

GPR1-12(24) Series

Gas Insulated Ring Main Unit





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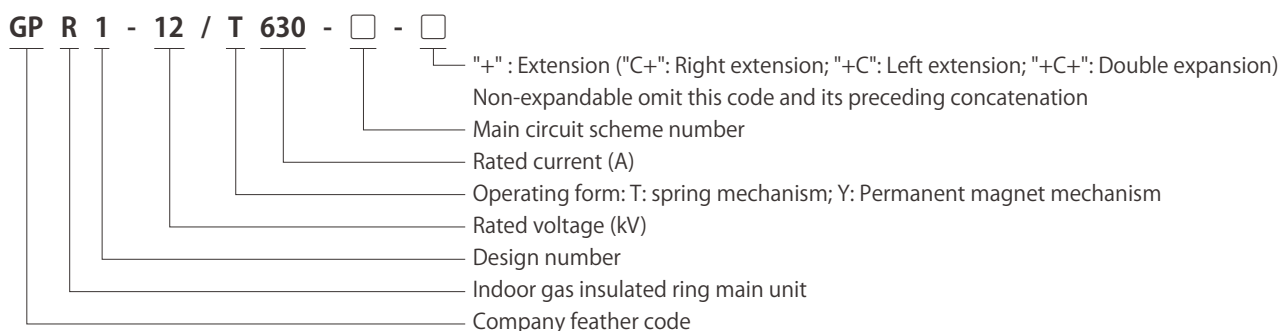
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01 Product overview

GPR1 series gas insulated ring main unit (hereinafter referred to as GPR1 ring main unit) uses SF₆ gas as the insulation medium. SF₆ gas has strong electronegativity, high dielectric strength, and insulation strength 2~3 times that of air. It is non-toxic, odorless, non flammable, and non explosive. It has excellent arc extinguishing and insulation performance, allowing the load switch/circuit breaker to quickly extinguish the arc after breaking the current. Its internal design has a compact structure and small volume, saving space and resources. The gas tank adopts a stainless steel welded fully sealed structure. The operating mechanism adopts a spring type, with a simple structure and flexible operation, and the operating speed is not affected by the size of manpower. The mechanism has complete mechanical locking and reliable interlocking. Adopting modular design, it can be flexibly combined into various distribution schemes to meet the diverse needs of different occasions and users.

1.1 Product model and meaning



1.2 Scope of application

GPR1 ring main unit is suitable for the 3.6~12kV three-phase AC 50/60Hz power system as a means of receiving and distributing electrical energy. It is widely used in oil-free, safe and reliable small distribution stations, switching stations, urban residential communities, airports, railways, tunnels, and high-rise buildings. Especially suitable for various places with harsh environmental conditions and polluted environments such as industrial and mining enterprises, mountainous areas, plateaus, and coastal areas.

1.3 Environmental conditions of use

- Altitude: Less than 3000m;
- Ambient temperature: Maximum +40℃ , Minimum -25℃ ;
- Earthquake intensity: Not exceeding 8 degree;
- Use in environments that can withstand dust, moisture, and short-term immersion in water.

Note: When the actual use environment conditions are inconsistent with the above conditions, please consult with our company.

1.4 Standards and specifications

IEC 60265-1:1998 High Voltage Load Switches Part 1: Load Switches with Rated Voltages Above 1kV and Below 52kV

IEC 60298:1990 AC Metal Enclosed Switchgear and Controlgear Above 1kV and Below 52kV

IEC 60694:2002 Common Technical Requirements for High Voltage Switchgear and Controlgear Standards

IEC 62271-100:2012 High Voltage AC Circuit Breaker

IEC 62271-102:2012 High Voltage AC Isolation Switch and Earthing Switch

GB/T 3906-2006 3.6kV~40.5kV AC Metal Enclosed Switchgear and Controlgear

GB/T 3804-2017 3.6kV~40.5kV High Voltage AC Load Switch

GB/T 1984-2014 High Voltage AC Circuit Breaker

GB/T 1985-2014 High Voltage AC Isolation Switch and Earthing Switch

GB/T 11022-2011 Common Technical Requirements for High Voltage Switchgear and Controlgear Standards

GB/T 16926-2009 AC High Voltage Load Switch - Fuse Combination Electrical Appliances

1.5 Advanced technology

- The main components and springs of the mechanism are made of imported materials to ensure reliable operation. The operating life of the load switch reaches 5000 times, and the operating life of the circuit breaker reaches 10000 times.
- The processing technology of injection molded parts and sealing parts is advanced and strictly tested, with a service life of ≥ 30 years.
- Adopting advanced equipment such as ABB automatic welding robots and Leybold helium leak detection system, ensuring an annual relative leakage rate of SF₆ gas of $\leq 0.05\%$.
- By using vacuum dehumidification technology, the micro water content of SF₆ gas can be controlled to ≤ 150 ppm.
- The inflation pressure is low, and under zero gauge pressure conditions, the switchgear can operate normally and achieve rated current opening and closing.
- The harmonious unity of fixed and flexible expansion allows for the configuration of multiple modules in the same SF₆ insulated gas chamber, or the use of extended busbars to connect the switchgear, achieving a semi modular structure.

1.6 Technical performance

1.6.1 Functional structure composition

GPR1 RMU is composed of small and compact functional units. The functional unit consists of the following parts:

- **Stainless steel sealed gas tank enclosure**
Load switches, earthing switches, circuit breakers, busbars, etc. can be installed in the enclosure.
- **Cable box**
It can be connected to the grid or transformer through the interface.
- **Secondary instrument box**
- **Operating mechanism box**
- **Fuse box**
Can be combined with load switch to install independent and insulated fuse barrel.
The transformer can be connected via the interface.

1.6.2 Sealed gas insulation system

In the GPR1 RMU, the sealed stainless steel box is filled with SF₆ gas at rated pressure as the insulation and arc extinguishing medium.

- SF₆ gas has strong electronegativity, high dielectric strength, and the dielectric strength is 2~3 times that of air. It has excellent arc extinguishing and insulating properties, ensuring that the switchgear can quickly extinguish the arc after breaking the current.
- The stainless steel metal gas tank is equipped with a good earthing device to ensure the safety of the operator.
- Advanced automatic welding equipment ensures the sealing performance of the gas tank when it is working.
- The gas tightness of the gas chamber is strictly inspected before leaving the factory, and the performance is reliable and the service lifetime of more than 30 years is guaranteed.
- All components in the gas tank are maintenance-free within 30 years of service lifetime.

1.6.3 Advanced arc extinguishing technology

- **SF₆ Load switch**
The arc extinguishing principle of arc extinguishing chamber structure with arc extinguishing grid is adopted.
An arc extinguishing technology with compact structure, mature and reliable performance.
- **Vacuum load switch**
Using vacuum arc extinguishing technology, it can quickly switch on and off rated current and below.
- **Circuit breaker**
Using vacuum arc extinguishing technology, it can reliably cut off any current up to the short-circuit current.

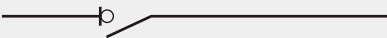
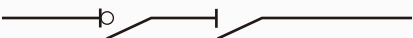
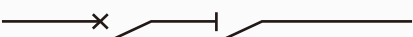
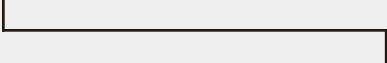
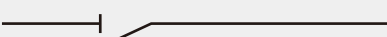
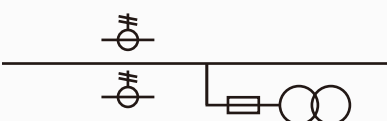
1.6.4 Breaking current capability

The load switch of GPR1 ring main unit is grade E3/M2, and the circuit breaker is grade E2/M1, that is:

- When the load switch has a rated current and a load power factor of 0.7, it can perform "closing/opening" operations 100 times; when the circuit breaker has a rated short-circuit breaking current, it can break a total of 30 times.
- The load switch is designed to meet 5,000 mechanical "opening/closing" operations; the circuit breaker is designed to meet 10,000 mechanical "closing/opening" operations.
- 200 "close/open" operations under rated current.

1.6.5 Feature selection

GPR1 RMU can provide 1~5 functions selected by the user to form a ring main unit and can also be used as a transformer feed switch.

● Load switch	C	
● Vacuum load switch	C	
● Load switch - fuse combination appliance	B	
● Vacuum circuit breaker	D	
● Riser unit	L	
● Connection unit	F	
● Disconnect switch	G	
● Metering unit	M	

1.6.6 Function combination

GPR1 is the main unit structure of the ring network. In the same SF₆ insulated air chamber, GPR1 can be configured with up to 6 modules, which can provide 16 fixed combinations for the power distribution network, adapting to most situations that require ring network units. The GPR1 combination forms are DF, CF, CCC, CCF, CFC, FCC, CCCC, CCCF, CCFF, CFFC, CCDD, CCCCC, CCFFF, CCCFF, CCCC, CCCCC.

1.6.7 Technical parameters of GPR1 RMU

No.	Item		Unit	Data		
				Load switch	Combination appliance	Circuit breaker
1	Rated voltage		kV	12/24		
2	Rated frequency		Hz	50/60		
3	Rated current of main busbar		A	630		
4	Rated current		A	630	125 *	200
						630
5	Rated short-circuit breaking current		kA		31.5 *	20/25
6	Rated transfer current		A		1750	
7	Rated short-circuit duration		s	4		4
8	Rated short-time withstand current (effective value)		kA	20/25		20/25
9	Rated peak withstand current		kA	50/63		50/63
10	Rated short-circuit making current (peak) of load switch and earthing switch		kA	50/63	80	50/63
11	1 min Power frequency withstand voltage	Phase to phase, phase to earth	kV	42/65		
		Across open contacts	kV	48/79		
12	Lightning impulse withstand voltage	Phase to phase, phase to earth	kV	75/125		
		Across open contacts	kV	85/145		
13	Auxiliary circuit / control circuit (1 min power frequency withstand voltage)		kV	2		
14	Rated active load breaking current		A	630		
15	Rated closed circuit breaking current		A	630		
16	Rated no-load transformer breaking current		A	16		
17	Rated cable-charging breaking current		A	30		
18	Mechanical life		times	5000, 10000	5000	10000
19	Rated pressure of SF ₆ gas (20°C gauge pressure)		MPa	0.02 or 0.045 (During SF ₆ arc extinguishing)		
20	Annual leakage rate of SF ₆ gas		%	≤ 0.05		
21	Moisture content of inflatable compartments (20°C)		ppm (μ L/L)	≤ 150		

Note:

* The rated current and rated short-circuit breaking current of the combination appliance unit are determined by the equipped fuse; The selection of technical parameters in "()" should be specifically noted during ordering.

1.7 Factory inspection

GPR1 gas insulated ring main unit must pass the following 9 tests strictly before leaving the factory:

- Circuit resistance detection
- SF₆ gas pressure detection
- Partial discharge test
- Secondary wiring detection
- Closing/opening synchronicity detection
- Micro water content detection
- Mechanical property test
- Air tightness detection
- Withstand voltage test

02 The structure of the cabinet

GPR1 ring main unit is mainly composed of two parts: the cabinet body and the sealed stainless steel gas tank. The cabinet is divided into operating mechanism box, cable box, secondary instrument box and other parts. Each functional unit and the cable box are separated into independent compartments by metal plates, which do not interfere with each other and can effectively prevent the impact of faults in a single compartment. to other compartments to maximize the scope of fault control. The busbar, load switch, circuit breaker, connecting conductor, etc. are all installed in a sealed stainless steel gas tank. SF₆ gas is used as the insulation and arc extinguishing medium. It is small in size and simple in structure.

The protection level of the GPR1 ring main unit enclosed is IP3X (IP4X is optional), the protection level of the stainless steel gas tank is IP67, and the protection level of the fuse barrel is IP67.

The enclosed of GPR1 ring main unit and the partitions of each functional unit compartment are made of high-quality cold-rolled steel plates that are processed and bent by CNC machine tools and other equipment, and are assembled with high-strength rivets, nuts and bolts. They have high mechanical strength and excellent corrosion resistance. Compared with similar equipment, it has the advantages of high precision, light weight, high mechanical strength, and beautiful appearance. At the same time, due to the modular design, the versatility and interchangeability of parts are improved, which can effectively shorten the processing cycle and reduce Production area. The cabinet surface spraying process adopts the world's most advanced electrostatic powder automatic spraying production technology, which has the advantages of beautiful topcoat, strong adhesion, corrosion resistance, high hardness, anti-aging, and good gloss and color retention.

2.1 Cabinet

2.1.1 Operating mechanism

The operating mechanism box is located in the front and middle part of the GPR1 ring main unit. Its height has been verified by ergonomics, which is labor-saving and convenient, and is suitable for operation. The operating mechanism adopts spring energy storage type, and the operating speed is stable and not affected by the size of manpower.

The electrical and mechanical operating mechanism (see Figure 2-1, Figure 2-2) is located on the back of the operation panel (see Figure 2-3), and the analog busbar can reliably display the three positions of the switch: closed, open, and earthed.

- **Closed: The moving contact is controlled by a quick-action operating mechanism:**

- For SF₆ load switches, apart from controlling the movement of moving contacts, there is no energy storage function.
- For circuit breakers, vacuum load switches and load switch-fuse combination appliances, when the contacts are closed, the operating mechanism can store energy at the same time.

- **Disconnection: The switch disconnection is achieved by the reverse action of the same quick-action operating mechanism.**

Circuit breakers, vacuum load switches and load switch-fuse combination electrical appliances are disconnected by:

- Button operation is realized.
- Fault tripping is realized.

- **Earthing:**

The specially designed operating handle is inserted into the earthing switch operating hole to close or open the earth contact.

The floor switch operating hole is locked through the interlocking stopper:

- When the switch is in the open position, the earthing switch operating hole is opened.
- When the switch is in the closed position, the floor switch operating hole is locked.

- **Switching device status indicator:**

Mounted directly on the drive shaft.

The three states of the switch device can be clearly indicated by the indicator.

- **Operating handle:**

The operating handle and mechanism have a unique design structure to prevent the load or earth switch from being opened again immediately after closing.

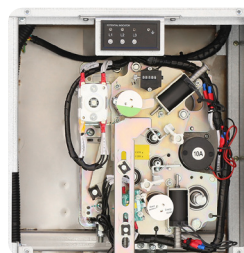


Figure 2-1
Circuit breaker
operating mechanism



Figure 2-2
Load switch
operating mechanism

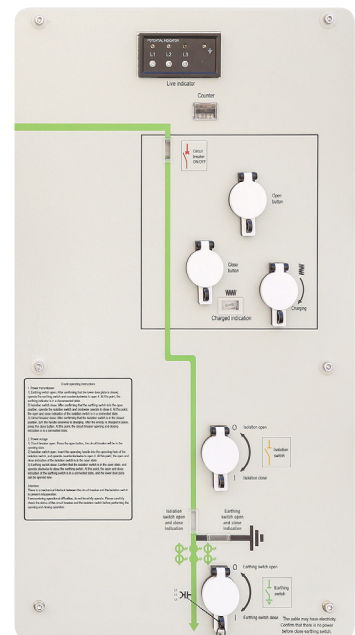


Figure 2-3
Operating mechanism panel

● Locking device (see Figure 2-4):

You can add 1, 2, 3, 4 or 5 padlocks, namely load switch, isolation switch, earthing switch operating shaft and switch opening and closing buttons, to prevent misoperation (i.e. for locking).



Figure 2-4

2.1.2 Electric operating mechanism

The motor operating mechanism (see Figure 2-5) can choose DC 24V/48V/110V/220V, AC 110V/220V power supply, which is safe and reliable.

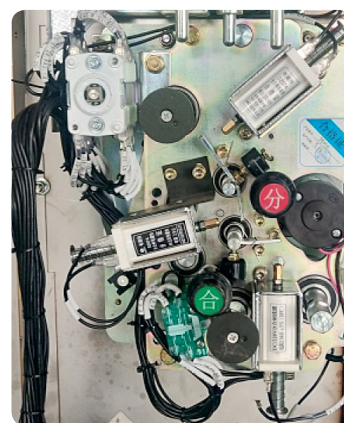


Figure 2-5

2.1.3 Trip device

In load switch-fuse combination appliances and circuit breaker units, the operating mechanism of the switch device is equipped with mechanical (see Figure 2-6) and electrical tripping devices (see Figure 2-7).

● Load switch-fuse combination electrical unit

▪ Mechanical tripping device

When the fuse operates, the spring striker pops out and the load switch opens through the mechanical linkage tripping device.

▪ Electrical tripping device

A tripping coil is installed in the operating mechanism, which can be connected to an external electrical tripping or protection device tripping contact to open the load switch.

● Circuit breaker unit

▪ Electrical tripping device

The operating mechanism is equipped with a tripping coil, which can be connected to an external electrical tripping or protection device tripping contact to open the circuit breaker.

2.1.4 Cable box

The front and lower part of the GPR1 ring main unit is the cable box (see Figure 2-8):

- Connected to the power grid or transformer through cable interface.
- The cable box, earthing switch, load switch and circuit breaker can be mutually locked by adding locking devices to ensure the safety of maintenance personnel.
- The cable boxes of each functional unit are separated by metal partitions, which effectively prevents faults in a single compartment from affecting other compartments.
- An observation window is installed on the sealing plate of the cable box to facilitate operation and maintenance.

2.1.5 Earthing system

- The panel is equipped with a mechanical linkage earthing switch position indication system and clear analog indication signs.
- The inside and outside of the gas tank are connected to the casing through M12 copper nuts to form a complete and reliable earthing system (see Figure 2-9).



Figure 2-6



Figure 2-7

2.1.6 Fuse

- Install three closed fuse barrels horizontally in the front and middle part of the switch cabinet (see Figure 2-10).
- Metal spraying inside the fuse barrel. Enhances insulation properties and limits electrical stress.

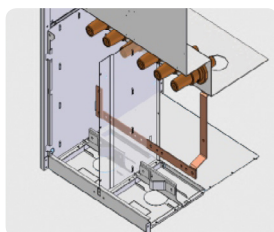


Figure 2-9



Figure 2-10



Figure 2-8

2.1.7 Live indicator device

- The live indicator (see Figure 2-11) is installed on each functional unit to provide internal cable live indication.
- Can be equipped with nuclear phase function according to user needs.

2.1.8 Secondary instrument box

The upper part of the GPR1 RMU is the secondary instrument box (see Figure 2-12):

- Reserve each port for user wiring and spare contact output.
- The wiring of each control circuit has been connected at the factory.



Figure 2-11

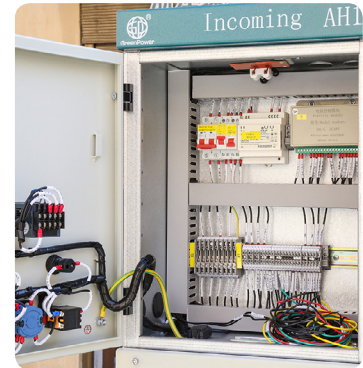


Figure 2-12

2.2 Gas tank

2.2.1 Switch device

The switch device (see Figure 2-13) has a unique structure and advanced technology:

- The switch device has three positions: closing, opening and earthing. This design eliminates the possibility of the load switch or isolating switch closing simultaneously with the earthing switch.
- The earthing switch has a short-circuit closing current that complies with the standard.
- The switch device has dual functions of isolating and breaking.
- The size of the earthing conductor matches the grid.
- The load switch adopts arc extinguishing technology with arc extinguishing grid structure.
- The vacuum load switch adopts vacuum arc extinguishing technology. Through the excellent insulation of the vacuum in the tube, the medium and high voltage circuit can quickly extinguish the arc and suppress the current after cutting off the power supply.
- After conducting a 25kA, 1s arc burning test, the equipment can meet the IAC AFLR level judgment standards specified in Appendix A of GB/T3906-2006.

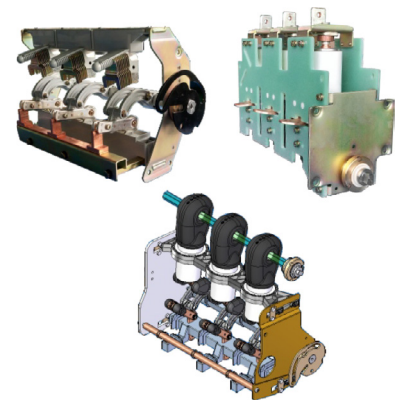


Figure 2-13

2.2.2 Sealed gas tank

The main primary components and busbars (see Figure 2-14) are installed in a sealed stainless steel box, which is strong, reliable and has strong environmental adaptability. The chance of internal failure is minimal.

- The gas box is filled with SF₆ gas at rated pressure, with reliable insulation and arc extinguishing properties.
- The sealed gas tank has undergone strict inspection and has a long life, ensuring reliable operation within 30 years.
- All components in the gas tank are maintenance-free for 30 years.
- Gas box welding adopts advanced equipment and automatic welding technology.

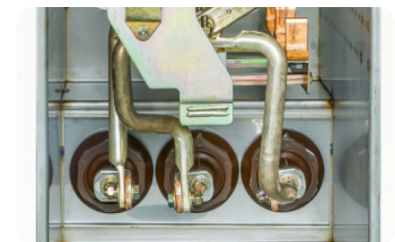


Figure 2-14

2.2.3 Internal arc withstand capability

The gas tank is made of high-quality stainless steel plates that are bent and welded and can withstand internal arcing under rated short-circuit current to ensure personal safety.

- The instantaneous overpressure generated by the internal combustion arc can be relieved by blasting the safety valve at the bottom of the metal enclosed (see Figure 2-15). The fault gas will be sprayed to the rear or below of the GPR1 ring main unit, and the front of the GPR1 ring main unit will not be affected and does not cause any danger to the operator.



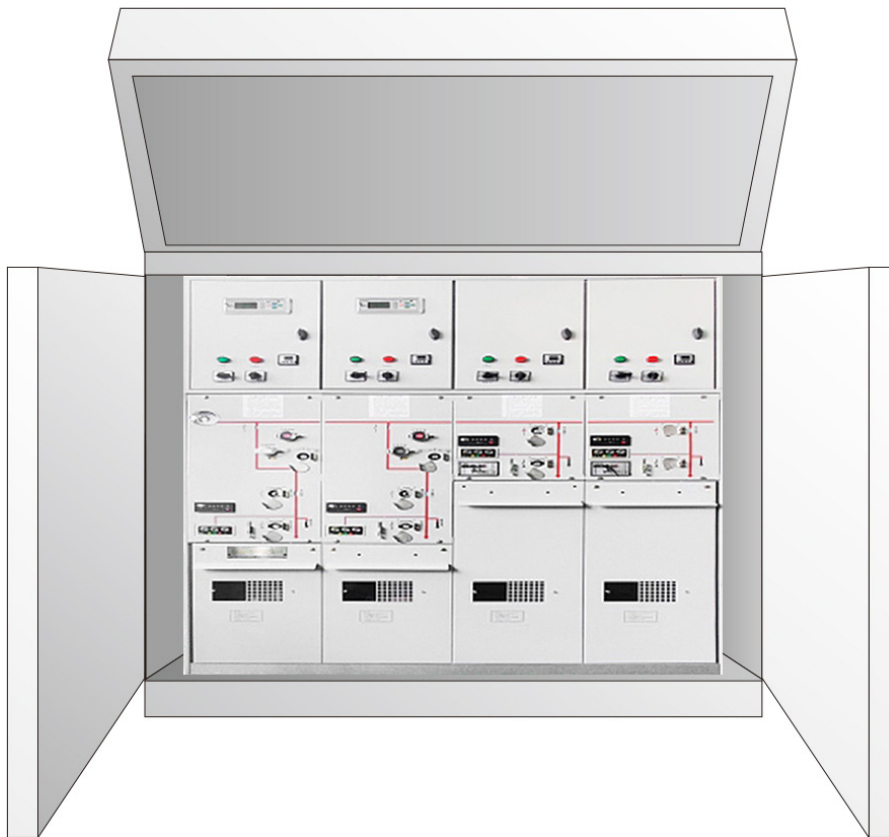
Figure 2-15

3.1 GPR1 ring main unit scalable series

- The GPR1 ring main unit expandable series allows for easy and safe expansion of your power grid, while also retaining the advantages of all fixed switchgear.
- The GPR1 ring main unit expandable series can be expanded on-site through cabinet merging operations, without the need for any gas treatment or special tools, nor any basic special preparation work.
- The GPR1 ring main unit expandable series can work in the harshest environments, just like non expandable series.

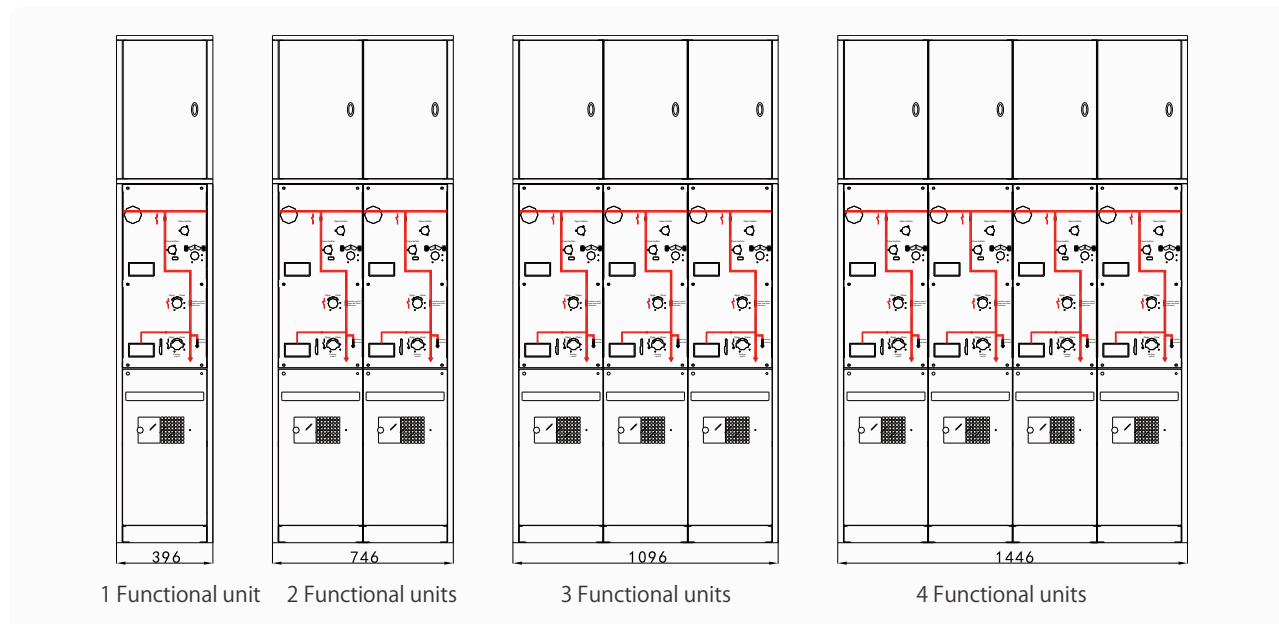
3.2 Outdoor application series

- We can provide matching outdoor boxes and corresponding accessories, making GPR1 ring main unit easy to apply in outdoor situations and meeting your various usage needs.
- The GPR1 ring main unit applied outdoors can be equipped with an electric operating mechanism, remote operation, control, and communication system according to usage requirements, achieving the automation function of the distribution network.
- The outdoor box structure (see Figure 3-1) has a small footprint, a small amount of civil engineering, a short construction period, and a small amount of operation and maintenance work.



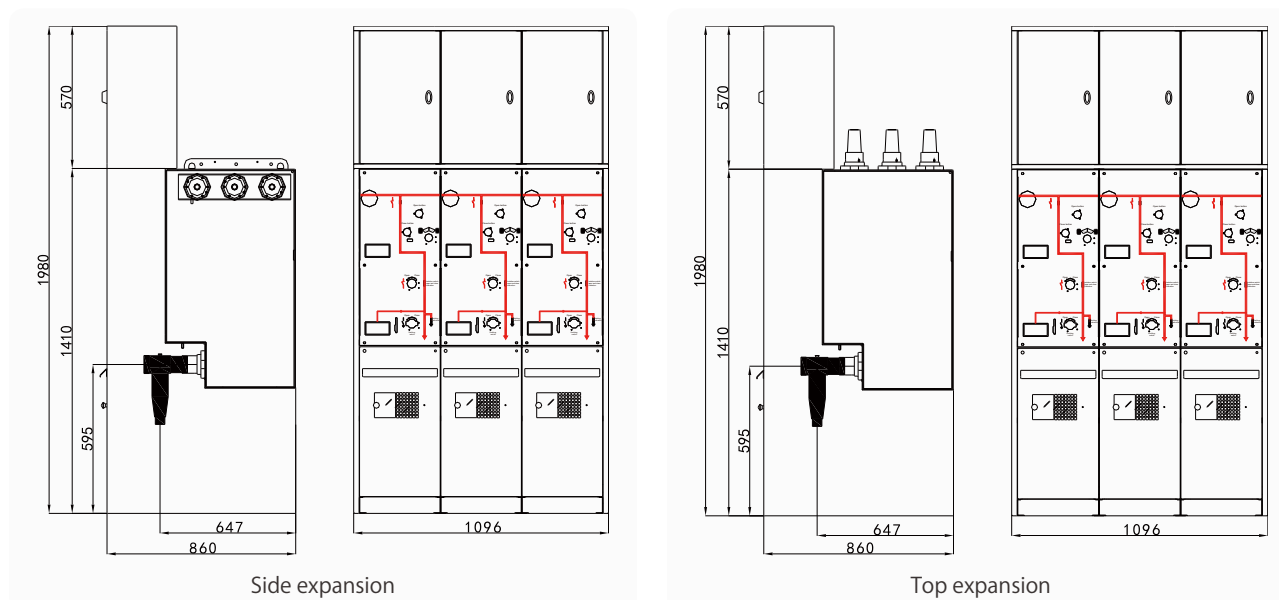
4.1 Outline dimensions

4.1.1 Non-expandable type



4.1.2 Expandable type

The external dimensions of the GPR1 ring main unit expandable type are consistent with those of the non expandable type, and it can provide two expansion methods: fully insulated side and top.



Series size Function series	Side extension / Top extension
1 Functional unit	396
2 Functional unit	746
3 Functional unit	1096
4 Functional unit	1446

Unit: mm

Note:

The installation dimensions are the same as those of the non-extended type.

Non-standard sizes can be negotiated with the user.

4.2 Weight

B	D	BC	DC	BF	CBC
130	130	260	260	260	320
CCC	CDC	BCBC	BCCC	CCCC	DCDC
300	320	430	410	390	411

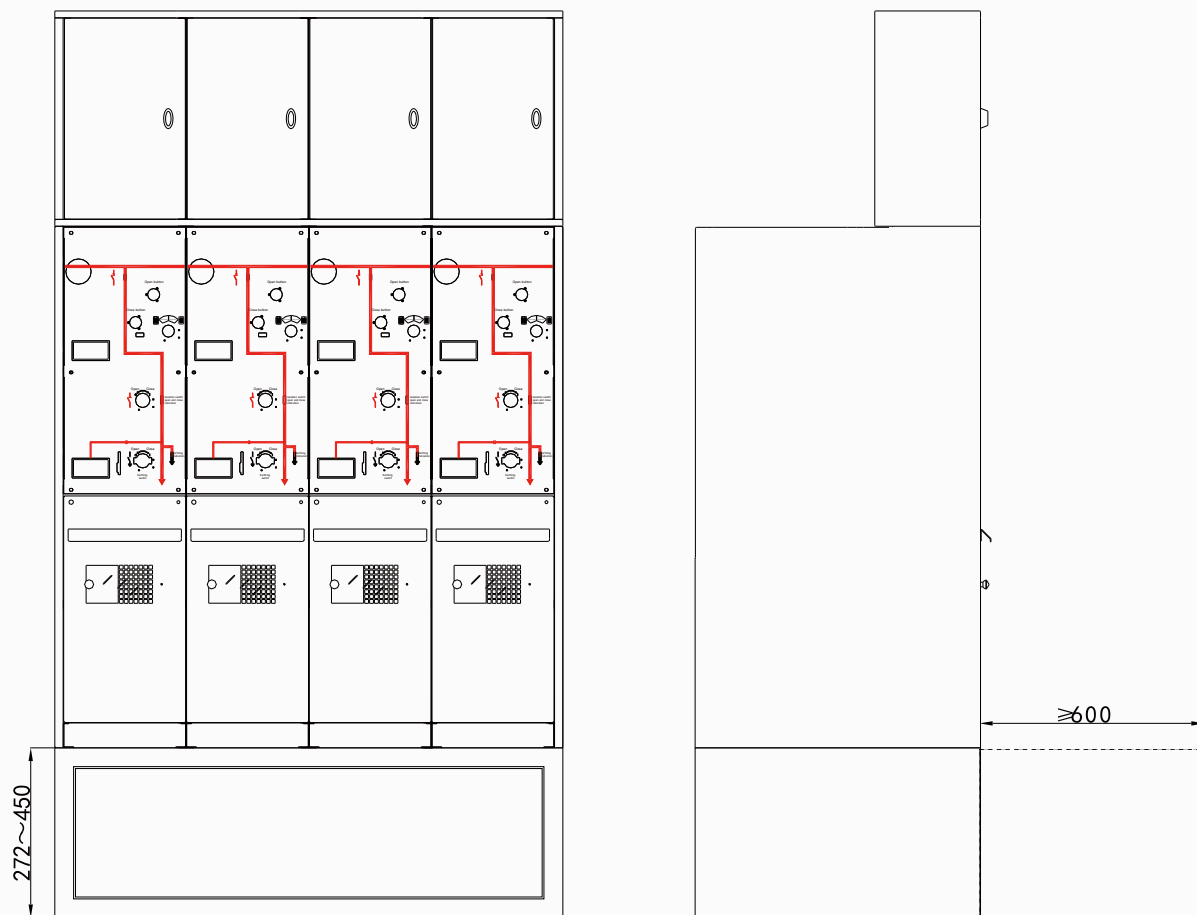
Unit: kg

Note: The weight of the non-extended type and the expandable type of GPR1 ring main unit is basically the same, with a fluctuation of ± 5 kg.

4.3 Additional raised base

GPR1 ring main unit can be installed on a raised base with a height of 272~450mm, as shown in the figure below.

- Adding a raised base can simplify civil construction, reduce the depth of cable trenches, and even eliminate cable trenches if the cable bending radius allows.
- The raised base can be directly fixed on the earth.



Note: To facilitate operation, a platform can be added.

4.4 Installation dimensions

4.4.1 Ground installation

Unit: mm

Fixed by mounting code or mounting beam to:

- On the ground with cable trenches or cable trays
- On cement base
- On the anchor bolts
- On metal base

(See Figure 4-4, Figure 4-5) as shown:

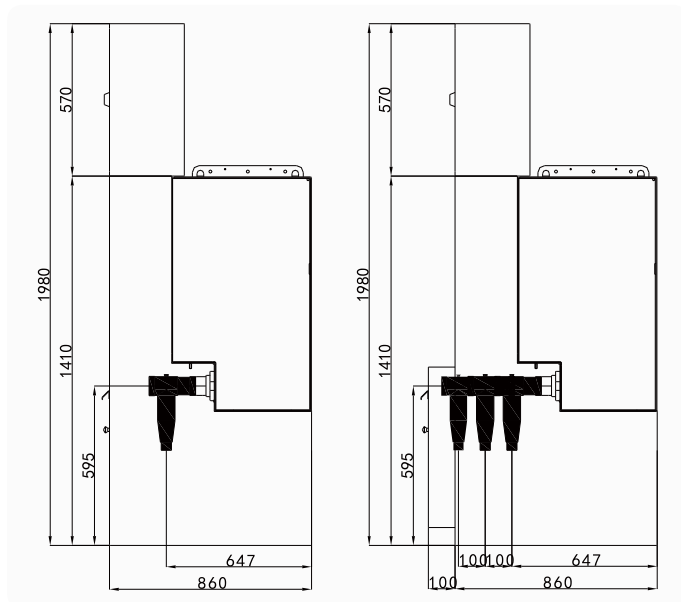


Figure 4-4 Cable connector diagram

Function series \ Series size	L	L1
1 Functional unit	396	322
2 Functional unit	746	672
3 Functional unit	1096	1022
4 Functional unit	1446	1372
5 Functional unit	1796	1722
6 Functional unit	2146	2072

Note: Non-standard sizes can be negotiated with the user.

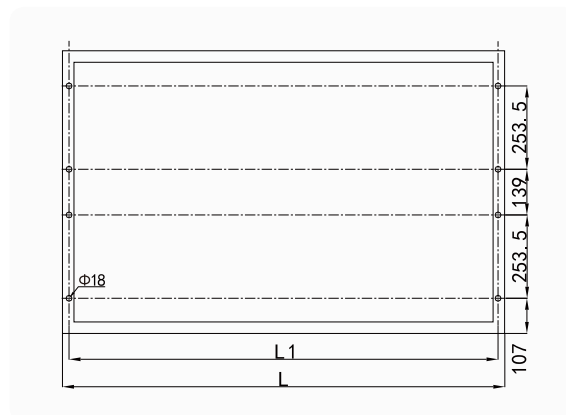


Figure 4-5 Installation dimension drawing

4.4.2 Installation against the wall

Use the mounting beam to fix it on the wall (see Figure 4-6).

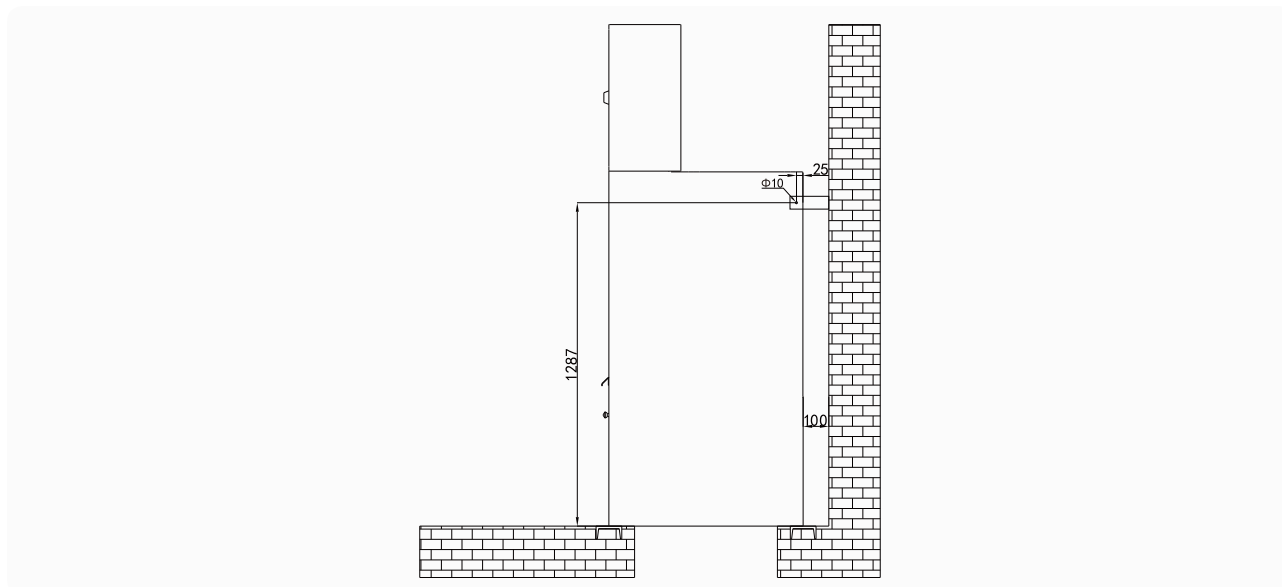
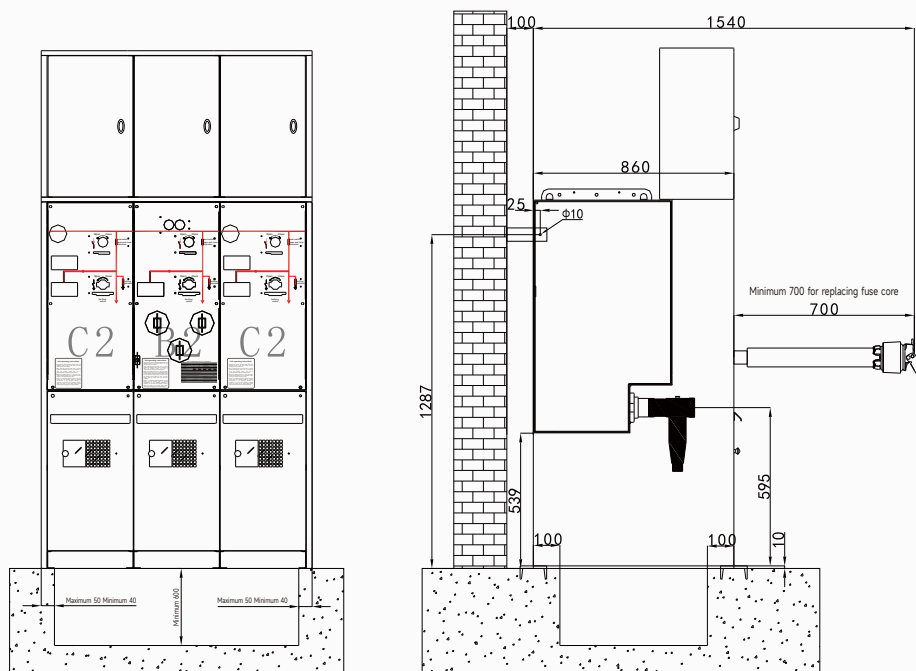


Figure 4-6 Installation against the wall

4.5 Schematic diagram of cable trench construction

4.5.1 Cables can pass from the front, back, left and right (see Figure 4-7).

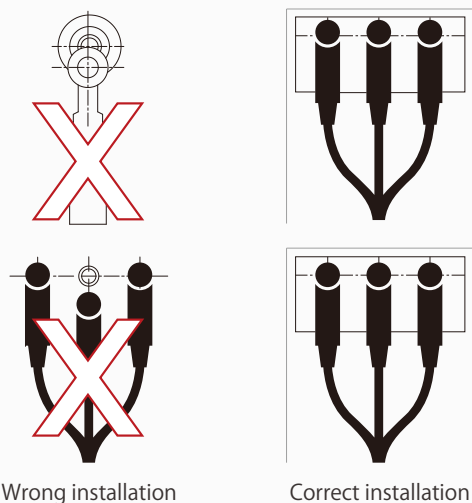


Note: If there is no cable trench designed, a raised base can be used.

Figure 4-7 Schematic diagram of cable trench construction

4.6 Cable installation method

- The center of the cable head must be consistent with the center of the casing to ensure that the casing is not subject to mechanical stress (see Figure 4-8).
- The length of each cable must be adjusted appropriately (especially the three-core cable).
- After installing the cable, confirm that the stress on the bushing is less than 300N or is not stressed.



Wrong installation

Correct installation

Figure 4-8 Cable installation diagram

4.7 Consider installation against internal arc faults

4.7.1 SF₆ gas is discharged to the rear of the substation (see Figure 4-9).

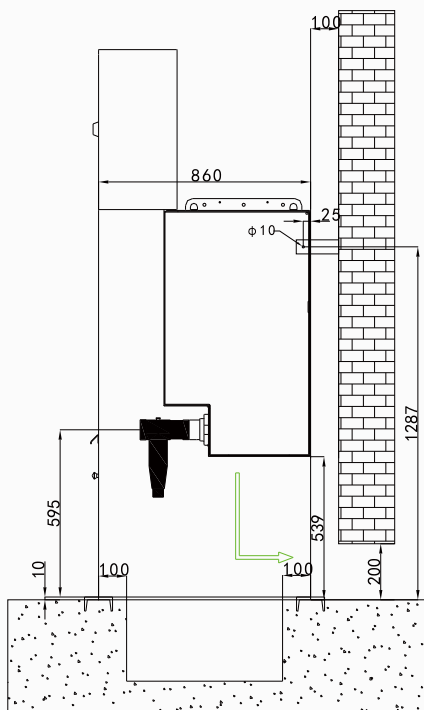


Figure 4-9 Schematic diagram of cable trench construction

4.7.2 SF₆ gas is discharged to the bottom of the substation (see Figure 4-10).

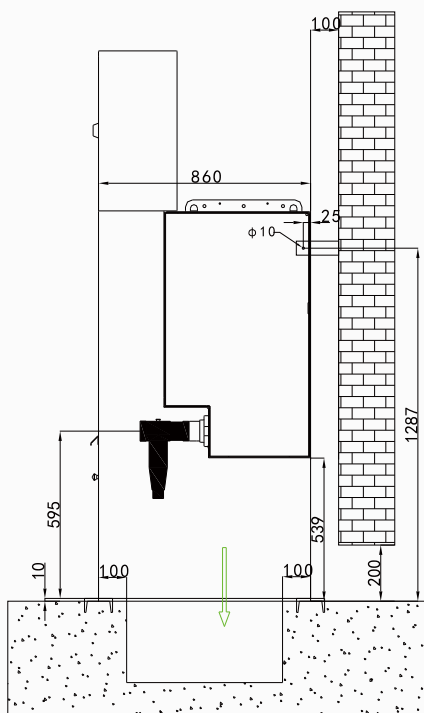
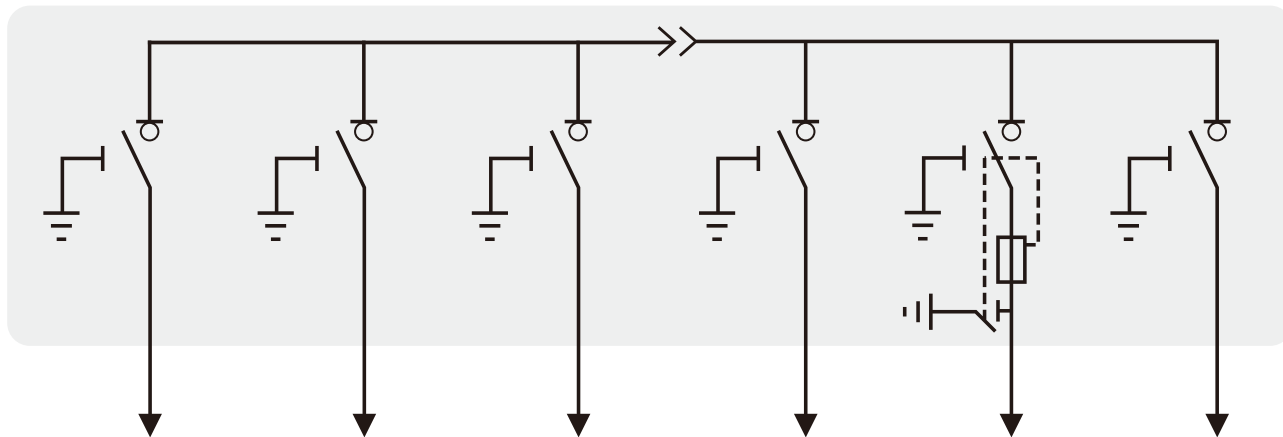


Figure 4-10 Schematic diagram of cable trench construction

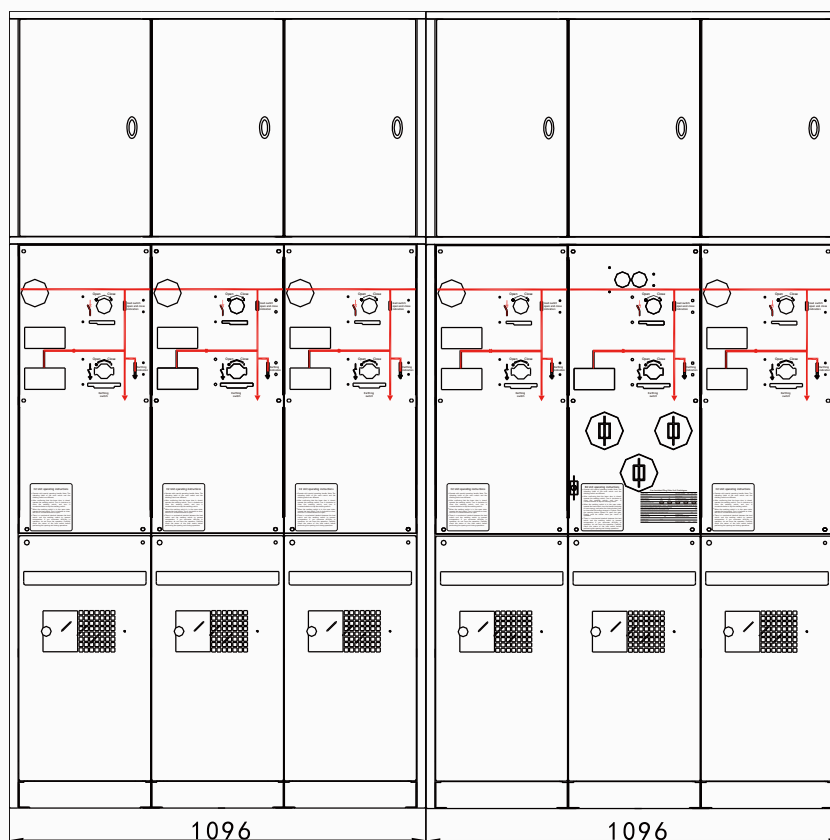
4.8 Line-up size

GPR1 ring main unit cabinet combination example: CCC + CBC.

CCC + CBC Primary diagram:



CCC + CBC Line-up layout:



4.9 Selection of bushings, cables and fuses

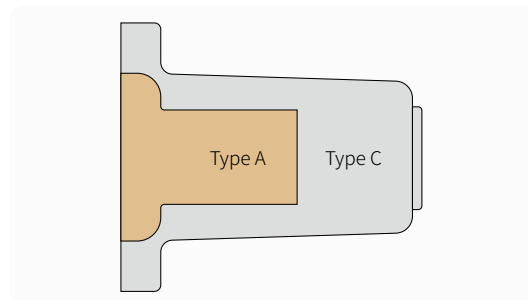
4.9.1 Overview

The shape, size and connection of GPR1 bushings meet the IEC 60137 standard definition, and 100% of epoxy resin bushings must pass power frequency withstand voltage and partial discharge tests. When the current flows through the bushing and enters the main circuit of the fully sealed SF₆ gas tank, the insulation between the live components and the frame is ensured.

4.9.2 Bushing type

According to the connection method and short-term withstand current, there are two types of bushings (see Figure 4-12):

- **Type A:** 200A: 16kA 4s and 31.5kA peak (plug-in type)
Specifications - $\Phi 31$ / $\Phi 32.5$ / 48 / $\Phi 7.9$
- **Type C:** 630A: 25kA 4s and 63kA peak (bolt-on type, M16 bolt)
Specifications - $\Phi 46$ / $\Phi 56$ / 91.5 / M16



4.9.3 Cable selection

Cable options include:

- Working voltage: Cable voltage and grid voltage
- Cable type: Aluminum and copper
- Cross section (unit: mm²)
- Insulation diameter
- Cable form: Single core and three core
- Insulation type: Dry type and oil-immersed type (non-drip type)
- Shielding type
- Metal-clad

4.9.4 Selection of connection interface

The choice of connection interface depends on specific parameters. For example: the rated current of the connected equipment: 200A, 630A; the short-time withstand current of the load switch and circuit breaker functions is 16kA and 25kA. but:

- For the load switch-fuse combination electrical function, since the fuse can limit the short-circuit current, the connection interface is type A.
- Minimum connection space between phases.
- Connection type:
 - Plug-in type ▪ Detachable: bolt connection
- Connection position: Horizontally arranged outlet casing at the front of the switch cabinet, elbow type.

4.9.5 Fuse selection

When selecting a fuse to protect a transformer, consider the following factors:

- Operating voltage
- Transformer rated capacity
- Fuse heat dissipation
- Technical specifications of fuse

4.9.6 Installable fuses

SDLAJ type: according to IEC 60282-1 dimensional standard, with impactor.

Selection table: (A is the rated value, no overload, $-25^{\circ}\text{C} < 0 < 40^{\circ}\text{C}$)

Usually IEC 60282-1 standard, IEC 62271-105 (replacing IEC 60420) and DIN 43265 standard.

Fuse current selection table:

Working voltage (kV)	Transformer rated capacity (kVA)															
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
3	20	31.5	40	50	50	63	80	100	125*	160						
3.3	20	25	40	40	40	63	80	80	125*	125*	160					
4.2	20	25	25	40	50	50	63.5	80	80	100	125*	160				
5.5	16	20	25	25	40	40	50	63	80	80	100	125*	160			
6	16	20	25	25	31.5	40	50	50	63	80	100	125*	160			
6.6	10	20	25	25	31.5	40	50	50	63	63	80	100	125*	160		
10	10	10	16	20	25	25	31.5	40	50	50	63	80	100	125*		
11	10	10	16	20	20	25	25	40	40	50	50	63	80	100	125*	
13.8	10	10	10	16	16	20	25	31.5	40	40	50	50	63	100*		
15	10	10	10	10	16	20	25	31.5	31.5	40	50	50	63	80	100*	
20	10	10	10	10	16	16	20	25	25	31.5	40	40	63	63	80	100*
22	10	10	10	10	10	16	16	20	25	31.5	40	40	50	63	80	100*

Note:

* In the case of external tripping (such as overcurrent relay), calculations must be made to ensure the normal operation of the load switch-fuse combination, please consult our company;

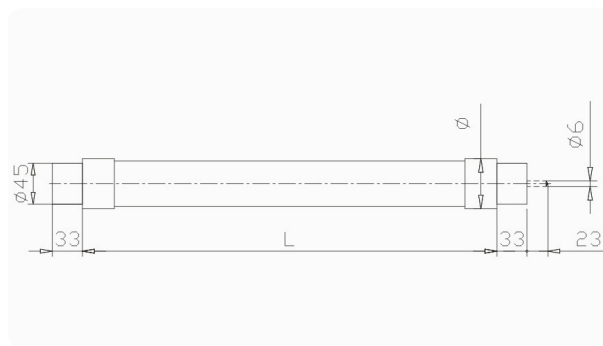
For fuse ratings not included in the table, please consult our company;

When the overload temperature exceeds 40°C , please consult our company;

If you choose fuses from other manufacturers, please consult our company.

4.9.7 Fuse dimension

Rated Voltage (kV)	Rated Current (A)	L (mm)	Φ (mm)	Weight (kg)
12	10 to 20	292	50.5	1.2
	25 to 40	292	57	1.5
	50 to 100	292	78.5	2.8
24	10 to 20	442	50.5	1.6
	25 to 40	442	57	2.2
	50 to 63	442	78.5	4.1
	80 to 100	442	88	5.3



4.9.8 Replacement of fuses

The IEC standard stipulates that when the one-phase fuse blows, the three-phase fuse must be replaced at the same time.

4.10 Fuse installation and replacement

4.10.1 Operation before installing and replacing fuses

Close the earthing switch before performing installation and replacement operations.
The replacement process for the three fuses is the same, repeat the following steps.

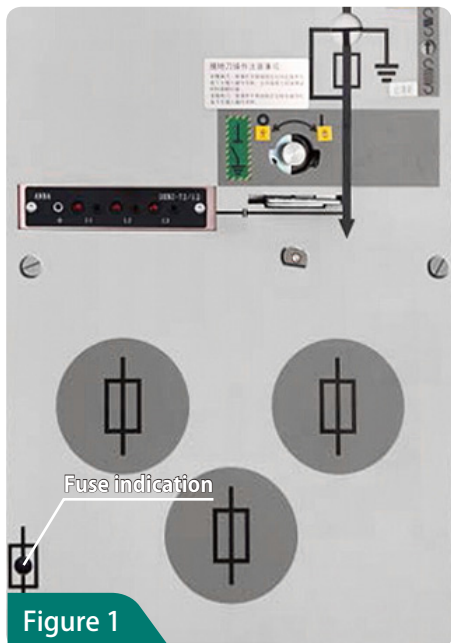


Figure 1

The fuse indicator sign is red, indicating that the fuse is blown and the switch is tripped.



Figure 2

Rotate the operating handle clockwise to close the earthing switch.



Figure 3

Release the panel.

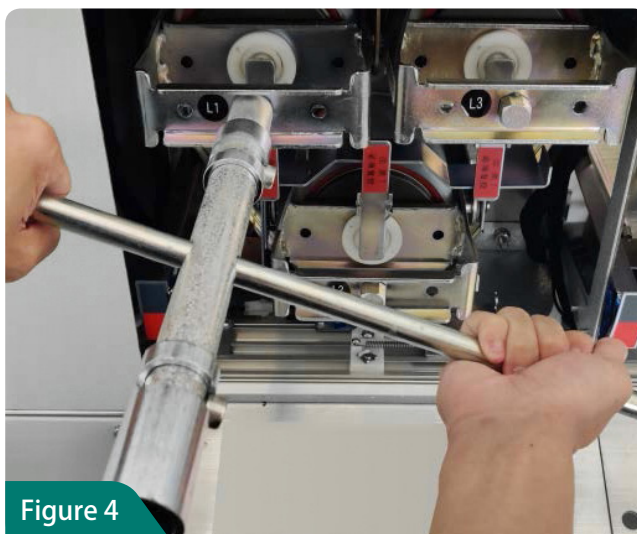


Figure 4

Rotate the operating handle counterclockwise to open the fuse box.

4.10.2 Installing fuses



Under no circumstances should a bumped fuse be installed.
It is recommended to check the fuses with a tester before installation.



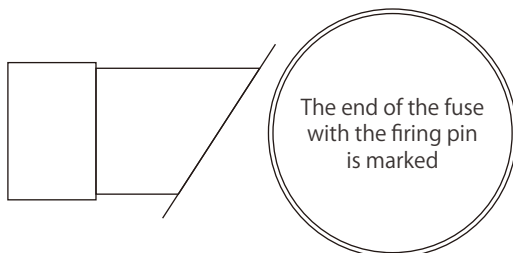
Pull the handle of the fuse box to remove the fuse.



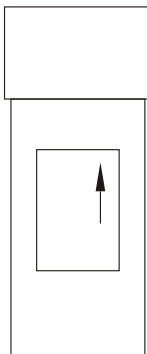
Use fastening screws to secure the fuse to the end cover of the fuse box, with the firing pin pointing outward to allow the fuse to function properly.

Assembly direction of firing pin fuse

The fuse releases the firing pin, causing the three-phase circuit of the switch to disconnect and prohibiting further closure.

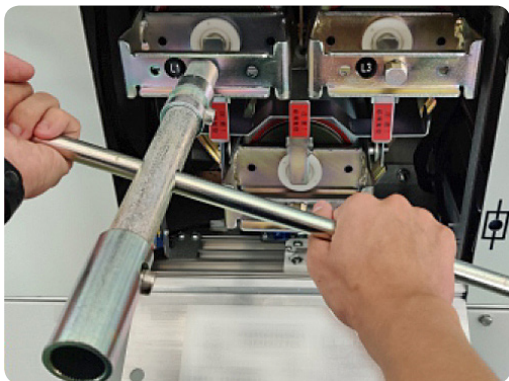


The end of the fuse containing the firing pin is marked.



The specifications and assembly direction are printed on the fuse housing (the firing pin must point outward).

4.10.3 Lock the sealing plug



Rotate the operating handle clockwise to close and seal the fuse box, and finally close the panel.

4.11 Protection and intelligence

The protection relay (see Figure 4-14) adopts a self powered microcomputer protection device, which is specifically designed for the application of ring main unit systems. It is a CT self powered protection relay with inverse and definite time protection characteristics, and has a three-stage combination overcurrent and earth fault protection function, especially for distribution boards with circuit breakers and extremely low rated output current. Can be applied to protection scenarios such as busbars, lines, and distribution transformers.

Distribution network automation devices can be configured according to user requirements to achieve intelligent distribution network functions.



Figure 4-14 Protection relay

4.11.1 Current transformer

The protection system can be configured with a variety of CT with different current ranges. According to the primary current of the system, the following CT can be selected:

Correspondence table between current and CT models

CT Model	Primary current range
LZCT-10 100/1 or 100/5	16-80A
LZCT-10 200/1 or 200/5	80-250A
LZCT-10 600/1 or 600/5	250-600A

4.11.2 Protection functions

- Phase current overcurrent protection and phase-to-phase fault protection

Provides inverse-time phase-to-phase protection when the phase current exceeds a certain multiple of the rated value, depending on the current level and selected characteristics.

The minimum trip time of the protection system can reach 40ms.

- Earth fault protection
- Fault value record

The built-in fault value record is used to store the data of the last 100 fault events, and the following fault information can be obtained:

- Protection unit causes tripping or externally triggered tripping
- Tripping current value or earth fault current between phases

4.11.3 Intelligent functions

GPR1 ring network cabinet has a "three remote" interface. After configuring a distribution automation terminal, it can realize remote signaling, telemetry, remote control, and protection logic (conventional protection, voltage and current feeder automation, and intelligent distributed feedback line automation) functions.

5.1 Verification and testing

- Check whether the fasteners are loose and tighten if found.
- Manually operated isolation switch, circuit breaker, mechanism interlocking device, etc. 5 times each. It should be flexible and free of jamming, and the movements should be accurate and the procedures correct.
- Check whether the mechanical characteristics meet the specified technical parameter requirements. The operation test must be carried out according to the specified maximum operating voltage and minimum operating voltage. The opening and closing should be normal.
- Check whether the control circuit wiring meets the requirements of the drawing. When the main circuit is not energized, perform an action test on the control circuit energized and it should comply with the requirements of the control circuit wiring diagram.
- Main circuit resistance measurement: Measure the main circuit resistance of the isolating switch and circuit breaker in the cabinet respectively, and the measured values should comply with their respective regulations. The measurement method adopts the DC voltage reduction method, and measures the voltage drop through 100A DC current.
- Control circuit insulation test: Apply a power frequency voltage of 2000V between the control circuit and the enclosed. There should be no breakdown discharge for 1 minute. When there are electronic components in the control circuit, the test voltage shall be mutually agreed upon by our company and the user.
- Main circuit insulation test: When the voltage level is 12kV, the power frequency withstand voltage of 42kV is applied between phase to phase and phase to earth; when the voltage level is 24kV, the power frequency withstand voltage of 65kV is applied between phase to phase and phase to earth, and the power frequency withstand voltage of 79kV is applied between across open contacts, and there should be no breakdown and flashover for 1 minute.

5.2 Maintenance and inspection

GPR1 ring main unit complies with IEC 60694 standards and can work for 30 years under normal operating conditions.

The GPR1 ring main unit should be opened/closed at least once every three years. The status of the mechanism (including contamination, corrosion and lubrication) and the cleanliness of the observation window (contamination) should be checked every five years. The battery should be replaced every four years (if any). equipment selection).

In addition, the following points should be noted:

- Check the operating mechanism and interlocking conditions, and they should meet the "five prevention" locking requirements.
- Check the earth circuit outside the as tank and the earth wire through the door to ensure its conductive continuity.
- Check whether the control circuit connection is good, whether there are any abnormalities in the control circuit contacts, and perform necessary processing.
- Check the fasteners of each part and tighten them in time if they are loose.
- Main circuit power frequency withstand voltage test: The test voltage value is 0.8 times the value specified in GB/T 11022-2011.

5.3 Packaging, transportation and storage

The following points should be noted during transportation and storage of GPR1 ring main unit:

- Do not overturn, invert or suffer severe vibration to prevent cabinet deformation and paint damage.
- Should be stored in a dry, ventilated room or a dry place protected from rain, snow, wind and sand.
- Do not disassemble parts at will.
- Any operation that may damage the sealing performance of the gas tank is prohibited.

5.4 Product complete set of documents and ordering instructions

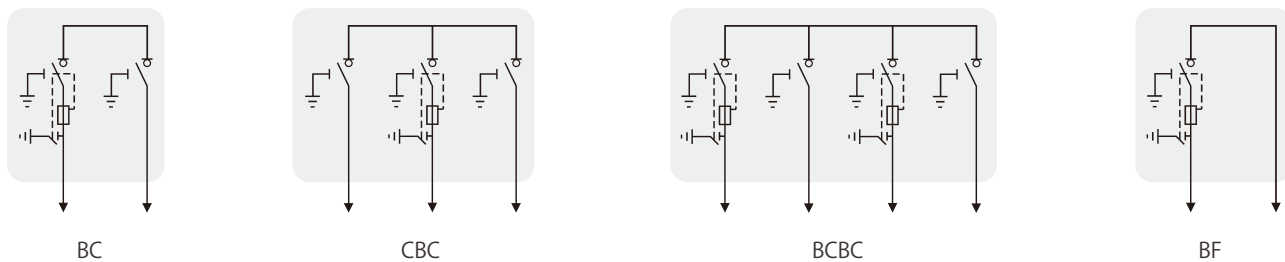
Product complete set of documents:

- Product certificate
- Product packing list
- Product factory test report
- Installation and user manual
- Control circuit wiring scheme

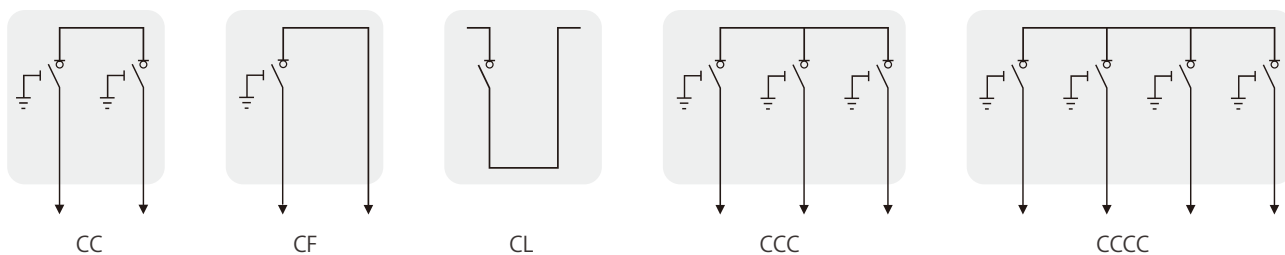
Ordering instructions:

- Main circuit wiring scheme, main circuit diagram and arrangement diagram
- Electrical equipment summary table
- When the switchgear cabinet is used in a special environment, it should be mentioned when ordering.
- Non-standard design can be carried out according to user requirements
- If you need other or additional accessories, please indicate the type and quantity.

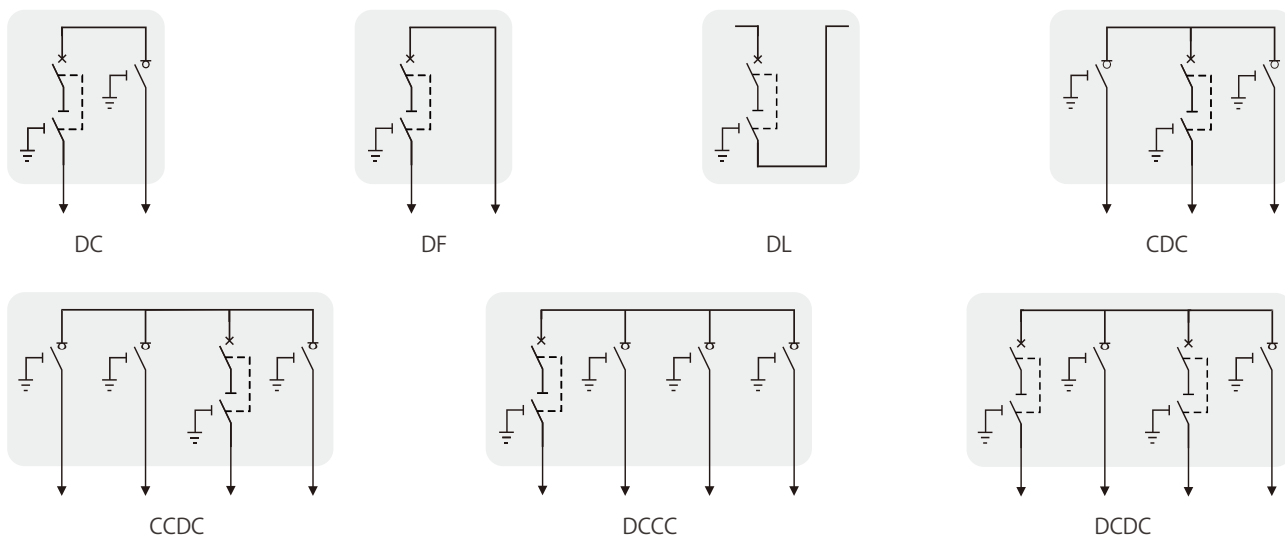
6.1 Transformer protection load switch-fuse combination appliance



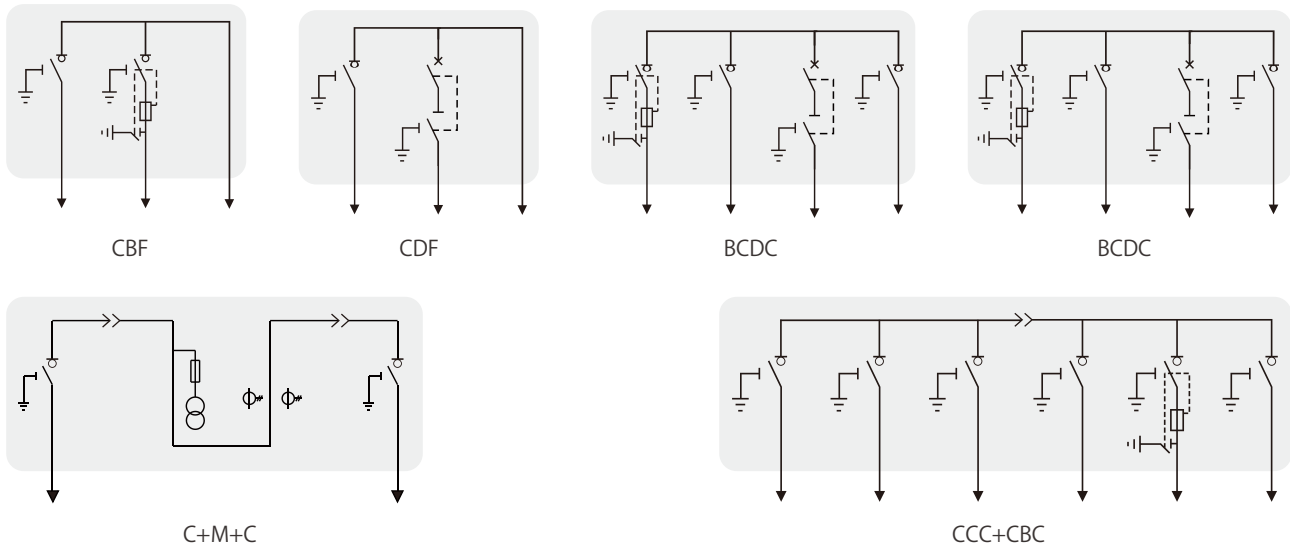
6.2 Network node load switch



6.3 Network node 630A circuit breaker



6.4 Other combination solutions



Note: The above are typical combined loop solutions. Any other combined loop solution can also be provided according to user requirements.

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Zhejiang Greenpower Electric Co., Ltd
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Professional Power Equipment Provider

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