

GSN1-40.5L

AC metal-enclosed
gas-insulated switchgear

40.5kV...2500A...31.5kA



EATON

Powering Business Worldwide

Provide power for the world with ever-increasing demands

We provide the following solutions:

- Electrical solutions that reduce energy consumption, improve power reliability, and enhance safety and comfort in life and work
- Hydraulic and electrical solutions that increase machine productivity and save energy
- Aviation solutions that help achieve lighter and safer aircraft, lower operating costs, and efficient operation of airport
- Vehicle power-transmission and powertrain solutions that provide long-lasting and strong power for automobile, trucks and buses while reducing fuel consumption and emissions

Product overview

GSN1 - 40.5 L is a new generation of AC metal-enclosed gas-insulated switchgear (C-GIS for short) newly developed by the Thomas Edison R&D Center of Cooper Power Systems according to the needs of today's power grid. It is fully suitable for public and industrial distribution networks, infrastructure engineering, rail transit, metallurgy, petrochemical, docks, ships, drilling platforms and other fields, playing the roles of receiving and distributing electric energy, and controlling, protecting and monitoring circuits.

- The rated voltage is 40.5kV, the rated current is up to 2500A, and the rated short-circuit breaking current is up to 31.5kA.
- Modular design, compact structure, small volume, space saving, high investment efficiency, and low use cost during the service life.
- Adopt highly reliable electrical components and advanced plug-in technology, it is maintenance-free during the service life..
- With excellent insulation performance, it has good insulation level and excellent electrical performance even if the insulating gas pressure is at zero gauge pressure.
- Higher reliability of power supply, simple and safe operation, and maximum protection of operation and maintenance personnel.
- It has successfully passed the conventional type tests stipulated by national standards and industry standards, and successfully passed the IAC internal arc fault test, so the safety performance of the switchgear is greatly improved.





Technological innovation

Modular design

The entire cubicle structure is divided into four basic modules:

- Gas tank module - double gas tank structure, including top expansion solid insulated bus
- Operating mechanism module
- Cable compartment module
- Secondary instrument room module

Highly air-tight gas tank

World-class manufacturing technology, laser cutting, laser welding, helium leak detection, imported processing equipment and strict production technology ensure the safe and trouble-free operation of the switchgear and ensure that the deformation of the gas tank is within the allowable range under any operating conditions.

Modular operating mechanism

The three-position switchgear and circuit breaker adopt modular operating mechanism, which greatly reduces the number of parts, simple and reliable, with manual and electric operation functions.

Perfect five-protection interlocking device

It has a reliable mechanical and electrical interlock design scheme, which can effectively prevent misoperation and maximize the protection of personnel safety.

Perfect combination of vacuum breaking and gas insulation

Sf6 has good insulation performance and arc extinguishing performance, combined with Cooper's advanced solid encapsulation technology and vacuum breaking technology, it ensures that the switchgear has good insulation performance and electrical and mechanical properties.

No gas work is required on site

Special top expansion solid insulated bus is adopted, which is easy to install and flexible to expand, and no treatment of gas system is required on site.

Not affected by the environment

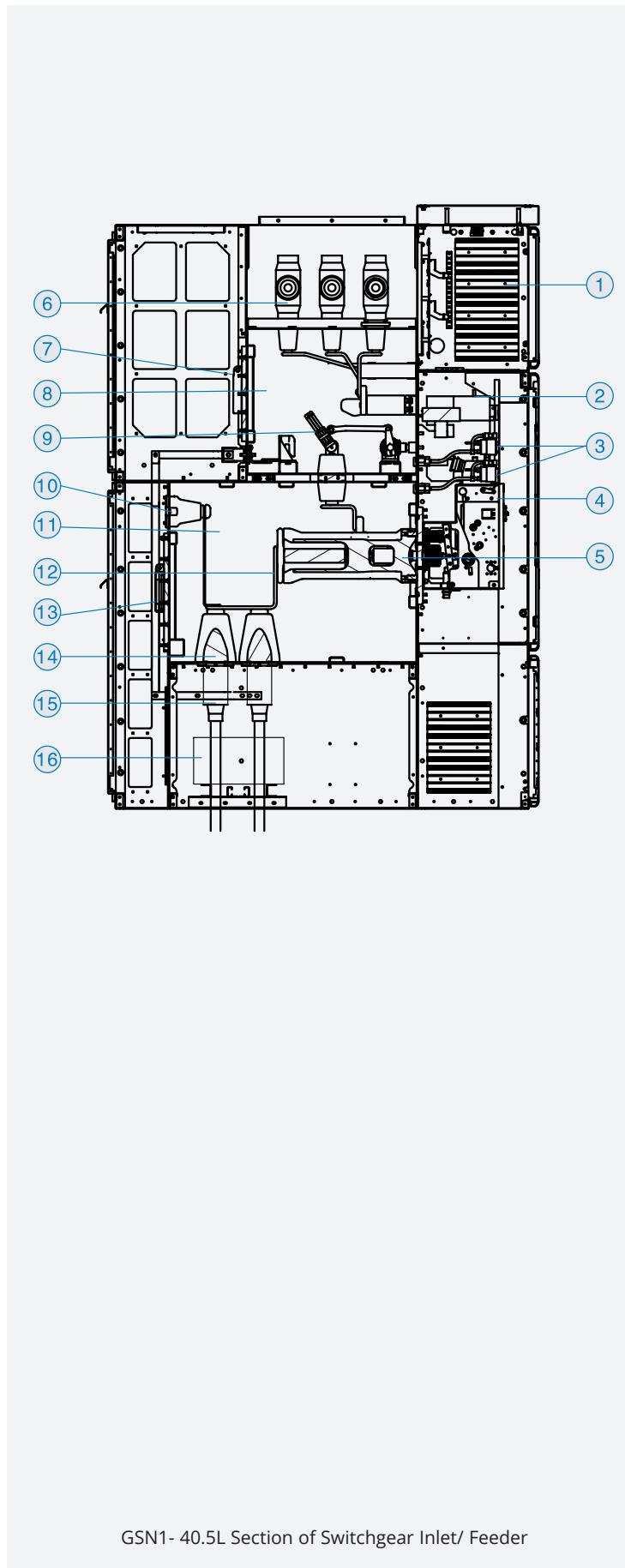
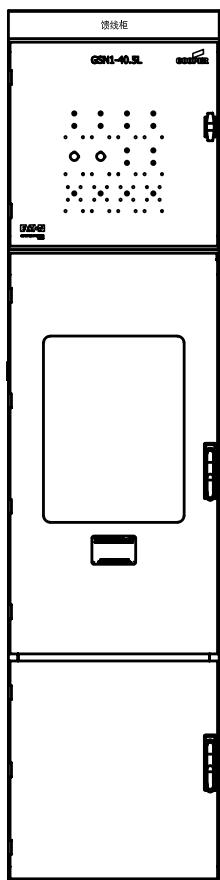
The high-voltage components are sealed inside the gas tank, which are not affected by altitude or surrounding environment, and are completely maintenance-free.

Flexible scheme configuration

With modular gas tank structure, combined with the modular plugin components, appropriate switchgear configuration scheme can be selected as required, so as to ensure the reliable and economical operation of the switchgear.

Typical structure diagram

1. Low voltage controller
2. Three-position switchgear operating
3. Gas monitoring of gas tank
4. Vacuum circuit breaker operating mechanism
5. Vacuum circuit breaker
6. Main bus and connecting bushing
7. Pressure relief device of upper gas tank
8. Upper gas tank
9. Three- position switchgear
10. 2# inner cone bushing
11. Lower gas tank
12. Branch bus
13. Pressure relief device of lower gas tank
14. 3# inner cone bushing
15. Inlet and outlet cables
16. Current transformer



GSN1- 40.5L Section of Switchgear Inlet/ Feeder

Standards compliant

The products are manufactured according to the following standards

- GB3906 3.6~40.5kV AC metal-enclosed switchgear and controlgear
- GB311.1 Insulation co-ordination for high voltage transmission and distribution equipment
- GB1984 High-voltage AC circuit breaker
- GB3309 Mechanical test at ambient temperature for high-voltage switchgear
- GB/T11022 Common specifications for high-voltage switchgear and controlgear standards
- DL/T404 3.6~40.5kV AC metal-enclosed switchgear and controlgear
- IEC 62271-100 AC circuit-breakers
- IEC 62271-200 AC metal-enclosed switchgear and controlgear

Factory inspection

Each switchgear has undergone routine system tests in the production process, and has been strictly inspected by the quality control department who shall sign on the factory inspection report before leaving the factory, which not only ensures the quality of the product, but also ensures the traceability of the product quality.

<ul style="list-style-type: none"> • Protection class inspection • Mechanical characteristic test • Interlocking device inspection • Auxiliary circuit check • Circuit resistance measurement • Mechanical operation test 	<ul style="list-style-type: none"> • Main switch and its operating mechanism • Electrical operation test • Insulation performance test • Main circuit resistance test
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National and industry standards



Type test report

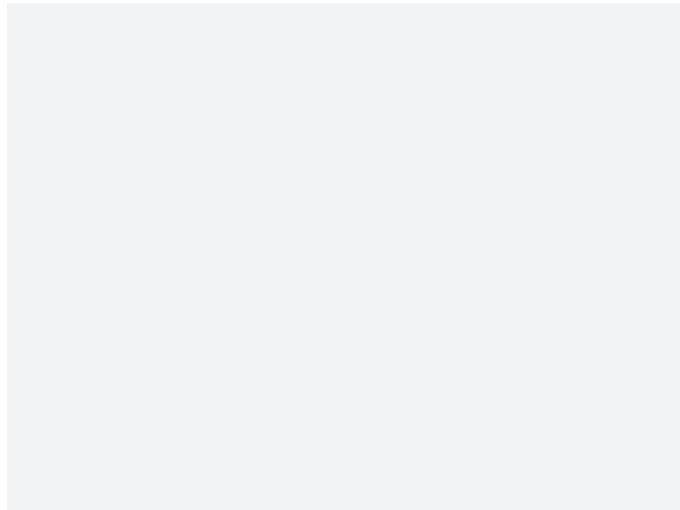
Type test

- Protection class inspection
- Seal test and moisture content test
- Pressure withstand test
- Circuit resistance measurement
- Temperature rise test
- Partial discharge test
- Mechanical characteristic and mechanical operation test
- Mechanical endurance test
- Insulation test
- Insulation test of auxiliary circuit
- Single fault breaking capacity test
- Dynamic and thermal stability test
- Cable charging current switching test
- Arc test

Quality assurance

World-class production equipment

Cooper (Ningbo) has world-class flexible processing equipment, which fully guarantees the high quality and high efficiency of production and realizes the optimization of human resources. Among them, the world-class Italian Salvagnini full-automatic sheet metal flexible processing production line is full-automatic from the feeding, conveying, stacking to unloading of metal materials. In addition, the high-quality bus bar processing production line and advanced inspection equipment composed of high-quality busbar vulcanization equipment, high-quality busbar electroplating equipment and CNC busbar punching and shearing machine also ensure excellent and stable product quality.



Switchgear assembly line

Industry-leading switchgear production line

Cooper (Ningbo) is committed to providing customers with technologically advanced, high-quality and reliable products. With the spirit of active innovation, we have changed the traditional switchgear manufacturing mode, designed and installed the first revolutionary switchgear intelligent production line in the industry, which is at the leading level in China's medium-voltage switchgear manufacturing industry. It has changed the traditional installation mode of immobile equipment while mobile personnel, and adopted the production mode of mobile equipment while immobile personnel. This line reasonably divides the entire installation process of the switchgear into multiple standard workstations. Each installation workstation realizes modular unit production and automatic control of subway-type transmission, and there is a visual electronic production kanban to record production information in real time. The unified and intelligent management of each process is realized via computer, which enables the switchgear to have excellent and reliable overall performance and fully guarantees that the switchgear will always have superior performance throughout its service life.



Automatic sheet metal flexible processing production line

Advanced GSN gas tank assembly line

- Atlas fixed-torque equipment is adopted, which has the function of error proofing and tracing.
- Automatic running-in/circuit resistance test/secondary circuit test integrated equipment.
- Automatic inflation leak detection equipment, voltage withstand partial discharge chamber and testing equipment.
- Circuit breaker hoisting manipulator is safe and efficient.



GSN gas tank assembly line

The industry's top-level circuit breaker production line

Drawing on the mature experience of today's manufacturing industry, through the design of professional manufacturers, strict and meticulous demonstration, we have built the industry's top-level circuit breaker automatic production line by referring to IEC standards;

The whole line is equipped with imported SEW drive motor, PLC control system, Omron sensor and material shortage alarm system, which fully guarantees the automatic and stable operation of the line; The assembly station of the circuit breaker production line is supplemented by a manipulator and an automatic lifting and turning device to reduce labor intensity, and the main test sites realize fullautomatic testing, including an automatic running-in room with special sound insulation materials;

Mechanical characteristic testing station using Al00 characteristic tester;

Strictly closed and insulated automatic withstand voltage test station and infrared camera device for dimensional inspection and verification;

The entire line has three Siemens PLC control units, which can automatically adjust the production takt, and can remotely monitor and view production records, completely realizing paperless records.



Vacuum tank helium leak detection system



VN3X circuit breaker production line



Circuit breaker assembly line

Quality inspection center

The company has made a huge investment in building a professional quality inspection center. After the purchased components enter the factory, they must go through strict quality inspection to eliminate hidden quality risks from the source and ensure the high quality and reliability of the company's products.



Quality inspection center

System certification

Environmental management system

Certified by a third-party independent agency;
1S014001:2015 compliant.

Quality assurance system

Certified by a third-party independent agency;
1S09001:2015 compliant.

Occupational health and safety management system

Certified by a third-party independent agency; OHSAS18001:2007 compliant;
Occupational health and safety management certification.



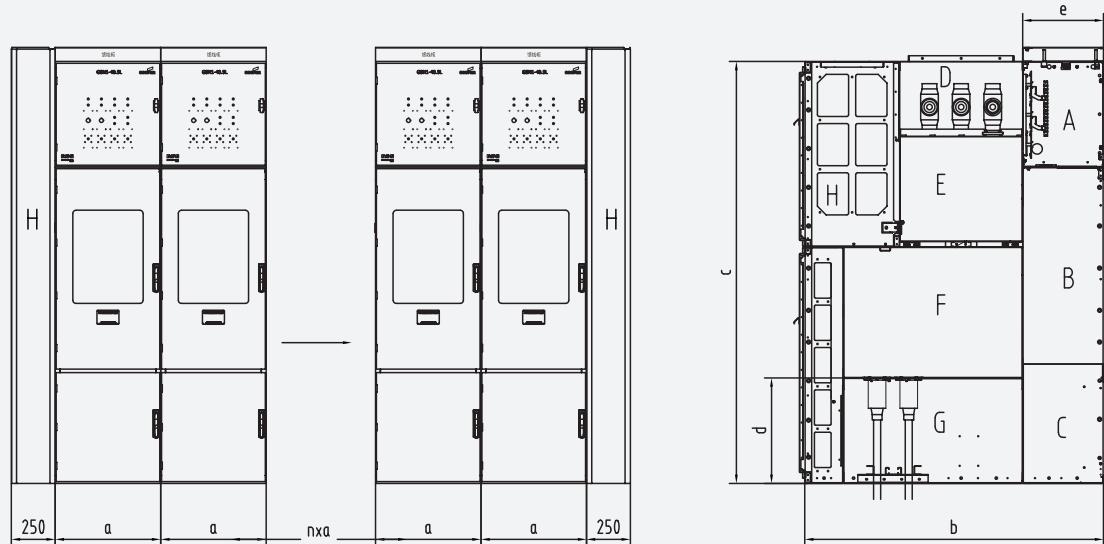
Conditions of working environment

Max. temperature	40°C
24h average temperature	35°C
Min. temperature	-25°C
Relative humidity	Daily average ≤ 95%, monthly average ≤ 90%
Value of vapor pressure	Daily average ≤ 2.2kPa, monthly average ≤ 1.8kPa
Seismic capability	The earthquake intensity not exceeding Magnitude 8
Installation site	The ambient air is not seriously polluted by corrosive or flammable gases and dust

Technical Parameters

Item	Unit	Parameters
Rated voltage	kV	40.5
Rated frequency	Hz	50
Insulating medium		SF6
Rated insulation level	1min power frequency withstand voltage (zero gauge pressure)	95
	Lightning impulse withstand voltage (zero gauge pressure)	kV 185
	Auxiliary circuit 1min power frequency withstand voltage	2
	Partial discharge (under 1.1 times rated voltage)	pC ≤ 20
Rated current	A	≤ 2500
Rated short circuit breaking current	kA	≤ 31.5
Rated short circuit closing current	kA	≤ 80
Rated short-duration withstand voltage (4S)	kA	≤ 31.5
Rated peak withstand current	kA	≤ 80
Internal arc level	kA/s	IAC A FLR 31.5kA/1s
Circuit breaker electrical endurance	time(s)	30
Circuit breaker mechanical endurance	time(s)	10,000
Mechanical endurance of isolating switch and earthing switch	time(s)	3,000
Temperature rise test	/	1.1lr
Rated operating cycle	/	0-0.3s-CO-180s-CO
Rated inflation pressure (relative)	MPa	0.03
Min. working air pressure (relative)	MPa	0.00
Annual leak rate	%/Y	< 0.05
Protection grade	/	Gas tank: IP65; others: IP4X

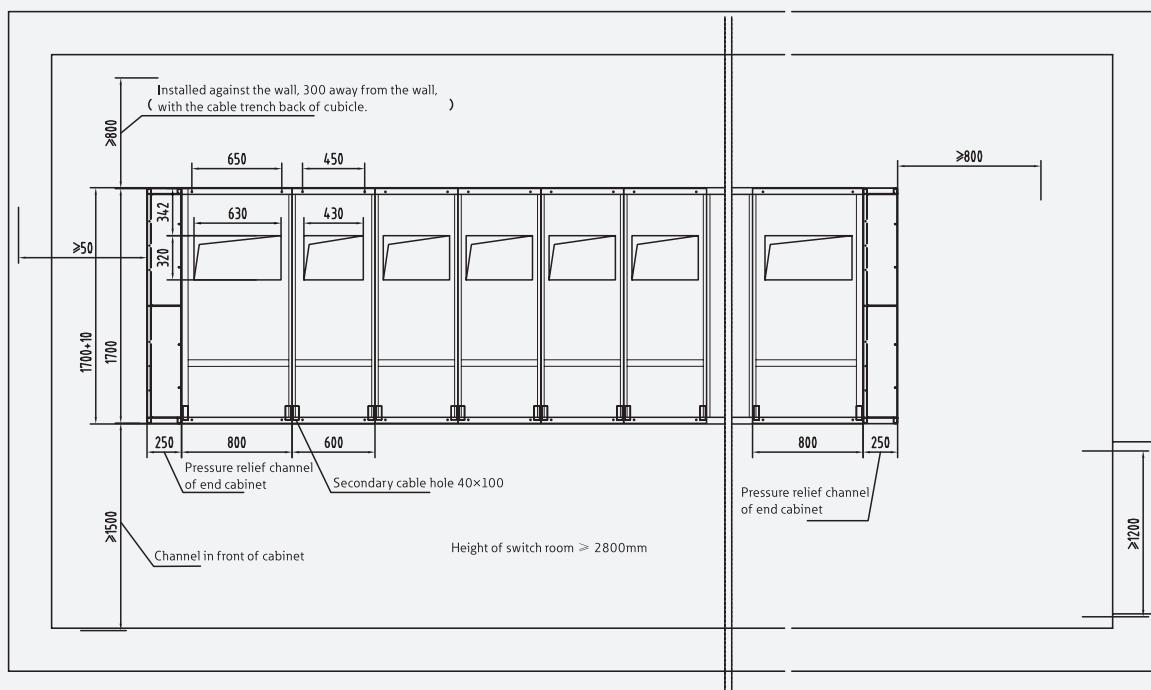
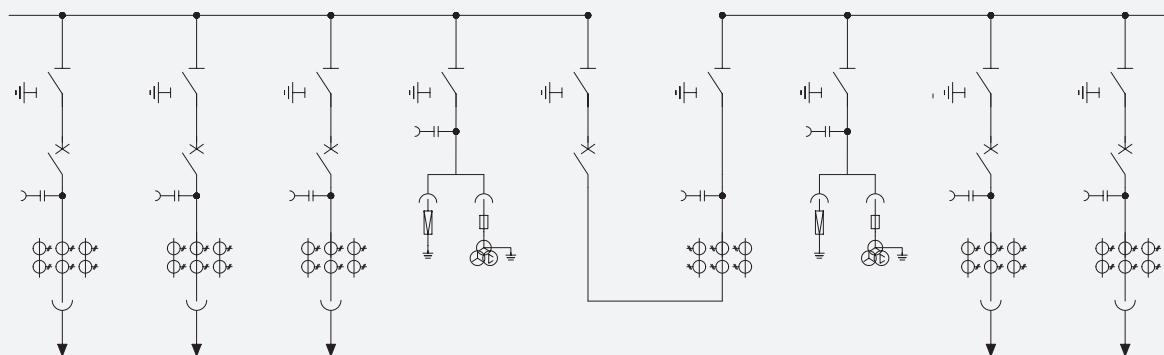
Outline dimensional drawing and weight of switchgear



- A. Upper LV control department
- B. Three-position and circuit breaker mechanism department
- C. Lower LV control department
- D. Bus department
- E. Three-position department
- F. Circuit breaker department
- G. Cable department
- H. Pressure relief channel

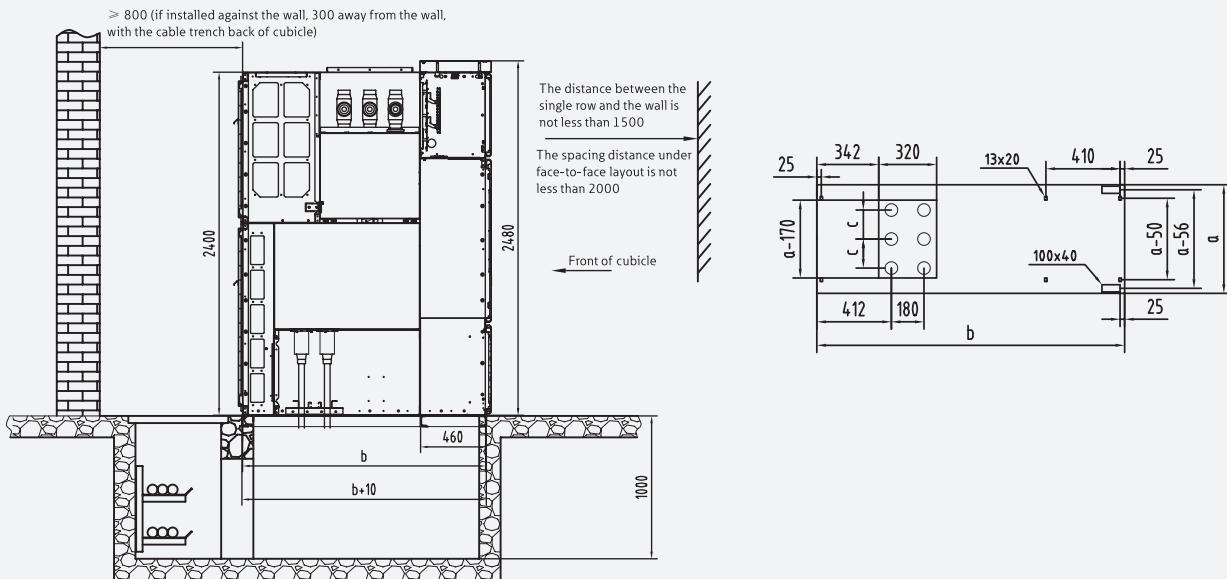
Rated voltage (kV)	Rated current (A)	a (mm)	b (mm)	c (mm)	d (mm)	e (mm)	Approximate weight (kg)
40.5	1250	600	1700	2400	600	460	1000
40.5	2500	800	1700	2400	600	460	1300

Typical cubicle combination scheme



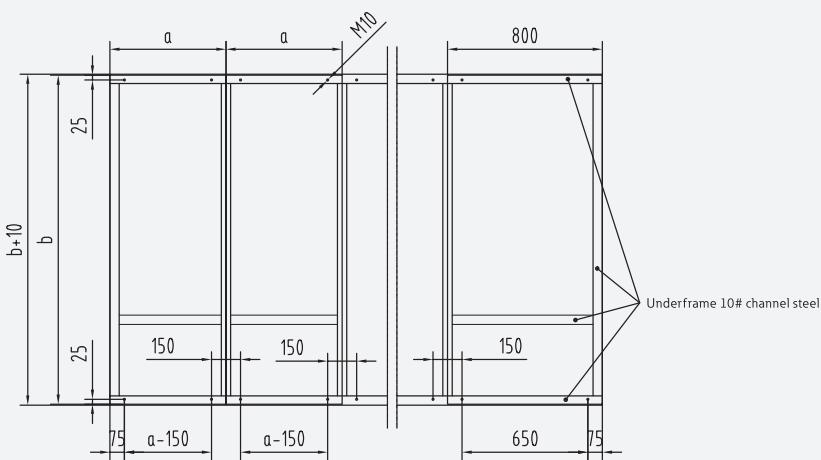
GSN1-40.5L Layout of Switchgear

Installation base



Installation Foundation of GSN1-40.5L Switchgear

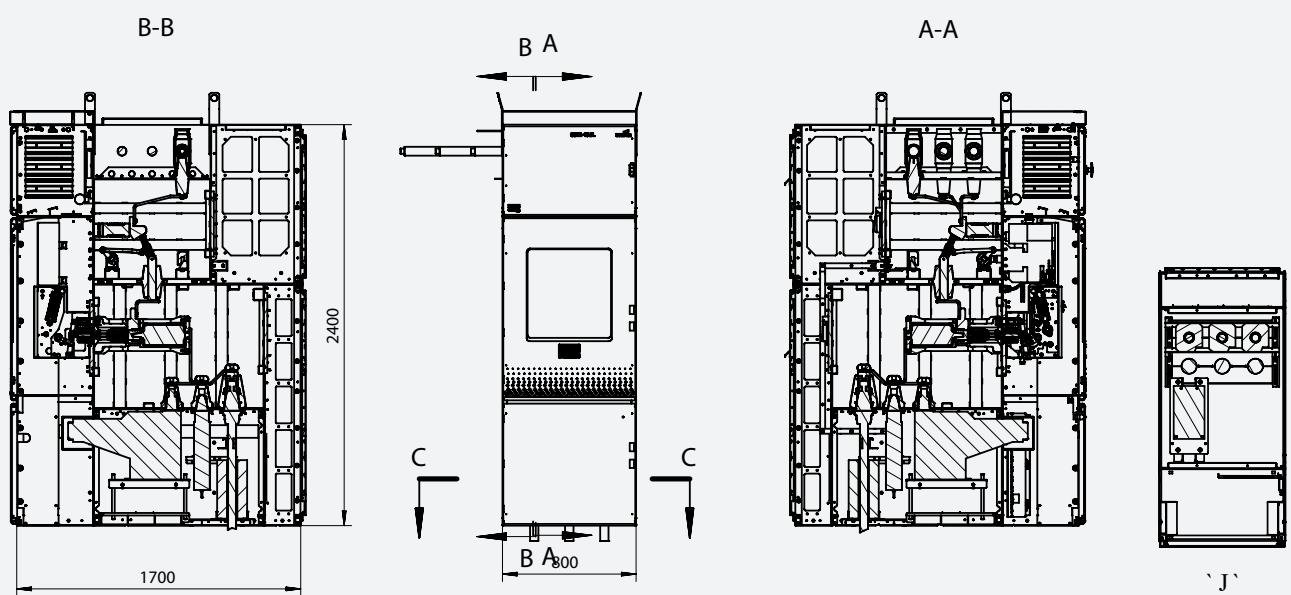
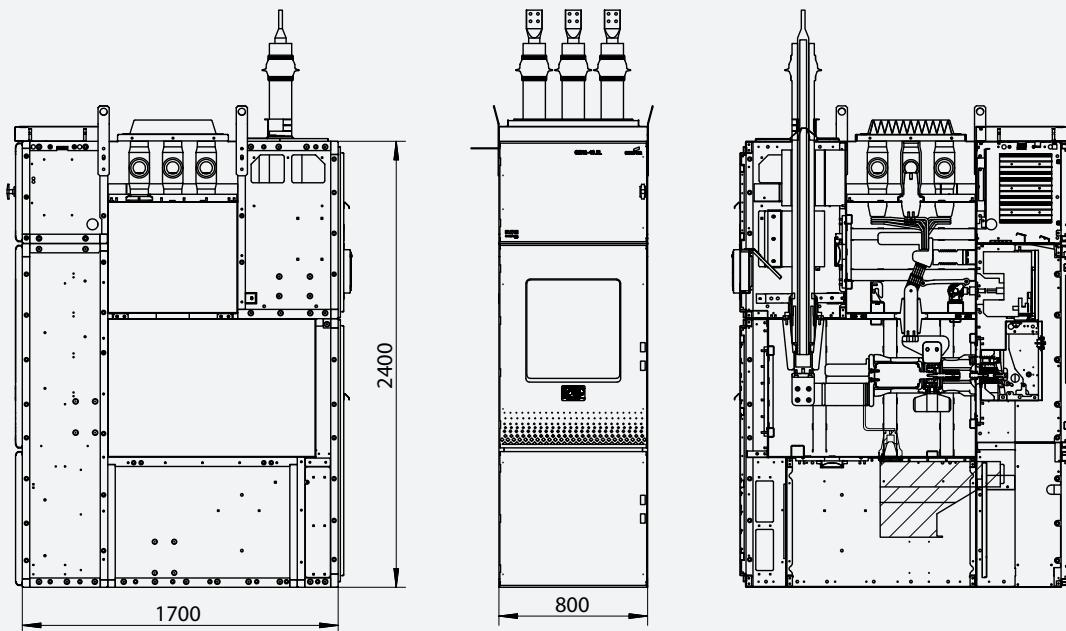
Rated voltage (kV)	Rated current (A)	a (mm)	b (mm)	c (mm)
40.5	1250	600	1700	160
40.5	2500	800	1700	210



Basic Frame of GSN1-40.5L Switchgear

Rated voltage (kV)	Rated current (A)	a (mm)	b (mm)
40.5	1250	600	1700
40.5	2500	800	1700

Top Entry Design



Ordering instructions

Users must provide the following technical information when ordering:

- Rated voltage, working voltage, frequency
- Rated busbar current and feeder current
- Rated short-duration withstand voltage
- Cross section of primary feeder cable
- The type of cable terminal equipment provided by the user
- Detailed single line diagram
- Data of protection, measurement & control and monitoring equipment
- Switchgear layout and dimensions of power distribution room
- Special regulations and specifications

Accompanying Documents

- Product certificate
- Factory inspection report
- Instruction manual
- Secondary wiring diagram and switchgear arrangement diagram
- Packing list and the list of spare parts and accessories

Accessories

- Circuit breaker energy storage handle
- Three-position switchgear operating handle

Spare parts

- Ordered directly by users according to the order contract

