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Professional Power Equipment Provider

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GPN1-12

Metal-clad Enclosed Switchgear





About Us»

GreenPower promotes environmental awareness, and aims to create unprecedented happiness and wealth for our investors, employees, clients and partners. By focusing in the mid-to-high voltage and low voltage eld, and professionally working on R&D, manufacturing, marketing and service of high-end green intelligent switchgears, equipments and products.GreenPower sets to become a well-respected global company in the power industry.

GreenPower, is jointly established by a number of state-owned excellent industrial electrical professional manufacturers, we committed to meet the procurement needs of clients. It is a professional procurement service provider with entity of industrial electrical.

GreenPower provides ONE-STOP solutions service for all customers in the International area. It is located in the time-honored electrical industrial city, a collection of worldclass brand of industrial electrical products,excellent brand of domestic electrical products as the basis.

Innovative business philosophy, strong professional supply team, expert technical guidance, advanced Information network management platform, fast logistics, which makes GreenPower as your procurement expert by your side.

GreenPower adheres to its own brand and multi-brand integration, marketing dierentiated development strategy. The products involving low voltage, medium voltage and high voltage transmission and distribution products and industrial automation products.

It covering all aspects of distribution, logistics, warehousing, professional and technical engineering services, systems integration and complete sets of manufacturing. Stable business foundation for cooperation with customers and suppliers, and has established a good reputation to maintain its leading position in the market competition.

Human quests for transcendence, with transcendence we make progress, when the pursuit of unlimited become a belief, our dream began to realize.

Hard-working, dedicated GreenPower people, will be adhering to its past glory, beginners mind, let go sailing, to face the fierce competition in the future, and always help customers make the best choice, and strive to become the best and most reliable procurement service provider in the eld of industrial electrical.

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1.1 General

GPN1-12 metal-clad enclosed switchgear is suitable for 3-phase AC 50Hz/7.2-12kV single bus bar and single bus bar section electric power system, with the function of “five preventions”. The removing compartment of the switchgear may be assembled with vacuum circuit breaker and vacuum contactor etc.

1.2 Standards and specifications

The switchgear complies with the standards of IEC60298, GB3906, DL404 etc.

Enclosure protection degree of switchgear is IP4X, protection degree is IP2X when the door of VCB room is open and the truck is drew out.

During the installation and running of electric system, observe all the relevant information in the IEC and the safety regulations in GB or local electrical utility, and consider the relevant information provided by GreenPower.

1.3 Service conditions

1.3.1 Normal service conditions

Normal service conditions of GPN1-12 switchgear following:

- **Ambient temperature in room:**
 - Maximum: +40°C
 - Maximum 24 hour average: +35°C
 - Minimum (according to “minus 15 indoor class”): -15°C
- **Ambient humidity in room:**
 - Daily average relative humidity: Less than 95%
 - Monthly average relative humidity: Less than 90%
- **Height above sea level at site:** Less than 1000m
- **Earthquake intensity:** Less than 8 degrees
- **This product should not be used under conditions of fire, explosion, earthquake and chemical corrosion environments.**

1.3.2 Special service conditions

The manufacture must be consulted in advance about each special service condition. Special service conditions are to be agreed on by the manufacturer and user.

- Allow for the reduction in the dielectric strength of the air when site altitude is over 1000m
- If the ambient temperature is over top of the high-point, must consider equalizing or limiting current capacity for the design of main bus bar and branching bus bar. Installation the aerator is favor of rejection of heat.

1.3.3 Matters need attention

If the humidity is higher on site, temperature fluctuations speed is rapidder and range is bigger, condensation phenomena will be appeared for the switchgears running in this clime condition, so user should ensure that the heater running full time on spare and running condition! But running in high-current, the heater can stop.

2.1 Switchgear electrical data

Item	Unit	Data
Rated voltage	kV	12
Rated power-frequency withstand voltage (1min)	kV	42
Rated lightening impulse withstand voltage	kV	75
Rated frequency	Hz	50
Rated main bus bar current	A	1600, 1200, 2500, 3150, 4000
Rated branching bus bar current	A	630, 1250, 1600, 2000, 2500, 3150, 4000*
4s Short-time withstand current (rms.)	kA	16, 20, 25, 31.5, 40**
Peak withstand current (peak.)***	kA	40, 50, 63, 80, 100, 125

* With forced ventilation.

** 3 Second for 40kA.

*** The short-circuit capability of transformer for measure should be considered by oneself.

2.2 Performance bearing inside fault arc

GPN1-12 has been considered with the problem of inside fault arc in switchgear on design. It is tested strictly according to GB3906 and IEC298, thus ensure effectively the safety of equipments and operation personnel.

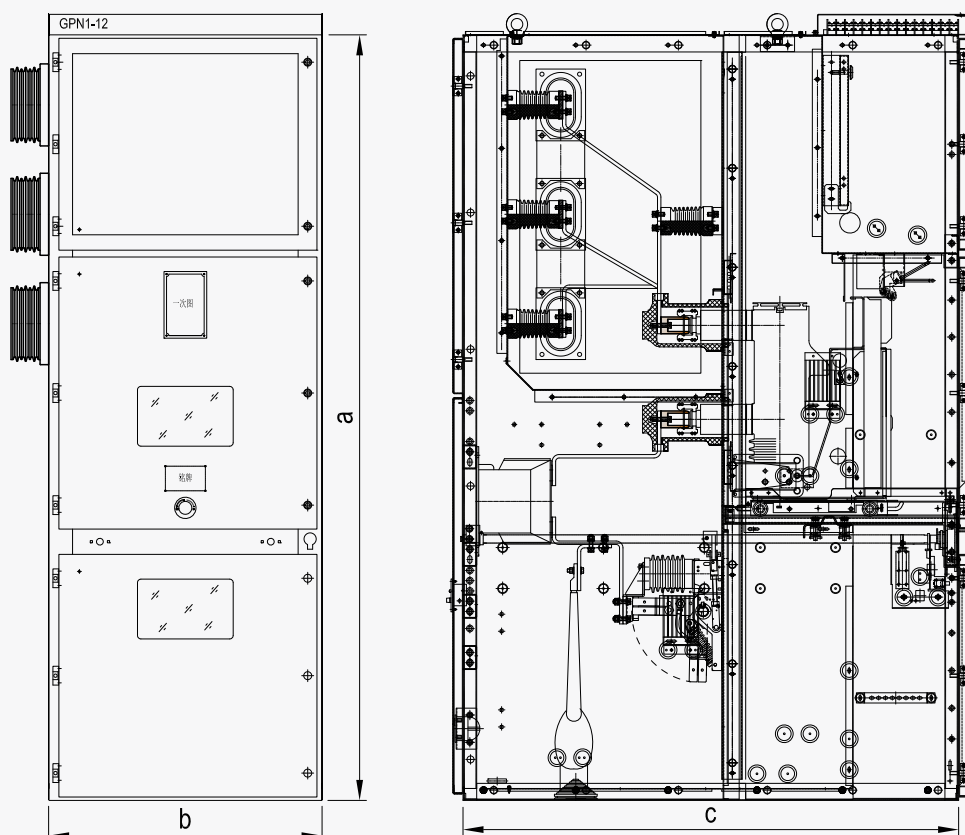
2.3 Outline dimensions and weight

Outline dimensions

Height a	2200 (mm)
Width b	
Rated branching bus bar current up to 1250A, Rated short-circuit breaking current (rms.) up to 31.5kA	800 / 650* (mm)
Rated branching bus bar current up to 1600A, Rated short-circuit breaking current (rms.) up to 40kA	800 (mm)
Rated branching bus bar current over 1600A	1000 (mm)
Depth c	1350 / 1500 (mm)

Weight 800~1200kg, for table 1 showing.

* Suitable for VD4 being equipped.



List 1 Dimension and weight for switchgear installation

Mode of device in switchgear	Unit	Removing type	Removing type	Removing type
Depth c	mm	1500	1500	1500
Width b	mm	650	800	1000
Distance to wall	mm	800	1000	1200
The width of Passage *	mm	1000	1100	1200
Assemble walkway (Demand of passage indoor)				
Width	mm	1000	1000	1200
Length (Depth)	mm	1500	1500	1500
Demands of door frame				
Width	mm	800	1000	1200
Height	mm	2200	2200	2200
Mass (Approximation)	kg	800	850	1200
Weight terrace beared	kg/m ²	1000	1000	1000

* Depend on the most width of the switchgear.

3.1 Basic structure (Figure 3/1)

The basic structure of switchgear panel comprises the panel itself a removing part. The panel and main components can see in figure 3-1. Incoming-line panel or outgoing-line panel are diagram of basic switchgear panel, there are other derivative diagram, for example, contact panel or metering panel.

In addition, there are so many diagrams of the switchgear panel with stationary type load switch, (SF₆) VCB truck, VC truck, Disconnect truck. The panel has two maintenance modes. That is single-face maintenance and double-face maintenance. The detail of structure and main components, can reference order document.

3.2 Enclosure and clapboard

The enclosure and clapboard of the switchgears is made up from high quality steel, have very strong function to resistant oxidation and corrosion, and its rigidity and mechanical robustness is higher than common low-carbon steel board.

Have been installed release of pressure plate on the top of three high-pressure chambers. When appear internal fault electric arc, air pressure heightens in high-pressure chamber, because that the doors of switchgear are already airtight coating, the pressure gas will clash out the release of pressure plat. Adjacent switchgears are isolated by its self side board, after putting the switchgears together, air buffer layer exist yet, it may prevent the switchgears from pronging and melted by electric arc.

Low voltage vault D is separate room with high-pressure area. Clapboard space isolate the VCB vault B with cable vault C, even if VCB. truck is moved (here the valve is closed self-motion), can prevent the operator from touching the electrification parts of bus bar vault A and cable vault C. releasing the tighten bolt, the level clapboard is removed, convenient for installation of cable seal terminal.

3.3 Compartments in switchgear

■ VCB Vault (Figure 3-1, 3-3, 3-5, 3-6)

VCB truck is installed in VCB vault B with track, may move in the middle of the position to service and test/disconnected. While the truck moves from service position to test/disconnected position, the valve can cover un-move contact in self-motion, open when moving reverse. The truck can be operated when the truck vault door is closed, while you can watch the position of the truck, ON (VCB closing)/OFF (VCB opening) push knob in the truck, close and open indicator and charging/releasing indicator by inspection window.

■ VCB Truck

The truck can be moved by manual. The structure of the truck is made of the steel, the VCB and other equipments are installed on top of it. The arm of spring bush is installed on the pillar of the VCB, When the truck is pushed on the service position, it has the effect of electrical interlocking. The signal, protection, control line between the truck and the switchgear is connection with the pin of control line. The truck is fixed on the test position as soon as it is pushed into the switchgear, and be connection to the earth system of the switchgear. The position of truck will be seen by the lamp that is installed on the looking window or the panel of low voltage.

Beside the VCB, the truck can be equipped the vacuum contactor, isolated device and the measuring equipment.

■ Bus bar compartment

The bus bar from one switchgear to the other switchgear is fixed with the bushing and the ramus bus. The ramus bus is connection to the main bus with the bolt, it needn't any clip. All bus and the ramus bus are covered with pyro condensation bushing. The panel of bushing and bushing are isolated between the switchgear and the switchgear. And it has the effect on supporting.

■ Cable compartment (Figure 3-1)

CT and earth switch are installed on the back of the Cable Compartment. The Surge arrester is also installed on the Cable Compartment. When the truck and the horizontal panel are moved. There is enough room so that the worker installs the cables (the most is 6). The bottom of panel that lie on the incoming of cable in made of the stainless-steel panel, it is uncork, disassembly so that working on the local. The airplane of panel where is together secondary cable make sure as same as the installed cable prevent the small animal being into it.

For the cable trench in humidity, it is suggested that the switchgear is airproofed with fireproofing mud and epoxide resin.

■ Low voltage compartment (Figure 3-1, 3-2)

Low voltage components of switchgear are installed in low-voltage compartment and on door. Control wiring trunking has ample space and cover board. Nearside wiring trunking is used to introduce and educe the wiring between switchgears, starboard wiring trunking is used to lay intramural wiring in switchgear. Traversing hole for control wiring on side board in low voltage compartment is used to connect with control power supply.

3.4 Interlocks/protection against mishandling

A series of interlocks are provided to prevent mishandling, thus protecting both personnel and switchgear itself. The function of interlocks is following:

- VCB and earth switch in the OPEN position, you can move the truck from the test/disconnected position to service position. On this state, it is be able to move reversely yet (electric interlock).
- Only the truck quite in the test or service position, VCB can be closed (machine and electric interlock).
- The truck is in the test or service position, but no given control voltage, VCB is not closed, only manual open (electric interlock).
- The truck in the service position, control wiring plug have been locked, don't be pull out.
- Only the truck has been in the test/disconnected position or moved out, the earth switch is permitted to be closed (machine interlock).
- When earth switch has been closed, the truck doesn't move from the test/disconnected position to service position (machine interlock).
- Some additive interlocks can be assembled on the truck and/or earth switch operating mechanism, as case electromagnet, user should provide the required information when ordering.

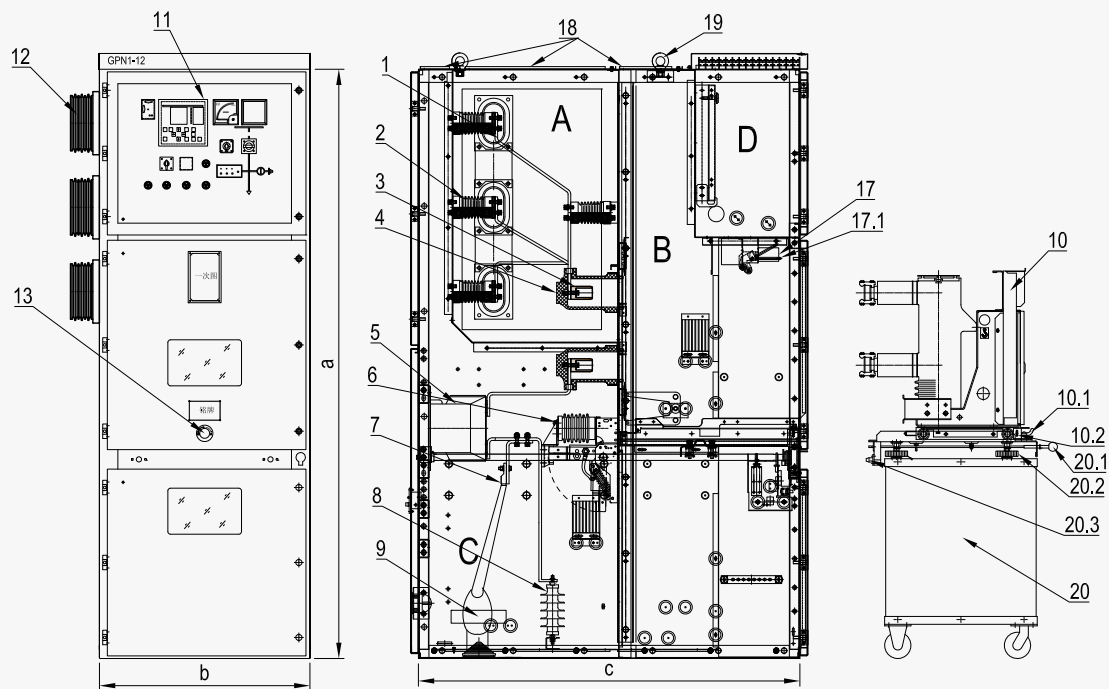


Figure 3-1 Basic structural sectional view of incoming line or outgoing line

Compartment

A Bus bar compartment B Truck compartment C Cable compartment D Low voltage compartment

Master parts

1 Bus bar	5 Current transformer	9 Zero-sequence current	11 Control and protection unit
2 Insulator	6 Earth switch	10 VCB Truck	12 Wall bushing
3 Fixed contact	7 Cable terminal	10.1 Slip handle	
4 Contact box	8 Arrester	10.2 Lock key (Link to sliding handle)	

Master accessories

13 Operation hole of screw machine	15.2 Connection board	17.1 Interlock lever	20 Transport cart
14 Cable grip	16 Earth bus	18 Pressure-relief plate	20.1 Lock bar
15.1 Cable lock-ring	17 Control wiring plug	19 Flying rings	20.2 Regulating wheel
			20.3 Guide bar

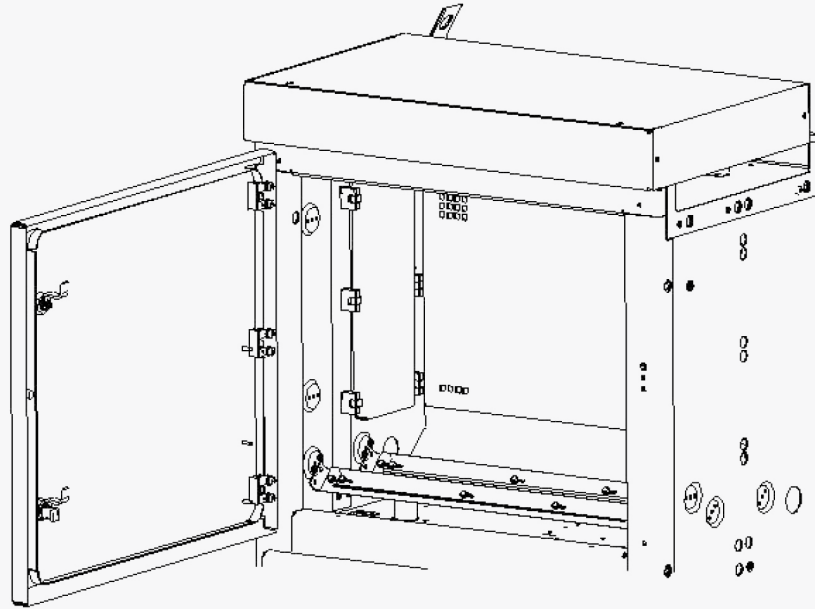


Figure 3-2 Intramural view in low-pressure chamber

In order to install auxiliary switch, control wiring and connection, the terminal foundation can be circumrotated upwards.

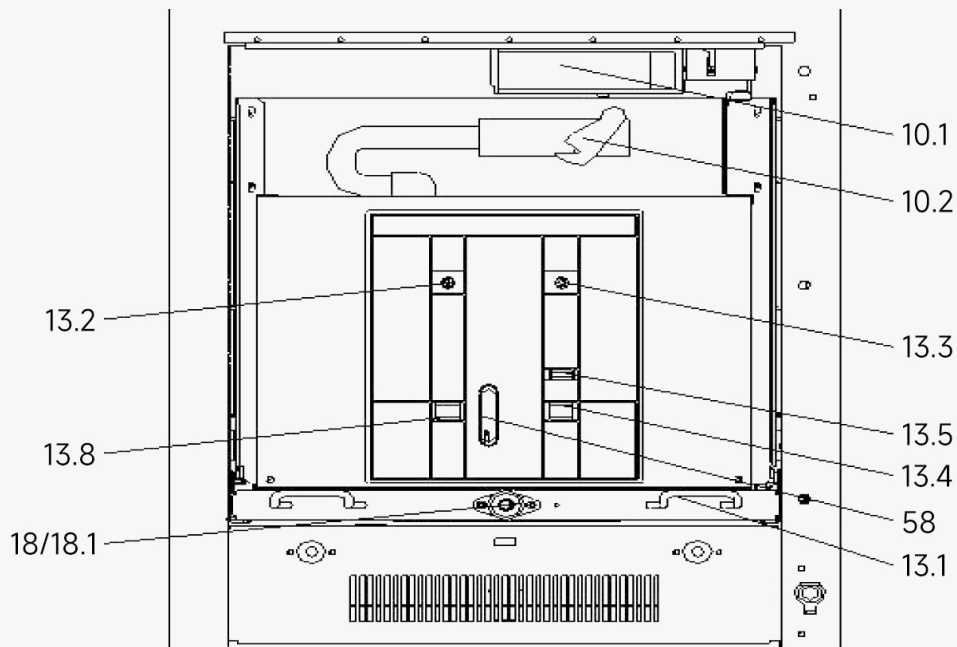
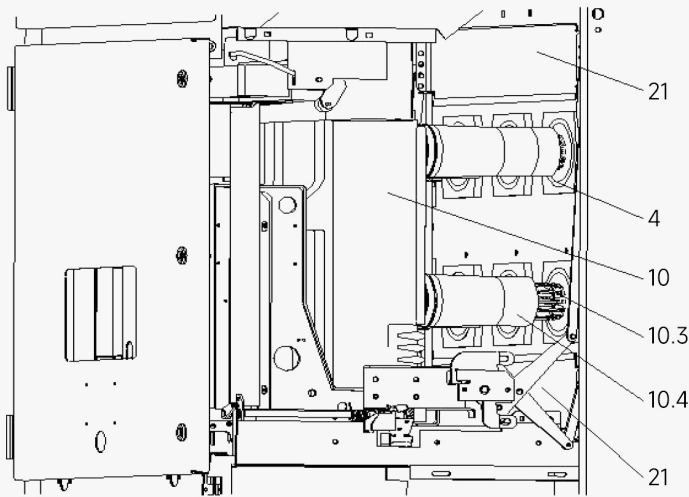


Figure 3-3 Door of the VCB truck compartment is opened, the truck in the test position

- | | | | |
|-----------------------|--------------------------------|--|---------------------------------|
| 10.1 Secondary socket | 13.5 Counter | 13.1 Chassis handle
(Interlocking handle) | 13.8 Energy storage indication |
| 10.2 Secondary plug | 13.4 Open and close indication | | 18/18.1 Trolley handle position |
| 13.3 Closing button | 58 Manual energy storage | 13.2 Opening button | |



No.	Description
21	Shutter
4	Contact box
10	VCB Truck
10.3	Tulip contact
10.4	Contact arm

Figure 3-4 Insert the VCB truck to service position

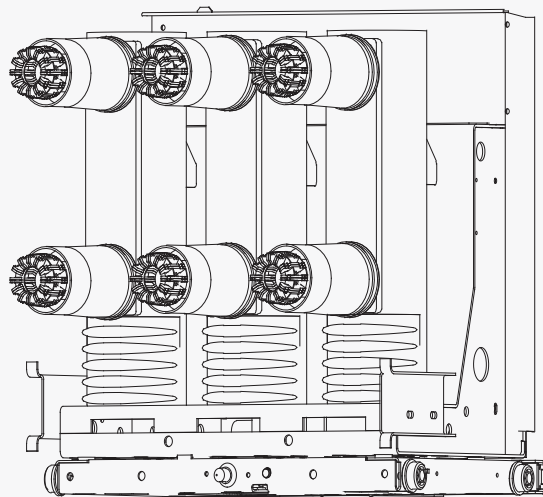
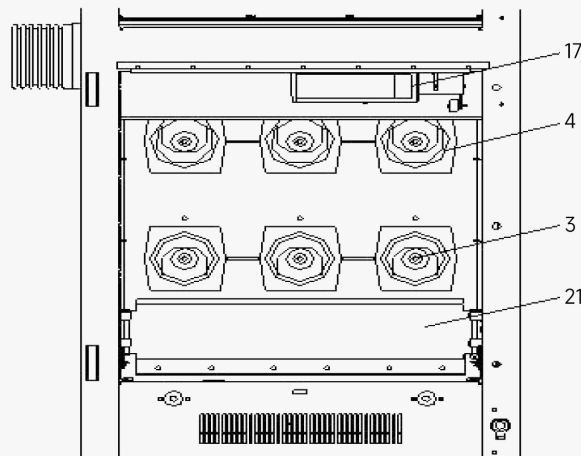


Figure 3-5 VCB Truck



No.	Description
17	Control wiring plug
4	Contact box
3	Fixed contact
21	Shutter

Figure 3-6 Intramural view of VCB compartment when the valve is open, the truck has taken off

4.1 Condition on delivery

The assembled switchgears are still tested for leaving factory in accordance with IEC 298 or GB3906 except that it is checked in accordance with order form, thus verifying their correct structure and function. Bus bar, fastening piece and accessory are packed by oneself.

4.2 Packaging

The packaging of switchgear may be adjusted according to request for specific conditions, such as navigation packaging or no packaging. Especially marine transport, the switchgear must be sealed in film even though it is packed in container, put appropriate drier in packaging for guard against damp.

4.3 Transport

Generally, transport unit is formed by single switchgear. Transport unit can be formed by switchgear group or switchgears fixed back-to-back for exceptional case. Every switchgear has four lifting lugs. (Figure 5-1, 5-2)

Switchgears should be transported erectly. It is necessary to adopt safety measures for protecting personnel and equipments. Loading work must only be carried out with among following tools:

- Crane, fork truck or manual hanger frame.
- Loading with crane.
- Lifting rope should have enough carrying capacity. The unlock width of lifting hook should not less than 30mm.
- The angle between the rope connected with lifting hook and horizontal line should keep above 60°.
- The lifting lugs are permitted to have relevant bend when the switchgears are lifted.

4.4 Delivery and intermediate storage

When the switchgears are in locale, the duties of the consignee include the following (not only):

- Inform GreenPower service engineers to join the work of opening box, checking and accepting.
- Checking the delivery for completeness and damage. Checking the marker, conformity certificate and instruction manual of switchgears for exactness and completeness. If you doubt, please open box and check. Put in drier and reseal the box when intermediate storage.
- Note any short quantities, defects or damage in transit in detail and inform related organization in time.

Please notice:

The delivery should be placed on location without any damage to switchgears and installation materials when intermediate storage.

The sequence of opening box is following:

First take apart the coverboard of packing box, second take apart the side boards around, last remove the bolt connected switchgear with underpan. Please notice that the socket bolts removed should be re-installed in original locale and screwed up. Lift the switchgear vertically and separate it from the underpan. Then takeoff the underpan, put roll pole under the switchgear and prize slowly by wood stick, thus remove the switchgear to the insulation or stay position. Notice no heavier strike or libration in course of moving.

Switchgears with basic packaging or unpacked:

- A dry and well-ventilated storeroom.
- Room temperature which does not fall below -25°C .
- No other dangerous environment infections.
- Storage switchgears erectly.
- Switchgears cannot be piled.
- Do not be knocking-out or damage packaging.
- Unpackaged devices are loosely covered with plastic film. Ventilation must be maintained for corrosion protection.
- Check the humidity regularly on schedule till to erecting works start.

Switchgears with seaworthy or similar packaging with internal protective film:

- Store the transport units in the place which is dry, protected from the weather and safe from damage.
- Check the packaging for damage.
- If the maximum storage period starting from the date of packaging has been exceeded, the protective function of the packaging is no longer guaranteed. Suitable action must be taken if intermediate storage is to continue.

5.1 General request of installation locale

Make sure of the correct installation sequence and highest installation quality, local installation should be carried out by fully trained personnel, or inform GreenPower engineers to guide and ward in locale.

Civil engineering in switching room should be equipped with lighting, power supply for installation and aerator after that it is complete and passed through checking and accepting. Switching room should be dry, clean, ventilation and the doors can be closed. Prepare the necessary preparative works such as hole which pull on wall, cable trench and so on. Cable trench should be constructed according of specific request in every cable work area. Reference the figure 5-5. The height of ceiling in switching room can not less than 3000mm. Make sure that the indoor work conditions of switchgears satisfy IEC, including the indoor temperature conditions.

5.2 Basic scheme of switching room's plan layout

The switchgears GPN1-12 have two kinds of maintenance manners for double faces and single face. GPN1-12 can be installed alongside wall, thus to save floor area. When it is permitted, collocation in switching room is advised to be designed with double maintenance for that channel for installation and servicing between the back cover board of switchgears and partition, between both side of switchgears and partition are be set aside.

Wide enough channels should be stay between the switchgears and wall for that installation and running and servicing are more advantageous. The distance between double switchgears is advised to be not less than 2500 mm when the switchgears are laid face-to-face between double lines.

5.3 Foundation

It is relative suitable to install the switchgear at the foundation frame built in the floor of distribution house or elevated auxiliary level ground. Build the foundation according to GB regulation, especial the permission tolerance, it is precondition for full installation of the switchgears. The switchgears foundation construction must be accord with relative item to power construction and technical regulation for checking and accepting.

5.3.1 Basing on the floor of distribution house

For the number of switchgears is few, weight isn't heavy, it is permit to install directly on the floor of distribution house. It is request that the floor is very flat and with enough carrying capacity. If needing, you may insert right shim under the switchgear while installing and adjusting.

5.3.2 Foundation frame on a concrete floor

For figure 5-5 showing, the inbuilt foundation frame of switchgear build requires to take the way of the second grouting, after finishing the Civil work construction, carry through the foundation frame building. It is advised to able to do that electric installation unit are charged with the foundation frame facture and building. It is agreed with blueprint drew accord to manufactory requests to process the concrete project's foundation frame.

Civil work construction should consider that the height of foundation channel beam is obligate, and a little allowance, figure 5-6 showing. Follow towards to frame width, built-in anchor steel board with distance at 1 m to 5 m.

The foundation frame is made of channel beam and angle iron welding, the basic dimension demand of the frame refers to figure 5-6, Channel beam's high isn't strict demand, may use [5 or [8 channel beam. The edgewise of longitudinal channel beam be agree with the dimension of switchgear body frame.

After civil work is completed, take installation of foundation frame for putting the machining foundation frame to the base plane by electric installation unit. Adjust it with steel shim. Adjust the related dimension for level and vertical direction with metal strip ruler and gradienter, request level error is no more than 1 mm / m, total error is no more than 3 mm. Top surface of foundation frame should higher 3mm to 5mm than final completion ground lever. Take no permission of that the height of foundation frame lower than final completion ground lever. Then weld the frame and steel shim with built-in fitting. Carry through the second grouting, and complete inbuilt to foundation frame. For figure 5-5 and 5-6. On installation moment, the foundation frame should not bear impact or pressure. Before foundation frame anchoring and the second grouting, carry out essential check and accept procedure.

5.4 Assembly of the switchgear at site (Figure 5-1 to 5-6)

Using standard bolts of tensile class 8.8 at least, the tightening torques for the bus bar screw connections are as follows:

Bolt d	6	8	10	12
Tightening torques Nm	10	25	50	85

Note: Not smearing any lubricant.

According to arrange order given by the switchgear arrangement plan, send the switchgears to preliminary installation position.

After the switchgears are all put together, fix it at the base frame by foot screw or welding. it is advised to start from the centre when assembling switchgear with more than ten panels. Firstly, install two centre switchgears, remove the switchgear to the base frame, adjust related dimension for level and vertical direction. split joint two switchgears together. Jointing procedure following:

Firstly, pull out the VCB truck from "service" position to "test/disconnected" position, open the VCB vault door, take up control wiring plug connection, remove the service truck to switchgear fore, adjust the height adjuster for suitable height to work platform, aim at guide pin hole, insert the service truck to switchgear body, and lock closed. Take hold of the sliding handle, Pull to sliding handle inside, release truck closedown, and pull out the VCB truck to service truck. Release sliding handle while the VCB truck is suitable position, ensure the track is locked with service truck. Take hold of lock handle of service truck frontage, pull toward left, make it break away from switchgear body. When, you will be able to remove easily the VCB truck to safe station and storage properly. Take progress of the action, should not push the VCB truck directly, but to the service truck. It is careful to push the service, and pay attention to that the floor is block off or sags and crests, take strict precautions against libration or roll-over to circuit breaker. Follow, open the cable vault door. When opening the cable vault door, must operate according to 6.2.5, if exiting closedown. Then release the back cover board. Firstly, release three nylon screw on top of back cover board for fixing press release board, then release fourteen bolts at both side of back cover board, here the back cover board may be released and taken.

Before split jointing switchgear, should release four handling ear and its fixed bolt on top of switchgear, check clapboard or press bar in the bus room and clapboard for lifting switchgear are installed properly. It is to connect the left and right switchgear together with ten m10*35 socket bolts for split jointing the switchgears. The ten haul nuts for split jointing are all ready well before the devices leave factory. While installing at site, only adjust the switchgears alignment, screw bolt into the haul nuts in neighbour switchgear from the switchgear nearside, make ten bolts all perch at in the first place, manual screw in, and then screw down one by one with spanner, the work is simple well.

Repeat to say about the procedure, split joint all switchgears one after another. Lastly, full install all back cover boards and control cable trough cover boards.

5.5 Installation and connection of busbar

- Install the bushing ,for switchgear with bus bar clapboard.
- Clean bus bar with cleansing and dry soft bibric, check insulation damage or no. According to 7.2 section state, clean lipa and feculence adhere to.
- Check the amount of the all-bus bar installation's accessories before installing bus bar. Cluding rectangle bus bar, M10 inner six-angle bolt, dish spring washer, nut, end-carriage, insulating boot and so on.
- Note: While the switchgear for different width is put together buder upon, the length of three phase bus bar is different, seeing about especially!
- To uninstall pressure release board before bus bar installation, the board and bolt all keeping kindly.
- Branch bus bar and main bus bar' connection should be four 8.8 class M10 inner six-angle bolt at least, the bolt end both all must add the dish spring washer. Note, dish spring washer' bell mouth must be exposed to the electrical conductor.
- Main bus bar installation should start from the middle switchgear yet, and connect toward to both side one after another. Firstly, install lowest phase bus bar one after another, make bolt, washer, female all to be fit well. When the phase bus bar all installing well, screw down all bolt according order with bushing-spanner and wring-spanner, main bus bar bolt's fastener power is 50Nm. Advise that after the bolt is checked, mark the sign, avoiding omission. Screw the sustain board (for support the insulating boot). While the phase main bus bar is screwed firstly with bolt, install insulting boot, and install middle phase, tiptop phase by the same way. Finally, full install the pressure release board.
- If meeting bus bar bridge installation, should refer to corresponding total assembly figures and accessory list.

5.6 Power cable and control cable connection

Cable connection must be according to local cable construction need. The following is only reference for construction.

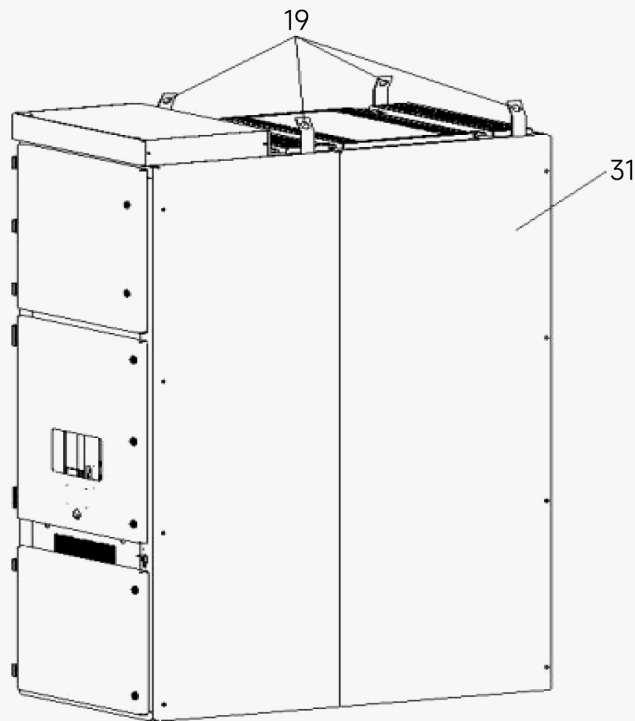
- Induct electric power cable, shell up the destine length.
- Install the end of cable according to the manufactory's instruction book.
- According to cable-core diameter, open the proper dimension circular hole on damp sealing india-rubber ring.
- Make the cable through in bottom board and on damp sealing india-rubber ring, connect wiring terminal, cover the heat-shrinkable sleeve, and connect to the cable connection terminal.
- Heat the heat-shrinkable sleeve, make it shrink, covering the bareness part of the cable core.
- Install the bottom board, cover closing damp sealing india-rubber ring, fasten the cable with cable clip.
- Send the control cable in the nearside control line trough (Figure 5-2).
- Shell up the cable join-box, fasten the cable on the top of line through. Turn up the terminal board frame, lead the control cable core in the low voltage vault D.
- According to the wiring diagram, connect the control line to the corresponding terminal.
- Lead the control line to the border switchgear through bushing hole (Figure 5-3).

5.7 Grounding copper bus bar connection

Make the grounding copper bus bar of the border switchgear connecting one after another, coming into the unified one. When the switchgear leave factory, the short join copper bus bar have been fixed on the main grounding bus bar starboard. When installation, unlade the join copper bus bar, through the preformed long-square hole, fixing it on the main grounding bus bar. The connection of the switchgear main grounding bus bar with distribution electricity house earth screen may be through the connection cable, grounding cable importing may be through the control cable obligate hole, connection through connection terminal.

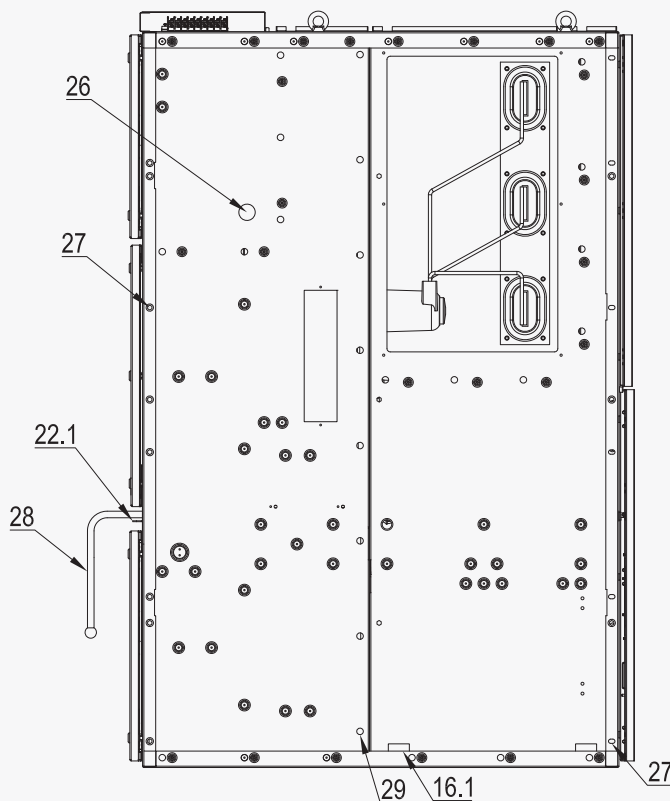
5.8 Installation ending

- Check the switchgear paint is shatter or no. If being, must repair. (See Section 7.3.1)
- Check bolt connection is in good condition or no, especial the bus bar and grounding system bolt on locale installing, must be all screw down.
- Clean the switchgear carefully.
- Full install the cover board removed during installation and wiring.
- Insert the circuit-breaker to the switchgear.
- Check disconnected contactor and interlock machine is flexible or no, daub newly Isoflex Topes NB52 anti-friction material for required part.



No.	Description
19	Handling ear
31	Closed board

Figure 5-1 End switchgear with backboard and terminal board



No.	Description
26	Through hole for control line bushing hole
27	Inter-nut for switchgear put together
28	Earth switch operating grip
22.1	Earth switch operating slide
29	Through hole for putting switchgear to-gether
16.1	Exceeding hole for main grounding bus bar

Figure 5-2 Rear elevation for switchgear side

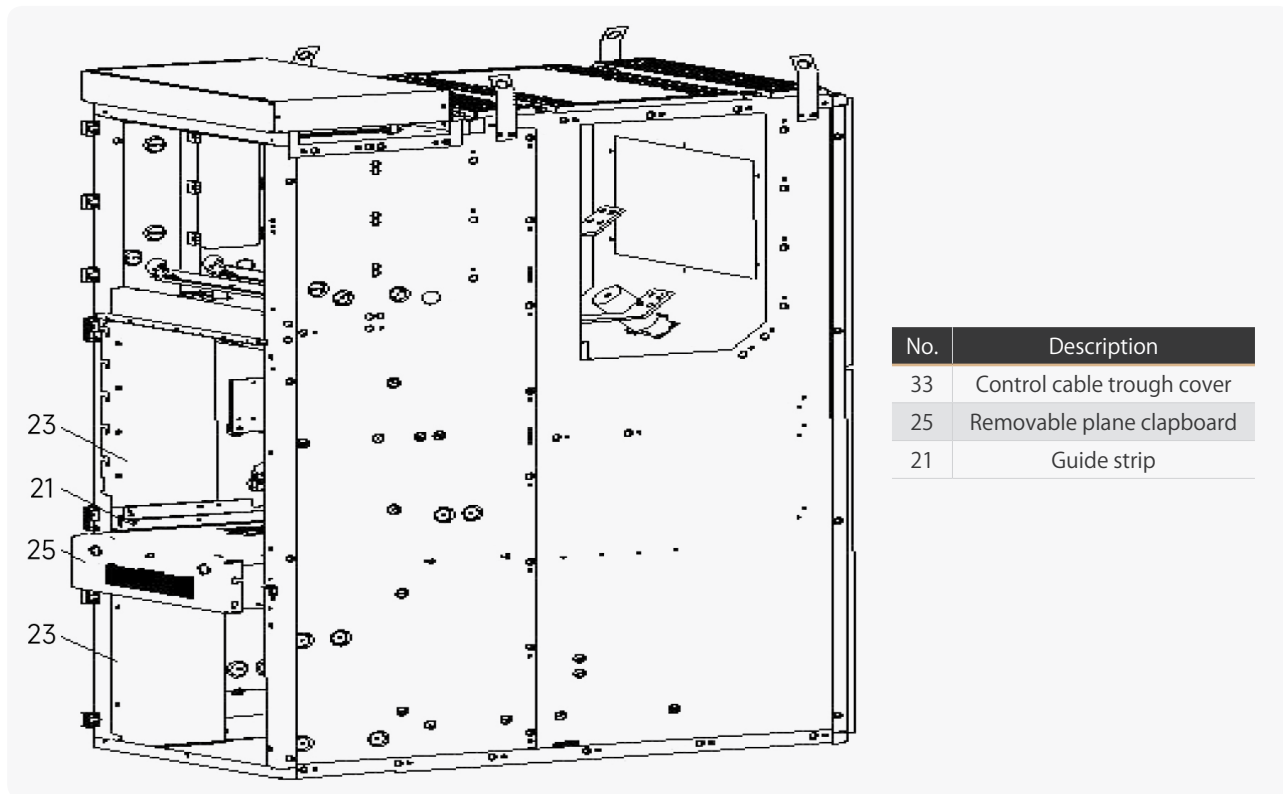


Figure 5-3 Seeing from the switchgear face, plane clapboard has been drawing out

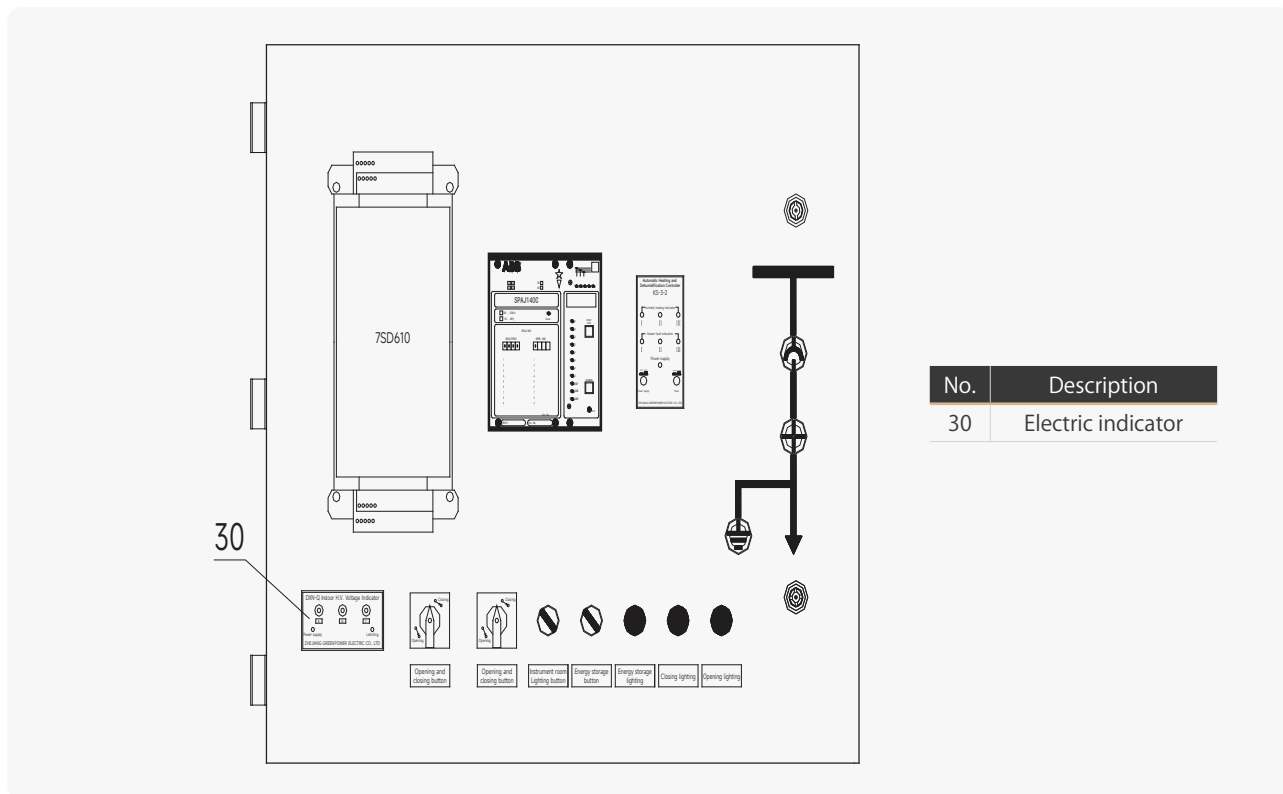


Figure 5-4 Low voltage vault door control and instrument device

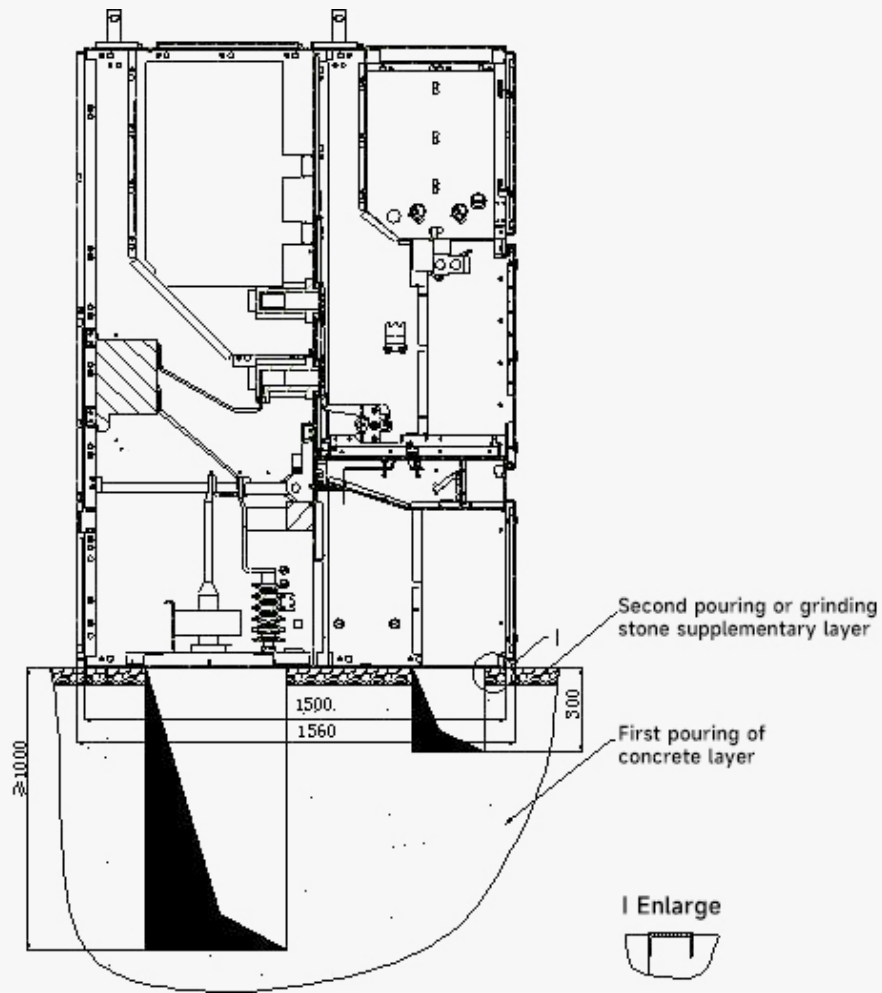


Figure 5-5 Type section figure of distribution electricity's house

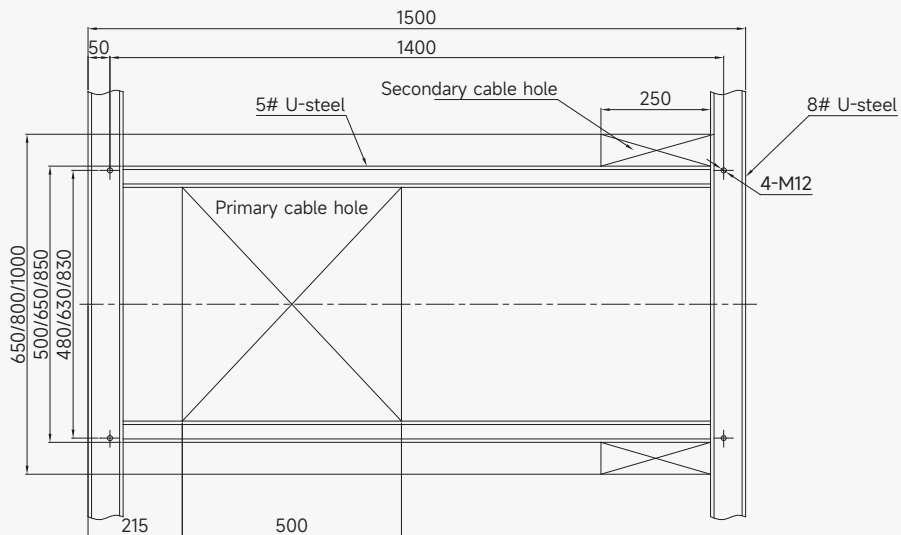


Figure 5-6 Three type foundation frame for width of 1000, 800, 650mm

Ensure that installation, operation and maintenance are carried out by specialist electricians only. They make acquainted with switchgear, think much of GB and IEC standard, and other special institution and local safety regulations, work regulations and operation instruction.

6.1 Start-up

6.1.1 Preparation work

In preparation for commissioning, the following work should be carried out prior to connection with the high voltage power supply:

- Check the technique data of the switchgear nameplate is agree with the running electric power system or no.
- Perform a visual examination of the switching devices, withdrawable parts, isolating contacts, insulating parts, etc.
- Check the connection of the main grounding bar to the grounding rail of the switchgear.
- Check the paintwork for damage and touch up the panel in where necessary section 7.3.
- Clean all the foreign matter, such as tools, leaving materials.
- Clean the switchgear, rubbing down insulating parts with a clean, soft, non-fraying and dry cloth. Remove greasy or adhesive dirt according to section 7.2.
- Full install the cover board removed during installation, wiring and testing.
- Check breaker pole cover (non-install for high-current circuit-breaker) is correct or no.
- Remove the transport covers etc. on breaker pole (while pasting the singe).
- Make progress of the power frequency voltage test according IEC 298 or GB3906. Should pay attention to voltage transformer and cable etc especially.
- Ensure all gate board is lock closed.
- Switch on assistant auxiliary power.
- Proceed switchgear operation test by manual or electric control mode.
- Check machine and electric interlock validity in no force condition.
- Set the protective device in the switchgear to the required values and check their function with test equipment.
- Instruct the local operators in the fundamental details of regular handling of the switchgear.
- Check readiness for running and switch state for device electrical system.

According to the regulation, should check out the neighborhood following device: Power cable, auxiliary cable, secondary power, distance control system, grounding system, distribution electrical house device, distribution electrical house status, and so on.

6.1.2 Start-up

- Dive into heater ahead of 48 hours, according to condition regulation.
- Comply with all relevant safety regulations. Ensure that the circuit-breakers in the system are in the OFF position.
- Remove grounding line and shorting stub inside of danger work area.
- Energize the feeder cables.
- Energize the feeder switchgear according to regular program, observing signal and indicator.
- While having a few entering route and switchgear group, should check phase-sequence (see section 6.3.2).
- Make progress of all the test, and check up all the function by high voltage power supply energized.
- Pay attention to all irregular conditions.

6.2 Switchgear operation (Figure 6-1)

Carry out switchgear operation with all the doors closed.

6.2.1 VCB Truck

Insert the truck from the test/disconnected position to the service position.

- Insert the control wiring plug contact to control wiring plug-in.
- Ensure that the circuit-breaker is in the OFF position.
- Insert the handle crank to the faucet of the screw mandrel mechanism.
- Turn the crank clockwise until the stop is reached (about 20 turns). When the truck is in operation position.
- Observe the position indicator.
- Draw out the hand crank, keep it non-scanning, prevent the truck move out, circuit-breaker don't arrive proper position, for influencing switch indication and control.

Note:

The trolley doesn't stop any centre position in service position and test/disconnected position.

Remove the trolley from the service position to the test/disconnected position.

Reverse the procedure described above for insertion into the service position.

- Observe the position indicator.
- Remove trolley from the test/disconnected position to repair position.
- Open the door of the circuit-breaker compartment.
- Release control wiring plug and engage it in the storage position of the removing part.
- Remove the service truck to the switchgear face, adjust the truck high with truck high adjuster, insert the guide pin to the orientation-hole in trouble-free, make the service truck lock-in with switchgear by lock key.
- Push down the sliding handle, release inter-lock keeping in track and switchgear, draw out the track to the service truck. Release sliding handle, ensure the track is locked with service truck.
- Operate lock key release lever, push the service truck from switchgear.
- Remove the truck from repair position to the test/disconnected position.
- Reverse the procedure described above for remove the circuit-breaker from the test/disconnected position to service truck.

6.2.2 VCB (Figure 6-1)

For operation instruction refer to operation manual of VCB.

Spring charging

- VCB charging is self-motion, for having the charging motor. But the charging motor is mangled, must manually charge.
- Insert the charging lever to faucet, turn up and down, until storage energy state (about 25) is displayed for having the manual charging motor. While storage energy state is reached, charging mechanism trip self-motion. Storage lever can not turn up and down.

VCB OFF and ON

- Operate local or distant control knob, observe the indicator of VCB OFF and ON, while the VCB operation turn one circle, operation counter will add to one count self-motion.
- The relation for Operating procedure and charging state refer to list 2 and list 3.

Charging state indicator showing:



Non-storage energy



Storage energy

6.2.3 Earth switch (Figure 6-1)

Earth switch has a fleet close mechanism.

Only the withdrawable circuit-breaker part locates on test/disconnected position, grounding switch operation is permitted. Only the switchgear door is closed, and closedown state is released, permit that grounding switch is closed.

Manual OFF and ON

- Press operating slide to the operation lever recess socket down. (When the grounding switch is closed, it is already in this position!)
- Insert operating lever which is now released for operation.
- Turn the lever clockwise, closing grounding switch; Turn the lever anti-clockwise, opening grounding switch. Turn angle is approx 180°, action should be link up.
- Observe the mechanical/electrical position indicator of grounding switch.
- Remove operating lever. Operating slide remains open if the grounding switch is in the closed position.

6.2.4 Cable vault door

Only the grounding switch is closed, opening cable vault door is permitted, only cable vault door is closed, opening grounding switch is permitted, if cable vault door having machine or electric force closedown device.

For operating procedure following:

- 1) Remove removing circuit-breaker to test position or switchgear out.
- 2) Operate grounding switch to closing position.
- 3) Release cable vault gate lock by special key, open cable vault door.
- 4) After completing examine and repair, close cable vault door.
- 5) Operate grounding switch to opening position.
- 6) Push the removing circuit-breaker to test position or service position.

6.2.5 Electric/machine indication/supervisory (Figure 6-1)

On switchgear running, take stock of all the running data and state instruct which are inside control area, Pay attention to all irregular conditions.

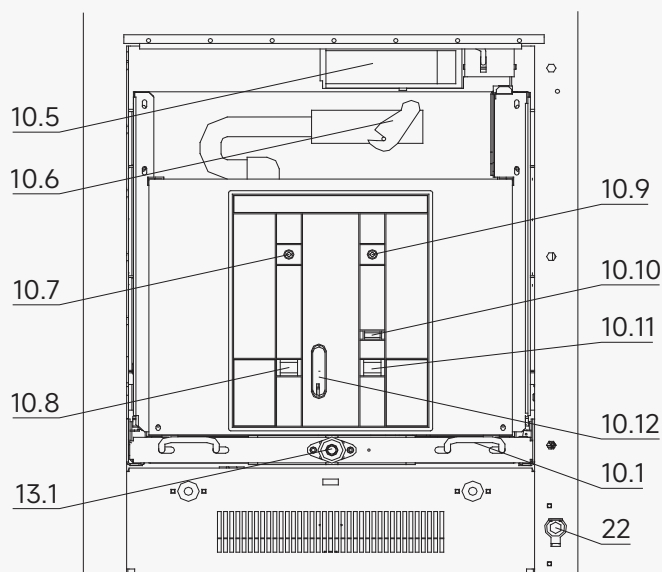


Figure 6-1 VCB Manual mechanism

- | | | |
|--------------------------------|--|---|
| 10.1 Sliding handle | 10.8 Charging condition indicator | 10.12 Charging lever (using only manual charge) |
| 10.5 Control wiring plug seat | 10.9 Mechanical OFF push-button | 13.1 Spindle machine hand crank faucet |
| 10.6 Control wiring plug | 10.10 Mechanical operation cycle counter | 22 Grounding switch operation machine |
| 10.7 Mechanical ON push-button | 10.11 Mechanical position indicator | |

7.1 General

Maintenance is used for preserving operation without fault and winning the longest working life of switchgear. It comprises the following closely related activities:

- **Inspection:** The actual running condition acknowledgement.
- **Servicing:** Measures to maintain the specified running condition.
- **Repair:** Measures to restore the specified running condition.

Note:

Maintenance work can only be performed by fully trained personnel. They make acquainted with switchgear, attach importance to IEC, other related safety rules defined by technical organization and other important guide rules. It is recommended that after-sales service personnel should be called in, at least during the performance of servicing and repair work.

The inspection and servicing intervals (maintain cycle) for some equipment/ components (e.g. parts subject to wear) are determined by running time, operation frequency level and number of short-circuit breaking and so on. The servicing intervals for other components are determined by operation mode on specific situation, load level and environmental influences (consist of pollution and corrosion air).

It is required that obeying this instruction book and operation guide for breaker and load switch on specific situations.

It is advised that obtaining the detailed date (such as specific work conditions) from technical date of switchgear when it is required.

7.2 Inspection and servicing

Inspection of the switchgear should be carried out approximately every 2 to 5 years, according to the operation conditions and local environment.

Inspection work contains (is not limit to) the following:

- Isolate the working area and make sure that the power mustn't be returned.
- Inspect switching device, control, interlocking, protection, signal and functions of other devices.
- Check the surface condition of the isolation contact. Move the truck, put up the valve and lockup the valve with padlock, then check the contacts by eye-measurement. When the galvanic silver coating on the contact parts is worn to such an extent that the copper conductor material below becomes visible, or when their surfaces are heavily corroded or show signs of other damage or overheating (surface off-color), replace the contact parts.
- Check accessory and auxiliary equipment of switch. Check the insulating board to keep them dry and clear.
- External discharge mustn't occur on the surfaces of equipment at operating voltage. It can identification from the phenomenon such as noise, off-flavor and glow.

Basic servicing and inspection are necessary work, contains the following contents:

- Clean carefully the equipment, especially on insulating material surfaces when founding to be dirty (contamination may also be caused by salt, mould fungus, insects or humidity when the switchgear is operated in tropical climate). Remove dry dust deposits which do not adhere strongly with a soft dry cloth. Remove more strongly adhering dunghill, e.g sticky/greasy dirt, with a cloth soaked in a slightly alkaline household cleanser, then wipe off with clear water and dry carefully. Use no halogen cleanser for insulation material and smeary seriously components. Please obey operating instruction manual and related guide of manufacturer for safety.
 - * Trichloroethane, trichloroethylene or tetrachloromethane is prohibited using.
- It is useful generally that coat flat silicon panniculus adiposus to repair provisionally on the surfaces which discharge when external discharge phenomenon occurs. About permanent resolvent for this problem, it is suggested that consult with GreenPower.
- Make sure that the bolt fastening of bus bar and earth system is tightened and the functions of isolating contact system are correct.
- Please add lubricating oil when the lubricated between the truck machine which insert system and point of contact is insufficient or disappeared.
- Add oil on slip parts and axletree surfaces in switchgear (e.g valve, interlocking, guide system, screw mandrel machine and truck trolley and so on). Add lubricating oil on places which need oil after cleaning.
- Obey servicing guide in specific instruction manual of switchgear.

7.3 Repair

7.3.1 General repair

- Repair immediately when the lacuna is discovered.
- Cleanup drastically rust on paint area which is damaged of armor plate and other steel components through machine way (such as copper brush), lapped finishing lightly around area on paint floor and remove oil dirt, then wipe anti-corrosive primer immediately and wipe top-coat when the primer is dry. Notice using consistent paint only.
- Clean up white rusty stain on surfaces of galvanization and chromeplate function component. Scrape off rusty stain mote using dry, clean, un-fall silk soft cloth. Degrease after that the equipment has fixed. Wipe primer immediately and wipe top-coat when the primer is dry.
- Move and running parts can not be painted, shall be spread lubricating oil equably.

7.3.2 Replacing components

Please contact GreenPower about replacing components and manage according to specific complexions.

7.4 Spare parts

Provide a comprehensive spare parts list. Please give clear indication of standard of relevant switchgear or breaker when spare parts are stocked.

List 2 Corresponding relation of operation program and charging condition

Breaker with electric charging machine, truck on service position

Operation sequence (Switchgear door has closed)	Result of operation		Possible subsequent switching operation
	Breaker position	Charging condition	
Switch on charging motor	○		Charging
Automatic charging	○		Close-Open
Close breaker ... and			Open
Automatically (re-)charge			Open-Close-Open or Auto-reclosing sequence
Open breaker	○		Close-Open
Close breaker ... and			Open
Automatically (re-)charge			Open-Close-Open or Auto-reclosing sequence
Autoreclosing sequence	○		(Automatic charging) Close-Open
(Activation via protection system) Close			
Open	○		
Automatic charging	○		
Close breaker ... and			Open
Automatically (re-)charge			Open-Close-Open or Auto-reclosing sequence

Test machine operation of breaker when the truck in test position (control wiring male contact plug into patera).