ECC®

HXGN15

交流金属封闭开关设备(SF6环网柜)

AC Metal-enclosed Switchgear (SF6 ring main unit cubicle)

中国·上海中科电气集团

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上海人民电力设备股份有限公司

SHANGHAI RENMIN ELECTRIC POWER EQUIPMERIL CO., LTD.

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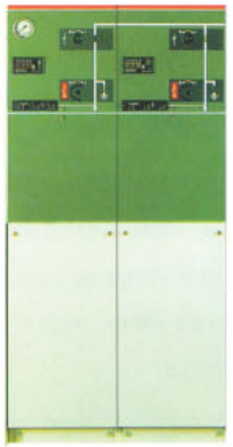


型号说明

H X G N - 15 S 6

- 6：额定电流:6–630A,12–1250A
  Rated current:
- S：开关组件:S–负荷开关，V–断路器
  Set assemblies: S - Load break switch, V - circuit breaker
- 15：额定电压:12kV,17.5kV,24kV
  Rated voltage:
- HXGN：环网开关柜
  Ring main unit cubicle

概述

HXGN系列中压开关柜是引进ABB技术、基本组件全部采用原装进口ABB产品–SFL型负荷开关、VD4–S型真空断路器及HAR/US断路器等。该产品现已能过国家高压电路电器质量监督检验中心的型式试验，完全能满足城市电网和工业的二次配电网络的供电要求。

运行环境

- 环境温度：–10–+40℃；
- 海拔高度：1000m以下；
- 相对湿度：95%以下；
- 周围空气应不受腐蚀性或可燃气体、水蒸气等明显污染；
- 无经常性的剧烈震动。

执行标准

- GB3906-1991　3–35kV交流金属封闭开关设备
- GB3804-1990　3–63kV交流高压负荷开关
- GB16926-1997　交流高压负荷开关–熔断器组合电器
- DL/T539-1993　户内交流高压开关柜和部件凝露及污秽试验
- IEC　56，129，265，289，420，529，694，932

General

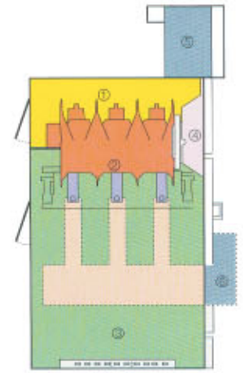
Manufactured with introduced ABB technology, HXGN Series Medium Voltage Switchgear consists its basic components and assemblies all imported originally from ABB such as SFL Load-break Switch, VD4-S Vacuum Circuit Breaker and HAR/US Circuit Breaker and so on. This Switchgear has successfully passed the Type Test conducted by China National High Voltage Apparatus Quality Supervision and Inspection Center and fully satisfies the power supply requirements of industrial secondary distributing systems and urban network.

Working conditions

- Ambient temperature: -10 ~ +40℃
- Altitude: Below 1000 meters above sea level
- Relative humidity: Less than 95%
- No apparent pollution in ambient atmosphere such as corrosive or flammable gases and water vapors.
- No constantly severe shocks

Applicable Standards

- GB 3906-1991　"3-35kV AC Metal-enclosed Switchgear"
- GB 3804-1990　"3-63 kV AC High Voltage Load-break Switch"
- GB 16926-1997　"Combined Apparatus of AC High Voltage Load-break Switch - Fuse Bank"
- DL/T 539-1993　"Component Condensation and Pollution Test on Indoor AC High Voltage Switchgear"
- IEC　56, 129, 265, 289, 420, 529, 694 and 932.



外型

本产品采用2mm钢板弯制成型，骨架各零部件表面均镀锌钝化处理，外表美观，抗腐蚀性能好。柜内分成五个小室，后面板设置两个压力释放口。

间隔小室

- 母线室：位于柜体上部，与相领柜连接；
- 负荷开关室：负荷开关是一个独立组件，采用ABB公司生产的SFL型SF6负荷开关；
- 电缆室：位于柜体下部，用于安装电缆、熔断器、接地开关、电流互感器、电压互感器等元件。
- 操作机构室：位于环网柜前上部，室内装有SF6负荷开关的手动操作机构，可电动操作；
- 低压室：位于柜体顶部，可以根据用户需要安装仪表、继电器及负荷开关电动操作机构的电动组件；
- 断路器室：一个断路器能置于负荷开关的下方。

压力释放口

压力释放设计分上下两个释放口，分别用于释放母线和负荷开关室、电缆室发生故障时产生的气体压力。

产品设计的优点

- 确保人身安全：
  - 内燃弧承受指标符合IEC 60298，附件AA有关规定。
  - 可视性接地功能。
  - 开关有合/分双功位置，闭锁直接可靠。
  - 开关位置指示器。
- 环境适应性强：
  - IP2XC防护等级。
  - 可拆装，密封性好，带金属型的熔断器室。
- 质量可靠：
  - 技术性能符合国际标准，中国国家标准。
  - 具有ISO9001国际质量保证体系的证书。
  - 具有国家定点生产许可证，产品列入国家经贸委两网改造设备的推荐目录。
- 环境保护：
  - 开关使用寿命终了时，SF6气体可回收。
  - 可符合ISO14001国际标准的有关规定。
- 安装快速简便：
  - 完全功能组合，可随意扩展。
  - 柜子有4个底脚螺栓，固定简便。
- 免维护（活动部件）：
  - 密封压力符合IEC 60298标准附件GG的有关规定。

Overall

Cubicle frame is made of 2mm sheet steel by bending and shaping machining. Surfaces of each component are treated with zinc plated and passivated. Consequently, the cubicle frame is good looking with high corrosion proof capacity. The cubicle frame may be divided into five compartments, and on rear panel, there are two openings for pressure release.

Compartment

- Busbar compartment: located in the upper part of the cubicle and connected to adjacent cubicles.
- Load-break switch compartment: As an independent assembly, the load-break switch is SFL Type SF6 one by ABB.
- Cable compartment: located in the lower part of the cubicle, used to hold cable, fuses, earth switches, PTs, CTs and others.
- Operating mechanism compartment: located in the upper part of the ring main unit cubicle for the operating mechanism both manual or motor-driven for SF6 load-break switch.
- Low voltage compartment: located in the top of the cubicle to hold instruments and meters, relays, motor-driven parts for the mechanism.
- Circuit breaker compartment: located beneath the load-break switch to hold one circuit breaker.

Pressure release vent

There are two pressure release vents situated at the upper and lower part respectively for gas pressure release of busbar, load-break switch compartments and cable compartment caused by internal faults.

The advantages of the design

- Assurance of personal safety:
  - Withstand internal arcing index in compliance with relevant regulations in attachment AA of IEC 60298;
  - Visual earthing function;
  - On/Off dual position of circuit breaker resulting in direct and reliable block;
  - With breaker status indication.
- Adaptability in environments:
  - IP2XC for degree of protection;
  - Removable and well hermetical metal fuse compartment.
- Reliable quality:
  - Technological performance in compliance with international and national standards;
  - With certificate of ISO international quality assurance system;
  - with national fixed point production and supplier license and the product is listed in the recommended catalogue for urban and rural power supply network renovation schedule of China National Economic and Trade Commission.
- Environmental protection:
  - When the circuit breaker reaches to its life time, SF6 gas is reclaimed;
  - In conformity of requirement in ISO 14001.
- Easy and quick installation:
  - Full function combination and extension;
  - Four foot bolts on the cubicle providing easy and quick installation.
- Maintenance free for movable parts:
  - The hermetical pressure in compliance with relevant regulations of standard attachment of IEC 60298.

技术特性
Technical parameters

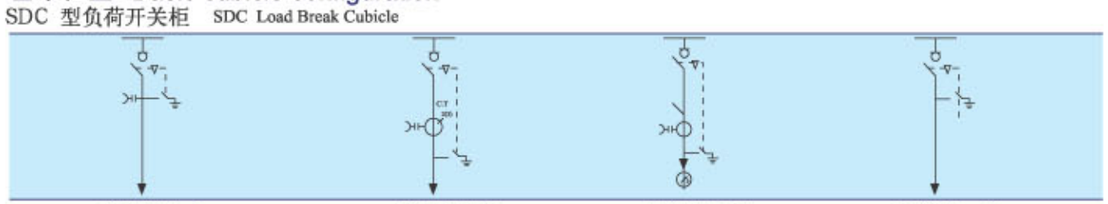
电气参数 Electric Parameters				
额定电压 Rated voltage:	kV	12	17.5	24
额定雷电冲击耐压 Rated lightning impulse withstand voltage				
相间，相对地 Between phases, phase to earth	kV	75	95	125
额定1分钟工频耐压 Rated 1min power frequency withstand voltage				
相间，相对地 Between phases, phase to earth	kV	42	42	50
频率 Frequency	Hz	50/60	50/60	50/60
额定电流 Rated current	A	630	630	630
开断百分之五额定有功电流 5% rated active breaking current	kA	31.5		
额定母线电流 Rated busbar current	A	630	630	630
热稳定电流 Short time withstand current	kA/s	20/3		
短路关合电流 Short circuit making current	kA	50		
转移电流 Transferring current	A	1700		
环境温度 Ambient temperature	℃	35	35	35
防护等级 Degree of protection		IP2XC	IP2XC	IP2XC
尺寸 Dimensions				
断路器柜宽 Width of circuit breaker cubicle	mm	750	750	750
其它柜宽 Width of other cubicle	mm	375/500	375/500	375/500
高 Height	mm	1600/1850	1600/1850	1600/1850
深 Depth	mm	980	980	980
低压箱高 Height of low voltage cubicle	mm	450	450	450

重量 (kg) Weight (kg)

尺寸:(宽×深×高mm) Dimension (W×D×H)	SDC	SDF	CBC	DBC	SEC	BRC
-375×980×1600	225	230	-	-	-	-
-500×980×1600	230	235	-	163	215	190
-375×980×1850	240	245	-	173	225	200
-750×980×1600	-	-	519	-	-	-
-750×980×1850	-	-	528	-	-	-

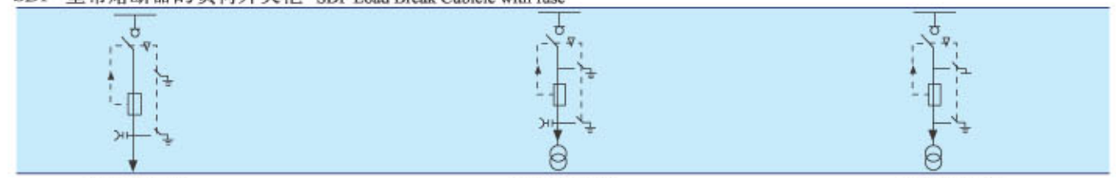
基本柜型 Basic cubicle configuration

SDC 型负荷开关柜 SDC Load Break Cubicle



柜型代号:1 Cubicle Code No. :1
柜型代号:1A Cubicle Code No. :1A
柜型代号:1B Cubicle Code No. :1B
柜型代号:1C Cubicle Code No. :1C

SDF 型带熔断器的负荷开关柜 SDF Load Break Cubicle with fuse

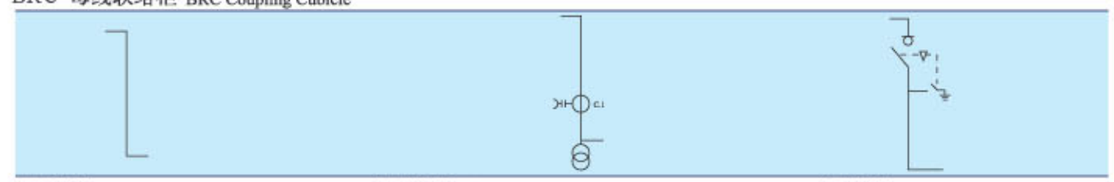


柜型代号:2 Cubicle Code No. :2
柜型代号:2A Cubicle Code No. :2A
柜型代号:2B Cubicle Code No. :2B

DBC 电缆出线柜 DBC Cable Outgoing Cubicle

柜型代号:3 Cubicle Code No. :2

BRC 母线联络柜 BRC Coupling Cubicle

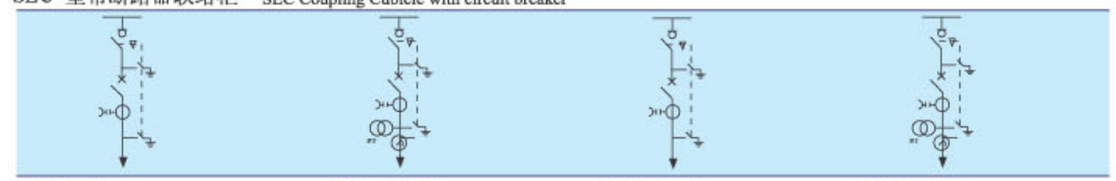


柜型代号:4 Cubicle Code No. :4
柜型代号:4A Cubicle Code No. :4A
柜型代号:4B Cubicle Code No. :4B

SEC 型联络柜 SEC Coupling Cubicle

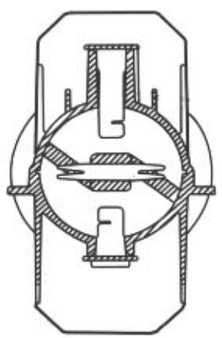
柜型代号:5 Cubicle Code No. :5
柜型代号:5A Cubicle Code No. :5A
柜型代号:5B Cubicle Code No. :5A
柜型代号:5C Cubicle Code No. :5C

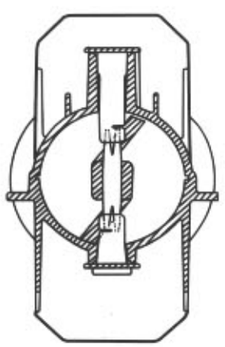
SEC 型带断路器联络柜 SEC Coupling Cubicle with circuit breaker



柜型代号:6 Cubicle Code No. :6
柜型代号:6B Cubicle Code No. :6B
柜型代号:7A Cubicle Code No. :7A
柜型代号:7B Cubicle Code No. :7B

原装进口ABB组件 Imported original ABB assembly





SFL型负荷开关

SFL型负荷开关是双断点、旋转式触头，以SF6气体为灭弧介质，动静触头置于加强结构的模铸环氧树脂外壳中。在操作轴引出端是一个透明的热压成型的塑料端盖，透过它可以观察触头状态。

每个开关充以1.4巴气压的SF6气体后是永久密封的（SFL意"永远密封"），用氨检测器可以检查有无气体渗漏。

开关垂直，水平安装不限，在单元式柜内，典型的安装方式是在电缆室和母线之间置一钢隔板，水平安装。这种安装方式将开关外壳封在接地的钢板围内并将母线与电缆接头之间隔离以符合运行维护的最严格的安全要求。

假若内部发生燃弧在外壳后部有一个结构薄弱点，它将被冲开，把电弧气体导出开关之外，随后柜上面的泄弧活门冲开并将过压气体导向柜外。

- 可选的装备
- 辅助触点2常闭2常开+扩展2常开2常闭
- 分励脱扣线圈供带A机构的SFL。
- 开关型号：
- 选K机构的开关：
  SFL12/17.5K 1VDP575305R1
  SFL24K 1VDP575304R1
- 选A机构的开关：
  SFL12/17.5K 1VDP575303R1
  SFL24A 1VDP575302R1

SFL Load Break Switch

With double breaks and rotating movable contacts, SFL Load Break Switch takes SF_6 gas as arc quenching medium, enclosing both its movable and fixed contacts in a re-enforced epoxy resin injected case. At one end of operating shaft, there is a transparent plastic end cover shaped by thermal pressing. Through this end cover, one may watch contact status.

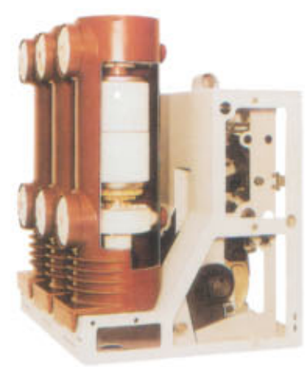
Each switch is filled with SF6 gas with a pressure of 1.4 bar and then permanent sealed. SFL is an acronym for "seal forever" in German. Gas leakage may be detected with an ammonia detector.

The switch may be installed vertically or horizontally. In a unit cubicle, the typical assembly is horizontally mounted switch with a steel partition between cable compartment and the busbar. AT this, the switch enclosure is enclosed in an earthed sheet steel circle with isolation between busbar and cable gland. This complies with most sever safety requirement.

If there is an internal arcing and there is a weak point in structure at rear of the enclosure, the weak point will be broken through and arcing gas will be lead out of the switch. Then the arc release plate will be open and the gas will be lead out of the cubicle.

- Optional components
- Auxiliary contact: 2NC 2NO + expending 2NO 2NC;
- Shunt tripping coil is provided to SFL with Mechanism A.
- Switch type:
- With Mechanism K:
  SFL 12/17.5 K 1VDP575305R1
  SFL 24K 1VDP575304R1
- With Mechanism A:
  SFL 12/17.5 K 1VDP575303R1
  SFL 24K 1VDP575302R1

VD4-S真空断路器 VD4 - S Vacuum Circuit Breaker



VD4-S型真空断路器是专为单元开关柜设计的，其开断容量足以应付各种状态，包括正常投切设备或分支网络的操作以及特殊情况下开端短路等。

真空断路器对在工作电流范围内频繁操作的网络尤为适用。VD4-S真空断路器配有弹簧操作机构具有重合闸功能（分-合分-合分），并且动作可靠，寿命长。整修断路器包括三只真空开关，整个断路器包括三只真空开关，外部是树脂绝缘筒，立式结构。

电弧的熄灭是由于灭弧触头的螺旋形沟槽使电弧产生强制性移位的结果，由于开关绝缘筒内最低静态真空度是10^{-4}至10^{-8}毫巴，所以尽管开关触头间相对只有不大的空隙，却可以得到很高的绝缘强度。电弧在短路电流过第一个零点是熄灭。

由于触头间隙小，弧压降处金属气化等离子区导电率高，加上燃弧时间短，使得电弧能量极低，这对触头乃至整个开关寿命的延长是有利的。

- 标准装备：
- 手动操作
- 电动操作
- 辅助触点2常开2常闭
- 分励跳闸带位置接点
- 分励合闸线圈
- 可选装备：
- S5或PR512过流继电器
- 低电压脱扣器
- 连锁线圈
- 断路器型号：
- VD4 1206-20S
- VD4 1706
- VD4 2406

Specially designed for unit cubicle, VD4 - S Vacuum Circuit Breaker has enough breaking capacity to deal with various situations including switching on and off equipment in normal conditions, operating branch network and breaking short current in particular conditions.

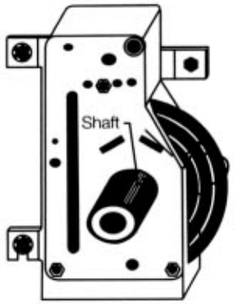
The vacuum circuit breaker is especially suitable for frequent operating network in scope of working current. It is equipped with a kind of operating mechanism that has reclosing function (O - CO - CO) with reliable operation and long endurance. The circuit breaker contains three vacuum switching devices in a vertical structure with resin insulating column outside.

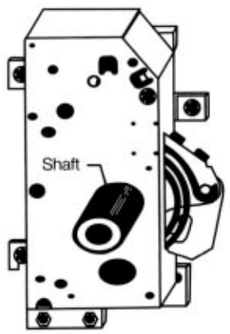
The extinguishment of arc results from enforced displacement of an arc due to conical slot of arcing contacts. Since the minimum static vacuity in insulating column is about 10-4 to 10-6 millibar, very high dielectric intensity is achieved though a relative short gap between contacts of the circuit breaker. The arc goes out when the short circuit current passes the first zero current point.

Small gap between contacts make the plasma zone high electric conductivity when metal evaporating at the point of arc voltage drop. All these plus short arcing time brings very small arc energy, which is good for elongation of endurance of contacts up to the whole circuit breaker.

- Typical device mounted:
- Manual operation
- Motor-driven operation
- Auxiliary contacts: 2 NO and 2 NC
- Shunt trip with position contacts
- Shunt closing coil
- Optional device:
- S5 or PR512 Overcurrent Relay
- Undervoltage trip
- Interlocking coil
- Type of the circuit breaker:
- VD4 1206 - 20S
- VD4 1706
- VD4 2406

K和A型操作机构 Type K and Type A Operating Mechanisms





本机构是用于操作负荷开关和带熔断器的负荷开关。

◆ K型机构

K型机构是用于负荷开关合分操作的单弹簧机构。开关的合分是通过弹簧储能经由死点来实现。K型机构可以选择马达来实现电动操作。

◆ A型机构

A型机构是双弹簧机构，其中一个是用于开关合闸，而另一个则用于开关分闸。在开关用合闸簧合闸之前先要置于储能状态，合闸操作后使分闸簧自动置于储能状态。于是可以用手动，分励脱扣线圈或是熔断器撞针等去跳闸。

◆ 机构型号

* 用于负荷开关，：
* 用于带熔断器的负荷开关：

◆ 可选装备

* 在K机构上用马达操作

These mechanisms are used for operation of load-break switch and load-break switch with fuses respectively.

◆ Type K Operating Mechanism

Type K Operating Mechanism is a single spring mechanism used for open and close operations of a load-break switch. The open and close operations of the switch is realized through energy-charging in a spring via a dead point. It may be motor-driven.

◆ Type A Operating Mechanism

Type A Operating Mechanism is a double spring mechanism with one spring for closing and another for opening. Prior to close operation, the closing spring must be fully charged, and after close operation, the opening spring is automatically placed in the charging status. Hence open operation may be done by hand, by shunt tripping coil or by fuse knocking needle.

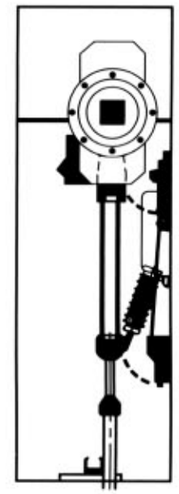
◆ Type of operating mechanism

* For load-break switch:
* For load-break switch with fuse:

◆ Optional device

* Motor-driven device for Type K.

熔断器及其配件 Fuse and its accessories



HXGN开关柜系列设计选用高开断容量限流或熔断器，符合IEC282-1标准，其外壳尺寸符合DIN43625，管身长"e"在12kV为292mm，在24kV为442mm用于保护变压器的熔断器规格的选择依下表。

熔断器下触座装在绝缘子上，这些绝缘子能选择带或不带电容电压抽取装置。

熔断器上触座直接固定在负荷开关上，里面装有熔断器撞针驱动的脱扣装置。

HXGN Series Switchgears adopt high breaking capacity current limiting devices or fuses in compliance with IEC 282-1. The overall dimensions conform to DIN 43625 with the tube height of e part 292mm for 12kV and 442mm for 24kV. The selection of specification of fuse for protection of transformer is as following table.

The lower contact holder of the fuse is mounted on insulator with or without capacitor voltage tap device on option.

The upper contact holder of fuse is directly fixed on the load-break switch, inside of which there is a tripping device for fuse knocking needle driver.

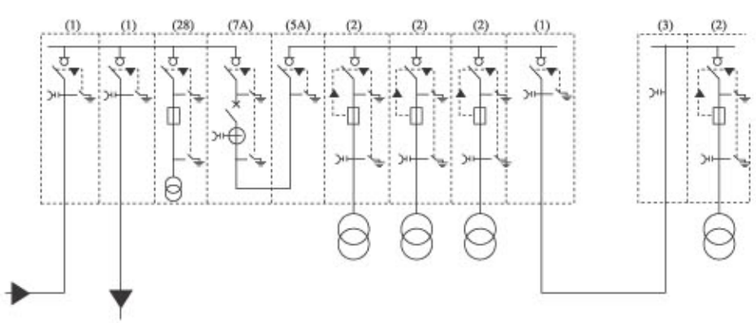
熔断器选择：根据IEC 420　Selection of fuse: As per IEC 420

工作电压 kV Working voltage	变压器额定容量 Rated voltage:															
	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
	熔断器选择（标称值为安培）Selection of fuse (value in amperes)															
3	25	25	40	40	63	63	63	80	100	100	160					
5	16	25	25	25	40	40	63	63	63	80	100	100	160			
6	16	16	25	25	25	40	40	63	63	63	80	100	100	160		
10	10	16	16	16	25	25	25	40	40	63	63	63	80	100	100	
12	10	16	16	16	16	25	25	25	40	40	63	63	63	80	100	
15	10	10	16	16	16	16	25	25	25	40	40	63	63	63	100	
20	10	10	10	16	16	16	16	25	25	25	40	40	63	63	63	80
24	10	10	10	10	16	16	16	16	25	25	25	40	40	63	63	63

技术数据
Technical Parameters

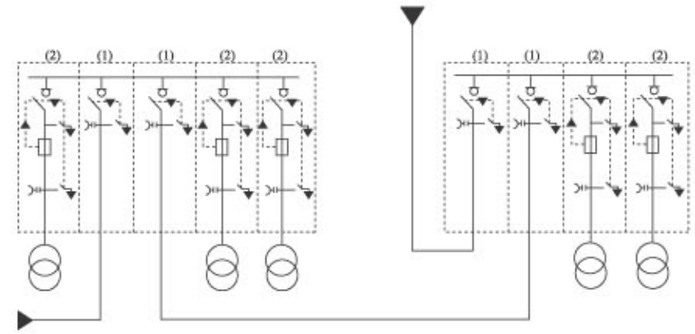
SFL负荷开关 SFL Load-break Switch				
额定电压 Rated voltage:	12 kV	17.5kV	24kV	
冲击耐压 Impulse withstand voltage	(kV)	75	95	125
交流耐压 Power frequency withstand voltage	(kV)	28	38	50
额定电流 Rated current	(A)	630	630	630
关合容量 Making capacity	(kV)	50	50	40
热稳定电流 Short time withstand current	(kA/S)	20/3	-	-
开断容量 Breaking capacity	(A)	1700		
最大熔断量 Max. fuse	(A)	125		
极距 Pole clearance	(mm)	210	210	210
VD4-S断路器 VD4-S Vacuum Circuit Breaker				
额定电压 Rated voltage	12 kV	17.5kV	24kV	
冲击耐压 Impulse withstand voltage	(kV)	75	95	125
工频耐压 Power frequency withstand voltage	(kV)	28	38	50
额定电流 Rated current	(A)	630	630	630
热稳定电流 Short time withstand current	(kA/S)	20/3	-	-
极距 Pole clearance	(mm)	210	210	210

安装参考 Reference for Installation



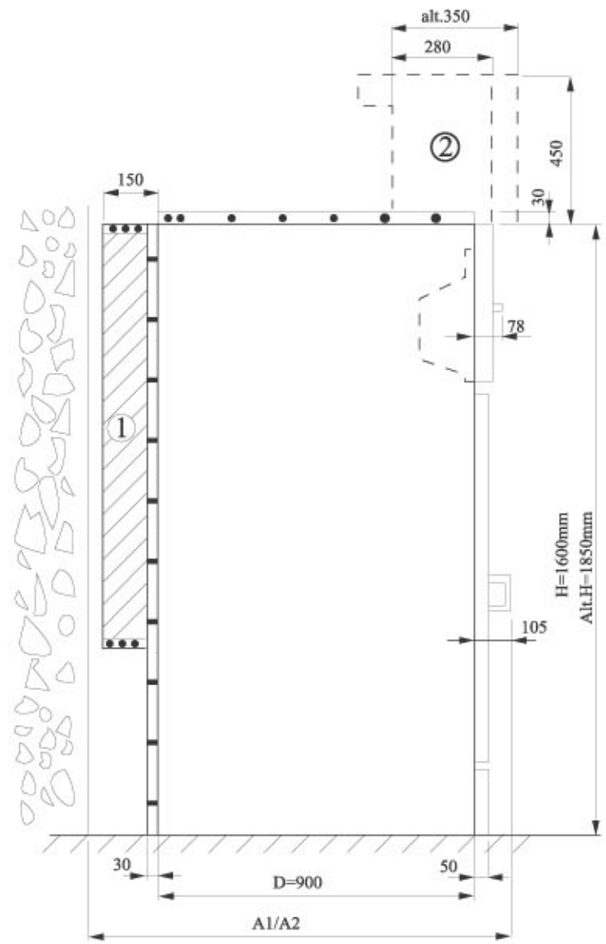
◆ 柜说明:

- 负荷开关柜带熔断器的负荷开关柜
- 2B带熔断器P.T的负荷开关柜
- 电缆出线柜
  5A联络柜
  7A带断路器的联络柜



◆ 柜说明:

- 负荷开关柜
- 带熔断器的负荷开关柜



◆ 柜布置图

- 柜前到墙最小距离
  A1=1150mm(没有气体通道)
  A1=1200mm(带气体通道)
- 电弧气体通道(可选)
- 低压箱(可选)

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