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万寿电气

® WANSHOU ELECTRIC



AGi-12

Environmentally friendly gas insulated ring main switchgear

**The new generation of ring main cabinets is green
and environmentally friendly without SF6
Environmentally friendly inflatable cabinets for State Grid**

GREEN EFFICIENT SMART

The core of the green power energysystem lies in reducing carbon emissions and environmental pollution.
Meeting the increasing demand for energy while reducing the negative impact on the environment



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AGi-12 series environmentally friendly gas insulated ring main unit is a fully insulated, green and intelligent ring main unit switchgear independently developed by our company with the introduction of advanced environmentally friendly intelligent design concepts from Germany. The environmentally friendly gas insulated ring main unit seals the primary main circuit in a gas box that uses advanced robot welding technology and undergoes strict helium mass spectrometry leak detection, uses environmentally friendly gas as the insulating medium, uses mature and reliable vacuum arc extinguishing chambers as the breaking and arc extinguishing functions, and uses a uniquely designed three-position isolating switch to ensure safe and reliable operation and maintenance.

AGi-12 series environmentally friendly gas insulated ring main unit is suitable for 12kV power supply lines or dual radiation power supply, especially for power supply with high load density.



INTRODUCING THE NEW PRODUCTS

AGi-12 series environmentally friendly gas insulated ring network is a fully insulated, green intelligent ring network switchgear independently developed with intelligent design concept. AGi-

12 series environmentally friendly gas insulated ring network cabinet has the characteristics of full insulation, long life, maintenance-free, small space occupation, safety and reliability, and no environmental impact. It is widely used in industrial and civil ring networks and terminal power supply. It is particularly suitable for small secondary distribution stations, switchgear, industrial and mining enterprises, airports, railways, commercial areas, high-rise buildings, highways, subways, tunnels and other fields. Especially in special environments such as plateaus, humidity, coldness, and low-lying areas.

The launch of the AGi-12 series of environmentally friendly gas-insulated ring main unit switchgear truly and fully meets the needs of customers such as the State Grid Corporation of China and China Southern Power Grid Corporation for environmentally friendly ring main unit cabinets, and will lead the future development trend of environmentally friendly ring main unit products.

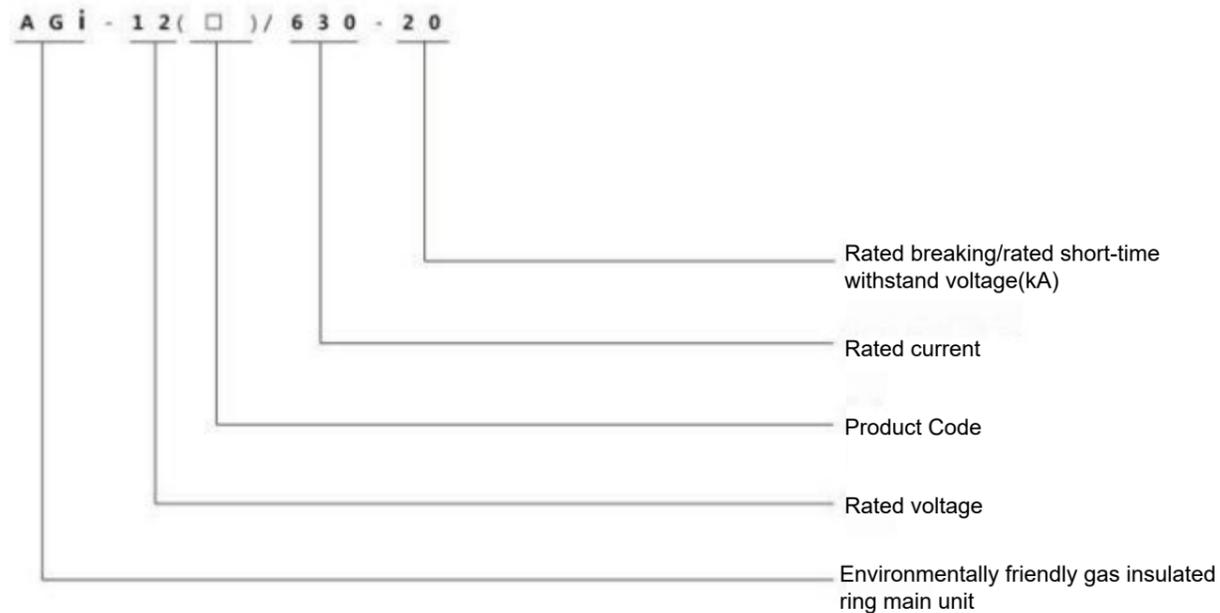
1. Operating environment

- Altitude: not more than 2000 meters (if the installation altitude exceeds 2000m, please contact our company).
- Environmental temperature: maximum temperature +50°C, minimum temperature -45°C, 24h average temperature does not exceed +35°C.
- Environmental humidity: 24h average relative humidity does not exceed 95%, monthly average relative humidity does not exceed 90%.
- Installation environment: There is no explosive and corrosive gas in the surrounding air, and there is no severe vibration and shock at the installation site.
- Seismic intensity: 8

2. Technical features

- Laser-welded gas box ensures 30 years of maintenance-free.
- Fully insulated and fully sealed, without any exposed live parts.
- Environmentally friendly gas is used as protection, which is green and environmentally friendly and does not affect the environment.
- The three-position disconnecter has a visible break, and the inspection and maintenance are safe and reliable.
- The grounding switch closes quickly and has the ability to close.
- The micro-positive pressure design can still operate safely under zero gauge pressure.
- The use of environmentally friendly recyclable materials reduces the impact on the environment.
- It has a complete mechanical lock, which is simple to operate and safe to use.
- The modular design makes busbar splicing safe and convenient.
- Integration and intelligence fully meet the needs of distribution automation.

3. Model and meaning



4. Reference standards

- GB/T 3906 3.6kV~40.5kV AC metal-enclosed switchgear and control equipment
- GB/T 11022 Common technical requirements for high-voltage switchgear and control equipment standards
- GB 1984 High-voltage AC circuit breakers
- GB/T 3804 3.6kV~40.5KV high-voltage AC loads
- GB 1985 High-voltage AC disconnectors and earthing switches
- GB 3309 Mechanical tests of high-voltage switchgear at room temperature
- DL/T 404 3.6kV~40.5kV AC metal-enclosed switchgear and control equipment
- DL/T 402 Technical conditions for ordering high-voltage AC circuit breakers
- DL/T 486 High-voltage AC disconnectors and earthing switches
- DL/T 593 Common technical requirements for high-voltage switchgear and control equipment standards
- GB/T 4208 Enclosure protection grade (IP code)



2、 Technical Parameters

Item		Unit	Parameter
Rated Voltage		kV	12
Rated power frequency withstand voltage (phase-to-phase and phase-to-ground)		kV	42
Rated power frequency withstand voltage (port)		kV	48
Rated lightning impulse withstand voltage (phase to phase and phase to ground)		kV	75
Rated lightning impulse withstand voltage (break)		kV	85
Bus rated current		A	630、1250
Circuit breaker parameters	Rated current	A	630、1250
	Rated short-time withstand current	kA/s	20、25/4
	Rated short-circuit breaking current	kA	20、25
	Rated peak withstand current	kA	50、63
	Rated short-circuit closing current	kA	50、63
Three-position isolating switch parameters	Rated current	A	630、1250
	Rated short-time withstand current	kA/s	20、25/4
	Rated peak withstand current	kA	50、63
Load switch parameters	Rated current	A	630、1250
	Rated short-time withstand current	kA/s	20、25/4
	Rated peak withstand current	kA	50、63
Mechanical life	Circuit breaker	Time	10000
	Isolating switch		5000
	Earthing switch		5000
Loop resistor	Circuit breaker cabinet	$\mu\Omega$	150

Item	Unit	Parameter
Rated operating sequence of circuit breaker		0-0.3s-C0-180s-C0
Rated filling pressure (gauge pressure at 20°C)	Mpa	≤ 0.02
Minimum functional pressure (gauge pressure at 20°C)	Mpa	0
Annual leakage rate	%/Year	≤ 0.01
Protection level		Box IP67, Cabinet IP4X
Dimensions (width × depth × height)	mm	420 × 850 × 1650 (2000Width instrument box)



3、 Available modules and types

V Circuit breaker module
(Width=420mm)

D Cable entry cabinet module without switch
(Width=420mm)

SL Busbar connection
(Width=520mm)

PT Voltage transformer cabinet module
(Width=600mm)

M Metering cabinet module
(Width=650mm)



D Cable entry cubicle modules without switches

Standard configuration and features:

630A/1250A busbar

Capacitive voltage indicator to show bushing voltage,

Cabinet

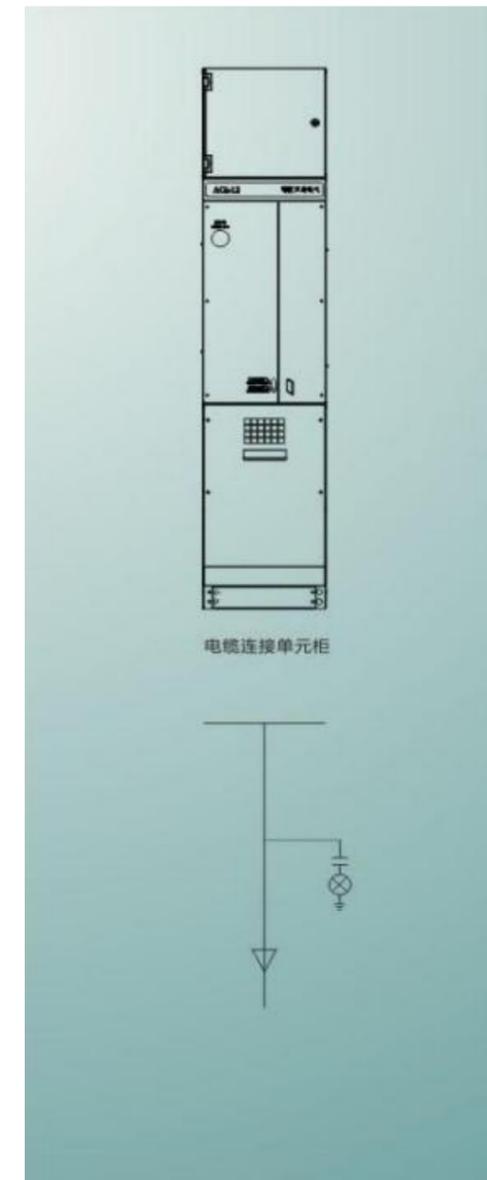
Gas pressure gauge

Ground busbar

Optional configuration and features:

Separable connector (cable connector)

Lightning arrester



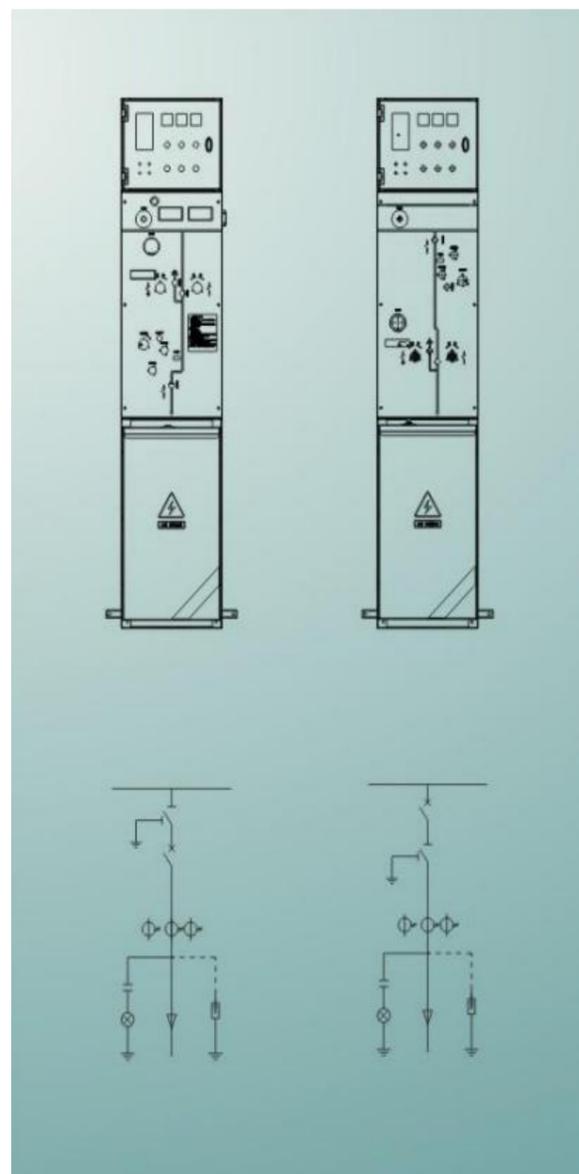
V Circuit breaker module

Standard configuration and features

- 630A/1250A busbar
- Vacuum circuit breaker
- Electric operating mechanism for vacuum switch
- Three-position disconnector
- Manual operating mechanism for three-position disconnector
- Position indicator for vacuum switch and three-position disconnector
- Cable connection bushing
- Capacitive voltage indicator to show bushing is energized
- Padlocking device
- Cabinet
- Grounding busbar
- Operating handle
- Current transformer (for protection only)
- Digital relay protection device

Optional configurations and features:

- Short circuit and ground fault indicators
- Detachable connector (cable connector)
- Lightning arrester
- Incoming line live/grounded locking device
- Key mechanical interlocking device
- Toroidal current transformer and meter



M Metering cabinet module

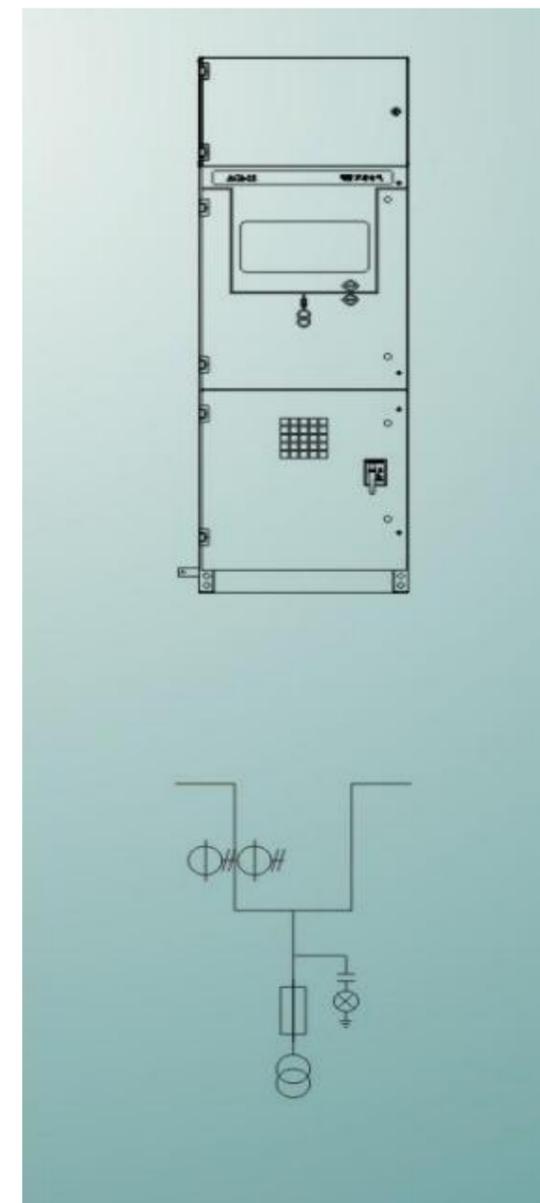


Standard configuration and features:

- 630A/1250A busbar
- Voltage transformer (two units)
- Current transformer (two units)
- Fuse to protect PT
- Capacitive voltage indicator to show bushing voltage
- Cabinet
- Ground busbar

Optional configuration and features:

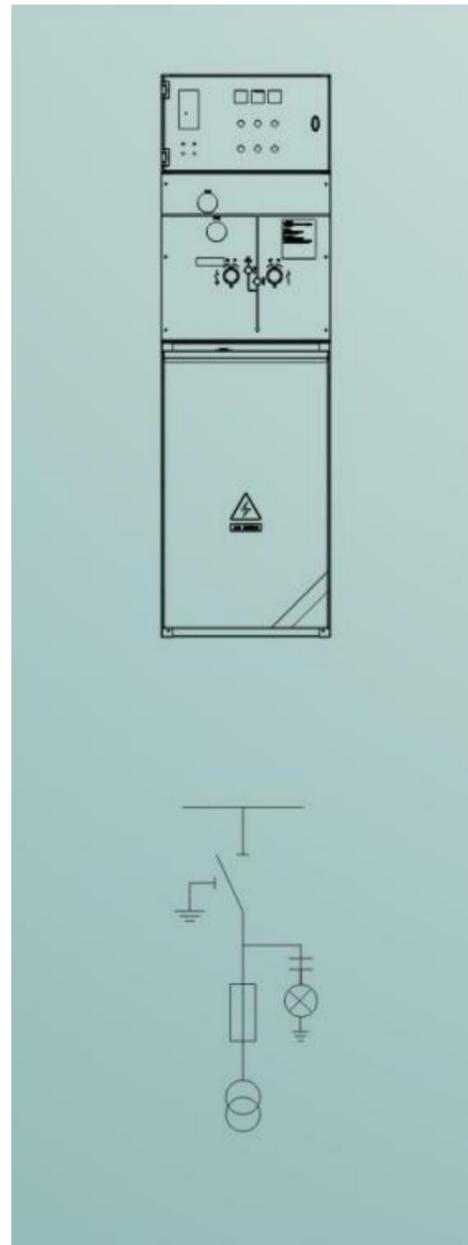
- 1 switch
- 1 voltmeter
- 1/2/3 ammeters
- 1 active energy meter
- 1 reactive energy meter



PT transformer module

Standard configuration and features:

- 630A/1250A busbar
- Three-phase integrated voltage transformer
- Three-position isolating switch
- Three-position isolating switch manual operating mechanism
- Fuse to protect PT
- 1 voltmeter with switch
- Capacitive voltage indicator to show bushing voltage
- Cabinet
- Barometer
- Ground busbar



Optional configuration and features:

- Lightning arrester



10kV Summary table of primary scheme diagrams of environmentally friendly gas insulated ring main unit (common box type)

Solution No.	1	2
Solution Name	2-way circuit breaker (VV)	3-way circuit breaker (VVV)
Primary wiring diagram		
Primary wiring diagram		

12

4、 Structure description and operation method description

1. Basic structural principle

The ring main unit can be composed of a common box (1-3 compartments) or a separate gas box compartment.

The primary element is placed in a closed shell welded from stainless steel plates. The shell is filled with environmentally friendly gas with a pressure of no more than 0.02Mpa as an insulating medium. The gas inside the gas-filled shell is monitored by a barometer. The cabinet part except the gas-filled shell plays the role of installing and fixing the gas-filled gas box. All components not sealed in the gas-filled gas box are installed in the cabinet. The cabinet is made of high-quality aluminum-zinc coated sheet metal, which is bent and processed by CNC sheet metal equipment and connected by high-strength bolts and nuts. The cabinet door panel is made of high-quality alloy steel plate, which is bent and formed by spraying technology.

The ring main unit consists of a gas box, a mechanism box, a cable room, an instrument room, and an extended busbar. A special pressure relief device is installed at the bottom of the gas box. When the internal arc pressure is too high, the high-pressure gas in the box will be released to the bottom of the cabinet by the pressure relief device without hurting the operator. The operating mechanism room is located at the front of the ring network cabinet. In each functional circuit, the circuit breaker is equipped with a manual (or electric) energy storage spring operating mechanism, and the three-position disconnecter and grounding switch are equipped with a manual energy storage spring operating mechanism. There is a switch status display card on the panel. The three-position disconnecter and grounding switch operating mechanism are equipped with a padlock position, which can be equipped with a padlock when not in operation to prevent unauthorized personnel from misoperating. The operation of the circuit breaker, the three-position disconnecter and the cable room door is equipped with a "five-protection" interlocking device.

Circuit breaker switch unit

Circuit breaker operation modes are divided into manual and electric



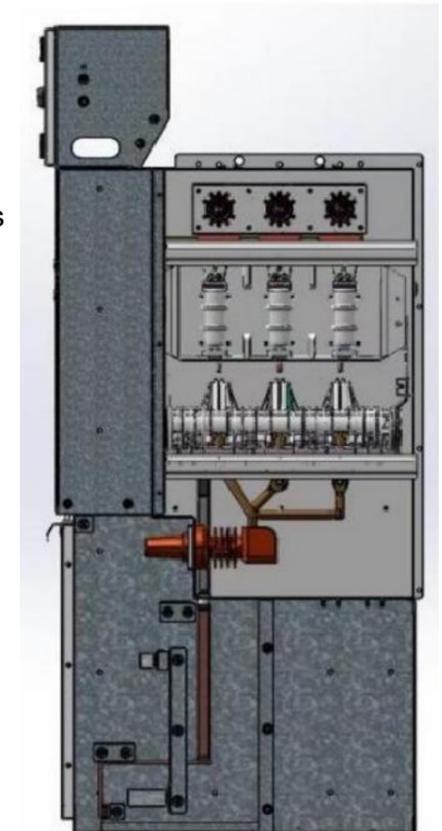
5、 Core Components Technology Introduction

Main switch design



a. Simple primary circuit design, uniform electric field distribution structure, no need for more composite insulation, spacious air box space, and good heat dissipation convection.

b. Use recyclable and environmentally friendly thermoplastic materials with high mechanical strength and excellent heat resistance. The three-phase integral vacuum interrupter frame is replaced by epoxy casting vacuum interrupter frame through one-time injection molding. It has many advantages such as simple structure, uniform field strength, good insulation performance, high production efficiency, less adjustment, and easy assembly.



Disconnecter design

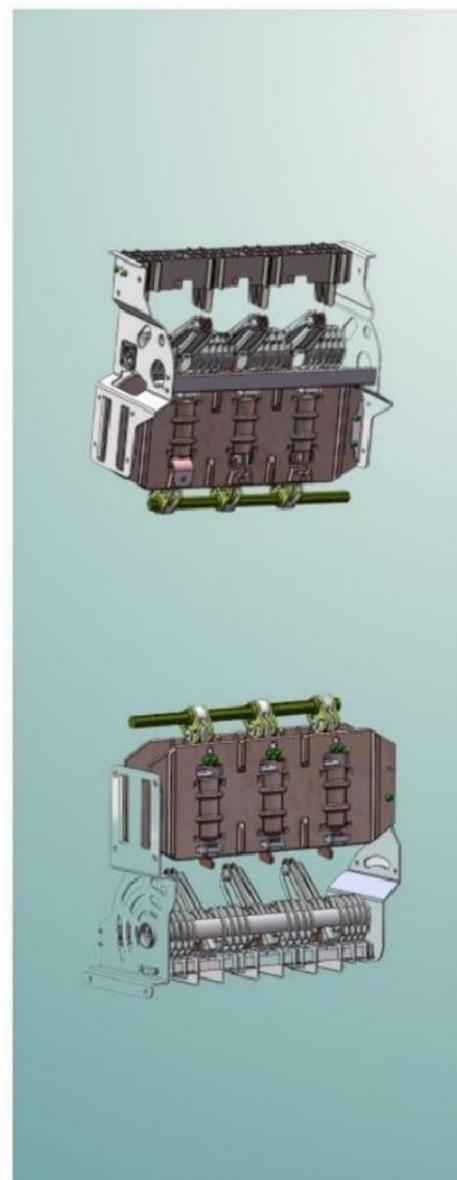
a. The isolating switch adopts a three-position design, which theoretically completely avoids the occurrence of misoperation.

b. The contact design is conducive to grounding and closing, and the grounding closing speed is \geq

4.2m/s.

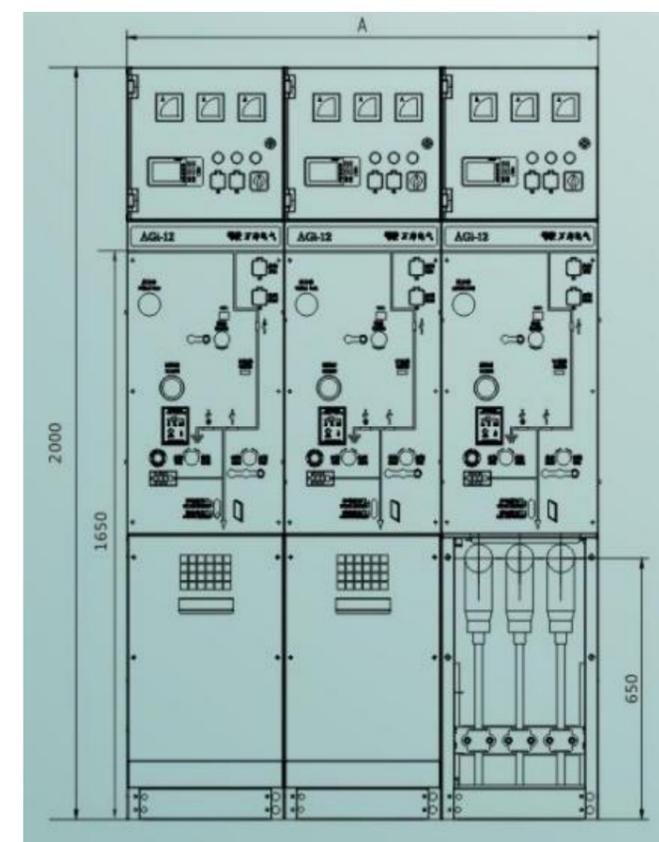
c. The high-performance German Mubea disc spring ensures the stability of the contact pressure.

d. The main shaft drives the rotary isolation, and the transmission gap is small, which ensures reliable grounding and isolation break distance.



6、Appearance and related dimensions

AGi-12 Cabinet Dimensions



Size A

Number of lines	A
1	420
2	840
3	1260

Size B

Solution Type	B
Circuit breaker unit	≥ 650

Note: Depends on unit type and quantity

7、 Installation, transportation and storage

Primary interface and civil engineering interface

1. The width of the PT unit cabinet is 600mm, and the width of the unit cabinets of other solutions is 420mm. The total cabinet width is determined by user needs.

2. Cabinet depth

Defines the bottom frame depth.

The cabinet depth of various functional units is 850mm, and the maximum appearance (projection distance) is $\leq 950\text{mm}$.

3. Cabinet height

Defines the front frame height.

From the front of the cabinet, the side expansion cabinet height (excluding the instrument box) is 1650mm, of which the instrument box height is 350mm.

1. Products can be packaged and shipped after passing factory inspection. When packaging, the product is fixed to the chassis with bolts. During transportation, it can only be placed upright, and it is not allowed to be inverted, tipped over, or dropped.

2. Before installation, the product should be stored in the warehouse in its original packaging. If it cannot be placed in the warehouse, it should be protected from rain and moisture, and electrical components and parts should not be disassembled at will.



Side expansion cabinet dimensions

From the front of the cabinet, the top expansion cabinet height (excluding the instrument box) is 1650mm, of which the instrument box height is 350mm

Pressure release channel direction

The pressure release channel direction is toward the cable trench.

Foundation channel steel

The foundation channel steel is 10# hot-dip galvanized channel steel, buckled, and the foundation is designed according to the cabinet depth of 750mm, with a depth spacing of 750mm (channel steel eaves). The channel steel fixing hole is an M12 threaded hole.

The cabinet frame is aligned with the front channel steel.

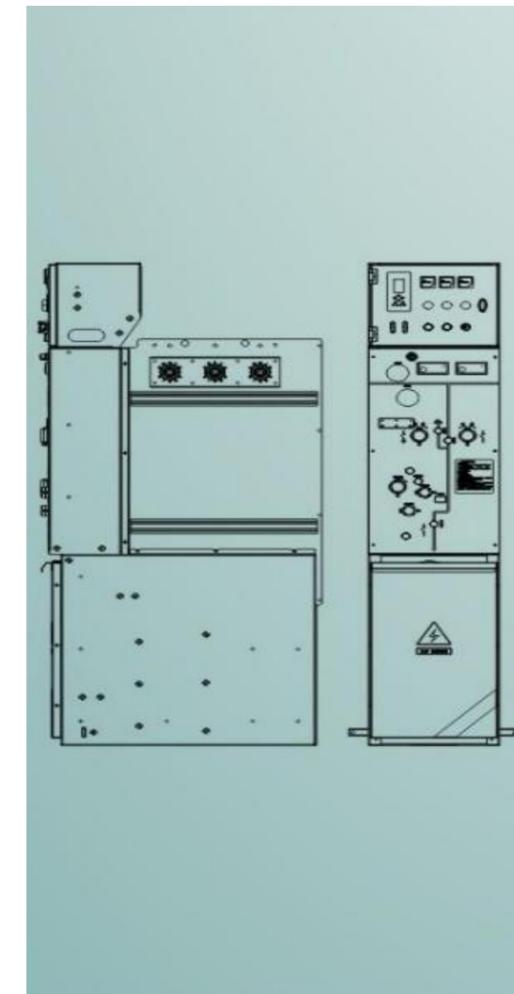
Side expansion method

Line side expansion position, specifications and connectors

①The height of the side expansion busbar center from the ground is 1550mm, the busbar center distance is

150mm, and the B phase center is 510mm from the front bottom frame.

②Busbar sockets and connectors used in the busbar side expansion method.



8、 Appendix

1、 Cable head selection

The shielded European cable heads used in the AGi series of environmentally friendly gas-insulated ring network switchgear can be matched with foreign brand products or with well-known domestic cable head manufacturers to meet the requirements of different users for cable heads.



2、 Charge display

The live display is used as a device to check whether the incoming and outgoing line cabinets are live. The incoming and outgoing line bushings of the switch unit are equipped with capacitive voltage indicating devices. Each live display has a three-phase voltage phase check point, and a phase checker can be used for phase checking. According to user requirements, a live display with a forced locking function can be selected. When the cable is live, the grounding switch operating hole is locked to prevent the grounding switch from being mistakenly closed when live, ensuring personal and equipment safety.



3、 Short circuit/ground fault indicator

When a short circuit or ground fault occurs in the distribution system, it will effectively help operators determine the fault interval and isolate the fault.



4、 Current transformer

Current transformers of different specifications and types can be configured according to requirements for metering/measurement/protection



5. Voltage transformer

Fully enclosed voltage transformers can be configured as needed to meet the requirements of distribution network automation. They can be used to provide metering/measurement voltage signals, switch electric operating mechanisms and backup power for other instruments. Single/three-phase voltage transformers can be selected as needed.



6. Signal contact of pressure indicating instrument

Each gas box of the switch unit is equipped with a N2 gas pressure gauge to display the N2 gas pressure in the box.



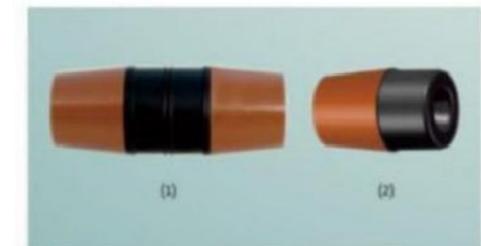
7. Cable connection

The switch unit is equipped with DIN4763 standard bushing, the cable compartment door is interlocked with the grounding switch, and switch wiring units with different responsibilities can be selected according to the number of outgoing line circuits.



8. Mother coupler

- (1) State Grid standardized side busbar connector
- (2) State Grid standardized side expansion bushing plug

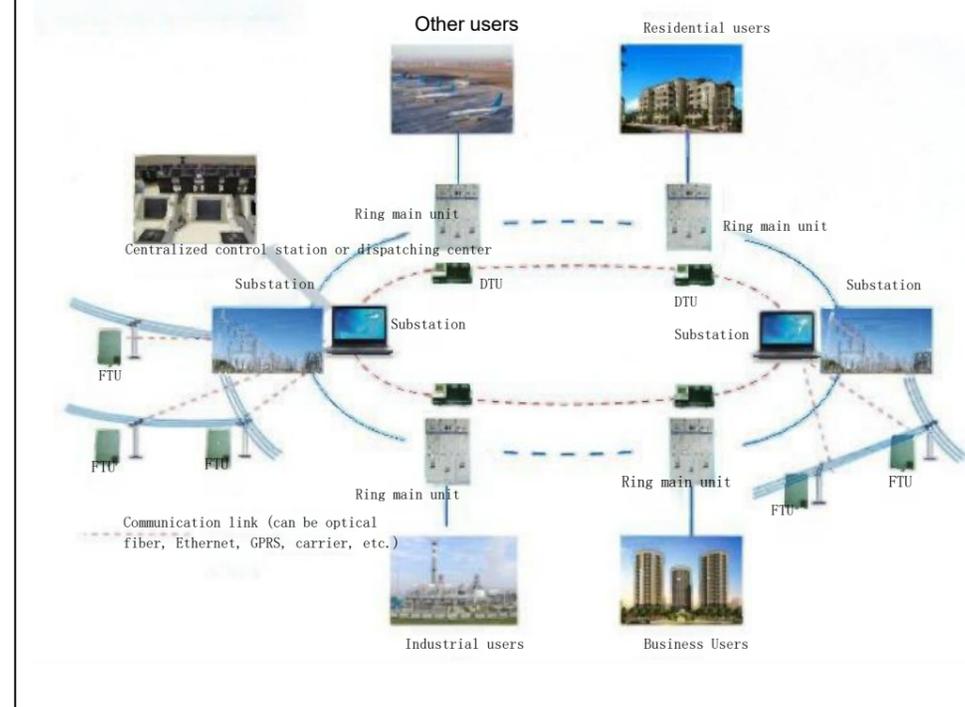


9、Expansion of distribution network automation

AGI-12 environmentally friendly gas insulated ring main unit can be easily upgraded to an intelligent ring main unit with automation functions. It is equipped with a distribution network automation terminal device with "four remote" functions to realize the intelligent application of ring network switch equipment. The ring main unit can be connected to the automation master station system by using communication (optical fiber, GPRS, etc.) to realize the automation function of the distribution system. Through the distribution automation system, the operation and maintenance personnel can realize the following functions without leaving home:

- Remotely control the opening, closing or closing lock operation of the switch unit of each ring main unit from the control master station or substation, which can also be completed locally.
- Obtain the contact position status, fuse status, circuit breaker fault protection status, grounding switch and other information of each switch from the control master station or substation.
- Obtain the electrical parameters of each circuit from the control master station or substation, such as voltage, current, zero-sequence voltage, zero-sequence current, power, power factor, frequency, etc.
- Optimize the configuration of the parameters of each distribution automation terminal from the control master station or substation.
- Unify the clocks of the master station or substation and each distribution automation terminal system.
- Acquire line fault information or abnormal information of each distribution automation terminal, and combine with the master station or substation software to realize automatic fault location, fault isolation, automatic power supply restoration in non-fault areas and network reorganization, thereby greatly shortening the power outage area and time, reducing the losses caused by faults, and improving the power supply reliability of the power system. In addition, it can also conveniently monitor and allocate loads, which is conducive to the rational use of the network.
- Configurable watchdog controller to process internal and external faults to improve the reliability of the power grid.

Distribution Automation Application System Solution Diagram



10、Box-type switch (XGW-12)

XGW-12 box-type switchgear is made of AGI-12 environmentally friendly gas insulated ring main unit, relay protection, and automation module, and the box is configured according to the use requirements. It has high cost performance, flexible configuration, small deformation, light weight, and beautiful appearance.

XGW-12 box-type switchgear can be made of stainless steel, aluminum-zinc plate, composite color steel plate, special cement fiber and other materials to meet the requirements of different users.

Normal operating conditions

- Operating environment: outdoor
- Humidity: 24-hour measurement: $\leq 95\%$ 1-month measurement: $\leq 90\%$
- Protection level: IP33

Structural features

- The box material is all made of high-quality plate with surface spraying treatment, with a thickness of not less than 2mm and good corrosion resistance.
- The box structure adopts natural ventilation measures to prevent condensation. In addition, the box installation has measures or devices such as sun protection, rain protection, dust protection, rust prevention, and prevention of small animals.
- The appearance and color of the box are very coordinated with the environment, highlighting the landscape effect, and reflective fluorescent paint is added to the frame of the box shell to prevent vehicle collision. The overall protection level of the outdoor ring network box is IP33, and the cable inlet and outlet holes should be strictly blocked with the bottom plate to reduce moisture intrusion and prevent small animals from entering.

■ There are no fasteners on the surface of the box for disassembly, and it has good anti-theft performance.

■ The top of the box adopts an arched shape with water flowing on both sides.

■ The box door opens outward, and the box door uniformly adopts an embedded square box-type horizontal latch padlock, and the square box adopts a movable panel to block rain. All metal accessories used are rust-proof.

■ The metal frame of the box and other accessible metal parts should be well grounded, and the grounding terminals should be marked with grounding symbols.



11、Ordering Instructions

When ordering, users should specify:

- Main wiring scheme number and single-line system diagram, floor plan.
- Secondary circuit schematic diagram, terminal block diagram. If there is no terminal arrangement diagram, follow the manufacturer's regulations.
- Model, specification, and quantity of components in the ring network cabinet.
- Specifications and models of cables and cable terminals should be determined when ordering.
- Ring network cabinets are used in special environmental conditions, which should be raised when ordering and negotiated with the manufacturer.
- When spare parts and accessories are required, their names and quantities should be stated.

12、Random Files

Random files generally include:

- Product certificate and factory inspection report
- Product instruction manual
- Packing list
- Secondary wiring diagram
- Other documents specified in the technical agreement

13、Wiring scheme

1、Standard solution configuration



Primary solution wiring diagram					
	Ground wire specifications: TMY-30×6				
	Solution no.	F001	F002	F003	F004
	Switchgear model	AGi-12	AGi-12	AGi-12	AGi-12
	Switchgear Application	Cable entry cabinet	Incoming isolation cabinet	PT cabinet	Lower isolation circuit breaker cabinet
Switch cabinet dimensions	420×850×2000	420×850×2000	600×850×2000	420×850×2000	
Primary solution wiring diagram					
	Ground wire specifications: TMY-30×6				
	Solution no.	F005	F006	F007	
	Switchgear model	AGi-12	AGi-12	AGi-12	
	Switchgear Application	Upper isolation circuit breaker cabinet	Measuring cabinet	Contact cabinet	
Switch cabinet dimensions	420×850×2000	650×850×2000	420×850×2000		