HUADE SWITCHGEAR

Non SF6 , Dry Air GIS Switchgear

Type : HG4-12

Rating : 12kv, 1250A , 20 ka/3s **Cat. No. 1000875**

Fig. 1 . HG4 -12

Width 550 mm --- Suitable for small compact size substation

EMISSION- FREE

SWITCHGEAR FOR THE

GREEN ENVIROMENT

AND SUSTAINABLE FUTURE

THE COMPANY :

Huade Electric Co. Ltd ., situated in the north east of China, in Liaoning Province is a Switchgear Manufacturer Of Non -Sf6 Gas Insulated Switchgear since 1990

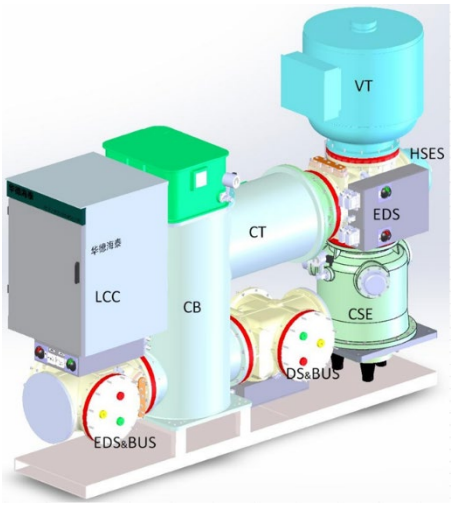
Its Product ranges from 12KV to 145KV Voltage Rating

12 KV CGIS

36 Kv CGIS

72.5 Kv GIS

72.5 Kv Outdoor switchgear



145 KV Indoor GIS Switchgear

HG4-12 -The Zero Gas Emmission Switchgear

What does net-zero emissions mean and how can we get there?

Fig. 2 GHG EMISSION

- It's the situation where Global greenhouse gas emissions from human activity are in balance with emissions reductions . At net zero, carbon dioxide emissions are still generated, but an equal amount of carbon dioxide is removed from the atmosphere as is released into it, resulting in zero increase in net emissions.

Some industries like aviation and shipping industry are hard to decarbonize . Inorder to reach net Zero it will require a lot of investment . One easier and cheaper way to do it is by using non green house gas emission equipment like non SF6 Switchgear in the case of Electric Substations . That way less amount of carbon dioxide need toberemoved from the atmosphere and a quicker way to reach net zero Emission .

Fig. 3 .INSIDE VIEW OF HG4-12

12KV Rated CGIS , 630A , 20kA/3 sec

FEATURES

- Made in China

GREEN PRODUCT , NON SF6 INSULATING MEDIUM

- **GIS Completely Sealed with Dry Air**

  Composition Nitrogen / Oxygen,

  (80%/20%)Respectively,collectively

  known as DRY AIR

- **Independent of outside environmental Conditions**
- **Compact 550mm Width for 12 KV Rating**
- **High Cable Compartment ,easy accessibility**
- **Maintenance Free**
- **REDUCTION OF CARBON FOOTPRINT**

Why non Sf6 GIS Switchgear?

ANSWER :

1) **SF6: High Impact to Environment**
2) **Dry Air: no Impact to Environment**
3) **Generates no carbon Dioxide**

.

What is Dry Air

Answer :-

Where Normal air but with moisture removed .

With Content of Nitrogen / Oxygen, (80%/20%) composition

THE SAD SF6 STORY

PROBLEMS WITH USING SF6 AS INSULATION MEDIUM

a) **RELEASE OF CO2 FROM LEAKING SF6**

b) **PRESENCE OF DECOMPOSITION PRODUCTS**

----------**GIVEN :**

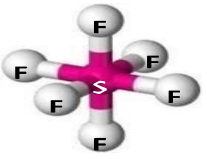
Releasing of 1 Kg of SF6 Generates 22,800 kg or 22.8tonnesof CO2.

Calculations :

A 12 KV SF6 GIS Switchgear Panel Contains 10KG of SF6. IF base on leakage of 0.1% Per year, the SF6 release will be 10gm of SF6 .

And basing on a switchboard of 60 Panels will produce 600gms of SF6 or 14,100 Kg of Carbon Dioxide per year . That is equivalent toTotal emissions of 4 Cars per year .

A Comparison of the properties of different gases for GIS and breaker



Clean-Air

Pure Gases	Chemical formula	SF6	N2 + O2 (80% / 20%)
	CO2-equivalent (GWP)	22.800	0
	Boiling point (Celsius)	-64°	< -183°
	Dielectric strength	1*	0,43
	Carrier gas	None, N2 or CF4	/
	CO2-equivalent (GWP)	< 22.800	
	Boiling point (Celsius)	<-64°(variable)	
	Dielectric strengthat same	1*	0,43
Impact Arc	Decomposition products	hydrofluoricacid, sulfur dioxide, sulfur compounds	Only if failure: ozone and nitrogen oxides

Product Overview

HUADE -HG4-12 Green Cubical **TYPE TESTED** gas-insulated switchgear (Green C-GIS) is an environment-friendly gas-insulated metal-enclosed switchgear ,which uses dry air air as the insulating medium.

With international leading technical level, it is a new generation of medium voltage switchgear ,integrating vacuum arc extinguishing technology, APG solid sealing technology, gas insulation technology and interface insulation technology, complying with standards like IEC62271.

Passing all type tests and technical appraisal, the product is widely applied to various power systems, such as power transmission and distribution station network, urban power supply network, large industrial and mining enterprises,petrochemical industry, metallurgy and urban rail transit system

Key Features:

- **Eco-Friendly Design**: Utilizes clean air as an insulating medium, eliminating the need for SF6 gas and reducing toxic emissions, ensuring minimal impact on the environment.
- **Compact and Efficient**: Miniaturized with a modular design, the switchgear features a compact structure, small size, and a minimal footprint, maximizing space efficiency.
- **Robust Construction**: High voltage components are sealed within a stainless steel enclosure, providing waterproof and dustproof performance. Resistant to environmental factors and altitude, ensuring safety and maintenance-free operation.

- **Flexible Configuration**: Offers flexible and diversified primary schemes to meet various system wiring requirements, enhancing adaptability.
- **Intelligent Control**: Equipped with an intelligent control and protection unit, featuring powerful control, protection, and measurement functions, meeting the automation needs of distribution networks.
- **Reliable Operation**: Incorporates reliable mechanical and electrical interlocking mechanisms, effectively preventing mis-operation and ensuring convenient and dependable operation.

Product model description

Normal service conditions

Ambient Temperature:

- Maximum: +55°C
- Minimum: -25°C

Environmental Conditions:

- Suitable for locations without fire, explosion hazard, chemical corrosion, severepollution, or excessive vibration.

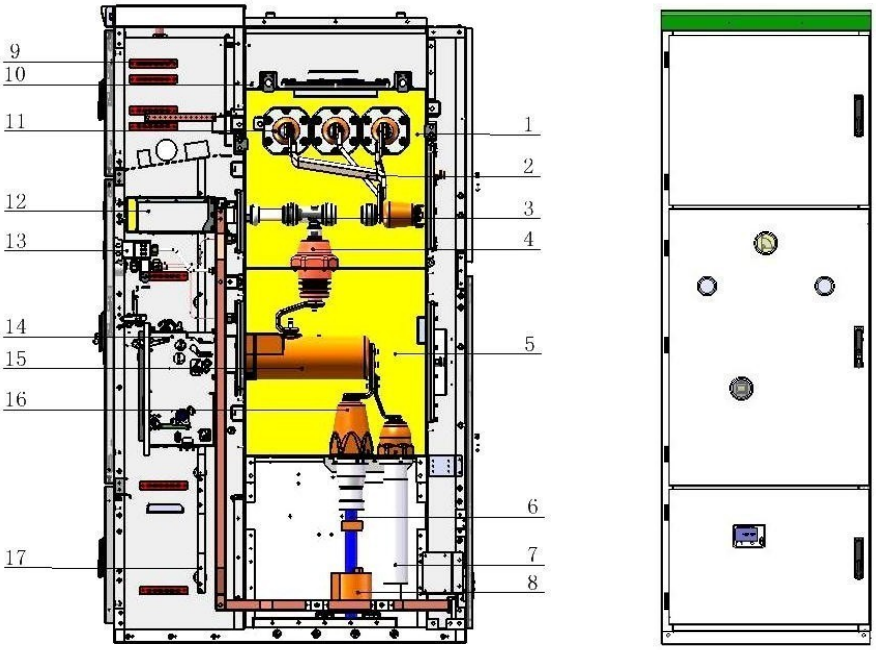
Relative Humidity:

- Daily Average: ≤95%
- Monthly Average: ≤90%

Altitude:

- Operating Altitude: ≤3000m

Product structure



DESCRIPTION

1-main bus compartment, 2-branch bus, 3-EDS, 4-wall bushing, 5-CB compartment,6-cable, 7-lightning arrester, 8-current transformer, 9-low-voltage compartment, 10-pressure relief channel, 11-main bus, 12-EDS mechanism, 13-gas pressure gauge,14-breaker mechanism, 15- circuit breaker, 16-cable bushing, 17-enclosure

Fig. 4 . HUADE HG4-12 C-GIS

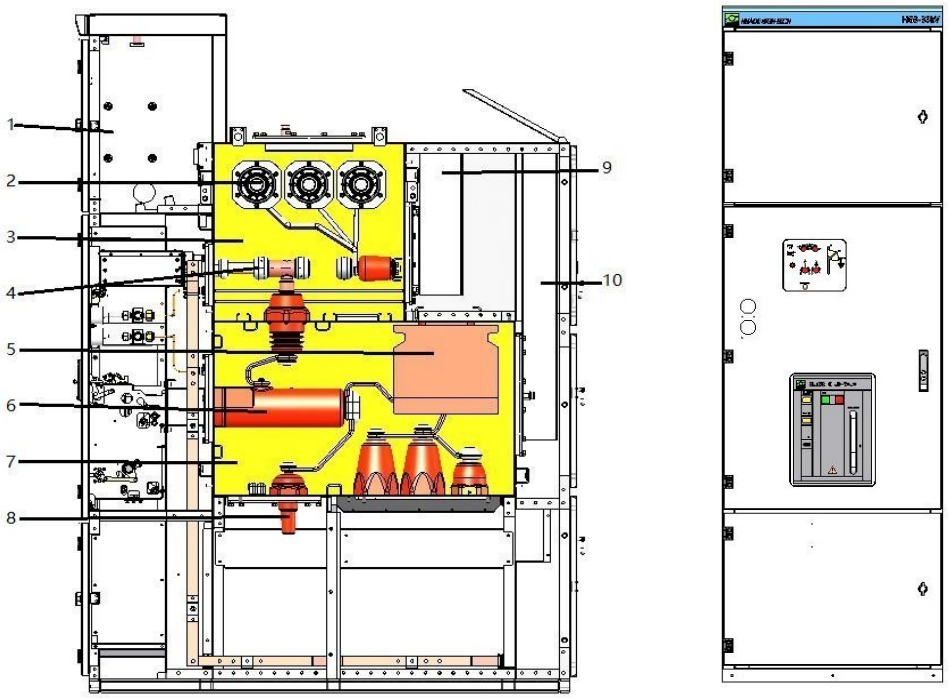
DOUBLE GAS TANK VERSION

✧ The product adopts three-phase common tank structure design, which is composed of core gas box tank, low-voltage compartment, operating mechanism compartment, cable compartment, etc.

✧ The gas tank is made of non-magnetic stainless steel plate through laser cutting and laser welding, and the non-welding sealing connection surface is sealed by O---ring. The gas tank has the advantages of high mechanical strength, strong deformation resistance, neat and beautiful appearance and high dimensional precision, ensuring extremely high air tightness.

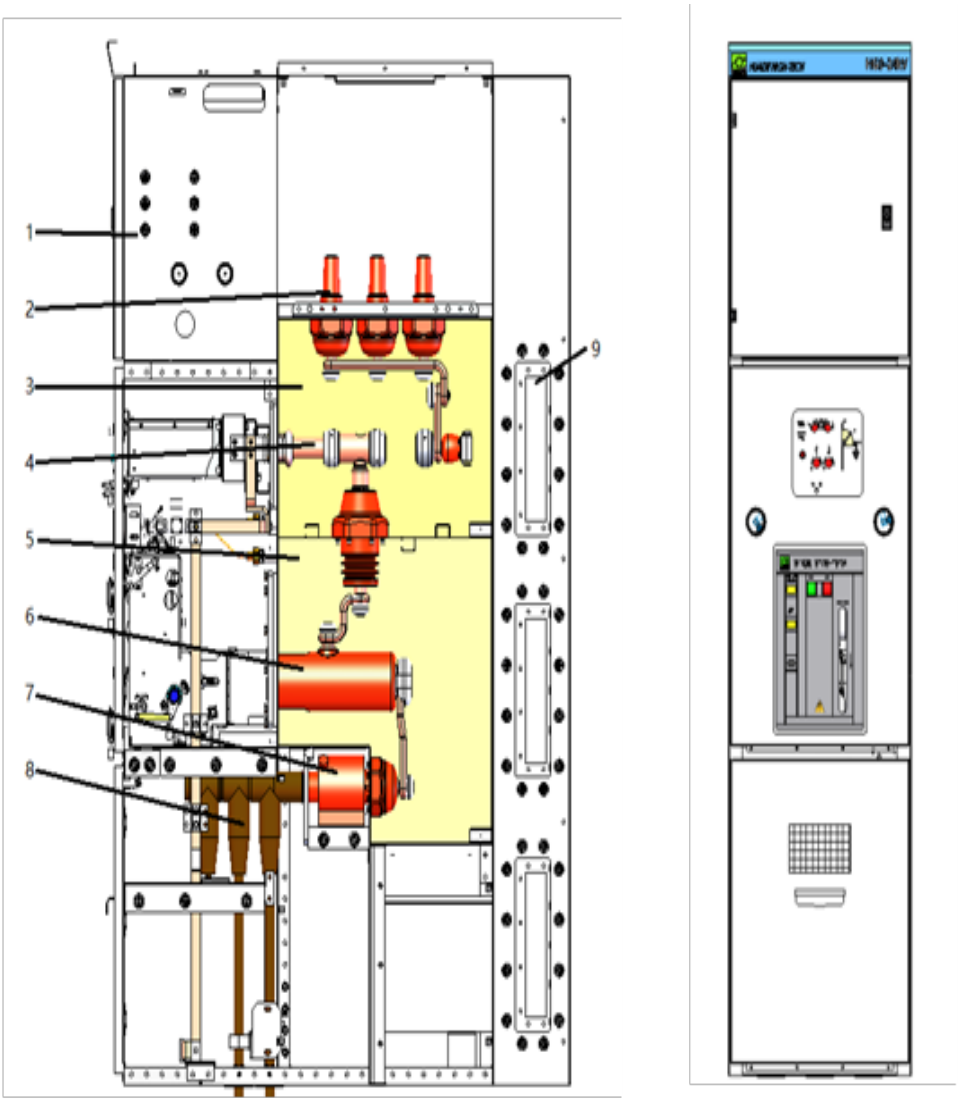
- The bus, earthing disconnecting switch and circuit breaker are installed in separate gas compartment. The vacuum circuit breaker adopts a spring operating mechanism, the vacuum arc-extinguishing chamber is horizontally arranged in a embedded pole mode, the isolating switch and the grounding switch are combined into the EDS, share a moving contact and are arranged on the bus side, and the operating mechanism is arranged outside the gas tank.

- The gas tank is equipped with a pressure relief device and a gas pressure gauge with temperature compensation function. When the internal pressure exceeds a certain limit value, the pressure relief device will automatically open to release gas to ensure the safety of operators and other equipment.



1) Low voltage compartment 2) Main bus 3) Main bus compartment 4) EDS 5) Current transformer 6) Circuit breaker 7) CB compartment 8) Cable test bushing 9) Pressure relief channel 10) Pressure relief device

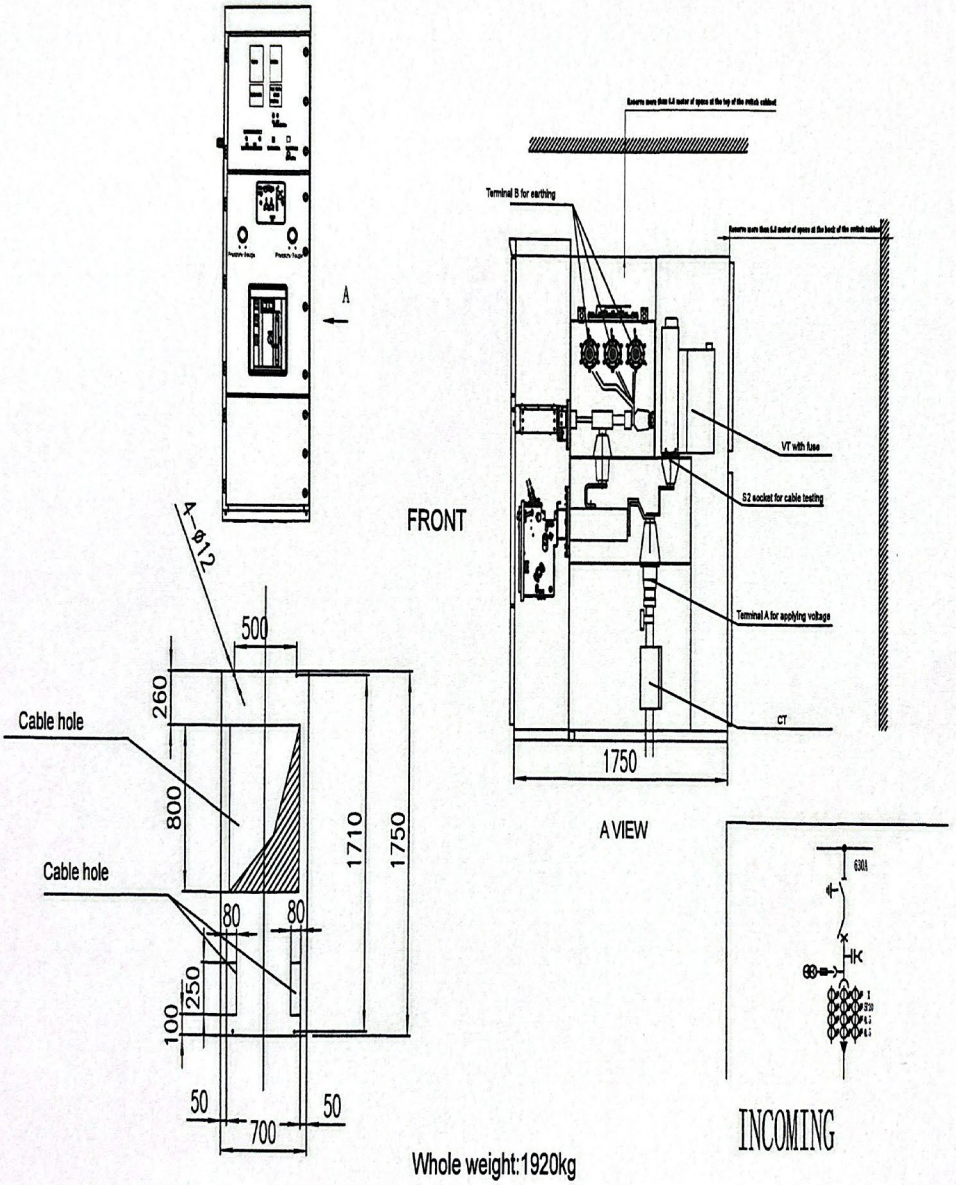
Fig. 5 . Switchgear with High Voltage Rated CT



1) Low voltage compartment 2) Main bus bushing 3) EDS compartment 4) EDS 5) Circuit breaker compartment 6) Circuit breaker 7) Current transformer 8) Cable 9) Pressure relief device

HG9-24 Typical structure

Fig. 6 Front Mounted Incoming Cables



Whole weight:1920kg

Technical Parameter

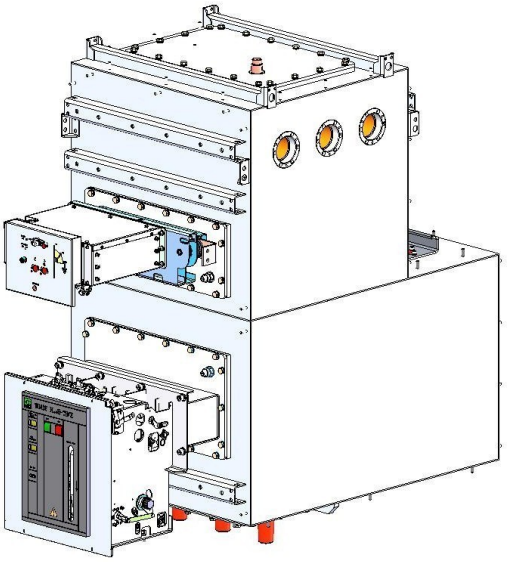
No.	Item			Unit	Parameter
1	Rated Voltage			kV	12
2	Rated frequency			Hz	50
3	Rated insulation level	Power frequency withstand voltage（1min）	Phase to phase, phase to ground	kV	42
			DS isolation distanceCB isolation distance	kV	48
		Lightning withstand voltage	Phase to phase, phase to ground	kV	75
			DS isolation distance CB isolation distance	kV	85
		Aux. and control circuit PF withstand voltage(1 min.)		kV	2
4	Rated current			A	1250、 2500、3150
5	Rated short-circuit breaking current			kA	25、31.5、40
6	Rated short-circuit making current			kA	63、80、100
7	Rated short-time withstand current			kA	25、31.5、40
8	Rated peak withstand current			kA	63、80、100
9	Rated short-circuit duration			s	4
10	Partial discharge			pC	≤10
11	Insulating gas in gas tank				Dry air
12	Water content in Gas tank			ppm	≤150
13	Leakage rate/year			%	≤0.01
14	Rated gas-filling pressure (20℃)			MPa	0.04
15	Alarm pressure (20 ℃)			MPa	0.02
16	Minimum function pressure (20 ℃)			MPa	0
17	Rated operation sequence				O-0.3s-CO-180s-CO
18	VCB level				M2 E2 C2
19	VCB mechanical life			times	20000
20	EDS mechanical life			times	3000
21	Rated short-circuit current breaking frequency of VCB			times	30
22	Protection level (switchgear enclosure/gas-filling compartment)				IP41/IP67

Note: The gas pressure above is the relative value (gauge press

24	Loss of service continuity category		LSC2A
25	Internal arc fault IAC	AFLR	25kA/1s 31.5kA /0.5s

Main components

Gas Tank Assembly



Circuit Breaker (CB)

- ✧ The cable is pre-earthed by a EDS (Earthing disconnector switch), andthe cable is earthed by a vacuum circuit breaker.
- ✧ The vacuum circuit breaker adopts embedded pole mode and ishorizontally installed in the gas tank of the circuit breaker, which is maintenance-free in the whole life cycle of the switchgear.

✧ The vacuum circuit breaker is provided with an optimized vacuum ainterrupter which is a miniaturized product with a ceramic shell and has extremely high insulation level, and the contact is made of CuCr alloy, and has the characteristics of long electric service life, low current cut-off value and strong short-circuit current breaking capacity

Three embedded poles of the vacuum circuit breaker are fixed on a flange plate of the frame. The vacuum interrupter and the upper and lower outgoing terminals are sealed in epoxy resin by a special injection machining process (APG).

✧ Opening/closing release: DC220V /DC110V optional; charging motor: DC220V/ DC110V optional

✧ Earthing disconnecting switch (EDS)

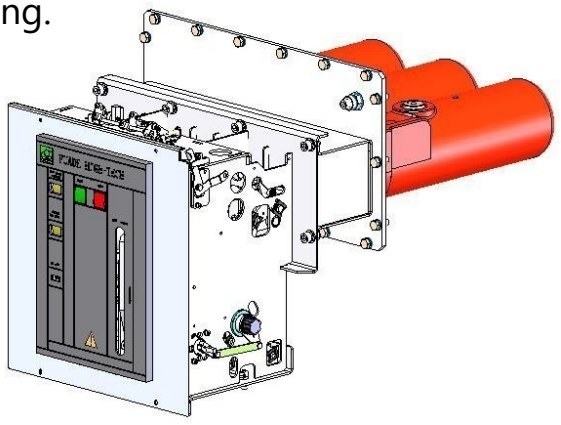
✧ The disconnecting switch operation method is divided into motor operation and manual operation, and the motor operation and manual operation are interlocked, and the operation panel is provided with padlock locking protection.

Vacuum Circuit Breaker

✧ The vacuum circuit breaker adopts the embedded poles, effectively reduces the insulation distance, and realizes the moving sealing connection between the circuit breaker mechanism and the embedded poles through the bellows. The rated short-circuit current breaking times are 30 times, and the mechanical servicelife reaches 10,000 times.

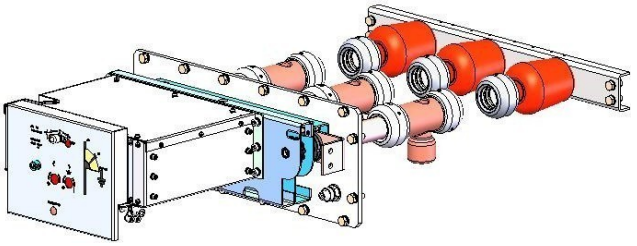
✧ The embedded pole is casted by APG process production equipment imported from Germany, so that the installation of the vacuum interrupter is simpler, the stability is good, and the mechanical strength is high.

✧ The circuit breaker is matched with the earthing disconnecting switch to realize line side earthing.



Earthing disconnecting switch (EDS)

- ✧ The disconnecting switch adopts direct-acting three-position structure design and is horizontally arranged to realize the functions of working, isolation and earthing,and has both manual and motor operations.
- ✧ The switching operation power is small, the transmission structure is simple, and the operation is stable and reliable.
- ✧ The direct-acting structure effectively ensures the uniformity of the isolating distance and the interphase electric field.
- ✧ The electric connection adopts the spring contact finger, the moving contact moves stably, the electric conductivity is strong, and the mechanical abrasion is small.
- ✧ Different operating handles are used for isolation and earthing, and perfect mechanical and electrical interlocking is provided to prevent mis-operation.



NOTE : As an option the status of the 3- Position Disconnection switch can also be visualy monitored from the HMI facia mounted on the LV Panel

Voltage transformer

- Inductance type, single-phase and plug-in design
- All-metal shell shielding
- Connect to the system through Size 2 standard inner cone plug
- Epoxy resin cast insulation, not affected by external environment

Current transformer

- 3 sets on incoming and outgoing cables
- Not affected by dielectric stress
- Ring core structure, arranged outside of the gas tank

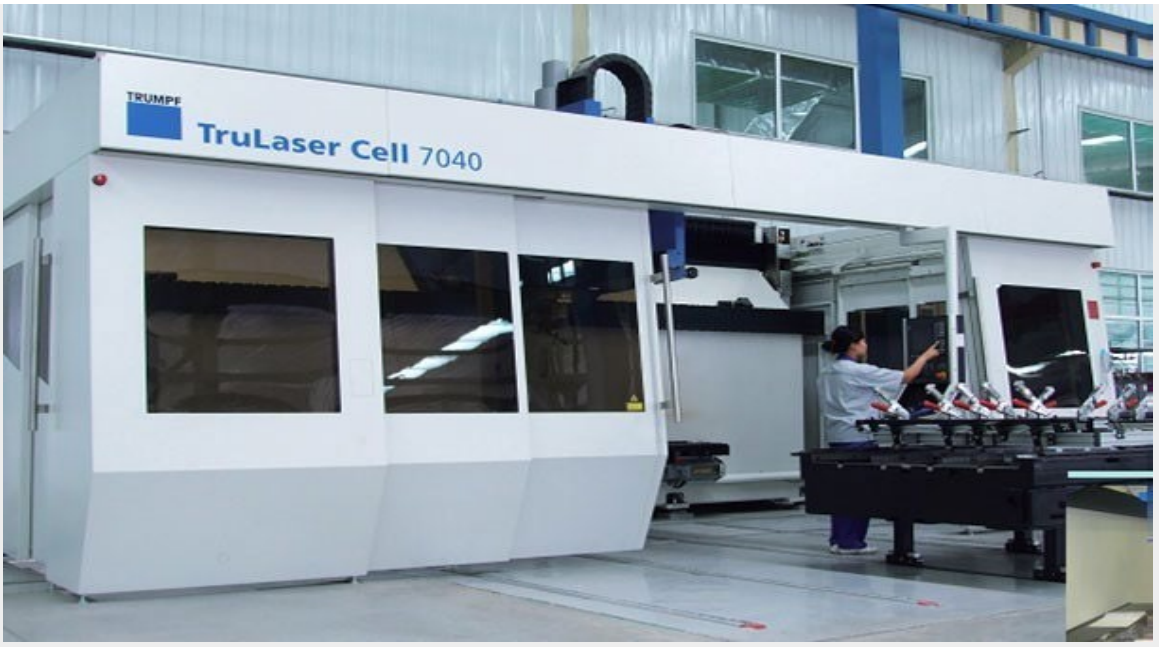
Cable terminal (Size 3, 2)

- For use with Size 3 innercone socket
- Enclosure earthing, safeand reliable

Silicone bus connector

- The panel bus adopts special bus connector, which effectively solves the problems of conductive connection and insulation between panels

The China Factory



Germany imported TRUMPF laser cutting and laser welding equipment

Germany imported helium leak detection and gas filling equipment

TESTING FACILITIES

References in Asia

PROJECT IN SINGAPORE .

VSMC WAFER FAB PLANT IN TAMPINESE

24 KV RATED SWITCHGEAR NON SF6 TYPE

COMMISSIONED INTO SERVICE 6th AUGIUST 2024

Site Testing

MANUFACTUER :

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AGENT :