Installation and Operation Manual

GreenPower

GPM2.1

Low Voltage Switchgear
Drawer Type

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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01 Product General

1.1 Overview

The GPM2.1 low voltage drawer switchgear produced by GreenPower adopts standard modules and is factory assembled low voltage drawer switchgear. It is suitable for AC 50/60Hz, rated working voltage <660V, and the power supply and distribution systems rated current 6300A and below, are used for electric energy distribution, conversion, control and reactive power compensation.

GPM2.1 cabinet frame is made of high quality aluminum-zinc-coated steel plate or high quality cold-rolled steel plate to be bent into parts, which are connected to each other by self-tapping lock screws or hexagonal screws, and then add corresponding doors according to the needs of program changes, sealing plates, partitions, mounting brackets, busbars, functional units and other components are assembled into a complete device. The size of the components in the device and the compartment size are modularized (modulus unit E=25mm). As a new generation of low voltage withdrawable switchgear, it has the following characteristics:

1 The structure is reasonable and the technical level is high. The rated current carrying capacity, breaking capacity and dynamic thermal stability of GPM2.1 switchgear are higher than other types of low voltage switchgear, and it is easy to maintain, safe and reliable.

2 Good protection performance. GPM2.1 is a fully isolated switchgear, the internal compartment meets the requirements of IEC439-1 "Form 3b" or "Form 4b" as ordering, and the enclosure protection grade is IP3X, IP31,

IP32, IP4X, IP41, IP42, IP43, IP5X, IP54 as ordering.

3 The interlock is reliable. GPM2.1's anti-misoperation interlock is jointly completed by the circuit breaker operating handle mechanism and the drawer position mechanical interlocking operating mechanism. Its design is accurate and logical, which can effectively prevent various possible misoperations and can be used with the operation mode to flexibly realize interlocking between cabinets.

4 There are many plans and it is complete and easy to combine. GPM2.1 takes 8E as the basic unit, and the functional units are 8E/4, 8E/2, 6E, 8E, 12E, 16E, 24E, 32E, 72E. At most 36 functional units can be arranged in one MCC cabinet, and it can be realized. The mixed installation of PC and MCC provides favorable conditions for reducing the number of cabinets and flexibly selecting solutions.

GPM2.1 low voltage drawer switchgear is a control device with advanced technology, stable performance, reasonable structure, convenient use, safe and reliable. It has been widely used in power supply and distribution systems such as power generation, construction, steel, cement, mining, and petrochemical.

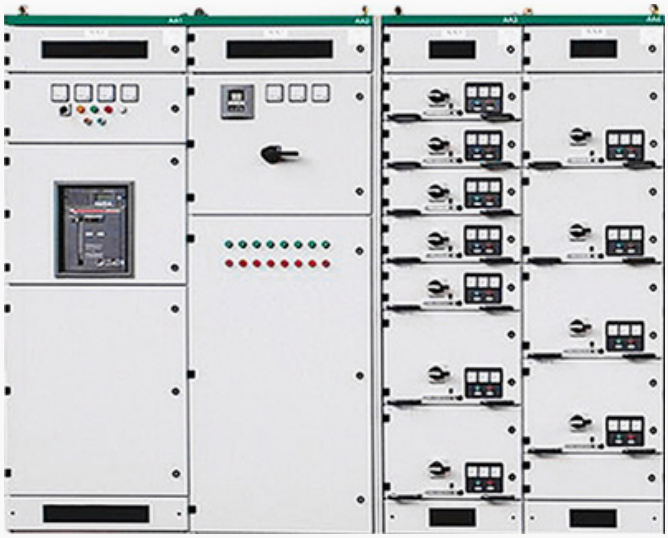


Figure 1-1 GPM 2.1 Draw-out type Switchgear (Black surface plan)

Figure 1-2 GPM 2.1 Draw-out type switchgear (Gray surface plan)

1.2 Standards and specifications

GPM2.1 switchgear is designed and manufactured according to the following standards:

National Standard Electrician Committee Standard:

IEC61439-2011 "Low Voltage Switchgear and Control Equipment"

China National Standard:

GB/T 17626-2008 "Electromagnetic Compatibility Test and Measurement Technology"

GB/T14048_1-93 "General Regulations for Low Voltage Switchgear and Control Equipment"

GB7947-87 "Color Marking of Insulated Conductors and Bare Conductors"

GB7251-2013 "Low Voltage Switchgear and Control Equipment"

JB/T9661-99 "Low Voltage Withdrawable Switchgear"

JB4012-85 "Low Voltage Air Type Isolator, Switch, Isolating Switch and Fuse Combination Electrical Appliance"

GB3983_1-89 "Low Voltage Shunt Capacitors"

GB7947-87 "Color Marking of Insulated Conductors and Bare Conductors"

GPM2.1 switchgear also meets the requirements of German standard VDE 0660 Part5, British standard BS EN61439 and American NEMA standard.

At the same time, GPM2.1 switchgear also has customized solutions designed for areas with frequent earthquakes, offshore drilling platforms, and marine switchgear (unconventional products must be specified when ordering)

1.3 Conditions of use

- Ambient temperature: The ambient air temperature does not exceed +40℃, not lower than -5℃, and the average value measured within 24 hours does not exceed +35℃.
- Environmental humidity: The air is clean, and its relative humidity does not exceed 50% at the highest temperature +40℃, and a higher relative humidity is allowed at lower temperatures. For example, it is 90% at +20℃, but considering that due to temperature changes, moderate condensation may occasionally occur.
- The temperature range is between 25℃ and +55℃, suitable for transportation and storage, and can reach +70℃ in a short time (≤ 24h).
- The altitude does not exceed 2000 meters.
- The earthquake intensity does not exceed 8 degrees.
- Environmental pollution level: Level 3.

Note:

1 If the selected electrical components cannot meet the above working conditions, the manufacturer shall negotiate with the user.

2 When the conditions of use are not in conformity with the above working conditions, the user sh all propose to the manufacturer for settlement through negotiation.

02 Technical Parameters and Structure

2.1 Electrical data

Items		Unit	Data
Rated working voltage	The main circuit	V	380, 660
	Auxiliary circuit	V	AC220, AC380, DC110, DC220
Rated insulation voltage	The main circuit	V	400, 690
Rated impulse withstand voltage (1.2/50μs)	The main circuit	kV	6, 8
Rated working current (when IP3X)	Horizontal bus	A	≤ 5000 (Single-sided operation cabinet), ≤ 3600 (Double-sided operation cabinet)
	Vertical bus	A	1000 (Withdrawable type), 2000 (Plug-in MCCB)
Rated short-time withstand current	Horizontal bus	kA/1S	50, 65, 80, 100
	Vertical bus	kA/1S	50, 65, 80
Rated peak withstand current	Horizontal bus	kA/0.1S	105, 143, 176, 220
	Vertical bus	kA/0.1S	105, 143, 176

2.2 Protection level

The protection level of the switchgear: the standard enclosure is IP3X, and the options are IP31, IP32, IP4X, IP41, IP43, IP5X, IP54, IP55. When IP5X, IP54, IP55 are selected, the double door structure must be adopted (see Figure 2-1).

When selecting a higher degree of protection, due to the decrea se in heat dissipation capacity, th e derating of the switchgear must be considered. When selecting IP43, it is recommended that the components in the switchgear be designed according to one level of amplification; when selecting IP5X, IP54, and IP55, it is recommended that the components in the switchgear be designed according to two levels of amplification.

When the drawer is connected, tested, and the main switch is closed or opened, the enclosure protection level remai ns unchanged; when the drawer is in the separation position, the enclosure protection level is IP2XD; when the drawer is in the removed position, there are dangerous live parts in the compartment, The protection level of the room is IPXXB.

The form of each compartment in the switchgear meets the requirements of 3 or 4 in IEC61439-1, and the protection level of the compartment reaches the requirement of IP2X.

Figure 2-1 GPM 2.1 (IP54) switchgear

2.3 Structure type

2.3.1 Structure overview

The basic framework of the low voltage switchgear structure is a combined assembly structure. The cabinet body sealing plate is made of high quality cold-rolled steel plate. All frames, internal partitions and functional units are made of high quality imported aluminum-zinc steel plate. The film automatically covers the cutting opening with the cutting knife, so the cutting opening has a strong self-healing ability and will not corrode or rust. The rest of the metal structural parts of the cold-rolled plate of the cabinet have been galvanized anti-corrosion treatment.

The low voltage switchgear uses C-type straight columns, assembled by steel self-tapping screws and 8.8 grade bolts. It has sufficient mechanical strength to ensure that the components are not shaken or deformed after installation and operation. Each cabinet in the switchgear is divided into three compartments, namely the horizontal bus compartment, the functional unit compartment and the cable compartment. The compartments are separated from each other by a whole piece of high strength flame retard ant environmentally friendly plastic functional board and aluminum-zinc clad board.

The GPM2.1 drawer cabinet takes 8E as the basic unit (E=25mm), and the functional units are 8E/4, 8E/2, 6E, 8E, 12E, 16E, 24E, 32E, 72E, and one MCC cabinet can be arranged at most 36 functional unit, which can realize PC and MCC mixed installation.

GPM2.1 Low voltage drawer type switchgear has the following cabinet types according to the purpose and cabinet structure:

1 PC cabinet: Mainly install frame type circuit breakers or large capacity knife-fuse switches, which are generally used for incoming switchgears and large current distribution outgoing cabinets.

2 MCC cabinet: mainly install plastic case switches, contactors, thermal relays or small capacity knife-melt switches, generally used in motor control centers or low current power distribution centers.

3 PC and MCC mixed cabinet: part of the switchgear is a PC circuit and part is an MCC circuit. The mixed structure can improve the installation efficiency of the cabinet components and reduce the number of switchgears.

4 Reactive power compensation cabinet: mainly install low voltage power capacitors and its corresponding control loops for low-voltage reactive power compensation of the system.

GPM2.1 (IP54) has a transparent glass door, beautiful appearance, and high anti-fouling, dust-proof, splash-proof ability, and can meet the requirements of high protection level.

According to actual project requirements, the MCC cabinet has two structural forms: withdrawable and plug/fixed. The functional unit of the withdrawable switchgear is in the form of a drawer, and components can be replaced and overhauled after the drawer is pulled out; the functional unit of the plug-in switchgear cannot be removed, and pluggable switches and other components are used for replacement and overhaul.

At the same time, according to on-site installation conditions and other conditions, the withdrawable GPM2.1 switchgear has two types of side outlet and rear outlet. The cable room of the side outlet switchgear is on the side of the switchgear, and the horizontal busbar is arranged at the rear of the cabinet; The cable room of the rear cable outlet switchgear is designed at the rear of the switchgear, and the horizontal bus bar is arranged on the top of the cabinet. For both switchgears, the cable outlet can be at the bottom or top of the cabinet.

2.3.2 Withdrawable switchgear

Busbar system (top busbar)

The horizontal busbar is arranged at the front or rear of the top of the cabinet.

The separate protective conductor (PE wire) that runs through the entire a rrangement is connected to the exposed otective grounding system. Moreover, the rrent. According to the system requirements, the switchgear can be three-phase four-wire (TN-C) or three-phase five-wire (TN-S or TN-C-S).

The vertical busbar of the MCC cabinet is assembled in the insulating functional board, which can prevent the phase-to-phase discharge to the vertical busbar caused by the switching arc, and improve the electric shock protection capability and safe operation rate of the product.

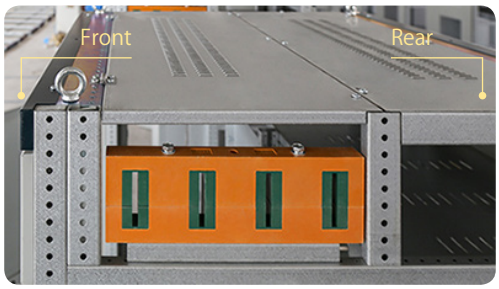


Figure 2-2 Top horizontal busbar

Drawer unit

The total usable height of the drawer type switchgear is 72E (E=25mm). It is arranged up, down, left and right. The minimum height of the unit is 8E (200mm). There are seven types of drawer units: 8E/4, 8E/2, 8E, 12E, 16E, 20E, 24E. When installing the smallest 8E/4 drawer, each cabinet can be equipped with up to 36 drawer units, and the double-sided operation cabinet can be equipped with up to 72 drawer units.

The maximum capacity of the drawer unit is shown in Table 2-1.

Table 2-1 Drawer capacity of withdrawable GPM2.1 switchgear

Unit specifications	Maximum unit capacity			Effective installation space (height×width×depth) (mm)
	Maximum current of plastic case switch (A)	Maximum motor control power for direct start (kW)	(Y/△)Maximum motor control power in starting mode (kW)	
8E/4	30 (3P, 4P)	7.5	—	140 × 120 × 275
8E/2	50 (3P, 4P)	15	7.5	140 × 260 × 275
8E	225 (3P), 125 (4P)	30	22	160 × 505 × 275
12E*	250 (3P, 4P)	45	37	260 × 505 × 275
16E	315 (3P, 4P)	75	55	360 × 505 × 275
20E*	315 (3P, 4P)	110	75	460 × 505 × 275
24E	400 (3P, 4P)	160	110	560 × 505 × 275

Note: "*" indicates the 12E and 20E drawer units are unusual specifications.

The drawer unit has a secondary plugin, which can be used to draw control signals from the outside of the control loop. Drawer units generally have 16 secondary isolation plugin. Except 8E/4, other drawer units can be increased to 32 lead terminals, and each lead-out unit can be connected with two 1.5~2.5mm^2 multi-strand flexible wires.

8E/4 and 8E/2 drawer units are surrounded by flame-retardant plastic partitions to isolate the units, so that the units have strong insulation and isolation; 8E and above drawer units are made of aluminum-zinc steel plate or high-quality cold-rolled steel plate. Has excellent mechanical strength and grounding performance.

The drawer unit has a reliable mechanical interlocking device to prevent misoperation and plugging and unplugging under load, and the closing, testing, moving and separating positions are indicated by the operating handle (see Figure 2-3). Up to three padlocks can be added after each position is positioned. For the detailed introduction and operation mode of the drawer unit interlocking device, please refer to the operation part of 7.3.2 drawer type switchgear.

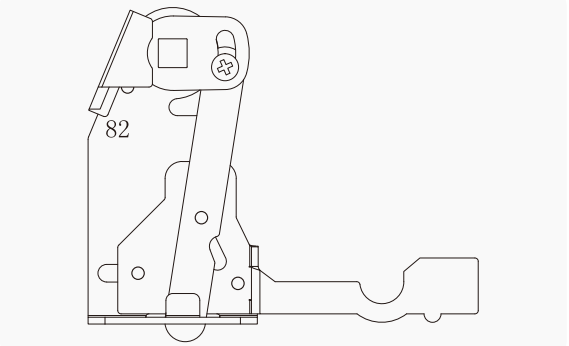


Figure 2-3 Interlocking device of drawer unit

PC Cabinet

According to the switch capacity and size requirements, the PC cabinet can have various widths. Various types of frame type circuit breakers or knife-fuse switches can be installed in the PC cabinet, and 1 to 3 frame type circuit breakers can be installed as required.

When installing two frame-type circuit breakers, they are usually arranged up and down, and they can also be arranged left and right as needed. In the left-right arrangement, the width of the cabinet body is increased compared with the up-and-down arrangement, but the heat dissipation conditions are better than the up-down arrangement, and it is better than the up-and-down arrangement in the case of long-term full-load operation.

When the horizontal busbar cabinet is arranged behind, when the rated current is >4000A, the busbar adapter cabinet must be added 600mm wide; when the horizontal busbar cabinet is arranged on the top, the busbar adapter cabinet with 300mm width must be added. For details, please refer to the first plan diagram.

Under normal circumstances, it is recommended to separate PC and MCC, and arrange frame circuit breakers and drawer units in different cabinets for convenient use and maintenance; but in special circumstances, it is allowed to mix PC and MCC in the same switchgear Both frame type circuit breakers and small current motor control units are installed. When using mixed installation, the PC should be arranged in the upper part of the cabinet, and the drawer unit should be arranged in the lower part. There should be an 8E empty room between the PC and the drawer unit as the transfer of the vertical bus. For details, please refer to the primary plan 32 to 34.

Reactive power compensation cabinet

According to the system situation, GPM2.1 low voltage drawer switchgear is designed with reactive power compensation cabinet for low voltage compensation. The reactive power compensation cabinet is equipped with low voltage capacitors, and corresponding control and protection components such as contactors, low voltage fuses, reactors, etc., and an automatic reactive power compensation controller can be installed as needed to realize automatic control of reactive power compensation.

According to the situation of electrical equipment, the reactive power automatic compensation cabinet is designed with a reactive power compensation scheme that approximates a sine wave in the power grid (see the primary plan 106 to 110) and a reactive power compensation plan equipped with a filter reactor (see Figure 11 and the primary Plans 111 to 114).

The primary scheme 106 to 110 is suitable for the normal situation where the ratio of the apparent power of the harmonic source to the apparent power of the transformer (Gh/Sn) is less than 20%. According to the difference of reactive power compensation power, there are a variety of cabinet widths for users to choose.

The primary scheme 111 to 114 is suitable for the situation of 20%<Gh/Sn<60%. It adopts the series connection of reactor and capacitor, and has the dual functions of harmonic absorption and reactive power compensation. There are two standard series of reactance rate p=XL/Xc×100%=7%, tuning frequency fR=189Hz and p=6%, fR=204Hz for selection:

1 When p=7% and fR=189Hz, a small amount of 5th harmonic can be absorbed. It also blocks the power grid containing harmonics.

2 b) When p=6%, fR=204Hz, it can absorb about 50% of the 5th harmonic. According to the actual situation of the power grid, the above parameters can also be configured according to user requirements.

Incoming and outgoing of cable room

According to actual needs, the incoming and outgoing cables of the GPM2.1 switchgear can be taken in and out of the side of the cabinet, or can be taken in and out of the rear of the cabinet (see Figure 2-4). The horizontal bus is arranged on the top of the cabinet.

The incoming and outgoing cables of the GPM2.1 low voltage drawer switchgear can be taken in and out from the bottom or the top of the cabinet. For cabinets where the horizontal busbars are arranged behind the cabinet and the cables go out on the side of the cabinet, the upper and lower cable compartments can enter and exit at will within the standard cabinet size. (It is necessary to provide corresponding data to our company so that the corresponding openings can be arranged when the cabinet is produced).

For cabinets with horizontal busbars arranged on the top of the cabinet and outlets behind the cable cabinet, when the horizontal busbars are not greater than 3150A (including 3150A) and only one set of busbars are arranged, the upper and lower cable compartments can enter and exit at will within the standard cabinet size. When the horizontal busbar is larger than 3150A or two sets of horizontal busbars are arranged, it is necessary to equip a cabinet top inlet and outlet channel at the top rear of the standard cabinet (see Figure 2-5)

Figure 2-4 GPM2.1 Low voltage drawer switchgear outlet diagram

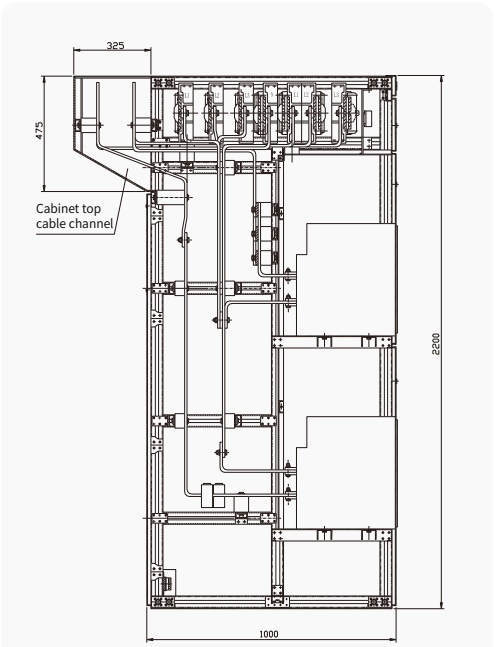


Figure 2-5 Rear Top outgoing cable channel

Dimensions and weight

See Table 2-2 and Table 2-3 for outline dimensions.

Table 2-2 GPM2.1 Low voltage drawer switchgear outline dimensions (single door)

Items	Unit	Height (H)	Width (W)	Depth (D)
PC Cabinet	mm	2200	500	1000
PC and reactive power compensation cabinet	mm	2200	600	1000
	mm	2200	800	1000
	mm	2200	1000	1000
	mm	2200	1200	1000
MCC Cabinet (side outlet)*	mm	2200	1000	1000**
MCC Cabinet (rear outlet)*	mm	2200	600	1000

Table 2-3 GPM2.1 (IP54) Switchgear outline dimensions (double door)

Items	Unit	Height (H)	Width (W)	Depth (D)
PC Cabinet	mm	2200	550	1000
PC and reactive power compensation cabinet	mm	2200	650	1000
	mm	2200	850	1000
MCC Cabinet (side outlet)*	mm	2200	1000	1000**
MCC Cabinet (rear outlet)*	mm	2200	650	1000

Note: "*" indicates the side outlet and rear outlet cannot be installed in the same arrangement.

"**" indicates the depth of the MCC cabinet with the bypass line can be reduced to 600mm, but when connecting with the 1000mm wide cabinet in the same arrangement, a busbar adapter cabinet with a width of 400mm must be added.

PC cabinets, reactive power compensation cabinets and double-sided operation cabinets with a width greater than or equal to 1000mm have no double-door structure.

The single cabinet weight of the GPM 2.1 low-voltage drawer switchgear is 500~800kg, which varies according to the structure and the types and quantities of components installed in the cabinet.

2.3.3 Plug-in/fixed switchgear

The pluggable switchgear adopts pluggable air circuit breaker to be fixedly installed, and the base is reliably connected to the busbar system, which simplifies the cabinet structure, reduces mechanical components, avoids the contact heat caused by the drawer structure, and the interlocking mechanism is complicated. The shortcomings improve the safety and reliability of operation.

Busbar system

The busbar of the plug-in switchgear is arranged on the top of the cabinet. According to requirements, one set or two sets of horizontal bus bars can be configured, both of which can be powered separately or in parallel, or one set is used as a working bus and the other set is used as a spare bus.

The maximum capacity of the vertical bus of the plug-in/fixed switchgear at IP3X is 2000A, and it is isolated by a grounded metal plate, which has excellent isolation performance and mechanical strength, while ensuring the product's electric shock protection capability.

The protective conductor (PE wire) and the exposed conductive parts (frame) that are set separately and run through the entire arrangement form a complete protective grounding system. Moreover, the PE bus can withstand a certain short-circuit current. According to the system requirements, the switchgear can be three-phase four-wire (TN-C) or three-phase five-wire (TN-S or TN-C-S).

Functional unit

The total usable height of the plug-in/fixed switchgear is 72E (E=25mm), arranged in up and down, left and right, and the minimum height of the unit is 2E (50mm). There are seven types of drawer units: 2E, 4E, 6E, 8E, 12E, 16E, 20E. When installing the 6E unit, each cabinet can install up to 12 functional units.

The maximum capacity of the functional unit is shown in Table 2-4.

Table 2-4 Pluggable/fixed GPM2.1 drawer switchgear unit capacity

Switch form	Unit specifications	Maximum unit capacity			Effective installation space (height×width×depth) (mm)
		Maximum switch current(A)	Direct start maximum motor control power(KW)	(Y/△)Maximum motor control power in starting mode (KW)	
Horizontal knife melt switch	2E	160	—	—	—
	4E	250	—	—	—
	8E	630	—	—	—
Plug-in circuit breaker	6E	225 (3P)	—	—	130 × 505 × 275
	8E	400(3P), 225(4P)	12	—	180 × 505 × 275
	12E	630(3P), 400(4P)	75	30	280 × 505 × 275
	16E	630 (4P)	132	45	380 × 505 × 275
Withdraw-able circuit breaker	20E	630 (3P, 4P)	—	—	460 × 505 × 276

All functional units are made of aluminum-zinc-clad steel sheet or high quality cold-rolled steel sheet, with excellent mechanical strength and grounding performance. The functional units, vertical bus bars and outlet terminals are all isolated from each other, ensuring the product's anti-fault and anti-electric shock capabilities.

The external operating handle and door on the functional unit have a reliable mechanical interlocking device to prevent misoperation and plugging and unplugging under load, and various positions of the switch are indicated by the operating handle. For detailed introduction and operation mode of functional units, please refer to 7.3.3 Operation section of pluggable switchgear.

PC and reactive power compensation cabinet

According to the switch capacity and size requirements, the PC cabinet can have various widths. Various types of frame type circuit breakers or knife-fuse switches can be installed in the PC cabinet, and 1 to 3 frame type circuit breakers can be installed as required.

For bus tie switchgear, a 300mm wide busbar transfer cabinet is required. For details, please refer to the first plan diagram. Under normal circumstances, it is recommended to separate PC and MCC, and arrange frame circuit breakers and functional units in different cabinets for convenient use and maintenance; but in special circumstances, it is allowed to mix PC and MCC in the same switchgear Both frame type circuit breakers and small current motor control units are installed. When using the mixed installation method, the PC should be arranged on the upper part of the cabinet, and the plug-in functional unit should be arranged on the lower part. There should be a 6E empty room between the PC and the functional unit as a vertical bus transfer.

According to the system situation, the pluggable GPM2.1 drawer type switchgear is designed with reactive power compensation cabinet for low voltage compensation. This type of cabinet is the same as the drawer switchgear, please refer to the Reactive Power Compensation Cabinet in section 2.3.2.

Incoming and outgoing cable room

The entry and exit positions of each unit are set behind the cabinet and form a separate functional compartment.

The incoming and outgoing cables can be from the bottom or from the top of the cabinet. When the horizontal busbar is not larger than 3150A (including 3150A) and only one set of busbars is arranged, the upper and lower cable compartments in the standard cabinet size can enter and exit at will; When the busbar is larger than 3150A or two sets of horizontal busbars are arranged, it is necessary to equip a cabinet top inlet and outlet channel at the rear and upper part of the standard cabinet. The channel size is the same as the drawer type switchgear (see Figure 2-4).

Dimensions and weight

See Table 2-5 and Table 2-6 for outline dimensions.

Table 2-5 GPM2.1 Drawer type switchgear outline dimension (single door)

Items	Unit	Height (H)	Width (W)	Depth (D)
PC Cabinet	mm	2200	500	1000
PC and reactive power compensation cabinet	mm	2200	600	1000
	mm	2200	800	1000
	mm	2200	1000	1000
	mm	2200	1200	1000
MCC Cabinet	mm	2200	600	1000

Table 2-6 GPM2.1 (IP54) Switchgear outline dimension (double door)

Items	Unit	Height (H)	Width (W)	Depth (D)
PC Cabinet	mm	2200	550	1000
PC and reactive power compensation cabinet	mm	2200	650	1000
	mm	2200	850	1000
MCC Cabinet	mm	2200	650	1000

The single cabinet weight of the plug-in switchgear is 500~800kg, which varies according to the structure and the type and quantity of components installed in the cabinet.

03 Introduction of Main Electrical Components

The components that can be used in GPM2.1 drawer switchgear are very flexible, and various leading products from internationally renowned companies such as ABB, Siemens, Schneider, Eaton, GE, Westinghouse, Fuji, Shihlin, Hager, LS, Mitsubishi, Hyundai, etc., Various domestic components can also be selected to realize the flexible combination of various schemes to meet the economic and technical requirements.

3.1 Primary circuit

The components in the GPM2.1 drawer switchgear can be flexibly designed and selected according to user needs. Under normal circumstances, frame type circuit breakers can choose ABB's Emax series, F series, Schneider's M series, domestically produced DW45, DW47, CW, RMW, YSA and other products; molded case switches can choose ABB's S series, Schneider The company's NS series, or domestically produced CM and other products; contactors can choose ABB's A series, EB series, Schneider's D2 series, N series, or domestically produced B series products; thermal relays can choose ABB's TU Series, Schneider's LR series, or domestic T series products. Other components can also be selected according to user needs.

If users need, our company's designers can assist users in design selection.

3.2 Secondary circuit

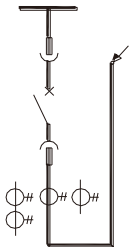
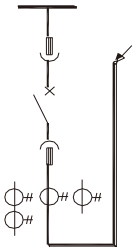
The measuring instruments, transfer switches, indicator lights and other secondary components in the GPM2.1 drawer switchgear can be equipped with various imported or domestic products according to the user's requirements. In principle, it is recommended to use the products of the supplier confirmed by Greenpower. To avoid problems with fit or quality.

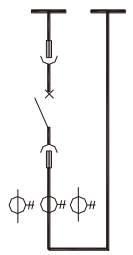
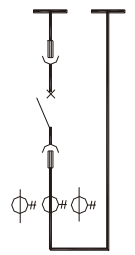
The secondary terminal blocks, wires, connectors and other accessories of the GPM2.1 drawer type switchgear are all products of internationally renowned companies or domestic high-quality products, and all have been inspected and confirmed by Greenpower to reduce failures caused by switching links possibility.

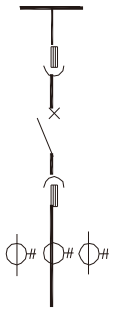
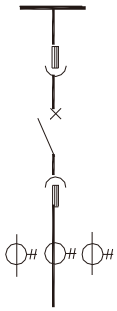
04 Main Connection Scheme

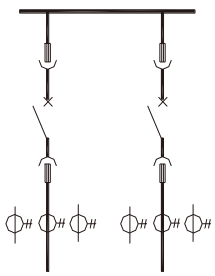
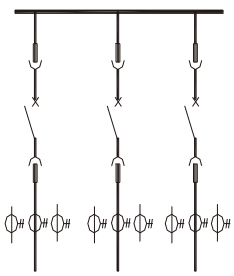
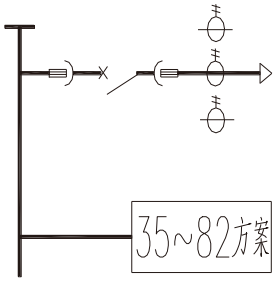
According to its basic structure, GPM2.1 drawer switchgear has various powerful wiring schemes. At the same time, if permitted, the main wiring can also be flexibly formed into various combinations, so that the same cabinet type has multiple functions; or according to the actual needs of on-site power distribution, certain changes can be made to a certain plan. Therefore, GPM2.1 drawer switchgear can flexibly expand the main wiring scheme to meet the various needs of users.

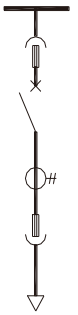
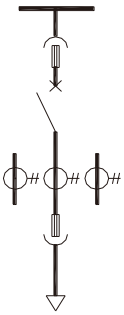
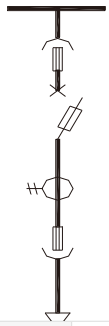
Listed below are the commonly used standard schemes of GPM2.1 drawer switchgears for reference by designers and users.

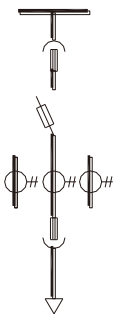
Plan No.	01	02	03	04	05	06	07	08
Primary diagram								
Cabinet width (mm)	500/550	600/650	800/850	1000	600/650	800/850	1000	1200
Unit height	72E	72E	72E	72E	72E	72E	72E	72E
Max working current (A)	1250	2500	3200	5000	1600	2500	3200	5000
Main equipment	E1~E2 800~1250 DW45 serial 400~1250 BHG-[]	E2~E3 1600~3200 DW45 serial 1600~3200 BHG-[]	E3~E4 3200~4000 DW45 serial 3200~4000 BHG-[]	E6 5000~6300 DW45 serial 5000~6300 BHG-[]	E1~E2 800~1600 DW45 serial 400~2000 BHG-[]	E2~E3 1600~3200 DW45 serial 2000~3200 BHG-[]	E4 3200~4000 DW45 serial 3200~4000 BHG-[]	E6 5000~6300 DW45 serial 5000~6300 BHG-[]
Application	Upward/outward line (3P Switch)				Upward/outward line (4P Switch)			

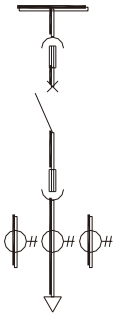
Plan No.	09	10	11	12	13	14	15	16
Primary diagram								
Cabinet width (mm)	500/550	600/650	800/850	1000	600/650	800/850	1000	1200
Unit height	72E	72E	72E	72E	72E	72E	72E	72E
Max working current (A)	1250	2500	3200	5000	1600	2500	3200	5000
Main equipment	E1~E2 800~1250 DW45 serial 400~1250 BHG-[]	E2~E3 1600~3200 DW45 serial 1600~3200 BHG-[]	E3~E4 3200~4000 DW45 serial 3200~4000 BHG-[]	E6 5000~6300 DW45 serial 5000~6300 BHG-[]	E1~E2 800~1600 DW45 serial 400~2000 BHG-[]	E2~E3 1600~3200 DW45 serial 2000~3200 BHG-[]	E4 3200~4000 DW45 serial 3200~4000 BHG-[]	E6 5000~6300 DW45 serial 5000~6300 BHG-[]
Use	Bus tie (3P Switch)				Bus tie (4P Switch)			

Plan No.	17	18	19	20	21	22	23	24
Primary diagram								
Cabinet width (mm)	500/550	600/650	800/850	1000	600/650	800/850	1000	1200
Unit height	72E	72E	72E	72E	72E	72E	72E	72E
Max working current (A)	1250	2500	3200	5000	1600	2500	3200	5000
Main equipment	E1~E2 800~1250 DW45 serial 400~1250 BHG-[]	E2~E3 1600~3200 DW45 serial 1600~3200 BHG-[]	E3~E4 3200~4000 DW45 serial 3200~4000 BHG-[]	E6 5000~6300 DW45 serial 5000~6300 BHG-[]	E1~E2 800~1600 DW45 serial 400~2000 BHG-[]	E2~E3 1600~3200 DW45 serial 2000~3200 BHG-[]	E4 3200~4000 DW45 serial 3200~4000 BHG-[]	E6 5000~6300 DW45 serial 5000~6300 BHG-[]
Use	Downward (outward) line (3P Switch)				Downward (outward) line (4P Switch)			

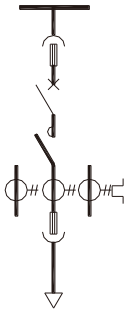
Plan No.	25	26	27	29	30	31	32
Primary diagram							
Cabinet width (mm)	500/550	800/850	1000	500/550	1000	1000, 600/650	1000, 600/650
Unit height	2 × 32E	2 × 32E	2 × 32E	3 × 24E	3 × 24E	24E(PC)+ 40E(MCC)	24E(PC)+ 40E(MCC)
Max working current (A)	2 × 630	2 × 1250	2 × 1250	3 × 630	3 × 1000	1600 (PC)	630 (PC)
Main equipment	S6 3P, 4P BHG-40II	E1~E2 800~1250 DW45 Serial 400~1250 3P BHG-60II	E1~E2 800~1250 DW45 Serial 400~1250 4P BHG-60II	S6 CM1-630 3P, 4P BHG-40II	E1~E2 800~1250 DW45 Serial 400~1250 3P, 4P BHG-60II	E1~E2 800~1600 DW45 Serial 400~1600 3P BHG-80II	S6 CM1-630 3P, 4P BHG-40II
Application	Feeder (top down in/out line)			Feeder (top down in/out line)		Feeder (top down in/out line)	

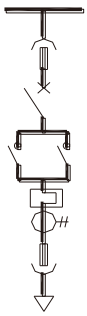
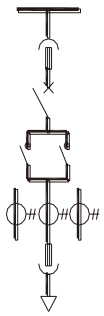
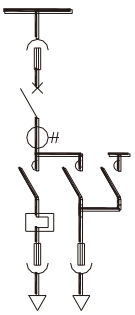
Plan No.	33	34	35	36	37	38	39	40	41
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650
Unit height	8E/4	8E/2	8E	8E	12E	16E	20E	8E/4	8E/2
Max Working current (A) IP3X	30	50	125	225	225	315	400	30	50
Main equipment (optional)	S503 CM1-63 3P, 4P BHG-30	S503 S1, S2 CM1 ≤ 100 3P, 4P BHG-30	S2-160 CM1-100 4P BHG-30	S2, S3 CM1-225 3P BHG-40II	S2, S3 CM1-225 4P BHG-40II	S3, S5 CM1 ≤ 400 3P, 4P BHG-40II	S5, S6 CM1 ≤ 630 3P, 4P BHG-60II	OS-63A FBCD32A 3P BHG-30	OS- 63 3P BHG-30
Application	Feeder, lighting								

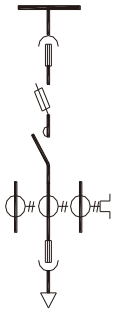
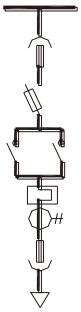
Plan No.	42	43	44	45	46	47	48	49	50
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	
Unit height	8E	12E	16E	2E	2E	4E	8E	8E	
Max Working current (A) IP3X	100	200	315	63	125	200	315	500	
Main equipment (optional)	OS160 QSA ≤ 125 3P BHG-40	OESA-250 QSA ≤ 400 3P BHG-40II	OESA-400 QSA-400 3P BHG-40 II	SR-E00 80A BHG-30	SR-E00 160A BHG-30	SR-E1 250A BHG-30	SR-E2 400A BHG-40II	SR-E3 630A BHG-40II	
Application	Feeder, lighting			Feeder, lighting / Horizontal knife melting unit					

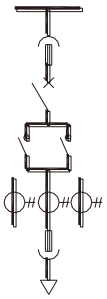
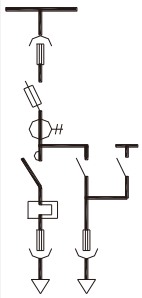
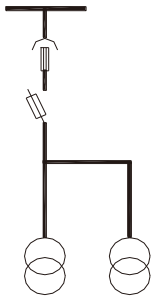
Plan No.	51	52	53	54	55	56	57	58	59
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650
Unit height	6E	6E	8E	8E	8E	12E	12E	16E	20E
Max Working current (A) IP3X	100	225	100	225	400	400	630	630	630
Main equipment (optional)	S2, S3 CM1-100 160 3P Plug-in type BHG-30	S2, S3, S4 CM1-160 225 3P Plug-in type BHG-30	S2, S3 CM1-100 160 4P Plug-in type BHG-30	S2, S3, S4 CM1-160 225 4P Plug-in type BHG-30	S5 CM1-400 3P Plug-in type BHG-40II	S5 CM1-400 4P Plug-in type BHG-40II	CM1-630 3P Plug-in type BHG-40II	CM1-630 4P Plug-in type BHG-40II	S5, S6 3P, 4P Withdraw type BHG-40II
Application	Feeder, lighting / Plug type unit								

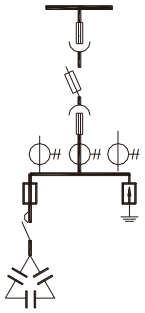
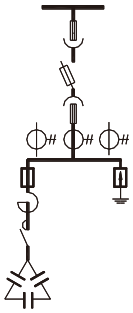
Plan No.	60	61	62	63	64	65	66	67	68
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	
Unit height	6E	6E	8E	8E	8E	12E	12E	16E	
Max Working current (A) IP3X	100	225	100	225	400	400	630	630	
Main equipment (optional)	S2, S3 CM1-100 160 3P Plug-in type BHG-30	S2, S3, S4 CM1-160 225 3P Plug-in type BHG-30	S2, S3 CM1-100 160 4P Plug-in type BHG-30	S2, S3, S4 CM1-160 225 4P Plug-in type BHG-30	S5 CM1-400 3P Plug-in type BHG-40II	S5 CM1-400 4P Plug-in type BHG-40II	CM1-630 3P Plug-in type BHG-40II	CM1-630 4P Plug-in type BHG-40II	
Application	Feeder, lighting / fixed separation unit								

Plan No.	69	70	71	72	73	74	75	76	77
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650
Unit height	8E/4	8E/2	8E/4	8E/2	8E	12E	16E	20E	24E
Max control power ~380V / AC-3 (kW)	7.5	15	7.5	15	30	45	75	110	160
Main equipment	S503 A16~26 B16~25 BHG-30	S2 S503 CM1-63 A30~40 B25~45 BHG-30	S503 A12~26 B16~25 TA25DU T25 BHG-30	S2 S503 CM1-63 A26~40 B25~45 TA42DU T25~45 BHG-30	S2~S4 CM1-100 A50~75 B45~85 TA75DU T45~105 BHG-40	S2~S4 CM1-100 A95~110 B65~105 TA110DU T45~105 BHG-40II	S3~S4 CM1-225 A145~185 B105~170 TA200DU T105~170 BHG-40II	S3~S4 CM1-225 A210~260 TA25DU T16 BHG-40II	S3~S5 CM1-400 A300~ AF400 TA25DU T16 BHG-40II
Application	Motor control (irreversible)								

Plan No.	78	79	80	81	82	83	84	85	86	87
Primary diagram										
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650
Unit height	8E/2	8E	12E	20E	24E	8E/2	8E	16E	20E	24E
Max control power ~380V / AC-3 (kW)	15	30	45	75	110	7.5	22	55	75	110
Main equipment	S2 S503 CM1-63 A26~40 B25~45 TA42DU T25~45 BHG-30	S2~S4 CM1-100 A50~75 B45~85 TA75DU T45~105 BHG-40	S2~S4 CM1-100 A95~110 B65~105 TA110DU T45~105 BHG-40I	S3~S4 CM1-225 A145~185 B105~170 TA200DU T105~170 BHG-40II	S3~S4 CM1-225 A210~260 TA25DU T16 BHG-40II	S2 S503 CM1-63 A9~16 B16 T16 BHG-30	S2~S4 CM1-100 A26~40 B25~37 T45 BHG-30	S2~S4 CM1-225 A50~95 B45~85 T105 BHG-40II	S3~S4 CM1-225 A95~110 B65~105 TA110DU T45~105 BHG-40II	S3~S4 CM1-225 A145~185 B105~170 TA25DU T16 3* BHG-40II
Application	Motor control (reversible)					Y/△				

Plan No.	88	89	90	91	92	93	94	95	96
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650
Unit height	8E/4	8E/2	8E	12E	20E	24E	8E/2	8E	16E
Max control power ~380V / AC-3 (kW)	7.5	15	30	30	75	110	15	30	45
Main equipment	OS32 FBCD25~32A A12~26 B16~25 TA25DU T25 BHG-30	OS63 A26~40 B25~45 TA42DU T25~45 BHG-30	OS160 QSA100 A50~75 B45~85 TA75DU T45~105 BHG-40	OESA ≤250 A95~110 B65~105 TA110DU T45~105 BHG-40II	OESA ≤400 QSA ≤400 A145~185 B105~170 TA200DU T105~170 BHG-40II	OESA ≤400A QSA ≤400 A210~260 TA25DU T16 BHG-40II	OS32~63 FBCD32~63A A26~40 B25~45 TA42DU T25~45 BHG-30	OS ≤160 QSA-125 A50~75 B45~85 TA75DU T45~105 BHG-40	OESA ≤250 QSA-250 A95~110 B65~105 TA110DU T45~105 BHG-40II
Application	Motor control (irreversible)					Reversible			

Plan No.	97	98	99	100	101	102	103	104	105
Primary diagram									
Cabinet width (mm)	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650	1000, 600/650
Unit height	20E	24E	8E	16E	20E	24E		8E	16E
Max control power ~380V / AC-3 (kW)	75	110	22	55	75	110		100VA	200VA
Main equipment	OESA ≤400 FB ≤400A QSA ≤400 A145~185 B105~170 TA200DU T105~170 BHG-40II	OESA ≤400A QSA ≤400A FB ≤400A A210~260 TA25DU T16 BHG-40II	OS ≤63 QSA-125 FBCD32~63A A9~40 B16~37 T16~45 BHG-30	OESA ≤250 QSA-250 A50~95 B45~85 T105	OESA ≤400 QSA ≤400 A95~110 B65~105 TA110DU T45~105 BHG-40II	OESA ≤400A QSA ≤400A A145~185 B105~170 TA25DU T16 3* BHG-40II		QSA-63 FB CD25A JDG4-0.5 380/100V	QSA-63 FB CD25A JDG4-0.5 380/100V
Application	Reversible		Y/△					Power	

Plan No.	106	107	108	109	110	111	112	113	114
Primary diagram									
Cabinet width (mm)	600/650	800/850	800/850	1000	1000	600/650	800/850	1000	1200
Unit height	72E	72E	72E	72E	72E	72E	72E	72E	72E
Max compensation capacity (kvar)	16×8=128	16×12=192	30×10=300	16×16=256	30×12=360	30×4=120	30×6=180	30×8=240	30×10=300
Main equipment (optional)	OESA 400 QSA-400 RT20-63 UA30 B30C BCMJ3-16 CLMD13-15/0.4 BHG-40II	OESA 400 QSA-400 RT20-63 UA30 B30C BCMJ3-16 CLMD13-15/0.4 BHG-40II	OESA 630 QSA-630 RT20-100 UA63 B63C BCMJ5-30 CLMD43-30/0.4 BHG-40II	OESA 630 QSA-630 RT20-63 UA30 B30C BCMJ3-16 CLMD13-15/0.4 BHG-40II	OESA-800DV RT20-100 UA63 B63C BCMJ5-30 CLMD43-30/0.4 BHG-60II	OESA 400 QSA-400 CKSG-[] RT20-100 UA63 B63C BZMJ-30 CLMD53-35/.44 BHG-40II	OESA 400 QSA-400 CKSG-[] RT20-100 UA63 B63C BZMJ-30 CLMD53-35/.44 BHG-40II	OESA 630 QSA-630 CKSG-[] RT20-100 UA63 B63C BZMJ-30 CLMD53-35/.44 BHG-40II	OESA 630 QSA-630 CKSG-[] RT20-100 UA63 B63C BZMJ-30 CLMD53-35/.44 BHG-40II
Application	Motor control (irreversible)					Reversible			

05 Transport and Storage

GPM2.1 drawer switchgear will be delivered to users for installation and use after the factory test is carried out according to the requirements. Under normal circumstances, GPM2.1 drawer type switchgear may be composed of 1 to 4 cabinets as a transport unit according to the conditions of the substation and in order to reduce the joints of the main busbar. Each switchgear transport unit is equipped with 4 lifting rings. According to requirements, the packaging may be a wooden box or a simple packaging, and the accessories are usually packaged separately.

5.1 Transportation

The switchgear should be transported upright, and safety measures to protect personnel and equipment must be taken. Avoid tipping, inverting and subjecting to severe vibration.

Take measures to prevent rain and water ingress to avoid moisture in the switchgear.

When loading and unloading from vehicles, ships and other transportation tools, only one of the following tools can be used for loading: Crane, forklift or manual lifting frame.

Pay attention to when loading with crane or lifting frame:

1. The sling should have sufficient carrying capacity, and the opening width of the hook should be ≥ 30mm.
2. The angle between the rope connecting the hook and the horizontal line should be kept above 120°.

When lifting the switchgear, allow the lifting lugs to be bent accordingly.

When lifting one or two switchgear, it can be lifted off with a single hook; when lifting 3 or 4 switchgear, it should be lifted by double hook. Refer to Figure 5-1 and Figure 5-2.

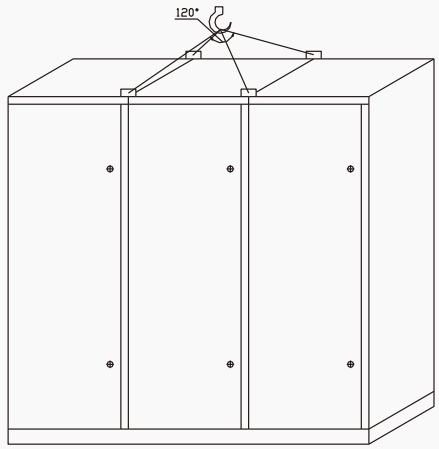


Figure 5-1 Schematic diagram of lifting method

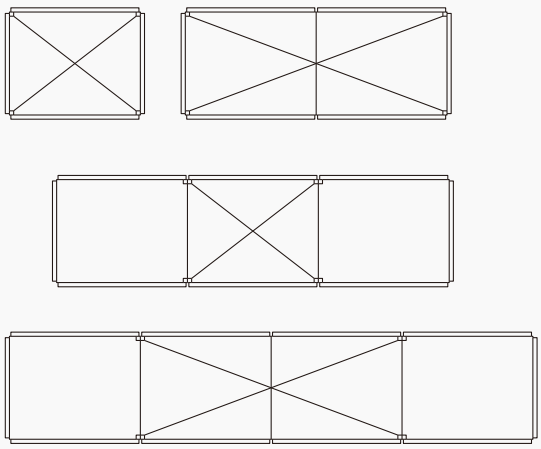


Figure 5-2 Lifting methods of different quantity units

5.2 Delivery and intermediate storage

After the switchgear arrives on site, the consignee has the responsibility (but not limited to) to do the following:

- Notify our company's on-site service personnel to participate in the unpacking acceptance.
- Check whether the goods are complete and damaged. Including the number of equipment, whether the busbars and accessories are complete, whether the certificate and instructions are complete. If in doubt, open the package for inspection.
- When equipment is found to be damaged or short, it should be recorded in detail in time, and when it is serious, it should be photographed and the original damaged state should be retained, and relevant agencies should be notified.

After the acceptance, if intermediate storage is not required for installation immediately, put in desiccant and repackage. The storage site should be a place without any damage to the switchgear and installation materials.

For switchgears with or without packaging, storage should be dry and well-ventilated, and the indoor temperature should not be lower than -5℃ , and there should be no other harmful environmental impacts. The switchgear should be stored upright, should not be stacked, and cannot be removed or damaged. The switchgear without packing box should be covered loosely with plastic film to avoid soiling. Air circulation must be maintained to prevent corrosion. And regularly conduct condensation checks until the installation work begins.

06 Foundation and Site Installation

In order to ensure the best installation procedures and quality, there should be specially trained or full-time personnel on site to provide guidance and supervision, and perform corresponding work in accordance with the requirements of this manual.

6.1 General requirements at the installation site

Before installing the switchgear, the civil works of the power distribution room must be completed and accepted, and be equipped with lighting and installation power and ventilation devices. The power distribution room should be dry, tidy, ventilated, doors can be locked, and wall holes and cable trenches should be prepared in advance. The ceiling height of the power distribution room should not be less than 3000mm. All power distribution room conditions must ensure that they meet the specified normal use environmental conditions of the indoor switchgear.

6.2 Layout plan of power distribution room

For GPM2.1 drawer type switchgear, when the side cable outlet is used (the main busbar is at the rear of the cabinet), all installation, debugging and maintenance are carried out on the front, and it can be installed against the wall to save floor space; When the rear cable outlet is used (the main busbar is on the top of the cabinet), because the installation and maintenance of the cable need to be carried out behind the cabinet, it is designed to be installed away from the wall. But generally speaking, if the floor space of the power distribution room permits, it is better to use the switchgear to install it instead of the wall when designing the layout of the power distribution room, so that the rear cover of the switchgear can be between the partition wall and the two sides of the switchgear. Appropriate passages are left between the partition walls, which is more convenient for installation, maintenance and fire fighting.

For the standard GPM2.1 drawer switchgear, please refer to Table 6-1 for the reference data of the earth construction timing of the power distribution room.

Table 6-1 Design reference data of power distribution room

Items		Unit	Data
Switchgear size	Cabinet width	mm	300~1200
	Cabinet Depth	mm	1000
	Cabinet Height	mm	2200
Width of corridor in front of cabinet	Single arrangement	mm	2000
	Face-to-face double arrangement	mm	2500
Off-wall installation requirements	Maintenance channel behind the cabinet	mm	800
	Side maintenance access	mm	800
Installation requirements against the wall	Wall behind the cabinet	mm	80, Recommended ≥ 300
	Side to wall*	mm	80, Recommended ≥ 300
Door frame requirements	Width	mm	1400
	Height	mm	2600
Weight (single cabinet)		Kg	500~800
Floor bearing		Kg/m^2	1000

Note: "*" indicates the installation and maintenance channel on one side must be considered, and the channel distance is not less than 800mm.

Figure 6-1 is a reference plan for the installation of GPM2.1 drawer switchgear from the wall. This scheme can be applied to various cable entry schemes. For the convenience of users when designing the power distribution room, the minimum distance is considered for the installation and maintenance channels. When conditions permit, the distance marked with an asterisk should be appropriately enlarged for installation and future operation Try to be as convenient as possible. If the switchgears are arranged in two rows facing each other, the distance between the two rows of switchgears is recommended to be no less than 2500mm.

If it is installed against a wall, the distance from the back of the cabinet to the wall is recommended to be no less than 300mm.

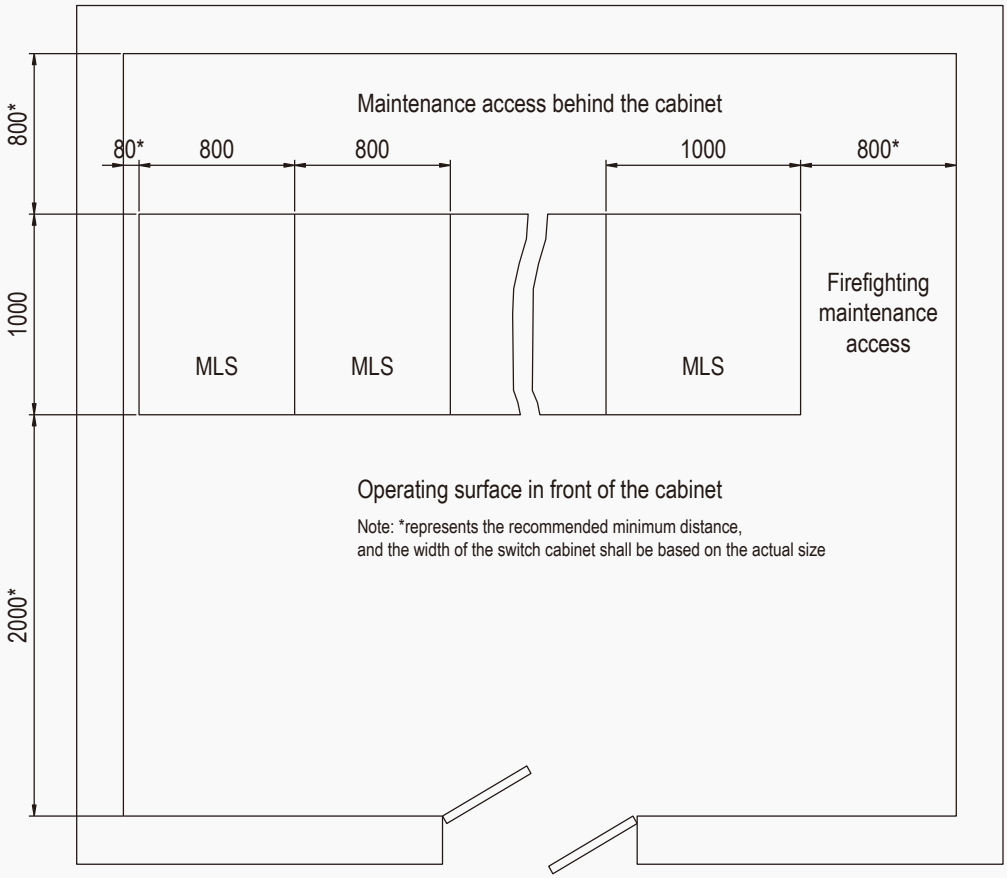


Figure 6-1 Lifting methods of different quantity units

6.3 Foundation of the switchgear

It is more appropriate to install the switchgear on the basic frame on the floor of the power distribution room or on an elevated auxiliary floor. When laying the foundation, it should meet the requirements of the "Technical Specifications for Electric Power Construction and Acceptance", especially the allowable tolerances of straightness and flatness, which are the prerequisites for ensuring the quality of switchgear installation.

6.3.1 Take the power distribution room floor as the foundation

When the number of switchgears is small and the weight is light, they can be directly installed on the floor of the power distribution room. The floor at the installation site is required to be very flat and have sufficient bearing capacity. If necessary, gaskets can be inserted under the switchgear during installation and adjustment.

However, this installation method is generally not recommended when installing the switchgear.

6.3.2 Channel steel foundation on concrete floor

The installation of the switchgear is generally required to be on a concrete floor with a channel steel foundation. GPM2.1 switchgear is equipped with a high strength base when it leaves the factory. When installing, the base can be buried with 10# channel steel, and the base of the switchgear is directly fixed on the foundation channel steel, which is very convenient for installation. The switchgear base can be fixed on the channel steel by welding or bolt connection, which can be selected according to the site conditions. The channel steel foundation should be made and buried by professionals of the electrical installation unit, and its dimensions should refer to Figure 6-2 and Figure 6-3.

Before installing the switchgear, a cable trench should be set in the power distribution room. The cable trench should be constructed in accordance with the specific requirements of the local cable work area.

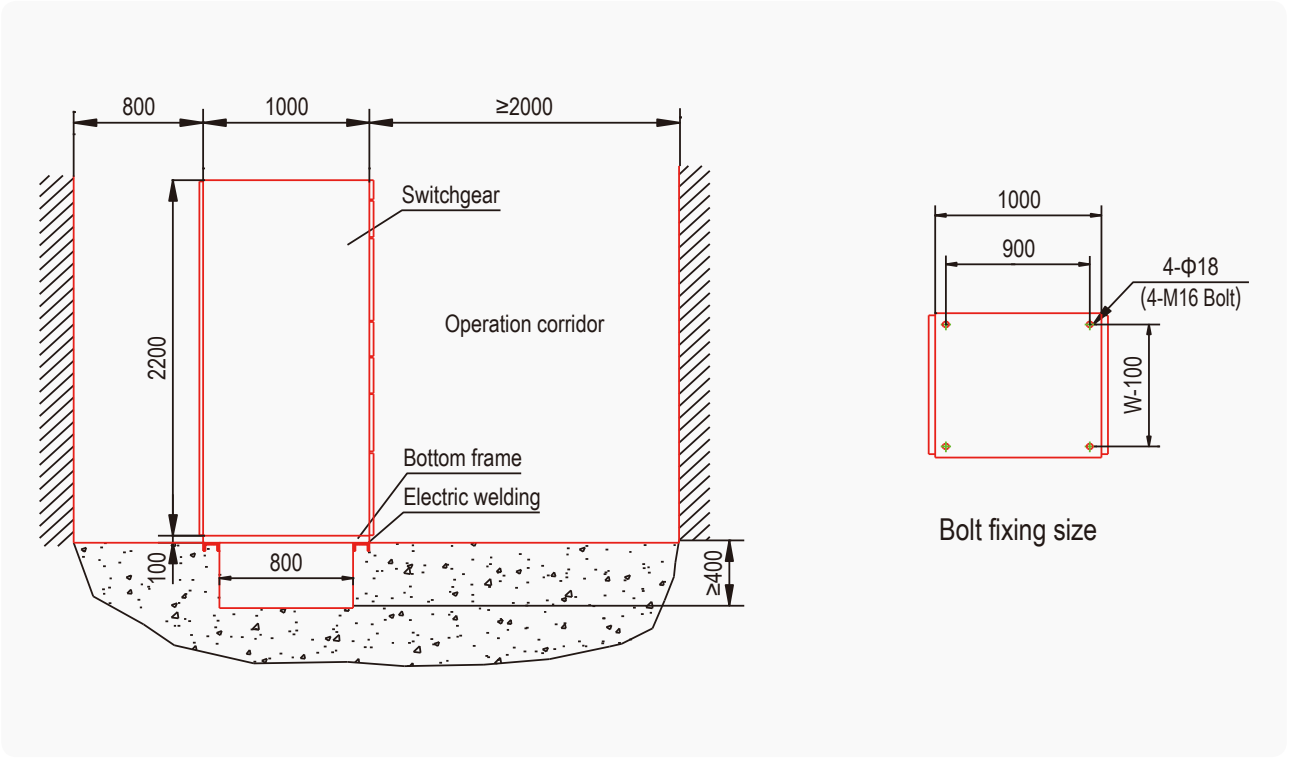


Figure 6-2 Single-sided arrangement of GPM2.1 switchgear installation diagram (W=Cabinet width in the figure)

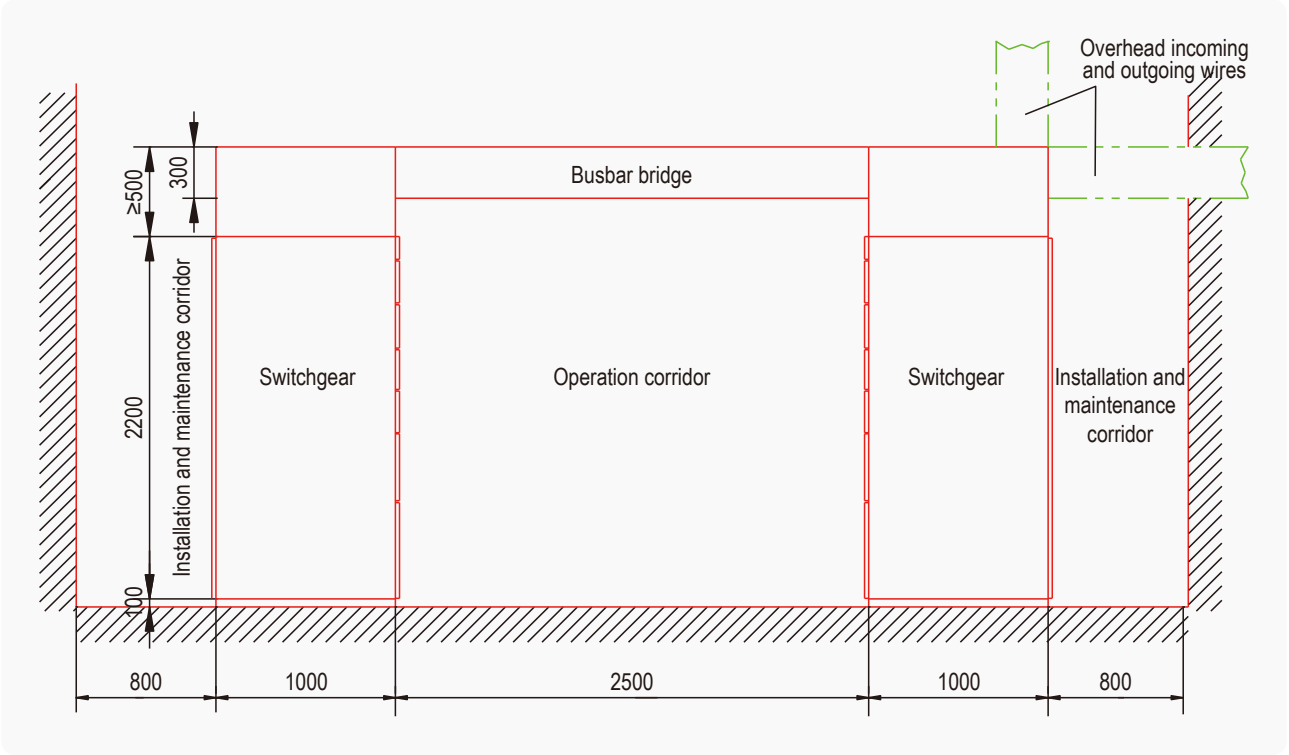


Figure 6-3 Installation diagram of GPM2.1 switchgear with double-sided arrangement

Note: "*" indicates the distance between the busbar bridge and the top of the power distribution room should not be less than 500mm
"*" indicates all dimensions in the picture are the recommended minimum dimensions, if you can't meet them, please contact us.

Strict attention should be paid to the following points when laying the foundation:

- The foundation must be overlaid firmly, and during the overlay period, the position of the frame must be kept intact.
- After the foundation is laid, smooth the protrusions and welds on the top plane of the frame.
- Determine the total length of the foundation according to the layout of the switchgear and the number of switchgears in each row.
- The size of the basic channel steel should be consistent with the requirements of the switchgear. If the size of the switchgear is not a standard size, it should be made according to the drawings provided by our company.

Installation of basic channel steel:

- According to the installation drawing, place the foundation channel steel accurately at the specified position on the concrete floor.
- Use a level or similar instrument to carefully adjust the height and level of the foundation channel steel. The top of the channel steel should be 1~3mm higher than the floor in order to install and adjust the switchgear. Therefore, the thickness of the supplementary concrete layer for the second pouring must be considered in advance.
- The allowable deviation of channel steel embedding, the horizontal error is 1/1000, and the total length deviation is ±3mm.
- Reliably ground the foundation channel steel with a galvanized steel strip with a width of 30mm. If the switchgear is arranged long, the channel steel must be grounded at two places.
- Pouring a supplementary layer of concrete. The channel steel must be 1~2mm higher than the supplementary layer. The bottom of the channel steel must be filled.
- In the installation phase, the foundation should not be subjected to shock and pressure.

If the above conditions are not fully met, there may be problems with the installation of the switchgear and the stability of the switchgear during operation.

Special cases:

- If a switchgear with a non-standard size is used, the overlay size of the foundation channel steel will be different from the requirements in this manual, please consult our company during installation.
- If the site has special requirements for installation methods and channel steel dimensions, you must contact our company to obtain confirmation in advance, and perform construction in accordance with special requirements during installation.

6.4 Installation of switchgear

After the installation conditions are met, the installation of the switchgear can be started. It must be noted that the installation of the switchgear must be completed by professional installers with installation qualifications to avoid any possible problems.

In a transport unit, one end of the main bus of the GPM2.1 low voltage drawer switchgear extends out of the switchgear for a certain length, so as to be connected to the switchgear of another unit. The main busbar connection has proper avoidance bends, which can be inserted into the main busbar of the adjacent switchgear for connection; the grounding busbar of the GPM2.1 low-voltage drawer switchgear also extends out of the cabinet for a certain length and is connected by a movable lap block. When the switchgear is in place, it should be noted that the main bus and ground bus should be inserted into the connection position of the adjacent cabinet, so that the bus can be connected after the installation is completed.

- Move the switchgear to the position to be installed according to the sequence given in the layout drawing.
- Wipe the busbar with a clean, dry soft cloth to remove grease and adhered dirt. If the cabinet is dirty, it should be cleaned before installation.
- Accurately adjust the position and verticality of the switchgear unit by unit on the basis (the front edge of the switchgear must not deviate from the vertical line by more than 2mm). When adjusting the position of the switchgear, pay attention to the main bus bar and grounding bus bar of the switchgear to insert it into the connection position of the adjacent cabinet. If there are more than 10 switchgears, it is best to install and adjust from the middle.
- Connect the switchgears together with bolts.
- After the switchgear is fully assembled, fix it on the foundation with anchor bolts or weld it with the foundation channel steel.
- After the switchgear is assembled, connect the main bus and grounding bus with the bolts attached to the switchgear.
- Connect the main ground bus to the ground grid of the power distribution room.

Note:

- When installing the switchgear, be careful, and do not operate circuit breakers, functional units and other components at will to avoid the loss and damage of components in the switchgear.
- When connecting the switchgear, use standard bolts with a strength grade of not less than 8.8, and the corresponding tightening torque is as follows:

Bolt	M6	M8	M10	M12	M16
Tightening torque Nm	10	25	50	85	200

If there is a busbar bridge in the system, follow the corresponding drawings for installation. Pay attention to the length of each busbar bridge during installation. If the busbar bridge is long, hangers should be installed on the ceiling or beam to pull up the part with weak support and heavy weight.

6.5 Installation of power cables and control cables

The connection of the cable must be carried out in accordance with the construction requirements of the local cable work area, and the following procedures can be referred to for routine operations.

- Open the door of the switchgear cable compartment (the rear door is the back door for the rear-outgoing switchgear, and the side door for the side-outgoing switchgear).
- Introduce the power cable and strip it at a predetermined length.
- Make cable terminations in accordance with the requirements of the manufacturer.
- Pass the cable through the bottom plate of the switchgear, connect to the cable terminal of the circuit breaker or functional unit in the cabinet, and fix the cable on the cable support.
- According to the construction requirements of various places, seal the gaps to prevent small animals from entering the cabinet.
- For the control cables between the cabinets, connect them through the cable trough above the control room.

6.6 End of installation

- Check whether the bolt connections are tightened, especially the bolts of the busbar and grounding system installed on site.
- Carefully clean the inside and outer shell of the switchgear.
- Carefully check whether there are remaining items such as tools and bolts left by the installation in the switchgear.

07 Operation of the Switchgear

7.1 Preparation before starting

Before turning on the power, the following tasks should be completed:

- Inspect the overall situation of the switchgear, find out various hazardous factors, and confirm that they have been completely eliminated.
- Check whether the installation of the switchgear is in good order and whether the busbar connection is reliable.
- Manually check whether the operation of the circuit breaker and the functional unit is flexible, and whether the interlocking mechanism of the functional unit is correct and reliable.
- Check whether the connection between the main ground bus and the ground conductor of the substation outside the cabinet is reliable, clean the surface of the ground bus, and the ground loop contact resistance should not be greater than 1000 microohms.
- Check whether the cable connection is reliable.
- Remove all remaining materials, irrelevant objects and tools in the cabinet.
- Wipe the cabinet body and the sealing strips inside the cabinet door with a clean, dry, soft cloth that does not lose waste. Wipe off the adhering dust and grease.
- Close all doors opened during installation.
- Familiar with and master the operation of circuit breakers, MCC drawers, etc.
- In accordance with the requirements of national standards, test the insulation resistance and voltage resistance of the switchgear.

7.2 Start

- Comply with relevant safety regulations.
- Leave all the switches in the cabinet in the off position. All manual/automatic transfer switches are placed in the manual position.
- Remove the ground wire and short wiring in the hazardous work area.
- Send power to the switchgear according to the normal procedure or power transmission plan, and observe the meters, signals and indicators.
- For main components such as circuit breakers/contactors, check their performance by opening and closing 5 times each.
- Check whether the control loop is normal.
- Carry out other measurements and inspections according to relevant requirements and check all functions.
- Pay attention to any abnormal conditions.

7.3 Switchgear operation

Note: Except as otherwise noted, all operations should be performed when the door of the switchgear is closed.

When encountering a particularly large resistance, it may be that the corresponding interlock has blocked the operation that needs to be performed. At this time, stop the operation and carefully check the operating procedures for errors.

7.3.1 PC Cabinet (frame type circuit breaker) operation

Movement of frame type circuit breakers

If a fixed circuit breaker is configured, you can skip this section.

If equipped with a withdrawable circuit breaker, the circuit breaker has run and test/disconnect positions. Using the operating handle equipped with the circuit breaker, the circuit breaker can be moved between the running and testing/disconnecting positions. Normally, when the circuit breaker is opened, the handle is inserted into the operating hole and the circuit breaker can be moved by turning the handle. When moving to the desired position, just remove the handle.

For detailed operating instructions and requirements, please refer to the operating instructions of the circuit breaker.

Opening and closing of frame type circuit breaker

Frame type circuit breakers usually have two mechanisms, manual operation and electric operation. For electric operation circuit breakers, they generally also have manual operation functions.

In manual operation, use the energy storage handle of the circuit breaker to store energy repeatedly and pay attention to whether the energy storage is in place. After the energy storage is completed, the circuit breaker can be closed by an electric or mechanical button; during electric operation, the energy storage of the circuit breaker is automatically completed by the circuit breaker without manual operation. The opening of the circuit breaker is usually operated by electric or mechanical buttons.

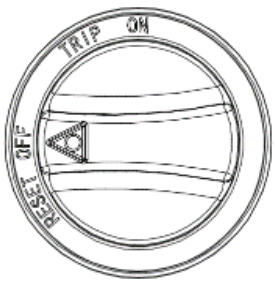
For detailed operating instructions and requirements, please refer to the operating instructions of the circuit breaker.

7.3.2 Operation of drawer switchgear

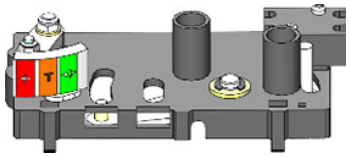
Operation of 8E/4 and 8E/2 drawer units

The operation of the drawer units of 8E/4 and 8E/2 is realized by the handle with unlocking button installed on the dashboard. When the circuit breaker is in the "OFF" position, pressing the unlocking button can operate the insertion and withdrawal of the drawer, each position is designed Interlocked by electrical and mechanical. A padlock can be added to the operating handle of the main switch to prevent the drawer from being inserted or switched on by mistake.

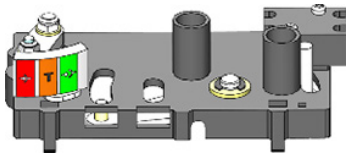
The function description of each position of the main switch handle is as follows:

Handle	Symbol	Position	Features
	ON	Closing	The main switch is closed, the control circuit is connected, and the drawer is locked
	TRIP	Trip	The main switch is abnormally tripped, the control circuit is turned on, and the drawer is locked
	OFF	Opening	The main switch is off, the control circuit is on, and the drawer is pluggable
	RESET	Buckle reset	The main circuit is deducted and reset, and the drawer is locked

The function description of each position of the drawer is as follows:

Mechanism	Symbol	Position	Features
	CON	Connection	Both main circuit and control circuit are connected
	TEST	Test	The main circuit is disconnected and the control circuit is connected
	SEP	Separation	Both main circuit and control circuit are disconnected

The operation instructions for each position of the drawer are as follows:

Mechanism	Symbol	Operation	Features
	SEP	Separation	The main circuit and control circuit are both disconnected, and the display is separated
	SEP-TEST	Separation → Test	Without pressing the unlock button, push the drawer lightly to hear a "click" sound, enter the test position and display separation.
	TEST-CON	Test → Connect	Press and hold the unlock button, pull out the drawer (borrowing inertial force) and push the drawer to hear a "click" sound, enter the connection and display the connection (the unlock button is always pressed until the drawer is in place).
	ON	Main switch closed	The switch can be closed in both the test position and the connection position. After the switch is closed, the unlock button is locked and cannot be unlocked.
	OFF	Pull out the drawer	First confirm that the main switch is open, press and hold the unlock button, and pull out the drawer

1 Close the main switch

After confirming that the drawer is in the connected position, the functional unit can be closed. Rotate the handle from the "OFF" position to the "ON" position, and release the handle after turning it in place, that is, the main switch is closed. After closing, the drawer is locked and cannot be withdrawn.

2 The main switch is off

Rotate the handle from the "ON" position to the "OFF" position, and release the handle after turning it in place to open the main switch. After the main switch is opened, the drawer lock is released.

3 Pull out the drawer

When you need to pull out the drawer, first turn the operating handle to the "OFF" position, press the unlock button on the handle, and the drawer can be pulled out). When pulling out most or all of the drawer, use your hands to support the lower part of the drawer to avoid the risk of falling or causing damage to the drawer.

4 Insert the drawer

When you need to insert the drawer, first confirm that the operating handle is in the "OFF" position, and then insert the drawer correctly into the guide rail on the cabinet, and then you can push it into the cabinet. When inserting the drawer, pay attention to applying a stable and appropriate force when pushing in, and ensure that the insertion guide rail is completely correct before pushing, so as not to damage the drawer unit or cause malfunctions.

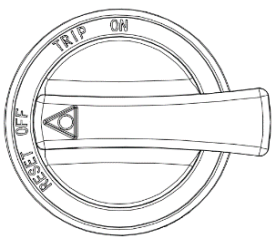
5 Test and separation

Rotate the operating handle to the "OFF" position, press the unlock button on the handle to pull out the drawer to the "TEST" position, the main switch is opened, and the control circuit is turned on. At this time, the circuit's contactor, etc. are closed and tested. It can prevent the load from being charged; press the unlock button on the handle to pull out the drawer to the display "SEP" position, the main switch and the secondary circuit are both disconnected and isolated by 30mm.

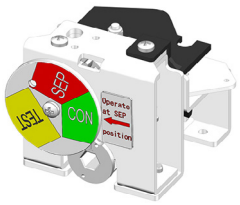
8E, 16E, 24E drawer unit operation

The 8E, 16E, 24E drawer units are different from the 8E/4, 8E/2 drawer units. The drawer is drawn by default with a manual mechanism (a push-pull mechanism is also optional). The main switch operating handle also has four positions, and each position is designed with electrical Interlocked with machinery. Turn the handle to perform corresponding operations on the main switch. A padlock can be added to the operating handle to prevent the drawer from being inserted or switched by mistake.

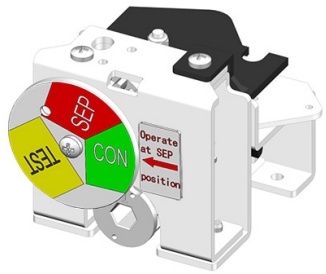
The function description of each position of the main switch handle is as follows:

Handle	Symbol	Position	Features
	ON	Closing	The main switch is closed, the control circuit is connected, and the drawer is locked
	TRIP	Trip	The main switch is abnormally tripped, the control circuit is turned on, and the drawer is locked
	OFF	Opening	The main switch is off, the control circuit is on, and the drawer is pluggable
	RESET	Buckle reset	The main circuit is deducted and reset, and the drawer is locked

The function description of each position of the drawer is as follows:

Mechanism	Symbol	Position	Features
	CON	Connection	Both main circuit and control circuit are connected
	TEST	Test	The main circuit is disconnected and the control circuit is connected
	SEP	Separation	Both main circuit and control circuit are disconnected

The operation instructions for each position of the drawer are as follows:

Mechanism	Symbol	Operation	Features
	SEP	Separation	The main circuit and control circuit are both disconnected, and the display is separated
	SEP-TEST	Separation → Test	Shake the mechanism clockwise, the drawer moves, and when you hear a "click" sound, enter the test and display the test. At this time, the main circuit is disconnected and the control circuit is connected.
	TEST-CON	Test → Connect	Shake the mechanism clockwise, the drawer moves, and when you hear a "click", it enters the connection and displays the connection. At this time, the main circuit is connected and the control circuit is connected.
	ON	Main switch closed	Take out the rocker handle, the main switch can be closed, the hole of the rocker handle is blocked after the switch is closed
	OFF	Pull out the drawer	Rotate the mechanism counterclockwise, according to the above sequence, the position display is separated, and the drawer can be pulled out of the cabinet.

There is a mechanical interlock between the drawer unit pushing mechanism and the main switch handle. When the main switch is "ON", the drawer unit is locked and the handle cannot be operated to connect the drawer unit; when the main switch is "OFF", it can be used as the drawer unit connection position.

1 Close the main switch

After confirming that the drawer pushing mechanism is in the connected position, the main switch handle can be closed. When closing, turn the main switch handle clockwise from the "OFF" position to the "ON" position to close the main switch. See Figure 7-1.

2 The main switch is off

When opening the main switch handle counterclockwise from the "ON" position to the "OFF" position, the main switch is opened.

3 Pull out the drawer

When you need to pull out the drawer, first confirm that the main switch is in the open position, then insert the drawer handle into the center operation hole, (if there is an unlock button, put your left hand on the drawer handle, press the unlock button on the handle), and then press the mechanism Roll out the drawer counterclockwise in the indicated out direction; when pulling out most or all of the drawer, hold the lower part of the drawer with your hands to avoid the risk of falling or damage to the drawer. See Figure 7-2 and Figure 7-3.

4 Insert the drawer

When you need to insert the drawer, first confirm that the main switch is in the open position, align it with the guide rail on the cabinet, and tilt the front end slightly to push it into the cabinet. After inserting the guide rail, you can lift the drawer and push the drawer in smoothly. When inserting the drawer, pay attention to applying a stable and appropriate force when pushing in, and ensure that the insert guide is completely pushed into place without error, insert the handle, and roll the drawer clockwise according to the In direction indicated on the mechanism, and hear the sound of the connection position. Observe the window When the display mechanism reaches the CON connection position, the drawer insertion is completed. Do not apply excessive force when the drawer is pushed in, so as to avoid damaging the drawer unit or causing malfunctions. After pushing it in place, use the swing handle to operate the pushing mechanism. Then the circuit breaker can be operated to close.

Square type handle (Black) Round type handle (Gray)

Figure 7-1 Main switch ON/OFF

Figure 7-2 Handle operation of drawer type circuit breaker

Figure 7-3 Inserting and pulling out the drawer

5 Test and isolation

Confirm that the main switch is in the open position. If the push mechanism is in the connected position, turn the drawer push mechanism counterclockwise to the test position. The main switch is opened, the main circuit is disconnected, and the control circuit is turned on. Operations such as closing test can prevent the load from being electrified; when the propulsion mechanism rotates to the isolation position, the main switch and the secondary circuit are both disconnected and isolated.

6 Reclosing after the main switch has tripped

When the main switch trips, the main switch handle will automatically jump to the "TRIP" position. When the switch is closed again after inspection and maintenance, the main switch handle must be turned counterclockwise to the "RESET" position. At this time, the main switch completes the "RESET" operation. After releasing the handle, the main switch returns to the open position, and the switch can be switched on. Re-closing or other operations.

7 Emergency unlocking of the drawer unit if the hand crank mechanism is damaged

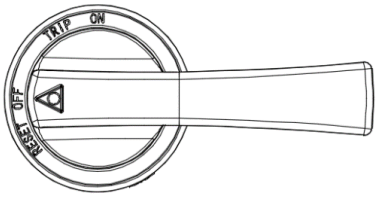
Remove the lower drawer, unscrew the four nuts of the groove-shaped positioning piece, and the groove-shaped positioning piece will fall off, and the drawer can be pulled out. (Figure 7-4 Emergency unlock hole)

Figure 7-4 Inserting and pulling out the drawer

7.3.3 Operation of plug-in switchgear

The plug-in switchgear adopts plug-in components, and its operation and use are very convenient. The main switch operating handle is installed on the plug-in unit panel. The operating handle has the on and off positions. Rotate the handle to perform corresponding operations on the main switch. A padlock can be added to the operating handle to avoid misoperation of the switch.

The function description of each position of the handle is as follows:

Handle	Symbol	Position	Features
	ON	Closing	Main switch closing
	OFF	Opening	Main switch opening

1 On and off of the main switch

Operate the main switch handle to switch on and off the main switch. When closing, turn the main switch handle from the "OFF" position to the "ON" position, and release the handle after turning it in place to close the main switch; turn the main switch handle from the "ON" position to "OFF" when opening "Position, after turning it in place, release the handle to open the main switch.

2 Reclosing after the main switch has tripped

When the main switch trips, the main switch handle will automatically jump to the "TRIP" position. When the switch is closed again after inspection and maintenance, the main switch handle must be turned counterclockwise to the "RESET" position. At this time, the main switch completes the "RESET" operation. After releasing the handle, the main switch returns to the open position, and the switch can be switched on. Re-closing or other operations.

3 Replacement of plug-in unit main switch

The main switch of the plug-in unit consists of two parts: the fixed part directly mounted on the base and the switch body equipped with the isolation contact for plug-in. When the main switch needs to be checked and repaired, pull out the switch according to the following steps (refer to Figure 7-5):

- Confirm that the switch is in the open state. When the switch is in the closed state, the removable body is locked by the interlock device to avoid accidental pulling out and causing malfunction.
- Loosen the upper and lower fixing screws of the removable switch body.
- Hold the switch with both hands and force outwards steadily to pull out the switch body. When pulling out, be careful not to shake it to the left and right to avoid damage to the switch or the base.
- Reverse the sequence of operations above to insert the switch into the fixed part of the base.

08 Maintenance

The maintenance workload of GPM2.1 low voltage drawer switchgear is very small. However, maintenance work can keep the switchgear flexible and reliable, and make it reach the longest possible service life. Maintenance work can only be carried out by well-trained full-time personnel. When the user has this need, the professional staff of our company can assist.

8.1 Inspection

Under normal circumstances, the switchgear should be inspected and maintained regularly.

- According to relevant on-site safety operating regulations, isolate the area to be worked on and ensure that the power supply will not be reconnected.
- Check the functions of switchgear, control, interlock, protection, signal and other devices.
- Check the surface condition of the isolation contact of the drawer unit. Pull out the drawer unit from the cabinet, visually inspect the multifunctional board in the cabinet and the moving contacts on the drawer. If the silver-plated layer on the surface of the contact is worn to the exposed copper, or the surface is severely corroded, and there is damage or overheating traces (surface discoloration), notify our company to assist in replacing the contact.
- Check the accessories and auxiliary devices of the switchgear, and also check the insulation boards. They should be kept dry and clean.

8.2 Maintenance

- When the switchgear is found to be dirty (if in tropical or subtropical climates, salt spray, mold, insects, condensation, etc. may cause pollution), carefully wipe the equipment, especially the surface of the insulating layer. Use a dry soft cloth to wipe off the dust with little adhesion. Dip a soft cloth with a mildly alkaline household cleaner to wipe off sticky/greasy dirt, then wipe it with clean water, and then dry it. For insulating materials and heavily contaminated components, clean them with halogen-free cleaners.

Note: It is strictly forbidden to use trichloroethane, trichloroethylene or carbon tetrachloride!

- When the lubrication of the mechanism and contact points of the drawer unit inserted into the system is insufficient or the lubrication disappears, a neutral lubricant should be added.
- Tighten the bolts of the loose busbar and grounding system.
- Oil the sliding, rolling and bearing surfaces (such as guide rails, interlocking systems, operating handle mechanisms and drawer rollers, etc.) in the switchgear.

8.3 Replacement of damaged components

The replacement of components should be based on the principle of not affecting the original performance of the switchgear. It is recommended to contact our company's after-sales service department.

09 Spare parts and special tools

Our company can provide primary and secondary components and material spare parts in the switchgear. After the switchgear is in operation, the user should prepare certain consumable spare parts and emergency spare parts, such as low-voltage fuses of various specifications, so that they can be replaced in time without affecting the power supply. If you need to purchase spare parts, you should indicate the detailed material name and quantity and contact our company.

Conventional special tools include the following:

- Operation handles of various frame type circuit breakers
- The plug handle of the fuse, etc.
- Door lock key

These tools can also be purchased separately from our company. When operating the switchgear, be sure to use special tools.

10 Ordering information

When ordering GPM2.1 low voltage drawer switchgear, the user should provide the following information:

- Primary circuit plan and single-line system diagram, system purpose, rated voltage, rated current, rated short-circuit breaking current and other data;
- Arrangement drawing of switchgear and layout drawing of power distribution room;
- Specifications of incoming and outgoing cables;
- Detailed model, quantity and specifications of various electrical equipment to be assembled inside each switchgear, the name, model and quantity of other accessories, and an equipment list;
- Expanded diagram of secondary loop;
- Other special requirements such as cabinet color.

Note!

Any operation of GPM2.1 low-voltage drawer switchgear should read this manual in advance.

- The installation and use of the switchgear must comply with the provisions of the standards and specifications for electrical products, and must comply with the requirements of this manual.
- The switchgear must be installed in a suitable indoor environment.
- Any operation and maintenance of the switchgear should be carried out by pre-trained professional electrical personnel.
- It is forbidden to operate the switchgear under the condition of exceeding its rated load.
- Attention must be paid to any live hazard markings on the switchgear.
- Any illegal operation of the switchgear may damage the equipment and even cause serious accidents.
- Keep this manual in a place where it can be easily accessed.
- Professionals should be responsible for the safety management of electrical equipment.

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Zhejiang Greenpower Electric Co., Ltd
Zhejiang GreenPower I&E Co., Ltd
Professional Power Equipment Provider

The data and illustrations are not binding.
We reserve the right to make modifications following technical developments to the products.

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