Summary

SRM16-40.5 series switchgear is indoor 12~40.5kV three-phaseAC50Hz. As a complete set of equipment for receiving and distributing electric energy, it is a new generation of switchgear products produced by our company. It is mainly used for power transformation and transmission of medium voltage power systems such as various power plants, substations, industrial and mining enterprises, subways, civil and commercial buildings for control, protection and monitoring. It is characterized by reliable performance, strong adaptability and small size.

Environmental conditions

◆ Ambient air temperature

Maximum temperature:40C; Minimum temperature: -25°C; The average value measured within 24h shall not exceed 35C.

◆ Relative humidity

The average value of relative humidity measured within 24h shall not exceed 95%;
The average monthly relative humidity shall not exceed 90%;
Condensation may occur when the temperature changes rapidly during high humidity;
The average value of water vapor pressure measured within 24h shall not exceed 2.2kPa;
The average monthly water vapor pressure shall not exceed 1.8kPa;

◆ Altitude

The altitude of the equipment installation site shall not exceed 1000m.

◆ The seismic intensity shall not exceed 8 degrees.

◆ The amplitude of electromagnetic interference induced in the secondary system shall not exceed 1.6kV.

◆ The surrounding air is not obviously polluted by dust, smoke, corrosive and combustible gases, steam or salt mist.

Note: When the use conditions exceed the above provisions, the solution can be determined through consultation with the user.

Compliance with standards

GB3906-2011 3.6kV~40.5kVAC Metal Enclosed Switchgear and Control Equipment
DL/T404-1997 Technical Conditions for Ordering Indoor AC High Voltage Switchgear
IEC 62271-200:2003AC metal enclosed switchgear and control equipment with rated voltage above 1kV and below 52kV
1016001/003-0000-00General Technical Specifications for 12kV, 24kV and 40.5kV High Voltage Switchgear of State Grid Corporation of China

开关柜主要技术参数 Main technical parameters of switch cabinet

表 1 Table 1

名称 Name			单位 Unit	参数 Parameter	
额定电压 Rated voltage			kV	12	40.5
额定电流 Rated current			A	1250~3150	1250~2500
额定频率 Rated frequency			Hz	50	
额定短时耐受电流 Rated short-time withstand current			k/Vs	25、31.5	
额定峰值耐受电流 Rated peak withstand current			kA	63、80	
额定短路电流持续时间 Rated short-circuit current duration			s	4	
额定短路开断电流 Rated short-circuit breaking current			kA	25、31.5	
额定短路关合电流 Rated short-circuit making current			kA	63、80	
燃弧持续时间 Duration of arcing			s	0.5	
机械寿命 Mechanical life	断路器 Circuit breaker		次 Times	2000	10000
	隔离开关 Isolating switch			3000	
	接地开关 Earthing switch			3000	
断路器电寿命 Electrical life of circuit breaker			次 Times	30	
额定充气压力（20℃表压）Rated inflation pressure (20℃ gauge pressure)			MPa	0.05	
最低功能压力（20℃表压）Minimum functional pressure (20℃ gauge pressure)				0.03	
SF_6 气体年泄漏率 Annual leakage rate of SF_6 gas			-	≤ 0.5%	
额定绝缘水平 Rated insulation level	额定工频 1min 耐受电压（有效值）Rated power frequency 1min withstand voltage (effective value)	相间，相对地 Phase to phase	kV	42	95
		隔离断口、真空断口 Isolation fracture, vacuum fracture		48	118
	额定雷电冲击耐受电压（峰值）Rated lightning impulse withstand voltage (peak value)	相间，相对地 Phase to phase		75	185
		隔离断口、真空断口 Isolation fracture, vacuum fracture		85	215
辅助控制回路 Auxiliary control circuit	额定电压 Rated voltage		V	DC:110、220 AC:110、220	
	1min 工频耐压 1min power frequency withstand voltage			2000	
柜体防护等级 Cabinet protection grade	柜体外壳 Cabinet shell		-	IP4X	
	充气隔室 Inflatable compartment		-	IP65	

名称 Name		单位 Unit	参数 Parameter	
丧失运行连续性类别 Category of loss of operation continuity		-	LSC2B	
温升试验 Temperature rise test		A	1.1Ir	
主回路电阻 Main circuit resistance	1250	μΩ	85	100
	2000			65
	2500		60	60
	3150		50	
局部放电 Partial discharge	试验电压 Test voltage	kV	1.1×12/ √3	1.1×40.5/ √3
	单个绝缘件 Single insulating element	pC	≤ 3	
	整机 Complete machine		≤ 50	
使用寿命 Service life		年 Year	≥ 30	

Note:

a) The rated short-circuit breaking current of 40.5kV/2000A is 31.5kA; Rated short-circuit breaking current of 12kV/3150A is 31.5kA;

b) The parameters of rated peak withstand current and rated short-time withstand current of current transformer shall be assessed separately;

c) The loop resistance refers to the measured value measured from the outgoing line of the bus coupler socket (including the bus coupler) to the outgoing line side of the cable socket (including the current device). When the bus coupler and the current device are not included, the value in the table is subtracted by 20.

Inflatable compartment parameters

1) The operating pressure of the pressure relief device of the inflatable compartment is 0.2MPa~0.25MPa;

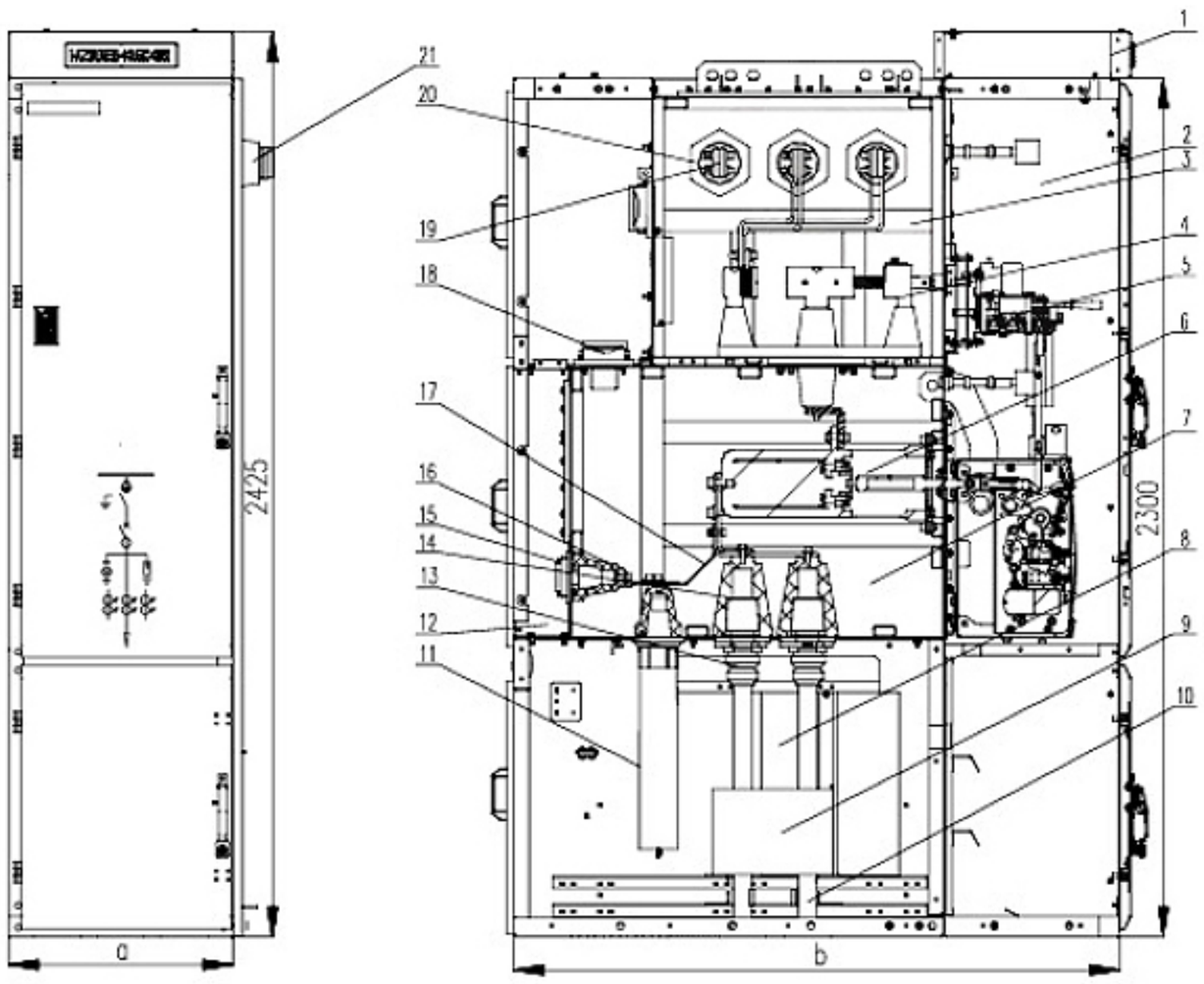
2)The water content of SF6 gas shall be no more than 250ppm after standing for 38 hours after inflation of the inflatable compartment, and the water content of SF6 gas shall be no more than 1000ppm during site acceptance. See DL/T 603-20060for reference standards.

Cabinet structure description

The switchgear is an assembled metal enclosed switchgear with low pressure SF6 gas insulation for the main circuit and vacuum circuit breaker for the main switch. The inflatable compartment is dividedinto two compartments, the circuit breaker compartment and the main busbar compartment. All main circuit elements (vacuum circuit breaker, three position disconnector),main bus and branch bus are installed inside the inflatable compartment. The switch cabinet structure can be divided into circuit breaker inflatable compartment, main bus inflatable compartment, cable compartment, operating mechanism room, instrument room, small bus compartment, etc. according to its functions. The inflatable compartment and cable chamber are equipped with independent pressure release channels to maximize personal safety and equipment operation.

The circuit breaker inflation compartment and the main bus inflation compartment of the switch cabinet are welded with thin high-quality stainless steel plates, and the switch cabinet shell is assembled after being bent and formed with high-quality steel plates.

开关柜外形及结构示意图 Outline and structure diagram of switch cabinet



1. 小母线室 Small bus room
2. 仪表室 Instrument room
3. 主母线充气隔室 Inflatable compartment of main bus
4. 工位隔离开关 Station disconnector
5. 操作机构室 Operating mechanism room
6. 断路器 Circuit breaker
7. 断路器充气隔室 Inflatable compartment of circuit breaker
8. 电缆室 Cable chamber
9. 电流互感器 Current transformer
10. 电缆 Cable
11. CM-35 避雷器 CM-35 arrester
12. 压力释放通道 Pressure release channel
13. 电缆插头 Cable plug
14. 电缆插座 Cable socket
15. 试验插座堵头 Test socket plug
16. 试验插座 Test socket
17. 分支母线 Branch bus
18. 泄压装置 Pressure relief device
19. 主母线 Main bus
20. 母线联接器插座 Bus coupler socket
21. 母线联接器 Bus coupler

注：a（柜体宽度）：600mm、800mm；

b（柜体深度）：12kV 深度为 1420；40.5kV 深度为 1620。

Note: a (cabinet width): 600mm, 800mm;

b (cabinet depth): 12kV depth is 1420; The depth of 40.5kV is 1620.

The main technical parameters are shown in Table 2. After the circuit breaker is assembled and adjusted, its mechanical characteristic parameters are shown in Table 3. The technical data of the secondary circuit are shown in Table 4. The technical data of the auxiliary switch are shown in Table 5.

名称 Name			单位 Unit	参数 Parameter	
额定电压 Rated voltage			kV	12	40.5
额定绝缘水平 Rated insulation level	1min 工频耐受电压（有效值） 1min power frequency withstand voltage (effective value)	对地、相间 Ground, interphase	kV	42	95
		真空断口 Vacuum fracture		48	118
	雷电冲击耐受电压（峰值） Lightning impulse withstand voltage (peak value)	对地、相间 Ground, interphase		75	185
		真空断口 Vacuum fracture		85	215
额定频率 Rated frequency			Hz	50	
额定电流 Rated current			A	1250~3150	1250~2500
额定短时耐受电流 Rated short-time withstand current			kA	25、31.5	
额定峰值耐受电流 Rated peak withstand current			kA	63、80	
额定短路电流持续时间 Rated short-circuit current duration			s	4	
额定短路开断电流 Rated short-circuit breaking current	交流分量有效值 Effective value of AC component		kA	25、31.5	
	直流分量百分数 DC component percentage			44%	46%
额定操作顺序 Rated operating sequence				分 -0.3s- 合分 -180s- 合分 O-0.3s-CO-180s-CO	
额定短路关合电流 Rated short-circuit making current			kA	63、 80	
额定失步开断电流 Rated out of step breaking current				6.3、8	
额定异相开断电流 Rated out of phase breaking current				21.8、27.4	
额定容性开合电流（C2 级）	额定电缆充电断开电流（有效值）		A	25	50
	额定单个电容器组开断电流（有效值）			800	630
	额定背对背电容器组开断电流（有效值）			400	400
	额定背对背电容器组关合涌流（峰值）		kA	20	20
额定主回路电阻（上、下导电支架间）	1250		μΩ	≤ 30	≤ 30
	2500			≤ 20	≤ 15
	3150			≤ 15	
机械寿命			次 Times	20000	10000
断路器电寿命			次 Times	30	
辅助及控制回路	额定电源电压		V	DC：110、220 AC：110、220	
	额定电源频率		Hz	50	

名称 Name	单位 Unit	参数 Parameter	
额定电压 Rated voltage	kV	12	40.5
合闸时间 Closing time	ms	55±20	55±20
分闸时间 Opening time		27~50	40±15
合、分闸三相不同期 Three phase different periods of closing and opening		≤ 2	≤ 2
合闸弹跳时间 Closing bounce time		≤ 2	≤ 3
分闸反弹幅值 Opening rebound amplitude	mm	≤ 2	≤ 2
合闸速度（刚合前 6mm）Closing speed (6mm before closing)	m/s	0.8±0.2	
合闸速度（刚合前 12mm）Closing speed (12mm before closing)			0.9±0.3
分闸速度（刚分后 6mm）Opening speed (6mm after opening)		1.3±0.3	
分闸速度（刚合后 12mm）Opening speed (12mm after just closing)			1.7±0.2
超行程 Overtravel	mm	5±1	4±1
触头开距 Contact opening		9±1	19±1.5

名称 Name		单位 Unit	参数 Parameter	
额定电压 Rated voltage		kV	12	40.5
线圈操作电压 Coil operating voltage	合闸线圈 Closing coil	v	DC220、110 AC220/110	
	分闸线圈 Opening coil			
线圈功率 Coil power	合闸线圈 Closing coil	w	242	
	分闸线圈 Opening coil			
储能电机功率 Power of energy storage motor		w	70	100
储能电机额定电压 Rated voltage of energy storage motor		V	DC:110、220 AC:110、220	
储能时间 Energy storage time		s	≤ 15	
正常工作电压范围 Normal operating voltage range	储能电机 Energy storage motor	V	85% ~ 110%额定电压	
	合闸线圈 Closing coil			
	分闸线圈 Opening coil		65% ~ 120%额定电压	

表 5 Table 5

名称 Name	型号 Type	规格 Specifications	用途 Purpose
微动开关 S1 Microswitch S1	CSK-AC11	AC 115A/380V	储能位置开关 Energy storage position switch
微动开关 S2 Microswitch S2	F10-16	AC 10A/380V	断路器主触头辅助开关 Auxiliary switch of main contact of circuit breaker

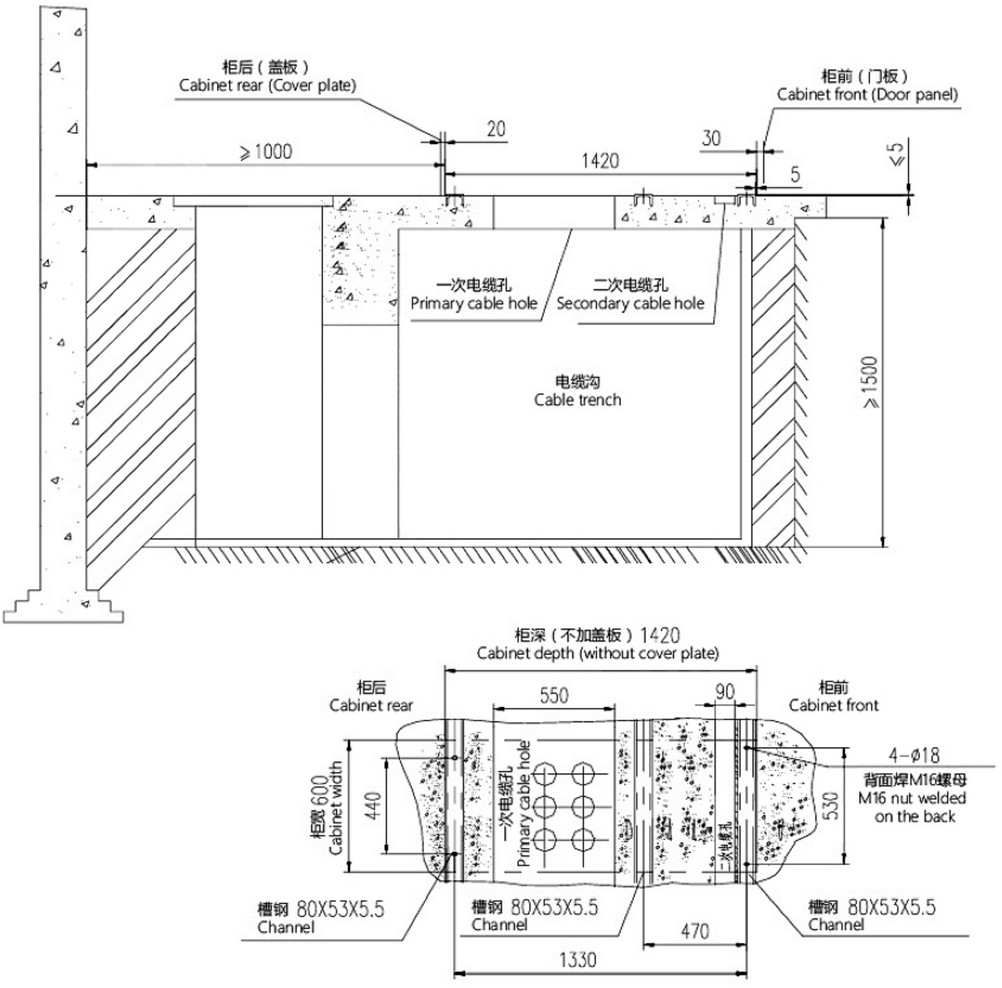
Optional configuration

◇ According to different unit schemes and user requirements, the following configurations can be provided:
◇ Reserved bus expansion and external expansion bus;
◇ Capacitive voltage indicator;
◇ Short circuit and ground fault indicator;
◇ Air pressure indicating device (pointer pressure gauge, density transmitter,etc.);
◇ Electric operating mechanism of three position disconnector;
◇ Auxiliary contact of three position disconnector;
◇ Arrester;
◇ Voltage sensor (with PT for protection);
◇ Current transformer;
◇ Integrated monitoring unit.

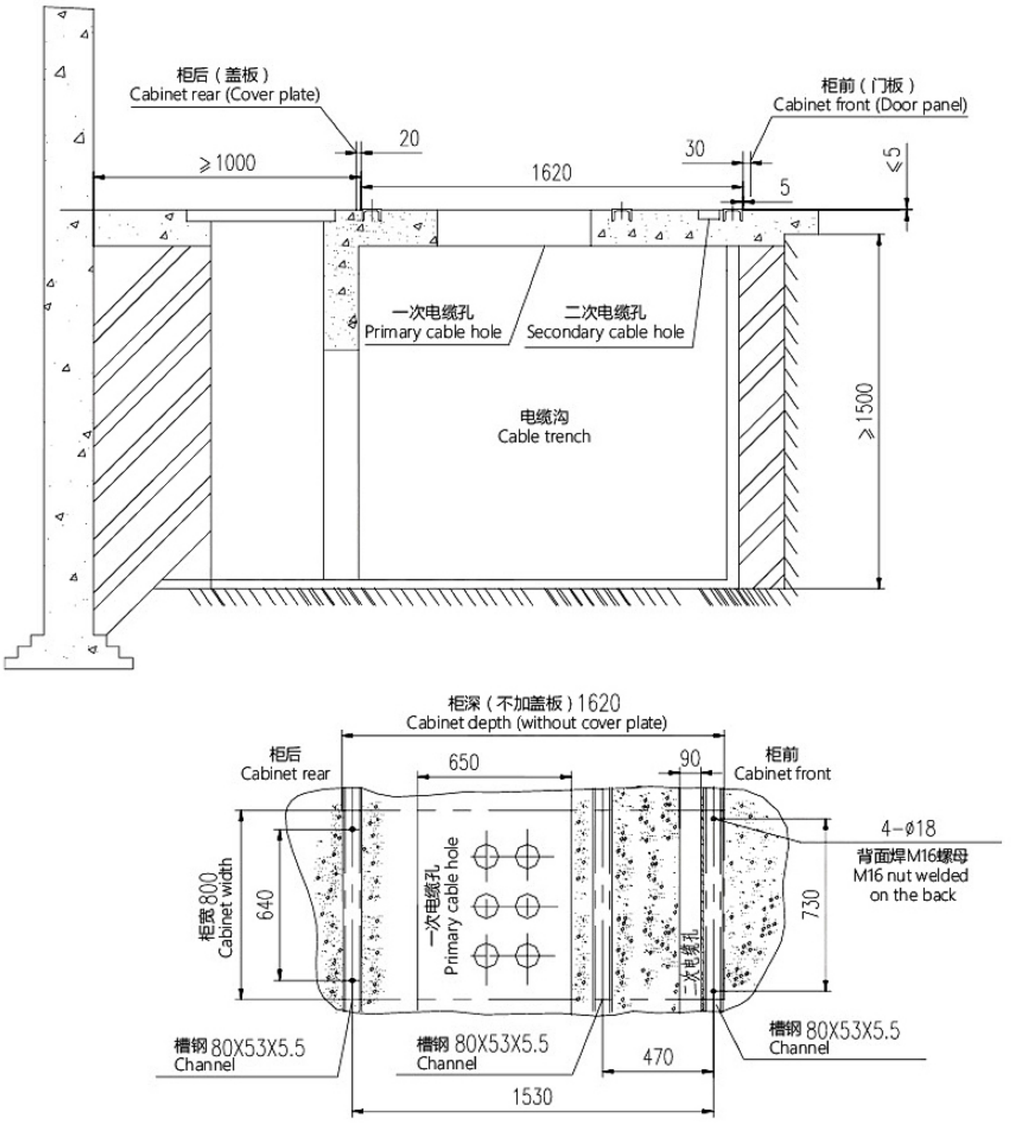
Cabinet installation

SRM16-40.5 series switchgear must be fixed on the ground with four M16x60 bolts. All unit modules are installed in the same way. The schematic diagram of the switchgear foundation is shown in Figure 11.The construction of switchgear installation foundation shall comply with the relevant provisions in the"Technical Code for Construction and Acceptance of Electric Power Construction".The switch cabinet is usually installed in the distribution room, and is fastened on the prefabricated foundation frame of channel steel which is preset on the concrete floor of the distribution room by means of electric welding or bolt connection. The installation of foundation is generally completed by pouring concrete twice. During the first pouring, embedded parts shall be installed for the switch cabinet and the foundation channel steel frame shall be laid. The second concrete is the supplementary layer of the ground. When pouring, the concrete ground height should be 2-5mm lower than the channel steel plane.

◇ The formation of the primary and secondary cable trenches of the switchgear depends on the number of switchgear and building conditions. The construction must be carried out in strict accordance with the foundation drawing provided by us, so as not to affect the consolidation work. When the foundation frame is buried, it is necessary to ensure that:
◇ The flatness tolerance of foundation channel steel shall not be greater than 2mm/m;
◇ The straightness tolerance of the foundation channel steel shall not exceed 2mm/m, and the total deviation within the total length of the frame shall not exceed 5mm/m;
The levelness tolerance of the foundation channel steel shall not exceed - 2mm/m, and the total deviation within the total length of the frame shall not exceed 5mm/m.
After arriving at the site, the service personnel can observe and test the installation foundation. If the above burial conditions are not met, the service personnel shall report to their responsible personnel and communicate with the responsible department of the company to solve the problem, so as not to affect the merging of the switchgear.



12kV开关柜地基示意图
Schematic Diagram of 12kV Switch Cabinet Foundation



40.5kV开关柜地基示意图
Schematic Diagram of 40.5kV Switch Cabinet Foundation

图 11 一次、二次电缆进（出）线基础图
Figure 11 Primary and secondary cable incoming (outgoing) line foundation diagram