

Type : N2S CB-24KV

The Intelligent DECOM- CGIS Switchgear

24kV, 25kA @3 Sec, with Online Monitoring

Of Partial Discharge , Ozone and Temperature data.



IMPULSE TESTING STATION

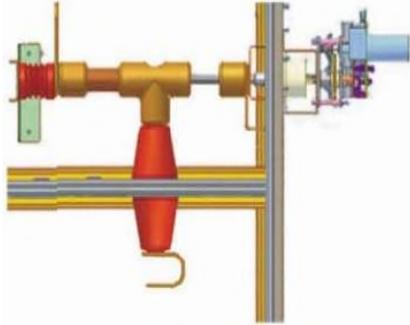


R & D Laboratory

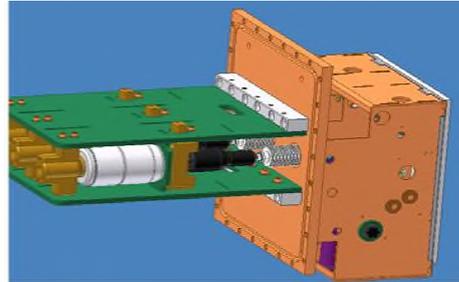


Design Features of the 24kV , 36 kV CGIS Switchgear

- **REVOLUTIONARY 3.5 ” touch panel HMI** for real-time display of all real time system data and also the actual physical **status of the 3 position switch** . This provides safety confidence to the Operator .



3- Position Switch



24kV, 36kV, Vacuum Circuit Breaker



- Up to 12 temperature sensors, 4 partial discharge air interfaces and 8 humidity sensors are built in. for measurement of all critical parameters . This information can be transmitted to the Substation RTU .
- Low pressure SF6 insulation.
- The gas compartments are made of stainless steel , and sealed gas tight by welding,

- The VCB and 3-position switch are in independent gas compartments hence meeting LSRC category of IEC Standards
- The busbar coupling design philosophy enables the removal of that particular faulty panel without the need for moving the adjacent side panels sideways, that is a big savings in maintenance down time. The busbar insulation consists of silicon rubber and with epoxy based sleeving.

CURRENT TRANSFORMERS

Normally, low Voltage 5P's Ct's are offered and are mounted below the cable termination. However, where the number of cores cannot be catered for, then High Voltage 24kv rated Ct.s mounted in the gas compartment will be used. Class PX Cts with high knee point Voltages to cater for non-CT saturation will be used. (NOTE : Besides the 24 kV Version, there is also a 33 kV GIS Version). Both Versions can be 100% Filled with SF6 or 50% filled with N2 and 50% SF6)

FRONT VIEW



INSIDE VIEW

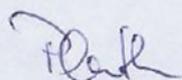


- **Type Tested IN IPH (MEMBER OF STL)**
- **To : IEC 60265-1, IEC 62271-1**
- **DESIGNED IN GERMANY BY DECOM GMBH, RATINGEN**
- **ASSEMBLED AND TESTED IN CHINA**

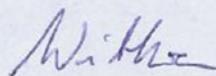
TEST CONFIRMATION

on the given range of performed tests

DECOM GmbH Lise-Meitner-Str. 6 D-40878 Ratingen		CLIENT
DECOM-CGIS		MANUFACTURER
SF ₆ -gasisulated medium voltage alternating current switchgear Circuit-breaker field with integrated 3-Position-disconnector		TEST OBJECT
N2S CB-24 kV		TYPE
Prototype		MANUFACTURING NO.
Rated voltage	U _r 24 kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated normal current	I _r 1250 A	
Rated frequency	f _r 50 Hz	
Rated power-frequency withstand voltage	U _d 50 / 60 kV	
Rated lightning impulse withstand voltage	U _p 125 / 145 kV	
IEC 62271-200: 2003-11 IEC 60694: 2002-01 DIN EN 62271-200 (VDE 0671 Teil 200): 2004-10 DIN EN 60694 (VDE 0670 Teil 1000): 2002-09		NORMATIVE DOCUMENT
Dielectric tests on the main circuits • Power-frequency voltage test • Lightning impulse voltage test		RANGE OF TESTS PERFORMED
2 July 2004 and 21 February 2005		DATE OF TEST
The rated characteristics related to the range of tests performed have been verified. The test has been PASSED. The test results are documented in IPH Type Test Report 2298.0246.5.017.		TEST RESULT



DR. R. PLATH
Head of high-voltage test laboratory
Berlin, 1 March 2005



J. WITTWER
Test engineer in charge



This documentation shall not be reproduced in extracts without written approval by IPH GmbH.
The test results relate only to the object tested.

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) eV. In the fields of hv apparatus and switchgear, power cables and power cable accessories, lv apparatus and switchgear, installation equipment and switching and control equipment.



DAT - P - 019/92

Test certificates and reports of CESI, IPH and FGH (the three companies of CESI Group) are international recognized by utilities and electromechanical manufacturers, being all of them also (Cesi as cofounder, IPH and FGH through PEHLA Association) member of the STL (Short-Circuit Testing Liaison)

Main Components

Beneficial Features

VEG Circuit Breaker (DECOM)



Circuit breaker is horizontally arranged for N2S.
Circuit breaker is embedded-pole type with epoxy APG process.

Driving mechanism is accessible outside the gas tank.

Metal bellow is used to connect the embedded pole of circuit breaker and the rod of driving mechanism.

Interlocking device ensures that the closing operation can only be realized when the 3-position switch is in its proper position, which prevents the maloperation.

Earthing function can be realized with 3-position switch and circuit breaker.

1. Vacuum circuit breaker has more advantageous in making capability than conventional earthing switch, which makes earthing short-circuit become more easily via vacuum circuit breaker.

2. More operations can be done for fault current.

3. Arc is limited in the vacuum interrupter, which reduces the exhaust of insulation gas.

LSC2A Category



The busbar compartment housing the 3-position switch is separated from the circuit breaker compartment. This enables repair of the breaker without the need to de-energize the busbar. And the fault in VCB compartment will not make the loss of service continuity of the whole busbar.

Current Transformer



These are bar primary epoxy cast resin type of current transformers of low voltage rating positioned outside the gis tank meaning the possibility of partial discharge occurring is nil. Also class PX type with high knee point voltages and low magnetising current can be installed easily.

Contact



Spring contacts or MC contacts are applied in 3-position disconnectors. These special contacts can maintain multipoint electrical touch between fixed and moving contactors of disconnector, it can guarantee high load capacity of rated current and short time current.

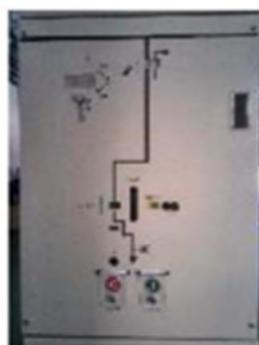
Cable Termination



That has a high cable floor-to-cable termination boot of 850mm thus enabling easy installation of ascending cables that is installed in the low trenches.

Both inner-cone and outer-cone system cable termination is possible. The cable compartment is able to accommodate all types and sizes of cables of single core or 3core 24kv rated cables.

Mimic Annunciation



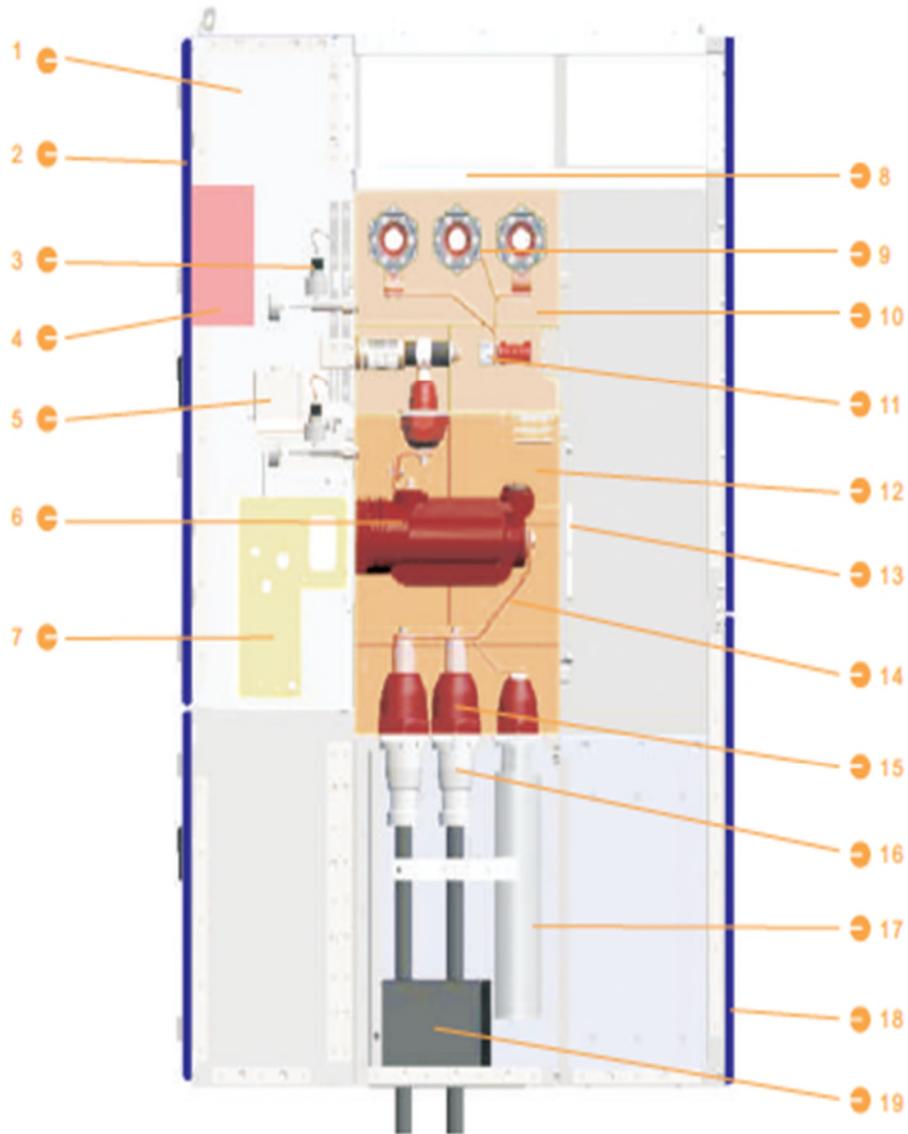
Direct mimic annunciation increases safety level to the operator. The actual status of the circuit breaker position and the 3-position switch is visible from the front of the panel along the mimic lines .this notify to the operator the exact status and not indicated separately to another annunciator, either by electrical signaling or mechanical linkage which prone to failure over time, will indicate the wrong status to the operator leading to disastrous consequences.

Bellow



Patented bellows are applied for moving sealing on insulated rod of VCB. No wearing of rubber O-rings for moving sealing and no leakage risk occur in panels life time.

SIDE VIEW



1.Framework

2.Low voltage compartment door

3.Gas density sensor

4.Protection and control unit

5.3-position switch mechanism

6.Vacuum circuit breaker

7.Vacuum circuit breaker mechanism

8.Pressure relief of busbar gas tank

9.Main busbar and bushing

10.Busbar gas tank

11.3-position switch

12.Circuit breaker gas tank

13.Pressure relief of circuit breaker gas tank

14.Feeder bus

15.Inner-cone bushing

16.Inner-cone cable terminal

17.Plug-in surge arrester

18.Rear cover

19.Current transformer

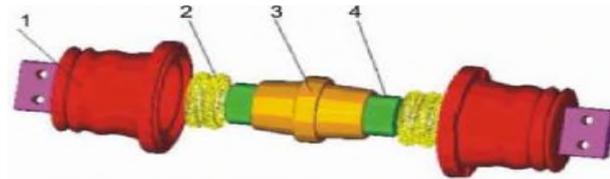


Pressure relief valve availability as first line defence against internal arc incidence inside the switchgear. Venting-off channels for internal arc discharges have been built into the switchgear. This provide high safety for operator on site.

Voltage Transformers

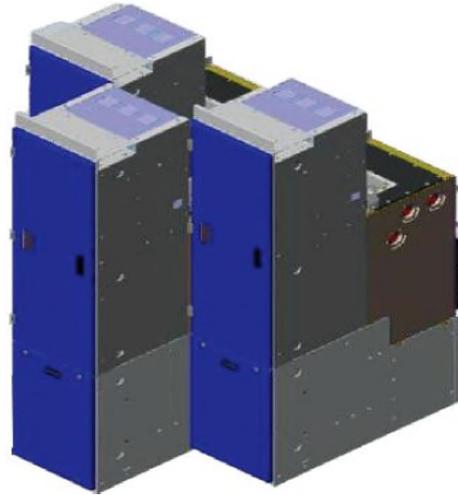
These are steel shielded VTs. mounted on top of the switchgear and both metering and protection classifications are available .

Uniqueness of the Busbar System



1.Epoxy resin sleeve of busbar 2.Spring finger 3.Silicon rubber sleeve of busbar 4.Copper busbar

Field experience gathered over the years has consequently evolved the design philosophy of busbar coupling system which enables the removal of the faulty panel without the need of having to move the adjacent panels sideways. This is because by removal of the side coupling internally it detaches the adjacent panels. The affected panel has just to be lifted upwards.



- Cable to floor height of 850mm means easy installation of Underground ascending cables even if cable trench is low and not requiring the ascending cable to be bent at too sharp an angle hence damaging the cable.
- Each functional gas compartment is separated independently. Meaning the CB can be removed for maintenance while the busbar is live
- Magnetic fluid or metal bellows sealing structure are used for all driving parts hence preventing gas leakage.
- Zero gas work on site, as all gas is already filled in the factory
- Availability of Testing Point before the CT. This solves the problem of having to switch off the adjacent panel and feeding in the Primary current from that panel when doing the Pilot Wire Solkor Protection Stability –on-load Testing.

COMPLETE SWITCHGEAR PARAMETERS			
Description	Unit	Data	Data
Rated voltage	kV	24	36
Rated power frequency, withstand voltage(1min)	kV	50	70
Rated lightning impulse withstand voltage(peak)	kV	125	170
Rated frequency	Hz	50, 60	50, 60
Rated current	A	1250., 2000	630、1250,2500
Rated short time withstand current 3s	kA	25	25
Rated peak withstand current	kA	63	63
Insulating gas		SF6、	SF6
Rated service pressure(at 20°C,gauge)	MP	0.04	0.04
Least service pressure(at 20°C,gauge)	MP	0.04	0.02
Protection degree provided by enclosure	S		IP65
	C		IP4X
Outline dimension(Width*Height*Depth)	mm	600*2000 * 1500	800*2000*1500

**** Note these are standard dimensions of standard VCb's ratings only.**

SPECIFICATION OF THE VACUUM CIRCUIT BREAKER

Description : TYPE DECOM CGIS				Data
Rated voltage		kV	24	36
Rated insulation level (Specific insulation medium)	Rated power frequency withstand	kV	50	70
	Rated lightning impulse withstand voltage(peak)	kV	125	170
Rated frequency		Hz	50/60	50,60
Rated current		A	1250,2000	630、1250,2500
Rated short time withstand current 3s		kA	25	25
Rated peak withstand current		kA	63	63
Rated breaking current			25	25
Rated breaking current for single back to back capacitor bank)		A	400	400
Rated operation sequence			O-0.3s-CO-15s-CO	
Rated voltage of auxiliary circuit			DC220V,DC24V,AC220V	
Mechanical life	Circuit breaker	times	10,000	10,000 (M2)
	Three-position switch		2,000	2000 (M1)

IDEA OF SMART GRID

The trend for most Power Grids in the world is moving towards the idea of a SMART Grid concept , where the application of computer intelligence and networking abilities changes a “dumb” electricity distribution system to that of a “ Smart “ one . In the case of the former , the power utility will only know that service is lost only when a customer rings up to complain. In the case of a smart grid , however, if service is interrupted the power company will know right away because certain components of the grid e.g. smart meters in the affected area, stop sending data back to the control room . Hence if by ensuring that all the components of the power system from transformers to power lines to home electric meters are capable of two-way communication, able to send information of the real time status of the component , then the company can manage distribution of power very efficiently, be proactive about maintenance and respond to outages faster , sometimes even before it happening. .This is possible only if advance sensing and measurement technologies are available that will constantly inform the Control Engineers of the “health “of the system components such as that of a Distribution switchgear .

The **intelligent N2SCB-24KV** switchgear, a product development of POWER T & D Ltd sets the standard for such a modern intelligent switchgear .



Well, then how intelligent can it be ? .

Well, It is able to monitor **ONLINE continuously** the following Parameters

- Partial Discharge Detection –Insulation degradation
- Condition of SF6 Gas, Gas Density, Temperature and humidity
- Temperature rise of the Cable Termination , Circuit Breaker Contact points , Busbar
- Ozone detection

Consequently, vital measurements required for predictive condition-based monitoring of the switchgear, circuit breakers, and bus ducts is available on both the local HMI on the switchgear , or sent through a Modbus-RTU for easy substation SCADA integration . Thus the switchgear is now brought closer to the Power Company .

- **Partial Discharge Detection**



SENSOR

From Switchgear



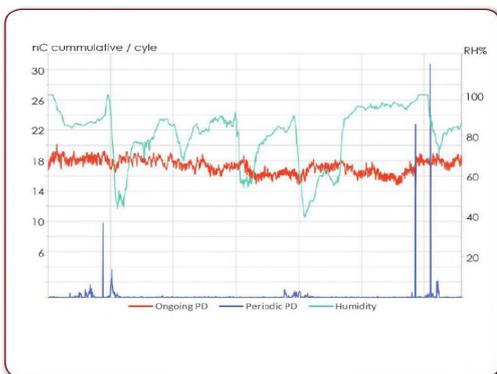
From Cable Termination

This broadband (300 MHz to three gigahertz) detection method monitors PD transient electromagnetic waves through a Sensor attached by a Electromagnet affixed to the Panel of the switchgear ..

It is capable of avoiding strong interfering signals at close proximity while advanced digital filtering methods are capable of detecting the presence of partial discharge—even with residual, unfiltered noise.

The Pd Detector for cable terminations consist of a High frequency Split Core CT mounted on the core of the incoming cable

The utilization of both sensors together significantly make 24/7 monitoring possible hence providing historical trending and information for the maintenance engineers to look out for any abnormalities.



Continuous, real-time trending of partial discharge events capturing periodic PD spikes due to condensing humidity; these events are unrecognizable with traditional (non-continuous) detection methods

Temperature Monitoring

This consists of a Panel mounted monitoring unit and six separate temperature sensors mounted on the cable terminations point, Busbar surfaces and the LV Control compartment of the switchgear. Non – invasive, 24/7 real time monitoring using Surface Acoustic Wave Technology, it is a great aid to the Operations and Maintenance Engineer



Monitoring of the Condition of SF6 Gas, Gas Density, Temperature and humidity

Here the focus is on the loss rate and the humidity content of the SF6 used in the switchgear. This in-



built sensor is capable of measuring the relative humidity, pressure and temperature precisely over a wide measuring range. The multi-functionality of the sensor ensures continuous, and at the same time proactive, monitoring. With this, trends

can be identified and maintenance planned in a targeted manner. This ultimately leads to a move from a time-based maintenance strategy to a condition-based one.

The sensor features a standardised RS485 interface and also an established MODBUS protocol

Ozone Detection

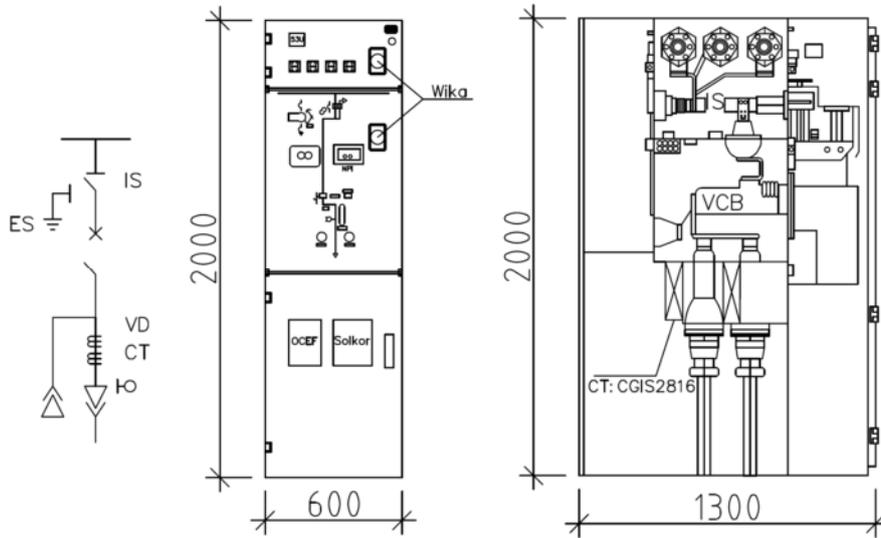
This is detected by a very accurate sensor mounted on the cable termination. Ozone which is produced in air on occurrence of corona discharges is hence detected before well any catastrophic failure happens to the switchgear panel, Condition Monitoring at its best.

Communication :

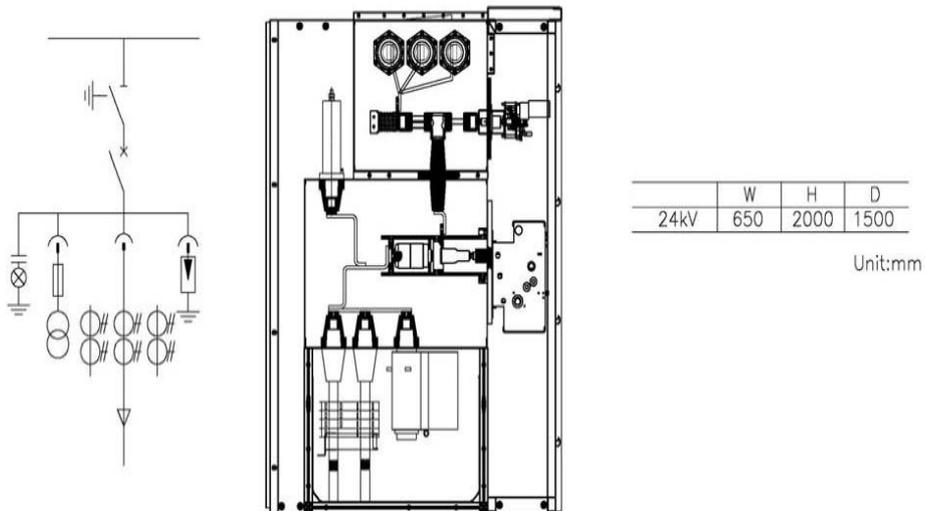
All the acquired information is sent from the data concentrator located in the CGIS Switchgear and sent back to the Control room via IEC 60870-5-104 over Ethernet or GSM /GPRS. No hard wired wiring is necessary.

PANEL DIMENSIONS

SIMPLE 24 KV , 1250A FEEDER PANEL

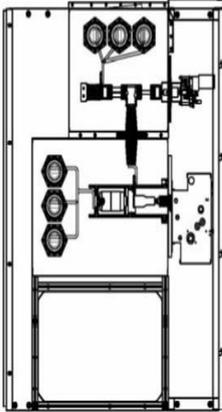
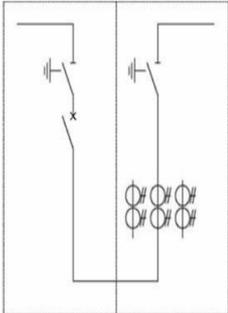


FEEDER PANEL WITH VT



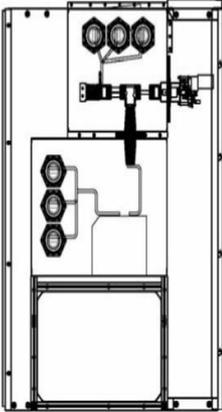
BUS COUPLER

BUS RISER



	W	H	D
24kV	500	2000	1500

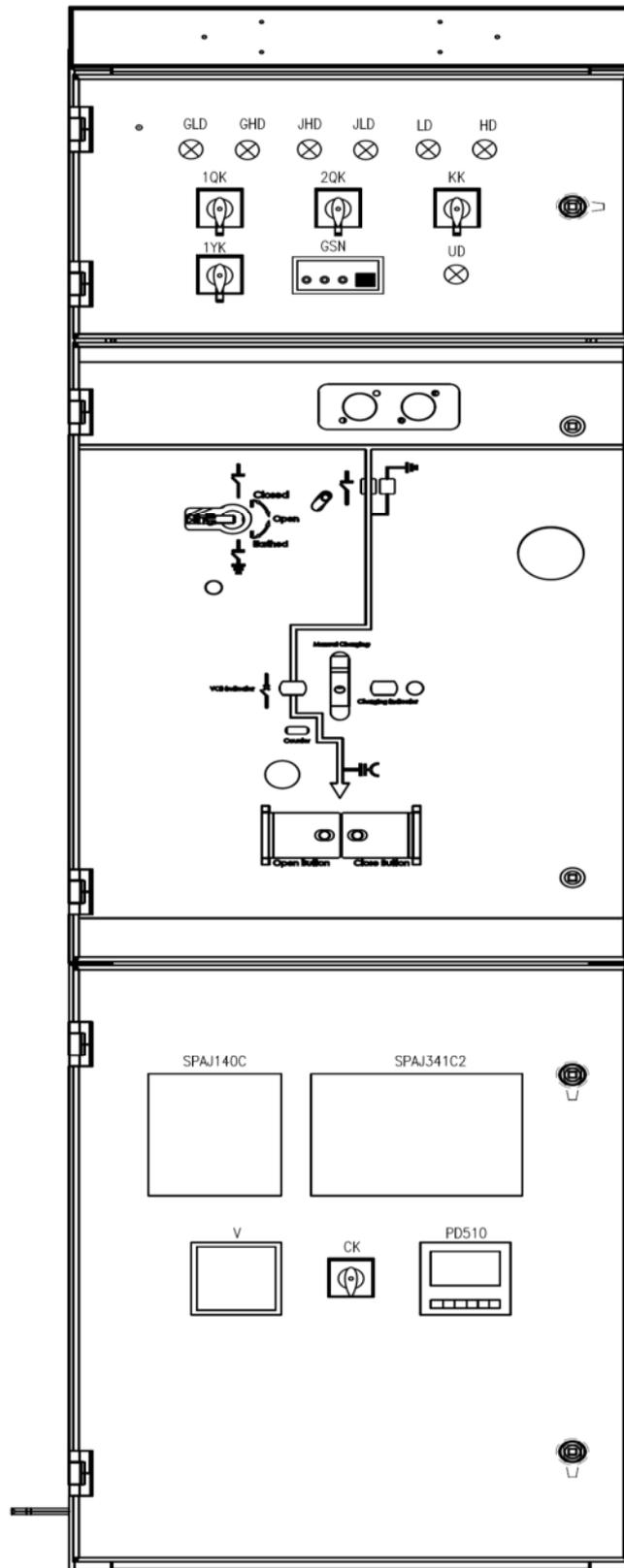
Unit:mm



	W	H	D
24kV	650	2000	1500

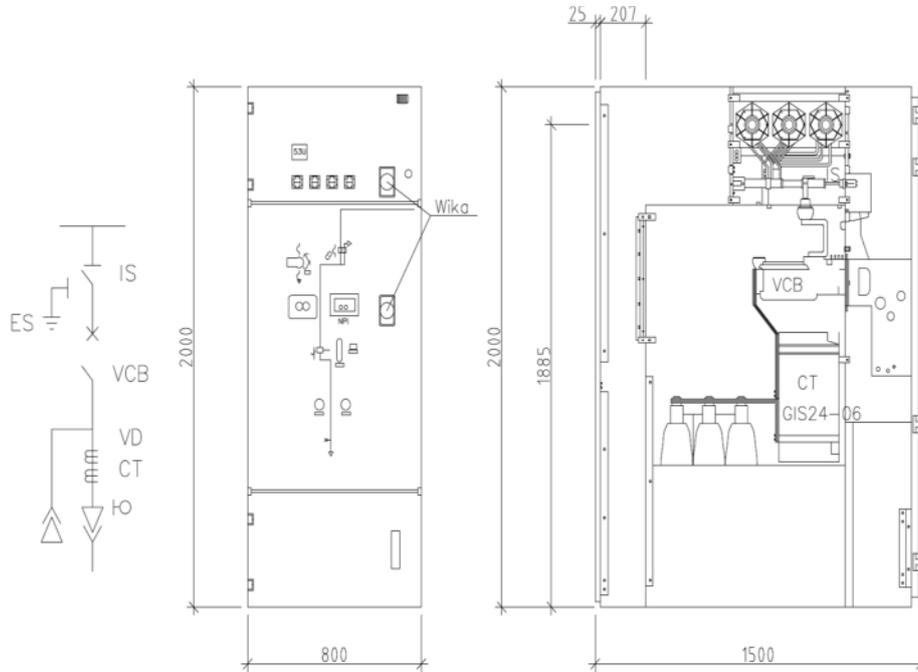
Unit:mm

BUSBAR RATED 2000A



STANDARD LAYOUT OF FRONT FACIA

36 KV GIS



**Fig 1.) 2000A PANEL WITH HIGH VOLTAGE 36 KV
KV RATED CT**

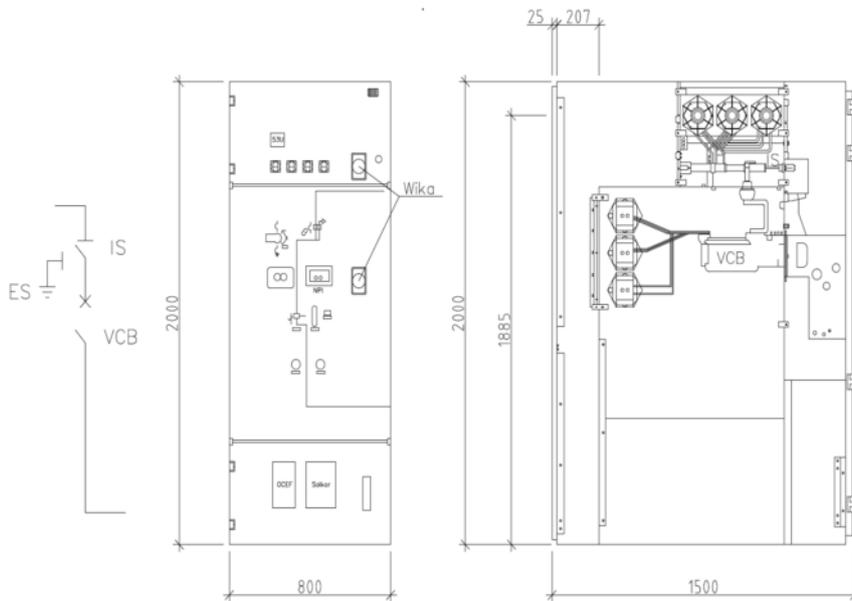
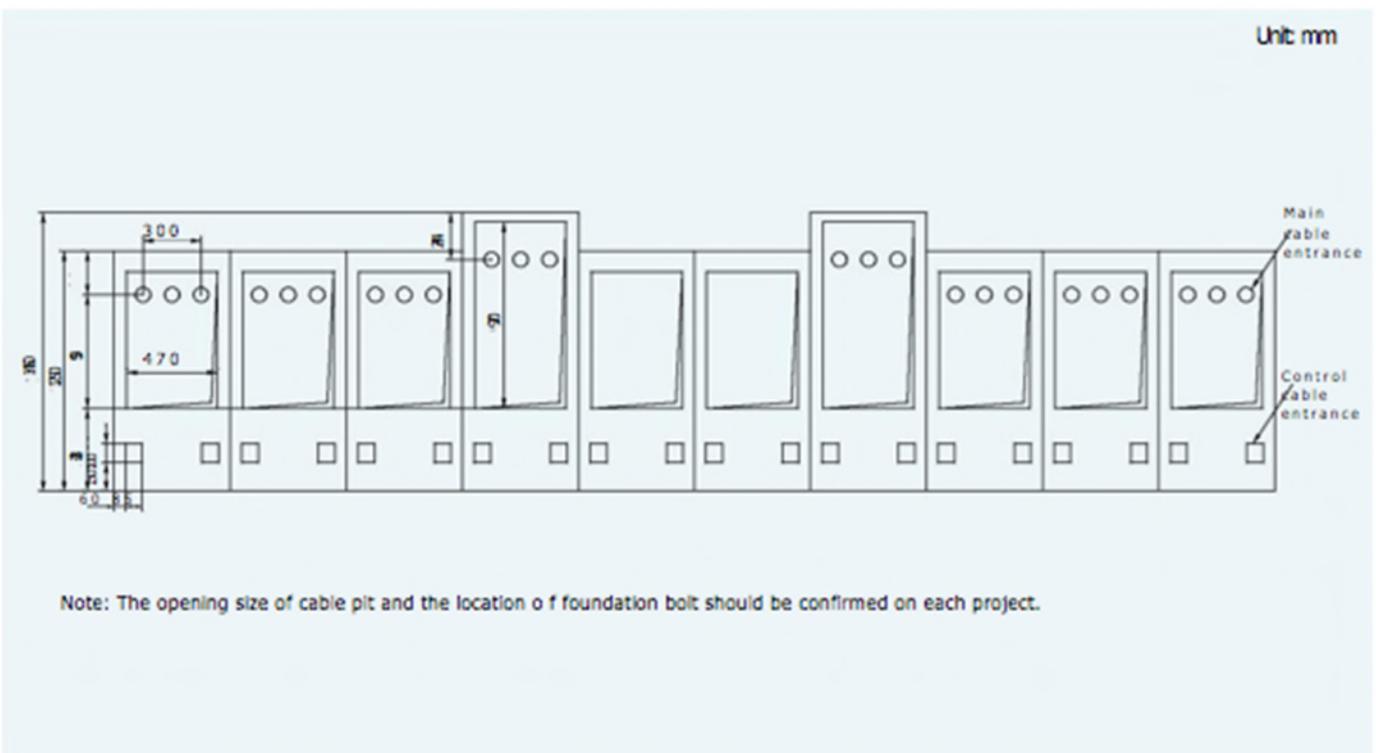
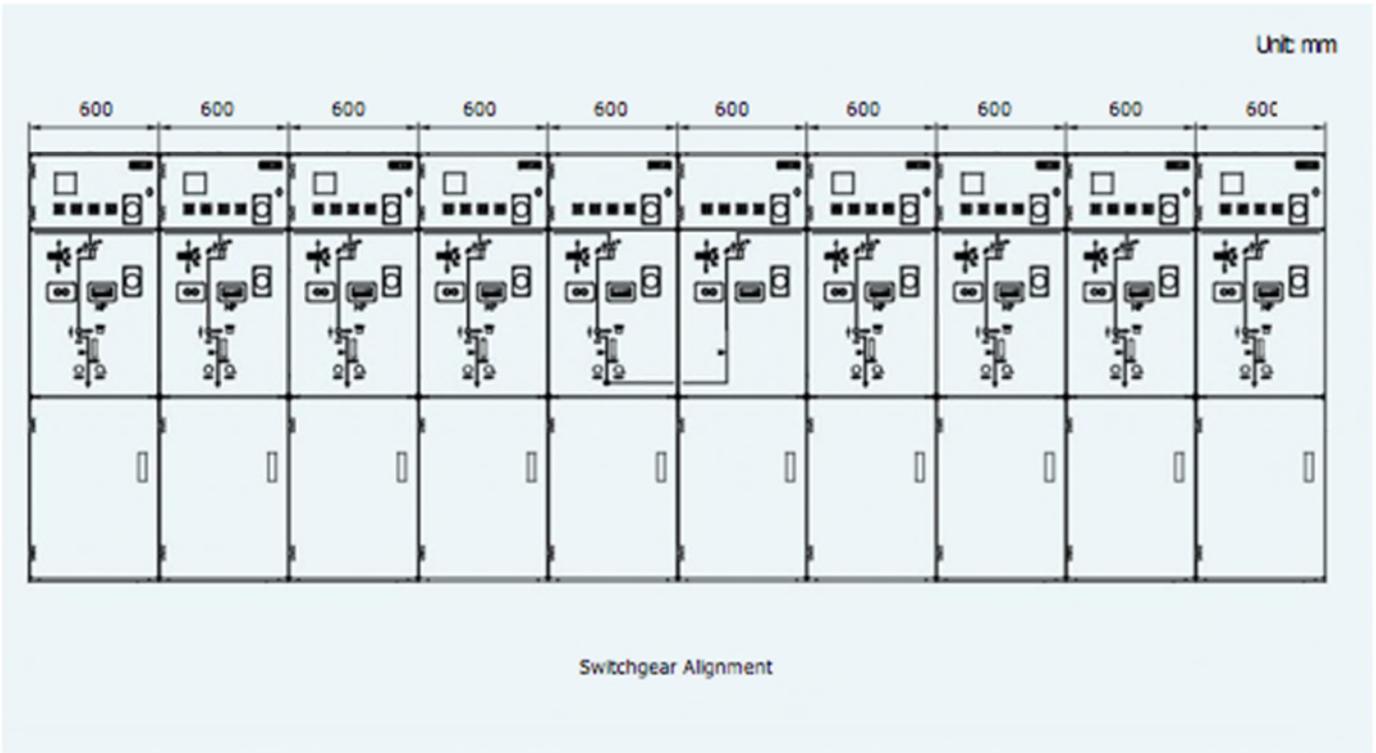


Fig 2.) 2000A BUS SECTION PANEL WITH VCB

Installation





Manufacturer:

POWER T & D LTD
Sovereign Way ,Chester West Employment Park,
Chester Cheshire CH1 4QJ
Tel : 01244-390215



Local Agent :

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