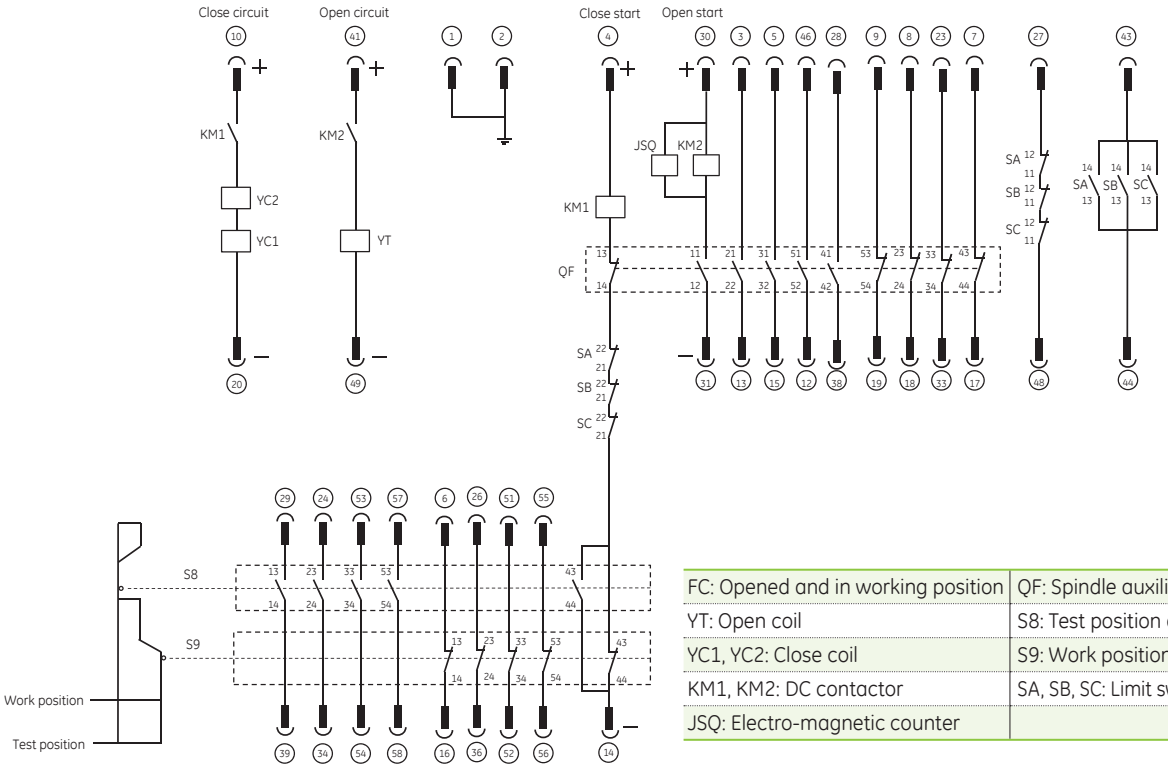
Item	Unit	EFEN	SIBA
Rated Current	A	200	250
Thermal Current	A	140	160

Main circuit resistance of Fuse Contactor

Item	Unit	Fuse-Contactor
Rated Current	A	400
Withdrawable	μΩ	≤ 250

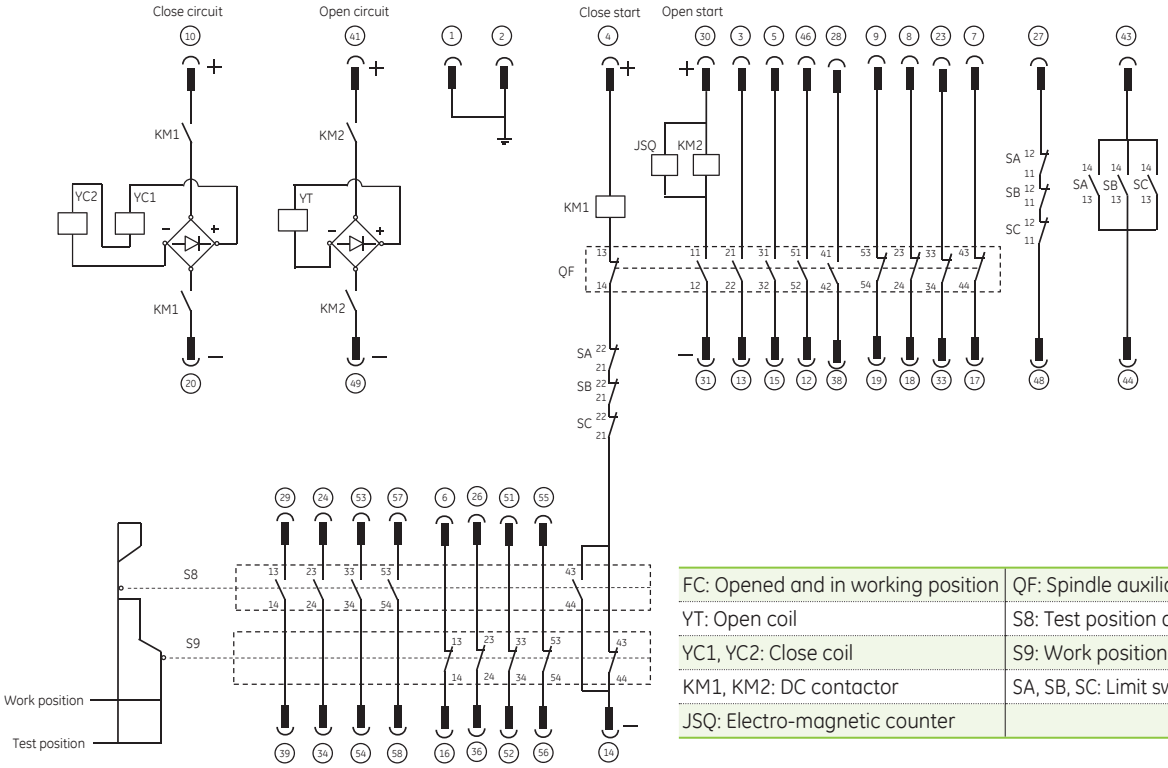
Internal wiring diagram for mechanical latch type contactor

DC control circuit scheme



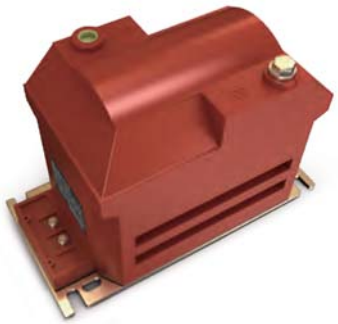
FC: Opened and in working position	QF: Spindle auxiliary contact
YT: Open coil	S8: Test position auxiliary contact
YC1, YC2: Close coil	S9: Work position auxiliary contact
KM1, KM2: DC contactor	SA, SB, SC: Limit switches for fuse strikers
JSQ: Electro-magnetic counter	

AC control circuit scheme



FC: Opened and in working position	QF: Spindle auxiliary contact
YT: Open coil	S8: Test position auxiliary contact
YC1, YC2: Close coil	S9: Work position auxiliary contact
KM1, KM2: DC contactor	SA, SB, SC: Limit switches for fuse strikers
JSQ: Electro-magnetic counter	

Component



Current Transformer

Current transformers are cast in resin, and totally enclosed. This provides superior protection against pollutants and moisture. It can be equipped with one or more independent magnetic cores with equal or different characteristics for measuring, metering and protection purposes.

Current ⩽ 1250A the CT type is LZZB-17 150A1 or A4

Current ＞1250A the CT type is LMZB1-17

Ground Fault Sensing CT

It is of the type insulated in resin and is used to supply measurement and protection devices. These CTs can be furnished in either a solid or split core design. They can be used either for measuring phase currents or for detecting the earth fault current. They conform to the IEC 61869-2 Standards.

CT type: LMZC

LZZB

Voltage Transformer

Voltage transformers are cast in resin, and totally enclosed. This provides superior protection against pollutants and moisture. It can be equipped with one or more independent magnetic cores with equal or different characteristics for measuring, metering and protection purposes.

17.5kV

VT type:

JDZ17-15A

JDZX11-15C

JDZX17-15R

Fuse type:

XRNP 17.5/1A

27kV

VT type:

JDZ11-25

JDZX11-25E

Fuse type:

JDZX15-25R

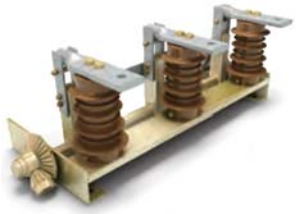
Recommended CT

Primary Current	Type	Ratio	Accuracy Class	Protection Class
500A 25kA/3s	LZZB-17 500	500/5A	0.5 or 0.5s 0.2 or 0.2s	5P or 10P
		500/1A	0.5 or 0.5s 0.2 or0.2s	5P or 10P
		500-250/5A	0.5 or 0.5s 0.2 or 0.2s	5P or 10P
		500-250/1A	0.5 or 0.5s 0.2 or0.2s	5P or 10P
1000A 25kA/3s	LZZB-17 1000	1000/5A	0.5 or 0.5s 0.2 or 0.2s	5P or 10P
		1000/1A	0.5 or 0.5s 0.2 or0.2s	5P or 10P
		1000-500/5A	0.5 or 0.5s 0.2 or 0.2s	5P or 10P
		1000-500/1A	0.5 or 0.5s 0.2 or0.2s	5P or 10P
3000A 25kA/3s	LZZB-17 3000	3000/5A	0.5 or 0.5s 0.2 or 0.2s	5P or 10P
		3000/1A	0.5 or 0.5s 0.2 or0.2s	5P or 10P
		3000-1500/5A	0.5 or 0.5s 0.2 or 0.2s	5P or 10P
		3000-1500/1A	0.5 or 0.5s 0.2 or0.2s	5P or 10P

Component

Voltage Transformer Truck

The withdrawable trucks also allow replacement of the fuses with the switchboard in service. Truck racking-out with the door closed automatically operates closure of a metallic segregation shutter between the live parts of the switchgear and the instrument compartment.



Earthing Switch

The earthing switch can be operated from the front of the switchgear. It is mechanically interlocked with the apparatus truck so that the earthing switch can only be operated when the apparatus is open in the Test position as well. The switch is also mechanically interlocked with the cable compartment for additional safety.

Surge arrester

Surge arrester is used to protect electric equipment against transient operating or lightning over-voltage. It is connected between primary conductor and ground for protecting protective load from damage effect. When the operating or lightning over-voltage occurs, surge arrester immediately limits over-voltage amplitude and protects the insulation of device.

Disconnector Truck

Disconnector truck is used to disconnect primary circuit and normally coupling with busbar tie breaker to achieve two section power supply. Disconnector truck can be provided with bus tie/riser panels.

Earthing switch characteristics

Specification	Unit	Data		
Rated voltage	kV	7.2/12/15/17.5	24	27
Rated Work frequency withstand voltage (1min) in open condition of switch	kV	20/28/36/38	50	65
Rated Lighting impulse withstand voltage (peak value) in open condition of switch	kVp	60/75/95/95	125	125
Rated short-time withstand current (3s)	kA	31.5/40/50	31.5	
Rated peak value withstand current	kAp	82/104/130	82	
Rated short circuit making current	kAp	82/104/130	82	
Centre distance between phases	mm	170/210/275	220/275	
Electric endurance class		E1	E1	
Mechanical endurance	Times	2000	2000	

Disconnector truck characteristics

Specification	Unit	Data			
Rated voltage	kV	17.5			
Rated power frequency withstand voltage (1min)	kV	38			
Rated Lighting impulse withstand voltage	kV	95			
Rated Frequency	Hz	50/60			
Rated Current	A	1250	1250	2000	3150
Rated short time withstand current	kA	31.5	40	40	40
Rated peak value withstand current	kAp	82	104	104	104
Rated duration time for short-circuit	s	3			
Dimension		As same current rating VCB			

Cable Connection

The cable compartment contains current transformers, voltage transformers (fixed), withdrawable, and earthing switch, depending on the individual operating requirements.

The cable compartment is constructed for installation of three current transformers. When all the three current transformers are not required, dummies can be installed in their place to maintain the same installation and connection procedures.

The fixed voltage transformers (optional) are connected on the primary side with busbar and fitted with HRC fuses. The earthing switch can be operated by manual, with position indicated by mechanical indicator on the driv eshaft and the auxiliary switch. Three surge arrestor (optional) can be mounted in the space available.

Rated voltage	Panel Width	Panel Type	Max # of cables	Max Corss section	Range of Cable clamp	Range of reducer ring
kV	mm		per phase	mm^2	mm	mm
7.2/12/15/17	550	without VTs	2*	630	35-54	26-62
	650	with VTs	3*			
	750	w or w/o VTS	4*			
	1000	w or w/o VTS	4*			
24/27	800	w or w/o VTS	6*	630	35-54	26-62
	1000	w or w/o VTS	6*			

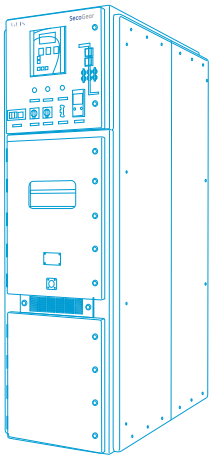
* If more cable required need increase the depth of switchgear. Please consult your GE.

Operation Tools

Gear door lock's key

Rack handle for truck

Earthing switch handle



Layout Detail

Layout Detail

In order to obtain an optimum installation sequence and ensure high quality standards, site installation of the switchgear should only be carried out by specially trained per sonnel, or supervised and monitored by quali ed personnel, or by personnel supervised and monitored by responsible persons.

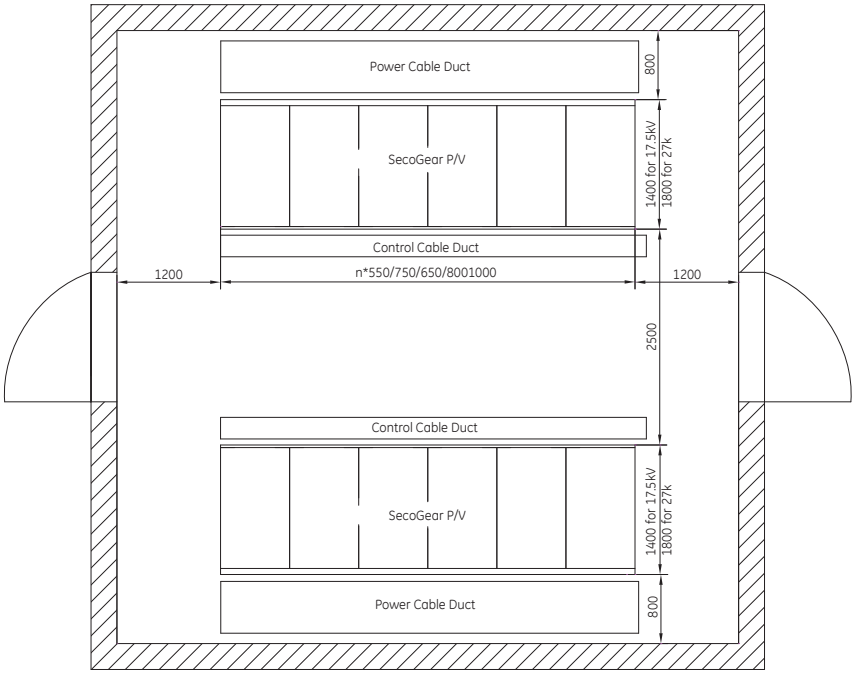
On commencement of installation on site, the switch-room must be fundamentally finished, provided with lighting and the electricity supply, lockable, dry and with facilities for ventilation, It is also required that the basic frame and indoor ground of substation should be checked and accepted before the construction, It must be ensure that the ceiling height is sufficient for the opening travel of the pressure relief plates and clearance for exhaust.

Tolerances for laying the floor frame are:

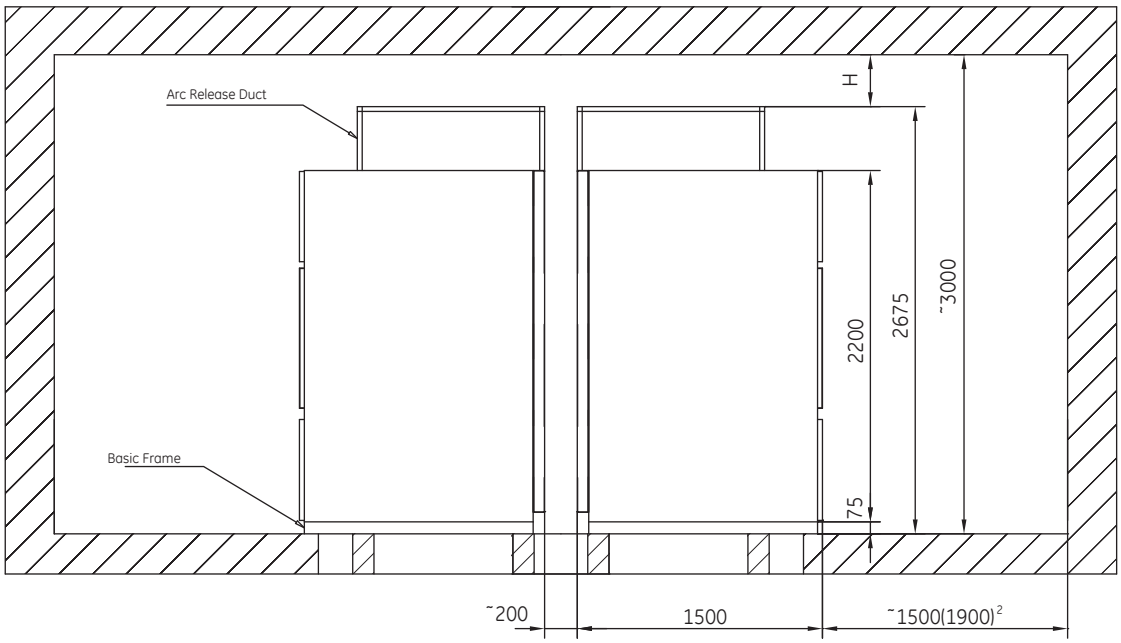
Evenness tolerance: ± 1mm within a measuring length of 1m,

Straightness tolerance: 1mm per 1m, but not more than 3mm over entire length of frame.

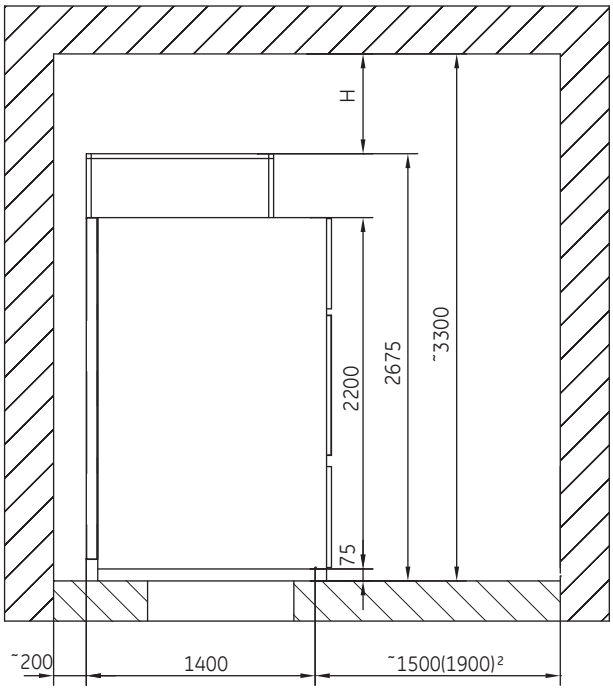
SecoGear panel layout for switchgear arrangement



SecoGear FA 17.5kV layout



a) Back to back scheme



b) Back to wall

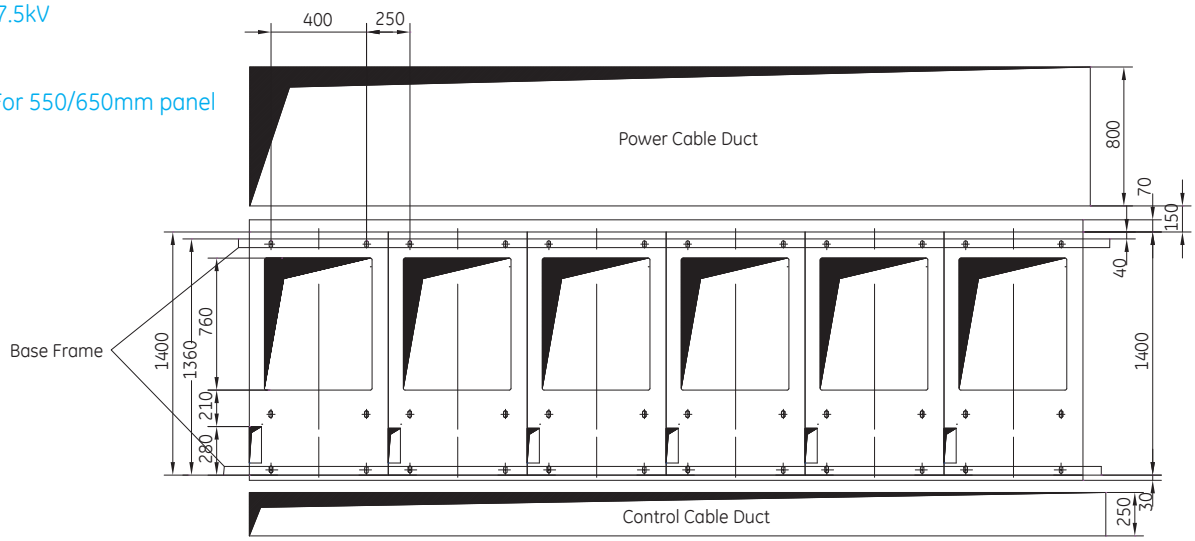
H: Maintain space, should make sure at least 300mm.

**: 1900mm are required for panel replacement.

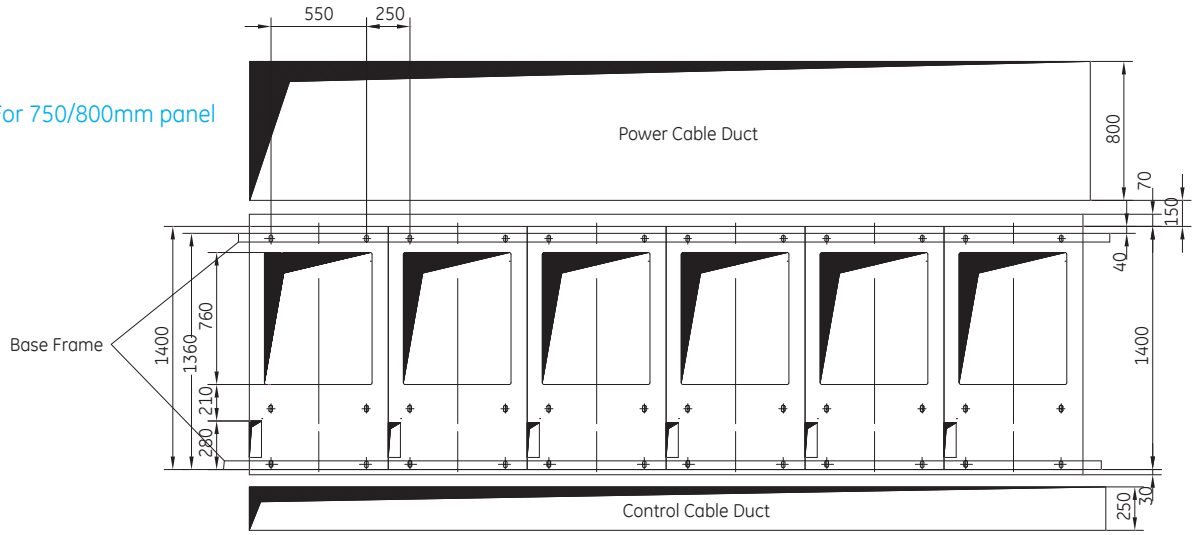
Switch room cable duct arrangement

12/17.5kV

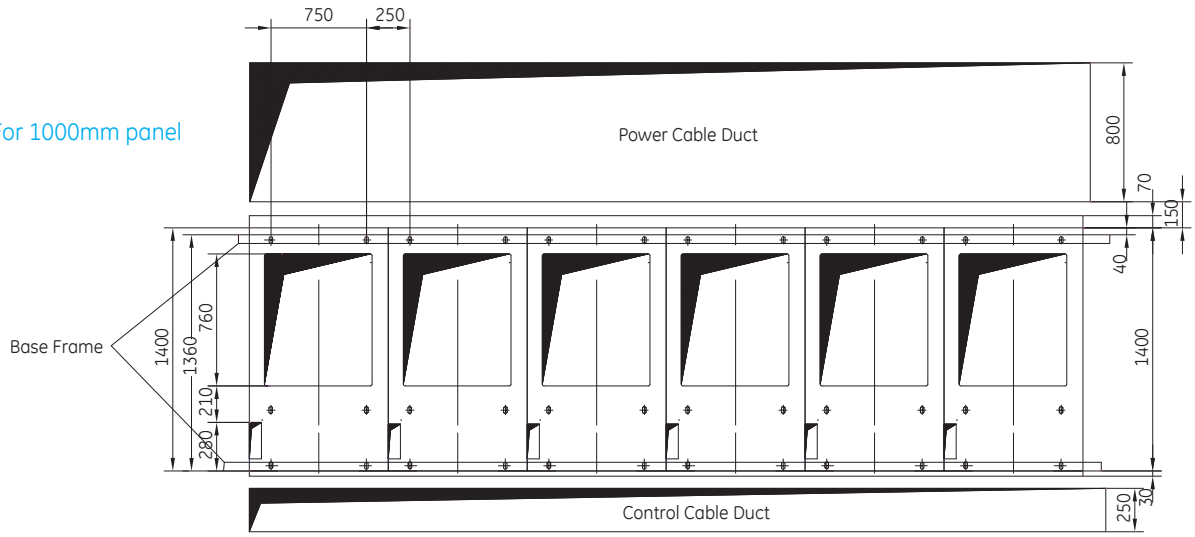
For 550/650mm panel



For 750/800mm panel

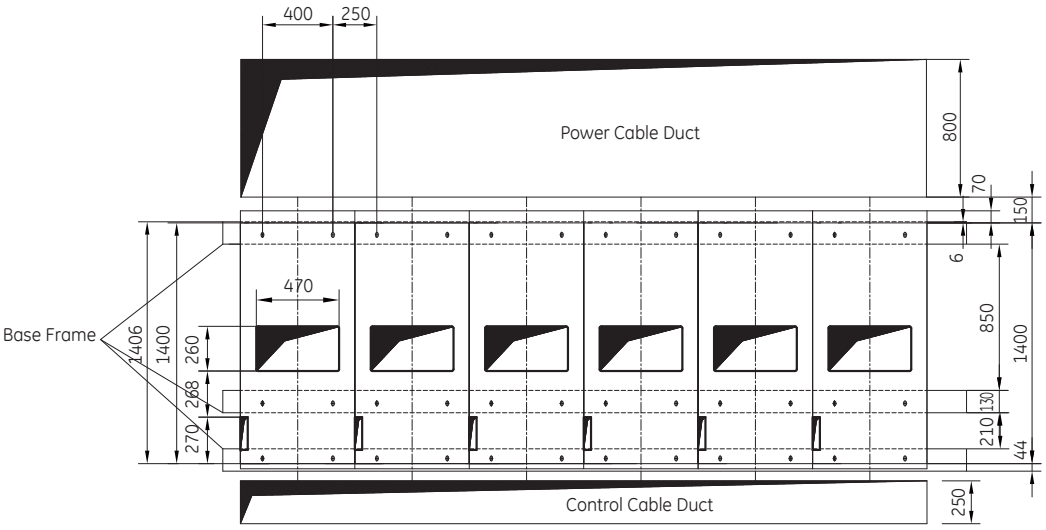


For 1000mm panel

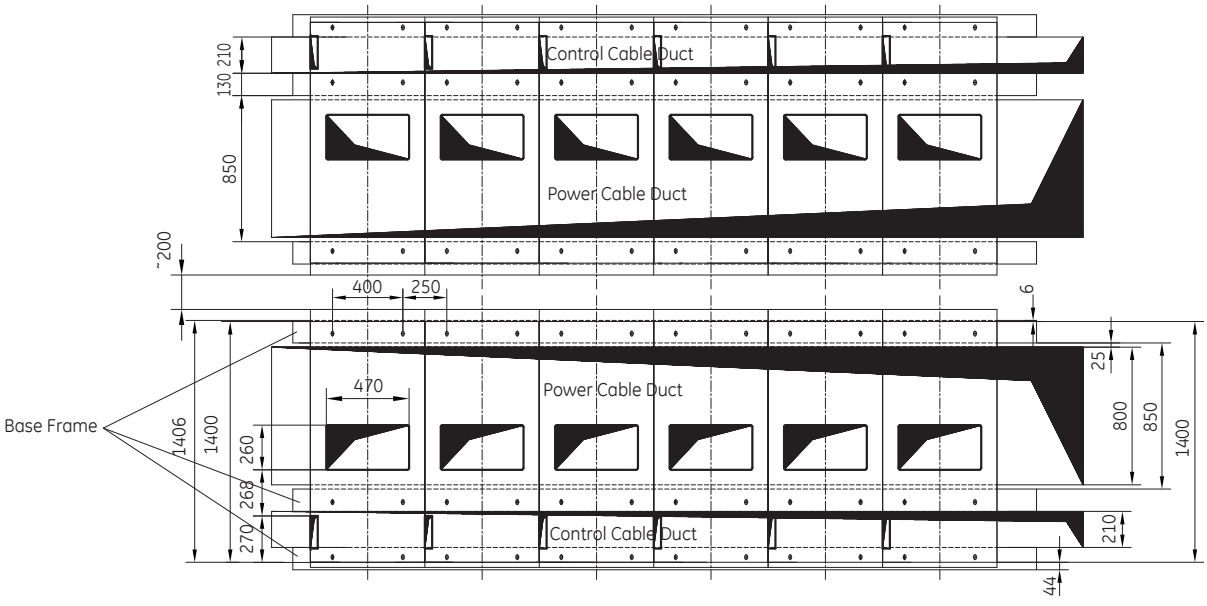


SecoGear FA17.5kV

Normal Laylout

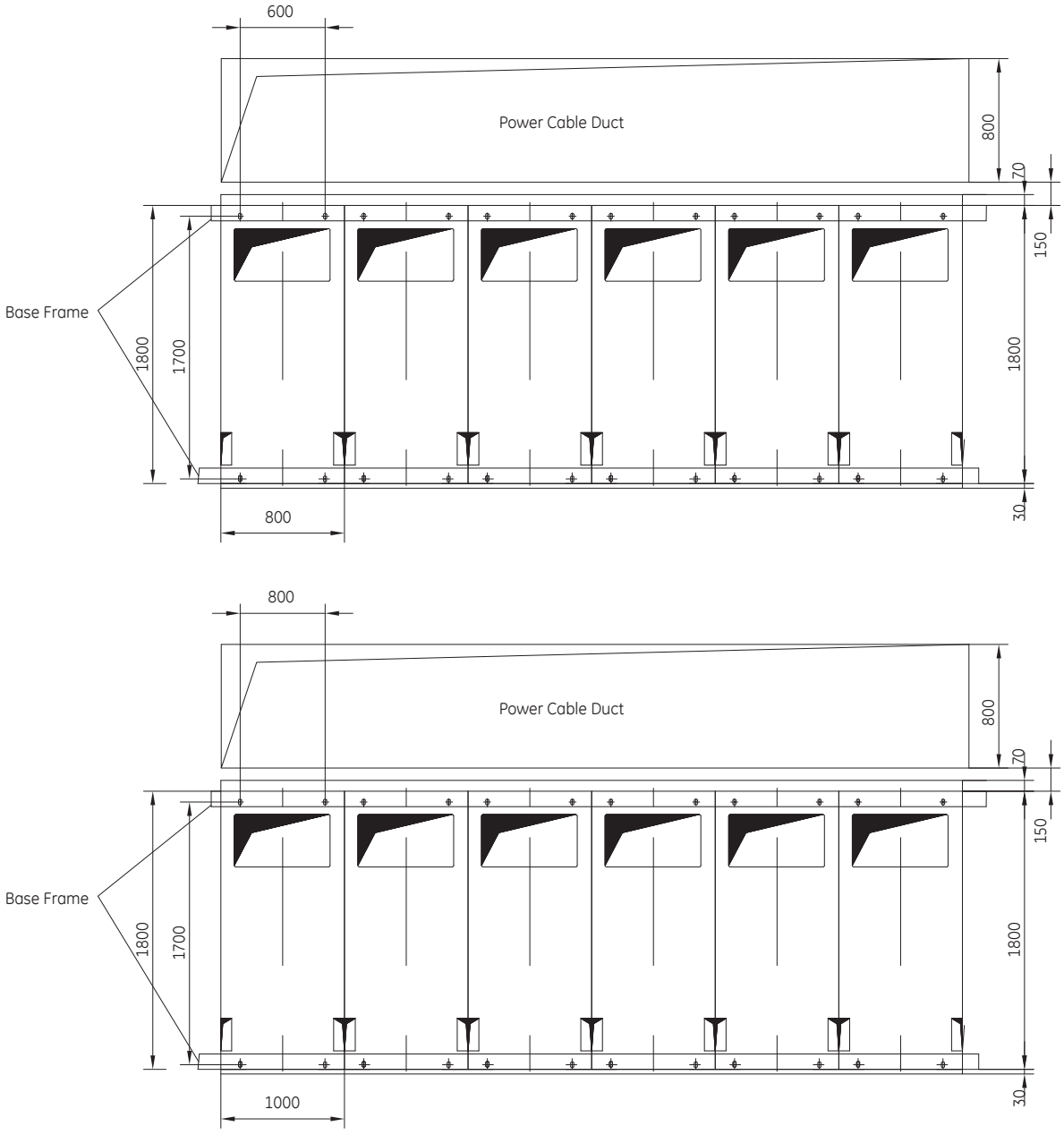


Back to Back Layout



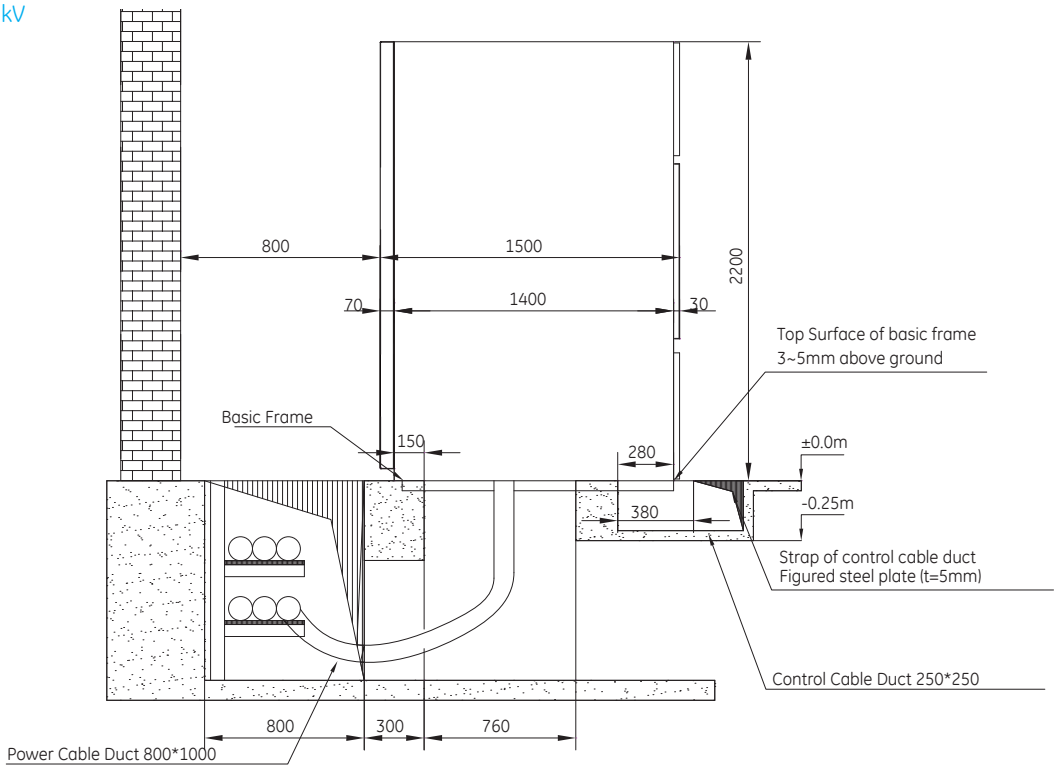
Switch room cable duct arrangement

27kV

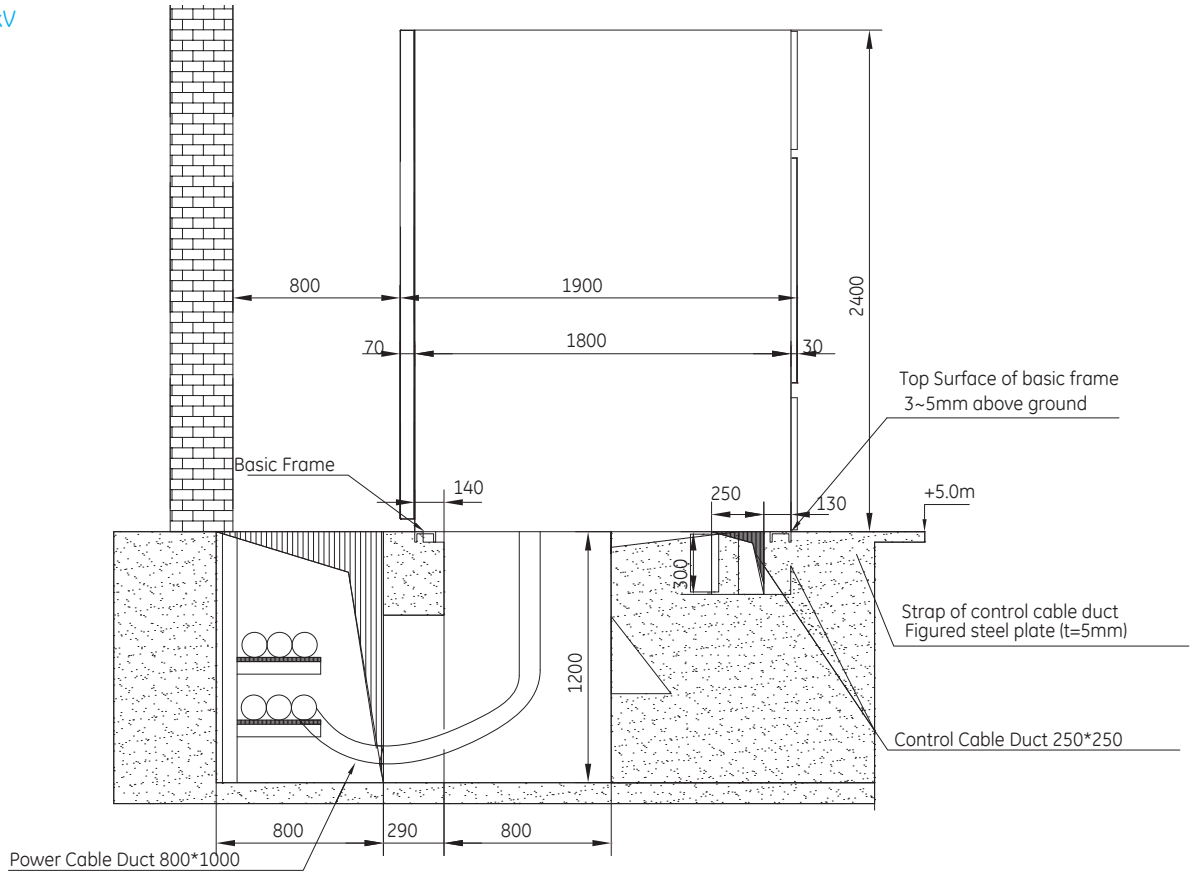


Cross section view of switchgear room layout

12/17.5kV

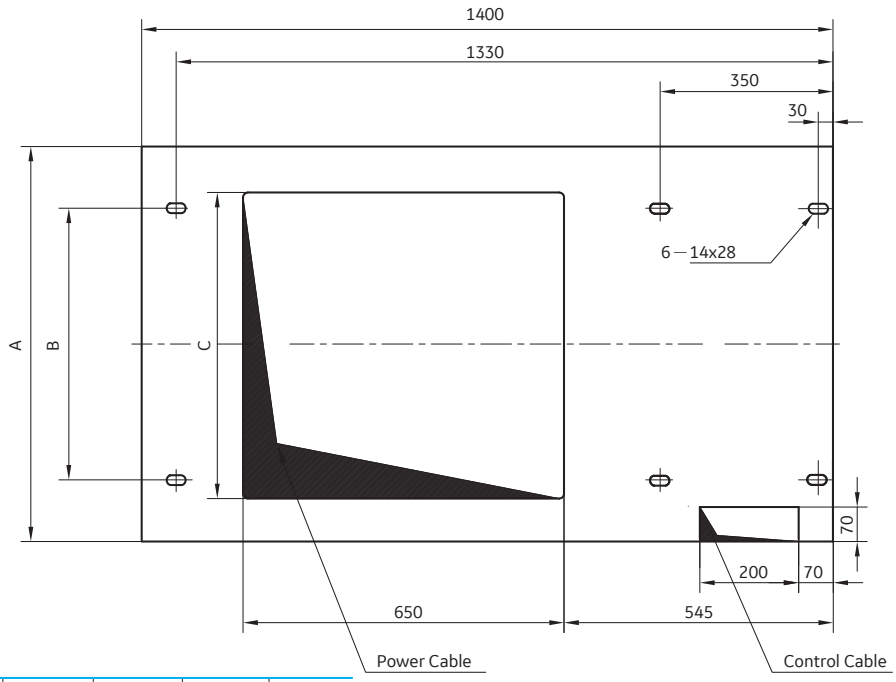


27kV



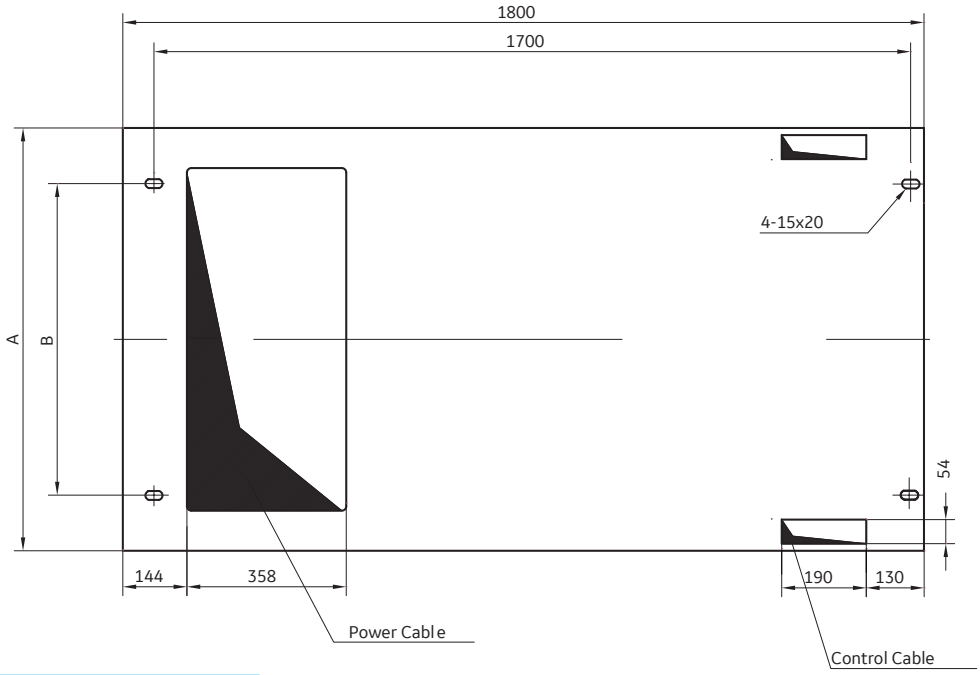
Detail of switchgear cable access cutout

12/17.5kV



Width A	550	650	750	800	100
B	300	400	550	550	750
C	370	470	600	620	820

27kV



Width A	800	1000
B	600	800
C	595	695

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