

## 订货须知

ORDERING INSTRUCTIONS

—应注明—

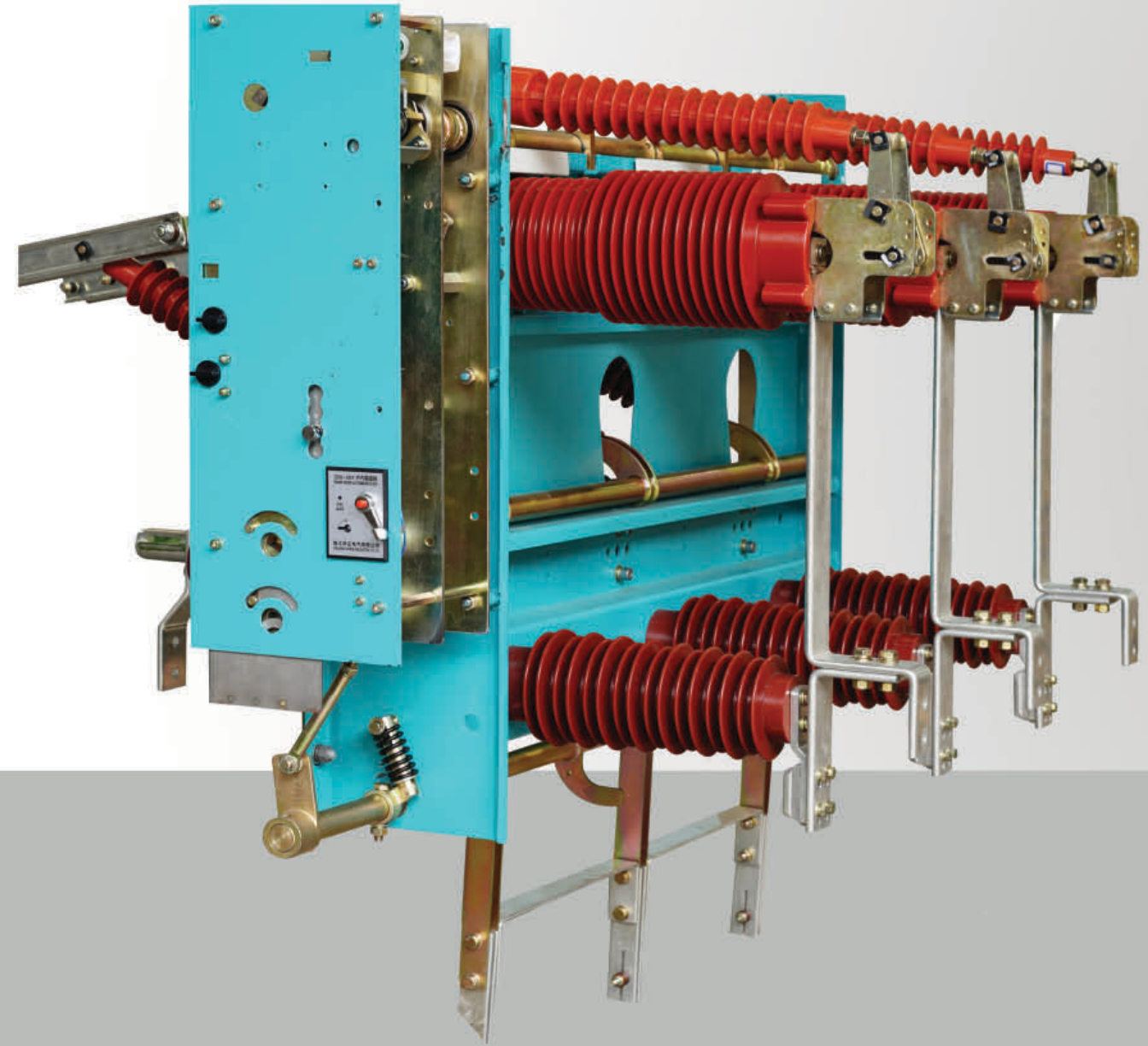
ITEMS ON THE RIGHT SHALL  
BE INDICATED

- 带隔离户内真空断路器 型号 名称;
- 额定电压、额定电流、额定短路开断电流、相间距及所需数量;
- 操动机构分合闸脱扣器额定电压和储能电机额定电压;
- 备品备件名称及数量。

标准配置不含可选件, 用户如有特殊要求应在订货前予以说明。

- Model and Name of isolation-equipped indoor high voltage AC vacuum circuit breaker;
- Rated voltage, rated current, rated short-circuit breaking current, phase spacing and required quantity ; electrode spacing and required quantity ;
- Rated voltage of actuator breaking-closing release and energy storage motor ;
- Name and quantity of spare parts .

Standard configuration of the circuit breaker does not contain optional extras.  
If the user proposes special requirements, it shall be described before ordering.



## VG3-40.5 SERIES ISOLATION-EQUIPPED INDOOR HIGH VOLTAGE AC VACUUM CIRCUIT BREAKER

VG3 - 40.5 系列带隔离户内真空断路器

 江苏大全高压开关有限公司  
JIANGSU DAQO HIGH VOLTAGE SWITCHGEAR CO.,LTD.

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由于技术的不断改良, 本样册上记载的产品规格和外观可能会进行变更, 恕不另行通知, 敬请原谅。  
Improvements to this product may result in unannounced changes to specifications and external appearance.

印制日期: 2018年5月



江苏大全高压开关有限公司  
JIANGSU DAQO HIGH VOLTAGE SWITCHGEAR CO.,LTD.

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## 江苏大全高压开关有限公司

江苏大全高压开关有限公司是中国电气工业领军企业大全集团旗下的核心子公司，专业从事高、中压输电设备的研发、生产、销售和服务。公司秉持“专业决定品质、专注铸就品牌”的经营理念，致力于开关设备和断路器技术及应用的研究与开发，精心打造国内知名电工品牌。

大全高压开关坐落于南京江宁高新技术开发区，总投资1.6亿元。公司厂房总面积逾万平方米，断路器年生产能力20000台，稳居国内高压电器设备设计与制造行业的一线阵营。

公司的主要产品有：7.2kV-40.5kV户内真空断路器，40.5kV高压真空负荷开关-熔断器组合电器，12kV户外柱上断路器等，服务于核电站、发电厂、变电站、城乡电网、石油、化工、冶金、电气化铁道、地铁、城市轻轨、港口、垃圾电站及环保等多个行业，并参与了多项国家重点项目建设。

得益于大全集团40多年的工程、服务经验以及吸收国外先进公司的电气技术和设计理念，大全高压开关向用户提供世界级高标准高性能的产品。自成立以来，公司持续为社会提供优质产品，成功运行于国内外不同行业的数万个变电站，产品以其优质的可靠性和安全性得到用户的一致认可与好评。

## JIANGSU DAQO HIGH VOLTAGE SWITCHGEAR CO.,LTD.

Jiangsu Daqo High Voltage Switchgear Co., Ltd. is a core subsidiary under Daqo Group which takes a leading position in China's electrical industry. It is specialized in research and development, production, sales and services of medium and high-voltage transmission and distribution equipment. Abiding by the business philosophy of "quality depending on specialty and concentration creating brand", it is engaged in research and development of switchgear and circuit breaker technology and application to create a famous electrical brand in China.

Daqo High Voltage Switchgear is located at Jiangning High-tech Development Zone in Nanjing. With total investment of RMB 160 million and total plant area of more than 10,000 m<sup>2</sup>, it can reach annual breaker production capacity of 20000 sets to take a leading position in China's High Voltage electrical equipment design and manufacture.

The company's main products are: 7.2KV-40.5KV indoor vacuum circuit breaker, 40.5KV high-voltage vacuum load switch-fuse combination electrical appliances, 12KV outdoor column circuit breaker, etc., serving nuclear power plants, power plants, substations, urban and rural power grids, petroleum, chemical, metallurgy, electrified railway, subway, urban light rail, ports, garbage power stations and environmental protection industries, and participated in a number of countries. Home key project construction.

Thanks to Daqo Group's engineering and service experiences of more than 40 years as well as electrical technology and design concept absorbed from foreign advanced companies, Daqo HV Switchgear can provide users with world-class products with high standard and high performance. Since inception, it has kept on offering quality products successfully applied to thousands of hundreds of power substations in different industries at home and abroad. Its products have been recognized and appraised by all users with high reliability and safety.

# 荣誉与资质 Honor and Qualification



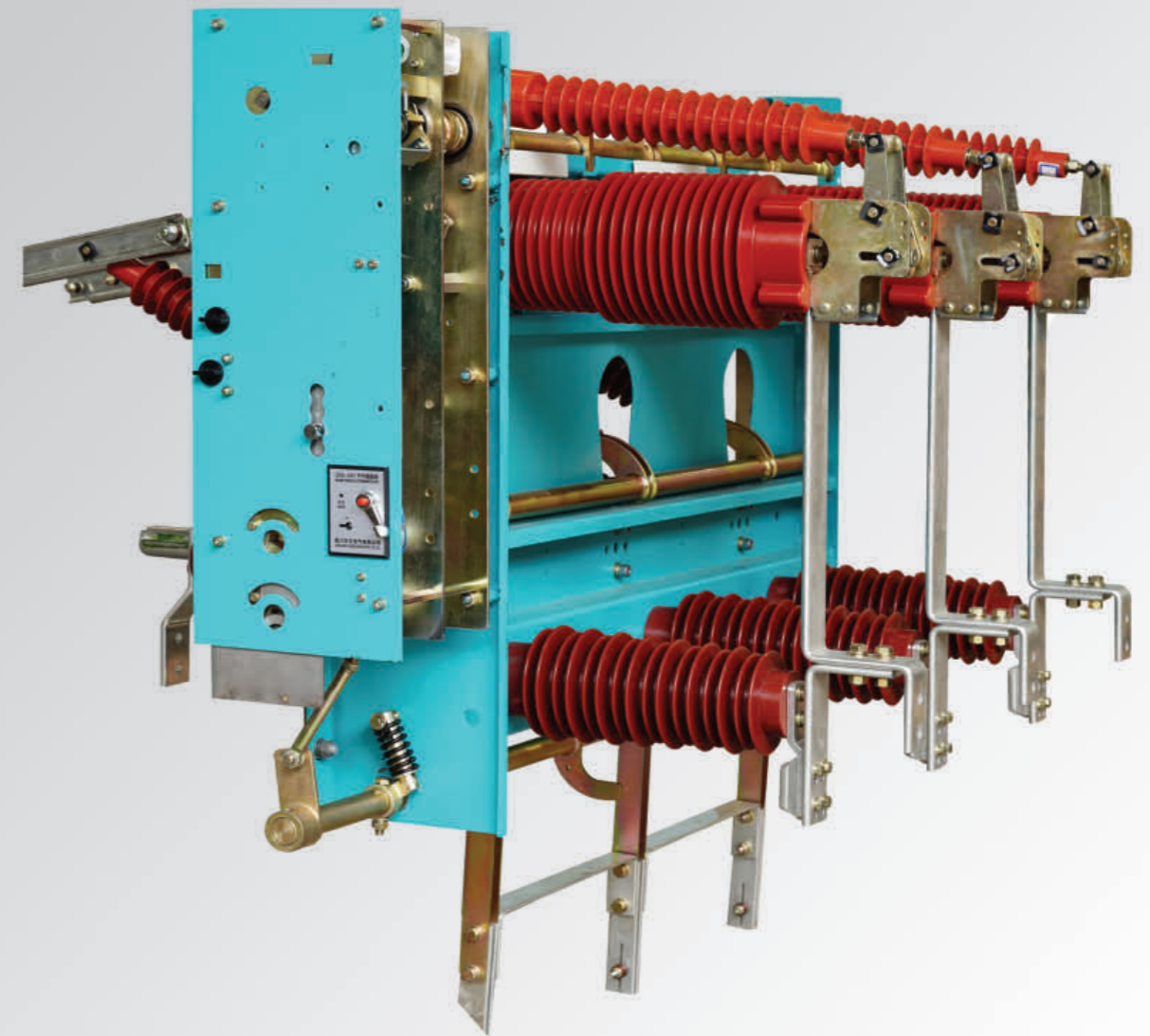
VG3-40.5 SERIES ISOLATION-EQUIPPED INDOOR  
HIGH VOLTAGE AC VACUUM CIRCUIT BREAKER

## VG3-40.5 带隔离户内真空断路器

- ① 环境管理体系认证证书
- ② 质量管理体系认证证书
- ③ 职业健康安全管理认证证书
- ④ VG3-40.5 系列产品型式试验报告
- ⑤ 企业法人营业执照
- ⑥ 高新技术企业认证证书

- ① Environmental Management System Certificate
- ② Quality Management System Certificate
- ③ Occupational Health and Safety Management System Certificate
- ④ VG3-40.5 Series Products Type Test Report
- ⑤ Business License
- ⑥ High-Tech Enterprise Certificate

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5	6		





## 总则 / GENERAL

共用：VG3-40.5带隔离户内高压交流真空断路器是江苏大全高压开关有限公司在吸收国内外先进技术基础上并摒弃目前行业普遍存在的不足，自主研发的具有国内领先水平的新型带隔离户内高压交流真空断路器。

Sharing: VG3-40.5 isolation-equipped indoor high voltage AC vacuum circuit breaker is a new type of domestically leading breaker, which is researched and developed independently by Jiangsu Daqo High Voltage Switchgear Co., Ltd. on the basis of absorbing advanced technologies at home and abroad, and removing the common deficiencies currently suffered by the industry.

主要特征：采用真空灭弧，真空灭弧室被环氧树脂包封形成固封极柱，穿墙式固封极柱采用水平安装，极柱动端通过软连接与出线端子相连，极柱静端与隔离开关的动刀支点相连，从而把隔离开关和接地开关分割成独立两个隔室，确保断路器在无电状态下检修。本产品具有设计新颖、结构紧凑、寿命长、动作可靠、体积小、操作维护方便、安全性高等优点。

Main characteristics: Adopting the vacuum arc extinguishing technology, the breaker is equipped with a vacuum arc extinguishing compartment, which is encapsulated with epoxy resin to form a solid-sealed pole. Installed horizontally, this through-wall solid-sealed pole has its moving end connected to the outlet terminal through soft connection, and its static end connected with the isolation switch's movable knife pivot. By doing so, the isolation switch and the grounding switch are separated into two independent compartments, which will ensure the breaker can be maintained or repaired under a power cut-off state. Characterized with the advantages of novel design, compact structure, longer service life, reliable actions and small dimensions, this product is easy in operation and maintenance and high in safety performances.

## 标准 / STANDARDS

应符合国家标准GB1984-2014《交流高压断路器》要求。

China's national standard High Voltage AC Circuit Breaker GB1984-2014 has been followed.

## 应用范围 / RANGE OF APPLICATION

VG3-40.5带隔离户内真空断路器适用于三相交流50Hz,额定电压40.5kV的风电、光伏发电输电网络,可开断负荷电流、过载电流和短路电流,是专为35KV箱式变电站设计,亦可作为独立电器单元应用于电力系统中(配柜安装或墙上安装),与配电设备、环网开关柜或组合式变电站等配套使用。

VG3-40.5 isolation-equipped indoor vacuum circuit breaker is suitable for 3-phase AC and 50Hz wind power and photovoltaic generator power transmission grids with a rated voltage of 40.5kV. With its load current, overload current and short-circuit current interruptible, this breaker is specially designed for 35KV box-type substations. It can also be used as an independent electrical unit in power systems (installed inside a cabinet or on the wall) to act as a supporting device for power distribution equipment, switchgears in a looped network or a combined substation.

## 试验 / TESTING

型式试验：工频耐压、雷电冲击、温升、短时和峰值耐受电流、局放、绝缘试验、短路开断与关合能力试验、机械操作试验、机械寿命试验。

出厂例行试验：机械特性测试、工频耐压、辅助回路和控制回路绝缘试验、主回路电阻测量、联锁操作试验、机械和电气操作试验。  
Type test: Power frequency withstand voltage, lightning impulse, temperature rise, short-time and peak withstand currents, partial discharge, insulation test, short circuit breaking and closing capability test, mechanical operation test, and mechanical life test.

Routine factory test: Mechanical characteristic test, power frequency withstand voltage, auxiliary circuit and control circuit insulation test, main circuit resistance measurement, interlock operation test, mechanical and electrical operation test.

## 使用环境 / OPERATING ENVIRONMENT

- a) 周围空气温度不超过40°C,日平均温度不超过35°C;最低周围空气温度为-15°C。
- b) 日相对湿度的平均值不超过95%;月相对湿度平均值不超过90%;
- c) 海拔不超过1000m。
- d) 周围空气应不受腐蚀性、可燃性气体、水蒸气等明显污染。
- e) 来自开关设备和控制设备外部的振动或地动是可以忽略的。

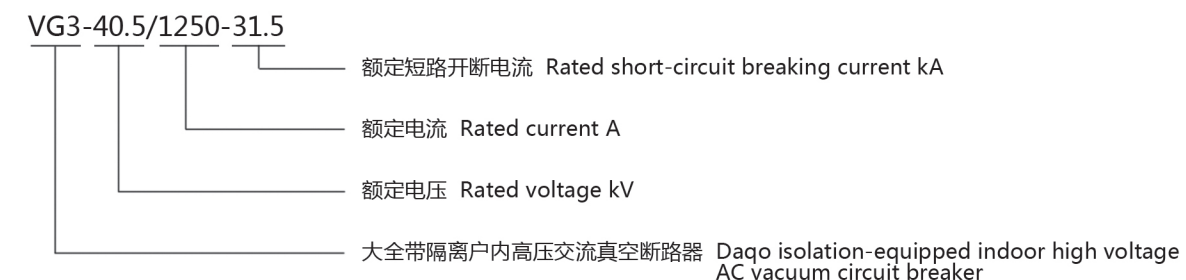
- a) The ambient air temperature does not exceed 40°C, and the daily average temperature does not exceed 35°C. The lowest ambient air temperature is -15°C.
- b) The average daily relative humidity does not exceed 95%. The average monthly relative humidity does not exceed 90%;
- c) The altitude does not exceed 1,000m.
- d) The surrounding air should be from any obvious pollution such as corrosive or flammable gas, water vapor and others.
- e) Vibration from any outside switchgear and control equipment or any ground movement can be negligible.

## 安全运行 / SAFE OPERATION

VG3-40.5带隔离户内高压交流真空断路器具有完善的机械和电气联锁装置,同时具有极高的操作可靠性和使用寿命,配合相应的开关柜可完成安全的配电功能,确保操作者和设备的安全。

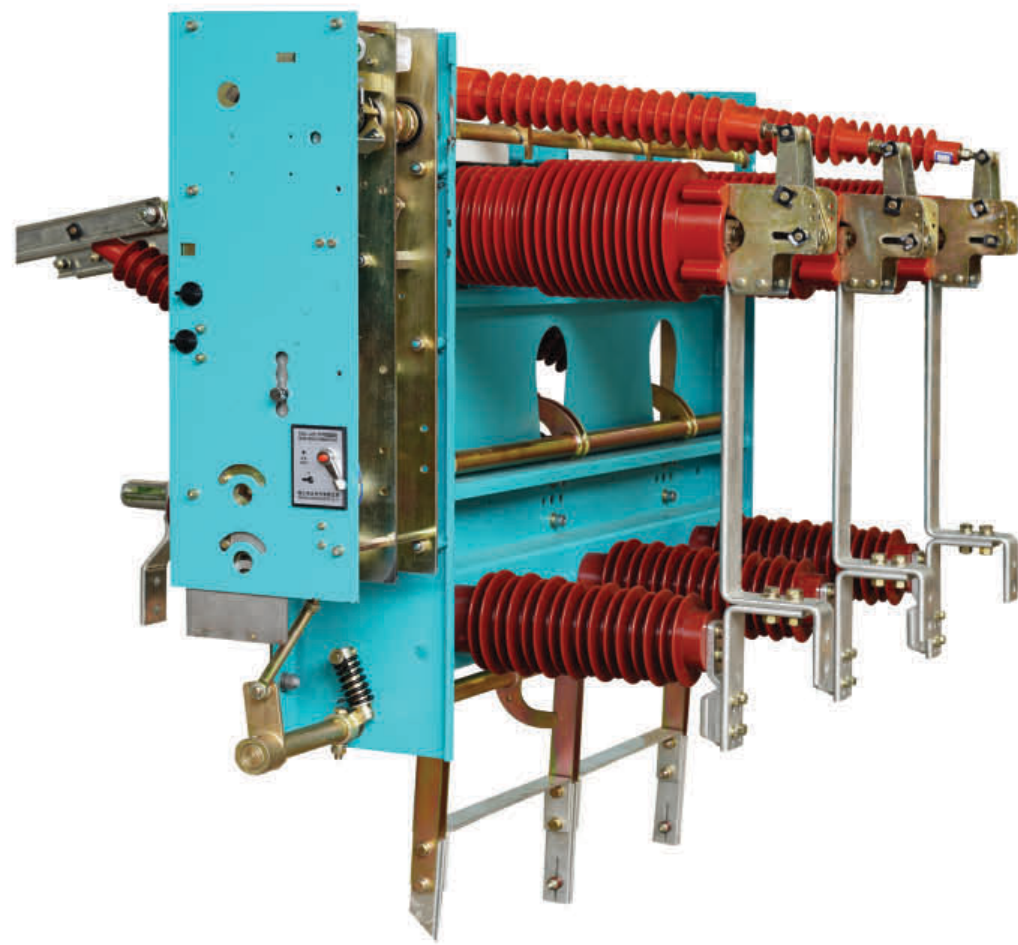
VG3-40.5 indoor high-voltage AC vacuum circuit breaker equipped with an isolation device is provided with complete mechanical and electrical interlock devices, enjoying extremely high operational reliability and long service life. With a corresponding switch cabinet, it can perform a safe power distribution function to ensure the safety of both operators and equipment.

## 型号及含义 / MODEL AND MEANING



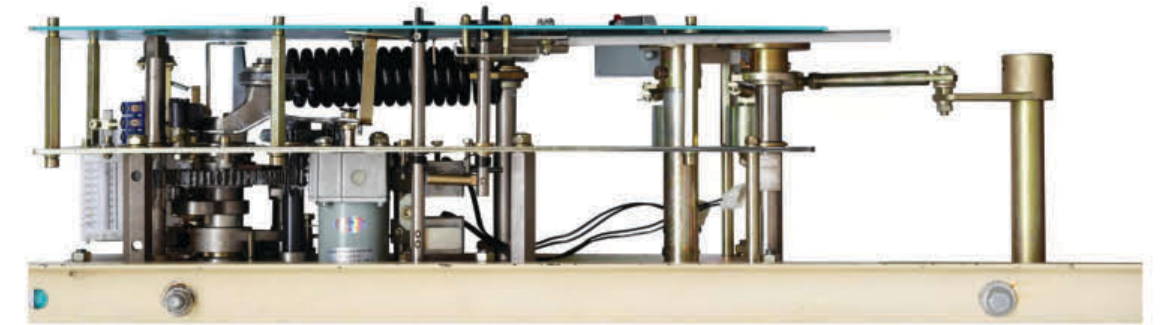
断路器机构采用模块化机构改制，动作简单可靠，可实现电动、手动储能和分合闸操作；

This breaker's mechanism has been modified with a modular mechanism, which is simple and reliable, and can perform electric and manual energy accumulation operations, and switch closing/opening operations.



隔离开关和接地开关为手动操作机构。隔离开关、断路器、接地开关之间具有完善的“五防”联锁，包括警示性的、具有程序化的操作说明，上下滑动的且每个位置只露出一个操作孔的联锁板，保证每个位置只能实现隔离、断路器和接地开关一种开关操作，彻底杜绝误操作。

The isolation switch and grounding switch are manual operating mechanisms. The isolation switch, circuit breaker, and grounding switch are provided with complete "five-prevention" interlocks, for which programmed operating instructions containing warning information are also provided. The interlocking plate that slides up and down and only one operating hole is exposed in each position to ensure each of such positions can only perform one switching operation.



产品采用侧面悬挂安装结构，固封极柱穿墙安装，把产品分成两个隔室。左侧为隔离开关，右侧为接地开关，A、B、C三相按后、中、前布置，断路器和隔离、接地操作机构在前部，断路器采用弹簧操动机构，可实现电动、手动储能和分合闸操作；

The product is a side hanging and installation structure. Its solid-sealed pole is installed through the wall, which divides the product into two compartments. The left side is the isolating switch, and the right side is the grounding switch. The three phases A, B, and C are arranged in the rear, middle and front positions. The breaker and the isolating and grounding operating mechanism are at the front. The breaker is a spring operating mechanism, which can perform electric, manual energy storage, and switch opening and closing operations.

VG3-40.5带隔离户内高压交流真空断路器结构合理，安装方便。一侧为接地开关，另一侧为隔离开关，可左右布置，也可上下布置，两部分中间由金属底架隔开，通过穿墙式固封极柱形成电气连接。

## 结构特点

组合电器为三级联动结构：主要由金属底架、穿墙式固封极柱、隔离开关、接地开关以及弹簧操作机构组成。

穿墙式固封极柱直接安装在金属底架上，静端与隔离开关静触头相连，隔离开关另一端通过绝缘子与接地开关一起固定在底架上。弹簧操作机构装于底架的侧板上。

## 工作原理

### □ 断路器的操作：

组合电器的断路器操作方式采用电动弹簧操作机构进行合闸，用分闸脱扣电磁铁进行分闸，也可用手动进行合、分闸操作，手动合闸使用操作手柄顺时针方向转动弹簧操动机构的储能轴，依靠合闸弹簧能量使断路器快速合闸。逆时针转动分闸旋钮可手动分闸。

### □ 隔离开关，接地开关的分，合闸操作：

组合电器的断路器，隔离开关和接地开关三者之间装有可靠的电器和机械联锁装置。当隔离开关合上，断路器开关才能合。分闸顺序与此相反，只有当断路器处于分闸状态时，才可操作隔离开关与接地开关。

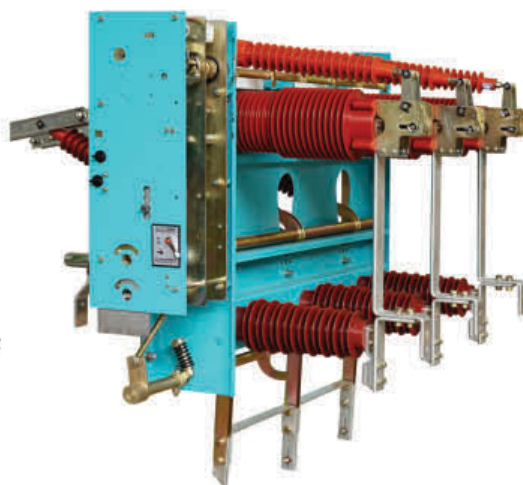
## 送电操作和断电操作

### □ 送电操作：

- 1、关闭前门；
- 2、联锁操作销从①拨到②，分开接地开关；
- 3、联锁操作销从②拨到③，锁上电磁锁，合上隔离开关；
- 4、联锁操作销从③拨到④，合上断路器，产品送电运行。

### □ 断电操作：

- 1、分开断路器；
- 2、联锁操作销从④拨到③，分开隔离开关；
- 3、确认出线侧无电，解锁电磁锁，联锁操作销从③拨到②，合上接地开关；  
联锁操作销从②拨到①，可开门维护。



The VG3-40.5 breaker with isolation is reasonable in structure and easy for installation. Its one side is a grounding switch, and the other is an isolating switch, which can be placed leftwards and rightwards, or up and down. Its two parts are separated by a metal bottom frame, and the electrical connection is formed by a through-wall solid-sealed pole.

## STRUCTURE CHARACTERISTIC

The combined electrical apparatus is a three-level linkage structure, which is mainly composed of a metal bottom frame, a through-wall solid-sealed pole, an isolating switch, a grounding switch, and a spring actuating mechanism.

The wall-through solid-sealed pole is directly installed on the bottom metal frame. Its static end is connected with the static contact of the isolating switch, and the other end of the isolating switch is fixed on the bottom frame together with the grounding switch through an insulator. The spring actuating mechanism is installed on the side plate of the bottom frame.

## WORKING PRINCIPLE

### □ Breaker operation：

For operation of the combined apparatus' breaker, switch closing is performed with the electric spring actuating mechanism, and its switch opening is done with a tripping electromagnet. The switch closing and opening can also be done manually. For manual switch closing, turn the operating handle to rotate the spring actuating mechanism' s energy storage shaft clockwise. The spring' s energy will complete breaker' s switch closing quickly. Turning the switch opening knob counterclockwise can perform the switch opening manually.

### □ Switch opening and closing operations of isolating switch and grounding switch：

Reliable electrical and mechanical interlocking devices are installed between the breaker and isolating switch and between the grounding switch of the combined electrical apparatus. The breaker switch can be closed only when the isolating switch has been closed. The switch opening sequence is contrary to that. Only when the circuit breaker is in the opening state, can the isolation switch and the grounding switch be operated.

## POWER-ON AND POWER-OFF OPERATION

### □ Power-on operation：

- 1、Close the front door;
- 2、Dial the interlock operating pin from ① to ② to separate the grounding switch;
- 3、Dial the interlock operating pin from ② to ③ to lock the electromagnetic lock, and close the isolating switch;
- 4、Dial the interlock operating pin from ③ to ④ to close the breaker, and the product will be powered on and start running.

### □ Power cutoff operation：

- 1、Separate the breaker;
- 2、Dial the interlock operation pin from ④ to ③ to separate the isolating switch;
- 3、Confirm outgoing line side is not live. Unlock the electromagnetic lock. Dial the interlock operating pin from ③ to ②, and close the grounding switch.

Dialing the interlock operating from ② to ①, the door can be opened for maintenance.

## 断路器的技术参数 Technical Parameters for Breaker

项目 Item	单位 Unit	参数 Parameter	
额定电压 Rated voltage	kV	40.5	
工频耐压 (有效值) Power frequency withstand voltage (effective value) 1min	kV	95	
额定雷电冲击耐受电压 (峰值) Rated lightning impulse withstand voltage (peak value)	kV	185	
额定频率 Rated frequency	Hz	50	
额定电流 Rated current	A	1250	
额定短时耐受电流 Rated short-time withstand current	kA	31.5	
额定峰值耐受电流 Rated peak withstand current	kA	80	
额定短路持续时间 Rated short-circuit holding time	s	4	
额定短路开断电流 Rated short-circuit breaking current	kA	31.5	
额定短路关合电流 Rated short-circuit making current	kA	80	
开断时间 Breaking time	ms	≤60	
额定操作顺序 Rated operating sequence		O-0.3s-CO-180s-CO	
额定短路开断电流开断次数 Rated short-circuit breaking current breaking times	次 time	30	
额定电容器组开断电流 Rated capacitor bank breaking current	A	400	
额定操作电压 Rated operating voltage	V	DC220/AC220/DC110/AC110	
机械寿命 Mechanical life	断路器 Breaker	次 time	10000
	隔离开关 Isolation switch	次 time	2000
	接地开关 Grounding switch	次 time	2000

## 隔离开关技术参数 Technical Parameters for Isolation Switch

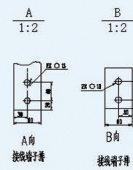
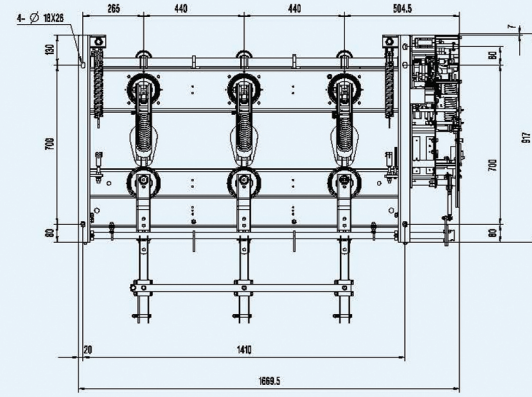
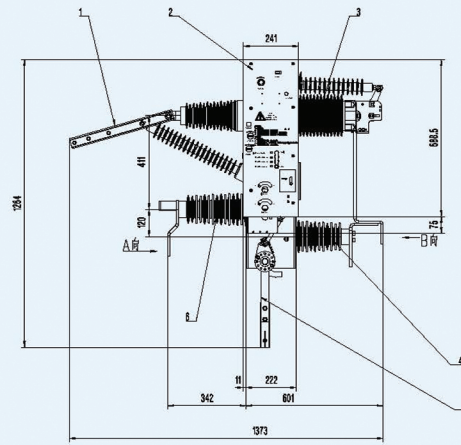
项目 Item	单位 Unit	参数 Parameter
合闸三相不同期 Three-phase closing desynchronization	ms	≤3
触刀正压力 Contact knife positive pressure	N	200±20
断口开距 Contact opening distance	mm	≥330
手动分、合闸力矩 Manual switch closing/opening torque	N.m	≤250

## Technical Parameters for Breaker 断路器的技术参数

项目 Item	单位 Unit	参数 Parameter	
触头开距 Contact opening distance	mm	18 ~ 20	
超行程 Overtravel	mm	3.0 ~ 4.0	
触头压力 (对应0.5mm超程) Contact pressure (corresponding to 0.5mm overtravel)	N	2450 ~ 2650	
触头压力 (对应4.0mm超程) Contact pressure (corresponding to 4.0mm overtravel)	N	3500 ~ 3700	
平均合闸速度(10mm-刚合) Average closing speed (10mm-instant contact touching speed)	m/s	0.9 ~ 1.5	
平均分闸速度(刚分-10mm) Average opening speed (instant contact separating speed -10mm)	m/s	1.5 ~ 2.2	
合闸时间 Switch closing time	ms	30 ~ 60	
分闸时间 Switch opening time	ms	20 ~ 45	
触头合闸弹跳时间 Contact closing bounce time	ms	≤2.0	
分闸反弹 Switch opening bounce	ms	≤3	
三相合闸不同期 Three-phase closing desynchronization	ms	≤2	
三相分闸不同期 Three-phase opening desynchronization	ms	≤2	
合闸弹簧储能时间 (电动) Energy storage time of closing spring (electric)	s	≤15	
各相回路电阻 Circuit resistance of each phase	断路器回路 (接地开关连接排至极柱静触头) Breaker circuit (grounding switch connection row connected to pole static end)	μΩ	≤30
	隔离回路 (极柱静触头至隔离刀下方的连接排) Isolation circuit (pole static contact connected to connection row under isolation knife)		≤40

## Technical Parameters for Grounding Switch 接地开关技术参数

项目 Item	单位 Unit	参数 Parameter
合闸三相不同期 Three-phase closing desynchronization	ms	≤3
触刀正压力 Contact knife positive pressure	N	200±20
断口开距 Contact opening distance	mm	≥400
手动分、合闸力矩 Manual switch closing/opening torque	N.m	≤250



1. 隔离刀 Isolating knife
2. 操作机构 Operating mechanism
3. 真空断路器 Vacuum circuit breaker
4. 传感器 Sensor
5. 接地刀 Grounding knife
6. 传感器 Sensor

注: 1. 使用场所: 海拔 ≤ 2000m;

Note: 1. Application location: Altitude ≤ 2000m;

2. 位置说明 Position description:

- ① 可开闭前门 Front door can be opened and closed;
- ② 可操作接地开关 Grounding switch can be operated;
- ③ 可操作隔离开关 Isolating switch can be operated;
- ④ 可操作断路器 Circuit breaker can be operated.

3. 图示联锁销在位置③, 断路器、隔离、接地开关均处于分闸状态;

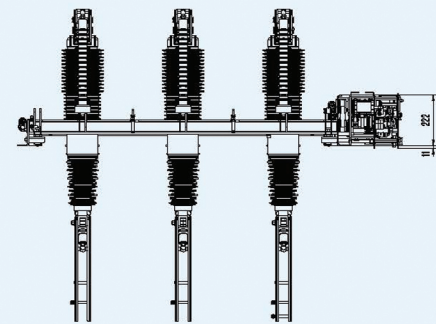
The interlocking pin shown in the figure is at position ③. Circuit breaker, isolation and grounding switches are all in the opening state;

4. 面板尺寸为 241mm x 688.5mm, 推荐柜门开孔尺寸 227mm x 674.5mm, 即每边留 7mm;

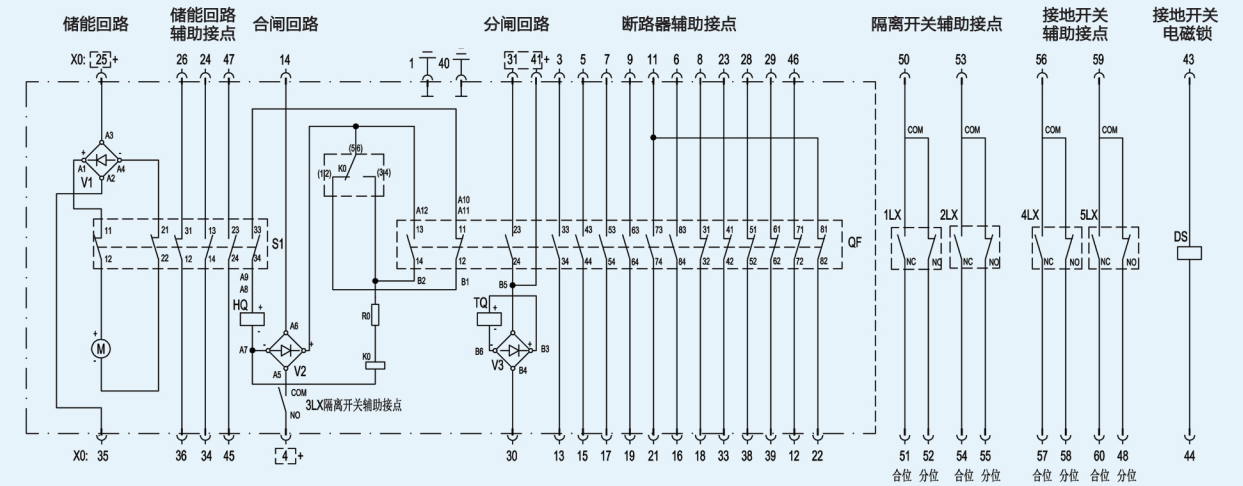
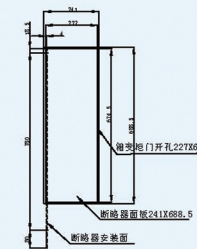
The panel size is 241mm x 688.5mm, and the recommended opening size of the cabinet is 227mm x 674.5mm, that is, 7mm left on each side;

5. 项4、项6为传感器且未把二次线接到带电显示器上, 对应三相传感器二次线必须接地。

Items 4 and 6 are sensors and their secondary wires are not connected to the live display. The secondary wires of the corresponding three-phase sensors must be grounded.



箱变柜门开孔示意



储能回路 Energy storage circuit

储能回路辅助接点 Auxiliary contacts of energy storage circuit

合闸回路 Switch closing circuit

断路器辅助接点 Auxiliary contacts of breaker

分闸回路 Switch opening circuit

隔离开关辅助接点 Auxiliary contacts of isolation switch

接地开关辅助接点 Auxiliary contacts of grounding switch

接地开关电磁锁 Electromagnetic lock of grounding switch

HQ: 合闸线圈 Switch closing coil

TQ: 分闸线圈 Switch opening coil

RO~R1: 电阻 Resistance

V1~V4: 桥式整流器(直流时取消) Bridge rectifier (cancelled for DC)

M: 储能电机 Energy storage motor

K0: 防跳继电器 Anti-jumping relay.

S1: 辅助开关(合闸弹簧储能后切换) Auxiliary switch (switchable after closing spring stores energy)

QF: 辅助开关(断路器分闸操作时切换) Auxiliary switch (switched after breaker's closing/opening operation)

1LX~2XL: 行程开关(隔离开关分合时切换) Travel switch (switched at isolating switch opening and closing)

3XL: 行程开关(断路器可操作位切换) Travel switch (for switching of breaker operating position)

4LX~5XL: 行程开关(接地开关分合时切换) Travel switch (switched when the grounding switch is opened and closed)

DS: 电磁锁 Electromagnetic lock

A1~A12, B1~B10: 线路板端子 Circuit board terminals

注 Note:

1. 图示二次回路未加电;

The secondary circuit shown in the figure is not powered on;

2. 断路器处于分闸状态、机构未储能、隔离开关处于分闸状态、接地开关处于分闸状态;

Breaker is in the opening state, the mechanism fails to store energy, the isolating switch is in the opening state, and the grounding switch is in the opening state;

3. 3LX 仅在断路器可操作位方闭合。

3LX can only be closed when the circuit breaker is at operable position.

4. 当为直流电源操作时, 虚线框中的极性应相同, 电机应按图示极性接线。

When operating with DC power supply, the polarity in the dashed box should be the same, and the motor should be wired according to the polarity shown in the figure.